

BIOLOGICAL MONITORING AT BULDIR ISLAND, ALASKA IN 2017



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Key words: *Aethia cristatella*, *Aethia psittacula*, *Aethia pusilla*, *Aethia pygmaea*, Aleutian Islands, black-legged kittiwake, breeding chronology, Buldir Island, crested auklet, food habits, fork-tailed storm-petrel, *Fratercula cirrhata*, *Fratercula corniculata*, glaucous-winged gull, horned puffin, *Larus glaucescens*, Leach's storm-petrel, least auklet, *Oceanodroma furcata*, *Oceanodroma leucorhoa*, parakeet auklet, pelagic cormorant, *Phalacrocorax pelagicus*, populations, productivity, red-legged kittiwake, *Rissa brevirostris*, *Rissa tridactyla*, thick-billed murre, tufted puffin, reproductive success, survival, *Uria lomvia*, whiskered auklet

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Photo: Kevin Pietrzak

"I should mention also the great scientific value [of Buldir]; a strictly isolated island with an isolated fauna in which the elements may interact unhindered. This will be of great value and interest to the biologist of the future"

- Olaus Murie, 1936
in Biological investigations of the Aleutian Islands and southwestern Alaska

"We were a weather station, but in reality we soon realized that they did not care about our weather reports. They were getting them from other places, but if we failed to come on the air they could assume the Japanese had returned...Our group [of 5] which was there for 7 months had to have the other radio operator relieved. Went a bit balmy and we were afraid he was going to take a gun to us..."

- Dave Grehl, 1943
U.S. Army weatherman stationed on Buldir Island

"The cliffs of Buldir are forbidding; marine erosion is rapidly and steadily removing the island by peripheral attack."

- Robert Coats, 1953
in The Geology of Buldir Island, Alaska

"We hope the weather gods allow a landing [at Buldir]"

- Robert D. Jones, 1961
Refuge Manager, Aleutian Islands National Wildlife Refuge

"It is the writer's intent to convey the impression of land, sea, and sky alive with birds in all of their activities. Such a concentration of birds produces an immense volume of sound. Add to this the grunting and roaring of about 10,000 Steller's sea lions and you have the *bedlam of Buldir*."

- Robert D. Jones, ~1964
Refuge Manager, Aleutian Islands National Wildlife Refuge

"Every blade of grass [on Buldir] holds a quart of water..."

- G. Vernon Byrd, 1975
Quote from the film *Chain of Life*

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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.

Buldir Island, in the western Aleutian Islands, has been an annual monitoring site since 1988 (Byrd and Climo 1988; Byrd and Douglas 1989; Hipfner et al. 1991; Williams and Byrd 1992; Williams et al. 1997a,b, 1998, 2001, 2002; Moore et al. 2001, Williams and Daniels 2001, Andersen and Barrett 2005, Barrett et al. 2005, Jones et al. 2005, Orben et al. 2006, Andersen 2007, Paine 2008, Freeman et al. 2010, Tucker et al. 2011, Warzybok 2011, Warzybok et al. 2013, Kohley and Herman 2014, Pollom et al. 2015, Mudge and Pietrzak 2015, Mudge et al. 2016). Additional historical data exist from as early as 1974 (e.g., Byrd and Trapp 1977, Byrd 1978, Byrd and Day 1986, Day et al. 1979, Trapp 1979, Early et al. 1980), particularly for storm-petrels and auklets. Buldir is almost unique among Aleutian Islands in that it escaped the widespread introduction of arctic foxes (Bailey 1993) and rats, both of which apply heavy predation pressure on breeding seabirds. The island's isolation and difficulty of access, as well as the absence of non-native predators, have made Buldir the most diverse (21 nesting species) and possibly largest seabird colony in Alaska (perhaps 4,000,000 individuals; Byrd 1978, Byrd and Day 1986, Byrd and Williams 1994).

The specific monitoring goals in 2017 were to estimate productivity and/or population parameters for 14 indicator species representing four major feeding guilds: 1) diving fish-feeders (pelagic and red-faced cormorants [*Phalacrocorax pelagicus* and *P. urile*], common and thick-billed murres [*Uria aalge* and *U. lomvia*], and horned and tufted puffins [*Fratercula corniculata* and *F. cirrhata*]), 2) surface fish-feeders (black-legged and red-legged kittiwakes [*Rissa tridactyla* and *R. brevirostris*]), 3) diving plankton feeders (parakeet, least, whiskered, and crested auklets [*Aethia psittacula*, *A. pusilla*, *A. pygmaea*, and *A. cristatella*]), and 4) surface plankton feeders (Leach's and fork-tailed storm-petrels [*Oceanodroma furcata* and *O. leucorhoa*]). Similar data were also collected on flexible-foraging glaucous-winged gulls (*Larus glaucescens*). Additional monitoring goals include the description of breeding chronology, food habits, and adult survival for one or more of the above species.

Detailed results of the 2017 monitoring program are contained in these appendices and archived at the AMNWR headquarters in Homer, Alaska. Summary data will also be included in the annual Alaska seabird monitoring summary report (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

Buldir Island (52°21' N, 176°56' E) is the westernmost island in the Rat Islands group of the Aleutian chain (Figure 1). This 2000-ha island is approximately 6.4 km long and 3.2 km wide. Located about 110 km

from both Shemya to the west and Kiska to the east, it is the most isolated island in the Aleutians, providing the only landfall in a 220 km-wide pass.

The weather is typical of a northern maritime climate, with moderate year-round temperatures and strong winds. Fog and rain are characteristic, and violent storms occur frequently. The average temperature at sea level is about 7.7°C in the summer and 3.7°C annually. Precipitation averages 80.6 cm annually. Snow accumulation at sea level rarely exceeds 0.5 m, however passes and higher elevations can have drifts in excess of 10 m. There is no permafrost. (Data for Shemya Island from Western Region Climate Center).

Buldir Island is a few thousand years old and composed of basalts and basaltic andesites from two volcanic cones: the older Buldir Volcano and newer East Cape Volcano. These two volcanic centers, each of which had two main eruptive periods, were separated by considerable time and later subjected to intense marine erosion continuing to the present day. There are no historic records of eruptions and the island is considered inactive. Only portions of each volcano remain today.

The highest point on the island, Buldir Eccentric (655 m), is part of a rim of an old summit tuff cone of Buldir Volcano. The center of the volcano, only a remnant of which is left today, was about 800m in diameter and centered about 800m south of Buldir Eccentric's summit. Glissade Valley is a fault line that separates the older portion of Buldir Volcano, represented by Buldir Eccentric, from the later parasitic cone of Buldir Volcano known today as Owl Knob. Kittiwake Lake is not the main crater of this later parasitic cone, but rather a small maar blasted from the side of the cone. Most of the main part of Owl Knob was eroded prior to the later eruption of East Cape Volcano. The rocks of Buldir Volcano are chiefly olivine basalts and olivine hypersthene basalts.

The East Cape Volcano consists of two parts: the older principle eruptive center of Slide Mountain and a smaller flank eruption volcanic dome of Round Mountain. Round Mountain is the most recent manifestation of eruptive activity on the island. Much of the cone of East Cape Volcano is mantled by a chaotic crumble breccia derived from the underlying plug dome of hypersthene-bearing hornblende basalts and basaltic andesites. This chaotic crumble breccia, a mixture of boulders in a dirt matrix, is especially evident at beach cliffs that are actively undergoing marine erosion. The northern portion of Slide Mountain is believed to have slid into the ocean during one of many earthquakes. The high ridgeline of East Cape sweeps northeasterly off the flanks of Round Mountain and is believed to be a lava flow now nearly eroded away.

There are only two areas of alluvial deposit on Buldir because of its mountainous nature and incessant marine erosion. The primary area is the valley containing North Marsh and South Marsh. This flat area is composed of sand, gravel, reworked cinders and ash and is retreating rapidly as evidenced by its vertical cliff face at the beach. At the time of deposition this area was most likely protected by now eroded portions of Buldir Volcano and its parasitic cone (Owl Knob). The other area is an area known as "The Dip" which was formed by material collected behind a bar formed by a landslide off Round Mountain (all geologic information from Coats 1953).

Vegetation on the island is composed of two distinct plant complexes: lowland tall-plant and upland short-plant (Byrd 1984). The lowland tall-plant complex is found generally below 300 m and contains eight recognizable plant communities, over 90% of which consists of only three communities *Leymus-umbel*, *Leymus-umbel-fern*, and *Carex-fescue meadow*. The upland short-plant complex is composed of four communities of which the moss-willow tundra is most widespread. Over 119 plant species have been identified on the island, fewer than on most other Aleutian Islands. There are no erect trees or shrubs.

Buldir Island is surrounded by deep water and is representative of a pelagic seabird colony where prey is diverse and availability is variable among years (Springer et al. 1996). Most prey species taken by birds are members of the Oceanic and Outer-shelf Zooplankton community (Cooney 1981), or are deep-dwelling vertical migrants (e.g., squid and Myctophids). The shallow water surrounding Buldir, Middle and Tahoma reefs to the southeast and south serve as surrogate meso-scale continental shelf-like habitats for coastal marine fauna in this otherwise deep water environment. The three reefs are important feeding areas for many birds breeding on Buldir (Dragoo and Byrd 1999). In particular, the juxtaposition of the Buldir reef escarpment (60-100 m) to the Buldir Depression, an 18x55 km basin with depths to 2000 m, creates a physiographic structure conducive to foraging by a wide variety of seabirds. Sea surface temperatures measured in North Bight are normally 3-4°C in late May and rise to 6-7°C in late August.

Humans have occupied Buldir since at least 800 AD. The midden site on North Bight Beach is large and contains evidence of substantial-sized houses. Although there was a relatively long period of use in the late prehistoric period, occupation of the site was typically intermittent with long breaks between uses. According to Corbett et al. (1997), it is unclear why Aleuts used Buldir at all. The site does not appear to have been a seasonal hunting camp in an annual subsistence cycle and the resources were not unusually rich. Inhabitants fed mainly on Steller's sea lions. Large numbers of birds, primarily alcids, were taken by inhabitants for food, clothing or decorations on clothing.

Buldir has been designated a federal Research Natural Area (RNA). RNAs are reserves where natural processes are allowed to dominate and where management is designed to preserve a given ecosystem or feature. There are three characteristics shared by most RNAs: 1) minimal human interference and a reasonable assurance of long-term existence, 2) the availability of diverse or multiple data sets for analysis of factor interrelationships or temporal sequences, and 3) the association of scientists of different disciplines leading toward scientific discoveries unlikely to occur without such association.

Buldir is also a component of the Aleutian Islands Biosphere Reserve under UNESCO's Man and the Biosphere program (MAB). Biosphere reserves are areas intended to conserve the diversity and integrity of biotic plants and animals in the natural ecosystem and to safeguard their genetic diversity. Biosphere Reserves also provide areas for ecological and environmental research and baseline studies.

METHODS

Personnel: The U. S. Fish and Wildlife Service field crew at Buldir Island in 2017 consisted of Kevin Pietrzak, Mckenzie Mudge, and Stephanie Walden (25 May to 28 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) with the following exceptions:

- No pigeon guillemot counts or circumnavigation surveys were conducted due to the lack of a skiff.
- Due to safety concerns about people being exposed to rockfall we did not regularly go to Kittiwake Lane or under the cliffs north of Spike Camp. This meant that ledgenester population counts, cormorant productivity, kittiwake survival, and egg method counts for gulls were cancelled.

- We established a new plot to obtain additional storm-petrel chronology and chick growth measurements. This plot (#27) measures 7m x 8m and is immediately adjacent to plot 9.
- No off-road point count was conducted.
- We conducted COASST surveys on beaches A-C and did not do them on beaches D and E due to rock fall concerns.
- While the R/V *Tiġlaġ* was at Buldir in late May we assisted with the recovery of two geolocator tags from red-legged kittiwakes at Kittiwake Lane that were instrumented the previous year. In July, Aleutian Islands unit biologist, Nora Rojek, with a crew of three others, deployed four geolocators on red-legged kittiwakes at Kittiwake Lane. We deployed eight additional geolocator tags on red-legged kittiwakes near Spike camp.
- We collected abandoned alcid egg shells for graduate student Duncan Jackson and Professor Tim Birkhead (University of Sheffield, United Kingdom) for a study of the design and surface properties of alcid eggs; feathers from dead breeding seabirds found throughout the island for the ARCTOX contamination project (P.I. Jerome Fort, Universite de La Rochelle, France); salvaged tufted puffin parts for a Pacific Seabird Group tufted Puffin technical committee supported range-wide genetic study; and collected *Honckenya pelloides* samples for Steven Talbot, USFWS and Sandra Talbot, USGS, Alaska Science Center for a genetics study.

Reproductive success and chronology data for kittiwakes, murrelets, auklets, and puffins were summarized using the AMNWR productivity database. Reproductive success and chronology data for storm-petrels in 2017 was summarized using the AMNWR productivity database; data for all prior years have not yet been added to the database and are hand-summarized (these data will be added to and summarized by the database in the future). Reproductive success and chronology data for gulls were summarized by hand.

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 A]). Diet is summarized for frequency of occurrence, percent composition and percent biomass for puffins; frequency of occurrence, percent composition and percent volume for gulls; and frequency of occurrence and percent composition for all other species. For brevity, presentation of diet data highlights only prey items that make up more than 5% of diets. A more detailed summary of Buldir diet data is presented in a consolidated refuge-wide diet report (Drummond 2016).

Sea surface temperatures were summarized using the AMNWR sea surface temperature database.

Data for all other parameters were summarized by hand.

INTERESTING OBSERVATIONS

- In general 2017 was an early season for breeding auklets and a late season for the other seabirds with moderate to poor productivity for most species of seabird.
- For the first time at Buldir we didn't record any hatching red-legged kittiwakes on our study plots nor did we see evidence of hatching anywhere else on the island.
- Common murrelets, tufted puffins, black-legged kittiwakes, glaucous-winged gulls, and fork-tailed storm-petrels also had very poor productivity.

- During a morning visit to Kittiwake Lane in late July Nora Rojek reported that there were no kittiwakes attending nests, a sight the prior unit biologist had never observed even in other years with poor productivity.
- Although we had a small sample size of only 14 nests for chronology, we recorded the latest recorded hatch for black-legged kittiwakes.
- One of the highest percentages of egg loss coupled with one of the highest percentages of chick loss lead to the lowest recorded productivity for fork-tailed storm-petrels. It is thought that a series of poorly timed storms brought copious amounts of rain that lead to these losses.
- Despite this general trend whiskered auklets had a pretty good year and horned puffins had their second most successful year in terms of productivity.
- We recorded the earliest hatch for whiskered auklets as well as the earliest average hatch.
- The weather was particularly wet for the first half of the season followed by foggy more moderate weather culminating with a >2 hour thunder and lightning storm a scant few days before departure from the island.
- Mean weekly sea surface temperature (measured nearshore with a data logger) was higher than the historic weekly means for the entire season.
- We had a much higher encounter rate of dead birds during COASST surveys from 2015 to 2017 than in previous years. We suspect this is because we counted all bird parts that were measurable which included many parts that were obviously from gull pellets.
- We observed a falcated duck (*Mareca falcata*) on 20 June and long-tailed duck (*Clangula hyemalis*) in early June. While there are records for falcated duck in the western and central Aleutian Islands, this is the first known record for Buldir. The only other record for long-tailed duck on Buldir was in 1975 (see Gibson and Byrd 2007).
- The large male dead walrus (*Odobenus rosmarus*) first encountered in 2016 continued to be in the wrack line on North Bight Beach the entire season.
- A new roof was installed on the Spike camp cabin.
- The roof of the bunk cabin was replaced by Captain John Ferris, Wes Kuhns, Andy Velsko, and David Martindell early in the season.
- The southern rim joist of the bunk cabin and part of the wall was discovered to be quite rotten and was replaced by Wes Kuhns and Andy Velsko.
- All of main camp (except one wall) and Spike camp received a fresh coat of paint.

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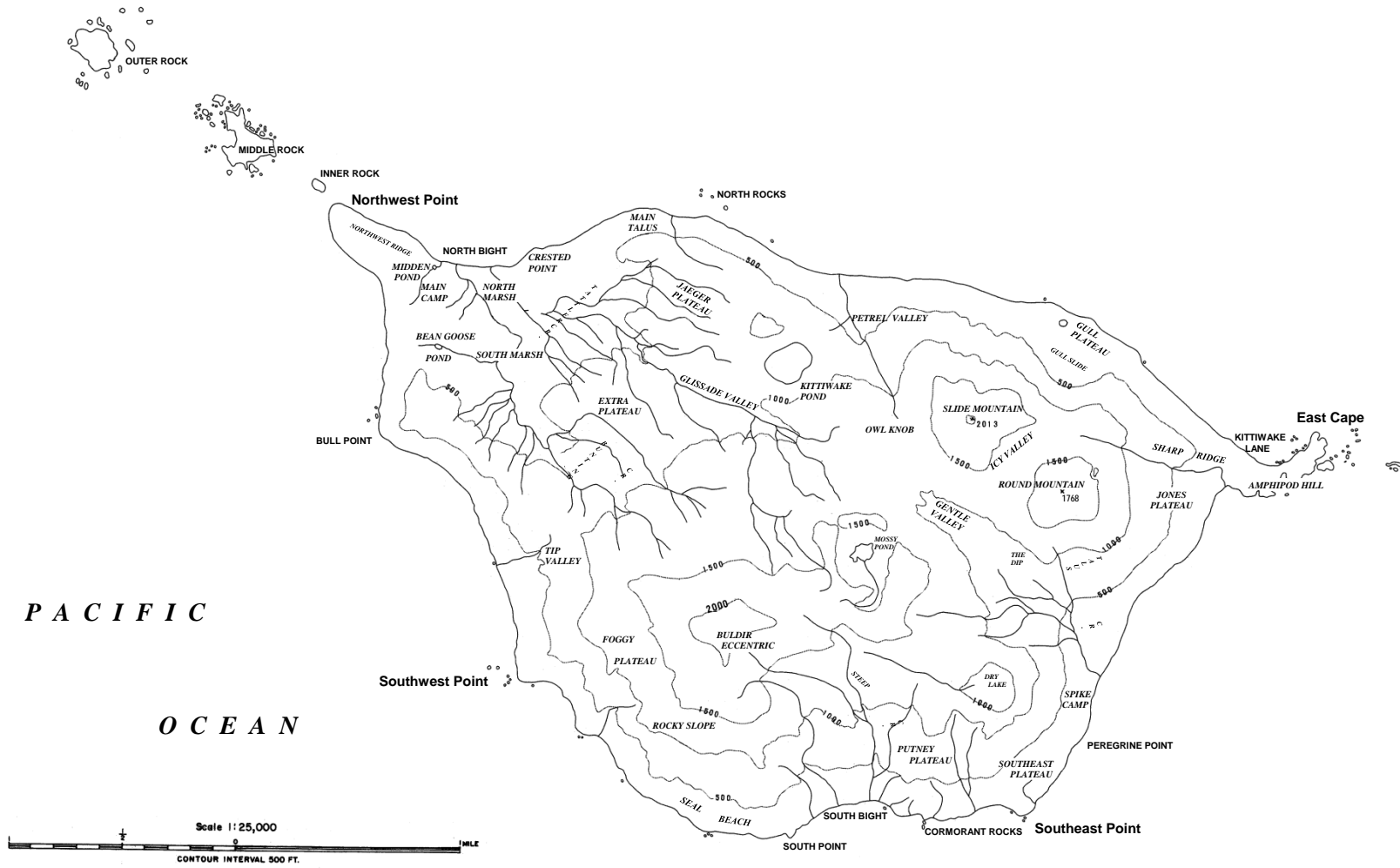


Figure 1. Map of Buldir Island, Alaska.

FIGURES AND TABLES



Northwest Rocks in the background.
Photo by Kevin Pietrzak/FWS

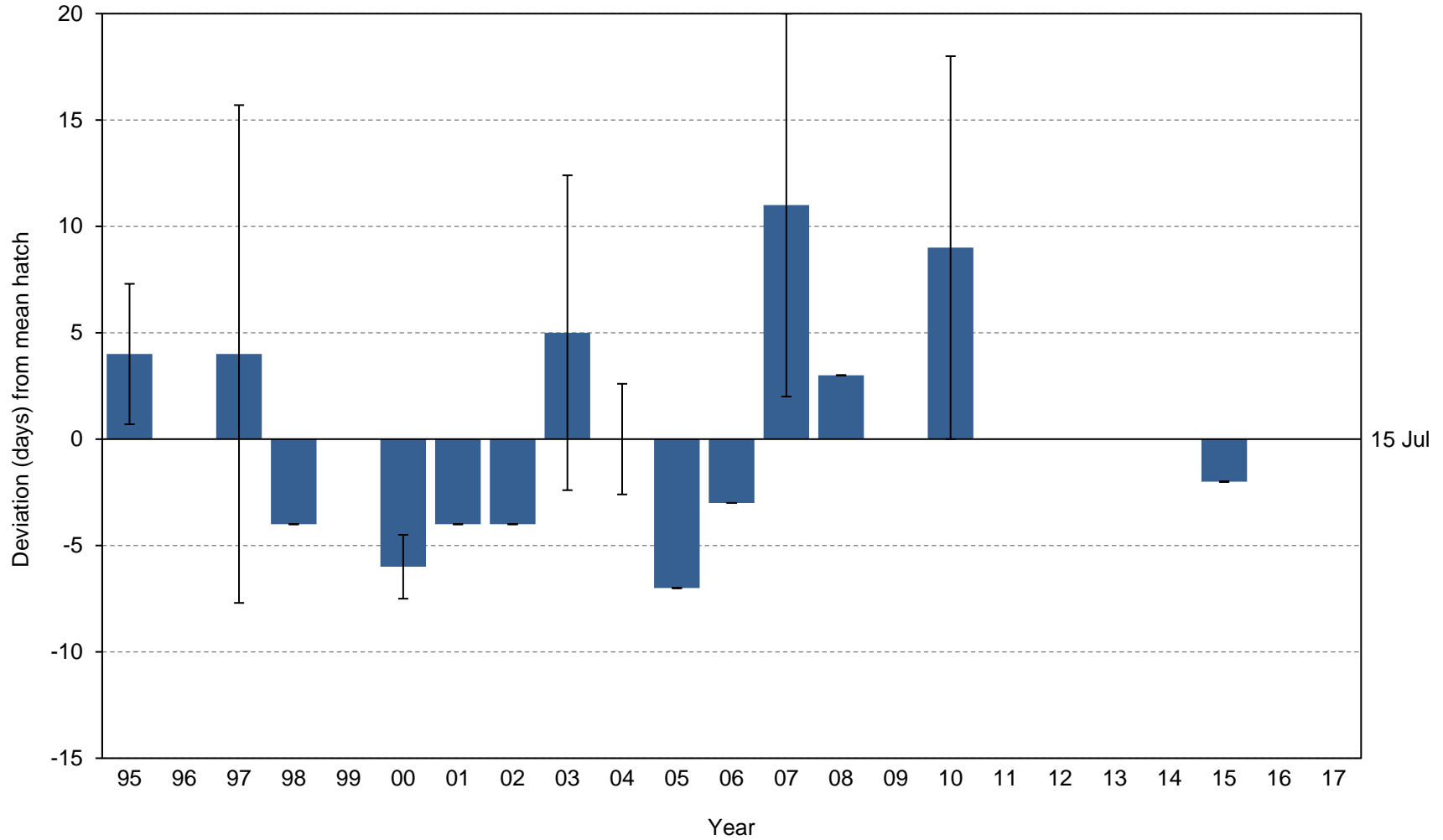


Figure 2. Yearly hatch date deviation (from the 1995-2015 average of 16 July) for common murrelets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date; no data exist in the current year. Error bars represent standard deviation around each year's mean hatch date. No data were collected in 1996 or 2012 and no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1989, 1991, 1994, 1999, 2009, or 2013; no eggs hatched in plots in 1990, 1992-1993, 2011, 2014, or 2016-2017.

Table 1. Breeding chronology of common murrelets at Buldir Island, Alaska. No data were collected in 1996 or 2012 and no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1989, 1991, 1994, 1999, 2009, or 2013; no eggs hatched in plots in 1990, 1992-1993, 2011, 2014, or 2016-2017.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First "jump" ^b
1989	-	-	-	-	-	13 Aug
1991	-	-	-	-	-	>13 Aug
1994	-	-	-	-	-	3 Aug
1995	19 Jul	3.3	3	15 Jul	23 Jul	6 Aug
1997	19 Jul	11.7	7	11 Jul	16 Aug	26 Jul
1998	11 Jul	0.0	1	11 Jul	-	17 Aug
2000	8 Jul	1.5	2	6 Jul	9 Jul	23 Jul
2001	11 Jul	0.0	1	11 Jul	-	1 Aug
2002	11 Jul	0.0	1	11 Jul	-	23 Jul
2003	20 Jul	7.4	8	13 Jul	31 Jul	5 Aug
2004	14 Jul	2.6	4	12 Jul	18 Jul	20 Aug
2005	8 Jul	0.0	1	8 Jul	-	5 Aug
2006	12 Jul	0.0	4	12 Jul	-	30 Jul
2007	26 Jul	9.0	2	17 Jul	4 Aug	9 Aug
2008	17 Jul	0.0	1	17 Jul	-	31 Jul
2009	-	-	-	-	-	>20 Aug
2010	24 Jul	9.0	2	15 Jul	2 Aug	2 Aug
2015	13 Jul	0.0	1	13 Jul	-	2 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.

Table 2. Frequency distribution of hatch dates for common murrelets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1996 or 2012 and no hatch dates were recorded with the appropriate egg to chick interval in 1989, 1991, 1994, 1999, 2009, or 2013; no eggs hatched in plots in 1990, 1992-1993, 2011, 2014, or 2016-2017.

Julian date ^a	No. nests hatching on Julian date												
	95	97	00	01	02	03	04	05	06	07	08	10	15
188	-	-	1	-	-	-	-	-	-	-	-	-	-
189	-	-	-	-	-	-	-	1	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	1	-	-	-	-	-	-	-	-	-	-
192	-	2	-	1	1	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	4	-	-	-	-
194	-	-	-	-	-	3	3	-	-	-	-	-	1
195	-	-	-	-	-	-	-	-	-	-	-	-	-
196	1	3	-	-	-	1	-	-	-	-	-	1	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	1	-	-	-
199	-	-	-	-	-	-	-	-	-	-	1	-	-
200	1	-	-	-	-	1	1	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	1	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-
204	1	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	1	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	2	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	1	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	1	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	3	7	2	1	1	8	4	1	4	2	1	2	1

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

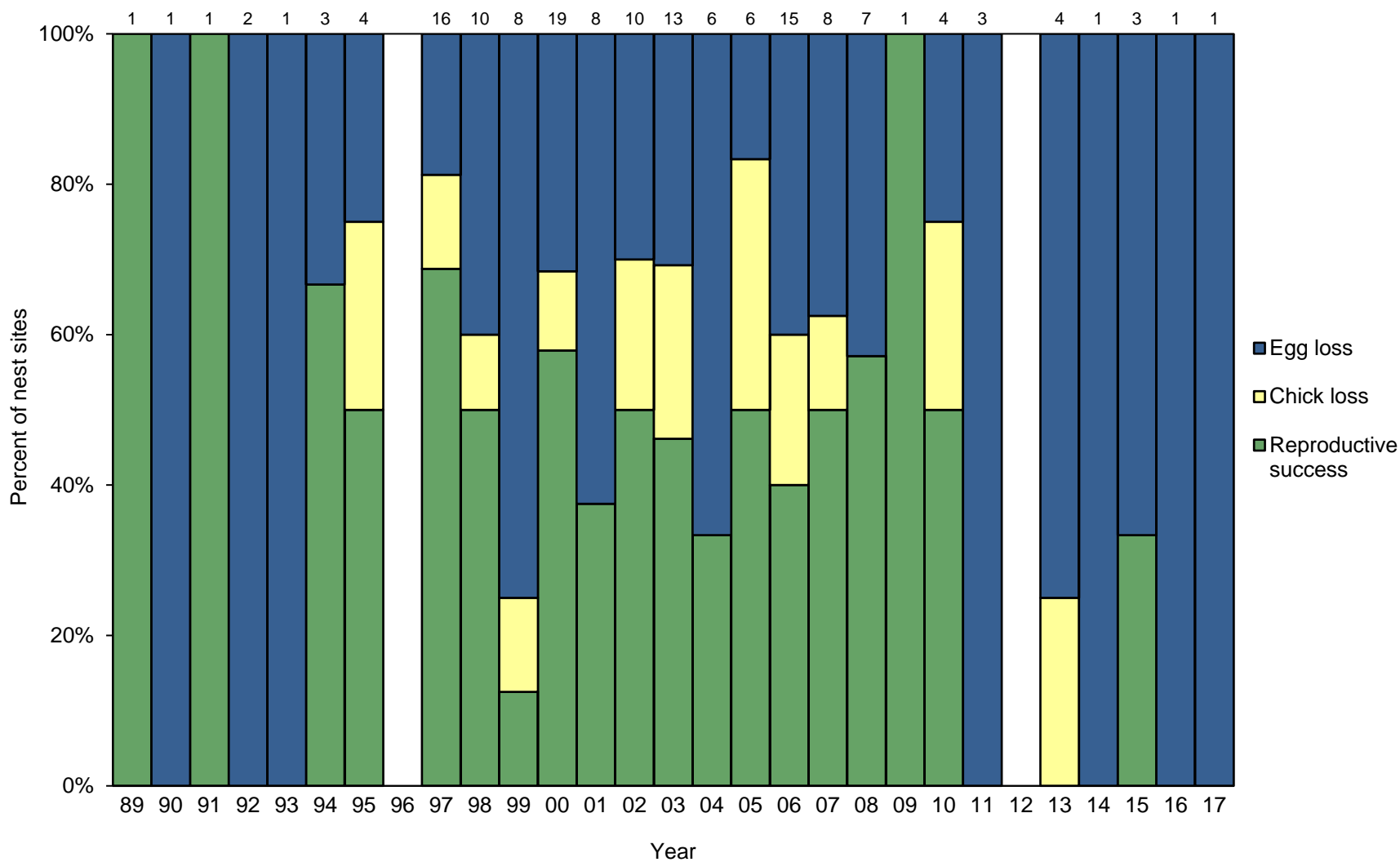


Figure 3. Reproductive performance of common murrelets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1996 or 2012.

Table 3. Reproductive performance of common murrelets at Buldir Island, Alaska. No data were collected in 1996 or 2012.

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)
1989	1	1	1	1.00	1.00	1.00
1990	1	0	0	0.00	-	0.00
1991	1	1	1	1.00	1.00	1.00
1992	2	0	0	0.00	-	0.00
1993	1	0	0	0.00	-	0.00
1994	3	2	2	0.67	1.00	0.67
1995	4	3	2	0.75	0.67	0.50
1997	16	13	11	0.81	0.85	0.69
1998	10	6	5	0.60	0.83	0.50
1999	8	2	1	0.25	0.50	0.13
2000	19	13	11	0.68	0.85	0.58
2001	8	3	3	0.38	1.00	0.38
2002	10	7	5	0.70	0.71	0.50
2003	13	9	6	0.69	0.67	0.46
2004	6	2	2	0.33	1.00	0.33
2005	6	5	3	0.83	0.60	0.50
2006	15	9	6	0.60	0.67	0.40
2007	8	5	4	0.63	0.80	0.50
2008	7	4	4	0.57	1.00	0.57
2009	1	1	1	1.00	1.00	1.00
2010	4	3	2	0.75	0.67	0.50
2011	3	0	0	0.00	-	0.00
2013	4	1	0	0.25	0.00	0.00
2014	1	0	0	0.00	-	0.00
2015	3	1	1	0.33	1.00	0.33
2016	1	0	0	0.00	-	0.00
2017	1	0	0	0.00	-	0.00

^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 Buldir 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 1996 or 2012.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1989	1	1	Simple random	-	-	-
1990	1	1	Simple random	-	-	-
1991	1	1	Simple random	-	-	-
1992	1	2	Simple random	0.00	-	0.00
1993	1	1	Simple random	-	-	-
1994	2	3	Simple random	0.27	0.00	0.27
1995	1	4	Simple random	0.22	0.27	0.25
1997	2	16	Simple random	0.10	0.10	0.12
1998	2	10	Simple random	0.15	0.15	0.16
1999	2	8	Simple random	0.15	0.35	0.12
2000	3	19	Simple random	0.11	0.10	0.11
2001	1	8	Simple random	0.17	0.00	0.17
2002	1	10	Simple random	0.14	0.17	0.16
2003	1	13	Simple random	0.13	0.16	0.14
2004	2	6	Simple random	0.19	0.00	0.19
2005	1	6	Simple random	0.15	0.22	0.20
2006	2	15	Simple random	0.13	0.16	0.13
2007	1	8	Simple random	0.17	0.18	0.18
2008	2	7	Simple random	0.19	0.00	0.19
2009	1	1	Simple random	-	-	-
2010	1	4	Simple random	0.22	0.27	0.25
2011	1	3	Simple random	0.00	-	0.00
2013	1	4	Simple random	0.00	0.00	0.00
2014	1	1	Simple random	-	-	-
2015	1	3	Simple random	0.27	0.00	0.27
2016	1	1	Simple random	-	-	-
2017	1	1	Simple random	-	-	-

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

^bFor sampling clustered by plot, values are calculated using ratio estimator spreadsheets 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.

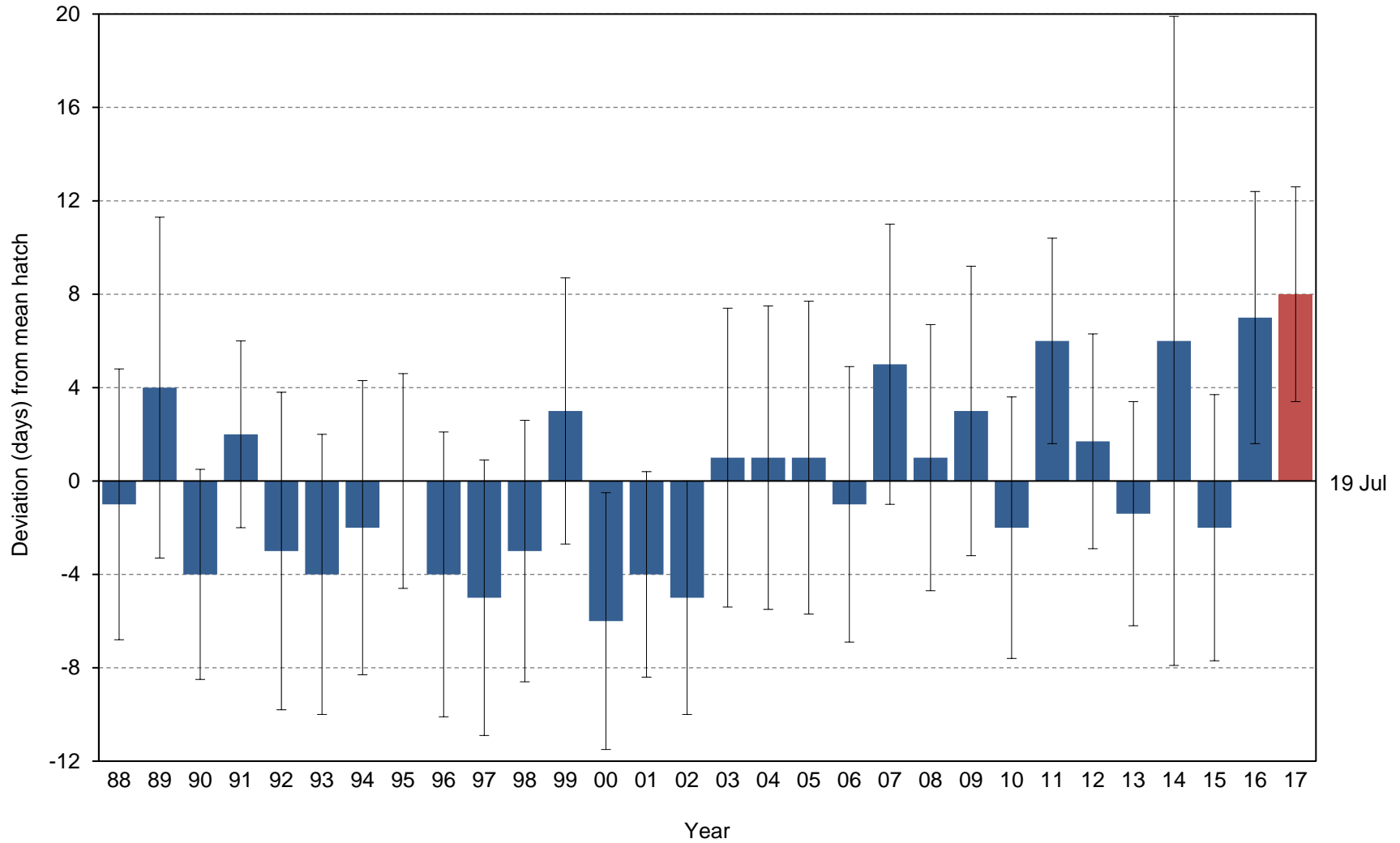


Figure 4. Yearly hatch date deviation (from the 1988-2016 average of 19 July) for thick-billed murres at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 5. Breeding chronology of thick-billed murrelets at Buldir Island, Alaska.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First "jump"
1988	17 Jul	5.8	86	10 Jul	18 Aug	2 Aug
1989	23 Jul	7.3	19	10 Jul	10 Aug	9 Aug
1990	15 Jul	4.5	23	13 Jul	3 Aug	24 Jul
1991	21 Jul	4.0	26	15 Jul	27 Jul	10 Aug
1992	15 Jul	6.8	35	4 Jul	3 Aug	29 Jul
1993	15 Jul	6.0	93	5 Jul	8 Aug	24 Jul
1994	17 Jul	6.3	40	5 Jul	3 Aug	29 Jul
1995	19 Jul	4.6	180	11 Jul	10 Aug	1 Aug
1996	14 Jul	6.1	198	2 Jul	12 Aug	21 Jul
1997	14 Jul	5.9	173	2 Jul	11 Aug	26 Jul
1998	16 Jul	5.6	56	5 Jul	29 Jul	24 Jul
1999	22 Jul	5.7	31	16 Jul	12 Aug	1 Aug
2000	12 Jul	5.5	35	3 Jul	28 Jul	19 Jul
2001	15 Jul	4.4	58	9 Jul	27 Jul	27 Jul
2002	14 Jul	5.0	57	7 Jul	9 Aug	28 Jul
2003	20 Jul	6.4	138	7 Jul	11 Aug	30 Jul
2004	19 Jul	6.5	88	8 Jul	9 Aug	27 Jul
2005	20 Jul	6.7	76	8 Jul	16 Aug	31 Jul
2006	18 Jul	5.9	143	7 Jul	4 Aug	30 Jul
2007	24 Jul	6.0	59	13 Jul	10 Aug	9 Aug
2008	19 Jul	5.7	84	13 Jul	6 Aug	25 Jul
2009	22 Jul	6.2	123	9 Jul	14 Aug	4 Aug
2010	17 Jul	5.6	133	7 Jul	2 Aug	29 Jul
2011	25 Jul	4.4	68	17 Jul	6 Aug	6 Aug
2012	20 Jul	4.6	135	11 Jul	5 Aug	30 Jul
2013	17 Jul	4.8	18	11 Jul	31 Jul	30 Jul
2014	25 Jul	13.9	4	17 Jul	18 Aug	29 Jul
2015	17 Jul	5.7	92	5 Jul	2 Aug	22 Jul
2016	25 Jul	5.4	148	18 Jul	16 Aug	4 Aug
2017	27 Jul	4.6	117	17 Jul	9 Aug	10 Aug

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

Table 6. Frequency distribution of hatch dates for thick-billed murres at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days.

Julian date ^a	No. nests hatching on Julian date														
	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
183	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
184	-	-	-	-	-	-	-	-	5	2	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
186	-	-	-	-	1	4	1	-	1	-	3	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	2	15	-	-	-	-	3
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	8	-	59	1	-	-	-	13	1
191	-	1	-	-	-	28	-	-	-	-	-	-	16	-	1
192	3	-	-	-	10	-	-	10	3	70	12	-	-	-	28
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	3	-	11	-	-	1	2	1	-	1	-	-	1	19	1
195	-	1	7	-	-	-	-	1	-	3	-	-	-	-	-
196	29	-	-	3	15	37	6	45	60	48	29	-	7	1	12
197	8	-	-	-	-	-	-	-	-	-	-	6	-	-	-
198	12	-	-	4	-	-	-	3	-	-	-	-	-	18	-
199	-	1	-	-	-	1	-	2	3	-	-	-	-	-	-
200	5	5	4	-	-	-	16	70	46	-	-	1	-	-	9
201	1	-	-	-	5	-	-	-	-	-	3	-	6	-	-
202	3	1	-	12	-	14	-	2	1	23	-	17	-	-	-
203	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-
204	15	-	-	-	-	-	-	31	11	-	-	-	-	6	1
205	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
206	1	7	-	-	1	-	4	-	-	-	6	-	-	-	-
207	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
208	-	1	-	7	-	5	-	-	2	5	-	3	-	1	-
209	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-
210	1	-	-	-	-	-	2	-	-	-	3	-	1	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	1	-	-	1	1	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	4	-	-	-	2	-	-	-
215	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-
216	-	-	-	-	3	-	-	-	2	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
219	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
221	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
222	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
225	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	86	19	23	26	35	93	40	180	198	173	56	31	35	58	57

Table 6 (continued). Frequency distribution of hatch dates for thick-billed murres at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days.

Julian date ^a	No. nests hatching on Julian date														
	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	2	-	-	1	-	-	-	3	-	-	-	-	-	-	-
189	3	-	2	8	-	-	-	-	-	-	-	-	-	-	-
190	-	2	3	-	-	-	1	3	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
192	-	-	1	5	-	-	-	20	-	-	2	-	9	-	-
193	-	-	-	23	-	-	-	-	-	3	-	-	14	-	-
194	30	17	4	3	2	-	5	5	-	-	1	-	10	-	-
195	-	2	4	-	-	24	6	2	-	2	1	-	-	-	-
196	-	-	3	-	-	-	-	52	-	-	-	-	-	-	-
197	-	1	1	39	-	-	-	-	-	-	8	-	1	-	-
198	-	1	-	2	8	-	4	-	5	44	-	3	27	-	2
199	-	-	-	-	-	1	-	2	-	-	-	-	1	-	-
200	64	30	18	-	-	-	63	2	-	5	-	-	10	29	1
201	-	-	21	-	-	37	1	-	1	2	-	-	-	-	-
202	-	-	-	43	23	-	-	24	22	56	4	-	-	-	19
203	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-
204	2	21	-	-	-	2	1	1	3	-	-	-	9	2	3
205	-	-	2	-	-	-	-	-	-	1	-	-	-	-	-
206	22	-	12	10	1	-	22	7	1	-	1	-	1	71	49
207	-	-	-	-	14	13	-	-	-	-	-	-	-	-	6
208	-	-	-	-	-	-	1	-	25	14	-	-	3	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
210	-	6	-	1	-	-	4	8	-	-	-	-	-	1	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	12	-	2	4	6	-	-	-	10	5	1	-	-	33	24
213	-	-	-	-	-	5	1	1	-	-	-	-	-	-	-
214	-	3	-	-	-	-	-	1	-	-	-	-	4	-	1
215	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
216	-	-	-	4	3	-	10	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
218	-	2	-	-	-	-	-	-	1	3	-	-	-	8	-
219	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
220	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
222	2	1	2	-	2	-	-	-	-	-	-	-	-	-	-
223	1	-	-	-	-	-	1	-	-	-	-	-	-	2	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
230	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	138	88	76	143	59	84	123	133	68	135	18	4	92	148	117

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

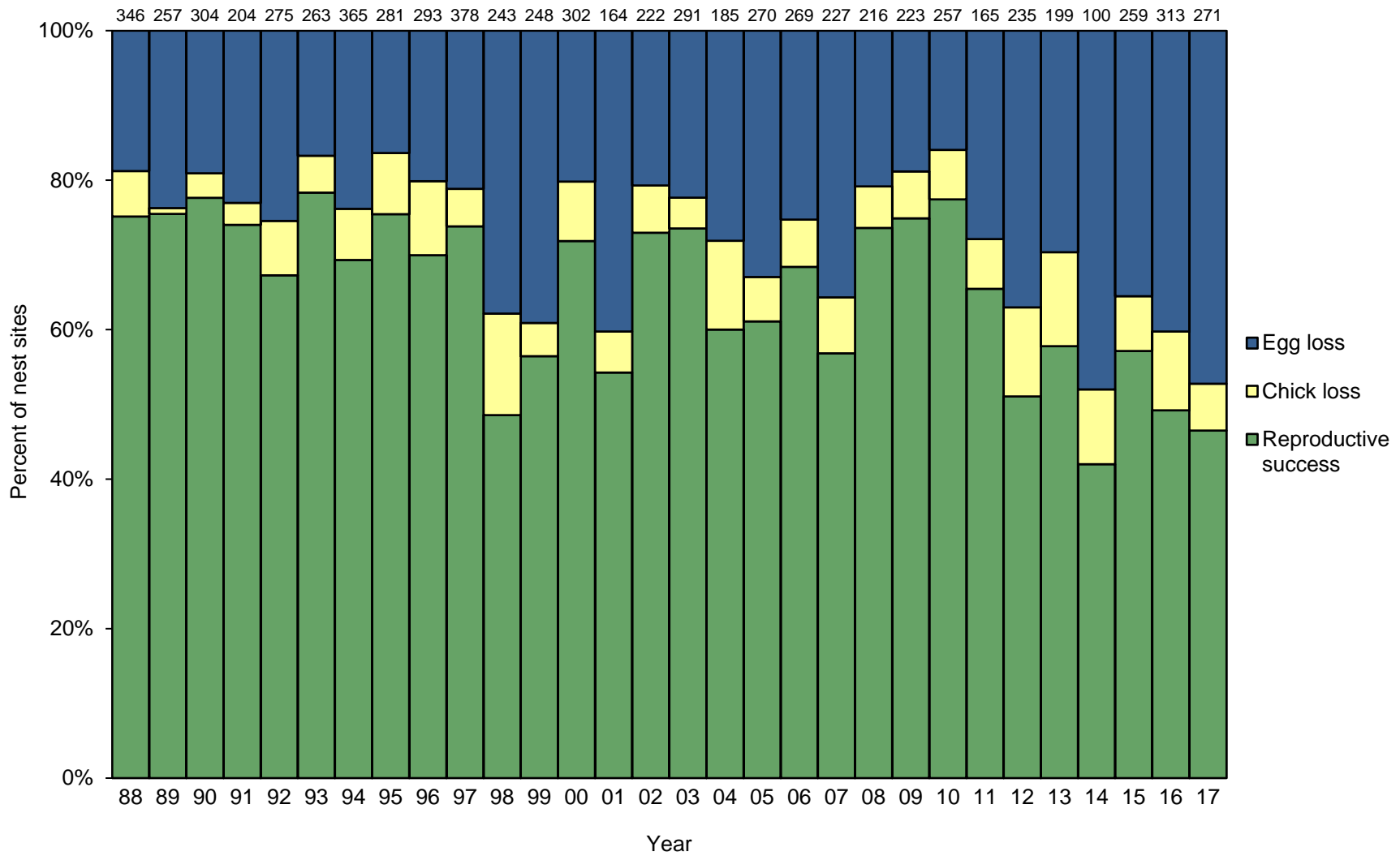


Figure 5. Reproductive performance of thick-billed murrelets at Buldir Island, Alaska. Egg loss= $(B-D)/B$; Chick loss= $(D-F)/B$; Reproductive success= F/B , where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B).

Table 7. Reproductive performance of thick-billed murres at Buldir Island, Alaska.

Year	Nest sites w/ eggs (B)	Nest sites w/ chicks (D)	Nest sites w/ chicks fledged (F)	Nesting success (D/B) ^a	Fledging success (F/D) ^b	Reproductive success (F/B)
1988	346	281	260	0.81	0.93	0.75
1989	257	196	194	0.76	0.99	0.75
1990	304	246	236	0.81	0.96	0.78
1991	204	157	151	0.77	0.96	0.74
1992	275	205	185	0.75	0.90	0.67
1993	263	219	206	0.83	0.94	0.78
1994	365	278	253	0.76	0.91	0.69
1995	281	235	212	0.84	0.90	0.75
1996	293	234	205	0.80	0.88	0.70
1997	378	298	279	0.79	0.94	0.74
1998	243	151	118	0.62	0.78	0.49
1999	248	151	140	0.61	0.93	0.56
2000	302	241	217	0.80	0.90	0.72
2001	164	98	89	0.60	0.91	0.54
2002	222	176	162	0.79	0.92	0.73
2003	291	226	214	0.78	0.95	0.74
2004	185	133	111	0.72	0.83	0.60
2005	270	181	165	0.67	0.91	0.61
2006	269	201	184	0.75	0.92	0.68
2007	227	146	129	0.64	0.88	0.57
2008	216	171	159	0.79	0.93	0.74
2009	223	181	167	0.81	0.92	0.75
2010	257	216	199	0.84	0.92	0.77
2011	165	119	108	0.72	0.91	0.65
2012	235	148	120	0.63	0.81	0.51
2013	199	140	115	0.70	0.82	0.58
2014	100	52	42	0.52	0.81	0.42
2015	259	167	148	0.64	0.89	0.57
2016	313	187	154	0.60	0.82	0.49
2017	271	143	126	0.53	0.88	0.46

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

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

Table 8. Standard deviation in reproductive performance parameters of thick-billed murres at Buldir Island, Alaska. Sampling for murres is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1988	12	346	Cluster by plot	0.04	0.02	0.05
1989	12	257	Cluster by plot	0.03	0.01	0.03
1990	12	304	Cluster by plot	0.04	0.01	0.03
1991	12	204	Cluster by plot	0.04	0.01	0.04
1992	12	275	Cluster by plot	0.03	0.04	0.05
1993	7	263	Cluster by plot	0.02	0.01	0.02
1994	10	365	Cluster by plot	0.04	0.02	0.05
1995	11	281	Cluster by plot	0.02	0.03	0.04
1996	9	293	Cluster by plot	0.04	0.02	0.04
1997	7	378	Cluster by plot	0.03	0.01	0.03
1998	9	243	Cluster by plot	0.06	0.03	0.06
1999	8	248	Cluster by plot	0.04	0.02	0.04
2000	9	302	Cluster by plot	0.05	0.03	0.06
2001	6	164	Cluster by plot	0.04	0.02	0.04
2002	7	222	Cluster by plot	0.05	0.02	0.05
2003	13	291	Cluster by plot	0.03	0.01	0.03
2004	8	185	Cluster by plot	0.03	0.04	0.04
2005	9	270	Cluster by plot	0.06	0.02	0.06
2006	8	269	Cluster by plot	0.05	0.02	0.05
2007	9	227	Cluster by plot	0.09	0.03	0.09
2008	9	216	Cluster by plot	0.05	0.02	0.05
2009	8	223	Cluster by plot	0.03	0.02	0.04
2010	8	257	Cluster by plot	0.03	0.03	0.04
2011	8	165	Cluster by plot	0.04	0.03	0.04
2012	8	235	Cluster by plot	0.03	0.03	0.03
2013	8	199	Cluster by plot	0.05	0.07	0.08
2014	12	100	Cluster by plot	0.08	0.08	0.07
2015	9	259	Cluster by plot	0.07	0.02	0.07
2016	9	313	Cluster by plot	0.06	0.04	0.06
2017	9	271	Cluster by plot	0.05	0.04	0.05

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

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

Table 9. Reproductive performance of thick-billed murres at Buldir Island, Alaska in 2017.

Parameter	Plot									Total	SD ^b
	36	37	38	39	40A	40B	45A	46	47		
Nest sites w/ eggs (B)	26	32	35	30	33	22	36	26	31	271	-
Nest sites w/ chicks (D)	9	20	11	19	14	16	18	15	21	143	-
Nest sites w/ chicks fledged (F)	9	19	7	16	13	11	17	13	21	126	-
Nesting success (D/B) ^c	0.35	0.63	0.31	0.63	0.42	0.73	0.50	0.58	0.68	0.53	0.05
Fledging success (F/D) ^d	1.00	0.95	0.64	0.84	0.93	0.69	0.94	0.87	1.00	0.88	0.04
Reproductive success (F/B)	0.35	0.59	0.20	0.53	0.39	0.50	0.47	0.50	0.68	0.46	0.05

^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).

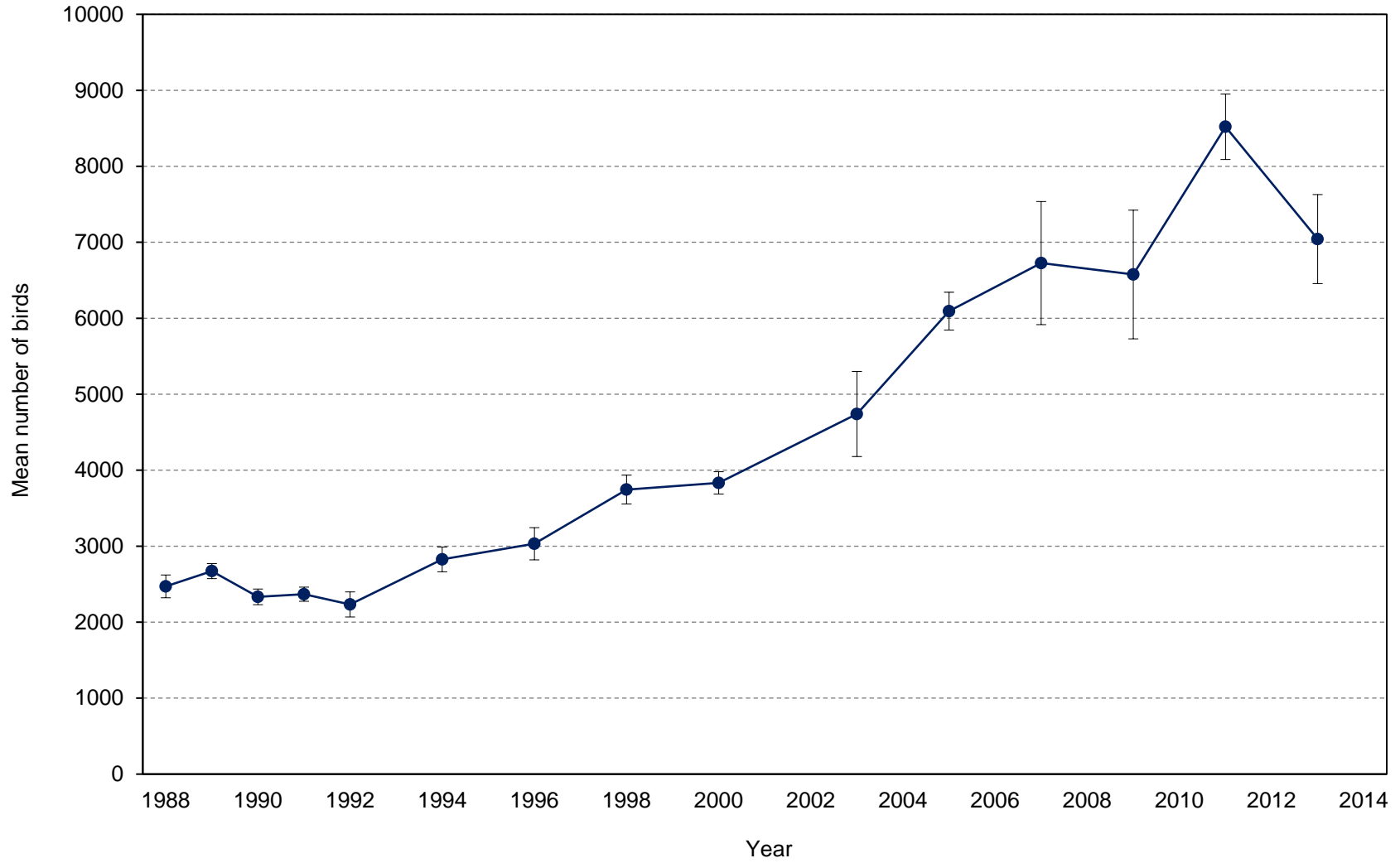


Figure 6. Mean numbers of murre birds counted on index plots at Buldir Island, Alaska. Values include both common and thick-billed murre birds but individuals could not be identified to species in most cases. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 10. Numbers of murres counted on index plots at Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Data represent combined totals from Spike (The Dip) and Kittiwake Lane. No counts were conducted in years not listed.

Replicate	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
1	2224	2637	2306	2245	2127	3046	3177	3575	3787	4362	5768	5537	6452	8667	6710
2	2487	2529	2379	2504	2195	2662	2863	3970	3791	4544	5958	6450	7834	7823	6279
3	2602	2798	2488	2354	2476	2758	3064	3812	3704	4482	6397	6743	5489	8801	7707
4	2464	2704	2237	2350	2135	2837	2775	3848	4086	5572	6075	7241	6760	8901	7526
5	2577	2692	2254	2386	-	-	3283	3522	3796	-	6268	7658	6342	8409	6988
Mean	2471	2672	2333	2368	2233	2826	3032	3745	3833	4740	6093	6726	6576	8520	7042
<i>n</i>	5	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	150	99	103	93	165	163	212	190	147	560	249	810	847	431	586
First count	5 Jul	26 Jun	30 Jun	4 Jul	3 Jul	3 Jul	27 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	27 Jul	16 Jul	18 Jul	19 Jul	21 Jul	19 Jul	19 Jul	24 Jul	20 Jul	25 Jul	18 Jul	15 Jul	31 Jul	26 Jul	20 Jul

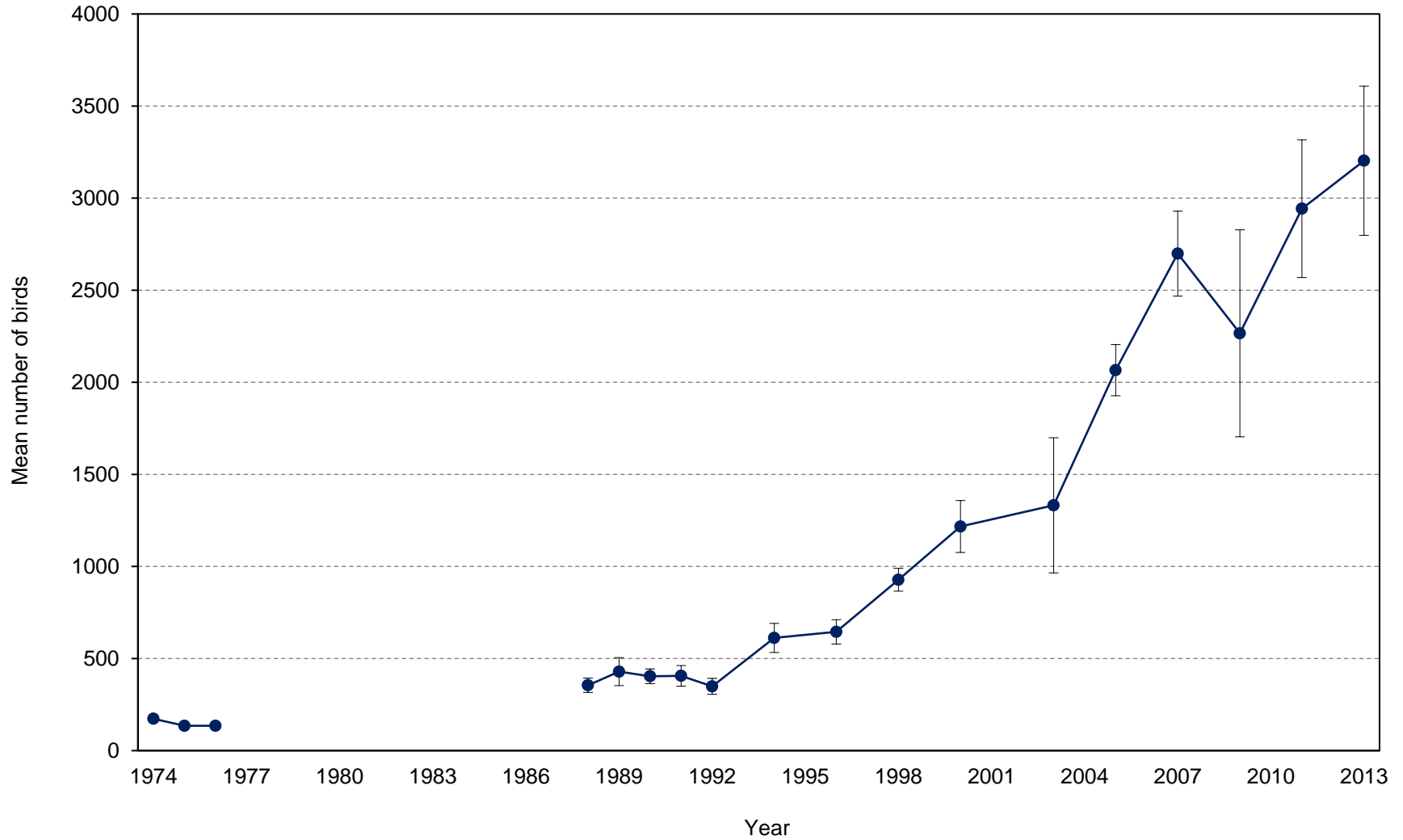


Figure 7. Mean numbers of murre counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Values include both common and thick-billed murre but individuals could not be identified to species in most cases. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) and are a subset of total counts on all index plots. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 11. Mean numbers of murres counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Plot values represent the average count of nests in that plot each year; total values and standard deviations are based on the average total count across all plots each year (as opposed to the sum of plot means). Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29); these data are a subset of total counts on all index plots (Table 10) but are presented separately for comparison with historic counts from 1974-1976. No counts were conducted in years not listed.

Plot (segment)	1974	1975	1976	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
15 (1)	-	20	-	73	70	93	65	73	85	88	163	116	146	220	0	0	36	0
16 (2)	-	43	-	99	167	144	126	119	195	158	370	407	343	412	703	271	343	237
17 (3)	-	37	-	113	125	112	116	78	145	136	101	230	273	375	347	377	435	308
18 (4)	-	35	-	71	67	55	85	57	121	149	94	145	114	176	228	160	197	108
19 (5)	-	0	-	0	0	0	0	0	0	0	31	81	119	211	360	331	534	172
20 (6)	-	0	-	0	0	0	13	22	42	46	88	135	99	181	303	298	346	222
21 (7)	-	0	-	0	0	0	0	0	0	0	0	0	16	95	162	204	250	181
22 (8)	-	0	-	0	0	0	0	0	0	0	0	0	11	94	129	171	213	170
23 (9)	-	0	-	0	0	0	0	0	0	0	0	0	0	6	41	56	72	57
24 (10)	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	2	29	39
25 (11)	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 (12)	-	0	-	0	0	0	0	0	0	0	0	0	0	13	43	71	73	89
27 (13)	-	0	-	0	0	0	0	0	0	0	0	0	0	4	12	16	31	36
28 (14)	-	0	-	0	0	0	0	0	24	67	82	103	190	236	298	237	299	219
29 (15)	-	0	-	0	0	0	0	0	0	0	0	0	21	42	72	72	86	91
Total	173	135	135	355	429	404	406	349	612	645	928	1217	1332	2066	2699	2266	2943	3203
<i>n</i>	1	1	1	6	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	-	-	-	39	76	40	56	43	79	66	62	141	367	139	231	562	374	405
First count	Jul ^a	Jul ^a	Jul ^a	5 Jul	29 Jun	30 Jun	8 Jul	6 Jul	4 Jul	28 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	5 Jul
Last count	-	-	-	27 Jul	16 Jul	18 Jul	18 Jul	20 Jul	19 Jul	18 Jul	24 Jul	20 Jul	25 Jul	18 Jul	14 Jul	31 Jul	26 Jul	19 Jul

^aData come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

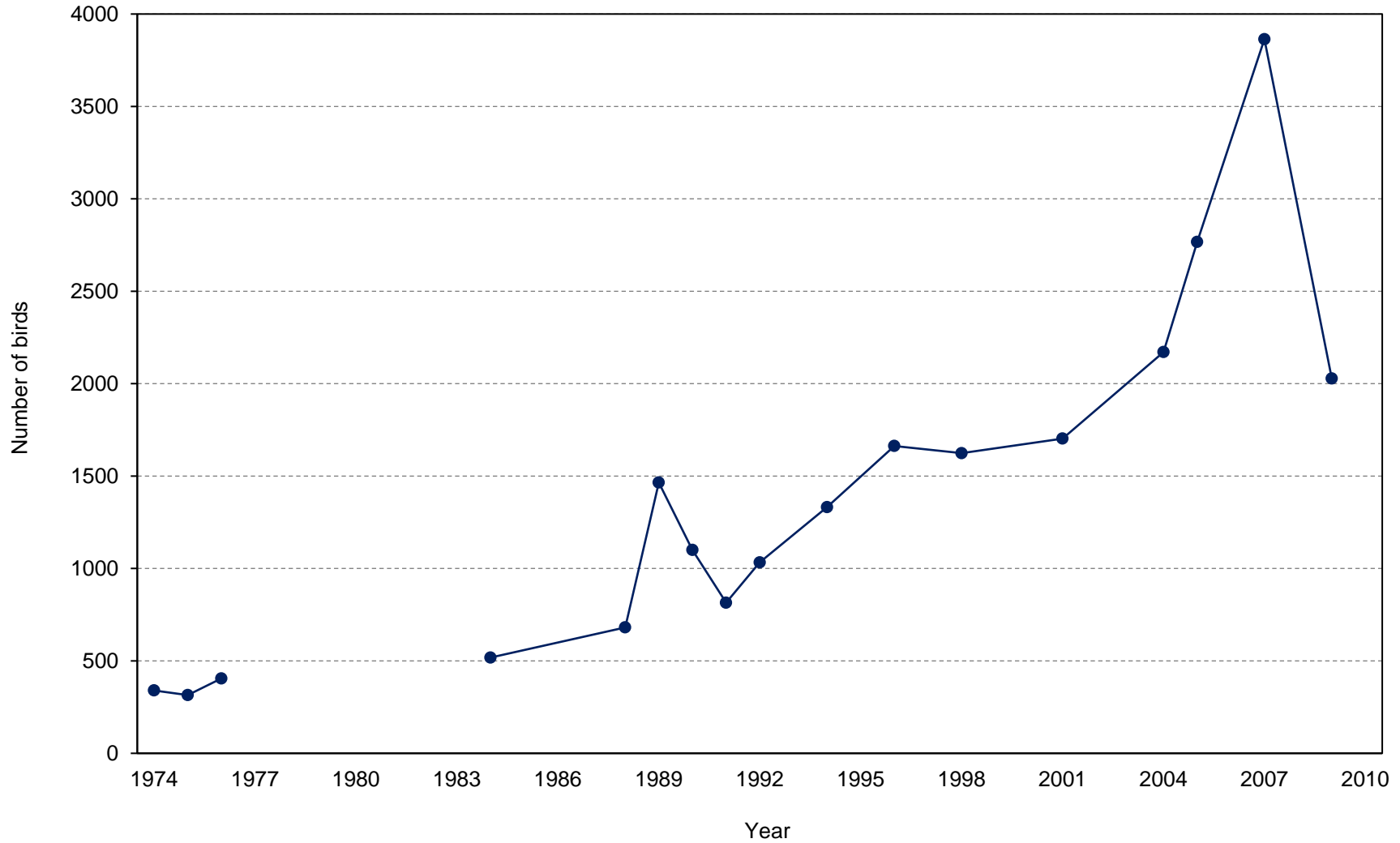


Figure 8. Numbers of murre counts at Middle Rock, Buldir Island, Alaska. Values include both common and thick-billed murre but individuals could not be identified to species in most cases. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown.

Table 12. Numbers of murres counted at Middle Rock, Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Counts at Middle Rock are separate from island-wide population counts on index plots; numbers are not included in population count totals (Table 10) and counts are not always conducted in the same years. No counts were conducted in years not listed.

Segment	1974	1975	1976	1984	1988	1989	1990	1991	1992	1994	1996	1998	2001	2004	2005	2007	2009
I	-	170	-	208 ^a	147 ^b	306	194	170	241	309	398	307	266	476	530	881	590
II	-	70	-	69	74	133	85	51	63	115	155	132	244	283	522	355	219
III	-	10	-	69	47	34	37	0	24	46	20	61	42	31	46	141	56
IV	-	0	-	149	28	111	104	39	62	253	188	196	184	162	249	549	287
V	-	65	-	23	0	72	58	34	56	42	172	129	146	282	293	355	102
VI	-	0	-	0	44	69	56	65	67	82	89	102	120	114	148	229	155
VII	-	0	-	0	341	740	566	456	520	485	641	697	701	823	979	1354	619 ^c
Total	340 ^d	315	405 ^e	518	681	1465	1100	815	1033	1332	1663	1624	1703	2171	2767	3864	2028
Date(s)	9 Aug	4 Jun	19 Jul	17 Jun	19 Jul	20 Jul	19-26 Jul	17 Jul	26 Jul	23-24 Jul	22 Jul	1 Jul	6 Jul	13 Jul	25 Jul	23 Jul	22 Jul

^aIn addition, 31 common murres observed in segment I.

^bIn addition, 35 common murres observed in segment I.

^cIn addition, 103 common murres were observed in segment VII.

^dIn addition, 22 common murres were observed.

^eIn addition, 28 common murres were observed.

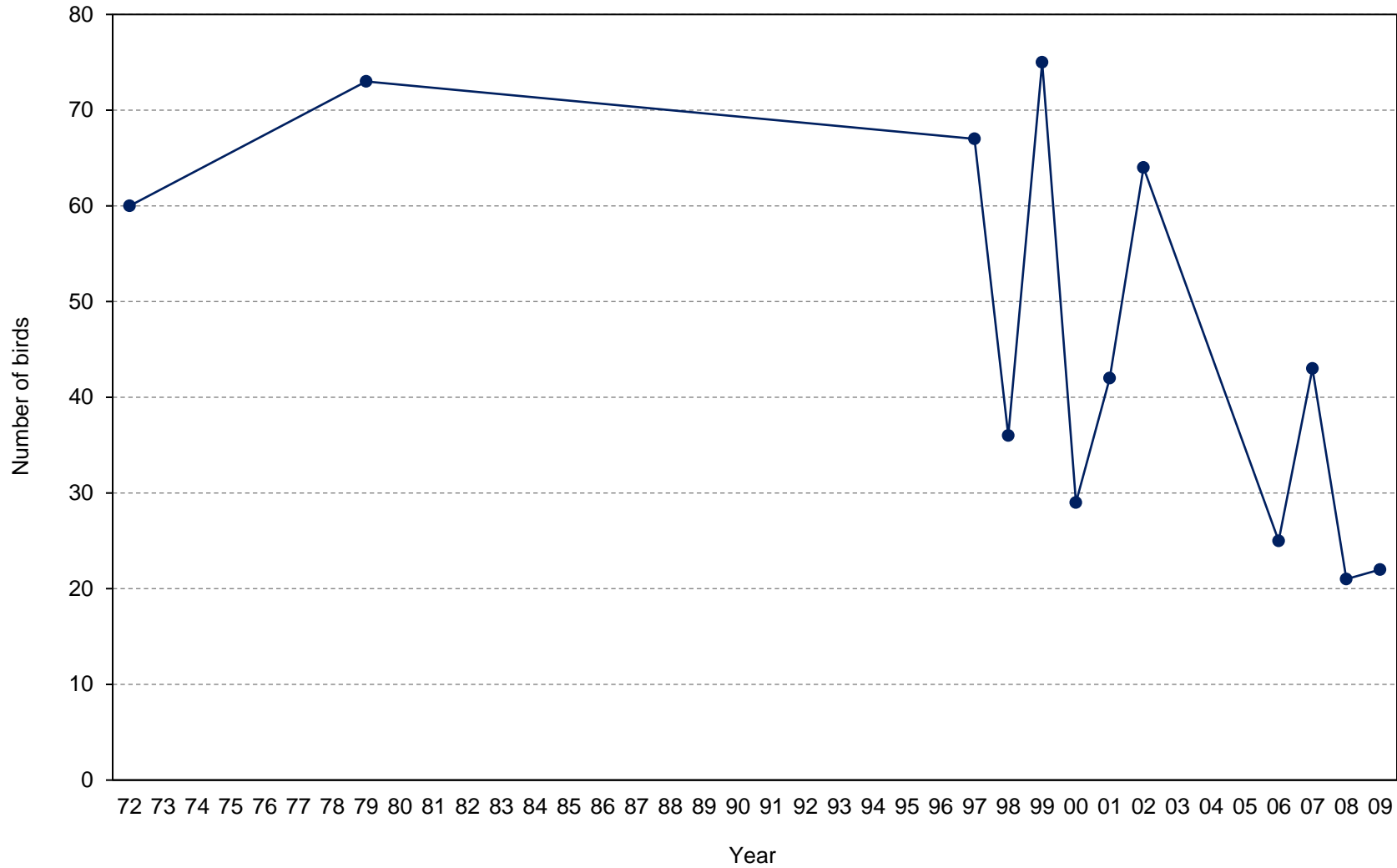


Figure 9. Numbers of pigeon guillemots counted during boat-based circumnavigation surveys at Buldir Island, Alaska. Values are based on a single survey each year. No counts were conducted in 1973-1978, 1980-1996, 2003-2004, or after 2009.

Table 13. Numbers of pigeon guillemots counted during boat-based circumnavigation surveys at Buldir Island, Alaska. No counts were conducted in 1973-1978, 1980-1996, 2003-2004, or after 2009.

Segment	1972	1979	1997	1998	1999	2000	2001	2002	2005	2006	2007	2008	2009
A-B	-	15	13	8	18	5	11	9	5	1	6	4	1
B-C	-	9	10	3	15	4	4	15	4	1	19	1	9
C-D	-	19	1	6	11	5	7	3	NC ^a	7	6	2	0
D-E	-	8	11	8	9	2	7	9	NC ^a	0	6	1	4
E-F	-	8	20	6	4	6	7	14	NC ^a	9	5	10	7
F-A	-	14	12	5	18	7	6	14	3 ^a	7	11	3	1
Total	60 ^b	73	67	36	75	29	42	64	- ^a	25	43	21	22
Date	.. ^b	24 Jun	3 Jun	13 Jun	1 Jul	20 Jun	5 Jun	2 Jul	10 Jun	7 Jun	2 Jun	3 Jun	3 Jun
Start time ^c	xx ^d	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
End time ^c	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

^aSurvey incomplete in 2005 because of technical difficulties: segments C-D, D-E, and E-F were not counted (NC) and segment F-A includes only the beginning of section A to Bull Point. Total count is not comparable with other years.

^bCount combined boat-based count on south side of island on 7 July (50 individuals) and counts along the north shore 30 June-8 July (10 individuals); Byrd (1972).

^cTimes are Aleutian Standard Time (-1 hr from Alaska Standard Time).

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

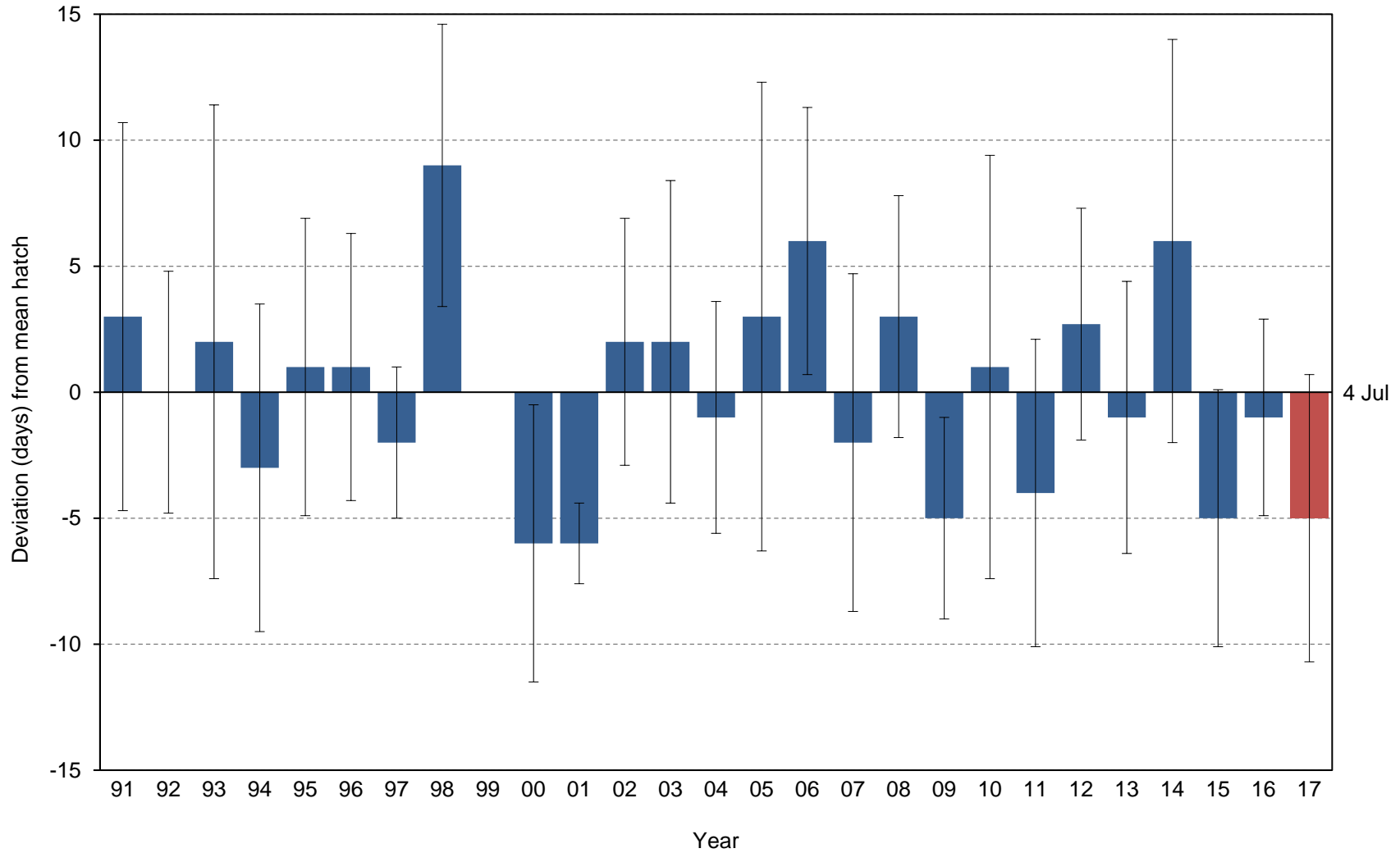


Figure 10. Yearly hatch date deviation (from the 1991-2016 average of 4 July) for parakeet auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1999.

Table 14. Breeding chronology of parakeet auklets at Buldir Island, Alaska. No data were collected in 1999.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge
1991	7 Jul	7.7	6	26 Jun	16 Jul	3 Aug
1992	3 Jul	4.8	7	25 Jun	10 Jul	9 Aug
1993	6 Jul	9.4	7	19 Jun	15 Jul	27 Jul
1994	1 Jul	6.5	41	20 Jun	23 Jul	23 Jul
1995	5 Jul	5.9	38	21 Jun	17 Jul	30 Jul
1996	4 Jul	5.3	32	22 Jun	20 Jul	1 Aug
1997	2 Jul	3.0	8	26 Jun	7 Jul	27 Jul
1998	13 Jul	5.6	31	4 Jul	29 Jul	30 Jul
2000	27 Jun	5.5	20	12 Jun	9 Jul	23 Jul
2001	28 Jun	1.6	5	25 Jun	29 Jun	-
2002	6 Jul	4.9	20	29 Jun	22 Jul	28 Jul
2003	6 Jul	6.4	6	29 Jun	19 Jul	25 Jul
2004	2 Jul	4.6	11	24 Jun	8 Jul	4 Aug
2005	7 Jul	9.3	9	27 Jun	27 Jul	25 Jul
2006	10 Jul	5.3	16	1 Jul	21 Jul	9 Aug
2007	2 Jul	6.7	10	25 Jun	21 Jul	22 Jul
2008	6 Jul	4.8	21	30 Jun	19 Jul	29 Jul
2009	29 Jun	4.0	29	21 Jun	8 Jul	24 Jul
2010	5 Jul	8.4	15	17 Jun	23 Jun	22 Jul
2011	30 Jun	6.1	11	21 Jun	9 Jul	27 Jul
2012	6 Jul	4.6	7	30 Jun	12 Jul	30 Jul
2013	3 Jul	5.4	12	29 Jun	19 Jul	6 Aug
2014	10 Jul	8.0	13	1 Jul	23 Jul	9 Aug
2015	29 Jun	5.1	12	23 Jun	7 Jul	28 Jul
2016	2 Jul	3.9	12	26 Jun	8 Jul	31 Jul
2017	29 Jun	5.7	12	18 Jun	13 Jul	26 Jul

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

Table 15. Frequency distribution of hatch dates for parakeet auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1999.

Julian date ^a	No. nests hatching on Julian date												
	91	92	93	94	95	96	97	98	00	01	02	03	04
164	-	-	-	-	-	-	-	-	1	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	-	-	-	-	-
169	-	-	-	-	-	-	-	-	-	-	-	-	-
170	-	-	1	-	-	-	-	-	-	-	-	-	-
171	-	-	-	1	-	-	-	-	-	-	-	-	-
172	-	-	-	2	1	-	-	-	1	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	-	-	-	-	1	-	-	-	-	-	-	-
175	-	-	1	1	-	-	-	-	1	-	-	-	-
176	-	-	-	-	-	-	-	-	1	1	-	-	1
177	1	1	-	8	5	-	1	-	-	-	-	-	-
178	-	-	-	5	-	-	-	-	6	-	-	-	1
179	-	-	-	-	-	-	-	-	3	-	-	-	-
180	-	1	-	1	-	6	-	-	-	4	2	1	2
181	1	-	-	-	-	-	-	-	-	-	-	-	-
182	-	-	-	5	-	4	5	-	-	-	3	-	-
183	-	-	-	7	-	-	-	-	-	-	-	-	-
184	1	-	-	-	15	1	-	-	6	-	2	2	-
185	-	-	-	-	-	-	-	1	-	-	-	1	-
186	-	2	-	3	-	5	1	3	-	-	5	-	4
187	-	1	-	1	-	1	-	-	-	-	1	-	-
188	-	-	-	-	6	-	1	-	-	-	1	-	1
189	-	1	-	1	-	11	-	-	-	-	2	1	-
190	1	-	3	2	7	1	-	7	-	-	3	1	2
191	-	-	-	2	-	-	-	-	1	-	-	-	-
192	-	1	-	-	-	-	-	4	-	-	-	-	-
193	-	-	-	-	-	-	-	1	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	1	-	-	-	-	-	-	-
196	-	-	2	1	1	-	-	10	-	-	-	-	-
197	2	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	3	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	2	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	1	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	1	-	-
204	-	-	-	1	-	-	-	2	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	1	-	-	-	-	-
<i>n</i>	6	7	7	41	38	32	8	31	20	5	20	6	11

Table 15 (continued). Frequency distribution of hatch dates for parakeet auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1999.

Julian date ^a	No. nests hatching on Julian date												
	05	06	07	08	09	10	11	12	13	14	15	16	17
164	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	1	-	-	-	-	-	-	-
169	-	-	-	-	-	-	-	-	-	-	-	-	1
170	-	-	-	-	-	-	-	-	-	-	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	-	1	1	2	-	-	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	-	-	-	1	-	-	-	-	-	3	-	-
175	-	-	-	-	-	-	-	-	-	-	1	-	2
176	-	-	1	-	1	-	-	-	-	-	-	-	1
177	-	-	-	-	1	-	1	-	-	-	1	-	-
178	2	-	-	-	10	-	2	-	-	-	-	2	1
179	-	-	-	-	-	-	-	-	-	-	2	1	-
180	1	-	4	-	5	-	-	-	4	-	-	1	-
181	-	-	-	-	-	-	-	-	1	-	1	-	5
182	-	1	1	1	-	-	3	1	-	4	-	-	1
183	-	-	-	-	-	-	-	1	-	-	-	-	-
184	2	3	3	9	7	4	-	1	1	-	-	4	-
185	-	-	-	-	-	-	-	-	2	-	-	1	-
186	-	-	-	-	1	3	-	-	-	-	3	1	-
187	-	-	-	4	-	-	-	-	3	-	-	-	-
188	-	-	-	1	-	1	1	1	-	2	1	-	-
189	-	3	-	-	2	-	-	1	-	-	-	-	-
190	2	-	-	2	-	1	2	-	-	1	-	2	-
191	-	-	-	-	-	-	-	-	-	1	-	-	-
192	-	3	-	-	-	2	-	-	-	1	-	-	-
193	-	2	-	1	-	-	-	-	-	-	-	-	-
194	-	1	-	-	-	-	-	2	-	-	-	-	1
195	-	-	-	2	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	1	-	-	-	-	-	-	-
197	1	2	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	1	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	1	-	-	-	-
201	-	-	-	1	-	-	-	-	-	1	-	-	-
202	-	1	1	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	1	-	-	-	2	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-
208	1	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	9	16	10	21	29	15	11	7	12	13	12	12	12

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

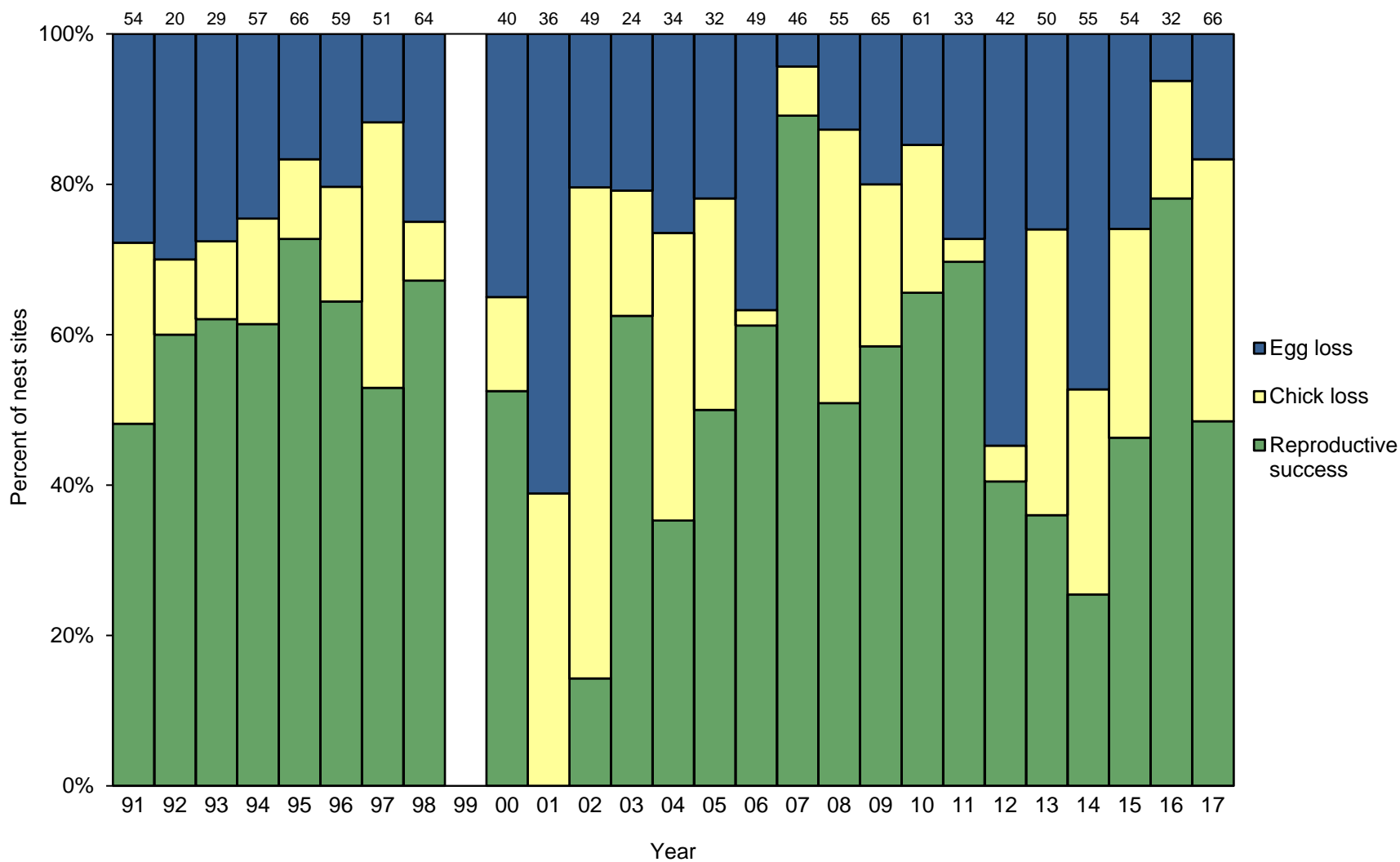


Figure 11. Reproductive performance of parakeet auklets at Buldir Island, Alaska. Egg loss= $(B-D)/B$; Chick loss= $(D-F)/B$; Reproductive success= F/B , where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1999.

Table 16. Reproductive performance of parakeet auklets at Buldir Island, Alaska. No data were collected in 1999.

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)
1991	54	39	26	0.72	0.67	0.48
1992	20	14	12	0.70	0.86	0.60
1993	29	21	18	0.72	0.86	0.62
1994	57	43	35	0.75	0.81	0.61
1995	66	55	48	0.83	0.87	0.73
1996	59	47	38	0.80	0.81	0.64
1997	51	45	27	0.88	0.60	0.53
1998	64	48	43	0.75	0.90	0.67
2000	40	26	21	0.65	0.81	0.53
2001	36	14	0	0.39	0.00	0.00
2002	49	39	7	0.80	0.18	0.14
2003	24	19	15	0.79	0.79	0.63
2004	34	25	12	0.74	0.48	0.35
2005	32	25	16	0.78	0.64	0.50
2006	49	31	30	0.63	0.97	0.61
2007	46	44	41	0.96	0.93	0.89
2008	55	48	28	0.87	0.58	0.51
2009	65	52	38	0.80	0.73	0.58
2010	61	52	40	0.85	0.77	0.66
2011	33	24	23	0.73	0.96	0.70
2012	42	19	17	0.45	0.89	0.40
2013	50	37	18	0.74	0.49	0.36
2014	55	29	14	0.53	0.48	0.25
2015	54	40	25	0.74	0.63	0.46
2016	32	30	25	0.94	0.83	0.78
2017	66	55	32	0.83	0.58	0.48

^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).

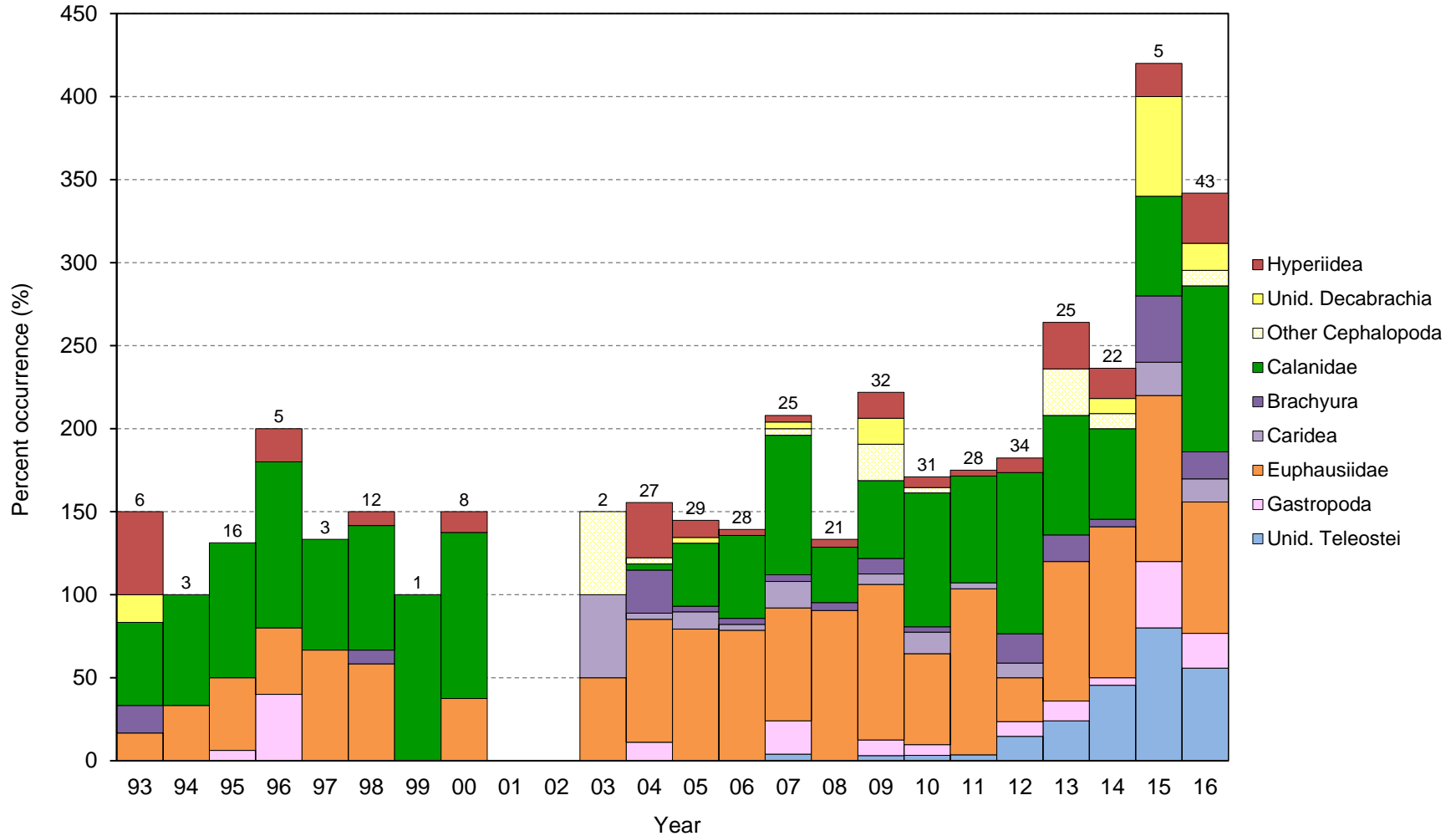


Figure 12. Frequency of occurrence of major prey items in diets of parakeet auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 2001-2002; samples were collected in 2017 but have not yet been analyzed.

