

BIOLOGICAL MONITORING AT ST. PAUL ISLAND, ALASKA IN 2017



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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

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November 2017

Cite as: Mong, R. N. and M. D. Romano. 2017. Biological monitoring at St. Paul Island, Alaska in 2017. U.S. Fish and Wildl. Serv. Rep., AMNWR 2017/16. Homer, Alaska.

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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; Thomson et al. 2014, 2015; Mong and Romano 2016).

The specific monitoring goals in 2017 were to estimate productivity and population parameters for five indicator species representing two major feeding guilds: 1) diving fish-feeders (red-faced cormorants [*Phalacrocorax urile*] and common and thick-billed murrens [*Uria aalge* and *U. lomvia*], and 2) surface fish-feeders (black-legged and red-legged kittiwakes [*Rissa tridactyla* and *R. brevirostris*]). 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 2017 monitoring program are contained in the figures and tables of this report and archived at the AMNWR headquarters in Homer, Alaska. Summary data will also be included in the annual Alaska seabird monitoring summary report (e.g., Dragoo et al. 2017). 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 U.S. Fish and Wildlife Service field crew at St. Paul Island in 2017 consisted of Ryan Mong (21 May to 3 September), Brady Deal (21 May to 25 August), and Sarah Gilman (9 July to 3 August).

Data Collection and Analysis: Crew members followed data collection and analysis methods outlined in the annual monitoring camp standardized protocols for 2017 (Alaska Maritime National Wildlife Refuge 2017). 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 22 May and continuing until 2 September. Diet samples were collected from least auklets captured via mist net, as well as red-faced cormorant chicks captured for banding purposes. In addition to the seabird work described above, the monitoring crew compiled a species account of all birds and marine mammals seen in 2017.

Reproductive success and chronology data for kittiwakes and murres 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]). Reproductive success and chronology data for cormorants were summarized by hand. A new productivity plot, 116, was added to the east side of Zapadni in 2017 primarily to monitor red-faced cormorant productivity.

Population data for all ledgenester species was collected in 2017. Tufted and horned puffin population counts were also conducted within the refuge's long term population monitoring plots. Data on puffin attendance has not been collected in the past but was included in 2017 due to the die-off that occurred in 2016. Data collected on all species in both 2014 and 2017 were summarized using the AMNWR population database; population data for ledgenesters in 1975-2011 and all other species in all years have not yet been added to the database and were 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]). Diet is summarized for frequency of occurrence and percent composition for all species. For brevity, presentation of diet data highlights only prey items that make up more than 5% of diets. A more detailed summary of St. Paul diet data is presented in a consolidated refuge-wide diet report (Drummond 2016).

Data for all other parameters were summarized by hand.

The field crew also provided support to other researchers for various projects. In partnership with the National Institute of Standards and Technology, thick-billed murre eggs were collected 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. The crew also assisted with COASST surveys for seabird carcasses coordinated by the St. Paul Ecosystem Conservation Office.

INTERESTING OBSERVATIONS

- Red-faced cormorants, a nearshore benthic feeder, had the highest productivity of all ledgenesting species monitored this season; 71% of nest starts fledged chicks with a fledgling rate of 1.65 chicks per nest start.
- Both black-legged kittiwakes and red-legged kittiwakes experienced complete reproductive failure, with a delayed and exceptionally low laying effort. All eggs were lost before hatching.
- Thick-billed murre had another low productivity year with just 7% of chicks fledging from total eggs laid. The majority of birds lost their eggs within 7 days of laying.
- Similar to last year, least auklets departed the island around July 18, approximately three weeks earlier than historically, presumably due to breeding failure. Parakeet auklets, the most abundant auklet on the island, departed prematurely as well.
- A total of 296 red-faced cormorant nests were observed during the period of 7 June to 3 July, with half of those located within a 600m stretch of coastline below the village water towers. Island-wide boat surveys were not conducted in 2017 and as a result only the west side of the island was searched for nests (Zolotoi Bay to Northwest Point). Despite the limited search area, this is the densest breeding concentration observed for the species in many years. During 2016 only 133 red-faced cormorant nests were observed during a boat-based circumnavigation survey of the entire island.
- In August a die off, primarily of dark morph northern fulmars as well as shearwaters, occurred with the birds mostly washing up on the north shore. More than 50 birds were encountered on island, with over 800 reported throughout the northern Bering Sea.
- A separate die-off occurred in mid-October 2016, and included mostly tufted puffins and crested auklets. Nearly 400 carcasses were recovered from this event.
- Several members of the community reported that sea ice reached St. Paul during the winter of 2016/2017.

ACKNOWLEDGMENTS

Brady Deal and Sarah Gilman worked tirelessly to collect much of the 2017 population and productivity data included in this report. Rolf Ream and Mike Williams (NOAA) gave helpful assistance and support at the NOAA Staff Quarters facilities on St. Paul. Pamela Lestenkof, Lauren Divine, and Veronica Padula with the St. Paul Ecosystem Conservation Office helped communicate seabird breeding conditions with the island community. Ann Harding, Tonia Kushin, Ram Papish (Alaska Seabird Youth Network), and Kendra Bush-St. Louis (USFWS) led another successful summer seabird camp; connecting the island youth with the breeding seabirds and marine environment. We thank the residents of St. Paul for their hospitality as well as Josh Cutler, Kristen Richardson and Shannon Moore with the fur seal resight crew for their camaraderie.

REFERENCES

- Alaska Maritime National Wildlife Refuge. 2017. Standardized protocols for annual seabird monitoring camps at Aiktak, Buldir, Chowiet, St. George, St. Lazaria, and St. Paul islands, Cape Lisburne, and select intermittent sites in the Alaska Maritime National Wildlife Refuge in 2017. U.S. Fish and Wildl. Serv. Rep., AMNWR 2017/07. 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.
- Dragoo, D. E., H. M. Renner, and R. S. A. Kaler. 2017. Breeding status and population trends of seabirds in Alaska, 2016. U.S. Fish and Wildlife Service Report, AMNWR 2017/06. Homer, Alaska.
- Drummond, B. A. 2016. Detailed summary of diet data from birds on the Alaska Maritime National Wildlife Refuge. U.S. Fish and Wildl. Serv. Rep., AMNWR 2016/05. 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 murrelets 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.
- Mong, R. N., and M. D. Romano. 2016. Biological monitoring at St. Paul Island, Alaska in 2016. U.S. Fish and Wildl. Serv. Rep., AMNWR 2016/10. Homer, Alaska.
- Preble, 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., 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.
- Thomson, G., B. A. Drummond, and M. D. Romano. 2015. Biological monitoring at St. Paul Island, Alaska in 2015. U.S. Fish and Wildl. Serv. Rep., AMNWR 2015/15. 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. Saporita. 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. Spitler. 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.

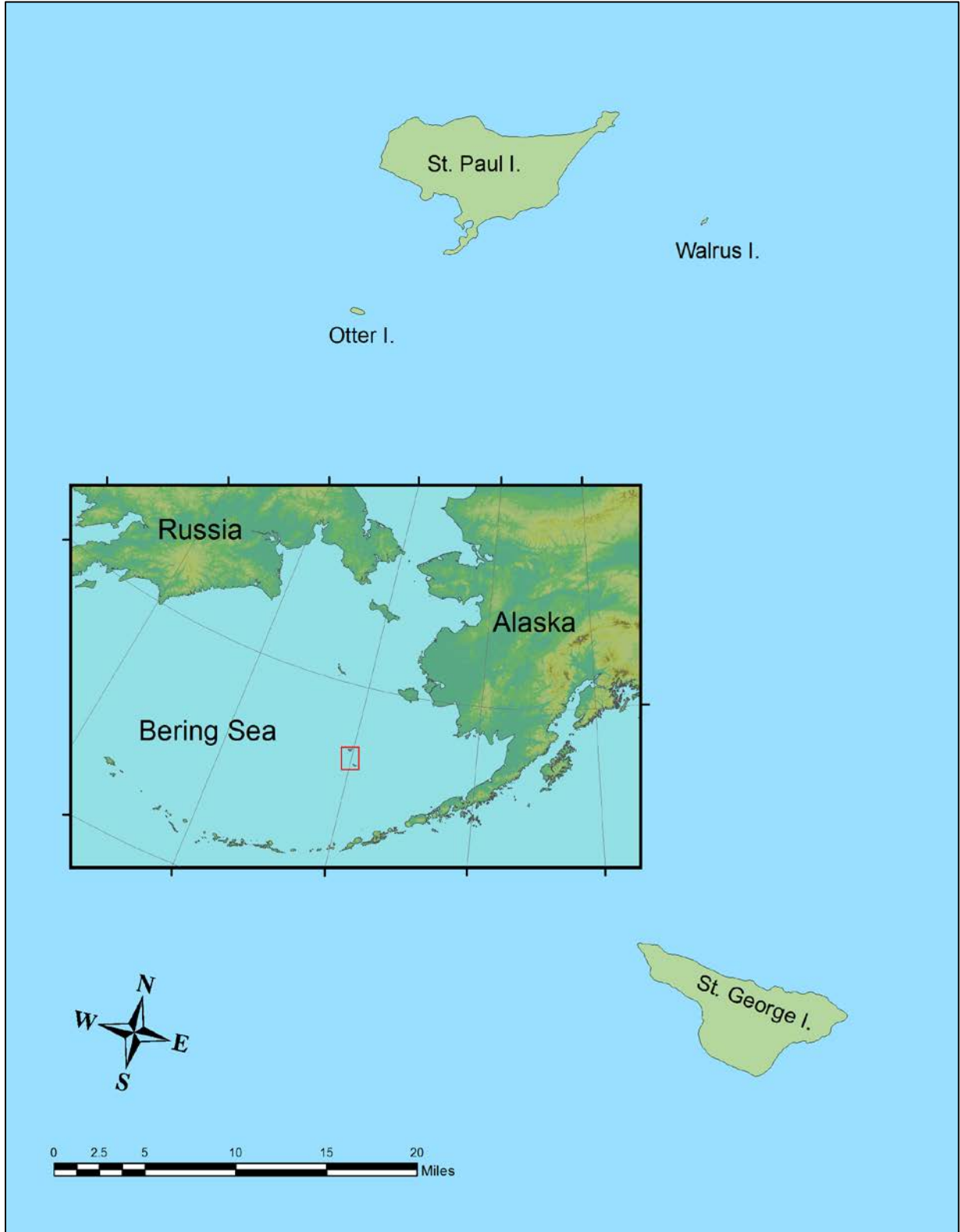


Figure 1. Map of the Pribilof Islands, Alaska.

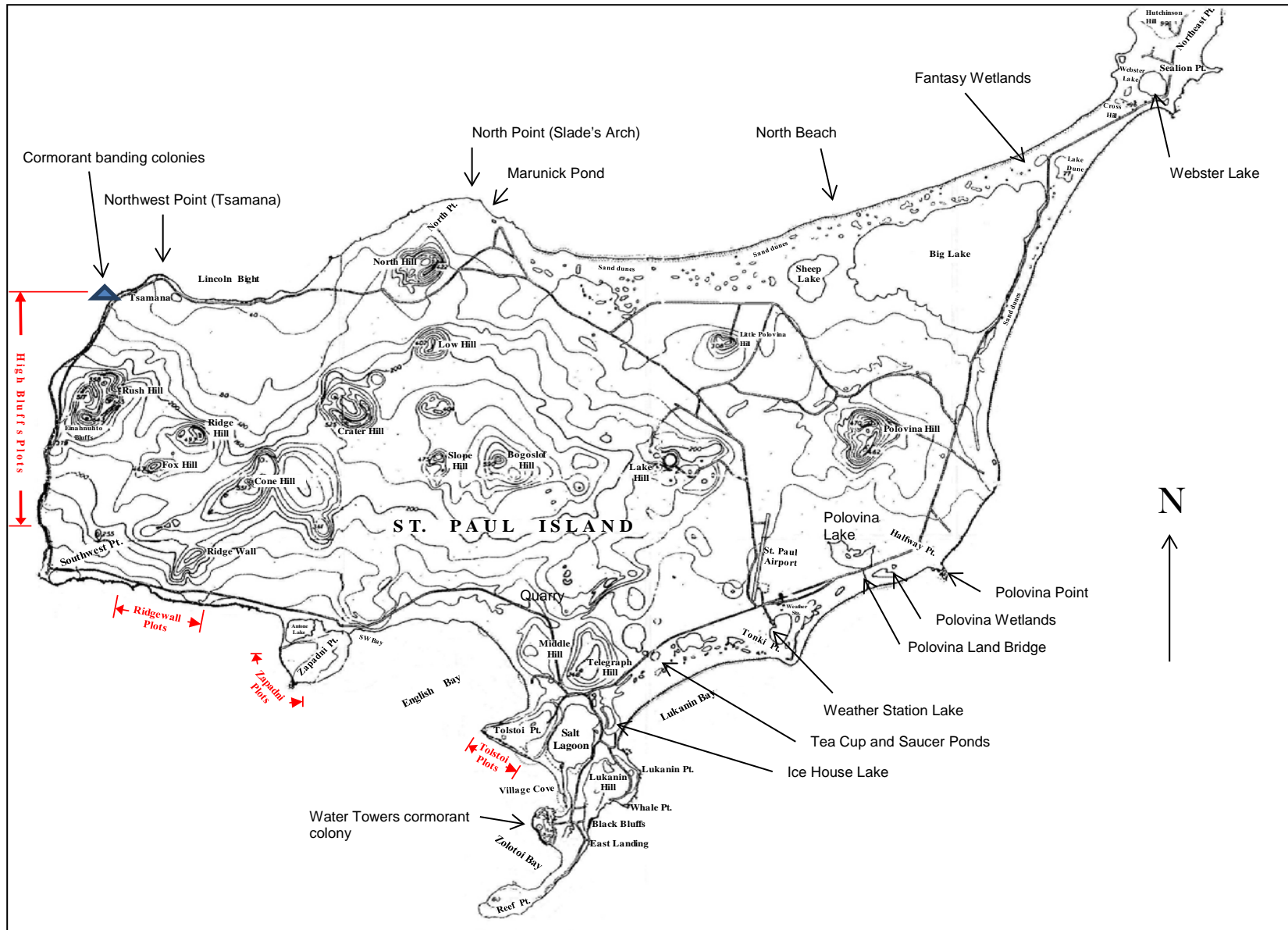


Figure 2. Map of St. Paul Island, Alaska, showing common place names and general locations of monitoring plots.

FIGURES AND TABLES

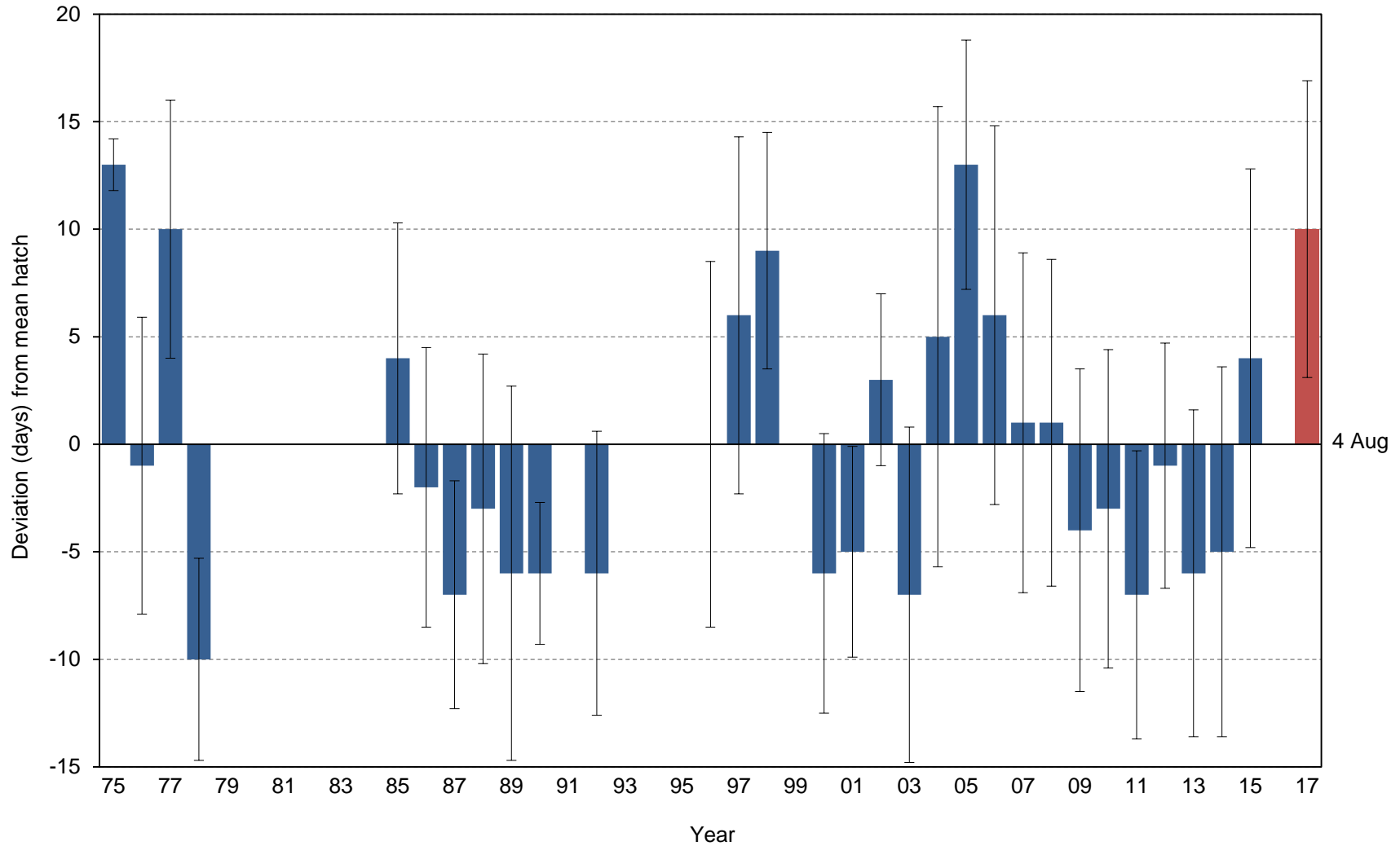


Figure 3. Yearly hatch date deviation (from the 1975-2016 mean of 4 August) for common murrelets at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent one standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1979-1984, 1991, or 1993-1995 and no hatch dates were recorded with the appropriate egg-to-chick interval (≤ 7 days) in 1999; no eggs hatched in plots in 2016.

Table 1. Breeding chronology of common murres at St. Paul Island, Alaska. No data were collected in 1979-1984, 1991, or 1993-1995 and no hatch dates were recorded with the appropriate egg-to-chick interval (≤ 7 days) in 1999; no eggs hatched in plots in 2016.

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	-	-	-
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
1992	28 Jul	6.6	11	20 Jul	11 Aug	11 Aug
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
2015	8 Aug	8.8	43	25 Jul	3 Sep	17 Aug
2017	14 Aug	6.9	3	5 Aug	22 Aug	30 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 2. 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. No data were collected in 1979-1984, 1991, or 1993-1995 and no hatch dates were recorded with the appropriate egg-to-chick interval in 1999; data for individual nests are not available before 1985 and no eggs hatched in plots in 2016.

Julian date ^a	No. nests hatching on Julian date														
	85	86	87	88	89	90	92	96	97	98	00	01	02	03	
191	-	xx ^b	xx	xx	-	-	-	-	-	-	-	-	-	-	
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	-	-	-	-	-	-	-	-	-	-	
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207	-	xx	xx	xx	-	1	1	-	-	-	-	1	-	2	
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209	1	xx	xx	xx	-	-	-	-	-	-	-	4	-	1	
210	-	xx	xx	xx	-	2	-	1	-	-	4	-	-	2	
211	1	xx	xx	xx	-	-	-	-	-	-	-	4	-	2	
212	3	xx	xx	xx	-	-	-	-	1	-	-	2	1	8	
213	-	xx	xx	xx	-	-	-	-	-	-	-	2	-	-	
214	-	xx	xx	xx	-	-	1	2	-	-	-	3	1	1	
215	-	xx	xx	xx	1	-	-	-	-	-	-	-	-	-	
216	-	xx	xx	xx	-	1	1	-	-	-	-	-	2	1	
217	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	2	
218	4	xx	xx	xx	-	-	1	-	-	-	-	1	-	1	
219	-	xx	xx	xx	-	-	-	-	-	1	-	-	2	-	
220	1	xx	xx	xx	-	-	-	-	1	-	-	1	-	-	
221	-	xx	xx	xx	-	-	-	-	-	-	-	1	-	-	
222	1	xx	xx	xx	-	-	-	-	2	-	-	-	2	-	
223	-	xx	xx	xx	-	-	-	-	-	-	-	1	-	1	
224	1	xx	xx	xx	-	-	1	-	1	-	-	-	2	-	
225	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	
226	3	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	
227	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	
228	-	xx	xx	xx	-	-	-	-	1	-	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	-	-	-	-	-	-	-	-	-	1	
<i>n</i>	18	33	39	116	7	6	11	5	9	2	10	26	10	42	

Table 2 (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. No data were collected in 1979-1984, 1991, or 1993-1995 and no hatch dates were recorded with the appropriate egg-to-chick interval in 1999; data for individual nests are not available before 1985 and no eggs hatched in plots in 2016.

Julian date ^a	No. nests hatching on Julian date												
	04	05	06	07	08	09	10	11	12	13	14	15	17
191	-	-	-	-	-	-	-	-	-	-	1	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	1	-	1	-	-	2	-	-
199	-	-	-	-	-	1	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	2	-	2	4	-	-
201	-	-	-	-	-	1	-	-	-	-	-	-	-
202	-	-	-	-	1	3	1	2	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-
204	1	-	-	-	2	-	1	1	-	4	-	-	-
205	-	-	-	-	-	-	2	-	-	8	1	-	-
206	5	-	-	-	1	4	3	-	1	-	-	3	-
207	-	-	-	-	-	-	3	-	-	-	-	-	-
208	1	-	-	6	1	7	4	9	-	1	10	1	-
209	-	-	-	-	-	-	-	-	-	6	3	-	-
210	1	-	1	1	4	8	6	-	4	-	-	1	-
211	-	-	-	-	-	-	-	-	-	1	-	-	-
212	1	-	-	4	3	5	9	6	4	3	-	4	-
213	-	-	1	-	1	-	-	-	-	-	2	-	-
214	1	-	2	4	5	11	6	-	-	-	5	6	-
215	-	-	-	7	-	-	3	-	3	-	-	-	-
216	5	-	2	1	4	3	3	1	-	4	-	4	-
217	2	-	4	-	-	-	-	-	2	-	-	-	1
218	1	-	5	3	6	-	-	-	-	1	4	2	-
219	-	-	-	2	-	1	-	-	-	-	-	1	-
220	3	1	3	-	5	2	2	1	1	-	2	1	-
221	-	-	1	-	1	-	-	-	-	-	-	-	-
222	2	-	-	1	2	1	1	-	-	-	2	5	-
223	-	-	1	-	-	-	-	-	-	1	-	-	-
224	2	-	3	2	1	1	1	-	1	-	-	2	-
225	-	-	-	1	1	1	-	-	-	-	-	-	-
226	1	1	2	-	-	-	2	-	-	-	1	3	1
227	-	-	-	-	1	-	-	-	-	1	-	-	-
228	1	2	1	-	1	1	1	-	-	-	-	2	-
229	1	-	-	-	-	-	-	-	-	-	2	3	-
230	2	-	-	1	1	-	-	1	1	-	-	1	-
231	-	1	-	-	-	-	-	-	-	-	-	-	-
232	-	-	-	-	2	1	-	-	-	-	-	1	-
233	-	1	-	-	-	-	-	-	-	-	-	1	-
234	3	-	-	-	-	-	-	-	-	-	-	-	1
235	-	-	-	-	-	-	-	-	-	-	-	-	-
236	2	-	1	-	1	1	2	-	-	1	-	-	-
237	-	-	-	1	-	-	-	-	-	-	-	-	-
238	-	-	1	-	-	-	-	-	-	-	-	1	-
239	-	-	-	-	-	-	-	-	-	-	-	-	-
240	1	1	-	-	-	-	-	-	-	-	-	-	-
241	-	-	-	-	-	-	-	-	-	-	-	-	-
242	-	-	-	-	-	-	-	-	-	-	-	-	-
243	-	-	-	-	-	-	-	-	-	-	-	-	-
244	-	-	-	1	-	-	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-	-	-	-
246	1	-	2	-	-	-	-	-	-	-	-	1	-
<i>n</i>	37	7	30	35	44	53	50	24	17	33	39	43	3

^aIn leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

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

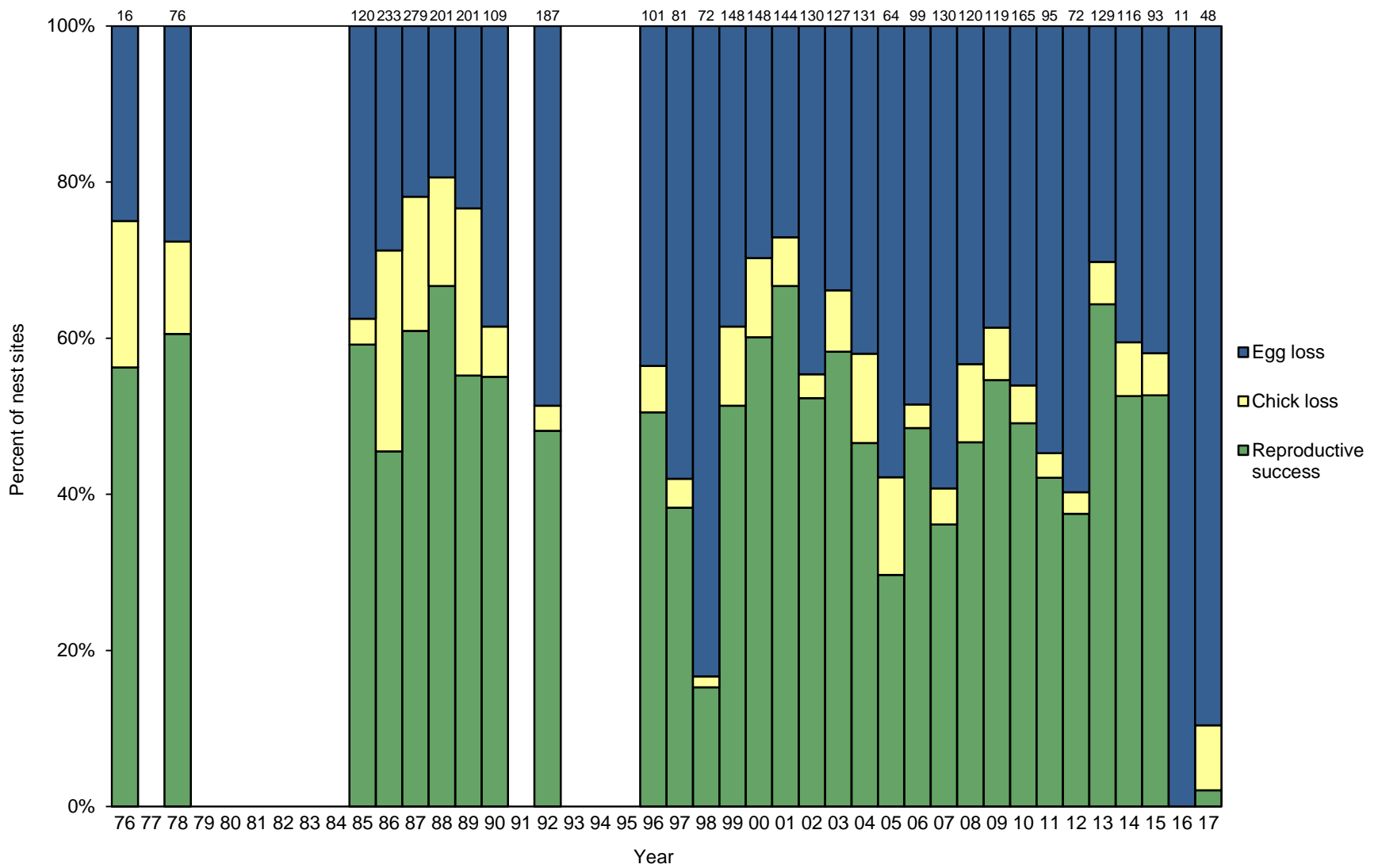


Figure 4. Reproductive performance of common murrelets at St. Paul Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1975, 1977, 1979-1984, 1991, or 1993-1995.

Table 3. Reproductive performance of common murrelets at St. Paul Island, Alaska. No data were collected in 1975, 1977, 1979-1984, 1991, or 1993-1995.

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)
1976	16	12	9	0.75	0.75	0.56
1978	76	55	46	0.72	0.84	0.61
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
1992	187	96	90	0.51	0.94	0.48
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
2015	93	54	49	0.58	0.91	0.53
2016	11	0	0	0.00	0.00	0.00
2017	48	5	1	0.10	0.20	0.02

^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 4. Standard deviation in reproductive performance parameters of common murrelets at St. Paul Island, Alaska. Sampling for murrelets is clustered by plot except when sample sizes per plot are too small or plot data are not available. No data were collected in 1975, 1977, 1979-1984, 1991, or 1993-1995.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1976	-	16	Simple random	0.11	0.13	0.12
1978	-	76	Simple random	0.05	0.05	0.06
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
1992	8	187	Cluster by plot	0.09	0.04	0.09
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
2015	5	93	Cluster by plot	0.07	0.06	0.08
2016	5	11	Simple random	0.00	0.00	0.00
2017	3	48	Cluster by plot	0.10	0.20	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.

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

Table 5. Reproductive performance of common murrelets at St. Paul Island, Alaska in 2017.

Parameter	Plots			Total	SD ^b
	104/48/81/84/116 ^a	114/90 ^a	64/66 ^a		
Nests w/ eggs (B)	15	17	16	48	-
Nests w/ chicks (D)	1	0	4	5	-
Nests w/ chicks fledged (F)	0	0	1	1	-
Nesting success (D/B) ^c	0.07	0.00	0.25	0.10	0.07
Fledging success (F/D) ^d	0.00	0.00	0.25	0.20	0.07
Reproductive success (F/B)	0.00	0.00	0.06	0.02	0.02

^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).

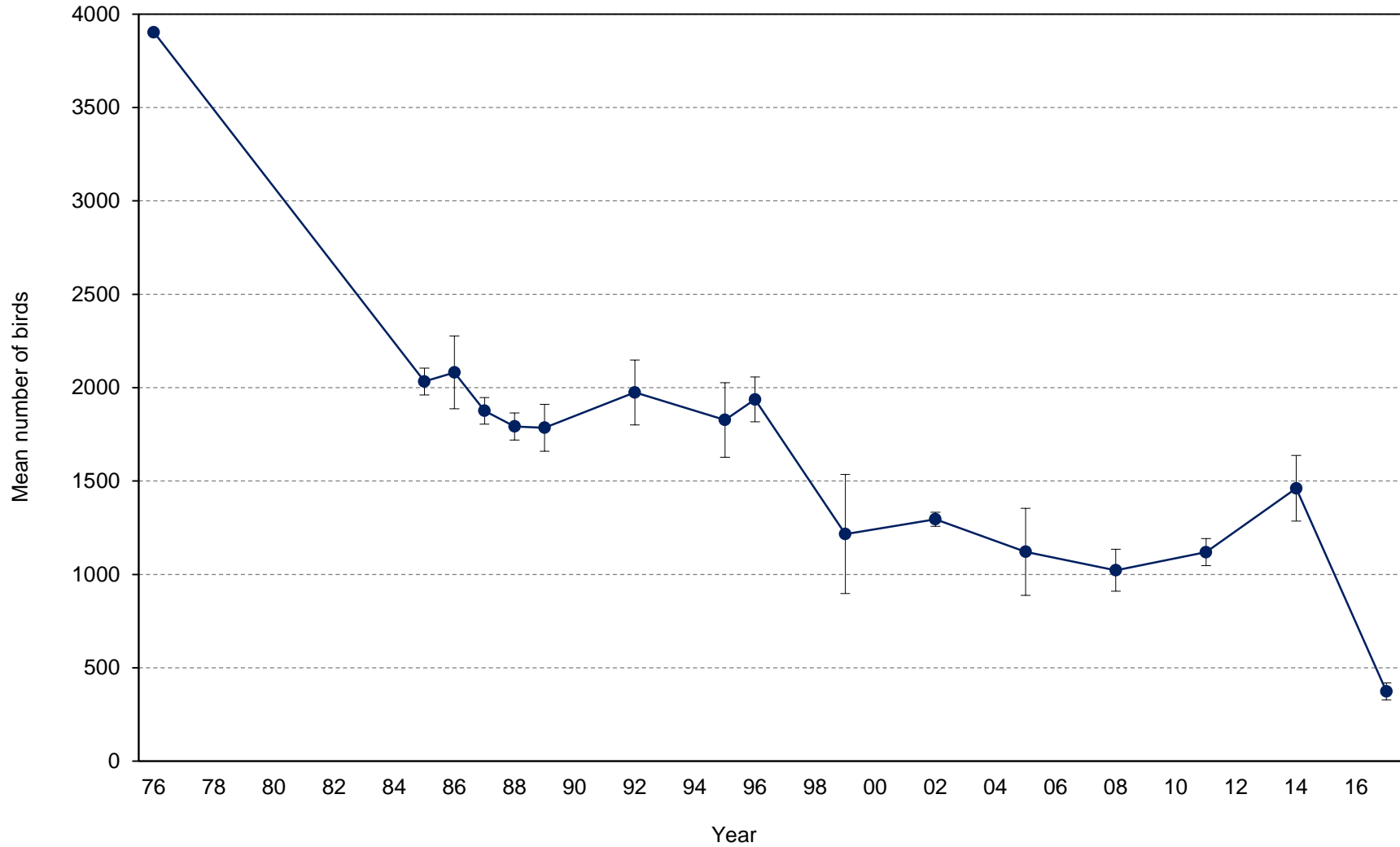


Figure 5. Mean numbers of common murre birds counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted.

Table 6. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014	2017
1	3903	2071	1808	1798	1688	1847	1858	1681	1999	855	1252	673	993	1249	1336	367
2	-	2114	1956	1850	1772	1819	1996	1745	1790	1161	1305	924	868	1062	1244	292
3	-	1962	2178	1853	1742	1688	2092	2055	1843	884	1324	1059	876	1047	1336	416
4	-	1985	2174	1871	1775	1776	1709	-	1926	1358	1350	1313	980	1139	1575	390
5	-	-	2289	1873	1838	1576	2203	-	1936	1349	1268	1394	1052	1094	2661	370
6	-	-	-	2011	1913	1716	1987	-	2129	1691	1274	1190	1139	1148	1612	414
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	375
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	6	6
SD	-	72	195	72	73	126	174	200	119	318	37	233	113	73	176	46
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	1 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	4 Aug

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

Table 7. Numbers of common murre counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-13 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul-4 Aug		
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	4	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	5	0	0	0	9	-	-
11	0	0	0	0	0	0	-	-
12	0	0	0	0	0	4	-	-
13	0	0	0	0	0	0	-	-
14	0	4	0	6	8	10	-	-
15	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	-	-
19top	0	0	0	0	0	4	-	-
19btm	0	4	3	2	2	2	-	-
20top	0	0	0	0	0	0	-	-
20btm	0	0	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	0	6	0	4	11	-	-
23	0	0	4	0	0	0	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	10	8	0	7	8	8	-	-
27	0	0	0	0	0	0	-	-
28	0	0	0	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	0	0	0	1	7	-	-
30	4	0	2	0	0	0	-	-
31	100	76	67	85	85	86	-	-
32	72	77	150	130	101	96	-	-
33	185	108	199	158	168	186	-	-
Total ^b	367	292	416	390	370	414	375	46

^aHistorical plots no longer counted.

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

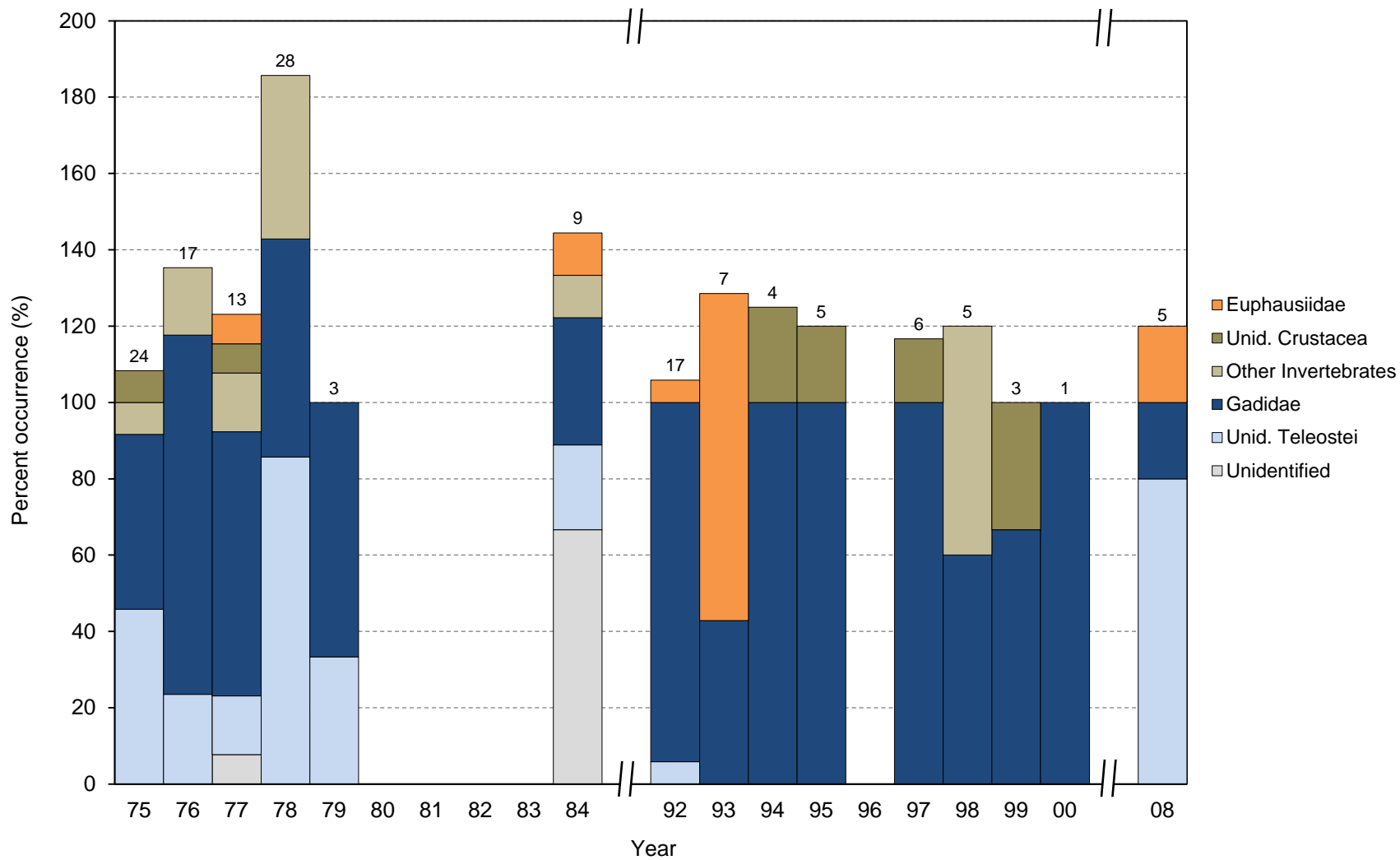


Figure 6. Frequency of occurrence of major prey items in diets of common murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents collected from adults near or at the colony. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1991, 1996, 2001-2007, or after 2008.

Table 8. 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	-	-	-	-	-	-	-	-	-

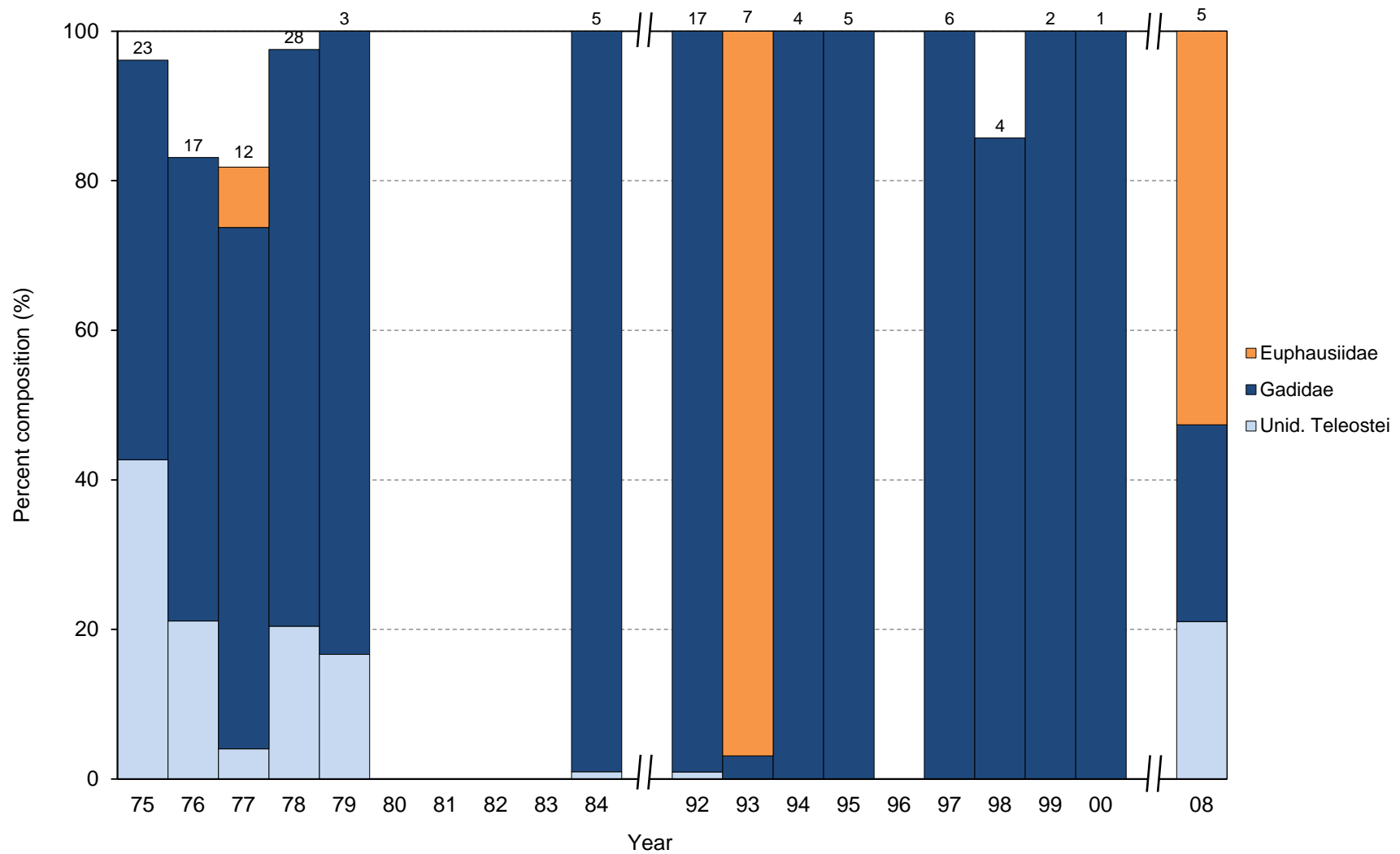


Figure 7. Percent composition of major prey items in diets of common murre adults at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of stomach contents collected from adults near or at the colony. Numbers above columns indicates sample sizes. No diet samples were collected in 1980-1983, 1985-1991, 1996, 2001-2007, or after 2008.

Table 9. Percent composition of major prey items in diets of common murre adults at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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	23	17	12	28	3	5	17	7	4	5	6	4	2	1	5
No. individuals	103	71	99	656	6	207	105	1134	37	17	17	7	2	8	38
Invertebrates	3.9	16.9	19.2	2.4	-	-	-	96.9	-	-	-	14.3	-	-	52.6
Euphausiacea	-	-	8.1	-	-	-	-	96.9	-	-	-	-	-	-	52.6
Euphausiidae	-	-	8.1	-	-	-	-	96.9	-	-	-	-	-	-	52.6
<i>Thysanoessa</i> spp.	-	-	-	-	-	-	-	96.9	-	-	-	-	-	-	-
Other Euphausiidae	-	-	8.1	-	-	-	-	-	-	-	-	-	-	-	52.6
Other Invertebrates	3.9	16.9	11.1	2.4	-	-	-	-	-	-	-	14.3	-	-	-
Fish	96.1	83.1	80.8	97.6	100.0	100.0	100.0	3.1	100.0	100.0	100.0	85.7	100.0	100.0	47.4
Teleostei	96.1	83.1	80.8	97.6	100.0	100.0	100.0	3.1	100.0	100.0	100.0	85.7	100.0	100.0	47.4
Gadidae	53.4	62.0	69.7	77.1	83.3	99.0	99.0	3.1	100.0	100.0	100.0	85.7	100.0	100.0	26.3
<i>Gadus chalcogrammus</i>	5.8	29.6	14.1	77.1	16.7	98.6	98.1	2.7	97.3	100.0	100.0	85.7	100.0	100.0	26.3
Unid. Gadidae	46.6	32.4	55.6	-	66.7	-	-	-	-	-	-	-	-	-	-
Other Gadidae	1.0	-	-	-	-	0.5	1.0	0.4	2.7	-	-	-	-	-	-
Unid. Teleostei	42.7	21.1	4.0	20.4	16.7	1.0	1.0	-	-	-	-	-	-	-	21.1
Other Teleostei	-	-	7.1	-	-	-	-	-	-	-	-	-	-	-	-

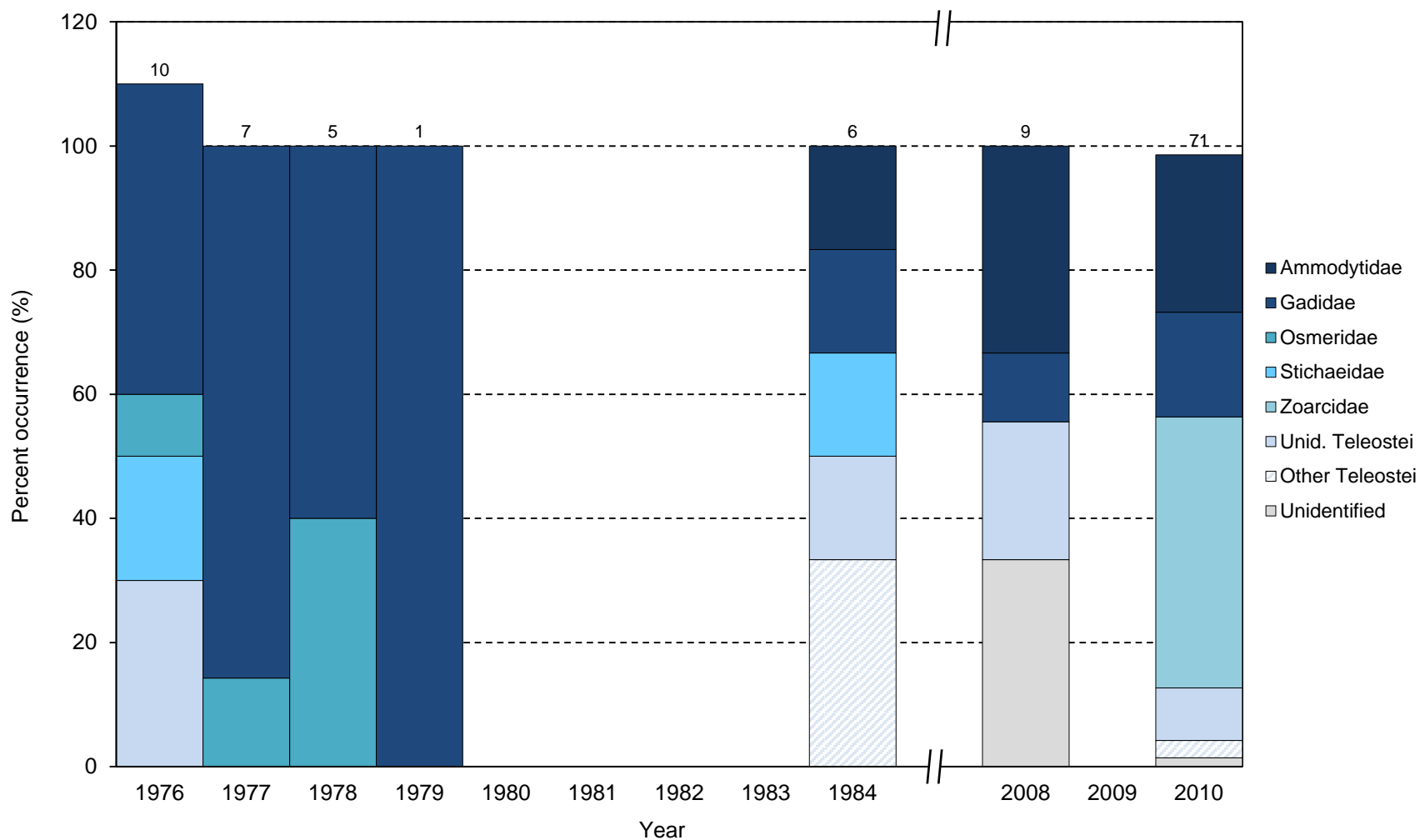


Figure 8. Frequency of occurrence of major prey items in diets of common murre chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads collected (1976-1984) and observed (2008, 2010) from adults returning to the colony to feed chicks, as well as regurgitations collected from chicks (1976, 1984, 2008). Numbers above columns indicate sample sizes. No diet samples were collected in 1979-1983, 1985-2007, 2009, or after 2010.

