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BIOLOGICAL MONITORING AT BULDIR ISLAND, ALASKA IN 2019

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Photo:
Reina Galvan


Photo: Reina Galvan

“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 eight 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; Pietrzak et al. 2017, 2018). 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 2019 were to estimate productivity and/or population parameters for 14 indicator species representing four major feeding guilds: 1) diving fish-feeders (common and thick-billed murres [*Uria aalge* and *U. lomvia*], horned and tufted puffins [*Fratercula corniculata* and *F. cirrhata*]), and red-faced and pelagic cormorants [*Phalacrocorax urile* and *P. pelagicus*]), 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 [*Hydrobates furcatus* and *H. leucorhous*]). 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 2019 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. 2018). 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 (52º21' N, 176º56' 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 7.7ºC in the summer and 3.7ºC 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 3-4ºC in late May and rise to 6-7ºC 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 2019 consisted of Stacie Evans (2 to 6 June and 17 June to 27 August), Daniel Schultz and Reina Galvan (2 June to 27 August), and Nora Rojek (9 June to 17 June). On 2 and 9 June Refuge Manager Steve Delehanty, a film crew from Tandem Stills and Motion, Inc. (led by Ian Shive), and other passengers on the R/V *Tiĝlax̂* visited the island. The videographers captured video images of the field camp area and the Main Talus auklet colony.

Data Collection and Analysis: Crew members followed data collection and analysis methods outlined in the annual monitoring camp standardized protocols for 2019 (Alaska Maritime National Wildlife Refuge 2019) with the following exceptions:

- No pigeon guillemot counts or circumnavigation surveys were conducted due to the lack of a skiff.

- Tufted puffin burrow-nester population surveys (density and apparent occupancy within plots) were not conducted in 2019 in order to minimize disturbance in important breeding habitat. Instead we continued testing a protocol being developed to track changes in puffin populations, using the

presence/absence of occupied burrows (i.e., the presence of fish, guano, feathers, shell fragments, egg(s), and chick(s) inside a burrow) within randomly placed 1.5m^2 quadrats as a surrogate for annual breeding population and colony attendance. Due to the difficulty of sampling tufted puffin habitat at Buldir, this work was limited to the Northwest Ridge and Crested Point colonies. We conducted two replicates of sampling, consisting of a total of 400 quadrats arranged along transect lines within these colonies. Details of this survey will be described in a special report on the new puffin protocol.

- Due to safety concerns about exposure to rock fall 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 tested a pilot protocol to quantify early breeding effort and success, and to obtain some absolute measures of success, in kittiwakes and murres in 2019. Within fixed-border plots and subplots, we periodically counted adults and nesting attempts (nests built for kittiwakes and eggs laid for murres) earlier in the season than usual productivity monitoring and tracked the cumulative number of nesting attempts. By using the same fixed-border plots in subsequent years, we will be able to compare absolute effort and absolute early-success measures between years, and use these values in conjunction with the ratio measures of success that we obtain from plots with non-fixed borders. At Buldir, we implemented this new protocol in two black-legged kittiwake plots and one red-legged kittiwake plot beginning on 18 June. We are still analyzing these data; results will be summarized in a separate report this winter.

- The average hatch date reported for Leach's storm-petrels does not include hatch dates for two viable eggs that were still present when the crew stopped monitoring chronology plots on 26 August.

- 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.

- We salvaged tufted puffin parts for a Pacific Seabird Group tufted puffin technical committee supported range-wide genetic study.

- We collected *Primula cuneifolia* leaves for a University for Zurich project studying the genetic consequences associated with colonization of the Aleutian Islands.

- We collected ticks for the Alaska Submit-A-Tick Program, which aims to document ticks in order to better understand the potential impacts of ticks in Alaska.

To abide by recent American Ornithological Union classification and nomenclature revisions taxonomic order and scientific names within tables and in the annotated list in this report were adjusted.

Reproductive success and chronology data for kittiwakes, murres, auklets, and puffins in all years, and storm-petrels in 2017-2019, were summarized using the AMNWR productivity database (except simple random standard deviation values for reproductive success parameters, which are calculated by hand). Reproductive success and chronology data for gulls in all years, and storm-petrels prior to 2017, were summarized by hand (these data will be added to and summarized by the database in the future).

Diet data for all species in all years were summarized using the AMNWR diet database (only ongoing diet datasets are presented here; additional diet datasets exist [Appendix 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 2019 was an early season for breeding seabirds at Buldir. All of the monitored auklet species, kittiwakes, thick-billed murres, and storm-petrels exhibited earlier than average hatch dates. Puffins and glaucous-winged gulls nested later than average.

- Thick-billed murres had a higher reproductive success (67%) than in recent years on Buldir. In the previous seven seasons their reproductive success has been lower than the overall mean for all years monitored since 1988. Last year was the lowest recorded reproductive success (41%) on Buldir.

- All auklet species had high reproductive success with crested auklets matching their best previous season recorded (90%) in 1997.

- Tufted puffins had average maximum potential reproductive success (48%) after two years of nearly complete failure.

- Only one red-legged kittiwake chick survived to fledge this season. All 37 nests located in productivity plots were monitored.

- Steller sea lions and harbor seals were observed far less frequently this season than in previous seasons.

- A pod of approximately 30 orcas was observed in late July. Smaller groups were recorded on five other days around that time. Males, females, and juveniles were present. This is an uncommonly large number for orcas on Buldir; no other crews reported seeing more than 10 individuals at one time.

- Fewer bird species were recorded on Buldir this season than expected. Of course many factors could have contributed to a lower rate of detection, but it was not due to the lack of effort. The crew arrived late this season, so it is likely that many spring migrators were missed. It is notable, however, that many obvious waterfowl were either not observed this year, or recorded in much fewer numbers than in previous years.

- The mean weekly sea surface temperature in 2019 exceeded the long-term mean throughout the season except for one week in early August.

- A portion of decking was replaced to complete the deck project started in 2018. Hinges were replaced on the outhouse and on the Main Talus blind.

- End of an era: the HF-SSB radio was not used this season; satellite email has become the primary form of communication for daily check-ins and contact with the outside world.

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We would like to thank the entire AMNWR staff: without them the monitoring program would not exist. We are also grateful for their dedication to safety and efficient response to emergency. Nora Rojek went above and beyond this year to help the field crew early season. Thanks especially to Lisa Spitler on Adak who provided a crucial communication link to the outside world. As always, we roundly appreciate the crew of the R/V *Tiĝlax̂* for providing safe transportation, wonderful food, and great hospitality throughout the summer. Finally, the crew and passengers of the M/V *Puk-uk* deserve gratitude for their timely response in a time of need and gracious accommodation of unexpected circumstances.

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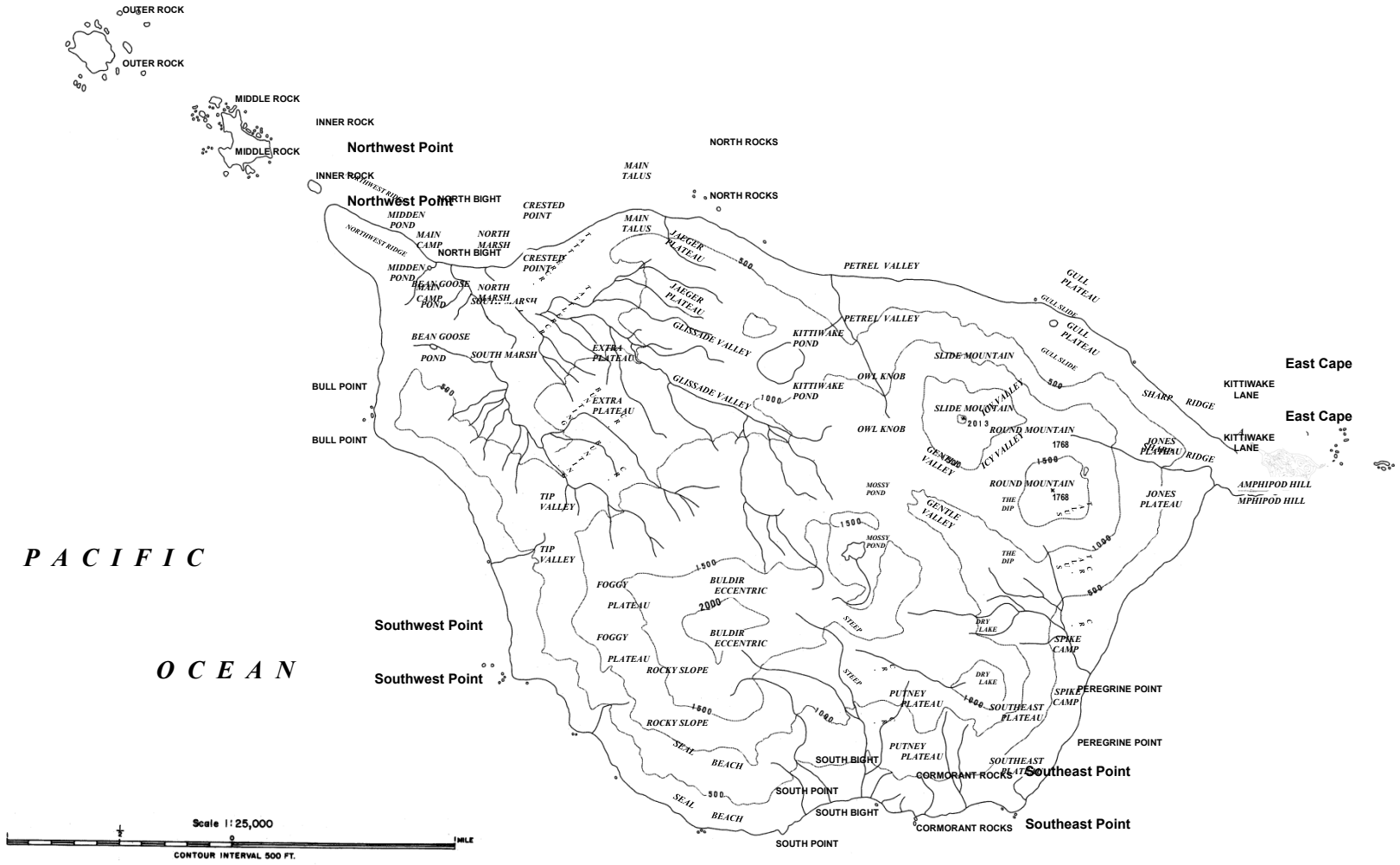

Figure 1. Map of Buldir Island, Alaska.

FIGURES AND TABLES

North Marsh with Middle and Outer Rocks.
Photo by Daniel Schultz/FWS

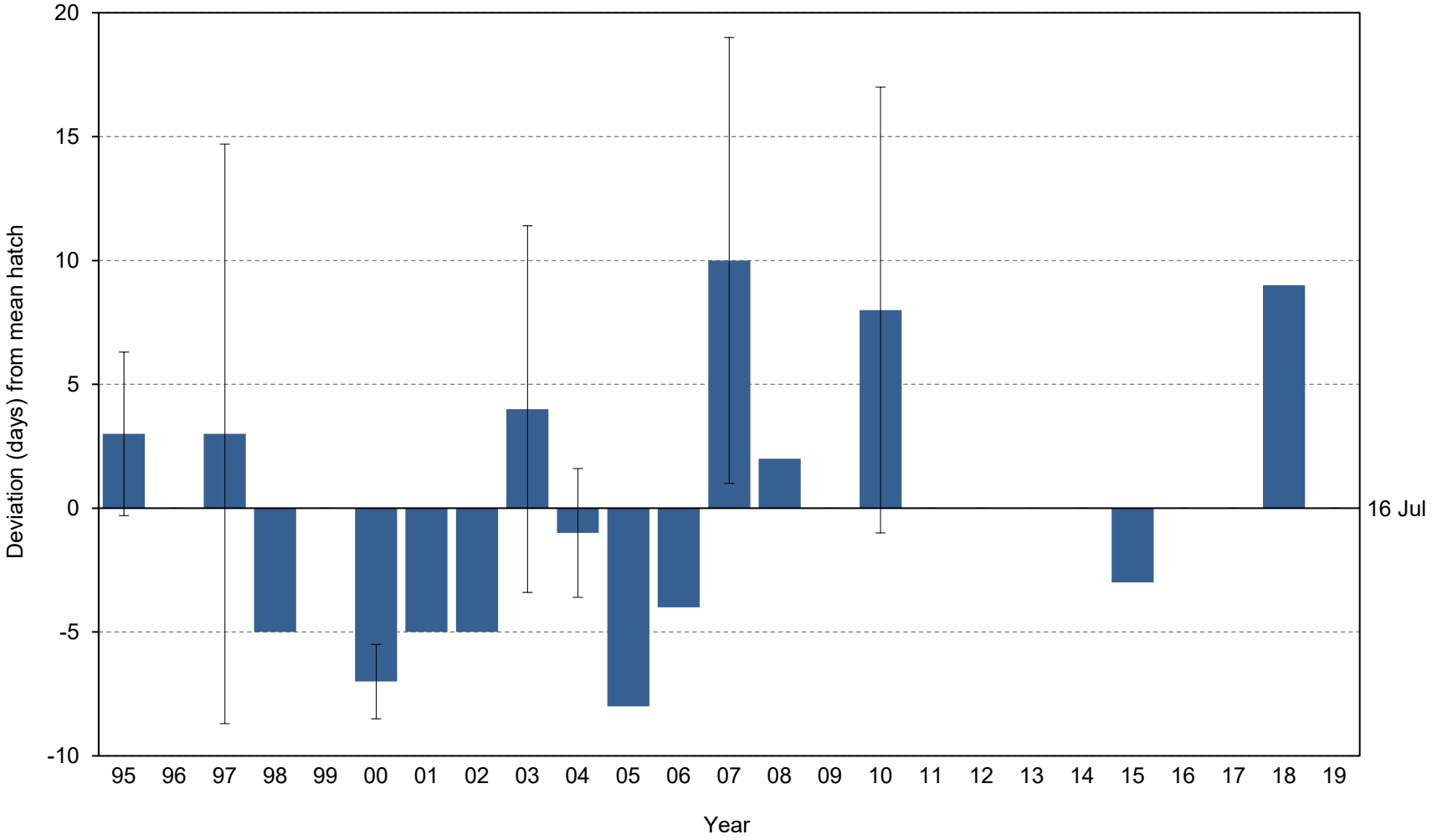

Figure 2. Yearly hatch date deviation (from the 1995-2018 average of 15 July) for common murres at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one). 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, 2016-2017, or 2019.

Table 1. Breeding chronology of common murres 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, 2016-2017, or 2019.

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	-	1	11 Jul	-	17 Aug
2000	8 Jul	1.5	2	6 Jul	9 Jul	23 Jul
2001	11 Jul	-	1	11 Jul	-	1 Aug
2002	11 Jul	-	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	-	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	-	1	17 Jul	-	31 Jul
2009	-	-	-	-	-	>20 Aug
2010	24 Jul	9.0	2	15 Jul	2 Aug	2 Aug
2015	13 Jul	-	1	13 Jul	-	2 Aug
2018	25 Jul	-	1	25 Jul	-	-

[a]Sample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.
[b]In 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 murres 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, 2016-2017, or 2019.