Table 17. Frequency of occurrence of major prey items in diets of parakeet auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2001-2002; 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	1993	1994	1995	1996	1997	1998	1999	2000	2003	2004	2005	2006
No. samples	6	3	16	5	3	12	1	8	2	27	29	28
Invertebrates	100.0	100.0	100.0	83.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Amphipoda	50.0	-	-	20.0	-	16.7	-	12.5	-	37.0	10.3	10.7
Hyperiidea	50.0	-	-	20.0	-	8.3	-	12.5	-	33.3	10.3	3.6
<i>Themisto pacifica</i>	-	-	-	20.0	-	-	-	12.5	-	33.3	-	3.6
Other Hyperiidea	50.0	-	-	-	-	8.3	-	-	-	3.7	10.3	-
Other Amphipoda	-	-	-	-	-	8.3	-	-	-	3.7	-	7.1
Cephalopoda	16.7	-	-	-	-	-	-	-	50.0	3.7	3.4	-
Unid. Decabrachia	16.7	-	-	-	-	-	-	-	-	-	3.4	-
Other Cephalopoda	-	-	-	-	-	-	-	-	50.0	3.7	-	-
Copepoda	66.7	66.7	81.3	100.0	66.7	75.0	100.0	100.0	-	3.7	37.9	50.0
Calanidae	50.0	66.7	81.3	100.0	66.7	75.0	100.0	100.0	-	3.7	37.9	50.0
<i>Neocalanus cristatus</i>	50.0	66.7	81.3	100.0	66.7	75.0	100.0	100.0	-	3.7	27.6	39.3
<i>N. plumchrus/flemengeri</i>	-	-	-	-	33.3	8.3	-	37.5	-	-	13.8	10.7
Other Calanidae	-	-	-	-	-	-	-	-	-	-	-	-
Other Copepoda	16.7	-	-	-	-	-	-	-	-	-	-	-
Decapoda	16.7	-	6.3	-	-	8.3	-	-	50.0	25.9	17.2	7.1
Brachyura	16.7	-	-	-	-	8.3	-	-	-	25.9	3.4	3.6
Caridea	-	-	-	-	-	-	-	-	50.0	3.7	10.3	3.6
Pandalidae	-	-	-	-	-	-	-	-	50.0	3.7	-	3.6
Other Caridea	-	-	-	-	-	-	-	-	-	-	10.3	-
Other Decapoda	-	-	6.3	-	-	-	-	-	-	-	3.4	-
Euphausiacea	16.7	33.3	43.8	40.0	66.7	58.3	-	37.5	50.0	74.1	79.3	78.6
Euphausiidae	16.7	33.3	43.8	40.0	66.7	58.3	-	37.5	50.0	74.1	79.3	78.6
<i>Euphausia pacifica</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa inermis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. inspinata</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. longipes</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. spinifera</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	16.7	33.3	-	-	-	-	-	-	50.0	18.5	31.0	3.6
Unid. Euphausiidae	-	-	43.8	40.0	66.7	58.3	-	37.5	50.0	66.7	79.3	75.0
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	6.9	-
Gastropoda	-	-	6.3	40.0	-	-	-	-	-	11.1	-	-
Limacinidae	-	-	-	-	-	-	-	-	-	-	-	-
<i>Limacina helicina</i>	-	-	-	-	-	-	-	-	-	-	-	-
Other Gastropoda	-	-	6.3	40.0	-	-	-	-	-	11.1	-	-
Other Invertebrates	-	-	-	-	-	-	-	-	50.0	-	-	-
Fish	-	-	-	-	-	-	-	-	-	-	-	-
Teleostei	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	-	-	-	-	-	-	-	-	-	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-

Table 17 (continued). Frequency of occurrence of major prey items in diets of parakeet auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2001-2002; 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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	25	21	32	31	28	34	25	22	5	43	38
Invertebrates	100.0	100.0	96.9	100.0	100.0	100.0	100.0	95.5	100.0	100.0	<i>pending</i>
Amphipoda	4.0	4.8	15.6	6.5	3.6	11.8	32.0	18.2	20.0	30.2	-
Hyperidea	4.0	4.8	15.6	6.5	3.6	8.8	28.0	18.2	20.0	30.2	-
<i>Themisto pacifica</i>	-	4.8	6.3	6.5	-	2.9	28.0	13.6	20.0	20.9	-
Other Hyperidea	4.0	4.8	9.4	6.5	3.6	8.8	4.0	4.5	-	14.0	-
Other Amphipoda	-	-	-	-	-	2.9	8.0	-	-	-	-
Cephalopoda	8.0	-	28.1	3.2	-	-	28.0	13.6	60.0	25.6	-
Unid. Decabrachia	4.0	-	15.6	-	-	-	-	9.1	60.0	16.3	-
Other Cephalopoda	4.0	-	21.9	3.2	-	-	28.0	9.1	-	9.3	-
Copepoda	84.0	33.3	46.9	80.6	64.3	97.1	72.0	54.5	60.0	100.0	-
Calanidae	84.0	33.3	46.9	80.6	64.3	97.1	72.0	54.5	60.0	100.0	-
<i>Neocalanus cristatus</i>	84.0	28.6	46.9	80.6	64.3	97.1	68.0	54.5	60.0	100.0	-
<i>N. plumchrus/flemengeri</i>	4.0	4.8	3.1	16.1	-	-	4.0	-	-	-	-
Other Calanidae	-	14.3	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	3.2	-	-	-	-	-	2.3	-
Decapoda	16.0	4.8	12.5	16.1	3.6	20.6	16.0	4.5	40.0	27.9	-
Brachyura	4.0	4.8	9.4	3.2	-	17.6	16.0	4.5	40.0	16.3	-
Caridea	16.0	-	6.3	12.9	3.6	8.8	-	-	20.0	14.0	-
Pandalidae	16.0	-	3.1	3.2	3.6	8.8	-	-	-	9.3	-
Other Caridea	-	-	6.3	12.9	-	5.9	-	-	20.0	4.7	-
Other Decapoda	-	-	-	3.2	-	2.9	-	-	20.0	2.3	-
Euphausiacea	68.0	90.5	93.8	54.8	100.0	26.5	84.0	90.9	100.0	79.1	-
Euphausiidae	68.0	90.5	93.8	54.8	100.0	26.5	84.0	90.9	100.0	79.1	-
<i>Euphausia pacifica</i>	16.0	-	37.5	16.1	10.7	14.7	36.0	63.6	40.0	30.2	-
<i>Thysanoessa inermis</i>	4.0	-	31.3	6.5	78.6	8.8	-	9.1	-	18.6	-
<i>T. inspinata</i>	32.0	-	84.4	19.4	7.1	17.6	68.0	81.8	100.0	60.5	-
<i>T. longipes</i>	60.0	-	87.5	51.6	96.4	11.8	68.0	77.3	40.0	44.2	-
<i>T. spinifera</i>	4.0	-	9.4	3.2	3.6	2.9	8.0	9.1	20.0	46.5	-
<i>Thysanoessa</i> spp.	64.0	14.3	90.6	51.6	92.9	14.7	40.0	4.5	20.0	9.3	-
Unid. Euphausiidae	-	76.2	-	-	-	-	36.0	31.8	20.0	23.3	-
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-
Gastropoda	20.0	-	9.4	6.5	-	8.8	12.0	4.5	40.0	20.9	-
Limacinidae	16.0	-	6.3	6.5	-	8.8	4.0	-	40.0	20.9	-
<i>Limacina helicina</i>	16.0	-	6.3	6.5	-	8.8	4.0	-	40.0	20.9	-
Other Gastropoda	4.0	-	3.1	-	-	-	8.0	4.5	-	2.3	-
Other Invertebrates	-	-	-	-	-	-	4.0	-	20.0	2.3	-
Fish	4.0	19.0	3.1	3.2	3.6	14.7	24.0	45.5	80.0	55.8	-
Teleostei	4.0	19.0	3.1	3.2	3.6	14.7	24.0	45.5	80.0	55.8	-
Unid. Teleostei	4.0	-	3.1	3.2	3.6	14.7	24.0	45.5	80.0	55.8	-
Other Teleostei	-	19.0	-	-	-	-	-	-	-	-	-

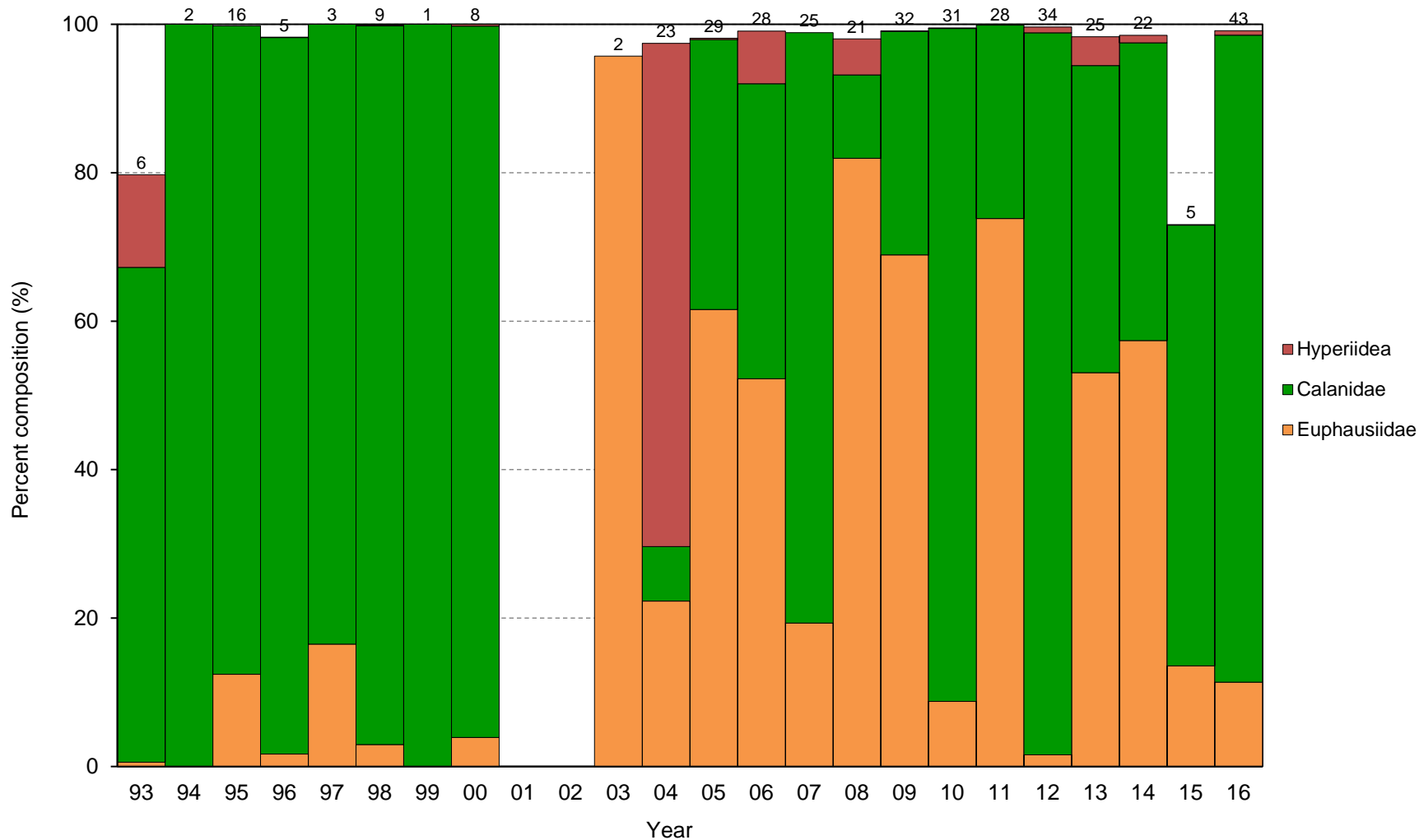


Figure 13. Percent composition of major prey items in diets of parakeet auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 2001-2002; samples were collected in 2017 but have not yet been analyzed.

Table 18. Percent composition of major prey items in diets of parakeet auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2001-2002; 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	1993	1994	1995	1996	1997	1998	1999	2000	2003	2004	2005	2006
No. samples	6	2	16	5	3	9	1	8	2	23	29	28
No. individuals	513	268	3405	1840	788	1485	22	1198	140	4476	4893	4401
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
Amphipoda	12.5	-	-	0.1	-	0.1	-	0.3	-	68.1	0.2	7.1
Hyperiidea	12.5	-	-	0.1	-	0.1	-	0.3	-	67.8	0.2	7.1
Other Amphipoda	-	-	-	-	-	0.1	-	-	-	0.3	-	-
Copepoda	86.2	100.0	87.4	96.5	83.5	96.8	100.0	95.8	-	7.3	36.4	39.8
Calanidae	66.7	100.0	87.4	96.5	83.5	96.8	100.0	95.8	-	7.3	36.4	39.8
<i>Neocalanus cristatus</i>	66.7	100.0	87.4	96.5	77.4	96.6	100.0	93.5	-	7.3	34.6	16.8
Other Calanidae	-	-	-	-	6.1	0.3	-	2.3	-	-	1.8	22.9
Other Copepoda	19.5	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	0.6	-	12.4	1.7	16.5	3.0	-	3.9	95.7	22.3	61.6	52.2
Euphausiidae	0.6	-	12.4	1.7	16.5	3.0	-	3.9	95.7	22.3	61.6	52.2
<i>Thysanoessa inspinata</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	0.6	-	-	-	-	-	-	-	18.6	2.5	14.7	0.2
Unid. Euphausiidae	-	-	12.4	1.7	16.5	3.0	-	3.9	77.1	19.7	46.3	52.0
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	0.6	-
Other Invertebrates	0.8	-	0.2	1.7	-	0.1	-	-	4.3	2.3	1.9	0.9
Fish	-	-	-	-	-	-	-	-	-	-	-	-

Table 18 (continued). Percent composition of major prey items in diets of parakeet auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2001-2002; 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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	25	21	32	31	28	34	25	22	5	43	38
No. individuals	12772	7246	13072	34411	2629	14839	3108	1680	1438	16373	<i>pending</i>
Invertebrates	100.0	98.0	100.0	100.0	100.0	99.9	99.8	98.9	92.4	99.6	-
Amphipoda	<0.1	4.9	0.1	0.1	<0.1	0.8	4.1	1.0	0.1	0.6	-
Hyperiidea	<0.1	4.9	0.1	0.1	<0.1	0.8	3.9	1.0	0.1	0.6	-
Other Amphipoda	-	-	-	-	-	-	0.2	-	-	-	-
Copepoda	79.5	11.2	30.1	90.7	26.1	97.3	41.4	40.1	59.4	87.2	-
Calanidae	79.5	11.2	30.1	90.7	26.1	97.3	41.4	40.1	59.4	87.2	-
<i>Neocalanus cristatus</i>	71.5	10.1	23.0	79.1	26.1	97.3	41.3	40.1	59.4	87.2	-
Other Calanidae	8.0	1.1	7.1	11.5	-	-	-	-	-	-	-
Other Copepoda	-	-	-	0.1	-	-	-	-	-	<0.1	-
Euphausiacea	19.3	82.0	68.9	8.8	73.8	1.6	53.1	57.4	13.6	11.4	-
Euphausiidae	19.3	82.0	68.9	8.8	73.8	1.6	53.1	57.4	13.6	11.4	-
<i>Thysanoessa inspinata</i>	1.0	-	18.8	0.2	0.2	0.2	28.4	44.6	9.7	3.5	-
<i>Thysanoessa</i> spp.	8.0	18.0	22.4	5.4	29.5	0.6	2.0	0.4	0.8	0.6	-
Unid. Euphausiidae	-	63.9	-	-	-	-	1.3	1.0	0.1	0.2	-
Other Euphausiidae	10.4	-	27.7	3.1	44.1	0.8	21.4	11.4	3.0	7.1	-
Other Invertebrates	1.1	-	0.9	0.4	0.1	0.3	1.3	0.4	19.4	0.5	-
Fish	<0.1	1.9	<0.1	<0.1	<0.1	0.1	0.2	1.1	7.6	0.4	-

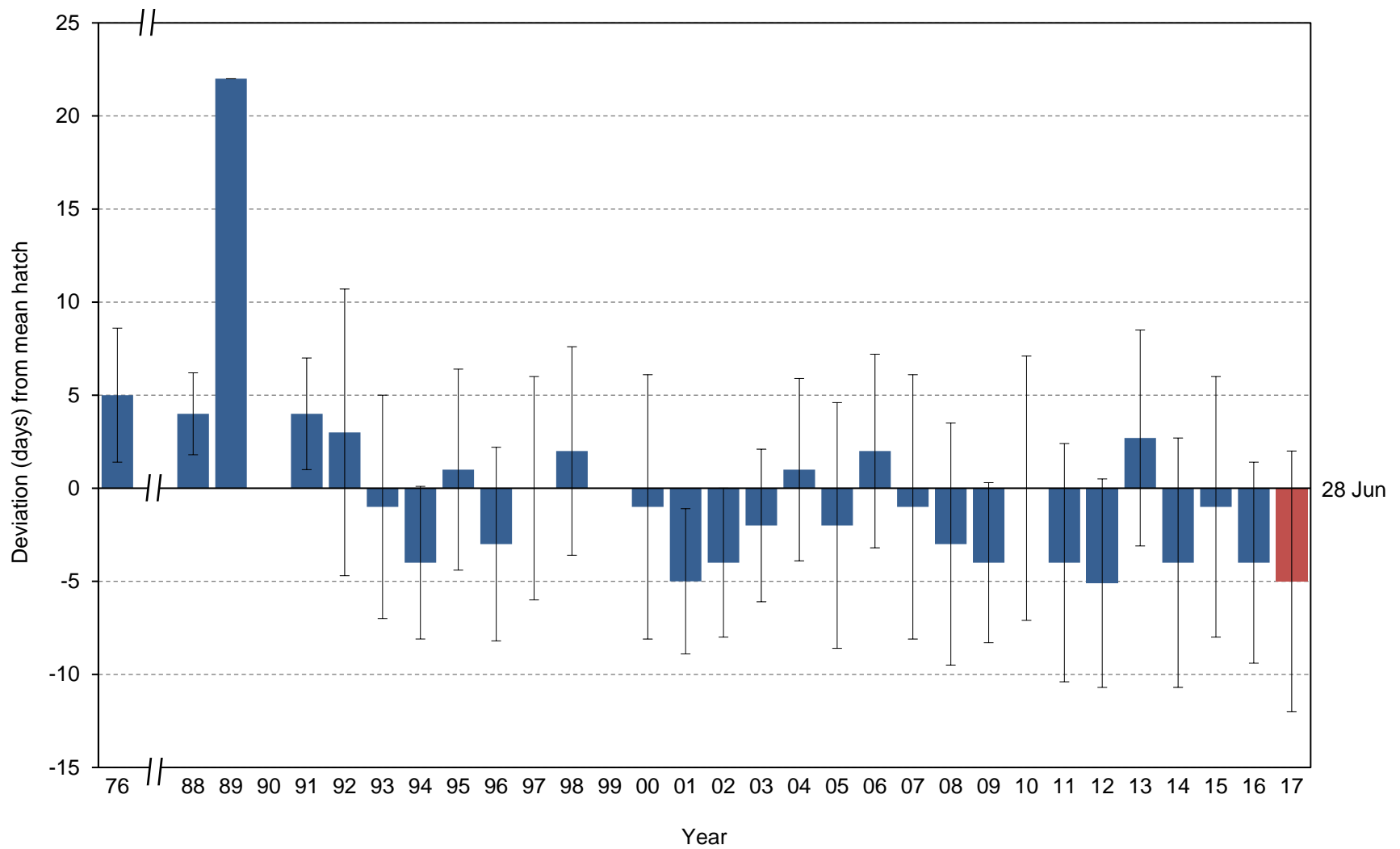


Figure 14. Yearly hatch date deviation (from the 1976-2016 average of 28 June) for least auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Table 19. Breeding chronology of least auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge ^b
1976 ^c	2 Jul	3.6	15	27 Jun	10 Jun	-
1988	1 Jul	2.2	4	30 Jun	5 Jul	>28 Jul
1989	20 Jul	0.0	1	20 Jul	-	>27 Jul
1990	-	-	-	-	-	>1 Aug
1991	2 Jul	3.0	7	27 Jun	5 Jul	25 Jul
1992	30 Jun	7.7	11	23 Jun	13 Jul	19 Jul
1993	27 Jun	6.0	5	24 Jun	9 Jul	19 Jul
1994	24 Jun	4.1	23	19 Jun	9 Jul	23 Jul
1995	29 Jun	5.4	49	21 Jun	18 Jul	21 Jul
1996	24 Jun	5.2	23	16 Jun	4 Jul	20 Jul
1997	28 Jun	6.0	21	21 Jun	15 Jul	19 Jul
1998	30 Jun	5.6	42	19 Jun	9 Jul	19 Jul
2000	26 Jun	7.1	27	18 Jun	22 Jul	17 Jul
2001	23 Jun	3.9	23	15 Jun	28 Jun	20 Jul
2002	24 Jun	4.0	12	17 Jun	1 Jul	14 Jul
2003	26 Jun	4.1	13	23 Jun	4 Jul	21 Jul
2004	28 Jun	4.9	23	20 Jun	12 Jul	21 Jul
2005	26 Jun	6.6	32	16 Jun	16 Jul	16 Jul
2006	30 Jun	5.2	33	19 Jun	11 Jul	16 Jul
2007	27 Jun	7.1	21	21 Jun	18 Jul	18 Jul
2008	24 Jun	6.5	30	20 Jun	17 Jul	17 Jul
2009	24 Jun	4.3	34	17 Jun	5 Jul	21 Jul
2010	28 Jun	7.1	17	21 Jun	18 Jul	13 Jul
2011	24 Jun	6.4	26	9 Jun	5 Jul	18 Jul
2012	22 Jun	5.6	28	9 Jun	7 Jul	12 Jul
2013	1 Jul	5.8	26	19 Jun	8 Jul	24 Jul
2014	24 Jun	6.7	29	11 Jun	3 Jul	14 Jul
2015	27 Jun	7.0	34	15 Jun	14 Jul	19 Jul
2016	23 Jun	5.4	26	14 Jun	4 Jul	21 Jul
2017	23 Jun	7.0	19	16 Jun	9 Jul	14 Jul

^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 last nest check, date of first fledge is listed as > the date of last nest check.

^cHatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 20. Frequency distribution of hatch dates for least auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1987 or 1999 and no hatch dates were recorded with the appropriate egg to chick interval in 1990; data from individual nests data are not available in 1976.

Julian date ^a	No. nests hatching on Julian date													
	88	89	91	92	93	94	95	96	97	98	00	01	02	03
160	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	-	-	-	-	-	-	-	-	-	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	2	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	3	-	-	-	-	2	-
169	-	-	-	-	-	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	6	-	-	-	2	6	1	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	-	-	-	3	-	3	-	-	1	-	-
173	-	-	-	-	-	-	-	-	-	-	-	11	-	-
174	-	-	-	-	-	-	1	12	-	9	2	-	4	7
175	-	-	-	6	4	14	1	-	-	-	7	-	-	-
176	-	-	-	-	-	-	-	-	9	-	-	-	-	1
177	-	-	-	-	-	-	27	-	-	-	-	1	-	-
178	-	-	2	-	-	2	-	-	-	-	-	-	5	-
179	-	-	-	-	-	-	-	-	-	-	5	7	-	-
180	-	-	-	-	-	-	1	5	-	17	-	-	-	3
181	-	-	-	-	-	-	-	-	-	-	-	-	-	-
182	3	-	-	-	-	-	-	-	6	1	-	-	1	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	4	-	-	-	11	-	-	1	6	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	2
186	-	-	1	-	-	-	-	3	1	6	-	-	-	-
187	1	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189	-	-	-	4	-	-	-	-	-	1	-	-	-	-
190	-	-	-	-	1	1	4	-	-	5	-	-	-	-
191	-	-	-	-	-	-	-	-	1	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	1	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	1	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	1	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	1	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	1	-	-	-
<i>n</i>	4	1	7	11	5	23	49	23	21	42	27	23	12	13

Table 20 (continued). Frequency distribution of hatch dates for least auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1987 or 1999 and no hatch dates were recorded with the appropriate egg to chick interval in 1990; data from individual nests data are not available in 1976.

Julian date ^a	No. nests hatching on Julian date													
	04	05	06	07	08	09	10	11	12	13	14	15	16	17
160	-	-	-	-	-	-	-	1	-	-	-	-	-	-
161	-	-	-	-	-	-	-	-	1	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	-	1	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	-	-	-	-	-	1	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	1	-	4	2	2	-
167	-	2	-	-	-	-	-	-	2	-	-	-	-	6
168	-	-	-	-	-	4	-	2	-	-	2	-	-	-
169	-	1	-	-	-	-	-	-	-	-	-	-	1	-
170	-	-	1	-	-	-	-	-	3	1	5	-	-	-
171	-	5	-	-	-	-	-	-	-	-	-	-	-	-
172	1	-	-	8	15	-	6	6	9	-	-	8	12	5
173	2	2	-	-	-	-	-	-	-	-	-	-	-	-
174	-	-	4	1	-	19	-	3	-	-	4	-	-	-
175	-	-	-	-	1	-	-	-	1	1	-	2	-	-
176	-	14	-	6	10	-	-	5	-	7	-	10	5	1
177	-	-	-	-	-	3	-	-	1	-	-	-	-	-
178	12	-	13	-	-	-	5	-	7	2	5	-	-	4
179	-	1	-	-	-	-	-	-	1	-	-	-	-	-
180	-	2	-	-	-	6	-	-	-	2	-	-	3	-
181	-	-	-	-	-	-	-	-	-	-	1	-	-	1
182	5	-	7	3	-	-	2	5	-	-	1	7	-	-
183	-	-	-	-	-	-	-	-	-	-	1	-	-	-
184	-	-	-	-	-	-	-	1	1	1	5	-	-	-
185	-	-	-	-	1	-	-	-	-	5	-	-	-	-
186	-	3	5	1	-	2	3	2	-	-	-	1	3	-
187	-	-	-	-	1	-	-	-	-	-	-	-	-	-
188	2	-	-	-	-	-	-	-	-	-	-	1	-	-
189	-	-	-	-	-	-	-	-	1	7	-	-	-	-
190	-	-	1	-	-	-	-	-	-	-	-	-	-	2
191	-	-	-	1	-	-	-	-	-	-	-	-	-	-
192	-	1	2	-	-	-	-	-	-	-	-	1	-	-
193	-	-	-	-	1	-	-	-	-	-	-	-	-	-
194	1	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	2	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	1	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	1	1	-	1	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	23	32	33	21	30	34	17	26	28	26	29	34	26	19

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

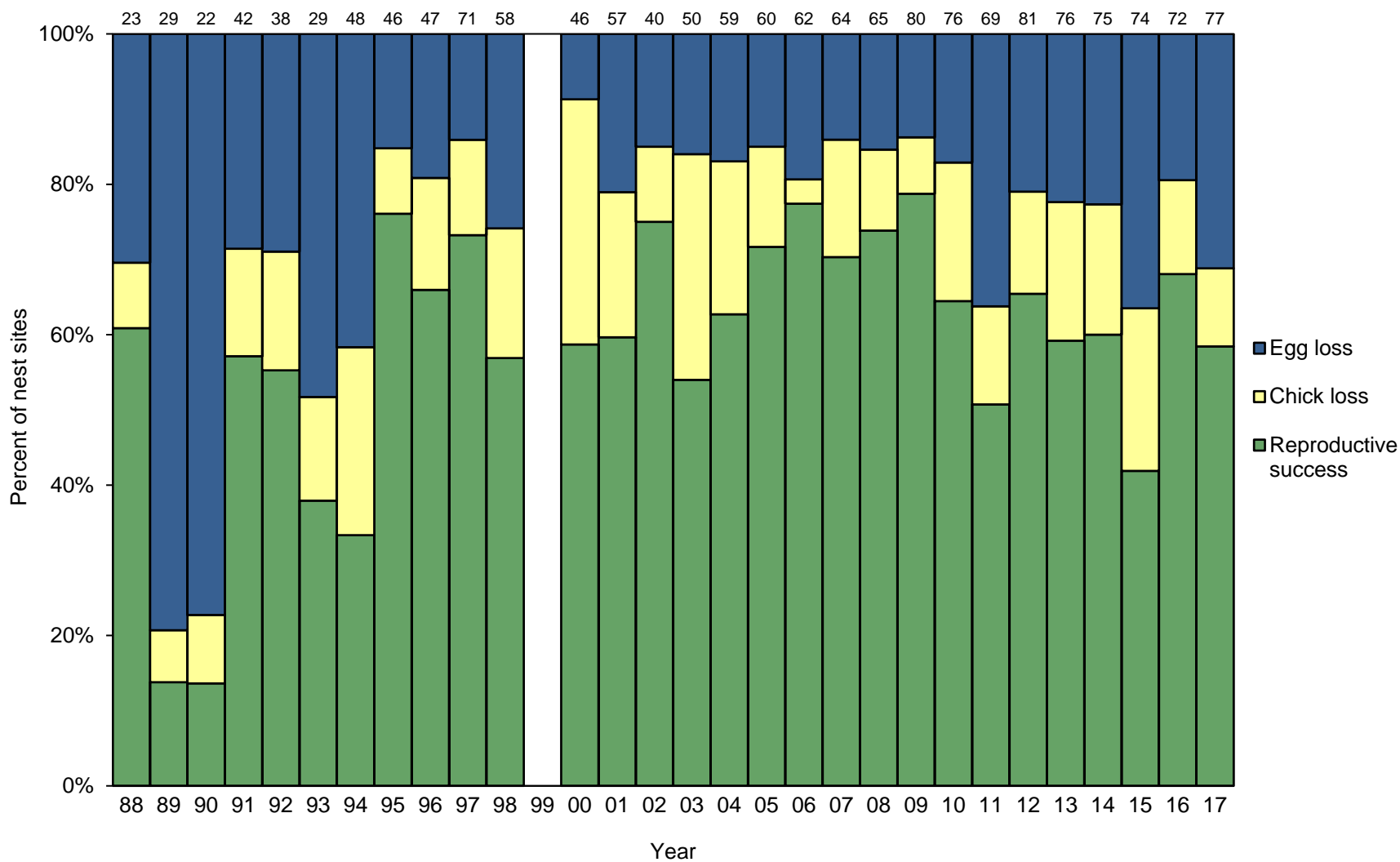


Figure 15. Reproductive performance of least auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1977-1987 or 1999; chick loss and reproductive success data are not available in 1976.

Table 21. Reproductive performance of least auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999.

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	28	19	-	0.68	-	-
1988	23	16	14	0.70	0.88	0.61
1989	29	6	4	0.21	0.67	0.14
1990	22	5	3	0.23	0.60	0.14
1991	42	30	24	0.71	0.80	0.57
1992	38	27	21	0.71	0.78	0.55
1993	29	15	11	0.52	0.73	0.38
1994	48	28	16	0.58	0.57	0.33
1995	46	39	35	0.85	0.90	0.76
1996	47	38	31	0.81	0.82	0.66
1997	71	61	52	0.86	0.85	0.73
1998	58	43	33	0.74	0.77	0.57
2000	46	42	27	0.91	0.64	0.59
2001	57	45	34	0.79	0.76	0.60
2002	40	34	30	0.85	0.88	0.75
2003	50	42	27	0.84	0.64	0.54
2004	59	49	37	0.83	0.76	0.63
2005	60	51	43	0.85	0.84	0.72
2006	62	50	48	0.81	0.96	0.77
2007	64	55	45	0.86	0.82	0.70
2008	65	55	48	0.85	0.87	0.74
2009	80	69	63	0.86	0.91	0.79
2010	76	63	49	0.83	0.78	0.64
2011	69	44	35	0.64	0.80	0.51
2012	81	64	53	0.79	0.83	0.65
2013	76	59	45	0.78	0.76	0.59
2014	75	58	45	0.77	0.78	0.60
2015	74	47	31	0.64	0.66	0.42
2016	72	58	49	0.81	0.84	0.68
2017	77	53	45	0.69	0.85	0.58

^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).

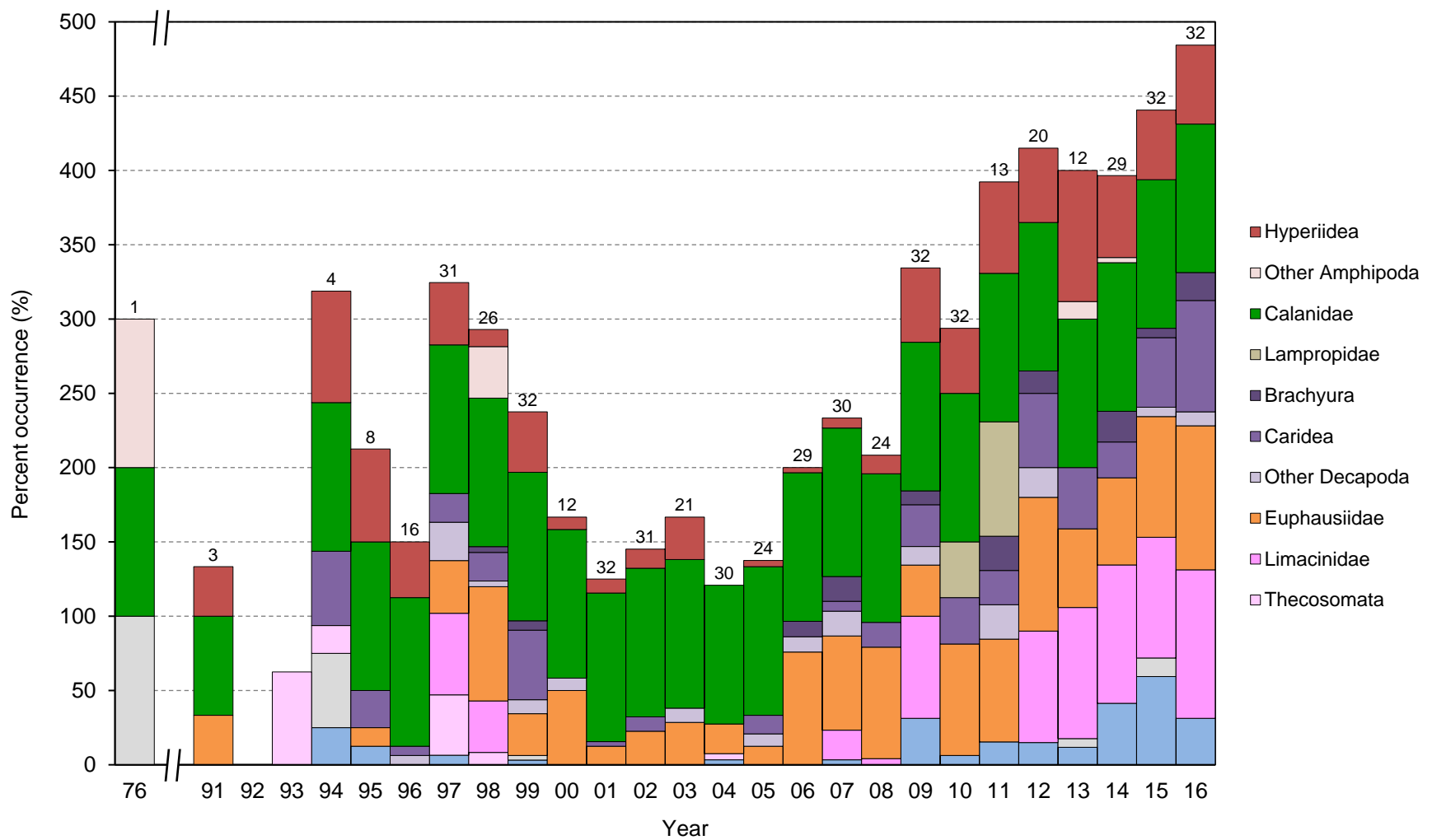


Figure 16. Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1977-1990 or 1992-1993; samples were collected in 2017 but have not yet been analyzed.

Table 22. Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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	1976	1991	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	1	3	4	8	16	31	26	32	12	32	31	21	30
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	100.0	33.3	75.0	62.5	37.5	41.9	42.3	40.6	8.3	9.4	12.9	28.6	-
Hyperiidea	-	33.3	75.0	62.5	37.5	41.9	11.5	40.6	8.3	9.4	12.9	28.6	-
<i>Primno macropa</i>	-	-	25.0	-	-	25.8	-	18.8	-	-	3.2	4.8	-
<i>Themisto pacifica</i>	-	-	75.0	50.0	31.3	19.4	11.5	31.3	8.3	9.4	9.7	-	-
Other Hyperiidea	-	33.3	-	50.0	12.5	3.2	-	-	-	-	3.2	28.6	-
Other Amphipoda	100.0	-	-	-	-	-	34.6	-	-	-	-	-	-
Copepoda	100.0	66.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3
Calanidae	100.0	66.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3
<i>Neocalanus cristatus</i>	-	-	75.0	37.5	12.5	58.1	69.2	81.3	100.0	46.9	19.4	42.9	3.3
<i>N. plumchrus/flemengeri</i>	100.0	66.7	100.0	100.0	100.0	100.0	100.0	93.8	100.0	100.0	100.0	95.2	93.3
Unid. Calanidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	-	-	7.7	-	41.7	-	-	-	-
Other Copepoda	-	-	-	-	-	-	-	6.3	-	-	-	-	-
Cumacea	-	-	-	-	-	-	-	-	-	-	-	-	-
Lampropidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Lampropidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	-	-	50.0	25.0	12.5	41.9	23.1	46.9	8.3	3.1	9.7	9.5	-
Brachyura	-	-	-	-	-	-	3.8	6.3	-	-	-	-	-
Caridea	-	-	50.0	25.0	6.3	19.4	19.2	46.9	-	3.1	9.7	-	-
Hippolytidae	-	-	-	-	-	-	-	37.5	-	-	-	-	-
Unid. Caridea	-	-	50.0	25.0	6.3	19.4	19.2	15.6	-	-	-	-	-
Other Caridea	-	-	-	-	-	-	-	-	-	3.1	9.7	-	-
Other Decapoda	-	-	-	-	6.3	25.8	3.8	9.4	8.3	-	-	9.5	-
Euphausiacea	-	33.3	-	12.5	-	35.5	76.9	28.1	50.0	12.5	22.6	28.6	20.0
Euphausiidae	-	33.3	-	12.5	-	35.5	76.9	28.1	50.0	12.5	22.6	28.6	20.0
<i>Euphausia pacifica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa inspinata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. longipes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	-	33.3	-	-	-	-	-	-	-	-	-	4.8	-
Unid. Euphausiidae	-	-	-	12.5	-	35.5	76.9	28.1	50.0	12.5	22.6	23.8	20.0
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Gastropoda	-	-	-	62.5	18.8	54.8	34.6	40.6	8.3	-	-	-	-
Limacinidae	-	-	-	-	-	54.8	34.6	-	-	-	-	-	-
<i>Limacina helicina</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Limacinidae	-	-	-	-	-	54.8	34.6	-	-	-	-	-	-
Thecosomata	-	-	-	62.5	18.8	-	-	40.6	8.3	-	-	-	-

Table 22 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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	24	29	30	24	32	32	13	20	17	29	32	32	39
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	<i>pending</i>
Amphipoda	4.2	3.4	6.7	12.5	50.0	43.8	61.5	50.0	94.1	55.2	46.9	53.1	-
Hyperidea	4.2	3.4	6.7	12.5	50.0	43.8	61.5	50.0	88.2	55.2	46.9	53.1	-
<i>Primno macropa</i>	-	-	-	-	28.1	15.6	23.1	30.0	88.2	20.7	25.0	46.9	-
<i>Themisto pacifica</i>	3.4	4.2	6.7	12.5	28.1	34.4	53.8	25.0	17.6	44.8	37.5	25.0	-
Other Hyperidea	-	-	3.3	-	3.1	-	-	-	5.9	-	-	-	-
Other Amphipoda	-	-	-	-	-	-	-	-	11.8	3.4	-	-	-
Copepoda	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-
Calanidae	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-
<i>Neocalanus cristatus</i>	24.1	54.2	70.0	54.2	90.6	59.4	100.0	60.0	58.8	31.0	71.9	87.5	-
<i>N. plumchrus/flemengeri</i>	96.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1	100.0	93.8	100.0	-
Unid. Calanidae	-	-	96.7	100.0	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	-	3.1	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	18.8	3.1	-	-	17.6	24.1	6.3	18.8	-
Cumacea	-	-	-	-	-	37.5	76.9	-	-	-	-	-	-
Lampropidae	-	-	-	-	-	37.5	76.9	-	-	-	-	-	-
Unid. Lampropidae	-	-	-	-	-	37.5	76.9	-	-	-	-	-	-
Decapoda	20.8	10.3	16.7	16.7	34.4	31.3	38.5	50.0	41.2	37.9	53.1	75.0	-
Brachyura	-	10.3	16.7	-	9.4	-	23.1	15.0	-	20.7	6.3	18.8	-
Caridea	12.5	-	6.7	16.7	28.1	31.3	23.1	50.0	41.2	24.1	46.9	75.0	-
Hippolytidae	-	-	3.3	4.2	21.9	9.4	15.4	45.0	23.5	24.1	25.0	46.9	-
Unid. Caridea	-	12.5	-	12.5	-	-	-	-	11.8	-	-	6.3	-
Other Caridea	-	4.2	3.3	-	18.8	28.1	7.7	15.0	11.8	-	37.5	53.1	-
Other Decapoda	8.3	10.3	16.7	-	12.5	-	23.1	20.0	-	-	6.3	9.4	-
Euphausiacea	12.5	75.9	63.3	75.0	34.4	75.0	69.2	90.0	52.9	58.6	81.3	96.9	-
Euphausiidae	12.5	75.9	63.3	75.0	34.4	75.0	69.2	90.0	52.9	58.6	81.3	96.9	-
<i>Euphausia pacifica</i>	-	-	-	-	-	9.4	7.7	50.0	-	17.2	21.9	25.0	-
<i>Thysanoessa inspinata</i>	-	-	-	-	12.5	-	-	40.0	29.4	31.0	50.0	46.9	-
<i>T. longipes</i>	-	-	-	-	25.0	40.6	23.1	15.0	17.6	24.1	12.5	59.4	-
<i>Thysanoessa</i> spp.	3.4	-	23.3	8.3	-	71.9	69.2	80.0	17.6	3.4	46.9	71.9	-
Unid. Euphausiidae	75.9	8.3	46.7	70.8	-	-	-	-	23.5	24.1	28.1	9.4	-
Other Euphausiidae	4.2	-	-	-	12.5	3.1	7.7	-	17.6	-	3.1	87.5	-
Gastropoda	-	4.2	20.0	4.2	68.8	-	-	75.0	88.2	93.1	81.3	100.0	-
Limacinidae	-	-	20.0	4.2	68.8	-	-	75.0	88.2	93.1	81.3	100.0	-
<i>Limacina helicina</i>	-	-	20.0	4.2	68.8	-	-	75.0	88.2	93.1	81.3	100.0	-
Other Limacinidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Thecosomata	-	4.2	-	-	-	-	-	-	-	-	-	-	-

Table 22 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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	1976	1991	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Other Invertebrates	100.0	-	50.0	-	-	-	-	3.1	-	-	-	-	-
Fish	-	-	25.0	12.5	-	6.5	-	3.1	-	-	-	-	3.3
Teleostei	-	-	25.0	12.5	-	6.5	-	3.1	-	-	-	-	3.3
Unid. Teleostei	-	-	25.0	12.5	-	6.5	-	3.1	-	-	-	-	3.3
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	100.0	-	-	-	-	-	-	-	-	-	-	-	-

Table 22 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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
Other Invertebrates	-	-	-	-	-	-	-	-	5.9	-	12.5	-	-
Fish	-	-	3.3	-	75.0	6.3	15.4	15.0	11.8	41.379	59.4	31.3	-
Teleostei	-	-	3.3	-	75.0	6.3	15.4	15.0	11.8	41.4	59.4	31.3	-
Unid. Teleostei	-	-	3.3	-	31.3	6.3	15.4	15.0	11.8	41.4	59.4	31.3	-
Other Teleostei	-	-	-	-	59.4	-	-	-	-	-	-	3.1	-
Other	-	-	-	-	-	-	-	-	-	3.4	-	-	-

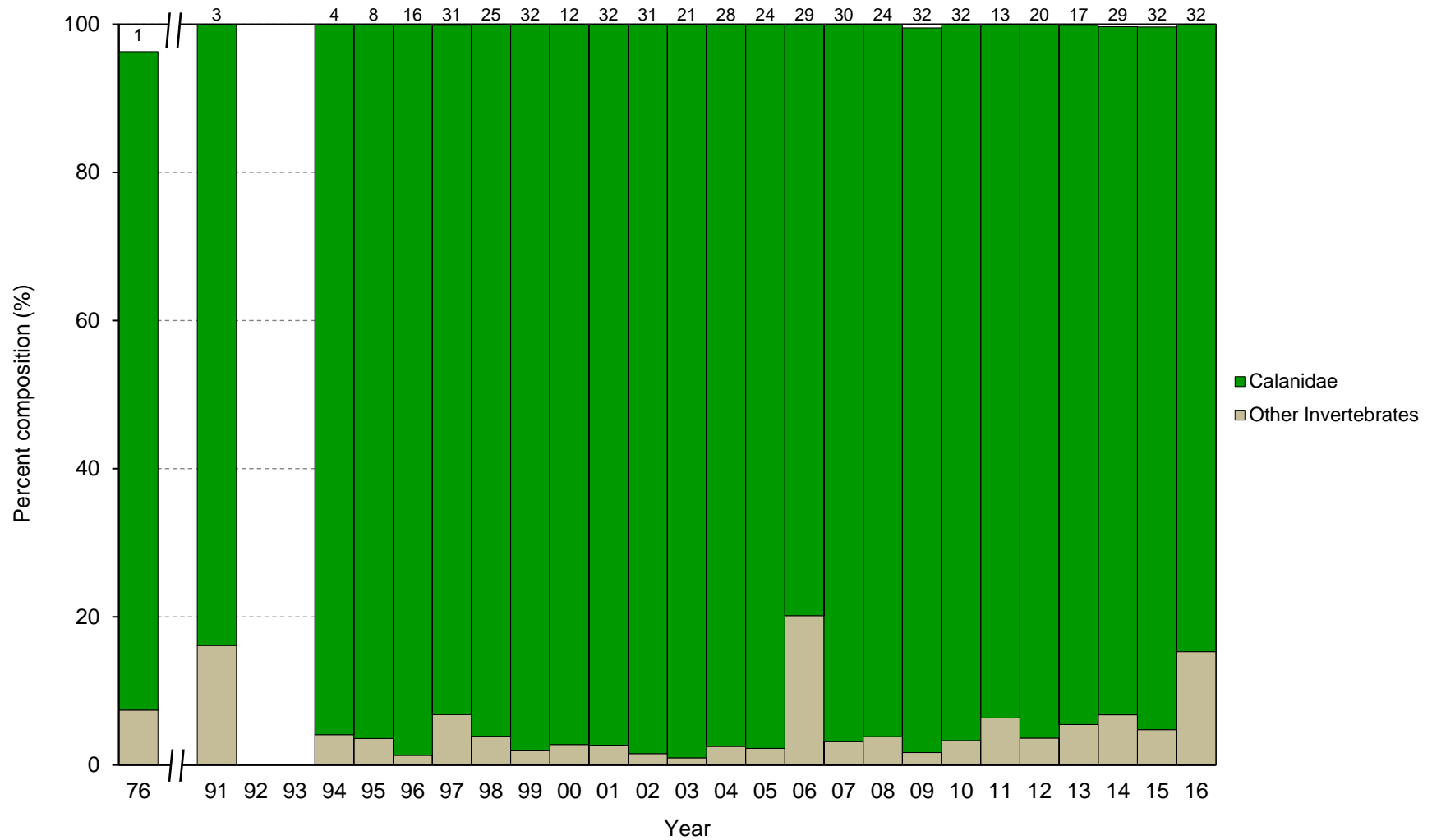


Figure 17. Percent composition of major prey items in diets of least auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1977-1990 or 1992-1993; samples were collected in 2017 but have not yet been analyzed.

Table 23. Percent composition of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1976	1991	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	1	3	4	8	16	31	25	32	12	32	31	21	28
No. individuals	27	372	1686	2372	5742	9370	8473	16797	2252	8248	8980	9947	6848
Invertebrates	96.3	100.0	99.9	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Copepoda	88.9	83.9	95.8	96.4	98.7	93.1	96.1	98.1	97.2	97.3	98.5	99.0	97.5
Calanidae	88.9	83.9	95.8	96.4	98.7	93.1	96.1	98.1	97.2	97.3	98.5	99.0	97.5
<i>Neocalanus cristatus</i>	-	-	3.6	0.4	2.2	3.5	6.7	13.4	48.7	4.9	0.3	5.7	0.7
<i>N. plumchrus/flemengeri</i>	88.9	83.9	92.2	96.0	96.5	89.5	89.3	84.6	46.3	92.5	98.1	93.4	96.8
Other Calanidae	-	-	-	-	-	-	0.1	-	2.3	-	-	-	-
Other Copepoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	7.4	16.1	4.1	3.6	1.3	6.8	3.9	1.9	2.8	2.7	1.5	1.0	2.5
Fish	-	-	0.1	-	-	0.1	-	<0.1	-	-	-	-	<0.1
Other	3.7	-	-	-	-	-	-	-	-	-	-	-	-

Table 23 (continued). Percent composition of major prey items in diets of least auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992-1993; 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. 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	24	29	30	24	32	32	13	20	17	29	32	32	39
No. individuals	8123	3789.9	8924	8710	67613	43360	9729	40194	9152	10797	23994	17448	pending
Invertebrates	100.0	100.0	99.9	100.0	99.7	100.0	99.9	100.0	99.9	99.7	99.6	100.0	-
Copepoda	97.8	79.8	96.8	96.2	98.0	96.7	93.6	96.3	94.5	93.0	94.9	84.7	-
Calanidae	97.8	79.8	96.8	96.2	97.8	96.7	93.6	96.3	94.4	92.9	94.9	84.6	-
<i>Neocalanus cristatus</i>	35.5	5.4	4.3	3.0	3.6	1.0	11.3	2.2	0.9	0.5	1.2	6.9	-
<i>N. plumchrus/flemengeri</i>	62.3	74.4	76.4	78.7	94.2	95.7	82.3	94.1	93.5	92.4	93.6	77.7	-
Other Calanidae	-	-	16.1	14.5	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	0.2	-	-	-	0.1	0.1	<0.1	0.1	-
Other Invertebrates	2.2	20.2	3.2	3.8	1.7	3.3	6.3	3.6	5.5	6.8	4.8	15.3	-
Fish	-	-	0.1	-	0.3	<0.1	0.1	<0.1	0.1	0.3	0.4	0.2	-
Other	-	-	-	-	-	-	-	-	-	<0.1	-	-	-

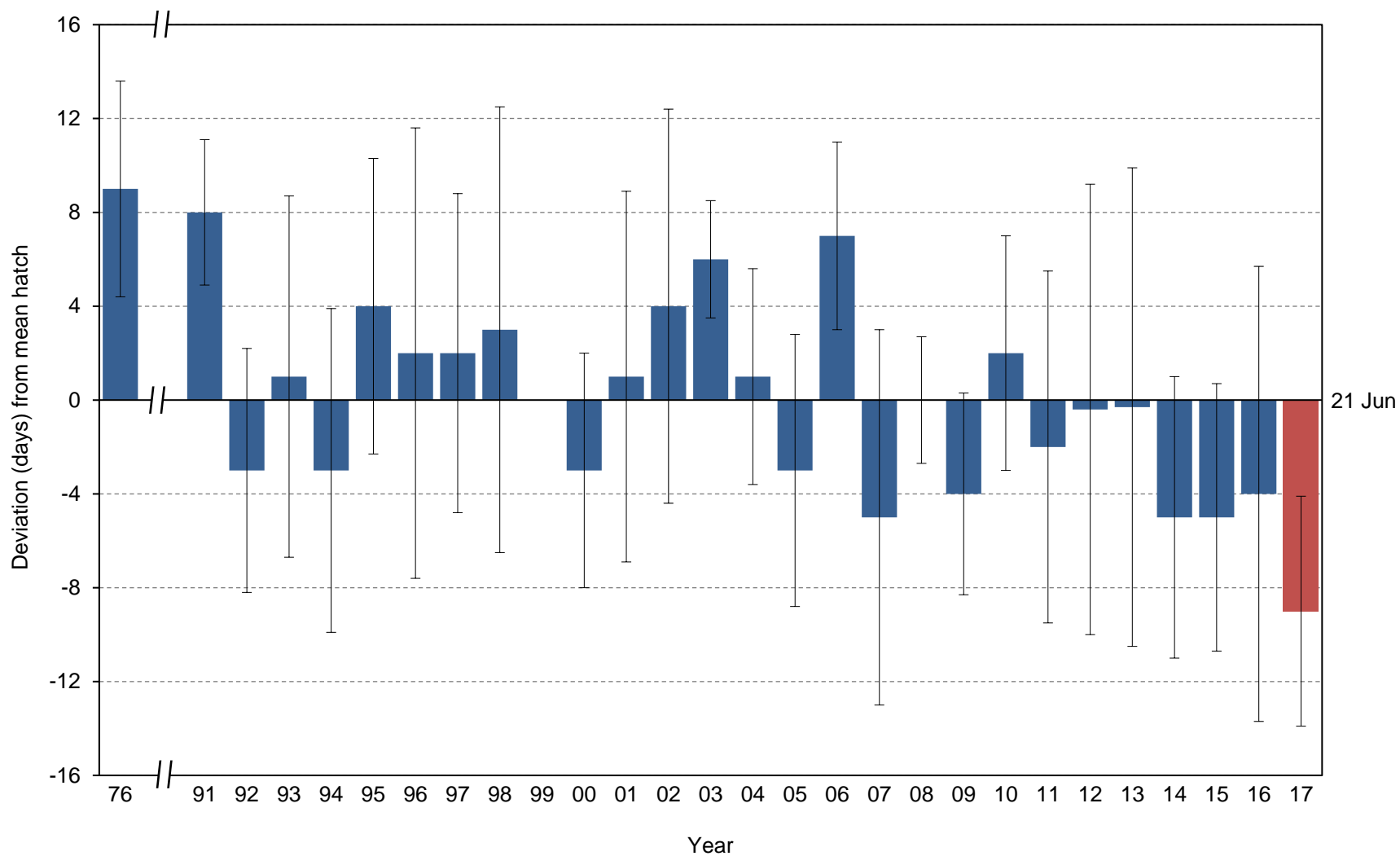


Figure 18. Yearly hatch date deviation (from the 1976-2016 average of 21 June) for whiskered auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1988-1990.

Table 24. Breeding chronology of whiskered auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1988-1990.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge ^b
1976 ^c	30 Jun	4.6	6	27 Jun	6 Jul	-
1989	-	-	-	-	-	>27 Jul
1990	-	-	-	-	-	>1 Aug
1991	29 Jun	3.1	8	26 Jun	3 Jul	26 Jul
1992	17 Jun	5.2	11	10 Jun	28 Jun	19 Jul
1993	22 Jun	7.7	14	13 Jun	9 Jul	15 Jul
1994	18 Jun	6.9	37	9 Jun	8 Jul	19 Jul
1995	25 Jun	6.3	51	18 Jun	15 Jul	21 Jul
1996	22 Jun	9.6	27	10 Jun	20 Jul	20 Jul
1997	23 Jun	6.8	22	11 Jun	7 Jul	19 Jul
1998	24 Jun	9.5	55	9 Jun	15 Jul	19 Jul
2000	17 Jun	5.0	26	6 Jun	27 Jun	17 Jul
2001	22 Jun	7.9	17	9 Jun	15 Jul	15 Jul
2002	25 Jun	8.4	35	15 Jun	15 Jul	20 Jul
2003	27 Jun	2.5	4	23 Jun	29 Jun	15 Jul
2004	21 Jun	4.6	27	16 Jun	4 Jul	21 Jul
2005	18 Jun	5.8	28	11 Jun	5 Jul	16 Jul
2006	28 Jun	4.0	17	23 Jun	5 Jul	31 Jul
2007	16 Jun	8.0	23	11 Jun	10 Jul	14 Jul
2008	20 Jun	2.7	36	14 Jun	24 Jun	23 Jul
2009	17 Jun	4.3	49	5 Jun	29 Jun	15 Jul
2010	23 Jun	5.0	24	17 Jun	5 Jul	18 Jul
2011	19 Jun	7.5	28	7 Jun	5 Jul	23 Jul
2012	20 Jun	9.6	18	9 Jun	12 Jul	17 Jul
2013	21 Jun	10.2	30	9 Jun	13 Jul	13 Jul
2014	16 Jun	6.0	29	10 Jun	11 Jul	18 Jul
2015	16 Jun	5.7	37	7 Jun	1 Jul	14 Jul
2016	16 Jun	9.7	21	7 Jun	10 Jul	15 Jul
2017	12 Jun	4.9	23	4 Jun	21 Jun	13 Jul

^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 last nest check, date of first fledge is listed as > the date of last nest check.

^cHatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 25. Frequency distribution of hatch dates for whiskered auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval in 1988-1990.

Julian date ^a	No. nests hatching on Julian date													
	91	92	93	94	95	96	97	98	00	01	02	03	04	
155	-	-	-	-	-	-	-	-	-	-	-	-	-	
156	-	-	-	-	-	-	-	-	-	-	-	-	-	
157	-	-	-	-	-	-	-	-	-	-	-	-	-	
158	-	-	-	-	-	-	-	-	1	-	-	-	-	
159	-	-	-	-	-	-	-	-	-	-	-	-	-	
160	-	-	-	2	-	-	-	2	-	1	-	-	-	
161	-	-	-	1	-	-	-	1	-	-	-	-	-	
162	-	1	-	3	-	1	1	-	-	-	-	-	-	
163	-	1	-	-	-	-	-	-	-	-	-	-	-	
164	-	-	2	2	-	-	-	1	8	-	-	-	-	
165	-	1	-	6	-	-	-	-	2	-	-	-	-	
166	-	1	-	4	-	-	-	9	-	2	3	-	-	
167	-	1	-	1	-	-	-	-	-	-	1	-	-	
168	-	3	1	1	-	12	6	1	-	-	4	-	8	
169	-	-	-	-	1	-	-	2	-	2	1	-	-	
170	-	-	6	4	-	-	-	11	10	1	-	-	-	
171	-	-	-	3	-	-	-	-	-	4	-	-	-	
172	-	-	-	1	30	-	6	2	-	-	10	-	4	
173	-	-	-	-	-	-	-	-	-	3	-	-	8	
174	-	1	-	-	1	8	-	6	-	-	2	1	-	
175	-	1	3	3	-	-	-	-	3	-	-	-	-	
176	-	-	-	-	-	-	3	-	-	1	3	-	-	
177	2	-	-	3	9	-	1	1	-	-	-	1	-	
178	3	-	-	-	-	-	-	-	1	-	2	-	5	
179	-	-	-	-	-	-	-	-	1	1	1	-	-	
180	-	1	-	-	-	2	-	5	-	-	-	2	-	
181	-	-	-	-	-	-	-	-	-	-	-	-	1	
182	-	-	-	-	-	-	2	-	-	-	2	-	-	
183	-	-	-	1	-	-	-	-	-	-	-	-	-	
184	3	-	-	-	4	-	-	-	-	-	-	-	-	
185	-	-	-	-	-	-	-	-	-	-	-	-	-	
186	-	-	-	1	-	2	2	7	-	1	1	-	1	
187	-	-	-	-	2	-	-	-	-	-	-	-	-	
188	-	-	-	-	-	-	1	-	-	-	-	-	-	
189	-	-	-	1	-	-	-	-	-	-	1	-	-	
190	-	-	2	-	3	-	-	4	-	-	-	-	-	
191	-	-	-	-	-	-	-	-	-	-	-	-	-	
192	-	-	-	-	-	-	-	1	-	-	2	-	-	
193	-	-	-	-	-	-	-	-	-	-	-	-	-	
194	-	-	-	-	-	-	-	-	-	-	-	-	-	
195	-	-	-	-	-	-	-	-	-	-	1	-	-	
196	-	-	-	-	1	-	-	2	-	1	1	-	-	
197	-	-	-	-	-	-	-	-	-	-	-	-	-	
198	-	-	-	-	-	-	-	-	-	-	-	-	-	
199	-	-	-	-	-	-	-	-	-	-	-	-	-	
200	-	-	-	-	-	-	-	-	-	-	-	-	-	
201	-	-	-	-	-	-	-	-	-	-	-	-	-	
202	-	-	-	-	-	2	-	-	-	-	-	-	-	
<i>n</i>	8	11	14	37	51	27	22	55	26	17	35	4	27	

Table 25 (continued). Frequency distribution of hatch dates for whiskered auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1987 or 1999; no hatch dates were recorded with the appropriate egg to chick interval in 1988-1990.

Julian date ^a	No. nests hatching on Julian date												
	05	06	07	08	09	10	11	12	13	14	15	16	17
155	-	-	-	-	-	-	-	-	-	-	-	-	1
156	-	-	-	-	1	-	-	-	-	-	-	-	2
157	-	-	-	-	-	-	-	-	-	-	-	-	-
158	-	-	-	-	-	-	2	-	-	-	1	-	-
159	-	-	-	-	-	-	-	-	-	-	-	2	1
160	-	-	-	-	-	-	-	-	3	-	2	6	5
161	-	-	-	-	-	-	-	3	2	4	1	-	-
162	5	-	9	-	8	-	3	-	-	3	2	-	5
163	-	-	-	-	-	-	-	-	-	-	1	-	-
164	1	-	2	-	-	-	5	1	-	2	-	-	-
165	1	-	-	-	4	-	-	1	10	2	12	3	-
166	4	-	7	3	1	-	-	2	-	8	10	2	2
167	7	-	-	-	-	-	-	2	-	-	-	-	4
168	-	-	-	-	27	5	3	-	-	2	-	-	-
169	-	-	-	-	-	-	-	-	-	2	-	-	-
170	1	-	-	2	-	-	-	-	3	4	2	1	-
171	1	-	-	-	2	-	-	-	-	-	-	-	-
172	1	-	2	21	1	10	8	4	-	-	1	1	3
173	-	-	-	-	-	-	1	-	-	-	-	-	-
174	-	4	-	1	3	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-	-	-	-	-
176	6	-	-	9	-	-	2	-	6	-	2	4	-
177	-	-	-	-	-	-	-	-	-	-	-	-	-
178	-	8	-	-	-	5	-	3	-	1	-	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	2	1	-	-	-	-	-	-	-
181	-	1	-	-	-	1	-	-	1	-	1	-	-
182	-	1	1	-	-	1	2	-	-	-	2	-	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	2	-	-	-	-
186	1	3	1	-	-	1	2	-	-	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	1	-	-	-	-	-	-	-	-	1	-
192	-	-	-	-	-	-	-	-	-	1	-	1	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	2	3	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	28	17	23	36	49	24	28	18	30	29	37	21	23

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

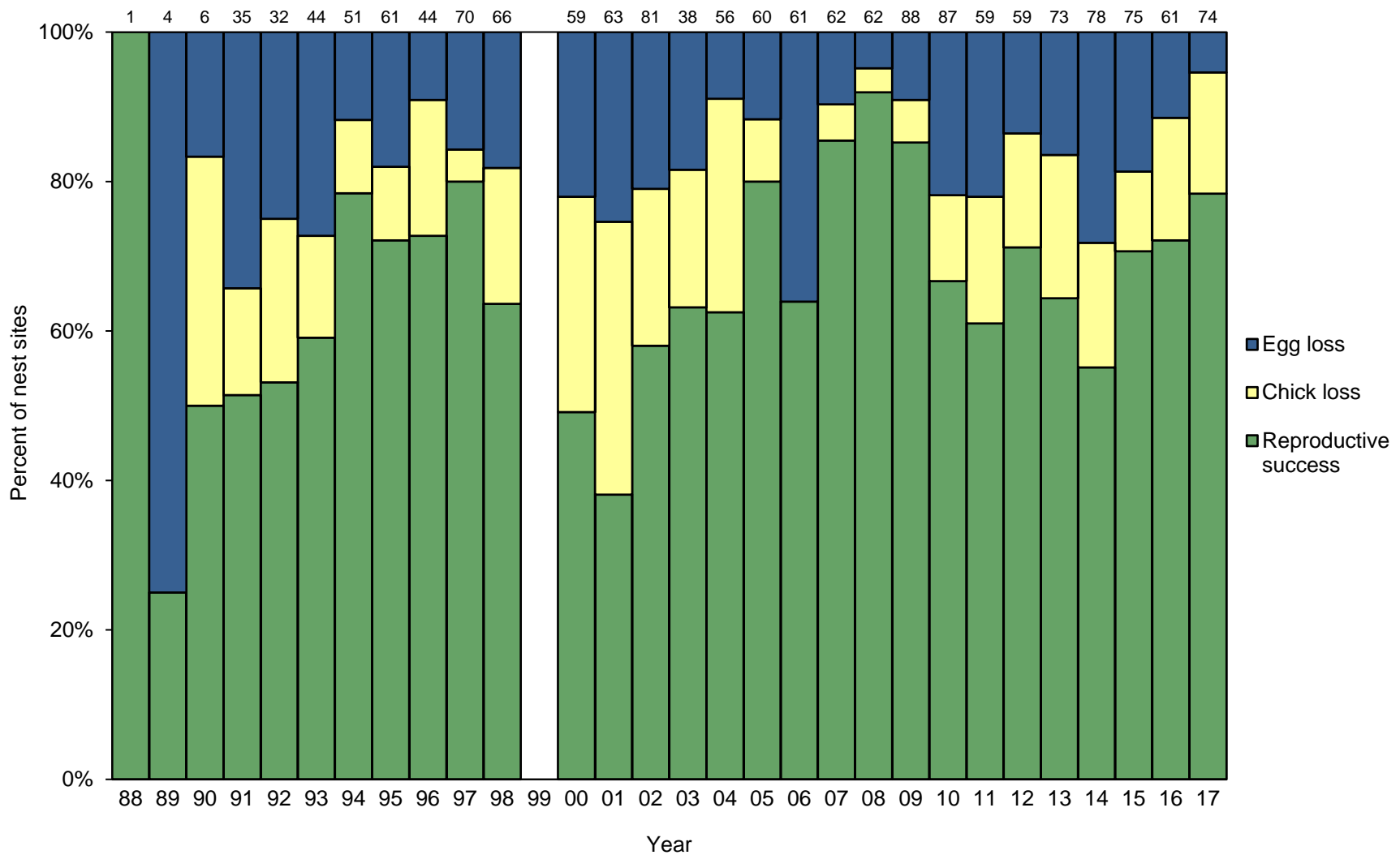


Figure 19. Reproductive performance of whiskered auklets at Buldir Island, Alaska. Egg loss= $(B-D)/B$; Chick loss= $(D-F)/B$; Reproductive success= F/B , where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1977-1987 or 1999; chick loss and reproductive success data are not available in 1976.

Table 26. Reproductive performance of whiskered auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999.

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	7	6	-	0.86	-	-
1988	1	1	1	1.00	1.00	1.00
1989	4	1	1	0.25	1.00	0.25
1990	6	5	3	0.83	0.60	0.50
1991	35	23	18	0.66	0.78	0.51
1992	32	24	17	0.75	0.71	0.53
1993	44	32	26	0.73	0.81	0.59
1994	51	45	40	0.88	0.89	0.78
1995	61	50	44	0.82	0.88	0.72
1996	44	40	32	0.91	0.80	0.73
1997	70	59	56	0.84	0.95	0.80
1998	66	54	42	0.82	0.78	0.64
2000	59	46	29	0.78	0.63	0.49
2001	63	47	24	0.75	0.51	0.38
2002	81	64	47	0.79	0.73	0.58
2003	38	31	24	0.82	0.77	0.63
2004	56	51	35	0.91	0.69	0.63
2005	60	53	48	0.88	0.91	0.80
2006	61	39	39	0.64	1.00	0.64
2007	62	56	53	0.90	0.95	0.85
2008	62	59	57	0.95	0.97	0.92
2009	88	80	75	0.91	0.94	0.85
2010	87	68	58	0.78	0.85	0.67
2011	59	46	36	0.78	0.78	0.61
2012	59	51	42	0.86	0.82	0.71
2013	73	61	47	0.84	0.77	0.64
2014	78	56	43	0.72	0.77	0.55
2015	75	61	53	0.81	0.87	0.71
2016	61	54	44	0.89	0.81	0.72
2017	74	70	58	0.95	0.83	0.78

^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).

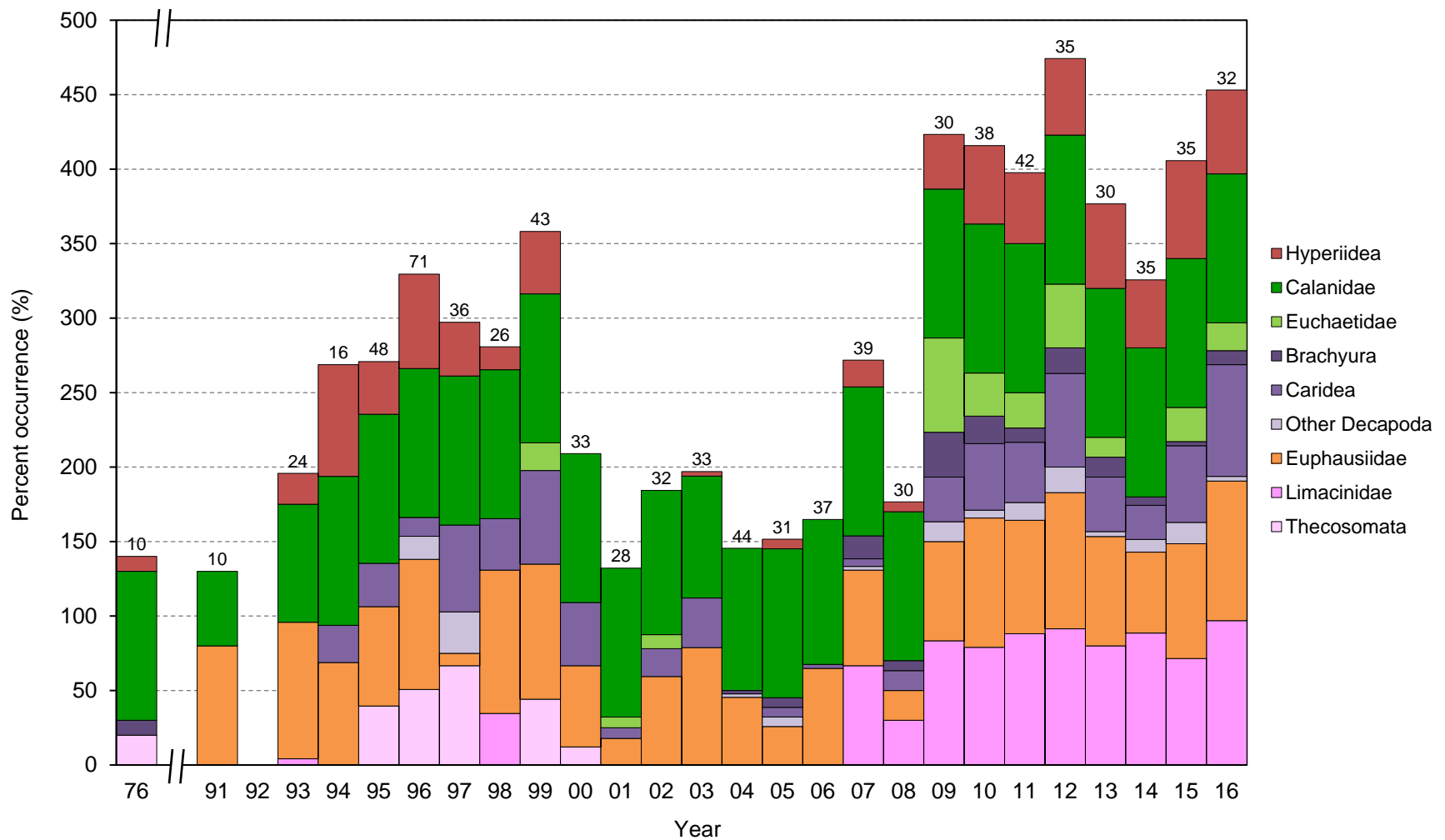


Figure 20. Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1977-1990 or 1992; samples were collected in 2017 but have not yet been analyzed.

Table 27. Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; samples were collected in 1917 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1976	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	10	10	24	16	48	71	36	26	43	33	28	32	33	44
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	100.0
Amphipoda	20.0	-	20.8	75.0	35.4	64.8	36.1	15.4	41.9	-	-	-	9.1	-
Hyperiid	10.0	-	20.8	75.0	35.4	63.4	36.1	15.4	41.9	-	-	-	3.0	-
<i>Primno macropa</i>	-	-	4.2	68.8	-	-	36.1	15.4	41.9	-	-	-	-	-
Other Hyperiid	10.0	-	16.7	12.5	35.4	63.4	2.8	-	-	-	-	-	3.0	-
Other Amphipoda	10.0	-	-	-	-	4.2	-	-	-	-	-	-	6.1	-
Copepoda	100.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	81.8	95.5
Calanidae	100.0	50.0	79.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9	81.8	95.5
<i>Neocalanus cristatus</i>	10.0	-	45.8	100.0	93.8	74.6	75.0	96.2	97.7	97.0	82.1	90.6	39.4	29.5
<i>N. plumchrus/flemengeri</i>	90.0	50.0	62.5	93.8	93.8	97.2	100.0	88.5	83.7	97.0	100.0	65.6	66.7	88.6
Unid. Calanidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	4.2	-	-	-	-	42.4	-	-	-	-
Euchaetidae	-	-	-	-	-	-	-	-	18.6	-	7.1	9.4	-	-
<i>Paraeuchaeta elongata</i>	-	-	-	-	-	-	-	-	18.6	-	7.1	9.4	-	-
Other Euchaetidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Copepoda	20.0	-	20.8	-	2.1	-	-	-	16.3	-	-	-	-	-
Decapoda	10.0	-	-	25.0	29.2	23.9	69.4	34.6	62.8	42.4	7.1	18.8	33.3	4.5
Brachyura	10.0	-	-	-	-	-	-	-	-	-	-	-	-	2.3
Caridea	-	-	-	25.0	29.2	12.7	58.3	34.6	62.8	42.4	7.1	18.8	33.3	-
Hippolytidae	-	-	-	-	-	-	-	-	16.3	-	-	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	2.3	-	7.1	15.6	33.3	-
Unid. Caridea	-	-	-	25.0	29.2	12.7	58.3	34.6	58.1	42.4	-	3.1	3.0	-
Other Caridea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Decapoda	-	-	-	-	-	15.5	27.8	-	-	-	-	-	-	2.3
Euphausiacea	-	80.0	91.7	68.8	66.7	87.3	8.3	96.2	90.7	54.5	17.9	59.4	78.8	45.5
Euphausiidae	-	80.0	91.7	68.8	66.7	87.3	8.3	96.2	90.7	54.5	17.9	59.4	78.8	45.5
<i>Euphausia pacifica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa inermis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. inspinata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. longipes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	-	80.0	91.7	68.8	-	-	-	-	-	-	-	12.5	24.2	6.8
Unid. Euphausiidae	-	-	-	-	66.7	87.3	8.3	96.2	90.7	54.5	17.9	56.3	57.6	40.9
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gastropoda	20.0	-	4.2	25.0	39.6	50.7	66.7	34.6	44.2	12.1	-	-	-	-
Limacinidae	-	-	4.2	-	-	-	-	34.6	-	-	-	-	-	-
<i>Limacina helicina</i>	-	-	4.2	-	-	-	-	-	-	-	-	-	-	-
Other Limacinidae	-	-	-	-	-	-	-	34.6	-	-	-	-	-	-

Table 27 (continued). Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; 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	31	37	39	30	30	38	42	35	30	35	35	32	37
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	<i>pending</i>
Amphipoda	6.5	-	17.9	6.7	40.0	52.6	47.6	54.3	66.7	45.7	65.7	56.3	-
Hyperiid	6.5	-	17.9	6.7	36.7	52.6	47.6	51.4	56.7	45.7	65.7	56.3	-
<i>Primno macropa</i>	-	-	15.4	-	30.0	50.0	47.6	51.4	53.3	45.7	62.9	56.3	-
Other Hyperiid	6.5	-	2.6	6.7	16.7	5.3	4.8	2.9	6.7	-	8.6	3.1	-
Other Amphipoda	-	-	-	-	3.3	-	-	2.9	13.3	2.9	-	-	-
Copepoda	100.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-
Calanidae	100.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-
<i>Neocalanus cristatus</i>	35.5	67.6	53.8	73.3	100.0	89.5	88.1	94.3	100.0	65.7	94.3	100.0	-
<i>N. plumchrus/flemengeri</i>	100.0	83.8	100.0	96.7	100.0	97.4	97.6	100.0	100.0	100.0	91.4	96.9	-
Unid. Calanidae	-	-	76.9	100.0	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	3.3	-	4.8	-	-	-	-	-	-
Euchaetidae	-	-	-	-	63.3	28.9	23.8	42.9	13.3	-	22.9	18.8	-
<i>Paraeuchaeta elongata</i>	-	-	-	-	-	28.9	23.8	42.9	13.3	-	22.9	18.8	-
Other Euchaetidae	-	-	-	-	63.3	-	-	-	-	-	-	-	-
Other Copepoda	-	-	2.6	-	13.3	2.6	7.1	11.4	6.7	2.9	2.9	3.1	-
Decapoda	12.9	2.7	15.4	20.0	46.7	52.6	47.6	71.4	40.0	28.6	57.1	78.1	-
Brachyura	6.5	-	15.4	6.7	30.0	18.4	9.5	17.1	13.3	5.7	2.9	9.4	-
Caridea	6.5	2.7	5.1	13.3	30.0	44.7	40.5	62.9	36.7	22.9	51.4	75.0	-
Hippolytidae	-	-	2.6	3.3	26.7	34.2	28.6	54.3	23.3	17.1	22.9	43.8	-
Pandalidae	-	2.7	2.6	6.7	20.0	36.8	31.0	34.3	10.0	5.7	37.1	59.4	-
Unid. Caridea	6.5	-	2.6	3.3	-	2.6	4.8	5.7	6.7	-	2.9	6.3	-
Other Caridea	-	-	2.6	-	10.0	-	7.1	2.9	-	5.7	-	-	-
Other Decapoda	6.5	-	2.6	-	13.3	5.3	11.9	17.1	3.3	8.6	14.3	3.1	-
Euphausiacea	25.8	64.9	64.1	20.0	66.7	86.8	76.2	91.4	73.3	54.3	77.1	93.8	-
Euphausiidae	25.8	64.9	64.1	20.0	66.7	86.8	76.2	91.4	73.3	54.3	77.1	93.8	-
<i>Euphausia pacifica</i>	-	-	2.6	-	33.3	28.9	16.7	34.3	13.3	8.6	28.6	25.0	-
<i>Thysanoessa inermis</i>	-	-	0.0	-	33.3	5.3	38.1	42.9	-	-	-	12.5	-
<i>T. inspinata</i>	-	-	5.1	-	10.0	55.3	23.8	31.4	60.0	25.7	57.1	71.9	-
<i>T. longipes</i>	-	-	12.8	-	63.3	50.0	50.0	48.6	13.3	20.0	22.9	12.5	-
<i>Thysanoessa</i> spp.	-	-	5.1	3.3	60.0	34.2	11.9	28.6	6.7	14.3	17.1	31.3	-
Unid. Euphausiidae	25.8	64.9	46.2	20.0	-	31.6	52.4	48.6	26.7	25.7	20.0	34.4	-
Other Euphausiidae	3.2	-	2.6	-	3.3	2.6	-	5.7	-	-	-	34.4	-
Gastropoda	-	-	66.7	30.0	83.3	78.9	88.1	91.4	80.0	88.6	71.4	96.9	-
Limacinidae	-	-	66.7	30.0	83.3	78.9	88.1	91.4	80.0	88.6	71.4	96.9	-
Limacina helicina	-	-	66.7	30.0	83.3	78.9	88.1	91.4	80.0	88.6	71.4	96.9	-
Other Limacinidae	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 27 (continued). Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; 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	1976	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Thecosomata	20.0	-	-	-	39.6	50.7	66.7	-	44.2	12.1	-	-	-	-
Other Gastropoda	-	-	-	25.0	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	30.0	-	-	-	-	1.4	-	-	-	-	-	-	-	-
Fish	10.0	-	4.2	-	6.3	-	-	-	2.3	-	-	-	-	-
Other	-	-	4.2	-	-	-	-	-	2.3	-	-	-	39.4	-

Table 27 (continued). Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; 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
Thecosomata	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	-	2.4	-	-	-	2.9	-	-
Other Invertebrates	-	-	-	-	-	-	-	-	-	2.9	-	3.1	-
Fish	-	-	-	-	-	10.5	7.1	8.6	3.3	25.7	8.6	9.4	-
Other	-	-	-	-	-	-	-	-	3.3	5.7	-	3.1	-

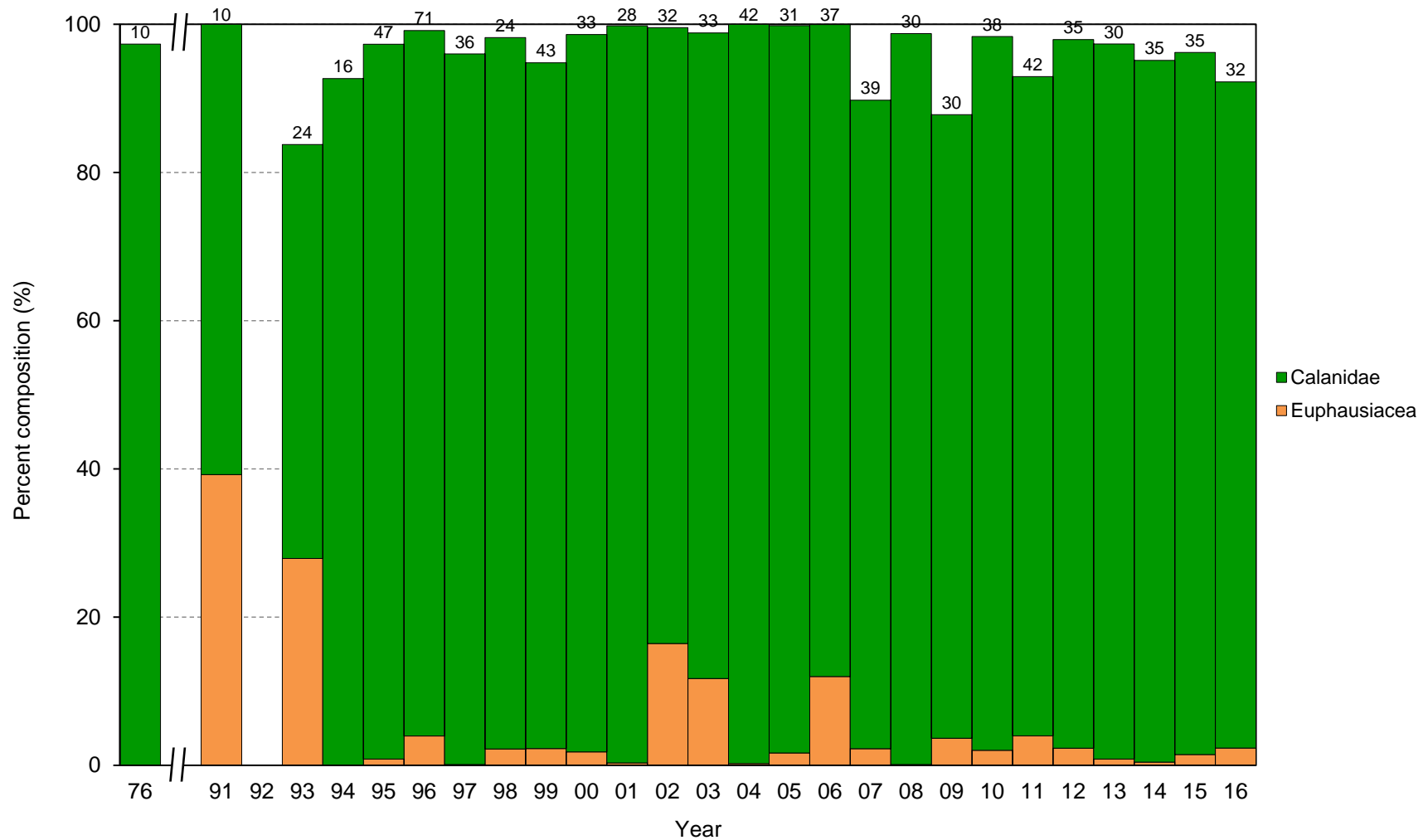


Figure 21. Percent composition of major prey items in diets of whiskered auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1977-1990 or 1992; samples were collected in 2017 but have not yet been analyzed.

Table 28. Percent composition of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; 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	1976	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	10	10	24	16	47	71	36	24	43	33	28	32	33	42
No. individuals	2282	920	5404	3477	32410	53729	30973	11138	20109	17217	14269	18074	13076	11163
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	100.0
Copepoda	97.4	60.8	71.3	92.7	96.7	95.2	95.9	96.0	94.3	96.8	99.6	83.3	87.1	99.8
Calanidae	97.3	60.8	55.8	92.7	96.5	95.2	95.9	96.0	92.5	96.8	99.5	83.1	87.1	99.8
<i>Neocalanus cristatus</i>	1.0	-	12.8	44.7	15.7	9.7	3.6	39.6	56.7	34.9	23.1	43.0	4.4	4.5
<i>N. plumchrus/flemengeri</i>	96.3	60.8	43.0	47.9	80.7	85.5	92.2	56.4	35.8	59.4	76.3	40.1	82.7	95.2
Other Calanidae	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-
Other Copepoda	0.1	-	15.5	-	0.2	-	-	-	1.8	-	0.2	0.2	-	-
Euphausiacea	-	39.2	27.9	-	0.8	4.0	0.1	2.2	2.3	1.8	0.3	16.4	11.7	0.2
Other Invertebrates	2.6	-	0.7	7.3	2.5	0.8	4.0	1.8	3.4	1.4	-	0.2	1.2	-
Fish	<0.1	-	<0.1	-	<0.1	-	-	-	<0.1	-	-	-	-	-
Other	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-

Table 28 (continued). Percent composition of major prey items in diets of whiskered auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1977-1990 or 1992; 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	31	37	39	30	30	38	42	35	30	35	35	32	37
No. individuals	22699	13085	19571	23333	57898	35681	23391	32631	27486	27836	22401	22776	pending
Invertebrates	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	-
Copepoda	98.1	88.0	87.5	98.6	85.0	96.4	89.2	95.9	96.6	94.7	94.8	90.0	-
Calanidae	98.1	88.0	87.5	98.6	84.1	96.3	89.0	95.6	96.5	94.7	94.7	89.9	-
<i>Neocalanus cristatus</i>	4.2	20.3	2.1	12.9	7.1	5.2	15.3	6.0	4.2	0.9	15.2	18.0	-
<i>N. plumchrus/flemengeri</i>	93.9	67.7	73.6	67.9	76.7	91.1	73.6	89.6	92.3	93.8	79.5	71.9	-
Other Calanidae	-	-	11.8	17.9	0.4	-	<0.1	-	-	-	-	-	-
Other Copepoda	-	-	<0.1	-	0.9	0.1	0.3	0.3	<0.1	<0.1	0.1	0.1	-
Euphausiacea	1.7	12.0	2.2	0.1	3.7	2.0	4.0	2.3	0.8	0.4	1.5	2.3	-
Other Invertebrates	0.2	-	12.5	1.4	15.0	3.6	10.8	4.1	3.4	5.3	5.2	10.0	-
Fish	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	-
Other	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-

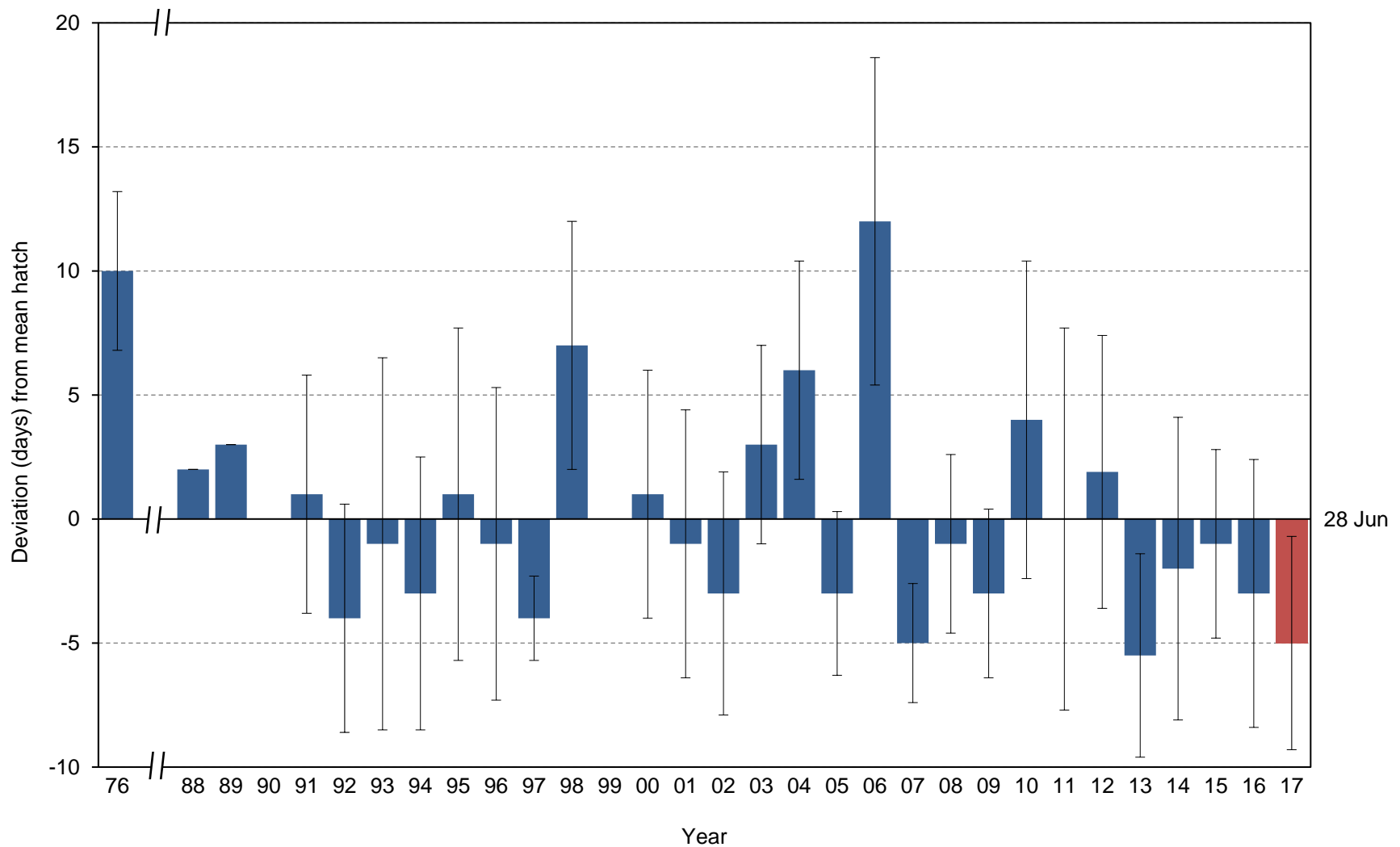


Figure 22. Yearly hatch date deviation (from the 1988-2016 average of 28 June) for crested auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1977-1986 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Table 29. Breeding chronology of crested auklets at Buldir Island, Alaska. No data were collected in 1977-1986 or 1999; no hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge ^b
1976 ^c	7 Jul	3.2	36	2 Jul	14 Jul	-
1988	30 Jun	0.0	3	30 Jun	-	>28 Jul
1989	1 Jul	0.0	1	1 Jul	-	24 Jul
1991	29 Jun	4.8	6	21 Jun	5 Jul	25 Jul
1992	23 Jun	4.6	7	16 Jun	3 Jul	19 Jul
1993	27 Jun	7.5	10	22 Jun	16 Jul	19 Jul
1994	25 Jun	5.5	36	19 Jun	9 Jul	23 Jul
1995	29 Jun	6.7	48	21 Jun	21 Jul	26 Jul
1996	26 Jun	6.3	14	16 Jun	12 Jul	19 Jul
1997	24 Jun	1.7	5	21 Jun	26 Jun	16 Jul
1998	5 Jul	5.0	10	25 Jun	9 Jul	27 Jul
2000	28 Jun	5.0	20	12 Jun	8 Jul	22 Jul
2001	27 Jun	5.4	14	15 Jun	7 Jul	20 Jul
2002	25 Jun	4.9	23	17 Jun	5 Jul	14 Jul
2003	1 Jul	4.0	6	23 Jun	4 Jul	21 Jul
2004	3 Jul	4.4	18	26 Jun	12 Jul	30 Jul
2005	25 Jun	3.3	29	20 Jun	5 Jul	21 Jul
2006	10 Jul	6.6	26	27 Jun	27 Jul	26 Jul
2007	23 Jun	2.4	31	21 Jun	1 Jul	18 Jul
2008	26 Jun	3.6	34	20 Jun	5 Jul	23 Jul
2009	25 Jun	3.4	45	17 Jun	5 Jul	21 Jul
2010	2 Jul	6.4	24	17 Jun	23 Jul	18 Jul
2011	28 Jun	7.7	29	13 Jun	19 Jul	19 Jul
2012	29 Jun	5.5	27	18 Jun	12 Jul	23 Jul
2013	23 Jun	4.1	13	15 Jun	1 Jul	29 Jul
2014	26 Jun	6.1	14	20 Jun	13 Jul	22 Jul
2015	27 Jun	3.8	52	18 Jun	7 Jul	24 Jul
2016	24 Jun	5.4	35	20 Jun	9 Jul	15 Jul
2017	23 Jun	4.3	39	16 Jun	13 Jul	18 Jul

^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 last nest check, date of first fledge is listed as > the date of last nest check.

^cHatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 30. Frequency distribution of hatch dates for crested auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1986 or 1999 and no hatch dates were recorded with the appropriate egg to chick interval in 1990; data from individual nests are not available for 1976.

Julian date ^a	No. nests hatching on Julian date													
	88	89	91	92	93	94	95	96	97	98	00	01	02	03
164	-	-	-	-	-	-	-	-	-	-	1	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	1	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	1	-	-	-	1	-	-	-	-	3	-
169	-	-	-	-	-	-	-	1	-	-	-	-	-	-
170	-	-	-	-	-	8	-	-	-	-	-	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	1	-	-	-	2	-	1	-	-	-	1	-
173	-	-	-	-	1	-	-	-	-	-	-	3	-	-
174	-	-	-	-	-	-	-	2	-	-	-	-	7	1
175	-	-	-	5	7	23	-	2	1	-	1	-	-	-
176	-	-	-	-	-	-	-	-	2	1	-	-	-	-
177	-	-	-	-	-	-	32	-	1	-	-	-	-	-
178	-	-	2	-	-	1	-	-	-	-	1	-	6	-
179	-	-	-	-	-	-	-	-	-	1	10	6	-	-
180	-	-	-	-	-	-	-	-	-	-	-	1	2	2
181	-	-	-	-	-	-	1	5	-	-	-	-	1	-
182	3	1	-	-	-	-	-	2	-	1	-	-	1	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	2	-	-	-	8	-	-	-	6	2	-	-
185	-	-	-	1	-	-	-	-	-	1	-	-	-	3
186	-	-	1	-	-	-	-	-	-	1	-	-	2	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	1	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	1	4	1	-	-	5	1	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	1	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	1	-	2	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	2	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	3	1	6	7	10	36	48	14	5	10	20	14	23	6

Table 30 (continued). Frequency distribution of hatch dates for crested auklets at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No data were collected in 1977-1986 or 1999 and no hatch dates were recorded with the appropriate egg to chick interval in 1990; data from individual nests are not available for 1976.

Julian date ^a	No. nests hatching on Julian date													
	04	05	06	07	08	09	10	11	12	13	14	15	16	17
164	-	-	-	-	-	-	-	1	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	1	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	1
168	-	-	-	-	-	1	1	1	-	-	-	-	-	-
169	-	-	-	-	-	-	-	-	-	-	-	1	-	-
170	-	-	-	-	-	-	-	1	1	1	-	-	-	1
171	-	4	-	-	-	-	-	-	-	-	2	-	-	-
172	-	-	-	16	2	-	-	1	-	6	1	5	14	26
173	-	1	-	-	-	-	-	2	-	-	-	-	-	-
174	-	2	-	-	-	28	-	1	-	1	5	1	-	-
175	-	-	-	1	-	-	-	-	2	1	-	2	-	-
176	-	14	-	13	18	-	-	3	1	1	-	22	14	2
177	-	-	-	-	-	3	-	4	2	-	-	-	-	-
178	1	1	1	-	-	4	7	2	4	-	2	-	1	7
179	-	1	-	-	1	-	-	1	6	-	-	2	1	-
180	-	5	-	-	-	7	-	3	-	-	1	2	1	1
181	1	-	-	-	-	-	-	-	1	1	-	-	-	-
182	8	-	3	1	11	-	9	3	-	1	-	16	-	-
183	-	-	-	-	-	-	-	-	4	-	1	-	-	-
184	-	-	-	-	-	-	-	1	1	-	1	-	-	-
185	-	-	-	-	1	-	-	-	-	-	-	-	-	-
186	-	1	6	-	-	2	4	-	-	-	-	-	1	-
187	-	-	-	-	1	-	-	-	1	-	-	-	-	-
188	6	-	-	-	-	-	-	2	1	-	-	1	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	2	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	1	-	-	-	3	-
192	-	-	10	-	-	-	-	-	1	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	2	-	-	-	-	-	-	2	1	-	1	-	-	1
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	4	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	1	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	1	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	1	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	18	29	26	31	34	45	24	29	27	13	14	52	35	39

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

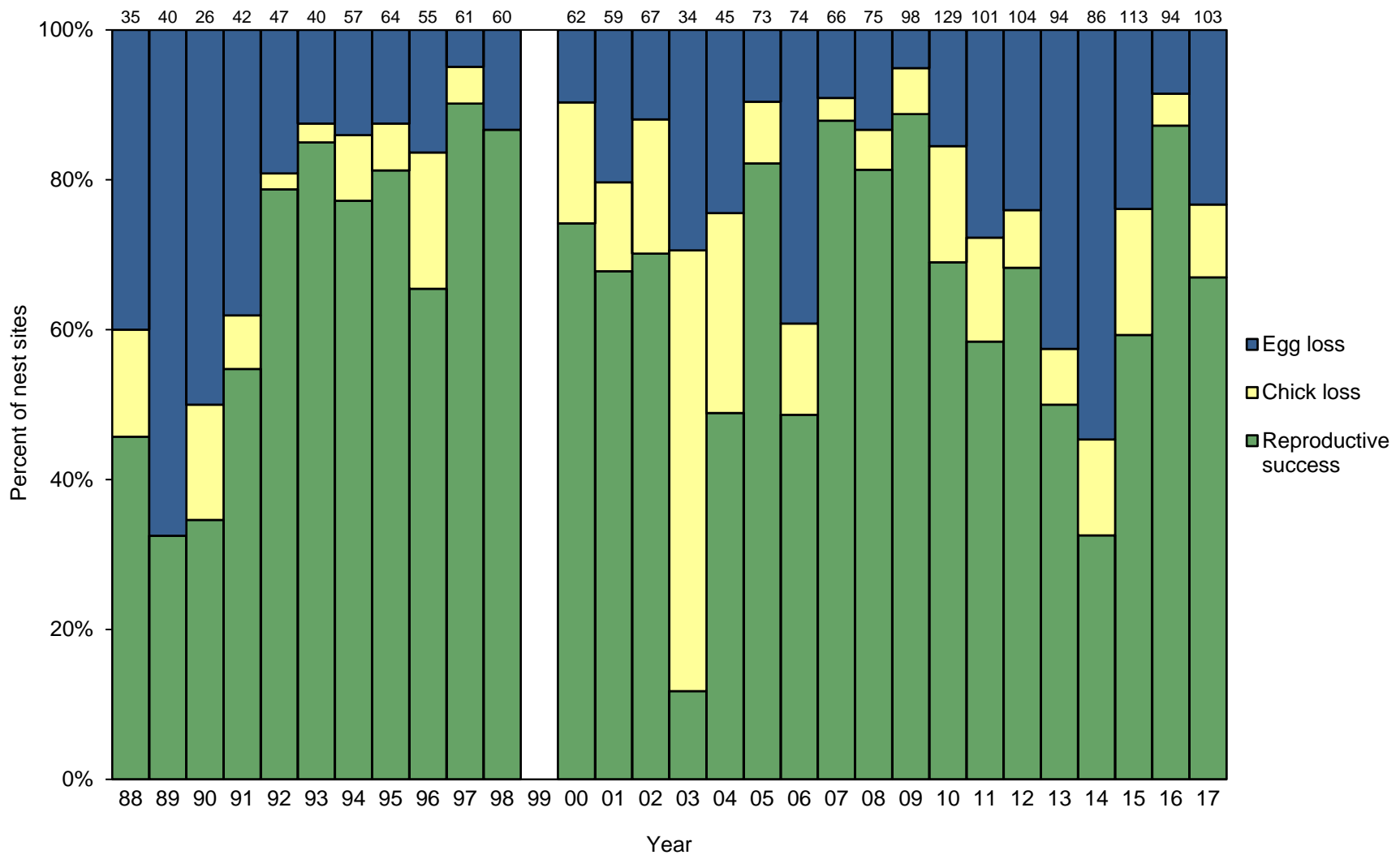


Figure 23. Reproductive performance of crested auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected in 1977-1987 or 1999; chick loss and reproductive success data are not available in 1976.

Table 31. Reproductive performance of crested auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999.

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	59	45	-	0.76	-	-
1988	35	21	16	0.60	0.76	0.46
1989	40	13	13	0.33	1.00	0.33
1990	26	13	9	0.50	0.69	0.35
1991	42	26	23	0.62	0.88	0.55
1992	47	38	37	0.81	0.97	0.79
1993	40	35	34	0.88	0.97	0.85
1994	57	49	44	0.86	0.90	0.77
1995	64	56	52	0.88	0.93	0.81
1996	55	46	36	0.84	0.78	0.65
1997	61	58	55	0.95	0.95	0.90
1998	60	52	52	0.87	1.00	0.87
2000	62	56	46	0.90	0.82	0.74
2001	59	47	40	0.80	0.85	0.68
2002	67	59	47	0.88	0.80	0.70
2003	34	24	4	0.71	0.17	0.12
2004	45	34	22	0.76	0.65	0.49
2005	73	66	60	0.90	0.91	0.82
2006	74	45	36	0.61	0.80	0.49
2007	66	60	58	0.91	0.97	0.88
2008	75	65	61	0.87	0.94	0.81
2009	98	93	87	0.95	0.94	0.89
2010	129	109	89	0.84	0.82	0.69
2011	101	73	59	0.72	0.81	0.58
2012	104	79	71	0.76	0.90	0.68
2013	94	54	47	0.57	0.87	0.50
2014	86	39	28	0.45	0.72	0.33
2015	113	86	67	0.76	0.78	0.59
2016	94	86	82	0.91	0.95	0.87
2017	103	79	69	0.77	0.87	0.67

^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).