Table 10. 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, as well as 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</i> spp.	-	-	-	-	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

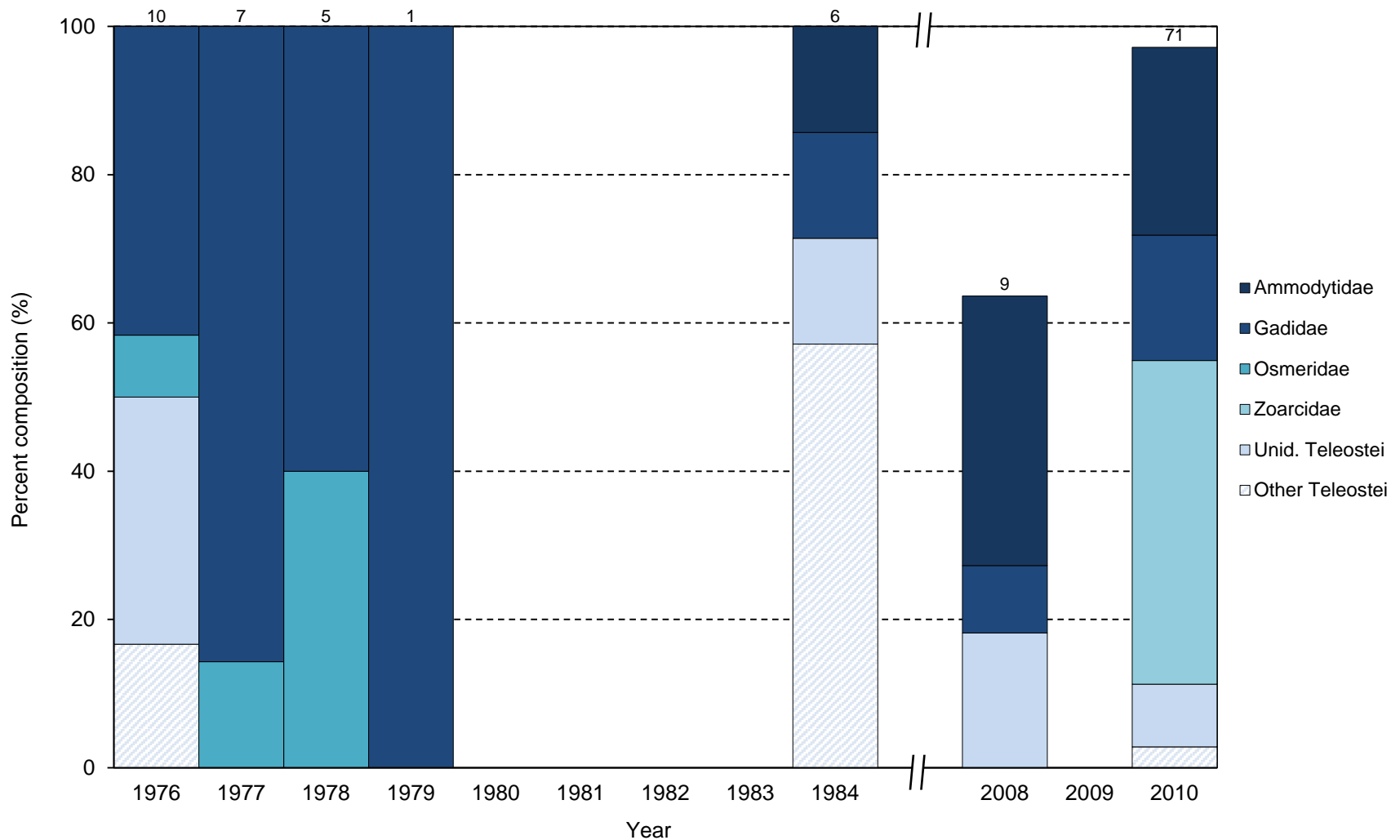


Figure 9. Percent composition of major prey items in diets of common murre chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads collected (1976-1984) and observed (2008, 2010) from adults returning to the colony to feed chicks, as well as regurgitations collected from chicks (1976, 1984, 2008). Numbers above columns indicates sample sizes. No diet samples were collected in 1979-1983, 1985-2007, 2009, or after 2010.

Table 11. Percent composition of major prey items in diets of common murre chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as 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
No. individuals	12	7	5	1	7	22	142
Invertebrates	-	-	-	-	-	9.1	1.4
Fish	100.0	100.0	100.0	100.0	100.0	63.6	97.2
Teleostei	100.0	100.0	100.0	100.0	100.0	63.6	97.2
Ammodytidae	-	-	-	-	14.3	36.4	25.4
<i>Ammodytes</i> spp.	-	-	-	-	14.3	36.4	25.4
Gadidae	41.7	85.7	60.0	100.0	14.3	9.1	16.9
<i>Gadus chalcogrammus</i>	33.3	85.7	60.0	100.0	14.3	-	-
Unid. Gadidae	8.3	-	-	-	-	9.1	16.9
Osmeridae	8.3	14.3	40.0	-	-	-	-
<i>Mallotus villosus</i>	8.3	14.3	40.0	-	-	-	-
Zoarcidae	-	-	-	-	-	-	43.7
Unid. Zoarcidae	-	-	-	-	-	-	43.7
Unid. Teleostei	33.3	-	-	-	14.3	18.2	8.5
Other Teleostei	16.7	-	-	-	57.1	-	2.8
Other	-	-	-	-	-	27.3	1.4

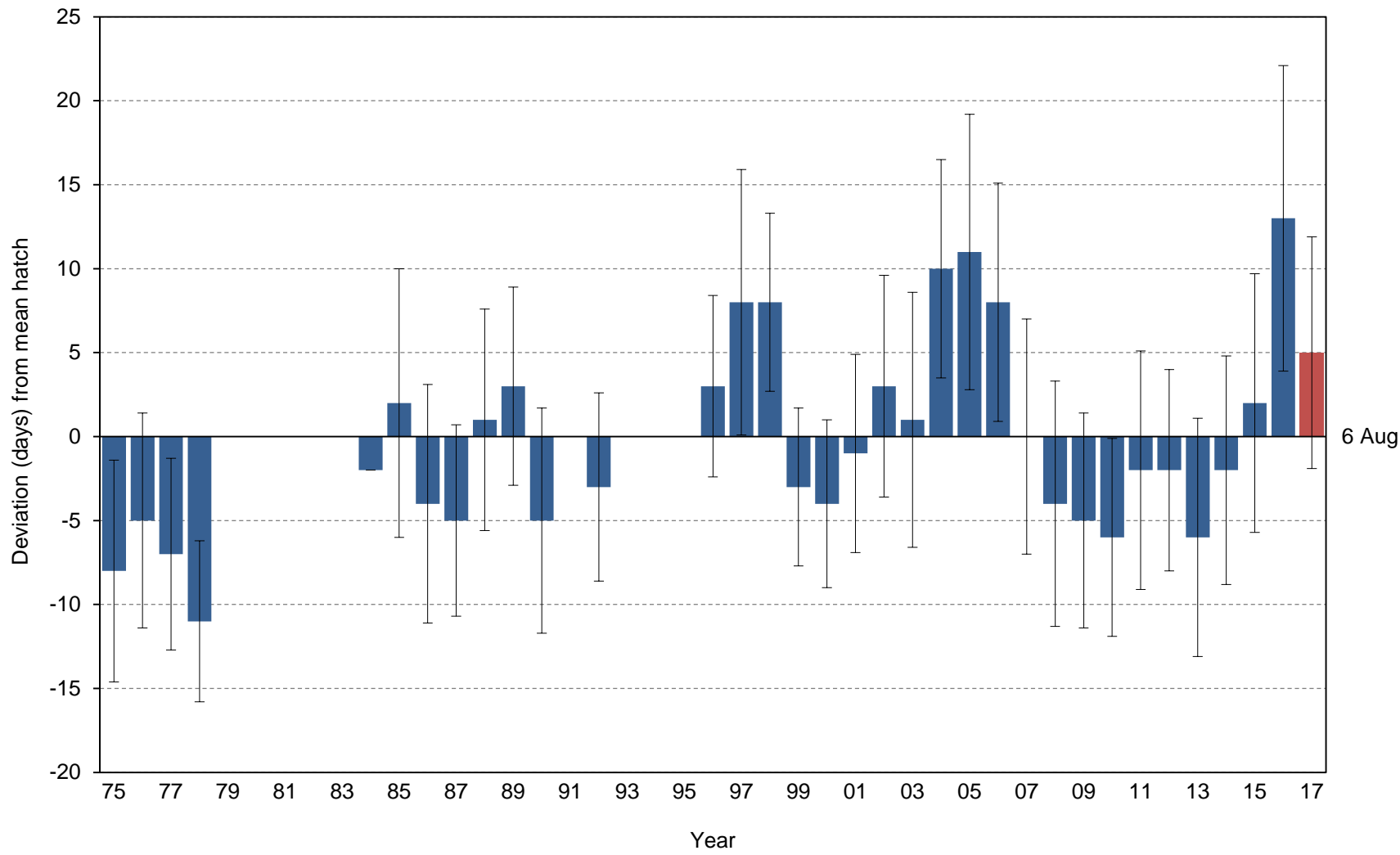


Figure 10. Yearly hatch date deviation (from the 1975-2016 mean of 6 August) for thick-billed murres at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent one standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1979-1983, 1991, or 1993-1995.

Table 12. Breeding chronology of thick-billed murres at St. Paul Island, Alaska. No data were collected in 1979-1983, 1991, or 1993-1995.

Year	Mean hatch	SD	<i>n</i> ^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	-	-	-
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
1992	2 Aug	5.6	44	24 Jul	14 Aug	10 Aug
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
2015	8 Aug	7.7	163	14 Jul	4 Sep	12 Aug
2016	18 Aug	9.1	10	12 Jul	27 Aug	9 Aug
2017	11 Aug	6.9	18	30 Jul	22 Aug	26 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 13. 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. No data were collected in 1979-1983, 1991, or 1993-1995; data from individual nests are not available before 1984.

Julian date ^a	No. nests hatching on Julian date														
	84	85	86	87	88	89	90	92	96	97	98	99	00	01	02
191	-	-	xx ^b	xx	xx	-	-	-	-	-	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-	-
203	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
204	-	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-
205	-	-	xx	xx	xx	-	2	-	-	-	-	-	-	-	-
206	-	-	xx	xx	xx	-	7	2	-	-	-	-	1	1	-
207	-	-	xx	xx	xx	-	-	1	-	-	-	-	-	-	-
208	-	5	xx	xx	xx	-	2	3	-	-	-	1	1	5	1
209	-	1	xx	xx	xx	-	-	2	-	-	-	-	1	2	1
210	-	5	xx	xx	xx	-	7	5	1	-	-	-	4	-	-
211	-	2	xx	xx	xx	-	2	1	-	1	-	-	2	1	-
212	-	7	xx	xx	xx	1	3	4	2	1	-	1	1	3	2
213	-	-	xx	xx	xx	1	1	4	1	1	-	-	2	1	-
214	-	-	xx	xx	xx	-	2	5	2	2	-	-	4	16	4
215	-	3	xx	xx	xx	-	-	1	-	1	-	-	4	-	-
216	1	4	xx	xx	xx	2	3	1	3	2	-	1	2	8	3
217	-	-	xx	xx	xx	-	-	-	-	1	-	1	-	4	-
218	-	2	xx	xx	xx	3	2	7	2	4	1	-	3	4	2
219	-	-	xx	xx	xx	1	-	-	-	1	-	-	-	2	4
220	-	3	xx	xx	xx	-	-	1	5	3	5	-	-	4	2
221	-	1	xx	xx	xx	2	-	-	2	-	-	-	-	1	1
222	-	2	xx	xx	xx	-	1	2	2	4	3	1	-	-	3
223	-	3	xx	xx	xx	1	2	-	3	4	5	-	-	7	1
224	-	-	xx	xx	xx	1	3	2	3	4	2	-	1	-	4
225	-	-	xx	xx	xx	-	1	-	2	2	-	-	-	3	1
226	-	8	xx	xx	xx	-	-	1	3	1	5	-	-	2	4
227	-	10	xx	xx	xx	-	-	2	-	1	-	-	-	3	-
228	-	1	xx	xx	xx	2	1	-	1	7	1	-	-	-	-
229	-	2	xx	xx	xx	-	-	-	-	2	-	-	-	-	1
230	-	1	xx	xx	xx	-	-	-	4	4	3	-	-	-	4
231	-	1	xx	xx	xx	1	-	-	-	1	-	-	1	-	-
232	-	-	xx	xx	xx	1	-	-	-	1	-	-	-	1	-
233	-	1	xx	xx	xx	-	-	-	-	1	1	-	-	-	-
234	-	2	xx	xx	xx	-	-	-	-	3	1	-	-	1	1
235	-	-	xx	xx	xx	-	-	-	-	3	-	-	-	-	-
236	-	1	xx	xx	xx	-	-	-	-	2	2	-	-	-	1
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	-	-	-	-	-
245	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
246	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
247	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
<i>n</i>	1	65	72	260	45	16	40	44	36	62	30	5	27	69	40

Table 13 (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. No data were collected in 1979-1983, 1991, or 1993-1995; data from individual nests are not available before 1984.

Julian date ^a	No. nests hatching on Julian date															
	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	
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	1	-	-	
206	2	-	-	-	-	5	15	6	-	1	1	-	3	-	-	
207	1	-	-	-	5	-	-	4	-	3	-	-	1	-	-	
208	1	-	-	-	24	13	19	16	23	2	4	6	1	-	-	
209	2	-	-	-	4	4	-	1	-	1	10	7	5	-	-	
210	6	-	-	-	13	6	8	20	6	12	9	1	2	-	-	
211	2	-	-	-	-	1	-	-	1	-	-	-	-	-	1	
212	19	1	-	-	24	16	9	14	22	14	5	-	5	1	1	
213	-	-	-	1	1	6	-	13	-	-	-	15	-	-	-	
214	8	-	-	2	17	12	29	14	1	2	12	8	27	-	1	
215	-	1	-	-	24	-	10	15	-	10	3	-	-	-	-	
216	11	6	-	4	17	9	3	7	5	-	3	2	18	1	2	
217	5	1	-	3	1	1	5	-	-	5	-	1	-	-	-	
218	8	10	3	9	20	7	10	8	6	7	5	10	13	-	-	
219	2	-	-	-	30	-	-	7	11	8	3	-	4	-	1	
220	8	9	1	10	18	8	3	11	11	1	5	3	15	-	1	
221	-	-	-	6	2	-	-	1	8	-	-	-	3	-	-	
222	9	11	1	10	15	1	7	6	2	1	4	2	7	-	-	
223	4	1	1	-	-	3	1	-	-	-	-	1	1	-	-	
224	9	18	2	13	22	4	7	6	3	8	4	8	18	-	-	
225	-	2	-	6	5	-	-	-	6	3	-	-	-	-	1	
226	4	14	-	12	-	-	1	-	4	1	-	6	7	-	5	
227	-	1	1	1	-	-	-	-	2	-	1	-	4	-	-	
228	6	10	-	8	6	2	-	-	-	2	-	2	8	-	2	
229	-	-	-	2	4	-	-	-	2	-	-	1	4	-	-	
230	9	19	1	1	9	2	-	1	2	1	1	-	-	-	1	
231	3	2	-	1	-	-	-	-	1	-	1	-	3	-	-	
232	1	14	-	7	4	1	-	-	-	1	-	-	4	3	-	
233	-	-	-	4	-	-	-	-	-	-	1	-	-	-	-	
234	1	15	1	5	1	1	-	-	1	-	-	-	3	-	2	
235	-	6	-	-	5	-	-	-	-	-	-	-	-	-	-	
236	1	4	2	12	3	-	1	-	-	-	-	-	-	3	-	
237	-	3	2	-	1	-	-	-	-	-	-	-	-	-	-	
238	-	7	-	1	-	-	-	-	-	-	-	-	-	-	-	
239	-	-	-	4	-	-	-	-	-	-	-	-	1	-	-	
240	1	2	2	1	-	-	-	-	-	-	-	-	1	2	-	
241	-	1	1	-	-	-	-	-	-	-	-	-	2	-	-	
242	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	
243	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	
244	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
247	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
<i>n</i>	125	159	18	126	276	110	143	183	122	83	98	78	163	10	18	

^aIn leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

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

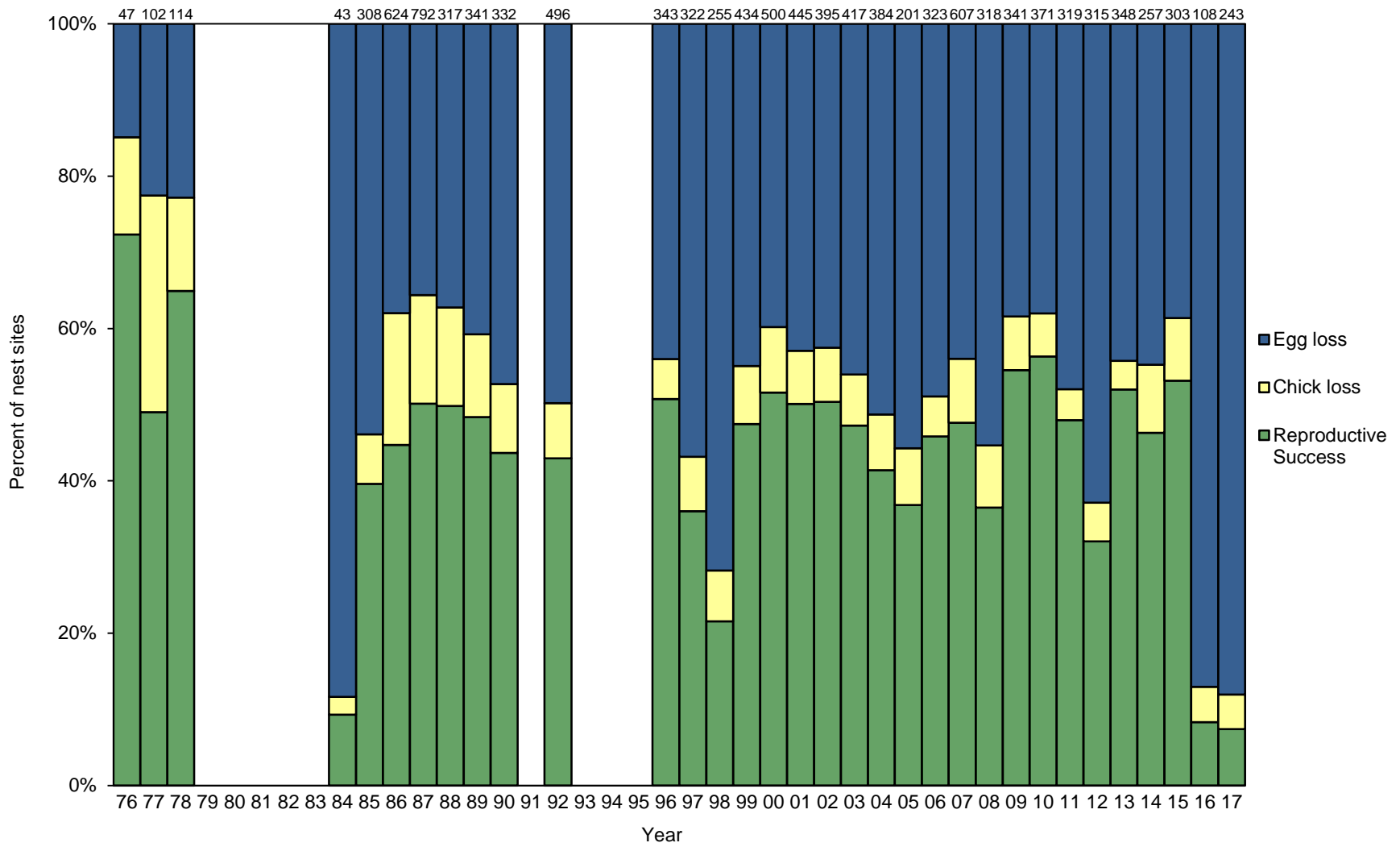


Figure 11. Reproductive performance of thick-billed murrelets at St. Paul Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1979-1983, 1991, or 1993-1995.

Table 14. Reproductive performance of thick-billed murres at St. Paul Island, Alaska. No data were collected in 1979-1983, 1991, or 1993-1995.

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)
1976	47	40	34	0.85	0.85	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
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
1992	496	249	213	0.50	0.86	0.43
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
2015	303	186	161	0.61	0.87	0.53
2016	108	14	9	0.13	0.64	0.08
2017	243	29	18	0.12	0.62	0.07

^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 15. 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. No data were collected in 1979-1983, 1991, or 1993-1995.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1976	-	47	Simple random	0.05	0.06	0.07
1977	-	102	Simple random	-. ^c	-. ^c	-. ^c
1978	-	114	Simple random	-. ^c	-. ^c	-. ^c
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
1992	20	496	Cluster by plot	0.03	0.03	0.03
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
2015	13	303	Cluster by plot	0.03	0.02	0.03
2016	10	108	Cluster by plot	0.04	0.05	0.03
2017	12	243	Cluster by plot	0.03	0.05	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.

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

Table 16. Reproductive performance of thick-billed murrelets at St. Paul Island, Alaska in 2017.

Parameter	Plot												Total	SD ^b
	104/ 114 ^a	90/91/ 110 ^a	88/89/98 /116 ^a	85/86/ 87 ^a	80/81/ 83/84 ^a	64/65/ 67 ^a	66	68/ 68 fal ^a	26/54/ 55 ^a	49/50/51 /52 ^a	53	4/48 ^a		
Nest sites w/ eggs (B)	17	24	29	20	25	19	12	23	27	15	15	17	243	-
Nest sites w/ chicks (D)	0	1	7	1	4	5	3	5	0	1	1	1	29	-
Nest sites w/ chicks fledged (F)	0	0	4	0	3	4	2	3	0	1	0	1	18	-
Nesting success (D/B) ^c	0.00	0.04	0.24	0.05	0.16	0.26	0.25	0.22	0.00	0.07	0.07	0.06	0.12	0.03
Fledging success (F/D) ^d	0.00	0.00	0.57	0.00	0.75	0.80	0.67	0.60	0.00	1.00	0.00	1.00	0.62	0.05
Reproductive success (F/B)	0.00	0.00	0.14	0.00	0.12	0.21	0.17	0.13	0.00	0.07	0.00	0.06	0.07	0.02

^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).

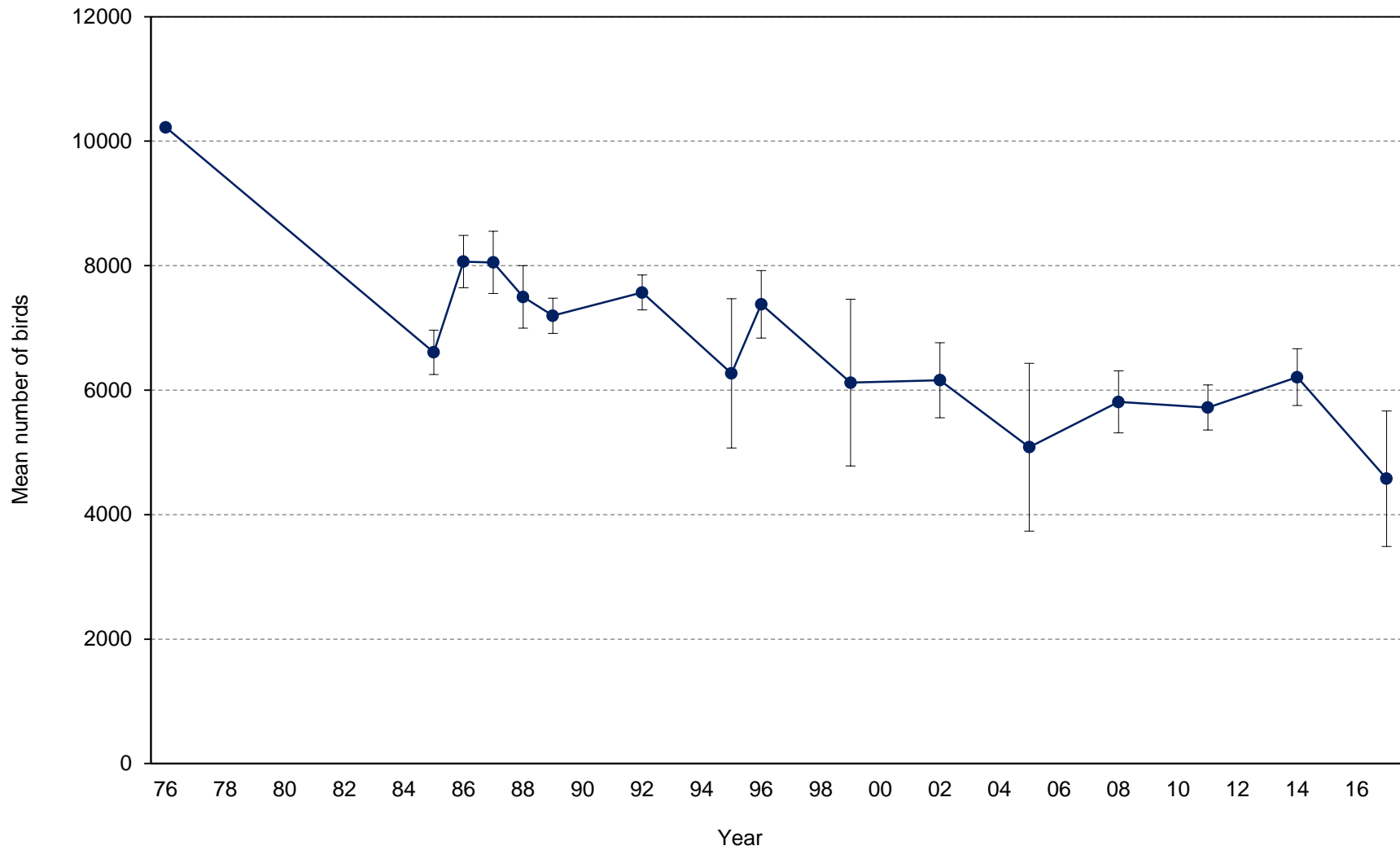


Figure 12. Mean numbers of thick-billed murres counted on index at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted.

Table 17. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014	2017
1	10223	6460	7473	7335	6877	6921	7216	5251	7121	4147	5165	2957	5662	6090	6491	3262
2	-	6478	8295	8152	6966	6904	7511	5966	6513	5139	6109	4156	5451	5886	5647	5630
3	-	6358	8499	7865	7813	6953	7381	7592	7561	5816	6109	3985	5075	6138	5612	4595
4	-	7134	8271	7763	7080	7406	7776	-	7552	7084	7050	4714	6656	5857	6518	5343
5	-	-	7789	8676	7755	7272	7854	-	7388	7750	6282	6223	5645	5771	6370	3231
6	-	-	-	8525	8046	7002	7766	-	8149	6786	6243	6918	6359	5465	6618	5407
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	4578
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	6	6
SD	-	355	421	501	502	283	252	1200	543	1340	602	1346	498	363	456	1088
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	1 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	4 Aug

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

Table 18. Numbers of thick-billed murres counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul -3 Aug		
1	0	10	2	13	4	15	-	-
2sw	0	0	0	0	0	0	-	-
2ne	0	0	0	0	0	0	-	-
3	3	15	5	30	8	23	-	-
4	35	99	12	97	47	97	-	-
5sw	4	110	4	75	31	102	-	-
5ne	1	4	0	9	0	5	-	-
6 ^a	-	-	-	-	-	-	-	-
7	2	49	0	0	0	16	-	-
8	1	41	2	15	9	27	-	-
9 ^a	-	-	-	-	-	-	-	-
10	60	166	51	139	114	157	-	-
11	0	14	0	0	0	17	-	-
12	17	45	41	42	17	57	-	-
13	11	64	10	8	4	54	-	-
14	99	184	71	153	122	181	-	-
15	28	44	32	49	23	29	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	11	33	44	44	18	33	-	-
19top	62	92	93	101	54	66	-	-
19btm	0	200	164	201	72	162	-	-
20top	20	65	62	40	8	38	-	-
20btm	15	50	44	38	18	49	-	-
21 ^a	-	-	-	-	-	-	-	-
22	44	243	25	229	100	255	-	-
23	70	131	89	96	63	101	-	-
24	42	58	70	50	38	50	-	-
25	34	67	48	49	18	50	-	-
26	62	137	42	116	25	97	-	-
27	0	0	0	0	0	0	-	-
28	3	30	22	31	3	35	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	60	74	74	28	70	-	-
30	27	100	73	92	24	87	-	-
31	1318	1439	1350	1404	1197	674	-	-
32	633	1010	1163	1097	323	1535	-	-
33	702	1480	1357	1456	1005	1693	-	-
Total ^b	3262	5630	4595	5343	3231	5407	4578	1088

^aHistorical plots no longer counted.

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

Table 19. 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	2015	2016	2017
New color bands	2	16	33	3	0	0	0	0	0	0
New metal and colors	2	14	29	0	0	0	0	0	0	0
New colors on previous metal-banded bird ^a	0	2	4	3	0	0	0	0	0	0
New color bands replace old color bands ^b	0	0	0	0	0	0	0	0	0	0
Cum. color-banded birds	2	18	51	54	54	54	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 20. 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 2017
		2009	2010	2011	2012	2013	2014	2015	2016	2017	
2008	2	2	2	1	1	0	0	0	0	0	0.00
2009	15	-	10	9	7	6	6	7	6	7	0.40
2010	29	-	-	23	25	16	18	13	8	11	0.28
2011	3	-	-	-	2	2	3	3	2	1	0.67
2012	0	-	-	-	-	-	-	-	-	-	-
2013	0	-	-	-	-	-	-	-	-	-	-
2014	0	-	-	-	-	-	-	-	-	-	-
2015	0	-	-	-	-	-	-	-	-	-	-
2016	0	-	-	-	-	-	-	-	-	-	-
2017	0 ^a	-	-	-	-	-	-	-	-	-	- ^a
Birds seen in current year (A)		2	12	33	35	24	27	22	16	19	-
Birds potentially alive from prior year (B) ^b		2	17	46	44	43	36	32	28	21	-
Apparent annual survival (A/B) ^c		1.00	0.71	0.72	0.80	0.56	0.75	0.67	0.57	0.90	-
Resighting effort ^d											
Total no. resight days		4	11	22	29	13	26	23	23	23	-
Total no. resight hours		N/A ^e	18.9	11.3	16.9	4.5	N/A	6.5	9	14.8	-

^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 21. 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		Z84 = Zapadni Plot 84					0 = not resighted					
DG = dark green		W = white	PZD = Past Zapadni Dip		TO = Tolstoi					x = band no longer resightable (dead, removed, etc.)					
O = orange		Y = yellow													
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	2015	2016	2017	
Yellow	R0	846-00195	2011	ZD		-	-	-	5	1	2	2	0	0	
Yellow	C1	895-12791	2009	ZD		-	1	0	1	0	0	0	0	0	
Yellow	A9	895-12792	2009	ZD		-	2	0	0	0	0	0	0	0	
Yellow	M0	895-12797	2010	ZD		-	-	1	1	0	4	2	2	0	
Yellow	N6	1186-04108	2010	PZD		-	-	1	1	1	2	2	5	2	
Yellow	J2	1186-04109	2009	Z84		-	0	5	2	1	1	1	2	7	
DG/O	DB	1186-04112	2008	ZD		2	3	0	0	0	0	0	0	0	
Yellow	R7	1186-04113	2011	ZD		-	-	-	5	0	5	4	1	7	
Yellow	A5	1186-04115	2009	ZD		-	6	3	2	1	1	1	2	6	
Yellow	N7	1186-04116	2010	ZD		-	-	0	2	0	0	0	3	2	
Yellow	A0	1186-04118	2009	ZD		-	5	1	0	0	0	0	0	1	
DG/R	DB	1186-04122	2008	ZD		3	5	1	3	0	0	0	0	0	
Yellow	M4	1186-04137	2010	PZD		-	-	5	4	0	0	0	0	0	
Yellow	A6	1186-04202	2009	ZD		-	0	3	4	1	1	0	3	0	
Yellow	A7	1186-04203	2009	ZD		-	0	8	3	0	0	0	0	0	
Yellow	T1	1186-04206	2011	ZD		-	-	-	4	3	0	1	1	0	
Yellow	E1	1186-04223	2009	Z84		-	1	0	0	0	0	0	0	0	
Yellow	E2	1186-04224	2009	Z84		-	4	2	3	5	2	3	2	10	
Yellow	E3	1186-04225	2009	Z84		-	1	0	0	0	0	0	0	0	
Yellow	E4	1186-04226	2009	Z84		-	4	0	0	0	0	0	0	0	
Yellow	N1	1186-04229	2010	TO		-	-	2	2	1	2	0	0	0	
Yellow	N2	1186-04230	2010	TO		-	-	1	2	0	1	0	0	0	
Yellow	P1	1186-04231	2009	Z84		-	0	1	0	0	0	1	0	1	
Yellow	P2	1186-04232	2009	Z84		-	1	3	0	0	3	2	4	4	
Yellow	P3	1186-04233	2009	Z84		-	0	2	5	1	2	1	3	1	
Yellow	P4	1186-04234	2009	Z84		-	1	4	4	1	0	2	0	0	
Yellow	N3	1186-04235	2010	TO		-	-	3	4	2	0	0	0	0	
Yellow	N4	1186-04236	2010	TO		-	-	1	4	0	0	0	0	0	
Yellow	N5	1186-04237	2010	TO		-	-	0	2	0	0	0	0	0	
Yellow	M1	1186-04243	2010	TO		-	-	0	3	1	0	0	0	0	
Yellow	M2	1186-04244	2010	TO		-	-	0	0	0	1	0	0	0	
Yellow	M3	1186-04245	2010	TO		-	-	4	4	1	0	0	0	0	
Yellow	M5	1186-04246	2010	ZD		-	-	1	2	3	0	0	3	2	
Yellow	L6	1186-04247	2010	TO		-	-	2	5	1	3	0	0	0	
Yellow	L7	1186-04248	2010	TO		-	-	0	0	0	0	0	0	0	

Table 21 (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		Z84 = Zapadni Plot 84					0 = not resighted					
DG = dark green		W = white	PZD = Past Zapadni Dip		TO = Tolstoi					x = band no longer resightable (dead, removed, etc.)					
O = orange		Y = yellow													
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	2015	2016	2017	
Yellow	L8	1186-04249	2010	TO		-	-	0	0	0	0	0	0	0	
Yellow	L9	1186-04250	2010	ZD		-	-	6	4	1	3	4	2	8	
Yellow	M6	1186-04761	2010	ZD		-	-	0	1	1	0	1	0	1	
Yellow	N8	1186-04762	2010	ZD		-	-	2	0	0	1	0	0	2	
Yellow	N0	1186-04763	2010	ZD		-	-	5	9	4	1	3	1	1	
Yellow	M7	1186-04764	2010	ZD		-	-	6	7	1	2	0	0	7	
Yellow	N9	1186-04765	2010	ZD		-	-	1	0	0	0	1	1	1	
Yellow	E0	1186-04766	2010	TO		-	-	1	1	0	0	0	0	0	
Yellow	H4	1186-04767	2010	TO		-	-	0	0	0	0	0	0	0	
Yellow	H2	1186-04768	2010	TO		-	-	0	1	0	5	2	0	0	
Yellow	H0	1186-04769	2010	TO		-	-	0	0	0	0	0	0	0	
Yellow	F7	1186-04770	2010	ZD		-	-	2	3	0	1	1	0	0	
Yellow	M9	1186-04781	2010	ZD		-	-	4	4	1	5	4	1	3	
Yellow	M8	1186-04782	2010	PZD		-	-	11	11	2	7	6	0	7	
Yellow	H5	1186-04783	2010	PZD		-	-	4	3	2	6	6	0	0	
Yellow	E5	1186-04784	2010	PZD		-	-	5	3	1	3	3	0	0	
Yellow	H6	1186-04785	2010	PZD		-	-	3	0	0	1	0	0	0	
Yellow	E7	1186-04786	2010	PZD		-	-	9	8	4	5	3	0	0	
Total birds resighted						2	12	34	37	24	26	23	16	19	

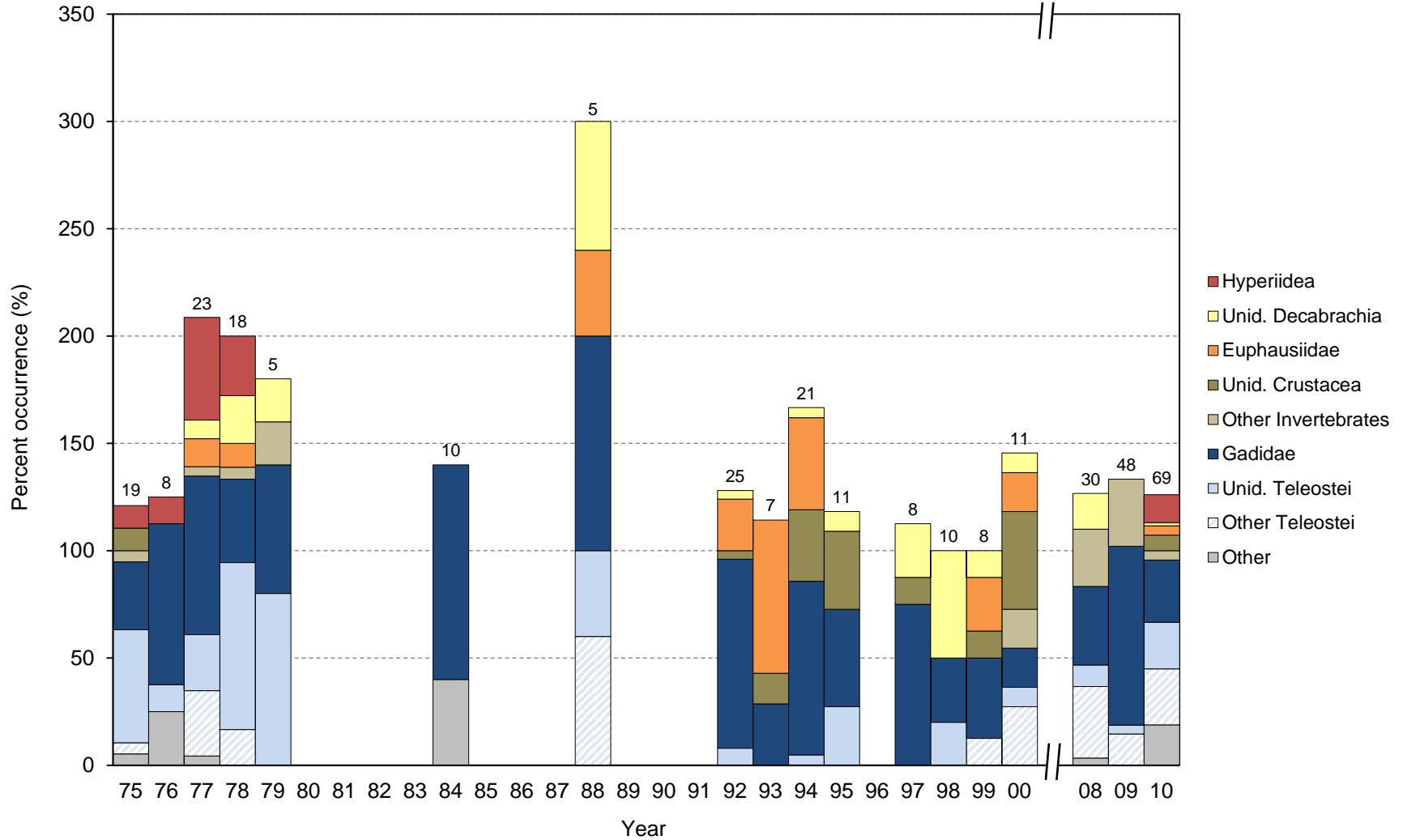


Figure 13. Frequency of occurrence of major prey items in diets of thick-billed murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents collected from adults near or at the colony. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1987, 1989-1991, 1996, 2001-2007, or after 2010.

Table 22. 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	69 ^a
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	-	18.8
Hyperiid	10.5	12.5	47.8	27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0
<i>Themisto libellula</i>	5.3	12.5	43.5	27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	8.7
Other Hyperiid	5.3	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
Other Amphipoda	5.3	12.5	-	-	-	-	-	-	-	-	-	-	-	12.5	-	6.7	-	5.8
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	1.4
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	-	1.4
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	-	-	-	-	-	-	-	-	1.4
Unid. Euphausiidae	-	-	8.7	11.1	-	-	20.0	-	-	42.9	-	-	-	25.0	18.2	-	-	1.4
Other Euphausiidae	-	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9
Unid. Crustacea	10.5	-	-	-	-	-	-	4.0	14.3	33.3	36.4	12.5	-	12.5	45.5	-	-	7.2
Other Invertebrates	5.3	-	4.3	5.6	20.0	-	-	-	-	-	-	-	-	-	18.2	26.7	31.3	4.3
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	73.9
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	73.9
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	29.0
<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	13.0
Unid. Gadidae	21.1	62.5	73.9	-	60.0	50.0	40.0	-	-	-	-	-	-	-	-	13.3	-	15.9
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.7	2.9
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	21.7
Other Teleostei	5.3	-	30.4	16.7	-	-	60.0	-	-	-	-	-	-	12.5	27.3	33.3	14.6	26.1
Other	5.3	25.0	4.3	-	-	40.0	-	-	-	-	-	-	-	-	-	3.3	-	18.8

^aTwo additional samples are still pending analysis.

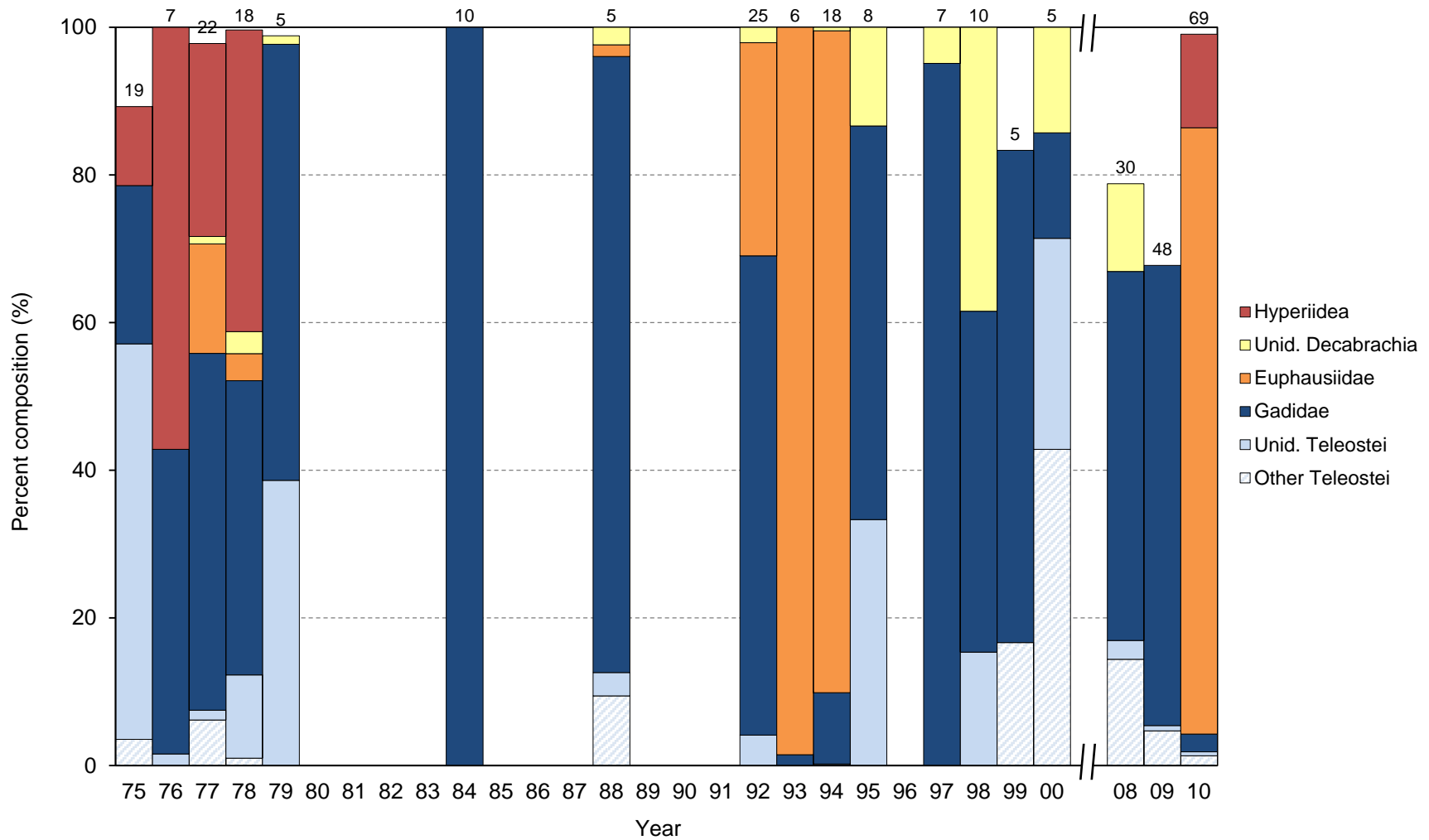


Figure 14. Percent composition of major prey items in diets of thick-billed murre adults at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of stomach contents collected from adults near or at the colony. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1987, 1989-1991, 1996, 2001-2007, or after 2010.