Julian date[a]	No. nests hatching on Julian date													
	95	97	00	01	02	03	04	05	06	07	08	10	15	18
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	-	-	-	-	-	-	-	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	-	-	-	-	-	-	-	-	-	-	-	-
n	3	7	2	1	1	8	4	1	4	2	1	2	1	1

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

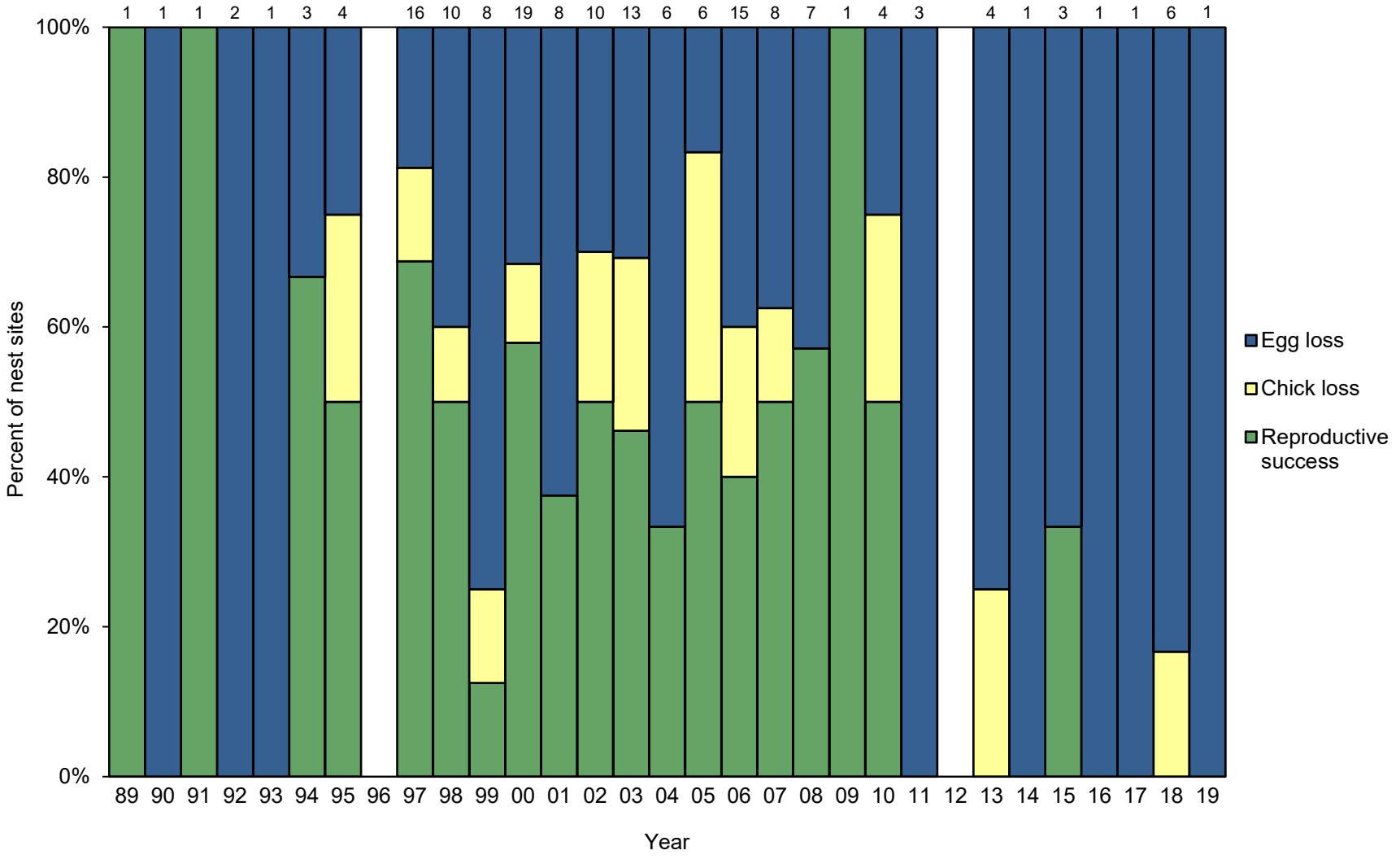

Figure 3. Reproductive performance of common murres at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected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

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

Year	Nest sites w/ eggs	Nest sites w/ chicks	Nest sites w/ chicks fledged	Nesting success (D/B)[a]		Fledging success (F/D)[b]		Reproductive success (F/B)		No. plots[c]	Sampling design[d]
	(B)	(D)	(F)	Total	SD	Total	SD	Total	SD		
1989	1	1	1	1.00	0.00	1.00	0.00	1.00	0.00	1	Simple random
1990	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
1991	1	1	1	1.00	0.00	1.00	0.00	1.00	0.00	1	Simple random
1992	2	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
1993	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
1994	3	2	2	0.67	0.27	1.00	0.00	0.67	0.27	2	Simple random
1995	4	3	2	0.75	0.22	0.67	0.27	0.50	0.25	1	Simple random
1997	16	13	11	0.81	0.10	0.85	0.10	0.69	0.12	2	Simple random
1998	10	6	5	0.60	0.15	0.83	0.15	0.50	0.16	2	Simple random
1999	8	2	1	0.25	0.15	0.50	0.35	0.13	0.12	2	Simple random
2000	19	13	11	0.68	0.11	0.85	0.10	0.58	0.11	3	Simple random
2001	8	3	3	0.38	0.17	1.00	0.00	0.38	0.17	1	Simple random
2002	10	7	5	0.70	0.14	0.71	0.17	0.50	0.16	1	Simple random
2003	13	9	6	0.69	0.13	0.67	0.16	0.46	0.14	1	Simple random
2004	6	2	2	0.33	0.19	1.00	0.00	0.33	0.19	2	Simple random
2005	6	5	3	0.83	0.15	0.60	0.22	0.50	0.20	1	Simple random
2006	15	9	6	0.60	0.13	0.67	0.16	0.40	0.13	2	Simple random
2007	8	5	4	0.63	0.17	0.80	0.18	0.50	0.18	1	Simple random
2008	7	4	4	0.57	0.19	1.00	0.00	0.57	0.19	2	Simple random
2009	1	1	1	1.00	0.00	1.00	0.00	1.00	0.00	1	Simple random
2010	4	3	2	0.75	0.22	0.67	0.27	0.50	0.25	1	Simple random
2011	3	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
2013	4	1	0	0.25	0.22	0.00	0.00	0.00	0.00	1	Simple random
2014	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
2015	3	1	1	0.33	0.27	1.00	0.00	0.33	0.27	1	Simple random
2016	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
2017	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random
2018	6	1	0	0.17	0.15	0.00	0.00	0.00	0.00	1	Simple random
2019	1	0	0	0.00	0.00	-	-	0.00	0.00	1	Simple random

[a]For 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).

[b]For 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).

[c]Plots that are combined for analysis are counted as a single "plot".

[d]Sampling for murres is clustered by plot except when sample sizes per plot are too small or plot data are not available. For sampling clustered by plot, standard deviation values are calculated based on plot as a sample unit; for simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

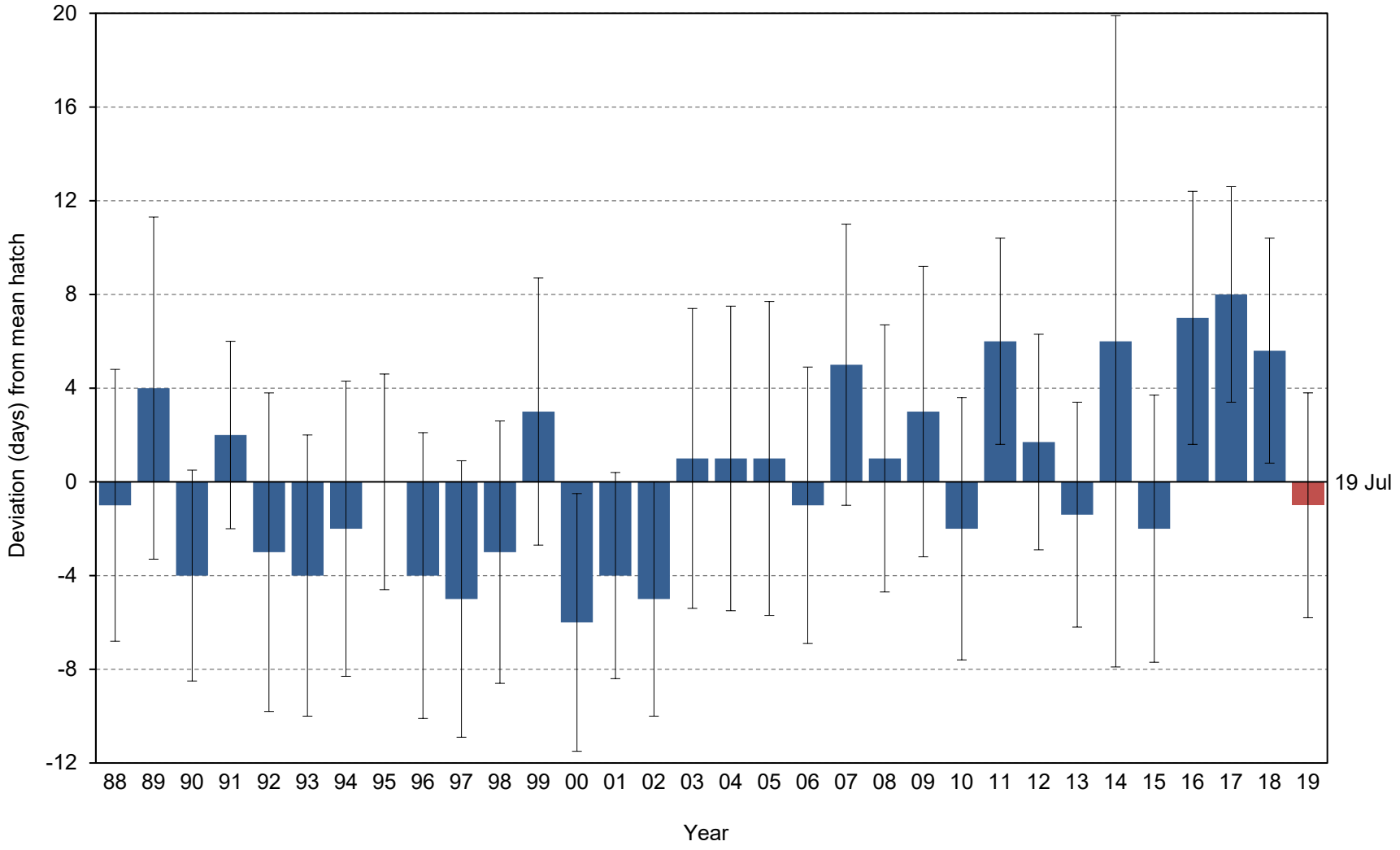

Figure 4. Yearly hatch date deviation (from the 1988-2018 average of 19 July) for thick-billed murres at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 4. Breeding chronology of thick-billed murres 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
2018	25 Jul	4.8	120	15 Jul	10 Aug	5 Aug
2019	18 Jul	4.8	143	7 Jul	7 Aug	27 Jul

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

Table 5. 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	03
183	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	5	2	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
186	-	-	-	-	1	4	1	-	1	-	3	-	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	2	15	-	-	-	-	3	2
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
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	30
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	64
201	1	-	-	-	5	-	-	-	-	-	3	-	6	-	-	-
202	3	1	-	12	-	14	-	2	1	23	-	17	-	-	-	-
203	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-
204	15	-	-	-	-	-	-	31	11	-	-	-	-	6	1	2
205	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
206	1	7	-	-	1	-	4	-	-	-	6	-	-	-	-	22
207	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
208	-	1	-	7	-	5	-	-	2	5	-	3	-	1	-	-
209	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-
210	1	-	-	-	-	-	2	-	-	-	3	-	1	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	1	-	-	1	1	-	-	-	-	-	12
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	4	-	-	-	2	-	-	-	-
215	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
216	-	-	-	-	3	-	-	-	2	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
219	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-
221	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
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229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	86	19	23	26	35	93	40	180	198	173	56	31	35	58	57	138

Table 5 (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															
	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	1	-	-	-	3	-	-	-	-	-	-	-	-	1
189	-	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-
190	2	3	-	-	-	1	3	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	14
192	-	1	5	-	-	-	20	-	-	2	-	9	-	-	-	-
193	-	-	23	-	-	-	-	-	3	-	-	14	-	-	-	-
194	17	4	3	2	-	5	5	-	-	1	-	10	-	-	-	-
195	2	4	-	-	24	6	2	-	2	1	-	-	-	-	-	-
196	-	3	-	-	-	-	52	-	-	-	-	-	-	-	6	-
197	1	1	39	-	-	-	-	-	-	8	-	1	-	-	-	67
198	1	-	2	8	-	4	-	5	44	-	3	27	-	2	-	-
199	-	-	-	-	1	-	2	-	-	-	-	1	-	-	-	-
200	30	18	-	-	-	63	2	-	5	-	-	10	29	1	-	-
201	-	21	-	-	37	1	-	1	2	-	-	-	-	-	1	1
202	-	-	43	23	-	-	24	22	56	4	-	-	-	19	44	-
203	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	52
204	21	-	-	-	2	1	1	3	-	-	-	9	2	3	-	-
205	-	2	-	-	-	-	-	-	1	-	-	-	-	-	4	-
206	-	12	10	1	-	22	7	1	-	1	-	1	71	49	33	-
207	-	-	-	14	13	-	-	-	-	-	-	-	-	6	-	-
208	-	-	-	-	-	1	-	25	14	-	-	3	-	-	4	6
209	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-
210	6	-	1	-	-	4	8	-	-	-	-	-	1	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	2	4	6	-	-	-	10	5	1	-	-	33	24	21	-
213	-	-	-	-	5	1	1	-	-	-	-	-	-	-	-	-
214	3	-	-	-	-	-	1	-	-	-	-	4	-	1	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-
216	-	-	4	3	-	10	-	-	-	-	-	-	-	-	-	1
217	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-
218	2	-	-	-	-	-	-	1	3	-	-	-	8	-	-	-
219	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1
220	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
222	1	2	-	2	-	-	-	-	-	-	-	-	-	-	2	-
223	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
230	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	88	76	143	59	84	123	133	68	135	18	4	92	148	117	120	143