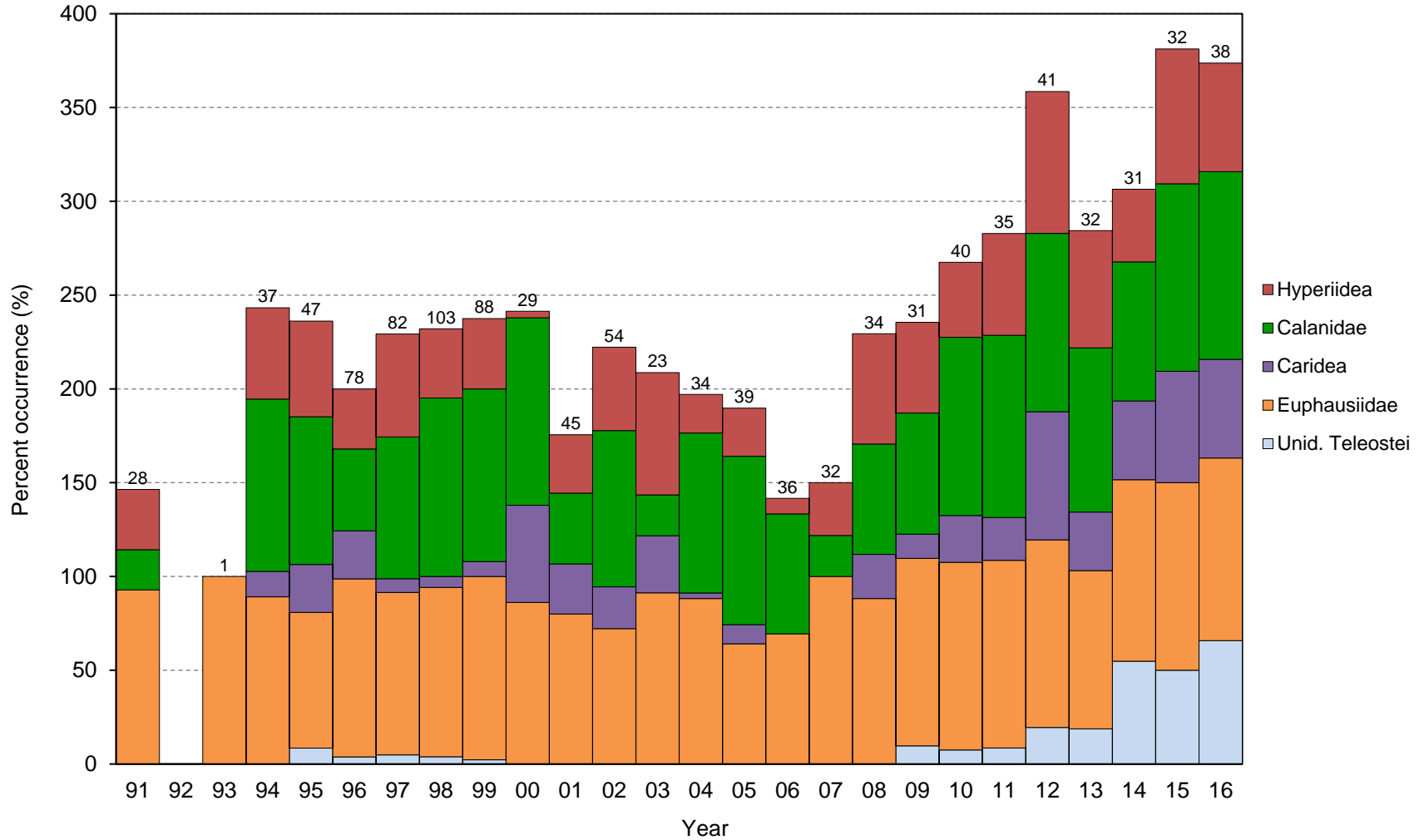


Figure 24. Frequency of occurrence of major prey items in diets of crested auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1992; samples were collected in 2017 but have not yet been analyzed.

Table 32. Frequency of occurrence of major prey items in diets of crested auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1992; 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	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	28	1	37	47	78	82	103	88	29	45	54	23	34
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	32.1	-	48.6	51.1	32.1	54.9	36.9	37.5	3.4	31.1	44.4	65.2	20.6
Hyperiidea	32.1	-	48.6	51.1	32.1	54.9	36.9	37.5	3.4	31.1	44.4	65.2	20.6
<i>Primno macropa</i>	-	-	21.6	-	-	-	-	1.1	-	-	1.9	-	-
<i>Themisto pacifica</i>	7.1	-	43.2	51.1	32.1	54.9	36.9	37.5	3.4	15.6	25.9	-	20.6
<i>Themisto</i> spp.	25.0	-	-	-	-	-	-	-	-	15.6	22.2	65.2	-
Other Hyperiidea	-	-	-	-	2.6	-	-	-	-	-	3.7	-	-
Other Amphipoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	35.7	-	91.9	78.7	43.6	75.6	95.1	92.0	100.0	37.8	83.3	21.7	85.3
Calanidae	21.4	-	91.9	78.7	43.6	75.6	95.1	92.0	100.0	37.8	83.3	21.7	85.3
<i>Neocalanus cristatus</i>	14.3	-	91.9	78.7	34.6	72.0	94.2	92.0	100.0	33.3	83.3	8.7	85.3
<i>N. plumchrus/flemengeri</i>	7.1	-	16.2	6.4	17.9	45.1	45.6	15.9	79.3	26.7	35.2	17.4	2.9
Other Calanidae	-	-	-	-	-	-	-	-	-	2.2	-	-	-
Other Copepoda	14.3	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	-	-	16.2	25.5	30.8	15.9	6.8	13.6	51.7	26.7	25.9	30.4	2.9
Caridea	-	-	13.5	25.5	25.6	7.3	5.8	8.0	51.7	26.7	22.2	30.4	2.9
Hippolytidae	-	-	-	-	-	-	-	8.0	-	-	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	51.7	26.7	22.2	30.4	2.9
Other Caridea	-	-	13.5	25.5	25.6	7.3	5.8	-	-	-	-	-	-
Other Decapoda	-	-	2.7	4.3	9.0	12.2	1.0	6.8	-	-	3.7	-	-
Euphausiacea	92.9	100.0	89.2	72.3	94.9	86.6	90.3	97.7	86.2	80.0	72.2	91.3	88.2
Euphausiidae	92.9	100.0	89.2	72.3	94.9	86.6	90.3	97.7	86.2	80.0	72.2	91.3	88.2
<i>Euphausia pacifica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa inspinata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. longipes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. spinifera</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	92.9	100.0	89.2	-	-	-	-	-	-	28.9	24.1	65.2	8.8
Unid. Euphausiidae	-	-	-	72.3	94.9	86.6	90.3	97.7	69.0	55.6	63.0	26.1	73.5
Other Euphausiidae	-	-	-	-	-	-	-	-	17.2	-	-	-	5.9
Other Invertebrates	-	-	-	4.3	2.6	2.4	1.0	-	-	-	-	-	-
Fish	-	-	-	8.5	3.8	4.9	3.9	2.3	-	-	-	-	-
Teleostei	-	-	-	8.5	3.8	4.9	3.9	2.3	-	-	-	-	-
Unid. Teleostei	-	-	-	8.5	3.8	4.9	3.9	2.3	-	-	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	34.8	-

Table 32 (continued). Frequency of occurrence of major prey items in diets of crested auklet chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 1992; 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	39	36	32	34	31	40	35	41	32	31	32	38	47
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	<i>pending</i>
Amphipoda	25.6	8.3	28.1	58.8	48.4	40.0	54.3	75.6	62.5	38.7	71.9	57.9	-
Hyperiidea	25.6	8.3	28.1	58.8	48.4	40.0	54.3	75.6	62.5	38.7	71.9	57.9	-
<i>Primno macropa</i>	-	-	-	-	-	2.5	-	14.6	28.1	6.5	25.0	18.4	-
<i>Themisto pacifica</i>	2.6	5.6	6.3	32.4	41.9	35.0	54.3	65.9	46.9	35.5	68.8	55.3	-
<i>Themisto</i> spp.	23.1	2.8	25.0	14.7	-	-	-	-	3.1	3.2	-	-	-
Other Hyperiidea	-	-	-	17.6	12.9	5.0	-	31.7	9.4	-	-	-	-
Other Amphipoda	-	-	-	-	-	-	-	-	3.1	-	-	-	-
Copepoda	89.7	63.9	21.9	58.8	64.5	95.0	97.1	95.1	87.5	74.2	100.0	100.0	-
Calanidae	89.7	63.9	21.9	58.8	64.5	95.0	97.1	95.1	87.5	74.2	100.0	100.0	-
<i>Neocalanus cristatus</i>	87.2	61.1	21.9	50.0	64.5	92.5	97.1	92.7	81.3	32.3	100.0	100.0	-
<i>N. plumchrus/flemengeri</i>	35.9	8.3	-	2.9	19.4	22.5	20.0	39.0	34.4	74.2	53.1	31.6	-
Other Calanidae	5.1	-	-	20.6	-	-	2.9	2.4	-	-	-	-	-
Other Copepoda	-	-	-	-	-	-	2.9	9.8	-	3.2	3.1	-	-
Decapoda	10.3	-	-	26.5	16.1	25.0	25.7	70.7	31.3	41.9	62.5	52.6	-
Caridea	10.3	-	-	23.5	12.9	25.0	22.9	68.3	31.3	41.9	59.4	52.6	-
Hippolytidae	-	-	-	11.8	9.7	25.0	17.1	65.9	31.3	41.9	56.3	44.7	-
Pandalidae	10.3	-	-	8.8	6.5	5.0	-	4.9	-	-	18.8	15.8	-
Other Caridea	-	-	-	5.9	-	-	11.4	-	-	-	3.1	13.2	-
Other Decapoda	-	-	-	2.9	6.5	2.5	2.9	9.8	9.4	-	6.3	7.9	-
Euphausiacea	64.1	69.4	100.0	88.2	100.0	100.0	100.0	100.0	84.4	96.8	100.0	97.4	-
Euphausiidae	64.1	69.4	100.0	88.2	100.0	100.0	100.0	100.0	84.4	96.8	100.0	97.4	-
<i>Euphausia pacifica</i>	-	-	-	-	-	15.0	22.9	36.6	6.3	29.0	34.4	42.1	-
<i>Thysanoessa inspinata</i>	-	-	-	-	61.3	42.5	17.1	56.1	56.3	93.5	96.9	97.4	-
<i>T. longipes</i>	-	-	-	-	83.9	90.0	91.4	46.3	53.1	93.5	75.0	89.5	-
<i>T. spinifera</i>	-	-	-	-	35.5	2.5	20.0	26.8	-	3.2	12.5	47.4	-
<i>Thysanoessa</i> spp.	10.3	-	3.1	17.6	-	100.0	100.0	92.7	12.5	71.0	46.9	68.4	-
Unid. Euphausiidae	56.4	69.4	100.0	79.4	-	-	-	-	21.9	16.1	9.4	18.4	-
Other Euphausiidae	-	-	-	-	19.4	-	20.0	4.9	-	3.2	-	2.6	-
Other Invertebrates	-	-	-	-	9.7	-	2.9	7.3	18.8	6.5	28.1	2.6	-
Fish	-	-	3.1	2.9	58.1	7.5	8.6	19.5	18.8	54.8	50.0	65.8	-
Teleostei	-	-	3.1	2.9	58.1	7.5	8.6	19.5	18.8	54.8	50.0	65.8	-
Unid. Teleostei	-	-	-	-	9.7	7.5	8.6	19.5	18.8	54.8	50.0	65.8	-
Other Teleostei	-	-	3.1	2.9	51.6	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-

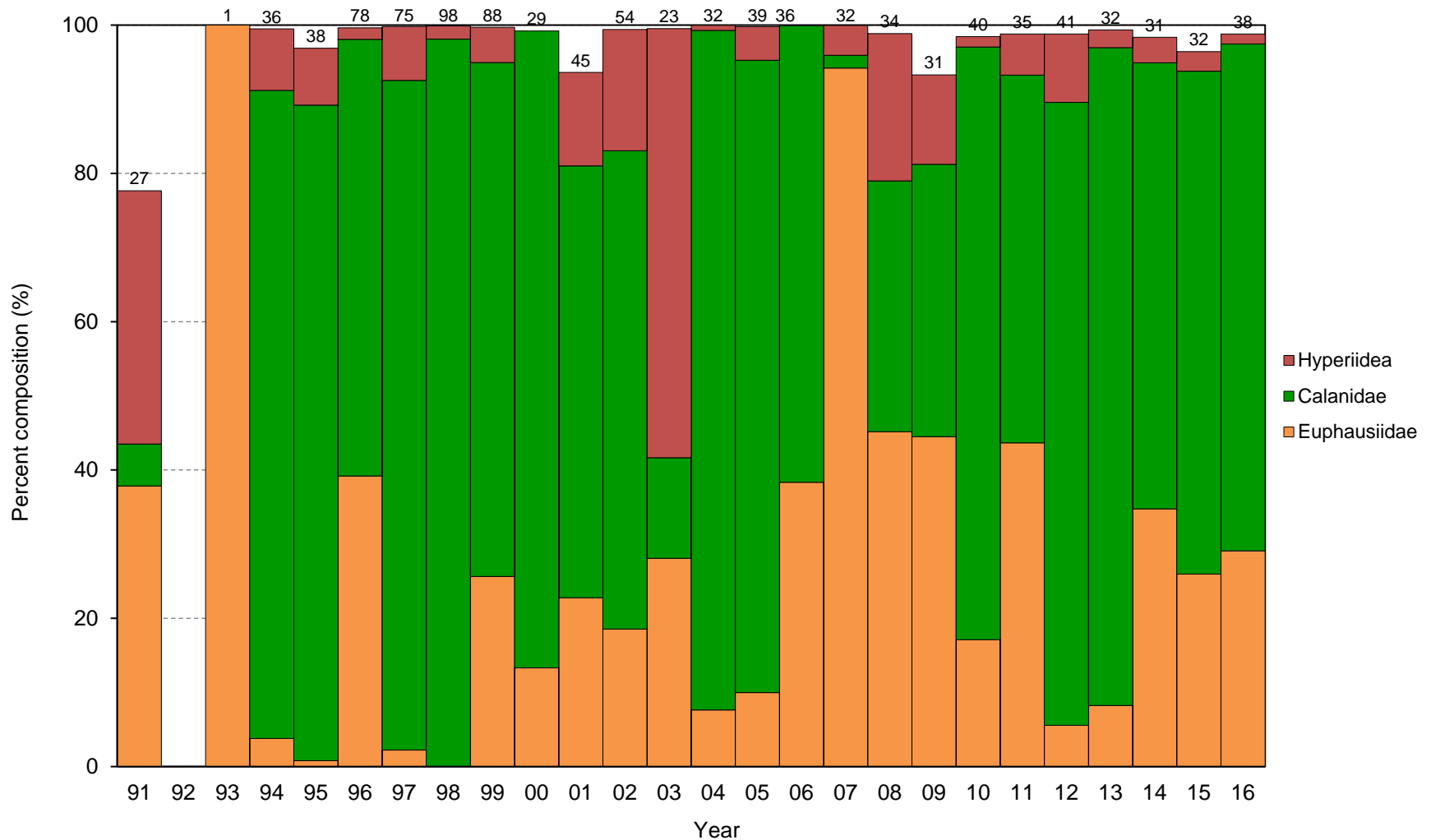


Figure 25. Percent composition of major prey items in diets of crested auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1992; samples were collected in 2017 but have not yet been analyzed.

Table 33. Percent composition of major prey items in diets of crested auklet chicks at Buldir 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. Count data are not always available for all samples or prey items so sample sizes for percent composition may not equal those for frequency of occurrence and some prey types may not appear in percent composition data although they were present in diet samples. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. No diet samples were collected in 1992; 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	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. samples	27	1	36	38	78	75	98	88	29	45	54	23	32
No. individuals	4262	120	9834	8155	22090	25045	28810	22275	11192	11932	23355	6308	5862
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	34.2	-	8.3	7.7	1.6	7.3	1.8	4.8	<0.1	12.6	16.4	57.9	0.7
Hyperidea	34.2	-	8.3	7.7	1.6	7.3	1.8	4.8	<0.1	12.6	16.4	57.9	0.7
<i>Themisto pacifica</i>	10.8	-	7.8	7.7	1.5	7.3	1.8	4.7	<0.1	11.8	15.1	-	0.7
Other Hyperidea	23.3	-	0.5	-	-	-	-	-	-	0.8	1.3	-	-
Other Amphipoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	28.0	-	87.4	88.4	58.9	90.3	98.1	69.3	85.9	58.2	64.5	13.6	91.6
Calanidae	5.7	-	87.4	88.4	58.9	90.3	98.1	69.3	85.9	58.2	64.5	13.6	91.6
<i>Neocalanus cristatus</i>	0.4	-	87.0	87.6	52.3	53.0	92.9	66.5	77.9	53.8	57.4	0.9	91.4
<i>N. plumchrus/flemengeri</i>	5.3	-	0.3	0.9	6.6	37.3	5.2	2.8	7.9	3.5	7.1	12.7	0.3
Other Calanidae	-	-	-	-	-	-	-	-	-	0.9	-	-	-
Other Copepoda	22.3	-	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	37.8	100.0	3.8	0.8	39.2	2.2	<0.1	25.6	13.3	22.8	18.5	28.1	7.6
Euphausiidae	37.8	100.0	3.8	0.8	39.2	2.2	<0.1	25.6	13.3	22.8	18.5	28.1	7.6
<i>Thysanoessa</i> spp.	37.8	100.0	3.8	-	-	-	-	-	-	7.1	1.6	17.2	0.7
Unid. Euphausiidae	-	-	-	0.8	39.2	2.2	<0.1	25.6	9.4	15.7	16.9	10.8	5.6
Other Euphausiidae	-	-	-	-	-	-	-	-	4.0	-	-	-	1.3
Other Invertebrates	-	-	0.5	3.1	0.3	0.2	0.1	0.3	0.8	6.4	0.6	0.5	-
Fish	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-

Table 33 (continued). Percent composition of major prey items in diets of crested auklet chicks at Buldir 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. Count data are not always available for all samples or prey items so sample sizes for percent composition may not equal those for frequency of occurrence and some prey types may not appear in percent composition data although they were present in diet samples. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. No diet samples were collected in 1992; 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	39	36	32	34	31	40	35	41	32	31	32	38	47
No. individuals	17525	11403	14447	11444	11136	24415	11581	54614	11715	6572	11656	12040	<i>pending</i>
Invertebrates	100.0	100.0	100.0	99.7	95.2	100.0	99.9	99.9	99.9	99.6	99.6	99.6	-
Amphipoda	4.5	0.1	4.0	19.9	12.1	1.4	5.5	9.2	2.4	3.4	2.6	1.3	-
Hyperiidea	4.5	0.1	4.0	19.9	12.1	1.4	5.5	9.2	2.4	3.4	2.6	1.3	-
<i>Themisto pacifica</i>	<0.1	<0.1	1.3	17.8	12.0	1.4	5.5	7.7	2.2	3.4	2.5	1.3	-
Other Hyperiidea	4.5	0.1	2.7	2.0	-	-	-	1.5	0.2	-	0.1	0.1	-
Other Amphipoda	-	-	-	-	-	-	-	-	<0.1	-	-	-	-
Copepoda	85.3	61.6	1.7	33.8	36.7	79.9	49.6	84.0	88.7	60.2	67.8	68.4	-
Calanidae	85.3	61.6	1.7	33.8	36.7	79.9	49.6	84.0	88.7	60.2	67.8	68.4	-
<i>Neocalanus cristatus</i>	81.7	57.7	1.7	31.6	33.8	65.3	45.7	60.3	66.1	5.2	52.4	62.3	-
<i>N. plumchrus/flemengeri</i>	2.8	3.9	-	0.3	3.0	14.6	3.8	23.7	22.6	54.9	15.4	6.1	-
Other Calanidae	0.8	-	-	1.9	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-
Euphausiacea	10.0	38.3	94.2	45.2	44.5	17.1	43.7	5.6	8.2	34.8	26.0	29.1	-
Euphausiidae	10.0	38.3	94.2	45.2	44.5	17.1	43.7	5.6	8.2	34.8	26.0	29.1	-
<i>Thysanoessa</i> spp.	2.3	-	0.3	4.1	-	9.0	28.2	2.7	0.1	5.0	1.1	5.5	-
Unid. Euphausiidae	7.7	38.3	93.9	41.1	-	-	-	-	0.6	0.1	0.1	0.4	-
Other Euphausiidae	-	-	-	-	44.5	8.1	15.4	2.8	7.6	29.6	24.8	23.2	-
Other Invertebrates	0.2	-	-	0.9	1.9	1.5	1.1	1.1	0.6	1.2	3.2	0.8	-
Fish	-	-	<0.1	0.3	4.8	<0.1	0.1	0.1	0.1	0.4	0.4	0.4	-

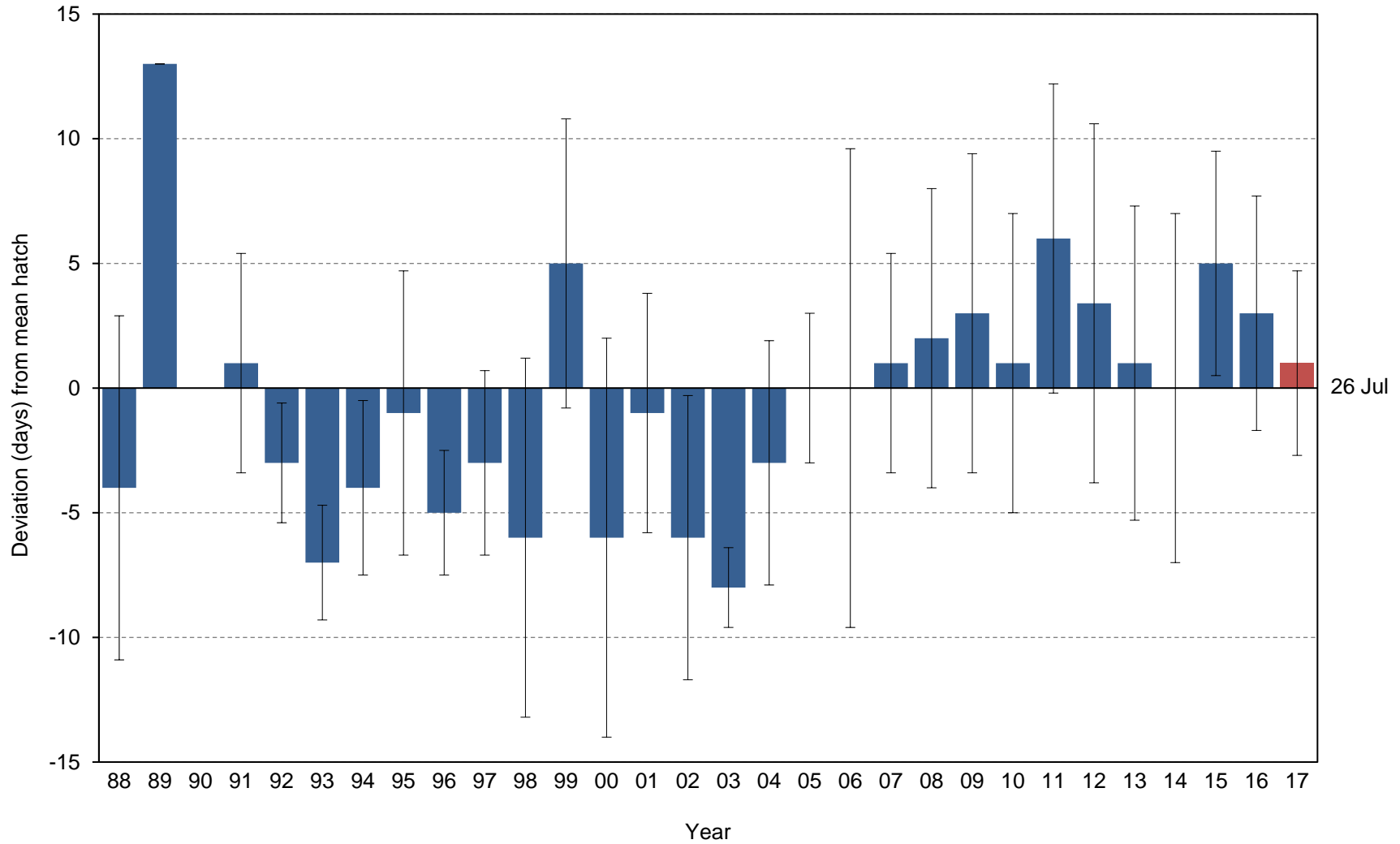


Figure 26. Yearly hatch date deviation (from the 1988-2016 average of 26 July) for horned puffins at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Table 34. Breeding chronology of horned puffins at Buldir Island, Alaska. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge ^b
1988	21 Jul	6.9	13	30 Jun	30 Jul	3 Sep
1989	8 Aug	0.0	1	8 Aug	-	>22 Aug
1990	-	-	-	-	-	>13 Aug
1991	27 Jul	4.4	11	19 Jul	4 Aug	>5 Aug
1992	22 Jul	2.4	6	20 Jul	26 Jul	>10 Aug
1993	19 Jul	2.3	6	15 Jul	23 Jul	28 Aug
1994	22 Jul	3.5	15	15 Jul	1 Aug	28 Aug
1995	25 Jul	5.7	10	15 Jul	4 Aug	>13 Aug
1996	20 Jul	2.5	14	13 Jul	26 Jul	>29 Jul
1997	23 Jul	3.7	5	19 Jul	29 Jul	>13 Aug
1998	20 Jul	7.2	16	5 Jul	2 Aug	>26 Aug
1999	31 Jul	5.8	7	23 Jul	8 Aug	>21 Aug
2000	19 Jul	8.0	21	2 Jul	1 Aug	>22 Aug
2001	25 Jul	4.8	8	19 Jul	6 Aug	>5 Aug
2002	20 Jul	5.7	28	10 Jul	2 Aug	>24 Aug
2003	18 Jul	1.6	5	15 Jul	19 Jul	23 Aug
2004	22 Jul	4.9	14	16 Jul	1 Aug	>18 Aug
2005	26 Jul	3.0	7	21 Jul	31 Jul	>24 Aug
2006	26 Jul	9.6	22	1 Jul	16 Aug	17 Aug
2007	27 Jul	4.4	18	17 Jul	4 Aug	>24 Aug
2008	27 Jul	6.0	21	19 Jul	13 Aug	>24 Aug
2009	29 Jul	6.4	25	19 Jul	11 Aug	>20 Aug
2010	27 Jul	6.0	14	18 Jul	5 Aug	21 Aug
2011	1 Aug	6.2	19	23 Jul	12 Aug	>18 Aug
2012	28 Jul	7.2	25	12 Jul	15 Aug	>24 Aug
2013	27 Jul	6.3	29	17 Jul	14 Aug	>24 Aug
2014	26 Jul	7.0	33	10 Jul	18 Aug	20 Aug
2015	31 Jul	4.5	48	23 Jul	10 Aug	>24 Aug
2016	28 Jul	4.7	42	19 Jul	12 Aug	>26 Aug
2017	27 Jul	3.7	38	19 Jul	6 Aug	>27 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.

Table 35. Frequency distribution of hatch dates for horned puffins at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No hatch dates were recorded with the appropriate egg to chick interval in 1990.

Julian date ^a	No. nests hatching on Julian date															
	88	89	91	92	93	94	95	96	97	98	99	00	01	02	03	
182	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
184	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
186	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
190	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	
191	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
194	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	
195	-	-	-	-	-	-	-	1	-	-	-	3	-	1	-	
196	-	-	-	-	1	1	1	-	-	2	-	1	-	-	1	
197	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
199	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	
200	1	-	1	-	4	-	-	-	2	3	-	3	1	9	4	
201	1	-	-	-	-	4	-	-	-	-	-	-	-	-	-	
202	2	-	1	3	-	-	4	12	-	-	-	-	-	-	-	
203	-	-	-	-	-	-	-	-	1	-	-	-	-	4	-	
204	1	-	-	-	1	8	-	-	-	3	2	1	2	1	-	
205	1	-	-	-	-	-	-	-	1	-	-	3	-	-	-	
206	3	-	3	2	-	1	-	-	-	2	-	-	4	1	-	
207	-	-	-	-	-	-	3	-	-	-	-	1	-	-	-	
208	2	-	2	1	-	-	-	1	-	-	-	-	-	2	-	
209	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	
210	-	-	-	-	-	-	-	-	1	2	1	1	-	-	-	
211	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
212	1	-	2	-	-	-	-	-	-	-	-	-	-	2	-	
213	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	
214	-	-	-	-	-	-	1	-	-	1	1	2	-	1	-	
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
216	-	-	1	-	-	-	1	-	-	-	2	-	-	-	-	
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
218	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
220	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>n</i>	13	1	11	6	6	15	10	14	5	16	7	21	8	28	5	

Table 35 (continued). Frequency distribution of hatch dates for horned puffins at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No hatch dates were recorded with the appropriate egg to chick interval in 1990.

Julian date ^a	No. nests hatching on Julian date													
	04	05	06	07	08	09	10	11	12	13	14	15	16	17
182	-	-	1	-	-	-	-	-	-	-	-	-	-	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189	-	-	1	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	1	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	1	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	2	-	-	1	-	-	-	-	-	1	2	-	-	-
199	-	-	-	-	-	-	3	-	-	-	-	-	-	-
200	1	-	-	-	-	1	-	-	-	1	1	-	-	1
201	1	-	-	-	4	-	-	-	1	-	-	-	1	-
202	2	1	4	1	-	3	1	-	-	6	-	-	1	-
203	-	-	-	-	-	-	-	-	1	-	-	-	1	3
204	4	-	-	1	-	-	1	3	3	4	15	5	1	3
205	-	-	1	3	1	-	-	-	-	2	1	-	2	-
206	-	3	6	1	-	4	1	-	-	5	-	2	3	6
207	-	-	-	3	7	-	-	1	-	-	1	-	-	2
208	1	1	2	2	-	6	1	1	5	-	-	-	14	12
209	-	-	-	1	-	1	-	1	-	-	-	13	-	-
210	1	1	-	-	-	1	3	-	4	-	5	6	1	1
211	-	-	-	1	4	-	-	1	-	-	-	-	-	1
212	-	1	3	2	-	-	-	4	5	4	2	1	1	4
213	1	-	-	-	2	1	-	-	-	-	-	-	12	-
214	1	-	-	-	-	3	3	-	-	2	1	12	2	4
215	-	-	-	-	-	-	-	2	-	-	-	-	-	-
216	-	-	1	2	-	1	-	1	-	2	-	3	-	-
217	-	-	-	-	2	1	1	-	-	-	2	1	-	-
218	-	-	1	-	-	-	-	2	1	1	-	1	1	1
219	-	-	-	-	-	-	-	-	-	-	1	-	-	-
220	-	-	-	-	-	-	-	-	1	-	-	3	1	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	1	2	-	-	1	-	-
223	-	-	1	-	-	3	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	2	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	1	-
226	-	-	-	-	1	-	-	-	-	1	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	1	-	-	-	-	-	1	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	1	-	-	-
<i>n</i>	14	7	22	18	21	25	14	19	25	29	33	48	42	38

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

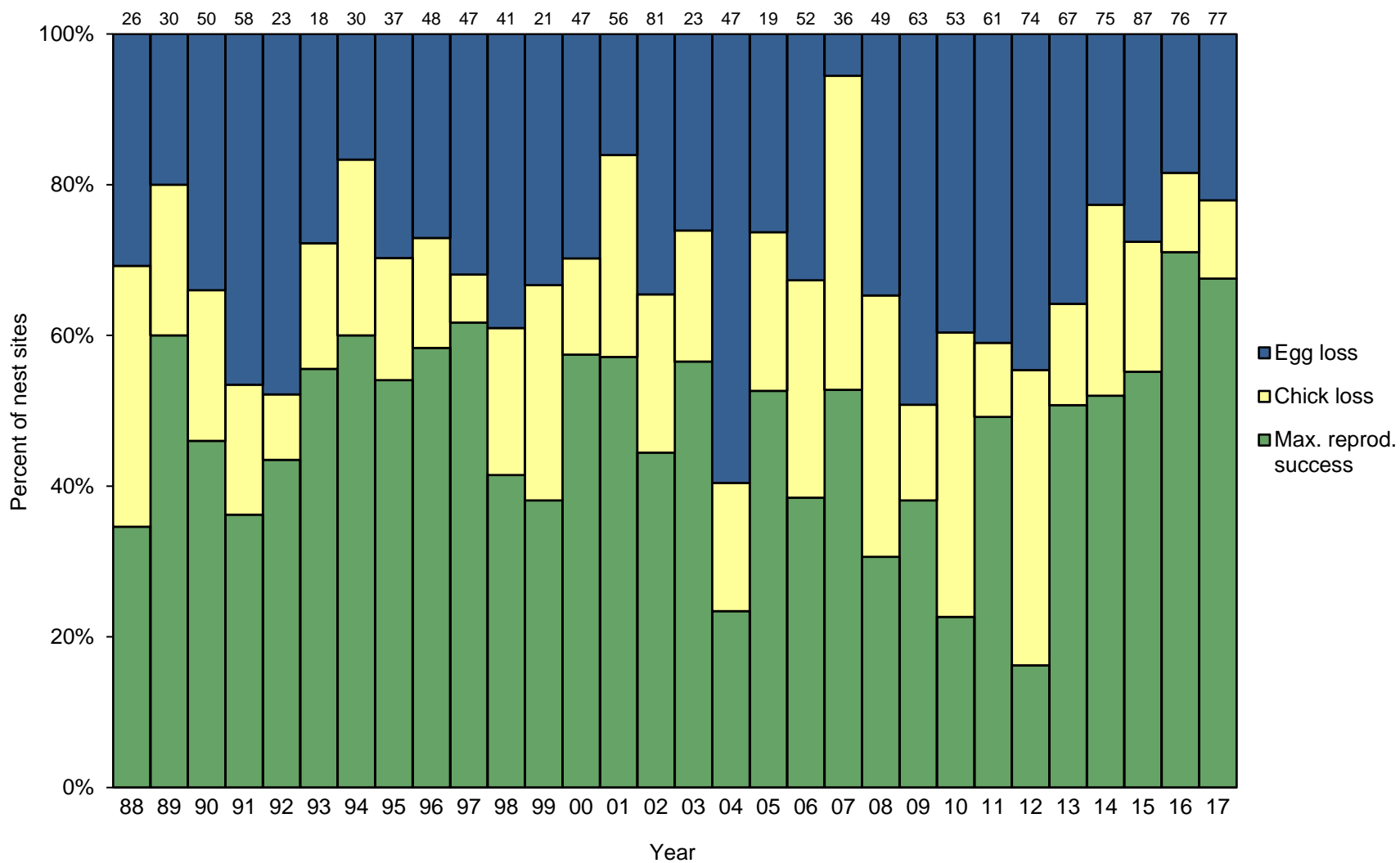


Figure 27. Reproductive performance of horned puffins at Buldir Island, Alaska. Values represent maximum potential success, including nest sites with chicks too young to consider fledged at the last check. Egg loss= $[(B+H)-D+H]/(B+H)$; Chick loss= $[(D+H)-F+H]/(B+H)$; Maximum potential reproductive success= $[(F+H)/(B+H)]$, where B=nest sites with eggs; D=nest site with chicks; F=nest sites with chicks fledged; H=nest sites with young chicks still present. Numbers above columns indicate sample sizes (B+H).

Table 36. Reproductive performance of horned puffins at Buldir Island, Alaska.

Year	Nest sites w/ eggs (B)	Nest sites w/ chicks (D)	Nest sites w/ chicks fledged (F)	Nest sites w/ young chicks still present ^a (H)	Nesting success (D/B) ^b	Fledging success (F/D) ^c	Reproductive success (F/B)	Max. potential nesting success ^d [(D+H)/(B+H)]	Max. potential fledging success ^d [(F+H)/(D+H)]	Max. potential reproductive success ^d [(F+H)/(B+H)]
1988	25	17	8	1	0.68	0.47	0.32	0.69	0.50	0.35
1989	12	6	0	18	0.50	0.00	0.00	0.80	0.75	0.60
1990	27	10	0	23	0.37	0.00	0.00	0.66	0.70	0.46
1991	37	10	0	21	0.27	0.00	0.00	0.53	0.68	0.36
1992	13	2	0	10	0.15	0.00	0.00	0.52	0.83	0.43
1993	17	12	9	1	0.71	0.75	0.53	0.72	0.77	0.56
1994	30	25	18	0	0.83	0.72	0.60	0.83	0.72	0.60
1995	17	6	0	20	0.35	0.00	0.00	0.70	0.77	0.54
1996	28	15	8	20	0.54	0.53	0.29	0.73	0.80	0.58
1997	20	5	2	27	0.25	0.40	0.10	0.68	0.91	0.62
1998	38	22	14	3	0.58	0.64	0.37	0.61	0.68	0.41
1999	13	6	0	8	0.46	0.00	0.00	0.67	0.57	0.38
2000	40	26	20	7	0.65	0.77	0.50	0.70	0.82	0.57
2001	20	3	0	37	0.15	0.00	0.00	0.70	0.93	0.65
2002	72	44	27	9	0.61	0.61	0.38	0.65	0.68	0.44
2003	22	16	12	1	0.73	0.75	0.55	0.74	0.76	0.57
2004	44	16	8	3	0.36	0.50	0.18	0.40	0.58	0.23
2005	17	12	8	2	0.71	0.67	0.47	0.74	0.71	0.53
2006	39	22	7	13	0.56	0.32	0.18	0.67	0.57	0.38
2007	21	19	4	15	0.90	0.21	0.19	0.94	0.56	0.53
2008	43	26	9	6	0.60	0.35	0.21	0.65	0.47	0.31
2009	44	13	5	19	0.30	0.38	0.11	0.51	0.75	0.38
2010	46	25	5	7	0.54	0.20	0.11	0.60	0.38	0.23
2011	34	9	3	27	0.26	0.33	0.09	0.59	0.83	0.49
2012	67	34	5	7	0.51	0.15	0.07	0.55	0.29	0.16
2013	50	26	17	17	0.52	0.65	0.34	0.64	0.79	0.51
2014	47	30	11	28	0.64	0.37	0.23	0.77	0.67	0.52
2015	44	20	5	43	0.45	0.25	0.11	0.72	0.76	0.55
2016	48	34	26	28	0.71	0.76	0.54	0.82	0.87	0.71
2017	44	27	19	33	0.61	0.70	0.43	0.78	0.87	0.68

^aChicks still present at last check but too young to consider successfully fledged by fledging age conventions (still present ≥ 30 d for horned puffins). These nests are not included in the number of nest sites w/ eggs (B) or chicks (D) or estimates of success but are used only to calculate a value of maximum potential reproductive success.

^bFor 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).

^cFor 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).

^dValues of maximum potential success include nest sites with chicks still present but too young to consider fledged at the last check; these values may be useful in years when crews leave the island before many chicks reach fledging age.

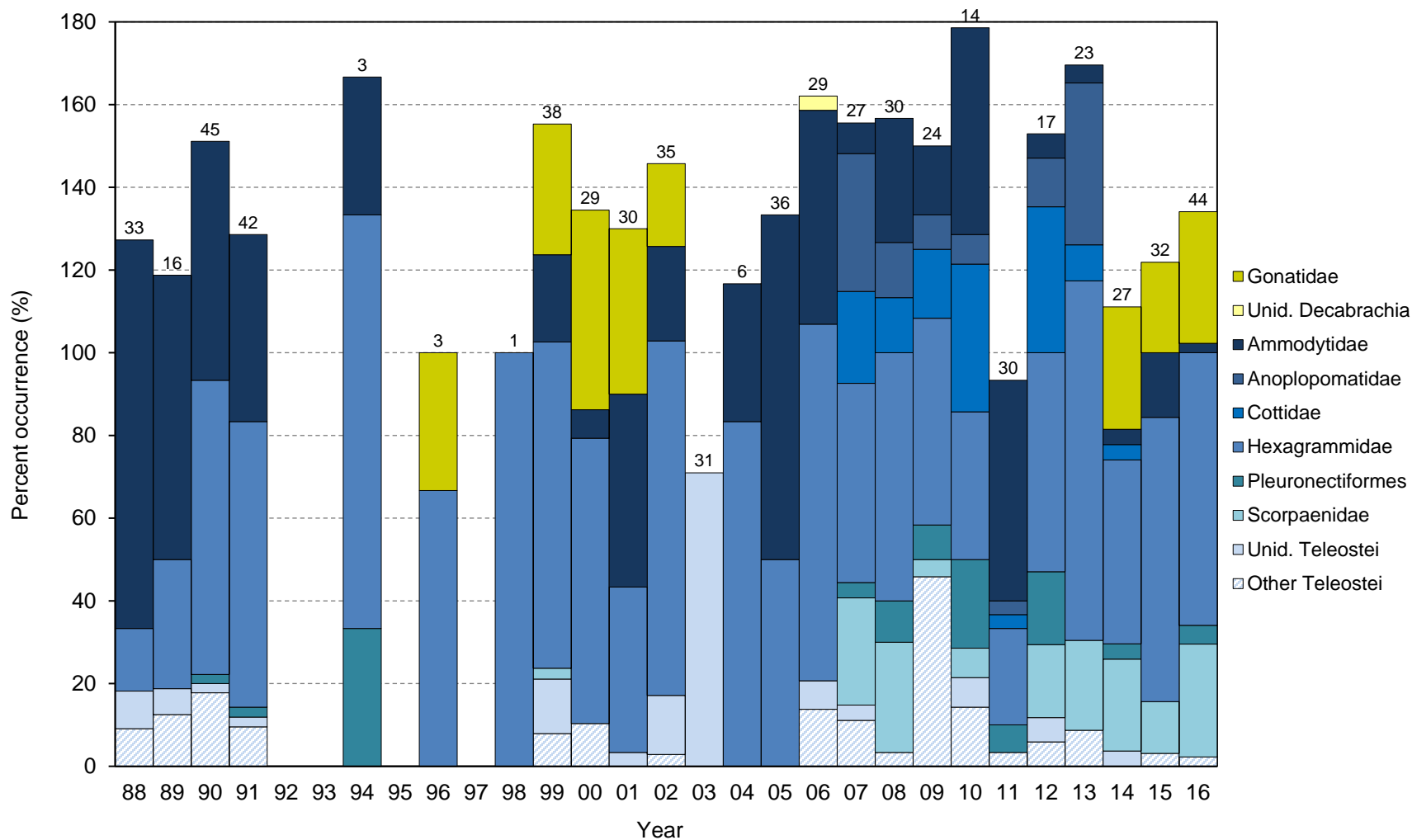


Figure 28. Frequency of occurrence of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1992-1993, 1995, or 1997; samples were collected in 2017 but have not yet been analyzed.

Table 37. Frequency of occurrence of major prey items in diets of horned puffin chicks at Buldir 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 (2000-2016), the field (1988-1997), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997; 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	1988	1989	1990	1991	1994	1996	1998	1999	2000	2001	2002	2003	2004
No. samples	33	16	45	42	3	3	1	38	29	30	35	31	6
Invertebrates	18.2	31.3	20.0	7.1	33.3	33.3	-	31.6	48.3	43.3	20.0	71.0	16.7
Cephalopoda	18.2	31.3	20.0	7.1	33.3	33.3	-	31.6	48.3	43.3	20.0	71.0	16.7
Gonatidae	-	-	-	-	-	33.3	-	31.6	48.3	40.0	20.0	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	31.6	48.3	40.0	20.0	-	-
Other Gonatidae	-	-	-	-	-	33.3	-	-	-	-	-	-	-
Unid. Decabrachia	18.2	31.3	20.0	7.1	33.3	-	-	2.6	-	3.3	-	71.0	16.7
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	93.9	87.5	93.3	97.6	100.0	66.7	100.0	86.8	72.4	80.0	91.4	71.0	100.0
Teleostei	93.9	87.5	93.3	97.6	100.0	66.7	100.0	86.8	72.4	80.0	91.4	71.0	100.0
Ammodytidae	93.9	68.8	57.8	45.2	33.3	-	-	21.1	6.9	46.7	22.9	-	33.3
<i>Ammodytes</i> spp.	93.9	68.8	57.8	45.2	33.3	-	-	21.1	6.9	46.7	22.9	-	33.3
Anoplopomatidae	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Anoplopoma fimbria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
Cottidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	15.2	31.3	71.1	69.0	100.0	66.7	100.0	78.9	69.0	40.0	85.7	-	83.3
<i>Hexagrammos decagrammus</i>	-	-	-	-	100.0	66.7	-	71.1	51.7	40.0	85.7	-	83.3
<i>H. lagocephalus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pleurogrammus monopterygius</i>	3.0	-	66.7	64.3	-	-	100.0	7.9	17.2	-	-	-	-
Other Hexagrammidae	12.1	31.3	4.4	4.8	-	-	-	-	17.2	-	-	-	-
Pleuronectiformes	-	-	2.2	2.4	33.3	-	-	-	-	-	-	-	-
Scorpaenidae	-	-	-	-	-	-	-	2.6	-	-	-	-	-
Unid. Teleostei	9.1	6.3	2.2	2.4	-	-	-	13.2	-	3.3	14.3	71.0	-
Other Teleostei	9.1	12.5	17.8	9.5	-	-	-	7.9	10.3	-	2.9	-	-

Table 37 (continued). Frequency of occurrence of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in laboratory (2000-2016), the field (1988-1997), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997; 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	36	29	27	30	24	14	30	17	23	30	32	44	32
Invertebrates	16.7	17.2	44.4	13.3	33.3	57.1	46.7	35.3	8.7	29.6	31.3	31.8	<i>pending</i>
Cephalopoda	16.7	17.2	44.4	13.3	33.3	57.1	46.7	35.3	8.7	29.6	31.3	31.8	-
Gonatidae	-	-	-	-	-	-	-	-	-	29.6	21.9	31.8	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	-	14.8	21.9	6.8	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	18.5	-	18.2	-
Unid. Decabrachia	16.7	13.8	44.4	13.3	33.3	57.1	46.7	35.3	8.7	3.7	15.6	2.3	-
Other Cephalopoda	-	3.4	-	-	-	-	-	-	-	-	-	-	-
Fish	100.0	96.6	77.8	93.3	95.8	78.6	70.0	76.5	100.0	70.4	84.4	86.4	-
Teleostei	100.0	96.6	77.8	93.3	95.8	78.6	70.0	76.5	100.0	70.4	84.4	86.4	-
Ammodytidae	83.3	51.7	7.4	30.0	16.7	50.0	53.3	5.9	4.3	3.7	15.6	2.3	-
<i>Ammodytes</i> spp.	83.3	51.7	7.4	30.0	16.7	50.0	53.3	5.9	4.3	3.7	15.6	2.3	-
Anoplopomatidae	-	-	33.3	13.3	8.3	7.1	3.3	11.8	39.1	-	-	-	-
<i>Anoplopoma fimbria</i>	-	-	33.3	13.3	8.3	7.1	3.3	11.8	39.1	-	-	-	-
Cottidae	-	-	22.2	13.3	16.7	35.7	3.3	35.3	8.7	3.7	-	-	-
Hexagrammidae	50.0	86.2	48.1	60.0	50.0	35.7	23.3	52.9	87.0	44.4	68.8	65.9	-
<i>Hexagrammos decagrammus</i>	50.0	69.0	-	-	-	-	3.3	-	26.1	-	-	-	-
<i>H. lagocephalus</i>	-	-	25.9	-	25.0	7.1	13.3	35.3	47.8	-	-	-	-
<i>Pleurogrammus monoptygius</i>	-	-	3.7	46.7	16.7	14.3	6.7	5.9	13.0	44.4	68.8	65.9	-
Other Hexagrammidae	-	17.2	29.6	13.3	25.0	14.3	-	17.6	4.3	-	-	-	-
Pleuronectiformes	-	-	3.7	10.0	8.3	21.4	6.7	17.6	-	3.7	-	4.5	-
Scorpaenidae	-	-	25.9	26.7	4.2	7.1	-	17.6	21.7	22.2	12.5	27.3	-
Unid. Teleostei	-	6.9	3.7	-	-	7.1	-	5.9	-	3.7	-	-	-
Other Teleostei	-	13.8	11.1	3.3	45.8	14.3	3.3	5.9	8.7	-	3.1	2.3	-

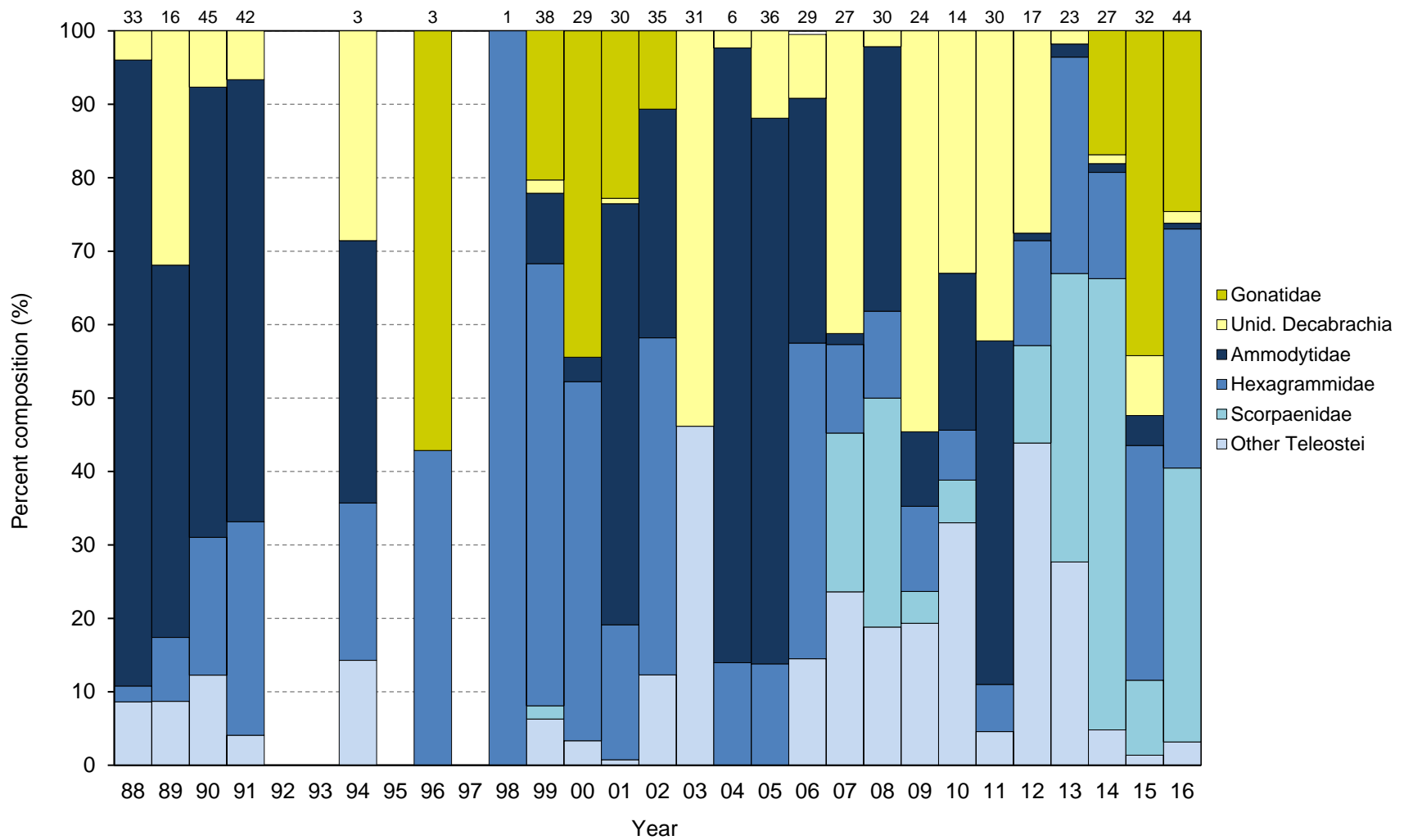


Figure 29. Percent composition of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1992-1993, 1995, or 1997; samples were collected in 2017 but have not yet been analyzed.

Table 38. Percent composition of major prey items in diets of horned puffin chicks at Buldir 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 (2000-2016), the field (1988-1997), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997; 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	1988	1989	1990	1991	1994	1996	1998	1999	2000	2001	2002	2003	2004
No. samples	33	16	45	42	3	3	1	38	29	30	35	31	6
No. individuals	278	69	261	196	14	7	1	166	90	136	122	208	43
Invertebrates	4.0	31.9	7.7	6.6	28.6	57.1	-	22.9	44.4	23.5	10.7	53.8	2.3
Cephalopoda	4.0	31.9	7.7	6.6	28.6	57.1	-	22.9	44.4	23.5	10.7	53.8	2.3
Gonatidae	-	-	-	-	-	57.1	-	21.1	44.4	22.8	10.7	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	21.1	44.4	22.8	10.7	-	-
Other Gonatidae	-	-	-	-	-	57.1	-	-	-	-	-	-	-
Unid. Decabrachia	4.0	31.9	7.7	6.6	28.6	-	-	1.8	-	0.7	-	53.8	2.3
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	96.0	68.1	92.3	93.4	71.4	42.9	100.0	78.0	55.6	76.5	89.3	46.2	97.7
Teleostei	96.0	68.1	92.3	93.4	71.4	42.9	100.0	78.0	55.6	76.5	89.3	46.2	97.7
Ammodytidae	85.3	50.7	61.3	60.2	35.7	-	-	9.6	3.3	57.4	31.1	-	83.7
<i>Ammodytes</i> spp.	85.3	50.7	61.3	60.2	35.7	-	-	9.6	3.3	57.4	31.1	-	83.7
Hexagrammidae	2.2	8.7	18.8	29.1	21.4	42.9	100.0	60.2	48.9	18.4	45.9	-	14.0
<i>Hexagrammos decagrammus</i>	-	-	-	-	21.4	42.9	-	57.8	17.8	18.4	45.9	-	14.0
<i>Pleurogrammus monopterygius</i>	0.4	-	17.6	21.9	-	-	100.0	2.4	6.7	-	-	-	-
Other Hexagrammidae	1.8	8.7	1.1	7.1	-	-	-	-	24.4	-	-	-	-
Scorpaenidae	-	-	-	-	-	-	-	1.8	-	-	-	-	-
Unid. Scorpaenidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Scorpaenidae	-	-	-	-	-	-	-	1.8	-	-	-	-	-
Other Teleostei	8.6	8.7	12.3	4.1	14.3	-	-	6.3	3.3	0.7	12.3	46.2	-

Table 38 (continued). Percent composition of major prey items in diets of horned puffin chicks at Buldir 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 (2000-2016), the field (1988-1997), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997; 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	36	29	27	30	24	14	30	17	23	27	32	44	32
No. individuals	261	207	199	186	207	103	109	98	112	83	147	126	<i>pending</i>
Invertebrates	11.9	9.2	41.2	2.2	54.6	33.0	42.2	27.6	1.8	18.1	52.4	26.2	-
Cephalopoda	11.9	9.2	41.2	2.2	54.6	33.0	42.2	27.6	1.8	18.1	52.4	26.2	-
Gonatidae	-	-	-	-	-	-	-	-	-	16.9	44.2	24.6	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	-	7.2	44.2	11.9	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	9.6	-	12.7	-
Unid. Decabrachia	11.9	8.7	41.2	2.2	54.6	33.0	42.2	27.6	1.8	1.2	8.2	1.6	-
Other Cephalopoda	-	0.5	-	-	-	-	-	-	-	-	-	-	-
Fish	88.1	90.8	58.8	97.8	45.4	67.0	57.8	72.4	98.2	81.9	47.6	73.8	-
Teleostei	88.1	90.8	58.8	97.8	45.4	67.0	57.8	72.4	98.2	81.9	47.6	73.8	-
Ammodytidae	74.3	33.3	1.5	36.0	10.1	21.4	46.8	1.0	1.8	1.2	4.1	0.8	-
<i>Ammodytes</i> spp.	74.3	33.3	1.5	36.0	10.1	21.4	46.8	1.0	1.8	1.2	4.1	0.8	-
Hexagrammidae	13.8	43.0	12.1	11.8	11.6	6.8	6.4	14.3	29.5	14.5	32.0	32.5	-
<i>Hexagrammos decagrammus</i>	13.8	22.7	-	-	-	-	0.9	-	11.6	-	-	-	-
<i>Pleurogrammus monopterygius</i>	-	-	0.5	9.1	1.9	2.9	-	1.0	2.7	14.5	32.0	32.5	-
Other Hexagrammidae	-	20.3	11.6	2.7	9.7	3.9	5.5	13.3	15.2	-	-	-	-
Scorpaenidae	-	-	21.6	31.2	4.3	5.8	-	13.3	39.3	61.4	10.2	37.3	-
Unid. Scorpaenidae	-	-	21.6	31.2	4.3	5.8	-	13.3	39.3	-	-	-	-
Other Scorpaenidae	-	-	-	-	-	-	-	-	-	61.4	10.2	37.3	-
Other Teleostei	-	14.5	23.6	18.8	19.3	33.0	4.6	43.9	27.7	4.8	1.4	3.2	-

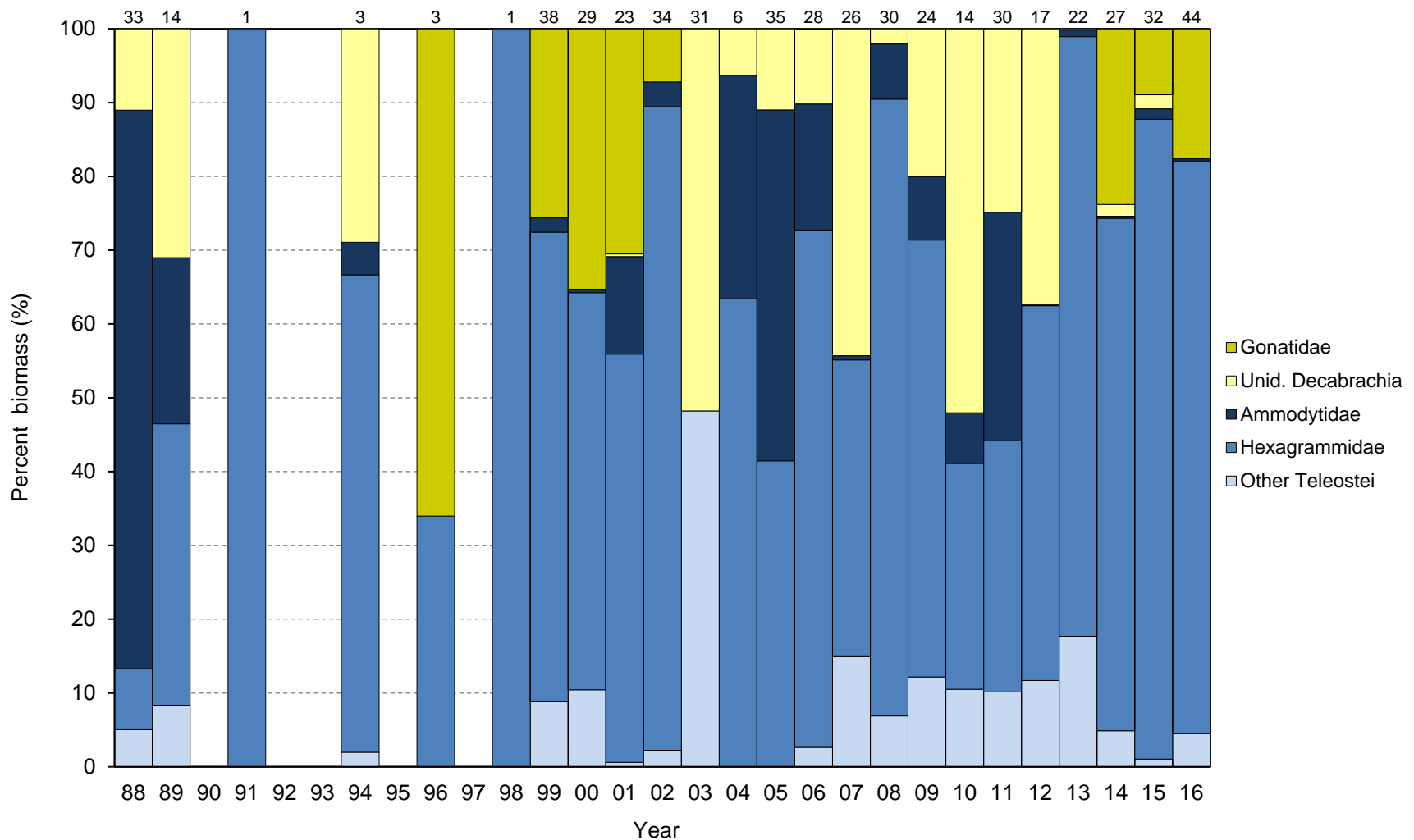


Figure 30. Relative biomass of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average biomass of at least 5% are shown. Samples consist of bill loads collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1992-1993, 1995, or 1997 and no biomass data exist in 1990; samples were collected in 2017 but have not yet been analyzed.

Table 39. Relative biomass of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey was identified and measured in the laboratory (2000-2016), the field (1988-1997), or both (1998-1999) 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 biomass 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 from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997 and no biomass data exist in 1990; 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	1988	1989	1991	1994	1996	1998	1999	2000	2001	2002	2003	2004	2005
No. samples	33	14	1	3	3	1	38	29	23	34	31	6	35
Total mass (g)	399	90	13	20	37	6	349	206	198	468	260	39	219
Invertebrates	11.0	31.0	-	28.9	66.0	-	25.6	35.3	30.9	7.2	51.8	6.3	11.0
Cephalopoda	11.0	31.0	-	28.9	66.0	-	25.6	35.3	30.9	7.2	51.8	6.3	11.0
Gonatidae	-	-	-	-	66.0	-	25.6	35.3	30.5	7.2	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	25.6	35.3	30.5	7.2	-	-	-
Other Gonatidae	-	-	-	-	66.0	-	-	-	-	-	-	-	-
Unid. Decabrachia	11.0	31.0	-	28.9	-	-	-	-	0.4	-	51.8	6.3	11.0
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	89.0	69.0	100.0	71.1	34.0	100.0	74.4	64.7	69.1	92.8	48.2	93.7	89.0
Teleostei	89.0	69.0	100.0	71.1	34.0	100.0	74.4	64.7	69.1	92.8	48.2	93.7	89.0
Ammodytidae	75.7	22.5	-	4.4	-	-	1.9	0.5	13.2	3.3	-	30.3	47.6
<i>Ammodytes</i> spp.	75.7	22.5	-	4.4	-	-	1.9	0.5	13.2	3.3	-	30.3	47.6
Hexagrammidae	8.3	38.2	100.0	64.7	34.0	100.0	63.6	53.8	55.3	87.2	-	63.4	41.5
<i>Hexagrammos decagrammus</i>	-	-	-	64.7	34.0	-	47.9	32.8	55.3	87.2	-	63.4	41.5
<i>H. lagocephalus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pleurogrammus monoptygius</i>	1.1	-	100.0	-	-	100.0	15.7	18.1	-	-	-	-	-
Other Hexagrammidae	7.2	38.2	-	-	-	-	-	2.9	-	-	-	-	-
Other Teleostei	5.0	8.3	-	2.0	-	-	8.8	10.4	0.6	2.2	48.2	-	-

Table 39 (continued). Relative biomass of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey was identified and measured in laboratory (2000-2016), the field (1988-1997), or both (1998-1999) 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 biomass 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 from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997 and no biomass data exist in 1990; 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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	28	26	30	24	14	30	17	22	27	32	44	32
Total mass (g)	303	150	244	146	121	146	101	120	169	209	405	<i>pending</i>
Invertebrates	10.2	44.3	2.1	20.0	52.0	24.9	37.4	0.2	25.4	10.8	17.6	-
Cephalopoda	10.2	44.3	2.1	20.0	52.0	24.9	37.4	0.2	25.4	10.8	17.6	-
Gonatidae	-	-	-	-	-	-	-	-	23.8	8.9	17.6	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	9.7	8.9	4.4	-
Other Gonatidae	-	-	-	-	-	-	-	-	14.1	-	13.2	-
Unid. Decabrachia	10.1	44.3	2.1	20.0	52.0	24.9	37.4	0.2	1.6	1.9	0.1	-
Other Cephalopoda	0.1	-	-	-	-	-	-	-	-	-	-	-
Fish	89.8	55.7	97.9	80.0	48.0	75.1	62.6	99.8	74.6	89.2	82.4	-
Teleostei	89.8	55.7	97.9	80.0	48.0	75.1	62.6	99.8	74.6	89.2	82.4	-
Ammodytidae	17.1	0.6	7.5	8.6	6.9	31.0	0.1	0.9	0.3	1.4	0.3	-
<i>Ammodytes</i> spp.	17.1	0.6	7.5	8.6	6.9	31.0	0.1	0.9	0.3	1.4	0.3	-
Hexagrammidae	70.1	40.2	83.6	59.2	30.6	34.0	50.8	81.3	69.4	86.7	77.6	-
<i>Hexagrammos decagrammus</i>	66.6	-	-	-	-	2.2	-	13.1	-	-	-	-
<i>H. lagocephalus</i>	-	18.8	-	25.5	2.7	9.3	29.5	30.6	-	-	-	-
<i>Pleurogrammus monoptyerygius</i>	-	12.3	82.9	28.7	27.2	22.5	19.2	37.1	69.4	86.7	77.6	-
Other Hexagrammidae	3.5	9.1	0.7	5.1	0.7	-	2.0	0.4	-	-	-	-
Other Teleostei	2.6	14.9	6.9	12.2	10.5	10.1	11.7	17.7	4.9	1.0	4.5	-

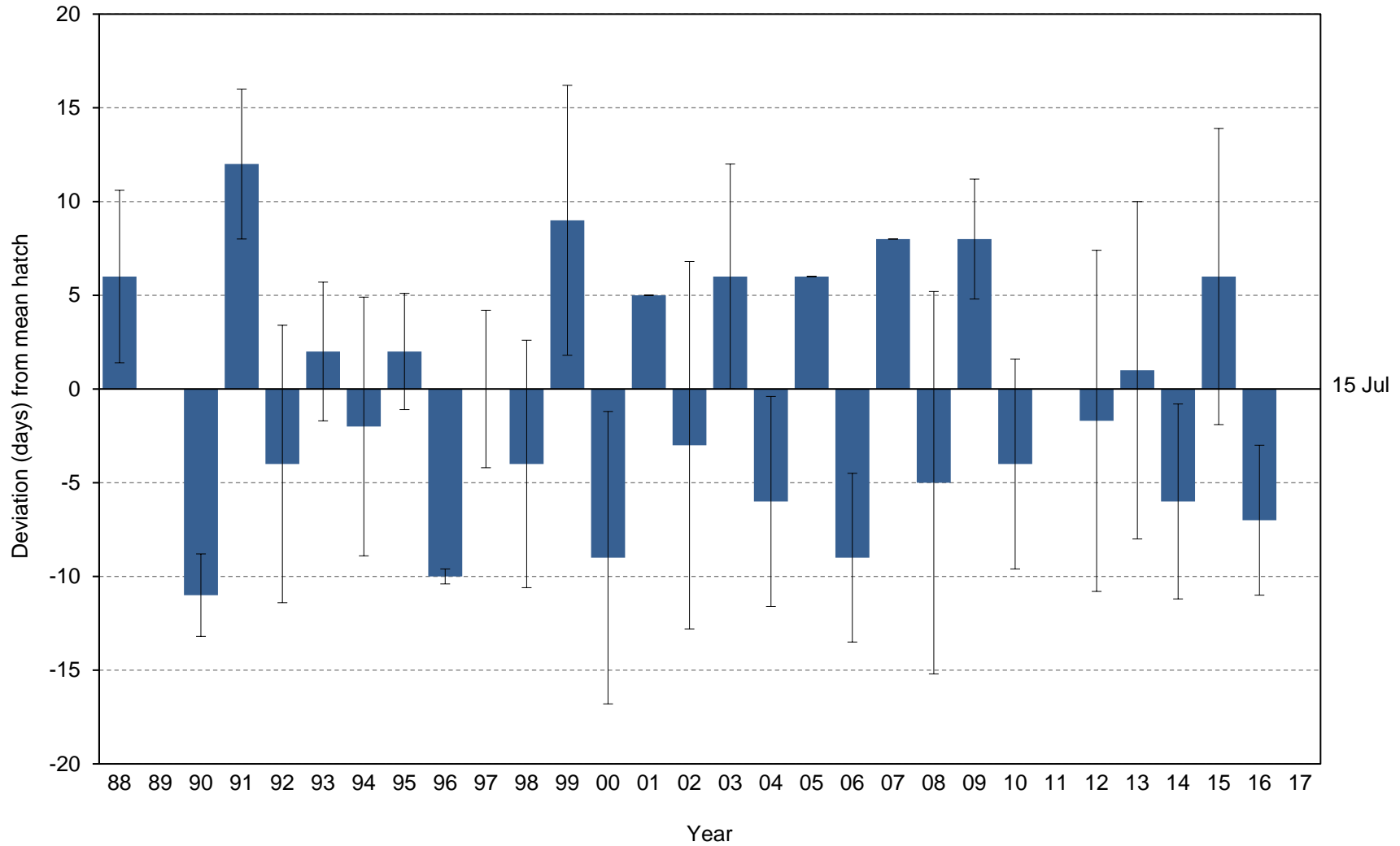


Figure 31. Yearly hatch date deviation (from the 1988-2016 average of 15 July) for tufted puffins at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; no data exist in the current year. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1989 or 2017; no eggs hatched in plots in 2011.

Table 40. Breeding chronology of tufted puffins at Buldir Island, Alaska. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1989 or 2017; no eggs hatched in plots in 2011.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First fledge ^b
1988	20 Jul	4.6	4	14 Jul	24 Jul	30 Aug
1989	-	-	-	-	-	>10 Aug
1990	4 Jul	2.2	3	2 Jul	7 Jul	11 Aug
1991	27 Jul	4.0	2	23 Jul	31 Jul	>2 Aug
1992	10 Jul	7.4	11	2 Jul	26 Jul	>30 Jul
1993	17 Jul	3.7	15	9 Jul	23 Jul	23 Aug
1994	13 Jul	6.9	4	9 Jul	25 Jul	28 Aug
1995	17 Jul	3.1	14	15 Jul	25 Jul	>13 Aug
1996	4 Jul	0.4	4	4 Jul	5 Jul	>14 Aug
1997	15 Jul	4.2	11	10 Jul	24 Jul	>13 Aug
1998	11 Jul	6.6	15	2 Jul	23 Jul	>18 Aug
1999	24 Jul	7.2	7	13 Jul	4 Aug	>26 Aug
2000	5 Jul	7.8	11	26 Jun	27 Jul	18 Aug
2001	20 Jul	0.0	1	20 Jul	-	>5 Aug
2002	12 Jul	9.8	13	1 Jul	4 Aug	>18 Jul
2003	21 Jul	6.0	2	15 Jul	27 Jul	>4 Sep
2004	8 Jul	5.6	10	30 Jun	16 Jul	19 Aug
2005	21 Jul	0.0	2	21 Jul	-	>24 Aug
2006	6 Jul	4.5	5	1 Jul	11 Jul	26 Aug
2007	23 Jul	0.0	1	23 Jul	-	>25 Aug
2008	9 Jul	10.2	11	30 Jun	4 Aug	>23 Aug
2009	23 Jul	3.2	5	21 Jul	29 Jul	>22 Aug
2010	11 Jul	5.6	10	1 Jul	18 Jul	>21 Aug
2012	12 Jul	9.1	4	7 Jul	28 Jul	>24 Aug
2013	16 Jul	9.0	6	3 Jul	29 Jul	>22 Aug
2014	9 Jul	5.2	6	3 Jul	19 Jul	16 Aug
2015	21 Jul	7.9	6	14 Jul	4 Aug	>24 Aug
2016	7 Jul	4.0	8	2 Jul	15 Jul	>26 Aug
2017	<i>no data (no known hatch dates)</i>			-	-	>27 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.

Table 41. Frequency distribution of hatch dates for tufted puffins at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No hatch dates were recorded with the appropriate egg to chick interval in 1989 or 2017; no eggs hatched in plots in 2011.

Julian date ^a	No. nests hatching on Julian date													
	88	90	91	92	93	94	95	96	97	98	99	00	01	02
178	-	-	-	-	-	-	-	-	-	-	-	1	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-	-	-	-	-	-
181	-	-	-	-	-	-	-	-	-	-	-	-	-	-
182	-	-	-	-	-	-	-	-	-	-	-	1	-	2
183	-	1	-	-	-	-	-	-	-	1	-	-	-	-
184	-	1	-	3	-	-	-	-	-	1	-	6	-	1
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	3	-	3	-	-	-	2
187	-	-	-	-	-	-	-	1	-	-	-	-	-	-
188	-	1	-	1	-	-	-	-	-	-	-	-	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	3	2	3	-	-	-	3	-	2	-	1
191	-	-	-	-	-	-	-	-	3	-	-	-	-	2
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	1	-	1	-	-	-
195	-	-	-	2	-	-	-	-	-	-	-	-	-	2
196	1	-	-	-	5	-	11	-	4	3	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	1	-	-	-
198	1	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	7	-	-	-	2	3	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	1	-
202	-	-	-	1	-	-	2	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	1
204	-	-	1	-	1	-	-	-	-	1	2	-	-	-
205	-	-	-	-	-	-	-	-	1	-	-	-	-	-
206	2	-	-	-	-	1	1	-	-	-	-	-	-	1
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	1	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	1	-	-
210	-	-	-	-	-	-	-	-	-	-	2	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	1	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	1	-	-	1
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	4	3	2	11	15	4	14	4	11	15	7	11	1	13

Table 41 (continued). Frequency distribution of hatch dates for tufted puffins at Buldir Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. No hatch dates were recorded with the appropriate egg to chick interval in 1989 or 2017; no eggs hatched in plots in 2011.

Julian date ^a	No. nests hatching on Julian date												
	03	04	05	06	07	08	09	10	12	13	14	15	16
178	-	-	-	-	-	-	-	-	-	-	-	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-	-	-	-	-
181	-	-	-	-	-	-	-	-	-	-	-	-	-
182	-	2	-	2	-	2	-	1	-	-	-	-	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	1	1	-	1
185	-	-	-	1	-	1	-	-	-	-	-	-	-
186	-	1	-	-	-	-	-	1	-	-	-	-	3
187	-	-	-	-	-	5	-	-	-	-	-	-	-
188	-	2	-	-	-	-	-	-	-	-	3	-	-
189	-	-	-	-	-	-	-	-	3	1	-	-	1
190	-	-	-	-	-	-	-	4	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-	1
192	-	1	-	2	-	-	-	-	-	-	-	-	1
193	-	-	-	-	-	1	-	-	-	-	-	-	-
194	-	1	-	-	-	-	-	-	-	1	1	-	-
195	-	-	-	-	-	-	-	-	-	-	-	2	-
196	1	2	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	1	-	-	-	-	1
198	-	1	-	-	-	-	-	1	-	-	-	1	-
199	-	-	-	-	-	-	-	2	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	1	1	1	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	2	-	-	-	3	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	1	-	-	-	-	-	-	-	-
205	-	-	-	-	-	1	-	-	-	1	-	-	-
206	-	-	-	-	-	-	1	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-
208	1	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	1	-	1	1	-	1	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	-	1	-
217	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>n</i>	2	10	2	5	1	11	5	10	4	6	6	6	8

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

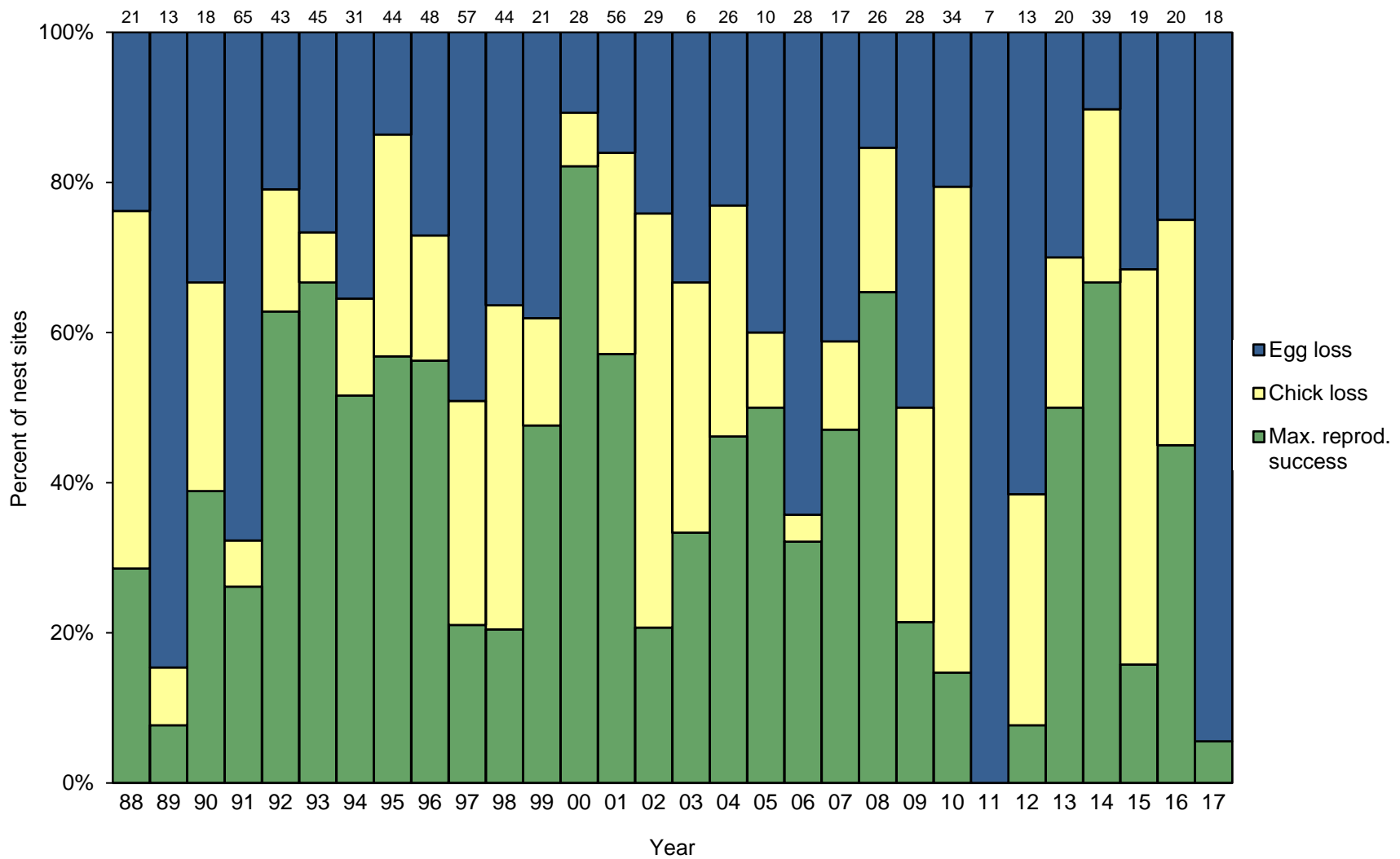


Figure 32. Reproductive performance of tufted puffins at Buldir Island, Alaska. Values represent maximum potential success, including nest sites with chicks too young to consider fledged at the last check. Egg loss= $[(B+H)-D+H]/(B+H)$; Chick loss= $[(D+H)-F+H]/(B+H)$; Maximum potential reproductive success= $[(F+H)/(B+H)]$, where B=nest sites with eggs; D=nest site with chicks; F=nest sites with chicks fledged; H=nest sites with young chicks still present. Numbers above columns indicate sample sizes (B+H).

Table 42. Reproductive performance of tufted puffins at Buldir Island, Alaska.

Year	Nest sites w/ eggs (B)	Nest sites w/ chicks (D)	Nest sites w/ chicks fledged (F)	Nest sites w/ young chicks still present ^a (H)	Nesting success (D/B) ^b	Fledging success (F/D) ^c	Reproductive success (F/B)	Max. potential nesting success ^d [(D+H)/(B+H)]	Max. potential fledging success ^d [(F+H)/(D+H)]	Max. potential reproductive success ^d [(F+H)/(B+H)]
1988	21	16	6	0	0.76	0.38	0.29	0.76	0.38	0.29
1989	12	1	0	1	0.08	0.00	0.00	0.15	0.50	0.08
1990	14	8	3	4	0.57	0.38	0.21	0.67	0.58	0.39
1991	48	4	0	17	0.08	0.00	0.00	0.32	0.81	0.26
1992	21	12	5	22	0.57	0.42	0.24	0.79	0.79	0.63
1993	41	29	26	4	0.71	0.90	0.63	0.73	0.91	0.67
1994	30	19	15	1	0.63	0.79	0.50	0.65	0.80	0.52
1995	22	16	3	22	0.73	0.19	0.14	0.86	0.66	0.57
1996	40	27	19	8	0.68	0.70	0.48	0.73	0.77	0.56
1997	50	22	5	7	0.44	0.23	0.10	0.51	0.41	0.21
1998	44	28	9	0	0.64	0.32	0.20	0.64	0.32	0.20
1999	17	9	6	4	0.53	0.67	0.35	0.62	0.77	0.48
2000	28	25	23	0	0.89	0.92	0.82	0.89	0.92	0.82
2001	9	2	1	12	0.22	0.50	0.11	0.67	0.93	0.62
2002	27	20	4	2	0.74	0.20	0.15	0.76	0.27	0.21
2003	6	4	2	0	0.67	0.50	0.33	0.67	0.50	0.33
2004	26	20	12	0	0.77	0.60	0.46	0.77	0.60	0.46
2005	5	1	0	5	0.20	0.00	0.00	0.60	0.83	0.50
2006	28	10	9	0	0.36	0.90	0.32	0.36	0.90	0.32
2007	15	8	6	2	0.53	0.75	0.40	0.59	0.80	0.47
2008	25	21	16	1	0.84	0.76	0.64	0.85	0.77	0.65
2009	22	8	0	6	0.36	0.00	0.00	0.50	0.43	0.21
2010	33	26	4	1	0.79	0.15	0.12	0.79	0.19	0.15
2011	7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2012	13	5	1	0	0.38	0.20	0.08	0.38	0.20	0.08
2013	11	5	1	9	0.45	0.20	0.09	0.70	0.71	0.50
2014	37	33	24	2	0.89	0.73	0.65	0.90	0.74	0.67
2015	18	12	2	1	0.67	0.17	0.11	0.68	0.23	0.16
2016	20	15	9	0	0.75	0.60	0.45	0.75	0.60	0.45
2017	17	0	0	1	0.00	0.00	0.00	0.06	1.00	0.06

^aChicks still present at last check but too young to consider successfully fledged by fledging age conventions (still present ≥ 33 d for tufted puffins). These nests are not included in the number of nest sites w/ eggs (B) or chicks (D) or estimates of success but are used only to calculate a value of maximum potential reproductive success.

^bFor 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).

^cFor 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).

^dValues of maximum potential success include nest sites with chicks still present but too young to consider fledged at the last check; these values may be useful in years when crews leave the island before many chicks reach fledging age.

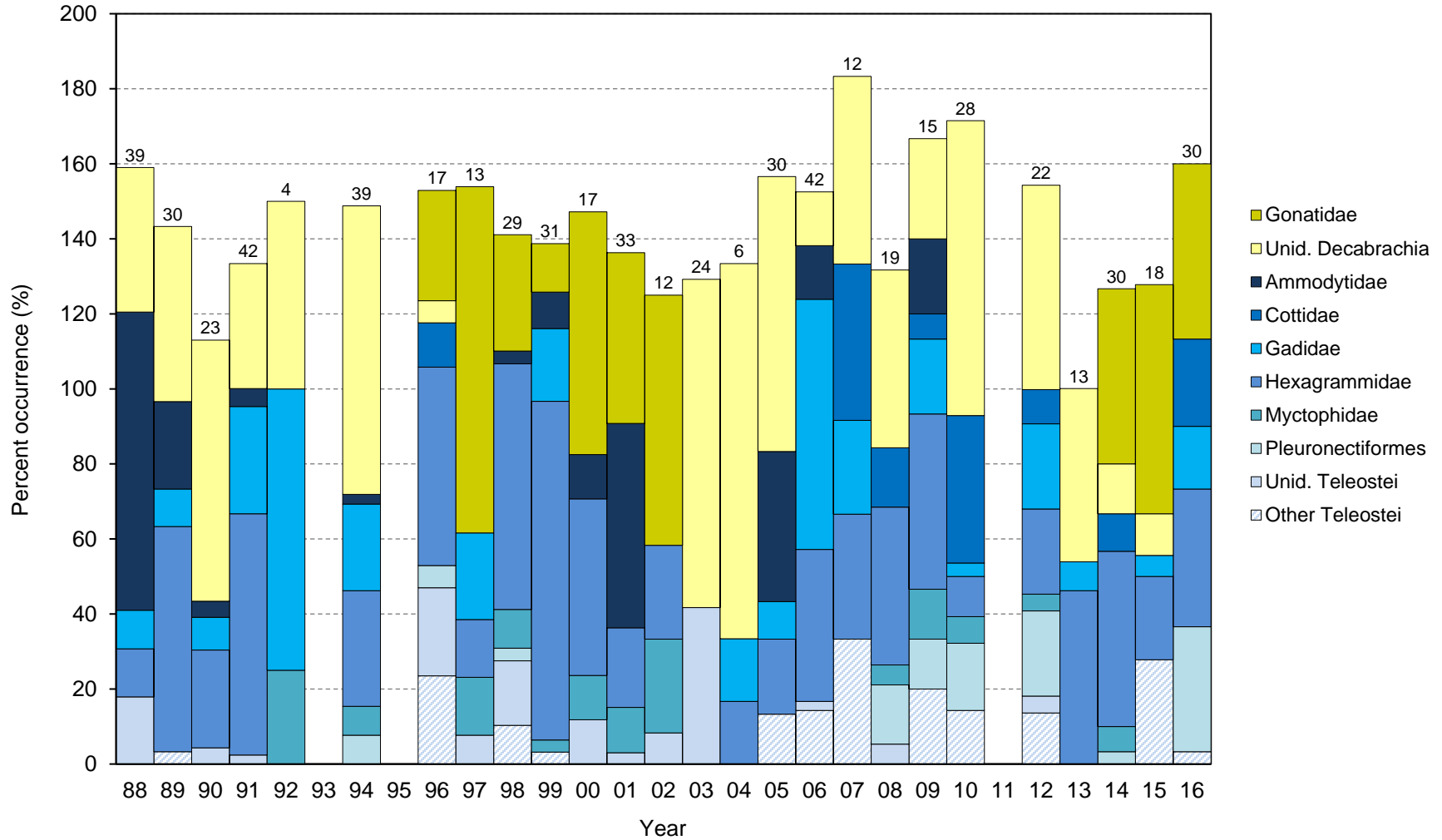


Figure 33. Frequency of occurrence of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1993, 1995, or 2011; samples were collected in 2017 but have not yet been analyzed.

Table 43. Frequency of occurrence of major prey items in diets of tufted puffin chicks at Buldir 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 (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; 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	1988	1989	1990	1991	1992	1994	1996	1997	1998	1999	2000	2001	2002	2003
No. samples	39	30	23	42	4	39	17	13	29	31	17	33	12	24
Invertebrates	41.0	46.7	69.6	33.3	50.0	76.9	35.3	92.3	34.5	12.9	64.7	48.5	66.7	87.5
Cephalopoda	38.5	46.7	69.6	33.3	50.0	76.9	35.3	92.3	31.0	12.9	64.7	45.5	66.7	87.5
Gonatidae	-	-	-	-	-	-	29.4	92.3	31.0	12.9	64.7	45.5	66.7	-
<i>Gonatus kamtschaticus</i>	-	-	-	-	-	-	29.4	84.6	-	-	-	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	31.0	12.9	64.7	45.5	66.7	-
Other Gonatidae	-	-	-	-	-	-	5.9	7.7	-	-	-	-	-	-
Unid. Decabrachia	38.5	46.7	69.6	33.3	50.0	76.9	5.9	-	-	-	-	-	-	87.5
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	2.6	-	-	-	-	-	-	-	10.3	-	-	3.0	-	-
Fish	89.7	80.0	39.1	83.3	100.0	66.7	70.6	53.8	89.7	100.0	76.5	78.8	58.3	41.7
Teleostei	89.7	80.0	39.1	83.3	100.0	66.7	70.6	53.8	89.7	100.0	76.5	78.8	58.3	41.7
Ammodytidae	79.5	23.3	4.3	4.8	-	2.6	-	-	3.4	9.7	11.8	54.5	-	-
<i>Ammodytes</i> spp.	79.5	23.3	4.3	4.8	-	2.6	-	-	3.4	9.7	11.8	54.5	-	-
Cottidae	-	-	-	-	-	-	11.8	-	-	-	-	-	-	-
Gadidae	10.3	10.0	8.7	28.6	75.0	23.1	-	23.1	-	19.4	-	-	-	-
<i>Gadus chalcogrammus</i>	10.3	10.0	8.7	28.6	75.0	23.1	-	23.1	-	19.4	-	-	-	-
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	12.8	60.0	26.1	64.3	-	30.8	52.9	15.4	65.5	90.3	47.1	21.2	25.0	-
<i>Hexagrammos decagrammus</i>	-	6.7	-	-	-	30.8	47.1	15.4	51.7	25.8	11.8	21.2	25.0	-
<i>Pleurogrammus monopterygius</i>	-	-	26.1	59.5	-	-	-	-	27.6	64.5	11.8	-	-	-
Other Hexagrammidae	12.8	53.3	-	4.8	-	-	11.8	-	-	-	29.4	-	-	-
Myctophidae	-	-	-	-	25.0	7.7	-	15.4	10.3	3.2	11.8	12.1	25.0	-
Pleuronectiformes	-	-	-	-	-	7.7	5.9	-	3.4	-	-	-	-	-
Unid. Teleostei	17.9	-	4.3	2.4	-	-	23.5	7.7	17.2	-	11.8	3.0	8.3	41.7
Other Teleostei	-	3.3	-	-	-	-	23.5	-	10.3	3.2	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 43 (continued). Frequency of occurrence of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in laboratory (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; 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	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
No. samples	6	30	42	12	19	15	28	22	13	30	18	30	2
Invertebrates	100.0	73.3	14.3	58.3	47.4	26.7	78.6	59.1	46.2	50.0	72.2	46.7	<i>pending</i>
Cephalopoda	100.0	73.3	14.3	58.3	47.4	26.7	78.6	54.5	46.2	50.0	72.2	46.7	-
Gonatidae	-	-	-	-	-	-	-	-	-	46.7	61.1	46.7	-
<i>Gonatus kamtschaticus</i>	-	-	-	-	-	-	-	-	-	20.0	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	-	13.3	55.6	33.3	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	20.0	22.2	13.3	-
Unid. Decabrachia	100.0	73.3	14.3	50.0	47.4	26.7	78.6	54.5	46.2	13.3	11.1	-	-
Other Cephalopoda	-	-	-	8.3	-	-	3.6	-	-	-	5.6	-	-
Other Invertebrates	-	-	-	16.7	-	-	3.6	4.5	-	-	-	-	-
Fish	33.3	66.7	100.0	83.3	73.7	100.0	64.3	59.1	53.8	63.3	50.0	80.0	-
Teleostei	33.3	66.7	100.0	83.3	73.7	100.0	64.3	59.1	53.8	63.3	50.0	80.0	-
Ammodytidae	-	40.0	14.3	-	-	20.0	-	-	-	-	-	-	-
<i>Ammodytes</i> spp.	-	40.0	14.3	-	-	20.0	-	-	-	-	-	-	-
Cottidae	-	-	-	41.7	15.8	6.7	39.3	9.1	-	10.0	-	23.3	-
Gadidae	16.7	10.0	66.7	25.0	-	20.0	3.6	22.7	7.7	-	5.6	16.7	-
<i>Gadus chalcogrammus</i>	16.7	10.0	61.9	16.7	-	13.3	3.6	22.7	7.7	-	5.6	16.7	-
Other Gadidae	-	-	19.0	8.3	-	6.7	-	-	-	-	-	-	-
Hexagrammidae	16.7	20.0	40.5	33.3	42.1	46.7	10.7	22.7	46.2	46.7	22.2	36.7	-
<i>Hexagrammos decagrammus</i>	16.7	20.0	40.5	8.3	-	-	-	-	-	-	-	-	-
<i>Pleurogrammus monopterygius</i>	-	-	-	25.0	42.1	40.0	10.7	13.6	46.2	46.7	22.2	36.7	-
Other Hexagrammidae	-	-	-	8.3	-	6.7	3.6	9.1	7.7	-	-	-	-
Myctophidae	-	-	-	-	5.3	13.3	7.1	4.5	-	6.7	-	-	-
Pleuronectiformes	-	-	-	-	15.8	13.3	17.9	22.7	-	3.3	-	33.3	-
Unid. Teleostei	-	-	2.4	-	5.3	-	-	4.5	-	-	-	-	-
Other Teleostei	-	13.3	14.3	33.3	-	20.0	14.3	13.6	-	-	27.8	3.3	-
Other	-	-	-	-	-	-	-	4.5	-	-	-	-	-

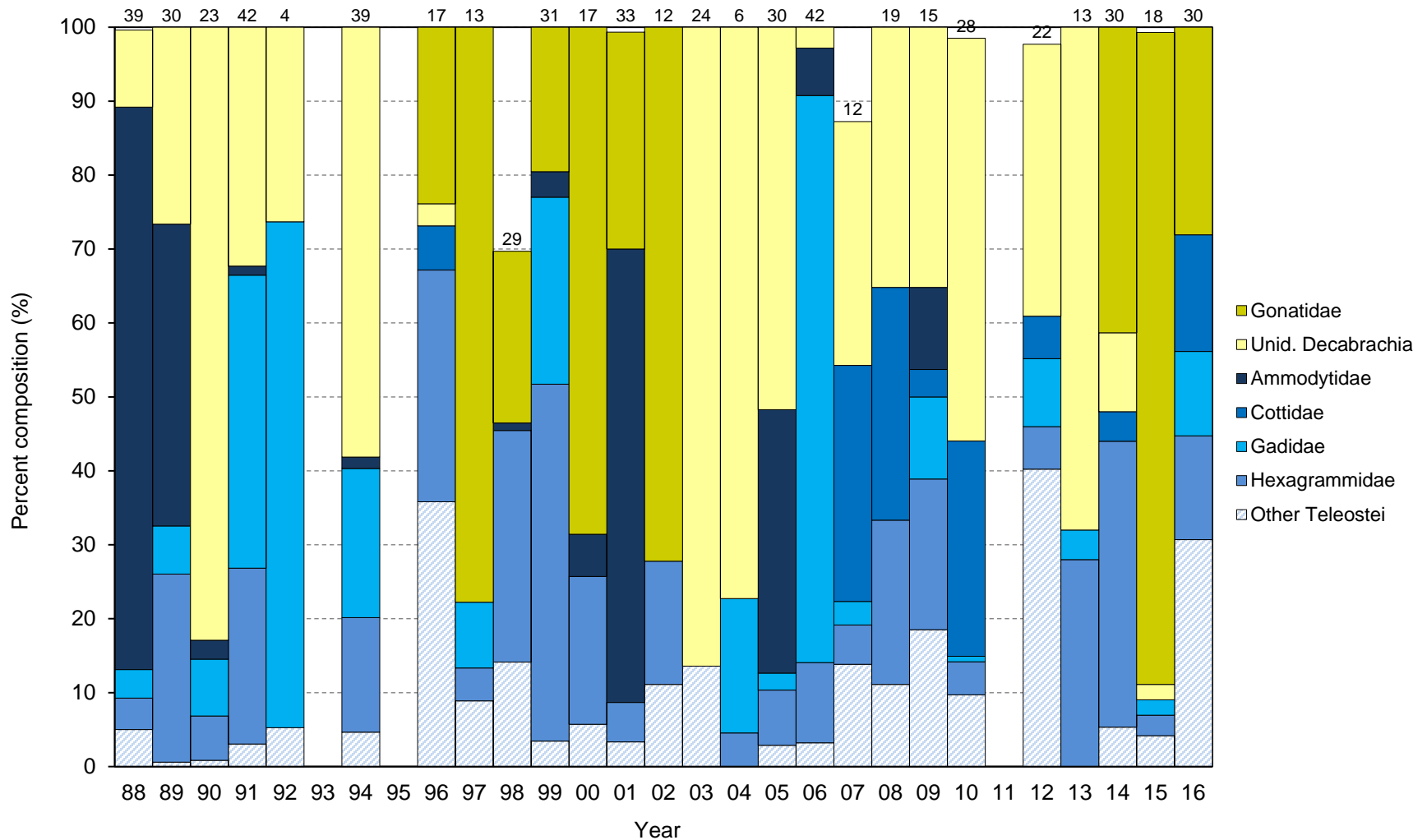


Figure 34. Percent composition of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1993, 1995, or 2011; samples were collected in 2017 but have not yet been analyzed.