Table 23. Percent composition of major prey items in diets of thick-billed murre adults at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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	7	22	18	5	10	5	25	6	18	8	7	10	5	5	30	48	69 ^a
No. individuals	28	63	600	301	88	508	127	97	1421	435	15	41	13	6	14	236	276	4189
Invertebrates	21.4	57.1	44.2	47.8	2.3	-	3.9	30.9	98.5	90.1	13.3	4.9	38.5	16.7	14.3	31.4	32.2	95.3
Amphipoda	14.3	57.1	26.2	40.9	-	-	-	-	-	-	-	-	-	16.7	-	3.4	-	12.9
Hyperiidea	10.7	57.1	26.2	40.9	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7
<i>Themisto libellula</i>	3.6	57.1	26.0	40.9	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3
Other Hyperiidea	7.1	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
Other Amphipoda	3.6	-	-	-	-	-	-	-	-	-	-	-	-	16.7	-	3.4	-	0.2
Cephalopoda	-	-	1.0	3.0	1.1	-	2.4	2.1	-	0.5	13.3	4.9	38.5	-	14.3	11.9	1.1	<0.1
Unid. Decabrachia	-	-	1.0	3.0	1.1	-	2.4	2.1	-	0.5	13.3	4.9	38.5	-	14.3	11.9	-	<0.1
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-
Euphausiacea	-	-	14.8	3.7	-	-	1.6	28.9	98.5	89.7	-	-	-	-	-	-	-	82.1
Euphausiidae	-	-	14.8	3.7	-	-	1.6	28.9	98.5	89.7	-	-	-	-	-	-	-	82.1
<i>Thysanoessa</i> spp.	-	-	-	-	-	-	0.8	28.9	98.5	-	-	-	-	-	-	-	-	39.9
Unid. Euphausiidae	-	-	0.3	3.7	-	-	0.8	-	-	89.7	-	-	-	-	-	-	-	<0.1
Other Euphausiidae	-	-	14.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.2
Other Invertebrates	7.1	-	2.2	0.3	1.1	-	-	-	-	-	-	-	-	-	-	16.1	31.2	0.4
Fish	78.6	42.9	55.8	52.2	97.7	100.0	96.1	69.1	1.5	9.9	86.7	95.1	61.5	83.3	85.7	66.9	67.8	4.3
Teleostei	78.6	42.9	55.8	52.2	97.7	100.0	96.1	69.1	1.5	9.9	86.7	95.1	61.5	83.3	85.7	66.9	67.8	4.3
Gadidae	21.4	41.3	48.3	39.9	59.1	100.0	83.5	64.9	1.5	9.7	53.3	95.1	46.2	66.7	14.3	50.0	62.3	2.4
<i>Gadus chalcogrammus</i>	7.1	7.9	-	39.9	-	33.3	77.2	62.9	1.5	9.7	46.7	95.1	46.2	66.7	14.3	44.9	54.7	1.6
Unid. Gadidae	14.3	33.3	48.3	-	59.1	66.7	6.3	-	-	-	-	-	-	-	-	5.1	-	-
Other Gadidae	-	-	-	-	-	-	-	2.1	-	-	6.7	-	-	-	-	-	7.6	0.8
Unid. Teleostei	53.6	1.6	1.3	11.3	38.6	-	3.1	4.1	-	0.2	33.3	-	15.4	-	28.6	2.5	0.7	0.5
Other Teleostei	3.6	-	6.2	1.0	-	-	9.4	-	-	-	-	-	-	16.7	42.9	14.4	4.7	1.3
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	0.4

^aTwo additional samples are still pending analysis.

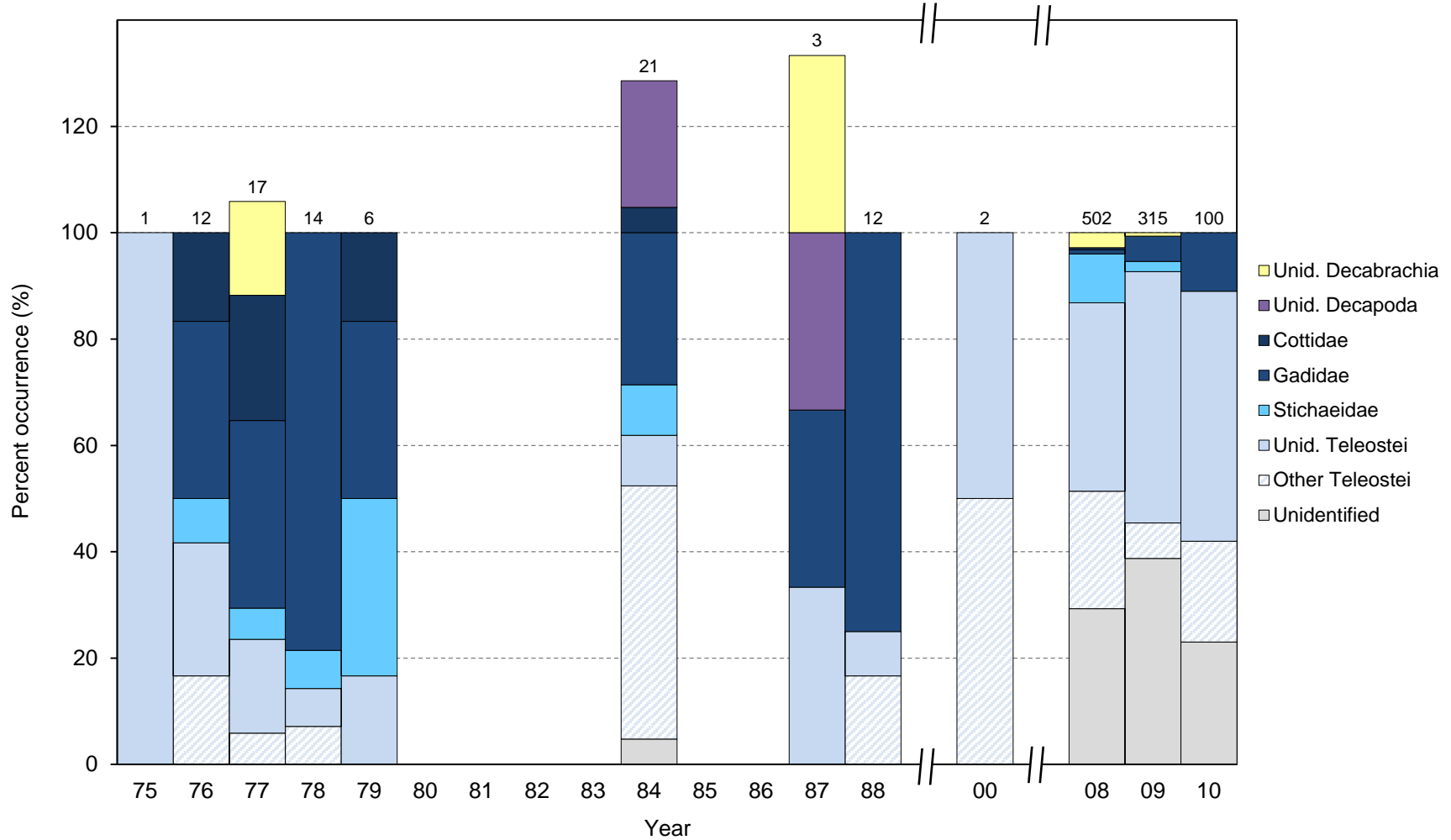


Figure 15. Frequency of occurrence of major prey items in diets of thick-billed murre chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads collected (1975-1988) and observed (2000-2010) from adults returning to the colony to feed chicks, as well as regurgitations collected from chicks (1976, 1979-1988). Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1986, 1989-1999, or after 2010.

Table 24. 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, as well as 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

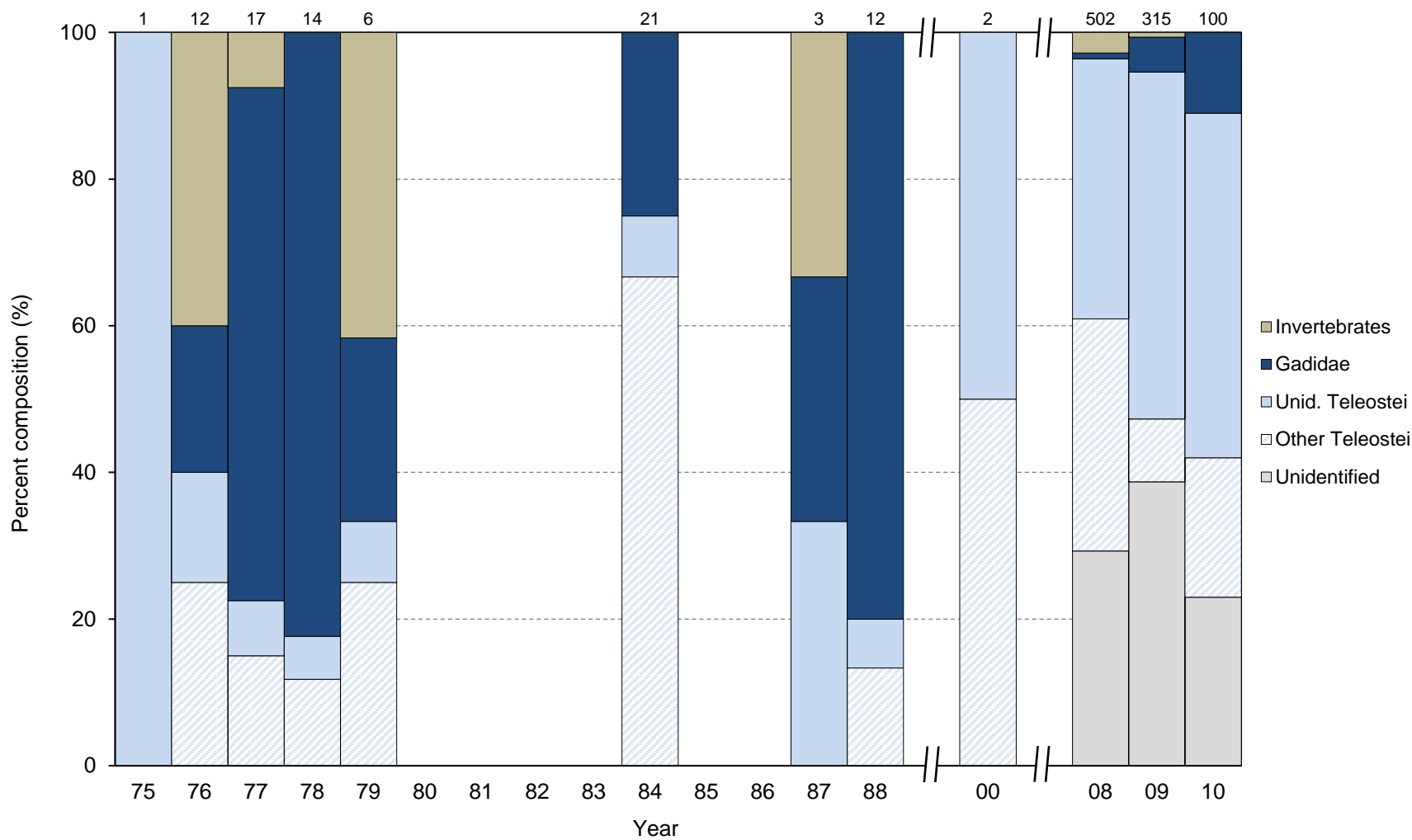


Figure 16. Percent composition of major prey items in diets of thick-billed murre chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads collected (1975-1988) and observed (2000-2010) from adults returning to the colony to feed chicks, as well as regurgitations collected from chicks (1976, 1979-1988). Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1986, 1989-1999, or after 2010.

Table 25. Percent composition of major prey items in diets of thick-billed murre chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as 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
No. individuals	1	20	40	17	12	24	3	15	4	1004	630	200
Invertebrates	-	40.0	7.5	-	41.7	-	33.3	-	-	2.8	0.6	-
Fish	100.0	60.0	92.5	100.0	58.3	100.0	66.7	100.0	100.0	67.9	60.6	77.0
Teleostei	100.0	60.0	92.5	100.0	58.3	100.0	66.7	100.0	100.0	67.9	60.6	77.0
Gadidae	-	20.0	70.0	82.4	25.0	25.0	33.3	80.0	-	0.8	4.8	11.0
<i>Gadus chalcogrammus</i>	-	15.0	12.5	82.4	25.0	4.2	33.3	73.3	-	0.6	-	-
Unid. Gadidae	-	5.0	57.5	-	-	16.7	-	-	-	0.2	4.8	11.0
Other Gadidae	-	-	-	-	-	4.2	-	6.7	-	-	-	-
Unid. Teleostei	100.0	15.0	7.5	5.9	8.3	8.3	33.3	6.7	50.0	35.5	47.3	47.0
Other Teleostei	-	25.0	15.0	11.8	25.0	66.7	-	13.3	50.0	31.7	8.6	19.0
Other	-	-	-	-	-	-	-	-	-	29.3	38.7	23.0
Unidentified	-	-	-	-	-	-	-	-	-	29.3	38.7	23.0

Table 26. 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 27. 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 28.

^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 28. 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 28 (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
LG/DB	DB	802-27764	1987		y	y	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
LG/O	Y	802-27769	1987		y	0	0	-	-	0	0	0	0	1	0	0	0	0	0
O/O	LG	802-58258	1987		y	y	y	-	-	2+	0	0	0	2+	2+	0	0	0	0
O/Y	DB	802-58267	1987		y	y	y	-	-	2+	0	0	2+	0	2+	2+	2+	2+	0
DB/R	O	802-58283	1987		y	y	y	-	-	2+	2+	0	2+	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
BK/DB	O	802-58343	1987		y	y	y	-	-	2+	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
O/Y	LG	802-58361	1987		y	0	0	-	-	1	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	2+	0	0
LG/Y	BK	802-58378	1987		y	y	y	-	-	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
LG/LG	Y	802-58408	1987		y	y	y	-	-	2+	0	0	0	0	2+	0	0	0	0
LG/BK	Y	802-58409	1987		y	y	y	-	-	2+	2+	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	1
LG/DG	BK	802-58411	1987		y	y	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	1
O/LG	R	802-58428	1987		y	y	y	-	-	2+	0	0	1	2+	2+	2+	2+	0	0
Y/BK	W	802-58432	1987		y	y	y	-	-	0	0	0	0	0	2+	2+	0	0	0
DB/O	W	802-58434	1987		y	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
O/BK	W	802-58440	1987		y	y	y	-	-	2+	0	0	1	2+	2+	2+	2+	0	0
R/LG	W	802-58444	1987		y	0	0	-	-	0	0	0	0	0	2+	0	0	0	0
DB/DB	W	802-58452	1987		y	y	y	-	-	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
W/Y	LG	802-58466	1987		y	y	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	1
W/LG	O	802-58468	1987		y	0	0	-	-	1	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
B/DG	BK	802-58472	1987		y	y	y	-	-	1	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
DG/R	LG	802-58537	1987		y	y	y	-	-	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
Y/O	LG	802-58739	1987		y	y	y	-	-	1	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
O/DB	LG	802-58748	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	1

Table 28 (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	0	2+	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	0	2+	0	0	0
DG/W	LG	802-58269	≤ 1988		0	y	y	-	-	0	0	0	0	0	0	0	0	2+	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	0	1	0	0
Y/BK	DG	802-58322	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	0	0	0	1	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 28 (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
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 28 (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 28 (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 28 (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 28 (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 28 (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 28 (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 28 (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 28 (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

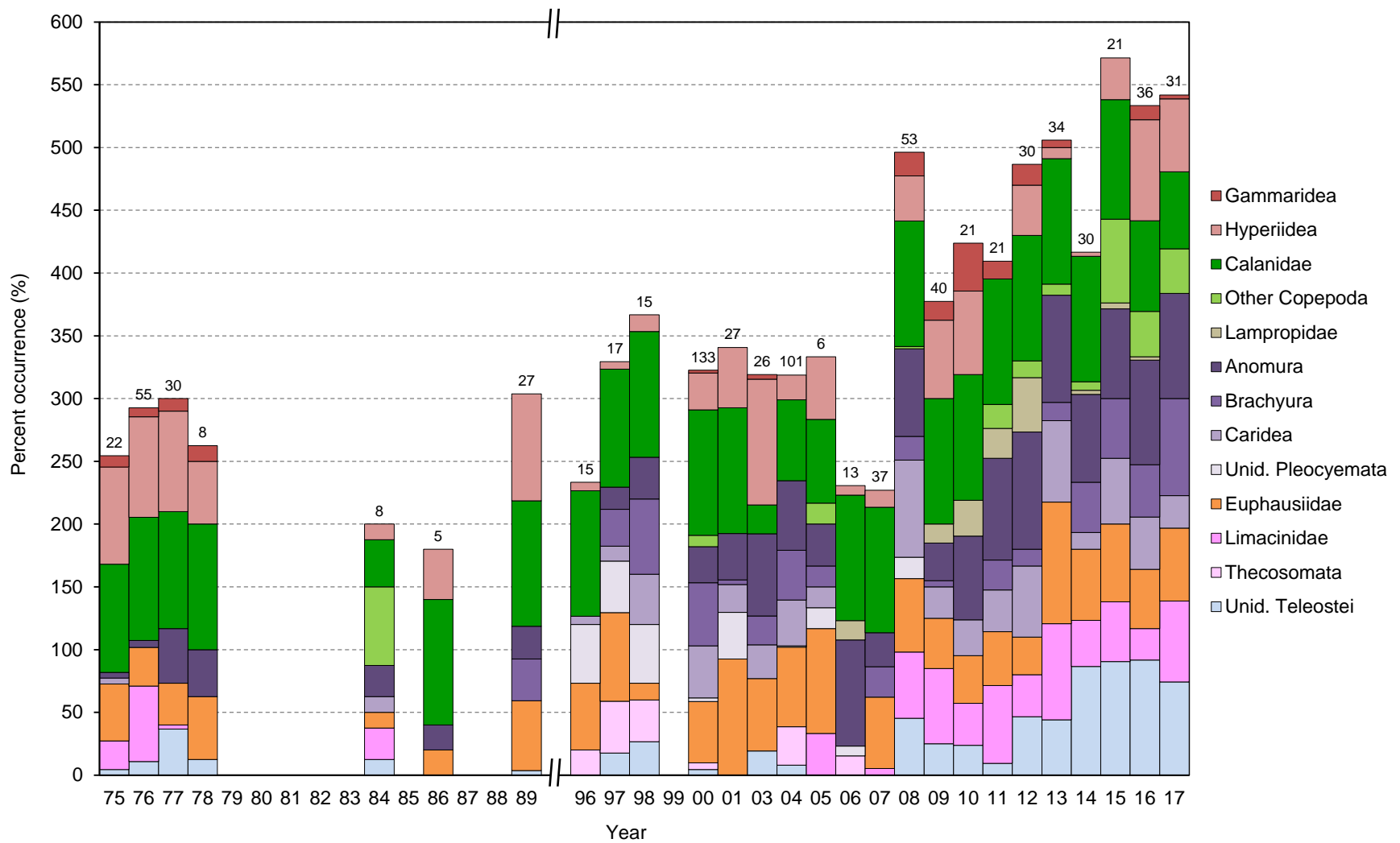


Figure 17. Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). Numbers above columns indicate sample sizes. No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002.

Table 29. 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, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002. 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	2003	2004
No. samples	22	55	30	8	8	5	27	15	17	15	133	27	26	101
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	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	30.8	48.1	100.0	19.8
Gammaridea	9.1	7.3	10.0	12.5	-	-	-	-	-	-	2.3	-	3.8	-
Hyperiidea	77.3	80.0	80.0	50.0	12.5	40.0	85.2	6.7	5.9	13.3	29.3	48.1	100.0	19.8
<i>Hyperoche medusarum</i>	-	29.1	-	12.5	-	-	70.4	-	-	-	-	-	53.8	5.0
<i>Themisto libellula</i>	68.2	56.4	56.7	25.0	-	-	3.7	-	-	-	27.1	25.9	-	1.0
<i>T. pacifica</i>	-	1.8	-	12.5	-	40.0	14.8	6.7	-	13.3	-	-	73.1	5.9
Other Hyperiidea	9.1	12.7	33.3	-	12.5	-	40.7	-	5.9	-	-	25.9	23.1	8.9
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	23.1	64.4
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	23.1	64.4
<i>Calanus marshallae</i>	68.2	14.5	-	-	25.0	-	29.6	13.3	88.2	53.3	97.7	100.0	11.5	3.0
<i>Calanus</i> spp.	18.2	80.0	90.0	50.0	-	80.0	-	-	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	-	61.8	60.0	100.0	37.5	40.0	100.0	33.3	35.3	46.7	69.9	3.7	15.4	26.7
<i>N. plumchrus/flemengeri</i>	-	-	-	-	-	-	29.6	80.0	64.7	100.0	70.7	7.4	3.8	64.4
Unid. Calanidae	-	-	-	-	-	-	3.7	-	-	-	91.0	100.0	-	-
Other Calanidae	-	65.5	-	37.5	12.5	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	62.5	-	-	-	-	-	9.0	-	-	-
Cumacea	-	27.3	13.3	25.0	-	-	-	-	-	-	-	-	-	-
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	77.4	63.0	80.8	82.2
Anomura	4.5	5.5	43.3	37.5	25.0	20.0	25.9	-	17.6	33.3	28.6	37.0	65.4	55.4
Lithodidae	-	1.8	-	-	25.0	20.0	3.7	-	-	-	-	-	61.5	32.7
Paguridae	-	-	-	-	-	-	25.9	-	17.6	33.3	26.3	37.0	57.7	45.5
Unid. Anomura	4.5	3.6	43.3	37.5	12.5	-	-	-	-	-	-	-	-	-
Other Anomura	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-
Brachyura	-	-	-	-	-	-	33.3	-	29.4	60.0	50.4	3.7	23.1	39.6
Cheiragonidae/Atelecyclidae ^a	-	-	-	-	-	-	-	-	-	60.0	-	-	23.1	39.6
<i>Erimacrus isenbeckii</i>	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-
Unid. Brachyura	-	-	-	-	-	-	33.3	-	-	-	45.9	3.7	-	-
Other Brachyura	-	-	-	-	-	-	-	-	29.4	-	3.8	-	-	-

Table 29 (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, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	6	13	37	53	40	21	21	30	34	30	21	36	31
Invertebrates	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Amphipoda	50.0	7.7	13.5	37.7	70.0	76.2	14.3	46.7	14.7	3.3	38.1	80.6	74.2
Gammaridea	-	-	-	18.9	15.0	38.1	14.3	16.7	5.9	-	-	11.1	3.2
Hyperiidea	50.0	7.7	13.5	35.8	62.5	66.7	-	40.0	8.8	3.3	33.3	80.6	58.1
<i>Hyperoche medusarum</i>	-	-	-	34.0	-	14.3	-	-	-	-	33.3	66.7	22.6
<i>Themisto libellula</i>	-	-	-	-	50.0	66.7	-	23.3	-	-	-	-	-
<i>T. pacifica</i>	50.0	-	5.4	1.9	12.5	-	-	10.0	5.9	3.3	19.0	69.4	58.1
Other Hyperiidea	-	7.7	8.1	-	35.0	19.0	-	13.3	2.9	-	-	2.8	-
Other Amphipoda	-	-	-	1.9	-	4.8	-	-	-	-	4.8	-	3.2
Copepoda	83.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.2	83.3	71.0
Calanidae	66.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.2	72.2	61.3
<i>Calanus marshallae</i>	66.7	38.5	75.7	83.0	95.0	95.2	100.0	100.0	97.1	100.0	95.2	47.2	61.3
<i>Calanus</i> spp.	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	-	100.0	97.3	100.0	72.5	81.0	57.1	86.7	32.4	36.7	14.3	30.6	9.7
<i>N. plumchrus/flemengeri</i>	-	38.5	81.1	98.1	100.0	95.2	100.0	96.7	100.0	53.3	19.0	44.4	29.0
Unid. Calanidae	-	-	91.9	56.6	-	-	-	-	-	-	-	-	6.5
Other Calanidae	-	-	-	-	-	4.8	-	-	-	-	4.8	-	-
Other Copepoda	16.7	-	-	1.9	-	-	19.0	13.3	8.8	6.7	66.7	36.1	35.5
Cumacea	-	15.4	-	7.5	15.0	28.6	23.8	43.3	20.6	3.3	4.8	2.8	-
Lampropidae	-	15.4	-	-	15.0	28.6	23.8	43.3	-	3.3	4.8	2.8	-
Other Cumacea	-	-	-	7.5	-	4.8	-	-	20.6	-	-	-	-
Decapoda	50.0	84.6	45.9	92.5	42.5	71.4	95.2	96.7	85.3	80.0	90.5	83.3	93.5
Anomura	33.3	84.6	27.0	69.8	30.0	66.7	81.0	93.3	85.3	70.0	71.4	83.3	83.9
Lithodidae	-	-	18.9	1.9	27.5	28.6	71.4	50.0	14.7	3.3	-	2.8	12.9
Paguridae	33.3	84.6	10.8	69.8	10.0	23.8	57.1	93.3	70.6	66.7	71.4	83.3	71.0
Unid. Anomura	-	-	-	-	-	33.3	-	-	-	13.3	-	-	-
Other Anomura	-	-	-	1.9	-	-	9.5	-	76.5	30.0	-	-	19.4
Brachyura	16.7	-	24.3	18.9	5.0	-	23.8	13.3	14.7	40.0	47.6	41.7	77.4
Cheiragonidae/Atelecyclidae ^a	16.7	-	-	3.8	5.0	-	23.8	-	2.9	6.7	-	-	-
<i>Erimacrus isenbeckii</i>	-	-	-	-	-	-	-	-	-	13.3	28.6	27.8	58.1
Unid. Brachyura	-	-	24.3	15.1	-	-	-	-	-	-	-	2.8	-
Other Brachyura	-	-	-	-	-	-	4.8	13.3	11.8	40.0	23.8	19.4	35.5

Table 29 (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, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002. 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	2003	2004
Caridea	4.5	-	-	-	12.5	-	-	6.7	11.8	40.0	41.4	22.2	26.9	36.6
Hippolytidae	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	-	-	-	-	26.9	2.0
Unid. Caridea	-	-	-	-	12.5	-	-	6.7	11.8	40.0	38.3	22.2	-	35.6
Other Caridea	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Pleocyemata	-	-	-	-	-	-	-	46.7	41.2	46.7	3.0	37.0	-	1.0
Other Decapoda	4.5	-	-	12.5	62.5	-	-	-	-	-	-	-	-	-
Euphausiacea	45.5	30.9	33.3	50.0	12.5	20.0	55.6	53.3	70.6	13.3	48.9	92.6	57.7	63.4
Euphausiidae	45.5	30.9	33.3	50.0	12.5	20.0	55.6	53.3	70.6	13.3	48.9	92.6	57.7	63.4
<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	-	-	-	-	-	26.9	8.9
<i>Thysanoessa</i> spp.	13.6	9.1	6.7	-	-	-	-	53.3	-	-	48.9	48.1	-	23.8
Unid. Euphausiidae	13.6	16.4	23.3	37.5	-	-	33.3	-	70.6	13.3	-	59.3	34.6	41.6
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	5.3	-	-	30.7
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	5.3	-	-	30.7
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	4.5	-	23.1	7.9
Teleostei	4.5	10.9	36.7	12.5	12.5	20.0	3.7	-	17.6	26.7	4.5	-	23.1	7.9
Unid. Teleostei	4.5	10.9	36.7	12.5	12.5	-	3.7	-	17.6	26.7	4.5	-	19.2	7.9
Other Teleostei	-	-	-	-	-	20.0	-	-	-	-	-	-	3.8	-
Other	4.5	1.8	3.3	-	50.0	-	-	-	-	-	-	-	-	-

Table 29 (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, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Caridea	16.7	-	-	77.4	25.0	28.6	33.3	56.7	64.7	13.3	52.4	41.7	25.8
Hippolytidae	-	-	-	66.0	5.0	14.3	23.8	50.0	55.9	13.3	52.4	22.2	9.7
Pandalidae	16.7	-	-	34.0	10.0	9.5	9.5	13.3	44.1	3.3	9.5	27.8	19.4
Unid. Caridea	-	-	-	28.3	-	14.3	-	-	-	3.3	4.8	8.3	6.5
Other Caridea	-	-	-	43.4	15.0	-	-	30.0	5.9	-	-	-	-
Unid. Pleocyemata	16.7	7.7	-	17.0	-	-	-	-	-	-	-	-	-
Other Decapoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	83.3	-	56.8	58.5	40.0	38.1	42.9	30.0	97.1	56.7	61.9	47.2	58.1
Euphausiidae	83.3	-	56.8	58.5	40.0	38.1	42.9	30.0	97.1	56.7	61.9	47.2	58.1
<i>Thysanoessa inermis</i>	16.7	-	-	-	35.0	-	-	-	20.6	23.3	4.8	11.1	-
<i>T. raschii</i>	-	-	-	-	-	-	-	-	-	13.3	42.9	13.9	32.3
<i>Thysanoessa</i> spp.	66.7	-	21.6	22.6	-	28.6	42.9	26.7	97.1	26.7	47.6	22.2	22.6
Unid. Euphausiidae	16.7	-	48.6	39.6	5.0	9.5	-	-	-	26.7	4.8	22.2	16.1
Other Euphausiidae	-	-	-	-	-	-	-	3.3	-	-	4.8	36.1	19.4
Gastropoda	33.3	15.4	5.4	52.8	60.0	33.3	61.9	33.3	76.5	36.7	47.6	33.3	74.2
Limacinidae	33.3	-	5.4	52.8	60.0	33.3	61.9	33.3	76.5	36.7	47.6	25.0	64.5
<i>Limacina helicina</i>	33.3	-	5.4	52.8	60.0	33.3	61.9	33.3	76.5	36.7	47.6	25.0	64.5
<i>Limacina</i> spp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Thecosomata	-	15.4	-	-	-	-	-	-	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	-	-	-	-	3.3	-	13.9	16.1
Other Invertebrates	-	-	-	7.5	-	-	-	-	-	-	19.0	11.1	19.4
Fish	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1	86.7	90.5	91.7	74.2
Teleostei	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1	86.7	90.5	91.7	74.2
Unid. Teleostei	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1	86.7	90.5	91.7	74.2
Other Teleostei	-	-	-	-	10.0	-	-	-	-	-	-	5.6	-
Other	-	-	-	3.8	-	-	-	-	-	-	-	-	-

^aMost likely Cheiragonidae but recent changes in taxonomy of Atelecyclidae and Cheiragonidae makes historic identification not entirely certain.

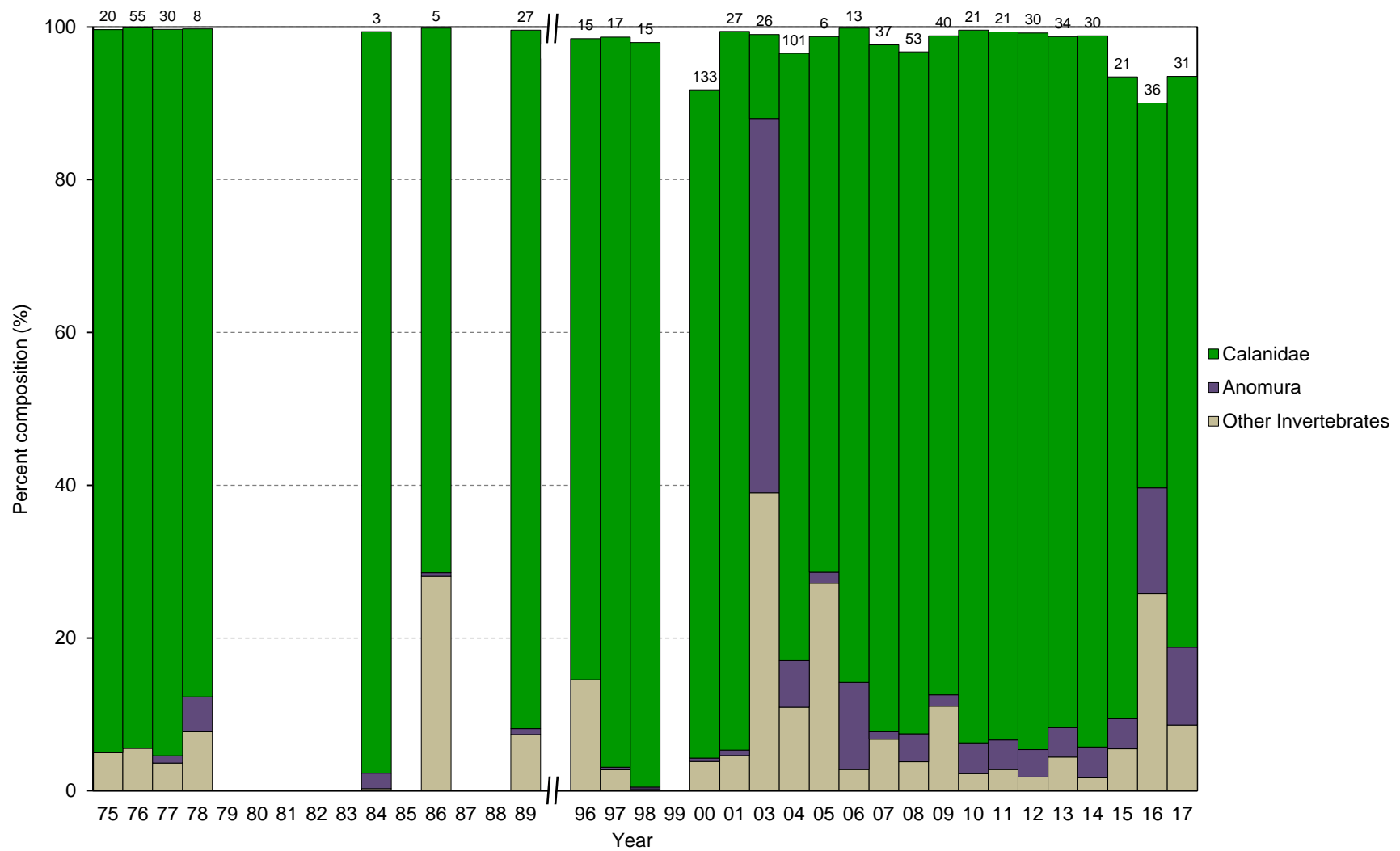


Figure 18. Percent composition of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2017) and gular pouch contents from adults collected at or near the colony (1984). Numbers above columns indicate sample sizes. No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002.

Table 30. Percent composition of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, 1986-2016) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002; samples were collected in 2017 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	2003	2004
No. samples	20	55	30	8	3	5	27	15	17	15	133	27	26	101
No. individuals	5026	23764	7914	828	3963	662	3700	3159	7209	8419	89538	15755	2735	26799
Invertebrates	100.0	99.9	99.7	99.9	100.0	99.8	100.0	100.0	99.9	99.9	100.0	100.0	99.7	100.0
Copepoda	94.7	94.3	95.1	87.4	97.0	71.3	91.4	84.0	95.6	97.5	94.9	94.1	11.0	79.5
Calanidae	94.7	94.3	95.1	87.4	97.0	71.3	91.4	84.0	95.6	97.5	87.5	94.1	11.0	79.5
<i>Calanus marshallae</i>	75.8	13.0	-	-	39.5	-	0.6	0.3	51.3	4.4	69.5	82.1	9.4	1.2
<i>Calanus</i> spp.	18.8	77.2	93.5	1.7	-	33.7	-	-	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	-	1.3	1.6	69.3	56.2	37.6	89.4	5.3	0.3	1.0	3.1	<0.1	1.1	0.5
<i>N. plumchrus/flemengeri</i>	-	-	-	-	-	-	1.4	78.3	43.9	92.1	14.9	0.1	0.6	77.8
Other Calanidae	-	2.8	-	16.4	1.3	-	-	-	-	-	-	11.9	-	-
Other Copepoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	0.3	<0.1	0.9	4.7	2.7	0.5	1.2	1.5	1.5	2.2	1.3	1.3	49.7	9.6
Anomura	<0.1	<0.1	0.9	4.6	2.0	0.5	0.8	-	0.3	0.2	0.4	0.7	49.0	6.1
Other Decapoda	0.3	-	-	0.1	0.6	-	0.4	1.5	1.2	2.0	0.9	0.6	0.7	3.5
Other Invertebrates	5.0	5.6	3.6	7.7	0.3	28.1	7.4	14.5	2.8	0.2	3.8	4.6	39.0	11.0
Fish	-	0.1	0.3	0.1	-	0.2	<0.1	-	0.1	0.1	<0.1	-	0.3	<0.1
Other	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-

Table 30 (continued). Percent composition of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, 1986-2016) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985, 1987-1988, 1990-1995, 1999, or 2002; samples were collected in 2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	6	13	37	53	40	21	21	30	34	30	21	36	31
No. individuals	5778	1506	5714	18135	34296	13170	8586	63766	72159	10689	6214	6869	9171
Invertebrates	100.0	100.0	100.0	99.2	99.5	99.9	100.0	99.8	99.9	99.7	98.4	94.3	96.6
Copepoda	70.5	85.7	89.9	89.3	86.2	93.3	92.8	93.8	90.5	93.2	87.1	51.9	75.6
Calanidae	70.1	85.7	89.9	89.3	86.2	93.3	92.7	93.8	90.4	93.1	84.0	50.4	74.7
<i>Calanus marshallae</i>	70.1	4.7	33.4	9.5	10.1	65.6	63.7	90.1	17.3	89.8	83.8	7.5	72.5
<i>Calanus</i> spp.	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	-	13.3	27.5	14.2	2.1	2.7	2.9	1.0	0.2	0.1	0.1	0.7	0.5
<i>N. plumchrus/flemengeri</i>	-	67.6	12.1	64.6	74.0	23.6	26.1	2.6	73.0	3.1	0.2	42.2	1.7
Other Calanidae	-	-	16.9	0.9	-	1.4	-	-	-	-	-	-	-
Other Copepoda	0.4	-	-	-	-	-	0.1	-	-	0.1	3.1	1.5	0.9
Decapoda	2.3	11.6	3.3	6.1	2.2	4.4	4.4	4.2	5.0	4.7	5.8	16.6	12.3
Anomura	1.5	11.4	1.0	3.7	1.5	4.0	3.8	3.6	3.9	4.1	3.9	13.9	10.2
Other Decapoda	0.9	0.1	2.4	2.5	0.7	0.3	0.6	0.6	1.2	0.7	1.9	2.7	2.1
Other Invertebrates	27.2	2.8	6.8	3.8	11.1	2.2	2.8	1.8	4.4	1.7	5.5	25.8	8.6
Fish	-	-	-	0.7	0.5	0.1	<0.1	0.2	0.1	0.3	1.6	5.7	3.4
Other	-	-	-	0.1	-	-	-	-	-	-	-	-	-

Table 31. Numbers of horned puffin counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul – 3 Aug		
1	0	0	0	0	0	0	-	-
2sw	0	0	0	4	0	0	-	-
2ne	0	0	0	2	0	0	-	-
3	1	0	0	2	2	0	-	-
4	0	0	0	0	0	0	-	-
5sw	3	0	3	0	5	2	-	-
5ne	0	0	2	7	1	0	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	-	-
8	6	1	0	0	0	0	-	-
9 ^a	-	-	-	-	-	-	-	-
10	0	0	2	0	0	0	-	-
11	1	0	1	2	0	1	-	-
12	0	0	0	0	0	0	-	-
13	1	1	0	12	5	5	-	-
14	2	5	13	4	0	4	-	-
15	2	10	0	11	0	6	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	2	0	1	-	-
19top	0	5	0	2	2	1	-	-
19btm	0	3	1	11	0	2	-	-
20top	0	3	0	4	0	1	-	-
20btm	0	1	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	2	10	4	0	0	-	-
23	1	1	1	1	0	1	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	-	-
27	0	1	0	0	0	0	-	-
28	0	0	0	2	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	1	0	0	0	0	-	-
30	1	7	2	14	0	8	-	-
31	57	88	119	97	22	55	-	-
32	7	87	56	25	19	80	-	-
33	10	21	27	39	16	33	-	-
Total ^b	92	237	237	245	72	200	180	78

^aHistorical plots no longer counted

Table 32. Numbers of tufted puffin counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul – 3 Aug		
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	1	3	0	-	-
5ne	0	0	0	1	2	0	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	0	1	2	2	0	-	-
8	0	0	0	0	0	0	-	-
9 ^a	0	0	0	0	0	0	-	-
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	0	2	1	0	0	0	-	-
15	0	2	0	3	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	-	-
19top	0	0	0	0	0	0	-	-
19btm	0	1	0	0	0	0	-	-
20top	1	0	2	0	0	0	-	-
20btm	0	1	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	1	0	1	0	0	-	-
23	1	1	1	2	1	1	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	-	-
27	0	0	0	0	0	0	-	-
28	0	2	0	0	0	2	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	-	-
30	0	1	1	0	1	2	-	-
31	14	53	41	16	17	26	-	-
32	0	34	15	15	20	30	-	-
33	55	36	10	71	44	31	-	-
Total ^b	71	134	70	114	90	92	95	25

^aHistorical plots no longer counted.

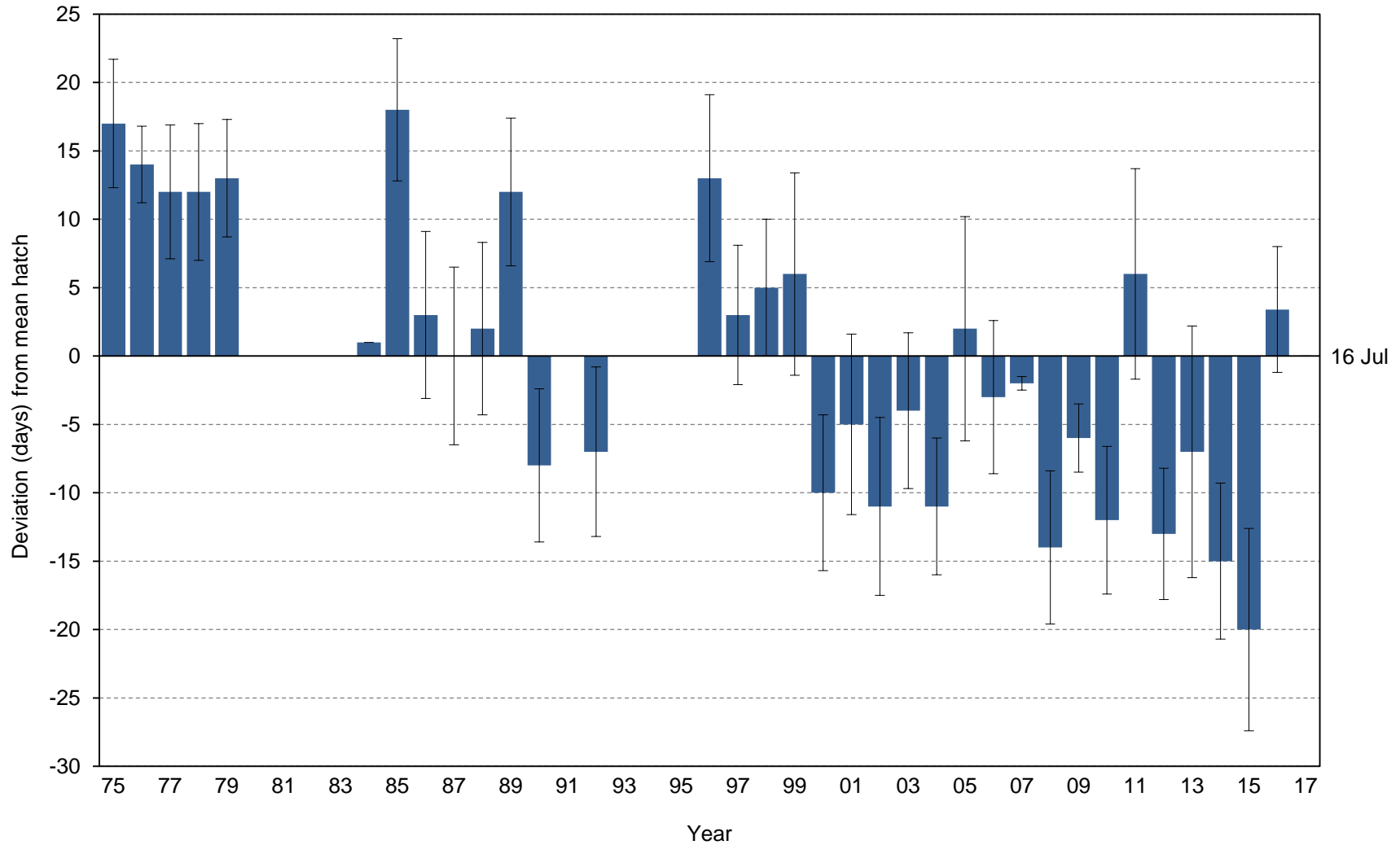


Figure 19. Yearly hatch date deviation (from the 1975-2016 average of 16 July) for black-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent one standard deviation around each year's mean hatch date. No data were collected in 1980-1983, 1991, or 1993-1995; no eggs hatched in plots in 2017.

Table 33. 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. No data were collected in 1980-1983, 1991, or 1993-1995.