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

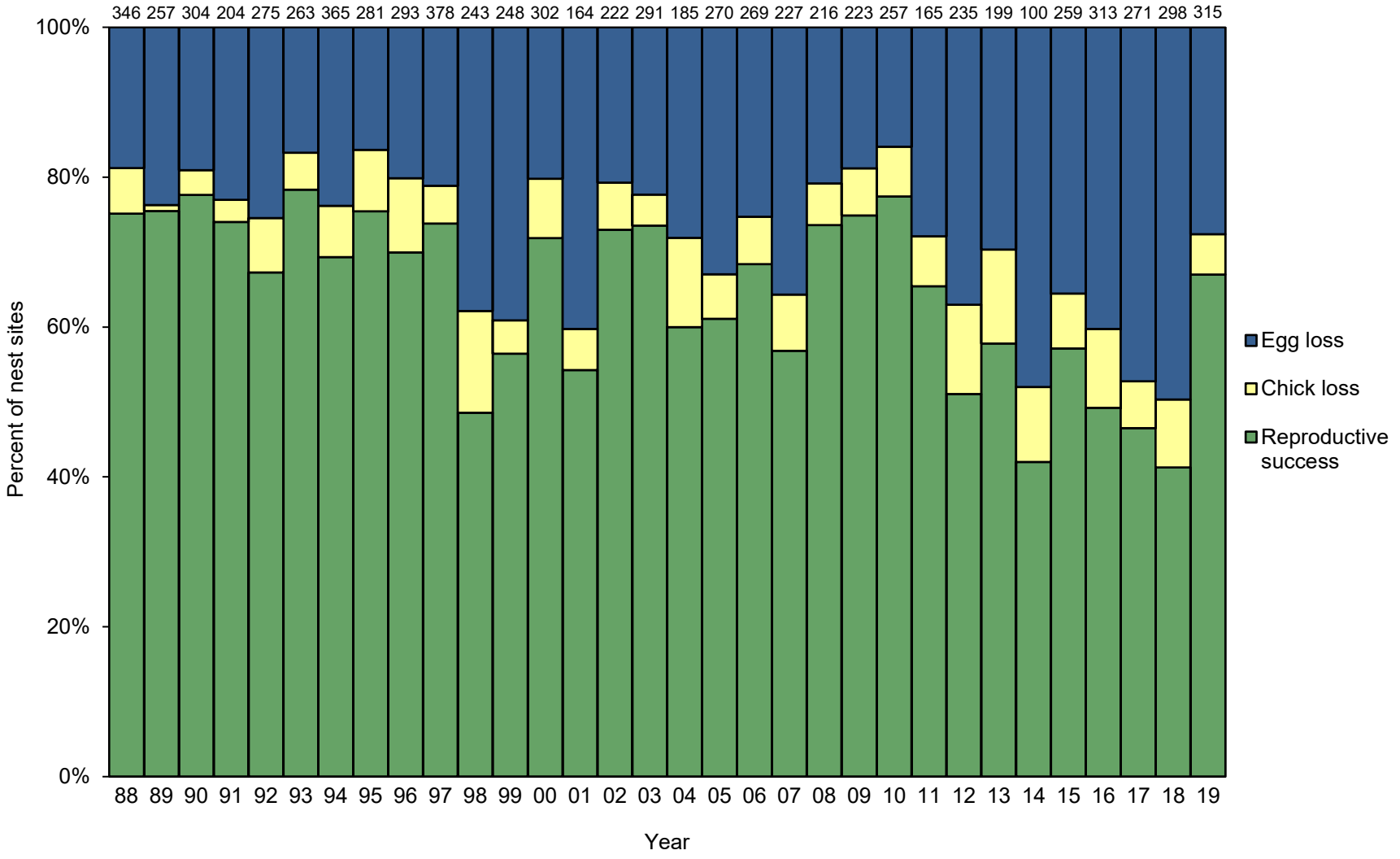

Figure 5. Reproductive performance of thick-billed murres at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B).

Table 6. 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] Total	Nesting success (D/B)[a] SD	Fledging success (F/D)[b] Total	Fledging success (F/D)[b] SD	Reproductive success (F/B) Total	Reproductive success (F/B) SD	No. plots[c]	Sampling design[d]
1988	346	281	260	0.81	0.04	0.93	0.02	0.75	0.05	12	Cluster by plot
1989	257	196	194	0.76	0.03	0.99	0.01	0.75	0.03	12	Cluster by plot
1990	304	246	236	0.81	0.04	0.96	0.01	0.78	0.03	12	Cluster by plot
1991	204	157	151	0.77	0.04	0.96	0.01	0.74	0.04	12	Cluster by plot
1992	275	205	185	0.75	0.03	0.90	0.04	0.67	0.05	12	Cluster by plot
1993	263	219	206	0.83	0.02	0.94	0.01	0.78	0.02	7	Cluster by plot
1994	365	278	253	0.76	0.04	0.91	0.02	0.69	0.05	10	Cluster by plot
1995	281	235	212	0.84	0.02	0.90	0.03	0.75	0.04	11	Cluster by plot
1996	293	234	205	0.80	0.04	0.88	0.02	0.70	0.04	9	Cluster by plot
1997	378	298	279	0.79	0.03	0.94	0.01	0.74	0.03	7	Cluster by plot
1998	243	151	118	0.62	0.06	0.78	0.03	0.49	0.06	9	Cluster by plot
1999	248	151	140	0.61	0.04	0.93	0.02	0.56	0.04	8	Cluster by plot
2000	302	241	217	0.80	0.05	0.90	0.03	0.72	0.06	9	Cluster by plot
2001	164	98	89	0.60	0.04	0.91	0.02	0.54	0.04	6	Cluster by plot
2002	222	176	162	0.79	0.05	0.92	0.02	0.73	0.05	7	Cluster by plot
2003	291	226	214	0.78	0.03	0.95	0.01	0.74	0.03	13	Cluster by plot
2004	185	133	111	0.72	0.03	0.83	0.04	0.60	0.04	8	Cluster by plot
2005	270	181	165	0.67	0.06	0.91	0.02	0.61	0.06	9	Cluster by plot
2006	269	201	184	0.75	0.05	0.92	0.02	0.68	0.05	8	Cluster by plot
2007	227	146	129	0.64	0.09	0.88	0.03	0.57	0.09	9	Cluster by plot
2008	216	171	159	0.79	0.05	0.93	0.02	0.74	0.05	9	Cluster by plot
2009	223	181	167	0.81	0.03	0.92	0.02	0.75	0.04	8	Cluster by plot
2010	257	216	199	0.84	0.03	0.92	0.03	0.77	0.04	8	Cluster by plot
2011	165	119	108	0.72	0.04	0.91	0.03	0.65	0.04	8	Cluster by plot
2012	235	148	120	0.63	0.03	0.81	0.03	0.51	0.03	8	Cluster by plot
2013	199	140	115	0.70	0.05	0.82	0.07	0.58	0.08	8	Cluster by plot
2014	100	52	42	0.52	0.08	0.81	0.08	0.42	0.07	12	Cluster by plot
2015	259	167	148	0.64	0.07	0.89	0.02	0.57	0.07	9	Cluster by plot
2016	313	187	154	0.60	0.06	0.82	0.04	0.49	0.06	9	Cluster by plot
2017	271	143	126	0.53	0.05	0.88	0.04	0.46	0.05	9	Cluster by plot
2018	298	150	123	0.50	0.07	0.82	0.04	0.41	0.07	9	Cluster by plot
2019	315	228	211	0.72	0.03	0.93	0.02	0.67	0.03	9	Cluster by plot

[a]For 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).
[b]For 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).
[c]Plots that are combined for analysis are counted as a single "plot".
[d]Sampling for murres is clustered by plot except when sample sizes per plot are too small or plot data are not available. For sampling clustered by plot, standard deviation values are calculated based on plot as a sample unit; for simple random sampling, standard deviation 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 7. Reproductive performance of thick-billed murres at Buldir Island, Alaska in 2019.

Parameter	Plot									Total	SD[b]
	36	37	38	39	40A/40C[a]	40B	45A	46	47A		
Nest sites w/ eggs (B)	40	41	29	42	32	25	29	25	52	315	-
Nest sites w/ chicks (D)	32	29	18	25	24	18	21	17	44	228	-
Nest sites w/ chicks fledged (F)	27	28	17	23	23	18	18	15	42	211	-
Nesting success (D/B)[c]	0.80	0.71	0.62	0.60	0.75	0.72	0.72	0.68	0.85	0.72	0.03
Fledging success (F/D)[d]	0.84	0.97	0.94	0.92	0.96	1.00	0.86	0.88	0.95	0.93	0.02
Reproductive success (F/B)	0.68	0.68	0.59	0.55	0.72	0.72	0.62	0.60	0.81	0.67	0.03

[a]Plots were combined for statistical purposes.

[b]Standard deviations are calculated based on plot as a sample unit.

[c]For 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).

[d]For 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).

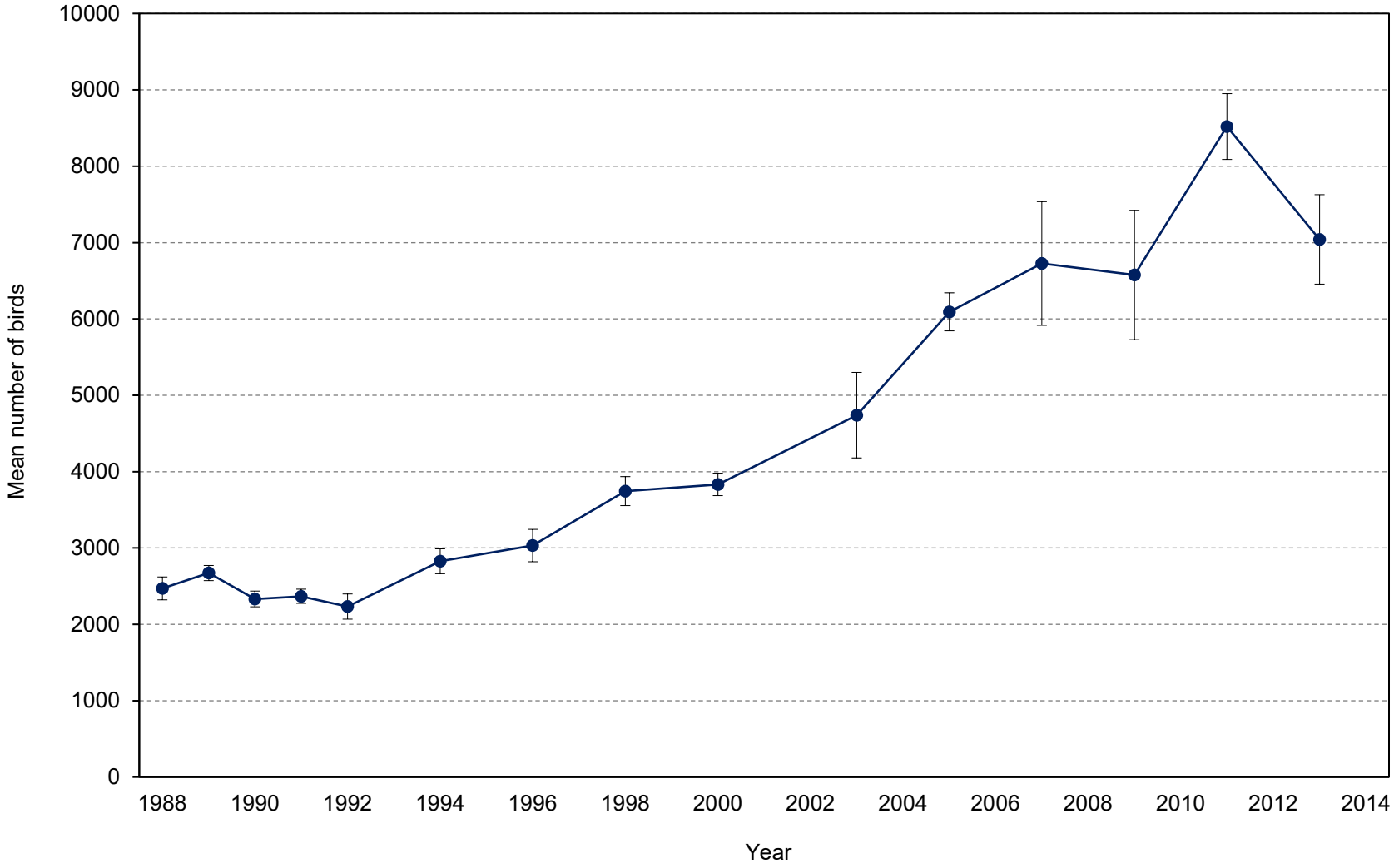

Figure 6. Mean numbers of murres counted on index plots at Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 8. 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
n	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

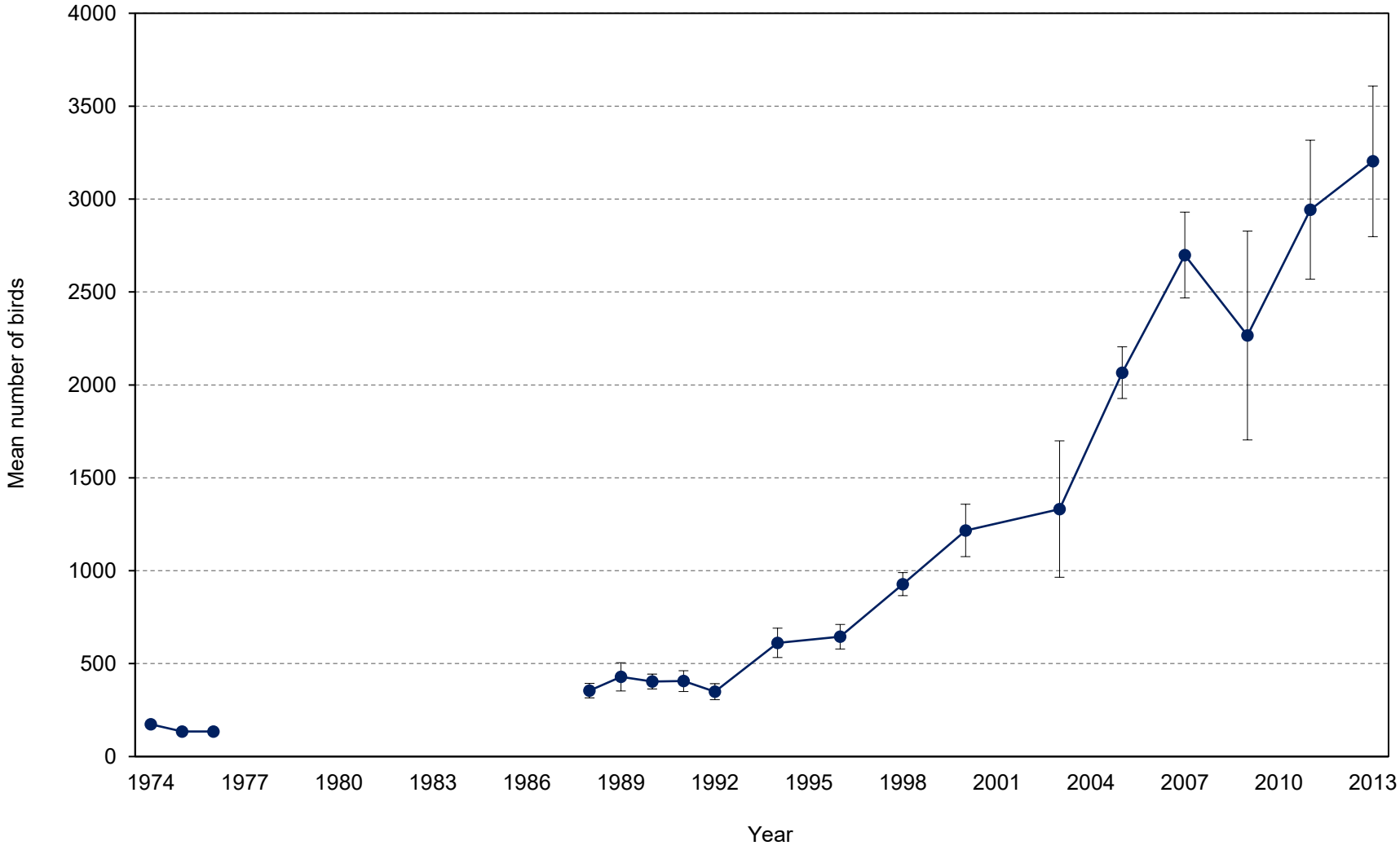

Figure 7. Mean numbers of murres counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) 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 9. 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 8) 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
n	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