Table 44. Percent composition of major prey items in diets of tufted puffin chicks at Buldir 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 laboratory (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; 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	1988	1989	1990	1991	1992	1994	1996	1997	1998	1999	2000	2001	2002	2003
No. samples	39	30	23	42	4	39	17	13	29	31	17	33	12	24
No. individuals	259	169	117	164	19	129	67	45	99	87	70	150	36	103
Invertebrates	10.8	26.6	82.9	32.3	26.3	58.1	26.9	77.8	53.5	19.5	68.6	30.0	72.2	86.4
Cephalopoda	10.4	26.6	82.9	32.3	26.3	58.1	26.9	77.8	23.2	19.5	68.6	29.3	72.2	86.4
Gonatidae	-	-	-	-	-	-	23.9	77.8	23.2	19.5	68.6	29.3	72.2	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	23.2	19.5	68.6	29.3	72.2	-
Other Gonatidae	-	-	-	-	-	-	23.9	77.8	-	-	-	-	-	-
Unid. Decabrachia	10.4	26.6	82.9	32.3	26.3	58.1	3.0	-	-	-	-	-	-	86.4
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	0.4	-	-	-	-	-	-	-	30.3	-	-	0.7	-	-
Fish	89.2	73.4	17.1	67.7	73.7	41.9	73.1	22.2	46.5	80.5	31.4	70.0	27.8	13.6
Teleostei	89.2	73.4	17.1	67.7	73.7	41.9	73.1	22.2	46.5	80.5	31.4	70.0	27.8	13.6
Ammodytidae	76.1	40.8	2.6	1.2	-	1.6	-	-	1.0	3.4	5.7	61.3	-	-
<i>Ammodytes</i> spp.	76.1	40.8	2.6	1.2	-	1.6	-	-	1.0	3.4	5.7	61.3	-	-
Cottidae	-	-	-	-	-	-	6.0	-	-	-	-	-	-	-
Gadidae	3.9	6.5	7.7	39.6	68.4	20.2	-	8.9	-	25.3	-	-	-	-
<i>Gadus chalcogrammus</i>	3.9	6.5	7.7	39.6	68.4	20.2	-	8.9	-	25.3	-	-	-	-
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	4.2	25.4	6.0	23.8	-	15.5	31.3	4.4	31.3	48.3	20.0	5.3	16.7	-
<i>Hexagrammos decagrammus</i>	-	1.2	-	-	-	15.5	26.9	4.4	20.2	10.3	2.9	5.3	16.7	-
<i>Pleurogrammus monopterygius</i>	-	-	6.0	22.6	-	-	-	-	11.1	37.9	2.9	-	-	-
Other Hexagrammidae	4.2	24.3	-	1.2	-	-	4.5	-	-	-	14.3	-	-	-
Other Teleostei	5.0	0.6	0.9	3.0	5.3	4.7	35.8	8.9	14.1	3.4	5.7	3.3	11.1	13.6
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 44 (continued). Percent composition of major prey items in diets of tufted puffin chicks at Buldir 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 (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 observed (1990) or collected (1988-1989, 1991-2016) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; 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	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
No. samples	6	30	42	12	19	15	28	22	13	30	18	30	2
No. individuals	22	174	249	94	54	54	134	87	25	75	144	114	<i>pending</i>
Invertebrates	77.3	51.7	2.8	45.7	35.2	35.2	56.0	37.9	68.0	52.0	91.0	28.1	-
Cephalopoda	77.3	51.7	2.8	37.2	35.2	35.2	55.2	36.8	68.0	52.0	91.0	28.1	-
Gonatidae	-	-	-	-	-	-	-	-	-	41.3	88.2	28.1	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	-	12.0	81.3	14.0	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	29.3	6.9	14.0	-
Unid. Decabrachia	77.3	51.7	2.8	33.0	35.2	35.2	54.5	36.8	68.0	10.7	2.1	-	-
Other Cephalopoda	-	-	-	4.3	-	-	0.7	-	-	-	0.7	-	-
Other Invertebrates	-	-	-	8.5	-	-	0.7	1.1	-	-	-	-	-
Fish	22.7	48.3	97.2	54.3	64.8	64.8	44.0	60.9	32.0	48.0	9.0	71.9	-
Teleostei	22.7	48.3	97.2	54.3	64.8	64.8	44.0	60.9	32.0	48.0	9.0	71.9	-
Ammodytidae	-	35.6	6.4	-	-	11.1	-	-	-	-	-	-	-
<i>Ammodytes</i> spp.	-	35.6	6.4	-	-	11.1	-	-	-	-	-	-	-
Cottidae	-	-	-	31.9	31.5	3.7	29.1	5.7	-	4.0	-	15.8	-
Gadidae	18.2	2.3	76.7	3.2	-	11.1	0.7	9.2	4.0	-	2.1	11.4	-
<i>Gadus chalcogrammus</i>	18.2	2.3	72.7	2.1	-	7.4	0.7	9.2	4.0	-	2.1	11.4	-
Other Gadidae	-	-	4.0	1.1	-	3.7	-	-	-	-	-	-	-
Hexagrammidae	4.5	7.5	10.8	5.3	22.2	20.4	4.5	5.7	28.0	38.7	2.8	14.0	-
<i>Hexagrammos decagrammus</i>	4.5	7.5	10.8	1.1	-	-	-	-	-	-	-	-	-
<i>Pleurogrammus monopterygius</i>	-	-	-	3.2	22.2	18.5	3.0	3.4	24.0	38.7	2.8	14.0	-
Other Hexagrammidae	-	-	-	1.1	-	1.9	1.5	2.3	4.0	-	-	-	-
Other Teleostei	-	2.9	3.2	13.8	11.1	18.5	9.7	40.2	-	5.3	4.2	30.7	-
Other	-	-	-	-	-	-	-	1.1	-	-	-	-	-

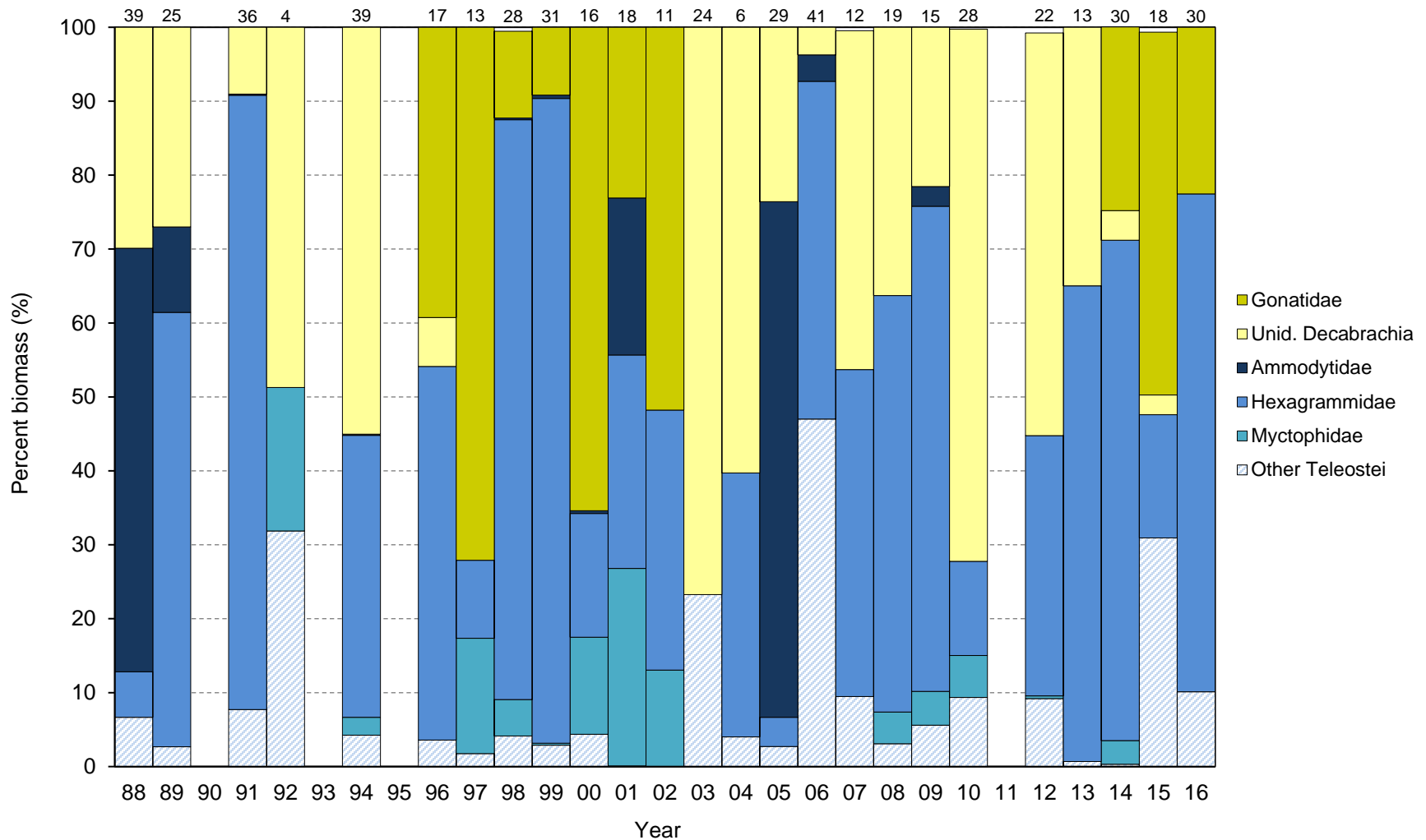


Figure 35. Relative biomass of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey is grouped to family level or higher; only taxa with an among-year average biomass of at least 5% are shown. Samples consist of bill loads collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 1993, 1995, or 2011; no biomass data exist in 1990. Samples were collected in 2017 but have not yet been analyzed.

Table 45. Relative biomass of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey was identified and measured in laboratory (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 biomass 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 from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; no biomass data exist in 1990. 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	1988	1989	1991	1992	1994	1996	1997	1998	1999	2000	2001	2002	2003
No. samples	39	25	36	4	39	17	13	28	31	16	18	11	24
Total mass (g)	279	381	607	30	649	196	228	360	464	135	227	234	455
Invertebrates	29.9	27.0	9.0	48.7	55.0	45.9	72.1	12.3	9.2	65.4	23.1	51.8	76.7
Cephalopoda	29.9	27.0	9.0	48.7	55.0	45.9	72.1	11.7	9.2	65.4	23.1	51.8	76.7
Gonatidae	-	-	-	-	-	39.3	72.1	11.7	9.2	65.4	23.1	51.8	-
<i>Gonatus kamtschaticus</i>	-	-	-	-	-	32.5	71.6	-	-	-	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	11.7	9.2	65.4	23.1	51.8	-
Other Gonatidae	-	-	-	-	-	6.7	0.4	-	-	-	-	-	-
Unid. Decabrachia	29.9	27.0	9.0	48.7	55.0	6.6	-	-	-	-	-	-	76.7
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	-	-	-	-	-	-	-	0.5	-	-	-	-	-
Fish	70.1	73.0	91.0	51.3	45.0	54.1	27.9	87.7	90.8	34.6	76.9	48.2	23.3
Teleostei	70.1	73.0	91.0	51.3	45.0	54.1	27.9	87.7	90.8	34.6	76.9	48.2	23.3
Ammodytidae	57.3	11.6	0.1	-	0.2	-	-	0.2	0.5	0.4	21.2	-	-
<i>Ammodytes</i> spp.	57.3	11.6	0.1	-	0.2	-	-	0.2	0.5	0.4	21.2	-	-
Hexagrammidae	6.2	58.8	83.1	-	38.2	50.5	10.5	78.4	87.2	16.7	28.9	35.2	-
<i>Hexagrammos decagrammus</i>	-	-	-	-	38.2	49.8	10.5	30.6	5.1	8.9	28.9	35.2	-
<i>Pleurogrammus monoptygius</i>	-	-	82.9	-	-	-	-	47.8	82.1	6.0	-	-	-
Other Hexagrammidae	6.2	58.8	0.2	-	-	0.8	-	-	-	1.9	-	-	-
Myctophidae	-	-	-	19.4	2.4	-	15.6	4.9	0.3	13.1	26.7	13.1	-
Other Teleostei	6.7	2.7	7.7	31.9	4.2	3.6	1.8	4.1	2.9	4.4	0.1	-	23.3
Other	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 45 (continued). Relative biomass of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey was identified and measured in the laboratory (1992-1997, 2000-2016), the field (1988-1991), or both (1998-1999) 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 biomass 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 from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011; no biomass data exist in 1990. 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	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
No. samples	6	29	41	12	19	15	28	22	13	30	18	30	2
Total mass (g)	68	457	479	140	153	104	233	160	155	301	146	273	<i>pending</i>
Invertebrates	60.3	23.6	3.7	46.3	36.3	21.5	72.2	54.5	35.0	28.8	52.4	22.5	-
Cephalopoda	60.3	23.6	3.7	46.1	36.3	21.5	72.2	54.5	35.0	28.8	52.4	22.5	-
Gonatidae	-	-	-	-	-	-	-	-	-	24.8	49.1	22.5	-
<i>Gonatus kamtschaticus</i>	-	-	-	-	-	-	-	-	-	10.7	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	-	6.0	32.6	7.7	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	8.2	16.5	14.8	-
Unid. Decabrachia	60.3	23.6	3.7	45.8	36.3	21.5	72.0	54.5	35.0	4.0	2.7	-	-
Other Cephalopoda	-	-	-	0.3	-	-	0.2	-	-	-	0.6	-	-
Other Invertebrates	-	-	-	0.2	-	-	<0.1	<0.1	-	-	-	-	-
Fish	39.7	76.4	96.3	53.7	63.7	78.5	27.8	44.8	65.0	71.2	47.6	77.5	-
Teleostei	39.7	76.4	96.3	53.7	63.7	78.5	27.8	44.8	65.0	71.2	47.6	77.5	-
Ammodytidae	-	69.7	3.6	-	-	2.7	-	-	-	-	-	-	-
<i>Ammodytes</i> spp.	-	69.7	3.6	-	-	2.7	-	-	-	-	-	-	-
Hexagrammidae	35.7	3.9	45.7	44.2	56.3	65.6	12.7	35.2	64.3	67.7	16.7	67.4	-
<i>Hexagrammos decagrammus</i>	35.7	3.9	45.7	2.4	-	-	-	-	-	-	-	-	-
<i>Pleurogrammus monopterygius</i>	-	-	-	41.7	56.3	62.8	9.8	31.0	62.1	67.7	16.7	67.4	-
Other Hexagrammidae	-	-	-	0.1	-	2.8	2.9	4.2	2.3	-	-	-	-
Myctophidae	-	-	-	-	4.3	4.6	5.7	0.4	-	3.2	-	-	-
Other Teleostei	4.0	2.7	47.0	9.5	3.1	5.6	9.4	9.2	0.7	0.3	30.9	10.1	-
Other	-	-	-	-	-	-	-	0.7	-	-	-	-	-

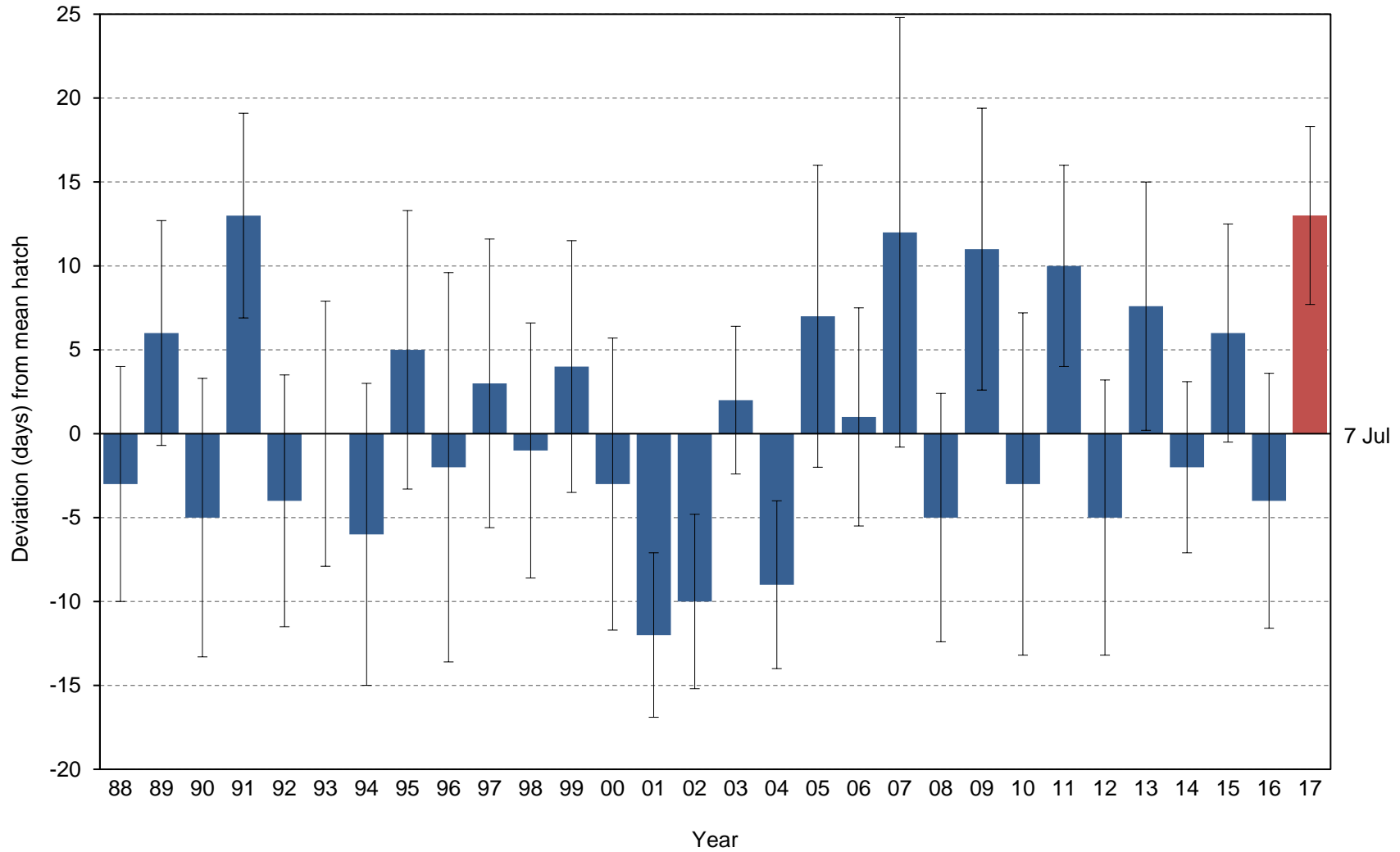


Figure 36. Yearly hatch date deviation (from the 1988-2016 average of 7 July) for black-legged kittiwakes at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 46. Breeding chronology of black-legged kittiwakes at Buldir Island, Alaska. Data represent the date of the first egg laid and the first chick hatched in each nest.

Year	Mean lay ^a	SD	<i>n</i> ^b	Mean hatch	SD	<i>n</i> ^c	First lay ^a	First hatch	Last hatch	First fledge ^d
1988	-	-	-	3 Jul	7.0	236	<21 Jun	23 Jun	24 Jul	>14 Aug
1989	-	-	-	13 Jul	6.7	32	<10 Jun	1 Jul	29 Jul	13 Jul
1990	-	-	-	2 Jul	8.3	192	<3 Jun	14 Jun	29 Jul	28 Jul
1991	-	-	-	20 Jul	6.1	67	<14 Jun	24 Jun	10 Aug	>13 Aug
1992	-	-	-	2 Jul	7.5	348	<4 Jun	14 Jun	5 Aug	27 Jul
1993	-	-	-	7 Jul	7.9	105	<7 Jun	26 Jun	23 Jul	16 Aug
1994	-	-	-	1 Jul	9.0	117	<15 Jun	19 Jun	6 Aug	12 Aug
1995	-	-	-	12 Jul	8.3	40	<15 Jun	29 Jun	8 Aug	17 Aug
1996	-	-	-	4 Jul	11.6	217	<12 Jun	16 Jun	7 Aug	2 Aug
1997	-	-	-	10 Jul	8.6	280	<9 Jun	17 Jun	7 Aug	31 Jul
1998	-	-	-	6 Jul	7.6	157	<14 Jun	16 Jun	29 Jul	4 Aug
1999	-	-	-	11 Jul	7.5	27	<24 Jun	28 Jun	4 Aug	15 Aug
2000	-	-	-	3 Jul	8.7	176	<11 Jun	12 Jun	1 Aug	1 Aug
2001	-	-	-	25 Jun	4.9	15	<17 Jun	17 Jun	5 Jul	-
2002	-	-	-	27 Jun	5.2	149	<6 Jun	15 Jun	11 Jul	26 Jul
2003	-	-	-	9 Jul	4.4	22	<17 Jun	2 Jul	19 Jul	11 Aug
2004	-	-	-	27 Jun	5.0	32	<14 Jun	17 Jun	8 Jul	15 Aug
2005	-	-	-	14 Jul	9.0	5	<15 Jun	3 Jul	25 Jul	10 Aug
2006	-	-	-	8 Jul	6.5	90	<13 Jun	23 Jun	25 Jul	4 Aug
2007	-	-	-	19 Jul	12.8	5	<15 Jun	2 Jul	10 Aug	15 Aug
2008	-	-	-	1 Jul	7.4	87	<15 Jun	18 Jun	19 Jul	31 Jul
2009	-	-	-	18 Jul	8.4	61	<12 Jun	27 Jun	4 Aug	11 Aug
2010	-	-	-	4 Jul	10.2	71	<15 Jun	18 Jun	29 Jul	2 Aug
2011	-	-	-	17 Jul	6.0	79	<18 Jun	27 Jun	31 Jul	17 Aug
2012	-	-	-	1 Jul	8.2	83	<5 Jun	14 Jun	20 Jul	30 Jul
2013	-	-	-	15 Jul	7.4	32	<19 Jun	5 Jul	31 Jul	15 Aug
2014	-	-	-	5 Jul	5.1	21	<18 Jun	30 Jun	17 Jul	5 Aug
2015	-	-	-	13 Jul	6.5	72	<16 Jun	29 Jun	27 Jul	>21 Aug
2016	-	-	-	2 Jul	7.6	137	<14 Jun	16 Jun	30 Jul	30 Jul
2017	-	-	-	20 Jul	5.3	14	6-13 Jun ^e	11 Jul	5 Aug	>24 Aug

^aIn years when birds are already on eggs at the first visit, mean lay date is not calculated and date of first lay is listed as < the date of first nest check.

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

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

^dIn 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.

^eIn 2017, no nests were present on 5 June, but nests with eggs were present on 14 June.

Table 47. Frequency distribution of hatch dates for black-legged kittiwakes at Buldir 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.

Julian date ^a	No. nests hatching on Julian date														
	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
164	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
165	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	6	-	-	-	-	-	-	-	-	-	1
167	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
168	-	-	-	-	-	-	-	-	11	2	-	-	4	2	-
169	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
170	-	-	-	-	-	-	2	-	-	-	-	-	-	-	8
171	-	-	-	-	15	-	10	-	2	-	3	-	-	3	22
172	-	-	-	-	-	-	-	-	15	-	-	-	1	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
174	-	-	3	-	-	-	-	-	-	5	-	-	16	-	4
175	15	-	-	1	1	-	-	-	-	-	-	-	-	-	18
176	3	-	-	-	38	-	36	-	34	-	14	-	-	-	3
177	3	-	1	-	-	13	-	-	-	-	-	-	1	7	2
178	8	-	84	-	-	-	-	-	-	-	-	-	-	-	12
179	8	-	-	-	-	-	-	-	-	20	-	2	54	-	-
180	56	-	32	-	2	-	-	3	33	-	-	-	-	1	35
181	1	-	22	-	-	-	37	-	-	-	-	-	-	-	-
182	22	2	8	1	130	31	-	-	-	1	37	-	1	1	5
183	15	-	-	-	-	-	-	-	1	-	-	-	1	-	4
184	-	-	-	-	-	-	-	1	31	-	-	-	-	-	26
185	1	-	-	-	3	-	-	-	-	82	4	4	30	-	-
186	22	-	1	-	82	1	19	5	-	-	34	-	-	1	1
187	5	-	-	-	-	-	-	-	1	-	-	-	-	-	-
188	21	-	5	-	-	19	-	1	-	1	-	-	-	-	4
189	14	5	-	-	-	-	-	-	13	1	-	-	2	-	-
190	-	-	-	-	4	-	-	8	-	72	1	9	-	-	-
191	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
192	9	-	-	-	33	2	-	-	-	1	38	-	44	-	1
193	7	-	11	-	-	-	-	1	-	2	-	1	-	-	-
194	5	19	-	-	-	21	-	12	-	41	-	9	-	-	-
195	-	-	-	-	3	-	-	-	23	-	-	-	-	-	-
196	3	-	-	1	18	-	-	-	-	-	17	-	-	-	-
197	-	-	1	-	-	1	2	-	-	1	-	-	9	-	-
198	2	-	-	34	-	-	-	5	-	-	-	-	-	-	-
199	-	-	-	-	-	9	1	-	-	-	-	-	-	-	-
200	4	-	-	-	-	-	4	-	30	22	-	-	1	-	-
201	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
202	-	-	16	8	6	-	-	-	-	-	-	-	10	-	-
203	-	-	-	10	-	2	-	-	-	1	-	-	-	-	-
204	7	-	-	-	-	6	1	2	15	-	-	-	-	-	-
205	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-
206	1	-	4	-	4	-	3	-	-	16	2	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	10	-	-	-	-	6	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	4	1	-	-	-	1	-	-	2	2	1	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	1	1	-	-	-	-	7	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
220	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	236	32	192	67	348	105	117	40	217	280	157	27	176	15	149

Table 47 (continued). Frequency distribution of hatch dates for black-legged kittiwakes at Buldir 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.

Julian date ^a	No. nests hatching on Julian date														
	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
169	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
170	-	1	-	-	-	2	-	-	-	4	-	-	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
172	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	10	-	1	-	16	-	12	-	-	-	-	-	18	-
175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	-	-	-	-	-	-	-	-	-	22	-	-	-	1	-
177	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
178	-	-	-	-	-	-	1	14	1	-	-	-	-	14	-
179	-	-	-	-	-	-	-	-	-	2	-	-	-	5	-
180	-	13	-	13	-	17	-	-	-	-	-	-	1	-	-
181	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
182	-	-	-	-	-	2	-	-	-	23	-	10	-	1	-
183	2	-	-	1	1	-	-	-	4	-	-	-	1	-	-
184	1	5	2	19	-	22	1	17	-	-	-	-	-	47	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	6	6	19	2	-
187	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
188	1	-	-	21	-	-	-	6	4	20	-	-	-	20	-
189	11	-	-	-	-	-	2	-	-	-	-	-	-	-	-
190	-	2	-	1	-	12	9	-	-	-	-	-	-	-	-
191	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
192	-	-	-	15	-	-	1	3	3	-	8	2	13	1	1
193	-	-	-	1	-	1	-	-	-	2	-	-	10	-	-
194	5	-	-	-	1	-	8	-	-	-	2	-	1	18	-
195	-	-	-	1	-	9	8	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	6	3	-	-	-	2	-	-
197	-	-	-	10	-	-	-	-	-	-	10	-	-	-	-
198	-	-	1	1	1	-	1	-	40	3	-	2	12	-	5
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	2	-	-	-	-	-	9	-	3	1	-	-	2	4	-
201	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-
202	-	-	-	3	1	-	-	6	6	5	1	-	-	-	7
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	1	-	10	-	-	-	10	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	1	2	-	-	6	2	-	-	2	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	1	-	4	-	-	-	1	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	11	2	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	1	-	3	-	-	2	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>n</i>	22	32	5	90	5	87	61	71	79	83	32	21	72	137	14

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

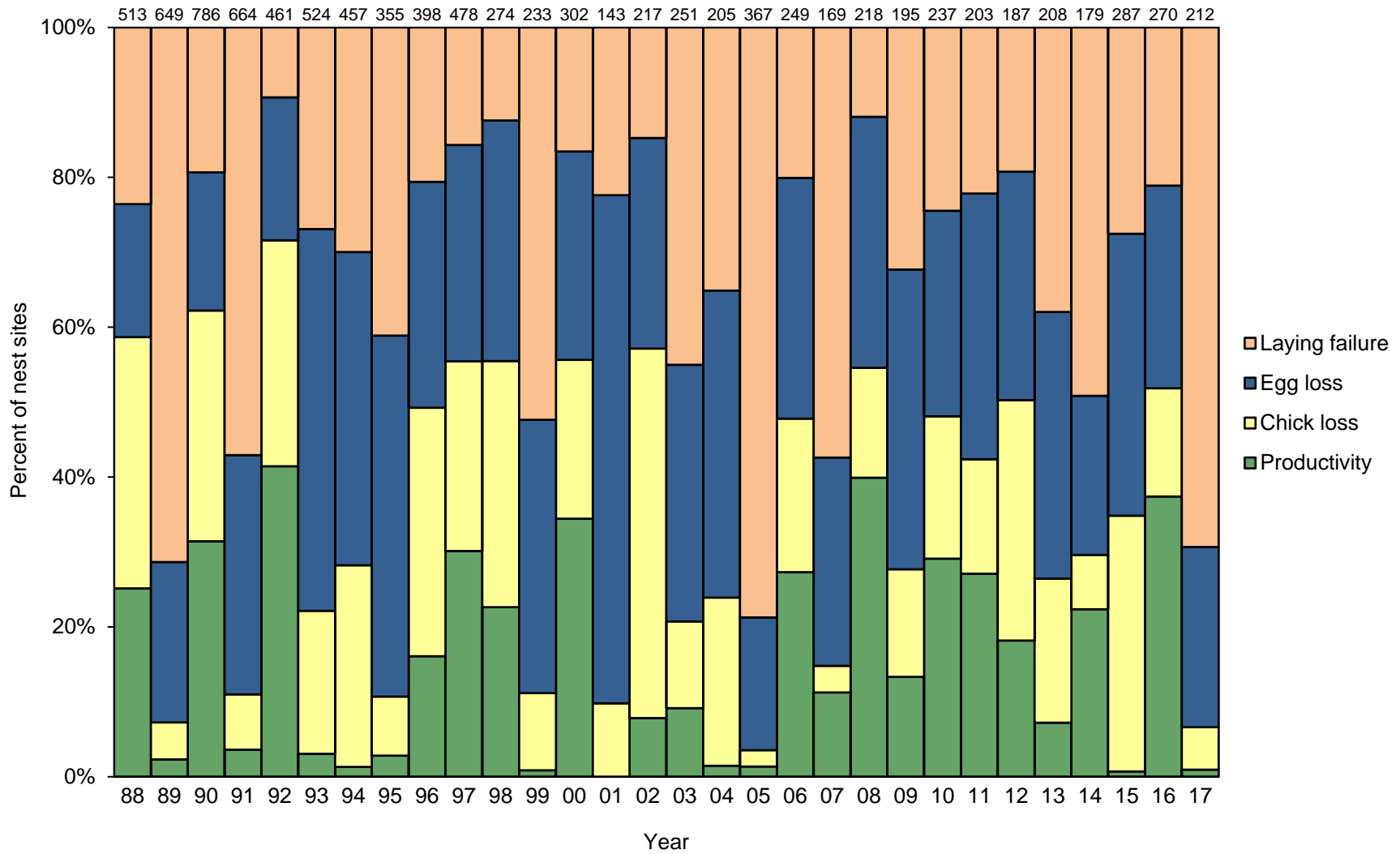


Figure 37. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A). No data were collected in 1977-1987; only data on clutch sizes are available in 1976.

Table 48. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska. No data were collected in 1977-1987.

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)
1976 ^a	-	74	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-
1988	513	392	688	301	400	129	130	0.76	1.8	0.77	0.58	0.33	0.19	0.43	0.33	0.25	0.25
1989	649	186	235	47	52	15	15	0.29	1.3	0.25	0.22	0.29	0.06	0.32	0.08	0.02	0.02
1990	786	634	1140	489	655	247	247	0.81	1.8	0.77	0.57	0.38	0.22	0.51	0.39	0.31	0.31
1991	664	285	383	73	88	24	24	0.43	1.3	0.26	0.23	0.27	0.06	0.33	0.08	0.04	0.04
1992	461	418	754	330	493	191	192	0.91	1.8	0.79	0.65	0.39	0.25	0.58	0.46	0.42	0.41
1993	524	383	621	116	152	16	16	0.73	1.6	0.30	0.24	0.11	0.03	0.14	0.04	0.03	0.03
1994	457	320	532	129	162	6	6	0.70	1.7	0.40	0.30	0.04	0.01	0.05	0.02	0.01	0.01
1995	355	209	294	38	50	10	10	0.59	1.4	0.18	0.17	0.20	0.03	0.26	0.05	0.03	0.03
1996	398	316	535	196	266	64	64	0.79	1.7	0.62	0.50	0.24	0.12	0.33	0.2	0.16	0.16
1997	478	403	694	265	383	144	144	0.84	1.7	0.66	0.55	0.38	0.21	0.54	0.36	0.30	0.30
1998	274	240	416	152	207	62	66	0.88	1.7	0.63	0.50	0.32	0.16	0.41	0.26	0.24	0.23
1999	233	111	166	26	33	2	2	0.48	1.5	0.23	0.20	0.06	0.01	0.08	0.02	0.01	0.01
2000	302	252	451	168	244	104	105	0.83	1.8	0.67	0.54	0.43	0.23	0.62	0.41	0.35	0.34
2001	143	111	167	14	14	0	0	0.78	1.5	0.13	0.08	0.00	0.00	0.00	0.00	0.00	0.00
2002	217	185	337	124	178	17	17	0.85	1.8	0.67	0.53	0.10	0.05	0.14	0.09	0.08	0.08
2003	251	138	187	52	57	23	23	0.55	1.4	0.38	0.30	0.40	0.12	0.44	0.17	0.09	0.09
2004	205	133	215	49	55	3	3	0.65	1.6	0.37	0.26	0.05	0.01	0.06	0.02	0.01	0.01
2005	367	78	90	13	13	5	5	0.21	1.2	0.17	0.14	0.38	0.06	0.38	0.06	0.01	0.01
2006	249	199	302	119	135	68	69	0.80	1.5	0.60	0.45	0.51	0.23	0.57	0.34	0.28	0.27
2007	169	72	101	25	25	19	19	0.43	1.4	0.35	0.25	0.76	0.19	0.76	0.26	0.11	0.11
2008	218	192	306	119	146	87	89	0.88	1.6	0.62	0.48	0.61	0.29	0.73	0.45	0.41	0.40
2009	198	132	196	54	65	26	26	0.68	1.5	0.41	0.33	0.40	0.13	0.48	0.20	0.13	0.13
2010	237	179	286	114	146	69	70	0.76	1.6	0.64	0.51	0.48	0.24	0.61	0.39	0.30	0.29
2011	203	158	240	86	102	55	56	0.78	1.5	0.54	0.43	0.55	0.23	0.64	0.35	0.28	0.27
2012	187	151	254	94	124	34	34	0.81	1.7	0.62	0.49	0.27	0.13	0.36	0.23	0.18	0.18
2013	208	129	182	55	63	15	15	0.62	1.4	0.43	0.35	0.24	0.08	0.27	0.12	0.07	0.07
2014	179	91	134	53	69	40	40	0.51	1.5	0.58	0.51	0.58	0.30	0.75	0.44	0.22	0.22
2015	287	208	346	100	117	2	2	0.72	1.7	0.48	0.34	0.02	0.01	0.02	0.01	0.01	0.01
2016	270	213	377	140	185	101	103	0.79	1.8	0.66	0.49	0.56	0.27	0.72	0.47	0.38	0.37
2017	212	65	80	14	15	2	2	0.31	1.2	0.22	0.19	0.13	0.03	0.14	0.03	0.01	0.01

^aData from Byrd and Day (1986).

Table 49. Standard deviation in reproductive performance parameters of black-legged kittiwakes at Buldir 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 1977-1987.

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.
1976	-	-	Simple random	-	0.11	-	-	-	-	-	-	-	-
1988	24	513	Cluster by plot	0.03	0.02	0.02	0.03	0.03	0.02	0.04	0.03	0.03	0.03
1989	23	649	Cluster by plot	0.05	0.04	0.08	0.07	0.08	0.03	0.09	0.04	0.01	0.01
1990	27	786	Cluster by plot	0.05	0.02	0.02	0.01	0.03	0.02	0.03	0.03	0.03	0.03
1991	30	664	Cluster by plot	0.05	0.04	0.04	0.04	0.06	0.02	0.08	0.03	0.01	0.01
1992	16	461	Cluster by plot	0.02	0.02	0.02	0.03	0.03	0.02	0.04	0.04	0.04	0.04
1993	9	524	Cluster by plot	0.03	0.05	0.06	0.04	0.02	0.01	0.02	0.01	0.01	0.01
1994	17	457	Cluster by plot	0.04	0.03	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.01
1995	15	355	Cluster by plot	0.03	0.04	0.06	0.05	0.06	0.02	0.08	0.02	0.01	0.01
1996	16	398	Cluster by plot	0.03	0.02	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03
1997	23	478	Cluster by plot	0.03	0.02	0.04	0.03	0.02	0.02	0.03	0.03	0.03	0.03
1998	10	274	Cluster by plot	0.02	0.04	0.02	0.02	0.04	0.02	0.05	0.03	0.03	0.02
1999	8	233	Cluster by plot	0.08	0.06	0.10	0.08	0.04	0.01	0.05	0.02	0.01	0.01
2000	8	302	Cluster by plot	0.04	0.03	0.07	0.06	0.01	0.03	0.03	0.06	0.07	0.06
2001	5	143	Cluster by plot	0.07	0.08	0.08	0.05	0.00	0.00	0.00	0.00	0.00	0.00
2002	7	217	Cluster by plot	0.03	0.03	0.05	0.04	0.03	0.01	0.04	0.02	0.02	0.02
2003	11	251	Cluster by plot	0.11	0.07	0.10	0.08	0.08	0.05	0.08	0.06	0.03	0.03
2004	7	205	Cluster by plot	0.05	0.04	0.04	0.05	0.05	0.01	0.06	0.02	0.01	0.01
2005	9	367	Cluster by plot	0.05	0.04	0.08	0.07	0.10	0.04	0.10	0.04	0.01	0.01
2006	6	249	Cluster by plot	0.03	0.11	0.04	0.05	0.08	0.06	0.10	0.08	0.07	0.07
2007	6	169	Cluster by plot	0.08	0.10	0.17	0.12	0.09	0.11	0.09	0.15	0.07	0.07
2008	7	218	Cluster by plot	0.03	0.04	0.04	0.04	0.06	0.03	0.06	0.04	0.05	0.04
2009	7	198	Cluster by plot	0.06	0.08	0.11	0.07	0.08	0.04	0.10	0.07	0.06	0.06
2010	7	237	Cluster by plot	0.05	0.09	0.04	0.04	0.03	0.03	0.07	0.06	0.05	0.05
2011	7	203	Cluster by plot	0.08	0.07	0.07	0.05	0.06	0.04	0.08	0.07	0.08	0.08
2012	7	187	Cluster by plot	0.08	0.11	0.05	0.05	0.03	0.02	0.05	0.04	0.05	0.05
2013	7	208	Cluster by plot	0.05	0.05	0.07	0.05	0.04	0.02	0.04	0.03	0.02	0.02
2014	12	179	Cluster by plot	0.16	0.06	0.11	0.12	0.05	0.08	0.06	0.11	0.08	0.08
2015	10	287	Cluster by plot	0.03	0.05	0.05	0.03	0.01	0.00	0.01	0.01	0.01	0.01
2016	8	270	Cluster by plot	0.05	0.02	0.05	0.04	0.05	0.03	0.05	0.05	0.06	0.06
2017	7	212	Cluster by plot	0.05	0.04	0.04	0.03	0.08	0.01	0.08	0.02	0.01	0.01

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

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

Table 50. Clutch sizes of black-legged kittiwakes at Buldir Island, Alaska. Sample units consist of total nest sites, not plots. No data were collected in 1977-1987.

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			
1976 ^a	-	-	-	-	-	74	-	1.6
1988	513	121	97	294	1	392	688	1.7
1989	649	463	137	49	0	186	235	1.3
1990	786	152	135	492	7	634	1140	1.8
1991	664	379	187	98	0	285	383	1.3
1992	461	43	84	332	2	418	754	1.8
1993	524	141	145	238	0	383	621	1.6
1994	457	137	108	212	0	320	532	1.7
1995	355	146	124	85	0	209	294	1.4
1996	398	82	98	217	1	316	535	1.7
1997	478	75	112	291	0	403	694	1.7
1998	274	34	66	172	2	240	416	1.7
1999	233	122	56	55	0	111	166	1.5
2000	302	50	54	197	1	252	451	1.8
2001	143	32	55	56	0	111	167	1.5
2002	217	32	34	150	1	185	337	1.8
2003	251	113	89	49	0	138	187	1.4
2004	205	72	51	82	0	133	215	1.6
2005	367	289	66	12	0	78	90	1.2
2006	249	50	98	99	2	199	302	1.5
2007	169	97	43	29	0	72	101	1.4
2008	218	26	79	112	1	192	306	1.6
2009	198	66	69	62	1	132	196	1.5
2010	237	58	72	107	0	179	286	1.6
2011	203	45	76	82	0	158	240	1.5
2012	187	36	48	103	0	151	254	1.7
2013	208	79	76	53	0	129	182	1.4
2014	179	88	50	39	2	91	134	1.5
2015	287	79	73	132	3	208	346	1.7
2016	270	57	50	162	1	213	377	1.8
2017	212	147	50	15	0	65	80	1.2

^aData from Byrd and Day (1986).

Table 51. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska in 2017. All plots in 2017 were located at Spike Camp.

Parameter	Plot							Total	SD ^b
	37	39/40A ^a	40B/40C ^a	45	45A	46	47		
Total nest starts (A)	29	34	23	30	33	33	30	212	-
Nest sites w/ eggs (B)	5	14	13	9	8	12	4	65	-
Total eggs (C)	7	18	16	12	9	14	4	80	-
Nest sites w/ chicks (D)	1	4	2	2	1	4	0	14	-
Total chicks (E)	1	4	2	3	1	4	0	15	-
Nest sites w/ chicks fledged (F)	0	1	1	0	0	0	0	2	-
Total chicks fledged (G)	0	1	1	0	0	0	0	2	-
Laying success (B/A)	0.17	0.41	0.57	0.30	0.24	0.36	0.13	0.31	0.05
Mean clutch size (C/B)	1.4	1.3	1.2	1.3	1.1	1.2	1.0	1.2	0.04
Nesting success (D/B)	0.20	0.29	0.15	0.22	0.13	0.33	0.00	0.22	0.04
Hatching success (E/C)	0.14	0.22	0.13	0.25	0.11	0.29	0.00	0.19	0.03
Chick success (G/E)	0.00	0.25	0.50	0.00	0.00	0.00	-	0.13	0.08
Egg success (G/C)	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.03	0.01
Fledging success (F/D)	0.00	0.25	0.50	0.00	0.00	0.00	-	0.14	0.08
Reproductive success (F/B)	0.00	0.07	0.08	0.00	0.00	0.00	0.00	0.03	0.02
Fledglings/nest start (G/A)	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	0.01
Productivity (F/A)	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.01	0.01

^aPlots were combined for statistical purposes.

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

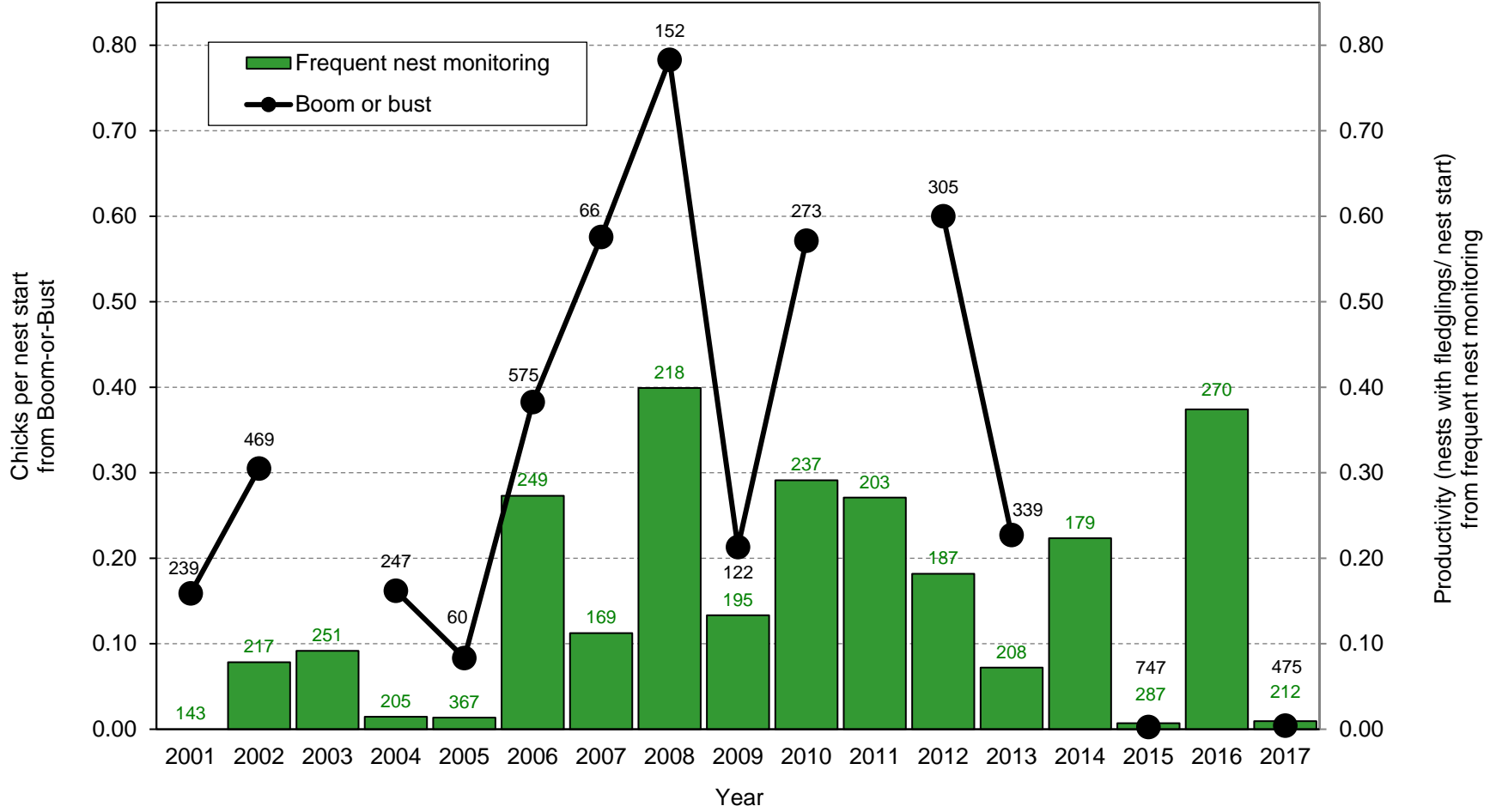


Figure 38. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska, as determined by a Boom-or-Bust methodology (black) and frequent nest monitoring (green). Reproductive success for Boom-or-Bust is measured by the number of chicks per nest start (E/A), where E =total chicks and A =total nest starts (including those without chicks), and 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. Reproductive success for frequent nest monitoring is measured by productivity (F/A), where F =nest sites with chicks fledged and A =total nest starts (see Table 48) and are based on following individual nests at 4-7 day intervals throughout the breeding season. Boom-or-Bust was conducted at Kittiwake Lane (2001-2013) and Spike Camp (2015-2017) and frequent nest monitoring at Spike Camp. Numbers above columns indicate sample sizes (A). No Boom-or-Bust data were collected in 2003, 2011, 2014, 2015, or 2016.

Table 52. Reproductive performance of black-legged kittiwakes at, Buldir 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. Boom-or-Bust monitoring was conducted at Kittiwake Lane (2001-2013) and Spike Camp (2015-2017). No Boom-or-Bust data were collected in 2003, 2011, 2014, or 2016.

Year	Total plots monitored	Total nest starts (A)	Total chicks (E)	Chicks/nest start (E/A) ^a	Date(s) of nest count	Date(s) of chick count
2001	3	239	38	0.15	26 Jun	29 Jul
2002	3	469	143	0.30	9 Jun	27 Jul
2004	2	247	40	0.16	17 Jun	3 Aug
2005	2	60	5	0.08	23 Jun	7 Aug
2006	3	575	220	0.38	23 Jun	9 Aug
2007	3	66	38	0.58	19 Jun	8 Aug
2008	7	152	119	0.78	18 Jun	19 Jul+12 Aug
2009	7	122	26	0.21	16 Jun	11 Aug+21 Aug
2010 ^b	7	273	156	0.57	6 Jul	28 Jul
2012	13	305	183	0.60	15 Jun	29 Jul
2013	7	339	77	0.23	1 Jul	7 Aug
2015	1	747	2	0.00	1 Jul	16 Aug
2017	1	475	2	0.00	3 Jul	14 Aug

^aChicks/nest start (E/A) may be considered a maximum potential value of success [fledglings/nest start (G/A)] based on the assumption that all chicks counted eventually fledge.

^bData represent maximum count of nests and chicks from 15 counts between 13 June and 22 August.

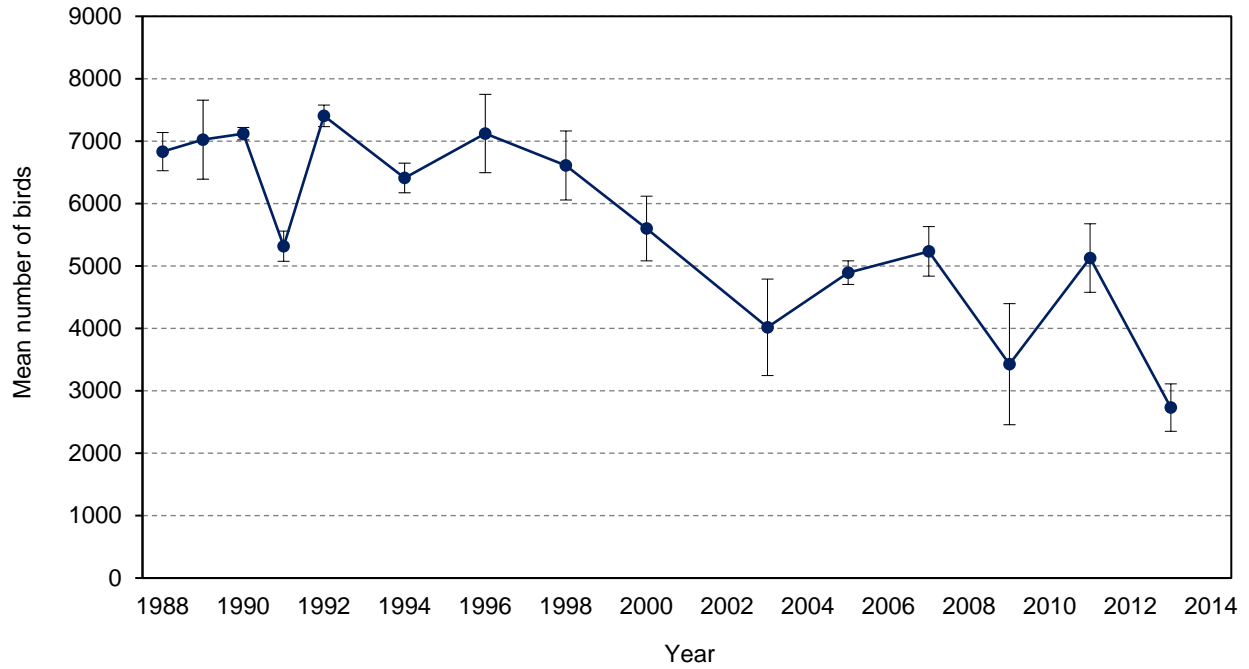


Figure 39. Mean numbers of black-legged kittiwakes counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

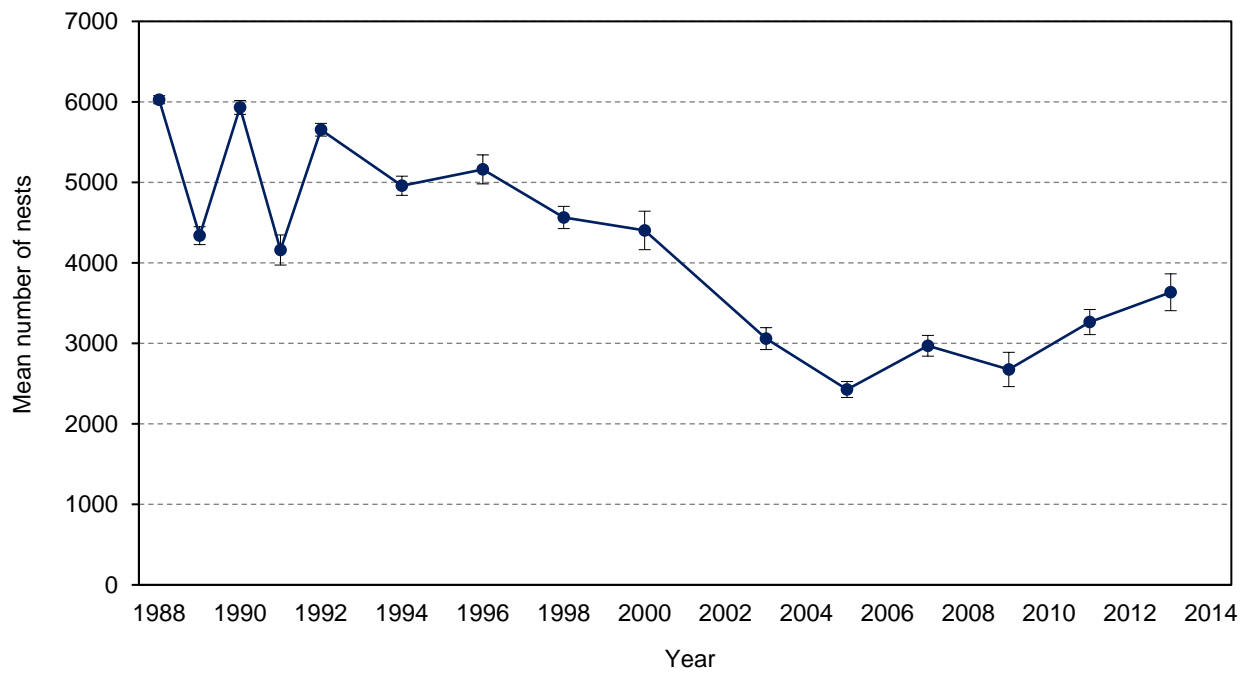


Figure 40. Mean numbers of black-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 53. Numbers of black-legged kittiwakes counted on index plots at Buldir Island, Alaska. Data represent combined totals from Spike (The Dip) and Kittiwake Lane. No counts were conducted in years not listed.

Replicate	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
1	6797	6534	6977	5125	7226	6185	6072	5821	5272	4848	5096	5004	4275	4981	2476
2	6998	6276	7042	5671	7607	6721	7036	6969	6020	4157	4719	5193	4608	4579	3382
3	6418	7048	7423	5145	7302	6463	7382	7263	5150	4084	4891	5161	2332	5583	2451
4	7115	7812	7141	5177	7484	6271	7483	6398	5267	2979	5111	4901	3046	5816	2627
5	-	7450	7019	5468	-	-	7639	6600	6291	-	4649	5913	2871	4678	2719
Mean	6832	7024	7120	5317	7405	6410	7122	6610	5600	4017	4893	5234	3426	5127	2731
<i>n</i>	4	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	306	633	99	242	173	238	628	553	518	773	189	397	970	549	380
First count	5 Jul	26 Jun	30 Jun	4 Jul	3 Jul	3 Jul	27 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	27 Jul	16 Jul	18 Jul	19 Jul	21 Jul	19 Jul	19 Jul	24 Jul	20 Jul	25 Jul	18 Jul	23 Jul	31 Jul	26 Jul	20 Jul

Table 54. Numbers of black-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Data represent combined totals from Spike (The Dip) and Kittiwake Lane. No counts were conducted in years not listed.

Replicate	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
1	5972	4452	5844	4079	5569	5106	4966	4393	4464	3122	2531	2952	2881	3124	3342
2	6070	4194	5845	4432	5663	5004	5246	4697	4786	3028	2561	3098	2930	3134	3966
3	6013	4403	6020	4254	5757	4867	5329	4711	4179	3200	2354	3098	2571	3417	3537
4	-	4247	6012	3949	5625	4856	4969	4545	4339	2885	2365	2899	2521	3447	3707
5	-	4393	5934	4088	-	-	5297	4471	4246	-	2324	2803	2478	3202	3625
Mean	6027	4338	5931	4160	5654	4958	5161	4564	4403	3059	2427	2970	2676	3265	3635
Max.	6070	4452	6020	4432	5757	5106	5329	4711	4786	3200	2561	3098	2930	3447	3966
<i>n</i>	3	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	50	111	86	187	79	119	180	138	239	136	99	129	213	156	229
First count	5 Jul	26 Jun	30 Jun	4 Jul	3 Jul	3 Jul	27 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	27 Jul	16 Jul	18 Jul	19 Jul	21 Jul	19 Jul	19 Jul	24 Jul	20 Jul	25 Jul	18 Jul	23 Jul	31 Jul	26 Jul	20 Jul

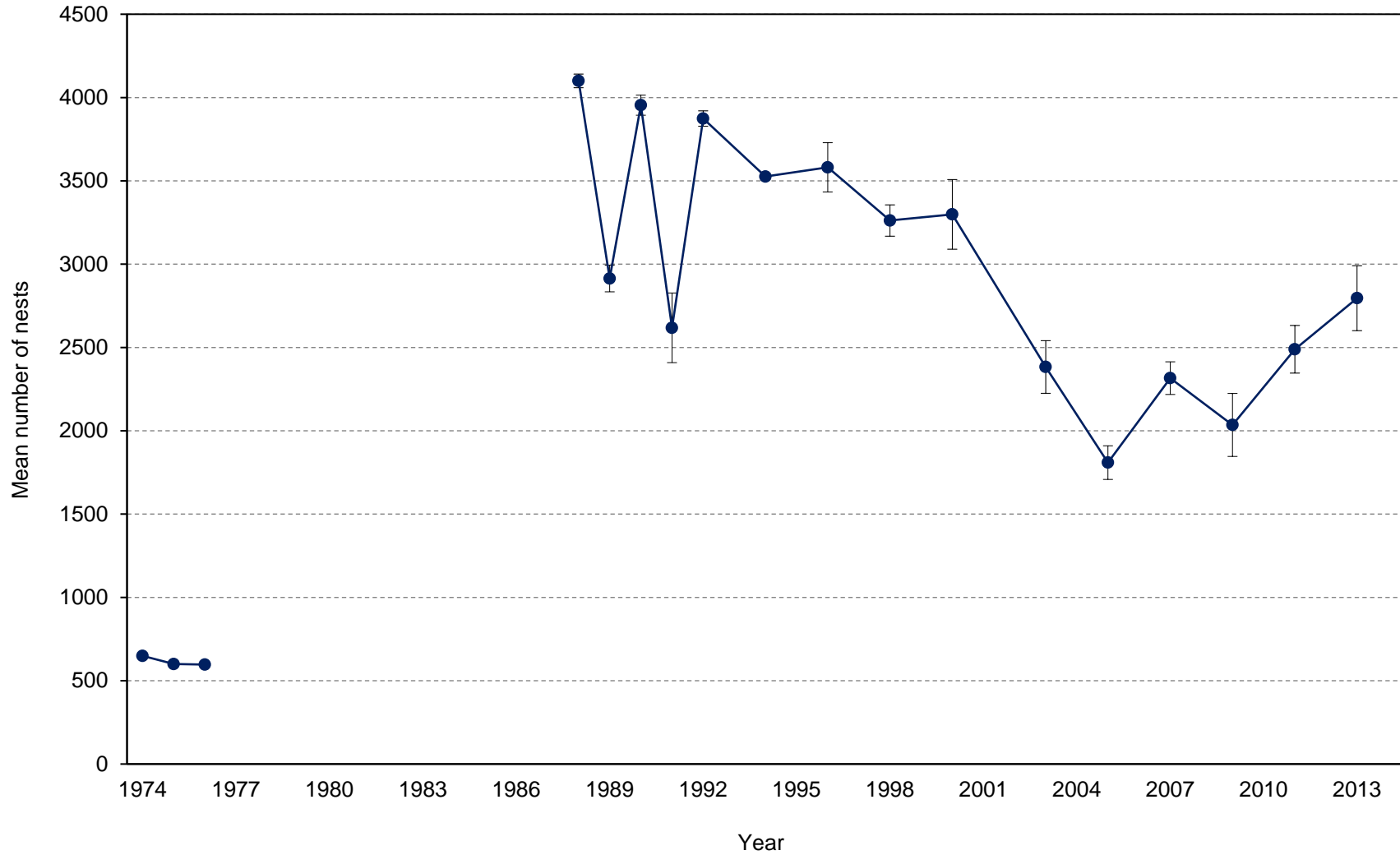


Figure 41. Mean numbers of black-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) and are a subset of total counts on all index plots. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 55. Mean numbers of black-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Plot values represent the average count of nests in that plot each year; total values and standard deviations are based on the average total count across all plots each year (as opposed to the sum of plot means). Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29); these data are a subset of total counts on all index plots (Table 53) but are presented separately for comparison with historic counts from 1974-1976. No counts were conducted in years not listed.

Plot (segment)	1974	1975	1976	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
15 (1)	-	137	-	563	424	542	241	515	344	352	338	300	256	176	22	2	44	0
16 (2)	-	133	-	637	510	580	296	595	509	415	460	351	317	236	309	256	373	208
17 (3)	-	76	-	728	568	642	378	586	566	515	405	381	297	320	315	365	483	226
18 (4)	-	123	-	628	271	474	351	449	448	436	401	335	255	268	413	305	441	190
19 (5)	-	63	-	368	237	361	300	346	376	360	268	281	159	175	209	201	243	194
20 (6)	-	39	-	284	180	298	230	297	301	280	202	209	101	122	158	123	137	122
21 (7)	-	24	-	341	215	290	256	324	299	325	279	274	185	139	193	148	171	144
22 (8)	-	5	-	264	236	343	277	329	244	317	297	303	213	130	185	145	153	138
23 (9)	-	0	-	219	230	344	251	355	264	244	238	268	153	89	207	185	188	133
24 (10)	-	0	-	10	9	26	11	23	43	114	115	185	90	30	81	86	83	88
25 (11)	-	0	-	7	5	11	9	12	35	48	52	90	69	41	77	69	58	79
26 (12)	-	0	-	18	11	19	8	7	19	49	77	163	121	28	63	74	61	105
27 (13)	-	0	-	15	9	4	1	14	29	52	58	71	86	39	45	40	35	40
28 (14)	-	0	-	18	9	20	9	22	49	74	71	84	64	11	38	36	20	38
29 (15)	-	0	-	0	0	0	0	0	0	0	0	4	17	3	0	1	0	5
Total	649 ^a	600	597	4100	2914	3954	2618	3874	3526	3581	3262	3299	2383	1809	2316	2035	2489	2796
<i>n</i>	1	1	1	3	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	-	-	-	41	80	60	209	46	20	148	94	209	158	101	98	189	143	195
First count	Jul ^b	Jul ^b	Jul ^b	5 Jul	29 Jun	30 Jun	8 Jul	6 Jul	4 Jul	28 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	-	-	-	27 Jul	16 Jul	18 Jul	18 Jul	20 Jul	19 Jul	18 Jul	24 Jul	20 Jul	25 Jul	18 Jul	14 Jul	31 Jul	26 Jul	20 Jul

^aIncludes 44 unspecified *Rissa* spp.

^bData come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

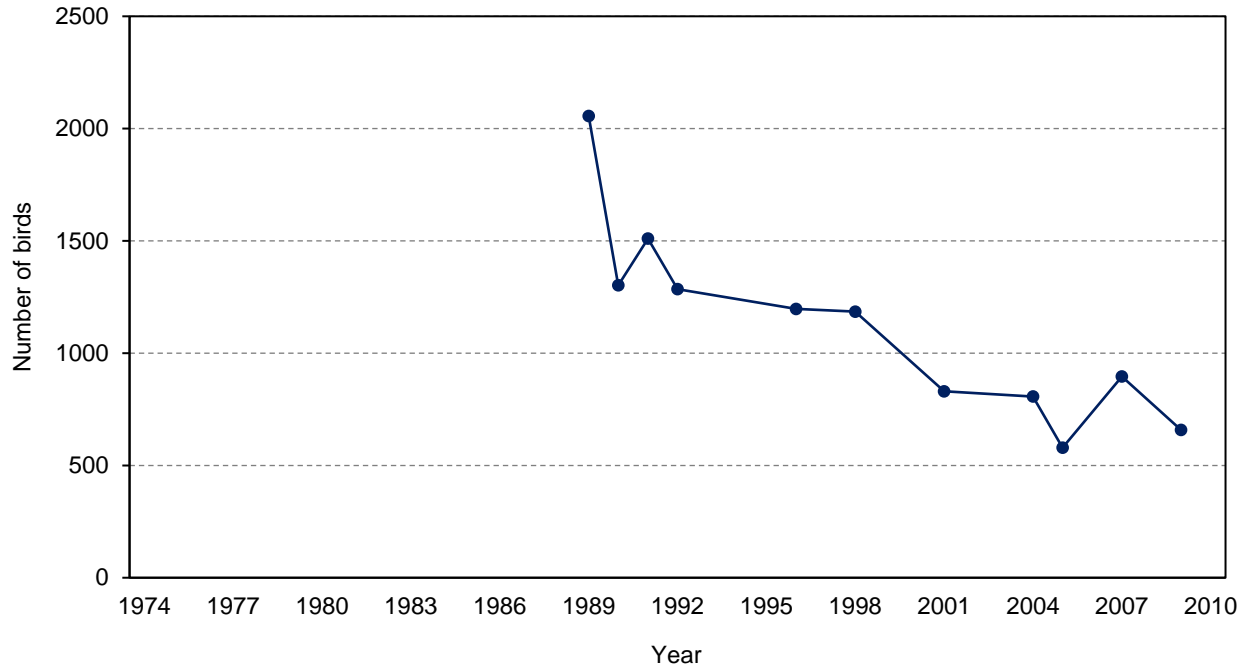


Figure 42. Numbers of black-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. Data do not include 1988 because birds were not identified to species. No counts were conducted in years not shown.

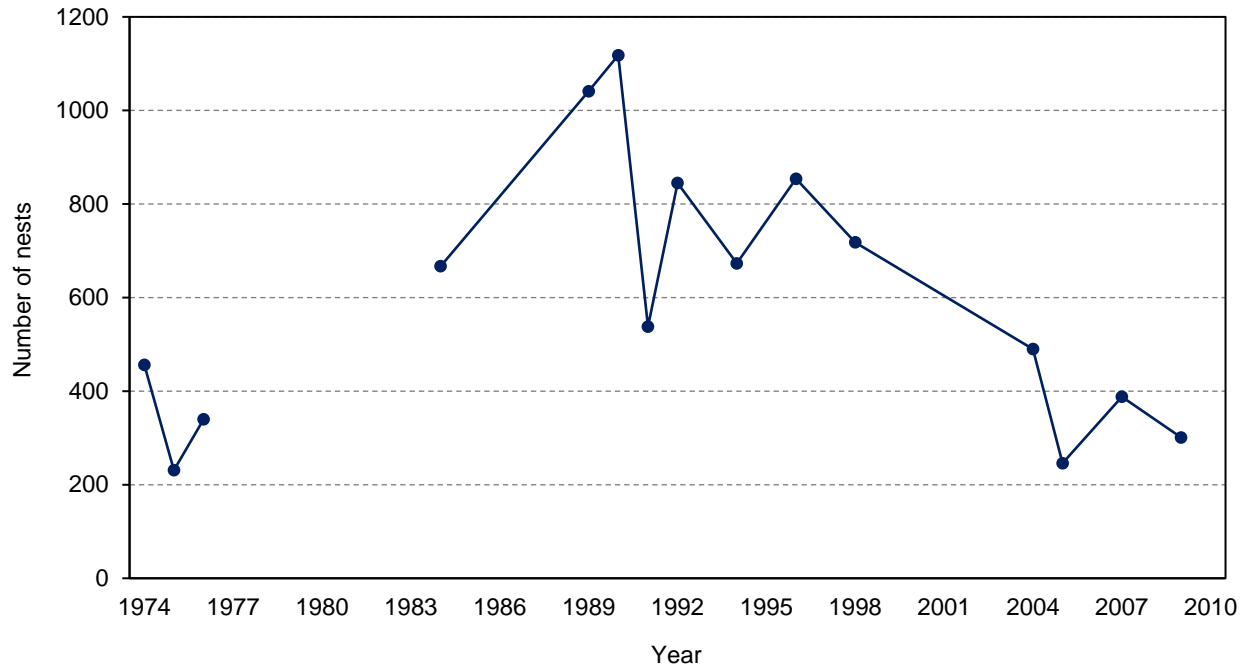


Figure 43. Numbers of black-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because nests were not identified to species, and 2001 when all areas were not counted.

Table 56. Numbers of black-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots; numbers are not included in population count totals (Table 53) and counts are not always conducted in the same years. No counts were conducted in years not listed.

Segment	1988	1989	1990	1991	1992	1996	1998	2001	2004	2005	2007	2009
I	206	342	211	229	239	161	125	136	122	76	163	86
II	135	225	128	111	120	96	111	139	132	49	82	63
III	241	175	125	68	106	40	102	0	0	0	6	0
IV	210	97	80	85	34	92	51	30	11	1	22	52
V	135	402	232	263	211	201	210	109	137	54	87	21
VI	300	296	203	309	236	241	271	94	92	76	130	98
VII	428	519	323	445	339	366	315	322	313	323	406	328
Total	1655 ^a	2056	1302	1510	1285	1197	1185	830	807	579	896	658
Date(s)	19 Jul	20 Jul	19-26 Jul	17 Jul	26 Jul	22 Jul	1 Jul	6 Jul	13 Jul	25 Jul	23 Jul	22 Jul

^aCount included both kittiwake species.

Table 57. Numbers of black-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots; numbers are not included in population count totals (Table 54) and counts are not always conducted in the same years. No counts were conducted in years not listed.

Segment	1974	1975	1976	1984	1988	1989	1990	1991	1992	1994	1996	1998	2001	2004	2005	2007	2009
I	161	50	-	177	139	139	187	58	134	25	107	60	85	75	21	68	26
II	60	20	-	72	75	95	101	34	73	40	62	50	111	33	10	25	33
III	81	70	-	107	150	120	116	43	82	59	36	72	1	0	0	3	0
IV	95	11	-	155	94	60	67	18	26	108	75	32	46	19	0	14	36
V	59	80	-	106	87	183	211	96	151	61	139	118	78	95	64	45	13
VI	0	-	-	50	172	170	186	99	163	182	168	186	-	61	37	55	27
VII	0	-	-	0	313	274	250	190	216	198	267	200	160	207	114	178	166
Total	456	231	340	667	1030 ^a	1041	1118	538	845	673	854	718	481 ^b	490	246	388	301
Date(s)	9 Aug	4 Jun	19 Jul	17 Jun	19 Jul	20 Jul	19-26 Jul	17 Jul	26 Jul	23-24 Jul	22 Jul	1 Jul	6 Jul	13 Jul	25 Jul	23 Jul	22 Jul

^aCount included both kittiwakes species.

^bPartial count, not for comparison.

Table 58. Total number of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Parameter	Year																											
	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	
New color bands	9	3	0	15	56	23	8	9	20	5	12	1	15	0	2	0	0	8	29	12	23	19	8	16	26	16	0	
New metal and colors	9	3	0	15	56	23	8	9	20	5	12	1	15	0	2	0	0	8	29	12	23	18	8	16	26	16	0	
New colors on previous metal-banded bird ^a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
New color bands replace old color bands ^b	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	
Cum. color-banded birds	9	12	12	27	83	106	114	123	143	148	160	161	176	176	178	178	178	186	215	227	250	269	277	293	319	335	335	

^aBird previously banded with metal band only and given color band(s) for inclusion in survival dataset.

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

Table 59. Fates of cohorts of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Year	No. birds banded in year	No. birds resighted in:														Prop. birds resighted in 2014													
		89	90	91	92	93	94	95	96	97	98	99	00	01	02		03	04	05	06	07	08	09	10	11	12	13	14	
1998	9	4	4	2	3	5	7	5	4	6	4	3	2	1	3	2	1	2	2	2	0	0	1	0	1	0	0	0.00	
1989	3	-	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	
1990	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1991	15	-	-	-	6	10	0	11	9	6	11	5	6	5	7	4	5	4	3	1	1	1	0	0	1	0	0	0.00	
1992	56	-	-	-	-	45	0	41	46	46	36	25	20	15	19	15	8	10	13	2	3	4	2	1	1	0	0	0.00	
1993	23	-	-	-	-	-	0	20	15	16	13	11	11	11	7	9	7	8	5	1	0	3	2	1	1	0	0	0.00	
1994	8	-	-	-	-	-	-	6	6	5	5	3	3	5	3	3	3	2	1	1	1	1	1	0	0	0	0	0.00	
1995	9	-	-	-	-	-	-	-	9	7	7	4	9	1	5	2	3	0	2	2	0	2	1	1	1	0	0	0.00	
1996	20	-	-	-	-	-	-	-	-	18	15	15	10	10	4	2	6	3	4	1	1	3	3	1	0	1	0	0.00	
1997	5	-	-	-	-	-	-	-	-	-	1	3	3	2	3	0	1	2	2	0	0	0	0	0	0	0	0	0.00	
1998	12	-	-	-	-	-	-	-	-	-	-	5	6	4	7	3	2	5	7	5	3	4	2	1	3	1	0	0.00	
1999	1	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0.00	
2000	15	-	-	-	-	-	-	-	-	-	-	-	-	11	11	10	5	6	4	2	1	2	0	1	1	0	0	0.00	
2001	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2002	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	1	0	1	1	1	1	1	1	1	0	0.00	
2003	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2004	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2005	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	4	6	4	4	3	2	2	0	0	0.00	
2006	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	9	15	12	10	6	6	3	0.10	
2007	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	7	8	3	5	3	0	0.00	
2008	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	16	8	8	5	1	0.04
2009	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	8	4	3	1	0.05	
2010	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	2	0	0.00	
2011	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	9	1	0.06	
2012	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	2	0.08	
2013	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.13	
2014	0 ^a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- ^a	
Birds seen in current year (A)		4	4	2	9	60	7	83	89	104	92	74	70	66	69	51	42	45	50	33	30	63	66	42	50	43	10	-	
Birds potentially alive from prior year (B) ^b		14	12	11	32	82	174	37	114	132	142	149	118	135	97	118	98	77	76	121	93	81	110	100	69	79	59	-	
Apparent annual survival (A/B) ^c		0.29	0.33	0.18	0.28	0.73	0.04	2.24	0.78	0.79	0.65	0.50	0.59	0.49	0.71	0.43	0.43	0.58	0.66	0.27	0.32	0.78	0.60	0.42	0.72	0.54	0.17	-	

Table 59 (continued). Fates of cohorts of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Resighting effort ^d																										
Total no. resight days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	6	5	10	17	15	8	8	3 ^e	-
Total no. resight hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^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.
^eResighting efforts were restricted in 2014 due to a large earthquake that made access to the survival plots unsafe; therefore, survival estimates in 2014 are likely underestimated.

Table 60. Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																														
BK = black		LB = light blue	W = white	y = resighted at least once (# times unknown)																														
DB = dark blue		O = orange	Y = yellow	0 = not resighted																														
DG = dark green		R = red		x = band no longer resightable (dead, removed)																														
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																													
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14				
Green	11	794-35109	1988		y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0					
Green	12	794-35108	1988		0	y	0	0	y	y	0	0	y	0	0	0	0	y	y	y	0	0	0	0	0	1	0	0	0	0				
Green	13	794-35110	1988		y	y	0	0	0	0	y	0	y	0	y	0	0	y	0	0	y	1	0	0	0	0	0	0	0	0				
Green	14	794-35111	1988		0	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0				
Green	15	794-35112	1988		0	0	0	0	0	y	0	0	0	y	0	0	y	0	0	0	0	0	1	0	0	0	0	0	1	0	0			
Green	21	794-35113	1988		0	0	0	0	y	y	y	y	y	y	y	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0			
Green	E4	794-35038	1991		-	-	-	y	y	0	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	E8	794-35041	1991		-	-	-	0	0	0	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0			
Green	E9	794-35043	1991		-	-	-	0	y	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	G2	794-35044	1991		-	-	-	0	y	0	y	0	y	0	y	0	y	y	y	y	1	0	0	0	0	0	0	0	0	0	0			
Green	G3	794-35045	1991		-	-	-	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	G5	794-35047	1991		-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	G6	794-35048	1991		-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0			
Green	G7	794-35049	1991		-	-	-	0	0	0	y	y	y	y	y	0	0	y	y	y	y	3	0	1	1	0	0	2	0	0	0			
Green	G8	794-35050	1991		-	-	-	0	y	0	0	0	0	y	y	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0			
Green	H1	794-35052	1991		-	-	-	y	0	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	H2	794-35053	1991		-	-	-	0	y	0	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	H4	794-35055	1991		-	-	-	y	y	0	y	y	y	0	0	0	y	y	0	0	y	0	2	0	0	0	0	0	0	0	0			
Green	H6	794-35057	1991		-	-	-	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	H7	794-35059	1991		-	-	-	0	y	0	y	y	0	y	y	y	y	y	y	0	0	1	0	0	0	0	0	0	0	0	0			
Green	H9	794-35060	1991		-	-	-	0	y	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	O1	794-35106	1988		y	0	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	O2	794-35107	1988		0	y	y	y	y	y	y	y	0	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	OO	794-35105	1988		y	0	0	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	P1	794-35251	1992		-	-	-	-	0	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	P3	794-35252	1992		-	-	-	-	y	0	y	y	0	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	P5	794-35253	1992		-	-	-	-	y	0	0	y	y	y	y	0	0	y	0	y	0	1	0	0	0	0	0	0	0	0	0	0	0	
Green	P6	794-35254	1992		-	-	-	-	y	0	y	y	y	y	y	0	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	P9	794-35255	1992		-	-	-	-	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	R1	794-35256	1992		-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
Green	R2	794-35257	1992		-	-	-	-	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	
Green	R3	794-35258	1992		-	-	-	-	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	R4	794-35259	1992		-	-	-	-	y	0	0	y	y	y	y	y	0	0	y	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	R5	794-35260	1992		-	-	-	-	y	0	y	0	0	0	0	0	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	R6	794-35261	1992		-	-	-	-	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
Green	R7	794-35262	1992		-	-	-	-	y	0	y	y	y	y	y	0	0	y	y	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																																					
BK = black		LB = light blue	W = white	y = resighted at least once (# times unknown)																																					
DB = dark blue		O = orange	Y = yellow	0 = not resighted																																					
DG = dark green		R = red		x = band no longer resightable (dead, removed)																																					
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																																				
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14											
Green	R8	794-35263	1992		-	-	-	-	y	0	y	y	y	y	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Green	R9	794-35265	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	0	y	0	0	0	0	2	0	0	0	0	0	0	0	0							
Green	S1	794-35266	1992		-	-	-	-	y	0	y	y	y	0	0	0	0	0	0	0	y	1	0	0	0	0	0	0	0	0	0	0	0	0							
Green	S2	794-35267	1992		-	-	-	-	y	0	0	y	y	y	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Green	S3	794-35268	1992		-	-	-	-	y	0	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Green	S4	794-35269	1992		-	-	-	-	y	0	y	y	y	y	y	0	0	0	0	0	y	y	2	0	0	0	0	0	0	0	0	0	0	0	0	0					
Green	S5	794-35270	1992		-	-	-	-	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Green	S6	794-35271	1992		-	-	-	-	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Green	S7	794-35272	1992		-	-	-	-	y	0	y	y	y	0	y	y	y	0	y	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Green	S8	794-35273	1992		-	-	-	-	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Green	S9	794-35274	1992		-	-	-	-	y	0	0	0	y	y	y	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0				
Green	T2	794-35275	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Green	T3	794-35276	1992		-	-	-	-	0	0	0	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Green	T4	794-35277	1992		-	-	-	-	y	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	T5	794-35278	1992		-	-	-	-	0	0	0	y	y	y	y	0	y	y	y	0	y	2	4	0	2	3	0	3	0	0	0	0	0	0	0	0	0				
Green	T6	794-35279	1992		-	-	-	-	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	T7	794-35280	1992		-	-	-	-	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	T8	794-35281	1992		-	-	-	-	y	0	y	y	y	y	0	y	0	0	y	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	T9	794-35282	1992		-	-	-	-	y	0	y	0	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	U1	794-35283	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	0	0	y	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0			
Green	U2	794-35284	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	0	0	y	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	U3	794-35285	1992		-	-	-	-	y	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	U4	794-35286	1992		-	-	-	-	y	0	y	y	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		
Green	U5	794-35287	1992		-	-	-	-	y	0	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	U6	794-35288	1992		-	-	-	-	y	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	U8	794-35290	1992		-	-	-	-	0	0	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	U9	794-35291	1992		-	-	-	-	y	0	y	y	y	y	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	
Green	Y1	794-35292	1992		-	-	-	-	0	0	y	y	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		
Green	Y2	794-35293	1992		-	-	-	-	y	0	y	y	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	Y3	794-35294	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	0	y	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	Y5	794-35295	1992		-	-	-	-	y	0	y	y	y	y	y	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	
Green	Y6	794-35296	1992		-	-	-	-	y	0	y	y	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
Green	Y7	794-35298	1992		-	-	-	-	y	0	0	y	y	y	y	y	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
Green	Y8	794-35299	1992		-	-	-	-	y	0	0	y	y	y	y	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
Green	Y9	794-35300	1992		-	-	-	-	y	0	0	y	y	y	0	0	0	0	y	y	y	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	Z1	794-35301	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																											
BK = black		LB = light blue	W = white	y = resighted at least once (# times unknown)																											
DB = dark blue		O = orange	Y = yellow	0 = not resighted																											
DG = dark green		R = red		x = band no longer resightable (dead, removed)																											
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																										
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	
Red	51	794-35220	1995		-	-	-	-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Red	52	794-35228	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	1	0	0	3	0	0	0	0	0	0	0
Red	53	794-35229	1995		-	-	-	-	-	-	-	y	y	y	0	y	0	y	y	0	0	0	3	0	0	0	0	0	0	0	0
Red	55	794-35230	1995		-	-	-	-	-	-	-	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Red	56	794-35233	1995		-	-	-	-	-	-	-	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	58	794-35240	1995		-	-	-	-	-	-	-	y	0	0	0	y	0	y	0	y	0	2	3	0	0	0	0	0	0	0	0
Red	59	794-62511	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	3	0	0	0	0	0	0	0	0	0	0
Red	63	794-62512	1996		-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	64	794-62514	1996		-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	65	794-62515	1996		-	-	-	-	-	-	-	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	67	794-62516	1996		-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	69	794-62517	1996		-	-	-	-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Red	70	794-62518	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	y	0	0	0	0	0	0	0	0	0	0	0
Red	71	794-62519	1996		-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	72	794-62520	1996		-	-	-	-	-	-	-	y	0	y	0	0	0	0	0	y	0	0	0	0	0	0	0	1	0	1	0
Red	73	794-62523	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	4	0	0	1	1	0	0	0	0	0
Red	74	794-62526	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	75	794-62527	1996		-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	76	794-62599	1996		-	-	-	-	-	-	-	y	y	y	0	0	0	y	y	y	2	5	0	0	1	0	0	0	0	0	0
Red	77	794-62528	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Red	78	794-62531	1996		-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	82	794-62532	1996		-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	83	794-62534	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	y	2	0	1	1	0	0	0	0	0	0	0
Red	84	794-62536	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	85	794-62537	1996		-	-	-	-	-	-	-	0	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	92	794-35309	1997		-	-	-	-	-	-	-	-	0	0	0	0	y	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Red	93	794-35310	1997		-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	94	794-35316	1997		-	-	-	-	-	-	-	-	0	Y	y	0	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Red	A1	794-35336	1998		-	-	-	-	-	-	-	-	-	y	0	y	y	0	0	y	4	3	0	0	0	0	0	0	0	0	0
Red	A2	794-35334	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	2	2	0	4	1	0	3	0	0	0	0	0
Red	A5	794-35344	1998		-	-	-	-	-	-	-	-	-	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	A6	794-35350	1998		-	-	-	-	-	-	-	-	-	y	0	0	y	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Red	A7	794-35351	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	2	1	1	2	3	2	1	2	0	0	0	0
Red	A8	794-35352	1998		-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Red	A9	794-35360	1998		-	-	-	-	-	-	-	-	-	0	y	0	0	y	0	3	3	2	0	0	0	0	0	0	0	0	0
Red	C1	794-35361	1998		-	-	-	-	-	-	-	-	-	0	y	0	y	0	0	y	3	0	1	1	0	0	1	0	0	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																										
		BK = black	LB = light blue	W = white	y = resighted at least once (# times unknown)																									
		DB = dark blue	O = orange	Y = yellow	0 = not resighted																									
		DG = dark green	R = red		x = band no longer resightable (dead, removed)																									
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																									
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Red	C2	794-35369	1998		-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Red	C3	794-35371	1998		-	-	-	-	-	-	-	-	-	-	0	y	0	y	0	0	0	0	0	0	0	0	0	0	0	
Red	C6	794-62543	2000		-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	C7	794-62544	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	
Red	C8	794-62542	2000		-	-	-	-	-	-	-	-	-	-	-	y	0	y	y	0	0	0	0	0	0	0	0	0	0	
Red	D1	1704-01304	2000		-	-	-	-	-	-	-	-	-	-	-	0	y	0	0	0	y	0	0	0	0	0	0	0	0	
Red	D2	794-62546	2000		-	-	-	-	-	-	-	-	-	-	-	0	y	0	0	0	0	0	0	0	0	0	0	0	0	
Red	D3	794-32545	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	2	3	1	1	0	0	0	0	
Red	D4	1704-01305	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	0	y	0	y	0	0	0	0	0	0	0	0	
Red	D5	1704-01306	2000		-	-	-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	D6	1704-01307	2000		-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	D7	1704-01308	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	1	0	0	0	0	0	0	0	
Red	D8	1704-01310	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	1	0	0	0	0	0	0	
Red	D9	1704-01313	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	3	3	0	0	0	1	1	0	
Red	E1	1704-01319	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	0	1	0	0	0	0	0	0	0	0	
Red	E6	1704-01320	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	
Red	E7	1704-01321	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	
Red	G1	584-00269	2002		-	-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	2	0	2	0	0	0	0	0	0	
Red	G2	584-00270	2002		-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	y	0	0	0	3	4	5	1	1	0	
Red	G7	794-35392	1999		-	-	-	-	-	-	-	-	-	-	0	y	0	0	0	0	y	0	1	0	2	0	1	0	0	
Red	H7	714-10076	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	1	0	0	0	1	0	
Red	H9	1704-01325	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	1	2	1	1	1	1	0
Red	J3	1704-01399	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	2	1	5	0	0	0	0
Red	J4	714-10099	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	0	0	0	0	0	0
Red	K4	1704-01401	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	1	1	2	0	1	0
Red	K5	1704-01402	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	0	1	0	0	0
Red	K6	714-10077	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	0	0	0	0	0
Red	K8	1704-01403	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	5	2	0	0	0	0
Red	M1	794-35377	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Red	N3	794-35380	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	0	1	3	1	0
Red	N4	794-35381	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	2	0	0	0	0	0	0
Red	N6	794-35382	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	3	1	0	2	1	0
Red	N8	794-35384	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	2	2	1	0	0	0	0
Red	N9	794-35385	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	0	0	0	0	0
Red	O3	794-35412	1993		-	-	-	-	0	y	y	y	0	y	0	y	y	0	0	y	2	0	0	0	1	0	0	0	0	0
Red	O4	794-35413	1993		-	-	-	-	0	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																																				
BK = black LB = light blue W = white				y = resighted at least once (# times unknown)																																				
DB = dark blue O = orange Y = yellow				0 = not resighted																																				
DG = dark green R = red				x = band no longer resightable (dead, removed)																																				
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																																			
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14										
Red	O5	794-35414	1993		-	-	-	-	-	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Red	O6	794-35415	1993		-	-	-	-	-	0	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Red	O7	794-35428	1993		-	-	-	-	-	0	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Red	O8	794-35434	1993		-	-	-	-	-	0	y	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		
Red	P1	794-35386	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	1	2	0	2	0	0	0	0	0	0	0			
Red	P5	794-35387	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	2	0	2	0	0	0	0	0	0	0	0	0	0			
Red	P8	794-35391	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Red	P9	794-35390	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0		
Red	R1	794-62552	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	4	0	2	0	0	0	0	0	0	0	0	0	0		
Red	R2	794-62551	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	R3	794-62550	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Red	R8	794-62555	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	R9	794-62556	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	S3	794-62558	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	S7	794-62559	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Red	S9	794-62563	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	T4	794-62565	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	T6	794-62567	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	T8	794-62569	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	T9	794-62570	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	
Red	U1	794-62571	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	
Red	U4	794-62573	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	
Red	U5	794-62575	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	6	1	1	2	4	1	0	0	0	0	0	0	0	0	0	
Red	U6	794-62574	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	U7	794-62576	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	U9	794-62577	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	2	4	0	2	1	1	0	0	0	0	0	0	0	0	0	
Red	Y1	794-62578	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z1	794-62588	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z2	794-62590	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z3	794-62591	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z4	794-62594	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z6	794-62595	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Red	Z7	794-62602	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	
Yellow	25	794-35219	1989		-	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	0	0	0	0	0	
Yellow	33	794-35232	1989		-	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	0	0	0	0	0	0
Yellow	39	794-35202	1989		-	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	0	0	0	0	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																																						
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		DB = dark blue	O = orange	Y = yellow	0 = not resighted																																					
		DG = dark green	R = red		x = band no longer resightable (dead, removed)																																					
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																																					
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14												
Yellow	P2	794-62522	1996		-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Yellow	R7	794-35342	1998		-	-	-	-	-	-	-	-	-	0	y	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Yellow	R8	794-35343	1998		-	-	-	-	-	-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Yellow	Y6	794-35313	1997		-	-	-	-	-	-	-	-	y	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Yellow	Y9	794-35308	1997		-	-	-	-	-	-	-	0	y	y	y	y	0	0	y	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
BK	BK/BK	794-62623	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	1	0	1	0	0	0						
BK	BK/O	794-62627	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	0	0	0						
BK	BK/W	794-62621	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	0	0	0						
BK	DB/DB	584-00279	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	1	0	0	0	0						
BK	DB/O	584-00293	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0						
BK	O/DB	584-00297	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	0	0	0	0	0						
BK	O/R	1704-01465	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0					
BK	R/BK	1704-01477	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0				
BK	W/DB	584-00287	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	0	0	0					
BK	W/O	794-62618	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0					
BK	W/Y	794-62615	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0	0	0	0	0					
BK	Y/DB	714-10078	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0	0	0	0	0					
BK	Y/W	794-62628	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	4	4	6	1	0	0					
DB	BK/DB	1704-01328	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0					
DB	BK/R	1704-01436	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0				
DB	BK/W	794-86863	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0		
DB	DB/BK	1704-01327	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0		
DB	DB/LB	1704-01341	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0		
DB	DB/O	1704-01329	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0		
DB	DB/W	1704-01326	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0		
DB	DG/DB	1704-01375	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
DB	DG/DG	1704-01376	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
DB	DG/LB	1704-01379	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	
DB	DG/O	1704-01381	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
DB	DG/R	1704-01384	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
DB	DG/W	1704-01393	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	
DB	DG/Y	1704-01333	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	
DB	O/BK	714-10089	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	2	0	0	
DB	O/O	714-10091	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	0	0	
DB	O/Y	714-10090	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	2	0	0
DB	R/BK	1704-01478	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

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		DB = dark blue	O = orange	Y = yellow	0 = not resighted																							
		DG = dark green	R = red		x = band no longer resightable (dead, removed)																							
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																							
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
DB	R/DB	1704-01486	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	W/BK	714-10081	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	1	0
DB	W/W	714-10080	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0
DB	W/Y	714-10082	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0
DB	Y/DB	794-86852	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	0
DG	DB/DB	1704-01359	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0
DG	DB/DG	1704-01360	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DB/O	1704-01365	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1
DG	DB/Y	1704-01368	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DG/DB	1704-01373	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	DG/DG	1704-01390	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DG/LB	1704-01395	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	DG/O	1704-01410	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	DG/W	1704-01351	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0
DG	LB/DB	1704-01354	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
DG	LB/LB	1704-01346	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
DG	LB/W	1704-01348	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0
DG	O/R	1704-01468	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
DG	O/W	1704-01473	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DG	R/DB	1704-01487	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
LB	DB/DB	1704-01415	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
LB	DB/DG	1704-01339	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0
LB	DB/LB	1704-01369	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
LB	DG/DG	1704-01372	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
LB	LB/R	1704-01364	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
LB	O/O	1704-01463	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
LB	O/Y	1704-01493	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
LB	R/DB	1704-01374	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1
O	BK/BK	794-62625	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	0	0	0
O	BK/R	1704-01441	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
O	Bk/W	794-62612	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	0
O	Bk/Y	794-62608	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
O	DB/O	584-00295	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	0	0
O	DB/W	584-00285	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	1
O	DG/DG	1704-01358	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
O	DG/O	1704-01337	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																									
		BK = black	LB = light blue	W = white	y = resighted at least once (# times unknown)																								
		DB = dark blue	O = orange	Y = yellow	0 = not resighted																								
		DG = dark green	R = red		x = band no longer resightable (dead, removed)																								
Color or R leg	Band # or L leg	Metal band #	Year banded	Notes	Year resighted																								
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
O	DG/Y	1704-01416	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
O	LB/LB	1704-01362	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
O	O/Bk	794-62604	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	3	1	1	0	0
O	O/DG	1704-01450	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
O	O/O	794-62650	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	4	0	0	0
O	O/W	794-62642	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0	0	0
O	O/Y	794-62603	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2	0	0	0	0
O	W/O	794-62620	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	7	1	0	0	0	0
O	W/W	794-62596	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	0	2	1	0
O	Y/O	794-62639	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	1	3	0	0
R	BK/R	1704-01441	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
R	DB/DG	1704-01388	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
R	DG/LB	1704-01336	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0
R	DG/W	1704-01353	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0
R	LB/DB	1704-01385	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
R	LB/O	1704-01347	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0
R	LB/Y	1704-01371	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
R	R/R	1704-01398	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
W	BK/DG	1704-01428	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
W	DB/BK	584-00288	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	0
W	DB/DB	584-00278	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3	0	0	0
W	DB/LB	1704-01343	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	0
W	DG/R	1704-01345	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0
W	DG/W	1704-01383	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
W	DG/Y	1704-01357	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0
W	O/BK	794-62643	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	0	0
W	O/DB	584-00296	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	1	0	0
W	R/DB	1704-01490	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
W	W/O	794-62617	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	5	0	0	0	0
W	W/Y	794-62614	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	5	0	0	0
W	Y/BK	794-62631	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	1	0	0
W	Y/Y	794-62634	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	4	1	1	0
Y	BK/BK	794-62624	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0
Y	BK/DB	584-00292	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	1	0
Y	BK/O	794-62607	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Y	BK/W	794-62622	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	0	1	0	0

Table 60 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes: Colors for three-band combos				Resight history																										
		BK = black	LB = light blue	W = white	y = resighted at least once (# times unknown)																									
		DB = dark blue	O = orange	Y = yellow	0 = not resighted																									
		DG = dark green	R = red		x = band no longer resightable (dead, removed)																									
Color or R leg	Color band Band # or L leg	Metal band #	Year banded	Notes	Year resighted																									
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Y	DB/DB	584-00280	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	0	0		
Y	DB/O	584-00294	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	0	0		
Y	DB/R	1704-01344	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0		
Y	O/DB	584-00298	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	0	0		
Y	O/O	794-62649	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	2	2	1	0		
Y	R/DB	1704-01491	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	W/O	794-62619	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0		
Y	W/Y	794-62616	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	3	0	1	0	0		
Y	Y/BK	794-62632	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	0	0	0		
Y	Y/DB	714-10079	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0		
Y	Y/W	794-62629	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	0	0	0		
Total resighted:					4	4	2	9	60	7	83	89	104	92	74	70	66	69	51	42	45	50	33	30	63	66	42	50	43	10

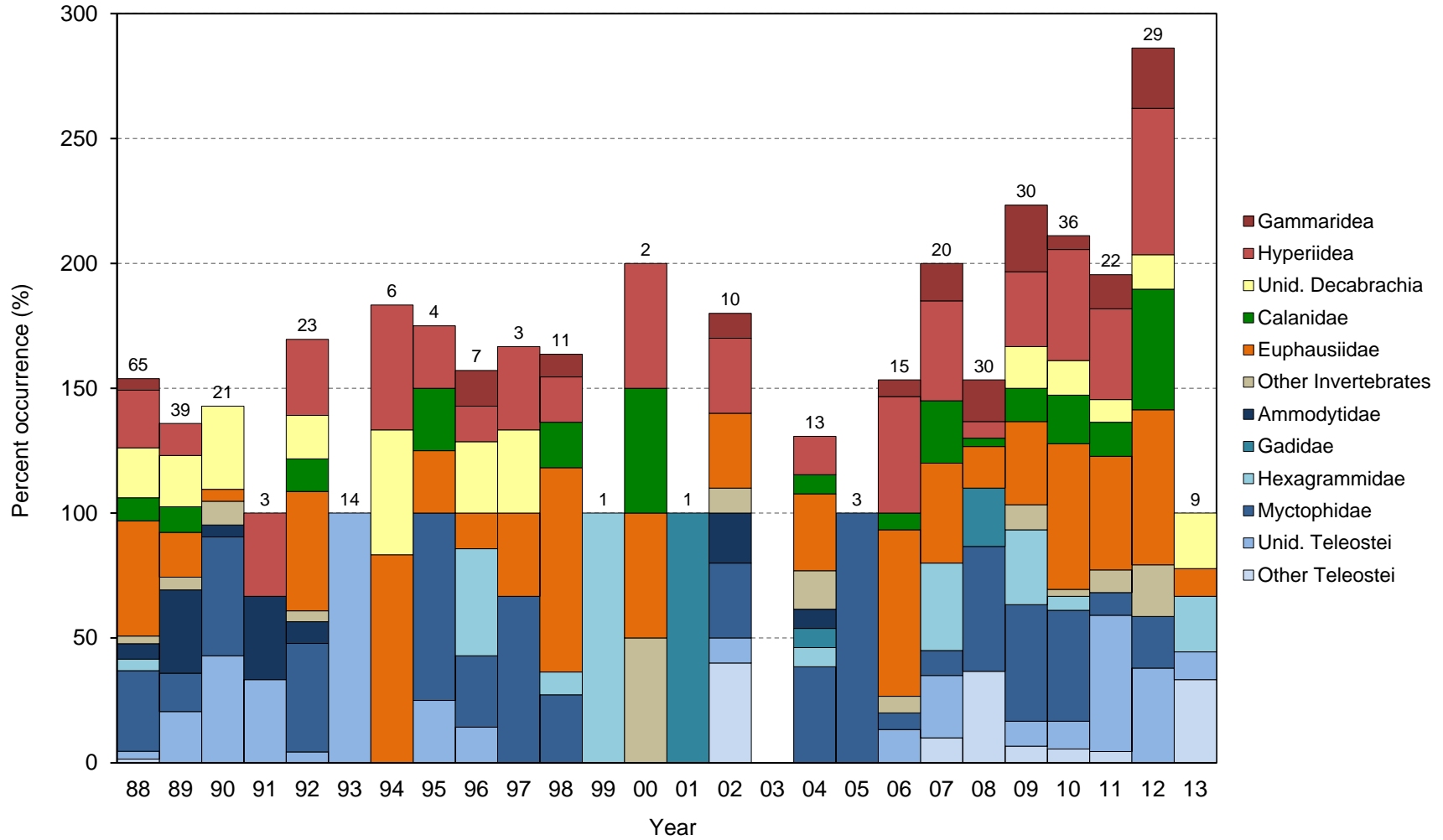


Figure 44. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 2003 or after 2013.