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	-	-	-	-
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
1992	13 Jun	6.7	271	8 Jul	6.2	129	5 Jun	28 Jun	7 Aug	12 Aug
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
2015	26 Jun	7.4	106	27 Jul	7.5	13	11 Jun	11 Jul	4 Aug	2 Sep
2016	23 Jun	5.5	172	18 Jul	4.6	79	12 Jun	8 Jul	1 Aug	23 Aug
2017	23 Jun	8.6	59	-	-	-	11 Jun	-	-	-

^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 34. 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. No data were collected in 1980-1983, 1991, or 1993-1995 and no eggs hatched in plots in 2017; data from individual nests are not available before 1984.

Julian date ^a	No. nests hatching on Julian date														
	84	85	86	87	88	89	90	92	96	97	98	99	00	01	02
170	-	-	xx ^b	xx	xx	-	-	-	-	-	-	-	-	-	-
171	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
172	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
173	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
174	-	-	xx	xx	xx	-	1	-	-	-	-	-	2	-	-
175	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-
176	-	-	xx	xx	xx	-	-	-	-	-	-	-	3	1	3
177	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
178	-	-	xx	xx	xx	-	3	-	-	-	-	-	2	1	5
179	-	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-
180	-	-	xx	xx	xx	-	8	1	-	-	-	-	10	1	15
181	-	-	xx	xx	xx	-	2	1	-	-	-	-	14	-	1
182	-	-	xx	xx	xx	-	10	6	-	-	-	-	5	1	5
183	-	-	xx	xx	xx	-	-	1	-	-	-	-	5	2	12
184	-	-	xx	xx	xx	-	8	4	-	-	-	-	7	3	15
185	-	-	xx	xx	xx	-	2	2	-	1	-	-	5	-	-
186	-	-	xx	xx	xx	-	22	29	-	-	-	-	38	3	14
187	-	-	xx	xx	xx	-	-	-	-	-	-	-	6	5	5
188	-	-	xx	xx	xx	-	10	13	-	-	-	-	2	4	12
189	-	-	xx	xx	xx	-	-	8	-	-	-	-	-	4	2
190	-	-	xx	xx	xx	-	30	22	-	-	-	-	24	3	7
191	-	-	xx	xx	xx	-	11	1	-	-	3	-	8	13	-
192	-	-	xx	xx	xx	-	14	6	-	5	1	-	5	6	2
193	-	-	xx	xx	xx	-	9	6	1	-	-	-	5	-	-
194	-	-	xx	xx	xx	-	9	8	-	14	10	2	9	4	9
195	-	-	xx	xx	xx	-	-	-	-	1	-	3	1	3	-
196	-	-	xx	xx	xx	-	14	4	-	14	12	-	2	12	2
197	-	-	xx	xx	xx	-	-	1	-	16	7	-	-	2	-
198	1	-	xx	xx	xx	1	2	2	-	3	20	2	-	-	-
199	-	-	xx	xx	xx	-	-	4	-	-	17	4	1	-	-
200	-	-	xx	xx	xx	2	5	2	1	14	29	2	2	3	-
201	-	-	xx	xx	xx	-	-	1	-	8	-	-	-	3	-
202	-	-	xx	xx	xx	-	-	1	1	18	23	-	1	1	6
203	-	-	xx	xx	xx	-	1	1	2	6	1	4	-	-	-
204	-	-	xx	xx	xx	2	1	1	-	1	29	4	-	1	-
205	-	2	xx	xx	xx	1	1	-	1	18	6	-	-	-	-
206	-	2	xx	xx	xx	4	-	1	3	4	12	-	-	2	-
207	-	-	xx	xx	xx	-	-	-	1	-	2	-	-	-	-
208	-	8	xx	xx	xx	5	-	-	1	6	10	3	-	2	-
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	-	-	-	-	1
217	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-
218	-	5	xx	xx	xx	1	-	-	-	-	1	2	1	-	-
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	-	-	-	-	-	-	-	-	-	-
n	1	86	229	148	113	31	164	129	28	135	198	28	158	81	116

Table 34 (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. No data were collected in 1980-1983, 1991, or 1993-1995 and no eggs hatched in plots in 2017; data from individual nests are not available before 1984.

Julian date ^a	No. nests hatching on Julian date													
	03	04	05	06	07	08	09	10	11	12	13	14	15	16
170	-	-	-	-	-	-	-	1	-	1	-	1	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	-	-	2	-	1	-	1	-	3	-	-
173	-	-	-	-	-	-	-	-	-	-	-	10	-	-
174	-	1	-	-	-	4	-	-	-	3	-	11	-	-
175	-	-	-	-	-	-	-	4	-	3	-	-	-	-
176	1	1	-	-	-	10	-	9	-	2	-	27	-	-
177	-	-	-	-	-	6	-	-	-	-	-	-	-	-
178	-	8	-	-	-	17	-	5	-	11	-	13	-	-
179	-	-	-	-	-	-	-	17	-	68	-	28	-	-
180	-	10	-	-	-	18	-	12	-	68	2	30	-	-
181	-	-	-	-	-	1	-	-	-	-	9	19	-	-
182	2	55	-	-	-	39	-	29	-	12	-	19	-	-
183	2	-	-	-	-	3	-	1	-	1	-	-	-	-
184	1	44	-	3	-	17	-	15	-	51	3	-	-	-
185	-	9	-	-	-	-	-	30	-	12	-	30	-	-
186	14	42	1	2	-	11	3	18	-	54	2	8	-	-
187	1	20	4	5	-	2	-	-	-	2	-	22	-	-
188	21	15	-	1	-	6	1	21	-	16	3	-	-	-
189	28	-	-	8	-	-	-	-	-	-	-	-	-	-
190	2	24	5	9	-	15	11	10	1	14	-	3	-	2
191	12	1	-	17	-	-	-	8	-	-	-	1	-	-
192	29	19	5	2	-	6	-	8	-	7	5	2	1	-
193	1	-	-	19	-	-	5	12	-	7	-	1	-	3
194	25	10	5	7	1	1	3	-	-	-	2	2	-	3
195	2	-	-	8	1	1	-	-	-	2	-	-	1	1
196	9	5	4	-	-	2	-	2	-	1	-	6	-	-
197	-	1	-	15	-	-	-	-	-	1	8	2	-	-
198	24	4	6	4	-	3	-	3	1	-	-	-	-	28
199	3	-	-	-	-	-	-	-	-	-	-	-	-	5
200	5	-	4	6	-	-	-	-	-	-	1	3	1	4
201	2	1	-	4	-	-	-	-	-	-	-	-	-	-
202	3	3	6	3	-	-	-	-	-	1	1	-	-	12
203	2	-	-	-	-	-	-	-	-	-	-	-	-	4
204	8	-	5	-	-	1	-	1	-	-	-	-	-	7
205	-	-	-	2	-	-	-	-	-	-	-	-	2	-
206	-	-	2	1	-	-	-	-	-	-	-	-	-	-
207	1	-	1	-	-	-	-	-	-	-	1	-	1	5
208	4	-	-	-	-	-	-	-	2	-	-	-	-	2
209	-	-	2	2	-	-	-	-	-	-	-	-	1	-
210	1	-	2	-	-	-	-	-	1	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	1	1	-	-	-	-	-	-	-	-	-	1	2
213	-	-	-	-	-	-	-	-	-	1	-	-	-	-
214	-	-	2	1	-	-	-	-	-	-	-	-	4	1
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	2	1	-	-	-	-	-	-	-	-	1	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	1	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	1	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	203	274	58	120	2	165	23	207	5	271	38	241	13	79

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

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

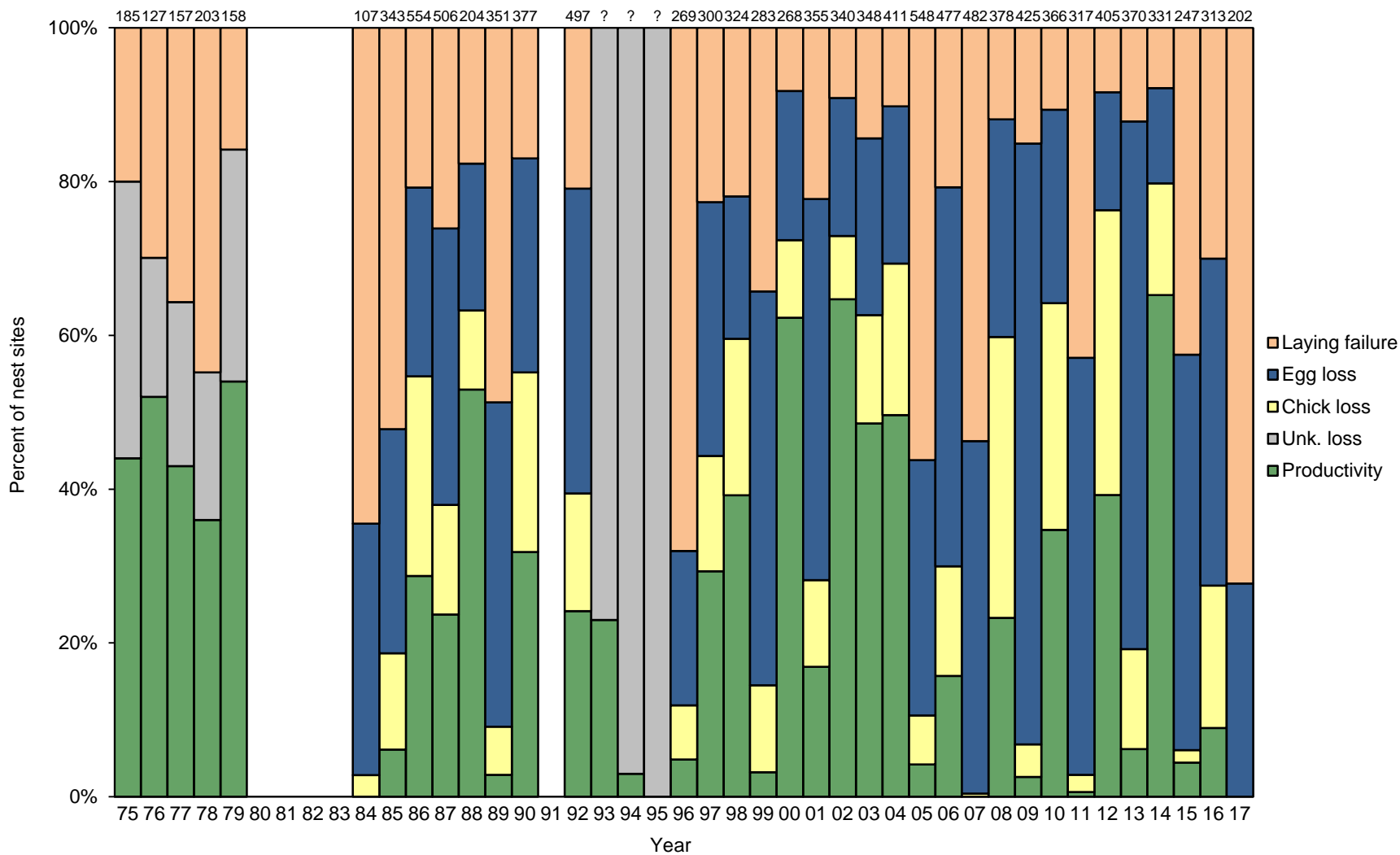


Figure 20. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A). No data were collected in 1980-1983 or 1991.

Table 35. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska. No data were collected in 1980-1983 or 1991.

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	-
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
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.23 ^d
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.03 ^d
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.00 ^d
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
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
2015	247	142	160	15	15	11	11	0.57	1.1	0.11	0.09	0.73	0.07	0.73	0.08	0.04	0.04
2016	313	219	293	86	106	28	28	0.70	1.3	0.39	0.36	0.26	0.10	0.33	0.13	0.09	0.09
2017	202	56	65	0	0	0	0	0.28	1.2	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.

^bValue calculated from smaller sample size.

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

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

Table 36. 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. No data were collected in 1980-1983 or 1991.

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	-
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
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
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
2015	13	247	Cluster by plot	0.02	0.04	0.04	0.04	0.15	0.04	0.15	0.04	0.02	0.02
2016	13	313	Cluster by plot	0.04	0.04	0.05	0.04	0.08	0.04	0.09	0.05	0.04	0.04
2017	10	202	Cluster by plot	0.28	1.16	0.00	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 unknown sample sizes or short-duration visits.

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

Table 37. Clutch sizes of black-legged kittiwakes at St. Paul Island, Alaska. Sample units consist of total nest sites, not plots. No data were collected in 1980-1983, 1991, or 1993-1995.

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
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
1992	497	104	105	287	1	393	682	1.7
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
2015	247	105	124	18	0	142	160	1.1
2016	313	94	145	74	0	219	293	1.3
2017	202	146	47	9	0	56	65	1.2

^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 38. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska in 2017.

Parameter	Plot										Total	SD ^b
	104	110/90 ^a	91	87	88/89/ 98 ^a	64/65/ 66 ^a	67/68 ^a	48/50/ 51 ^a	49/53/ 52 ^a	26/54/ 55/56 ^a		
Total nest starts (A)	21	28	26	11	17	17	13	20	18	31	202	-
Nest sites w/ eggs (B)	6	11	15	1	5	2	5	2	3	6	56	-
Total eggs (C)	6	11	22	1	7	2	5	2	3	6	65	-
Nest sites w/ chicks (D)	0	0	0	0	0	0	0	0	0	0	0	-
Total chicks (E)	0	0	0	0	0	0	0	0	0	0	0	-
Nest sites w/ chicks fledged (F)	0	0	0	0	0	0	0	0	0	0	0	-
Total chicks fledged (G)	0	0	0	0	0	0	0	0	0	0	0	-
Laying success (B/A)	0.29	0.39	0.58	0.09	0.29	0.12	0.38	0.10	0.17	0.19	0.28	0.05
Mean clutch size (C/B)	1.0	1.0	1.5	1.0	1.4	1.0	1.0	1.0	1.0	1.0	1.2	0.10
Nesting success (D/B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hatching success (E/C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chick success (G/E)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Egg success (G/C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fledging success (F/D)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reproductive success (F/B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fledglings/nest start (G/A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Productivity (F/A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

^aPlots were combined for statistical purposes.

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

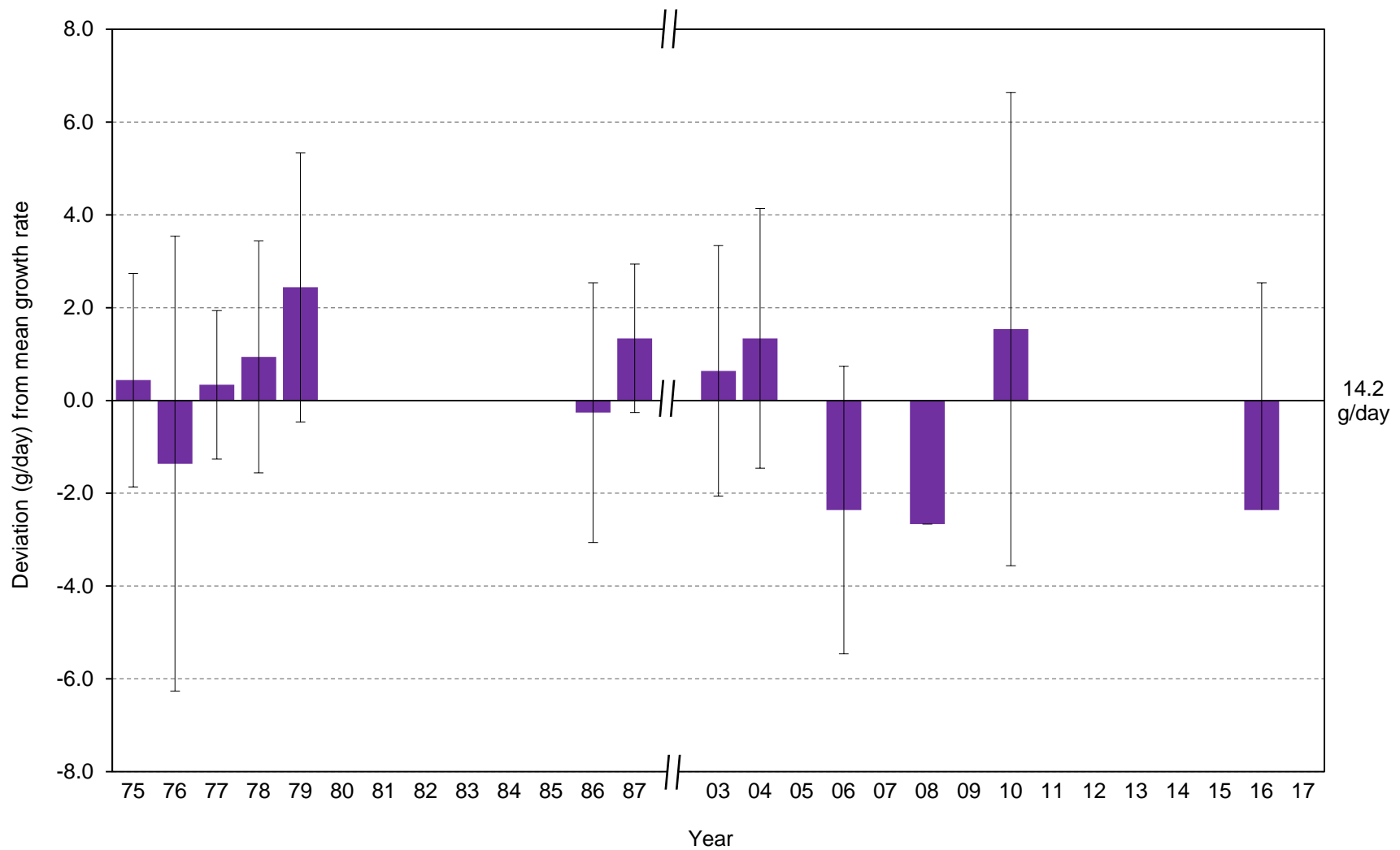


Figure 21. Yearly chick growth rate deviation (from the 1975-2016 average of 14.2 g/day) for black-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent one standard deviation around each year's mean growth rate. No chicks were measured in 1980-1985, 1988-2002, 2005, 2007, 2009, 2011-2015, or 2017.

Table 39. 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, 2005, 2007, 2009, 2011-2015, or 2017.

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
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
2016	11.8	4.9	2.8-18.2	9	2.5	0.9	0.5-3.5	9	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.

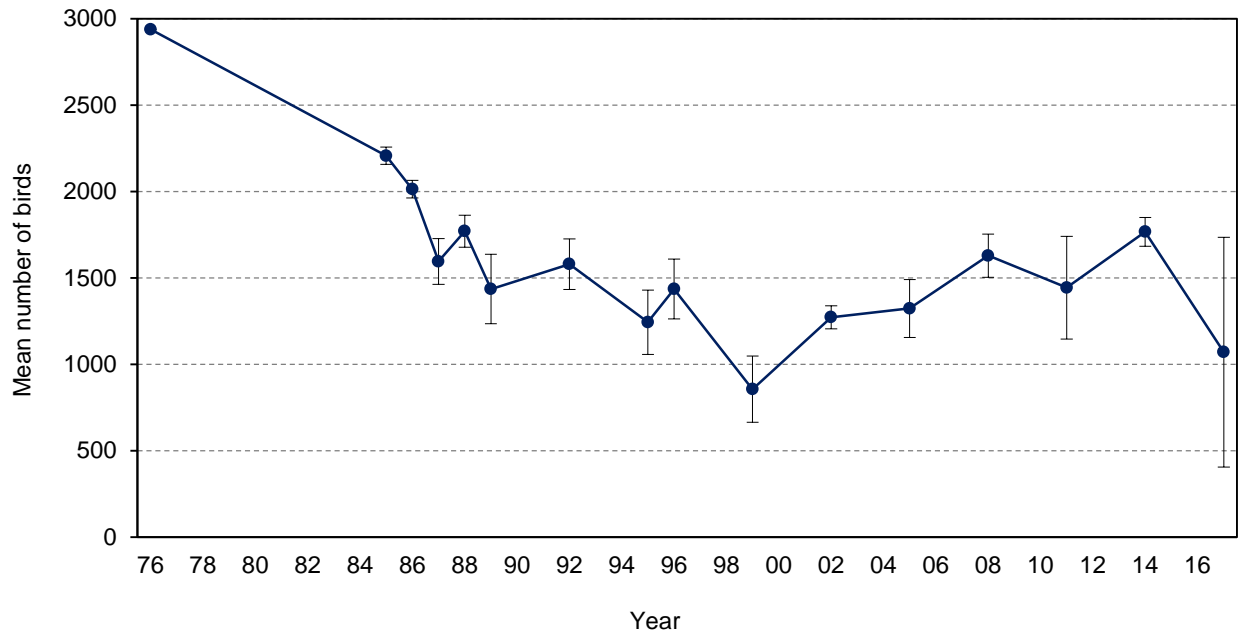


Figure 22. Mean numbers of black-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted.

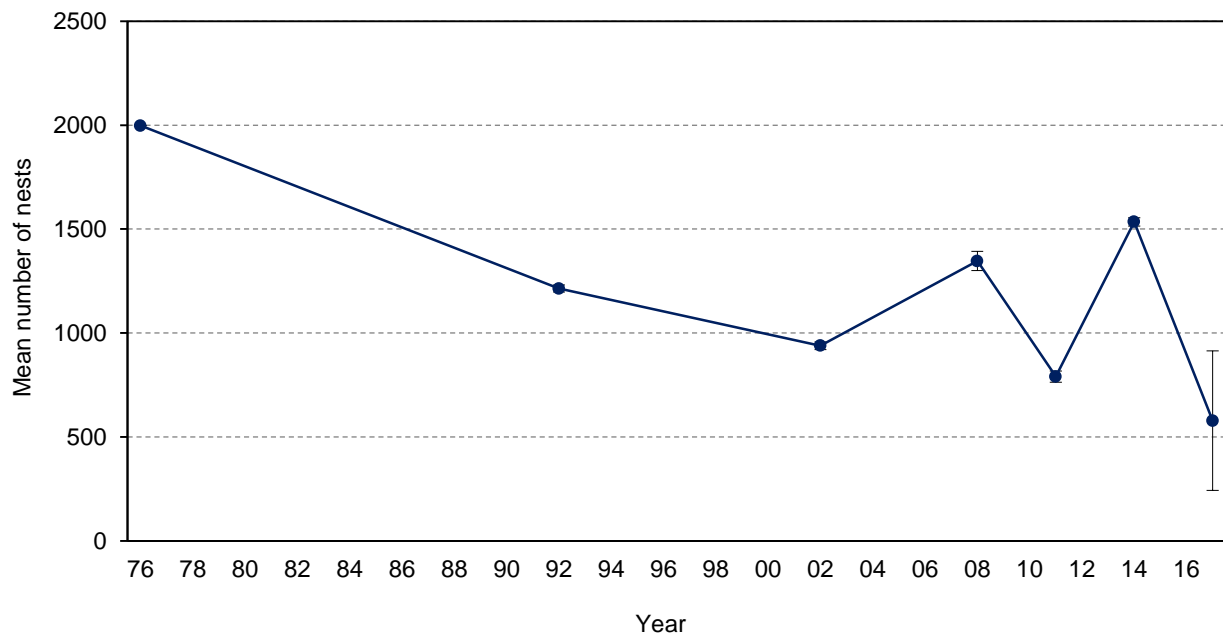


Figure 23. Mean numbers of black-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted; data potentially exist in 1985-1989, 1996, 1999, and 2005 but have not yet been summarized.

Table 40. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014	2017
1	2939	2240	2003	1382	1714	1596	1630	1132	1195	635	1175	1266	1569	1004	1752	1712
2	-	2238	2100	1636	1739	1708	1687	1142	1476	698	1226	1165	1606	1050	1742	1873
3	-	2133	1971	1644	1758	1602	1521	1459	1592	831	1290	1140	1559	1399	1664	1403
4	-	2219	2016	1559	1721	1244	1709	-	1382	803	1299	1353	1507	1508	1695	538
5	-	-	1979	1568	1666	1220	1314	-	1316	1069	1369	1164	1585	1744	1781	489
6	-	-	-	1787	1880	1226	1621	-	1657	1102	1278	1568	1572	1380	1818	415
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	1071
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	7	6
SD	-	51	52	133	92	201	146	186	173	191	66	168	125	297	83	666
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	1 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	4 Aug

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

Table 41. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1996	1999	2002	2005	2008	2011	2014	2017
1	1998	xx ^a	xx	xx	xx	xx	1200	xx	xx	917	xx	1399	816	1406	789
2	-	xx	xx	xx	xx	xx	1237	xx	xx	951	xx	1384	792	1451	698
3	-	xx	xx	xx	xx	xx	1216	xx	xx	948	xx	1396	763	1422	327
4	-	xx	xx	xx	xx	xx	1201	xx	xx	-	xx	1357	-	1420	135
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	578
Overall max. ^b	1998	1569	1959	1521	1399	924	1277	940	851	987	441	1496	881	1549	943
<i>n</i>	1	xx	xx	xx	xx	xx	4	xx	xx	3	xx	8	3	7	4
SD	-	xx	xx	xx	xx	xx	17	xx	xx	19	xx	46	27	20	308
First count	17 Jul	xx	xx	xx	xx	xx	12 Jul	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun	1 Jul
Last count	21 Jul	xx	xx	xx	xx	xx	30 Jul	xx	xx	23 Jul	xx	31 Jul	14 Jul	27 Jul	20 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 42. Numbers of black-legged kittiwakes counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul-4 Aug		
1	5	9	8	5	2	6	-	-
2sw	3	6	9	5	1	1	-	-
2ne	2	4	3	1	0	0	-	-
3	27	22	18	19	4	9	-	-
4	3	4	2	3	9	3	-	-
5sw	32	40	28	14	7	32	-	-
5ne	16	19	11	11	2	16	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	28	10	6	3	9	-	-
8	1	3	2	7	6	0	-	-
9	-	-	-	-	-	-	-	-
10	16	12	12	9	6	4	-	-
11	9	10	15	2	0	0	-	-
12	56	64	61	50	15	24	-	-
13	31	28	28	23	6	8	-	-
14	15	15	11	10	3	4	-	-
15	17	11	14	9	2	1	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	6	6	10	6	0	1	-	-
19top	2	1	0	1	0	0	-	-
19btm	0	37	41	12	8	5	-	-
20top	0	0	0	0	0	0	-	-
20btm	19	25	30	3	8	1	-	-
21 ^a	-	-	-	-	-	-	-	-
22	21	27	19	2	3	4	-	-
23	36	37	32	26	9	12	-	-
24	62	77	71	53	20	29	-	-
25	44	43	29	21	5	6	-	-
26	22	17	6	8	1	4	-	-
27	37	21	20	2	7	7	-	-
28	2	1	4	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	-	-
30	13	12	10	2	2	11	-	-
31	475	456	327	196	162	99	-	-
32	255	195	233	27	73	63	-	-
33	500	696	393	20	135	95	-	-
Total ^b	1712	1873	1403	538	489	415	1071	666

^aHistorical plots no longer counted.

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

Table 43. Numbers of black-legged kittiwake nests counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate				Mean	SD	Max.
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul			
1	3	4	3	2	3	1	4
2sw	1	2	0	2	2	1	2
2ne	0	0	0	0	0	0	0
3	18	10	2	6	11	7	18
4	2	3	1	1	2	1	3
5sw	19	10	2	3	11	8	19
5ne	6	3	1	1	3	2	6
6 ^a	-	-	-	-	-	-	-
7	9	8	2	0	7	4	9
8	1	1	1	0	1	0	1
9 ^a	-	-	-	-	-	-	-
10	6	3	0	0	5	2	6
11	3	1	0	0	2	1	3
12	20	8	5	1	11	8	20
13	11	8	5	5	8	3	11
14	5	4	1	0	4	2	5
15	4	1	1	1	2	2	4
16 ^a	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-
18	1	2	0	0	2	1	2
19top	0	1	0	0	1	0	1
19btm	0	0	0	0	0	0	0
20top	0	0	0	0	0	0	0
20btm	0	0	1	0	1	0	1
21 ^a	-	-	-	-	-	-	-
22	3	3	6	0	5	2	6
23	11	5	2	2	6	4	11
24	19	3	6	4	10	7	19
25	9	4	5	1	6	3	9
26	6	0	0	1	4	4	6
27	16	10	6	1	10	6	16
28	2	1	0	0	2	1	2
29 ^a	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0
30	0	0	0	0	3	1	0
31	210	155	95	49	144	70	212
32	146	92	94	43	106	42	154
33	258	356	88	12	221	157	393
Total ^b	789	698	327	135	578	308	943 ^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 44. 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	2015	2016	2017
New color bands	7	7	78	0	10	0	1	0	21	0
New metal and colors	7	0	54	0	10	0	1	0	21	0
New colors on previous metal-banded bird ^a	0	7	24	0	0	0	0	0	0	0
New color bands replace old color bands ^b	0	0	0	0	0	0	0	0	0	0
Cum. color-banded birds	7	14	92	92	102	102	103	103	124	124

^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 45. 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 2017
		2009	2010	2011	2012	2013	2014	2015	2016	2017	
2008	7	5	3	2	2	3	1	2	1	0	0.00
2009	7	-	4	6	5	1	2	3	3	3	0.43
2010	75	-	-	52	52	40	39	41	40	48	0.64
2011	0	-	-	-	-	-	-	-	-	-	-
2012	10	-	-	-	-	6	4	4	6	5	0.50
2013	0	-	-	-	-	-	-	-	-	-	-
2014	1	-	-	-	-	-	-	1	1	1	1.00
2015	0	-	-	-	-	-	-	-	-	-	-
2016	13	-	-	-	-	-	-	-	-	13	1.00
2017	0 ^a	-	-	-	-	-	-	-	-	-	- ^a
Birds seen in current year (A)		5	7	60	59	50	46	51	51	70	-
Birds potentially alive from prior year (B) ^b		7	14	87	87	88	77	73	69	78	-
Apparent annual survival (A/B) ^c		0.71	0.50	0.69	0.68	0.57	0.60	0.70	0.74	0.90	-
Resighting effort ^d											
Total no. resight days		16	14	15	10	8	19	35	35	37	-
Total no. resight hours		N/A ^e	46.0	16.1	8.3	6.0	17.6	17.7	25.9	30.2	-

^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 46. 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	2015	2016	2017	
Yellow	H3	714-10301	2010	TS		-	-	2	0	0	0	0	0	1	
Yellow	H5	714-10303	2010	TS		-	-	5	3	1	4	2	7	7	
Yellow	H8	714-10305	2010	TS		-	-	2	1	0	2	0	0	7	
Yellow	C0	714-10306	2010	TS		-	-	6	2	4	1	1	7	4	
Yellow	H4	714-10307	2010	TS		-	-	3	3	4	4	1	1	7	
Yellow	E3	714-10312	2010	TS		-	-	0	0	0	0	0	0	0	
Yellow	E0	714-10324	2010	TS		-	-	3	1	0	0	0	0	0	
Yellow	C8	714-10325	2010	TS		-	-	3	2	1	3	1	1	4	
Yellow	C9	714-10330	2010	TS		-	-	0	0	0	0	0	0	0	
Yellow	J1	714-10346	2010	SW		-	-	1	2	0	0	2	3	3	
Yellow	J2	714-10347	2010	SW		-	-	2	0	0	0	0	0	0	
Yellow	J3	714-10348	2010	SW		-	-	2	2	0	0	4	3	2	
Yellow	J4	714-10349	2010	SW		-	-	2	1	1	4	5	5	4	
Yellow	J5	714-10350	2010	SW		-	-	0	0	0	0	1	0	2	
Yellow	J6	714-10351	2010	SW		-	-	0	2	1	0	1	3	0	
Yellow	J7	714-10352	2010	SW		-	-	1	2	0	0	2	1	1	
Yellow	J8	714-10353	2010	TN		-	-	1	0	0	0	0	0	3	
Yellow	J9	714-10354	2010	SW		-	-	0	0	0	0	1	0	0	
Yellow	K1	714-10355	2010	SW		-	-	0	0	1	0	7	2	0	
Yellow	J0	714-10356	2010	SW		-	-	3	1	1	4	4	0	0	
Yellow	K2	714-10357	2010	SW		-	-	2	2	1	7	1	0	0	
Yellow	K3	714-10358	2010	SW		-	-	0	3	0	0	0	3	2	
Yellow	K4	714-10359	2010	SW		-	-	0	0	0	1	3	5	4	
Yellow	K6	714-10360	2010	SW		-	-	0	3	1	1	2	3	2	
Yellow	N1	714-10361	2010	SW		-	-	0	1	0	0	0	0	0	
Yellow	N2	714-10362	2010	SW		-	-	0	0	0	0	1	2	1	
Yellow	K7	714-10363	2010	SW		-	-	0	0	0	0	1	1	1	
Yellow	N3	714-10364	2010	SW		-	-	0	0	0	0	0	5	2	
Yellow	K8	714-10365	2010	SW		-	-	2	2	2	2	5	6	3	
Yellow	N4	714-10366	2010	SW		-	-	3	3	0	0	0	0	0	

Table 46 (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	2015	2016	2017	
Yellow	L1	714-10367	2010	SW		-	-	1	0	1	3	0	5	1	
Yellow	K9	714-10368	2010	SW		-	-	1	1	0	0	0	0	0	
Yellow	F1	714-10369	2010	SW		-	-	1	1	1	0	3	5	1	
Yellow	L2	714-10370	2010	SW		-	-	0	0	0	0	0	0	0	
Yellow	F2	714-10371	2010	SW		-	-	0	2	0	4	1	3	3	
Yellow	L3	714-10372	2010	SW		-	-	0	0	0	0	0	0	0	
Yellow	F3	714-10373	2010	SW		-	-	3	2	0	0	0	0	0	
Yellow	N5	714-10374	2010	SW		-	-	0	4	0	5	3	2	3	
Yellow	F4	714-10375	2010	SW		-	-	0	3	2	3	2	4	3	
Yellow	K0	714-10376	2010	SW		-	-	2	4	1	0	0	3	3	
Yellow	N6	714-10377	2010	SW		-	-	0	0	0	0	5	7	0	
Yellow	L4	714-10378	2010	SW		-	-	0	0	0	1	0	2	2	
Yellow	L5	714-10379	2010	SW		-	-	3	2	1	3	3	6	5	
Yellow	F5	714-10380	2010	SW		-	-	0	0	0	0	0	0	0	
Yellow	F7	714-10381	2010	SW		-	-	1	3	0	1	0	0	0	
Yellow	L6	714-10382	2010	SW		-	-	1	1	0	0	0	0	0	
Yellow	M6	714-10391	2010	TN		-	-	1	0	0	0	0	0	0	
Yellow	H9	714-10392	2010	TN		-	-	0	1	0	0	0	1	2	
Yellow	M7	714-10393	2010	TN		-	-	2	0	1	0	0	0	1	
Yellow	H6	714-10395	2012	SW		-	-	-	-	0	10	0	6	1	
Yellow	H0	714-10396	2012	SW		-	-	-	-	1	0	0	0	0	
Yellow	M8	714-10397	2012	SW		-	-	-	-	0	0	0	0	0	
Yellow	M9	714-10398	2012	SW		-	-	-	-	1	0	0	0	0	
Yellow	M0	714-10399	2012	SW		-	-	-	-	0	0	1	5	3	
Yellow	T1	714-10400	2012	SW		-	-	-	-	1	0	2	5	3	
Yellow	E1	794-86621	2010	TS		-	-	3	2	1	2	0	0	4	
Yellow	C1	794-86629	2009	TS		-	3	3	3	0	0	0	0	0	
Yellow	C7	794-86631	2010	TS		-	-	3	0	0	0	0	0	0	
Yellow	C5	794-86632	2009	TS		-	2	5	3	0	0	0	0	1	
Yellow	C6	794-86641	2010	TS		-	-	5	3	2	3	2	0	0	
Yellow	M2	794-86720	2010	TS		-	-	2	0	0	0	0	0	0	
Yellow	P7	934-94151	2016	SW		-	-	-	-	-	-	-	-	0	

Table 46 (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	2015	2016	2017	
Yellow	P9	934-94152	2016	RW		-	-	-	-	-	-	-	-	0	
Yellow	P0	934-94153	2016	RW		-	-	-	-	-	-	-	-	4	
Yellow	R1	934-94154	2016	RW		-	-	-	-	-	-	-	-	7	
Yellow	R2	934-94155	2016	RW		-	-	-	-	-	-	-	-	0	
Yellow	R3	934-94156	2016	SW		-	-	-	-	-	-	-	-	5	
Yellow	R4	934-94157	2016	SW		-	-	-	-	-	-	-	-	4	
Yellow	R5	934-94158	2016	SW		-	-	-	-	-	-	-	-	3	
Yellow	R6	934-94159	2016	SW		-	-	-	-	-	-	-	-	0	
Yellow	R7	934-94160	2016	SW		-	-	-	-	-	-	-	-	2	
Yellow	R8	934-94161	2016	TS		-	-	-	-	-	-	-	-	3	
Yellow	R9	934-94162	2016	TS		-	-	-	-	-	-	-	-	1	
Yellow	R0	934-94163	2016	RW		-	-	-	-	-	-	-	-	5	
Yellow	T6	934-94164	2016	RW		-	-	-	-	-	-	-	-	0	
Yellow	T7	934-94165	2016	RW		-	-	-	-	-	-	-	-	0	
Yellow	T8	934-94166	2016	SW		-	-	-	-	-	-	-	-	2	
Yellow	T9	934-94167	2016	TS		-	-	-	-	-	-	-	-	5	
Yellow	T0	934-94168	2016	TS		-	-	-	-	-	-	-	-	1	
Yellow	P5	934-94198	2016	SW		-	-	-	-	-	-	-	-	0	
Yellow	P4	934-94199	2016	SW		-	-	-	-	-	-	-	-	4	
Yellow	E6	974-09332	2010	SW		-	-	2	0	0	0	0	0	0	
Yellow	T2	974-09335	2012	TS		-	-	-	-	1	3	2	2	4	
Yellow	T3	974-09336	2012	TS		-	-	-	-	0	1	0	1	2	
Yellow	T4	974-09337	2012	TS		-	-	-	-	1	9	3	5	0	
Yellow	T5	974-09338	2012	TS		-	-	-	-	1	0	0	0	0	
Yellow	U1	974-09339	2014	SW		-	-	-	-	-	-	2	3	2	
Yellow	P3	974-09340	2016	SW		-	-	-	-	-	-	-	-	0	
O/Y	R	974-09356	2008	SW		0	1	0	0	1	0	1	1	0	
DG/R	GY	974-09357	2008	SW		0	1	0	1	0	0	0	0	0	
DG/O	GY	974-09358	2008	SW		3	0	0	0	0	0	0	0	0	
R/Y	O	974-09359	2008	SW		2	0	3	0	1	0	1	0	0	
R/O	Y	974-09360	2008	SW		3	0	0	0	0	0	0	0	0	
O/DB	R	974-09361	2008	SW		2	5	1	2	0	0	0	0	0	
Y/GY	DG	974-09362	2008	SW		1	0	0	0	1	1	0	0	0	

Table 46 (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 DG = dark green O = orange	R = red W = white	Y = yellow GY = gray	SW = Southwest Pt. TS = Tsamana RW =Ridgewall	TN = Tsamana North	0 = not resighted x = band no longer resightable (dead, removed, etc.)								
Color or L leg	Color band		Year banded	Location banded	Notes	Year resighted								
	Band # or R leg	Metal band #				2009	2010	2011	2012	2013	2014	2015	2016	2017
Yellow	E9	974-09363	2010	SW		-	-	2	1	1	1	3	6	2
Yellow	M5	974-09365	2010	SW		-	-	0	3	2	1	1	5	4
Yellow	A5	974-09366	2009	SW		-	0	1	0	0	0	0	0	0
Yellow	K5	974-09367	2010	SW		-	-	0	0	0	0	0	0	3
Yellow	A1	974-09368	2009	SW		-	6	1	1	0	0	0	0	0
Yellow	A9	974-09372	2009	SW		-	0	2	3	0	8	4	2	0
Yellow	A4	974-09377	2009	SW		-	0	0	0	0	0	3	4	3
Yellow	A0	974-09378	2009	SW		-	5	1	2	1	3	7	11	2
Yellow	E8	974-09380	2010	TS		-	-	2	2	1	2	3	0	4
Yellow	F6	974-09381	2010	TS		-	-	5	3	3	1	0	1	0
Yellow	L7	974-09382	2010	TS		-	-	4	2	2	6	1	0	3
Yellow	H7	974-09383	2010	TS		-	-	2	0	2	1	2	0	5
Yellow	F9	974-09384	2010	TS		-	-	3	0	2	2	2	5	5
Yellow	C4	974-09385	2010	TS		-	-	2	2	1	0	1	0	6
Yellow	E2	974-09386	2010	TS		-	-	0	1	1	0	0	2	4
Yellow	F8	974-09387	2010	TS		-	-	6	1	3	3	1	0	1
Yellow	L8	974-09388	2010	TS		-	-	5	5	4	5	0	1	0
Yellow	N7	974-09389	2010	TS		-	-	3	3	3	3	4	3	3
Yellow	M1	974-09390	2010	TS		-	-	2	1	2	1	0	1	1
Yellow	N8	974-09391	2010	TS		-	-	3	1	0	0	0	0	0
Yellow	F0	974-09392	2010	TS		-	-	1	1	1	4	1	1	3
Yellow	L9	974-09393	2010	TS		-	-	6	2	4	1	0	0	0
Yellow	N9	974-09394	2010	TS		-	-	2	4	2	3	4	2	5
Yellow	N0	974-09395	2010	TS		-	-	5	3	1	3	2	6	2
Yellow	M3	974-09396	2010	TS		-	-	3	1	2	1	1	0	2
Yellow	L0	974-09397	2010	TS		-	-	5	4	3	4	1	2	0
Yellow	M4	974-09398	2010	TS		-	-	5	2	3	2	0	0	0
Yellow	H1	974-09399	2010	TS		-	-	4	4	6	3	2	1	2
Yellow	H2	974-09400	2010	TN		-	-	0	1	0	0	0	0	1
Total birds resighted						5	7	60	59	50	46	51	51	70

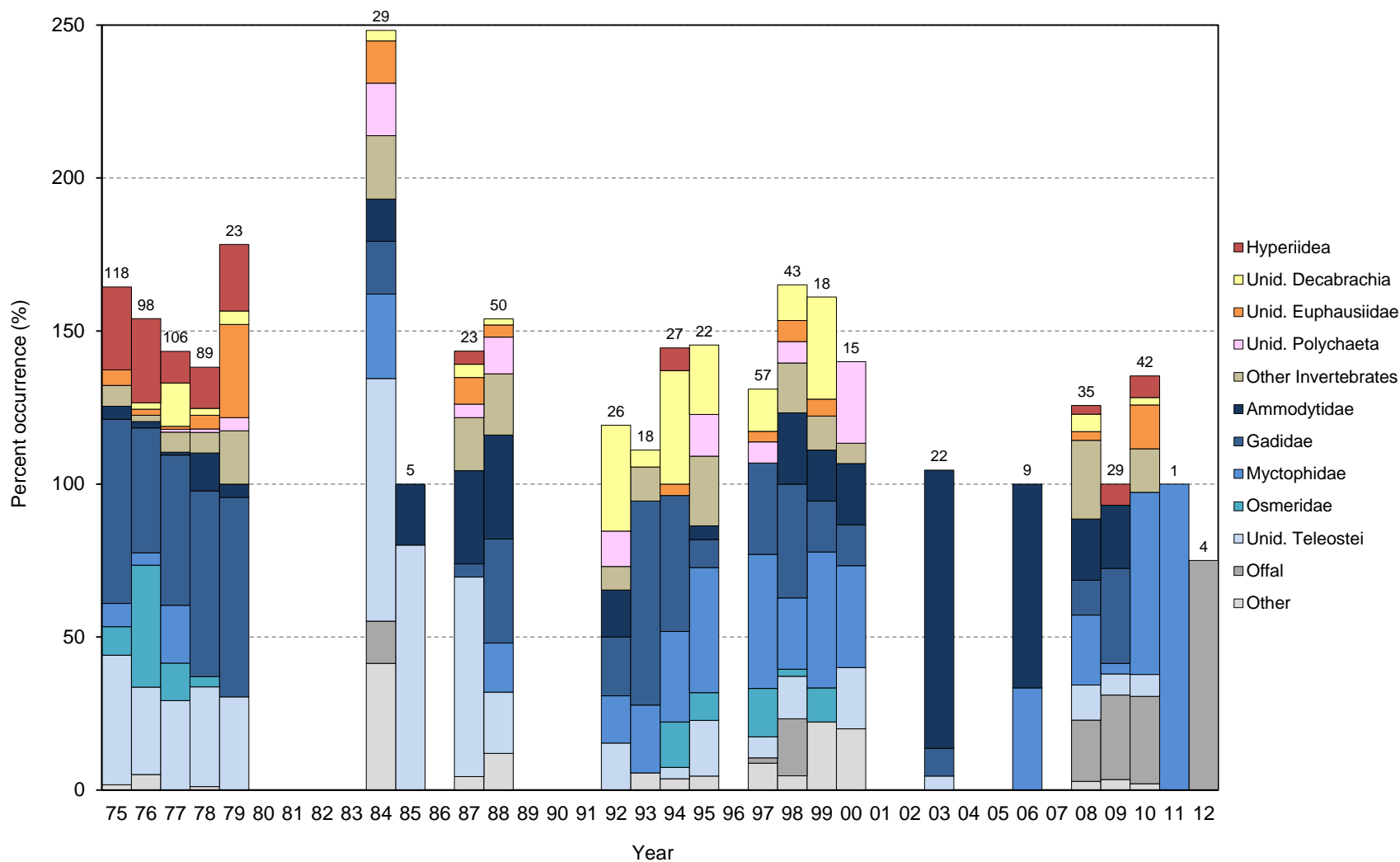


Figure 24. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. 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, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 but have not yet been analyzed.