[a]Data come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

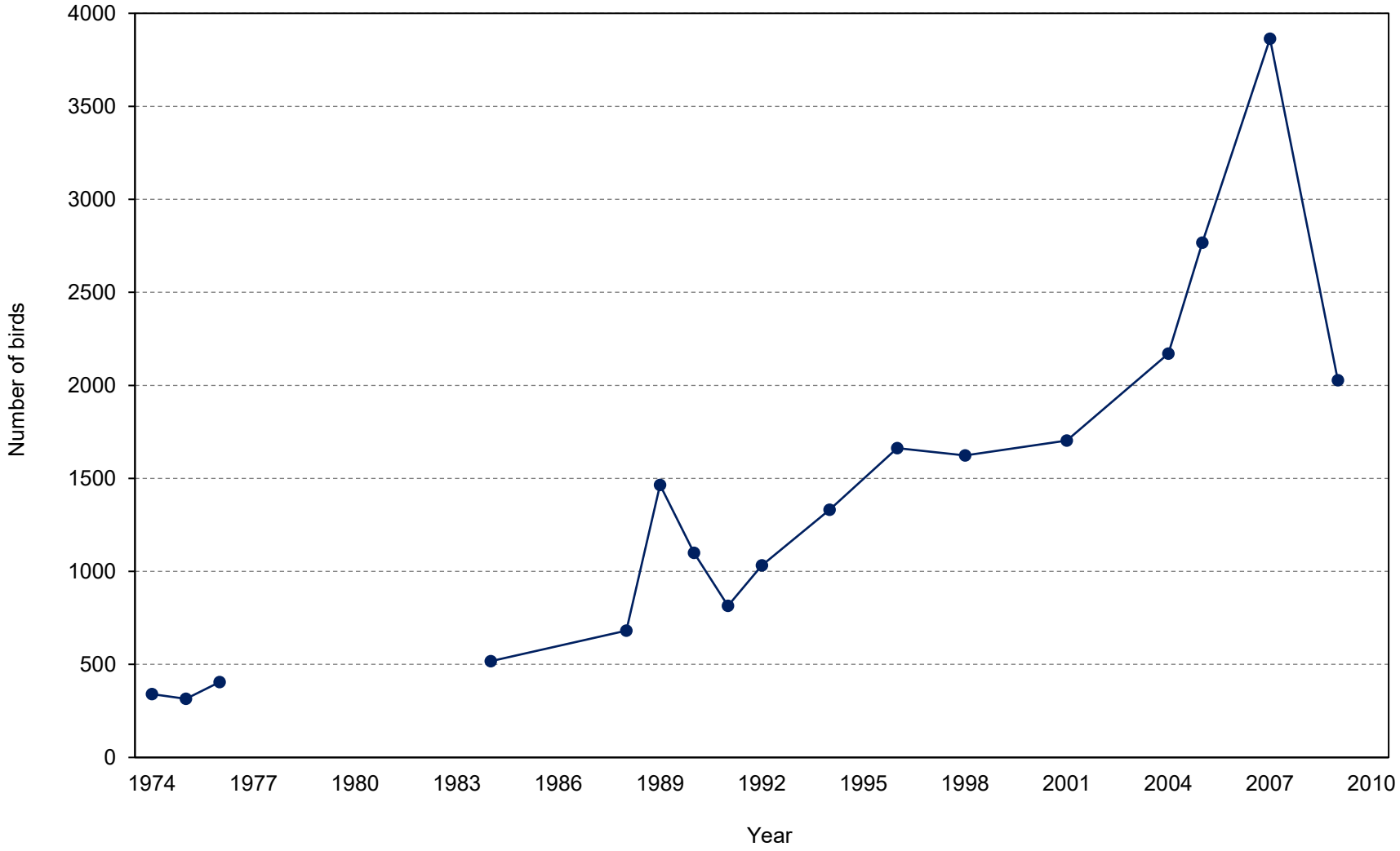

Figure 8. Numbers of murres counted at Middle Rock, Buldir Island, Alaska. Values include both common and thick-billed murres but individuals could not be identified to species in most cases. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted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

Table 10. 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 8) 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

[a]In addition, 31 common murres observed in segment I.
[b]In addition, 35 common murres observed in segment I.
[c]In addition, 103 common murres were observed in segment VII.
[d]In addition, 22 common murres were observed.
[e]In addition, 28 common murres were observed.

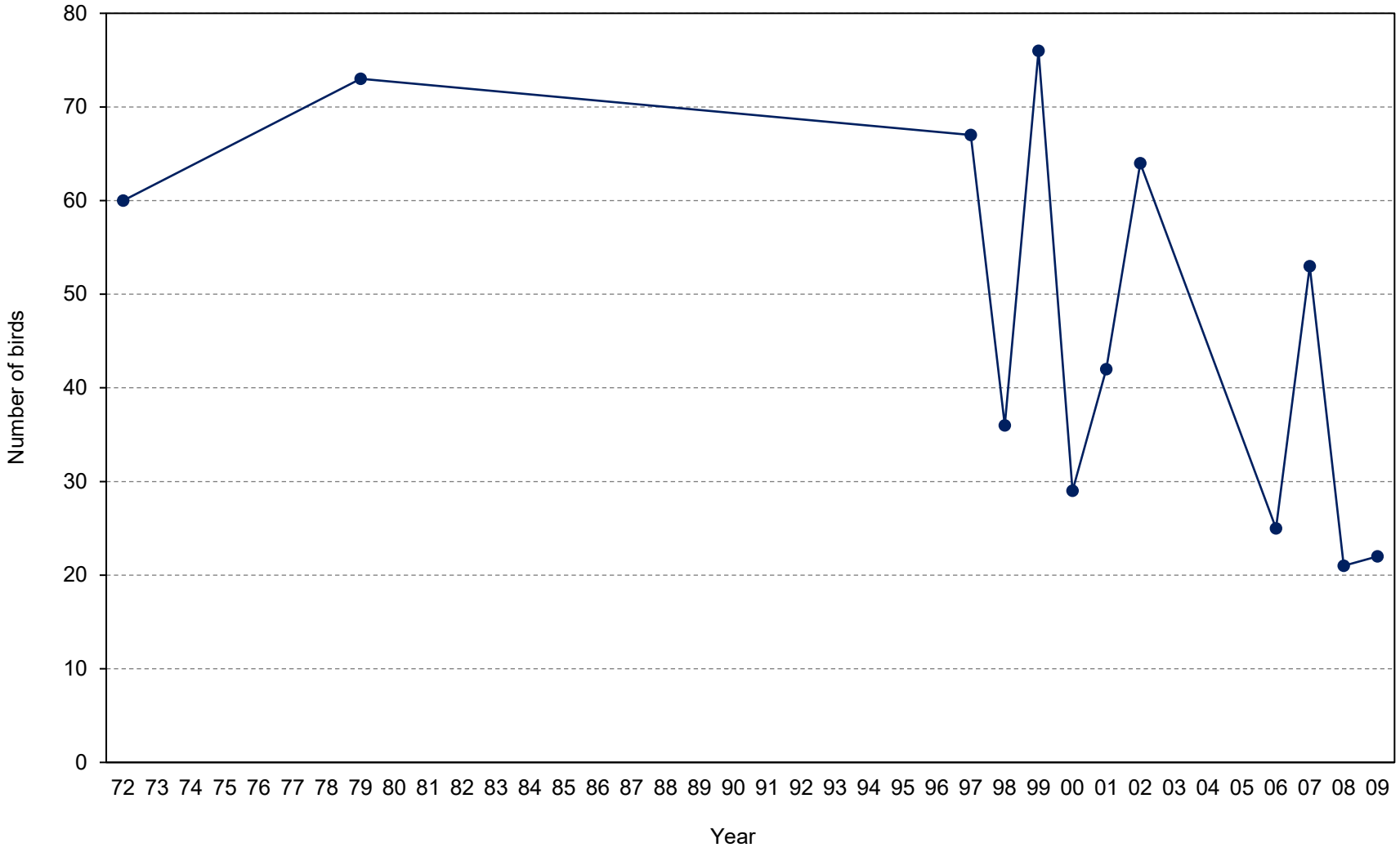

Figure 9. Numbers of pigeon guillemots counted during boat-based circumnavigation surveys at Buldir Island, Alaska. Values are based on a single survey each year. No counts were conducted in 1973-1978, 1980-1996, 2003-2004, or after 2009.

Table 11. 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	5	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	76	29	42	64	-[a]	25	53	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	8:45	8:00	21:45	10:10	10:00	10:05	8:30	7:55	11:20	10:00	xx
End time[c]	xx	xx	12:00	11:40	23:21	15:30	13:00	13:35	11:00	10:30	17:30[e]	-[f]	xx

[a]Survey 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.

[b]Count 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).

[c]Times are Aleutian Standard Time (-1 hr from Alaska Standard Time).

[d]xx indicates data potentially exist but have not yet been summarized.

[e]Survey time in 2007 included a three hour break at Kittiwake Lane.

[f]In 2008, no end time was recorded in the original field notebook.

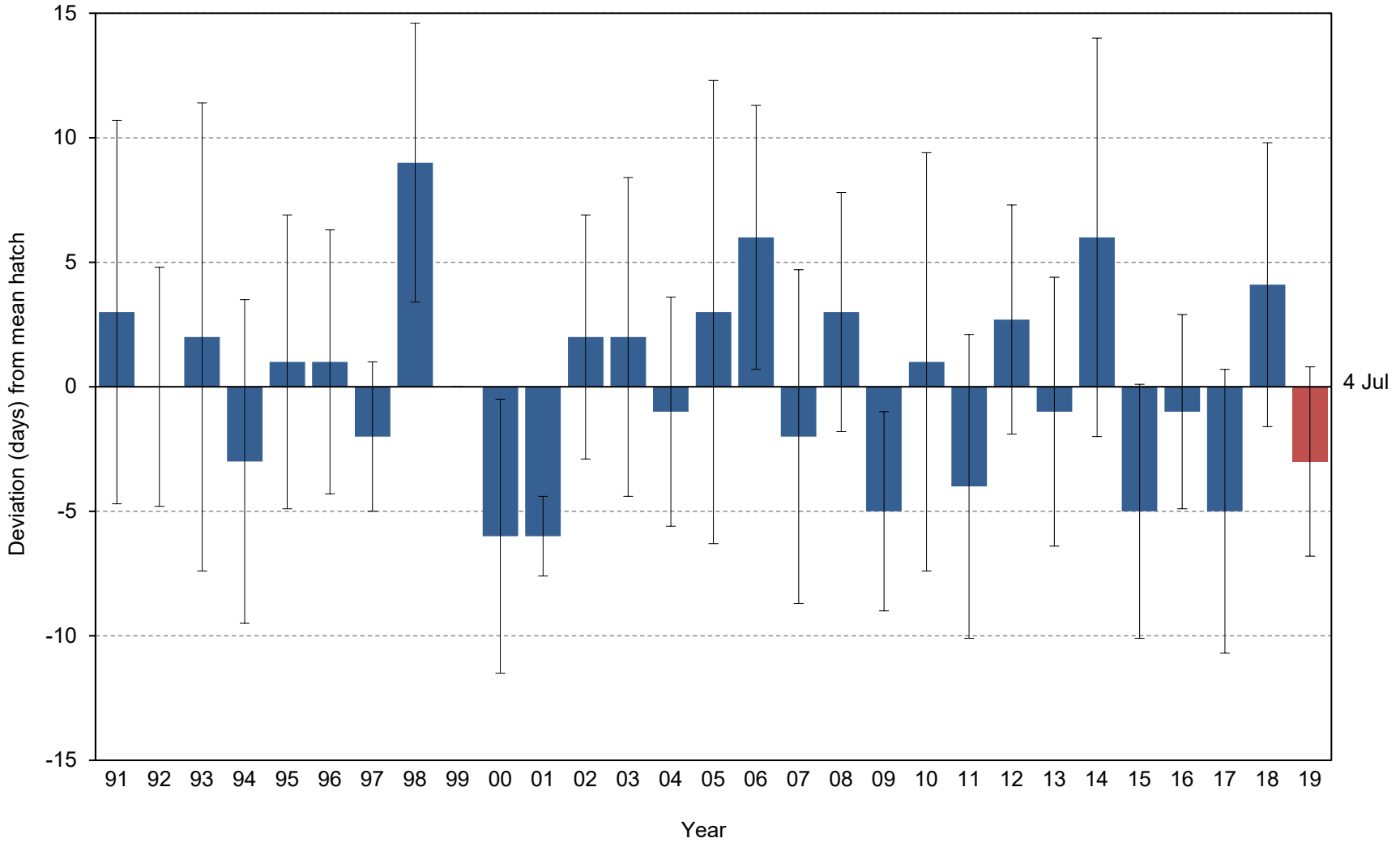

Figure 10. Yearly hatch date deviation (from the 1991-2018 average of 4 July) for parakeet auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year. No data were collected in 1999.

Table 12. 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
2018	8 Jul	5.7	27	29 Jun	25 Jul	31 Jul
2019	1 Jul	3.8	31	22 Jun	11 Jul	28 Jul

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

Table 13. 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	05
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	2
179	-	-	-	-	-	-	-	-	3	-	-	-	-	-
180	-	1	-	1	-	6	-	-	-	4	2	1	2	1
181	1	-	-	-	-	-	-	-	-	-	-	-	-	-
182	-	-	-	5	-	4	5	-	-	-	3	-	-	-
183	-	-	-	7	-	-	-	-	-	-	-	-	-	-
184	1	-	-	-	15	1	-	-	6	-	2	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	2
191	-	-	-	2	-	-	-	-	1	-	-	-	-	-
192	-	1	-	-	-	-	-	4	-	-	-	-	-	-
193	-	-	-	-	-	-	-	1	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	1	-	-	-	-	-	-	-	-
196	-	-	2	1	1	-	-	10	-	-	-	-	-	-
197	2	-	-	-	-	-	-	-	-	-	-	-	-	1
198	-	-	-	-	3	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	2	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	1	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	1	-	-	-
204	-	-	-	1	-	-	-	2	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	1
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	1	-	-	-	-	-	-
n	6	7	7	41	38	32	8	31	20	5	20	6	11	9