Table 61. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as “others” in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. samples	65	39	21	3	23	14	6	4	7	3	11	1	2
Invertebrates	75.4	64.1	38.1	66.7	73.9	-	100.0	25.0	57.1	66.7	90.9	-	100.0
Amphipoda	30.8	25.6	-	66.7	43.5	-	50.0	25.0	28.6	33.3	27.3	-	50.0
Gammaridea	4.6	-	-	-	-	-	-	-	14.3	-	9.1	-	-
Hyperiidea	23.1	12.8	-	33.3	30.4	-	50.0	25.0	14.3	33.3	18.2	-	50.0
<i>Themisto pacifica</i>	21.5	12.8	-	-	13.0	-	50.0	25.0	14.3	33.3	18.2	-	50.0
<i>Themisto</i> spp.	1.5	-	-	33.3	17.4	-	-	-	-	-	-	-	-
Other Hyperiidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Amphipoda	3.1	12.8	-	33.3	13.0	-	-	-	-	-	-	-	-
Cephalopoda	20.0	20.5	33.3	-	17.4	-	50.0	-	28.6	33.3	-	-	-
Unid. Decabrachia	20.0	20.5	33.3	-	17.4	-	50.0	-	28.6	33.3	-	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	12.3	12.8	-	-	17.4	-	-	25.0	-	-	18.2	-	50.0
Calanidae	9.2	10.3	-	-	13.0	-	-	25.0	-	-	18.2	-	50.0
<i>Neocalanus cristatus</i>	6.2	7.7	-	-	13.0	-	-	-	-	-	18.2	-	50.0
Other Calanidae	7.7	7.7	-	-	-	-	-	25.0	-	-	-	-	50.0
Other Copepoda	3.1	2.6	-	-	4.3	-	-	-	-	-	-	-	-
Euphausiacea	46.2	17.9	4.8	-	47.8	-	83.3	25.0	14.3	33.3	81.8	-	50.0
Euphausiidae	46.2	17.9	4.8	-	47.8	-	83.3	25.0	14.3	33.3	81.8	-	50.0
<i>Thysanoessa</i> spp.	1.5	-	-	-	47.8	-	83.3	-	-	33.3	-	-	-
Unid. Euphausiidae	32.3	7.7	4.8	-	-	-	-	25.0	14.3	-	81.8	-	50.0
Other Euphausiidae	12.3	12.8	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	3.1	5.1	9.5	-	4.3	-	-	-	-	-	-	-	50.0
Fish	47.7	64.1	85.7	66.7	52.2	100.0	-	100.0	71.4	66.7	36.4	100.0	-
Teleostei	47.7	64.1	85.7	66.7	52.2	100.0	-	100.0	71.4	66.7	36.4	100.0	-
Ammodytidae	6.2	33.3	4.8	33.3	8.7	-	-	-	-	-	-	-	-
<i>Ammodytes</i> spp.	6.2	33.3	4.8	33.3	8.7	-	-	-	-	-	-	-	-
Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	4.6	-	-	-	-	-	-	-	42.9	-	9.1	100.0	-
<i>Hexagrammos</i> spp.	-	-	-	-	-	-	-	-	42.9	-	-	100.0	-
Other Hexagrammidae	4.6	-	-	-	-	-	-	-	-	-	9.1	-	-
Myctophidae	32.3	15.4	47.6	-	43.5	-	-	75.0	28.6	66.7	27.3	-	-
Unid. Myctophidae	32.3	15.4	47.6	-	43.5	-	-	75.0	28.6	66.7	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	27.3	-	-
Unid. Teleostei	3.1	20.5	42.9	33.3	4.3	100.0	-	25.0	14.3	-	-	-	-
Other Teleostei	1.5	-	-	-	-	-	-	-	-	-	-	-	-
Other	3.1	-	-	-	-	-	-	-	14.3	-	-	-	-

Table 61 (continued). Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2001	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. samples	1	10	13	3	15	20	30	30	36	22	29	9
Invertebrates	-	50.0	69.2	-	86.7	70.0	30.0	56.7	69.4	77.3	96.6	33.3
Amphipoda	-	40.0	15.4	-	53.3	55.0	20.0	53.3	47.2	50.0	75.9	-
Gammaridea	-	10.0	-	-	6.7	15.0	16.7	26.7	5.6	13.6	24.1	-
Hyperiidea	-	30.0	15.4	-	46.7	40.0	6.7	30.0	44.4	36.4	58.6	-
<i>Themisto pacifica</i>	-	30.0	-	-	-	-	6.7	30.0	30.6	13.6	37.9	-
<i>Themisto</i> spp.	-	-	15.4	-	46.7	40.0	-	-	13.9	4.5	17.2	-
Other Hyperiidae	-	-	-	-	0.0	-	-	-	2.8	18.2	3.4	-
Other Amphipoda	-	-	-	-	6.7	-	-	-	-	-	-	-
Cephalopoda	-	-	15.4	-	6.7	10.0	3.3	16.7	13.9	13.6	31.0	22.2
Unid. Decabrachia	-	-	-	-	-	-	-	16.7	13.9	9.1	13.8	22.2
Other Cephalopoda	-	-	15.4	-	6.7	10.0	3.3	-	-	4.5	17.2	-
Copepoda	-	-	7.7	-	6.7	25.0	3.3	13.3	19.4	18.2	62.1	-
Calanidae	-	-	7.7	-	6.7	25.0	3.3	13.3	19.4	13.6	48.3	-
<i>Neocalanus cristatus</i>	-	-	-	-	-	-	3.3	3.3	8.3	9.1	31.0	-
Other Calanidae	-	-	7.7	-	6.7	25.0	-	10.0	11.1	13.6	27.6	-
Other Copepoda	-	-	-	-	-	-	-	-	2.8	4.5	17.2	-
Euphausiacea	-	30.0	30.8	-	66.7	40.0	16.7	33.3	58.3	45.5	62.1	11.1
Euphausiidae	-	30.0	30.8	-	66.7	40.0	16.7	33.3	58.3	45.5	62.1	11.1
<i>Thysanoessa</i> spp.	-	-	23.1	-	-	5.0	6.7	-	25.0	40.9	48.3	-
Unid. Euphausiidae	-	30.0	7.7	-	66.7	35.0	13.3	33.3	33.3	22.7	24.1	11.1
Other Euphausiidae	-	-	-	-	-	-	-	13.3	11.1	18.2	20.7	-
Other Invertebrates	-	10.0	15.4	-	6.7	-	-	10.0	2.8	9.1	20.7	-
Fish	100.0	80.0	61.5	100.0	20.0	80.0	90.0	76.7	63.9	68.2	58.6	66.7
Teleostei	100.0	80.0	61.5	100.0	20.0	80.0	90.0	76.7	63.9	68.2	58.6	66.7
Ammodytidae	-	20.0	7.7	-	-	-	-	-	-	-	-	-
<i>Ammodytes</i> spp.	-	20.0	7.7	-	-	-	-	-	-	-	-	-
Gadidae	100.0	-	7.7	-	-	-	23.3	-	-	-	-	-
Unid. Gadidae	100.0	-	7.7	-	-	-	16.7	-	-	-	-	-
Other Gadidae	-	-	-	-	-	-	6.7	-	-	-	-	-
Hexagrammidae	-	-	7.7	-	-	35.0	-	30.0	5.6	-	-	22.2
<i>Hexagrammos</i> spp.	-	-	-	-	-	-	-	-	-	-	-	-
Other Hexagrammidae	-	-	7.7	-	-	35.0	-	30.0	5.6	-	-	22.2
Myctophidae	-	30.0	38.5	100.0	6.7	10.0	50.0	46.7	44.4	9.1	20.7	-
Unid. Myctophidae	-	30.0	30.8	100.0	6.7	5.0	50.0	16.7	27.8	9.1	20.7	-
Other Myctophidae	-	-	15.4	-	-	5.0	-	33.3	16.7	-	-	-
Unid. Teleostei	-	10.0	-	-	13.3	25.0	-	10.0	11.1	54.5	37.9	11.1
Other Teleostei	-	40.0	-	-	-	10.0	36.7	6.7	5.6	4.5	-	33.3
Other	-	-	-	-	-	-	-	-	-	9.1	10.3	-

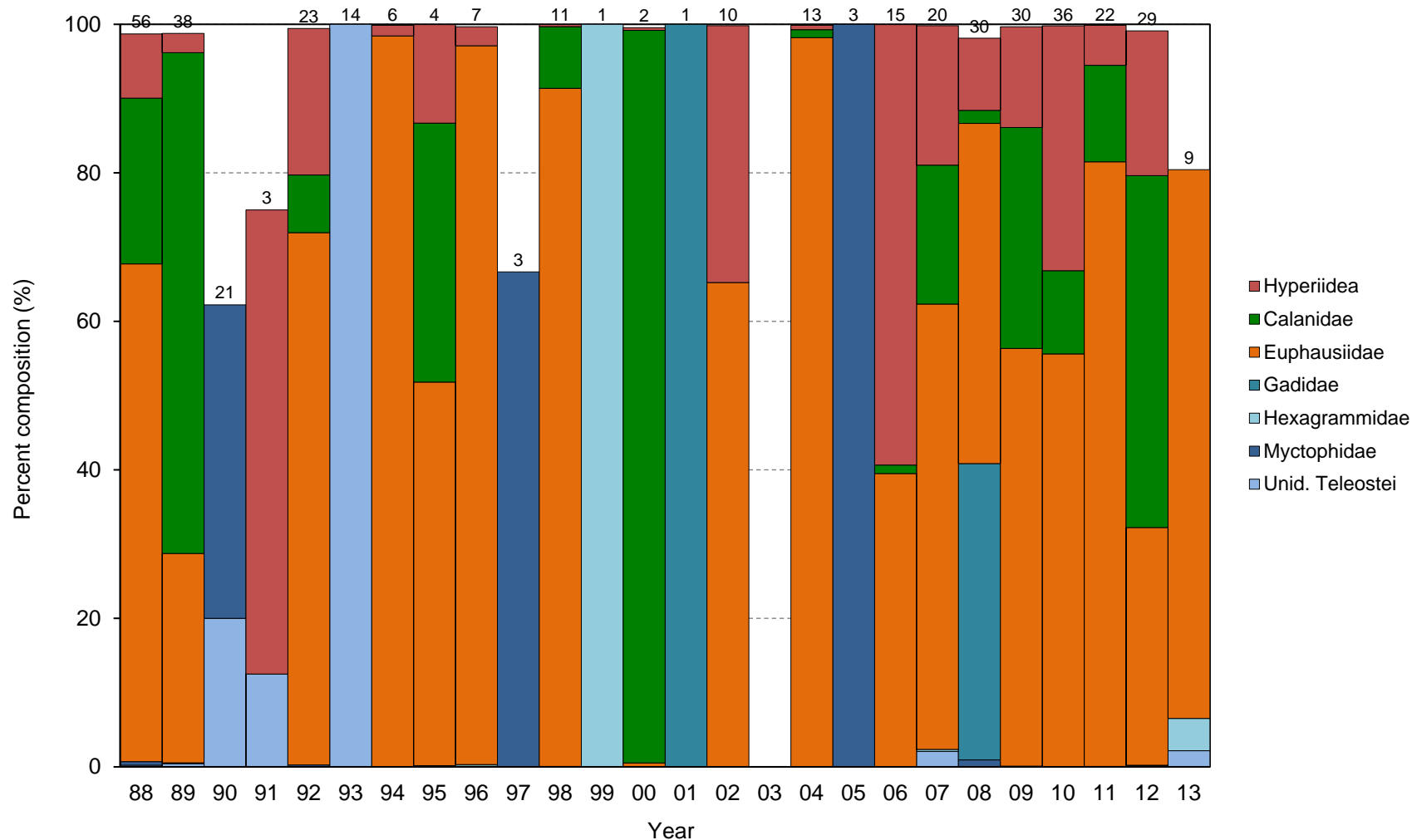


Figure 45. Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. Number7s above columns indicate sample sizes. No diet samples were collected in 2003 or after 2013.

Table 62. Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at Buldir 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 and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. samples	56	38	21	3	23	14	6	4	7	3	11	1	2
No. individuals	13048	6912	45	8	3912	31	7020	2293	3631	3	10144	6	1735
Invertebrates	99.2	99.2	35.6	75.0	99.7	-	100.0	99.8	99.7	33.3	99.9	-	100.0
Amphipoda	8.7	2.7	-	75.0	19.9	-	1.4	13.3	2.6	-	0.3	-	0.3
Hyperiidea	8.7	2.6	-	62.5	19.7	-	1.4	13.3	2.6	-	0.3	-	0.3
<i>Themisto pacifica</i>	8.6	2.6	-	-	12.7	-	1.4	13.3	2.6	-	0.3	-	0.3
<i>Themisto</i> spp.	<0.1	-	-	62.5	7.1	-	-	-	-	-	-	-	-
Other Hyperiidea	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Amphipoda	<0.1	0.1	-	12.5	0.1	-	-	-	-	-	-	-	-
Copepoda	22.8	68.1	-	-	7.8	-	-	34.9	-	-	8.3	-	98.7
Calanidae	22.3	67.4	-	-	7.8	-	-	34.9	-	-	8.3	-	98.7
<i>Neocalanus cristatus</i>	0.7	4.8	-	-	7.8	-	-	-	-	-	8.3	-	93.6
<i>N. plumchrus/flemengeri</i>	21.6	62.7	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	-	-	-	34.9	-	-	-	-	5.1
Other Copepoda	0.5	0.7	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	67.0	28.2	-	-	71.7	-	98.4	51.6	96.8	-	91.3	-	0.5
Euphausiidae	67.0	28.2	-	-	71.7	-	98.4	51.6	96.8	-	91.3	-	0.5
<i>Thysanoessa</i> spp.	0.3	-	-	-	71.7	-	98.4	-	-	-	-	-	-
Unid. Euphausiidae	31.0	22.1	-	-	-	-	-	51.6	96.8	-	91.3	-	0.5
Other Euphausiidae	35.8	6.1	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	0.7	0.2	35.6	-	0.4	-	0.1	-	0.3	33.3	-	-	0.5
Fish	0.8	0.8	64.4	25.0	0.3	100.0	-	0.2	0.3	66.7	0.1	100.0	-
Teleostei	0.8	0.8	64.4	25.0	0.3	100.0	-	0.2	0.3	66.7	0.1	100.0	-
Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	<0.1	-	-	-	-	-	-	-	0.2	-	<0.1	100.0	-
Myctophidae	0.5	0.1	42.2	-	0.3	-	-	0.2	0.1	66.7	0.1	-	-
Unid. Myctophidae	0.5	0.1	42.2	-	0.3	-	-	0.2	0.1	66.7	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	0.1	-	-
Unid. Teleostei	0.2	0.4	20.0	12.5	<0.1	100.0	-	<0.1	<0.1	-	-	-	-
Other Teleostei	0.1	0.2	2.2	12.5	0.1	-	-	-	-	-	-	-	-
Other	<0.1	-	-	-	-	-	-	-	-	-	-	-	-

Table 62 (continued). Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at Buldir 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 and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2001	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. samples	1	10	13	3	15	20	30	30	36	22	29	9
No. individuals	2	13493	14657	6	42077	8665	3312	23827	31419	29700	14771	46
Invertebrates	-	99.8	99.9	-	100.0	97.6	57.6	99.8	99.8	99.9	99.7	87.0
Amphipoda	-	34.6	0.6	-	59.3	18.9	10.0	13.6	33.0	5.4	19.6	-
Hyperiidea	-	34.6	0.6	-	59.3	18.8	9.7	13.6	33.0	5.4	19.5	-
<i>Themisto pacifica</i>	-	34.6	-	-	-	-	9.7	13.6	28.4	5.1	9.3	-
<i>Themisto</i> spp.	-	-	0.6	-	59.3	18.8	-	-	4.4	<0.1	10.1	-
Other Hyperiidea	-	-	-	-	-	-	-	-	0.2	0.2	0.1	-
Other Amphipoda	-	-	-	-	-	0.1	0.3	0.1	<0.1	<0.1	0.1	-
Copepoda	-	-	1.1	-	1.1	18.7	1.8	29.8	11.2	13.1	47.9	-
Calanidae	-	-	1.1	-	1.1	18.7	1.8	29.8	11.2	13.0	47.4	-
<i>Neocalanus cristatus</i>	-	-	-	-	-	-	1.8	<0.1	9.6	1.5	18.4	-
<i>N. plumchrus/flemengeri</i>	-	-	-	-	0.4	14.0	-	29.7	0.7	11.5	23.1	-
Other Calanidae	-	-	1.1	-	0.8	4.7	-	-	0.9	<0.1	5.8	-
Other Copepoda	-	-	-	-	-	-	-	-	<0.1	0.1	0.5	-
Euphausiacea	-	65.2	98.2	-	39.5	60.0	45.8	56.3	55.6	81.4	32.0	73.9
Euphausiidae	-	65.2	98.2	-	39.5	60.0	45.8	56.3	55.6	81.4	32.0	73.9
<i>Thysanoessa</i> spp.	-	-	97.5	-	0.0	8.1	32.9	-	23.7	4.6	9.5	-
Unid. Euphausiidae	-	65.2	0.7	-	39.5	51.9	12.9	50.7	23.8	76.7	1.7	73.9
Other Euphausiidae	-	-	-	-	-	-	-	5.6	8.0	0.1	20.9	-
Other Invertebrates	-	-	0.1	-	-	0.1	-	0.2	<0.1	0.1	0.2	13.0
Fish	100.0	0.2	0.1	100.0	<0.1	2.4	42.4	0.2	0.2	0.1	0.2	13.0
Teleostei	100.0	0.2	0.1	100.0	<0.1	2.4	42.4	0.2	0.2	0.1	0.2	13.0
Gadidae	100.0	-	<0.1	-	-	-	39.9	-	-	-	-	-
Hexagrammidae	-	-	<0.1	-	-	0.3	0.0	<0.1	<0.1	-	-	4.3
Myctophidae	-	<0.1	<0.1	100.0	<0.1	<0.1	0.9	0.1	0.1	<0.1	0.1	-
Unid. Myctophidae	-	<0.1	<0.1	100.0	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	0.1	-
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	-	<0.1	-	-	<0.1	2.1	-	<0.1	<0.1	0.1	0.1	2.2
Other Teleostei	-	0.2	0.1	-	-	0.1	1.5	0.1	0.2	-	-	6.5
Other	-	-	-	-	-	-	-	-	-	<0.1	0.1	-

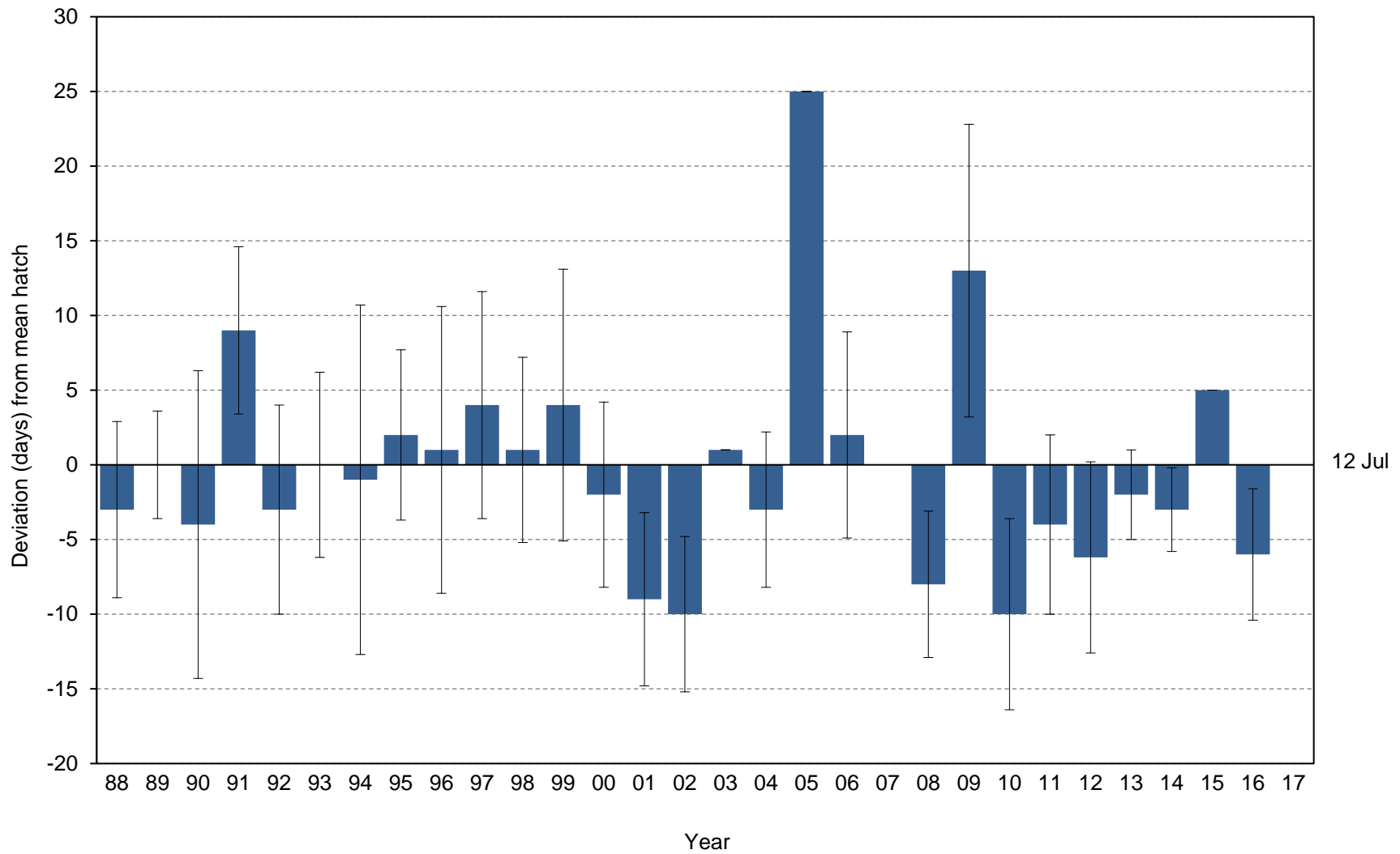


Figure 46. Yearly hatch date deviation (from the 1988-2016 average of 12 July) for red-legged kittiwakes at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; no data exist in the current year. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 2007; no eggs hatched in plots in 2017.

Table 63. Breeding chronology of red-legged kittiwakes at Buldir Island, Alaska. Data represent the dates of the first egg laid and the first chick hatched in each nest. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 2007.

Year	Mean lay ^a	SD	<i>n</i> ^b	Mean hatch	SD	<i>n</i> ^c	First lay ^a	First hatch	Last hatch	First fledged ^d
1988	-	-	-	8 Jul	5.9	57	<21 Jun	28 Jun	25 Jul	>11 Aug
1989	-	-	-	12 Jul	3.6	33	<12 Jun	8 Jul	29 Jul	>15 Aug
1990	-	-	-	8 Jul	10.3	40	<3 Jun	27 Jun	31 Jul	31 Jul
1991	-	-	-	21 Jul	5.6	25	<14 Jun	17 Jul	10 Aug	10 Aug
1992	-	-	-	8 Jul	7.0	133	<4 Jun	20 Jun	30 Jul	3 Aug
1993	-	-	-	12 Jul	6.2	35	<7 Jun	1 Jul	23 Jul	16 Aug
1994	-	-	-	11 Jul	11.7	18	<15 Jun	25 Jun	6 Aug	17 Aug
1995	-	-	-	14 Jul	5.7	30	<15 Jun	7 Jul	8 Aug	>17 Aug
1996	-	-	-	12 Jul	9.6	62	<14 Jun	24 Jun	3 Aug	15 Aug
1997	-	-	-	16 Jul	7.6	75	<9 Jun	28 Jun	31 Jul	13 Aug
1998	-	-	-	13 Jul	6.2	61	<14 Jun	1 Jul	29 Jul	13 Aug
1999	-	-	-	16 Jul	9.1	15	<24 Jun	4 Jul	4 Aug	>19 Aug
2000	-	-	-	9 Jul	6.2	69	<11 Jun	27 Jun	27 Jul	19 Aug
2001	-	-	-	3 Jul	5.8	14	<17 Jun	23 Jun	17 Jul	-
2002	-	-	-	2 Jul	5.2	23	<6 Jun	23 Jun	19 Jul	1 Aug
2003	-	-	-	13 Jul	0.0	1	<17 Jun	13 Jul	-	>29 Aug
2004	-	-	-	8 Jul	5.2	7	<14 Jun	2 Jul	18 Jul	>18 Aug
2005	-	-	-	6 Aug	0.0	1	<20 Jun	6 Aug	-	10 Aug
2006	-	-	-	14 Jul	6.9	22	<13 Jun	3 Jul	28 Jul	19 Aug
2007	-	-	-	-	-	-	<15 Jun	-	-	>24 Aug
2008	-	-	-	3 Jul	4.9	13	<16 Jun	28 Jun	13 Jul	6 Aug
2009	-	-	-	25 Jul	9.8	8	<12 Jun	9 Jul	11 Aug	>20 Aug
2010	-	-	-	2 Jul	6.4	6	<15 Jun	27 Jun	15 Jul	12 Aug
2011	-	-	-	8 Jul	6.0	8	<18 Jun	27 Jun	17 Jul	22 Aug
2012	-	-	-	5 Jul	6.4	19	<5 Jun	24 Jun	20 Jul	9 Aug
2013	-	-	-	10 Jul	3.0	4	<19 Jun	5 Jul	13 Jul	15 Aug
2014	-	-	-	9 Jul	2.8	3	<18 Jun	5 Jul	11 Jul	5 Aug
2015	-	-	-	17 Jul	0.0	2	<15 Jun	17 Jul	17 Jul	>21 Aug
2016	-	-	-	5 Jul	4.4	13	<14 Jun	29 Jun	12 Jul	10 Aug
2017	23 Jun	0.0	1	-	-	-	23 Jun	-	-	-

^aIn years when birds are already on eggs at the first visit, mean lay date is not calculated and date of first lay is listed as < the date of first nest check.

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

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

^dIn 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.

Table 64. Frequency distribution of hatch dates for red-legged kittiwakes at Buldir 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 hatch dates were recorded with the appropriate egg to chick interval in 2007 and no eggs hatched in plots in 2017.

Julian date ^a	No. nests hatching on Julian date														
	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
172	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	-	-	-	-	3	-	2	-	2	-	-	-	-	-	-
177	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
178	-	-	7	-	-	-	-	-	-	-	-	-	-	-	2
179	-	-	-	-	-	-	-	-	-	1	-	-	4	-	-
180	4	-	9	-	-	-	-	-	5	-	-	-	-	-	4
181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
182	1	-	2	-	15	1	-	-	1	-	1	-	1	6	1
183	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
184	-	-	-	-	-	-	-	-	8	-	-	-	-	-	10
185	-	-	-	-	2	-	-	-	-	5	-	2	13	-	-
186	11	-	-	-	43	1	9	-	1	-	11	-	-	4	-
187	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
188	7	-	1	-	-	14	1	2	-	1	-	-	-	-	3
189	8	7	-	-	-	-	-	-	8	-	2	-	1	-	-
190	-	-	-	-	5	-	-	4	3	13	1	4	-	1	-
191	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-
192	2	-	-	-	27	1	-	1	-	4	20	-	39	-	-
193	10	-	6	-	-	-	-	-	-	3	-	-	-	-	-
194	-	23	2	-	-	5	-	12	-	17	-	3	-	-	-
195	-	-	-	-	3	-	-	-	5	-	1	-	-	-	-
196	7	-	-	-	21	-	-	4	2	-	15	-	1	-	-
197	-	-	-	-	-	1	1	-	-	1	-	-	3	-	-
198	-	-	-	14	-	-	-	4	2	2	-	-	-	1	-
199	-	-	-	-	1	7	-	-	-	-	-	-	-	-	-
200	1	-	1	-	1	-	-	1	11	9	-	-	1	-	1
201	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-
202	-	-	4	3	6	-	-	-	-	2	-	-	2	-	-
203	-	-	-	2	-	2	-	-	-	1	-	-	-	-	-
204	2	-	-	-	-	3	-	1	8	-	-	4	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	2	1	2	-	3	-	-	10	2	-	-	-	-
207	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	1	-	3	-	-
210	-	1	-	-	1	-	1	-	-	-	2	1	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	2	-	2	-	-	-	2	6	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	57	33	40	25	133	35	18	30	62	75	61	15	69	14	23

Table 64 (continued). Frequency distribution of hatch dates for red-legged kittiwakes at Buldir 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 hatch dates were recorded with the appropriate egg to chick interval in 2007 and no eggs hatched in plots in 2017.

Julian date ^a	No. nests hatching on Julian date												
	03	04	05	06	08	09	10	11	12	13	14	15	16
172	-	-	-	-	-	-	-	-	-	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	-	-	-	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-	-	-	-	-
176	-	-	-	-	-	-	-	-	2	-	-	-	-
177	-	-	-	-	-	-	-	-	-	-	-	-	-
178	-	-	-	-	-	-	3	1	-	-	-	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	5	-	-	-	1	-	-	-	-
181	-	-	-	-	-	-	-	-	-	-	-	-	2
182	-	-	-	-	-	-	-	-	4	-	-	-	-
183	-	-	-	-	-	-	-	1	-	-	-	-	-
184	-	2	-	2	3	-	2	-	-	-	-	-	3
185	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	1	1	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	1
188	-	-	-	3	1	-	-	3	7	-	-	-	4
189	-	-	-	1	-	-	-	-	-	-	-	-	-
190	-	3	-	-	3	1	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-	-
192	-	-	-	6	-	-	-	1	-	2	2	-	-
193	-	-	-	1	-	-	-	-	4	-	-	-	-
194	1	1	-	-	-	-	-	-	-	1	-	-	3
195	-	-	-	-	1	1	-	1	-	-	-	-	-
196	-	-	-	-	-	-	1	-	-	-	-	-	-
197	-	-	-	3	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	1	-	-	-	2	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	1	-	1	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	2	-	-	-	-	1	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	2	-	4	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	1	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	1	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	1	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>n</i>	1	7	1	22	13	8	6	8	19	4	3	2	13

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

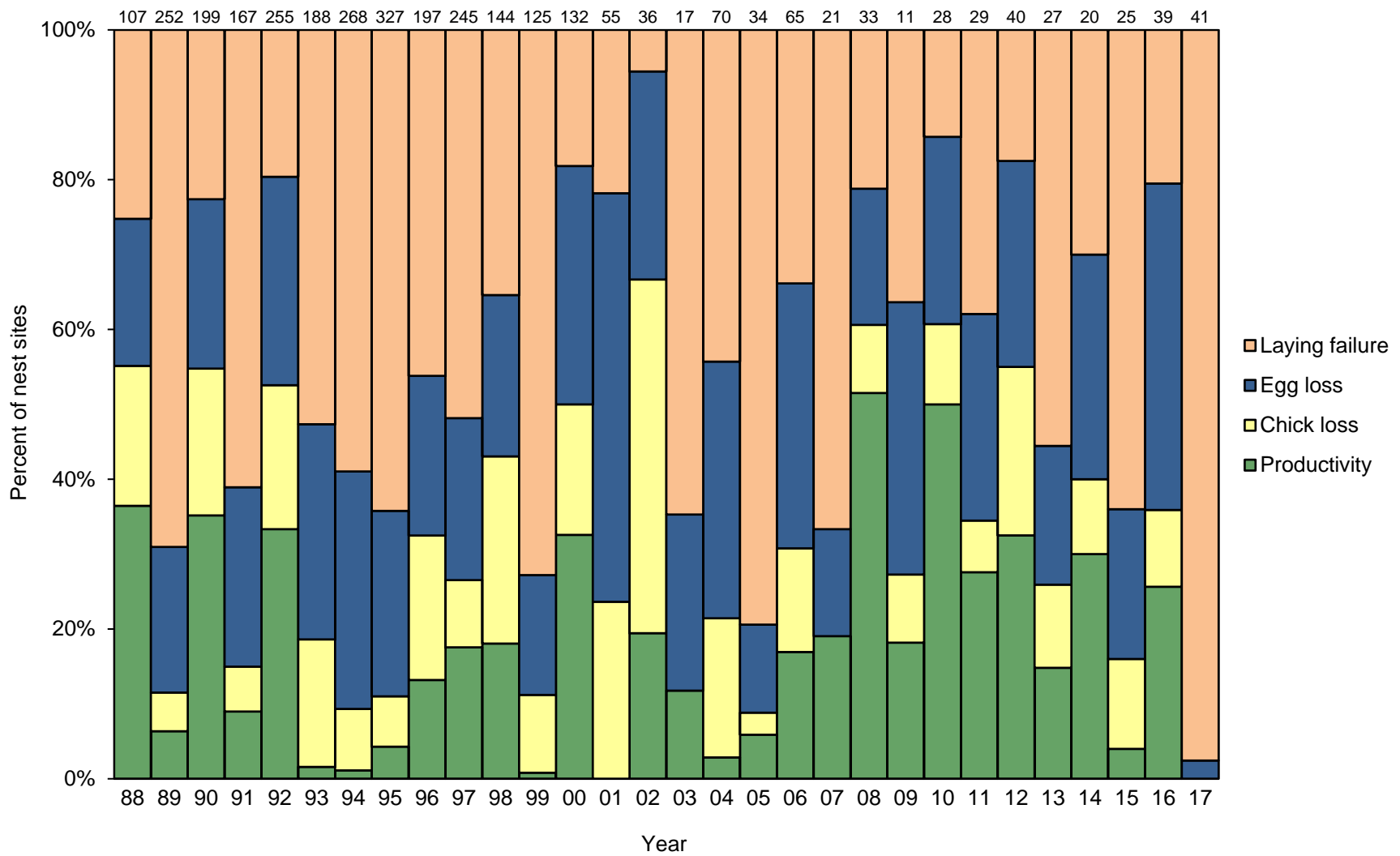


Figure 47. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska. Laying failure= $(A-B)/A$; Egg loss= $(B-D)/A$; Chick loss= $(D-F)/A$; Productivity= F/A , where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A).

Table 65. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska.

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
1988	107	80	80	59	59	39	39	0.75	1.0	0.74	0.74	0.66	0.49	0.66	0.49	0.36	0.36
1989	252	78	80	29	30	16	16	0.31	1.0	0.37	0.38	0.53	0.20	0.55	0.21	0.06	0.06
1990	199	154	165	109	111	70	70	0.77	1.1	0.71	0.67	0.63	0.42	0.64	0.45	0.35	0.35
1991	167	65	67	25	26	15	15	0.39	1.0	0.38	0.39	0.58	0.22	0.60	0.23	0.09	0.09
1992	255	205	211	134	135	85	85	0.80	1.0	0.65	0.64	0.63	0.40	0.63	0.41	0.33	0.33
1993	188	89	92	35	35	3	3	0.47	1.0	0.39	0.38	0.09	0.03	0.09	0.03	0.02	0.02
1994	268	110	110	25	25	3	3	0.41	1.0	0.23	0.23	0.12	0.03	0.12	0.03	0.01	0.01
1995	327	117	117	36	36	14	14	0.36	1.0	0.31	0.31	0.39	0.12	0.39	0.12	0.04	0.04
1996	197	106	107	64	64	26	26	0.54	1.0	0.60	0.60	0.41	0.24	0.41	0.25	0.13	0.13
1997	245	118	118	65	65	43	43	0.48	1.0	0.55	0.55	0.66	0.36	0.66	0.36	0.18	0.18
1998	144	93	94	62	62	26	26	0.65	1.0	0.67	0.66	0.42	0.28	0.42	0.28	0.18	0.18
1999	125	34	34	14	14	1	1	0.27	1.0	0.41	0.41	0.07	0.03	0.07	0.03	0.01	0.01
2000	132	108	119	66	69	43	44	0.82	1.1	0.61	0.58	0.64	0.37	0.65	0.40	0.33	0.33
2001	55	43	45	13	13	0	0	0.78	1.1	0.30	0.29	0.00	0.00	0.00	0.00	0.00	0.00
2002	36	34	34	24	24	7	7	0.94	1.0	0.71	0.71	0.29	0.21	0.29	0.21	0.19	0.19
2003	17	6	6	2	2	2	2	0.35	1.0	0.33	0.33	1.00	0.33	1.00	0.33	0.12	0.12
2004	70	39	40	15	15	2	2	0.56	1.0	0.38	0.38	0.13	0.05	0.13	0.05	0.03	0.03
2005	34	7	7	3	3	2	2	0.21	1.0	0.43	0.43	0.67	0.29	0.67	0.29	0.06	0.06
2006	65	43	43	20	20	11	11	0.66	1.0	0.47	0.47	0.55	0.26	0.55	0.26	0.17	0.17
2007	21	7	7	4	4	4	4	0.33	1.0	0.57	0.57	1.00	0.57	1.00	0.57	0.19	0.19
2008	33	26	26	20	20	17	17	0.79	1.0	0.77	0.77	0.85	0.65	0.85	0.65	0.52	0.52
2009	11	7	7	3	3	2	2	0.64	1.0	0.43	0.43	0.67	0.29	0.67	0.29	0.18	0.18
2010	28	24	24	17	17	14	14	0.86	1.0	0.71	0.71	0.82	0.58	0.82	0.58	0.50	0.50
2011	29	18	18	10	10	8	8	0.62	1.0	0.56	0.56	0.80	0.44	0.80	0.44	0.28	0.28
2012	40	33	33	22	22	13	13	0.83	1.0	0.67	0.67	0.59	0.39	0.59	0.39	0.33	0.33
2013	27	12	12	7	7	4	4	0.44	1.0	0.58	0.58	0.57	0.33	0.57	0.33	0.15	0.15
2014	20	14	14	8	8	6	6	0.70	1.0	0.57	0.57	0.75	0.43	0.75	0.43	0.30	0.30
2015	25	9	9	4	4	1	1	0.36	1.0	0.44	0.44	0.25	0.11	0.25	0.11	0.04	0.04
2016	39	31	31	14	14	10	10	0.79	1.0	0.45	0.45	0.71	0.32	0.71	0.32	0.26	0.26
2017	41	1	1	0	0	0	0	0.02	1.0	0.00	0.00	-	0.00	-	0.00	0.00	0.00

Table 66. Standard deviation in reproductive performance parameters of red-legged kittiwakes at Buldir Island, Alaska. Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Total nest starts	Sampling design ^b	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
1988	13	107	Simple random	0.04	0.00	0.05	0.05	0.06	0.06	0.06	0.06	0.05	0.05
1989	15	252	Simple random	0.03	0.02	0.05	0.05	0.09	0.04	0.09	0.05	0.01	0.01
1990	15	199	Simple random	0.03	0.02	0.04	0.04	0.05	0.04	0.05	0.04	0.03	0.03
1991	18	167	Simple random	0.04	0.02	0.06	0.06	0.10	0.05	0.10	0.05	0.02	0.02
1992	19	255	Simple random	0.03	0.01	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03
1993	9	188	Simple random	0.04	0.02	0.05	0.05	0.05	0.02	0.05	0.02	0.01	0.01
1994	13	268	Simple random	0.03	0.00	0.04	0.04	0.06	0.02	0.06	0.02	0.01	0.01
1995	17	327	Simple random	0.03	0.00	0.04	0.04	0.08	0.03	0.08	0.03	0.01	0.01
1996	14	197	Simple random	0.04	0.01	0.05	0.05	0.06	0.04	0.06	0.04	0.02	0.02
1997	21	245	Simple random	0.03	0.00	0.05	0.05	0.06	0.04	0.06	0.04	0.02	0.02
1998	9	144	Simple random	0.04	0.01	0.05	0.05	0.06	0.05	0.06	0.05	0.03	0.03
1999	8	125	Simple random	0.04	0.00	0.08	0.08	0.07	0.03	0.07	0.03	0.01	0.01
2000	9	132	Simple random	0.03	0.03	0.05	0.05	0.06	0.04	0.06	0.05	0.04	0.04
2001	4	55	Simple random	0.06	0.03	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00
2002	4	36	Simple random	0.04	0.00	0.08	0.08	0.09	0.07	0.09	0.07	0.07	0.07
2003	8	17	Simple random	0.12	0.00	0.19	0.19	0.00	0.19	0.00	0.19	0.08	0.08
2004	7	70	Simple random	0.06	0.03	0.08	0.08	0.09	0.03	0.09	0.03	0.02	0.02
2005	5	34	Simple random	0.07	0.00	0.19	0.19	0.27	0.17	0.27	0.17	0.04	0.04
2006	7	65	Simple random	0.06	0.00	0.08	0.08	0.11	0.07	0.11	0.07	0.05	0.05
2007	3	21	Simple random	0.10	0.00	0.19	0.19	0.00	0.19	0.00	0.19	0.09	0.09
2008	5	33	Simple random	0.07	0.00	0.08	0.08	0.08	0.09	0.08	0.09	0.09	0.09
2009	3	11	Simple random	0.14	0.00	0.19	0.19	0.27	0.17	0.27	0.17	0.12	0.12
2010	4	28	Simple random	0.07	0.00	0.09	0.09	0.09	0.10	0.09	0.10	0.09	0.09
2011	4	29	Simple random	0.09	0.00	0.12	0.12	0.13	0.12	0.13	0.12	0.08	0.08
2012	4	40	Simple random	0.06	0.00	0.08	0.08	0.10	0.08	0.10	0.08	0.07	0.07
2013	2	27	Simple random	0.04	0.00	0.10	0.10	0.00	0.06	0.00	0.06	0.01	0.01
2014	5	20	Simple random	0.05	0.00	0.10	0.10	0.26	0.19	0.26	0.19	0.13	0.13
2015	4	25	Simple random	0.10	0.00	0.10	0.10	0.09	0.06	0.09	0.06	0.04	0.04
2016	6	39	Simple random	0.07	0.00	0.09	0.09	0.12	0.08	0.12	0.08	0.07	0.07
2017	6	41	Simple random	0.01	0.00	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.

Table 67. Clutch sizes of red-legged kittiwakes at Buldir Island, Alaska. Sample units consist of total nest sites, not plots.

Year	Total nest starts (A)	Nest sites w/ x eggs:			Nest sites w/ eggs (B)	Total eggs (C)	Mean clutch size (C/B)
		0	1	2			
1988	107	27	80	0	80	80	1.0
1989	252	174	76	2	78	80	1.0
1990	199	45	143	11	154	165	1.1
1991	167	102	63	2	65	67	1.0
1992	255	50	199	6	205	211	1.0
1993	188	99	86	3	89	92	1.0
1994	268	158	110	0	110	110	1.0
1995	327	210	117	0	117	117	1.0
1996	197	91	105	1	106	107	1.0
1997	245	127	118	0	118	118	1.0
1998	144	51	92	1	93	94	1.0
1999	125	91	34	0	34	34	1.0
2000	132	24	97	11	108	119	1.1
2001	55	12	41	2	43	45	1.1
2002	36	2	34	0	34	34	1.0
2003	17	11	6	0	6	6	1.0
2004	70	31	38	1	39	40	1.0
2005	34	27	7	0	7	7	1.0
2006	65	22	43	0	43	43	1.0
2007	21	14	7	0	7	7	1.0
2008	33	7	26	0	26	26	1.0
2009	11	4	7	0	7	7	1.0
2010	28	4	24	0	24	24	1.0
2011	29	11	18	0	18	18	1.0
2012	40	7	33	0	33	33	1.0
2013	27	15	12	0	12	12	1.0
2014	20	6	14	0	14	14	1.0
2015	25	16	9	0	9	9	1.0
2016	39	8	31	0	31	31	1.0
2017	41	40	1	0	1	1	1.0

Table 68. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska in 2017. All plots in 2017 were located at Spike Camp.

Parameter	Plot						Total	SD ^a
	40B	40C	45	45A	46	47		
Total nest starts (A)	2	1	6	25	4	3	41	-
Nest sites w/ eggs (B)	0	0	0	1	0	0	1	-
Total eggs (C)	0	0	0	1	0	0	1	-
Nest sites w/ chicks (D)	0	0	0	0	0	0	0	-
Total chicks (E)	0	0	0	0	0	0	0	-
Nest sites w/ chicks fledged (F)	0	0	0	0	0	0	0	-
Total chicks fledged (G)	0	0	0	0	0	0	0	-
Laying success (B/A)	0.00	0.00	0.00	0.04	0.00	0.00	0.02	0.01
Mean clutch size (C/B)	-	-	-	1.0	-	-	1.0	0.00
Nesting success (D/B)	-	-	-	0.00	-	-	0.00	0.00
Hatching success (E/C)	-	-	-	0.00	-	-	0.00	0.00
Chick success (G/E)	-	-	-	-	-	-	-	-
Egg success (G/C)	-	-	-	0.00	-	-	0.00	0.00
Fledging success (F/D)	-	-	-	-	-	-	-	-
Reproductive success (F/B)	-	-	-	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
Productivity (F/A)	0.00	0.00	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. 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.

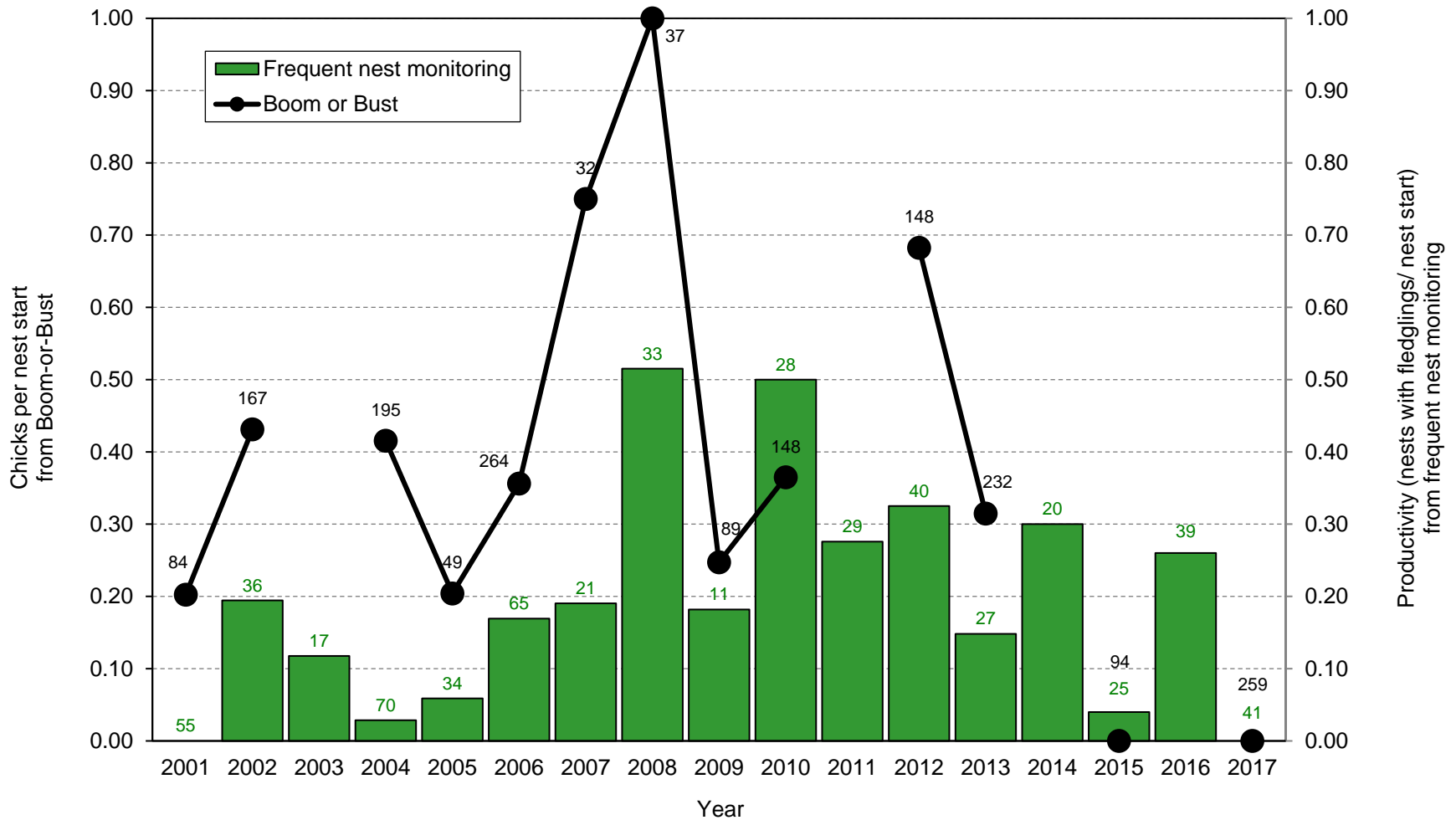


Figure 48. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska, as determined by a Boom-or-Bust methodology (black) and frequent nest monitoring (green). Reproductive success for Boom-or-Bust is measured by the number of chicks per nest start (E/A), where E =total chicks and A =total nest starts (including those without chicks), and 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. Reproductive success for frequent nest monitoring is measured by productivity (F/A), where F =nest sites with chicks fledged and A =total nest starts (see Table 65) and are based on following individual nests at 4-7 day intervals throughout the breeding season. Boom-or-Bust was conducted at Kittiwake Lane (2001-2013) and Spike Camp (2015-2017) and frequent nest monitoring at Spike Camp. Numbers above columns indicate sample sizes (A). No Boom-or-Bust data were collected in 2003, 2011, 2014, or 2016.

Table 69. Reproductive performance of red-legged kittiwakes at Buldir 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. Boom-or-Bust monitoring was conducted at Kittiwake Lane (2001-2013) and Spike Camp (2015-2017). No Boom-or-Bust data were collected in 2003, 2011, 2014, or 2016.

Year	Total plots monitored	Total nest starts (A)	Total chicks (E)	Chicks/ nest start (E/A) ^a	Date(s) of nest count	Date(s) of chick count
2001	3	84	17	0.20	26 Jun	29 Jul
2002	3	167	72	0.43	9 Jun	27 Jul
2004	4	195	81	0.42	17 Jun	3 Aug
2005	2	49	10	0.20	23 Jun	7 Aug
2006	3	264	94	0.36	23 Jun	9 Aug
2007	3	32	24	0.75	19 Jun	8 Aug
2008	7	37	37	0.66	18 Jun	19 Jul+12 Aug
2009	7	89	22	0.25	16 Jun	11+21 Aug
2010 ^b	7	148	54	0.36	13 Jun	22 Jul
2012	13	148	101	0.68	15 Jun	29 Jul
2013	8	232	73	0.31	1 Jul	7 Aug
2015	1	94	0	0.00	1 Jul	16 Aug
2017	1	259	0	0.00	3 Jul	14 Aug

^aChicks/nest start (E/A) may be considered a maximum potential value of success [fledglings/nest start (G/A)] based on the assumption that all chicks counted eventually fledge.

^bData represent maximum count of nests and chicks from 15 counts between 13 June and 22 August.

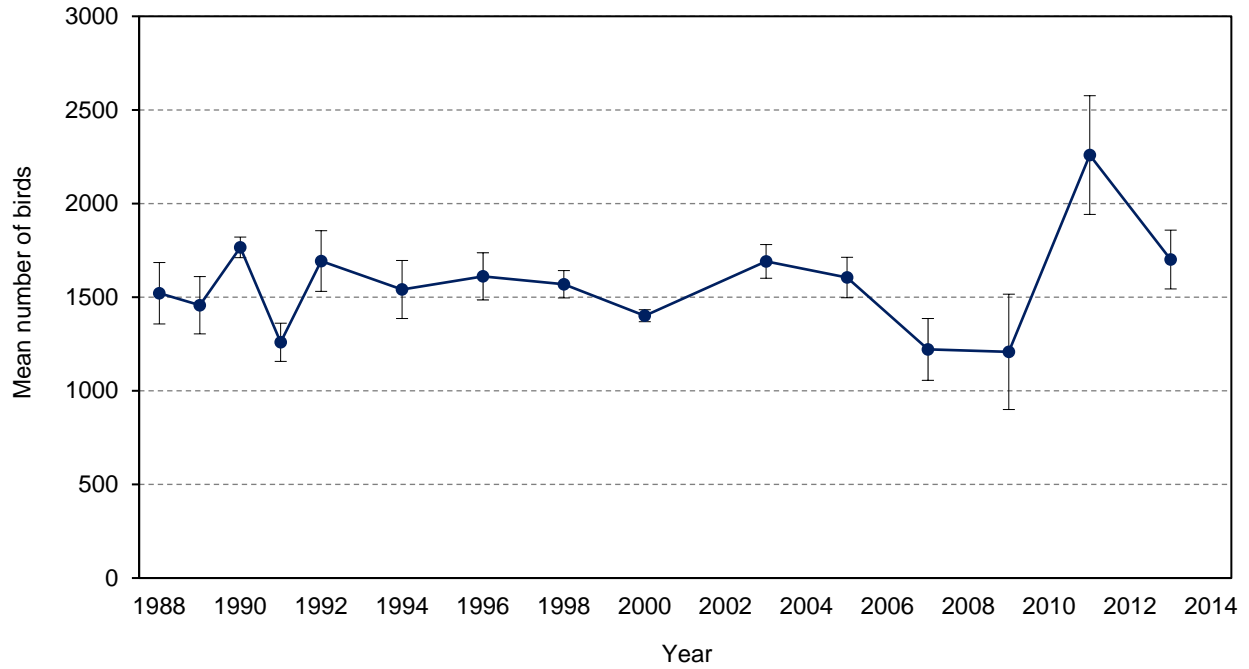


Figure 49. Mean numbers of red-legged kittiwakes counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

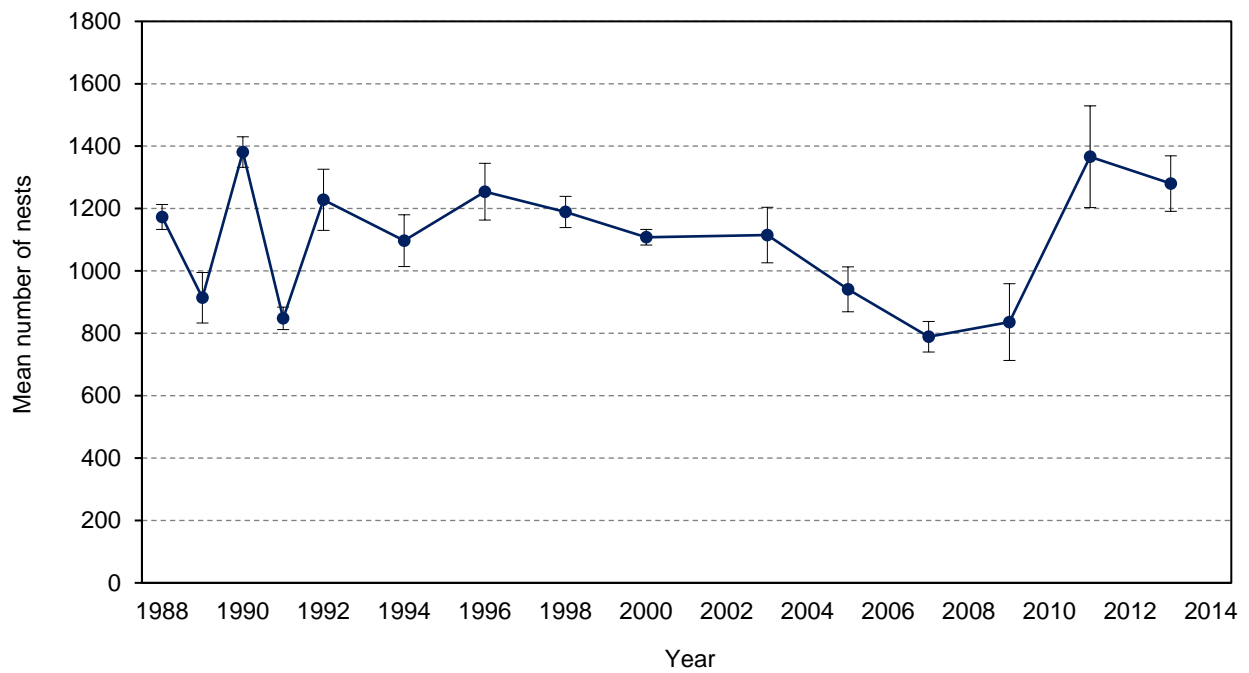


Figure 50. Mean numbers of red-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 70. Numbers of red-legged kittiwakes counted on index plots at Buldir Island, Alaska. Data represent combined totals from Spike (The Dip) and Kittiwake Lane. No counts were conducted in years not listed.

Replicate	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
1	1279	1220	1823	1139	1470	1387	1422	1506	1396	1630	1488	1026	1067	1873	1579
2	1558	1389	1727	1165	1752	1466	1565	1487	1394	1790	1612	1110	1156	1987	1545
3	1614	1533	1695	1320	1695	1565	1625	1582	1371	1742	1503	1229	808	2554	1905
4	1633	1560	1774	1320	1854	1747	1747	1605	1389	1602	1707	1289	1603	2557	1650
5	-	1585	1811	1373	-	-	1697	1664	1455	-	1714	1453	1409	2324	1825
Mean	1521	1457	1766	1259	1693	1541	1611	1569	1401	1691	1605	1221	1208	2259	1701
<i>n</i>	4	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	164	153	55	102	162	155	126	73	32	90	108	165	308	317	157
First count	5 Jul	26 Jun	30 Jun	4 Jul	3 Jul	3 Jul	27 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	27 Jul	16 Jul	18 Jul	19 Jul	21 Jul	19 Jul	19 Jul	24 Jul	20 Jul	25 Jul	18 Jul	23 Jul	31 Jul	26 Jul	20 Jul

Table 71. Numbers of red-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Data represent combined totals from Spike (The Dip) and Kittiwake Lane. No counts were conducted in years not listed.

Replicate	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
1	1182	826	1441	806	1094	1030	1133	1168	1120	984	829	729	753	1538	1228
2	1130	828	1415	835	1237	1060	1196	1112	1147	1139	954	803	848	1546	1222
3	1208	973	1315	874	1251	1082	1299	1239	1092	1156	937	819	675	1291	1357
4	-	957	1366	828	1330	1217	1366	1210	1084	1179	956	748	971	1210	1199
5	-	988	1367	895	-	-	1274	1215	1099	-	1030	854	933	1245	1394
Mean	1173	914	1381	848	1228	1097	1254	1189	1108	1115	941	789	836	1366	1280
Max.	1208	988	1441	895	1330	1217	1366	1239	1147	1179	1030	854	971	1546	1394
<i>n</i>	3	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	40	81	49	36	98	83	91	50	25	89	72	49	123	163	89
First count	5 Jul	26 Jun	30 Jun	4 Jul	3 Jul	3 Jul	27 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	27 Jul	16 Jul	18 Jul	19 Jul	21 Jul	19 Jul	19 Jul	24 Jul	20 Jul	25 Jul	18 Jul	23 Jul	31 Jul	26 Jul	20 Jul

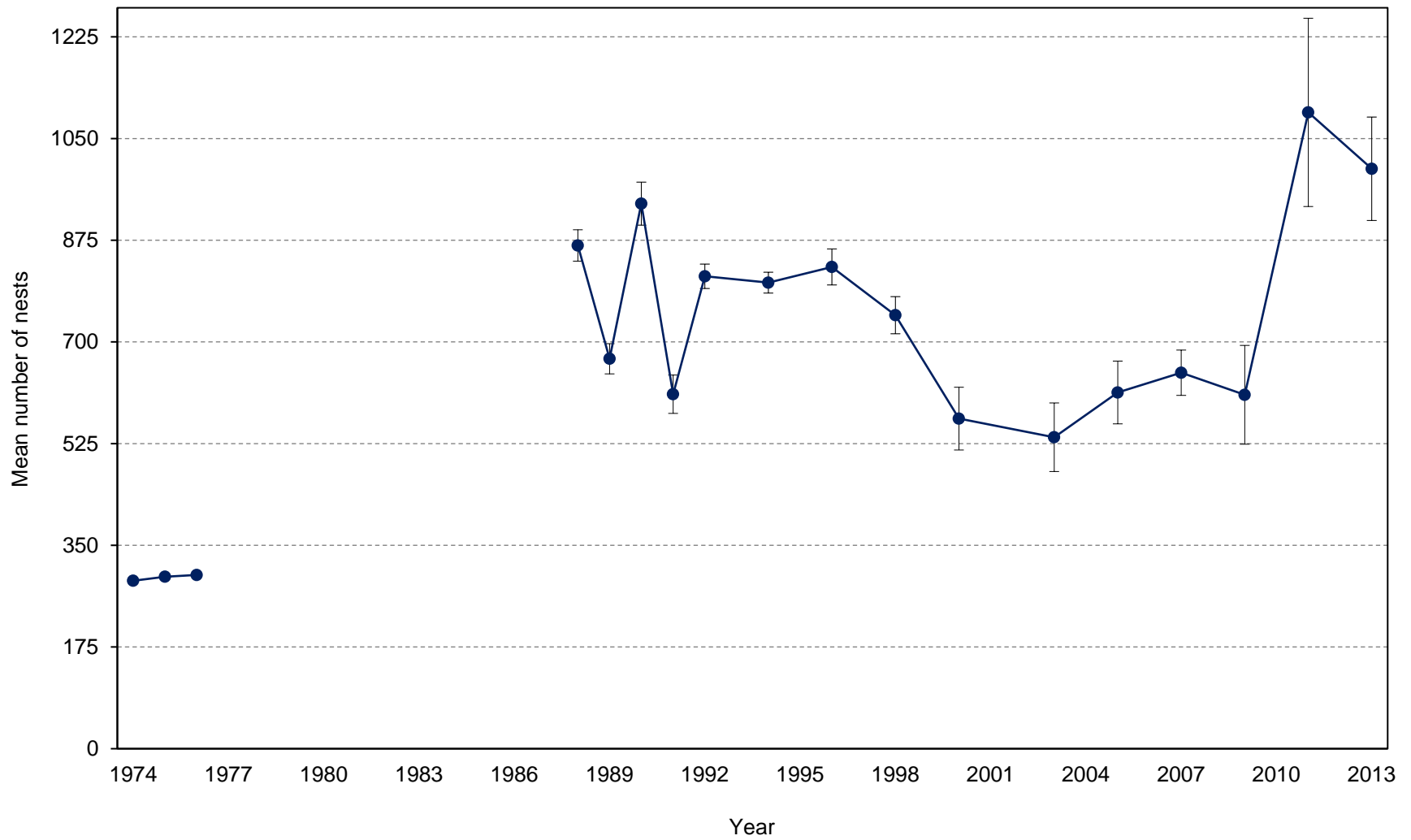


Figure 51. Mean numbers of red-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) and are a subset of total counts on all index plots. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 72. Mean numbers of red-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Plot values represent the average count of nests in that plot each year; total values and standard deviations are based on the average total count across all plots each year (as opposed to the sum of plot means). Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29); these data are a subset of total counts on all index plots (Table 71) but are presented separately for comparison with historic counts from 1974-1976. No counts were conducted in years not listed.

Plot (segment)	1974	1975	1976	1988	1989	1990	1991	1992	1994	1996	1998	2000	2003	2005	2007	2009	2011	2013
15 (1)	-	80	-	127	95	145	75	96	81	88	81	46	69	46	1	0	3	0
16 (2)	-	89	-	110	83	108	75	98	95	68	70	37	33	31	92	63	149	67
17 (3)	-	46	-	149	125	129	63	87	80	79	56	57	53	88	89	75	146	74
18 (4)	-	49	-	167	75	114	85	123	137	171	135	93	81	141	79	117	315	70
19 (5)	-	12	-	52	51	75	34	62	66	59	49	46	43	52	41	71	112	73
20 (6)	-	20	-	109	72	117	44	95	94	81	81	83	38	45	54	48	66	61
21 (7)	-	0	-	49	49	76	73	70	86	95	95	70	63	68	92	65	90	92
22 (8)	-	0	-	56	56	78	79	88	82	66	69	31	48	44	64	54	74	73
23 (9)	-	0	-	46	63	87	80	90	57	44	37	27	31	59	46	61	86	59
24 (10)	-	0	-	1	1	6	2	4	7	17	26	24	12	4	12	19	29	13
25 (11)	-	0	-	0	0	0	0	0	5	11	10	11	22	24	15	21	15	12
26 (12)	-	0	-	0	0	0	0	0	2	12	14	18	28	7	12	14	9	21
27 (13)	-	0	-	0	0	0	0	0	1	10	8	13	10	3	2	0	0	0
28 (14)	-	0	-	0	1	3	0	0	9	28	15	12	3	1	1	0	1	0
29 (15)	-	0	-	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Total	289	296	299	866	671	938	610	813	802	829	746	568	536	613	647	609	1095	998
<i>n</i>	1	1	1	3	5	5	5	4	4	5	5	5	4	5	5	5	5	5
SD	-	-	-	27	26	37	33	21	18	31	32	54	59	54	39	85	162	89
First count	Jul ^a	Jul ^a	Jul ^a	5 Jul	29 Jun	30 Jun	8 Jul	6 Jul	4 Jul	28 Jun	4 Jul	27 Jun	9 Jul	23 Jun	25 Jun	29 Jun	8 Jul	4 Jul
Last count	-	-	-	27 Jul	16 Jul	18 Jul	18 Jul	20 Jul	19 Jul	18 Jul	24 Jul	20 Jul	25 Jul	18 Jul	14 Jul	31 Jul	26 Jul	20 Jul

^aData come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

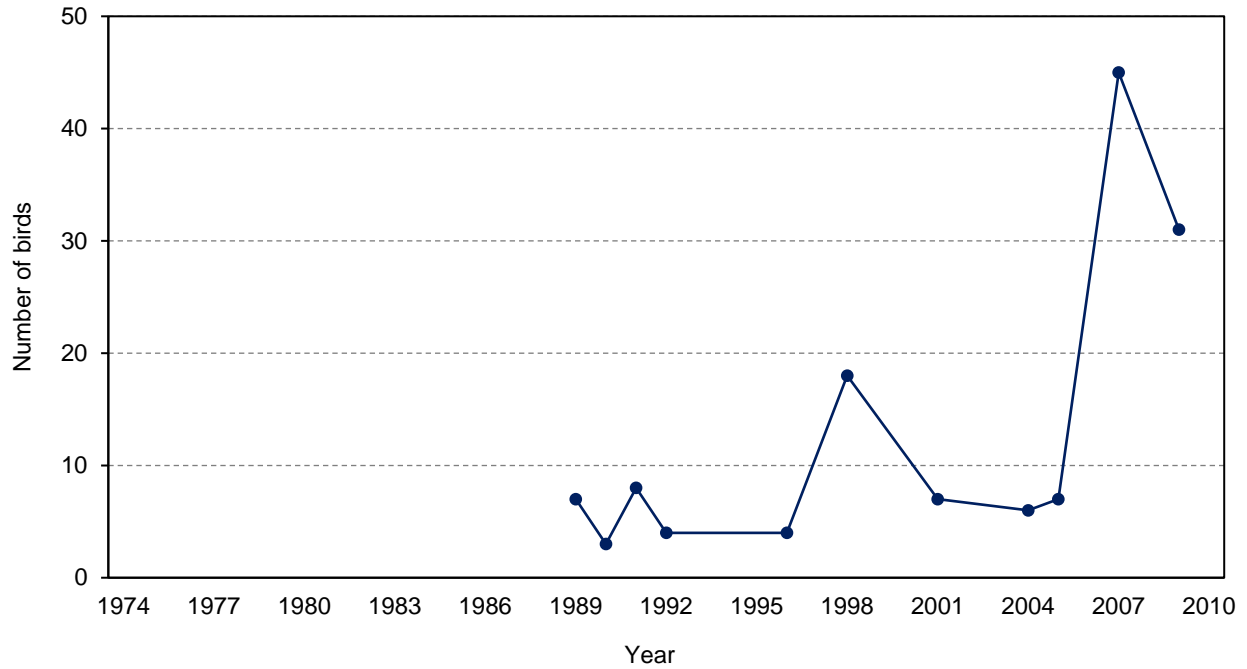


Figure 52. Numbers of red-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because birds were not identified to species.

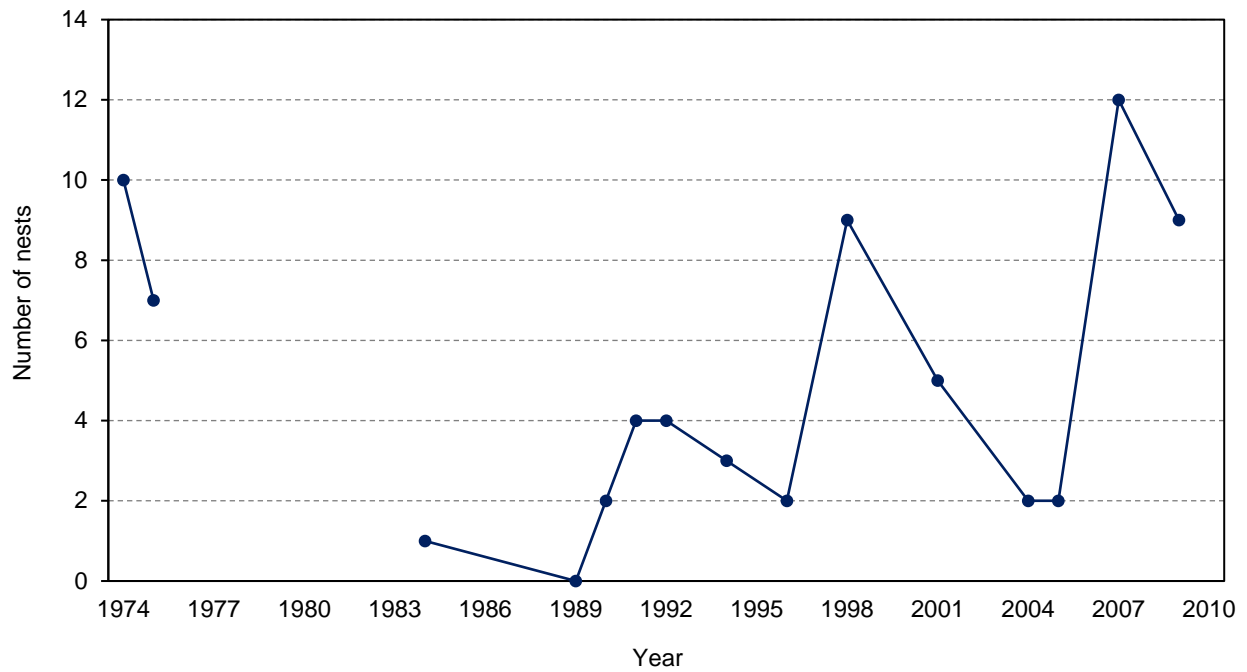


Figure 53. Numbers of red-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because nests were not identified to species.

Table 73. Numbers of red-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots; numbers are not included in population count totals (Table 70) and counts are not always conducted in the same years. No counts were conducted in years not listed.

Segment	1988	1989	1990	1991	1992	1996	1998	2001	2004	2005	2007	2009
I	-	0	0	0	0	0	0	0	0	4	0	0
II	-	0	0	0	0	0	0	2	0	0	0	0
III	-	0	0	0	0	0	0	0	0	0	0	0
IV	-	0	0	0	0	0	0	0	0	0	0	0
V	-	3	0	0	0	0	5	1	0	0	2	0
VI	-	0	0	0	0	1	13	0	0	3	23	21
VII	-	4	3	8	4	3	0	4	6	0	20	10
Total	- ^a	7	3	8	4	4	18	7	6	7	45	31
Date(s)	19 Jul	20 Jul	19-26 Jul	17 Jul	26 Jul	22 Jul	1 Jul	6 Jul	13 Jul	25 Jul	23 Jul	22 Jul

^aCount in 1988 not broken down to species, see black-legged kittiwakes counts (Table 56).

Table 74. Numbers of red-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots; numbers are not included in population count totals (Table 71) and counts are not always conducted in the same years. No counts were conducted in years not listed.

Segment	1974	1975	1984	1988	1989	1990	1991	1992	1994	1996	1998	2001	2004	2005	2007	2009
I	9	5	0	-	0	0	0	0	0	0	0	0	0	2	0	0
II	0	0	0	-	0	0	0	0	1	0	0	2	0	0	0	0
III	0	0	0	-	0	0	0	0	2	0	0	0	0	0	0	0
IV	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	2
V	1	2	1	-	0	0	0	0	0	0	0	1	0	0	1	0
VI	0	0	0	-	0	0	0	0	0	1	9	0	0	0	5	5
VII	0	0	0	-	0	2	4	4	0	1	0	2	2	0	6	2
Total	10	7	1	- ^a	0	2	4	4	3	2	9	5	2	2	12	9
Date(s)	9 Aug	4 Jun	17 Jun	19 Jul	20 Jul	19-26 Jul	17 Jul	26 Jul	23-24 Jul	22 Jul	1 Jul	6 Jul	13 Jul	25 Jul	23 Jul	22 Jul

^aCount in 1988 not broken down to species, see black-legged kittiwakes counts (Table 57).

Table 75. Total number of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Parameter	Year																										
	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
New color bands	17	11	16	37	39	86	49	26	8	21	26	3	17	0	0	0	0	18	20	14	18	15	10	8	27	58	0
New metal and colors	17	11	16	35	39	86	48	26	8	21	26	3	17	0	0	0	0	17	20	14	18	9	8	7	27	58	0
New colors on previous metal-banded bird ^a	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6	2	1	0	0	0
New color bands replace old color bands ^b	0	1	0	0	1	0	1	1	2	0	1	0	12	2	0	1	0	2	5	1	3	6	0	1	1	0	0
Cum. color-banded birds	17	28	44	81	120	206	256	282	290	311	337	340	357	357	357	357	357	375	395	409	427	442	452	460	487	545	545

^aBird previously banded with metal band only and given color band(s) for inclusion in survival dataset.

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

Table 76. Fates of cohorts of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Year	No. birds banded in year	No. birds resighted in:																							Prop. birds resighted in 2014			
		89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11		12	13	14
1988	17	15	17	17	16	15	17	15	17	16	16	10	11	12	9	8	6	3	3	1	1	1	3	3	1	1	2	0.11
1989	11	-	7	8	9	10	9	9	9	9	5	7	4	4	1	1	1	1	2	1	0	1	1	0	0	0	0	0.00
1990	16	-	-	12	13	15	16	14	15	13	12	10	6	5	5	2	1	1	2	1	1	0	0	0	0	0	0	0.00
1991	37	-	-	-	33	33	35	27	24	28	25	24	19	18	16	12	5	7	7	6	2	5	5	4	2	1	0	0.00
1992	39	-	-	-	-	37	39	36	32	33	23	23	16	22	19	11	8	6	10	6	4	5	3	2	1	0	1	0.03
1993	85	-	-	-	-	-	76	65	63	67	55	50	41	42	32	17	14	17	18	17	10	20	12	7	3	4	1	0.01
1994	50	-	-	-	-	-	-	45	40	43	32	27	25	18	15	12	12	12	9	5	2	8	5	1	0	0	0	0.00
1995	26	-	-	-	-	-	-	-	23	25	23	21	14	14	15	13	13	14	13	6	2	4	4	5	3	1	0	0.00
1996	8	-	-	-	-	-	-	-	-	8	7	8	7	7	6	4	5	3	5	2	1	4	3	2	2	3	0	0.00
1997	21	-	-	-	-	-	-	-	-	-	19	18	14	11	11	7	8	7	5	7	2	5	4	1	3	0	0	0.00
1998	26	-	-	-	-	-	-	-	-	-	-	22	19	16	14	14	12	9	8	3	3	5	2	3	3	1	0	0.00
1999	3	-	-	-	-	-	-	-	-	-	-	-	2	3	3	2	3	2	3	0	1	1	1	0	0	0	0	0.00
2000	17	-	-	-	-	-	-	-	-	-	-	-	-	17	11	10	7	9	10	6	3	4	3	2	2	2	0	0.00
2001	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	9	4	12	9	5	7	2	3	0.17
2006	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	10	17	14	11	10	9	0.20
2007	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	13	11	12	8	6	0.29
2008	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	15	12	11	10	0.22
2009	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	12	6	9	0.20
2010	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	7	5	2	0.20
2011	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	4	3	0.38
2012	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	6	0.22
2013	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	0.19
2014	0 ^a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- ^a
Birds seen in current year (A)		15	24	37	71	111	193	212	224	243	218	221	179	190	158	113	96	91	108	82	55	121	109	91	76	77	44	-
Birds potentially alive from prior year (B) ^b		21	29	46	83	118	204	273	282	261	320	305	307	247	233	231	187	162	159	194	184	104	165	150	119	115	135	-
Apparent annual survival (A/B) ^c		0.71	0.83	0.80	0.86	0.93	0.94	0.78	0.79	0.93	0.68	0.72	0.58	0.77	0.68	0.49	0.51	0.56	0.68	0.42	0.30	1.16	0.66	0.61	0.64	0.67	0.33	-

Table 76 (continued). Fates of cohorts of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Data do not include birds with duplicate bands or unknown banding history. No survival work was conducted after 2014.

Resighting effort ^d																												
Total no. resight days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	6	5	10	17	15	8	8	3 ^e	-
Total no. resight hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^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.

^eResighting efforts were restricted in 2014 due to a large earthquake that made access to the survival plots unsafe; therefore, survival estimates in 2014 are likely underestimated.

Table 77. Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																								
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																								
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																								
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																								
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Blue	10	794-35358	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	4	2	0	2	0	0	0	0	0	
Blue	13	794-35359	1998		-	-	-	-	-	-	-	-	-	y	0	0	0	0	y	y	2	0	1	0	0	0	0	0	
Blue	15	794-35362	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	
Blue	16	794-35363	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	
Blue	18	794-35364	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	3	0	1	1	3	1	3	0	0	
Blue	19	794-35365	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	4	0	0	0	0	0	0	0	0	
Blue	20	794-35366	1998		-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	21	794-35367	1998		-	-	-	-	-	-	-	-	-	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	
Blue	24	794-35370	1998		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	25	794-35372	1998		-	-	-	-	-	-	-	-	-	0	0	y	0	y	y	0	0	0	0	0	0	0	0	0	
Blue	27	794-35357	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	6	0	2	0	0	0	0	0	0	
Blue	29	794-62538	2000		-	-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	31	794-35394	1999		-	-	-	-	-	-	-	-	-	-	y	y	y	0	y	0	1	0	0	0	0	0	0	0	
Blue	33	794-62539	2000		-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	35	794-35210	1993	A (G 69; 00)	-	-	-	-	-	y	y	0	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	
Blue	41	794-35395	1999		-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	6	0	0	0	0	0	0	0	0	
Blue	42	794-35397	1999		-	-	-	-	-	-	-	-	-	-	0	y	y	y	y	3	0	1	4	1	0	0	0	0	
Blue	46	794-62540	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	9	3	0	0	0	0	0	0	0	
Blue	47	794-62541	2000		-	-	-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	49	794-62547	2000		-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Blue	50	1704-01301	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	0	y	y	8	2	0	4	3	1	1	0	0
Blue	51	1704-01302	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	4	0	0	0	0	0	0	0	0	
Blue	52	1704-01303	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	y	5	0	1	1	3	4	0	1	0
Blue	53	1704-01309	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	y	2	0	0	0	0	0	0	0	
Blue	54	1704-01311	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	0	1	0	0	0	0	0	0	0	
Blue	55	1704-01312	2000		-	-	-	-	-	-	-	-	-	-	-	y	0	y	0	y	4	1	0	4	3	0	1	2	0
Blue	57	1704-01314	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Blue	59	1704-01315	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Blue	63	1704-01316	2000		-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Blue	64	1704-01317	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	0	1	1	3	0	0	0	0	0	
Blue	65	584-01618	1988	A (G 26; 00)	y	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	69	1704-01318	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	2	1	4	0	0	0	0	0	0
Blue	70	794-35076	1992	A (G K7; 00)	-	-	-	-	y	y	y	y	y	y	y	0	y	y	y	y	3	2	1	0	0	0	0	0	0
Blue	71	794-35022	1991	A (G C5; 00)	-	-	-	-	y	y	y	y	y	y	y	0	y	y	y	y	8	3	0	2	4	3	1	1	0
Blue	72	794-35058	1991	A (G H8; 00)	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes		Resight history																							
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)		y = resighted at least once (# times unknown)																							
		DB = dark blue	R = red	B = bird missing color band (year)		0 = not resighted																							
		DG = dark green	W = white	C = bird died (year)		x = band no longer resightable (dead, removed)																							
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Blue	74	794-01322	2000		-	-	-	-	-	-	-	-	-	-	-	y	y	0	0	0	1	2	0	0	0	0	0	0	0
Blue	76	1704-01323	1993	A (Y 42; 00)	-	-	-	-	-	y	y	0	0	y	y	y	0	y	y	y	y	3	0	0	0	0	0	0	0
Blue	77	794-35450	1993	A (Y 48; 00)	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	y	3	0	0	0	0	0	0	0
Blue	79	794-35488	1993	A (Y 84; 00)	-	-	-	-	-	0	0	0	0	0	0	0	y	y	y	y	2	1	1	3	3	0	0	0	0
Blue	82	584-00248	1989	A (G 41; 00)	-	y	y	y	y	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	83	794-35054	1991	A (G H3; 00)	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	84	584-01617	1988	A (G 25; 00)	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0
Blue	85	584-01619	1988	A (G 33; 01)	y	y	y	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Blue	94	794-35069	1992	A (G J9; 01)	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Green	16	584-01611	1988		y	y	y	y	y	y	y	y	y	y	0	y	y	0	0	y	y	0	0	0	0	1	1	0	0
Green	17	584-01612	1988		y	y	y	y	y	y	y	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Green	18	584-01610	1988		0	y	y	y	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	19	584-01613	1988	B (94)	y	y	y	y	0	y	0	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	20	584-01614	1988		y	y	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	22	584-01615	1988		y	y	y	y	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0
Green	32	584-01620	1988		y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	37	584-00243	1989		-	0	y	y	y	y	y	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	38	584-00247	1989		-	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	39	584-01621	1988		y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	45	584-00250	1989		-	y	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	46	584-00249	1989		-	y	y	y	y	y	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	48	584-00267	1990		-	-	y	y	y	y	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	52	584-00244	1989		-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	56	794-35500	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	63	584-01626	1990		-	-	0	y	y	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	64	584-00266	1990		-	-	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	67	584-01603	1988		y	y	y	y	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	72	584-00261	1990		-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	73	584-00256	1990	C (00)	-	-	y	y	y	y	y	y	y	0	y	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Green	74	584-00257	1990		-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	75	584-00258	1990		-	-	0	0	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	78	584-00265	1990		-	-	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	80	584-00263	1990		-	-	y	y	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	82	584-00251	1989		-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	86	584-00255	1990	B (01)	-	-	y	y	y	y	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																							
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																							
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																							
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																							
		LB = light blue	Y = yellow	D = bird with broken foot (year)																								
Color band		Metal band #	Year banded	Notes	Year resighted																							
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
Green	87	584-00252	1989		-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	88	584-00262	1990		-	-	y	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	90	584-00253	1989		-	y	y	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	95	584-00254	1990		-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	97	584-01625	1990		-	-	y	y	y	y	y	y	0	y	y	0	y	y	y	y	4	1	1	0	0	0	0	0
Green	A2	794-35012	1991		-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	A3	584-01607	1991		-	-	-	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	A5	794-35104	1991		-	-	-	y	y	y	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Green	A6	794-35014	1991		-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0
Green	A7	794-35015	1991		-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	A8	794-35016	1991		-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	A9	794-35017	1991		-	-	-	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	C1	794-35018	1991		-	-	-	y	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	C2	794-35019	1991		-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	C3	794-35020	1991		-	-	-	y	y	y	y	0	0	y	y	y	y	y	0	y	2	1	0	3	2	0	0	0
Green	C4	794-35021	1991		-	-	-	y	y	y	y	y	y	y	y	y	0	0	0	0	3	0	0	0	0	0	0	0
Green	C6	794-35023	1991		-	-	-	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	C7	794-35024	1991		-	-	-	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	C9	794-35025	1991		-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	D1	794-35026	1991		-	-	-	y	y	y	y	y	y	0	y	y	0	y	y	1	1	0	0	0	0	0	0	0
Green	D2	794-35027	1991		-	-	-	y	y	y	y	y	y	0	y	y	y	0	y	2	0	0	0	0	0	0	0	0
Green	D3	794-35028	1991		-	-	-	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	D4	794-35029	1991		-	-	-	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	D5	794-35030	1991		-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	D6	794-35031	1991		-	-	-	0	y	y	y	y	y	y	0	0	y	y	y	1	1	0	0	0	1	0	0	0
Green	D7	794-35032	1991		-	-	-	y	y	y	0	y	y	y	0	y	0	0	0	0	0	0	0	1	0	0	0	0
Green	D8	794-35033	1991		-	-	-	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	D9	794-35035	1991		-	-	-	y	y	y	y	0	y	y	y	0	0	y	y	y	0	0	0	0	0	0	0	0
Green	E1	794-35034	1991		-	-	-	0	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	E2	794-35036	1991		-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	E3	794-35037	1991		-	-	-	y	y	y	0	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Green	E6	794-35039	1991	C (03)	-	-	-	y	y	y	y	y	y	y	y	y	y	y	x	x	x	x	x	x	x	x	x	x
Green	E7	794-35040	1991		-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	G1	794-35042	1991		-	-	-	y	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	G9	794-35051	1991		-	-	-	y	y	y	y	0	y	y	y	0	0	y	y	y	y	3	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																							
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																							
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																							
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																							
		LB = light blue	Y = yellow	D = bird with broken foot (year)																								
Color band		Metal band #	Year banded	Notes	Year resighted																							
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
Green	H5	794-35056	1991		-	-	-	y	0	y	y	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	J1	794-35061	1992	D (01)	-	-	-	-	y	y	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	J2	794-35062	1992		-	-	-	-	0	y	y	0	0	y	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Green	J3	794-35063	1992		-	-	-	-	0	y	y	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	J4	794-35064	1992		-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	J5	794-35065	1992		-	-	-	-	y	y	y	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0
Green	J6	794-35066	1992		-	-	-	-	y	y	y	0	0	0	0	0	0	y	0	y	0	4	0	0	4	1	0	0
Green	J7	794-35067	1992		-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	J8	794-35068	1992		-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	y	0	3	0	0	0	0	0	0
Green	K2	794-35071	1992		-	-	-	-	y	y	0	0	y	y	y	0	y	y	0	y	y	6	2	1	0	0	0	0
Green	K3	794-35072	1992		-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	K4	794-35073	1992		-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	2	0	2	2	2	3	0	0
Green	K5	794-35074	1992		-	-	-	-	y	y	y	y	0	y	y	y	y	y	0	y	0	1	0	0	0	0	0	0
Green	K6	794-35075	1992		-	-	-	-	y	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0
Green	K8	794-35077	1992		-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	K9	794-35078	1992		-	-	-	-	y	y	y	y	y	0	y	y	y	y	0	0	1	0	0	0	0	0	0	0
Green	L1	794-35079	1992		-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	L2	794-35080	1992		-	-	-	-	y	y	y	y	y	0	y	y	y	y	y	y	6	0	0	0	0	0	0	0
Green	L4	794-35081	1992		-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	L5	794-35082	1992		-	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	L6	794-35083	1992		-	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	L7	794-35084	1992		-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	0	1	1	1	0	0	0	0
Green	L8	794-35085	1992		-	-	-	-	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	L9	584-00260	1990	A (G 83; 92)	-	-	-	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	M1	794-35086	1992		-	-	-	-	y	y	y	y	y	0	y	y	y	0	0	1	0	0	0	0	0	0	0	0
Green	M2	794-35087	1992		-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Green	M4	794-35088	1992		-	-	-	-	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	M5	794-35089	1992		-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	M7	794-35090	1992	C (05)	-	-	-	-	y	y	y	y	y	0	0	y	y	y	y	x	x	x	x	x	x	x	x	x
Green	M8	794-35091	1992		-	-	-	-	y	y	y	y	y	0	y	0	y	0	0	0	0	0	0	0	0	0	0	0
Green	M9	794-35092	1992		-	-	-	-	y	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0
Green	N2	794-35093	1992		-	-	-	-	y	y	y	y	0	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0
Green	N3	794-35094	1992		-	-	-	-	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	N4	794-35095	1992		-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	N6	794-35096	1992		-	-	-	-	y	y	0	0	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																								
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																								
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																								
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																								
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Green	N7	794-35097	1992		-	-	-	-	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	
Green	N8	794-35098	1992		-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	N9	794-35099	1992		-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	O6	584-01609	1988		0	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	1	0	0	0	0	0	0	0	
Green	O7	584-01608	1988		y	y	y	y	y	y	y	y	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	
Red	H4	584-01622	1988	A (G 30; 03)	y	y	y	0	y	y	y	y	y	0	0	0	y	0	0	0	1	0	0	3	0	2	0	0	
Red	H8	794-86848	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	2	0	0	0	0	0	
Red	J2	794-35248	1995	A (Y M6; 05)	-	-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	y	1	0	0	2	1	0	0	0
Red	J5	714-10098	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	1	5	3	0	0	0	0	
Red	J6	794-35398	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	2	0	0	0	0	0	
Red	J8	794-35373	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	0	5	2	0	0	0	0	
Red	J9	794-35396	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	4	2	0	1	0	0	
Red	K3	584-00299	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	0	4	2	1	2	1	0	
Red	K9	584-00271	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	
Red	L2	794-35363	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	3	2	0	1	0	0	
Red	L3	584-00276	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	0	0	0	0	0	0	0	0	
Red	L4	794-62600	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	5	0	2	0	0	0	
Red	L6	584-00277	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	
Red	L7	794-35399	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	
Red	L8	794-62598	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	1	4	1	5	0	0	
Red	M2	794-62549	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	0	3	5	1	0	0	0	
Red	M4	794-35374	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2	2	1	1	1	1	0	
Red	M5	794-35400	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	2	0	0	0	0	1	0	0	
Red	M7	794-62548	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	2	3	0	1	0	0	
Red	M8	794-35375	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	0	0	0	0	0	
Red	N1	794-35378	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	4	1	1	0	0	0	
Red	N2	794-35379	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	4	1	1	0	0	0	0	
Red	N7	794-35383	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	2	0	0	0	0	0	
Red	O2	794-35102	1988		0	0	0	0	y	y	y	y	y	0	y	0	y	0	0	y	3	2	0	0	0	0	0	0	
Red	P2	794-35388	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	0	0	0	0	0	
Red	P6	794-35389	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	3	4	5	2	1	0	0	
Red	R5	794-62553	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	0	0	0	0	0	
Red	R6	794-62554	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	0	1	0	0	0	0	
Red	R7	794-35464	1993	A (Y 55; 06)	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	1	2	1	3	1	0	1	2	0
Red	S1	794-62557	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	2	0	0	0	0	0	0	