Table 47. 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 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	1994	1995
No. samples	118	98	106	89	23	29	5	23	50	26	18	27	22
Invertebrates	39.0	36.7	39.6	34.8	65.2	65.5	-	43.5	34.0	50.0	22.2	37.0	54.5
Amphipoda	29.7	32.7	12.3	13.5	21.7	20.7	-	4.3	-	-	11.1	7.4	-
Hyperiidea	27.1	27.6	10.4	13.5	21.7	-	-	4.3	-	-	-	7.4	-
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	37.0	22.7
Unid. Decabrachia	-	2.0	14.2	2.2	4.3	3.4	-	4.3	2.0	34.6	5.6	37.0	22.7
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	3.7	-
Euphausiidae	8.5	6.1	1.9	6.7	39.1	13.8	-	17.4	4.0	11.5	5.6	3.7	-
Polychaeta	6.8	-	10.4	15.7	13.0	34.5	-	4.3	12.0	11.5	-	-	13.6
Unid. Polychaeta	-	-	0.9	1.1	4.3	17.2	-	4.3	12.0	11.5	-	-	13.6
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	-	22.7
Fish	96.6	89.8	91.5	93.3	95.7	89.7	100.0	95.7	96.0	65.4	83.3	85.2	72.7
Teleostei	96.6	89.8	91.5	93.3	95.7	89.7	100.0	95.7	96.0	65.4	83.3	85.2	72.7
Ammodytidae	4.2	2.0	0.9	12.4	4.3	13.8	20.0	30.4	34.0	15.4	-	-	4.5
<i>Ammodytes</i> spp.	4.2	2.0	0.9	12.4	4.3	13.8	20.0	30.4	34.0	15.4	-	-	4.5
Gadidae	60.2	40.8	49.1	60.7	65.2	17.2	-	4.3	34.0	19.2	66.7	44.4	9.1
<i>Gadus chalcogrammus</i>	51.7	24.5	34.9	60.7	65.2	13.8	-	4.3	30.0	19.2	66.7	44.4	9.1
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	29.6	40.9
Unid. Myctophidae	7.6	3.1	18.9	-	-	27.6	-	-	16.0	15.4	22.2	29.6	40.9
Other Myctophidae	-	1.0	-	-	-	-	-	-	-	-	-	-	-
Osmeridae	9.3	39.8	12.3	3.4	-	-	-	-	-	-	-	14.8	9.1
<i>Mallotus villosus</i>	9.3	39.8	12.3	3.4	-	-	-	-	-	-	-	14.8	9.1
Other Osmeridae	-	-	-	-	-	-	-	-	-	-	-	-	9.1
Unid. Teleostei	42.4	28.6	29.2	32.6	30.4	79.3	80.0	65.2	20.0	15.4	-	3.7	18.2
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	3.7	4.5
Offal	-	-	-	-	-	13.8	-	-	-	-	-	-	-
Other	1.7	5.1	-	1.1	-	41.4	-	4.3	12.0	-	5.6	3.7	4.5

Table 47. (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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1997	1998	1999	2000	2003	2006	2008	2009	2010	2011	2012	2016
No. samples	57	43	18	15	22	9	35	29	49	1	4	10
Invertebrates	24.6	39.5	50.0	46.7	-	-	42.9	13.8	36.7	-	-	<i>pending</i>
Amphipoda	3.5	2.3	5.6	6.7	-	-	14.3	10.3	12.2	-	-	-
Hyperiidea	-	-	-	-	-	-	2.9	6.9	6.1	-	-	-
Other Amphipoda	3.5	2.3	5.6	6.7	-	-	14.3	3.4	6.1	-	-	-
Cephalopoda	14.0	11.6	33.3	6.7	-	-	5.7	-	2.0	-	-	-
Unid. Decabrachia	13.8	11.6	33.3	-	-	-	5.7	-	2.0	-	-	-
Other Cephalopoda	-	-	-	6.7	-	-	-	-	-	-	-	-
Euphausiacea	3.5	7.0	5.6	-	-	-	8.6	3.4	18.4	-	-	-
Euphausiidae	3.5	7.0	5.6	-	-	-	8.6	3.4	18.4	-	-	-
Polychaeta	6.9	7.0	-	26.7	-	-	-	3.4	-	-	-	-
Unid. Polychaeta	6.9	7.0	-	26.7	-	-	-	-	-	-	-	-
Other Polychaeta	-	-	-	-	-	-	-	3.4	-	-	-	-
Other Invertebrates	-	16.3	11.1	6.7	-	-	25.7	-	12.2	-	-	-
Fish	91.2	76.7	77.8	80.0	100.0	100.0	62.9	58.6	73.5	100.0	50.0	-
Teleostei	91.2	76.7	77.8	80.0	100.0	100.0	62.9	58.6	73.5	100.0	50.0	-
Ammodytidae	-	23.3	16.7	20.0	90.9	66.7	20.0	20.7	2.0	-	-	-
<i>Ammodytes</i> spp.	-	23.3	16.7	20.0	90.9	66.7	20.0	20.7	2.0	-	-	-
Gadidae	29.8	37.2	16.7	13.3	9.1	-	11.4	31.0	-	-	-	-
<i>Gadus chalcogrammus</i>	29.3	37.2	16.7	13.3	-	-	-	27.6	-	-	-	-
Other Gadidae	-	-	-	-	9.1	-	11.4	3.4	-	-	-	-
Myctophidae	43.9	23.3	44.4	33.3	-	33.3	22.9	3.4	51.0	100.0	-	-
Unid. Myctophidae	43.1	23.3	44.4	33.3	-	33.3	2.9	3.4	34.7	100.0	-	-
Other Myctophidae	-	-	-	-	-	-	22.9	-	18.4	-	-	-
Osmeridae	15.8	2.3	11.1	-	-	-	-	-	-	-	-	-
<i>Mallotus villosus</i>	15.5	2.3	11.1	-	-	-	-	-	-	-	-	-
Other Osmeridae	10.5	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	6.9	14.0	-	20.0	4.5	-	11.4	6.9	12.2	-	-	-
Other Teleostei	7.0	2.3	-	20.0	-	-	8.6	17.2	14.3	-	-	-
Other	10.5	23.3	22.2	20.0	-	-	22.9	27.6	28.6	-	75.0	-
Offal	1.7	18.6	-	-	-	-	20.0	27.6	28.6	-	75.0	-
Other	8.8	4.7	22.2	20.0	-	-	2.9	3.4	2.0	-	-	-

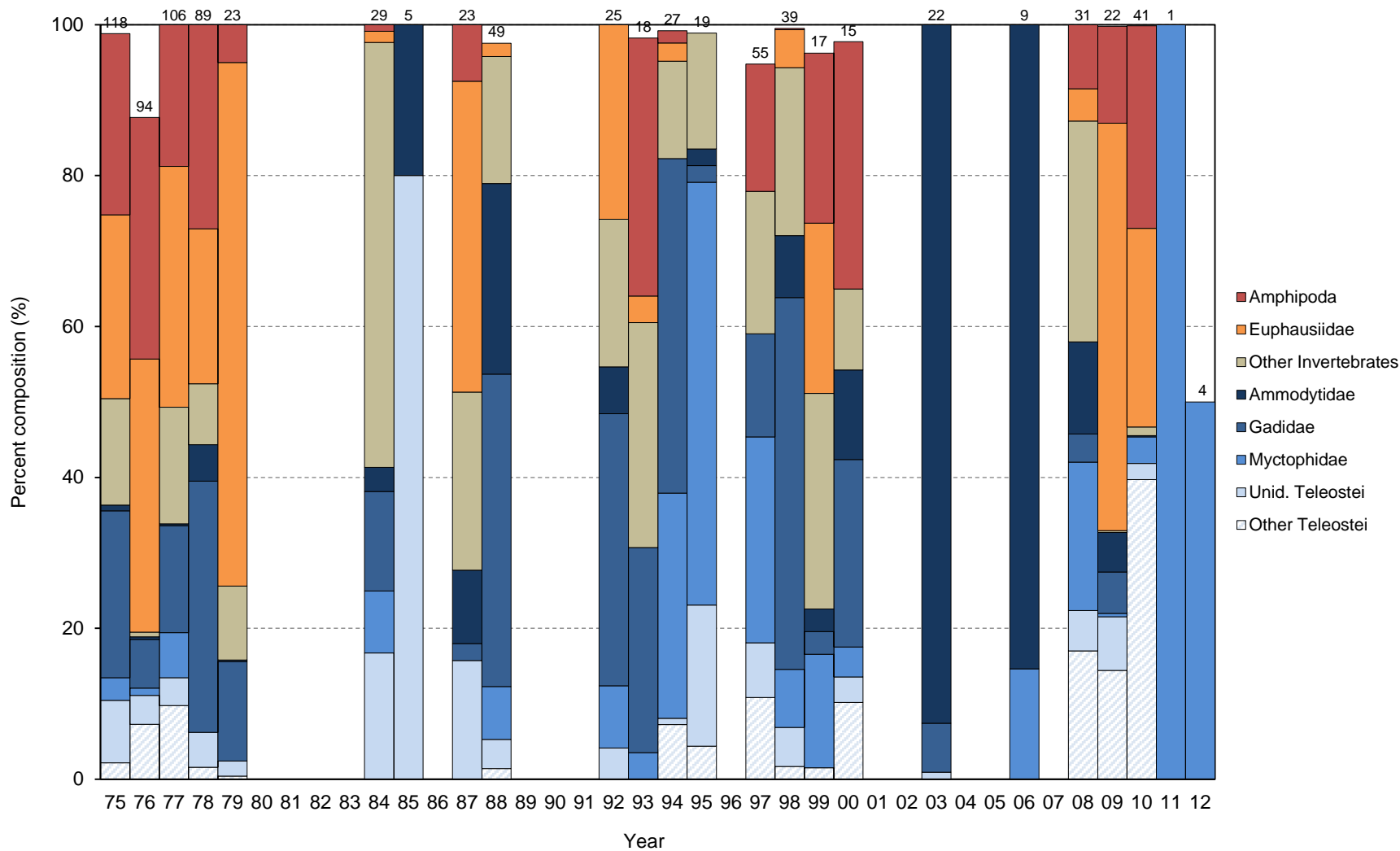


Figure 25. Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations and boluses from adults returning to the colony to feed chicks, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 but have not yet been analyzed.

Table 48. Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 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	1994	1995
No. samples	118	94	106	89	23	29	5	23	49	25	18	27	19
No. individuals	928	837	943	1013	500	341	5	267	285	97	114	124	91
Invertebrates	62.5	68.8	66.2	55.7	84.2	58.7	-	72.3	18.6	45.4	67.5	16.9	15.4
Amphipoda	24.0	32.0	18.8	27.0	5.0	0.9	-	7.5	-	-	34.2	1.6	-
Euphausiacea	24.4	36.2	31.9	20.5	69.4	1.5	-	41.2	1.8	25.8	3.5	2.4	-
Euphausiidae	24.4	36.2	31.9	20.5	69.4	1.5	-	41.2	1.8	25.8	3.5	2.4	-
<i>Thysanoessa raschii</i>	19.7	2.5	31.8	0.4	0.6	-	-	-	-	-	-	-	-
Unid. Euphausiidae	4.6	1.6	0.1	17.9	46.4	1.5	-	7.1	1.8	-	-	2.4	-
Other Euphausiidae	-	32.1	-	2.3	22.4	-	-	34.1	-	25.8	3.5	-	-
Other Invertebrates	14.1	0.6	15.5	8.1	9.8	56.3	-	23.6	16.8	19.6	29.8	12.9	15.4
Fish	36.3	18.9	33.8	44.3	15.8	41.3	100.0	27.7	78.9	54.6	30.7	82.3	83.5
Teleostei	36.3	18.9	33.8	44.3	15.8	41.3	100.0	27.7	78.9	54.6	30.7	82.3	83.5
Ammodytidae	0.8	0.4	0.2	4.8	0.2	3.2	20.0	9.7	25.3	6.2	-	-	2.2
<i>Ammodytes</i> spp.	0.8	0.4	0.2	4.8	0.2	3.2	20.0	9.7	25.3	6.2	-	-	2.2
Gadidae	22.1	6.5	14.2	33.3	13.2	13.2	-	2.2	41.4	36.1	27.2	44.4	2.2
<i>Gadus chalcogrammus</i>	18.0	3.6	11.8	33.3	13.2	12.9	-	2.2	40.0	36.1	27.2	44.4	2.2
Other Gadidae	4.1	2.9	2.4	-	-	0.3	-	-	1.4	-	-	-	-
Myctophidae	3.0	1.0	5.9	-	-	8.2	-	-	7.0	8.2	3.5	29.8	56.0
Unid. Myctophidae	3.0	0.8	5.9	-	-	8.2	-	-	7.0	8.2	3.5	29.8	56.0
Other Myctophidae	-	0.1	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	8.3	3.8	3.7	4.6	2.0	16.7	80.0	15.7	3.9	4.1	-	0.8	18.7
Other Teleostei	2.2	7.3	9.8	1.6	0.4	-	-	-	1.4	-	-	7.3	4.4
Other	1.2	12.3	-	-	-	-	-	-	2.5	-	1.8	0.8	1.1

Table 48 (continued). Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005, 2007, 2013-2015, or 2017; samples were collected in 2016 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1997	1998	1999	2000	2003	2006	2008	2009	2010	2011	2012	2016
No. samples	55	39	17	15	22	9	31	22	41	1	4	10
No. individuals	249	597	133	177	108	41	376	437	1926	2	6	<i>pending</i>
Invertebrates	35.7	27.5	73.7	43.5	-	-	42.0	67.0	54.3	-	-	-
Amphipoda	16.9	0.2	22.6	32.8	-	-	8.5	12.8	26.9	-	-	-
Euphausiacea	-	5.0	22.6	-	-	-	4.3	54.0	26.3	-	-	-
Euphausiidae	-	5.0	22.6	-	-	-	4.3	54.0	26.3	-	-	-
<i>Thysanoessa raschii</i>	-	-	-	-	-	-	-	54.0	0.1	-	-	-
Unid. Euphausiidae	-	5.0	22.6	-	-	-	0.5	-	25.4	-	-	-
Other Euphausiidae	-	-	-	-	-	-	3.7	-	0.8	-	-	-
Other Invertebrates	18.9	22.3	28.6	10.7	-	-	29.3	0.2	1.1	-	-	-
Fish	59.0	72.0	22.6	54.2	100.0	100.0	58.0	32.7	45.5	100.0	50.0	-
Teleostei	59.0	72.0	22.6	54.2	100.0	100.0	58.0	32.7	45.5	100.0	50.0	-
Ammodytidae	-	8.2	3.0	11.9	92.6	85.4	12.2	5.3	0.2	-	-	-
<i>Ammodytes</i> spp.	-	8.2	3.0	11.9	92.6	85.4	12.2	5.3	0.2	-	-	-
Gadidae	13.7	49.2	3.0	24.9	6.5	-	3.7	5.5	-	-	-	-
<i>Gadus chalcogrammus</i>	13.7	49.2	3.0	24.9	-	-	-	4.6	-	-	-	-
Other Gadidae	-	-	-	-	6.5	-	3.7	0.9	-	-	-	-
Myctophidae	27.3	7.7	15.0	4.0	-	14.6	19.7	0.5	3.5	100.0	50.0	-
Unid. Myctophidae	27.3	7.7	15.0	4.0	-	14.6	1.1	0.5	2.3	100.0	50.0	-
Other Myctophidae	-	-	-	-	-	-	18.6	-	1.2	-	-	-
Unid. Teleostei	7.2	5.2	-	3.4	0.9	-	5.3	7.1	2.1	-	-	-
Other Teleostei	10.8	1.7	1.5	10.2	-	-	17.0	14.4	39.7	-	-	-
Other	5.2	0.5	3.8	2.3	-	-	-	0.2	0.2	-	50.0	-

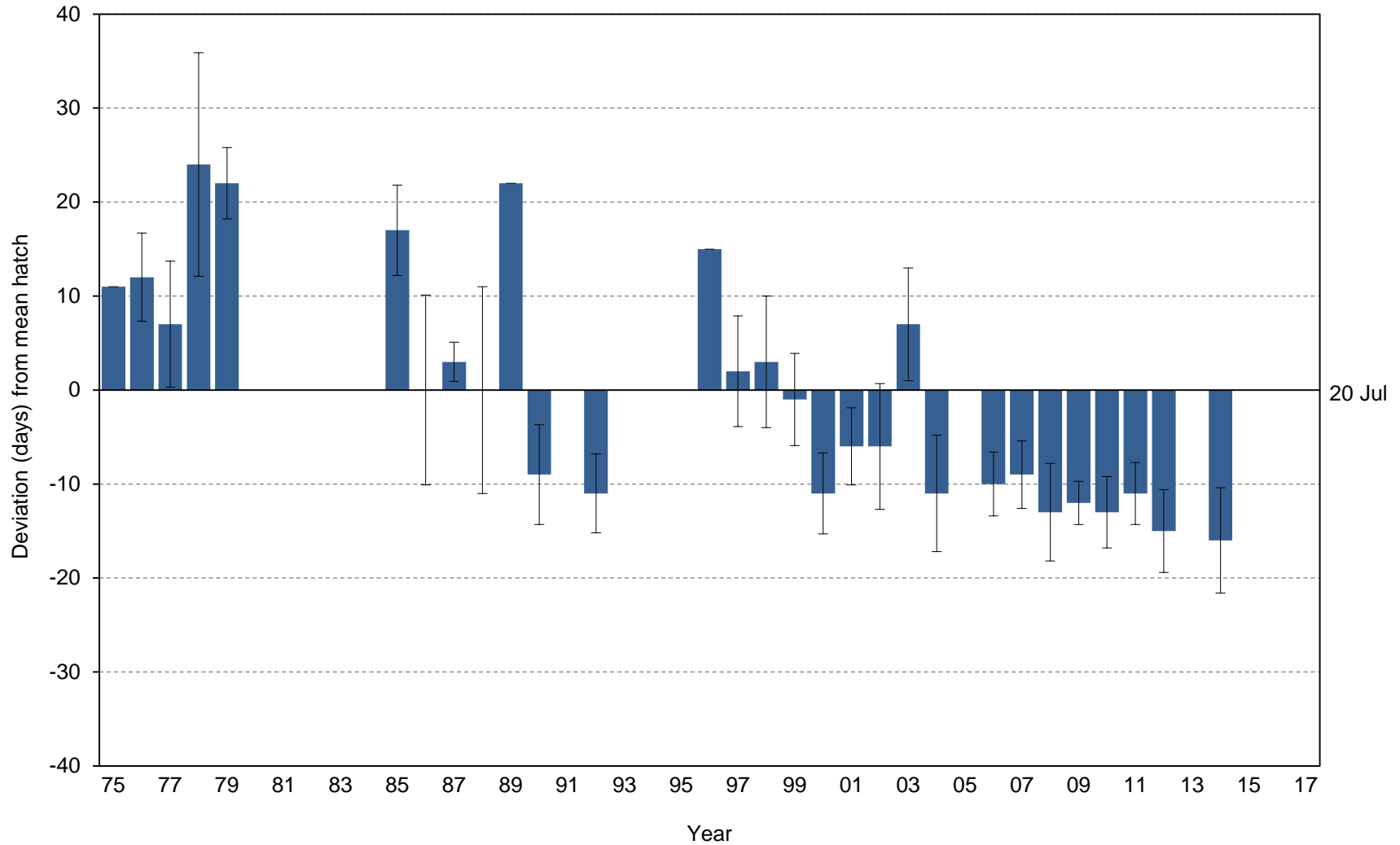


Figure 26. Yearly hatch date deviation (from the 1975-2016 average of 20 July) for red-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent one standard deviation around each year's mean hatch date. No data were collected in 1980-1984, 1991, 1993-1995, or 2013; no eggs hatched in plots in 2005 or 2015-2017.

Table 49. 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. No data were collected in 1980-1984, 1991, or 1993-1995.

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	-	-	-	-
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
1992	11 Jun	4.2	34	8 Jul	4.2	21	6 Jun	29 Jun	22 Jul	18 Aug
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
2015	20 Jun	3.0	2	-	-	-	17 Jun	-	-	-
2016	25 Jun	7.5	2	-	-	-	-	-	-	-
2017	20 Jun	3.5	2	-	-	-	-	-	-	-

^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 50. 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. No data were collected in 1980-1984, 1991, 1993-1995, or 2013; data from individual nests are not available before 1985 and no eggs hatched in plots in 2005 or 2015-2017.

Julian date ^a	No. nests hatching on Julian date												
	85	86	87	88	89	90	92	96	97	98	99	00	01
178	-	xx ^b	xx	xx	-	-	-	-	-	-	-	-	-
179	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
180	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
181	-	xx	xx	xx	-	-	1	-	-	-	-	1	-
182	-	xx	xx	xx	-	-	-	-	-	-	-	1	-
183	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
184	-	xx	xx	xx	-	2	-	-	-	-	-	-	-
185	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
186	-	xx	xx	xx	-	-	3	-	-	-	-	7	-
187	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
188	-	xx	xx	xx	-	2	1	-	-	-	1	-	-
189	-	xx	xx	xx	-	-	1	-	-	-	-	-	1
190	-	xx	xx	xx	-	2	13	-	-	-	-	4	1
191	-	xx	xx	xx	-	-	-	-	-	-	-	-	-
192	-	xx	xx	xx	-	1	-	-	-	1	-	4	1
193	-	xx	xx	xx	-	1	-	-	-	-	-	2	-
194	-	xx	xx	xx	-	2	-	-	-	-	1	1	2
195	-	xx	xx	xx	-	-	-	-	-	-	-	1	-
196	-	xx	xx	xx	-	-	1	-	2	-	-	1	-
197	-	xx	xx	xx	-	-	-	-	1	4	-	-	1
198	-	xx	xx	xx	-	-	-	-	-	-	-	1	-
199	-	xx	xx	xx	-	-	-	-	-	2	-	-	-
200	-	xx	xx	xx	-	3	-	-	2	3	6	-	3
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	23	9

Table 50 (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. No data were collected in 1980-1984, 1991, 1993-1995, or 2013; data from individual nests are not available before 1985 and no eggs hatched in plots in 2005 or 2015-2017.

Julian date ^a	No. nests hatching on Julian date										
	02	03	04	06	07	08	09	10	11	12	14
178	-	-	-	-	-	1	-	-	-	-	-
179	-	-	-	-	-	-	-	-	-	-	2
180	-	-	-	-	-	-	-	-	-	1	-
181	-	-	-	-	-	-	-	-	-	-	1
182	-	-	2	-	-	-	-	-	-	-	5
183	1	-	-	-	-	3	-	-	-	-	-
184	-	-	-	1	-	1	-	1	-	4	-
185	-	-	2	-	-	-	-	3	-	-	-
186	-	-	3	-	-	1	1	-	1	-	-
187	-	-	2	-	-	1	-	-	-	-	3
188	-	-	3	-	2	2	1	2	-	1	-
189	-	-	-	3	-	-	-	-	-	-	-
190	1	-	1	1	-	3	2	-	1	-	-
191	-	-	-	1	-	-	-	1	-	-	-
192	-	-	2	-	-	1	-	-	-	-	-
193	-	-	-	4	-	-	1	-	-	-	-
194	1	-	1	-	1	1	-	-	1	-	-
195	-	-	-	-	-	-	-	-	-	1	-
196	1	-	1	-	1	-	-	1	-	-	1
197	-	-	-	-	-	-	-	-	-	-	1
198	-	1	-	1	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-
200	-	-	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>	6	6	20	11	4	14	5	8	3	7	13

^aIn leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

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

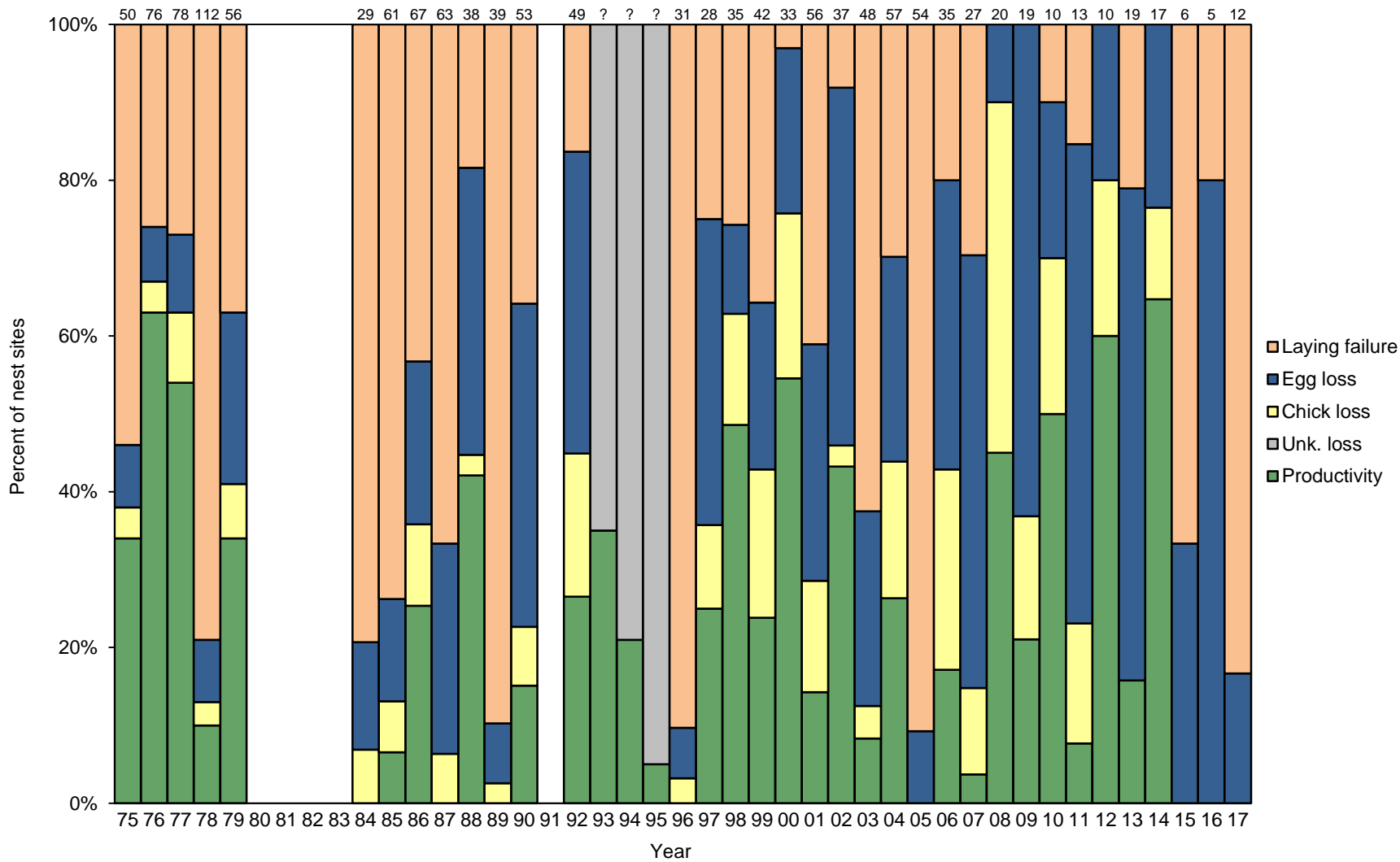


Figure 27. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A). No data were collected in 1980-1983 or 1991.

Table 51. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska. No data were collected in 1980-1983 or 1991.

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
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 ^c	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
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
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
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
2015	6	2	2	0	0	0	0	0.33	1.0	0.00	0.00	-	0.00	-	0.00	0.00	0.00
2016	5	4	4	0	0	0	0	0.80	1.0	0.00	0.00	-	0.00	-	0.00	0.00	0.00
2017	12	2	2	0	0	0	0	0.17	1.0	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 52. 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. No data were collected in 1980-1983 or 1991.

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
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
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	0.00	0.00
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
2015	3	6	Simple random	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	5	4	Simple random	0.80	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	4	12	Simple random	0.17	1.00	0.00	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 53. Clutch sizes of red-legged kittiwakes at St. Paul Island, Alaska. Sample units consist of total nest sites, not plots. No data were collected in 1980-1983, 1991, or 1993-1995.

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	-	-
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
1992	49	8	41	0	41	41	1.0
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
2015	6	4	2	0	2	2	1.0
2016	5	1	4	0	4	4	1.0
2017	12	10	2	0	2	2	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 54. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska in 2017.

Parameter	Plots				Total	SD ^a
	48	53	56	64		
Total nest starts (A)	4	2	5	1	12	-
Nest sites w/ eggs (B)	0	0	1	1	2	-
Total eggs (C)	0	0	1	1	2	-
Nest sites w/ chicks (D)	0	0	0	0	0	-
Total chicks (E)	0	0	0	0	0	-
Nest sites w/ fledged chicks (F)	0	0	0	0	0	-
Total fledged chicks (G)	0	0	0	0	0	-
Laying success (B/A)	0.00	0.00	0.20	1.00	0.17	0.11
Mean clutch size (C/B)	0.0	0.0	1.0	1.0	1.0	0.00
Nesting success (D/B)	0.00	0.00	0.00	0.00	0.00	0.00
Hatching success (E/C)	0.00	0.00	0.00	0.00	0.00	0.00
Chick success (G/E)	0.00	0.00	0.00	0.00	0.00	0.00
Egg success (G/C)	0.00	0.00	0.00	0.00	0.00	0.00
Fledging success (F/D)	0.00	0.00	0.00	0.00	0.00	0.00
Reproductive success (F/B)	0.00	0.00	0.00	0.00	0.00	0.00
Fledglings/nest start (G/A)	0.00	0.00	0.00	0.00	0.00	0.00
Productivity (F/A)	0.00	0.00	0.00	0.00	0.00	0.00

^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 55. Reproductive performance of red-legged kittiwakes at SW Point and Ridgewall colonies, St. Paul Island, Alaska in 2017, as determined by a Boom-or-Bust methodology.

Date	Total nest starts	Nest sites w/ x chicks ^a :		Nest sites w/ chicks	Total chicks	Mean brood size	Prop. nest sites w/ chicks	Chicks/ nest start
		0	1					
	(A)			(D)	(E)	(E/D)	(D/A)	(E/A)
SW Point								
25 May	4	-	-	-	-	-	-	-
8 Jun	6	-	-	-	-	-	-	-
20 Jun	5	-	-	-	-	-	-	-
9 Jul	6	6	0	0	0	0	0	0
14 Jul	3	3	0	0	0	0	0	0
25 Jul	3	3	0	0	0	0	0	0
Ridgewall								
26 May	5	-	-	-	-	-	-	-
15 Jun	5	-	-	-	-	-	-	-
28 Jun	7	-	-	0	0	0	0	0
3 Jul	8	8	0	0	0	0	0	0
13 Jul	4	4	0	0	0	0	0	0
19 Jul	3	3	0	0	0	0	0	0

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

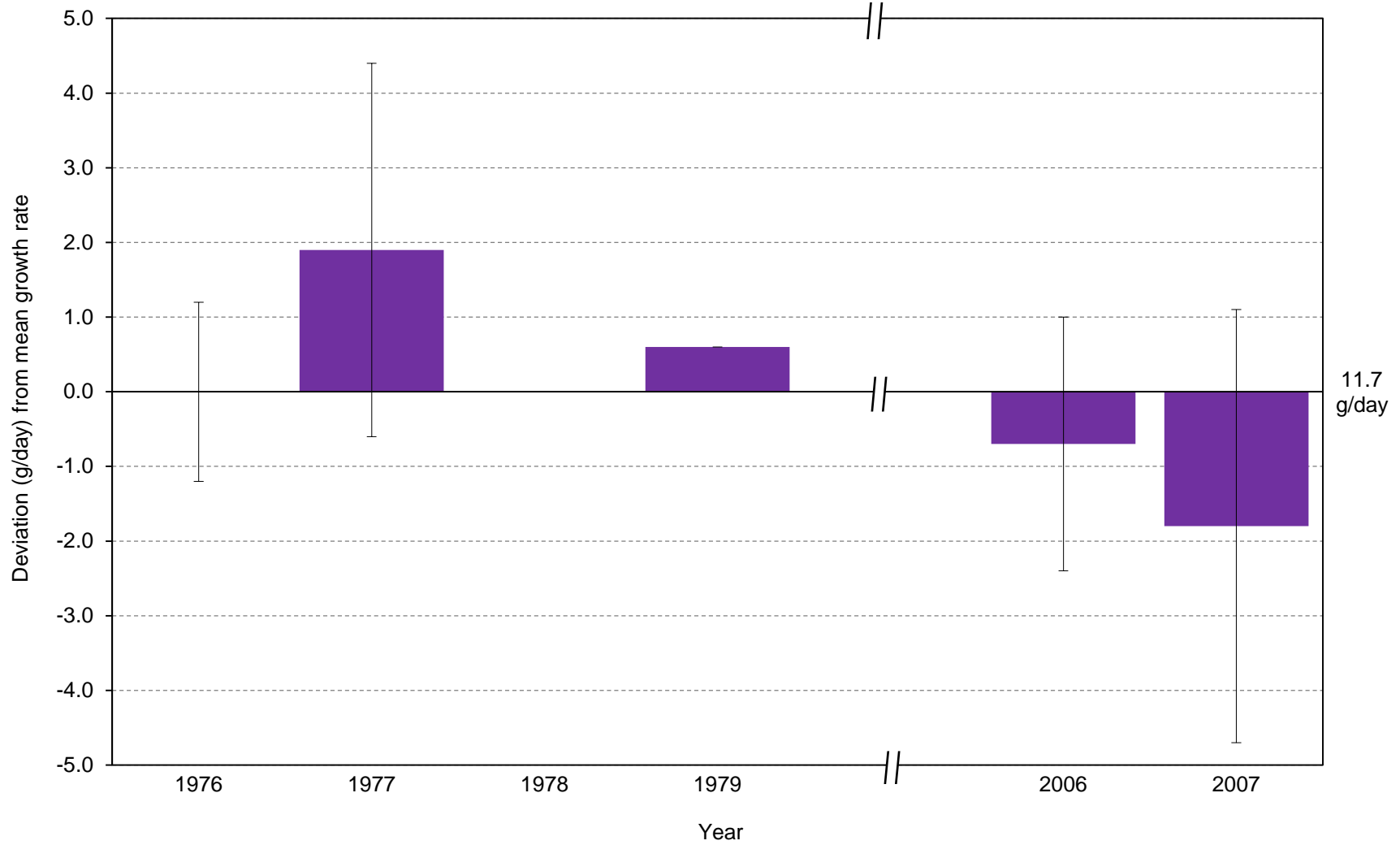


Figure 28. Yearly chick growth rate deviation (from the 1976-2007 average of 11.7 g/day) for red-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent one standard deviation around each year's mean growth rate. No chicks were measured in 1978, 1980-2005, or after 2007.

Table 56. 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 1978, 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
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.

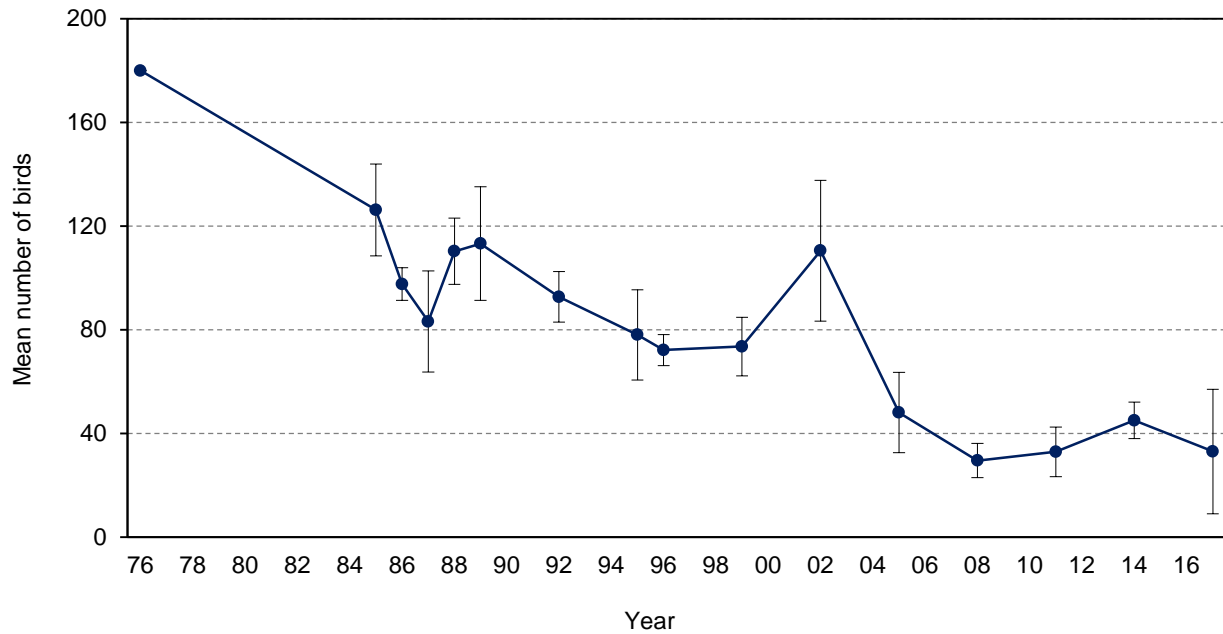


Figure 29. Mean numbers of red-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted.

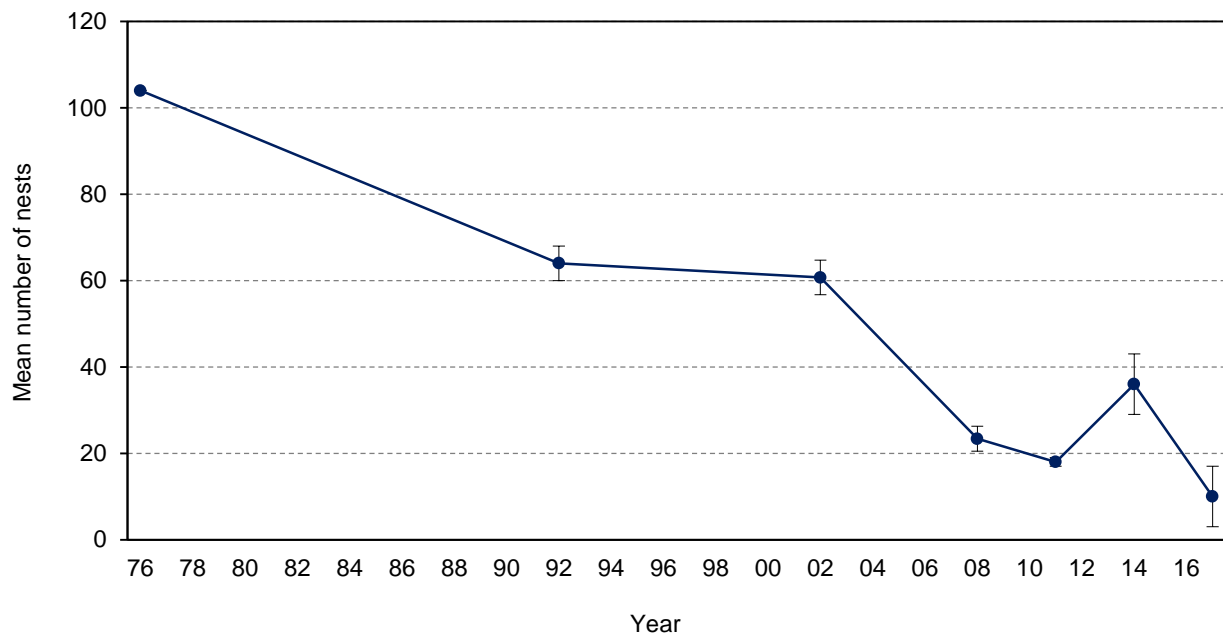


Figure 30. Mean numbers of red-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted; data potentially exist in 1985-1989, 1996, 1999, and 2005 but have not yet been summarized.

Table 57. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014	2017
1	180	101	106	59	106	80	87	66	62	65	99	40	26	21	36	44
2	-	142	96	87	108	115	101	70	70	74	87	35	27	23	43	15
3	-	131	93	78	87	119	104	98	75	66	90	28	24	21	40	71
4	-	119	91	70	108	123	93	-	71	77	109	40	25	42	40	35
5	-	135	102	116	122	112	77	-	76	65	161	49	25	38	49	28
6	-	-	-	89	126	124	94	-	79	94	117	66	31	36	53	2
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	33
<i>n</i>	1	5	5	6	7	8	6	3	6	6	6	8	8	8	7	6
SD	-	16	6	20	13	22	10	17	6	11	27	15	7	10	7	24
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	2 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	3 Aug

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

Table 58. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1996	1999	2002	2005	2008	2011	2014	2017
1	104	xx ^a	xx	xx	xx	xx	60	xx	xx	65	xx	24	18	29	16
2	-	xx	xx	xx	xx	xx	65	xx	xx	57	xx	22	19	35	3
3	-	xx	xx	xx	xx	xx	69	xx	xx	60	xx	22	17	37	7
4	-	xx	xx	xx	xx	xx	61	xx	xx	-	xx	22	0 ^b	35	5
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	10
Overall max. ^c	104	104	101	83	79	61	75	51	103	74	3	32	21	41	17
<i>n</i>	1	xx	xx	xx	xx	xx	4	xx	xx	3	xx	8	3	7	4
SD	-	xx	xx	xx	xx	xx	4	xx	xx	4	xx	3	1	3	7
First count	17 Jul	xx	xx	xx	xx	xx	12 Jul	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun	2 Jul
Last count	21 Jul	xx	xx	xx	xx	xx	30 Jul	xx	xx	23 Jul	xx	31 Jul	17 Jul	27 Jul	19 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 59. Numbers of red-legged kittiwakes counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 2-3 Jul	2 9 Jul	3 11-14 Jul	4 19 Jul	5 22-23 Jul	6 31 Jul-3 Aug		
1	0	0	0	0	0	0	-	-
2sw	0	1	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	-	-	-	-	-	-	-	-
8	0	0	0	0	0	0	-	-
9 ^a	0	0	0	0	0	0	-	-
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	9	0	9	6	8	0	-	-
15	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	-	-
19top	0	0	0	0	0	0	-	-
19btm	0	0	0	0	0	0	-	-
20top	0	0	0	0	0	0	-	-
20btm	0	0	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	2	0	3	0	0	-	-
23	0	1	0	0	0	0	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	-	-
27	2	3	12	3	2	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	33	8	49	23	18	2	-	-
32	0	0	1	0	0	0	-	-
33	0	0	0	0	0	0	-	-
Total ^b	44	15	71	35	28	2	33	24

^aHistorical plots no longer counted.

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

Table 60. Numbers of red-legged kittiwake nests counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate				Mean	SD	Max.
	1 2-3 Jul	2 9 Jul	3 11-14 Jul	4 19 Jul			
1	0	0	0	0	-	-	0
2sw	0	0	0	0	-	-	0
2ne	0	0	0	0	-	-	0
3	0	0	0	0	-	-	0
4	0	0	0	0	-	-	0
5sw	0	0	0	0	-	-	0
5ne	0	0	0	0	-	-	0
6 ^a	-	-	-	-	-	-	-
7	0	0	0	0	-	-	0
8	0	0	0	0	-	-	0
9 ^a	-	-	-	-	-	-	-
10	0	0	0	0	-	-	0
11	0	0	0	0	-	-	0
12	0	0	0	0	-	-	0
13	0	0	0	0	-	-	0
14	4	0	0	0	-	-	4
15	0	0	0	0	-	-	0
16 ^a	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-
18	0	0	0	0	-	-	0
19top	0	0	0	0	-	-	0
19btm	0	0	0	0	-	-	0
20top	0	0	0	0	-	-	0
20btm	0	0	0	0	-	-	0
21 ^a	-	-	-	-	-	-	-
22	0	0	0	0	-	-	0
23	0	0	0	0	-	-	0
24	0	0	0	0	-	-	0
25	0	0	0	0	-	-	0
26	0	0	0	0	-	-	0
27	2	1	2	2	-	-	2
28	0	0	0	0	-	-	0
29 ^a	-	-	-	-	-	-	-
29new	0	0	0	0	-	-	0
30	0	0	0	0	-	-	0
31	10	2	5	3	-	-	10
32	0	0	0	0	-	-	0
33	0	0	0	0	-	-	0
Total ^b	16	3	7	5	10	7	16 ^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 61. Numbers of red-legged kittiwakes counted by boat during all-island census of St. Paul Island, Alaska. Total nests are shown in parenthesis. 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. No counts were conducted in 2011 and 2017; nests were not counted in 2010, 2012.

Replicate	2010	2012	2013	2014	2015	2016
1	760	953	929 (570)	1571	1173 (196)	1151 (291) ^a
2	-	821	-	1228 (662)	-	-
Mean	760	887	929 (570)	1400 (662)	1173 (196)	1151 (291)
<i>n</i>	1	2	1	2	1	1
SD	0	93	0	243	0	0
First count	17 Jul	7 Jul	12 Jul	5 Jul	1 Aug	3 Jul
Last count	-	17 Jul	-	16 Jul	-	-

^aDoes not include the segment called Reef. Reef had 13 red-legged kittiwakes in the 2015 counts.

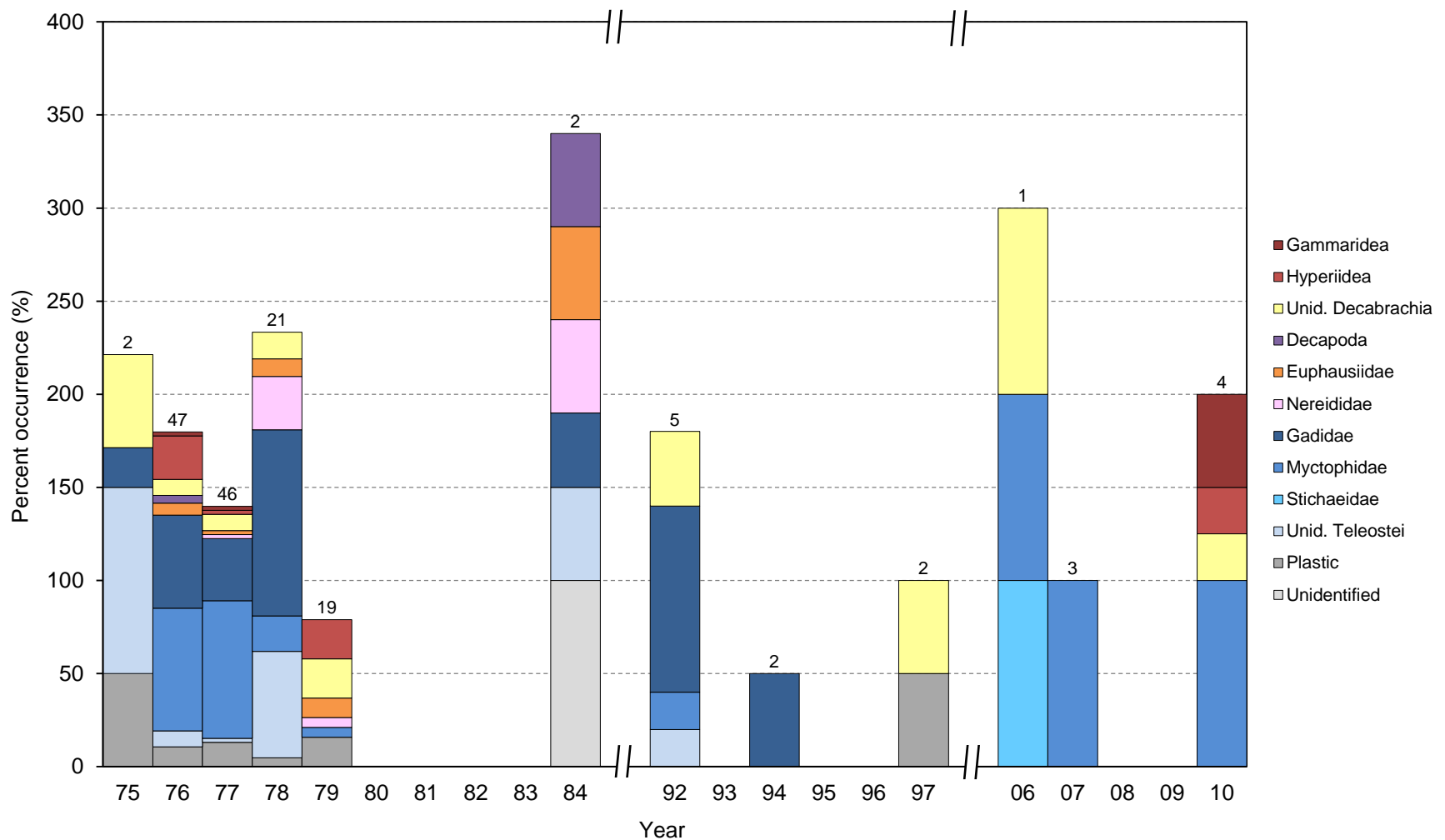


Figure 31. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Only prey with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1991, 1993, 1995-1996, 1998-2005, 2008-2009, or after 2010.