Table 13 (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													
	06	07	08	09	10	11	12	13	14	15	16	17	18	19
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	1	-	-	-	-	-	-	-	-	-
169	-	-	-	-	-	-	-	-	-	-	-	1	-	-
170	-	-	-	-	-	-	-	-	-	-	-	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	1	1	2	-	-	-	-	-	-	-	-
173	-	-	-	-	-	-	-	-	-	-	-	-	-	1
174	-	-	-	1	-	-	-	-	-	3	-	-	-	-
175	-	-	-	-	-	-	-	-	-	1	-	2	-	-
176	-	1	-	1	-	-	-	-	-	-	-	1	-	-
177	-	-	-	1	-	1	-	-	-	1	-	-	-	1
178	-	-	-	10	-	2	-	-	-	-	2	1	-	-
179	-	-	-	-	-	-	-	-	-	2	1	-	-	-
180	-	4	-	5	-	-	-	4	-	-	1	-	1	17
181	-	-	-	-	-	-	-	1	-	1	-	5	-	6
182	1	1	1	-	-	3	1	-	4	-	-	1	-	-
183	-	-	-	-	-	-	1	-	-	-	-	-	-	-
184	3	3	9	7	4	-	1	1	-	-	4	-	-	-
185	-	-	-	-	-	-	-	2	-	-	1	-	-	-
186	-	-	-	1	3	-	-	-	-	3	1	-	16	3
187	-	-	4	-	-	-	-	3	-	-	-	-	-	1
188	-	-	1	-	1	1	1	-	2	1	-	-	2	-
189	3	-	-	2	-	-	1	-	-	-	-	-	-	-
190	-	-	2	-	1	2	-	-	1	-	2	-	-	-
191	-	-	-	-	-	-	-	-	1	-	-	-	1	-
192	3	-	-	-	2	-	-	-	1	-	-	-	1	2
193	2	-	1	-	-	-	-	-	-	-	-	-	-	-
194	1	-	-	-	-	-	2	-	-	-	-	1	1	-
195	-	-	2	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	1	-	-	-	-	-	-	-	-	-
197	2	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	1	-	-	-	4	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	1	-	-	-	-	-	-
201	-	-	1	-	-	-	-	-	1	-	-	-	-	-
202	1	1	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	1	-	-	-	2	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	1	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	16	10	21	29	15	11	7	12	13	12	12	12	27	31

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

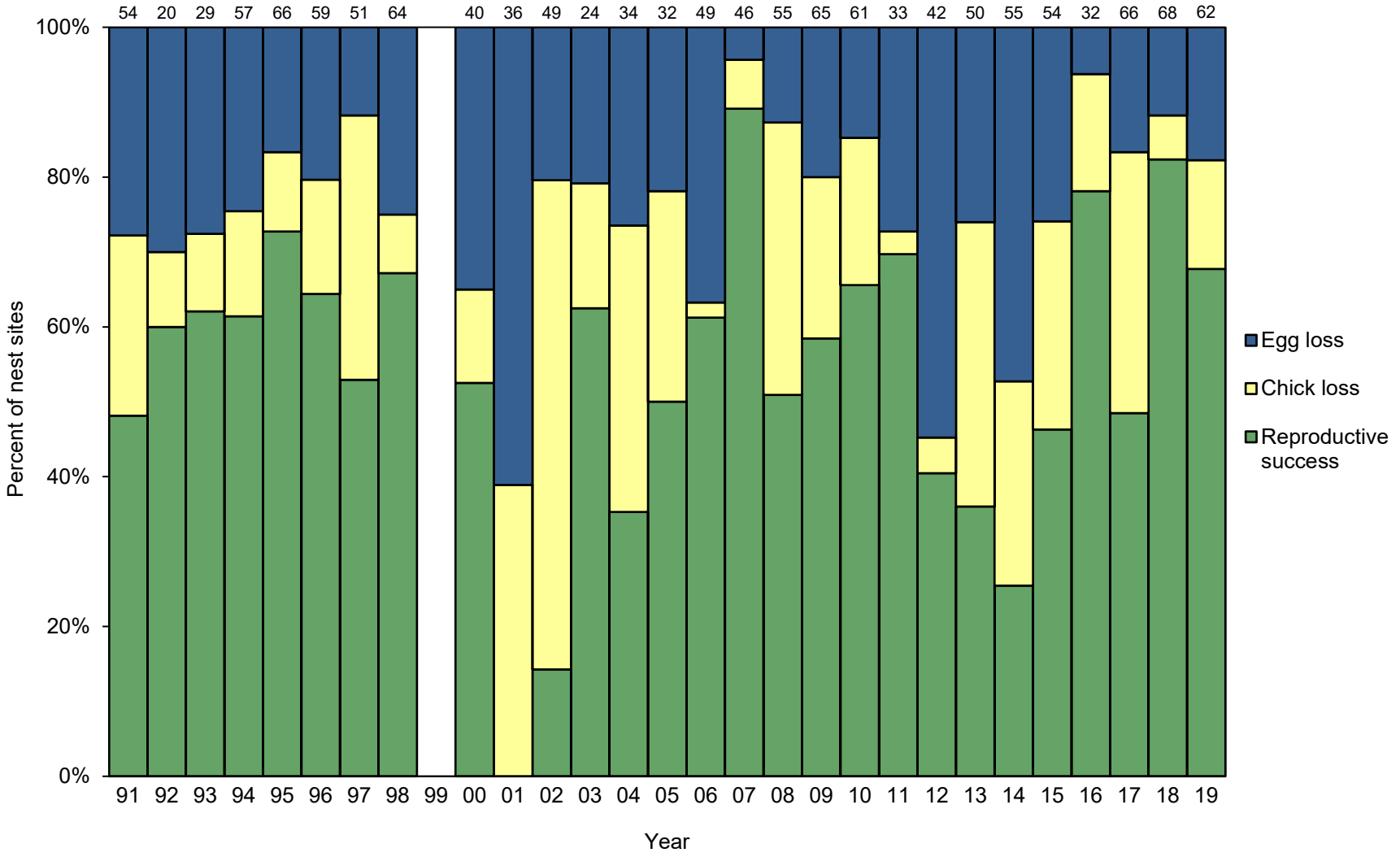

Figure 11. Reproductive performance of parakeet auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected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

Table 14. 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)		Sampling design[c]
				Total	SD	Total	SD	Total	SD	
1991	54	39	26	0.72	0.06	0.67	0.08	0.48	0.07	Simple random
1992	20	14	12	0.70	0.10	0.86	0.09	0.60	0.11	Simple random
1993	29	21	18	0.72	0.08	0.86	0.08	0.62	0.09	Simple random
1994	57	43	35	0.75	0.06	0.81	0.06	0.61	0.06	Simple random
1995	66	55	48	0.83	0.05	0.87	0.05	0.73	0.05	Simple random
1996	59	47	38	0.80	0.05	0.81	0.06	0.64	0.06	Simple random
1997	51	45	27	0.88	0.05	0.60	0.07	0.53	0.07	Simple random
1998	64	48	43	0.75	0.05	0.90	0.04	0.67	0.06	Simple random
2000	40	26	21	0.65	0.08	0.81	0.08	0.53	0.08	Simple random
2001	36	14	0	0.39	0.08	0.00	0.00	0.00	0.00	Simple random
2002	49	39	7	0.80	0.06	0.18	0.06	0.14	0.05	Simple random
2003	24	19	15	0.79	0.08	0.79	0.09	0.63	0.10	Simple random
2004	34	25	12	0.74	0.08	0.48	0.10	0.35	0.08	Simple random
2005	32	25	16	0.78	0.07	0.64	0.10	0.50	0.09	Simple random
2006	49	31	30	0.63	0.07	0.97	0.03	0.61	0.07	Simple random
2007	46	44	41	0.96	0.03	0.93	0.04	0.89	0.05	Simple random
2008	55	48	28	0.87	0.05	0.58	0.07	0.51	0.07	Simple random
2009	65	52	38	0.80	0.05	0.73	0.06	0.58	0.06	Simple random
2010	61	52	40	0.85	0.05	0.77	0.06	0.66	0.06	Simple random
2011	33	24	23	0.73	0.08	0.96	0.04	0.70	0.08	Simple random
2012	42	19	17	0.45	0.08	0.89	0.07	0.40	0.08	Simple random
2013	50	37	18	0.74	0.06	0.49	0.08	0.36	0.07	Simple random
2014	55	29	14	0.53	0.07	0.48	0.09	0.25	0.06	Simple random
2015	54	40	25	0.74	0.06	0.63	0.08	0.46	0.07	Simple random
2016	32	30	25	0.94	0.04	0.83	0.07	0.78	0.07	Simple random
2017	66	55	32	0.83	0.05	0.58	0.07	0.48	0.06	Simple random
2018	68	60	56	0.88	0.04	0.93	0.03	0.82	0.05	Simple random
2019	62	51	42	0.82	0.05	0.82	0.05	0.68	0.06	Simple random

[a]For 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).

[b]For 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).

[c]Sampling for auklets is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

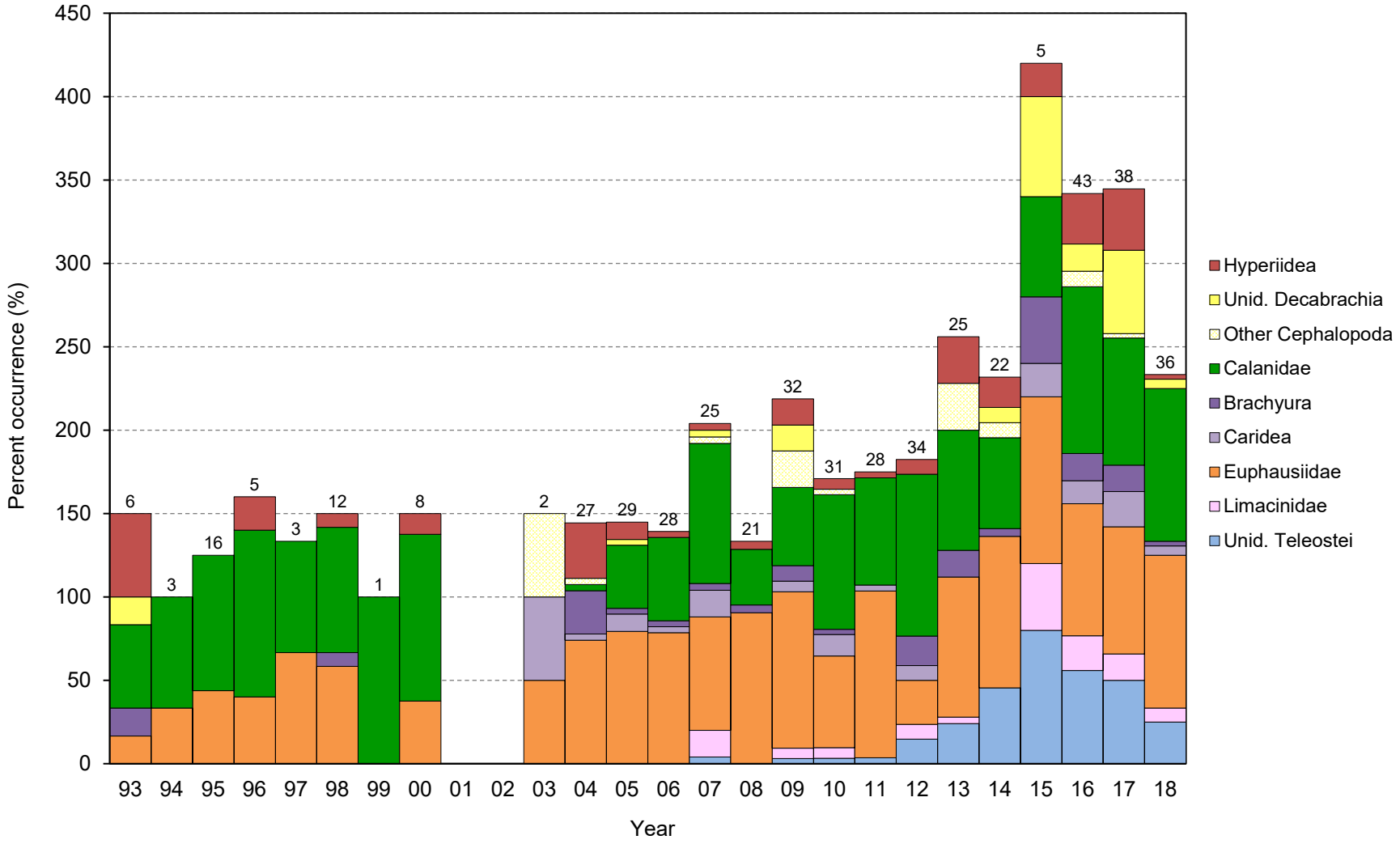

Figure 12. Frequency of occurrence of major prey items in diets of parakeet auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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 2019 but have not yet been analyzed.