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																										
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																										
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																										
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																										
		LB = light blue	Y = yellow	D = bird with broken foot (year)																											
Color band		Metal band #	Year banded	Notes	Year resighted																										
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	
Red	S4	794-35311	1997	A (Y Y8; 06)	-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	y	y	1	4	1	3	0	0	0	0	0	
Red	S6	794-62562	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	4	2	2	0	1	0			
Red	S8	794-62561	1989	A (G 91; 06)	-	0	0	0	y	y	y	y	0	0	0	0	y	0	0	0	1	0	0	0	0	0	0	0	0		
Red	T1	794-35204	1993	A (G 94; 06)	-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	1	1	1	4	4	0	0	0	0		
Red	T2	794-62564	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	2	4	0	1	1	0		
Red	T5	794-62566	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	4	5	0	1	1	0		
Red	T7	794-62568	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	1	2	1	0	0		
Red	U3	794-62572	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	3	5	0	0	0	0		
Red	U8	794-62579	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	2	0	0	1	0		
Red	Y2	794-62580	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	4	5	3	1	0	0		
Red	Y3	794-62581	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	2	1	0		
Red	Y4	794-62582	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	1	2	3	0		
Red	Y5	794-62583	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	2	1	0	0		
Red	Y6	794-62585	1988	A (G 24; 00/ B 75; 06)	y	y	y	y	y	y	0	y	y	y	y	y	0	y	y	y	y	1	1	0	0	1	0	0	0	0	
Red	Y7	794-62584	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	1	0	
Yellow	11	794-35409	1993		-	-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	12	794-35410	1993		-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4	1	1	0	0	0	
Yellow	14	794-35416	1993		-	-	-	-	-	y	0	y	y	y	y	y	y	0	y	y	2	1	0	1	0	0	0	0	0	0	
Yellow	15	794-35417	1993		-	-	-	-	-	y	0	y	0	0	y	0	y	0	0	0	0	0	0	0	0	0	1	0	0	0	
Yellow	16	794-35418	1993		-	-	-	-	-	0	y	y	y	y	0	y	0	0	y	y	0	0	1	1	0	0	0	0	0	0	
Yellow	17	794-35419	1993		-	-	-	-	-	y	0	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	18	794-35420	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	y	3	0	0	0	0	0	0	0	0	0	0	
Yellow	19	794-35421	1993		-	-	-	-	-	y	y	y	y	0	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	20	794-35422	1993	B (97)	-	-	-	-	-	y	y	y	y	y	y	y	0	y	y	0	1	0	0	1	0	0	0	0	0	0	
Yellow	21	794-35423	1993		-	-	-	-	-	y	y	y	y	0	0	y	y	y	0	0	0	0	0	0	0	1	0	0	0	0	
Yellow	22	794-35424	1993		-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	23	794-35425	1993		-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	24	794-35426	1993		-	-	-	-	-	y	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	26	794-35427	1993		-	-	-	-	-	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	27	794-35429	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Yellow	29	794-35431	1993		-	-	-	-	-	y	0	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	30	794-35432	1993		-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	31	794-35433	1993		-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	32	794-35436	1993		-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	34	794-35437	1993		-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																							
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																							
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																							
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																							
		LB = light blue	Y = yellow	D = bird with broken foot (year)																								
Color band		Metal band #	Year banded	Notes	Year resighted																							
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
Yellow	35	794-35438	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0
Yellow	36	794-35439	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	37	794-35440	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	1	0	0	0	0	0
Yellow	40	794-35441	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	41	794-35442	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	43	794-35445	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	y	4	0	0	2	0	0	0	0	0	0
Yellow	44	794-35446	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	45	794-35447	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	1	1	2	2	0	0	0	0
Yellow	46	794-35448	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	47	794-35449	1993	C (98)	-	-	-	-	-	y	y	y	y	y	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Yellow	49	794-35451	1993		-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Yellow	50	794-35458	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	51	794-35460	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	52	794-35461	1993		-	-	-	-	-	y	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	53	794-35462	1993		-	-	-	-	-	y	y	0	y	y	y	0	y	y	y	y	3	2	0	2	3	1	0	0
Yellow	54	794-35463	1993		-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	56	794-35465	1993		-	-	-	-	-	y	y	y	y	0	y	y	0	0	0	0	3	1	0	0	0	0	0	0
Yellow	57	794-35466	1993		-	-	-	-	-	y	y	y	y	0	0	0	0	y	y	0	0	0	0	0	0	0	0	0
Yellow	58	794-35467	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	59	794-35468	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	62	794-35469	1993		-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	y	0	0	0	0	0	0	0	0
Yellow	63	794-35470	1993		-	-	-	-	-	y	0	0	0	0	0	0	0	y	0	0	0	0	0	0	2	2	1	0
Yellow	65	794-35471	1993		-	-	-	-	-	y	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	66	794-35472	1993		-	-	-	-	-	0	0	0	0	0	y	0	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	67	794-35473	1993		-	-	-	-	-	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	68	794-35474	1993		-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	69	794-35475	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	0	2	1	1	0	0	0	0	0
Yellow	71	794-35477	1993		-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	73	794-35478	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Yellow	74	794-35479	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	75	794-35480	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	76	794-35481	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	y	y	y	0	0	0	0	0	0	0	0
Yellow	77	794-35482	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	78	794-35483	1993		-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	79	794-35484	1993		-	-	-	-	-	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																							
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																							
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																							
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Color band		Metal band #	Year banded	Notes	Year resighted																							
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
Yellow	82	794-35485	1993		-	-	-	-	-	y	y	y	y	y	0	y	y	0	0	0	0	1	0	0	0	0	0	0
Yellow	83	794-35487	1993		-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	85	794-35489	1993		-	-	-	-	-	y	y	y	y	0	y	y	y	0	0	0	6	0	0	1	1	2	0	0
Yellow	86	794-35490	1993		-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	1	0	0	0	0	0	0
Yellow	87	794-35491	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	1	0	0	0
Yellow	88	794-35492	1993		-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	92	794-35494	1993		-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	93	794-35495	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	1	0	0	0	0	0	0	0
Yellow	94	794-35496	1993		-	-	-	-	-	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	95	794-35497	1993		-	-	-	-	-	y	y	y	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0
Yellow	96	794-35498	1993		-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	A1	794-35411	1993	A (Y 13; 94)	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	1	0	0	1	3	0	0	0
Yellow	A3	794-35101	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0
Yellow	A4	714-10019	1994		-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	A5	714-10020	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	7	3	0	4	4	4	0	0
Yellow	A6	714-10021	1994		-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	A7	714-10022	1994		-	-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	y	0	0	0	0	0	0	0
Yellow	A8	714-10023	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	A9	714-10024	1994		-	-	-	-	-	-	y	y	y	0	0	y	0	0	0	0	0	0	0	0	1	0	0	0
Yellow	C1	714-10025	1994		-	-	-	-	-	-	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	C2	714-10026	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	C3	714-10027	1994		-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C4	714-10028	1994		-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C5	714-10029	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C6	714-10031	1994		-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C7	714-10032	1994		-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C8	714-10033	1994		-	-	-	-	-	-	y	y	y	y	0	y	y	y	y	y	y	4	1	0	3	7	0	0
Yellow	C9	714-10034	1994		-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	D1	714-10035	1994		-	-	-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	D2	714-10036	1994		-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	D3	714-10037	1994		-	-	-	-	-	-	y	y	y	y	0	y	y	0	y	0	6	1	0	0	1	0	0	0
Yellow	D4	714-10040	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	D5	714-10041	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	5	0	2	1	0	0	0	0
Yellow	D6	714-10042	1994		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	D7	714-10044	1994	B (97)	-	-	-	-	-	-	y	0	y	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																								
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																								
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																								
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																								
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Yellow	D8	714-10045	1994		-	-	-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	1	0	0	0	0	
Yellow	D9	714-10047	1994		-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	E1	714-10048	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	y	y	y	5	0	3	1	0	0	0	0	
Yellow	E2	714-10049	1994		-	-	-	-	-	-	y	y	y	y	y	0	y	y	0	y	2	0	0	0	0	0	0	0	
Yellow	E3	714-10050	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	1	0	0	1	0	0	0	0	0	
Yellow	E4	714-10051	1994		-	-	-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	E5	714-10052	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	1	0	0	0	0	0	0	0	0	
Yellow	E6	714-10053	1994		-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	E7	714-10054	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	4	0	0	0	0	0	0	0	
Yellow	E8	714-10055	1994	C (98)	-	-	-	-	-	-	y	y	y	y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Yellow	E9	714-10056	1994		-	-	-	-	-	-	y	0	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	G2	714-10058	1994		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	G3	714-10059	1994		-	-	-	-	-	-	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	G4	714-10060	1994		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	y	y	0	1	0	1	0	0	0	
Yellow	G5	714-10061	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	
Yellow	G6	714-10063	1994		-	-	-	-	-	-	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	G7	714-10064	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	G8	714-10065	1994		-	-	-	-	-	-	y	y	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	
Yellow	G9	714-10066	1994		-	-	-	-	-	-	y	y	y	0	y	y	0	y	0	0	y	0	0	0	0	0	0	0	
Yellow	H1	714-10067	1994		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	H2	714-10068	1994		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	H3	714-10069	1994		-	-	-	-	-	-	0	0	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	H4	714-10070	1994	C (99)	-	-	-	-	-	-	y	y	y	y	y	x	x	x	x	x	x	x	x	x	x	x	x	x	
Yellow	H5	714-10071	1994		-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	H6	714-10072	1994	B (97)	-	-	-	-	-	-	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	H7	714-10073	1994	B (97)	-	-	-	-	-	-	y	0	0	y	0	0	0	0	0	0	y	0	0	0	0	0	0	0	
Yellow	H8	794-35213	1995		-	-	-	-	-	-	-	y	y	y	0	0	y	y	0	y	y	1	1	0	0	0	0	0	
Yellow	H9	794-35214	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	6	0	0	0	0	1	0	0	
Yellow	J1	794-35215	1995		-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	y	0	0	0	0	0	0	0	
Yellow	J2	794-35216	1995		-	-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	J3	794-35217	1995		-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	1	0	0	
Yellow	J5	794-35222	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	1	0	
Yellow	J6	794-35223	1995		-	-	-	-	-	-	-	y	y	y	y	0	y	0	y	0	0	0	0	0	0	0	0	0	
Yellow	J7	794-35430	1993	A (Y 28; 95)	-	-	-	-	-	-	0	y	y	y	0	y	y	0	y	0	1	1	0	2	0	0	0	1	
Yellow	J8	794-35224	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	y	1	0	1	4	4	2	3	2	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																								
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																								
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																								
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																								
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Yellow	J9	794-35225	1995		-	-	-	-	-	-	y	y	y	y	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0
Yellow	K1	794-35226	1995		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	5	0	0	0	0	0	0	0	0
Yellow	K2	794-35227	1995		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	2	0	0	0	0	0	0	0	0
Yellow	K3	794-35231	1995		-	-	-	-	-	-	y	y	y	y	0	y	y	y	y	y	6	1	0	2	2	1	0	0	0
Yellow	K4	794-35234	1995		-	-	-	-	-	-	y	y	y	y	0	y	y	y	y	0	1	1	0	0	0	0	0	0	
Yellow	K5	794-35235	1995		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	K6	794-35236	1995		-	-	-	-	-	-	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	K7	794-35237	1995		-	-	-	-	-	-	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	K8	794-35238	1995		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	0	1	0	0	0	0	0	0	
Yellow	K9	794-35239	1995		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	2	3	0	0	0	0	0	0	
Yellow	M1	794-35241	1995		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	4	0	1	0	0	0	0	0	
Yellow	M2	794-35242	1995		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	y	1	0	0	0	0	0	0	0	
Yellow	M3	794-35243	1995		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	M4	794-35246	1995		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
Yellow	M5	794-35247	1995		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	M7	794-35249	1995		-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	
Yellow	M8	794-62513	1996		-	-	-	-	-	-	y	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	
Yellow	M9	794-62521	1996		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	3	0	0	3	0	0	0	0	
Yellow	O2	794-35402	1993		-	-	-	-	0	0	0	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	O4	794-35403	1993		-	-	-	-	y	y	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	O6	794-35405	1993		-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	O7	794-35406	1993		-	-	-	-	y	0	0	0	0	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	
Yellow	O8	794-35407	1993		-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	O9	794-35408	1993	B (97, 98)	-	-	-	-	y	y	0	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	OO	794-35401	1993		-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	P1	584-00259	1990	A (G 51; 96)	-	-	0	0	y	y	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	P3	794-62524	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	3	0	0	0	1	1	0	0	0	
Yellow	P4	794-62525	1996		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	P5	584-00264	1990	A (G 93; 96)	-	-	y	y	0	y	y	y	y	y	y	0	0	0	0	2	0	0	0	0	0	0	0	0	
Yellow	P6	794-62529	1996		-	-	-	-	-	-	-	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	P7	794-62530	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	7	0	3	5	0	0	5	1	0	
Yellow	P8	794-62533	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	2	3	0	2	1	4	1	2	0	
Yellow	P9	794-62535	1996		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	3	1	0	4	1	0	0	1	0	
Yellow	R1	584-00245	1989	A (G 70; 98)	-	0	y	y	y	y	0	y	y	y	y	y	y	y	y	3	2	0	2	1	0	0	0	0	
Yellow	R2	794-35338	1998	C (99)	-	-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																									
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																									
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																									
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																									
		LB = light blue	Y = yellow	D = bird with broken foot (year)																										
Color band		Metal band #	Year banded	Notes	Year resighted																									
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Yellow	R3	794-35337	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	
Yellow	R4	794-35339	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	R5	794-35341	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	
Yellow	R6	794-35340	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	1	0	0	0	0	1	0	0	0	
Yellow	R9	794-35345	1998		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	S1	794-35346	1998		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	S2	794-35348	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	2	0	0	0	1	0	0	1	0	0	
Yellow	S4	794-35349	1998		-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	S6	794-35353	1998		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	3	0	0	1	0	0	0	0	0	
Yellow	S7	794-35354	1998		-	-	-	-	-	-	-	-	-	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	S8	794-35355	1998		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	S9	794-35356	1998		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T2	794-35335	1998		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T3	794-35333	1997		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T4	794-35332	1997		-	-	-	-	-	-	-	-	-	y	y	0	0	y	0	y	y	2	2	0	0	0	0	0	0	
Yellow	T5	794-35331	1997		-	-	-	-	-	-	-	-	-	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T6	794-35330	1997		-	-	-	-	-	-	-	-	-	y	y	0	y	y	y	y	0	1	0	0	1	3	0	0	0	
Yellow	T7	794-35329	1997		-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T8	794-35328	1997		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	T9	794-35327	1997		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	U1	794-35326	1997		-	-	-	-	-	-	-	-	-	0	y	y	y	y	0	0	y	0	1	0	1	5	0	0	0	
Yellow	U3	794-35325	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	5	2	0	4	2	0	1	0	
Yellow	U4	794-35324	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	0	0	1	0	1	0	0	0	0	
Yellow	U5	794-35323	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	0	1	0	
Yellow	U6	794-35322	1997		-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	U8	794-35321	1997		-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	
Yellow	U9	794-35320	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	3	0	0	0	0	0	0	
Yellow	Y1	794-35319	1997		-	-	-	-	-	-	-	-	-	0	y	y	y	y	y	y	y	1	1	0	0	0	0	0	0	
Yellow	Y2	794-35318	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	1	0	
Yellow	Y3	794-35317	1997		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Yellow	Y4	794-35315	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	1	0	0	0	0	0	
Yellow	Y5	794-35314	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	1	0	
Yellow	Y7	794-35312	1997		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-	DB/W	584-00283	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
BK	BK/DB	794-35218	1995	A (Y J4; 09)	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	3	2	0	1	3	1	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos	Notes	Resight history																												
	BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																												
	DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																												
	DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																												
	LB = light blue	Y = yellow	D = bird with broken foot (year)																													
Color or R leg	Color band Band # or L leg	Metal band #	Year banded	Notes	Year resighted																											
					89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14		
BK	BK/DG	1704-01423	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0				
BK	BK/LB	1704-01334	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0				
BK	BK/R	1704-01437	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0				
BK	BK/Y	794-62626	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0	0	0	0				
BK	DB/BK	584-00289	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0				
BK	DB/DG	1704-01394	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0				
BK	DB/LB	1704-01405	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0				
BK	DB/Y	794-86899	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	2	2	0				
BK	DG/DB	794-35431	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0				
BK	DG/LB	1704-01335	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0			
BK	DG/W	1704-01352	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0			
BK	LB/BK	794-35368	1998	A (B 23; 11)	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	5	1	0	2	1	1	1	2	0			
BK	O/BK	794-62644	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	5	2	2	0			
BK	O/DG	1704-01446	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			
BK	O/LB	1704-01454	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0			
BK	O/O	794-62648	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	10	1	2	0	0		
BK	O/W	794-62605	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	1	0	1	0	0		
BK	O/Y	794-62646	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	7	2	2	0	0		
BK	R/DB	1704-01485	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0		
BK	R/DG	1704-01495	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0		
BK	W/BK	794-62592	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	3	1	0	2	0	0		
BK	W/W	794-62601	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	0	0	0		
BK	Y/BK	794-70195	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	1	0	0		
BK	Y/O	794-62638	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	2	0	0	0		
BK	Y/Y	794-62635	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	0	0	0	0		
DB	BK/BK	794-35013	1991	A (G A4; 91)	-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	1	2	0	0	0		
DB	BK/DG	1704-01356	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	
DB	BK/LB	1704-01430	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	
DB	BK/O	714-10083	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	1	0	0	
DB	BK/Y	794-86877	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	0	
DB	DB/DB	714-10092	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0	0	
DB	DB/DG	1704-01404	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0
DB	DB/LB	1704-01397	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0
DB	DB/Y	714-10060	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	0	0	0	0	
DB	DG/BK	1704-01411	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Color band		Metal band #	Year banded	Notes	Year resighted																							
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12
DB	O/DG	1704-01447	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	O/LB	1704-01455	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	O/R	1704-01466	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	O/W	714-10088	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	1	0
DB	R/DG	1704-01496	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	W/DB	1704-01324	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	2	0
DB	W/O	794-86849	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	0	0	0
DB	Y/BK	714-10085	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	0	0
DB	Y/O	714-10087	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	1	0
DB	Y/W	714-10084	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0
DB	Y/Y	714-10086	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	2	0
DB/Y	Y	794-86851	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3	2	0
DG	BK/DB	1704-01370	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
DG	BK/LB	1704-01378	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
DG	BK/O	1704-01380	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	BK/R	1704-01382	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	BK/W	1704-01386	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	BK/Y	1704-01387	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DB/BK	1704-01389	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DB/DB	1704-01392	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	DB/DG	1704-01407	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	DB/LB	1704-01408	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
DG	DB/W	1704-01420	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DG	DB/Y	794-35499	1993	A (Y 97; 12)	-	-	-	-	y	y	y	y	y	y	y	y	y	y	0	1	1	2	1	0	0	1	0	0
DG	DG/BK	1704-01421	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DG	O/DG	1704-01448	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DG	O/LB	1704-01456	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DG	O/O	1704-01462	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DG	O/Y	1704-01492	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DG	R/BK	1704-01479	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
LB	BK/BK	1704-01396	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
LB	BK/DB	1704-01406	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0
LB	BK/DG	1704-01413	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
LB	BK/LB	1704-01414	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0
LB	BK/O	1704-01340	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																								
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																								
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																								
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																								
		LB = light blue	Y = yellow	D = bird with broken foot (year)																									
Color band		Metal band #	Year banded	Notes	Year resighted																								
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
LB	BK/R	1704-01438	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	BK/W	1704-01444	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	BK/Y	1704-01409	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	
LB	DB/DB	1704-01332	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	
LB	DB/O	1704-01412	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	
LB	DB/Y	1704-01400	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	
LB	DG/W	1704-01418	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	
LB	LB/DB	1704-01422	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	
LB	O/DG	1704-01449	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	O/LB	1704-01457	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	O/R	1704-01467	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	O/W	1704-01474	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
LB	R/BK	1704-01480	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	BK/DB	794-35070	1992	A (G K1; 09)	-	-	-	-	y	y	y	y	y	y	y	y	y	0	y	2	1	0	1	2	2	0	0	0	
O	BK/DG	1704-01426	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	BK/LB	1704-01431	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	BK/O	794-62613	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	1	0	
O	DB/DB	584-00281	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5	0	2	0	
O	DG/O	1704-01417	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	
O	O/DB	584-00299	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	2	4	2	0	
O	O/LB	1704-01458	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	O/R	1704-01469	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	R/BK	1704-01481	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	R/DB	1704-01488	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
O	W/BK	794-62589	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7	6	7	1	2	0
O	W/DB	794-35476	1993	A (Y 70; 09)	-	-	-	-	y	y	0	y	y	0	0	y	0	0	0	0	0	1	0	1	0	1	0	1	0
O	W/Y	714-10095	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	0	2	3	0
O	Y/BK	794-62633	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6	5	1	3	0
O	Y/DB	794-35404	1993	A (Y 05; 09)	-	-	-	-	y	y	y	y	y	y	0	y	y	y	0	y	0	2	1	2	3	4	4	1	0
O	Y/W	794-62630	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5	0	0	1	0
O	Y/Y	794-62636	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	0	0
R	BK/BK	1704-01424	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
R	BK/DB	1704-01425	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
R	BK/DG	1704-01427	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
R	BK/LB	1704-01432	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																										
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																										
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																										
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																										
		LB = light blue	Y = yellow	D = bird with broken foot (year)																											
Color band		Metal band #	Year banded	Notes	Year resighted																										
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	
R	BK/O	1704-01435	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	BK/W	1704-01443	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	BK/Y	1704-01445	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/DG	1704-01451	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/LB	1704-01459	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/O	1704-01464	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/R	1704-01470	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/W	1704-01475	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	O/Y	1704-01494	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	R/BK	1704-01482	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	R/DB	1704-01489	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
R	R/W	1704-01476	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
W	BK/BK	794-35046	1991	A (G G4; 08)	-	-	-	0	0	y	y	y	y	y	y	0	y	0	y	0	0	0	3	1	2	1	1	0	0	0	
W	BK/DB	584-00291	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	0	0	0	
W	BK/LB	1704-01433	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
W	BK/O	794-62611	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	5	2	4	0	0
W	BK/R	1704-01440	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
W	BK/W	714-10094	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	8	3	1	3	0
W	BK/Y	794-62610	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	7	12	2	1	0	0
W	DB/O	794-35395	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	4	1	0	0
W	DB/W	584-00282	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	2	0	0
W	DB/Y	794-35241	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	0	1	0	0
W	O/DG	1704-01452	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
W	O/LB	1704-01460	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
W	O/O	794-62647	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
W	O/R	1704-01471	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
W	O/W	794-62640	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	1	1	0
W	O/Y	794-62645	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3	2	1	0
W	R/BK	1704-01483	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
W	W/BK	794-62586	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	1	4	2	0	0
W	W/DB	584-00286	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0	0	0
W	W/W	794-62593	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	7	3	4	1	0
W	W/Y	714-10096	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	5	0	0
W	Y/DB	794-35011	1991	A (G A1; 09)	-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	y	2	0	1	1	3	0	1	0	0	0	
W	Y/O	794-62637	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	3	0	3	0	

Table 77 (continued). Resight history of adult red-legged kittiwakes banded on survival plots at Buldir Island, Alaska. Values represent number of times birds were resighted each year, except when actual numbers of resights are unknown (1989-2005). No resighting was conducted after 2014.

Codes:		Colors for three-band combos		Notes	Resight history																									
		BK = black	O = orange	A = rebanded from original color band(s) (original band; year rebanded)	y = resighted at least once (# times unknown)																									
		DB = dark blue	R = red	B = bird missing color band (year)	0 = not resighted																									
		DG = dark green	W = white	C = bird died (year)	x = band no longer resightable (dead, removed)																									
		LB = light blue	Y = yellow	D = bird with broken foot (year)																										
Color band		Metal band #	Year banded	Notes	Year resighted																									
Color or R leg	Band # or L leg				89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
W	Y/W	794-86859	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	3	1	2	0	0		
Y	BK/DG	1704-01429	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	BK/LB	1704-01434	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	BK/R	1704-01442	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	BK/Y	794-62609	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	1	0	0	0		
Y	DB/BK	584-00290	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	1	0		
Y	DB/DG	1704-01350	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0		
Y	DB/W	584-00284	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	2	1	0		
Y	O/BK	794-62606	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	0	1	0	0	0		
Y	O/DG	1704-01453	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	O/LB	1704-01461	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	O/R	1704-01472	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	O/W	794-62641	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	0	0		
Y	O/Y	584-01623	1988	A (G 34; 08)	y	y	y	y	0	y	y	y	y	y	y	y	y	y	y	0	0	1	0	2	1	1	2	0		
Y	R/BK	1704-01484	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		
Y	W/BK	794-62587	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	9	4	0	0	0		
Y	W/DB	714-10029	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	0	0	0		
Y	W/W	794-62597	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	2	7	5	3	0		
Y	Y/O	794-62560	2006	A (R S5; 08)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	2	2	1	2	0		
Y	Y/Y	714-10057	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	0	1	0	4	5	0	0	0	0		
Total resighted:					15	24	37	71	110	192	212	224	243	218	221	179	190	158	113	96	91	108	82	55	121	109	91	76	77	44

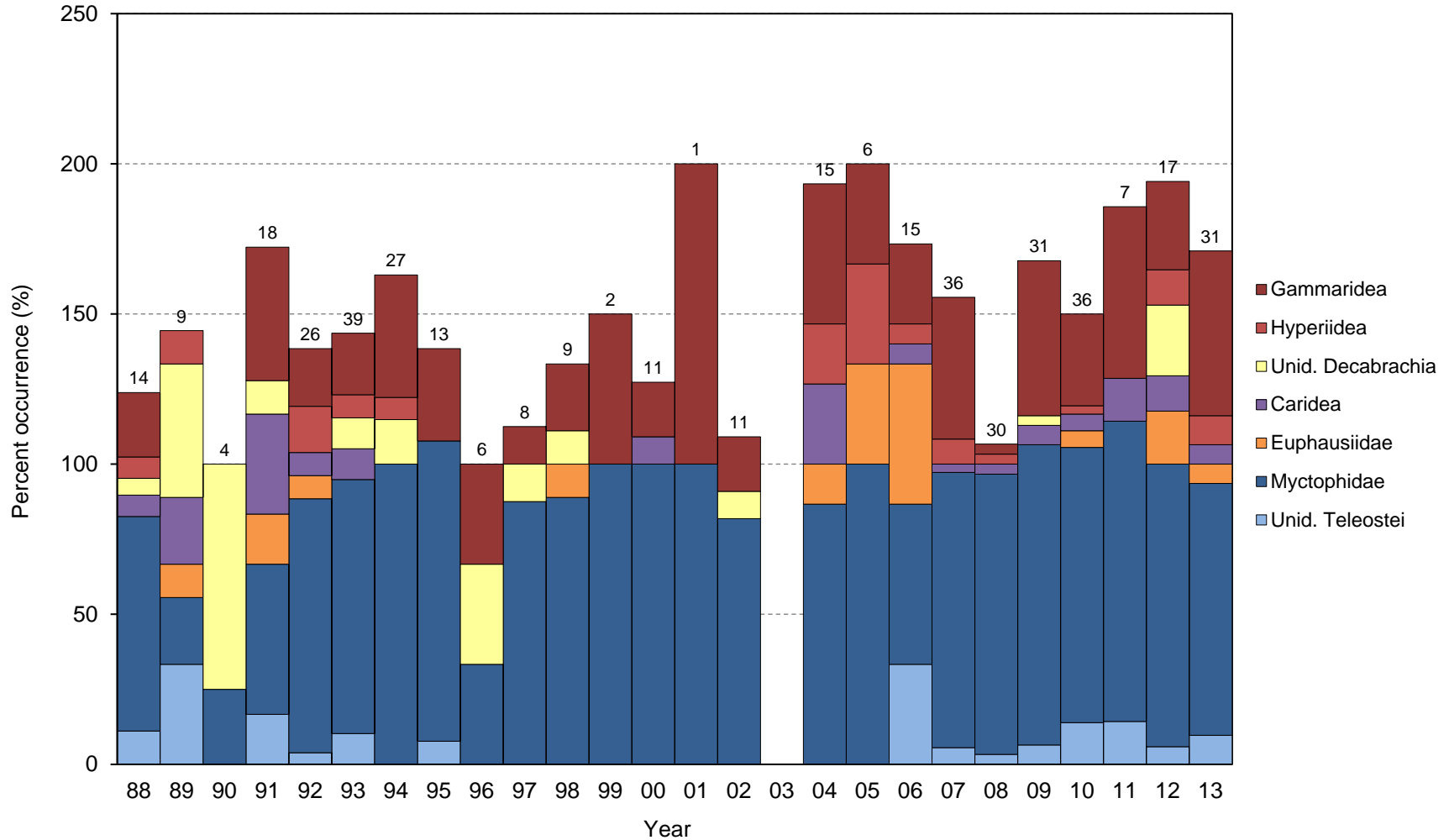


Figure 54. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 2003 or after 2013.

Table 78. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. samples	14	9	4	18	26	39	27	13	6	8	9	2	11
Invertebrates	42.9	55.6	75.0	88.9	42.3	41.0	55.6	30.8	50.0	25.0	33.3	50.0	27.3
Amphipoda	28.6	22.2	-	61.1	30.8	23.1	48.1	30.8	33.3	12.5	22.2	50.0	18.2
Gammaridea	21.4	-	-	44.4	19.2	20.5	40.7	30.8	33.3	12.5	22.2	50.0	18.2
Lysianassidae	16.7	-	-	44.4	19.2	20.5	40.7	30.8	33.3	12.5	22.2	50.0	18.2
<i>Orchomene</i> spp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyperidea	7.1	11.1	-	-	15.4	7.7	7.4	-	-	-	-	-	-
Other Amphipoda	-	11.1	-	16.7	3.8	-	-	-	-	-	-	-	-
Cephalopoda	5.6	44.4	75.0	11.1	-	10.3	14.8	-	33.3	12.5	11.1	-	-
Unid. Decabrachia	5.6	44.4	75.0	11.1	-	10.3	14.8	-	33.3	12.5	11.1	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	7.1	22.2	-	33.3	7.7	10.3	-	-	-	-	-	-	9.1
Caridea	7.1	22.2	-	33.3	7.7	10.3	-	-	-	-	-	-	9.1
Unid. Caridea	7.1	22.2	-	33.3	7.7	10.3	-	-	-	-	-	-	9.1
Other Caridea	-	-	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	-	11.1	-	16.7	7.7	-	-	-	-	-	11.1	-	-
Euphausiidae	-	11.1	-	16.7	7.7	-	-	-	-	-	11.1	-	-
Unid. Euphausiidae	-	11.1	-	-	-	-	-	-	-	-	11.1	-	-
Other Euphausiidae	-	-	-	16.7	7.7	-	-	-	-	-	-	-	-
Other Invertebrates	7.1	-	50.0	-	-	-	-	-	-	-	-	-	-
Fish	85.7	55.6	25.0	72.2	88.5	97.4	100.0	100.0	33.3	87.5	100.0	100.0	100.0
Teleostei	85.7	55.6	25.0	72.2	88.5	97.4	100.0	100.0	33.3	87.5	100.0	100.0	100.0
Myctophidae	71.4	22.2	25.0	50.0	84.6	84.6	100.0	100.0	33.3	87.5	88.9	100.0	100.0
<i>Stenobrachius leucopsarus</i>	-	-	-	-	-	82.1	-	-	-	87.5	88.9	-	-
Unid. Myctophidae	55.6	22.2	25.0	50.0	84.6	2.6	100.0	100.0	33.3	-	22.2	100.0	100.0
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	11.1	33.3	-	16.7	3.8	10.3	-	7.7	-	-	-	-	-
Other Teleostei	-	-	-	5.6	-	5.1	-	-	-	-	44.4	-	-
Other	-	11.1	-	-	-	-	-	-	33.3	-	-	-	-

Table 78 (continued). Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2001	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. samples	1	11	15	6	15	36	30	31	36	7	17	31
Invertebrates	100.0	27.3	86.7	50.0	66.7	50.0	13.3	54.8	41.7	57.1	64.7	61.3
Amphipoda	100.0	18.2	66.7	50.0	40.0	50.0	6.7	51.6	33.3	57.1	35.3	58.1
Gammaridea	100.0	18.2	46.7	33.3	26.7	47.2	3.3	51.6	30.6	57.1	29.4	54.8
Lysianassidae	100.0	18.2	46.7	33.3	6.7	19.4	-	-	-	-	-	6.5
<i>Orchomene</i> spp.	-	-	-	-	-	13.9	-	51.6	30.6	57.1	29.4	-
Other Gammaridea	-	-	-	-	20.0	13.9	3.3	-	-	-	-	48.4
Hyperiidea	-	-	20.0	33.3	6.7	8.3	3.3	-	2.8	-	11.8	9.7
Other Amphipoda	-	-	6.7	-	13.3	-	-	-	-	-	-	-
Cephalopoda	-	9.1	13.3	16.7	6.7	-	3.3	3.2	-	-	23.5	-
Unid. Decabrachia	-	9.1	-	-	-	-	-	3.2	-	-	23.5	-
Other Cephalopoda	-	-	13.3	16.7	6.7	-	3.3	-	-	-	-	-
Decapoda	-	-	26.7	-	6.7	2.8	3.3	6.5	5.6	14.3	11.8	6.5
Caridea	-	-	26.7	-	6.7	2.8	3.3	6.5	5.6	14.3	11.8	6.5
Unid. Caridea	-	-	-	-	6.7	2.8	3.3	3.2	5.6	-	5.9	-
Other Caridea	-	-	26.7	-	-	-	-	3.2	-	14.3	5.9	6.5
Euphausiacea	-	-	13.3	33.3	46.7	-	-	-	5.6	-	17.6	6.5
Euphausiidae	-	-	13.3	33.3	46.7	-	-	-	5.6	-	17.6	6.5
Unid. Euphausiidae	-	-	6.7	33.3	40.0	-	-	-	5.6	-	17.6	-
Other Euphausiidae	-	-	6.7	16.7	6.7	-	-	-	-	-	-	6.5
Other Invertebrates	-	-	6.7	-	-	-	-	-	5.6	-	5.9	6.5
Fish	100.0	90.9	86.7	100.0	80.0	100.0	100.0	100.0	94.4	100.0	100.0	90.3
Teleostei	100.0	90.9	86.7	100.0	80.0	100.0	100.0	100.0	94.4	100.0	100.0	90.3
Myctophidae	100.0	81.8	86.7	100.0	53.3	91.7	93.3	100.0	91.7	100.0	94.1	83.9
<i>Stenobrachius leucopsarus</i>	-	-	60.0	-	-	11.1	-	61.3	88.9	100.0	82.4	-
Unid. Myctophidae	100.0	81.8	46.7	100.0	53.3	80.6	93.3	38.7	2.8	14.3	11.8	83.9
Other Myctophidae	-	-	-	-	-	2.8	-	-	2.8	28.6	17.6	-
Unid. Teleostei	-	-	-	-	33.3	11.1	3.3	6.5	13.9	14.3	5.9	9.7
Other Teleostei	-	18.2	-	-	-	2.8	10.0	-	2.8	-	-	-
Other	-	-	-	-	-	8.3	-	-	-	-	-	3.2

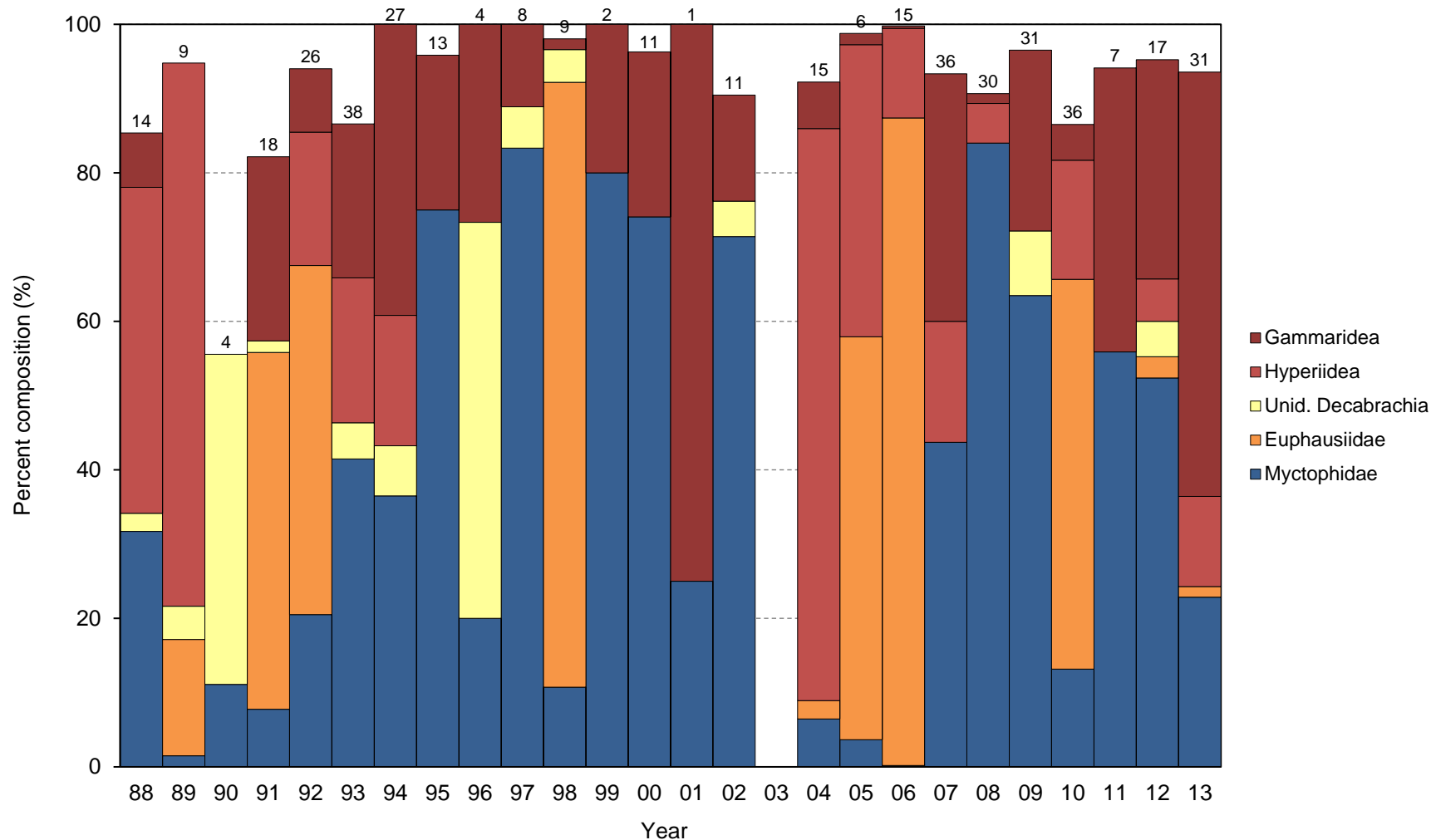


Figure 55. Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. Numbers above columns indicate sample sizes. No diet samples were collected in 2003 or after 2013.

Table 79. Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at Buldir 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 and regurgitations from chicks themselves. No diet samples were collected in 2003 or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. samples	14	9	4	18	26	38	27	13	4	8	9	2	11
No. individuals	41	134	9	129	117	82	74	24	15	18	205	5	27
Invertebrates	58.5	96.3	88.9	89.1	78.6	50.0	63.5	20.8	80.0	16.7	87.3	20.0	25.9
Amphipoda	51.2	74.6	-	31.8	29.9	40.2	56.8	20.8	26.7	11.1	1.5	20.0	22.2
Gammaridea	7.3	-	-	24.8	8.5	20.7	39.2	20.8	26.7	11.1	1.5	20.0	22.2
Lysianassidae	7.3	-	-	24.8	8.5	20.7	39.2	20.8	26.7	11.1	1.5	20.0	22.2
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyperiidea	43.9	73.1	-	-	17.9	19.5	17.6	-	-	-	-	-	-
<i>Themisto pacifica</i>	43.9	-	-	-	-	-	17.6	-	-	-	-	-	-
<i>Themisto</i> spp.	-	73.1	-	-	17.9	19.5	-	-	-	-	-	-	-
Other Hyperiidea	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Amphipoda	-	1.5	-	7.0	3.4	-	-	-	-	-	-	-	-
Cephalopoda	2.4	4.5	44.4	1.6	-	4.9	6.8	-	53.3	5.6	4.4	-	-
Unid. Decabrachia	2.4	4.5	44.4	1.6	-	4.9	6.8	-	53.3	5.6	4.4	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Euphausiacea	-	15.7	-	48.1	47.0	-	-	-	-	-	81.5	-	-
Euphausiidae	-	15.7	-	48.1	47.0	-	-	-	-	-	81.5	-	-
Unid. Euphausiidae	-	15.7	-	-	-	-	-	-	-	-	81.5	-	-
Other Euphausiidae	-	-	-	48.1	47.0	-	-	-	-	-	-	-	-
Other Invertebrates	4.9	1.5	44.4	7.8	1.7	4.9	-	-	-	-	-	-	3.7
Fish	41.5	3.7	11.1	10.9	21.4	50.0	36.5	79.2	20.0	83.3	12.7	80.0	74.1
Teleostei	41.5	3.7	11.1	10.9	21.4	50.0	36.5	79.2	20.0	83.3	12.7	80.0	74.1
Myctophidae	31.7	1.5	11.1	7.8	20.5	41.5	36.5	75.0	20.0	83.3	10.7	80.0	74.1
<i>Stenobrachius leucopsarus</i>	-	-	-	-	-	40.2	-	-	-	83.3	9.8	-	-
Unid. Myctophidae	31.7	1.5	11.1	7.8	20.5	1.2	36.5	75.0	20.0	-	1.0	80.0	74.1
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Teleostei	9.8	2.2	-	3.1	0.9	8.5	-	4.2	-	-	2.0	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 79 (continued). Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at Buldir 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 and regurgitations from chicks themselves. No diet samples were collected in 2003 and or after 2013. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2001	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. samples	1	11	15	6	15	36	30	31	36	7	17	31
No. individuals	4	21	527	328	5972	135	75	115	623	34	105	140
Invertebrates	75.0	19.0	93.5	96.3	99.7	50.4	9.3	34.8	74.0	41.2	46.7	73.6
Amphipoda	75.0	14.3	83.5	40.9	12.4	49.6	6.7	24.3	20.9	38.2	35.2	69.3
Gammaridea	75.0	14.3	6.3	1.5	0.3	33.3	1.3	24.3	4.8	38.2	29.5	57.1
Lysianassidae	75.0	14.3	6.3	1.5	0.3	17.8	-	-	-	-	-	5.7
Other Gammaridea	-	-	-	-	0.1	15.6	1.3	24.3	4.8	38.2	29.5	51.4
Hyperiidea	-	-	77.0	39.3	12.1	16.3	5.3	0.0	16.1	-	5.7	12.1
<i>Themisto pacifica</i>	-	-	38.3	39.3	12.1	16.3	5.3	0.0	16.1	-	4.8	11.4
<i>Themisto</i> spp.	-	-	38.7	-	-	-	-	-	-	-	-	-
Other Hyperiidea	-	-	-	-	-	-	-	-	-	-	1.0	0.7
Other Amphipoda	-	-	0.2	-	<0.1	-	-	-	-	-	-	-
Cephalopoda	-	4.8	0.4	1.2	0.1	-	1.3	8.7	-	-	4.8	-
Unid. Decabrachia	-	4.8	-	-	-	-	-	8.7	-	-	4.8	-
Other Cephalopoda	-	-	0.4	1.2	0.1	-	1.3	-	-	-	-	-
Euphausiacea	-	-	2.5	54.3	87.2	-	-	-	52.5	-	2.9	1.4
Euphausiidae	-	-	2.5	54.3	87.2	-	-	-	52.5	-	2.9	1.4
Unid. Euphausiidae	-	-	1.1	52.4	87.1	-	-	-	52.5	-	2.9	-
Other Euphausiidae	-	-	1.3	1.8	0.1	-	-	-	-	-	-	1.4
Other Invertebrates	-	-	7.2	-	-	0.7	1.3	1.7	0.6	2.9	3.8	2.9
Fish	25.0	81.0	6.5	3.7	0.3	49.6	90.7	65.2	26.0	58.8	53.3	25.7
Teleostei	25.0	81.0	6.5	3.7	0.3	49.6	90.7	65.2	26.0	58.8	53.3	25.7
Myctophidae	25.0	71.4	6.5	3.7	0.2	43.7	84.0	63.5	13.2	55.9	52.4	22.9
<i>Stenobranchius leucopsarus</i>	-	-	3.0	-	-	10.4	-	45.2	12.8	44.1	47.6	-
Unid. Myctophidae	25.0	71.4	3.4	3.7	0.2	32.6	84.0	18.3	0.2	2.9	1.9	22.9
Other Myctophidae	-	-	-	-	-	0.7	-	-	0.2	8.8	2.9	-
Other Teleostei	-	9.5	-	-	0.1	5.9	6.7	1.7	12.8	2.9	1.0	2.9
Other	-	-	-	-	-	-	-	-	-	-	-	0.7

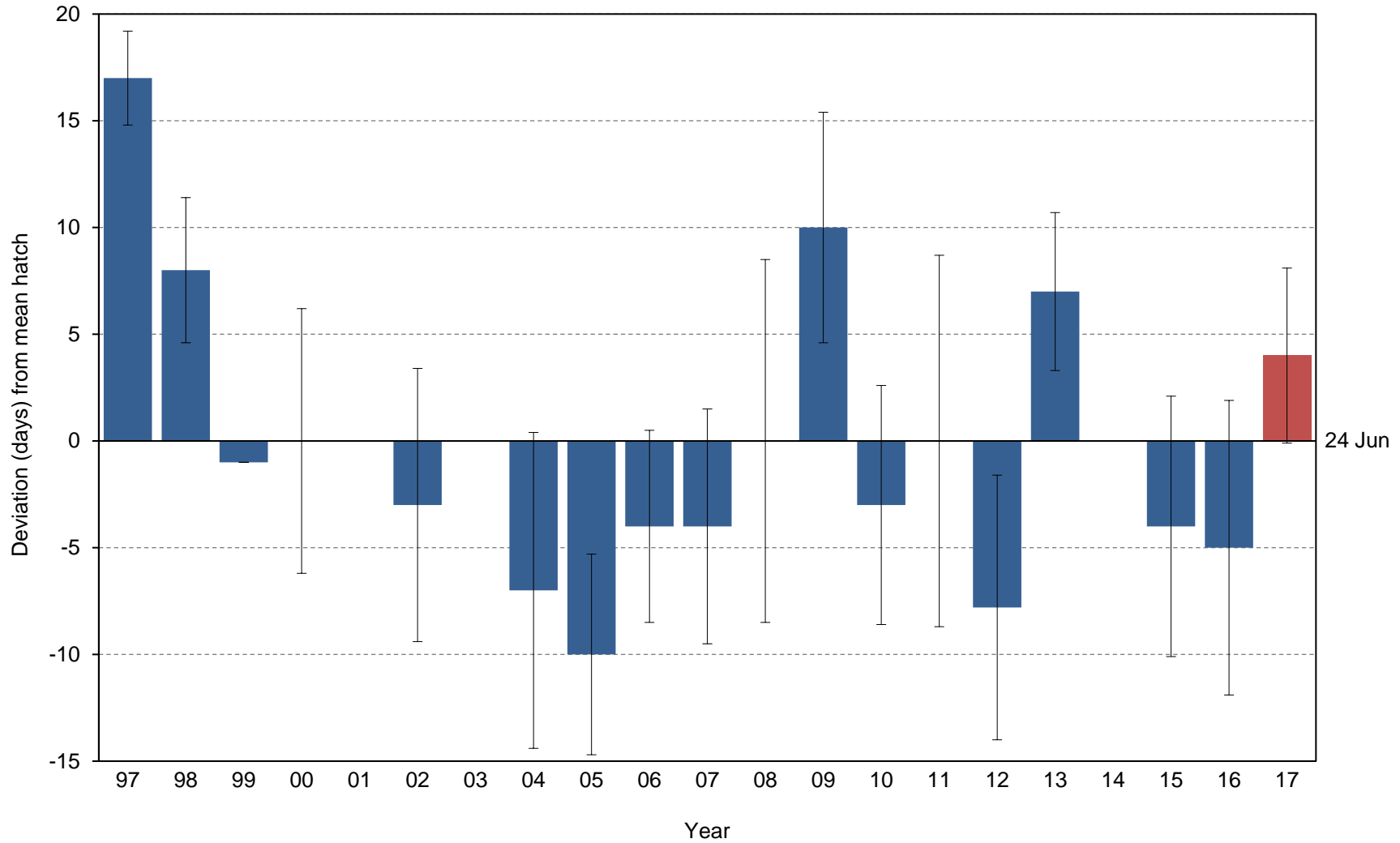


Figure 56. Yearly hatch date deviation (from the 1997-2016 average of 24 June) for glaucous-winged gulls at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. Mean hatch dates could not be calculated in 2001, 2003, or 2014 because some nests contained a chick at the first visit in those years.

Table 80. Breeding chronology of glaucous-winged gulls at Buldir Island, Alaska. Data represent the date of the first chick hatched in each nest.

Year	Mean lay ^a	SD	n ^b	Mean hatch	SD	n ^c	First lay ^a	First hatch	Last hatch
1997	xx ^d	xx	xx	11 Jul	2.2	5	xx	27 May ^e	9 Jul
1998	xx	xx	xx	2 Jul	3.4	13	xx	25 Jun	5 Jul
1999	xx	xx	xx	23 Jun	-	1	xx	23 Jun	23 Jun
2000	xx	xx	xx	23 Jun	6.2	7	xx	16 Jun	10 Jul
2001	xx	xx	xx	_ ^f	-	-	-	<26 Jun	-
2002	xx	xx	xx	21 Jun	6.4	14	xx	13 Jun	15 Jul
2003	xx	xx	xx	_ ^f	-	-	-	<13 Jun	23 Jun
2004	xx	xx	xx	16 Jun	7.4	18	xx	8 Jun	30 Jun
2005	xx	xx	xx	14 Jun	4.5	12	xx	6 Jun	20 Jun
2006	xx	xx	xx	20 Jun	4.6	14	xx	14 Jun	30 Jun
2007	xx	xx	xx	20 Jun	5.5	22	xx	13 Jun	29 Jun
2008	xx	xx	xx	23 Jun	8.5	22	xx	8 Jun	9 Jul
2009	xx	xx	xx	4 Jul	5.4	10	xx	25 Jun	15 Jul
2010	xx	xx	xx	21 Jun	5.6	29	xx	9 Jun	3 Jul
2011	xx	xx	xx	24 Jun	8.7	3	-	18 Jun	4 Jul
2012	-	-	-	15 Jun	6.2	27	<29 May	6 Jun	25 Jun
2013	-	-	-	1 Jul	3.2	5	<3 Jun	27 Jun	5 Jul
2014	-	-	-	_ ^f	-	-	<3 Jun	<4 Jun	5 Jul
2015	-	-	-	20 Jun	6.1	25	<6 Jun	6 Jun	30 Jun
2016	-	-	-	18 Jun	6.9	25	<30 May	7 Jun	8 Jul
2017	-	-	-	28 Jun	4.1	6	<28 May	21 Jun	1 Jul

^aIn years when birds are already on eggs at the first visit, mean lay date is not calculated and date of first lay is listed as < the date of first nest check.

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

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

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

^eOutlier not included in mean hatch calculation.

^fChicks present at first check in 2001, 2003, and 2014 so mean and distribution of hatch dates could not be determined.

Table 81. Frequency distribution of hatch dates for glaucous-winged gulls at Buldir 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.

Julian date ^a	No. nests hatching on Julian date																				
	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Before 1 st visit	-	-	-	-	xx ^b	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
156	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
157	-	-	-	-	xx	-	xx	-	1	-	-	-	-	-	-	-	-	xx	1	-	-
158	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	4	-	xx	-	-	-
159	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	2	-
160	-	-	-	-	xx	-	xx	6	1	-	-	2	-	2	-	-	-	xx	-	-	-
161	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	1	-	xx	-	-	-
162	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	1	2	-
163	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	4	-	xx	-	1	-
164	-	-	-	-	xx	4	xx	-	-	-	6	-	-	-	-	-	-	xx	2	-	-
165	-	-	-	-	xx	-	xx	1	3	3	-	-	-	1	-	5	-	xx	3	2	-
166	-	-	-	-	xx	-	xx	-	-	-	-	5	-	2	-	-	-	xx	-	-	-
167	-	-	-	-	xx	-	xx	3	-	-	-	-	-	-	-	-	-	xx	-	-	-
168	-	-	-	2	xx	1	xx	-	-	1	-	-	-	3	-	3	-	xx	1	2	-
169	-	-	-	-	xx	-	xx	-	-	5	-	-	-	1	1	-	-	xx	3	1	-
170	-	-	-	-	xx	-	xx	2	3	-	4	-	-	4	-	1	-	xx	4	4	-
171	-	-	-	-	xx	-	xx	2	1	-	-	-	-	-	1	-	-	xx	-	-	-
172	-	-	-	-	xx	-	xx	-	-	1	2	3	-	1	-	3	-	xx	-	1	1
173	-	-	-	-	xx	-	xx	-	-	-	-	-	-	2	-	-	-	xx	1	1	-
174	-	-	1	2	xx	-	xx	-	-	-	4	-	-	3	-	1	-	xx	3	2	-
175	-	-	-	-	xx	2	xx	-	-	2	-	-	-	1	-	-	-	xx	-	-	-
176	-	1	-	-	xx	-	xx	2	-	1	-	-	1	5	-	4	-	xx	2	6	1
177	-	-	-	-	xx	-	xx	-	-	-	4	-	-	1	-	1	-	xx	-	-	-
178	-	1	-	-	xx	7	xx	-	-	-	-	7	-	-	-	-	1	xx	-	-	-
179	-	-	-	2	xx	-	xx	-	-	-	-	-	-	1	-	-	-	xx	2	-	-
180	-	-	-	-	xx	-	xx	-	-	-	2	-	-	1	-	-	1	xx	1	-	1
181	-	3	-	-	xx	-	xx	-	-	1	-	-	2	-	-	-	-	xx	1	-	-
182	-	-	-	-	xx	-	xx	2	-	-	-	-	1	-	-	-	1	xx	-	-	3
183	-	1	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
184	-	1	-	-	xx	-	xx	-	-	-	-	4	-	1	-	-	1	xx	-	-	-
185	-	-	-	1	xx	-	xx	-	-	-	-	-	-	1	-	1	-	xx	-	-	-
186	-	6	-	-	xx	-	xx	-	-	-	-	-	-	2	-	-	-	1	xx	-	-
187	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
188	-	-	-	-	xx	-	xx	-	-	-	-	-	-	2	-	-	-	xx	-	-	-
189	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
190	3	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	1	-
191	-	-	-	-	xx	-	xx	-	-	-	-	1	-	-	-	-	-	xx	-	-	-
192	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
193	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
194	2	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
195	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-
196	-	-	-	-	xx	-	xx	-	-	-	-	-	1	-	-	-	-	xx	-	-	-
<i>n</i>	5	13	1	7	xx	14	xx	18	12	14	22	22	10	29	3	27	5	xx	25	25	6

^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.

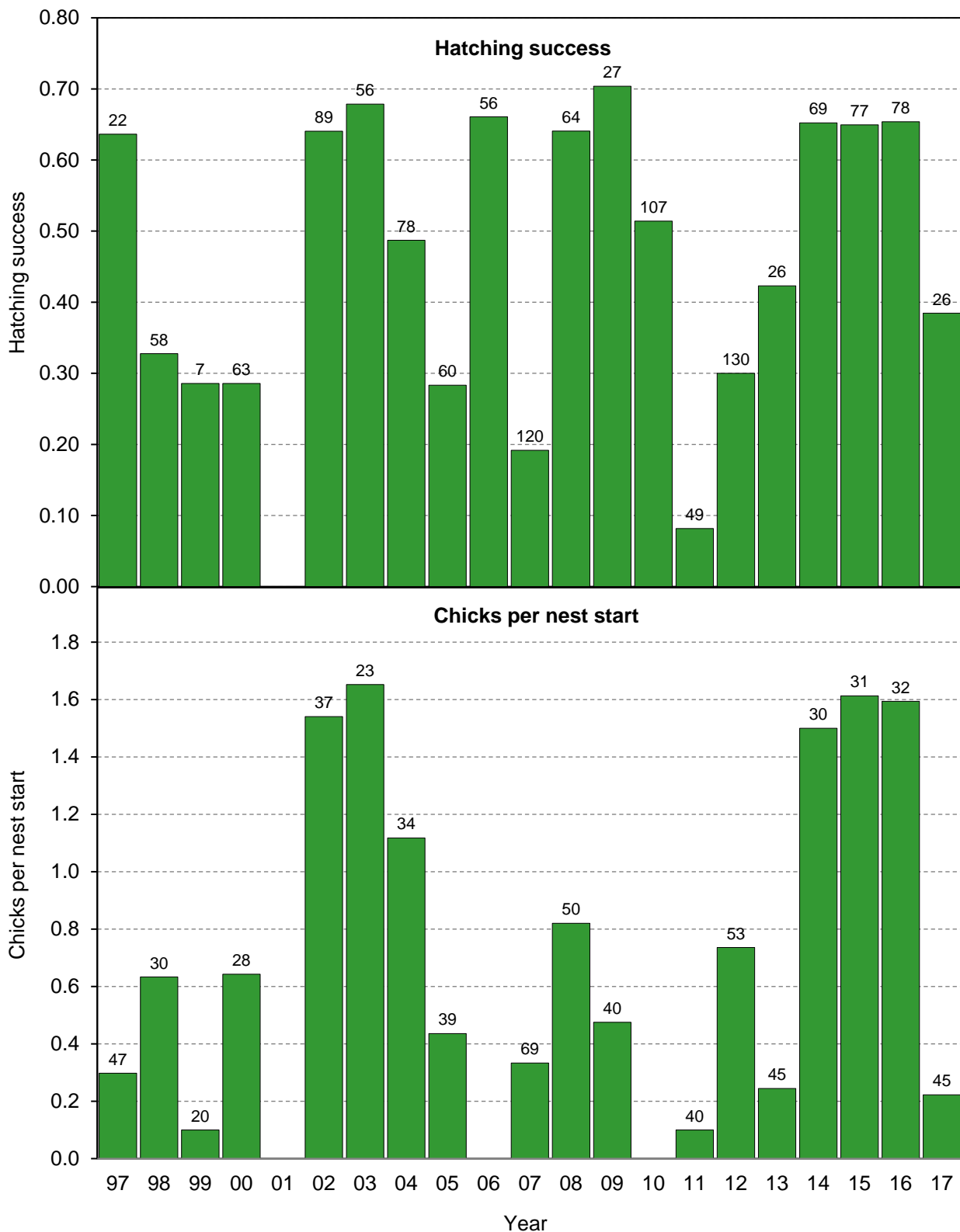


Figure 57. Reproductive performance of glaucous-winged gulls at Buldir Island, Alaska. Hatching success= E/C ; Chicks per nest start= E/A ; where A =total nest starts, C =total eggs; E =total chicks. Numbers above columns indicate sample sizes ($[C]$ for hatching success, $[A]$ for chicks per nest start). No data were collected in 2001; chicks per nest start data are not available in 2006 or 2010.

Table 82. Reproductive performance of glaucous-winged gulls at Buldir Island, Alaska, as determined by a nest-monitoring methodology (also called the Nest Method). Measures of success are based on frequent monitoring of individual nests (as opposed to count methodology presented in Table 83). Data include gull nests in both beach (between Northwest Point and Bull Point) and inland areas. No data were collected in 2001.

Year	Total nest starts (A) ^a	Nest sites w/ x eggs:					Nest sites w/ eggs (B)	Total eggs (C)	Nest sites w/ x chicks:			Nest sites w/ chicks (D)	Total chicks (E)	Laying success (B/A)	Mean clutch size (C/B)	Mean brood size (E/D)	Nesting success (D/B)	Hatching success (E/C)	Prop. nest sites w/ chicks (D/A) ^b	Chicks/nest start (E/A) ^b
		0	1	2	3	4			1	2	3									
1997	47	37	2	4	4	0	10	22	3	4	1	8	14	0.21	2.2	1.8	0.80	0.64	0.17	0.30
1998	30	4	3	19	9	0	26	58	4	7	1	12	19	0.87	2.2	1.6	0.46	0.33	0.40	0.63
1999	20	17	0	2	1	0	3	7	-	-	-	1	2	0.15	2.3	2.0	0.33	0.29	0.05	0.10
2000	28	4	2	5	17	0	24	63	3	6	1	10	18	0.86	2.6	1.8	0.42	0.29	0.36	0.64
2002	37	6	0	4	27	0	31	89	6	12	9	27	57	0.84	2.9	2.1	0.87	0.64	0.73	1.54
2003 ^c	23	1	3	4	15	0	22	56	6	10	4	20	38	0.96	2.5	1.9	0.91	0.68	0.87	1.65
2004	34	6	1	4	23	0	28	78	3	10	5	18	38	0.82	2.8	2.1	0.64	0.49	0.53	1.12
2005	39	15	4	4	16	0	24	60	13	2	0	15	17	0.62	2.5	1.1	0.63	0.28	0.38	0.44
2006	- ^d	- ^d	3	7	13	0	23	56	1	9	6	16	37	- ^d	2.4	2.3	0.70	0.66	- ^d	- ^d
2007	69	20	5	17	27	0	49	120	6	7	1	14	23	0.71	2.4	1.6	0.29	0.19	0.20	0.33
2008	50	23	2	13	12	0	27	64	8	9	5	22	41	0.54	2.4	1.9	0.81	0.64	0.44	0.82
2009	40	28	0	9	3	0	12	27	1	9	0	10	19	0.30	2.3	1.9	0.83	0.70	0.25	0.48
2010 ^e	- ^d	- ^d	1	5	32	0	38	107	7	15	6	28	55	- ^d	2.8	2.0	0.74	0.51	- ^d	- ^d
2011	40	19	3	10	8	0	21	49	2	1	0	3	4	0.53	2.3	1.3	0.14	0.08	0.08	0.10
2012	53	8	0	5	40	0	45	130	11	11	2	24	39	0.85	2.9	1.6	0.53	0.30	0.45	0.74
2013	45	31	1	5	5	0	11	26	1	5	0	6	11	0.24	2.4	1.8	0.55	0.43	0.13	0.24
2014	30	3	4	4	19	0	27	69	8	5	9	22	45	0.90	2.6	2.0	0.81	0.65	0.73	1.50
2015	31	3	0	7	21	0	28	77	7	11	7	25	50	0.90	2.8	2.0	0.89	0.65	0.81	1.61
2016	32	5	0	3	24	0	27	78	7	10	8	25	51	0.84	2.9	2.0	0.93	0.65	0.78	1.59
2017	45	34	1	5	5	0	11	26	3	2	1	6	10	0.24	2.4	1.7	0.55	0.38	0.13	0.22

^aNumber of nests represents maximum number of nests during the season.

^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.

^cChicks were present on the first visit in 2003.

^dEmpty nest bowls were not counted in 2006 and 2010.

^eGull nests were monitored between North Bight Beach and West Main Talus in 2010.

Table 83. Reproductive performance of glaucous-winged gulls at Buldir Island, Alaska, as determined by a count methodology (also called the Egg Method). Measures of success are based on count of nests and eggs at varying intervals during the nesting period (as opposed to nest-monitoring methodology presented in Table 82); numbers of nests, eggs, and chicks represent maximum counts each year. Data include only gull nests on the beach between East Main Talus and East Kittiwake Lane. No data were collected 1980-1991 or after 2014. Although monitoring individual nests is considered a better way to measure gull reproductive performance, data is collected and presented using count methodology to allow for comparisons with historic data.

Year	Total nest starts (A) ^a	Nest sites w/ x eggs:				Nest sites w/ eggs (B)	Total eggs (C)	Nest sites w/ chicks (D)	Total chicks (E)	Laying success (B/A)	Mean clutch size (C/B)	Mean brood size (E/D)	Nesting success (D/B)	Hatching success (E/C)	Prop. nest sites w/ chicks (D/A) ^b	Chicks/nest start (E/A) ^b
		1	2	3	4											
1979 ^b	-	1	10	56	0	67	-	-	-	2.8	-	-	-	-	-	
1992	209	28	48	84	0	160	376	-	122	0.77	2.4	-	-	0.32	-	0.58
1993	199	26	35	72	0	133	312	-	35	0.67	2.3	-	-	0.11	-	0.18
1994	180	15	40	75	1	131	324	-	49	0.73	2.5	-	-	0.15	-	0.27
1995	133	5	20	26	0	51	123	-	34	0.38	2.4	-	-	0.28	-	0.26
1996	175	15	35	85	0	135	340	-	83	0.77	2.5	-	-	0.24	-	0.47
1997	88	6	10	9	0	25	53	-	28	0.28	2.1	-	-	0.53	-	0.32
1998	75	8	26	22	0	56	126	-	28	0.75	2.3	-	-	0.22	-	0.37
1999	20	0	2	1	0	3	7	-	2	0.15	2.3	-	-	0.29	-	0.10
2000	54	3	10	30	0	43	113	-	17	0.80	2.6	-	-	0.15	-	0.31
2001	40	3	12	19	0	34	84	-	12	0.85	2.5	-	-	0.14	-	0.30
2002	38	0	6	23	0	29	81	-	33	0.76	2.8	-	-	0.41	-	0.87
2003	23	3	4	14	0	21	53	-	22	0.91	2.5	-	-	0.42	-	0.96
2004	31	1	5	21	0	27	74	-	23	0.87	2.7	-	-	0.31	-	0.74
2005	39	3	3	15	0	21	54	-	17	0.54	2.6	-	-	0.31	-	0.44
2006	9	2	0	3	0	5	11	-	5	0.56	2.2	-	-	0.45	-	0.56
2007 ^c	4	0	0	3	0	3	9	-	-	0.75	3.0	-	-	-	-	-
2008	38	3	11	10	0	24	55	-	33	0.63	2.3	-	-	0.60	-	0.87
2009 ^d	19	0	3	1	0	4	9	3	6	0.21	2.3	2.0	0.75	0.67	0.16	0.32
2010 ^d	- ^e	0	2	16	0	18	52	15	27	- ^e	2.9	1.8	0.83	0.52	- ^e	- ^e
2011	7	1	2	3	0	6	14	0	0	0.86	2.3	0.0	0.00	0.00	0.00	0.00
2012	17	0	2	9	0	11	31	-	-	0.65	2.8	-	-	-	-	-
2013	7	0	1	1	0	2	5	2	4	0.29	2.5	2.0	1.00	0.80	0.29	0.57
2014	9	0	2	6	0	8	22	0	0	0.88	2.8	0.0	0.00	0.00	0.00	0.00

^aProportion 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.

^bData for 1979 were collected at plots located in inland areas (Early et al. 1980) and are comparable with other years only for estimates of clutch size.

^cIn 2007, only three active nests were present between E. Main Talus and E. Kittiwake Lane; nest counts were not conducted after 5 June because field crews redirected monitoring efforts to inland areas (Table 82).

^dValues from 2009 and 2010 come from data collected by frequent nest monitoring within transect area (East Main Talus to East Kittiwake Lane) and not from simple counts of nests.

^eEmpty nest bowls were not counted in 2006 and 2010.

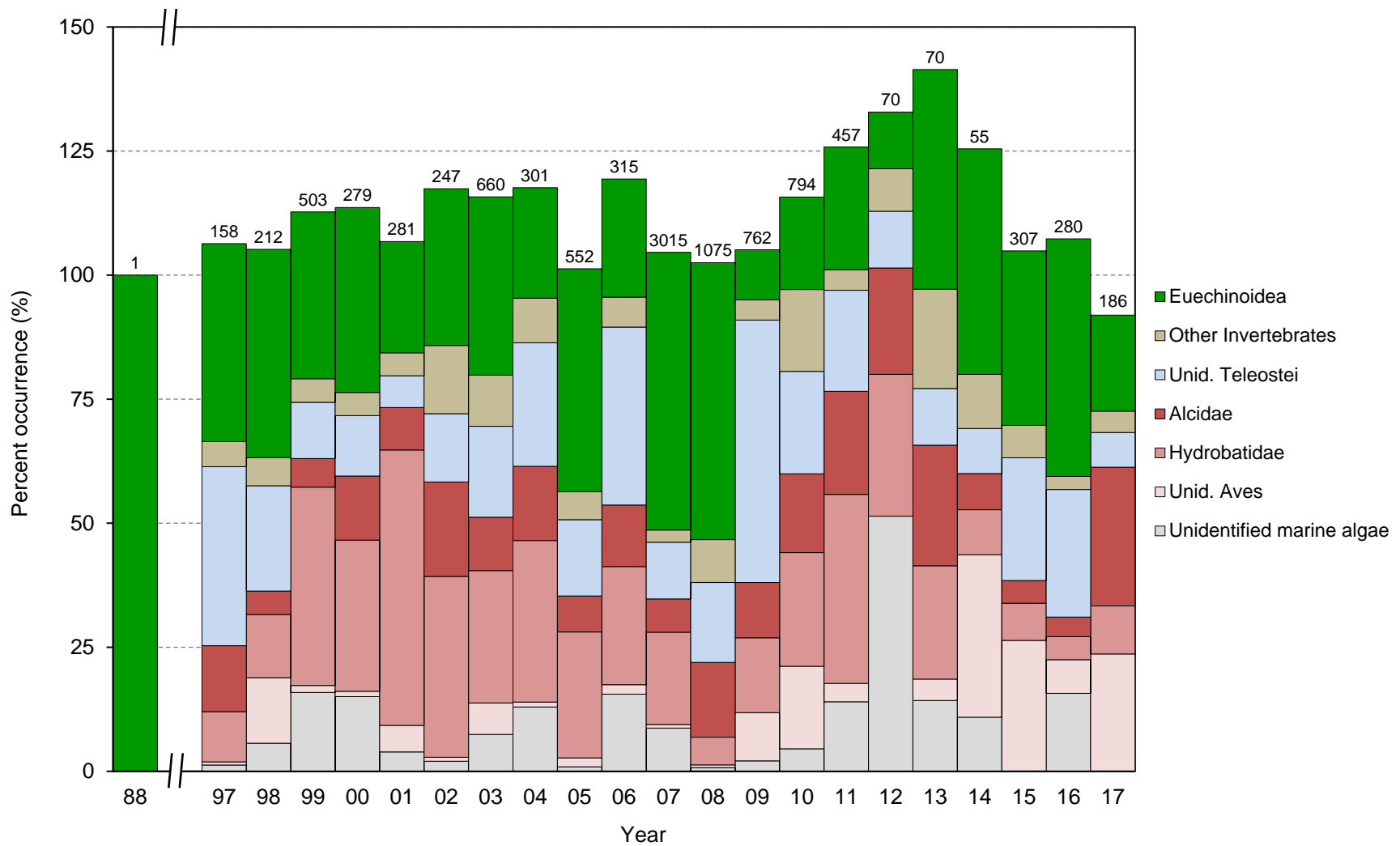


Figure 58. Frequency of occurrence of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of stomach contents from adults collected at or near the colony (1988) and pellets regurgitated by adults at the colony (1997-2017). Numbers above columns indicate sample sizes. No diet samples were collected in 1989-1996.

Table 84. Frequency of occurrence of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified in the laboratory (1988) or field (1997-2017) to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey that occurred in at least 5% of diets on average across all years 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 (1988) and pellets regurgitated by adults at the colony (1997-2017). No diet samples were collected in 1989-1996. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1988	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	1	158	212	503	279	281	247	660	301	552	315	3015	1075	762	794	457	70	70	55	307	280	186
Invertebrates	100.0	44.3	46.2	37.2	40.9	25.3	42.1	41.7	28.9	50.4	28.9	58.0	64.1	13.9	33.0	27.4	20.0	57.1	49.1	41.7	49.6	22.0
Echinoidea	100.0	39.9	42.0	33.6	37.3	22.4	31.6	35.9	22.3	44.9	23.8	56.0	55.8	10.1	18.6	24.7	11.4	44.3	45.5	35.2	47.9	19.4
Euechinoidea	100.0	39.9	42.0	33.6	37.3	22.4	31.6	35.9	22.3	44.9	23.8	56.0	55.8	10.1	18.6	24.7	11.4	44.3	45.5	35.2	47.9	19.4
Other Invertebrates	-	5.1	5.7	4.8	4.7	4.6	13.8	10.3	9.0	5.6	6.0	2.5	8.7	4.1	16.5	4.2	8.6	20.0	10.9	6.5	2.7	4.3
Fish	-	36.1	21.2	11.3	12.2	6.4	13.8	18.3	24.9	15.4	35.9	11.4	16.1	52.9	20.8	20.4	11.4	11.4	9.1	24.8	25.7	7.0
Teleostei	-	36.1	21.2	11.3	12.2	6.4	13.8	18.3	24.9	15.4	35.9	11.4	16.1	52.9	20.8	20.4	11.4	11.4	9.1	24.8	25.7	7.0
Unid. Teleostei	-	36.1	21.2	11.3	12.2	6.4	13.8	18.3	24.9	15.4	35.9	11.4	16.1	52.9	20.7	20.4	11.4	11.4	9.1	24.8	25.7	7.0
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-
Birds	-	24.1	32.1	48.5	43.4	69.0	55.9	47.9	56.1	34.4	37.8	26.3	22.0	36.1	57.1	63.0	50.0	51.4	49.1	38.1	15.4	61.3
Charadriiformes	-	13.3	4.7	5.8	12.9	8.9	19.4	13.3	22.6	7.2	12.4	6.8	15.3	11.2	17.4	21.0	21.4	24.3	7.3	4.6	3.9	28.0
Alcidae	-	13.3	4.7	5.8	12.9	8.5	19.0	10.8	15.0	7.2	12.4	6.7	15.1	11.2	15.9	20.8	21.4	24.3	7.3	4.6	3.9	28.0
Procellariiformes	-	10.1	12.7	40.0	30.5	55.5	36.4	26.7	32.6	25.4	23.8	18.6	5.6	15.1	22.9	38.1	28.6	22.9	9.1	7.5	4.6	9.7
Hydrobatidae	-	10.1	12.7	40.0	30.5	55.5	36.4	26.7	32.6	25.4	23.8	18.6	5.6	15.1	22.9	38.1	28.6	22.9	9.1	7.5	4.6	9.7
<i>Oceanodroma furcata</i>	-	7.0	5.2	22.3	16.1	29.5	18.2	9.1	18.6	15.0	12.4	10.9	2.9	3.3	13.2	3.7	1.4	7.1	-	2.6	1.4	1.1
<i>O. leucorhoa</i>	-	1.3	3.8	15.5	14.3	26.3	16.2	16.1	14.3	10.3	9.8	7.6	2.5	5.4	4.4	1.8	1.4	12.9	-	4.9	3.2	5.9
Other Hydrobatidae	-	1.9	3.8	2.2	-	-	2.0	1.5	-	-	1.6	0.2	0.2	6.4	5.3	32.6	25.7	2.9	9.1	-	-	2.7
Unid. Aves	-	0.6	13.2	1.4	1.1	5.3	0.8	6.4	1.0	1.8	1.9	0.7	0.6	9.7	16.6	3.7	-	4.3	32.7	26.4	6.8	23.7
Other Birds	-	-	1.4	1.6	0.4	0.4	4.5	2.4	2.7	-	0.3	0.4	0.6	0.3	1.5	3.1	-	-	-	-	0.3	2.7
Other	-	1.3	9.9	17.7	20.8	6.4	4.9	8.0	15.9	1.1	17.1	9.1	1.2	2.2	6.7	16.0	51.4	14.3	12.7	0.3	16.1	18.8
Unid. marine algae	-	1.3	5.7	15.9	15.1	3.9	2.0	7.4	13.0	0.9	15.6	8.7	0.7	2.1	4.5	14.0	51.4	14.3	10.9	-	15.7	-
Other	-	-	4.2	2.2	6.5	2.8	2.8	0.9	3.0	0.2	1.9	0.6	0.5	0.1	2.3	3.1	1.4	-	1.8	0.3	0.3	18.8

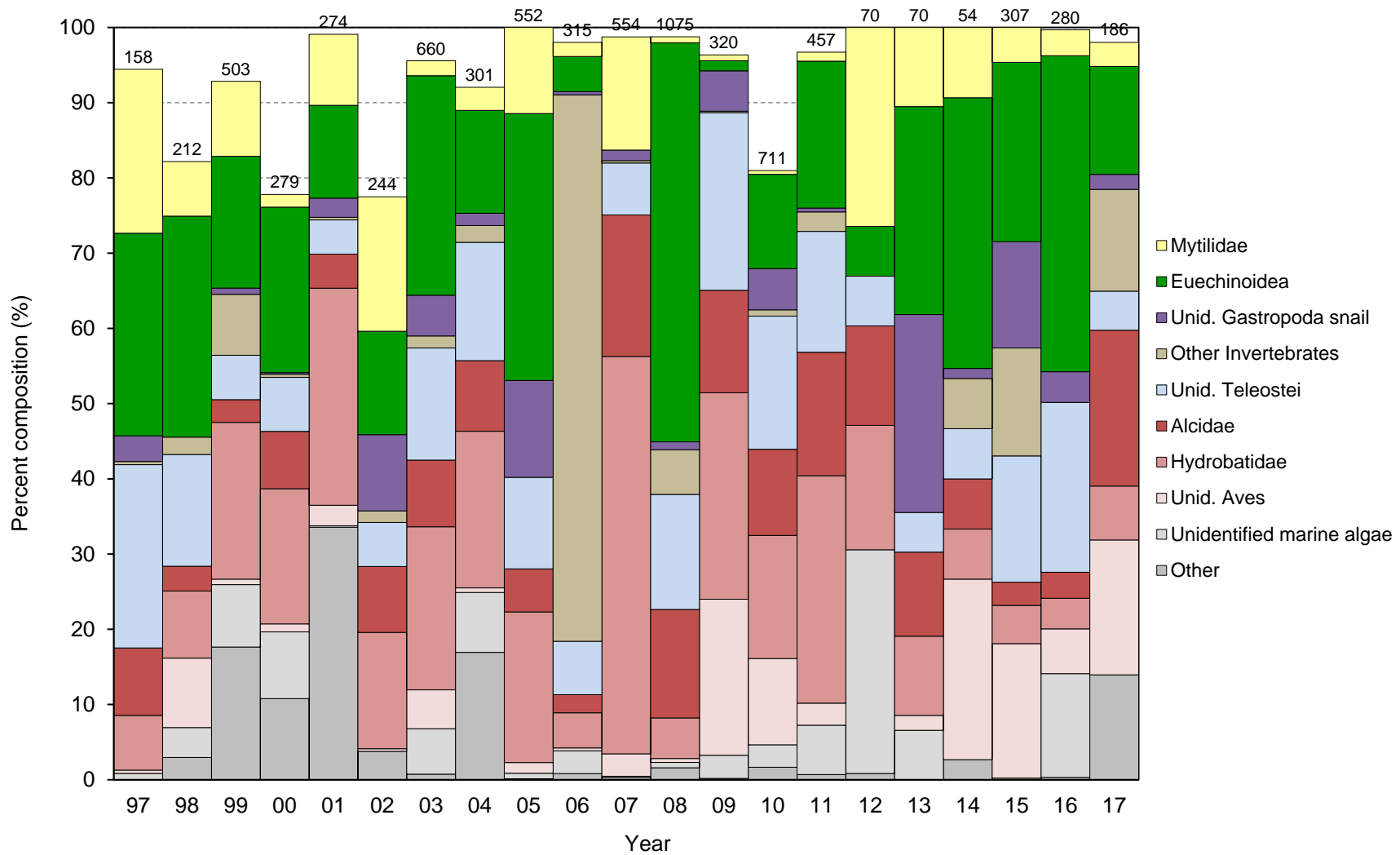


Figure 59. Percent composition of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of pellets regurgitated by adults at the colony. Numbers above columns indicate sample sizes. No diet samples were collected in 1989-1996; no count data exist in 1988.

Table 85. Percent composition of major prey items in diets of glaucous-winged gull adults at Buldir 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 field 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 pellets regurgitated by adults at the colony. No diet samples were collected in 1989-1996; no count data exist in 1988. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	158	212	503	279	274	244	660	301	552	315	554	1075	320	711	457	70	70	54	370	280	186
No. individuals	234	303	964	473	551	582	812	490	699	1608	638	1131	521	1204	579	121	152	75	453	319	251
Invertebrates	58.1	55.8	42.7	46.3	25.2	63.7	38.5	22.2	59.8	81.5	17.4	61.4	11.3	36.1	24.2	33.1	64.5	53.3	57.0	49.5	33.1
Bivalvia	26.5	7.3	15.2	1.7	9.8	17.9	2.0	4.7	11.4	1.9	15.0	1.1	0.8	0.5	1.4	26.4	10.5	9.3	4.6	3.4	3.2
Mytilidae	21.8	7.3	10.0	1.7	9.4	17.9	2.0	3.1	11.4	1.9	15.0	0.8	0.8	0.5	1.2	26.4	10.5	9.3	4.6	3.4	3.2
Unid. Mytilidae	21.8	7.3	10.0	1.7	9.4	17.9	2.0	3.1	11.4	1.9	15.0	0.8	0.8	0.5	1.2	26.4	10.5	9.3	4.6	3.4	3.2
Other Bivalva	4.7	-	5.3	-	0.4	-	-	1.6	-	0.1	-	0.3	-	-	0.2	-	-	-	-	-	-
Echinoidea	26.9	29.4	17.5	22.0	12.3	13.7	29.2	13.7	35.5	4.7	-	53.1	1.3	12.5	19.5	6.6	27.6	36.0	23.8	42.0	14.3
Euechinoidea	26.9	29.4	17.5	22.0	12.3	13.7	29.2	13.7	35.5	4.7	-	53.1	1.3	12.5	19.5	6.6	27.6	36.0	23.8	42.0	14.3
Gastropoda	4.3	16.8	1.9	22.2	2.7	30.6	5.8	1.6	12.9	2.3	2.0	1.3	9.0	22.3	0.7	-	26.3	1.3	14.1	4.1	2.0
Unid. Gastropoda snail	3.4	-	0.8	0.2	2.5	10.1	5.4	1.6	12.9	0.4	1.4	1.1	5.4	5.5	0.5	-	26.3	1.3	14.1	4.1	2.0
Other Gastropoda	0.9	16.8	1.0	22.0	0.2	20.4	0.4	-	-	1.9	0.6	0.3	3.6	16.8	0.2	-	-	-	-	-	-
Other Invertebrates	0.4	2.3	8.1	0.4	0.4	1.5	1.6	2.2	-	72.6	0.3	5.9	0.2	0.8	2.6	-	-	6.7	14.3	-	13.5
Fish	24.4	14.9	5.9	7.2	4.5	5.8	14.9	15.7	12.2	7.1	6.9	15.3	23.6	17.8	16.1	6.6	5.3	6.7	16.8	22.6	5.2
Teleostei	24.4	14.9	5.9	7.2	4.5	5.8	14.9	15.7	12.2	7.1	6.9	15.3	23.6	17.7	16.1	6.6	5.3	6.7	16.8	22.6	5.2
Unid. Teleostei	24.4	14.9	5.9	7.2	4.5	5.8	14.9	15.7	12.2	7.1	6.9	15.3	23.6	17.7	16.1	6.6	5.3	6.7	16.8	22.6	5.2
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-
Birds	16.7	22.4	25.4	26.8	36.5	26.6	39.8	37.1	27.2	7.5	75.2	21.0	61.8	41.4	52.5	29.8	23.7	37.3	26.0	13.8	47.8
Charadriiformes	9.0	3.3	3.0	7.6	4.7	8.9	11.0	14.1	5.7	2.4	19.1	14.6	13.6	12.6	16.6	13.2	11.2	6.7	3.1	3.4	20.7
Alcidae	9.0	3.3	3.0	7.6	4.5	8.8	8.9	9.4	5.7	2.4	18.8	14.4	13.6	11.5	16.4	13.2	11.2	6.7	3.1	3.4	20.7
Other Charadriiformes	-	-	-	-	0.2	0.2	2.1	4.7	-	-	0.3	0.2	-	1.2	0.2	-	-	-	-	-	-
Procellariiformes	7.3	8.9	20.9	18.0	28.9	15.5	21.7	20.8	20.0	4.7	52.8	5.4	27.4	16.4	30.2	16.5	10.5	6.7	5.1	4.1	7.2
Hydrobatidae	7.3	8.9	20.9	18.0	28.9	15.5	21.7	20.8	20.0	4.7	52.8	5.4	27.4	16.4	30.2	16.5	10.5	6.7	5.1	4.1	7.2
<i>Oceanodroma furcata</i>	5.1	3.6	11.6	9.5	15.2	7.9	7.4	11.8	11.9	2.4	28.1	2.8	5.6	9.2	2.9	0.8	3.3	-	1.8	1.3	0.8
<i>O. leucorhoa</i>	0.9	2.6	8.1	8.5	13.6	6.7	13.1	9.0	8.2	1.9	23.8	2.4	7.7	3.2	1.4	0.8	5.9	-	3.3	2.8	4.4
Other Hydrobatidae	1.3	2.6	1.1	-	-	0.9	1.2	-	-	0.3	0.9	0.2	14.2	3.9	25.9	14.9	1.3	6.7	-	-	2.0
Unid. Aves	0.4	9.2	0.7	1.1	2.7	0.3	5.2	0.6	1.4	0.4	3.0	0.5	20.7	11.5	2.9	-	2.0	24.0	17.9	6.0	17.9
Other Birds	-	1.0	0.8	0.2	1.9	2.0	1.6	-	0.1	0.3	0.5	-	1.0	2.8	-	-	-	-	-	0.3	2.0
Other	0.9	6.9	25.9	19.7	33.8	3.8	6.8	24.9	0.9	3.9	0.5	2.3	3.3	4.7	7.3	30.6	6.6	2.7	0.2	14.1	13.9
Unidentified marine algae	0.9	4.0	8.3	8.9	0.2	-	6.0	8.0	0.7	3.0	0.2	0.7	3.1	3.0	6.6	29.8	6.6	-	-	13.8	-
Other	-	3.0	17.6	10.8	33.6	3.8	0.7	16.9	0.1	0.8	0.3	1.6	0.2	1.7	0.7	0.8	0.0	2.7	0.2	0.3	13.9

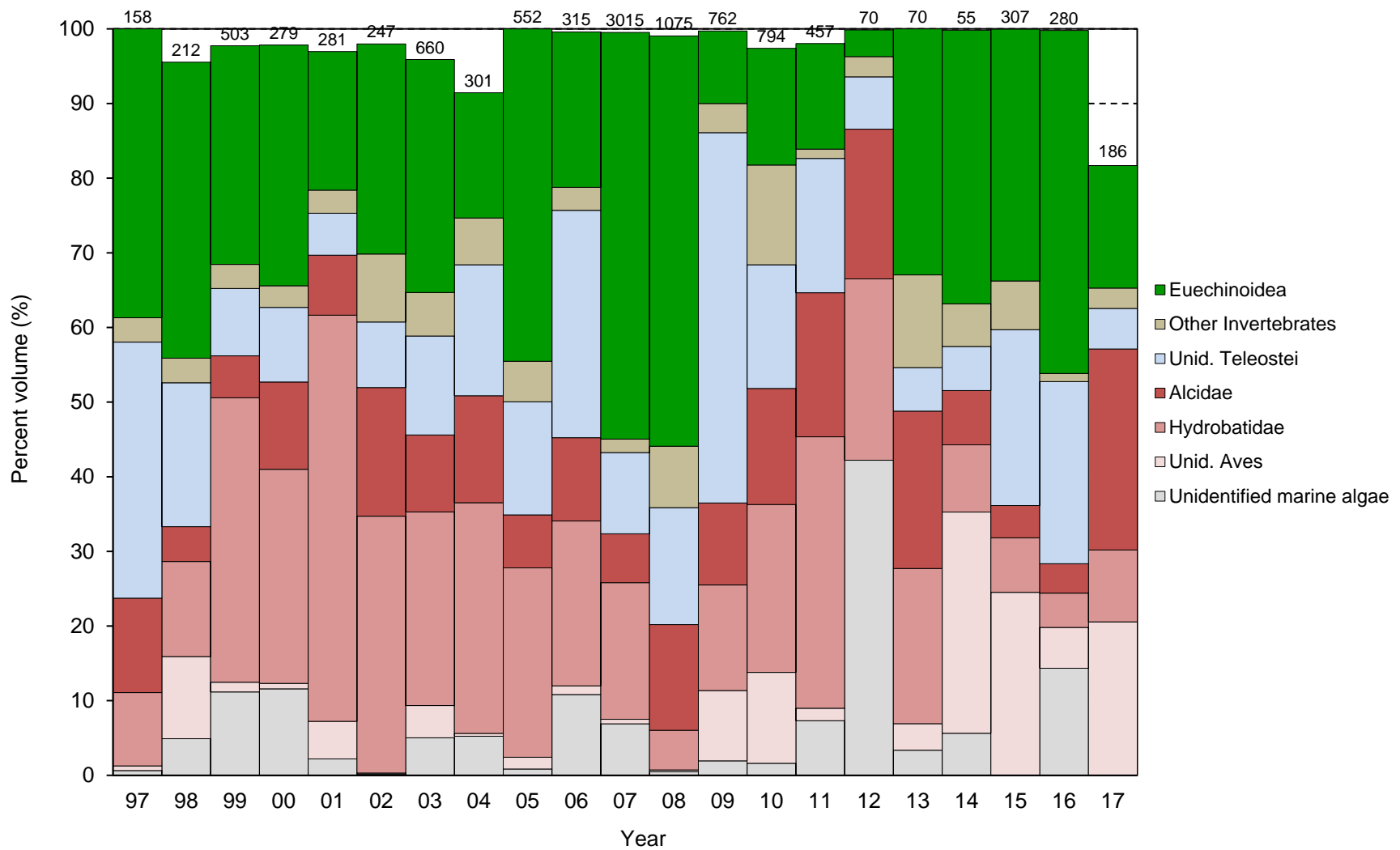


Figure 60. Percent volume of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets. Prey is grouped to family level or higher; only taxa with an among-year average volume of at least 5% are shown. Samples consist of pellets regurgitated by adults at the colony. Numbers above columns indicate sample sizes. No diet samples were collected in 1989-1996; no volume data exist in 1988.

Table 86. Percent volume of prey in regurgitated pellets of glaucous-winged gull adults at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets (sums to 100% each year). Prey was identified in the field to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey that made up at least 5% of diet volume on average across all years 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. No diet samples were collected in 1989-1996; no volume data exist in 1988. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	158	212	503	279	281	247	660	301	552	315	3015	1075	762	794	457	70	70	55	307	280	186
Invertebrates	42.0	42.9	32.5	35.1	21.7	37.3	37.1	23.0	50.0	23.9	56.3	63.1	13.6	29.0	15.4	6.3	45.4	42.4	40.3	47.0	19.1
Echinoidea	38.7	39.6	29.3	32.3	18.6	28.1	31.2	16.8	44.5	20.8	54.5	54.9	9.7	15.6	14.1	3.6	33.0	36.6	33.7	45.9	16.4
Euechinoidea	38.7	39.6	29.3	32.3	18.6	28.1	31.2	16.8	44.5	20.8	54.5	55.0	9.7	15.6	14.1	3.6	33.0	36.6	33.7	45.9	16.4
Other Invertebrates	3.3	3.3	3.2	2.9	3.1	9.1	5.8	6.3	5.4	3.1	1.8	8.2	3.9	13.4	1.3	2.7	12.4	5.7	6.5	1.1	2.7
Fish	34.3	19.3	9.0	10.0	5.6	8.8	13.3	17.5	15.1	30.4	10.9	15.6	49.6	16.7	18.0	7.0	5.8	5.9	23.6	24.4	5.4
Teleostei	34.3	19.3	9.0	10.0	5.6	8.8	13.3	17.5	15.1	30.4	10.9	15.6	49.6	16.7	18.0	7.0	5.8	5.9	23.6	24.4	5.4
Unid. Teleostei	34.3	19.3	9.0	10.0	5.6	8.8	13.3	17.5	15.1	30.4	10.9	15.7	49.6	16.6	18.0	7.0	5.8	5.9	23.6	24.4	5.4
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-
Birds	23.1	29.2	46.3	41.5	67.9	53.6	44.5	53.4	34.0	34.4	25.8	20.4	34.8	52.2	58.8	44.4	45.4	45.9	36.1	14.1	58.5
Charadriiformes	12.7	4.7	5.6	11.7	8.1	17.6	12.8	21.8	7.1	11.2	6.6	14.3	11.0	17.0	19.5	20.1	21.1	7.3	4.3	3.9	26.9
Alcidae	12.7	4.7	5.6	11.7	8.0	17.2	10.3	14.3	7.1	11.2	6.5	14.2	11.0	15.5	19.3	20.1	21.1	7.3	4.3	3.9	26.9
Procellariiformes	9.8	12.7	38.1	28.7	54.4	34.4	25.9	30.9	25.4	22.1	18.3	5.3	14.2	22.5	36.4	24.3	20.8	9.0	7.3	4.6	9.6
Hydrobatidae	9.8	12.7	38.1	28.7	54.4	34.4	25.9	30.9	25.4	22.1	18.3	5.3	14.2	22.5	36.4	24.3	20.8	9.0	7.3	4.6	9.6
<i>Oceanodroma furcata</i>	6.6	5.2	21.8	15.1	29.0	17.5	9.0	17.4	15.0	11.9	10.7	2.8	3.3	13.1	3.6	1.4	6.4	-	2.6	1.4	1.1
<i>O. leucorhoa</i>	1.3	3.8	14.3	13.6	25.5	15.6	15.5	13.5	10.3	9.6	7.4	2.3	4.7	4.3	1.6	1.4	12.6	-	4.7	3.2	5.9
Other Hydrobatidae	1.9	3.8	2.0	-	-	1.3	1.4	-	-	0.6	0.2	0.2	6.2	5.1	31.2	21.4	1.8	9.0	-	-	2.6
Unid. Aves	0.6	11.0	1.3	0.7	5.0	0.1	4.3	0.4	1.6	1.2	0.6	0.2	9.4	12.2	1.7	-	3.6	29.6	24.5	5.5	20.6
Other Aves	-	0.8	1.3	0.4	0.4	1.4	1.5	0.3	-	-	0.2	0.5	0.3	0.6	1.2	-	-	-	-	0.1	1.3
Other	0.6	8.5	12.1	13.4	4.9	0.4	5.2	6.0	0.9	11.2	7.1	0.7	2.0	2.1	7.9	42.4	3.4	5.8	<0.1	14.5	17.0
Unid. marine algae	0.6	4.9	11.2	11.6	2.2	0.2	5.0	5.2	0.8	10.8	6.9	0.5	1.9	1.6	7.3	42.2	3.4	5.6	-	14.3	-
Other	-	3.6	0.9	1.8	2.7	0.2	0.2	0.8	-	0.4	0.2	0.2	-	0.5	0.5	0.1	-	0.2	<0.1	0.1	17.0

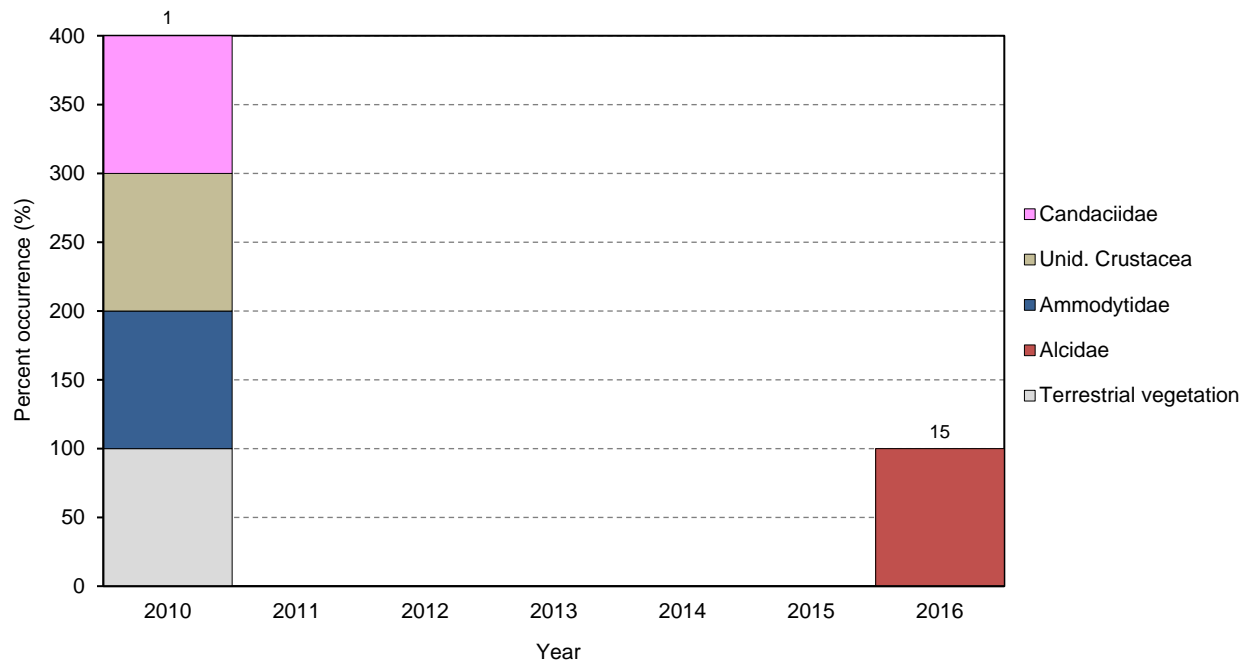


Figure 61. Frequency of occurrence of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of chick samples from an unknown source (2010) and prey left by adults for chicks at the colony (2016). Numbers above columns indicate sample sizes. No diet samples were collected before 2010, 2011-2015, or after 2016.

Table 87. Frequency of occurrence of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified in the field to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey that occurred in at least 5% of diets on average across all years 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 chick samples from an unknown source (2010) and prey left by adults for chicks at the colony (2016). No diet samples were collected before 2010, 2011-2015, or after 2016. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2010	2016
No. samples	1	15
Invertebrates	100.0	-
Copepoda	100.0	-
Candaciidae	100.0	-
<i>Candacia columbia</i>	100.0	-
Unid. Crustacea	100.0	-
Fish	100.0	-
Teleostei	100.0	-
Ammodytidae	100.0	-
<i>Ammodytes</i> spp.	100.0	-
Birds	-	100.0
Charadriiformes	-	100.0
Alcidae	-	100.0
<i>Uria</i> spp. egg	-	100.0
Other	100.0	-
Terrestrial vegetation	100.0	-

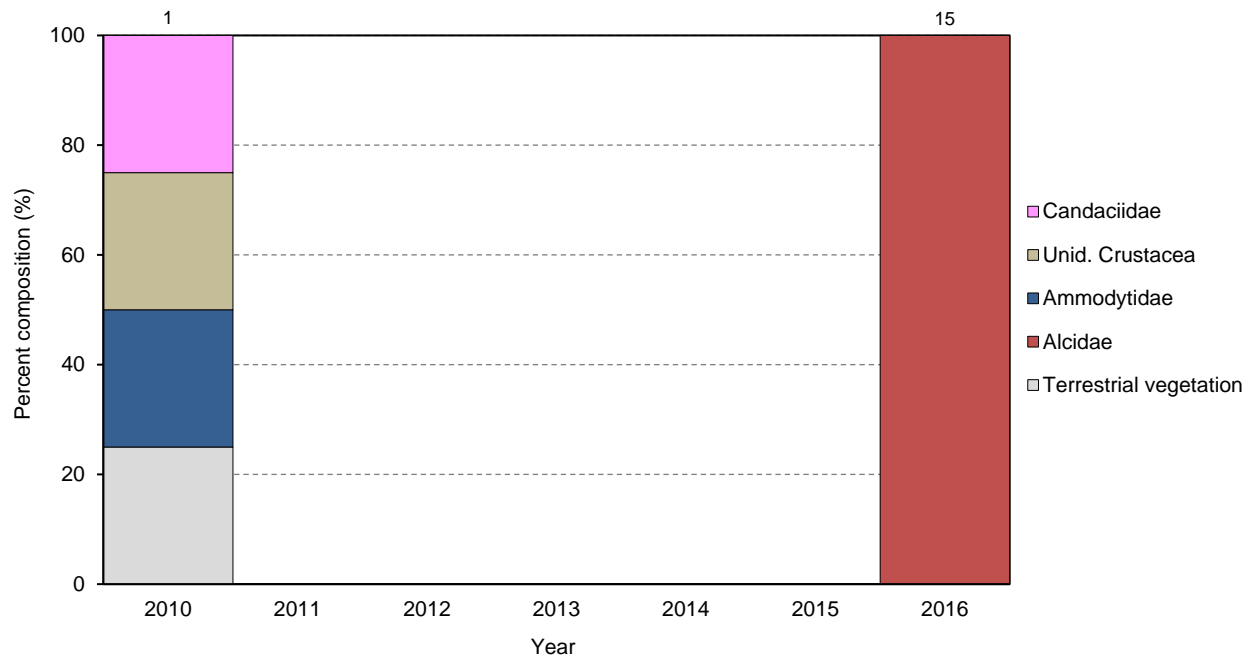


Figure 62. Percent composition of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of chick samples from an unknown source (2010) and prey left by adults for chicks at the colony (2016). Numbers above columns indicate sample sizes. No diet samples were collected before 2010, 2011-2015, or after 2016.

Table 88. Percent composition of major prey items in diets of glaucous-winged gull chicks at Buldir 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 field 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 chick samples from an unknown source (2010) and prey left by adults for chicks at the colony (2016). No diet samples were collected before 2010, 2011-2015, or after 2016. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2010	2016
No. samples	1	15
No. individuals	4	15
Invertebrates	50.0	-
Copepoda	25.0	-
Candaciidae	25.0	-
<i>Candacia columbia</i>	25.0	-
Unid. Crustacea	25.0	-
Fish	25.0	-
Teleostei	25.0	-
Ammodytidae	25.0	-
<i>Ammodytes</i> spp.	25.0	-
Birds	-	100.0
Charadriiformes	-	100.0
Alcidae	-	100.0
<i>Uria</i> spp. egg	-	100.0
Other	25.0	-
Terrestrial vegetation	25.0	-

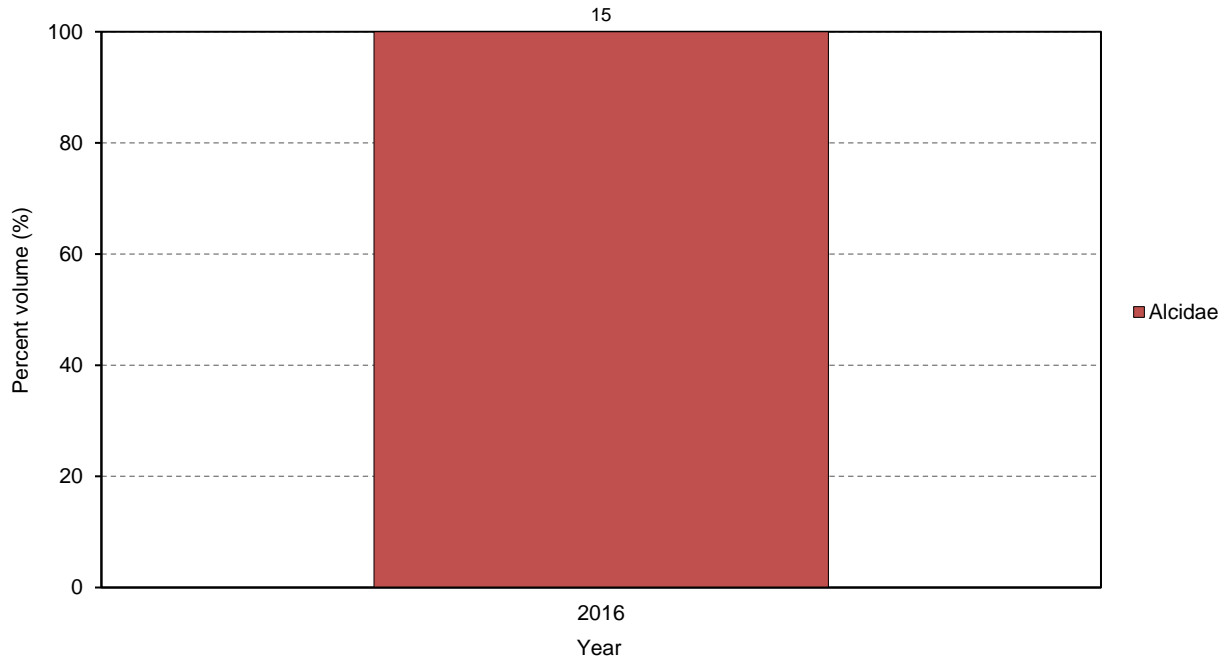


Figure 63. Percent volume of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets. Prey is grouped to family level or higher; only taxa with an among-year average volume of at least 5% are shown. Samples consist of prey left by adults for chicks at the colony. Numbers above columns indicate sample sizes. No diet samples were collected before 2010, 2011-2015, or after 2016; no volume data exist in 2010.

Table 89. Percent volume of prey in regurgitated pellets of glaucous-winged gull chicks at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets (sums to 100% each year). Prey was identified in the field to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey that made up at least 5% of diet volume on average across all years 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 prey left by adults for chicks at the colony. No diet samples were collected before 2010, 2011-2015, or after 2016; no volume data exist in 2010. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2016
No. samples	15
Birds	100.0
Charadriiformes	100.0
Alcidae	100.0
<i>Uria</i> spp. egg	100.0

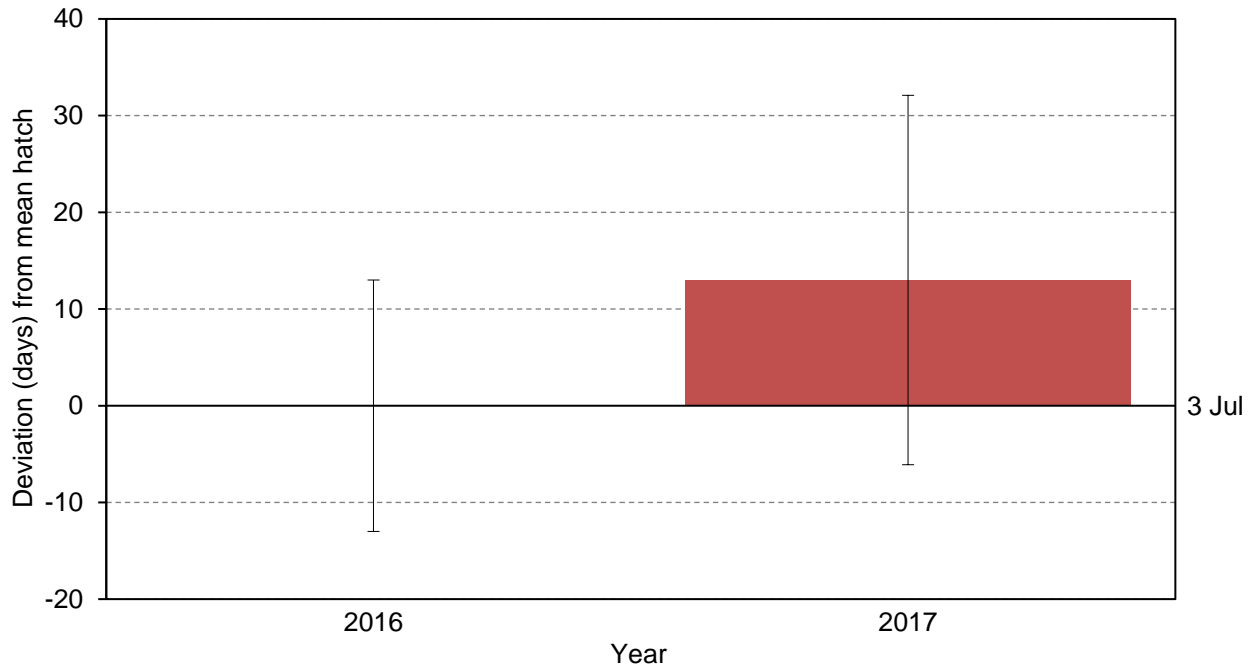


Figure 64. Yearly hatch date deviation (from the 2016 average of 3 July) for fork-tailed storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No known data exist before 2016.