Table 62. 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1985-1991, 1993, 1995-1996, 1998-2005, 2008-2009, or after 2010. 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	2010
No. samples	2	47	46	21	19	2	5	2	2	1	3	4
Invertebrates	50.0	36.2	15.2	57.1	42.1	100.0	40.0	-	50.0	100.0	-	75.0
Amphipoda	-	25.5	4.3	-	21.1	-	-	-	-	-	-	75.0
Gammaridea	-	2.1	2.2	-	-	-	-	-	-	-	-	50.0
Hyperiidea	-	23.4	2.2	-	21.1	-	-	-	-	-	-	25.0
Cephalopoda	50.0	8.5	8.7	14.3	21.1	-	40.0	-	50.0	100.0	-	25.0
Unid. Decabrachia	50.0	8.5	8.7	14.3	21.1	-	40.0	-	50.0	100.0	-	25.0
Decapoda	-	4.3	-	-	-	50.0	-	-	-	-	-	-
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	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	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	100.0
Unid. Myctophidae	-	61.7	73.9	19.0	5.3	-	20.0	-	-	100.0	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	-	-	-
Plastic	50.0	10.6	13.0	4.8	15.8	-	-	-	50.0	-	-	-
Unidentified	-	-	-	-	-	100.0	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	50.0	-	-	-

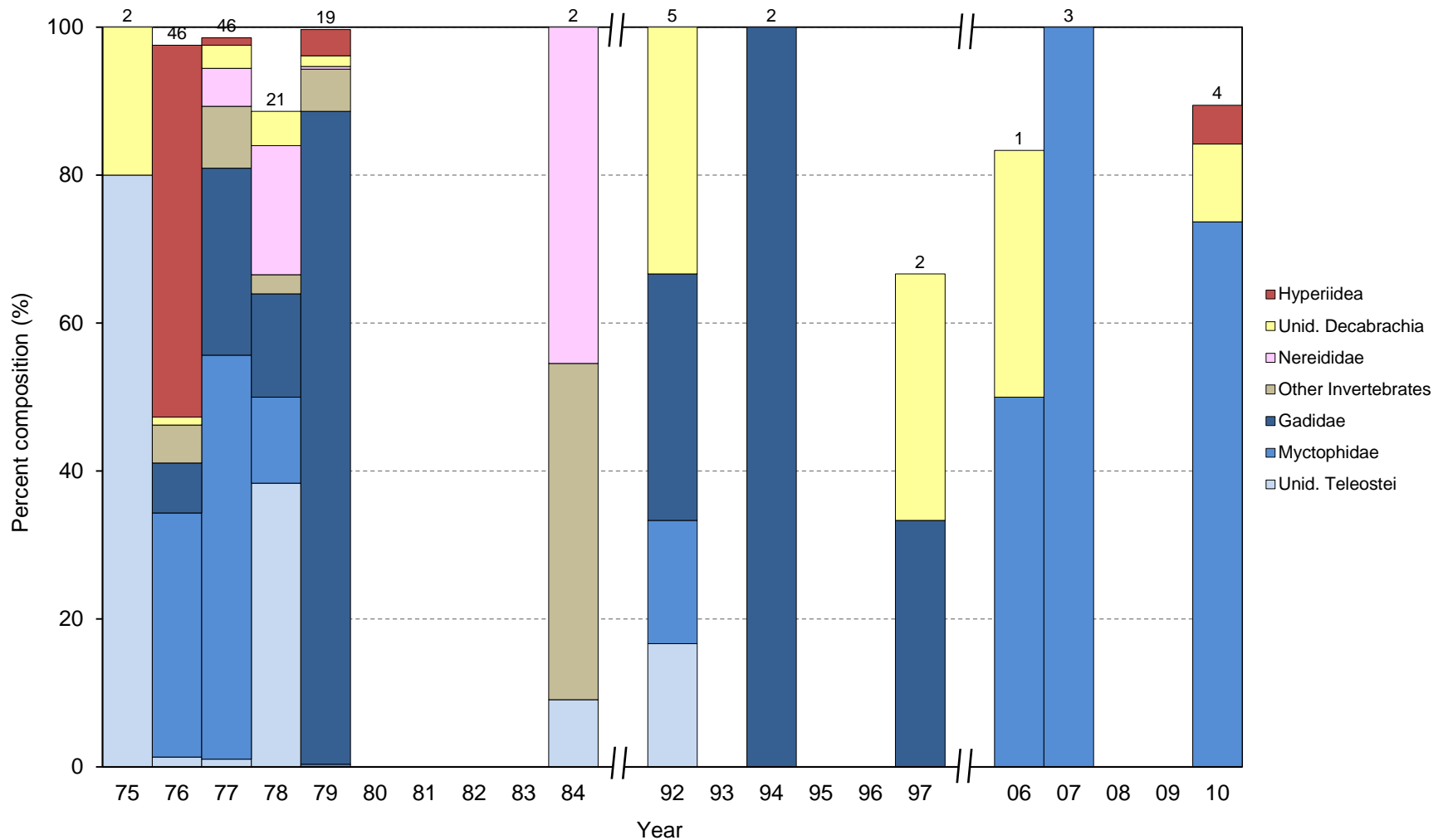


Figure 32. Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Only prey with an among-year average composition of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1980-1983, 1985-1991, 1993, 1995-1996, 1998-2005, 2008-2009, or after 2010.

Table 63. Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1985-1991, 1993, 1995-1996, 1998-2005, 2008-2009, or after 2010. 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	2010
No. samples	2	46	46	21	19	2	5	2	2	1	3	4
No. individuals	5	370	194	86	281	11	6	2	3	6	4	19
Invertebrates	20.0	57.6	19.2	35.1	14.6	90.9	33.3	-	33.3	33.3	-	26.3
Amphipoda	-	50.5	1.5	-	3.6	-	-	-	-	-	-	15.8
Hyperiidea	-	50.3	1.0	-	3.6	-	-	-	-	-	-	5.3
Other Amphipoda	-	0.3	0.5	-	-	-	-	-	-	-	-	10.5
Cephalopoda	20.0	1.1	3.1	4.7	1.4	0.0	33.3	-	33.3	33.3	-	10.5
Unid. Decabrachia	20.0	1.1	3.1	4.7	1.4	0.0	33.3	-	33.3	33.3	-	10.5
Polychaeta	-	0.8	6.2	27.9	3.9	45.5	-	-	-	-	-	-
Nereididae	-	-	5.2	17.4	0.4	45.5	-	-	-	-	-	-
<i>Nereis</i> spp.	-	-	-	17.4	-	45.5	-	-	-	-	-	-
Other Nereididae	-	-	5.2	0.0	0.4	-	-	-	-	-	-	-
Other Polychaeta	-	0.8	1.0	10.5	3.6	-	-	-	-	-	-	-
Other Invertebrates	-	5.1	8.4	2.6	5.7	45.5	-	-	-	-	-	-
Fish	80.0	42.4	80.9	66.3	88.6	9.1	66.7	100.0	33.3	66.7	100.0	73.7
Teleostei	80.0	42.4	80.9	66.3	88.6	9.1	66.7	100.0	33.3	66.7	100.0	73.7
Gadidae	-	6.8	25.3	14.0	88.3	-	33.3	100.0	33.3	-	-	-
<i>Gadus chalcogrammus</i>	-	6.8	13.9	9.3	88.3	-	33.3	100.0	33.3	-	-	-
Other Gadidae	-	-	11.3	4.7	-	-	-	-	-	-	-	-
Myctophidae	-	33.0	54.6	11.6	0.4	-	16.7	-	-	50.0	100.0	73.7
Unid. Myctophidae	-	31.6	54.6	11.6	0.4	-	16.7	-	-	50.0	100.0	73.7
Other Myctophidae	-	1.4	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	80.0	1.4	1.0	38.4	-	9.1	16.7	-	-	-	-	-
Other Teleostei	-	1.4	-	2.3	-	-	-	-	-	16.7	-	-
Other	-	-	-	-	1.4	-	-	-	33.3	-	-	-

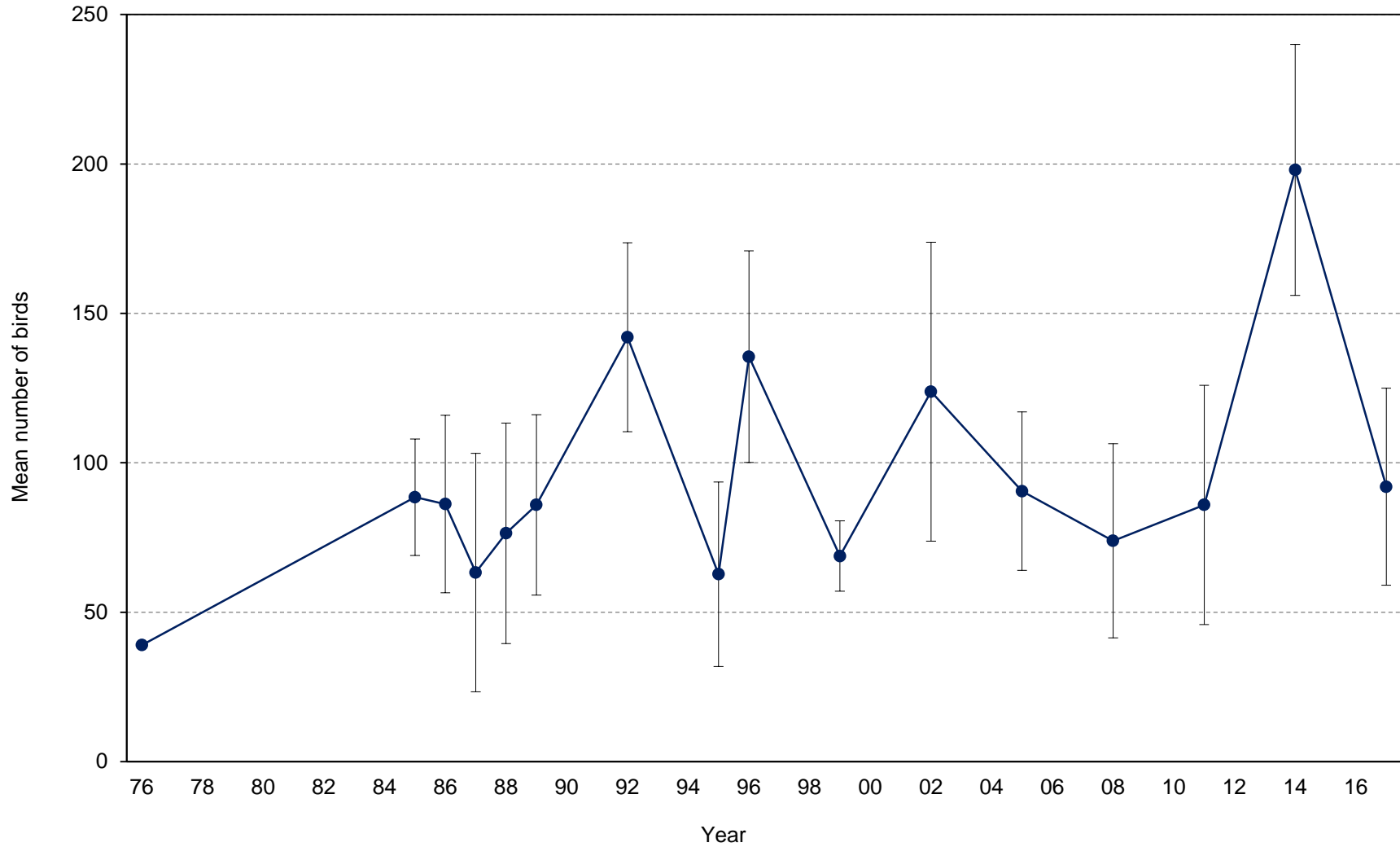


Figure 33. Mean numbers of northern fulmars counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 and 1984 when data are excluded because not all plots were counted.

Table 64. 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 in years not listed except 1982 and 1984 when data are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014	2017
1	39	95	63	133	116	74	120	37	99	84	68	83	119	47	148	129
2	-	95	105	72	123	52	159	97	176	69	129	60	64	117	182	75
3	-	104	129	75	27	124	100	54	94	63	84	68	37	90	178	74
4	-	60	61	34	73	89	136	-	175	58	117	81	59	165	165	37
5	-	-	73	43	42	69	191	-	138	57	211	88	50	88	218	74
6	-	-	-	23	57	62	146	-	131	82	134	114	47	52	220	58
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	75
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	7	6
SD	-	20	30	40	37	30	32	31	35	12	50	27	33	40	40	30
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	2 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	3 Aug

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

Table 65. Numbers of northern fulmars counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 2-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 25 Jul-3 Aug		
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	1	1	0	0	0	0	-	-
5sw	7	5	0	4	6	4	-	-
5ne	1	2	1	1	2	1	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	-	-
8	5	4	2	-	-	0	-	-
9 ^a	-	-	-	-	-	-	-	-
10	7	7	4	4	10	4	-	-
11	0	0	0	0	0	0	-	-
12	0	0	0	0	0	0	-	-
13	2	0	0	0	0	0	-	-
14	15	9	4	4	10	4	-	-
15	2	1	0	0	1	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	1	-	-
19top	5	5	4	3	3	3	-	-
19btm	-	-	-	-	-	-	-	-
20top	-	-	-	-	-	-	-	-
20btm	-	-	-	-	-	-	-	-
21 ^a	-	-	-	-	-	-	-	-
22	1	1	0	0	3	5	-	-
23	0	9	9	6	9	12	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	-	-
27	0	0	0	0	0	0	-	-
28	0	2	2	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	-	-
30	22	16	22	14	13	18	-	-
31	60	22	25	8	19	19	-	-
32	23	6	22	7	10	5	-	-
33	0	1	1	0	1	0	-	-
Total ^b	129	75	74	37	74	58	75	30

^aHistorical plots no longer counted.

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

Table 66. Numbers of northern fulmar adults and chicks counted on Plot 53 at St. Paul Island, Alaska. No counts were conducted in 2013.

Year	Adults					Chicks	Date of first count	Date of last count	Date of first chick ^a	Date(s) 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
2014	37	13	18	24	60	13	4 Jun	26 Aug	10 Aug	21 Aug
2015	38	10	24	17	52	10	22 May	4 Sep	26 Jul	18,31 Aug, 4 Sep
2016	24	10	15	18	42	6	29 Jun	6 Sep	27 Jul	25,30 Aug, 3 Sep
2017	22	10	20	1	42	4	16 Jun	28 Aug	19 Jul	19, 28 Aug

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

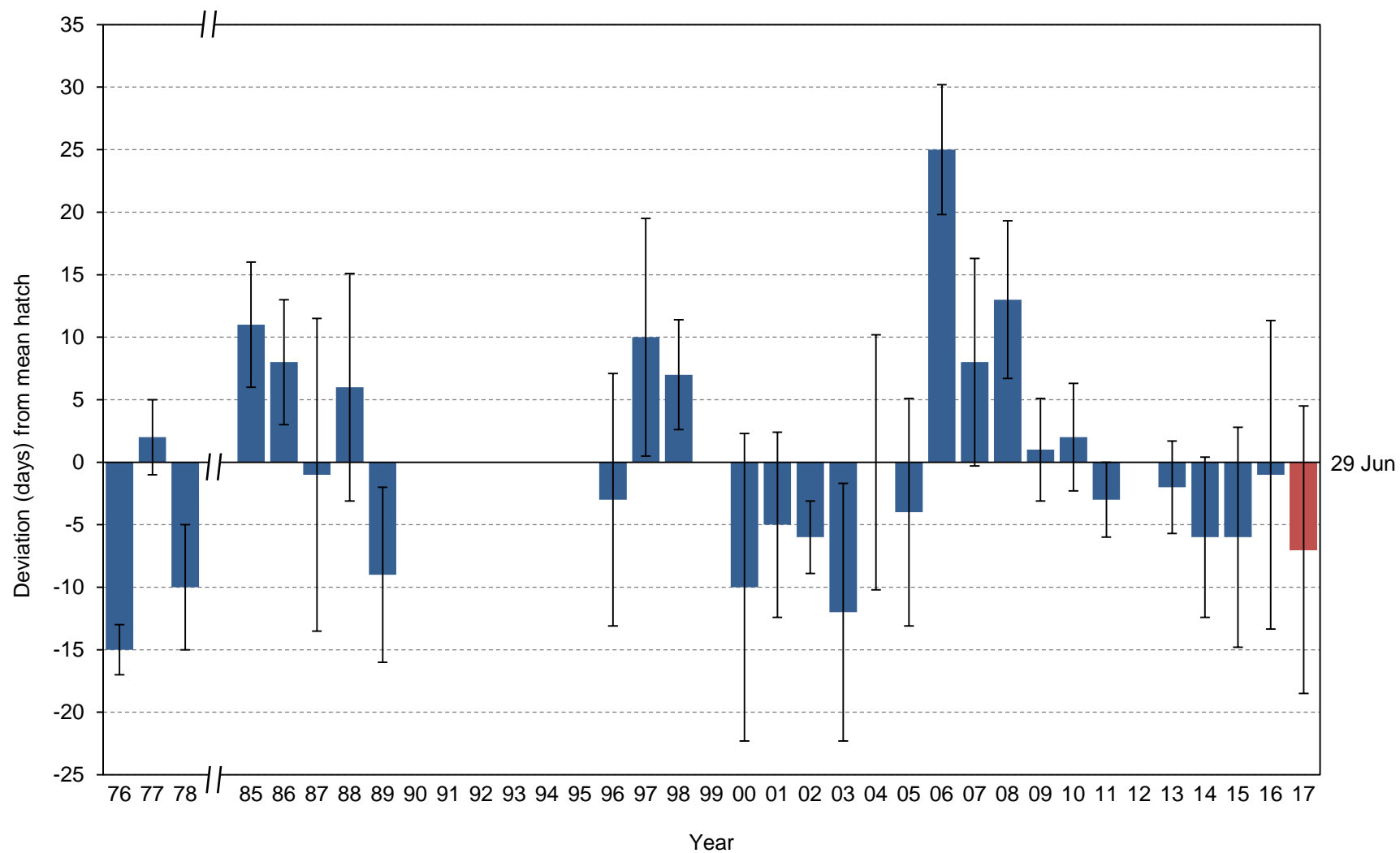


Figure 34. Yearly hatch date deviation (from the 1976-2016 average of 29 June) for red-faced cormorants at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent one standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1979-1984, 1990-1995, 1999, or 2012.

Table 67. Breeding chronology of red-faced cormorants at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest. No data were collected in 1979-1984, 1990-1995, 1999, or 2012.

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	-	-
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
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
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
2013	27 Jun	3.7	16	21 Jun	3 Jul
2014	23 Jun	6.4	16	14 Jun	5 Jul
2015	23 Jun	8.8	46	3 Jun	12 Jul
2016	27 Jun	12.3	12	16 Jun	1 Aug
2017	22 Jun	11.5	55	30 May	6 Aug

^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 68. 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. No data were collected in 1979-1984, 1990-1995, 1999, or 2012; data from individual nests are not available before 1987.

Julian date ^a	No. nests hatching on Julian date																						
	87	88	89	96	97	98	00	01	02	03	04	05	06	07	08	09	10	11	13	14	15	16	17
150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
152	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
157	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
158	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	1
159	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
160	1	-	2	-	-	-	1	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-
161	-	-	-	-	-	-	3	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-
162	-	-	1	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	1	-	5
163	1	-	1	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
164	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
165	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-	-
166	3	-	4	-	-	-	-	-	-	5	3	8	-	-	-	-	-	-	-	-	2	-	7
167	-	-	-	1	-	-	-	-	-	-	3	6	-	-	-	-	-	-	-	-	1	-	-
168	-	-	1	-	-	-	1	1	-	-	1	2	-	-	-	-	-	-	-	-	3	2	-
169	4	-	-	-	-	-	1	-	1	2	4	7	-	-	-	-	-	-	-	-	-	-	-
170	-	-	3	-	-	-	-	3	2	-	6	6	-	-	-	-	-	-	-	2	1	1	1
171	-	-	-	-	-	-	-	-	-	-	1	4	-	-	-	-	-	-	-	1	2	-	8
172	3	-	3	-	-	-	-	1	-	2	4	7	-	-	-	-	-	3	2	-	1	1	-
173	-	-	-	2	-	-	-	-	1	-	4	2	-	-	-	-	-	-	-	2	-	-	-
174	-	-	2	-	-	-	-	-	-	2	3	5	-	-	-	-	-	-	1	1	9	1	1
175	2	-	-	-	-	-	1	-	-	-	7	9	-	2	-	-	3	11	-	-	-	-	7
176	-	-	-	-	-	-	-	2	8	-	4	5	-	-	-	1	-	1	5	-	-	-	6
177	-	2	-	-	-	-	-	-	-	-	1	2	-	1	-	-	-	3	-	-	1	-	1
178	5	2	1	2	-	1	-	-	-	-	6	6	-	-	-	11	-	7	2	4	10	2	1
179	-	-	-	1	-	-	-	-	-	-	5	7	-	1	-	-	5	-	-	-	-	-	2
180	-	-	3	-	1	-	-	-	-	-	1	3	-	4	-	-	2	6	2	-	1	2	1
181	2	3	-	-	1	-	3	-	-	-	9	2	-	-	-	-	1	-	2	1	1	-	-
182	-	-	-	-	2	3	-	1	-	1	-	2	-	3	-	10	9	1	-	1	-	-	1
183	-	-	-	-	1	-	-	-	-	-	-	1	-	4	2	-	-	-	-	-	-	-	-
184	2	-	-	-	5	4	-	-	-	1	1	4	-	2	-	1	2	-	2	-	-	2	3
185	-	-	-	-	-	-	1	-	-	-	3	-	-	2	1	-	-	-	-	-	-	-	-
186	-	-	1	1	6	2	-	-	-	-	-	4	-	1	1	-	6	1	-	1	2	-	1
187	-	-	-	-	-	-	2	-	-	-	2	1	-	8	1	4	-	-	-	-	1	-	-
188	-	-	-	-	2	4	-	-	-	-	-	1	-	1	-	-	-	-	-	-	1	-	-
189	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1
190	2	3	-	-	1	-	-	-	-	-	1	4	-	-	3	-	2	-	-	-	-	-	-
191	-	-	-	-	1	6	1	1	-	-	1	2	-	3	1	-	-	-	-	-	1	-	-

Table 68 (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. No data were collected in 1979-1984, 1990-1995, 1999, or 2012; data from individual nests are not available before 1987.

Julian date ^a	No. nests hatching on Julian date																						
	87	88	89	96	97	98	00	01	02	03	04	05	06	07	08	09	10	11	13	14	15	16	17
192	-	-	-	-	2	2	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-
193	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	1	-	-
194	-	-	-	-	1	-	-	-	-	-	3	1	-	-	-	1	-	-	-	-	-	-	-
195	-	-	-	1	-	-	-	-	-	-	-	1	-	3	2	-	-	-	-	-	-	-	-
196	2	-	-	-	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-
198	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
199	1	-	-	-	-	-	-	-	-	-	-	1	-	2	1	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
202	-	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1	-	-	-	-	-	-	-	-
204	-	-	-	-	1	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
205	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
208	1	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	31	11	22	10	31	23	22	9	12	24	84	111	11	43	16	28	31	33	16	16	46	12	55

^aIn leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

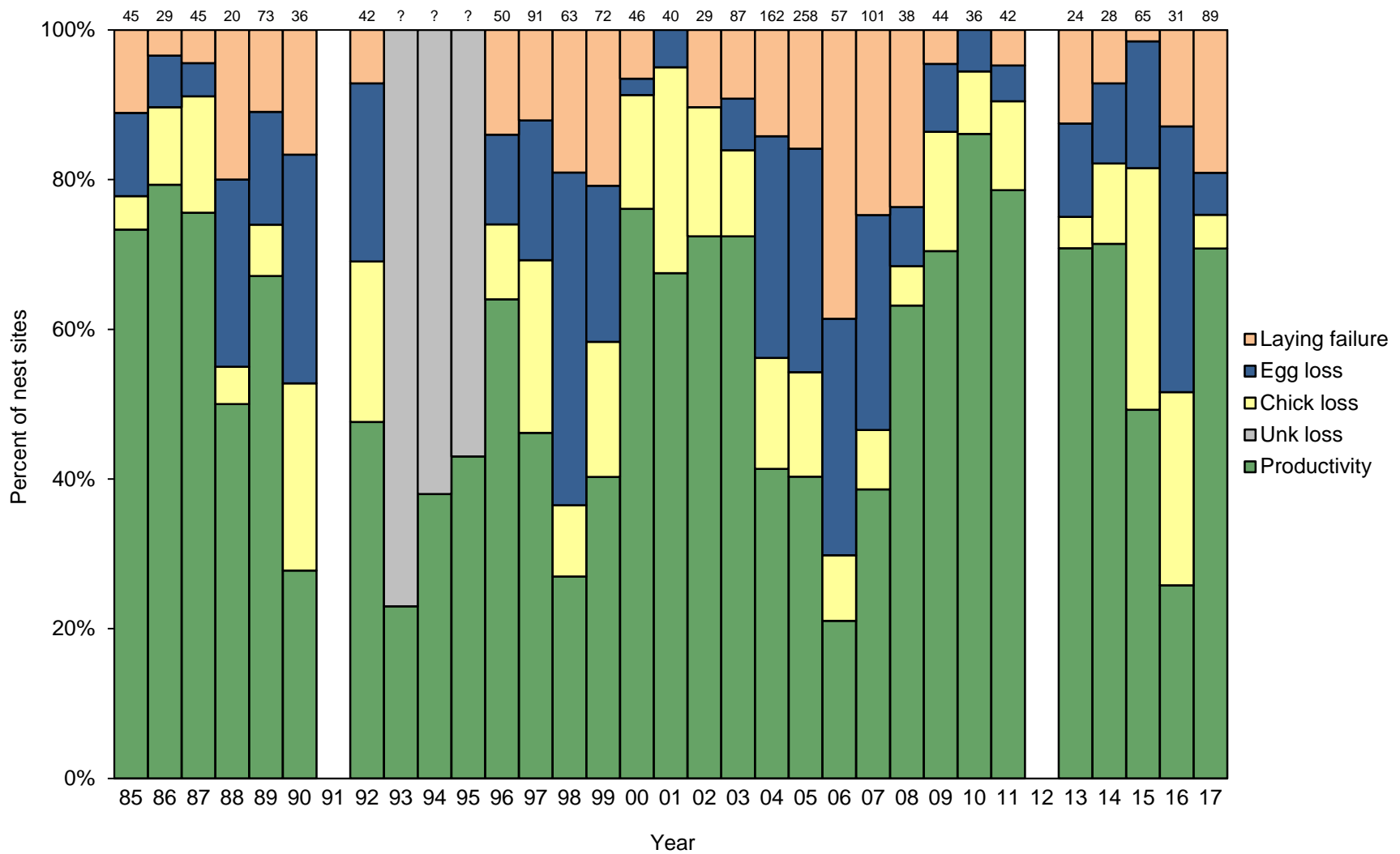


Figure 35. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A). No data were collected in 1979-1983, 1991, or 2012.

Table 69. 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 70). No data were collected in 1979-1983, 1991, or 2012.

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	-
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
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
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
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
2015	65	64	185	53	132	32	78	0.98	2.9	0.83	0.71	0.59	0.42	0.60	0.50	1.20	0.49
2016	31	27	62	16	35	8	20	0.87	2.3	0.59	0.56	0.32	0.32	0.50	0.30	0.65	0.26
2017	89	72	205	67	168	63	147	0.81	2.9	0.93	0.82	0.88	0.72	0.94	0.88	1.65	0.71

^aValue calculated from smaller sample size.

^bData based on short-duration visits.

Table 70. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska in 2017. Measures of success are based on frequent monitoring of individual nests (as opposed to Boom-or-Bust methodology presented in Table 70).

Parameter	Plots				Total	SD ^a
	Water Towers	Zapadni	Ridgewall	High Bluffs		
Total nest starts (A)	28	22	24	15	89	-
Nest sites w/ eggs (B)	28	19	14	11	72	-
Total eggs (C)	72	57	42	34	205	-
Nest sites w/ chicks (D)	27	19	10	11	67	-
Total chicks (E)	67	48	28	25	168	-
Nest sites w/ chicks fledged (F)	26	19	9	9	63	-
Total chicks fledged (G)	61	44	22	20	147	-
Laying success (B/A)	1.00	0.86	0.58	0.73	0.81	0.18
Mean clutch size (C/B)	2.6	3.0	3.0	3.1	2.9	0.23
Nesting success (D/B)	0.96	1.00	0.71	1.00	0.93	0.14
Hatching success (E/C)	0.93	0.84	0.67	0.74	0.82	0.12
Chick success (G/E)	0.91	0.92	0.79	0.80	0.88	0.07
Egg success (G/C)	0.85	0.77	0.52	0.59	0.72	0.15
Fledging success (F/D)	0.96	1.00	0.90	0.82	0.94	0.08
Reproductive success (F/B)	0.93	1.00	0.64	0.82	0.88	0.16
Fledglings/nest start (G/A)	2.18	2.00	0.92	1.33	1.65	0.59
Productivity (F/A)	0.93	0.86	0.38	0.60	0.71	0.25

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

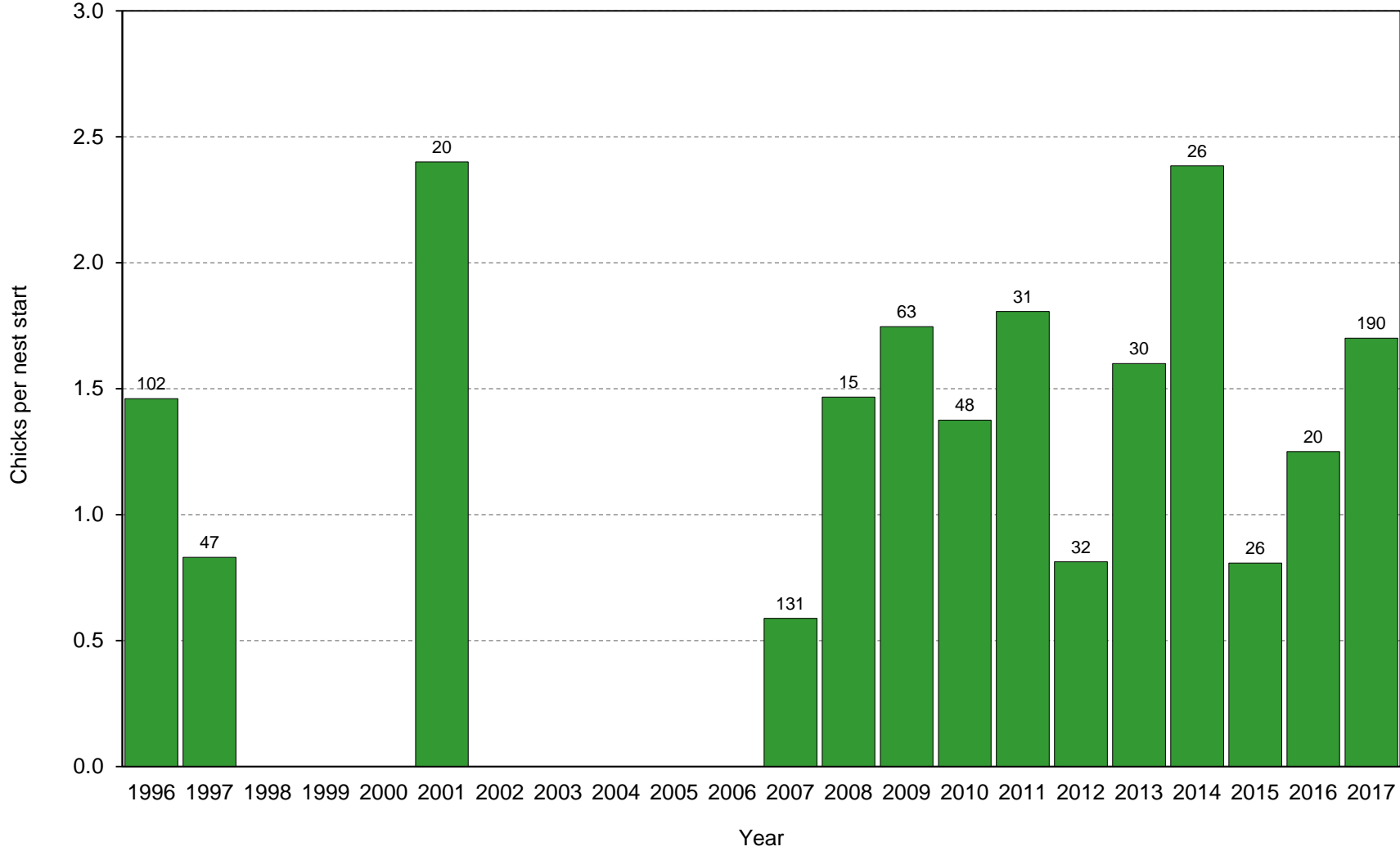


Figure 36. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska, as determined by a Boom-or-Bust methodology. Success is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A). No data were collected in 1998-2000 or 2002-2006.

Table 71. 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. No data were collected in 1998-2000 or 2002-2006.

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
2001	20	-	-	-	-	-	19	48	2.5	0.95	2.40	xx	xx
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 Jun	7,15 Aug
2014	26	1	5	13	3	0	22	62	2.8	0.85	2.38	3,12,23 Jun	10,20,30 Jul
2015	26	4	4	3	0	0	11	21	1.9	0.42	0.80	31 May, 6,15, 30 Jun	12,24,31 Jul
2016	20	3	3	4	1	0	11	25	2.3	0.55	1.25	1,8,Jun	16 Jul,12, Aug
2017	190	28	63	56	7	0	141	323	2.3	0.74	1.70	28 May-21 Jun	14 Jul-10 Aug

^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 72. Reproductive performance of red-faced cormorants at Water Towers, Black Bluffs, SW Point, and Tsamana colonies, St. Paul Island, Alaska in 2017, as determined by a Boom-or-Bust methodology. Chicks were counted only during the final three counts.

Date	Total nest starts (A)	Nest sites w/ x chicks ^a :					Nest sites w/ chicks (D)	Total chicks (E)
		0	1	2	3	4		
Water Towers								
1 Jun	147	-	-	-	-	-	-	-
10 Jun	151	-	-	-	-	-	-	-
21 Jun	138	-	-	-	-	-	-	-
21 Jul	130	19	18	47	39	7	111	257
1 Aug	130	9	21	44	50	6	121	283
9 Aug	130	6	22	52	48	2	124	278
Black Bluffs								
3 Jun	6	-	-	-	-	-	-	-
10 Jun	6	-	-	-	-	-	-	-
19 Jun	6	-	-	-	-	-	-	-
15 Jul	6	6	0	0	0	0	0	0
28 Jul	6	6	0	0	0	0	0	0
10 Aug	6	6	0	0	0	0	0	0
SW Point								
28 May	11	-	-	-	-	-	-	-
8 Jun	9	-	-	-	-	-	-	-
20 Jun	9	-	-	-	-	-	-	-
14 Jul	6	0	2	1	1	0	4	7
25 Jul	6	0	1	3	1	0	5	10
5 Aug	5	0	0	3	2	0	5	12
Tsamana								
4 Jun	9	-	-	-	-	-	-	-
11 Jun	7	-	-	-	-	-	-	-
19 Jun	8	-	-	-	-	-	-	-
14 Jul	8	6	0	1	1	0	2	5
25 Jul	8	5	1	1	1	0	3	6
10 Aug	8	5	0	2	1	0	3	7

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

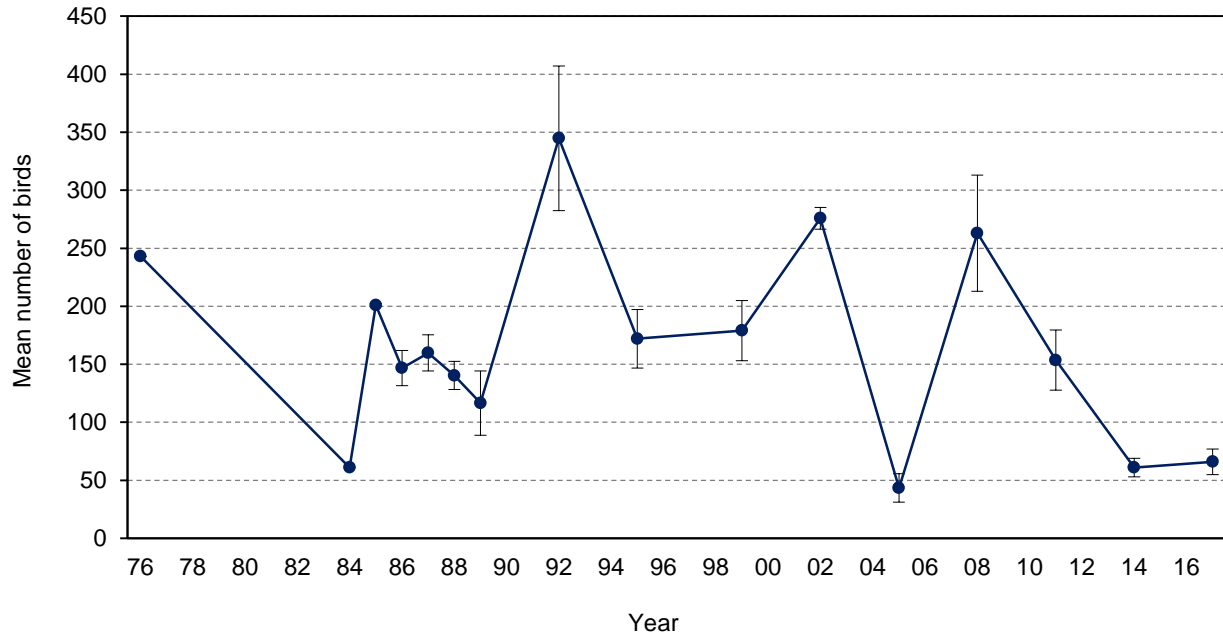


Figure 37. Mean numbers of red-faced cormorants counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 when data are excluded because not all plots were counted.



Figure 38. 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. Error bars represent standard deviation. No counts were conducted in years not shown except 1982 when data are excluded because not all plots were counted; data potentially exist in 1985-1989, 1992, 1995, 1999, and 2005 but have not yet been summarized.

Table 73. 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 in years not listed except 1982 when data are excluded because not all plots were counted.

Replicate	1976	1984	1985	1986	1987	1988	1989	1992	1995	1999	2002	2005	2008	2011	2014	2017
1	243	61	200	148	164	149	123	372	160	216	272	63	340	178	74	66
2	-	-	200	142	187	137	150	361	201	198	276	49	238	190	63	78
3	-	-	201	140	163	140	151	425	155	186	291	33	211	176	63	72
4	-	-	203	132	143	142	135	268	-	146	276	34	249	146	66	74
5	-	-	-	172	153	141	97	298	-	165	278	32	224	150	60	61
6	-	-	-	-	149	156	74	-	-	163	262	55	230	113	49	47
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	66
<i>n</i>	1	1	4	5	6	7	8	6	3	6	6	7	8	8	7	6
SD	-	-	1	15	16	12	28	62	25	26	9	12	50	26	8	11
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	1 Jul
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	4 Aug

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

Table 74. 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 in years not listed except 1982 when data are excluded because not all plots were counted.

Replicate	1976	1984	1985	1986	1987	1988	1989	1992	1995	1999	2002	2005	2008	2011	2014	2017
1	120	22	xx ^a	xx	xx	xx	xx	xx	xx	xx	166	xx	148	153	50	32
2	-	-	xx	xx	xx	xx	xx	xx	xx	xx	167	xx	123	155	50	34
3	-	-	xx	xx	xx	xx	xx	xx	xx	xx	186	xx	117	146	46	29
4	-	-	xx	xx	xx	xx	xx	xx	-	xx	-	xx	133	-	47	35
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	33
Overall max. ^b	120	22	142	132	138	107	87	314	122	156	194	29	179	155	53	49
<i>n</i>	1	1	xx	xx	xx	xx	xx	xx	xx	xx	3	xx	8	3	7	4
SD	-	-	xx	xx	xx	xx	xx	xx	xx	xx	11	xx	19	5	3	3
First count	17 Jul	xx	xx	xx	xx	xx	xx	xx	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun	1 Jul
Last count	21 Jul	xx	xx	xx	xx	xx	xx	xx	xx	xx	23 Jul	xx	31 Jul	14 Jul	27 Jul	4 Aug

^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 75. Numbers of red-faced cormorants counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate						Mean	SD
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul	5 22-23 Jul	6 24 Jul-4 Aug		
1	6	10	3	0	1	1	-	-
2sw	0	1	9	2	0	2	-	-
2ne	1	4	2	0	1	3	-	-
3	1	1	1	0	0	1	-	-
4	15	20	9	29	16	13	-	-
5sw	0	0	1	0	0	0	-	-
5ne	2	1	2	0	0	2	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	-	-
8	0	0	0	0	0	0	-	-
9	0	0	0	0	0	0	-	-
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	0	0	0	0	0	0	-	-
15	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	-	-
19top	0	0	0	0	0	0	-	-
19btm	0	0	0	0	0	0	-	-
20top	0	0	0	0	0	0	-	-
20btm	0	1	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	0	0	0	0	0	-	-
23	0	0	0	0	0	0	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	-	-
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	40	45	47	43	44	27	-	-
32	2	0	0	0	0	1	-	-
33	0	0	0	0	0	0	-	-
Total ^b	66	78	72	74	61	47	66	11

^aHistorical plots no longer counted.

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

Table 76. Numbers of red-faced cormorant nests counted on index plots at St. Paul Island, Alaska in 2017.

Plot	Replicate				Mean	SD	Max.
	1 1-3 Jul	2 9 Jul	3 11-14 Jul	4 19-20 Jul			
1	0	1	0	0	-	-	1
2sw	0	1	0	1	-	-	1
2ne	0	0	0	0	-	-	0
3	0	0	0	0	-	-	0
4	6	6	3	8	-	-	8
5sw	0	0	0	0	-	-	0
5ne	1	0	0	0	-	-	1
6 ^a	-	-	-	-	-	-	0
7	0	0	0	0	-	-	0
8	0	0	0	0	-	-	0
9	0	0	0	0	-	-	0
10	0	0	0	0	-	-	0
11	0	0	0	0	-	-	0
12	0	0	0	0	-	-	0
13	0	0	0	0	-	-	0
14	0	0	0	0	-	-	0
15	0	0	0	0	-	-	0
16 ^a	-	-	-	-	-	-	0
17 ^a	-	-	-	-	-	-	0
18	0	0	0	0	-	-	0
19top	0	0	0	0	-	-	0
19btm	0	0	0	0	-	-	0
20top	0	0	0	0	-	-	0
20btm	0	0	0	0	-	-	0
21 ^a	-	-	-	-	-	-	0
22	0	0	0	0	-	-	0
23	0	0	0	0	-	-	0
24	0	0	0	0	-	-	0
25	0	0	0	0	-	-	0
26	0	0	0	0	-	-	0
27	0	0	0	0	-	-	0
28	0	0	0	0	-	-	0
29 ^a	-	-	-	-	-	-	0
29new	0	0	0	0	-	-	0
30	0	0	0	0	-	-	0
31	25	26	26	26	-	-	26
32	0	0	0	0	-	-	0
33	0	0	0	0	-	-	0
Total ^b	32	34	29	35	33	3	49 ^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 77. Numbers of red-faced and pelagic cormorants counted during boat-based surveys of the south and west coast of St. Paul Island, Alaska^a. No counts were conducted in 2006-2012.

Year	Red-faced cormorant					Pelagic cormorant	
	On land				Flying or on water	On land	Flying or on water
	Adult	Immature	Unknown	Nests			
2005	1342	102	96	706	25	47	0
2013	256	6	0	173	66	1	0
2014	247	19	1	217	38	0	1
2015 ^b	424	85	1	296	55	1	0
2016	438	38	1	113	53	0	0
2017 ^c	-	-	-	296	-	-	-

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

^bValues reported are the mean of multiple counts, $n=3$.

^cThe count conducted in 2017 was made from a combination of boat-based and land-based counts conducted between 7 Jun and 3 Jul, which is earlier than the recommended count window.

Table 78. Numbers of red-faced and pelagic cormorants counted during boat-based surveys of the entire coast of St. Paul Island, Alaska. Survey totals include counts summarized in Table 80 above. No counts were conducted in 2006-2012 or 2017.

Year	Red-faced cormorant					Pelagic cormorant	
	On land				Flying or on water	On land	Flying or on water
	Adult	Immature	Unknown	Nests			
2005	1505	164	411	714	27	87	6
2014	283	56	1	227	52	4	1
2015 ^a	460	235	2	302	108	41	0
2016	554	85	4	133	44	24	30

^aValues reported for 2015 are a mean of multiple counts, $n=3$.

Table 79. Total number of red-faced cormorant chicks banded on banding plot at St. Paul Island, Alaska.