Table 15. 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 2019 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	2007
No. samples	6	3	16	5	3	12	1	8	2	27	29	28	25
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**	**100.0**
Amphipoda	**50.0**	**-**	**-**	**20.0**	**-**	**16.7**	**-**	**12.5**	**-**	**37.0**	**10.3**	**10.7**	**4.0**
Hyperiidea	**50.0**	**-**	**-**	**20.0**	**-**	**8.3**	**-**	**12.5**	**-**	**33.3**	**10.3**	**3.6**	**4.0**
Themisto pacifica	-	-	-	20.0	-	-	-	12.5	-	33.3	-	3.6	-
Other Hyperiidea	50.0	-	-	-	-	8.3	-	-	-	3.7	10.3	-	4.0
Other Amphipoda	-	-	-	-	-	8.3	-	-	-	3.7	-	7.1	-
Cephalopoda	**16.7**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**50.0**	**3.7**	**3.4**	**-**	**8.0**
Unid. Decabrachia	16.7	-	-	-	-	-	-	-	-	-	3.4	-	4.0
Other Cephalopoda	-	-	-	-	-	-	-	-	50.0	3.7	-	-	4.0
Copepoda	**66.7**	**66.7**	**81.3**	**100.0**	**66.7**	**75.0**	**100.0**	**100.0**	**-**	**3.7**	**37.9**	**50.0**	**84.0**
Calanidae	**50.0**	**66.7**	**81.3**	**100.0**	**66.7**	**75.0**	**100.0**	**100.0**	**-**	**3.7**	**37.9**	**50.0**	**84.0**
Neocalanus cristatus	50.0	66.7	81.3	100.0	66.7	75.0	100.0	100.0	-	3.7	27.6	39.3	84.0
N. plumchrus/flemengeri	-	-	-	-	33.3	8.3	-	37.5	-	-	13.8	10.7	4.0
Other Calanidae	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Copepoda	16.7	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	**16.7**	**-**	**6.3**	**-**	**-**	**8.3**	**-**	**-**	**50.0**	**25.9**	**17.2**	**7.1**	**16.0**
Brachyura	16.7	-	-	-	-	8.3	-	-	-	25.9	3.4	3.6	4.0
Caridea	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**50.0**	**3.7**	**10.3**	**3.6**	**16.0**
Pandalidae	-	-	-	-	-	-	-	-	50.0	3.7	-	3.6	16.0
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**	**68.0**
Euphausiidae	**16.7**	**33.3**	**43.8**	**40.0**	**66.7**	**58.3**	**-**	**37.5**	**50.0**	**74.1**	**79.3**	**78.6**	**68.0**
Euphausia pacifica	-	-	-	-	-	-	-	-	-	-	-	-	16.0
Thysanoessa inermis	-	-	-	-	-	-	-	-	-	-	-	-	4.0
T. inspinata	-	-	-	-	-	-	-	-	-	-	-	-	32.0
T. longipes	-	-	-	-	-	-	-	-	-	-	-	-	60.0
T. spinifera	-	-	-	-	-	-	-	-	-	-	-	-	4.0
Thysanoessa spp.	16.7	33.3	-	-	-	-	-	-	50.0	18.5	31.0	3.6	64.0
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**	**-**	**-**	**20.0**
Limacinidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16.0**
Limacina helicina	-	-	-	-	-	-	-	-	-	-	-	-	16.0
Other Gastropoda	-	-	6.3	40.0	-	-	-	-	-	11.1	-	-	4.0
Other Invertebrates	-	-	-	-	-	-	-	-	50.0	-	-	-	-
Fish	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4.0**
Teleostei	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4.0**
Unid. Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	4.0
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 15 (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 2019 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	2018	2019
No. samples	21	32	31	28	34	25	22	5	43	38	36	36
Invertebrates	**100.0**	**96.9**	**100.0**	**100.0**	**100.0**	**100.0**	**95.5**	**100.0**	**100.0**	**100.0**	**100.0**	*pending*
Amphipoda	**4.8**	**15.6**	**6.5**	**3.6**	**11.8**	**32.0**	**18.2**	**20.0**	**30.2**	**36.8**	**2.8**	**-**
Hyperiidea	**4.8**	**15.6**	**6.5**	**3.6**	**8.8**	**28.0**	**18.2**	**20.0**	**30.2**	**36.8**	**2.8**	**-**
Themisto pacifica	4.8	6.3	6.5	-	2.9	28.0	13.6	20.0	20.9	28.9	2.8	-
Other Hyperiidea	4.8	9.4	6.5	3.6	8.8	4.0	4.5	-	14.0	10.5	-	-
Other Amphipoda	-	-	-	-	2.9	8.0	-	-	-	-	-	-
Cephalopoda	**-**	**28.1**	**3.2**	**-**	**-**	**28.0**	**13.6**	**60.0**	**25.6**	**50.0**	**5.6**	**-**
Unid. Decabrachia	-	15.6	-	-	-	-	9.1	60.0	16.3	50.0	5.6	-
Other Cephalopoda	-	21.9	3.2	-	-	28.0	9.1	-	9.3	2.6	-	-
Copepoda	**33.3**	**46.9**	**80.6**	**64.3**	**97.1**	**72.0**	**54.5**	**60.0**	**100.0**	**76.3**	**91.7**	**-**
Calanidae	**33.3**	**46.9**	**80.6**	**64.3**	**97.1**	**72.0**	**54.5**	**60.0**	**100.0**	**76.3**	**91.7**	**-**
Neocalanus cristatus	28.6	46.9	80.6	64.3	97.1	68.0	54.5	60.0	100.0	73.7	91.7	-
N. plumchrus/flemengeri	4.8	3.1	16.1	-	-	4.0	-	-	-	7.9	2.8	-
Other Calanidae	14.3	-	-	-	-	-	-	-	-	2.6	-	-
Other Copepoda	-	-	3.2	-	-	-	-	-	2.3	-	-	-
Decapoda	**4.8**	**12.5**	**16.1**	**3.6**	**20.6**	**16.0**	**4.5**	**40.0**	**27.9**	**31.6**	**11.1**	**-**
Brachyura	4.8	9.4	3.2	-	17.6	16.0	4.5	40.0	16.3	15.8	2.8	-
Caridea	**-**	**6.3**	**12.9**	**3.6**	**8.8**	**-**	**-**	**20.0**	**14.0**	**21.1**	**5.6**	**-**
Pandalidae	-	3.1	3.2	3.6	8.8	-	-	-	9.3	15.8	5.6	-
Other Caridea	-	6.3	12.9	-	5.9	-	-	20.0	4.7	7.9	-	-
Other Decapoda	-	-	3.2	-	2.9	-	-	20.0	2.3	5.3	2.8	-
Euphausiacea	**90.5**	**93.8**	**54.8**	**100.0**	**26.5**	**84.0**	**90.9**	**100.0**	**79.1**	**76.3**	**91.7**	**-**
Euphausiidae	**90.5**	**93.8**	**54.8**	**100.0**	**26.5**	**84.0**	**90.9**	**100.0**	**79.1**	**76.3**	**91.7**	**-**
Euphausia pacifica	-	37.5	16.1	10.7	14.7	36.0	63.6	40.0	30.2	36.8	55.6	-
Thysanoessa inermis	-	31.3	6.5	78.6	8.8	-	9.1	-	18.6	34.2	52.8	-
T. inspinata	-	84.4	19.4	7.1	17.6	68.0	81.8	100.0	60.5	68.4	75.0	-
T. longipes	-	87.5	51.6	96.4	11.8	68.0	77.3	40.0	44.2	57.9	83.3	-
T. spinifera	-	9.4	3.2	3.6	2.9	8.0	9.1	20.0	46.5	65.8	75.0	-
Thysanoessa spp.	14.3	90.6	51.6	92.9	14.7	40.0	4.5	20.0	9.3	57.9	75.0	-
Unid. Euphausiidae	76.2	-	-	-	-	36.0	31.8	20.0	23.3	26.3	19.4	-
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-
Gastropoda	**-**	**9.4**	**6.5**	**-**	**8.8**	**12.0**	**4.5**	**40.0**	**20.9**	**15.8**	**8.3**	**-**
Limacinidae	**-**	**6.3**	**6.5**	**-**	**8.8**	**4.0**	**-**	**40.0**	**20.9**	**15.8**	**8.3**	**-**
Limacina helicina	-	6.3	6.5	-	8.8	4.0	-	40.0	20.9	15.8	8.3	-
Other Gastropoda	-	3.1	-	-	-	8.0	4.5	-	2.3	-	-	-
Other Invertebrates	-	-	-	-	-	4.0	-	20.0	2.3	-	-	-
Fish	**19.0**	**3.1**	**3.2**	**3.6**	**14.7**	**24.0**	**45.5**	**80.0**	**55.8**	**50.0**	**25.0**	**-**
Teleostei	**19.0**	**3.1**	**3.2**	**3.6**	**14.7**	**24.0**	**45.5**	**80.0**	**55.8**	**50.0**	**25.0**	**-**
Unid. Teleostei	-	3.1	3.2	3.6	14.7	24.0	45.5	80.0	55.8	50.0	25.0	-
Other Teleostei	19.0	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	5.3	-	

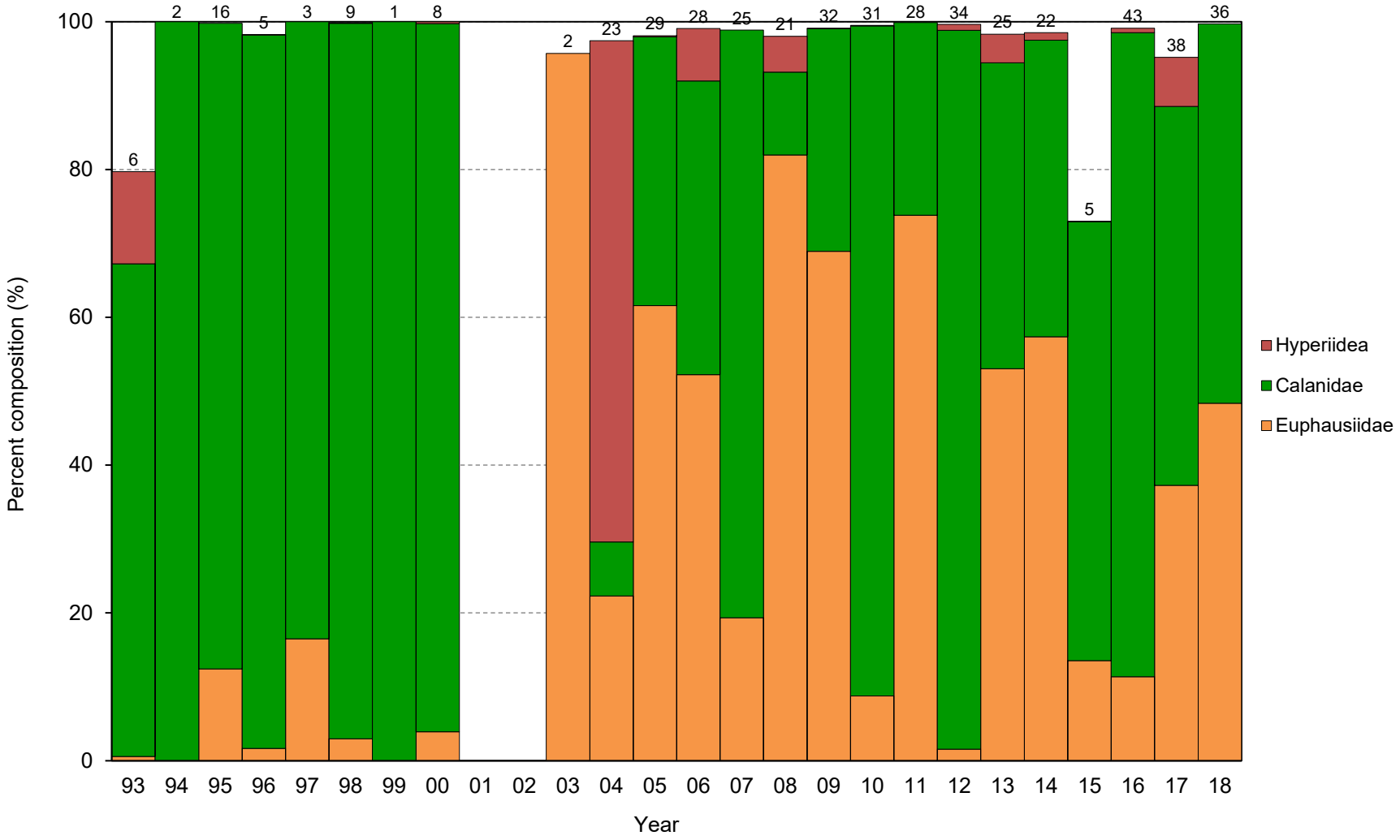

Figure 13. Percent composition of major prey items in diets of parakeet auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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 2019 but have not yet been analyzed.

Table 16. 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 2019 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	2007
No. samples	6	2	16	5	3	9	1	8	2	23	29	28	25
No. individuals	513	268	3405	1840	788	1485	22	1198	140	4476	4893	4401	12772
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	**12.5**	**-**	**-**	**0.1**	**-**	**0.1**	**-**	**0.3**	**-**	**68.1**	**0.2**	**7.1**	**<0.1**
Hyperiidea	12.5	-	-	0.1	-	0.1	-	0.3	-	67.8	0.2	7.1	<0.1
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**	**79.5**
Calanidae	**66.7**	**100.0**	**87.4**	**96.5**	**83.5**	**96.8**	**100.0**	**95.8**	**-**	**7.3**	**36.4**	**39.8**	**79.5**
Neocalanus cristatus	66.7	100.0	87.4	96.5	77.4	96.6	100.0	93.5	-	7.3	34.6	16.8	71.5
Other Calanidae	-	-	-	-	6.1	0.3	-	2.3	-	-	1.8	22.9	8.0
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**	**19.3**
Euphausiidae	**0.6**	**-**	**12.4**	**1.7**	**16.5**	**3.0**	**-**	**3.9**	**95.7**	**22.3**	**61.6**	**52.2**	**19.3**
Thysanoessa inspinata	-	-	-	-	-	-	-	-	-	-	-	-	1.0
T. longipes	-	-	-	-	-	-	-	-	-	-	-	-	10.2
Thysanoessa spp.	0.6	-	-	-	-	-	-	-	18.6	2.5	14.7	0.2	8.0
Unid. Euphausiidae	-	-	12.4	1.7	16.5	3.0	-	3.9	77.1	19.7	46.3	52.0	-
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	0.6	-	0.2
Other Invertebrates	0.8	-	0.2	1.7	-	0.1	-	-	4.3	2.3	1.9	0.9	1.1
Fish	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
Other	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 16 (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 2019 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	2018	2019
No. samples	21	32	31	28	34	25	22	5	43	38	36	36
No. individuals	7246	13072	34411	2629	14839	3108	1680	1438	16373	11129	11479	*pending*
Invertebrates	**98.0**	**100.0**	**100.0**	**100.0**	**99.9**	**99.8**	**98.9**	**92.4**	**99.6**	**98.4**	**99.9**	**-**
Amphipoda	**4.9**	**0.1**	**0.1**	**<0.1**	**0.8**	**4.1**	**1.0**	**0.1**	**0.6**	**6.6**	**<0.1**	**-**
Hyperiidea	4.9	0.1	0.1	<0.1	0.8	3.9	1.0	0.1	0.6	6.6	<0.1	-
Other Amphipoda	-	-	-	-	-	0.2	-	-	-	-	-	-
Copepoda	**11.2**	**30.1**	**90.7**	**26.1**	**97.3**	**41.4**	**40.1**	**59.4**	**87.2**	**51.3**	**51.4**	**-**
Calanidae	**11.2**	**30.1**	**90.7**	**26.1**	**97.3**	**41.4**	**40.1**	**59.4**	**87.2**	**51.3**	**51.4**	**-**
Neocalanus cristatus	10.1	23.0	79.1	26.1	97.3	41.3	40.1	59.4	87.2	50.0	51.4	-
Other Calanidae	1.1	7.1	11.5	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	0.1	-	-	-	-	-	<0.1	-	-	-
Euphausiacea	**82.0**	**68.9**	**8.8**	**73.8**	**1.6**	**53.1**	**57.4**	**13.6**	**11.4**	**37.3**	**48.4**	**-**
Euphausiidae	**82.0**	**68.9**	**8.8**	**73.8**	**1.6**	**53.1**	**57.4**	**13.6**	**11.4**	**37.3**	**48.4**	**-**
Thysanoessa inspinata	-	18.8	0.2	0.2	0.2	28.4	44.6	9.7	3.5	14.0	14.5	-
T. longipes	-	24.6	2.9	30.7	0.1	19.0	4.6	1.5	4.0	3.5	14.8	-
Thysanoessa spp.	18.0	22.4	5.4	29.5	0.6	2.0	0.4	0.8	0.6	4.6	3.0	-
Unid. Euphausiidae	63.9	-	-	-	-	1.3	1.0	0.1	0.2	0.5	0.3	-
Other Euphausiidae	-	3.2	0.3	13.4	0.6	2.4	6.7	1.5	3.1	14.7	15.7	-
Other Invertebrates	-	0.9	0.4	0.1	0.3	1.3	0.4	19.4	0.5	3.2	0.2	-
Fish	1.9	<0.1	<0.1	<0.1	0.1	0.2	1.1	7.6	0.4	1.6	0.1	-
Other	-	-	-	-	-	-	-	-	-	<0.1	-	-