Table 90. Breeding chronology of fork-tailed storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. No known data exist before 2016.

Year	Mean hatch	SD	<i>n</i> ^a	First hatch	Last hatch	First fledge
2016	3 Jul	13.0	18	14 Jun	3 Aug	21 Aug
2017	17 Jul	19.1	13	27 Jun	24 Aug	>27 Aug

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

Table 91. Frequency distribution of hatch dates for fork-tailed storm-petrels at Buldir Island, Alaska. Data include only chronology plots in which observations of egg to chick ≤ 7 days. No known data exist before 2016.

Julian date ^a	No. nests hatching on Julian date	
	2016	2017
166	1	-
167	-	-
168	-	-
169	-	-
170	-	-
171	-	-
172	4	-
173	-	-
174	-	-
175	-	-
176	-	-
177	-	-
178	2	2
179	-	-
180	-	-
181	-	-
182	3	-
183	-	-
184	-	4
185	-	-
186	-	-
187	3	-
188	-	-
189	-	-
190	-	1
191	-	-
192	-	-
193	2	-
194	-	-
195	-	-
196	-	1
197	-	-
198	-	-
199	-	-
200	1	-
201	-	-
202	-	1
203	-	-
204	-	-
205	1	-
206	-	-
207	-	-
208	-	-
209	-	-
210	-	-
211	-	-
212	-	-

Table 91 (continued). Frequency distribution of hatch dates for fork-tailed storm-petrels at Buldir Island, Alaska. Data include only chronology plots in which observations of egg to chick ≤ 7 days. No known data exist before 2016.

Julian date ^a	No. nests hatching on Julian date	
	2016	2017
214	-	1
215	-	-
216	1	-
217	-	-
218	-	-
219	-	-
219	-	-
220	-	-
221	-	-
222	-	-
223	-	-
224	-	2
224	-	-
225	-	-
226	-	-
227	-	-
228	-	-
229	-	-
230	-	-
231	-	-
232	-	-
233	-	-
234	-	-
235	-	-
236	-	1
<i>n</i>	18	13

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

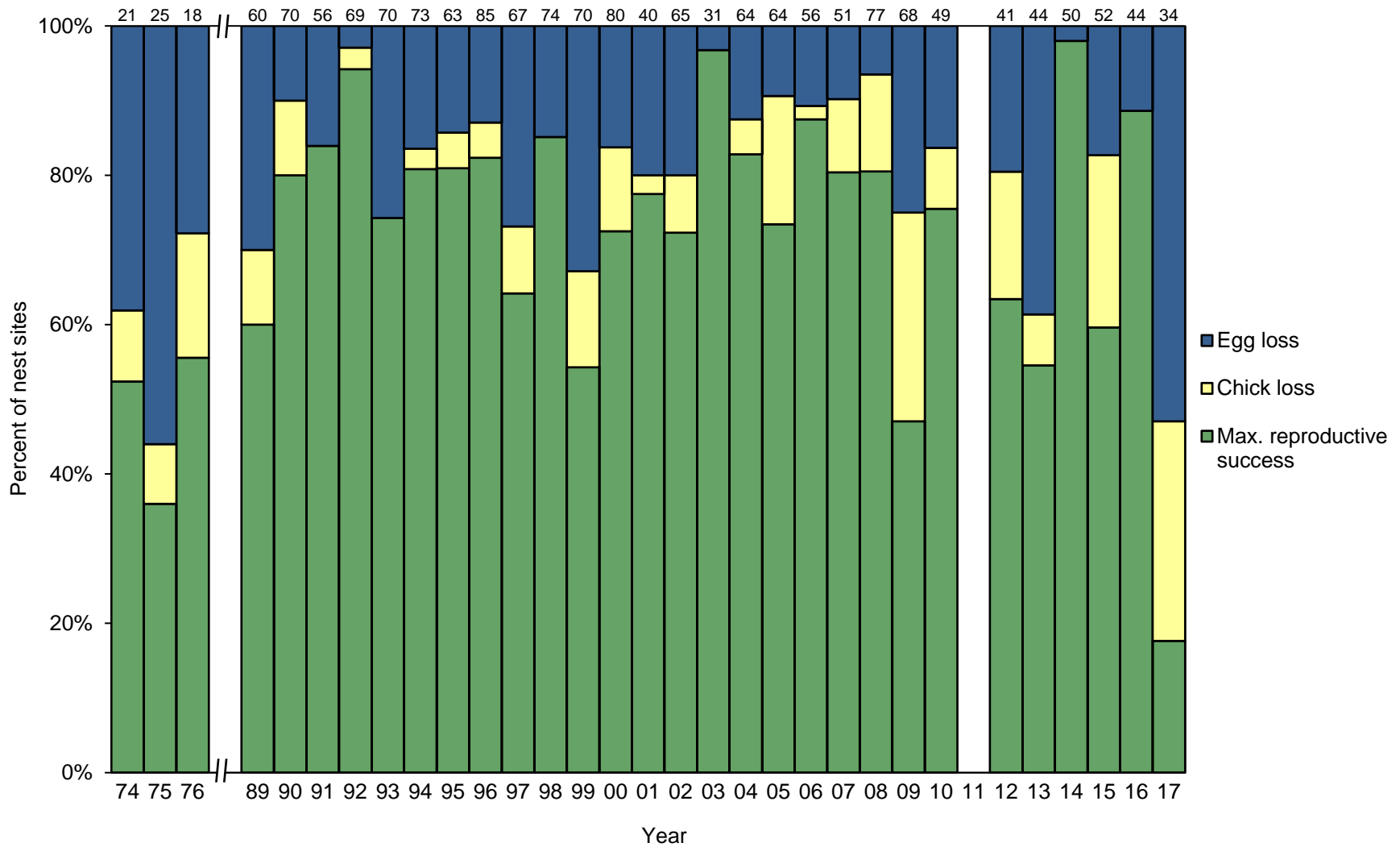


Figure 65. Reproductive performance of fork-tailed storm-petrels at Buldir Island, Alaska. Egg loss= $[(B+H)-(D+H)]/(B+H)$; Chick loss= $[(D+H)-(F+H)]/(B+H)$; Maximum potential reproductive success= $(F+H)/(B+H)$, where B+H=maximum nest sites with eggs; D+H=maximum nest sites with chicks; F+H=maximum nest sites with chicks fledged. Numbers above columns indicate sample sizes (B+H). No data were collected in 1977-1988 or 2011.

Table 92. Reproductive performance of fork-tailed storm-petrels at Buldir Island, Alaska. Measures of success are based on only a few nest checks during the early, middle, and late periods of the season (usually intervals of about 30 days) for 1974-2014 and more frequent checks (intervals of about 14 days) for 2015-2017. Most chicks are too young to fledge by the time of last visit so measures of success represent maximum potential estimates, based on the assumption that any chick still present at last check could fledge. No data were collected in 1977-1988.

Year	Max. nest sites w/ eggs (B+H)	Max nest sites w/ chicks (D+H)	Max. nest sites w/ chicks fledged (F+H) ^a	Nest sites w/ viable eggs at last visit ^b	Max. potential nesting success [(D+H)/(B+H)] ^c	Max. potential fledging success [(F+H)/(D+H)] ^d	Max. potential reproductive success [(F+H)/(B+H)]
1974	21	13	11	-	0.62	0.85	0.52
1975	25	11	9	-	0.44	0.82	0.36
1976	18	13	10	-	0.72	0.77	0.56
1989	60	42	36	7	0.70	0.86	0.60
1990	70	63	56	4	0.90	0.89	0.80
1991	56	47	47	11	0.84	1.00	0.84
1992	69	67	65	4	0.97	0.97	0.94
1993	70	52	52	11	0.74	1.00	0.74
1994	73	61	59	5	0.84	0.97	0.81
1995	63	54	51	11	0.86	0.94	0.81
1996	85	74	70	5	0.87	0.95	0.82
1997	67	49	43	2	0.73	0.88	0.64
1998	74	63	63	4	0.85	1.00	0.85
1999	70	47	38	1	0.67	0.81	0.54
2000	80	67	58	1	0.84	0.87	0.73
2001	40	32	31	0	0.80	0.97	0.78
2002	65	52	47	0	0.80	0.90	0.72
2003	31	30	30	0	0.97	1.00	0.97
2004	64	56	53	0	0.88	0.95	0.83
2005	64	58	47	0	0.91	0.81	0.73
2006	56	50	49	1	0.89	0.98	0.88
2007	51	46	41	4	0.90	0.89	0.80
2008	77	72	62	0	0.94	0.86	0.81
2009	68	51	32	3	0.75	0.63	0.47
2010	49	41	37	2	0.84	0.90	0.76
2011	59	-	-	-	-	-	-
2012	41	33	26	0	0.80	0.79	0.63
2013	44	27	24	0	0.61	0.89	0.55
2014	50	49	49	0	0.98	1.00	0.98
2015	52	43	31	0	0.83	0.72	0.60
2016	44	39	39	0	0.89	1.00	0.89
2017	34	16	6	2	0.47	0.38	0.18

^aF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^bEggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

^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).

Table 93. Standard deviation in reproductive performance parameters of fork-tailed storm-petrels at Buldir Island, Alaska. Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. No data were collected in 1977-1988.

Year	No. plots	Nest sites w/ eggs	Sampling design ^a	Max. potential nesting success	Max. potential fledging success	Max. potential reproductive success
1974	xx ^b	21	xx	xx	xx	xx
1975	xx	25	xx	xx	xx	xx
1976	xx	18	xx	xx	xx	xx
1989	xx	60	xx	xx	xx	xx
1990	xx	70	xx	xx	xx	xx
1991	xx	56	xx	xx	xx	xx
1992	xx	69	xx	xx	xx	xx
1993	xx	70	xx	xx	xx	xx
1994	xx	73	xx	xx	xx	xx
1995	xx	63	xx	xx	xx	xx
1996	xx	85	xx	xx	xx	xx
1997	xx	67	xx	xx	xx	xx
1998	xx	74	xx	xx	xx	xx
1999	xx	70	xx	xx	xx	xx
2000	xx	80	xx	xx	xx	xx
2001	xx	40	xx	xx	xx	xx
2002	xx	65	xx	xx	xx	xx
2003	xx	31	xx	xx	xx	xx
2004	xx	64	xx	xx	xx	xx
2005	xx	64	xx	xx	xx	xx
2006	xx	56	xx	xx	xx	xx
2007	xx	51	xx	xx	xx	xx
2008	xx	77	xx	xx	xx	xx
2009	5	68	Cluster by plot	0.09	0.17	0.13
2010	5	49	Cluster by plot	0.05	0.04	0.07
2011	5	59	-	-	-	-
2012	5	41	Cluster by plot	0.05	0.08	0.08
2013	5	44	Cluster by plot	0.09	0.04	0.10
2014	5	50	Cluster by plot	0.03	0.00	0.03
2015	7	52	Cluster by plot	0.07	0.07	0.09
2016	5	44	Cluster by plot	0.05	0.00	0.05
2017	5	34	Cluster by plot	0.12	0.14	0.07

^aFor sampling clustered by plot, values are calculated using ratio estimator spreadsheets 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.

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

Table 94. Reproductive performance of fork-tailed storm-petrels at Buldir Island, Alaska in 2017.

Parameter	Plot					Total	SD ^a
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	3	8	3	11	9	34	-
Max. nest sites w/ chicks (D+H)	3	2	3	6	2	16	-
Max. nest sites w/ chicks fledged (F+H) ^b	2	0	0	2	2	6	-
Nest sites w/ viable eggs at last visit ^c	0	1	0	0	1	2	-
Max. potential nesting success [(D+H)/(B+H)] ^d	1.00	0.25	1.00	0.55	0.22	0.47	0.12
Max. potential fledging success [(F+H)/(D+H)] ^e	0.67	0.00	0.00	0.33	1.00	0.38	0.14
Max. potential reproductive success [(F+H)/(B+H)]	0.67	0.00	0.00	0.18	0.22	0.18	0.07

^aStandard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

^bF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^cEggs still present and apparently viable at last check are considered unknown fate and are not included in the number of nest sites w/ eggs (B) or success estimates.

^dFor 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).

^eFor 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).

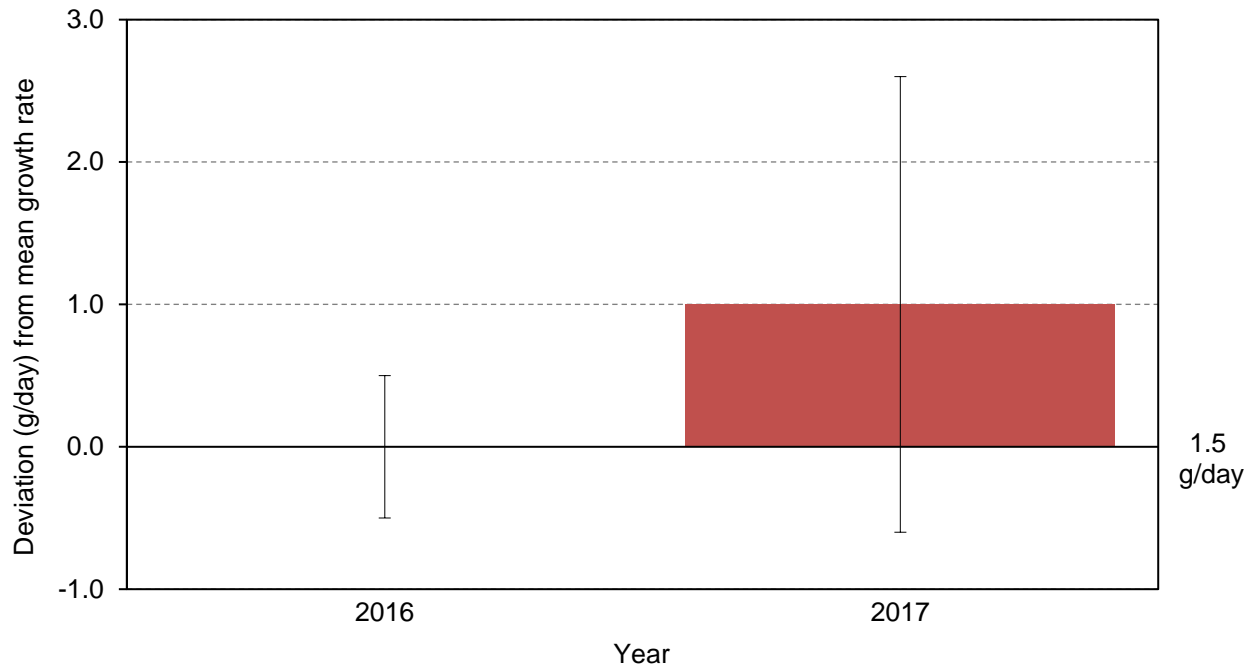


Figure 66. Yearly chick growth rate deviation (from the 2016 average of 1.5 g/day) for fork-tailed storm-petrels at Buldir Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent standard deviation around each year's mean growth rate; red highlights the current year. No known data exist before 2016.

Table 95. Mean growth rates of fork-tailed storm-petrel chicks at Buldir Island, Alaska. Data include chicks measured at least two times during the linear phase of growth (approximately mass 0-80g; wing chord 20-140mm). No known data exist before 2016.

Year	Mass (g/day)				Wing chord (mm/day) ^a			
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>
2016	1.5	0.5	0.9-2.7	15	3.0	0.6	1.4-3.6	14
2017	2.5	1.6	1.3-5.3	7	3.4	0.3	3.2-3.8	5

^aAll rates of growth are based on relaxed wing chord measurements.

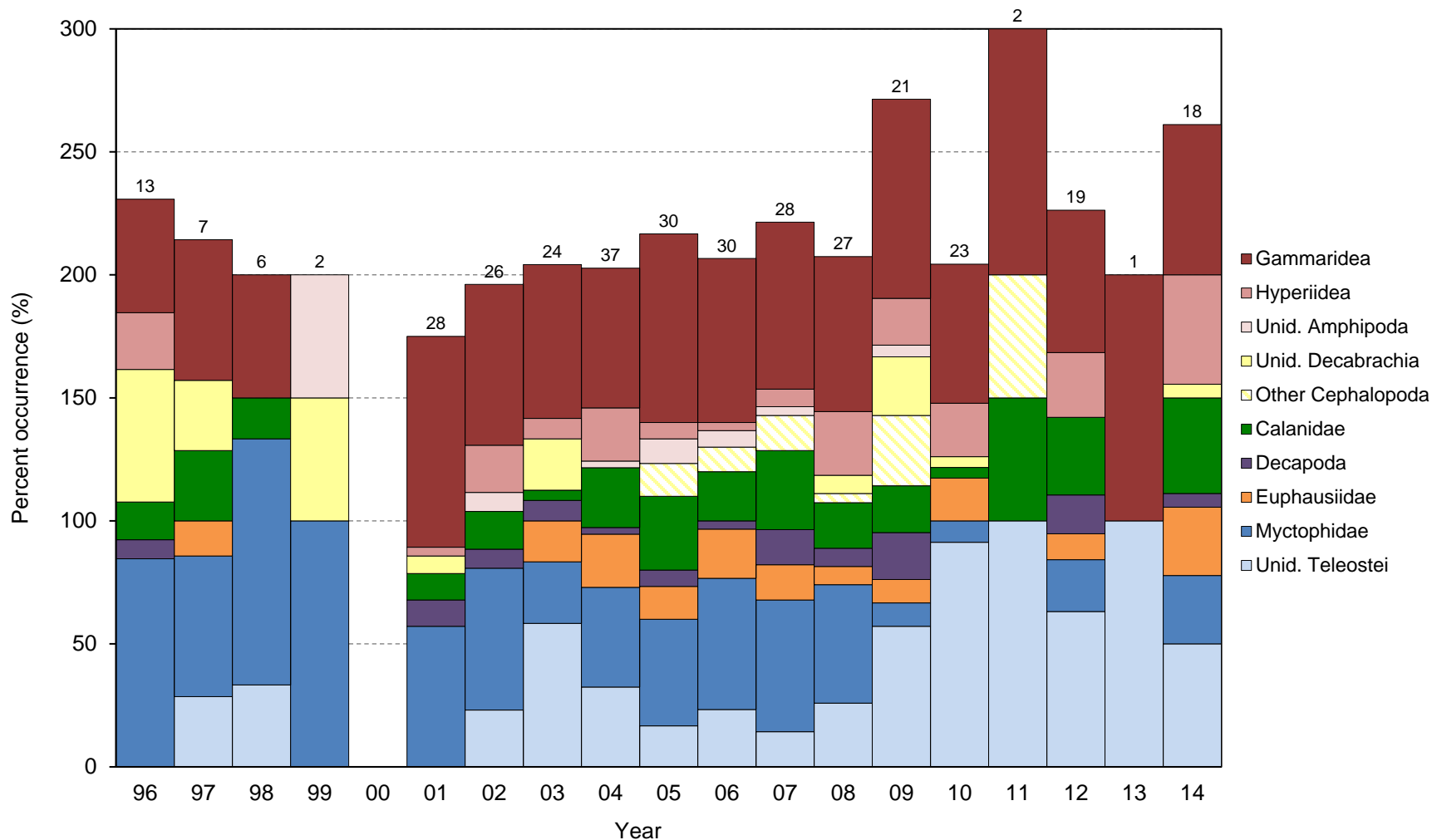


Figure 67. Frequency of occurrence of major prey items in diets of fork-tailed storm-petrel chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed.

Table 96. Frequency of occurrence of major prey items in diets of fork-tailed storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006	2007
No. samples	13	7	6	2	28	26	24	37	30	30	28
Invertebrates	76.9	85.7	66.7	50.0	92.9	73.1	79.2	83.8	86.7	83.3	89.3
Amphipoda	61.5	57.1	50.0	50.0	85.7	73.1	66.7	70.3	83.3	73.3	75.0
Gammaridea	46.2	57.1	50.0	-	85.7	65.4	62.5	56.8	76.7	66.7	67.9
Lysianassidae	46.2	57.1	50.0	-	85.7	65.4	62.5	56.8	76.7	50.0	21.4
<i>Paracallisoma coecum</i>	-	-	-	-	-	-	-	-	-	16.7	50.0
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-
Hyperiidea	23.1	-	-	-	3.6	19.2	8.3	21.6	6.7	3.3	7.1
<i>Themisto pacifica</i>	15.4	-	-	-	-	19.2	4.2	8.1	6.7	-	7.1
Other Hyperiidea	7.7	-	-	-	3.6	-	4.2	13.5	-	3.3	-
Unid. Amphipoda	-	-	-	50.0	-	7.7	-	2.7	10.0	6.7	3.6
Cephalopoda	53.8	28.6	-	50.0	7.1	-	20.8	-	13.3	10.0	14.3
Unid. Decabrachia	53.8	28.6	-	50.0	7.1	-	20.8	-	-	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	13.3	10.0	14.3
Copepoda	15.4	28.6	16.7	-	10.7	15.4	4.2	24.3	30.0	20.0	32.1
Calanidae	15.4	28.6	16.7	-	10.7	15.4	4.2	24.3	30.0	20.0	32.1
<i>Neocalanus plumchrus/flemingeri</i>	15.4	28.6	16.7	-	7.1	11.5	4.2	18.9	23.3	6.7	32.1
Unid. Calanidae	-	-	-	-	-	-	-	18.9	26.7	13.3	25.0
Other Calanidae	-	-	-	-	7.1	3.8	-	5.4	10.0	16.7	7.1
Other Copepoda	-	-	-	-	7.1	3.8	-	-	-	-	-
Decapoda	7.7	-	-	-	10.7	7.7	8.3	2.7	6.7	3.3	14.3
Euphausiacea	-	14.3	-	-	-	-	16.7	21.6	13.3	20.0	14.3
Euphausiidae	-	14.3	-	-	-	-	16.7	21.6	13.3	20.0	14.3
Other Invertebrates	-	14.3	-	-	-	-	-	-	-	-	-
Fish	84.6	100.0	100.0	100.0	57.1	80.8	83.3	75.7	63.3	76.7	67.9
Teleostei	84.6	100.0	100.0	100.0	57.1	80.8	83.3	75.7	63.3	76.7	67.9
Myctophidae	84.6	57.1	100.0	100.0	57.1	57.7	25.0	40.5	43.3	53.3	53.6
<i>Stenobrachius leucopsarus</i>	-	14.3	100.0	-	-	-	-	5.4	-	-	-
Unid. Myctophidae	84.6	42.9	-	100.0	57.1	57.7	25.0	32.4	43.3	53.3	53.6
Other Myctophidae	-	-	-	-	-	-	-	2.7	-	-	-
Unid. Teleostei	-	28.6	33.3	-	-	23.1	58.3	32.4	16.7	23.3	14.3
Other Teleostei	-	14.3	-	-	-	-	-	2.7	3.3	-	-
Other	-	14.3	-	-	-	-	-	-	-	-	-

Table 96 (continued). Frequency of occurrence of major prey items in diets of fork-tailed storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	27	21 ^a	23	2	19	1	18	12	20	3
Invertebrates	77.8	100.0	78.3	100.0	94.7	100.0	94.4	<i>pending</i>	<i>pending</i>	<i>pending</i>
Amphipoda	66.7	90.5	65.2	100.0	78.9	100.0	77.8	-	-	-
Gammaridea	63.0	81.0	56.5	100.0	57.9	100.0	61.1	-	-	-
Lysianassidae	-	-	-	-	-	-	-	-	-	-
<i>Paracallisoma coecum</i>	59.3	81.0	56.5	100.0	57.9	100.0	-	-	-	-
Other Gammaridea	7.4	-	-	-	-	-	61.1	-	-	-
Hyperiidea	25.9	19.0	21.7	-	26.3	-	44.4	-	-	-
<i>Themisto pacifica</i>	14.8	14.3	8.7	-	15.8	-	44.4	-	-	-
Other Hyperiidea	11.1	4.8	13.0	-	10.5	-	-	-	-	-
Unid. Amphipoda	-	4.8	-	-	-	-	-	-	-	-
Cephalopoda	11.1	52.4	4.3	50.0	-	-	5.6	-	-	-
Unid. Decapodachia	7.4	23.8	4.3	-	-	-	5.6	-	-	-
Other Cephalopoda	3.7	28.6	-	50.0	-	-	-	-	-	-
Copepoda	18.5	19.0	8.7	50.0	36.8	-	50.0	-	-	-
Calanidae	18.5	19.0	4.3	50.0	31.6	-	38.9	-	-	-
<i>Neocalanus plumchrus/flemingeri</i>	18.5	19.0	4.3	50.0	15.8	-	38.9	-	-	-
Unid. Calanidae	-	-	-	-	5.3	-	-	-	-	-
Other Calanidae	7.4	4.8	-	-	10.5	-	5.6	-	-	-
Other Copepoda	-	-	4.3	-	5.3	-	22.2	-	-	-
Decapoda	7.4	19.0	-	-	15.8	-	5.6	-	-	-
Euphausiacea	7.4	9.5	17.4	-	10.5	-	27.8	-	-	-
Euphausiidae	7.4	9.5	17.4	-	10.5	-	27.8	-	-	-
Other Invertebrates	-	-	4.3	-	5.3	-	11.1	-	-	-
Fish	70.4	66.7	95.7	100.0	84.2	100.0	66.7	-	-	-
Teleostei	70.4	66.7	95.7	100.0	84.2	100.0	66.7	-	-	-
Myctophidae	48.1	9.5	8.7	-	21.1	-	27.8	-	-	-
<i>Stenobrachius leucopsarus</i>	-	-	-	-	-	-	27.8	-	-	-
Unid. Myctophidae	48.1	9.5	8.7	-	21.1	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	25.9	57.1	91.3	100.0	63.2	100.0	50.0	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-
Other	14.8	14.3	4.3	-	15.8	-	-	-	-	-

^aOne sample is still pending analysis.

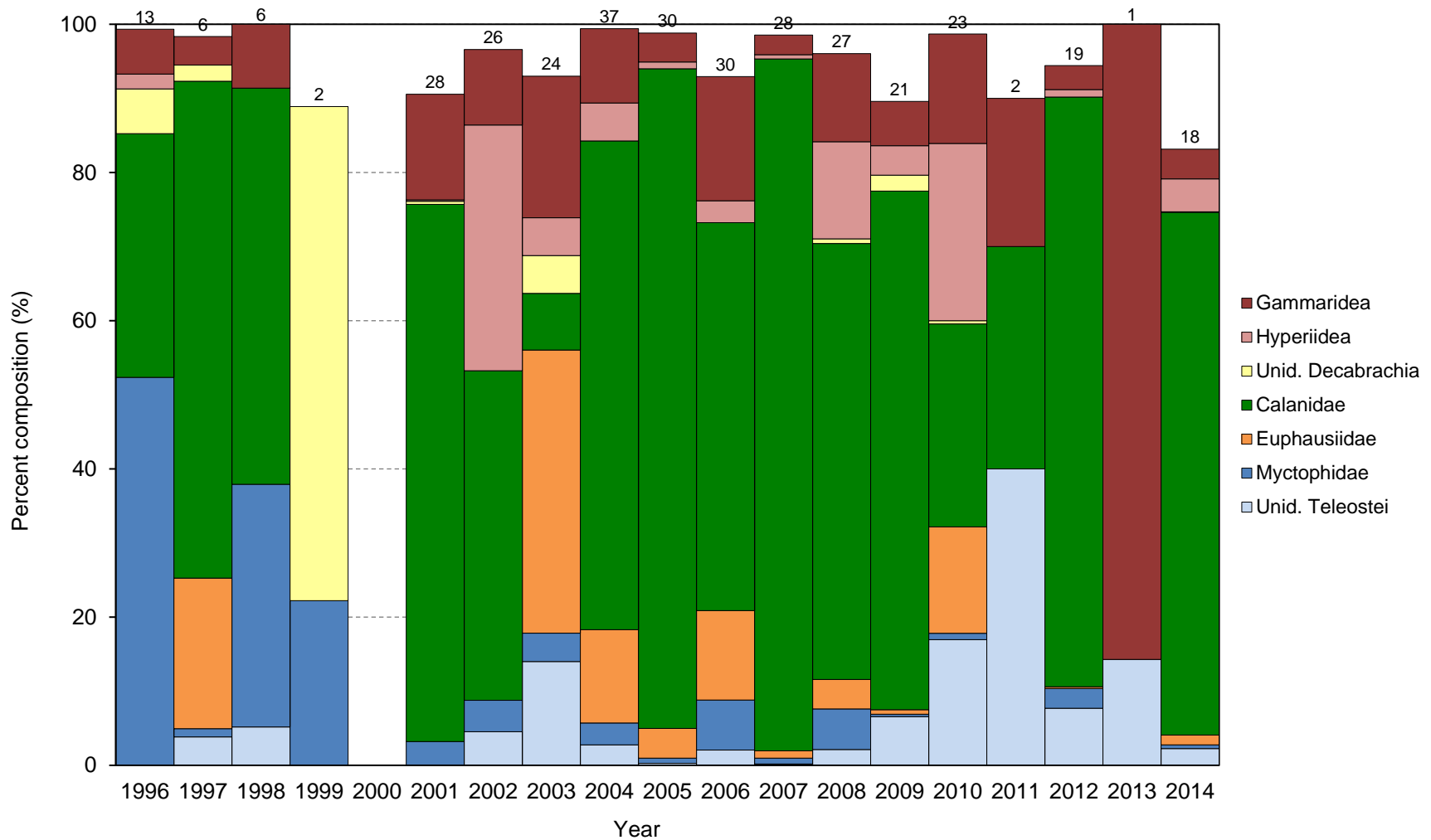


Figure 68. Percent composition of major prey items in diets of fork-tailed storm-petrel chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed.

Table 97. Percent composition of major prey items in diets of fork-tailed storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006	2007
No. samples	13	6	6	2	28	26	24	37	30	30	28
No. individuals	149	182	58	9	498	353	157	508	1849	340	2140
Invertebrates	47.7	94.0	62.1	77.8	96.8	91.2	82.2	94.1	99.0	91.2	99.0
Amphipoda	8.1	3.8	8.6	11.1	14.5	43.9	24.2	15.4	5.1	20.6	3.3
Gammaridea	6.0	3.8	8.6	-	14.3	10.2	19.1	10.0	3.9	16.8	2.7
Lysianassidae	6.0	3.8	8.6	-	14.3	10.2	19.1	10.0	3.9	14.1	1.4
<i>Paracallisoma coecum</i>	-	-	-	-	-	-	-	-	-	2.6	1.3
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-
Hyperiidea	2.0	-	-	-	0.2	33.1	5.1	5.1	0.9	2.9	0.6
Other Amphipoda	-	-	-	11.1	-	0.6	-	0.2	0.3	0.9	<0.1
Cephalopoda	6.0	2.2	-	66.7	0.4	-	5.1	-	0.2	5.9	1.0
Unid. Decabrachia	6.0	2.2	-	66.7	0.4	-	5.1	-	-	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	0.2	5.9	1.0
Copepoda	32.9	67.0	53.4	-	78.9	46.2	7.6	65.9	89.0	52.4	93.4
Calanidae	32.9	67.0	53.4	-	72.5	44.5	7.6	65.9	89.0	52.4	93.4
<i>Neocalanus plumchrus/flemingeri</i>	32.9	67.0	53.4	-	71.9	44.2	7.6	49.4	59.5	10.3	76.6
Other Calanidae	-	-	-	-	0.6	0.3	-	16.5	29.5	42.1	16.7
Other Copepoda	-	-	-	-	6.4	1.7	-	-	-	-	-
Euphausiacea	-	20.3	-	-	-	-	38.2	12.6	4.0	12.1	1.0
Euphausiidae	-	20.3	-	-	-	-	38.2	12.6	4.0	12.1	1.0
Other Invertebrates	0.7	0.5	-	-	3.0	1.1	7.0	0.2	0.6	0.3	0.4
Fish	52.3	5.5	37.9	22.2	3.2	8.8	17.8	5.9	1.0	8.8	1.0
Teleostei	52.3	5.5	37.9	22.2	3.2	8.8	17.8	5.9	1.0	8.8	1.0
Myctophidae	52.3	1.1	32.8	22.2	3.2	4.2	3.8	3.0	0.7	6.8	0.8
Unid. Myctophidae	52.3	0.5	-	22.2	3.2	4.2	3.8	2.4	0.7	6.8	0.8
Other Myctophidae	-	0.5	32.8	-	-	-	-	0.6	-	-	-
Unid. Teleostei	-	3.8	5.2	-	-	4.5	14.0	2.8	0.3	2.1	0.2
Other Teleostei	-	0.5	-	-	-	-	-	0.2	0.1	-	-
Other	-	0.5	-	-	-	-	-	-	-	-	-

Table 97 (continued). Percent composition of major prey items in diets of fork-tailed storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. No diet samples were collected in 2000; samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	27	21 ^a	23	2	19	1	18	12	20	3
No. individuals	328	653	230	10	896	7	1371	<i>pending</i>	<i>pending</i>	<i>pending</i>
Invertebrates	91.2	91.9	81.3	60.0	89.2	85.7	97.2	-	-	-
Amphipoda	25.0	10.1	38.7	20.0	4.2	85.7	8.5	-	-	-
Gammaridea	11.9	6.0	14.8	20.0	3.2	85.7	4.0	-	-	-
Lysianassidae	-	-	-	-	-	-	-	-	-	-
<i>Paracallisoma coecum</i>	11.3	6.0	14.8	20.0	3.2	85.7	-	-	-	-
Other Gammaridea	0.6	-	-	-	-	-	4.0	-	-	-
Hyperiidea	13.1	4.0	23.9	-	1.0	-	4.4	-	-	-
Other Amphipoda	-	0.2	-	-	-	-	-	-	-	-
Cephalopoda	2.1	10.3	0.4	10.0	-	-	0.1	-	-	-
Unid. Decabrachia	0.6	2.1	0.4	-	-	-	0.1	-	-	-
Other Cephalopoda	1.5	8.1	-	10.0	-	-	-	-	-	-
Copepoda	58.8	70.0	27.4	30.0	79.6	-	87.0	-	-	-
Calanidae	58.8	70.0	27.4	30.0	79.6	-	70.5	-	-	-
<i>Neocalanus plumchrus/flemingeri</i>	49.7	69.5	27.4	30.0	72.8	-	68.9	-	-	-
Other Calanidae	9.1	0.5	-	-	6.8	-	1.6	-	-	-
Other Copepoda	-	-	-	-	-	-	16.5	-	-	-
Euphausiacea	4.0	0.6	14.3	-	0.2	-	1.3	-	-	-
Euphausiidae	4.0	0.6	14.3	-	0.2	-	1.3	-	-	-
Other Invertebrates	1.2	0.9	0.4	-	5.1	-	0.4	-	-	-
Fish	7.6	6.9	17.8	40.0	10.4	14.3	2.8	-	-	-
Teleostei	7.6	6.9	17.8	40.0	10.4	14.3	2.8	-	-	-
Myctophidae	5.5	0.3	0.9	-	2.7	-	0.5	-	-	-
Unid. Myctophidae	5.5	0.3	0.9	-	2.7	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	0.5	-	-	-
Unid. Teleostei	2.1	6.6	17.0	40.0	7.7	14.3	2.3	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-
Other	1.2	1.2	0.4	-	0.3	-	-	-	-	-

^aOne sample is still pending analysis.

Table 98. Morphological measurements of adult fork-tailed storm-petrels at Buldir Island, Alaska. No data were collected in 1998, 2000, or 2008-2013.

Year	Mass (g)				Wing chord (mm)				Diagonal tarsus (mm)			
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>
1993	63.4	5.9	42.5-72.5	32	-	-	-	-	27.3	0.9	24.4-29.1	32
1994	64.5	4.8	55.4-74.7	42	-	-	-	-	27.5	1.0	24.9-29.9	38
1995	62.9	5.4	52.0-75.5	56	-	-	-	-	27.1	0.9	24.7-29.8	56
1996	63.2	6.7	45.5-81.5	51	-	-	-	-	27.2	0.8	24.9-29.8	47
1997	62.3	4.1	53.5-69.0	13	-	-	-	-	26.8	0.7	25.5-28.1	13
1999	62.1	3.7	56.0-67.5	10	163	3.6	156-169	10	27.3	0.8	26.2-28.5	10
2001	63.4	6.5	52.0-80.0	31	160	4.1	152-169	30	-	-	-	-
2002	62.1	4.6	55.0-73.0	30	164	3.5	157-171	30	27.6	1.0	25.8-29.5	30
2003	62.5	6.2	48.0-75.0	43	162	4.7	155-177	43	27.0	1.1	24.5-28.8	43
2004	63.0	5.1	54.0-76.0	33	162	3.7	153-168	33	27.1	0.7	26.1-29.1	33
2005	62.7	6.2	48.5-70.5	17	156	2.8	151-160	12	-	-	-	-
2006	64.7	5.4	55.0-78.0	23	161	3.6	152-168	23	30.0	1.3	27.5-31.9	23
2007	62.1	6.3	53.0-66.5	4	157	3.8	152-161	5	27.2	1.2	26.4-29.0	4
2014	72.7	8.9	60.0-90.0	36	160	3.3	151-165	36	27.0	1.3	24.4-31.0	32
2015	59.7	2.4	55.0-63.0	9	160	3.6	155-167	10	27.2	0.9	25.8-29.0	10
2016	62.3	6.0	55.0-75.0	29	159	4.0	150-171	29	26.7	0.9	25.2-28.3	28
2017	63.5	6.2	55.0-72.0	6	162	1.2	161-164	6	26.8	1.0	25.3-28.0	6

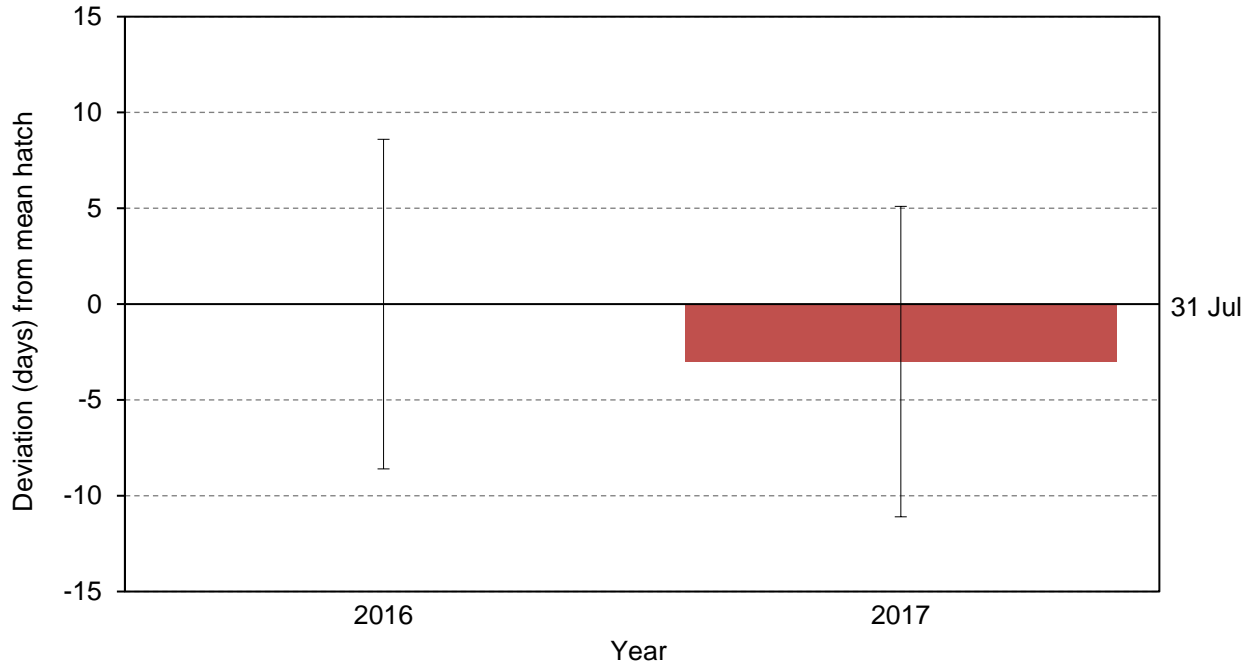


Figure 69. Yearly hatch date deviation (from the 2016 average of 31 July) for Leach's storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No known data exist before 2016.

Table 99. Breeding chronology of Leach's storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. No known data exist before 2016.

Year	Mean hatch	SD	<i>n</i> ^a	First hatch	Last hatch	First fledge ^b
2016	31 Jul	8.6	7	23 Jul	9 Aug	>25 Aug
2017	29 Jul	8.1	20	9 Jul	18 Aug	>27 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.

Table 100. Frequency distribution of hatch dates for Leach's storm-petrels at Buldir Island, Alaska. Data include only chronology plots in which observations of egg to chick ≤ 7 days. No known data exist before 2016.

Julian date ^a	No. nests hatching on Julian date	
	2016	2017
190	-	1
191	-	-
192	-	-
193	-	-
194	-	-
195	-	-
196	-	-
197	-	-
198	-	-
199	-	-
200	-	-
201	-	-
202	-	3
203	-	-
204	-	-
205	3	-
206	-	-
207	-	-
208	-	8
209	-	-
210	1	-
211	-	-
212	-	-
213	-	-
214	-	5
215	-	-
216	-	-
217	-	-
218	-	-
219	-	-
220	-	2
221	-	-
222	3	-
223	-	-
224	-	-
225	-	-
226	-	-
227	-	-
228	-	-
229	-	-
230	-	1
<i>n</i>	7	20

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

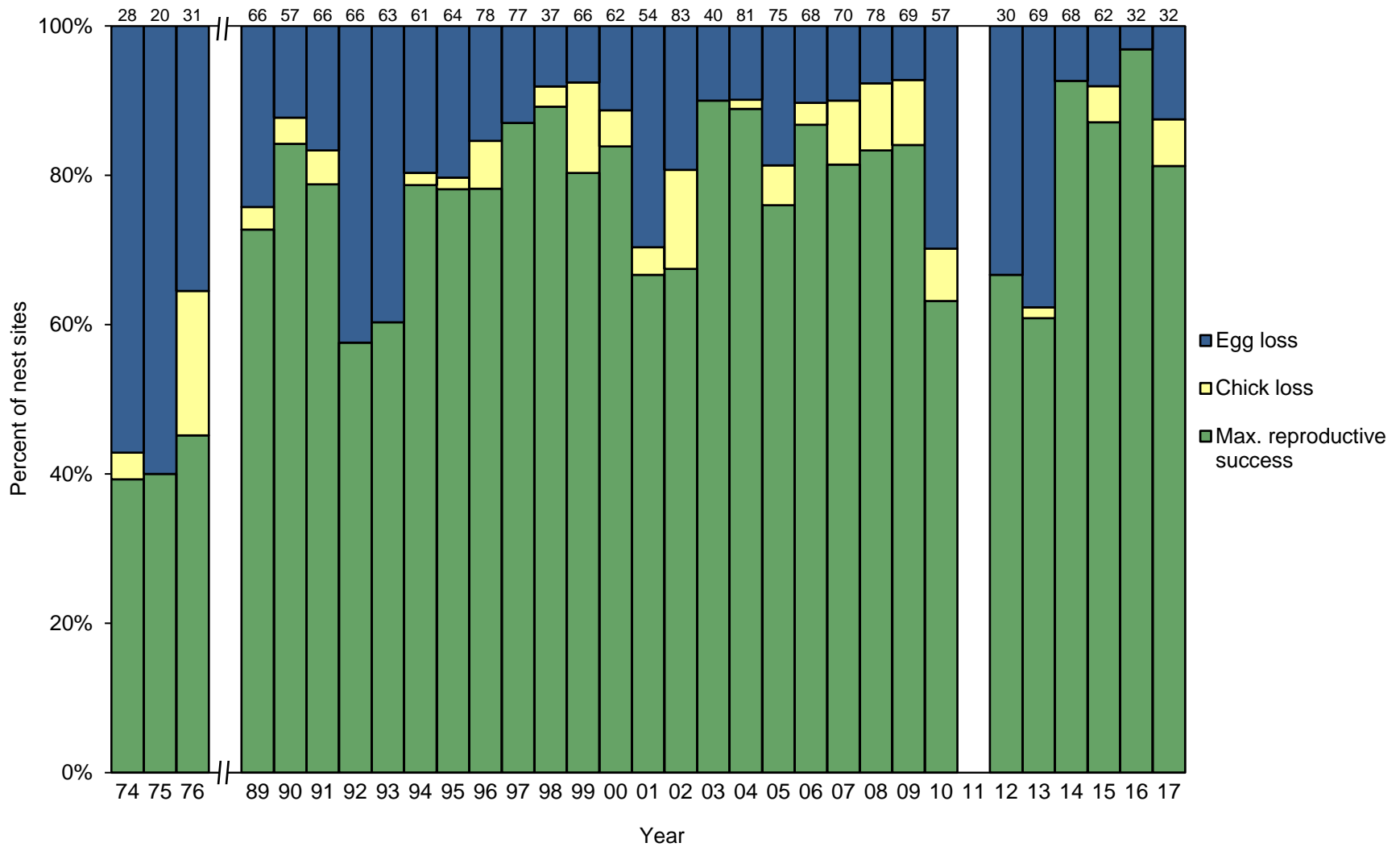


Figure 70. Reproductive performance of Leach's storm-petrels at Buldir Island, Alaska. Egg loss= $[(B+H)-(D+H)]/(B+H)$; Chick loss= $[(D+H)-(F+H)]/(B+H)$; Maximum potential reproductive success= $(F+H)/(B+H)$, where B+H=maximum nest sites with eggs; D+H=maximum nest sites with chicks; F+H=maximum nest sites with chicks fledged. Numbers above columns indicate sample sizes (B+H). No data were collected in 1977-1988 or 2011.

Table 101. Reproductive performance of Leach's storm-petrels at Buldir Island, Alaska. Measures of success are based on only a few nest checks during the early, middle, and late periods of the season (usually intervals of about 30 days) for 1974-2014 and more frequent checks (intervals of about 14 days) for 2015-2017. Most chicks are too young to fledge by the time of last visit so measures of success represent maximum potential estimates, based on the assumption that any chick still present at last check could fledge. No data were collected in 1977-1988.

Year	Max. nest sites w/ eggs (B+H)	Max nest sites w/ chicks (D+H)	Max. nest sites w/ chicks fledged (F+H) ^a	Nest sites w/ viable eggs at last visit ^b	Max. potential nesting success [(D+H)/(B+H)] ^c	Max. potential fledging success [(F+H)/(D+H)] ^d	Max. potential reproductive success [(F+H)/(B+H)]
1974	28	12	11	-	0.43	0.92	0.39
1975	20	8	8	-	0.40	1.00	0.40
1976	31	20	14	-	0.65	0.70	0.45
1989	66	50	48	18	0.76	0.96	0.73
1990	57	50	48	18	0.88	0.96	0.84
1991	66	55	52	18	0.83	0.95	0.79
1992	66	38	38	16	0.58	1.00	0.58
1993	63	38	38	39	0.60	1.00	0.60
1994	61	49	48	11	0.80	0.98	0.79
1995	64	51	50	11	0.80	0.98	0.78
1996	78	66	61	10	0.85	0.92	0.78
1997	77	67	67	7	0.87	1.00	0.87
1998	37	34	33	14	0.92	0.97	0.89
1999	66	61	53	17	0.92	0.87	0.80
2000	62	55	52	7	0.89	0.95	0.84
2001	54	38	36	1	0.70	0.95	0.67
2002	83	67	56	2	0.81	0.84	0.67
2003	40	36	36	0	0.90	1.00	0.90
2004	81	73	72	4	0.90	0.99	0.89
2005	75	61	57	2	0.81	0.93	0.76
2006	68	61	59	4	0.90	0.97	0.87
2007	70	63	57	2	0.90	0.90	0.81
2008	78	72	65	0	0.92	0.90	0.83
2009	69	64	58	10	0.93	0.91	0.84
2010	57	40	36	4	0.70	0.90	0.63
2011	49	-	-	-	-	-	-
2012	30	20	20	4	0.67	1.00	0.67
2013	69	43	42	4	0.62	0.98	0.61
2014	68	63	63	0	0.93	1.00	0.93
2015	62	57	54	6	0.92	0.95	0.88
2016	32	31	31	3	0.97	1.00	0.97
2017	32	28	26	2	0.88	0.93	0.81

^aF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^bEggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

^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).

Table 102. Standard deviation in reproductive performance parameters of Leach's storm-petrels at Buldir Island, Alaska. Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. No data were collected in 1977-1988.

Year	No. plots	Nest sites w/ eggs	Sampling design ^a	Max. potential nesting success	Max. potential fledging success	Max. potential reproductive success
1974	xx ^b	28	xx	xx	xx	xx
1975	xx	20	xx	xx	xx	xx
1976	xx	31	xx	xx	xx	xx
1989	xx	66	xx	xx	xx	xx
1990	xx	57	xx	xx	xx	xx
1991	xx	66	xx	xx	xx	xx
1992	xx	66	xx	xx	xx	xx
1993	xx	63	xx	xx	xx	xx
1994	xx	61	xx	xx	xx	xx
1995	xx	64	xx	xx	xx	xx
1996	xx	78	xx	xx	xx	xx
1997	xx	77	xx	xx	xx	xx
1998	xx	37	xx	xx	xx	xx
1999	xx	66	xx	xx	xx	xx
2000	xx	62	xx	xx	xx	xx
2001	xx	54	xx	xx	xx	xx
2002	xx	83	xx	xx	xx	xx
2003	xx	40	xx	xx	xx	xx
2004	xx	81	xx	xx	xx	xx
2005	xx	75	xx	xx	xx	xx
2006	xx	68	xx	xx	xx	xx
2007	xx	70	xx	xx	xx	xx
2008	xx	78	xx	xx	xx	xx
2009	5	69	Cluster by plot	0.09	0.11	0.15
2010	5	57	Cluster by plot	0.11	0.06	0.13
2011	5	49	-	-	-	-
2012	5	30	Cluster by plot	0.06	0.00	0.06
2013	5	69	Cluster by plot	0.03	0.02	0.03
2014	5	68	Cluster by plot	0.03	0.00	0.03
2015	5	62	Cluster by plot	0.01	0.01	0.01
2016	5	32	Cluster by plot	0.03	0.00	0.03
2017	5	32	Cluster by plot	0.03	0.03	0.03

^aFor sampling clustered by plot, values are calculated using ratio estimator spreadsheets 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.

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

Table 103. Reproductive performance of Leach's storm-petrels at Buldir Island, Alaska in 2017.

Parameter	Plot					Total	SD ^a
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	0	13	2	9	8	32	-
Max. nest sites w/ chicks (D+H)	0	12	1	8	7	28	-
Max. nest sites w/ chicks fledged (F+H) ^b	0	11	1	7	7	26	-
Nest sites w/ viable eggs at last visit ^c	1	0	0	1	0	2	-
Max. potential nesting success $[(D+H)/(B+H)]^d$	-	0.92	0.50	0.89	0.88	0.88	0.03
Max. potential fledging success $[(F+H)/(D+H)]^e$	-	0.92	1.00	0.88	1.00	0.93	0.03
Max. potential reproductive success $[(F+H)/(B+H)]$	-	0.85	0.50	0.78	0.88	0.81	0.03

^aStandard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

^bF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^cEggs still present and apparently viable at last check are considered unknown fate and are not included in the number of nest sites w/ eggs (B) or success estimates.

^dFor 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).

^eFor 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).

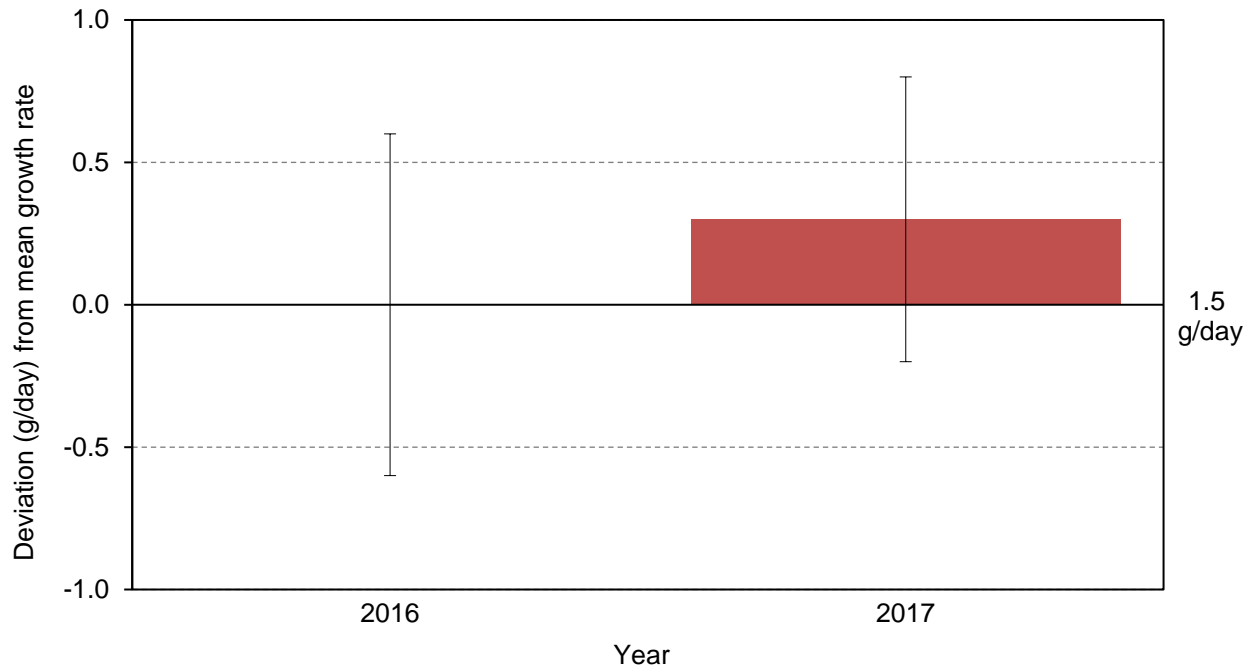


Figure 71. Yearly chick growth rate deviation (from the 2016 average of 1.5 g/day) for Leach's storm-petrels at Buldir Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent standard deviation around each year's mean growth rate; red highlights the current year. No known data exist before 2016.

Table 104. Mean growth rates of Leach's storm-petrel chicks at Buldir Island, Alaska. Data include chicks measured at least two times during the linear phase of growth (approximately mass 0-80g; wing chord 20-140mm). No known data exist before 2016.

Year	Mass (g/day)				Wing chord (mm/day) ^a			
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>
2016	1.5	0.6	1.1-2.3	4	3.1	0.6	2.6-3.9	4
2017	1.8	0.5	1.0-3.0	18	2.8	0.4	1.9-3.4	10

^aAll rates of growth are based on relaxed wing chord measurements.

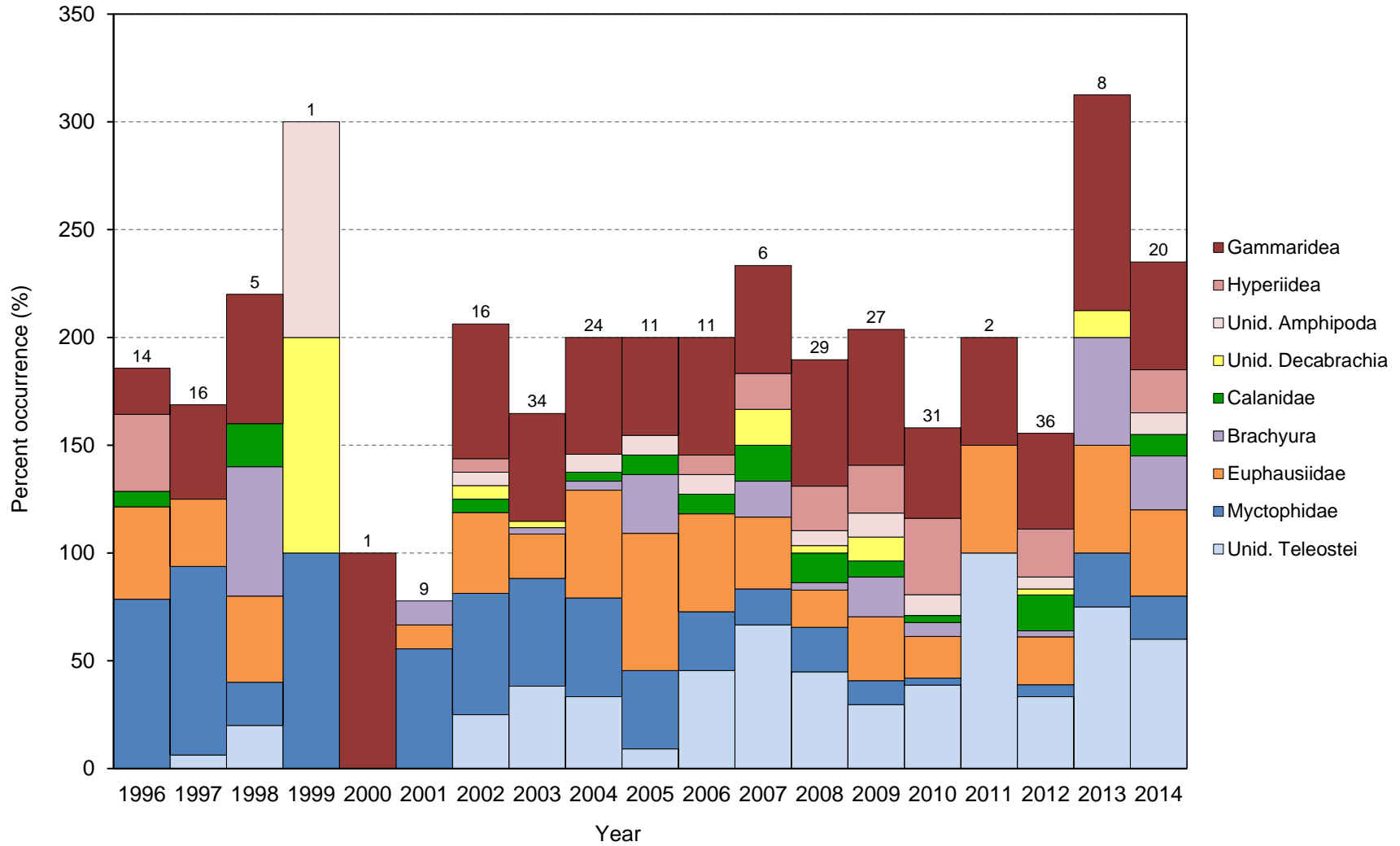


Figure 72. Frequency of occurrence of major prey items in diets of Leach's storm-petrel chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. Samples were collected in 2015-2017 but have not yet been analyzed.

Table 105. Frequency of occurrence of major prey items in diets of Leach's storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. Samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	14	16	5	1	1	9	16	34	24	11	11
Invertebrates	71.4	68.8	80.0	100.0	100.0	33.3	81.3	58.8	83.3	90.9	81.8
Amphipoda	57.1	43.8	60.0	100.0	100.0	-	68.8	50.0	58.3	54.5	63.6
Gammaridea	21.4	43.8	60.0	-	100.0	-	62.5	50.0	54.2	45.5	54.5
Lysianassidae	21.4	43.8	60.0	-	100.0	-	62.5	44.1	54.2	36.4	-
<i>Paracallisoma coecum</i>	-	-	-	-	-	-	-	-	-	-	54.5
Unid. Gammaridea	-	-	20.0	-	-	-	-	-	-	-	-
Other Gammaridea	-	-	-	-	-	-	-	8.8	-	9.1	-
Hyperiidea	35.7	-	-	-	-	-	6.3	-	-	-	9.1
<i>Themisto pacifica</i>	21.4	-	-	-	-	-	6.3	-	-	-	-
Other Hyperiidea	21.4	-	-	-	-	-	-	-	-	-	9.1
Unid. Amphipoda	-	-	-	100.0	-	-	6.3	-	8.3	9.1	9.1
Cephalopoda	-	-	-	100.0	-	-	6.3	-	8.3	9.1	9.1
Unid. Decabrachia	-	-	-	100.0	-	-	6.3	2.9	-	-	-
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-
Copepoda	7.1	-	20.0	-	-	-	6.3	-	4.2	9.1	9.1
Calanidae	7.1	-	20.0	-	-	-	6.3	-	4.2	9.1	9.1
Other Copepoda	-	-	-	-	-	-	-	-	-	-	-
Decapoda	14.3	-	60.0	-	-	22.2	6.3	2.9	8.3	27.3	-
Brachyura	-	-	60.0	-	-	11.1	-	2.9	4.2	27.3	-
Cheiragonidae/Atelecyclidae ^b	-	-	60.0	-	-	11.1	-	2.9	4.2	27.3	-
Other Brachyura	-	-	-	-	-	-	-	-	-	-	-
Other Decapoda	14.3	-	-	-	-	11.1	6.3	-	4.2	-	-
Euphausiacea	42.9	31.3	40.0	-	-	11.1	37.5	20.6	50.0	63.6	45.5
Euphausiidae	42.9	31.3	40.0	-	-	11.1	37.5	20.6	50.0	63.6	45.5
<i>Thysanoessa</i> spp.	-	-	-	-	-	-	-	-	29.2	18.2	9.1
Unid. Euphausiidae	42.9	31.3	40.0	-	-	11.1	37.5	20.6	20.8	54.5	36.4
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-
Other invertebrates	-	-	-	-	-	-	-	-	-	-	-
Fish	78.6	93.8	40.0	100.0	-	88.9	81.3	85.3	83.3	45.5	72.7
Teleostei	78.6	93.8	40.0	100.0	-	88.9	81.3	85.3	83.3	45.5	72.7
Myctophidae	78.6	87.5	20.0	100.0	-	55.6	56.3	50.0	45.8	36.4	27.3
Unid. Myctophidae	78.6	68.8	-	100.0	-	55.6	56.3	50.0	45.8	36.4	27.3
Other Myctophidae	-	18.8	20.0	-	-	-	-	-	-	-	-
Unid. Teleostei	-	6.3	20.0	-	-	-	25.0	38.2	33.3	9.1	45.5
Other Teleostei	-	-	-	-	-	33.3	-	-	4.2	-	-
Other	-	-	-	-	-	-	-	-	-	-	-

Table 105 (continued). Frequency of occurrence of major prey items in diets of Leach's storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. Samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	6	29	27	31	2 ^a	36	8	20	29	31	33
Invertebrates	83.3	86.2	92.6	90.3	100.0	83.3	100.0	85.0	<i>pending</i>	<i>pending</i>	<i>pending</i>
Amphipoda	50.0	72.4	85.2	77.4	50.0	69.4	100.0	70.0	-	-	-
Gammaridea	50.0	58.6	63.0	41.9	50.0	44.4	100.0	50.0	-	-	-
Lysianassidae	50.0	-	-	3.2	-	-	-	-	-	-	-
<i>Paracallisoma coecum</i>	-	55.2	55.6	29.0	50.0	36.1	100.0	-	-	-	-
Unid. Gammaridea	16.7	-	11.1	12.9	-	8.3	12.5	10.0	-	-	-
Other Gammaridea	-	3.4	11.1	-	-	-	62.5	50.0	-	-	-
Hyperiidea	16.7	20.7	22.2	35.5	-	22.2	-	20.0	-	-	-
<i>Themisto pacifica</i>	16.7	10.3	14.8	9.7	-	5.6	-	20.0	-	-	-
Other Hyperiidea	-	10.3	7.4	29.0	-	16.7	12.5	-	-	-	-
Unid. Amphipoda	-	6.9	11.1	9.7	-	5.6	-	10.0	-	-	-
Cephalopoda	-	6.9	11.1	9.7	-	5.6	37.5	10.0	-	-	-
Unid. Decapodachia	16.7	3.4	11.1	-	-	2.8	12.5	-	-	-	-
Other Cephalopoda	-	-	7.4	-	-	2.8	12.5	-	-	-	-
Copepoda	16.7	17.2	7.4	6.5	-	22.2	-	25.0	-	-	-
Calanidae	16.7	13.8	7.4	3.2	-	16.7	-	10.0	-	-	-
Other Copepoda	-	3.4	-	3.2	-	5.6	-	15.0	-	-	-
Decapoda	16.7	6.9	18.5	12.9	-	5.6	50.0	30.0	-	-	-
Brachyura	16.7	3.4	18.5	6.5	-	2.8	50.0	25.0	-	-	-
Cheiragonidae/Atelecyclidae ^b	-	-	3.7	-	-	-	37.5	20.0	-	-	-
Other Brachyura	16.7	3.4	14.8	6.5	-	2.8	12.5	5.0	-	-	-
Other Decapoda	-	3.4	-	6.5	-	2.8	12.5	5.0	-	-	-
Euphausiacea	33.3	17.2	29.6	19.4	50.0	22.2	50.0	40.0	-	-	-
Euphausiidae	33.3	17.2	29.6	19.4	50.0	22.2	50.0	40.0	-	-	-
<i>Thysanoessa</i> spp.	-	13.8	11.1	12.9	-	5.6	25.0	5.0	-	-	-
Unid. Euphausiidae	33.3	3.4	18.5	6.5	50.0	16.7	12.5	25.0	-	-	-
Other Euphausiidae	-	6.9	-	3.2	-	-	12.5	20.0	-	-	-
Other invertebrates	-	3.4	-	9.7	-	11.1	-	5.0	-	-	-
Fish	83.3	65.5	37.0	41.9	100.0	38.9	87.5	75.0	-	-	-
Teleostei	83.3	65.5	37.0	41.9	100.0	38.9	87.5	75.0	-	-	-
Myctophidae	16.7	20.7	11.1	3.2	-	5.6	25.0	20.0	-	-	-
Unid. Myctophidae	16.7	20.7	11.1	3.2	-	5.6	25.0	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	20.0	-	-	-
Unid. Teleostei	66.7	44.8	29.6	38.7	100.0	33.3	75.0	60.0	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-
Other	-	13.8	18.5	12.9	-	19.4	-	10.0	-	-	-

^aOne additional sample is still pending analysis.

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

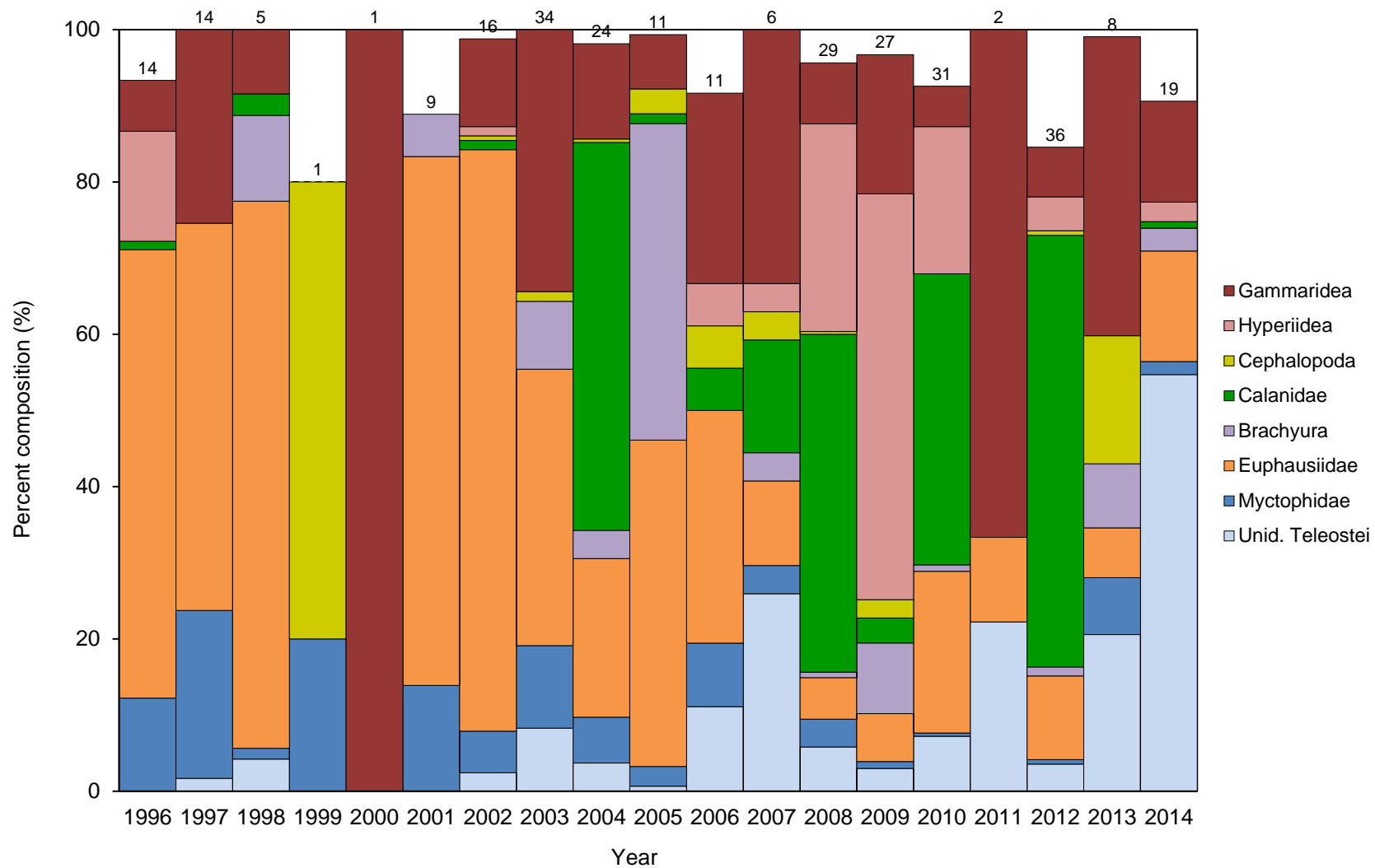


Figure 73. Percent composition of major prey items in diets of Leach's storm-petrel chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of regurgitations collected from adults returning to the colony to feed chicks. Numbers above columns indicate sample sizes. Samples were collected in 2015-2017 but have not yet been analyzed.

Table 106. Percent composition of major prey items in diets of Leach's storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. Samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	14	14	5	1	1	9	16	34	24	11	11
No. individuals	90	59	71	5	1	36	165	157	216	154	36
Invertebrates	87.8	76.3	94.4	80.0	100.0	77.8	92.1	80.9	89.8	96.8	80.6
Amphipoda	21.1	25.4	8.5	20.0	100.0	-	13.3	34.4	13.4	7.8	38.9
Gammaridea	6.7	25.4	8.5	-	100.0	-	11.5	34.4	12.5	7.1	25.0
Lysianassidae	6.7	25.4	7.0	-	100.0	-	11.5	32.5	12.5	5.2	-
<i>Paracallisoma coecum</i>	-	-	-	-	-	-	-	-	-	-	25.0
Other Gammaridea	-	-	1.4	-	-	-	-	1.9	-	1.9	-
Hyperiidea	14.4	-	-	-	-	-	1.2	-	-	-	5.6
Other Amphipoda	-	-	-	20.0	-	-	0.6	-	0.9	0.6	8.3
Cephalopoda	-	-	-	60.0	-	-	0.6	1.3	0.5	3.2	5.6
Copepoda	1.1	-	2.8	-	-	-	1.2	-	50.9	1.3	5.6
Calanidae	1.1	-	2.8	-	-	-	1.2	-	50.9	1.3	5.6
<i>Neocalanus plumchrus/flemengeri</i>	-	-	-	-	-	-	-	-	38.0	1.3	-
Other Calanidae	1.1	-	2.8	-	-	-	1.2	-	13.0	-	5.6
Other Copepoda	-	-	-	-	-	-	-	-	-	-	-
Decapoda	6.7	-	11.3	-	-	8.3	0.6	8.9	4.2	41.6	-
Brachyura	-	-	11.3	-	-	5.6	-	8.9	3.7	41.6	-
Other Decapoda	6.7	-	-	-	-	2.8	0.6	-	0.5	-	-
Euphausiacea	58.9	50.8	71.8	-	-	69.4	76.4	36.3	20.8	42.9	30.6
Euphausiidae	58.9	50.8	71.8	-	-	69.4	76.4	36.3	20.8	42.9	30.6
Unid. Euphausiidae	58.9	50.8	71.8	-	-	69.4	76.4	36.3	8.3	37.7	27.8
Other Euphausiidae	-	-	-	-	-	-	-	-	12.5	5.2	2.8
Other Invertebrates	-	-	-	-	-	-	-	-	-	-	-
Fish	12.2	23.7	5.6	20.0	-	22.2	7.9	19.1	10.2	3.2	19.4
Teleostei	12.2	23.7	5.6	20.0	-	22.2	7.9	19.1	10.2	3.2	19.4
Myctophidae	12.2	22.0	1.4	20.0	-	13.9	5.5	10.8	6.0	2.6	8.3
Unid. Myctophidae	12.2	15.3	-	20.0	-	13.9	5.5	10.8	6.0	2.6	8.3
Other Myctophidae	-	6.8	1.4	-	-	-	-	-	-	-	-
Unid. Teleostei	-	1.7	4.2	-	-	-	2.4	8.3	3.7	0.6	11.1
Other Teleostei	-	-	-	-	-	8.3	-	-	0.5	-	-
Other	-	-	-	-	-	-	-	-	-	-	-

Table 106 (continued). Percent composition of major prey items in diets of Leach's storm-petrel chicks at Buldir 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 collected from adults returning to the colony to feed chicks. Samples were collected in 2015-2017 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. samples	6	29	27	31	2 ^a	36	8	19	29	31	33
No. individuals	27	275	334	471	9	337	107	234	<i>pending</i>	<i>pending</i>	<i>pending</i>
Invertebrates	70.4	89.1	93.7	90.9	77.8	93.5	72.0	40.2	-	-	-
Amphipoda	37.0	36.0	72.5	25.3	66.7	11.6	39.3	16.7	-	-	-
Gammaridea	33.3	8.0	18.3	5.3	66.7	6.5	39.3	13.2	-	-	-
Lysianassidae	29.6	-	-	0.2	-	-	-	-	-	-	-
<i>Paracallisoma coecum</i>	-	7.6	15.9	4.2	66.7	5.6	32.7	-	-	-	-
Other Gammaridea	3.7	0.4	2.4	0.8	-	0.9	6.5	13.2	-	-	-
Hyperiidea	3.7	27.3	53.3	19.3	-	4.5	-	2.6	-	-	-
Other Amphipoda	-	0.7	0.9	0.6	-	0.6	-	0.9	-	-	-
Cephalopoda	3.7	0.4	2.4	-	-	0.6	16.8	-	-	-	-
Copepoda	14.8	45.1	3.3	38.4	-	66.5	-	5.1	-	-	-
Calanidae	14.8	44.4	3.3	38.2	-	56.7	-	0.9	-	-	-
<i>Neocalanus plumchrus/flemengeri</i>	14.8	32.4	3.0	-	-	30.0	-	0.9	-	-	-
Other Calanidae	-	12.0	0.3	38.2	-	26.7	-	-	-	-	-
Other Copepoda	-	0.7	-	0.2	-	9.8	-	4.3	-	-	-
Decapoda	3.7	1.1	9.3	4.9	-	1.8	9.3	3.4	-	-	-
Brachyura	3.7	0.7	9.3	0.8	-	1.2	8.4	3.0	-	-	-
Other Decapoda	-	0.4	-	4.0	-	0.6	0.9	0.4	-	-	-
Euphausiacea	11.1	5.5	6.3	21.2	11.1	11.0	6.5	14.5	-	-	-
Euphausiidae	11.1	5.5	6.3	21.2	11.1	11.0	6.5	14.5	-	-	-
Unid. Euphausiidae	11.1	0.4	4.5	10.4	11.1	4.2	0.9	6.8	-	-	-
Other Euphausiidae	-	5.1	1.8	10.8	-	6.8	5.6	7.7	-	-	-
Other Invertebrates	-	1.1	-	1.1	-	2.1	-	0.4	-	-	-
Fish	29.6	9.5	3.9	7.6	22.2	4.2	28.0	59.4	-	-	-
Teleostei	29.6	9.5	3.9	7.6	22.2	4.2	28.0	59.4	-	-	-
Myctophidae	3.7	3.6	0.9	0.4	-	0.6	7.5	1.7	-	-	-
Unid. Myctophidae	3.7	3.6	0.9	0.4	-	0.6	7.5	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	1.7	-	-	-
Unid. Teleostei	25.9	5.8	3.0	7.2	22.2	3.6	20.6	54.7	-	-	-
Other Teleostei	-	-	-	-	-	-	-	3.0	-	-	-
Other	-	1.5	2.4	1.5	-	2.4	-	0.4	-	-	-

^aOne additional sample is still pending analysis.

Table 107. Morphological measurements of adult Leach's storm-petrels at Buldir Island, Alaska. No data were collected in 1998, 2000, or 2008-2013.

Year	Mass (g)				Wing chord (mm)				Diagonal tarsus (mm)			
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>
1993	44.6	3.0	40.0-52.0	18	-	-	-	-	24.5	1.1	21.5-26.2	18
1994	47.0	4.4	38.0-57.3	51	-	-	-	-	24.5	0.8	22.4-26.0	49
1995	46.5	4.0	37.5-58.5	88	-	-	-	-	24.6	0.9	21.4-27.7	87
1996	46.3	4.1	38.0-55.5	53	-	-	-	-	24.6	0.7	22.3-25.9	50
1997	43.0	3.3	36.0-50.5	32	-	-	-	-	24.5	0.6	23.2-25.7	32
1999	43.3	4.6	36.0-55.0	42	158	4.5	150-168	42	24.5	0.9	22.6-26.5	42
2001	43.3	2.1	40.0-49.0	23	155	5.3	147-164	23	-	-	-	-
2002	42.2	3.2	37.5-49.5	32	160	3.5	153-168	32	24.5	0.6	23.2-26.0	32
2003	44.1	4.3	37.0-58.0	60	158	3.8	150-167	60	24.7	0.8	23.0-26.4	60
2004	43.1	3.1	37.5-52.0	30	158	3.7	150-166	30	24.5	0.6	23.5-26.0	30
2005	48.2	4.9	42.0-65.5	37	153	22.9	143-158	36	-	-	-	-
2006	48.8	4.5	35.0-56.0	38	158	4.4	149-164	39	26.8	1.3	23.5-31.7	39
2007	45.8	4.9	43.0-51.5	3	154	0.6	153-154	3	24.3	0.4	24.0-24.7	3
2014	45.2	5.7	35.0-60.0	77	156	3.8	146-169	75	23.8	1.3	21.0-26.8	63
2015	44.0	4.1	39.0-56.0	31	155	4.3	147-166	31	24.4	0.9	22.8-27.0	31
2016	42.8	3.6	37.0-54.0	72	157	3.9	148-166	72	24.6	0.7	23.1-26.9	72
2017	42.4	3.4	36.0-52.0	55	156.4	4.3	148-166	55	24.3	0.8	22.5-26.1	55

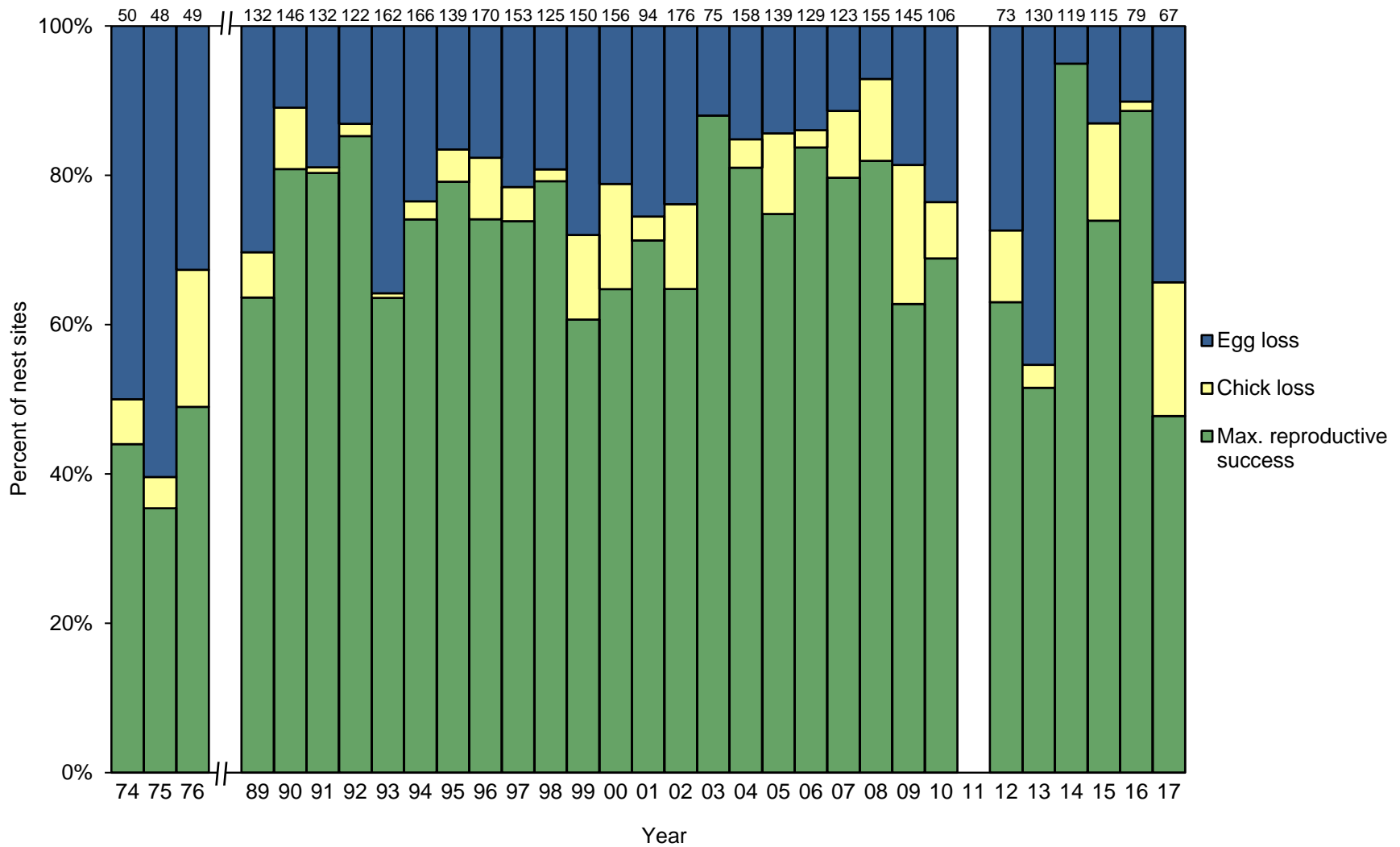


Figure 74. Reproductive performance of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska. Egg loss= $[(B+H)-(D+H)]/(B+H)$; Chick loss= $[(D+H)-(F+H)]/(B+H)$; Maximum potential reproductive success= $(F+H)/(B+H)$, where B+H=maximum nest sites with eggs; D+H=maximum nest sites with chicks; F+H=maximum nest sites with chicks fledged. Numbers above columns indicate sample sizes (B+H). No data were collected in 1977-1988 or 2011.

Table 108. Reproductive performance of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska. Measures of success are based on only a few nest checks during the early, middle, and late periods of the season (usually intervals of about 30 days) for 1974-2014 and more frequent checks (intervals of about 14 days) for 2015-2017. Most chicks are too young to fledge by the time of last visit so measures of success represent maximum potential estimates, based on the assumption that any chick still present at last check could fledge. No data were collected in 1977-1988.

Year	Max. nest sites w/ eggs (B+H)	Max nest sites w/ chicks (D+H)	Max. nest sites w/ chicks fledged (F+H) ^a	Nest sites w/ viable eggs at last visit ^b	Max. potential nesting success [(D+H)/(B+H)] ^c	Max. potential fledging success [(F+H)/(D+H)] ^d	Max. potential reproductive success [(F+H)/(B+H)]
1974	50	25	22	-	0.50	0.88	0.44
1975	48	19	17	-	0.40	0.89	0.35
1976	49	33	24	7	0.67	0.73	0.49
1989	132	92	84	4	0.70	0.91	0.64
1990	146	130	118	0	0.89	0.91	0.81
1991	132	107	106	0	0.81	0.99	0.80
1992	122	106	104	1	0.87	0.98	0.85
1993	162	104	103	0	0.64	0.99	0.64
1994	166	127	123	0	0.77	0.97	0.74
1995	139	116	110	7	0.83	0.95	0.79
1996	170	140	126	17	0.82	0.90	0.74
1997	153	120	113	9	0.78	0.94	0.74
1998	125	101	99	20	0.81	0.98	0.79
1999	150	108	91	16	0.72	0.84	0.61
2000	156	123	101	8	0.79	0.82	0.65
2001	94	70	67	1	0.74	0.96	0.71
2002	176	134	114	3	0.76	0.85	0.65
2003	75	66	66	0	0.88	1.00	0.88
2004	158	134	128	5	0.85	0.96	0.81
2005	139	119	104	2	0.86	0.87	0.75
2006	129	111	108	5	0.86	0.97	0.84
2007	123	109	98	7	0.89	0.90	0.80
2008	155	144	127	0	0.93	0.88	0.82
2009	145	118	91	15	0.81	0.77	0.63
2010	113	81	73	6	0.72	0.90	0.72
2011	118	-	-	-	-	-	-
2012	73	53	46	4	0.72	0.87	0.63
2013	130	71	67	4	0.55	0.94	0.52
2014	119	113	113	0	0.95	1.00	0.95
2015	115	100	85	6	0.87	0.85	0.74
2016	79	71	70	3	0.90	0.99	0.89
2017	67	44	32	4	0.66	0.73	0.48

^aF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^bEggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

^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).

Table 109. Standard deviation in reproductive performance parameters of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska. Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. No data were collected in 1977-1988.

Year	No. plots	Nest sites w/ eggs	Sampling design ^a	Max. potential nesting success	Max. potential fledging success	Max. potential reproductive success
1974	xx ^b	50	xx	xx	xx	xx
1975	xx	48	xx	xx	xx	xx
1976	xx	49	xx	xx	xx	xx
1989	xx	132	xx	xx	xx	xx
1990	xx	146	xx	xx	xx	xx
1991	xx	132	xx	xx	xx	xx
1992	xx	122	xx	xx	xx	xx
1993	xx	162	xx	xx	xx	xx
1994	xx	166	xx	xx	xx	xx
1995	xx	139	xx	xx	xx	xx
1996	xx	170	xx	xx	xx	xx
1997	xx	153	xx	xx	xx	xx
1998	xx	125	xx	xx	xx	xx
1999	xx	150	xx	xx	xx	xx
2000	xx	156	xx	xx	xx	xx
2001	xx	94	xx	xx	xx	xx
2002	xx	176	xx	xx	xx	xx
2003	xx	75	xx	xx	xx	xx
2004	xx	158	xx	xx	xx	xx
2005	xx	139	xx	xx	xx	xx
2006	xx	129	xx	xx	xx	xx
2007	xx	123	xx	xx	xx	xx
2008	xx	155	xx	xx	xx	xx
2009	5	145	Cluster by plot	0.07	0.12	0.15
2010	5	113	Cluster by plot	0.07	0.04	0.09
2011	5	118	-	-	-	-
2012	5	73	Cluster by plot	0.04	0.06	0.06
2013	5	130	Cluster by plot	0.05	0.01	0.05
2014	5	119	Cluster by plot	0.03	0.00	0.03
2015	7	115	Cluster by plot	0.04	0.04	0.06
2016	5	79	Cluster by plot	0.04	0.01	0.05
2017	5	67	Cluster by plot	0.04	0.09	0.04

^aFor sampling clustered by plot, values are calculated using ratio estimator spreadsheets 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.

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

Table 110. Reproductive performance of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska in 2017.

Parameter	Plot					Total	SD ^a
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	3	21	5	21	17	67	-
Max. nest sites w/ chicks (D+H)	3	14	4	14	9	44	-
Max. nest sites w/ chicks fledged (F+H) ^b	2	11	1	9	9	32	-
Nest sites w/ viable eggs at last visit ^c	1	1	0	1	1	4	-
Max. potential nesting success $[(D+H)/(B+H)]^d$	1.00	0.67	0.80	0.67	0.53	0.66	0.04
Max. potential fledging success $[(F+H)/(D+H)]^e$	0.67	0.79	0.25	0.64	1.00	0.73	0.09
Max. potential reproductive success $[(F+H)/(B+H)]$	0.67	0.52	0.20	0.43	0.53	0.48	0.04

^aStandard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

^bF+H=maximum number of chicks potentially fledged and includes both fledged chicks (F) and chicks still present at last check but too young to have fledged (H).

^cEggs still present and apparently viable at last check are considered unknown fate and are not included in the number of nest sites w/ eggs (B) or success estimates.

^dFor 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).

^eFor 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).

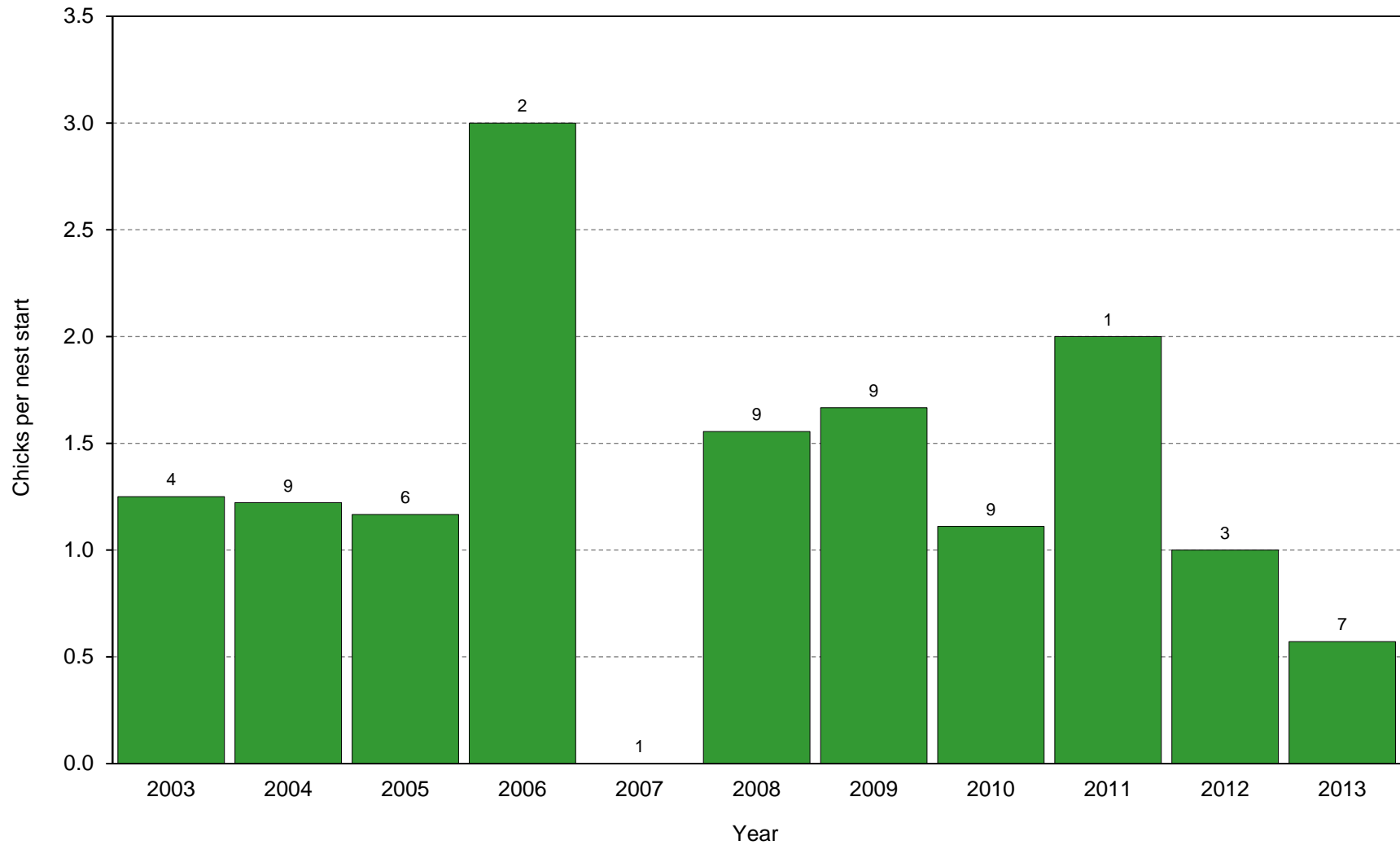


Figure 75. Reproductive performance of red-faced cormorants at Buldir Island, Alaska. Success is measured by the number of chicks per nest start (E/A), where E =total chicks and A =total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A). No data were collected in 2014-2017.

Table 111. Reproductive performance of red-faced cormorants at Buldir Island, Alaska. Success is determined by a Boom-or-Bust methodology, using 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 2014-2017.

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 max. nest count	Date(s) of max. chick count
		1	2	3	4							
2003	4	1	2	0	0	3	5	1.7	0.75	1.25	19 Jun	25 Jun
2004	9	1	2	2	0	5	11	2.2	0.55	1.22	17 Jun	3 Aug
2005	6	1	1	1	0	3	7	2.3	0.50	1.17	8 Jun	2 Aug
2006	2	0	0	2	0	2	6	3.0	1.00	3.00	17 Jun	4 Aug
2007	1	0	0	0	0	0	0	-	0.00	0.00	-	-
2008	9	0	1	4	0	5	14	2.8	0.55	1.56	10 Jun	22 Aug
2009	9	0	0	5	0	5	15	3.0	0.55	1.67	4 Jul	6 Aug
2010	9	0	2	2	0	5	10	2.0	0.55	1.11	17 Jul	7 Aug
2011	1	0	1	0	0	1	2	2.0	1.00	2.00	11 Jun	31 Jul
2012	3	0	0	1	0	1	3	3.0	0.33	1.00	7 Jun	29 Jul
2013	7	0	2	0	0	2	4	2.0	0.29	0.57	10 Jun	21 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.

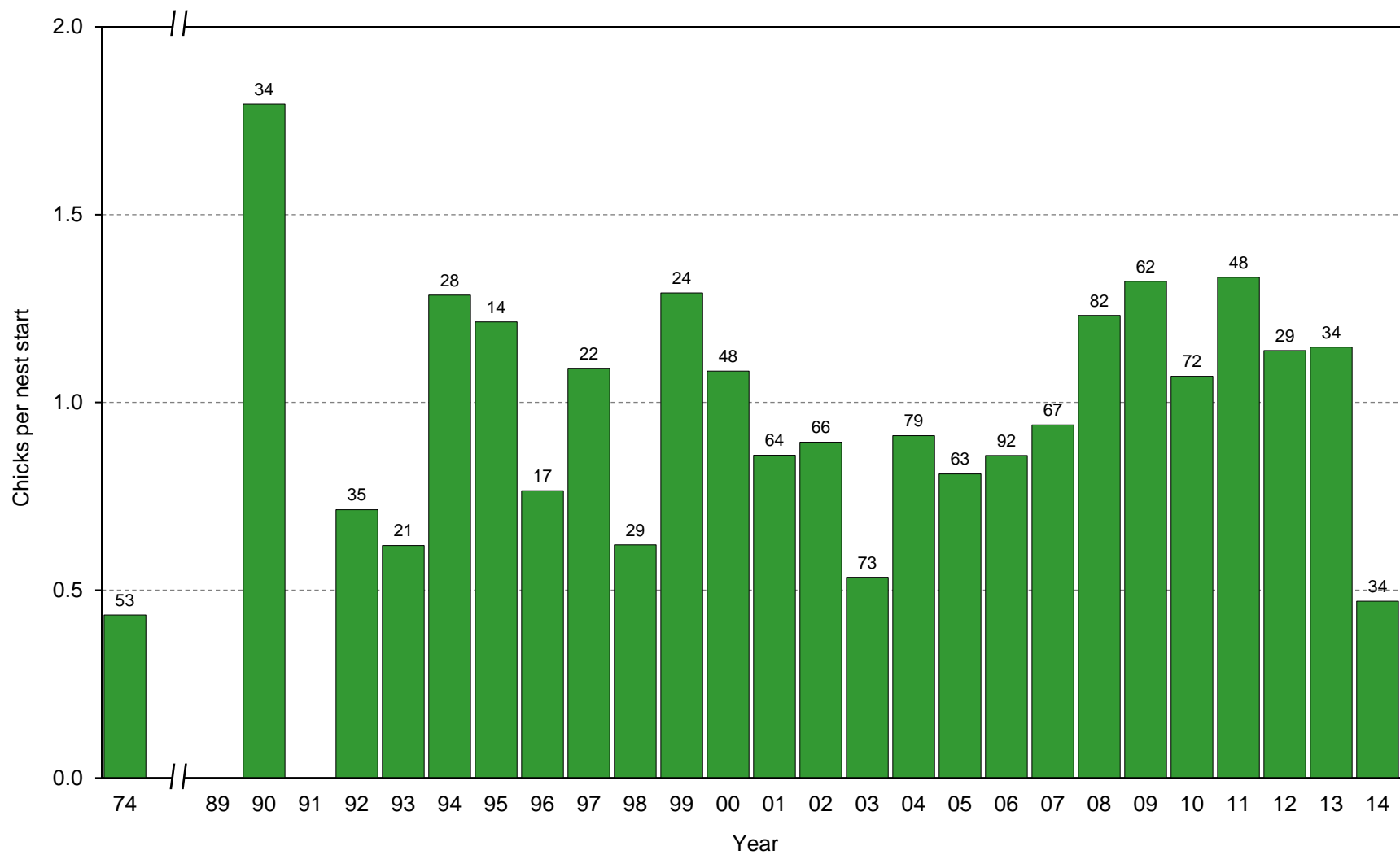


Figure 76. Reproductive performance of pelagic cormorants at Buldir Island, Alaska. Success is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A). No data were collected in 1975-1988, 1991, or 2015-2017.