Parameter	Year													
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total new chicks banded	47	55	0	0	22	31	62	37	18	10	28	37	12	49
Cumulative chicks banded	47	102	102	102	124	155	217	254	272	282	310	347	359	408

Table 80. Fates of cohorts of red-faced cormorants banded as chicks on banding plot at 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 2017	
		05	06	07	08	09	10	11	12	13	14	15	16	17		
2004	47	0(0)	0(0)	0(0)	0(0)	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(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(0)	0(0)	1(0)	1(0)	0.05	
2009	31	-	-	-	-	-	0(1)	1(6)	4(0)	3(0)	1(0)	2(0)	2(0)	2(0)	0.06	
2010	62	-	-	-	-	-	-	0(36)	0(2)	1(0)	2(0)	1(0)	1(0)	1(0)	0.01	
2011	37	-	-	-	-	-	-	-	0(0)	0(0)	0(0)	1(0)	0(0)	0(0)	0.00	
2012	18	-	-	-	-	-	-	-	-	0(5)	5(2)	2(0)	4(0)	3(0)	0.17	
2013	10	-	-	-	-	-	-	-	-	-	0(4)	0(0)	1(0)	3(0)	0.30	
2014	28	-	-	-	-	-	-	-	-	-	-	0(13)	10(0)	9(0)	0.32	
2015	37	-	-	-	-	-	-	-	-	-	-	-	0(1)	2(0)	0.05	
2016	12	-	-	-	-	-	-	-	-	-	-	-	-	0(0)	0.00	
2017	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
No. birds seen in current year (A)		0	0	0	0	0(1)	0(1)	1(42)	4(2)	4(5)	8(6)	6(13)	19(1)	21(0)	-	

Table 81. Resight history of red-faced cormorants banded as chicks on banding plots at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band		Metal band #	Year banded	Notes	Year resighted												
Color	band #				05	06	07	08	09	10	11	12	13	14	15	16	17
-	-	778-26751	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26752	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26753	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26754	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26755	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26756	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26757	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26758	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26759	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26760	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26761	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26762	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26763	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26764	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26765	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26766	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26767	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26768	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26769	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26770	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26771	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26772	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26773	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26774	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26775	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26776	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26777	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26778	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26779	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26780	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26781	2004		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
-	-	778-26782	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26783	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26784	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26785	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26786	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26787	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26788	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26789	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26790	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26791	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26792	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26793	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26794	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26795	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26796	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	778-26797	2004		0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	1	1018-01201	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	2	1018-01202	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	3	1018-01203	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	4	1018-01204	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	5	1018-01205	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	7	1018-01206	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	8	1018-01207	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	9	1018-01208	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	10	1018-01209	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	11	1018-01210	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	12	1018-01211	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	13	1018-01212	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	14	1018-01213	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	15	1018-01214	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	17	1018-01215	2005		-	0	0	0	0	0	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	18	1018-01216	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	19	1018-01217	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	20	1018-01218	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	21	1018-01219	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	22	1018-01220	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	23	1018-01221	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	24	1018-01222	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	25	1018-01223	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	27	1018-01224	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	28	1018-01225	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	29	1018-01226	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	30	1018-01227	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	31	1018-01228	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	32	1018-01229	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	33	1018-01230	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	34	1018-01231	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	35	1018-01232	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	37	1018-01233	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	38	1018-01234	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	39	1018-01235	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	40	1018-01236	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	41	1018-01237	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	42	1018-01238	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	43	1018-01239	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	44	1018-01240	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	45	1018-01241	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	47	1018-01242	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	48	1018-01243	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	49	1018-01244	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	50	1018-01245	2005		-	0	0	0	0	0	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	51	1018-01246	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	52	1018-01247	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	53	1018-01248	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	54	1018-01249	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	55	1018-01250	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	57	1018-01251	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	58	1018-01252	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	59	1018-01253	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	70	1018-01254	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	71	1018-01255	2005		-	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	103	1018-01283	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	104	1018-01284	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	105	1018-01285	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	107	1018-01286	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	108	1018-01287	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	109	1018-01288	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	110	1018-01289	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	111	1018-01290	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	112	1018-01291	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	113	1018-01292	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	115	1018-01294	2008		-	-	-	-	(1)	0	0	0	0	0	0	1	0
Yellow	117	1018-01295	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	118	1018-01296	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	119	1018-01297	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	120	1018-01298	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	121	1018-01299	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	122	1018-01300	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	123	1018-01301	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	124	1018-01302	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	125	1018-01303	2008		-	-	-	-	0	0	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	127	1018-01304	2008		-	-	-	-	0	0	0	0	0	0	0	0	0
Yellow	128	1018-01305	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	129	1018-01306	2009		-	-	-	-	-	0	(2)	0	0	0	0	0	0
Yellow	130	1018-01307	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	131	1018-01308	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	132	1018-01309	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	133	1018-01310	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	134	1018-01311	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	135	1018-01312	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	137	1018-01313	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	138	1018-01314	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	139	1018-01315	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	140	1018-01316	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	141	1018-01317	2009		-	-	-	-	-	(1)	0	1	1	0	2	1	0
Yellow	142	1018-01318	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	143	1018-01319	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	144	1018-01320	2009		-	-	-	-	-	0	(2)	0	0	0	0	0	0
Yellow	145	1018-01321	2009		-	-	-	-	-	0	1	0	0	0	0	0	0
Yellow	147	1018-01322	2009		-	-	-	-	-	0	(1)	1	2	2	1	10	2
Yellow	148	1018-01323	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	149	1018-01324	2009		-	-	-	-	-	0	(2)	2	0	0	0	0	0
Yellow	150	1018-01325	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	151	1018-01326	2009		-	-	-	-	-	0	(1)	0	1	0	0	0	0
Yellow	153	1018-01327	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	154	1018-01328	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	155	1018-01329	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	157	1018-01330	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	158	1018-01331	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	152	1018-01332	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	159	1018-01333	2009		-	-	-	-	-	0	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	170	1018-01334	2009		-	-	-	-	-	0	0	0	0	0	0	0	0
Yellow	171	1018-01335	2009		-	-	-	-	-	0	(1)	2	0	0	0	0	1
Yellow	172	1018-01336	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	173	1018-01337	2010		-	-	-	-	-	-	(3)	0	0	0	0	0	0
Yellow	174	1018-01338	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	175	1018-01339	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	177	1018-01340	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	178	1018-01341	2010		-	-	-	-	-	-	(4)	0	0	0	0	0	0
Yellow	179	1018-01342	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	180	1018-01343	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	181	1018-01344	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	182	1018-01345	2010		-	-	-	-	-	-	(3)	0	0	0	0	0	0
Yellow	183	1018-01346	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	184	1018-01347	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	185	1018-01348	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	187	1018-01349	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	188	1018-01350	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	191	1018-01351	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	189	1018-01352	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	190	1018-01353	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	192	1018-01354	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	194	1018-01355	2010		-	-	-	-	-	-	(3)	0	0	0	0	0	0
Yellow	193	1018-01356	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	195	1018-01357	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	197	1018-01358	2010		-	-	-	-	-	-	(4)	0	0	0	0	0	0
Yellow	198	1018-01359	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	199	1018-01360	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	200	1018-01361	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	201	1018-01362	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	202	1018-01363	2010		-	-	-	-	-	-	0	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	203	1018-01364	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	204	1018-01365	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	205	1018-01366	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	207	1018-01367	2010		-	-	-	-	-	-	0	0	0	0	0	1	1
Yellow	208	1018-01368	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	209	1018-01369	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	210	1018-01370	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	211	1018-01371	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
-	-	1018-01372	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	212	1018-01373	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	213	1018-01374	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	214	1018-01375	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	215	1018-01376	2010		-	-	-	-	-	-	(4)	(2)	1	3	2	0	0
Yellow	217	1018-01377	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	219	1018-01378	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	218	1018-01379	2010		-	-	-	-	-	-	(5)	0	0	0	0	0	0
Yellow	220	1018-01380	2010		-	-	-	-	-	-	(5)	0	0	0	0	0	0
Yellow	221	1018-01381	2010		-	-	-	-	-	-	(4)	0	0	0	0	0	0
Yellow	222	1018-01382	2010		-	-	-	-	-	-	(4)	0	0	0	0	0	0
Yellow	223	1018-01383	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	225	1018-01384	2010		-	-	-	-	-	-	(5)	0	0	0	0	0	0
Yellow	224	1018-01385	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	227	1018-01386	2010		-	-	-	-	-	-	(2)	0	0	2	0	0	0
Yellow	228	1018-01387	2010		-	-	-	-	-	-	0	(5)	0	0	0	0	0
Yellow	229	1018-01388	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	230	1018-01389	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	231	1018-01390	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	232	1018-01391	2010		-	-	-	-	-	-	(3)	0	0	0	0	0	0
Yellow	233	1018-01392	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0
Yellow	234	1018-01393	2010		-	-	-	-	-	-	(2)	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	235	1018-01394	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	237	1018-01395	2010		-	-	-	-	-	-	(1)	0	0	0	0	0	0
Yellow	238	1018-01396	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	239	1018-01397	2010		-	-	-	-	-	-	0	0	0	0	0	0	0
Yellow	240	1018-01398	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	241	1018-01399	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	242	1018-01400	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	243	1018-01401	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	244	1018-01402	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	245	1018-01403	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	247	1018-01404	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	248	1018-01405	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	249	1018-01406	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	250	1018-01407	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	251	1018-01408	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	252	1018-01409	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	253	1018-01410	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	254	1018-01411	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	255	1018-01412	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	257	1018-01413	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	258	1018-01414	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	259	1018-01415	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	270	1018-01416	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	271	1018-01417	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	272	1018-01418	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	273	1018-01419	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	274	1018-01420	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	275	1018-01421	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	277	1018-01422	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	278	1018-01423	2011		-	-	-	-	-	-	-	0	0	0	0	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	279	1018-01424	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	280	1018-01425	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	282	1018-01427	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	283	1018-01428	2011		-	-	-	-	-	-	-	0	0	0	1	0	0
Yellow	284	1018-01429	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	285	1018-01430	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	287	1018-01431	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	288	1018-01433	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	289	1018-01434	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	290	1018-01435	2011		-	-	-	-	-	-	-	0	0	0	0	0	0
Yellow	291	1018-01436	2012		-	-	-	-	-	-	-	-	(2)	0	0	2	3
Yellow	292	1018-01437	2012		-	-	-	-	-	-	-	-	0	1	0	5	0
Yellow	293	1018-01438	2012		-	-	-	-	-	-	-	-	(2)	5	7	4	0
Yellow	294	1018-01439	2012		-	-	-	-	-	-	-	-	(1)	1	0	0	0
Yellow	295	1018-01440	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	297	1018-01441	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	298	1018-01442	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	299	1018-01443	2012		-	-	-	-	-	-	-	-	0	(1)	1	0	0
Yellow	300	1018-01444	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	301	1018-01445	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	302	1018-01446	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	303	1018-01447	2012		-	-	-	-	-	-	-	-	0	2	0	0	0
Yellow	304	1018-01448	2012		-	-	-	-	-	-	-	-	(2)	(2)	0	2	2
Yellow	305	1018-01449	2012		-	-	-	-	-	-	-	-	(3)	1	0	0	2
Yellow	307	1018-01450	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	308	1018-01451	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	309	1018-01452	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	310	1018-01453	2012		-	-	-	-	-	-	-	-	0	0	0	0	0
Yellow	311	1018-01454	2013		-	-	-	-	-	-	-	-	-	0	0	0	0
Yellow	312	1018-01455	2013		-	-	-	-	-	-	-	-	-	0	0	0	1

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	317	1018-01456	2013		-	-	-	-	-	-	-	-	-	(1)	0	0	0
Yellow	314	1018-01457	2013		-	-	-	-	-	-	-	-	-	(1)	0	0	0
Yellow	315	1018-01458	2013		-	-	-	-	-	-	-	-	-	0	0	2	1
Yellow	318	1018-01459	2013		-	-	-	-	-	-	-	-	-	(1)	0	0	0
Yellow	319	1018-01460	2013		-	-	-	-	-	-	-	-	-	0	0	0	0
Yellow	320	1018-01461	2013		-	-	-	-	-	-	-	-	-	0	0	0	1
Yellow	321	1018-01462	2013		-	-	-	-	-	-	-	-	-	(2)	0	0	0
Yellow	322	1018-01463	2014		-	-	-	-	-	-	-	-	-	-	(2)	0	0
Yellow	323	1018-01464	2014		-	-	-	-	-	-	-	-	-	-	(4)	6	1
Yellow	324	1018-01465	2014		-	-	-	-	-	-	-	-	-	-	(1)	7	6
Yellow	325	1018-01466	2014		-	-	-	-	-	-	-	-	-	-	(2)	0	0
Yellow	327	1018-01467	2014		-	-	-	-	-	-	-	-	-	-	(4)	4	3
Yellow	328	1018-01468	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	329	1018-01469	2014		-	-	-	-	-	-	-	-	-	-	(3)	3	4
Yellow	333	1018-01471	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	335	1018-01472	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	337	1018-01473	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	338	1018-01474	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	339	1018-01475	2014		-	-	-	-	-	-	-	-	-	-	0	3	1
Yellow	340	1018-01476	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	341	1018-01477	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	342	1018-01478	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	343	1018-01479	2014		-	-	-	-	-	-	-	-	-	-	(6)	2	0
Yellow	344	1018-01480	2014		-	-	-	-	-	-	-	-	-	-	(3)	0	0
Yellow	345	1018-01481	2014		-	-	-	-	-	-	-	-	-	-	0	1	0
Yellow	347	1018-01482	2014		-	-	-	-	-	-	-	-	-	-	(3)	6	2
Yellow	348	1018-01483	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	349	1018-01484	2014		-	-	-	-	-	-	-	-	-	-	(5)	9	2
Yellow	350	1018-01485	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	351	1018-01486	2014		-	-	-	-	-	-	-	-	-	-	(1)	2	2

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	352	1018-01487	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	353	1018-01488	2014		-	-	-	-	-	-	-	-	-	-	(1)	0	4
Yellow	354	1018-01489	2014		-	-	-	-	-	-	-	-	-	-	(1)	0	0
Yellow	355	1018-01490	2014		-	-	-	-	-	-	-	-	-	-	0	0	0
Yellow	357	1018-01491	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	358	1018-01492	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	359	1018-01493	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	370	1018-01494	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	371	1018-01495	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	372	1018-01496	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	373	1018-01497	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	374	1018-01498	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	375	1018-01499	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	377	1018-01500	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	378	1018-01501	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	379	1018-01502	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	380	1018-01503	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	381	1018-01504	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	382	1018-01505	2015		-	-	-	-	-	-	-	-	-	-	-	0	1
Yellow	383	1018-01506	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	393	1018-01507	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	384	1018-01508	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	385	1018-01509	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	387	1018-01510	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	388	1018-01511	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	389	1018-01512	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	390	1018-01513	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	391	1018-01514	2015		-	-	-	-	-	-	-	-	-	-	-	(1)	0
Yellow	392	1018-01515	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	394	1018-01516	2015		-	-	-	-	-	-	-	-	-	-	-	0	0

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	395	1018-01517	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	397	1018-01518	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	399	1018-01519	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	398	1018-01520	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	400	1018-01521	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	401	1018-01522	2015		-	-	-	-	-	-	-	-	-	-	-	0	1
Yellow	402	1018-01523	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	403	1018-01524	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	404	1018-01525	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	405	1018-01526	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	407	1018-01527	2015		-	-	-	-	-	-	-	-	-	-	-	0	0
Yellow	434	1018-01528	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	435	1018-01529	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	437	1018-01530	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	438	1018-01531	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	439	1018-01532	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	440	1018-01533	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	441	1018-01534	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	442	1018-01535	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	443	1018-01536	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	444	1018-01537	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	445	1018-01538	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	447	1018-01539	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	448	1018-01540	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	449	1018-01541	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	450	1018-01542	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	451	1018-01543	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	452	1018-01544	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	453	1018-01545	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	454	1018-01546	2017		-	-	-	-	-	-	-	-	-	-	-	-	-

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted												
					05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	455	1018-01547	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	457	1018-01548	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	458	1018-01549	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	459	1018-01550	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	411	1018-01554	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	412	1018-01555	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	413	1018-01556	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	414	1018-01557	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	415	1018-01558	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	417	1018-01559	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	418	1018-01560	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	419	1018-01561	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	420	1018-01562	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	421	1018-01563	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	430	1018-01570	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	431	1018-01571	2016		-	-	-	-	-	-	-	-	-	-	-	-	0
Yellow	470	1018-01575	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	471	1018-01576	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	472	1018-01577	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	473	1018-01578	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	474	1018-01579	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	475	1018-01580	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	477	1018-01581	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	478	1018-01582	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	479	1018-01583	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	480	1018-01584	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	481	1018-01585	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	482	1018-01586	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	484	1018-01587	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	483	1018-01588	2017		-	-	-	-	-	-	-	-	-	-	-	-	-

Table 81 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at St. Paul Island, Alaska. Data represent number of times birds were resighted 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.

Color band		Metal band #	Year banded	Notes	Year resighted												
Color	band #				05	06	07	08	09	10	11	12	13	14	15	16	17
Yellow	485	1018-01589	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	487	1018-01590	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	488	1018-01591	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	489	1018-01592	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	490	1018-01593	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	491	1018-01594	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	492	1018-01595	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	493	1018-01596	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	494	1018-01597	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	495	1018-01598	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	497	1018-01599	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow	500	1018-01600	2017		-	-	-	-	-	-	-	-	-	-	-	-	-
Total adults resighted					0	0	0	0	0	0	1	4	4	8	6	19	21
Total immatures resighted					0	0	0	0	1	1	42	2	5	6	13	1	0

Table 82. Resight history of red-faced cormorants banded as adults on St. Paul Island, Alaska. Data represent number of times birds were resighted each year. Resights are based on incidental observations only and not a standardized resighting effort.

Color band		Metal band #	Year banded	Location	Year resighted	
Color	band #				16	17
Yellow	408	1018-01551	2016	Reef	-	-
Yellow	409	1018-01552	2016	Reef	-	-
Yellow	410	1018-01553	2016	Zapadni	-	-
Yellow	422	1018-01564	2016	Zapadni	-	1
Yellow	423	1018-01565	2016	Zapadni	-	-
Yellow	424	1018-01566	2016	Zapadni	-	-
Yellow	425	1018-01573	2016	Zapadni	-	2
Yellow	427	1018-01567	2016	Zapadni	-	1
Yellow	428	1018-01568	2016	Population plot 18	-	-
Yellow	429	1018-01569	2016	Population plot 4	-	2
Yellow	432	1018-01572	2016	Population plot 4	-	2
Yellow	433	1018-01574	2016	Population plot 4	-	2
Total adults resighted					0	6

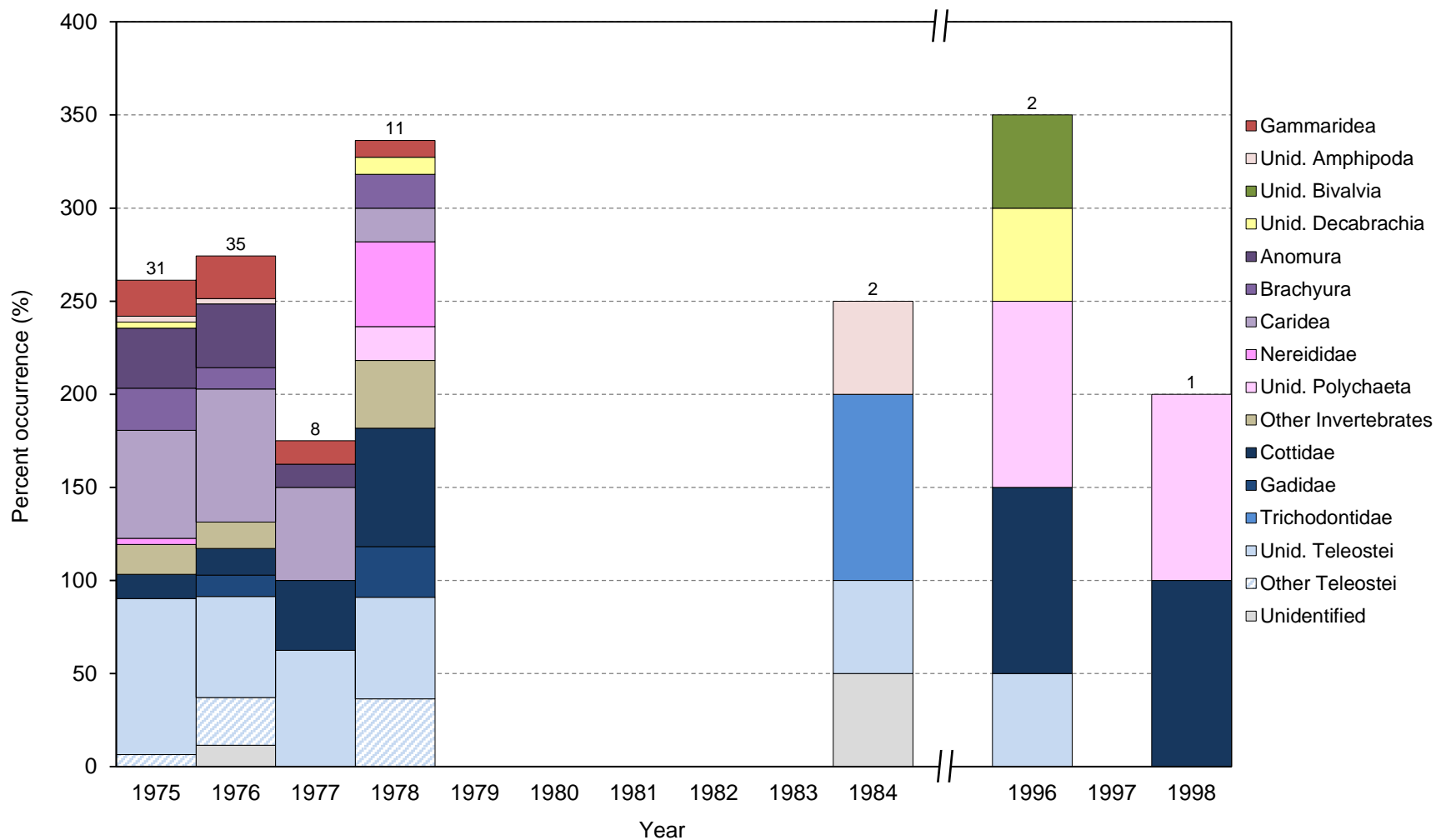


Figure 39. Frequency of occurrence of major prey items in diets of red-faced cormorant chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations and boluses from adults returning to the colony to feed chicks, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1979-1983, 1985-1995, 1997, or 1999-2008; samples were collected in 2009-2017 but have not yet been analyzed.

Table 83. 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1979-1983, 1985-1995, 1997, or 1999-2008; samples were collected in 2009-2017 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	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	31	35	8	11	2	2	1	4	28	8	4	6	8	10		34
Invertebrates	74.2	85.7	50.0	72.7	50.0	100.0	100.0	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>
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	-	-	-	-	-	-	-	-	-	-	-	-

Table 83 (continued). 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1979-1983, 1985-1995, 1997, or 1999-2008; samples were collected in 2009-2017 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	2009	2010	2011	2012	2013	2014	2015	2016	2017
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	-	-	-	-	-	-	-	-	-	-	-

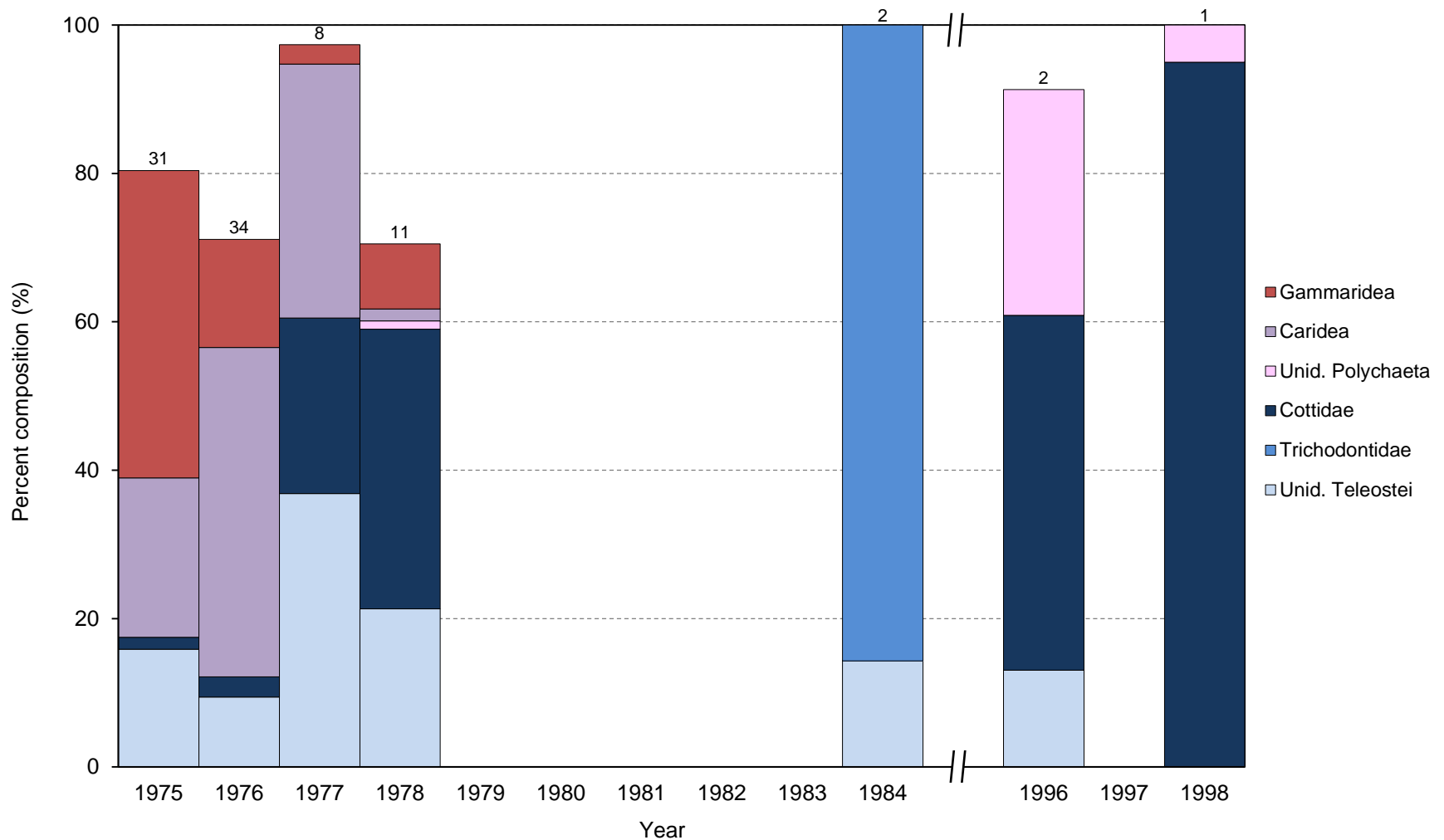


Figure 40. Percent composition of major prey items in diets of red-faced cormorant chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations and boluses from adults returning to the colony to feed chicks, as well as regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 1979-1983, 1985-1995, 1997, or 1999-2008; samples were collected in 2009-2017 but have not yet been analyzed.

Table 84. Percent composition of major prey items in diets of red-faced cormorant chicks at St. Paul Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item (sums to 100% each year). 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 composition 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, as well as regurgitations from chicks themselves. No diet samples were collected in 1979-1983, 1985-1995, 1997, or 1999-2008; samples were collected in 2009-2017 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	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	31	34	8	11	2	2	1	4	28	8	4	6	8	10		34
No. individuals	372	329	38	183	7	23	40	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>	<i>pending</i>
Invertebrates	79.8	76.3	39.5	30.6	-	39.1	5.0	-	-	-	-	-	-	-	-	-
Amphipoda	43.3	17.6	2.6	8.7	-	-	-	-	-	-	-	-	-	-	-	-
Gammaridea	41.4	14.6	2.6	8.7	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ischyrocerus anguipes</i>	34.1	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gammaridea	7.3	7.3	2.6	8.7	-	-	-	-	-	-	-	-	-	-	-	-
Other Amphipoda	1.9	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	34.1	55.6	36.8	4.9	-	-	-	-	-	-	-	-	-	-	-	-
Caridea	21.5	44.4	34.2	1.6	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lebbeus polaris</i>	0.3	28.9	21.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Caridea	21.2	15.5	13.2	1.6	-	-	-	-	-	-	-	-	-	-	-	-
Other Decapoda	12.6	11.2	2.6	3.3	-	-	-	-	-	-	-	-	-	-	-	-
Polychaeta	0.3	-	-	13.1	-	30.4	5.0	-	-	-	-	-	-	-	-	-
Unid. Polychaeta	-	-	-	1.1	-	30.4	5.0	-	-	-	-	-	-	-	-	-
Other Polychaeta	0.3	-	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	2.2	3.0	-	3.8	-	8.7	-	-	-	-	-	-	-	-	-	-
Fish	20.2	23.4	60.5	69.4	100.0	60.9	95.0	-	-	-	-	-	-	-	-	-
Teleostei	20.2	23.4	60.5	69.4	100.0	60.9	95.0	-	-	-	-	-	-	-	-	-
Cottidae	1.6	2.7	23.7	37.7	-	47.8	95.0	-	-	-	-	-	-	-	-	-
<i>Hemilepidotus jordani</i>	-	-	-	-	-	43.5	-	-	-	-	-	-	-	-	-	-
Unid. Cottidae	1.6	1.8	-	37.7	-	-	95.0	-	-	-	-	-	-	-	-	-
Other Cottidae	-	0.9	23.7	-	-	4.3	-	-	-	-	-	-	-	-	-	-
Trichodontidae	-	-	-	-	85.7	-	-	-	-	-	-	-	-	-	-	-
<i>Trichodon trichodon</i>	-	-	-	-	85.7	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	15.9	9.4	36.8	21.3	14.3	13.0	-	-	-	-	-	-	-	-	-	-
Other Teleostei	2.7	11.2	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 85. 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. No surveys were conducted in 2004-2009.

Species	2003	2010	2011	2012	2013	2014	2015	2016	2017
Rock sandpiper	6	1	1	0	1	1	1	2	17
Pacific wren	0	0	0	0	0	0	<1	0	0
Gray-crowned rosy finch	7	0	1	0	<1	<1	0	1	0
Lapland longspur	22	1	3	7	9	7	6	4	6
Snow bunting	0	0	0	0	0	0	<1	0	<1
<i>n</i>	5	4	5	5	5	5	5	5	5
First survey	10 Jun	18 Jun	12 Jun	11 Jun	12 Jun	12 Jun	17 Jun	10 Jun	19 Jun
Last survey	30 Jun	30 Jun	19 Jun	18 Jun	26 Jun	24 Jun	22 Jun	29 Jun	23 Jun

Table 86. 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. No surveys were conducted in 2004-2007, 2009, or 2012-2013.

Species	2003	2008	2010	2011	2014	2015	2016	2017
Rock sandpiper	24	0	1	<1	2	5	8	5
Pacific wren	0	0	0	0	0	0	<1	0
Gray-crowned rosy finch	69	1	12	9	6	9	24	9
Lapland longspur	7	0	1	2	5	8	4	12
Snow bunting	3	0	1	1	0	5	3	3
<i>n</i>	5	2	4	5	5	5	5	5
First survey	14 Jun	11 Jun	18 Jun	12 Jun	13 Jun	17 Jun	10 Jun	19 Jun
Last survey	4 Jul	20 Jun	29 Jun	18 Jun	26 Jun	22 Jun	29 Jun	30 Jun

Table 87. Numbers of birds detected on beach transect surveys along Lukanin Beach, St. Paul Island, Alaska in 2017.

Species	Date					Mean	SD
	19 Jun	20 Jun	21 Jun	22 Jun	23 Jun		
Rock sandpiper	4	24	31	21	6	17	12
Pacific wren	0	0	0	0	0	0	0
Gray-crowned rosy finch	0	0	0	0	0	0	0
Lapland longspur	5	8	6	5	5	6	1
Snow bunting	0	1	0	0	0	<1	<1
Start time (AKST)	0900	0910	0930	0914	0908	-	-
End time (AKST)	0921	0930	0948	0940	0930	-	-

Table 88. Numbers of birds detected on beach transect surveys along Zapadni Beach, St. Paul Island, Alaska in 2017.

Species	Date					Mean	SD
	19 Jun	21 Jun	28 Jun	29 Jun	30 Jun		
Rock sandpiper	3	1	0	4	18	5	7
Pacific wren	0	0	0	0	0	0	0
Gray-crowned rosy finch	9	7	3	18	8	9	6
Lapland longspur	6	6	15	10	23	12	7
Snow bunting	5	3	2	3	3	3	1
Start time (AKST)	0850	0831	0900	0848	0812	-	-
End time (AKST)	0920	0855	0933	0918	0835	-	-

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

Greater white-fronted goose (*Anser albifrons*). Uncommon migrant. A single individual was seen periodically during the first half of June near Antone Lake

Aleutian cackling goose (*Branta hutchinsii leucopareia*). Uncommon migrant. A group of 45 individuals was seen flying over Ridgewall on 12 June.

Eurasian wigeon (*Anas penelope*). Uncommon migrant. Two individuals were seen on Antone Lake at the end of May.

American wigeon (*Anas americana*). Irregular migrant. Single individuals were seen on Antone Lake throughout June.

Mallard (*Anas platyrhynchos*). Rare migrant. Individuals or pairs were seen during the 1st half of June on many of the island's lakes.

Northern shoveler (*Anas clypeata*). Irregular migrant. Single individuals or pairs were seen throughout September, often at Webster Lake.

Northern pintail (*Anas acuta*). Common breeder. Species is commonly found throughout the breeding season on many of the island's lakes. As many as 74 were observed on Antone Lake on 25 August.

Eurasian green-winged teal (*Anas crecca crecca*). Common breeder. Species is commonly found throughout the season in small numbers on many of the island's lakes.

Common pochard (*Aythya ferina*). Irregular migrant. A single individual was seen on Antone Lake on 18 May.

Tufted duck (*Aythya fuligula*). Irregular migrant. A single individual was seen on 9 June on Weather Bureau Lake.

Greater scaup (*Aythya marila*). Common migrant. Seen in flocks fewer than 10 throughout the season on lakes such as Polovina and Weather Bureau.

King eider (*Somateria spectabilis*). Uncommon migrant. Individuals in breeding and non-breeding plumage were seen throughout the season offshore at NW Point and Tolstoi Point, in Salt Lagoon, and in the Town Harbor.

Harlequin duck (*Histrionicus histrionicus*). Abundant migrant. Commonly seen offshore in rafts ranging from 5 to 300 individuals.

White-winged scoter (*Melanitta fusca*). Uncommon migrant. Seen offshore throughout the first half of June.

Long-tailed duck (*Clangula hyemalis*). Common breeder. Seen often throughout the season on lakes of varying size.

Bufflehead (*Bucephala albeola*). Uncommon migrant. Few individuals seen in late May to early June on Salt Lagoon, Ice House Lake, and Big Polovina Lake.

Red-breasted merganser (*Mergus serrator*). Rare migrant. An individual was seen on 5 June in Salt Lagoon, and two individuals were seen on Antone Lake on 10 June.

Sandhill crane (*Grus canadensis*). Irregular migrant. Single individuals were regularly sighted from late June through late August.

Pacific golden-plover (*Pluvialis fulva*). Abundant migrant. Starting in late July, small groups were commonly seen in the tundra above SW point up to the saddle of the High Bluffs trail.

Semipalmated plover (*Charadrius semipalmatus*). Common resident breeder. Seen throughout the season on Salt Lagoon behind Staff Quarters and at Pump House Lake.

Whimbrel (*Numenius phaeopus*). Uncommon migrant. A single individual was seen multiple times from 26 May to 10 June.

Bar-tailed godwit (*Limosa lapponica*). Uncommon migrant. A single individual was observed near the road at the Big Zapadni seal rookery on 23 May.

Ruddy turnstone (*Arenaria interpres*). Common migrant. This species is seen in abundance across the island foraging primarily along the coast or roosting on gravel roads. Migrants increase in mid-July with as many as 300 seen in a day.

Red knot (*Calidris canutus*). Accidental vagrant. Up to three individuals were sighted on the island between mid-August and early September.

Ruff (*Calidris pugnax*). Rare migrant. Single birds were sighted in mid-August through the end of the season at Pump House Lake and Tonki wetlands

Sharp-tailed sandpiper (*Calidris acuminata*). Common migrant. From the beginning of August through the end of the season, individuals were commonly found around Pump House Lake, Tonki Wetlands, and Barabaras Pond, with as many as 15 seen in a single day.

Red-necked stint (*Calidris ruficollis*). Irregular migrant. Single individuals were seen sporadically throughout the season in various wetlands, mixed with rock sandpipers.

Dunlin (*Calidris alpina*). Casual migrant. A single individual was seen with a mixed shorebird flock on Salt Lagoon on 27 August.

Pribilof rock sandpiper (*Calidris ptilocnemis ptilocnemis*). Abundant breeder. This species was seen daily across the island in a variety of habitats.

Buff-breasted sandpiper (*Calidris subruficollis*). Rare migrant. A single individual was seen in the tundra above SW Point on 20 August.

Pectoral sandpiper (*Calidris melanotos*). Common migrant. Single individuals seen throughout the month of June at small ponds and wetlands. Groups of up to 10 seen from 15 August until departure from the island.

Western sandpiper (*Calidris mauri*). Irregular migrant. Single individuals were observed in early June and groups of fewer than 10 individuals were observed from mid-August to early September.

Long-billed dowitcher (*Limnodromus scolopaceus*). Common migrant. Starting mid-August, this species was seen routinely at small ponds and wetlands, with a high count of eight individuals occurring on 26 August at Pump House Lake.

Gray-tailed tattler (*Tringa brevipes*). Uncommon migrant. Single individuals were seen in late May, and late August along rocky shorelines around the island.

Wandering tattler (*Heteroscelus incanus*). Common migrant. Commonly seen in small numbers throughout field season along rocky shorelines around the island, as well as in Salt Lagoon.

Marsh sandpiper (*Tringa stagnatilis*). Irregular migrant. One bird was seen at Pump House Lake or Saucer Pond for a period of two weeks starting 28 May.

Wood sandpiper (*Tringa glareola*). Rare migrant. Individuals were commonly seen at Pump House Lake and Tonki Wetlands from July through our departure in September.

Red-necked phalarope (*Phalaropus lobatus*). Common resident breeder. Commonly seen on small lakes such as Pump House, Saucer, and Weather Bureau. Seen offshore as well.

Red phalarope (*Phalaropus fulicaria*). Common resident non-breeder. Commonly seen as single individuals throughout the month of June on lakes such as Pump House, Saucer and Weather Bureau, with numbers growing starting in early August. A flock of 140 seen on Salt Lagoon on 2 August.

Parasitic jaeger (*Stercorarius parasiticus*). Uncommon migrant. Sighted sporadically offshore from Ridgewall and High Bluffs during the month of June.

Common murre (*Uria aalge*). Abundant breeder. Breeds on many cliffs around the island and can be seen daily. This species experienced near complete reproductive failure in 2017.

Thick-billed murre (*Uria lomvia*). Abundant breeder. This species breeds on the cliffs of the island and can be seen daily. Breeding success for this species in 2017 was the lowest on record.

Pigeon guillemot (*Cephus columbia*). Rare resident non-breeder. Single individuals seen off Tourist Point and SW Point during July.

Ancient murrelet (*Sythliboramphus antiquus*). Rare resident non-breeder. Single individuals were seen offshore from SW point, Ridgewall and High Bluffs during the month of June.

Parakeet auklet (*Aethia psittacula*). Abundant breeder. The most common auklet on St. Paul, this species was seen daily on the cliffs until late July with very few individuals sighted throughout August and September, presumably due to nesting failure.

Least auklet (*Aethia pusilla*). Abundant breeder. This species was seen daily along the coast until July 18. They breed in moderate numbers in the rocky beaches of Reef, Tolstoi, and Zapadni, and in lower numbers at Lincoln Bight. In 2017 island-wide abundance of least auklets plummeted around the 3rd week of July, with very few individuals sighted throughout August, presumably due to nesting failure.

Crested auklet (*Aethia cristatella*). Common breeder. This species is not as abundant as least and parakeet auklets, yet with effort can be seen daily along the cliffs, especially at Zapadni and Reef. The most individuals seen this season was a raft of 34 on 8 June off of Tolstoi.

Horned puffin (*Fratercula corniculata*). Abundant breeder. This species was seen daily starting the last week of May on nearshore and offshore waters and on the cliffs where they breed. No individuals were seen this season carrying prey items.

Tufted puffin (*Fratercula cirrhata*). Abundant breeder. This species was seen daily on nearshore and offshore waters of the island starting the last week of May. They typically breed in rocky crevasses on the cliffs rather than in earthen burrows. No individuals were seen this season carrying prey items.

Black-legged kittiwake (*Rissa tridactyla*). Abundant breeder. This species breeds on cliffs around the island and can be seen daily on many of the lakes of the island. In 2017 this species experienced complete breeding failure, which was the 4th time since 1984 that failure occurred.

Red-legged kittiwake (*Rissa brevirostris*). Abundant breeder. Observations of this species were similar to black-legged kittiwakes this year. For the 3rd year in a row this species has failed to breed successfully on St. Paul. Most red-legged kittiwakes are found on the lower reaches of the High Bluff Cliffs opposite Rush Hill.

Glaucous-winged gull (*Larus glaucescens*). Abundant non-resident breeder. This species can be seen daily on the island. Throughout June, daily counts averaged 40 individuals, whereas starting in late July as many as 200 individuals could be seen daily on the island.

Glaucous gull (*Larus hyperboreus*). Rare migrant. Regularly sighted during May and June, and again in late August.

Common tern (*Sterna hirundo longipennis*). Rare migrant. Single individual seen flying around Antone Lake.

Red-throated loon (*Gavia stellata*). Rare migrant. Single individuals were seen throughout late May and early June on Salt Lagoon or offshore at Marunick on the north coast.

Yellow-billed loon (*Gavia adamsii*). Rare migrant. One bird was observed during the second week of July in Ice Lagoon.

Northern fulmar (*Fulmarus glacialis*). Abundant breeder. Common breeder found nesting and soaring along the rocky coastlines of the island. The first chick was seen on 22 July at Zapadni, though many nests were abandoned throughout the breeding season. At least 50 fulmar carcasses were found washed ashore starting on 3 August, primarily dark morphs.

Short-tailed shearwater (*Puffinus tenuirostris*). Common migrant. Regularly seen offshore, particularly off Southwest Point.

Double-crested cormorant (*Phalacrocorax auritus*). Irregular resident non-breeder. A single individual was seen five times at the Water Towers cormorant colony in June.

Red-faced cormorant (*Phalacrocorax urile*). Abundant breeder. This species breeds on the southern and western cliffs of the island and can be found roosting around the island wherever there is a rocky coastline. Nesting effort coalesced along the coastline below the water towers in the village this year, with 150 nests counted, which is the highest nesting density observed in recent years.

Pelagic cormorant (*Phalacrocorax pelagicus*). Uncommon resident non-breeder. Individuals seen among red-faced cormorants at nesting sites and nearshore rock roosts.

Osprey (*Pandion haliaetus*). Accidental vagrant. A single bird was observed multiple times on the island during July.

Bald eagle (*Haliaeetus leucocephalus*). Casual resident non-breeder. Adults were seen regularly throughout the season at High Bluffs, Salt Lagoon, and Tolstoi. Interactions between eagles and ledge-nesting seabirds were frequently observed and at times severe in scope due to higher than average reproductive failure for most ledge-nesting species this season.

White-tailed eagle (*Haliaeetus albicilla*). An individual was seen starting on 22 May near Salt Lagoon and continued to be seen periodically during June, often at High Bluffs flushing ledgenesters from the cliffs.

Peregrine falcon (*Falco peregrinus tundrius*). Casual migrant. An individual was observed periodically during the middle of July.

Pacific wren (*Troglodytes pacifica*). Abundant breeder. Commonly found throughout rocky coast and grass/umbel plant habitats. Community members stated that this species was far less abundant in 2017 than it has been in the past.

Northern wheatear (*Oenanthe oenanthe*). Uncommon migrant. As many as 14 individuals were seen on gravel roads near the airport on 24 August.

Eastern yellow wagtail (*Motacilla tschutschensis*). Common migrant. Two individuals were seen on the shoreline of Pumphouse Lake on 25 August.

American pipit (*Anthus rubescens*). Common migrant. Single individuals or pairs were observed from 20 August until early September, along gravel roads.

Brambling (*Fringilla montifringilla*). Common migrant. As many as six individuals were observed near shipping containers in the village or out at NE Point during the last week of May.

Gray-crowned rosy finch (*Leucosticte tephrocotis umbrina*). Abundant breeder. Found across the island in nearly all habitats. The first fledgling was observed on 20 June.

Hawfinch (*Coccothraustes coccothraustes*). Irregular migrant. A single individual was seen in town on 14 June.

Lapland longspur (*Calcarius lapponicus*). Abundant breeder. This species is the most numerous passerine on the island and is seen daily in all habitats and areas of the island. The first fledgling was observed on 20 June. Large flocks of fledglings were often seen near the roads of the island in late July through August.

Snow bunting (*Plectrophenax nivalis*). Abundant breeder. This species was seen daily. Regular sightings were at the Antone Lake Seawall, rocky outcrops near Southwest Point, and Hutchinson Hill.

MAMMALS

Pribilof island shrew (*Sorex pribilofensis*). Two shrews were encountered this season, in early June at Tsamana Lake and in late August near Little Zapadni fur seal rookery.

Arctic fox (*Alopex lagopus*). Foxes were abundant this year with pups encountered daily along the Zapadni, Tolstoi and High Bluffs coastlines, as well as in town and near fur seal rookeries.

Northern fur seal (*Callorhinus ursinus*). Fur seals are abundant on St. Paul with large rookeries scattered along the coastline. National Marine Mammal Lab considers the species 'depleted' and performed numerous research projects investigating survival and foraging locations during the pup rearing period.

Steller sea lion (*Eumetopias jubatus*). Single individuals were observed at Zapadni and Southwest Point throughout the season. Over 30 individuals were counted on Sea Lion Rock on 18 July.

Harbor seal (*Phoca vitulina*). This species was routinely seen near Southwest Point, and the high count was 32 individuals. In addition, three dead pups were found in mid-June, two on the sandy NE coastline, and one on the sandy SE coastline.

Reindeer (*Rangifer tarandus*). Reindeer were encountered primarily at High Bluffs, west and north of Rush Hill. Evidence of grazing and trampling of vegetation along with soil disturbance was encountered from population plot 28 north to plot 12.

Orca (*Orcinus orca*). Three orcas were observed off SW Point on 20 July. A pair were also sighted within English Bay this season.