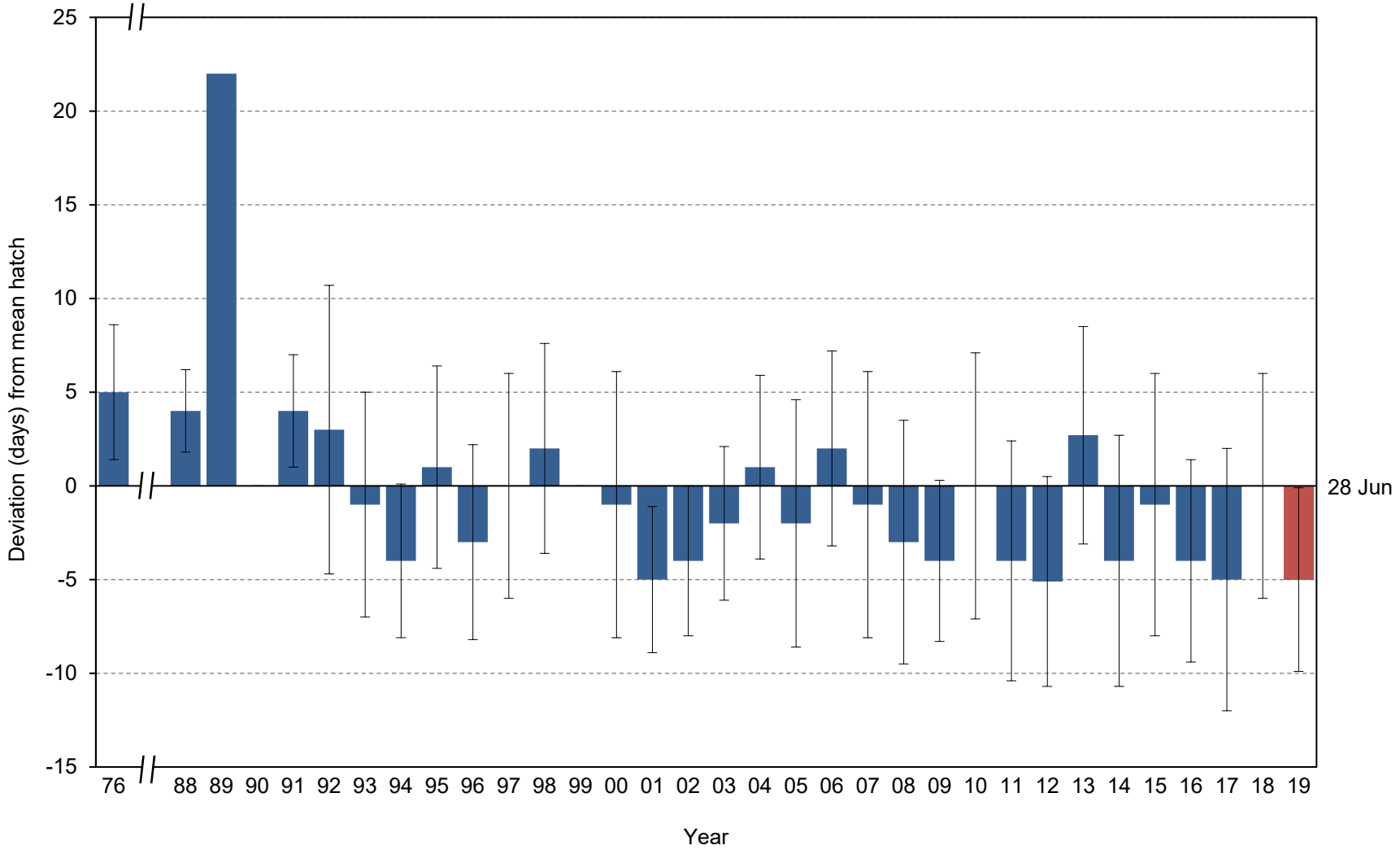

Figure 14. Yearly hatch date deviation (from the 1976-2018 average of 28 June) for least auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); 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 17. 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	-	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
2018	28 Jun	6.0	26	21 Jun	13 Jul	12 Jul
2019	23 Jun	4.9	32	13 Jun	1 Jul	19 Jul

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

[b]In years when no chicks fledged before the last nest check, date of first fledge is listed as > the date of last nest check.

[c]Hatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 18. 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 in1976.

Julian date[a]	No. nests hatching on Julian date														
	88	89	91	92	93	94	95	96	97	98	00	01	02	03	04
160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	3	-	-	-	-	2	-	-
169	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	6	-	-	-	2	6	1	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	-	-	-	3	-	3	-	-	1	-	-	1
173	-	-	-	-	-	-	-	-	-	-	-	11	-	-	2
174	-	-	-	-	-	-	1	12	-	9	2	-	4	7	-
175	-	-	-	6	4	14	1	-	-	-	7	-	-	-	-
176	-	-	-	-	-	-	-	-	9	-	-	-	-	1	-
177	-	-	-	-	-	-	27	-	-	-	-	1	-	-	-
178	-	-	2	-	-	2	-	-	-	-	-	-	5	-	12
179	-	-	-	-	-	-	-	-	-	-	5	7	-	-	-
180	-	-	-	-	-	-	1	5	-	17	-	-	-	3	-
181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
182	3	-	-	-	-	-	-	-	6	1	-	-	1	-	5
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	4	-	-	-	11	-	-	1	6	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
186	-	-	1	-	-	-	-	3	1	6	-	-	-	-	-
187	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
189	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-
190	-	-	-	-	1	1	4	-	-	5	-	-	-	-	-
191	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
195	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
n	4	1	7	11	5	23	49	23	21	42	27	23	12	13	23

Table 18 (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 in1976.

Julian date[a]	No. nests hatching on Julian date														
	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
160	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
161	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	1	-	4	2	2	-	-	-
167	2	-	-	-	-	-	-	2	-	-	-	-	6	-	-
168	-	-	-	-	4	-	2	-	-	2	-	-	-	-	-
169	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
170	-	1	-	-	-	-	-	3	1	5	-	-	-	-	10
171	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	8	15	-	6	6	9	-	-	8	12	5	6	-
173	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	-	4	1	-	19	-	3	-	-	4	-	-	-	-	1
175	-	-	-	1	-	-	-	1	1	-	2	-	-	-	-
176	14	-	6	10	-	-	5	-	7	-	10	5	1	1	14
177	-	-	-	-	3	-	-	1	-	-	-	-	-	8	-
178	-	13	-	-	-	5	-	7	2	5	-	-	4	-	-
179	1	-	-	-	-	-	-	1	-	-	-	-	-	2	-
180	2	-	-	-	6	-	-	-	2	-	-	3	-	-	-
181	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
182	-	7	3	-	-	2	5	-	-	1	7	-	-	4	4
183	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
184	-	-	-	-	-	-	1	1	1	5	-	-	-	2	-
185	-	-	-	1	-	-	-	-	5	-	-	-	-	-	-
186	3	5	1	-	2	3	2	-	-	-	1	3	-	-	-
187	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
188	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
189	-	-	-	-	-	-	-	1	7	-	-	-	-	-	-
190	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-
191	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
192	1	2	-	-	-	-	-	-	-	-	1	-	-	-	-
193	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
195	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	32	33	21	30	34	17	26	28	26	29	34	26	19	26	32

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

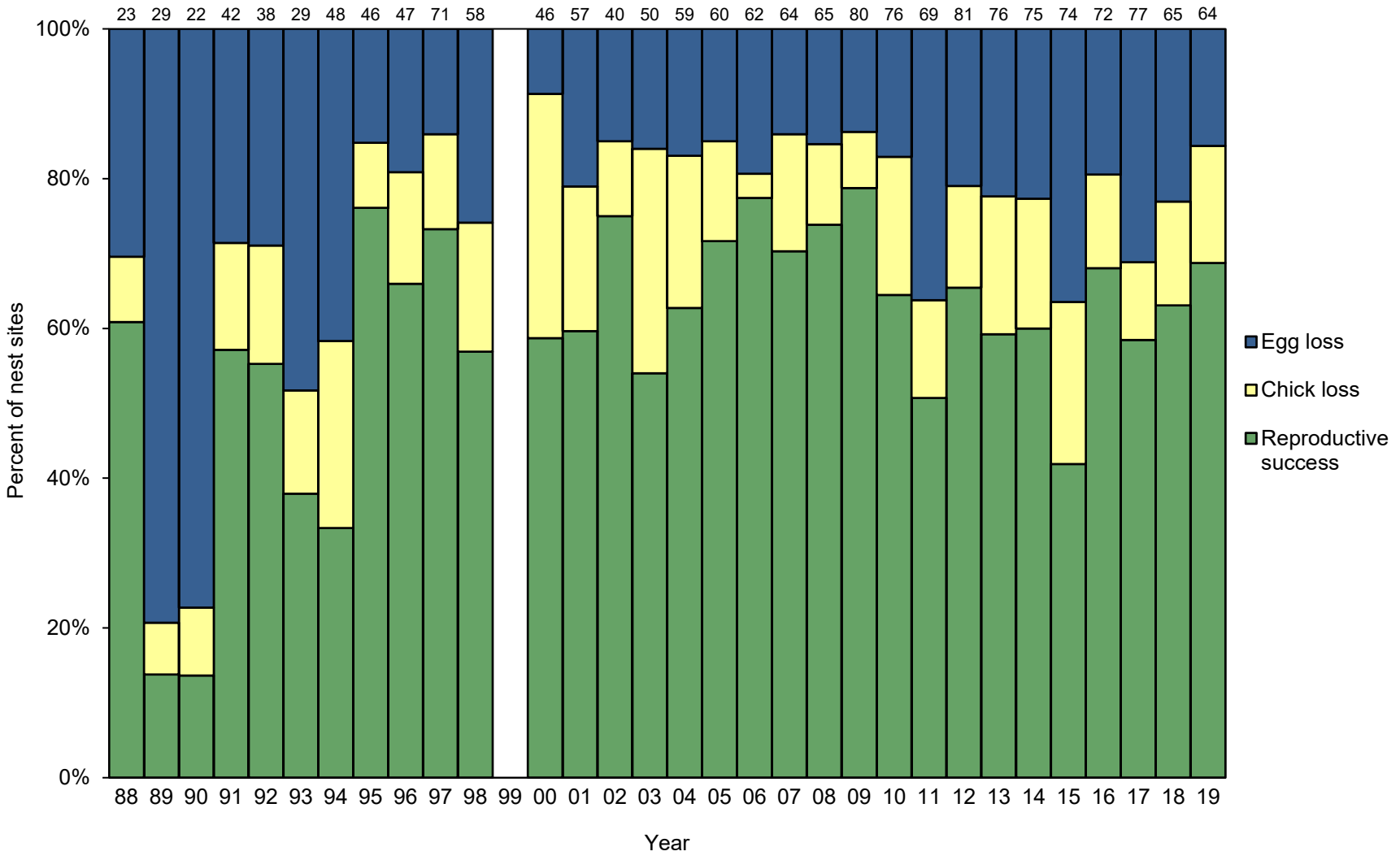

Figure 15. Reproductive performance of least auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected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

Table 19. Reproductive performance of least auklets at Buldir Island, Alaska. No data were collected in 1977-1987 or 1999.

Year	Nest sites w/ eggs	Nest sites w/ chicks	Nest sites w/ chicks fledged	Nesting success (D/B)[a]		Fledging success (F/D)[b]		Reproductive success (F/B)		Survey design[c]
	(B)	(D)	(F)	Total	SD	Total	SD	Total	SD	
1976	28	19	-	0.68	0.09	-	-	-	-	Simple random
1988	23	16	14	0.70	0.10	0.88	0.08	0.61	0.10	Simple random
1989	29	6	4	0.21	0.08	0.67	0.19	0.14	0.06	Simple random
1990	22	5	3	0.23	0.09	0.60	0.22	0.14	0.07	Simple random
1991	42	30	24	0.71	0.07	0.80	0.07	0.57	0.08	Simple random
1992	38	27	21	0.71	0.07	0.78	0.08	0.55	0.08	Simple random
1993	29	15	11	0.52	0.09	0.73	0.11	0.38	0.09	Simple random
1994	48	28	16	0.58	0.07	0.57	0.09	0.33	0.07	Simple random
1995	46	39	35	0.85	0.05	0.90	0.05	0.76	0.06	Simple random
1996	47	38	31	0.81	0.06	0.82	0.06	0.66	0.07	Simple random
1997	71	61	52	0.86	0.04	0.85	0.05	0.73	0.05	Simple random
1998	58	43	33	0.74	0.06	0.77	0.06	0.57	0.07	Simple random
2000	46	42	27	0.91	0.04	0.64	0.07	0.59	0.07	Simple random
2001	57	45	34	0.79	0.05	0.76	0.06	0.60	0.06	Simple random
2002	40	34	30	0.85	0.06	0.88	0.06	0.75	0.07	Simple random
2003	50	42	27	0.84	0.05	0.64	0.07	0.54	0.07	Simple random
2004	59	49	37	0.83	0.05	0.76	0.06	0.63	0.06	Simple random
2005	60	51	43	0.85	0.05	0.84	0.05	0.72	0.06	Simple random
2006	62	50	48	0.81	0.05	0.96	0.03	0.77	0.05	Simple random
2007	64	55	45	0.86	0.04	0.82	0.05	0.70	0.06	Simple random
2008	65	55	48	0.85	0.04	0.87	0.05	0.74	0.05	Simple random
2009	80	69	63	0.86	0.04	0.91	0.03	0.79	0.05	Simple random
2010	76	63	49	0.83	0.04	0.78	0.05	0.64	0.06	Simple random
2011	69	44	35	0.64	0.06	0.80	0.06	0.51	0.06	Simple random
2012	81	64	53	0.79	0.05	0.83	0.05	0.65	0.05	Simple random
2013	76	59	45	0.78	0.05	0.76	0.06	0.59	0.06	Simple random
2014	75	58	45	0.77	0.05	0.78	0.05	0.60	0.06	Simple random
2015	74	47	31	0.64	0.06	0.66	0.07	0.42	0.06	Simple random
2016	72	58	49	0.81	0.05	0.84	0.05	0.68	0.05	Simple random
2017	77	53	45	0.69	0.05	0.85	0.05	0.58	0.06	Simple random
2018	65	50	41	0.77	0.05	0.82	0.05	0.63	0.06	Simple random
2019	64	54	44	0.84	0.05	0.81	0.05	0.69	0.06	Simple random

[a]For 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).

[b]For 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).

[c]Sampling for auklets is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

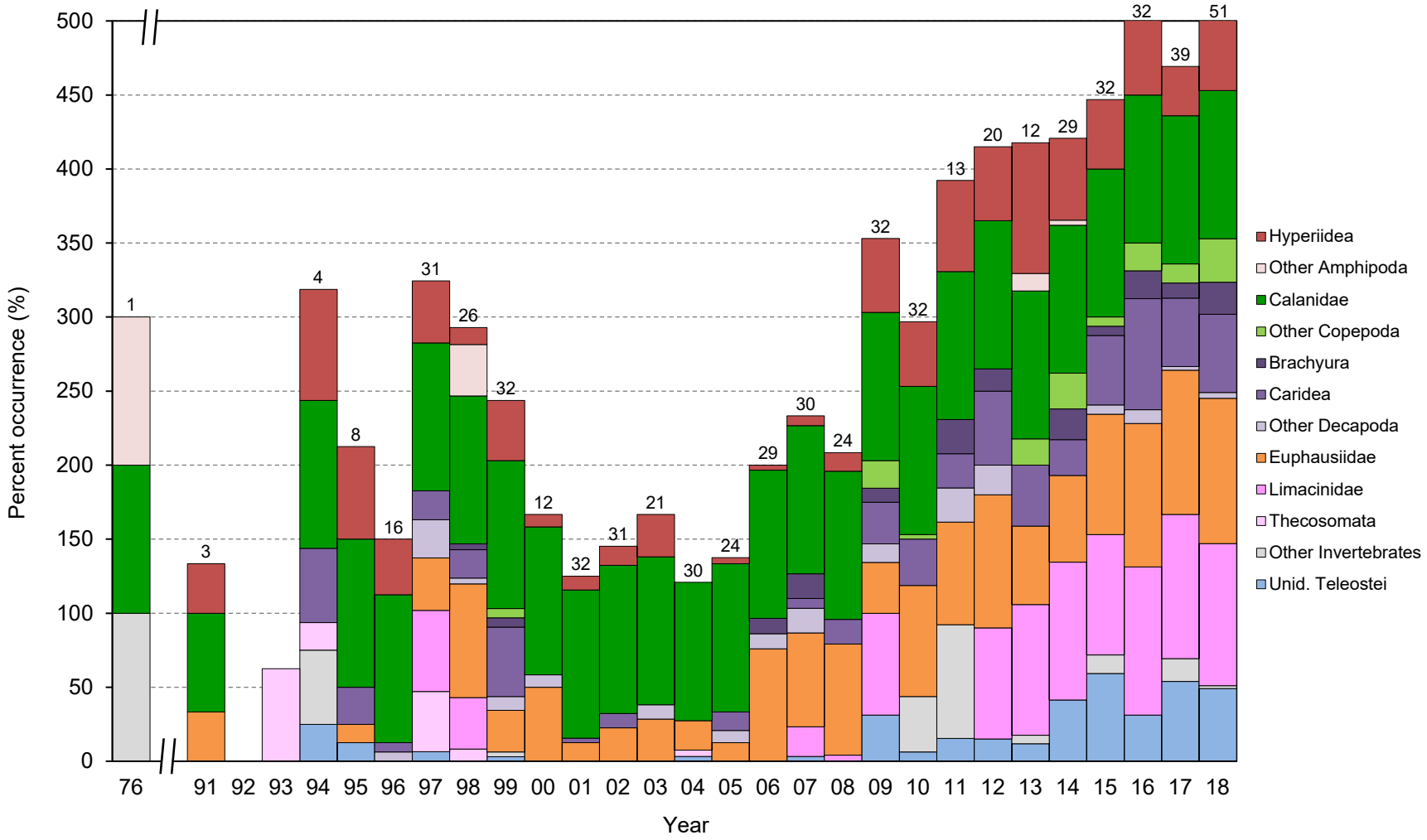

Figure 16. Frequency of occurrence of major prey items in diets of least auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of 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 2019 but have not yet been analyzed.