Table 112. Reproductive performance of pelagic cormorants at Buldir Island, Alaska. Success is determined by a Boom-or-Bust methodology, using 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. Data include only cormorant nests from East Main Talus through Kittiwake Lane. No data were collected in 1975-1988, 1991, or 2015-2017.

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 max. nest count	Date(s) of max. chick count
		1	2	3	4							
1974 ^c	53	-	-	-	-	-	23	-	0.69 ^d	0.43	?	19 Aug
1989 ^c	37	-	-	-	-	-	-	-	-	-	16 Jun	-
1990	34	4	12	11	0	27	61	2.3	0.79	1.79	13 Aug	13 Aug
1992	35	0	5	5	0	10	25	2.5	0.29	0.71	11 Jun	2 Aug
1993	21	3	2	2	0	7	13	1.9	0.33	0.62	12 Jun	19 Aug
1994	28	6	6	6	0	18	36	2.0	0.64	1.29	15 Jun	9 Aug
1995	14	3	4	2	0	9	17	1.9	0.64	1.21	13 Jun	10 Aug
1996	17	3	5	0	0	8	13	1.6	0.47	0.76	1 Aug	5 Aug
1997	22	0	3	6	-	9	24	2.7	0.41	1.09	25 May	10 Aug
1998	29	0	6	2	-	8	18	2.3	0.28	0.62	22 Jun	7 Aug
1999	24	2	8	5	-	15	31	2.1	0.63	1.29	24 Jun	12 Aug
2000	48	8	10	0	-	25	52	2.1	0.52	1.08	6 Jun	4 Aug
2001	64	9	18	3	-	33	55	1.7	0.52	0.86	10 Jun	29 Aug
2002	66	9	19	4	-	32	59	1.8	0.48	0.89	16 Jun	5 Jul
2003	73	8	11	3	-	22	39	1.8	0.30	0.53	13 Jun	1 Aug
2004	79	2	15	12	1	30	72	2.4	0.38	0.91	27 Jun	3 Aug
2005	63	4	10	4	-	23	51	2.2	0.37	0.81	8 Jun	7 Aug
2006	92	8	17	11	1	37	79	2.1	0.40	0.86	17 Jun	4 Aug
2007	67	6	9	10	0	25	63	2.5	0.37	0.94	25 May	14 Aug
2008	82	2	25	15	1	47	101	2.1	0.57	1.23	10 Jun	6 Aug
2009	62	2	12	14	0	34	82	2.4	0.55	1.32	23 Jun	11 Aug
2010	72	5	17	10	0	33	77	2.3	0.46	1.07	23 Jun	12 Aug
2011	48	6	14	10	0	30	64	2.1	0.63	1.33	11 Jun	15 Aug
2012	29	4	7	5	0	16	33	2.1	0.55	1.14	7 Jun	5 Aug
2013	34	5	9	4	1	19	39	2.1	0.56	1.15	24 Jun	21 Aug
2014	34	5	4	1	0	10	16	1.6	0.29	0.47	15 Jun	17 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.

^cNest contents were not recorded in 1974 or 1989; data from 1974 from Byrd (1978).

^dFrom a subsample of 16 nests.

Table 113. Numbers of birds detected during off-road point count survey (route 315) at Buldir Island, Alaska. Data represent only individuals observed from survey points and do not include birds flying over census area; asterisks indicate species observed between points along the route but not at actual survey points. No counts were conducted in 1999-2000, 2004, 2007-2010, or after 2011.

Species	1995	1996	1997	1998	2001	2002	2003	2005	2006	2011
Aleutian cackling goose	133	112	85	22	70	2	76	-	31	-
Parasitic jaeger	2	2	8	5	1	2	1	0	8	0
Parakeet auklet	1	3	12	0	1	0	0	0	-	0
Tufted puffin	0	0	0	1	0	0	0	0	-	0
Glaucous-winged gull	60	142	161	66	18	20	34	-	54	2
Fork-tailed storm-petrel	6	0	1	1	0	0	0	0	-	0
Leach's storm-petrel	0	1	0	0	0	0	0	0	-	0
Bald eagle	1	0	0	0	0	0	0	0	0	0
Peregrine falcon	0	0	0	0	0	0	0	0	1	0
Pacific wren	1	6	9	1	5	4	7	3	3	6
Brambling	0	0	0	0	0	0	0	0	1	0
Gray-crowned rosy finch	2	4	1	9	1	5	0	7	4	9
Common rosefinch	0	0	1	0	0	0	0	0	0	0
Lapland longspur - total	30	26	22	14	18	31	18	22	30	9
male	24	22	17	11	-	-	13	17	-	3
female	5	3	3	0	-	-	0	5	-	0
unknown	1	1	2	3	18	31	5	0	-	6
Snow bunting	9	6	14	1	2	8	0	11	11	3
Song sparrow	10	10	8	3	2	1	2	9	5	5
Date	8 Jun	9 Jun	12 Jun	18 Jun	12 Jun	17 Jun	14 Jun	15 Jun	15 Jun	15 Jun
Survey design ^a	xx ^b	xx	xx	xx	xx	xx	xx	xx	xx	B

^aA=5-minute counts, < and > 50m; B=5-minute counts, distance estimation out to 400m.

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

Table 114. Mean numbers of birds detected on beach transect surveys along North Bight Beach, Buldir Island, Alaska. Data represent species' presence but not necessarily absence in all years. No counts were conducted in 2003-2004.

Species	1997	1998	1999	2000	2001	2002	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Harlequin duck	N/A ^a	N/A	xx ^b	N/A	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	0	N/A	N/A	N/A
Horned grebe	0	0	xx	0	0	0	<1	0	0	0	0	0	0	0	0	0	N/A	N/A	N/A
Lesser sand (Mongolian) plover	0	0	xx	<1	0	0	0	0	0	<1	0	0	0	0	0	0	1	<1	0
Common ringed plover	0	0	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	0
Whimbrel	0	0	xx	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	3	0
Bar-tailed godwit	0	0	xx	0	<1	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Ruddy turnstone	0	0	xx	<1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Red-necked stint	0	0	xx	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	2	0
Dunlin	0	<1	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock sandpiper	0	<1	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common sandpiper	0	0	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Wandering tattler	0	0	xx	<1	0	0	0	0	0	0	1	0	0	0	<1	0	0	<1	0
Wood sandpiper	0	0	xx	0	0	0	1	0	0	0	0	0	0	0	<1	0	2	<1	<1
Parasitic jaeger	0	0	xx	0	0	0	0	0	0	0	<1	0	0	0	0	0	N/A	N/A	N/A
Black-backed woodpecker	0	<1	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific wren	2	2	xx	3	4	5	2	3	7	6	3	8	8	7	7	6	7	3	9
Lanceolated warbler	0	0	xx	0	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0
Eastern yellow wagtail	0	1	xx	<1	<1	0	0	<1	0	0	0	1	0	0	0	0	0	0	0
Gray-crowned rosy finch	<1	1	xx	2	0	0	3	1	1	2	4	6	8	8	8	5	7	1	1
Lapland longspur	0	1	xx	1	<1	2	3	2	3	1	1	0	3	2	2	<1	0	1	1
Song sparrow	8	2	xx	3	3	2	5	4	9	6	8	6	11	7	7	5	8	3	3
<i>n</i>	5	5	xx	5	4	5	5	5	4	3	5	4	5	5	5	5	5	5	5
First survey	6 Jun	4 Jun	xx	5 Jun	1 Jun	8 Jun	7 Jun	2 Jun	7 Jun	4 Jun	2 Jun	1 Jun	6 Jun	7 Jun	7 Jun	4 Jun	4 Jun	30 May	29 May
Last survey	16 Jun	9 Jun	xx	12 Jun	14 Jun	14 Jun	16 Jun	12 Jun	14 Jun	8 Jun	14 Jun	13 Jun	19 Jun	15 Jun	13 Jun	10 Jun	11 Jun	5 Jun	2 Jun

^aN/A indicates species may not have been counted during surveys, so presence is unknown.

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

Table 115. Numbers of birds detected on beach transect along North Bight Beach, Buldir Island, Alaska in 2017.

Species	Date					Mean	SD
	29 May	30 May	31 May	1 Jun	2 Jun		
Common sandpiper	1	0	0	0	0	<1	<1
Wood sandpiper	0	0	0	1	0	<1	<1
Pacific wren	8	11	8	11	7	9	2
Gray-crowned rosy finch	0	2	0	3	0	1	1
Lapland longspur	0	1	2	2	0	1	1
Song sparrow	5	2	2	4	1	3	2
Start time (AKST)	0700	0727	0717	0745	0703	-	-
End time (AKST)	0725	0745	0744	0802	0723	-	-

Table 116. Mean numbers of individuals found and encounter rates during COASST surveys along Transect A, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (0.8 km for Transect A) divided by the number of surveys.

Species	2006		2007		2008		2009		2010		2011	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	0.3	1.3	-	-	-	-	-	-	-	-
Northern pintail	-	-	-	-	-	-	-	-	-	-	-	-
Greater scaup	-	-	-	-	-	-	-	-	-	-	0.2	1.0
Common eider	-	-	-	-	0.3	0.3	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.2	1.8	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.2	1.5	0.3	1.3	-	-
Unidentified murre	-	-	-	-	-	-	-	-	-	-	-	-
Pigeon guillemot	-	-	0.5	0.6	-	-	-	-	-	-	-	-
Ancient murrelet	-	-	-	-	0.5	0.9	0.4	0.5	0.2	0.2	-	-
Cassin's auklet	-	-	-	-	-	-	-	-	-	-	-	-
Parakeet auklet	-	-	0.3	0.3	0.5	0.6	0.4	0.5	0.2	0.2	0.2	0.3
Least auklet	-	-	-	-	-	-	-	-	0.3	0.6	-	-
Whiskered auklet	-	-	-	-	-	-	-	-	-	-	-	-
Crested auklet	1.0	1.3	-	-	-	-	-	-	-	-	-	-
Unidentified auklet	-	-	-	-	0.5	0.9	-	-	-	-	0.2	0.8
Horned puffin	-	-	-	-	-	-	0.2	0.5	0.2	0.6	0.2	1.0
Tufted puffin	1.0	1.3	0.5	0.6	-	-	0.8	2.0	-	-	-	-
Unidentified alcid	-	-	0.5	0.6	-	-	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	-	-	-	-	0.3	0.4	-	-
Herring gull	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Glaucous-winged gull	-	-	-	-	1.8	4.4	1.4	7.0	0.2	0.8	0.2	0.5
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	1.0	1.3	0.3	0.6	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	0.2	1.8	-	-	-	-
Northern fulmar	1.0	1.3	-	-	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	0.3	0.8	-	-
Leach's storm-petrel	-	-	-	-	-	-	0.2	0.3	0.5	0.6	-	-
Red-faced cormorant	-	-	0.3	0.9	-	-	0.2	1.3	-	-	-	-
Pelagic cormorant	-	-	0.3	0.6	0.3	0.9	0.6	3.5	0.2	0.4	-	-
Unidentified cormorant	-	-	0.3	0.3	-	-	-	-	-	-	0.2	0.3
Unidentified bird	-	-	-	-	-	-	-	-	-	-	-	-
All species	4.0	5.0	3.0	6.6	3.8	8.1	4.6	18.8	2.8	6.3	1.2	3.8
<i>n</i>	1		4		5		5		6		5	
First survey	15 Aug		7 Jun		31 May		4 Jun		5 Jun		10 Jun	
Last survey	-		25 Aug		2 Aug		19 Aug		20 Aug		17 Aug	

Table 116 (continued). Mean numbers of individuals found and encounter rates during COASST surveys along Transect A, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (0.8 km for Transect A) divided by the number of surveys.

Species	2012		2013		2014		2015		2016		2017	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	-	-	-	-	-	-	-	-	0.2	0.8
Northern pintail	-	-	-	-	-	-	-	-	-	-	0.2	1.0
Greater scaup	-	-	-	-	-	-	-	-	-	-	0.2	0.8
Common eider	-	-	-	-	0.2	0.5	-	-	0.2	0.2	0.2	0.8
Common murre	-	-	-	-	-	-	-	-	0.3	1.3	-	-
Thick-billed murre	-	-	-	-	-	-	0.0	0.3	0.2	0.2	0.3	0.8
Unidentified murre	0.2	0.2	0.3	1.3	-	-	-	-	-	-	-	-
Pigeon guillemot	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Ancient murrelet	1.1	1.5	-	-	-	-	0.2	0.3	0.8	1.9	1.0	2.3
Cassin's auklet	-	-	-	-	-	-	-	-	-	-	0.2	0.6
Parakeet auklet	0.6	1.3	-	-	0.2	0.8	0.4	1.0	0.8	1.9	2.2	4.8
Least auklet	-	-	-	-	-	-	-	-	-	-	0.2	0.6
Whiskered auklet	-	-	-	-	-	-	0.2	0.3	0.3	0.4	0.7	0.8
Crested auklet	-	-	-	-	-	-	-	-	0.3	1.3	0.5	1.0
Unidentified auklet	0.2	0.3	-	-	0.2	0.3	0.8	1.0	0.3	0.8	1.5	4.6
Horned puffin	-	-	-	-	-	-	-	-	-	-	0.2	0.6
Tufted puffin	0.2	0.5	0.5	0.9	0.2	0.3	0.4	1.3	-	-	-	-
Unidentified alcid	-	-	-	-	-	-	-	-	-	-	-	-
Black-legged kittiwake	-	-	0.8	1.3	-	-	0.2	1.0	0.2	0.4	0.2	0.8
Herring gull	-	-	-	-	-	-	0.2	0.8	-	-	-	-
Glaucous-winged gull	1.4	3.3	0.3	0.9	1.6	2.3	0.6	2.3	0.7	1.7	0.2	1.0
Large immature gull	-	-	-	-	-	-	0.4	1.5	0.2	1.3	0.2	0.4
Unidentified gull	-	-	-	-	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	-	-	-	-	0.2	1.0
Northern fulmar	0.2	0.3	-	-	-	-	0.2	0.3	0.2	1.3	-	-
Short-tailed shearwater	-	-	-	-	-	-	0.2	0.3	-	-	-	-
Unidentified shearwater	-	-	-	-	-	-	0.2	0.3	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	0.2	0.3	0.2	0.6	0.3	1.3
Leach's storm-petrel	-	-	-	-	-	-	-	-	0.3	1.3	0.8	1.3
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	-	-
Pelagic cormorant	-	-	-	-	-	-	-	-	-	-	0.2	0.8
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified bird	-	-	-	-	-	-	0.4	1.3	-	-	-	-
All species	3.6	7.3	1.8	4.4	2.4	4.2	4.6	11.8	5.2	14.6	9.3	26.5
<i>n</i>	5		4		6		5		6		6	
First survey	1 Jun		8 Jun		15 Jun		8 Jun		30 May		31 May	
Last survey	9 Aug		8 Aug		11 Aug		3 Aug		16 Aug		17 Aug	

Table 117. Mean numbers of individuals found and encounter rates during COASST surveys along Transect B, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (0.5 km for Transect B) divided by the number of surveys.

Species	2006		2007		2008		2009		2010		2011	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	0.2	0.8	-	-	-	-	0.2	1.2	0.2	0.2	0.2	0.8
Greater scaup	-	-	-	-	-	-	-	-	-	-	-	-
Common eider	-	-	-	-	-	-	-	-	0.3	0.4	-	-
Harlequin duck	-	-	-	-	0.3	1.0	-	-	-	-	-	-
Common merganser	-	-	-	-	-	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-	-	-	-	0.2	0.5
Red-necked grebe	-	-	-	-	-	-	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.4	3.2	0.7	1.7	0.4	1.5
Unidentified murre	-	-	-	-	-	-	0.4	3.2	0.2	0.2	-	-
Ancient murrelet	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Parakeet auklet	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Whiskered auklet	-	-	-	-	-	-	-	-	-	-	0.2	0.3
Crested auklet	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified auklet	-	-	-	-	-	-	-	-	-	-	-	-
Horned puffin	-	-	-	-	-	-	0.2	0.8	-	-	-	-
Tufted puffin	-	-	-	-	-	-	0.4	2.0	-	-	0.2	0.3
Unidentified alcid	-	-	-	-	-	-	-	-	-	-	-	-
Black-legged kittiwake	0.2	0.4	-	-	-	-	0.4	1.6	-	-	-	-
Red-legged kittiwake	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified kittiwake	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Black-headed gull	-	-	-	-	-	-	-	-	-	-	-	-
Herring gull	-	-	-	-	-	-	-	-	-	-	-	-
Glaucous-winged gull	1.2	2.4	1.0	3.0	0.5	1.5	2.6	18.4	1.3	4.0	1.4	3.5
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	-	-	0.3	0.5	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Northern fulmar	0.2	0.4	0.3	1.5	-	-	0.4	3.6	0.3	0.4	-	-
Short-tailed shearwater	0.2	0.4	-	-	-	-	0.2	1.2	0.2	0.2	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	0.3	1.0	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-
Red-faced cormorant	-	-	-	-	0.3	1.0	-	-	-	-	0.2	0.3
Pelagic cormorant	-	-	-	-	0.3	1.0	0.2	2.0	0.2	0.2	0.2	0.8
Unidentified cormorant	0.2	0.4	0.3	1.5	0.3	1.0	-	-	-	-	-	-
Peregrine falcon	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified bird	-	-	0.3	0.5	-	-	-	-	-	-	-	-
All species	2.2	4.8	2.0	7.0	1.5	5.0	6.2	38.8	3.8	8.5	3.0	7.8
<i>n</i>	5		4		4		5		6		5	
First survey	17 Jun		7 Jun		31 May		4 Jun		5 Jun		10 Jun	
Last survey	15 Aug		25 Aug		2 Aug		19 Aug		20 Aug		17 Aug	

Table 117 (continued). Mean numbers of individuals found and encounter rates during COASST surveys along Transect B, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (0.5 km for Transect B) divided by the number of surveys.

Species	2012		2013		2014		2015		2016		2017	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	0.2	0.3	-	-	-	-	0.2	2.0	-	-	0.5	2.7
Greater scaup	-	-	-	-	-	-	0.2	1.2	-	-	-	-
Common eider	-	-	-	-	-	-	-	-	0.2	1.7	-	-
Harlequin duck	-	-	-	-	-	-	0.2	0.8	-	-	0.2	1.3
Common merganser	-	-	-	-	-	-	-	-	0.2	2.0	-	-
Red-breasted merganser	-	-	-	-	0.2	0.4	0.2	0.4	-	-	-	-
Red-necked grebe	0.2	0.3	-	-	-	-	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.4	1.2	0.2	0.7	-	-
Unidentified murre	-	-	-	-	-	-	-	-	0.3	2.0	0.2	1.7
Ancient murrelet	-	-	-	-	-	-	0.4	0.8	1.0	3.3	2.3	10.3
Parakeet auklet	-	-	0.3	0.5	0.2	0.4	0.6	1.6	1.3	4.7	1.8	5.7
Whiskered auklet	-	-	-	-	-	-	0.2	0.4	1.3	3.3	4.7	10.7
Crested auklet	-	-	-	-	-	-	0.2	0.4	0.5	1.7	1.5	3.3
Unidentified auklet	-	-	-	-	0.8	3.6	1.4	3.2	1.8	5.0	6.3	15.0
Horned puffin	-	-	0.3	0.5	-	-	-	-	0.2	0.3	-	-
Tufted puffin	-	-	0.3	0.5	-	-	0.4	1.2	-	-	0.2	1.0
Unidentified alcid	-	-	-	-	-	-	-	-	0.2	0.7	0.2	0.3
Black-legged kittiwake	-	-	0.3	0.5	0.2	0.4	-	-	0.8	5.0	0.5	3.3
Red-legged kittiwake	-	-	-	-	-	-	-	-	0.2	1.3	-	-
Unidentified kittiwake	-	-	-	-	-	-	-	-	-	-	-	-
Black-headed gull	-	-	-	-	-	-	0.2	0.8	-	-	-	-
Herring gull	-	-	-	-	-	-	0.0	0.8	-	-	-	-
Glaucous-winged gull	3.6	10.8	2.5	9.5	1.3	5.6	1.0	4.0	1.5	8.7	1.5	12.0
Large immature gull	-	-	-	-	-	-	1.6	4.8	0.8	4.3	0.2	1.0
Unidentified gull	-	-	-	-	-	-	-	-	-	-	0.7	3.3
Laysan albatross	-	-	-	-	-	-	-	-	-	-	-	-
Northern fulmar	0.2	0.3	-	-	-	-	-	-	0.2	1.3	0.2	0.3
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	0.3	2.7
Unidentified shearwater	-	-	-	-	-	-	0.2	1.2	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	0.4	0.8	0.2	0.3	0.2	0.3
Leach's storm-petrel	-	-	-	-	-	-	0.6	1.2	0.7	1.7	0.7	1.7
Unidentified storm-petrel	-	-	-	-	-	-	-	-	-	-	0.2	0.3
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	-	-
Pelagic cormorant	-	-	0.3	0.5	-	-	-	-	-	-	0.2	2.0
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	-	-	0.2	0.8	-	-	0.2	1.3	-	-
Unidentified bird	-	-	-	-	0.2	0.4	0.4	0.8	-	-	-	-
All species	4.2	12.0	3.8	11.0	2.6	11.6	9.0	28.0	12.0	49.3	22.3	79.0
<i>n</i>	5		4		5		5		6		6	
First survey	1 Jun		8 Jun		14 Jun		8 Jun		30 May		1 Jun	
Last survey	9 Aug		8 Aug		11 Aug		3 Aug		17 Aug		15 Aug	

Table 118. Mean numbers of individuals found and encounter rates during COASST surveys along Transect C, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Transect C) divided by the number of surveys.

Species	2006		2007		2008		2009		2010		2011	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	-	-	0.3	0.8	-	-	0.3	0.4	-	-
Ancient murrelet	-	-	-	-	0.3	0.5	-	-	0.2	0.4	-	-
Cassin's auklet	-	-	-	-	-	-	-	-	-	-	-	-
Parakeet auklet	-	-	0.3	0.3	0.3	0.3	-	-	-	-	-	-
Whiskered auklet	-	-	-	-	-	-	-	-	-	-	-	-
Crested auklet	-	-	-	-	1.0	2.0	-	-	0.3	0.8	-	-
Unidentified auklet	-	-	-	-	1.3	2.3	-	-	-	-	-	-
Horned puffin	-	-	-	-	-	-	0.2	1.0	-	-	-	-
Tufted puffin	-	-	-	-	0.5	1.0	-	-	-	-	-	-
Unidentified puffin	-	-	0.5	0.5	0.3	0.5	-	-	-	-	-	-
Black-legged kittiwake	-	-	0.3	0.5	-	-	-	-	-	-	-	-
Red-legged kittiwake	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Unidentified kittiwake	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Glaucous-winged gull	1.0	1.0	0.3	0.8	0.3	0.5	0.4	0.6	0.2	0.2	0.4	0.5
Glaucous gull	-	-	-	-	-	-	-	-	-	-	-	-
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	-	-	0.3	0.8	-	-	-	-	-	-	-	-
Northern fulmar	-	-	-	-	-	-	-	-	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-
Pelagic cormorant	-	-	-	-	-	-	0.2	0.2	-	-	0.2	0.8
Unidentified cormorant	-	-	0.5	0.5	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	0.5	1.3	-	-	-	-	-	-	-	-
Unidentified bird	-	-	-	-	-	-	-	-	-	-	-	-
All species	1.0	1.0	2.5	4.5	4.0	7.8	0.8	1.8	1.3	2.3	0.6	1.3
<i>n</i>	1		4		4		5		6		5	
First survey	15 Aug		13 Jun		31 May		4 Jun		5 Jun		11 Jun	
Last survey	-		20 Aug		2 Aug		19 Aug		20 Aug		17 Aug	

Table 118 (continued). Mean numbers of individuals found and encounter rates during COASST surveys along Transect C, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Transect C) divided by the number of surveys.

Species	2012		2013		2014		2015		2016		2017	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	-	-	-	-	0.2	0.4	-	-	-	-
Ancient murrelet	-	-	-	-	-	-	-	-	-	-	0.7	0.8
Cassin's auklet	-	-	-	-	-	-	-	-	0.2	0.2	0.3	0.7
Parakeet auklet	-	-	-	-	0.2	0.2	1.0	2.4	-	-	0.2	0.5
Whiskered auklet	-	-	-	-	-	-	-	-	0.2	0.4	1.3	1.5
Crested auklet	0.2	0.2	-	-	-	-	1.0	1.4	1.0	1.4	0.8	1.2
Unidentified auklet	-	-	-	-	0.8	1.4	-	-	1.4	4.4	2.7	3.0
Horned puffin	0.4	0.4	-	-	-	-	0.2	0.2	0.4	1.2	-	-
Tufted puffin	-	-	-	-	0.4	0.8	0.6	1.8	0.2	0.6	0.2	0.8
Unidentified puffin	-	-	-	-	-	-	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	-	-	-	-	-	-	0.2	0.2
Red-legged kittiwake	-	-	-	-	-	-	-	-	-	-	0.2	0.2
Unidentified kittiwake	-	-	-	-	-	-	-	-	-	-	-	-
Glaucous-winged gull	0.6	0.6	0.5	1.3	1.8	2.8	0.2	0.8	1.2	1.6	0.5	0.8
Glaucous gull	-	-	-	-	-	-	-	-	0.2	0.8	-	-
Large immature gull	-	-	-	-	-	-	-	-	0.2	0.4	-	-
Unidentified gull	-	-	-	-	-	-	-	-	-	-	-	-
Northern fulmar	-	-	-	-	-	-	0.4	1.2	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	0.2	0.2	0.2	0.2	0.2	0.2
Pelagic cormorant	-	-	-	-	-	-	-	-	0.2	0.6	0.2	0.8
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	-	-	0.2	0.8	-	-	-	-	-	-
Unidentified bird	-	-	-	-	0.2	0.2	-	-	-	-	-	-
All species	1.2	1.2	0.5	1.3	3.6	6.2	3.8	8.4	5.4	11.8	7.3	10.7
<i>n</i>	5		4		5		5		5		6	
First survey	1 Jun		8 Jun		15 Jun		8 Jun		6 Jun		2 Jun	
Last survey	9 Aug		12 Aug		12 Aug		3 Aug		18 Aug		17 Aug	

Table 119. Mean numbers of individuals found and encounter rates during COASST surveys along Transect D, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Transect D) divided by the number of surveys. No surveys were conducted after 2010.

Species	2006		2007		2008		2009		2010	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	0.5	1.0	-	-	0.3	0.7	0.2	0.2
Common murre	1.0	1.0	-	-	-	-	-	-	-	-
Thick-billed murre	-	-	2.0	2.5	1.0	2.0	2.3	3.3	2.8	7.1
Unidentified murre	-	-	-	-	-	-	0.7	1.0	-	-
Ancient murrelet	-	-	0.5	0.5	0.3	0.3	-	-	-	-
Cassin's auklet	-	-	-	-	0.3	0.3	-	-	-	-
Parakeet auklet	1.0	1.0	1.0	1.0	1.0	1.3	2.0	2.0	3.2	6.7
Crested auklet	-	-	-	-	0.3	0.7	0.7	0.7	0.2	0.2
Unidentified auklet	-	-	-	-	0.3	0.7	-	-	-	-
Horned puffin	-	-	-	-	0.3	0.3	0.3	0.7	0.5	1.0
Tufted puffin	1.0	1.0	0.5	0.5	0.7	0.7	-	-	-	-
Unidentified alcid	-	-	2.5	2.5	1.0	0.7	-	-	-	-
Black-legged kittiwake	3.5	3.5	5.0	6.0	6.3	11.3	3.3	6.3	8.2	13.5
Red-legged kittiwake	-	-	-	-	1.0	1.7	-	-	0.5	0.8
Unidentified kittiwake	0.5	1.0	-	-	-	-	-	-	-	-
Glaucous-winged gull	0.5	0.5	-	-	0.7	0.7	0.3	0.7	0.5	1.3
Unidentified gull	-	-	1.0	1.0	-	-	-	-	-	-
Northern fulmar	-	-	-	-	0.3	0.3	1.0	1.3	0.2	0.6
Fork-tailed storm-petrel	-	-	-	-	0.3	0.7	-	-	0.2	0.4
Leach's storm-petrel	-	-	-	-	-	-	-	-	0.2	0.2
Pelagic cormorant	-	-	0.5	1.0	-	-	0.3	0.3	-	-
Unidentified cormorant	-	-	0.5	1.0	-	-	-	-	-	-
Bald eagle	-	-	0.5	1.0	-	-	-	-	-	-
All species	7.5	7.5	14.5	17.5	14.0	22.7	11.3	17.0	16.5	32.1
<i>n</i>	2		2		3		3		6	
First survey	12 Jun		11 Jun		16 Jun		5 Jun		11 Jun	
Last survey	17 Aug		11 Jul		29 Jul		1 Aug		21 Aug	

Table 120. Mean numbers of individuals found and encounter rates during COASST surveys along Transect E, Buldir Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and does not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1.4 km for Transect E) divided by the number of surveys. No surveys were conducted after 2014.

Species	2006		2007		2008		2009		2010		2011		2012		2013		2014	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Aleutian cackling goose	-	-	-	-	0.3	0.2	0.5	0.4	0.7	2.1	-	-	-	-	-	-	-	-
Parasitic jaeger	-	-	-	-	-	-	0.5	0.4	-	-	-	-	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.5	0.4	-	-	-	-	-	-	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.5	0.4	-	-	-	-	-	-	-	-	-	-
Ancient murrelet	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	-
Parakeet auklet	-	-	-	-	0.3	0.7	-	-	1.0	1.3	-	-	0.3	0.2	0.3	0.2	-	-
Crested auklet	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	-	-	-	-
Unidentified auklet	-	-	-	-	0.7	0.7	-	-	-	-	-	-	-	-	-	-	-	-
Horned puffin	-	-	1.0	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tufted puffin	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	0.5	0.7
Unidentified alcid	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	0.5	0.7
Glaucous-winged gull	-	-	-	-	-	-	-	-	-	-	0.3	0.4	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	-	-	-	-
Northern fulmar	-	-	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	1.0	0.7	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	0.3	0.4	-	-	-	-	-	-
Pelagic cormorant	-	-	1.0	0.7	0.3	0.7	-	-	0.2	0.4	-	-	0.3	0.2	-	-	0.5	0.7
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	-	-
All species	1.0	0.7	1.0	1.4	1.7	2.4	2.0	1.4	2.8	5.4	0.7	0.8	1.3	1.0	1.0	0.7	1.5	2.1
<i>n</i>	1		1		3		2		6		3		3		4		5	
First survey	15 Aug		5 Jun		2 Jun		11 Jun		6 Jun		7 Jun		1 Jun		10 Jun		7 Jun	
Last survey	-		-		12 Jul		4 Jul		17 Aug		15 Aug		5 Aug		12 Aug		17 Aug	

Table 121. Numbers of birds found during COASST surveys along Transect A, Buldir Island, Alaska in 2017. Data represent numbers of new individuals found each survey; numbers of birds still present and re-encountered on each survey are shown parentheses.

Species	Date						Individuals ^a			Encounters ^b	
	31 May	19 Jun	1 Jul	17-18 Jul	5 Aug	17 Aug	Total	Mean	SD	Total	Enc. rate ^c
Aleutian cackling goose	0 (0)	1 (0)	0 (0)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	4	0.8
Northern pintail	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	1.0
Greater scaup	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	4	0.8
Common eider	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	4	0.8
Thick-billed murre	0 (0)	0 (0)	0 (0)	1 (0)	1 (1)	0 (1)	2	0.3	0.5	4	0.8
Ancient murrelet	0 (0)	0 (0)	2 (0)	2 (1)	1 (1)	1 (3)	6	1.0	0.9	11	2.3
Cassin's auklet	0 (0)	0 (0)	1 (0)	0 (1)	0 (0)	0 (1)	1	0.2	0.4	3	0.6
Parakeet auklet	0 (0)	0 (0)	4 (0)	2 (3)	5 (2)	2 (5)	13	2.2	2.0	23	4.8
Least auklet	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	0 (0)	1	0.2	0.4	3	0.6
Whiskered auklet	0 (0)	0 (0)	0 (0)	0 (0)	4 (0)	0 (0)	4	0.7	1.6	4	0.8
Crested auklet	0 (0)	0 (0)	0 (0)	3 (0)	0 (1)	0 (1)	3	0.5	1.2	5	1.0
Unidentified auklet	3 (0)	0 (2)	1 (1)	1 (4)	0 (3)	4 (3)	9	1.5	1.6	22	4.6
Horned puffin	0 (0)	0 (0)	1 (0)	0 (0)	0 (1)	0 (1)	1	0.2	0.4	3	0.6
Black-legged kittiwake	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	4	0.8
Glaucous-winged gull	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	1.0
Large immature gull	0 (0)	0 (0)	0 (0)	1 (0)	0 (1)	0 (0)	1	0.2	0.4	2	0.4
Laysan albatross	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	1.0
Fork-tailed storm-petrel	0 (0)	0 (0)	2 (0)	0 (2)	0 (1)	0 (1)	2	0.3	0.8	6	1.3
Leach's storm-petrel	1 (0)	0 (1)	1 (0)	1 (0)	0 (0)	2 (0)	5	0.8	0.8	6	1.3
Pelagic cormorant	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	4	0.8
Total new individuals	4	4	17	11	11	9	56	9.3	0.9	-	-
Total encounters	4	7	21	31	31	33	-	-	-	127	26.5

^aIndividuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.

^bEncounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.

^cEncounter rate = number of birds encountered / km beach surveyed (0.8 km for Transect A) / number of surveys.

Table 122. Numbers of birds found during COASST surveys along Transect B, Buldir Island, Alaska in 2017. Data represent numbers of new individuals found each survey; numbers of birds still present and re-encountered on each survey are shown parentheses.

Species	Date						Individuals ^a			Encounters ^b	
	1 Jun	22 Jun	1 Jul	18 Jul	31 Jul	15 Aug	Total	Mean	SD	Total	Enc. rate ^c
Aleutian cackling goose	1 (0)	0 (1)	0 (1)	0 (1)	1 (1)	1 (1)	3	0.5	0.5	8	2.7
Harlequin duck	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (0)	1	0.2	0.4	4	1.3
Unidentified murre	1 (0)	0 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	1.7
Ancient murrelet	0 (0)	2 (0)	2 (2)	4 (3)	5 (6)	1 (6)	14	2.3	1.9	31	10.3
Parakeet auklet	0 (0)	2 (0)	0 (2)	2 (2)	6 (0)	1 (2)	11	1.8	2.2	17	5.7
Whiskered auklet	0 (0)	0 (0)	0 (0)	0 (0)	17 (0)	11 (4)	28	4.7	7.5	32	10.7
Crested auklet	1 (0)	0 (0)	0 (0)	3 (0)	5 (0)	0 (1)	9	1.5	2.1	10	3.3
Unknown auklet	0 (0)	0 (0)	4 (0)	3 (2)	9 (3)	22 (2)	38	6.3	8.4	45	15.0
Tufted puffin	0 (0)	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	1	0.2	0.4	3	1.0
Unidentified alcid	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	1	0.2	0.4	1	0.3
Black-legged kittiwake	1 (0)	1 (1)	0 (2)	1 (1)	0 (2)	0 (1)	3	0.5	0.5	10	3.3
Glaucous-winged gull	2 (0)	3 (2)	1 (5)	2 (5)	1 (8)	0 (7)	9	1.5	1.0	36	12.0
Large immature gull	0 (0)	0 (0)	0 (0)	1 (0)	0 (1)	0 (1)	1	0.2	0.4	3	1.0
Unidentified gull	1 (0)	0 (1)	1 (1)	1 (0)	1 (1)	0 (3)	4	0.7	0.5	10	3.3
Northern fulmar	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1	0.2	0.4	1	0.3
Short-tailed shearwater	0 (0)	0 (0)	2 (0)	0 (2)	0 (2)	0 (2)	2	0.3	0.8	8	2.7
Fork-tailed storm-petrel	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	1	0.2	0.4	1	0.3
Leach's storm-petrel	1 (0)	0 (0)	0 (1)	0 (0)	2 (0)	1 (0)	4	0.7	0.8	5	1.7
Unidentified storm-petrel	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1	0.2	0.4	1	0.3
Pelagic cormorant	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	6	2.0
Total new individuals	10	10	10	18	48	38	134	22.3	2.9	-	-
Total encounters	10	16	17	37	76	71	-	-	-	237	79

^aIndividuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.

^bEncounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.

^cEncounter rate = number of birds encountered / km beach surveyed (0.5 km for Transect B) / number of surveys.

Table 123. Numbers of birds found during COASST surveys along Transect C, Buldir Island, Alaska in 2017. Data represent numbers of new individuals found each survey; numbers of birds still present and re-encountered on each survey are shown parentheses.

Species	Date						Individuals ^a			Encounters ^b	
	2 Jun	22 Jun	1 Jul	17 Jul	5 Aug	17 Aug	Total	Mean	SD	Total	Enc. rate ^c
Ancient murrelet	1 (0)	0 (0)	0 (0)	2 (0)	1 (0)	0 (1)	4	0.7	0.8	5	0.8
Cassin's auklet	0 (0)	0 (0)	0 (0)	1 (0)	1 (1)	0 (1)	2	0.3	0.5	4	0.7
Parakeet auklet	1 (0)	0 (1)	0 (0)	0 (1)	0 (0)	0 (0)	1	0.2	0.4	3	0.5
Whiskered auklet	0 (0)	0 (0)	0 (0)	0 (0)	3 (0)	5 (1)	8	1.3	2.2	9	1.5
Crested auklet	1 (0)	0 (0)	2 (0)	2 (0)	0 (1)	0 (1)	5	0.8	1.0	7	1.2
Unidentified auklet	1 (0)	1 (0)	4 (1)	4 (0)	5 (0)	1 (1)	16	2.7	1.9	18	3.0
Tufted puffin	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	0.8
Black-legged kittiwake	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	1	0.2	0.4	1	0.2
Red-legged kittiwake	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)	1	0.2	0.4	1	0.2
Glaucous-winged gull	0 (0)	1 (0)	0 (0)	0 (0)	2 (0)	0 (2)	3	0.5	0.8	5	0.8
Leach's storm-petrel	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	1	0.2	0.4	1	0.2
Pelagic cormorant	0 (0)	1 (0)	0 (1)	0 (1)	0 (1)	0 (1)	1	0.2	0.4	5	0.8
Total new individuals	4	4	6	10	13	7	44	7.3	1.2	-	-
Total encounters	4	5	9	13	17	16	-	-	-	64	10.7

^aIndividuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.

^bEncounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.

^cEncounter rate = number of birds encountered / km beach surveyed (1 km for Transect C) / number of surveys.

Table 124. Numbers of sea otters counted at Buldir Island, Alaska. No counts were conducted in 1990-1991, 1993-1994, 1996, 2003-2004, or after 2009.

Year	Date(s)	Segment						Total	Survey type	Source
		A-B	B-C	C-D	D-E	E-F	F-A			
1959 ^a	19 May	0	0	0	0	0	0	0	aerial	?
1962 ^b	25-28 Jun	-	-	-	-	-	-	7	boat	Jones 1963
1963 ^c	7-19 Jul	14	-	-	-	-	-	14	boat	Kenyon 1969
1965	2 May	-	-	-	-	-	-	15	aerial	Kenyon 1969
1972 ^d	7 Jul	-	-	-	-	-	-	>27	boat	Byrd 1972
1974 ^e	18 Jul	-	-	-	-	-	20	>20	boat	G. V. Byrd, unpubl. data
1979 ^f	23-24 Jun	5	2	0	5	12	16	40	boat	Early et al. 1980
1988 ^g	26 Jun	-	-	-	-	-	-	95	boat	?
1989 ^h	13 Jun	11	14	3	13	14	3	58	boat	USFWS unpubl. data
1992	April	-	-	-	-	-	-	11	aerial	Evans et al. 1997
1995	28 Jun	0	0	2	0	0	0	2	boat	USFWS unpubl. data
1997	3 Jun	-	-	-	-	-	-	4	boat	USFWS unpubl. data
1998	13 Jun	0	1	5	3	1	0	10	boat	USFWS unpubl. data
1999	1 Jul	0	0	0	0	2	2	4	boat	USFWS unpubl. data
2000	20 Jun	0	0	0	0	5	0	5	boat	USFWS unpubl. data
2001	5 Jun	0	0	0	0	0	0	0	boat	USFWS unpubl. data
2002	2 Jul	0	0	0	6	0	1	7	boat	USFWS unpubl. data
2005	10 Jun	0	0	-	-	-	0 ⁱ	0	boat	USFWS unpubl. data
2006	7 Jun	0	0	0	0	0	0	0	boat	USFWS unpubl. data
2007	2 Jun	0	1	0	1	0	0	2	boat	USFWS unpubl. data
2008	3 Jun	0	0	0	0	0	0	0	boat	USFWS unpubl. data
2009	3 Jun	0	0	0	0	0	0	0	boat	USFWS unpubl. data

^aAerial count conducted in less than ideal conditions.

^bIncludes one male and three females with pups.

^cIncludes five females with pups and four lone adults along the north coast of the island (A-B and B-C).

^dPartial count by boat around Northwest Point only.

^ePartial count by boat.

^fIncludes 36 adults and 4 pups (1 pup each in segments A-B, D-E, E-F, F-A).

^gPartial count by boat from East Cape to Peregrine Point only (approximately C-D and D-E); includes 75 adults and 20 pups.

^hIncludes two pups.

ⁱPartial count by boat from A to Bull Point only.

Abundance categories are 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 of 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*). Casual migrant. Seen with a group of cackling geese in South Marsh in early June.

Bean goose sp. (*Anser fabalis* or *A.serrirostris*). Irregular migrant. Seen regularly in late May with groups of Aleutian cackling geese in North Marsh. Tundra Bean goose (*A. serrirostris*) is the expected species for the western Aleutians (Gibson and Byrd 2007).

Aleutian cackling goose (*Branta hutchinsii leucopareia*). Abundant breeder. Frequently observed during May and June; geese become much less conspicuous between mid-July and early August, however, when they are flightless and seek cover in dense vegetation. During this time, many leave low-lying areas in favor of higher elevation sites.

Northern shoveler (*Spatula clypeata*). Irregular migrant. One to two individuals were seen in Bean Goose Pond in late May, early June and once in mid-July.

Falcated duck (*Mareca falcata*). Accidental vagrant. A pair was flushed from North Marsh on 19 June. The male was clearly identified as a falcated duck; however we were unable to identify the female with him. This is the first known record of the species on island since annotated lists have been summarized in the report.

Eurasian wigeon (*Mareca penelope*). Uncommon to common spring migrant. Birds were observed frequently at Bean Goose Pond in early May and through most of June. A maximum of 10 birds were seen on 28 May and the last record was on 19 June.

Mallard (*Anas platyrhynchos*). Uncommon migrant and resident non-breeder. A maximum of four individuals were seen on 16 July and the last record was on 8 August.

Northern pintail (*Anas acuta*). Uncommon spring migrant and rare summer resident non-breeder. Birds were seen on Bean Goose Pond early in the season. A maximum of 10 birds were seen in June and the last record was 20 August.

Aleutian green-winged teal (*Anas crecca nimia*). Common migrant and rare summer resident breeder. Birds were common throughout May, June and July with only one record in August. A maximum of 30 were seen on 28 May and the last record was 20 August.

American green-winged teal (*Anas crecca carolinensis*). Accidental migrant. One male was seen on 23 June, and then on every trip to Bean Goose Pond until 16 July (Figure B1). This teal was seen hanging out with Aleutian green-winged teal as well as Aleutian cackling geese.

Tufted duck (*Aythya fuligula*). Irregular migrant. One individual was seen at the eastern spring in South Marsh on 17 June.

Greater scaup (*Aythya marila*). Uncommon migrant. Birds were seen frequently in late May and early June between North Bight Beach and Crested Point. A maximum of two birds were seen on 25 May and the last record was 4 June.

Common eider (*Somateria mollissima*). Common breeder. Birds were seen regularly throughout the season. Young chicks were observed into mid-August. Multiple broods of two to six were seen around the north of the island.

Harlequin duck (*Histrionicus histrionicus*). Common resident non-breeder. Single birds or pairs were commonly seen on near shore waters during May, June and July and less frequently in August.

Long-tailed duck (*Clangula hyemalis*). Casual migrant. A single bird was seen on several occasions off of North Bight Beach in late May and early June.

Red-breasted merganser (*Mergus serrator*). Uncommon resident non-breeder. Birds were seen sporadically between May and July.

Horned grebe (*Podiceps auritus*). Casual vagrant. An individual was seen off of North Bight Beach on 16 and 20 August.

Cuckoo sp. (*Cuculus canorus* or *C. optatus*). Rare vagrant. An individual was seen in South Marsh, then Glissade Valley several times in mid-June.

Whimbrel (*Numenius phaeopus*). Rare migrant. Seen several times upon arrival until 7 June.

Bar-tailed godwit (*Limosa lapponica*). Rare migrant. A pair was seen once on 12 July on the beach between North Bight Beach and Northwest Point.

Ruddy turnstone (*Arenaria interpres*). Uncommon spring and fairly common fall migrant. Individuals were seen in late May and early June on the beach by Northwest Point.

Long-toed stint (*Calidris subminuta*). Rare migrant. One individual was seen in South Marsh on 3 June.

Red-necked stint (*Calidris ruficollis*). Irregular vagrant. One individual was seen on North Bight Beach on 17 August (Figure B2).

Dunlin (*Calidris alpina*). Casual migrant. One individual was seen in South Marsh on 28 May.

Little stint (*Calidris minuta*). Casual vagrant. One individual was seen in North Marsh on 31 May (Figure B3).

Snipe sp. (*Gallinago sp.*). Rare migrant. One individual was seen in South Marsh on 28 May and 1 June. Common snipe (*Gallinago gallinago*) is the expected species in the western Aleutians (Gibson and Byrd 2007).

Common sandpiper (*Actitis hypoleucos*). Rare spring migrant. A bird was seen 29 May on North Bight Beach.

Gray-tailed tattler (*Tringa brevipes*). Irregular migrant. One individual was seen on North Bight Beach between Main Camp and Crested Point in mid-August (Figure B4).

Wandering tattler (*Tringa incana*). Uncommon migrant. Single birds were seen in late May and mid-June.

Wood sandpiper (*Tringa glareola*). Uncommon migrant. Seen in early-May and early to mid-June on North Bight Beach. An individual was also seen on 20 August in South Marsh.

Parasitic jaeger (*Stercorarius parasiticus*). Common breeder. Parasitic jaegers (all dark morph birds) were commonly observed throughout the island, with the greatest concentrations breeding at higher elevations.

Common murre (*Uria aalge*). Abundant breeder. Common murre nest sympatrically with thick-billed murre, but in much smaller numbers.

Thick-billed murre (*Uria lomvia*). Abundant breeder. This species nests in large colonies at East Cape, Kittiwake Lane, Spike Camp and on Middle and Outer Rocks.

Pigeon guillemot (*Cephus columba*). Uncommon breeder. Pigeon guillemots were regularly seen on near shore waters around the island. In mid- to late August juveniles were seen foraging near shore.

Ancient murrelet (*Synthliboramphus antiquus*). Abundant breeder. Although seen only occasionally during the day, this species nests on Buldir Island in large numbers. Fledging events were frequently heard until mid-July as the birds called to their young at night.

Cassin's auklet (*Ptychoramphus aleuticus*). Abundant breeder. Nocturnal - rarely observed during the day and not monitored as intensively as the other auklet species.

Parakeet auklet (*Aethia psittacula*). Abundant breeder. Parakeet auklets nest in crevices or burrows at many lower elevation sites across the island.

Least auklet (*Aethia pusilla*). Abundant breeder. This auklet, the second most abundant on Buldir, is most common at Main Talus.

Whiskered auklet (*Aethia pygmaea*). Abundant breeder. This nocturnal auklet nests throughout coastal areas of the island, and is most common at Northwest Ridge, Main Talus, and Crested Point.

Crested auklet (*Aethia cristatella*). Abundant breeder. Crested auklets are the most abundant auklet species on Buldir Island with the greatest breeding concentrations at Main Talus. Large flocks were also observed originating from the 1000' ridge above Bottle Hill at Spike Camp. A large group of birds was also seen often flushing from Outer Rock.

Rhinoceros auklet (*Cerorhinca monocerata*). Accidental probable breeder. A single bird was seen off of main talus with a large group of horned puffins.

Horned puffin (*Fratercula corniculata*). Abundant breeder. Horned puffins nest in crevices and burrows throughout the island and are abundant at Main Talus and above Spike Camp.

Tufted puffin (*Fratercula cirrhata*). Abundant breeder. Tufted puffins nest in burrows on grassy and rocky slopes around the island and in dense numbers on Northwest Ridge and Middle Rock.

Black-legged kittiwake (*Rissa tridactyla*). Abundant breeder. Black-legged kittiwakes nest in large colonies at East Cape, Kittiwake Lane, Spike Camp, and Middle and Outer Rocks.

Red-legged kittiwake (*Rissa brevirostris*). Abundant breeder. Less abundant of the two kittiwake species, red-leggeds nest in large colonies sympatrically with black-legged kittiwakes.

Black-headed gull (*Chroicocephalus ridibundus*). Rare migrant. A single juvenile was seen on 19 May in Midden Pond.

Herring gull (*Larus argentatus*). Casual migrant. An individual was seen 24 July on the beach below Spike Camp. *Larus argentatus vegae* is the expected subspecies in the western Aleutians (Gibson and Byrd 2007).

Slaty-backed gull (*Larus schistisagus*). Rare vagrant. An individual was seen on 29 June on North Bight Beach and 14 July on the beach below Spike Camp.

Glaucous-winged gull (*Larus glaucescens*). Abundant breeder. Nests were recorded from the boulder beaches to the high alpine tundra.

Red-throated loon (*Gavia stellata*). Rare migrant/summer resident non-breeder. Single individuals were heard from camp twice in May, once in June and once in July.

Common loon (*Gavia immer*). Casual migrant. Individuals were seen at least once every month off of North Bight Beach and the beach between North Bight and Northwest Point, all were in 1st summer plumage.

Laysan albatross (*Phoebastria immutabilis*). Uncommon to common migrant. Sea watching was limited but this species was common offshore and could be spotted using a scope.

Northern fulmar (*Fulmarus glacialis*). Abundant breeder. Nests colonially at East Cape, Kittiwake Lane, and Spike Camp. Most breeding birds were dark morph.

Fork-tailed storm-petrel (*Oceanodroma furcata*). Abundant breeder. Nests in burrows and crevices throughout lower elevations of the island.

Leach's storm-petrel (*Oceanodroma leucorhoa*). Abundant breeder. Nests sympatrically with fork-tailed storm-petrel.

Red-faced cormorant (*Phalacrocorax urile*). Uncommon breeder. Nests on sea-facing cliffs around the island, but generally most activity confined to the south side. Breeding areas not frequented, no direct observation of breeding this season.

Pelagic cormorant (*Phalacrocorax pelagicus*). Common breeder. Nests on sea-facing cliffs around the island. Breeding areas not frequented, no direct observation of breeding this season.

Bald eagle (*Haliaeetus leucocephalus*). Uncommon breeder. Adults as well as a few juveniles were regularly seen during the summer. Buldir is the westernmost breeding location for bald eagles in North America and the limit of their range.

Peregrine falcon (*Falco peregrinus*). Uncommon breeder. Adults were observed throughout the season. Areas of activity included Peregrine Point, Main Camp, Northwest Ridge and Main Talus. Newly fledged birds were observed at Peregrine Point, Main Talus, Northwest Ridge and Main Camp from mid-July onwards.

Pacific wren (*Troglodytes pacificus*). Abundant breeder. Adults were observed carrying nesting material when we arrived on island. Adults were still provisioning second or possibly third broods of nestlings in late August.

Siberian rubythroat (*Luscinia calliope*). Irregular spring migrant. A single male was observed from the trail that parallels North Bight Beach on 29 May.

Eyebrowed thrush (*Turdus obscurus*). Irregular spring migrant. A male and female pair was observed in South Marsh from early to mid-June (Figure B5).

Brambling (*Fringilla montifringilla*). Rare spring migrant. A single bird was seen on the beach by Main Talus on 30 May and up on the tundra in Glissade Valley on 5 June.

Hawfinch (*Coccothraustes coccothraustes*). Rare spring migrant. A single bird was observed from Main Camp on 28 May and 5 June.

Gray-crowned rosy-finch (*Leucosticte tephrocotis*). Common breeder across the island.

Common redpoll (*Acanthis flammea*). Rare migrant. A group of at least 10 individuals were first seen on 27 June at Spike Camp. Individuals and small groups of birds were seen throughout the island until mid-August.

Lapland longspur (*Calcarius lapponicus*). Abundant breeder. This species is present in a wider variety of habitats than song sparrows (Figure B6). It was commonly seen at all elevations.

Snow bunting (*Plectrophenax nivalis*). Common breeder. This resident species is found at higher elevations with shorter vegetation and/or rocky areas.

Song sparrow (*Melospiza melodia*). Abundant breeder across the island.

MARINE MAMMALS

Sea otter (*Enhydra lutris*). No sea otters were observed in 2017.

Steller sea lion (*Eumetopias jubatus*). Sea lions were occasionally seen during the 2017 season. Most sightings were of lone individuals swimming off of spike beach or hauled out animals on the outer rocks at East Cape.

Harbor seal (*Phoca vitulina*). Harbor seals were seen frequently on the north side of the island. A female pup pair was seen hauled out at Northwest Point.

Humpback whale (*Megaptera novaeangliae*). Two individuals were observed in mid-June and mid-August.

Orca (*Orcinus orca*). An individual was seen from Main Camp on 15 August.

Sperm whale (*Physeter macrocephalous*). An individual was seen from Main Camp on 22 August.

Table 125. Observations and breeding status of birds and selected mammals at Buldir Island, Alaska. 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). Data come from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Emperor goose	X	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-
Greater white-fronted goose	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	-	-	X
Bean goose	-	X	X	-	-	X	-	-	X	X	-	-	-	-	-	-	X	-	-	X
Brant	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	X	-	-
Aleutian cackling goose	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Tundra swan	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tundra swan - Bewick's subsp.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Baikal teal	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Garganey	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern shoveler	X	-	-	-	-	-	-	X	X	-	-	-	X	X	-	-	X	-	X	X
Falcatid duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Eurasian wigeon	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American wigeon	-	-	-	-	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-
Mallard	X	-	P	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern pintail	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aleutian green-winged teal	X	B	P	X	X	X	X	X	X	B	X	B	P	P	P	P	P	B	B	P
American green-winged teal	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X
Common pochard	-	-	-	-	-	-	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	X	X	X	X
Steller's eider	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-
Common eider	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Harlequin duck	X	X	X	X	X	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	X	X	-	-	-	-
Black scoter	-	-	-	-	X	-	-	-	-	X	X	-	X	X	-	-	-	-	-	-
Long-tailed duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Bufflehead	-	-	X	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-
Common goldeneye	-	-	-	-	X	-	-	-	X	-	-	X	X	X	X	-	-	-	-	-
Smew	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Common merganser	-	-	X	X	X	X	-	X	X	-	-	X	-	X	X	-	-	X	-	-
Red-breasted merganser	X	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X
Horned grebe	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	X
Red-necked grebe	X	-	-	-	-	-	-	X	-	X	-	X	-	-	X	-	-	-	-	-
Common cuckoo	-	-	X	-	-	X	X	X	X	X	-	-	-	-	-	X	X	X	-	-
Cuckoo sp.	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	X
Sandhill crane	-	-	X	-	X	-	-	X	X	-	X	-	X	-	-	X	-	-	X	-
Eurasian oystercatcher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Black oystercatcher	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Black-bellied plover	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American golden-plover	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pacific golden-plover	-	-	-	-	X	X	-	-	-	X	-	X	-	-	-	X	X	-	X	-

Table 125 (continued). Observations and breeding status of birds and selected mammals at Buldir Island, Alaska. 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). Data come from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Lesser sand-(Mongolian) plover	X	X	X	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	X	-
Common ringed plover	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Semipalmated plover	X	-	X	X	-	-	-	-	X	-	-	-	X	X	-	X	-	-	-	-
Whimbrel	X	X	X	X	X	-	-	X ^b	X	-	X	-	-	-	-	X	X	-	X	X
Far-eastern curlew	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Bar-tailed godwit	X	-	X	X	X	-	X	-	-	X	-	-	X	X	-	X	X	-	-	X
Black-tailed godwit	-	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	X	-	-
Ruddy turnstone	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ruff	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Sharp-tailed sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Temmick's stint	-	-	X	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-
Long-toed stint	X	-	X	X	X	-	X	X	X	X	X	X	X	X	X	-	-	-	-	X
Red-necked stint	X	-	-	-	X	-	X	X	X	X	-	-	X	-	-	X	-	X	X	X
Sanderling	-	-	-	X	X	X	-	-	-	-	X	-	X	-	-	-	-	-	-	-
Dunlin	X	-	-	-	X	-	-	-	X	-	-	-	X	-	-	-	X	-	X	X
Rock sandpiper	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Little stint	X	-	-	-	-	-	-	-	X	-	X	X	-	-	-	-	-	-	-	X
Buff-breasted sandpiper	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Pectoral sandpiper	-	-	-	X	-	-	X	-	-	X	X	-	X	-	X	X	-	-	-	-
Western sandpiper	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Long-billed dowitcher	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Dowitcher sp.	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common snipe	-	-	P	X	X	-	X	X	X	X	X	X	-	-	X	X	X	-	-	-
Snipe sp.	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	X	X	-	X
Terek sandpiper	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	-	-	-	X	-
Common sandpiper	X	-	X	X	X	-	X	X	X	X	-	-	X	X	X	X	X	X	X	X
Gray-tailed tattler	X	-	X	X	-	X	X	X	X	X	-	X	X	-	X	-	X	X	X	X
Wandering tattler	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X
Common greenshank	-	-	X	X	-	-	-	X	-	-	-	-	X	X	-	-	X	-	-	-
Wood sandpiper	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marsh sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Red-necked phalarope	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	X	-
Pomarine jaeger	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	-
Parasitic jaeger	B	X/B?	B	X/B?	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Long-tailed jaeger	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Common murre	B	B	B	B	B	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	B	B	B	B	B
Pigeon guillemot	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Marbled murrelet	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ancient murrelet	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Cassin's auklet	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Table 125 (continued). Observations and breeding status of birds and selected mammals at Buldir Island, Alaska. 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). Data come from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Parakeet auklet	B	B	B	B	B	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	B	B	B	B	B
Whiskered auklet	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Crested auklet	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Rhinoceros auklet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X
Horned puffin	B	B	B	B	B	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	B	B	B	B	B
Black-legged kittiwake	B	B	B	B	B	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	B	B	B	B	B
Black-headed gull	X	-	X	X	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	X
Black-tailed gull	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Herring gull	-	-	-	-	X	-	-	-	-	X	-	-	X	-	-	-	-	-	-	X
Slaty-backed gull	X	-	X	X	-	X	X	P	P	X	X	X	X	X	-	X	X	-	X	X
Glaucous-winged gull	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Glaucous gull	-	-	-	-	X	-	-	X	-	X	X	-	-	-	-	-	X	-	-	-
Least tern	-	-	-	-	-	-	-	? ^c	-	-	-	-	-	-	-	-	-	-	-	-
Red-throated loon	-	-	X	X	X	-	-	-	-	X	-	X	X	X	X	X	X	X	X	X
Arctic loon	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-
Common loon	X	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	X
Laysan albatross	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Black-footed albatross	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
Short-tailed albatross	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-
Northern fulmar	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Mottled petrel	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	X	X	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-	-
Fork-tailed storm-petrel	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Leach's storm-petrel	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Red-faced cormorant	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Pelagic cormorant	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Bittern sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Great egret	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Intermediate egret	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Little egret	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-crowned night-heron	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Bald eagle	X	X	B	X	B	B	B	B	B	B	B	B	P	B	B	B	B	B	B	B
Steller's sea eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(X) ^a	X	-	-
Rough-legged hawk	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Snowy owl	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	-
Long-eared owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Short-eared owl	-	X	X	X	X	X	-	-	X	X	X	-	-	X	X	-	X	X	-	-

Table 125 (continued). Observations and breeding status of birds and selected mammals at Buldir Island, Alaska. 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). Data come from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Gyr Falcon	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Common raven	-	-	-	-	-	-	X	-	-	-	X	-	-	X	X	X	-	-	-	-
Tree swallow	X	-	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	-	-	-
Bank swallow	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	-	-	-
Cliff swallow	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Barn swallow	-	-	-	-	-	-	X	-	-	X	X	-	-	-	X	-	-	-	-	-
Pacific (formerly winter) wren	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Arctic warbler	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Middendorff's grasshopper-warbler	-	-	-	-	-	X	-	X ^b	-	-	-	-	-	-	-	-	-	-	-	-
Lanceolated warbler	-	-	-	-	-	-	-	-	-	B	-	-	-	-	-	-	-	-	-	-
Gray-streaked flycatcher	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Asian brown flycatcher	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Dark-sided (Siberian) flycatcher	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Siberian rubythroat	-	-	X	-	X	X	X	X	X	X	-	-	-	X	-	X	-	-	-	X
Red-flanked bluetail	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-
Red-breasted flycatcher	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
Taiga flycatcher	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	-	-
Northern wheatear	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gray-cheeked thrush	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
Eyebrowed thrush	X	-	X	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	-	X
Eastern yellow wagtail	X	-	X	X	X	X	X	X	X	X	-	-	X	X	X	X	-	-	X	-
Gray wagtail	-	-	X	X	-	X	X	-	X	-	-	X	-	-	-	-	-	-	X	-
White wagtail (black-backed subsp.)	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Olive-backed pipit	X	-	X	-	X	-	-	X	-	X	-	X	-	-	-	-	-	-	-	-
Pechora pipit	X	-	-	X	-	-	-	X ^b	-	X	-	-	-	-	-	-	-	-	-	-
Red-throated pipit	X	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-
American pipit	-	-	-	X	-	-	-	X ^b	X	-	-	-	-	-	-	-	-	-	-	-
Brambling	X	-	X	X	-	X	X	X	X	X	-	X	X	X	-	X	-	-	X	X
Hawfinch	-	-	X	-	-	X	X	X	-	X	-	X	-	X	X	-	X	-	X	X
Common rosefinch	-	-	X	-	-	-	X	-	-	X	-	X	X	-	-	-	-	-	-	-
Gray-crowned rosy-finch	B	-	B	B	B	B	B	B	B	B	B	X	B	B	B	B	B	B	B	B
Oriental greenfinch	-	-	-	-	-	-	-	X	-	X	-	-	-	-	X ^c	-	-	-	-	-
Common redpoll	-	-	X	X	-	-	-	X	X	X	X	-	X	-	X	-	X	X	X	X
Red crossbill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
Siskin sp.	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lapland longspur	B	B	B	B	B	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	B	B	B	B
Rustic bunting	-	-	X	X	-	-	X	X	-	X	-	X	X	-	-	-	X	-	-	-
Reed bunting	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Song sparrow	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Table 125 (continued). Observations and breeding status of birds and selected mammals at Buldir Island, Alaska. 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). Data come from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Sea otter	B	B	B	NR ^d	B	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-
Northern fur seal	-	-	X	NR	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-
Steller sea lion	X/B?	X/B?	B	NR	B	X/B?	X/B?	B	X/B?	B	X/B?	X	X	X	X	X	X	X	B	X
Northern elephant seal	-	-	X	NR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harbor seal	B	X/B?	B	NR	B	X/B?	B	B	B	X/B?	X/B?	X	X	X	X	X	X	B	P	B
Humpback whale	-	-	-	NR	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X
Orca	X	-	X	NR	X	-	-	-	X	X	X	-	X	X	X	X	X	X	X	X
Dall's porpoise	-	-	-	NR	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Sperm whale	-	X	-	NR	-	X	X	X	X	X	X	X	-	-	X	-	-	X	-	X
Observation dates	22 May- 28 Aug	21 Jun- 29 Aug	27 May- 29 Aug	24 May- 5 Sep	24 May- 5 Sep	1 Jun- 5 Sep	26 May- 23 Aug	29 May- 26 Aug	24 May- 30 Aug	29 May- 27 Aug	26 May- 27 Aug	29 May- 25 Aug	29 May- 27 Aug	28 May- 28 Aug	25 May- 30 Aug	27May- 26Aug	28 May- 26 Aug	2 Jun- 28 Aug	29 May- 29 Aug	25 May- 27 Aug

^aAnimal very likely seen and misidentified as a white-tailed sea eagle.

^bSpecies not recorded by monitoring crew but observed by Ian Jones and Sampath Seneviratne 29 May-6 June 2005.

^c"?" indicates probable identification as least tern (as opposed to little tern) but not confirmed because field crew could not identify bird in hand or take pictures.

^dMammals not recorded (NR) in all years.

Table 126. First flowering dates of plants identified on Buldir 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 years not listed.

Family	Species	2000	2002	2004	2006	2010
Lycopodiaceae	<i>Lycopodium selago selago</i>	-	-	-	-	-
	<i>Lycopodium annotinum annotinum</i>	-	-	-	-	-
Equisetaceae	<i>Equisetum arvense</i>	-	-	-	-	-
	<i>Athyrium felix-femina cyclosorum</i>	-	-	-	-	-
Graminae	Poaspp.	-	-	-	-	-
	<i>Bromus sitchensis</i>	-	15 Aug	-	-	-
	<i>Elymus arenarius mollis</i>	30 Jun	5 Jul	-	-	-
	<i>Calamagrostis canadensis</i>	-	-	-	-	-
	<i>Calamagrostis nutkatensis</i>	-	7 Aug	-	-	-
	<i>Festuca rubra aucta</i>	-	10 Aug	-	-	-
	<i>Phleum commutatum americanum</i>	-	28 Jun	-	-	-
	<i>Puccinella langeana</i>	-	13 Jun	-	-	-
Cyperaceae	<i>Carex macrochaeta</i>	23 Jun	28 Jun	-	-	-
	<i>Carex lyngbyaei</i>	2 Jul	13 Jun	-	-	-
	<i>Carex kelloggi</i>	-	-	late Jun	-	-
Juncaceae	<i>Luzula multiflora multiflora</i>	-	-	late Jun	-	-
	<i>Luzula multiflora Kobayashii</i>	-	-	-	-	-
	<i>Luzula spp.</i>	24 Jun	22 Jun	-	-	-
	<i>Juncus arcticus sitchensis</i>	23 Jul	-	-	-	-
Liliaceae	<i>Fritillaria camschatcensis</i>	28 Jun	14 Jun	21 Jun	25 Jun	21 Jun
	<i>Streptopus amplexifolius</i>	21 Jun	4 Jul	-	-	-
Orchidaceae	<i>Platanthera convallariaefolia</i>	5 Jul	5 Jul	-	mid Jul	20 Jul
	<i>Platanthera dilatata</i>	-	1 Jul	-	-	-
	<i>Listera chordata</i>	-	20 Aug	-	-	-
Salicaceae	<i>Salix arctica crassijulis</i>	19 Jun	31 May	10 Jul	30 Jun	-
	<i>Salix rotundifolia</i>	-	31 May	-	-	-
Polygonaceae	<i>Oxyria digyna</i>	29 Jul	20 Jun	-	-	-
	<i>Rumex fenestratus</i>	22 Jul	15 Jul	-	-	-
	<i>Polygonum viviparum</i>	-	-	-	-	-
Portulacaceae	<i>Claytonia sibirica</i>	early Jun	11 Jun	-	-	24 Jun
	<i>Montia fontana Fontana</i>	-	-	-	-	-
Caryophyllaceae	<i>Honkenya peploides major</i>	5 Jul	-	-	-	1 Jul
	<i>Cerastium beeringianum grandiflorum</i>	-	-	-	-	-
	<i>Cerastium fischerianum</i>	-	-	-	-	-
	<i>Moehringia lateriflora</i>	-	-	-	-	-
	<i>Stellaria media</i>	-	-	-	-	-
	<i>Stellaria ruscifolia</i>	-	-	-	-	-
Caryophyllaceae	<i>Sagina crassicaulis</i>	-	-	-	-	18 Jun
	<i>Cerastium aleuticum</i>	-	1 Jul	-	-	-
	<i>Cerastium fischerianum</i>	-	5 Jul	-	-	-
Ranunculaceae	<i>Coptis trifolia</i>	-	17 Jul	-	30 Jun	-
	<i>Ranunculus hyperboreus</i>	-	-	-	-	14 Jun

Table 126 (continued). First flowering dates of plants identified on Buldir 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 years not listed.

Family	Species	2000	2002	2004	2006	2010
Ranunculaceae (con'd)	<i>Ranunculus occidentalis</i>	-	9 Jun	9 Jun	-	14 Jun
	<i>Ranunculus eschscholtzii</i>	-	-	-	-	-
	<i>Ranunculus grandis</i>	-	4 Jul	-	-	-
	<i>Anemone narcissiflora villosissiflora</i>	-	-	-	-	-
Cruciferae	<i>Draba hyperborea</i>	8 Jun	6 Jun	-	1 Jul	-
	<i>Draba borealis</i>	8 Jun	6 Jun	-	-	-
	<i>Cardemine umbellata</i>	17 Jun	6 Jun	-	1 Jul	-
	<i>Cochlearia officinalis oblongifolia</i>	13 Jun	6 Jul	-	-	-
Saxifragaceae	<i>Saxifraga punctata insularis</i>	16 Jun	31 May	26 Jun	-	-
	<i>Saxifraga bracteata</i>	2 Jun	28 May	3 Jun	25 Jun	4 Jun
	<i>Saxifraga aleutica</i>	-	28 May	-	-	-
	<i>Chrysosplenium wrightii</i>	-	29 May	-	-	-
Rosaceae	<i>Rubus arcticus stellatus</i>	16 Jul	19 Jun	25 Jun	30 Jun	30 Jun
	<i>Rubus chamaemorus</i>	-	11 Jun	-	-	12 Jun
	<i>Sibbaldia procumens</i>	4 Jul	9 Jul	-	-	-
	<i>Potentilla villosa</i>	4 Jul	15 Jul	-	-	-
	<i>Potentilla egea</i>	-	26 Jun	-	-	-
	<i>Potentilla hyperarctica</i>	-	7 Jul	-	-	-
	<i>Geum macrophyllum</i>	-	12 Jun	-	23 Jun	-
	<i>Geum calthifolium</i>	-	17 Jul	10 Jul	-	-
	<i>Geum rossii</i>	-	6 Jul	-	-	-
	<i>Geranium erianthum</i>	27 Jun	17 Jun	-	23 Jun	30 Jun
Violaceae	<i>Viola epipsila repens</i>	-	-	21 Jun	18 Jun	-
	<i>Viola langsdoerffii</i>	7 Jul	12 Jun	-	-	30 Jun
Onagraceae	<i>Epilobium glandulosum</i>	<28 Aug	17 Jul	-	-	-
	<i>Epilobium behringianum</i>	-	17 Jul	18 Jul	19 Jul	-
Apiaceae	<i>Heracleum lanatum</i>	21 Jul	30 Jul	-	-	29 May
	<i>Angelica lucida</i>	2 Jul	11 Jul	-	-	-
	<i>Ligusticum scoticum-Hultenii</i>	16 Jul	25 Jul	-	-	-
	<i>Conioselinum chinense</i>	21 Jul	4 Aug	-	-	-
Cornaceae	<i>Cornus suecica</i>	7 Jul	12 Jun	21 Jun	18 Jun	-
	<i>Cornus canadensis</i>	-	-	-	-	-
Ericaceae	<i>Rhododendron camtschaticum</i>	-	5 Aug	-	-	-
	<i>Cassiope lycopioides</i>	-	16 Jul	15 Jul	-	-
	<i>Vaccinium vitis-idaea minus</i>	-	-	20 Jul	-	-
	<i>Loiseleuria procumbens</i>	-	17 Jul	-	-	-
	<i>Phyllodoce aleutica</i>	-	13 Jul	-	-	-
Empetraceae	<i>Empetrum nigrum</i>	mid Jul	-	-	-	-
Primulaceae	<i>Trientalis europaea arctica</i>	-	1 Jul	20 Jul	-	-
	<i>Primula cuneifolia</i>	19 Jun	11 Jun	26 Jun	-	8 Jun
Gentianaceae	<i>Gentiana amarelle acuta</i>	-	-	-	-	-
	<i>Gentiana aleutica</i>	-	15 Aug	-	-	-

Table 126 (continued). First flowering dates of plants identified on Buldir 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 years not listed.

Family	Species	2000	2002	2004	2006	2010
Scrophulariaceae	<i>Veronica stelleri</i>	-	17 Jun	24 Jun	30 Jun	-
	<i>Veronica grandiflora</i>	4 Jul	22 Jun	20 Jun	29 Jun	-
	<i>Veronica serpyllifolia humifusa</i>	-	21 Jun	-	6 Jul	-
	<i>Veronica americana</i>	-	19 Aug	-	-	-
	<i>Rhinanthus minor boreales</i>	-	8 Aug	-	-	-
Plantaginaceae	<i>Plantago macrocarpa</i>	-	19 Jun	-	-	-
	<i>Hippuris montana</i>	-	-	-	-	-
Campanulaceae	<i>Campanula lasiocarpa lasiocarpa</i>	-	8 Aug	-	16 Aug	-
Asteraceae	<i>Achillea borealis</i>	16 Jul	29 Jul	-	19 Jul	-
Compositae	<i>Senecio pseudo-arnica</i>	16 Jul	17 Jul	20 Jul	19 Jul	-
	<i>Arnica unalaskanesis</i>	-	25 Jul	-	-	-
	<i>Erigeron peregrinus</i>	mid Jul	9 Jul	14 Jul	6 Jul	-
	<i>Artemisia unalaskensis aleutica</i>	-	7 Aug	15 Aug	-	-
	<i>Chrysanthemum articum</i>	12 Jul	14 Jul	early Aug	23 Jul	-
	<i>Cacalia auriculata kamtschatica</i>	-	-	16 Aug	-	-
	<i>Anaphalis margaritacea</i>	-	7 Aug	-	-	-
	<i>Tataxicum trigonolobum</i>	-	19 Jun	-	-	-

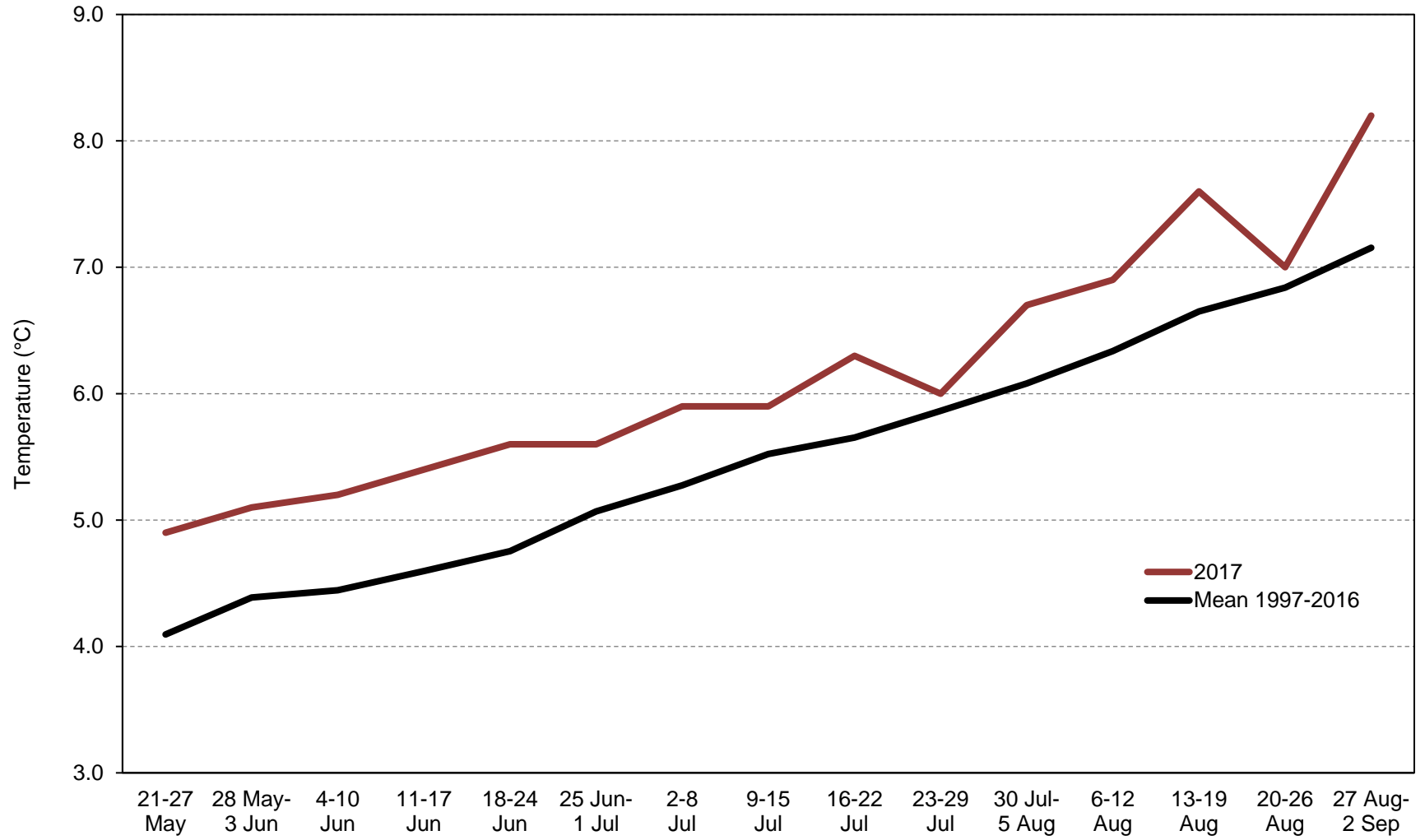


Figure 77. Mean weekly sea surface temperatures (°C) at Buldir Island, Alaska.

Table 127. Mean weekly sea surface temperatures (°C) at Buldir Island, Alaska.

Week	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
21-27 May	4.6	-	-	3.6	4.4	4.1	-	-	-	4.3	-	3.9	-	-	-	3.8	-	-	-	-	4.9
28 May-3 Jun	4.9	4.0	-	3.8	4.5	4.2	4.4	-	4.6	4.2	4.2	4.0	4.8	3.9	4.4	3.9	-	4.6	-	5.6	5.1
4-10 Jun	5.1	4.0	-	3.8	4.8	4.2	4.7	4.5	4.6	4.6	4.3	4.0	4.0	4.0	4.5	3.9	4.2	4.9	5.0	5.2	5.2
11-17 Jun	5.4	4.3	-	4.1	4.7	4.3	4.8	4.6	4.7	4.6	4.4	4.1	4.2	4.1	4.6	4.1	4.7	4.9	5.2	5.5	5.4
18-24 Jun	5.0	4.4	4.5	4.3	4.7	4.7	5.2	4.9	4.9	4.8	4.6	4.4	4.5	4.5	4.5	4.4	4.8	5.2	5.6	5.3	5.6
25 Jun-1 Jul	5.5	4.9	4.5	4.6	4.8	4.9	5.3	5.1	5.5	5.1	5.0	4.6	4.5	4.7	5.0	4.5	4.7	5.5	6.1	6.4	5.6
2-8 Jul	5.5	5.0	5.0	4.4	4.9	5.6	5.4	5.1	6.0	5.6	5.0	4.6	4.7	5.5	5.3	4.5	4.8	5.9	6.0	6.5	5.9
9-15 Jul	5.9	5.2	5.0	4.7	5.8	5.1	5.9	5.8	6.1	5.2	5.1	4.9	4.9	5.6	5.7	5.3	5.1	5.9	6.0	7.2	5.9
16-22 Jul	5.9	5.1	5.1	5.0	5.6	5.5	5.9	5.8	6.1	5.3	5.7	5.1	5.1	6.1	5.6	5.6	5.2	6.0	6.4	6.9	6.3
23-29 Jul	5.9	6.0	5.6	5.3	5.6	5.3	5.9	6.4	5.8	5.1	5.7	5.7	5.4	6.6	5.4	5.7	5.6	6.2	7.0	7.2	6.0
30 Jul-5 Aug	6.1	6.0	5.7	6.0	5.9	6.1	6.0	6.2	6.1	5.9	5.8	5.1	5.2	6.6	5.7	5.9	6.2	7.0	6.8	7.3	6.7
6-12 Aug	6.8	5.9	5.7	5.3	7.1	5.7	6.4	6.3	6.7	5.7	5.6	6.0	5.5	7.0	5.9	6.5	6.5	7.2	7.0	8.0	6.9
13-19 Aug	6.8	6.1	6.0	6.3	6.7	6.5	7.4	6.5	7.1	6.2	6.8	6.1	5.7	6.5	6.9	6.3	7.2	6.9	7.1	8.0	7.6
20-26 Aug	-	-	6.7	7.6	6.7	6.5	6.7	7.7	6.2	7.0	6.4	6.0	5.5	6.0	6.9	6.7	6.6	6.8	8.2	8.9	7.0
27 Aug-2 Sep	-	-	5.7	6.9	7.1	7.7	6.8	-	6.3	8.5	-	-	-	-	-	-	-	-	6.8	8.6	8.2
3-9 Sep	-	-	-	-	7.1	5.9	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 128. History of official visits to Buldir Island, Alaska.

Year	Dates	Type of work	Number	Names	Source
1936	27 & 31 Jul	faunal recon	3	Olaus Murie, Homer Jewell, Douglas Gray,	?
1937	18 Jun	faunal recon	1+	Olaus Murie	13
1943	?	U.S. Army weather station	5	Dave Grehl, 3 groups of 5 for around 7 mo. each	1
1947	19-22 Jul	geological reconnaissance	2	Robert R. Coats, Will F. Thompson	2
1962	25-27 Jun	ACG survey	2	Robert Jones, Vern Berns	14
1963	6-19 Jul	obtain ACG goslings	6	Vern Berns, Erwin Boeker, Robert Jones, Karl Kenyon, Alexander Peden, Milsted Zhan	3
1972	30 June-8 Jul	ACG, faunal recon.	6	Vernon Byrd, Palmer Sekora, Glen Smart, Clayton White, Allen McCartney, Dan Gibson	4
1974	9 May-6 Sep	ACG biology	4	Vernon Byrd, Chris Dau, Matt Dick, John Trapp*	
	16-24 Jul	ACG capture	3	Dave Spencer, Jim Shaw, Jim Bartonek	
1975	18 May-5 Sep	ACG biology	5	Vernon Byrd*, Dennis Woolington, Eric Hoberg, Elaine Rhode*, John Trapp*, John Sarvis*	
	3-25 Jul	Film Chain of Life	2	Tom Ramsey, Cecilia Ramsey	
	17 May-5 Sep	ACG, puffins	2	D.H.S. Wehle, Bob Day	7
1976	18 May-28 Sep	ACG	5	Vernon Byrd, Dennis Woolington, Thede Tohish, Erik Knudtson, Bill Rodstrom	
1977	25 May-2 Jul	ACG nest census	5	Dennis Woolington, Bob Day, Eric Knudtson, Tom Early, Bob Schulmeister*	
1978	13-25 Jul		4	Bob Day, Kent Hall, Brian Lawhead, Elaine Rhode	6
1979	4-30 Jun	ACG nest survey, petrels	4	Tom Early, Bill Henry, Andy Taber, Jonathan Beall	22
	23-24 Jun	faunal survey	4	Bob Day, Tom Early, Brian Lawhead, Elaine Rhode	
1980	?	ACG capture	4	Leslie Slater, John Mueller, Jack Arnold, Tom Early	4
1982	29 May-28 Jun	ACG nest census	6	Van Klett, Fred Deines, Mark Ostwald, Tom Early, Don Drago, Dana Bradley	15
	28 Jul-30 Jul	ACG capture	8	Mike Amaral, Fred Deines, Don Drago, Tom Early, Doug Forsell, Van Klett, Natasha Kline, Konrad Schmidt	20
1983	27 Jul-5 Aug	ACG capture	10	Mike Amaral, Chris Ambroz, Brenda Becker, Dan Benfield, Fred Deines, Don Drago, Natasha Kline, Leslie Slater, Susan Steinacher, Fred Zeilemaker	21
1984	8-25 Jun	ACG eggs, petrel work	2	Anthony DeGange, Richard Wood	5
1987	1-9 Aug	ACG capture	13	Donna Dewhurst, Jim Fuller, Martha Gillham, Greg McClellan, Daniel Niven, Dave Nysewander, William Penning, Kevin Rayor, Leslie Slater, Amy Snyder, David Watson, John Andrew, Lon Lauber	
1988	7 Jun-7 Sep	Refuge monitoring	4	Colleen Baggot, Lisa Climo, Dave Backstrom*, Hector Douglas*, Vernon Byrd*	
	19 Jun-5 Jul	Seabird investigations	3	John Piatt, John Wells, Andrea Mc Charles	
	29 Jul-10 Aug	ACG capture & seabirds	5	Alan Springer, Gus Van Vliet, Greg McClellan, Mark Pfof, Brian Anderson	
1989	29 May	BIA ANSCA site visit	4	Ken Pratt, Randall Cooper, Brian Hoffman, Robert Drozda	19
1990	28 May-17 Aug	Refuge monitoring	3	Hector Douglas, Mark Hipfner, Greg Zuberbier	
	?	Refuge monitoring	4	Elizabeth Mayock, Karen Kreisel, Mark Hipfner, Scott Richardson*	
	?	Auklet biology	1	Ian Jones	
1991	4 Jun-14 Aug	Refuge monitoring	4	Jeff Williams, Mark Hipfner, Ron Walder, Ken Russell	
	25-29 Jul	ACG capture	4	Jim Schneeweiss, Vernon Byrd, Jim Fuller, Rob Lewis	
	4 Jun-6 Aug	Auklet biology	2	Ian Jones, Christine Adkins	
	25 Jul-6 Aug	Photography	1	Ed Steele	
	25 July-6 Aug	Archaeology	3	Doug Siegel-Causey, Debbie Corbett, C. Lefevre	12
1992	31 May-14 Aug	Refuge monitoring	4	Jeff Williams, Hugh Knechtel, Andrew Durand, Geoff Beyersdorff	
	31 May-1 Aug	Auklet biology	2	Ian Kones, Fiona Hunter	
1993	30 May-31 Aug	Refuge monitoring	2	Jeff Williams, Julian Fischer	
	30 May-31 Aug	Auklet biology	2	Victor Zubakin, Nikolai Konyukhov	
	30 May -?	Auklet biology	2	Ian Jones, Fiona Hunter	
	31 May-17 Jun	Archaeology	7	Dixie West, Debbie Corbett, Christine Lefevre, Liz Wilmerding, Stephen Loring, Tom Corbett, Ann Andres	10
1994	?	Refuge monitoring	4	Julian Fischer, Scott Hall, Peter Duley, Wendy Cruso	
	?	Auklet biology	2	Ian Jones, Fiona Hunter	
1995	1 Jun-21 Aug	Refuge monitoring	3	Julian Fischer, Mari Ortwerth, Lisa Meehan	18
	?	Auklet biology	3	Ian Jones, Fiona Hunter, Gail Fraser	

Table 128 (continued). History of official visits to Buldir Island, Alaska.

Year	Dates	Type of work	Number	Names	Source
1995	5 Aug	ACG capture	19	Vernon Byrd, Jeff Williams, Forrest Lee, Brian Anderson, Dan Boone, Laura Greffinius, Kent Livezey, Marcia Macone, Dave McCargo, Joe Meehan, Laura Olson, Tom Paragi, Billy Pepper, Nora Rojek, Lisa Scharf, Greg Snedgen, Colin Studds, Greg Thomson, Jim Schneeweis	
1996	4 Jun-24 Aug	Refuge monitoring	4	Julian Fischer, Lisa Meehan, Pat Ryan, Dave Clutter	
	4 Jun -?	Auklet biology	?	Gail Fraser, ?	
1997	21 May-24 Aug	Refuge monitoring	4	Mary Ortwerth, Nora Rojek, Emily Drew, Jeff Williams*	16
	5-23 May	Archaeology	6	Christine Lefevre, Debbie Corbett, Carole Fritz, Margaret Beck, Gena Weinberger, Anne Young	11
	5 May-7 Aug	Auklet biology	4	Ian Jones, Fiona Hunter, Gail Fraser, Laura Cowen	
1998	3 Jun-28 Aug	Refuge monitoring	4	Julian Fischer, Angela Palmer, Susan Hootman, Kim Elkin	9
	3 Jun-?	Auklet biology	1+	Gail Fraser, ?	
1999	22 Jun-29 Aug	Refuge monitoring	6	Jason Daniels, Jessica Peterson, Jeff Williams*	8
	?	Auklet biology	3	Allison Veit, Nicole Winter, Nicolai Konyukhov	
2000	27 May-29 Aug	Refuge monitoring	4	Heather Moore, Karen Brenneman, Graeme Loh, Sarah Lantz	
	27 May-6 Aug	Auklet biology	4	Ian Jones, Martin Renner, Jolene Sutton, Josh Pennell	
2001	25 May-5 Sep	Refuge monitoring	3	Heather Moore, Peter Kappes, Matthew Grinnell	
	25 May-5 Sep	PAAU/HOPU attendance	2	Nikolai Konyukhov, Kyle Juk	
	1 Aug-5 Sep	Archaeology	5	Debbie Corbett, Dixie West, Ginny Hatfield, Kale Brennerman	
	25 May-1 Aug	Auklet biology	3	Martin Renner, Fiona Hunter, Heather Major, Ian Jones*	
	28 May-1 Aug	CRAU smell	2	Julie Hagelin, Peter Elsner	
2002	24 May-5 Sep	Refuge monitoring	3	Erica Sommer, Trevor Joyce, Nikolai Konyukhov	
	24 May- 7 Aug	Auklet biology	3	Martin Renner, Jason Wade, Greg McClelland	
2003	1 Jun-5 Sep	Refuge monitoring	3	Nathan Jones, Martin Murphy, Naomi Sugimura*	
	1 Jun-5 Sep	Regime forcing project	2	Hector Douglas, Brie Drummond	
	1 Jun-7 Aug	Auklet biology	1	Travis Clarke, Ian Jones*	
2004	26 May-25 Aug	Refuge monitoring	2	Martin Murphy, Slade Sapora	
	26 May-? Aug	Auklet biology	1	Christina Bourne	
	26 May-7 Jun	Auklet biology	2	Ian Jones, Dan Roby	
	26 May-25 Aug	Regime Forcing project	2	John Citta, Joe Seyfried	
2005	29 May-27 Aug	Refuge monitoring	4	Erik Andersen, Trevor Joyce, Meredith Barrett, Aaron Stoertz	
	29 May-10 Aug	Auklet biology	1	Paul Regular	
	29 May-7 Jun	Auklet biology	4	Ian Jones, Sampath Seneviratne, Chris Eggleston, Cari Eggleston	
2006	24 May-30 Aug	Refuge monitoring	3	Rachael Orben, Corey Van Stratt, Stephan Lorenz	
	24 May-13 Aug	Auklet biology	3	Sampath Seneviratne, Grant Humphries, Adam Hunt, Ian Jones*	
	13 Aug-30 Aug	Cabin building	2	Jeff Williams, Craig Williams	
2007	29 May-27 Aug	Refuge monitoring	4	Erik Andersen, Scott Freeman, Nick Seferovic, Cornelius Schlawe	
	29 May-4 Aug	Auklet biology	4	Sampath Seneviratne, Stephan Lorenz, Pam Woodman, Chris Smalls	
2008	26 May-27 Aug	Refuge monitoring	3	Scott Freeman, Kevin Payne, Bob Keller	
	26 May-5 Aug	Auklet biology	2	Jessica Fowler, Patrick Leveque	
	26 May-6 Jun	Auklet biology	2	Ian Jones, Rachel Buxton	
2009	29 May-25 Aug	Refuge monitoring	3	Scott Freeman, Ray Buchheit, Kyle Morrison	
	29 May-3 Aug	Auklet biology	2	Hannah Munro, Allie Patrick	
	29 May-3 Aug	ACG biology	2	Joshua Cocke, Steve Alton	
	29 May-18 Jun	Auklet biology	1	Ian Jones	
2010	29 May-27 Aug	Refuge monitoring	3	Alexis Will, Steve Tucker, Alex Wang	
	29 May-18 Jun	Auklet biology	2	Ian Jones, Paul Jones	
	29 May-3 Aug	Auklet biology	2	Hannah Munro, Sarah Kennedy	
	3 Aug-27 Aug	Botany	1	Monte Garrouthe	
2011	28 May-28 Aug	Refuge monitoring	2	John Warzybok, David Cockerill	
	28 May-5 Aug	Refuge monitoring	1	Jaime Neill	

Table 128 (continued). History of official visits to Buldir Island, Alaska.

Year	Dates	Type of work	Number	Names	Source
2011	28 May-15 Jul	Auklet biology	1	Ian Jones	
	28 May-5 Aug	Auklet biology	2	Jill Robinson, Michelle Valliant	
	7 Aug-28 Aug	Botany	1	Monte Garrouette	
2012	25 May-30 Aug	Refuge monitoring	2	John Warzybok, Matt Henschen	
	25 May-11 Aug	Refuge monitoring	1	Ronan Dugan	
	25 May-11 Aug	Auklet biology	4	Jill Robinson, Michelle Goh, Carley Schacter, Ian Jones	
2013	27 May-26 Aug	Refuge monitoring	3	Robby Kohley, Rachael Herman, Ryan DeRegnier	
	27 May-12 Jun	Auklet biology	2	Ian Jones, Jill Robinson	
	27 May-6 Aug	Auklet biology	2	Carley Schacter, Katherine Robbins	
	12 Jun-6 Aug	Auklet biology	2	Marc Dodds, Chelsey Stephenson	
2014	28 May-26 Aug	Refuge monitoring	3	John Gorey, Emily Pollom, Sara Naval	
	28 May-30 Jul	Auklet biology	4	Katherine Robbins, Eva Gruber, Carley Schacter, Matt Webb	
2015	2 Jun-28 Aug	Refuge monitoring	2	McKenzie Mudge, Kevin Pietrzak	
	2 Jun-4 Aug	Refuge monitoring	1	Ryan Mong	
	2 Jun-25 Jun	Auklet biology	2	Katherine Robbins, Carley Schacter	
2016	29 May-29 Aug	Refuge monitoring	3	McKenzie Mudge, Kevin Pietrzak, Stephanie Walden	
	29 May-6 Jun	Refuge monitoring	1	Nora Rojek	
	2 Jun	Cabin maintenance	3	Billy Pepper, John Faris, Tim Plucinski	
	2 Jun	Kittiwake biology	1	Heather Renner	
2017	25 May-28 Aug	Refuge monitoring	3	Kevin Pietrzak, McKenzie Mudge, Stephanie Walden	
	25 May-26 May	Kittiwake biology	2	Nora Rojek, Heather Renner	
	26 May	Cabin maintenance	4	John Faris, Wes Kuhns, Andy Velsko, David Martindell	
	22 July	Kittiwake biology	4	Nora Rojek, Dean Kildaw, Aaron Christ, Steve Holzman	
	22 July	Cabin maintenance	4	Wes Kuhns, Billy Pepper, Andy Velsko, Morgan Stewart	

* indicates that a person only spent a portion of the time period on the island.

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Appendix A. Diet datasets in the AMNWR diet dataset from Buldir Island, Alaska. Years in parentheses are pending analysis.

Species	Recipient	Diet type	Years	In 2017 annual report
Common eider	Adult	Stomach	1990	N
Common murre	Adult	Stomach	1988-1989, 1998	N
Thick-billed murre	Adult	Stomach	1988-1989, 1998	N
Thick-billed murre	Chick	Bill load	2010	N
Ancient murrelet	Adult	Stomach	1988	N
Cassin's auklet	Adult	Stomach	1988-1990	N
Cassin's auklet	Chick	Regurgitation	1993, 1999-2001, 2004-2013	N
Parakeet auklet	Adult	Stomach	1988-1990	N
Parakeet auklet	Chick	Regurgitation	1993-2000, 2003-2016, (2017)	Y
Least auklet	Adult	Stomach	1988, 1990	N
Least auklet	Chick	Regurgitation	1991, 1994-2016, (2017)	Y
Whiskered auklet	Adult	Stomach	1976, 1988-1989	N
Whiskered auklet	Chick	Gular	1976	Y
Whiskered auklet	Chick	Regurgitation	1991, 1993-2016, (2017)	Y
Crested auklet	Adult	Stomach	1988, 1990	N
Crested auklet	Chick	Regurgitation	1991, 1993-2016, (2017)	Y
Horned puffin	Adult	Stomach	1988, 1990	N
Horned puffin	Chick	Bill load	1990-1991, 1994, 1996, 1998-2016, (2017)	Y
Tufted puffin	Adult	Stomach	1988-1990	N
Tufted puffin	Chick	Bill load	1988-1992, 1994, 1996-2016, (2017)	Y
Black-legged kittiwake	Adult	Stomach	1989-1990	N
Black-legged kittiwake	Chick	Regurgitation	1988-2002, 2004-2013	Y
Red-legged kittiwake	Adult	Stomach	1988-1990	N
Red-legged kittiwake	Chick	Regurgitation	1988-2002, 2004-2013	Y
Glaucous-winged gull	Adult	Stomach	1988	N
Glaucous-winged gull	Adult	Pellet	1997-2017	Y
Glaucous-winged gull	Chick	Regurgitation	2010, 2016	Y
Northern fulmar	Adult	Stomach	1989	N
Short-tailed shearwater	Adult	Stomach	1990	N
Fork-tailed storm-petrel	Adult	Stomach	1989	N
Fork-tailed storm-petrel	Chick	Regurgitation	1996-1999, 2001-2014, (2015-2017)	Y
Leach's storm-petrel	Adult	Stomach	1989-1990	N
Leach's storm-petrel	Chick	Regurgitation	1996-2014, (2015-2017)	Y
Pelagic cormorant	Chick	Bolus	2006	N
Red-faced cormorant	Adult	Stomach	1990	N

Appendix B. Photos of Interest.



Figure B1. Male American green-winged teal. Photo by McKenzie Mudge.



Figure B4. Gray-tailed tattler. Photo by Kevin Pietrzak.



Figure B2. Red-necked stint. Photo by Kevin Pietrzak.



Figure B5. Female eyebrowed thrush. Photo by Kevin Pietrzak.



Figure B3. Little stint. Photo by Kevin Pietrzak.



Figure B6. Female Lapland longspur. Photo by Kevin Pietrzak.