Table 89. 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" and "Walrus", 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	2015	2016	2017	
Bean goose	X	X	-	-	-	-	-	-	-	X	-	-	-	-	-	
Greater white-fronted goose	X	X	-	-	-	X	-	-	X	X	-	-	-	-	X	
Lesser white-fronted goose	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	
Emperor goose	X	(X) ^a	X	-	Otter	X	-	-	-	X	-	-	-	X	-	
Snow goose	-	-	X	-	-	Otter	-	-	-	X	-	-	-	-	-	
Brant	X	X	-	-	X	X	-	-	-	X	-	X	X	X	-	
Aleutian cackling goose	X	X	-	X	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	-	-	X	X	X	
American wigeon	X	X	-	X	-	-	X	-	-	-	-	-	-	X	X	
Mallard	X	X	-	-	-	X	-	X	-	X	X	X	X	X	X	
Northern shoveler	X	X	-	X	-	X	X	-	-	-	X	-	X	X	X	
Northern pintail	B	B	B	X/B?	X/B?	P	B	X	B	B	B	B	B	B	B	
Eurasian green-winged teal (<i>A. c. crecca</i>)	B	B	-	-	X	X	-	-	B	B	B	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	-	-	-	-	-	-	-	-	-	X	
Ring-necked duck	-	-	X	-	-	-	X	-	X	-	-	-	-	-	-	
Tufted duck	X	X	-	X	-	X	X	-	-	-	X	-	-	X	X	
Greater scaup	X	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	X	X	X	
Common eider	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	
Harlequin duck	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
White-winged scoter	X	X	-	-	-	X	-	-	-	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	B	X	X	
Bufflehead	X	X	-	X	-	X	X	X	X	X	X	X	X	X	X	
Common goldeneye	X	X	-	-	-	X	X	-	X	X	-	-	-	-	-	
Barrow's goldeneye	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	
Smew	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	
Common merganser	-	(X)	-	X	X	X	-	-	-	-	-	-	-	-	-	

Table 89 (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" and "Walrus", 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	2015	2016	2017
Red-breasted merganser	X	X	-	-	X	X	X	X	X	X	-	-	X	X	X
Horned grebe	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-
Red-necked grebe	X	-	-	-	X	X	X	-	X	X	-	-	-	-	-
Common cuckoo	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Oriental cuckoo	-	(X) ^a	-	-	-	-	-	-	-	-	-	X	-	-	-
Sandhill crane	-	(X)	-	X	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	X	X	X
Lesser sand-(Mongolian) plover	X	X	X	-	-	-	X	-	-	X	-	-	-	-	-
Common ringed plover	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Semipalmated plover	B	B	-	X/B?	X/B?	B	B	P	B	B	B	B	B	X	B
Whimbrel	X	X	X	X	-	X	X	X	X	X	-	-	-	-	X
Bristle-thighed curlew	X	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	X	X	X
Ruddy turnstone	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X
Black turnstone	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Great knot	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-
Red knot	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X
Ruff	X	X	X	-	X	-	X	X	X	-	-	X	-	X	X
Broad-billed sandpiper	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Sharp-tailed sandpiper	X	X	-	-	X	X	X	X	X	X	-	-	-	X	X
Stilt sandpiper	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Temmick's stint	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Long-toed stint	X	-	-	-	-	-	-	-	X	-	-	X	-	-	-
Red-necked stint	X	X	-	X	X	X	X	X	X	X	-	X	-	X	X
Sanderling	-	X	X	X	X	X	-	-	-	X	-	-	-	-	-
Dunlin	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	B	B	B
Baird's sandpiper	X	X	-	-	-	-	-	-	-	X	-	-	-	-	-
Little stint	X	-	-	-	X	-	-	-	-	X	-	-	-	-	-
Least sandpiper	P	B	-	X/B?	X/B?	B	X/B?	X	X	X	-	X	-	-	-
Buff-breasted sandpiper	-	X	X	-	-	X	X	-	-	X	-	-	-	X	X
Pectoral sandpiper	X	X	-	X	-	X	X	X	X	X	-	X	-	X	X
Semipalmated sandpiper	X	X	X	-	-	X	-	-	-	-	-	-	-	X	-

Table 89 (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" and "Walrus", 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	2015	2016	2017	
Western sandpiper	X	X	-	-	X	X	X	X	X	X	-	X	-	X	X	
Short-billed dowitcher	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	
Long-billed dowitcher	X	X	-	-	-	-	X	X	-	X	-	-	-	X	X	
Jack snipe	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wilson's snipe	-	X	-	-	-	X	-	-	X	X/B?	-	-	-	-	-	
Common snipe	X	X	-	-	-	-	X	-	-	X	-	-	-	-	-	
Pin-tailed snipe	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	
Terek sandpiper	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	
Common sandpiper	X	X	-	-	-	X	-	-	-	-	-	X	-	-	-	
Gray-tailed tattler	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	
Wandering tattler	X	X ^a	-	X	X	X	X	X	X	X	X	X	X	X	X	
Spotted redshank	-	(X) ^a	-	-	-	-	-	-	-	-	-	-	-	-	-	
Greater yellowlegs	X	(X)	-	X	-	-	-	-	-	-	X	X	X	-	-	
Common greenshank	X	X	-	-	-	-	-	-	-	-	-	-	X	-	-	
Lesser yellowlegs	X	X	-	-	X	-	-	-	X	-	-	-	-	-	-	
Marsh sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	
Wood sandpiper	X	X	-	-	-	-	X	-	X	X	-	X	X	X	X	
Red-necked phalarope	X	B	B	X	X	X	X	B	B	B	X	X	X	X	B	
Red phalarope	X	X	-	X	X	X	X	X	P	P	X	X	X	X	X	
Pomarine jaeger	X	X	-	X	X	X	X	-	X	X	X	X	X	-	-	
Parasitic jaeger	X	X	-	X	X	X	X	-	X	X	X	-	X	X	X	
Long-tailed jaeger	X	X	-	-	X	X	X	X	X	X	X	-	-	-	-	
Dovekie	-	-	-	-	-	X	Walrus	-	-	-	-	-	-	-	-	
Common murre	B	B	B	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	B	B	B	
Black guillemot	X	-	-	-	-	-	-	-	-	X	X	X	-	-	-	
Pigeon guillemot	X	X	X	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	-	-	-	X	
Parakeet auklet	B	B	B	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	B	B	B	
Whiskered auklet	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	
Crested auklet	B	B	B	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	B	B	B	
Tufted puffin	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	

Table 89 (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" and "Walrus", 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	2015	2016	2017	
Black-legged kittiwake	B	B	B	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	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)	B (Otter)	B (Otter)	X	
Glaucous gull	X	X	-	-	X	X	X	-	X	-	X	-	X	X	X	
Aleutian tern	X	-	-	-	-	-	-	-	-	X	-	-	X	-	-	
Common tern	-	X	-	-	-	-	X	-	X	-	-	-	-	-	X	
Siberian common tern	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	
Arctic tern	X	X	-	-	-	X	X	X	-	X	-	-	-	-	-	
Red-throated loon	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	
Pacific loon	X	X	-	-	-	-	X	-	X	X	-	-	-	-	-	
Common loon	-	-	X	-	-	X	X	-	-	-	X	X	-	-	-	
Yellow-billed loon	X	X	-	-	X	X	-	-	-	X	-	-	X	X	X	
Laysan albatross	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	
Black-footed albatross	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Northern fulmar	B	B	B	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	X	X	X	
Fork-tailed storm-petrel	X	X	-	-	-	X	X	X	-	X	-	-	-	-	-	
Leach's storm-petrel	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	
Double-crested cormorant	X	-	-	-	-	-	X	-	-	X	-	-	X	X	X	
Red-faced cormorant	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
Pelagic cormorant	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	
Osprey	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	
Bald eagle	X	X	X	X	X	X	X	-	X	-	-	X	X	X	X	
White-tailed eagle	-	-	-	-	-	-	-	-	-	X	X	-	-	-	X	
Northern harrier	-	(X) ^a	-	-	-	-	-	-	-	-	-	-	-	-	-	

Table 89 (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" and "Walrus", 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	2015	2016	2017
Rough-legged hawk		X	-	-	-	-	-	-	-	-	-	-	-	-	-
Snowy owl	X	X	-	X	X	X	-	-	-	-	X	-	-	X	-
Short-eared owl	X	X	-	X	X	X	X	-	X	X	X	-	-	-	-
Brown hawk-owl	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Boreal owl	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
White-throated needletail	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
Belted kingfisher	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurasian hobby	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyrfalcon	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-
Peregrine falcon	X	X	-	X	-	-	-	-	-	-	-	-	-	X	X
Olive-sided flycatcher	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Say's phoebe	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Eastern kingbird	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Northern shrike	-	(X) ^a	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-	-	X	-	-	-	-
Red-breasted nuthatch	-	(X)	-	-	-	-	-	X	-	-	-	-	-	-	-
Pacific (formerly winter) wren	B	B	B	-	B	B	B	B	B	B	B	B	B	B	B
Golden-crowned kinglet	-	(X)	-	-	-	-	-	-	-	-	-	-	-	-	-
Ruby-crowned kinglet	-	X	-	-	Walrus	-	-	-	-	-	-	-	-	-	-
Wood warbler	-	(X)	-	-	-	-	-	-	-	-	-	-	-	-	-
Arctic warbler	-	(X)	X	-	-	-	-	-	-	-	-	-	-	-	-
Gray-streaked flycatcher	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Dark-sided (Siberian) flycatcher	X	X	X	-	-	-	X	-	X	X	-	-	-	-	-
Rufus-tailed robin	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Siberian rubythroat	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bluethroat	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Taiga flycatcher	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-

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Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Northern wheatear	X	-	X	X	-	X	X	X	-	X	X	X	-	-	X
Mountain bluebird	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
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	-	-	-	-	-	-	X
Gray wagtail	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
White (black-backed) wagtail	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Olive-backed pipit	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Red-throated pipit	X	(X)	-	-	-	-	-	-	-	-	-	-	-	-	-
American pipit	X	X	-	X	X	X	-	-	-	-	-	-	-	-	X
Brambling	X	X	-	X	-	-	B	-	-	-	-	-	-	-	X
Gray-crowned rosy-finch	B	B	B	B	B	B	B	B	B	X	B	B	B	B	B
Common rosefinch	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
Red crossbill	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
White-winged crossbill	X	-	-	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Lapland longspur	B	B	B	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	B	B	B
McKay's bunting	-	X	X	-	X	X	-	-	-	-	-	-	-	-	-
Northern waterthrush	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Orange-crowned warbler	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow warbler	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow-rumped warbler	X	(X)	-	-	-	-	-	X	-	-	-	-	-	-	-
Townsend's warbler	-	(X)	-	-	-	-	-	-	-	-	-	-	-	-	-
Wilson's warbler	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-
American tree sparrow	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Chipping sparrow	-	(X)	-	-	-	-	-	-	-	-	-	-	-	-	-
Savannah sparrow	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-

Table 89 (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" and "Walrus", 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	2015	2016	2017
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	-	-	-	-	-	-	-	-
MAMMALS															
Pribilof Island shrew	NR ^b	NR	NR	-	-	-	-	-	-	-	-	-	-	-	B
Arctic fox	NR	NR	NR	-	B	B	B	B	B	B	B	B	B	B	B
Red fox	NR	NR	NR	-	X	X	-	-	-	-	-	-	-	-	-
Sea otter	NR	NR	NR	X	-	-	-	-	X	-	-	-	-	-	-
Walrus	NR	NR	NR	-	-	-	-	-	X	-	X	-	-	-	-
Northern fur seal	NR	NR	NR	B	B	B	B	B	B	X	X	B	B	B	B
Steller sea lion	NR	NR	NR	-	X	X	X	X	X	X	X	X	X	X	X
Ribbon seal	NR	NR	NR	-	-	-	-	-	-	-	-	-	X	-	-
Northern elephant seal	NR	NR	NR	-	-	-	-	-	-	-	-	X	-	-	-
Harbor seal	NR	NR	NR	X	X	-	X	X	X	X	X	X	X	X	X
Reindeer	NR	NR	NR	-	B	B	B	B	B	B	B	B	B	B	B
Common minke whale	NR	NR	NR	-	-	-	-	-	-	-	-	-	-	-	-
Orca	NR	NR	NR	X	-	X	-	X	-	X	-	X	X	X	X
Gray whale	NR	NR	NR	-	-	-	-	X	-	-	-	-	-	-	-
Dall's porpoise	NR	NR	NR	-	X	-	-	X	-	-	-	-	-	-	-
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	20 May- 6 Sep	18 May- 6 Sep	21 May- 3 Sep

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct 2004.

^bMammals not recorded (NR) in all years.

Table 90. 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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2011	2012
Apiaceae (Umbelliferae)	<i>Angelica lucida</i>	Wild celery	-	21 Jun	12 Jul	16 Jul	13 Jul	6 Jul
	<i>Conioselinum chinense</i>	Hemlock parsley	15 Jul	31 Jul	7 Aug	1 Aug	21 Jul	26 Jul
	<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
	<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	-
	<i>Artemesia titesii</i>	Northern wormwood	13 Jul	1 Aug	3 Aug	25 Jul	14 Jul	25 Jul
	<i>Aster sibiricus</i>	Siberian aster	2 Aug	-	25 Jul	24 Jul	23 Jul	29 Jul
	<i>Chrysanthemum arcticum</i>	Arctic daisy	16 Jul	-	23 Jul	24 Jul	15 Jul	21 Jul
	<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
	<i>Senecio pseudo-arnica</i>	Beach sunflower	16 Jul	1 Aug	1 Aug	29 Jul	4 Aug	30 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
	<i>Mertensia maritima</i>	Beach bluebells	-	23 Jun	23 Jul	6 Jul	6 Aug	24 Jul
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
	<i>Cardamine umbellata</i>	Siberian bittercress	-	24 Jun	12 Jul	-	-	6 Jul
	<i>Cochlearia officinalis oblongifolia</i>	Scurvy grass	-	3 Jun	31 May	9 Jun	8 Jun	17 Jun
	<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
	<i>Draba hyperborea</i>	Northern draba	-	25 May	28 May	-	23 May	3 Jun
	<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	-
	<i>Campanula uniflora</i>	Arctic harebell	-	26 Jun	7 Jun	-	1 Aug	29 Jul
Caryophyllaceae	<i>Cerastium maleuticum</i>	Aleutian chickweed	-	-	-	-	-	-
	<i>Cerastium beeringianum</i>	Mouse-eared chickweed	-	-	-	3 Jul	-	-
	<i>Cerastium beeringianum</i> var. <i>grandifolium</i>	Bering Sea chickweed	-	6 Jul	28 Jul	27 Jul	20 Aug	-
	Unid. <i>Cerastium</i> sp.	Unid. chickweed	14 Jun	-	-	-	-	-
	<i>Honckenya peploides</i>	Beach greens	-	20 Jul	12 Jul	-	14 Jun	1 Jul
	<i>Minuartia arctica</i>	Arctic sandwort	-	6 Jul	23 Jul	-	10 Jul	9 Jul
	<i>Silene acaulis</i>	Moss campion	-	3 Jul	22 Jul	26 Jul	10 Jul	9 Jul
	<i>Stellaria calycnatha</i>	Northern starwort	-	19 Jul	-	-	-	-
Cornus	<i>Stellaria crassifolia</i>	Fleshy stichwort	-	-	-	-	22 Aug	-
	<i>Cornus suecica</i>	Dogwood	-	20 Jul	-	26 Jul	10 Jul	18 Jul
Fabaceae (Leguminosae)	<i>Lathyrus maritimus</i>	Beach pea	17 Jun	9 Jul	6 Jul	-	1 Jul	2 Jul
	<i>Lupinus nootkatensis</i>	Nootka lupine	31 May	30 May	7 Jun	-	29 May	19 Jul
Fumariaceae	<i>Corydalis pauciflora</i>	Few-flowered corydalis	14 Jun	13 Jun	12 Jun	9 Jun	13 Jun	17 Jun

Table 90 (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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2013	2014	2015	2016	2017
Apiaceae (Umbelliferae)	<i>Angelica lucida</i>	Wild celery	11 Jun	22 Jun	20 Jun	23 Jun	22 Jun
	<i>Conioselinum chinense</i>	Hemlock parsley	27 Jul	7 Jun	9 Jul	5 Jul	6 Jul
	<i>Ligustocum scotisum</i>	Lovage	-	-	-	-	-
Asteraceae (Compositae)	<i>Achillea borealis</i>	Northern yarrow	15 Jul	2 Jul	3 Jul	21 Jun	12 Jul
	<i>Antennaria momocephala</i>	Arctic puss toes	-	-	-	-	-
	<i>Arnica unalaschensis</i>	Unalaska arnica	-	-	-	-	-
	<i>Artemesia arctica</i>	Arctic sage	-	-	9 Jul	-	22 Jul
	<i>Artemesia globularia</i>	Globe wormwood	24 Jun	5 Jun	7 Jul	-	24 Jul
	<i>Artemesia titesii</i>	Northern wormwood	25 Jul	7 Jul	7 Jul	-	-
	<i>Aster sibiricus</i>	Siberian aster	26 Jul	4 Jul	3 Jul	-	-
	<i>Chrysanthemum arcticum</i>	Arctic daisy	23 Jul	22 Jun	3 Jul	23 Jun	3 Jul
	<i>Matricaria matricarioides</i>	Pineapple weed	-	-	-	-	-
	<i>Petasites hyperboreus</i>	Sweet coltsfoot	30 May	27 May	21 May	-	-
	<i>Senecio pseudo-arnica</i>	Beach sunflower	28 Jul	2 Jul	9 Jul	28 Jun	14 Jul
	<i>Taraxacum ceratophorum</i>	Horned dandelion	-	-	-	-	-
	<i>Taraxacum kamtschaticum</i>	Kamchatka dandelion	-	-	-	-	-
	<i>Taraxacum officinale</i>	Common dandelion	-	-	-	-	-
Boraginaceae	<i>Eritrichium chamissonis</i>	Arctic forget-me-not	23 Jun	5 Jun	17 Jun	-	-
	<i>Mertensia maritima</i>	Beach bluebells	29 Jul	22 Jun	18 Jun	26 Jun	15 Jun
Brassicaceae (Cruciferae)	<i>Barbarea orthoceras</i>	Wintercress	-	-	-	-	-
	<i>Cardamine pratensis angustifolia</i>	Cuckoo flower	18 Jul	13 Jun	20 Jun	24 Jun	27 Jun
	<i>Cardamine umbellata</i>	Siberian bittercress	4 Jul	13 Jun	10 Jun	-	27 Jun
	<i>Cochlearia officinalis oblongifolia</i>	Scurvy grass	6 Jun	25 May	20 May	-	10 Jun
	<i>Draba aleutica</i>	Aleutian draba	-	-	-	-	-
	<i>Draba borealis</i>	Arctic whitlow-grass	6 Jun	26 May	11 Jun	19 May	7 Jun
	<i>Draba hyperborea</i>	Northern draba	29 May	25 May	20 May	19 May	28 May
	<i>Draba lactea</i>	Arctic draba	-	-	-	-	-
Campanulaceae	<i>Campanula lasiocarpa</i>	Mountain harebell	-	10 Jul	19 Jul	-	-
	<i>Campanula uniflora</i>	Arctic harebell	27 Jul	9 Jul	-	-	-
Caryophyllaceae	<i>Cerastium aleuticum</i>	Aleutian chickweed	-	-	26 Jun	-	-
	<i>Cerastium beeringianum</i>	Mouse-eared chickweed	7 Jul	-	-	-	-
	<i>Cerastium beeringianum</i> var. <i>grandifolium</i>	Bering Sea chickweed	4 Jul	28 May	16 Jun	2 Jun	25 Jun
	Unid. <i>Cerastium</i> sp.	Unid. chickweed	-	-	-	-	-
	<i>Honckenya peploides</i>	Beach greens	25 Jun	11 Jun	17 Jun	6 Jun	28 May
	<i>Minuartia arctica</i>	Arctic sandwort	7 Jul	-	3 Jul	3 Jun	20 Jul
	<i>Silene acaulis</i>	Moss campion	26 Jun	5 Jun	26 Jun	4 Jun	29 Jun
	<i>Stellaria calycnatha</i>	Northern starwort	-	-	-	-	-
Cornus	<i>Stellaria crassifolia</i>	Fleshy stitchwort	-	13 Jun	-	-	-
	<i>Cornus suecica</i>	Dogwood	14 Jul	9 Jun	3 Jul	23 Jun	25 Jun
Fabaceae (Leguminosae)	<i>Lathyrus maritimus</i>	Beach pea	23 Jun	22 Jun	17 Jun	6 Jun	5 Jul
	<i>Lupinus nootkatensis</i>	Nootka lupine	13 Jun	25 May	30 May	22 May	5 Jun
Fumariaceae	<i>Corydalis pauciflora</i>	Few-flowered corydalis	8 Jun	26 May	7 Jun	29 May	10 Jun

Table 90 (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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2011	2012
Gentianaceae	<i>Gentiana algida</i>	Whitish gentian	2 Aug	7 Aug	12 Aug	1 Aug	11 Aug	12 Aug
	<i>Gentiana glauca</i>	Glaucous gentian	-	7 Aug	-	-	-	-
Geraniaceae	<i>Geranium erianthum</i>	Wild geranium	-	26 Jul	12 Aug	26 Jul	10 Jul	31 Jul
Lilacaea	<i>Fritillaries camschatcensis</i>	Chocolate lily	-	-	25 Jul	-	23 Jul	13 Jul
	<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	-	-	-	-	1 Aug	-
	<i>Epilobium anagallidifolium</i>	Alpine willow herb	-	-	-	-	14 Aug	23 Jul
	<i>Epilobium hornemannii Behrringianum</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
	<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
Polemoniaceae	<i>Polemonium acutiflorum</i>	Tall Jacob's ladder	17 Jun	5 Aug	3 Jul	11 Jul	17 Jun	2 Jul
	<i>Polemonium acutiflorum macranthum</i>	Northern Jacob's ladder	-	-	-	-	-	-
	<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	-
	<i>Oxyria digyna</i>	Mountain sorrel	-	23 Jun	-	-	-	25 Jul
Portulacaceae	<i>Claytonia sarmentosa</i>	Alaska spring beauty	7 Jun	22 Jun	16 Jun	22 Jun	9 Jun	18 Jun
Primulaceae	<i>Androsace tschuktschorum. lehmanniana</i>	Rock jasmine	-	18 Jun	8 Jun	-	11 Jun	18 Jun
	<i>Primula tschuktschorum var. arctica</i>	Chukchi primrose	23 May	6 Jun	4 Jun	26 May	28 May	7 Jun
	<i>Trientalis europaea arctica</i>	Northern starflower	26 Jun	20 Jul	24 Jul	26 Jul	10 Jul	23 Jul
Pyrolaceae	<i>Pyrola minor</i>	Lesser wintergreen	-	5 Aug	-	1 Aug	-	-
Ranunculaceae	<i>Aconitum delphinifolium chamissonianum</i>	Big monkshood	-	15 Jul	20 Jul	-	18 Jul	22 Jul
	<i>Aconitum delphinifolium paradoxum</i>	Little monkshood	-	15 Jul	-	-	13 Jul	-
	Unid. <i>Aconitum</i> sp.	Unid. monkshood	7 Jul	-	-	-	-	-
	<i>Ranunculus eschscholtzii</i>	Subalpine buttercup	-	24 Jun	-	-	-	25 Jun
	<i>Ranunculus nivalis</i>	Snow buttercup	-	-	-	-	-	-
	<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
	Unid. <i>Ranunculus</i> sp.	Unid. buttercup	6 Jun	-	-	-	-	-
	Rosaceae	<i>Geum Rossi</i>	Ross' avens	-	3 Jul	12 Jul	16 Jul	-
<i>Potentilla egedii</i>		Beach cinquefoil	-	-	-	-	11 Aug	-
<i>Potentilla hyperarctica</i>		High Arctic cinquefoil	-	29 Jun	-	16 Jul	-	25 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
Unid. <i>Potentilla</i> sp.		Cinquefoil sp.	7 Jun	-	-	-	-	-
<i>Rubus arcticus</i>		Nagoonberry	-	1 Jul	22 Aug	1 Aug	14 Aug	22 Jul
<i>Rubus chamaemorus</i>		Cloudberry	-	2 Jul	14 Jul	-	7 Jul	6 Jul
<i>Sibbaldia procumbens</i>		Sibbaldia	-	5 Aug	-	-	-	-
Salicaceae		<i>Salix arctica</i>	Arctic willow	-	16 Jun	-	-	18 Jun

Table 90 (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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

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	<i>Gentiana glauca</i>	Glaucous gentian	-	-	-	-	-
Geraniaceae	<i>Geranium erianthum</i>	Wild geranium	7 Jul	22 Jun	3 Jul	-	29 Jun
Lilacaea	<i>Fritillaries camschatcensis</i>	Chocolate lily	-	23 Jun	20 Jun	22 Jun	12 Jul
	<i>Lloydia serotina</i>	Alp lily	-	-	-	-	-
	<i>Streptopus amplexifolius</i>	Twisted stalk	-	-	22 Jun	-	-
Onagraceae	<i>Epilobium angustifolium</i>	Large-leaved Fireweed	-	12 Aug	-	-	-
	<i>Epilobium anagallidifolium</i>	Alpine willow herb	-	-	-	-	11 Jul
	<i>Epilobium hornemannii Behringianum</i>	Bering willow herb	-	-	-	-	-
Papaveraceae	<i>Papaver alaskanum</i>	Alaska poppy	18 Jun	2 Jun	7 Jun	-	10 Jun
	<i>Papaver macounii</i>	Macoun's poppy	-	-	-	-	-
Plumbaginaceae	<i>Armeria maritima</i>	Thrift	24 Jun	27 May	28 May	29 May	3 Jun
Polemoniaceae	<i>Polemonium acutiflorum</i>	Tall Jacob's ladder	4 Jul	8 Jun	20 Jun	3 Jun	3 Jul
	<i>Polemonium acutiflorum macranthum</i>	Northern Jacob's ladder	22 Jun	19 Jun	13 Jun	11 Jun	25 Jun
	<i>Polemonium boreale macranthum</i>	Bluebells	-	-	-	-	-
Polygonaceae	<i>Polygonum bistora plumosum</i>	Pink plumes	-	-	-	-	-
	<i>Polygonum viviparium</i>	Alpine bistort	-	12 Jul	22 Jul	-	-
	<i>Oxyria digyna</i>	Mountain sorrel	27 Jun	-	-	15 Jul	3 Jul
Portulacaceae	<i>Claytonia sarmentosa</i>	Alaska spring beauty	12 Jun	26 May	9 Jun	29 May	4 Jun
Primulaceae	<i>Androsace tschuktschorum. lehmanniana</i>	Rock jasmine	12 Jun	25 May	1 Jun	19 May	7 Jun
	<i>Primula tschuktschorum var. arctica</i>	Chukchi primrose	21 May	29 May	22 May	20 May	23 May
	<i>Trientalis europaea arctica</i>	Northern starflower	14 Jul	22 Jun	3 Jul	23 Jun	20 Jun
Pyrolaceae	<i>Pyrola minor</i>	Lesser wintergreen	-	14 Jul	-	23 Jun	23 Jul
Ranunculaceae	<i>Aconitum delphinifolium chamissonianum</i>	Big monkshood	22 Jul	20 Jun	3 Jul	5 Jul	2 Jul
	<i>Aconitum delphinifolium paradoxum</i>	Little monkshood	23 Jul	22 Jun	11 Jul	14 Jul	18 Jul
	Unid. <i>Aconitum</i> sp.	Unid. monkshood	-	-	-	-	-
	<i>Ranunculus eschscholtzii</i>	Subalpine buttercup	19 Jun	-	11 Jun	-	-
	<i>Ranunculus nivalis</i>	Snow buttercup	-	-	1 Jun	-	30 May
	<i>Ranunculus pygmaeus</i>	Pigmy buttercup	-	-	-	-	-
	<i>Ranunculus repans</i>	Creeping spearwort	-	-	-	-	-
	<i>Ranunculus sulphureus</i>	Sulphur buttercup	31 May	25 May	1 Jun	-	-
	Unid. <i>Ranunculus</i> sp.	Unid. buttercup	-	-	-	-	-
	Rosaceae	<i>Geum Rossi</i>	Ross' avens	27 Jun	31 May	1 Jun	25 Jun
<i>Potentilla egedii</i>		Beach cinquefoil	-	-	-	-	-
<i>Potentilla hyperarctica</i>		High Arctic cinquefoil	30 Jun	-	-	-	-
<i>Potentilla uniflora</i>		One-flowered cinquefoil	-	-	-	14 Jul	27 Jun
<i>Potentilla villonosa</i>		Cinquefoil	24 Jun	3 Jun	1 Jun	23 May	15 Jun
Unid. <i>Potentilla</i> sp.		Cinquefoil sp.	-	-	-	-	-
<i>Rubus arcticus</i>		Nagoonberry	18 Jul	13 Jun	20 Jun	28 Jun	8 Jul
<i>Rubus chamaemorus</i>		Cloudberry	8 Jul	2 Jun	11 Jun	15 Jun	8 Jul
Salicaceae	<i>Sibbaldia procumbens</i>	Sibbaldia	-	-	-	-	-
	<i>Salix arctica</i>	Arctic willow	11 Jun	-	-	23 Jun	19 Jun

Table 90 (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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2011	2012
Saxifragaceae	<i>Salix reticulata orbicularis</i>	Netleaf willow	-	23 Jun	-	-	22 Jun	-
	<i>Chrysosplenium wrightii</i>	Bering Sea water carpet	-	3 Jun	-	-	11 Jun	12 Jun
	<i>Saxifraga bracteata</i>	Bracted saxifrage	-	27 Jun	15 Jul	-	-	-
	<i>Saxifraga bronchialis</i>	Yellow-spotted saxifrage	-	19 Jul	-	-	-	-
	<i>Saxifraga hieracifolia</i>	Rusty saxifrage	-	22 Jul	-	11 Jul	13 Jul	4 Aug
	<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	-
	<i>Saxifraga serpyllifolia</i>	Thyme-leaved saxifrage	2 Aug	18 Jul	2 Aug	14 Jul	10 Jul	29 Jul
	<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
	<i>Pedicularis lanata</i>	Woolly lousewort	17 Jun	1 Jun	22 Jun	10 Jun	19 Jun	15 Jun
	<i>Pedicularis langsdorffii</i> Langsdorffii	Arctic lousewort	-	29 Jun	6 Jul	6 Jul	22 Jun	6 Jul
	<i>Pedicularis sudetica</i> Pacifica	Fern-leaf lousewort	-	9 Jul	1 Jul	6 Jul	29 Jun	30 Jun
	<i>Pedicularis verticillata</i>	Whorled lousewort	-	29 Jun	-	6 Jul	28 Jun	4 Jul
	<i>Veronica serpyllifolia</i>	Thyme-leaf speedwell	-	-	-	-	20 Aug	10 Aug
	<i>Veronica stelleri</i>	Steller's speedwell	-	26 Jul	16 Aug	8 Aug	24 Jun	10 Aug
Valerianaceae	<i>Valeriana capitata</i>	Capitate valerian	30 Jun	-	16 Jun	26 Jul	19 Jun	22 Jul
Violaceae	<i>Viola langsdorffii</i>	Alaska violet	10 Jun	23 Jun	28 Jun	27 Jun	28 Jun	1 Jul
	<i>Viola epipsila</i> Repens	Marsh violet	-	-	-	-	-	20 Jul

Table 90 (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. No data were collected in 2010; data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2013	2014	2015	2016	2017
Saxifragaceae	<i>Salix reticulata orbicularis</i>	Netleaf willow	24 Jun	-	-	-	19 Jun
	<i>Chrysosplenium wrightii</i>	Bering Sea water carpet	-	27 May	-	-	14 Jun
	<i>Saxifraga bracteata</i>	Bracted saxifrage	18 Jun	3 Jun	4 Jun	1 Jun	4 Jun
	<i>Saxifraga bronchialis</i>	Yellow-spotted saxifrage	-	-	-	-	-
	<i>Saxifraga hieracifolia</i>	Rusty saxifrage	-	9 Jul	23 Jun	29 Jun	16 Jul
	<i>Saxifraga hirculus</i>	Bog saxifraga	-	-	-	-	-
	<i>Saxifraga oppositifolia</i>	Purple mountain saxifraga	-	-	-	-	-
	<i>Saxifraga punctata nelsoniana</i>	Brook saxifraga	24 Jun	9 Jun	12 Jun	4 Jun	28 Jun
	<i>Saxifraga serpyllifolia</i>	Thyme-leaved saxifrage	7 Jul	22 Jun	3 Jul	23 Jun	20 Jul
	<i>Saxifraga unalaschensis</i>	Unalaska saxifrage	-	-	-	-	-
Scrophulariaceae	<i>Lagotis glauca</i>	Weasel snout	19 Jun	9 Jun	12 Jun	3 Jun	15 Jun
	<i>Pedicularis lanata</i>	Woolly lousewort	22 Jun	-	20 Jun	-	15 Jun
	<i>Pedicularis langsdorffii</i> Langsdorffii	Arctic lousewort	24 Jun	-	10 Jun	-	-
	<i>Pedicularis sudetica</i> Pacifica	Fern-leaf lousewort	24 Jun	-	16 Jun	3 Jun	19 Jun
	<i>Pedicularis verticillata</i>	Whorled lousewort	4 Jul	-	17 Jun	6 Jun	1 Jul
	<i>Veronica serpyllifolia</i>	Thyme-leaf speedwell	-	7 Jul	7 Jul	-	18 Aug
	<i>Veronica stelleri</i>	Steller's speedwell	-	-	-	24 Jun	-
Valerianaceae	<i>Valeriana capitata</i>	Capitate valerian	5 Jul	13 Jun	21 Jun	23 Jun	28 Jun
Violaceae	<i>Viola langsdorffii</i>	Alaska violet	30 Jun	26 May	10 Jun	28 May	10 Jun
	<i>Viola epipsila</i> Repens	Marsh violet	24 Jun	26 May	30 May	28 May	7 Jun

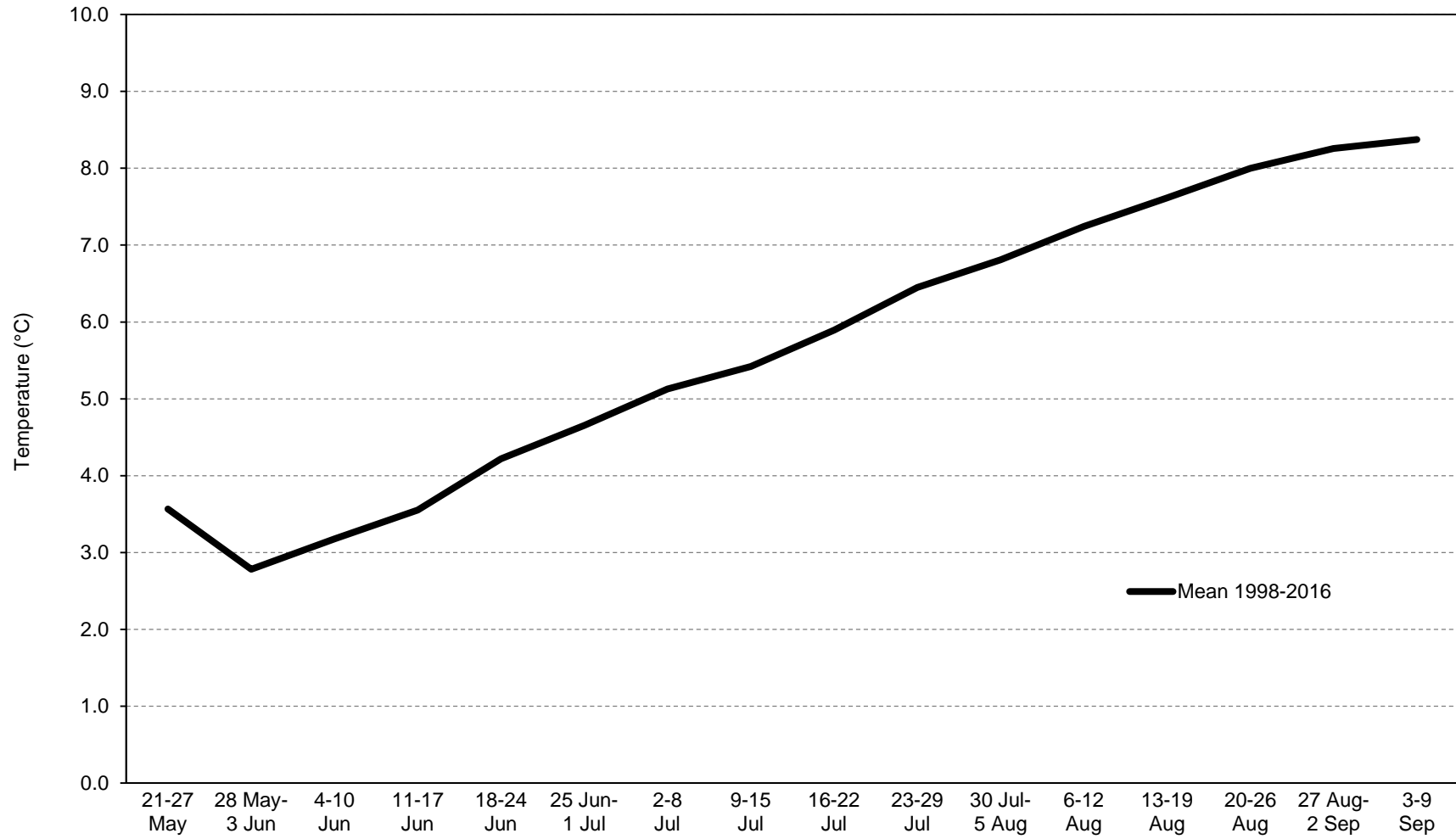


Figure 41. Mean weekly sea surface temperatures (°C) at English Bay, St. Paul Island, Alaska. No data were collected in 1999, 2004-2006, or 2017.

Table 91. Mean weekly sea surface temperatures (°C) at English Bay, St. Paul Island, Alaska. No data were collected in 1999, 2004-2006, or 2017.

Week	1998	2000	2001	2002	2003	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
14-20 May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2
21-27 May	-	-	-	-	-	1.4	-	1.8	-	-	-	-	-	-	7.2
28 May-3 Jun	-	-	2.8	-	5.5	2.5	1.3	1.5	0.5	-	1.3	1.3	3.8	4.5	6.1
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	4.8	6.4
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	5.2	6.8
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	5.7	7.3
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	6.4	8.0
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	7.0	8.4
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	7.4	-
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	7.7	-
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	8.2	-
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	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	8.8	-
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	9.0	-
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	9.5	-
27 Aug-2 Sep	-	7.1	8.3	-	9.0	7.7	7.2	-	-	-	-	-	-	9.8	-
3-9 Sep	-	-	8.5	-	9.0	8.0	7.9	-	-	-	-	-	-	-	-

Table 92. Numbers of black-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No counts were made in 2011-2013 or 2016-2017.

Year	Replicate 1				Replicate 2			
	Adults	Nests	Chicks	Date	Adults	Nests	Chicks	Date
2007	392	140	0	6 Jul	350	45	4	27 Jul
2008	<i>nc</i> ^a	<i>nc</i>	<i>nc</i>	<i>nc</i>	356	188	55	8 Aug
2009	363	265	0	14 Jun	120	53	14	25 Jul
2010	368	254	1	25 Jun	295	189	32	16 Jul
2014	365	312	0	14 Jun	355	213	213	31 Jul
2015	251	72	0	19 Jun	329	116	3	29 Jul

^a*nc* = no count was made.

Table 93. Numbers of red-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No counts were conducted in 2011-2013 or 2016-2017.

Year	Replicate 1				Replicate 2			
	Adults	Nests	Chicks	Date	Adults	Nests	Chicks	Date
2007	132	61	1	6 Jul	186	54	25	27 Jul
2008	<i>nc</i> ^a	<i>nc</i>	<i>nc</i>	<i>nc</i>	149	63	44	8 Aug
2009	88	60	0	14 Jun	75	41	21	25 Jul
2010	157	73	0	25 Jun	137	72	8	16 Jul
2014	149	119	0	14 Jun	194	98	98	31 Jul
2015	125	62	0	19 Jun	201	55	3	29 Jul

^a*nc* = no count was made.

Table 94. Numbers of red-faced cormorant adults, nests, and chicks counted on plots at Otter Island, Alaska. No counts were conducted in years not listed.

Year	Replicate 1				Replicate 2						Total	Date
	Adults	Nests	Chicks	Date	Adults	Nests	Nests w/x # chicks:					
							1	2	3	4		
2014	<i>nc</i> ^a	15	0	14 Jun	17	25	2	12	6	5	64	31 Jul
2015	50	25	0	19 Jun	51	21	5	10	3	0	34	29 Jul

^a*nc* = no count was made.

Table 95. 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 1988-1996, 1998-2007, 2011, 2013-2014, or 2016-2017.

Species	1987	1997	2008	2009	2010	2012	2015
Common murre	1313	1021	373	232	126	-	1178
Thick-billed murre	120	50	32	38	207	-	57
Unidentified murre spp.	0	0	0	243	29	168	30
Black-legged kittiwake	88	69	111	295	201	125	266
nests	66	50	92	74	145	120	166
chicks	73	17	25	-	0	-	0
Red-legged kittiwake	0	0	0	0	0	-	4
nests	0	0	0	0	0	-	4
chicks	0	0	0	0	0	-	0
Pelagic cormorant	0	0	13	2	0	0	10
Red-faced cormorant	131	95	17	27	5	9	108
nests	34	21	3	0	1	-	26
chicks	-	26	2	-	0	-	-
Northern fur seal (adults)	1	15	0	0	0	0	<i>separate</i> ^a
pups	0	0	0	0	0	0	<i>separate</i>
Steller sea lion (adults)	<i>separate</i>	108	88	171	132	175	<i>separate</i>
bulls	<i>separate</i>	-	7	-	-	-	<i>separate</i>
pups	<i>separate</i>	35	26	0	0	0	<i>separate</i>
Harbor seal	0	0	1	0	1	0	<i>separate</i>
Survey date	28 Jul	24 Jul	8 Aug	28 Jul	16 Jul	28 Jul	18 Jul

^aSome marine mammal counts were made by National Marine Fisheries personnel and are presented in a separate report.

Table 96. Land-based counts of common murrens on Murre Rock, Walrus Island, Alaska. No surveys were conducted in 1988-1996, 1998-2005, 2007, or 2011-2017.

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

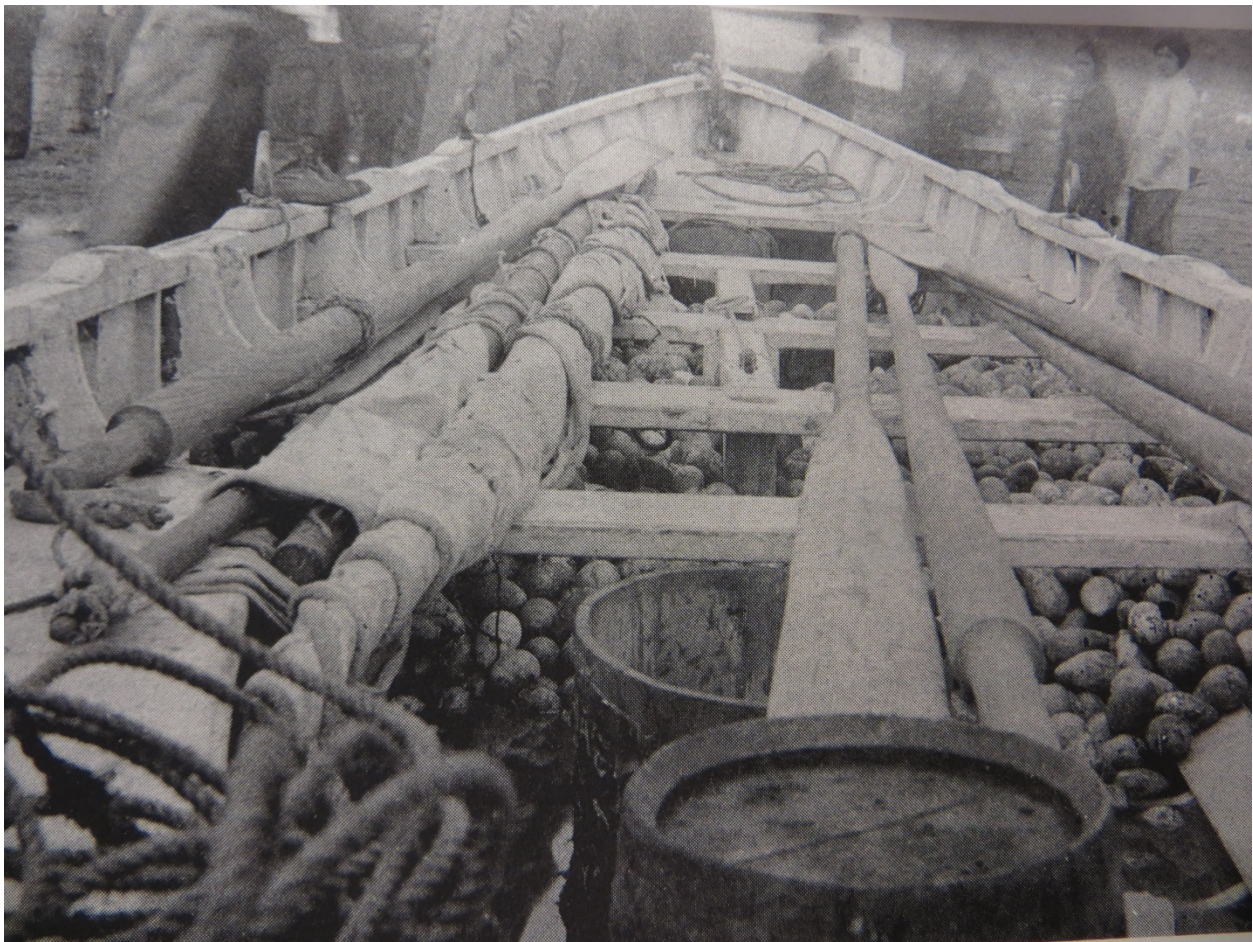


Figure 42. A boat load of murre eggs from Walrus Island. Photo by G. Dallas Hanna circa 1914.

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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Spittler 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 Sapura 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 Sapura 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 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 Sapora 2007, Thomson and Spitler 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 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 Sapora 2007, Thomson and Spitler 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 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 Sapora 2007, Thomson and Spitler 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 band		Metal band #	Year banded	Location banded
Color or L leg	Band # or R leg			
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 murres 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. Years in parentheses are pending analysis.

Species	Recipient	Diet type	Years	In 2017 annual report
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, 2003-2016, (2017)	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, 2016	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
Northern fulmar	Adult	Stomach	1978	N
Red-faced cormorant	Adult	Stomach, Regurgitation	1975-1979, 1993,	N
Red-faced cormorant	Chick	Regurgitation, Bolus	1975-1978, 1984, 1996, 1998, (2009-2017)	Y
Red-faced cormorant	Immature	Stomach	1975-1976	N