Table 20. 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 2019 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	2005
No. samples	1	3	4	8	16	31	26	32	12	32	31	21	30	24
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	**100.0**	**33.3**	**75.0**	**62.5**	**37.5**	**41.9**	**42.3**	**40.6**	**8.3**	**9.4**	**12.9**	**28.6**	**-**	**4.2**
Hyperiidea	**-**	**33.3**	**75.0**	**62.5**	**37.5**	**41.9**	**11.5**	**40.6**	**8.3**	**9.4**	**12.9**	**28.6**	**-**	**4.2**
Primno macropa	-	-	25.0	-	-	25.8	-	18.8	-	-	3.2	4.8	-	-
Themisto pacifica	-	-	75.0	50.0	31.3	19.4	11.5	31.3	8.3	9.4	9.7	-	-	3.4
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**	**100.0**
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**	**100.0**
Neocalanus cristatus	-	-	75.0	37.5	12.5	58.1	69.2	81.3	100.0	46.9	19.4	42.9	3.3	24.1
N. plumchrus/flemengeri	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	96.6
Unid. Calanidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	-	-	7.7	-	41.7	-	-	-	-	-
Other Copepoda	-	-	-	-	-	-	-	6.3	-	-	-	-	-	-
Decapoda	**-**	**-**	**50.0**	**25.0**	**12.5**	**41.9**	**23.1**	**46.9**	**8.3**	**3.1**	**9.7**	**9.5**	**-**	**20.8**
Brachyura	**-**	-	-	-	-	-	3.8	6.3	-	-	-	-	-	-
Caridea	**-**	**-**	**50.0**	**25.0**	**6.3**	**19.4**	**19.2**	**46.9**	**-**	**3.1**	**9.7**	**-**	**-**	**12.5**
Hippolytidae	-	-	-	-	-	-	-	37.5	-	-	-	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	-	3.1	9.7	-	-	-
Unid. Caridea	-	-	50.0	25.0	6.3	19.4	19.2	15.6	-	-	-	-	-	-
Other Caridea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Decapoda	-	-	-	-	6.3	25.8	3.8	9.4	8.3	-	-	9.5	-	8.3
Euphausiacea	**-**	**33.3**	**-**	**12.5**	**-**	**35.5**	**76.9**	**28.1**	**50.0**	**12.5**	**22.6**	**28.6**	**20.0**	**12.5**
Euphausiidae	**-**	**33.3**	**-**	**12.5**	**-**	**35.5**	**76.9**	**28.1**	**50.0**	**12.5**	**22.6**	**28.6**	**20.0**	**12.5**
Euphausia pacifica	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa inspinata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. longipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. spinifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa spp.	-	33.3	-	-	-	-	-	-	-	-	-	4.8	-	3.4
Unid. Euphausiidae	-	-	-	12.5	-	35.5	76.9	28.1	50.0	12.5	22.6	23.8	20.0	75.9
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2
Gastropoda	**-**	**-**	**-**	**62.5**	**18.8**	**54.8**	**34.6**	**40.6**	**8.3**	**-**	**-**	**-**	**-**	**-**
Limacinidae	**-**	**-**	**-**	**-**	**-**	**54.8**	**34.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Limacina helicina	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Limacinidae	-	-	-	-	-	54.8	34.6	-	-	-	-	-	-	-
Thecosomata	-	-	-	62.5	18.8	-	-	40.6	8.3	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 20 (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 2019 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	2018	2019
No. samples	29	30	24	32	32	13	20	17	29	32	32	39	51	40
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**	*pending*
Amphipoda	**3.4**	**6.7**	**12.5**	**50.0**	**43.8**	**61.5**	**50.0**	**94.1**	**55.2**	**46.9**	**53.1**	**33.3**	**56.9**	**-**
Hyperiidea	**3.4**	**6.7**	**12.5**	**50.0**	**43.8**	**61.5**	**50.0**	**88.2**	**55.2**	**46.9**	**53.1**	**33.3**	**56.9**	**-**
Primno macropa	-	-	-	28.1	15.6	23.1	30.0	88.2	20.7	25.0	46.9	25.6	47.1	-
Themisto pacifica	4.2	6.7	12.5	28.1	34.4	53.8	25.0	17.6	44.8	37.5	25.0	15.4	23.5	-
Other Hyperiidea	-	3.3	-	3.1	-	-	-	5.9	-	-	-	-	2.0	-
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**	**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**	**100.0**	**-**
Neocalanus cristatus	54.2	70.0	54.2	90.6	59.4	100.0	60.0	58.8	31.0	71.9	87.5	79.5	88.2	-
N. plumchrus/flemengeri	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1	100.0	93.8	100.0	100.0	100.0	-
Unid. Calanidae	-	96.7	100.0	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	3.1	-	-	-	-	-	-	-	5.9	-
Other Copepoda	-	-	-	18.8	3.1	-	-	17.6	24.1	6.3	18.8	12.8	29.4	-
Decapoda	**10.3**	**16.7**	**16.7**	**34.4**	**31.3**	**38.5**	**50.0**	**41.2**	**37.9**	**53.1**	**75.0**	**51.3**	**62.7**	**-**
Brachyura	10.3	16.7	-	9.4	-	23.1	15.0	-	20.7	6.3	18.8	10.3	21.6	-
Caridea	**-**	**6.7**	**16.7**	**28.1**	**31.3**	**23.1**	**50.0**	**41.2**	**24.1**	**46.9**	**75.0**	**46.2**	**52.9**	**-**
Hippolytidae	-	3.3	4.2	21.9	9.4	15.4	45.0	23.5	24.1	25.0	46.9	17.9	33.3	-
Pandalidae	4.2	3.3	-	18.8	-	-	15.0	11.8	-	31.3	50.0	35.9	41.2	-
Unid. Caridea	12.5	-	12.5	-	-	-	-	11.8	-	-	6.3	-	-	-
Other Caridea	-	-	-	-	28.1	7.7	-	-	-	15.6	12.5	-	-	-
Other Decapoda	10.3	16.7	-	12.5	-	23.1	20.0	-	-	6.3	9.4	2.6	3.9	-
Euphausiacea	**75.9**	**63.3**	**75.0**	**34.4**	**75.0**	**69.2**	**90.0**	**52.9**	**58.6**	**81.3**	**96.9**	**97.4**	**98.0**	**-**
Euphausiidae	**75.9**	**63.3**	**75.0**	**34.4**	**75.0**	**69.2**	**90.0**	**52.9**	**58.6**	**81.3**	**96.9**	**97.4**	**98.0**	**-**
Euphausia pacifica	-	-	-	-	9.4	7.7	50.0	-	17.2	21.9	25.0	28.2	35.3	-
Thysanoessa inspinata	-	-	-	12.5	-	-	40.0	29.4	31.0	50.0	46.9	43.6	80.4	-
T. longipes	-	-	-	25.0	40.6	23.1	15.0	17.6	24.1	12.5	59.4	59.0	74.5	-
T. spinifera	-	-	-	-	-	7.7	-	-	-	3.1	87.5	89.7	84.3	-
Thysanoessa spp.	-	23.3	8.3	-	71.9	69.2	80.0	17.6	3.4	46.9	71.9	53.8	86.3	-
Unid. Euphausiidae	8.3	46.7	70.8	-	-	-	-	23.5	24.1	28.1	9.4	33.3	39.2	-
Other Euphausiidae	-	-	-	12.5	3.1	-	-	17.6	-	-	3.1	5.1	52.9	-
Gastropoda	**4.2**	**20.0**	**4.2**	**68.8**	**-**	**-**	**75.0**	**88.2**	**93.1**	**81.3**	**100.0**	**97.4**	**96.1**	**-**
Limacinidae	**-**	**20.0**	**4.2**	**68.8**	**-**	**-**	**75.0**	**88.2**	**93.1**	**81.3**	**100.0**	**97.4**	**96.1**	**-**
Limacina helicina	-	20.0	4.2	68.8	-	-	75.0	88.2	93.1	81.3	100.0	97.4	96.1	-
Other Limacinidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thecosomata	4.2	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	-	-	-	-	-	-	2.6	3.9	-

Table 20 (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 2019 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	2005
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 20 (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 2019 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	2018	2019
Other Invertebrates	-	-	-	-	37.5	76.9	-	5.9	-	12.5	-	15.4	2.0	-
Fish	**-**	**3.3**	**-**	**75.0**	**6.3**	**15.4**	**15.0**	**11.8**	**41.38**	**59.4**	**31.3**	**53.8**	**49.0**	**-**
Teleostei	**-**	**3.3**	**-**	**75.0**	**6.3**	**15.4**	**15.0**	**11.8**	**41.4**	**59.4**	**31.3**	**53.8**	**49.0**	**-**
Unid. Teleostei	-	3.3	-	31.3	6.3	15.4	15.0	11.8	41.4	59.4	31.3	53.8	49.0	-
Other Teleostei	-	-	-	59.4	-	-	-	-	-	-	3.1	-	-	-
Other	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-

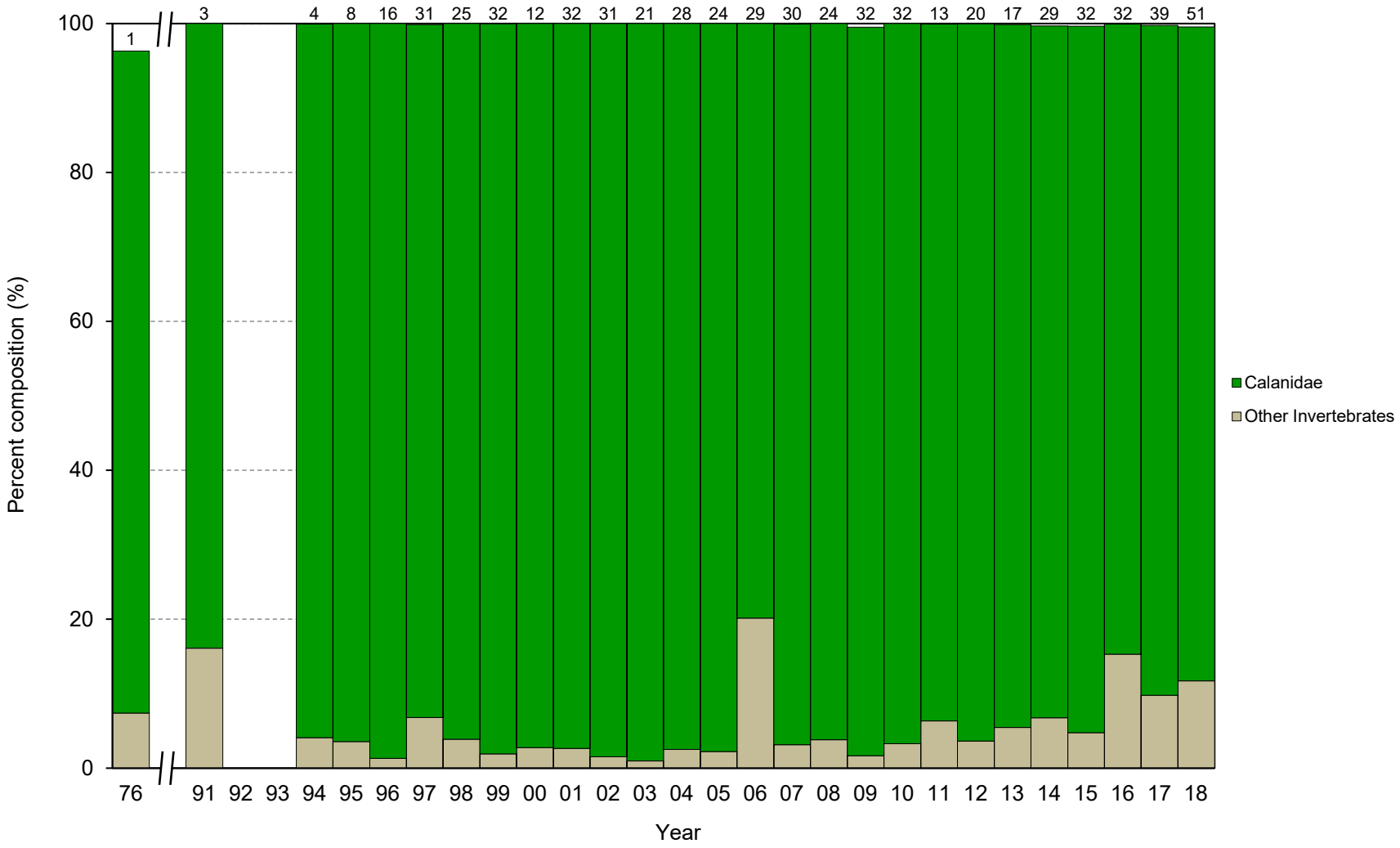

Figure 17. Percent composition of major prey items in diets of least auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of 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 2019 but have not yet been analyzed.

Table 21. 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 2019 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	2005
No. samples	1	3	4	8	16	31	25	32	12	32	31	21	28	24
No. individuals	27	372	1686	2372	5742	9370	8473	16797	2252	8248	8980	9947	6848	8123
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**	**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**	**97.8**
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**	**97.8**
Neocalanus cristatus	-	-	3.6	0.4	2.2	3.5	6.7	13.4	48.7	4.9	0.3	5.7	0.7	35.5
N. plumchrus/flemengeri	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	62.3
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	2.2
Fish	-	-	0.1	-	-	0.1	-	<0.1	-	-	-	-	<0.1	-
Other	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 21 (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 2019 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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	29	30	24	32	32	13	20	17	29	32	32	39	51	40
No. individuals	3790	8924	8710	67613	43360	9729	40194	9152	10797	23994	17448	28765	36336	*pending*
Invertebrates	**100.0**	**99.9**	**100.0**	**99.7**	**100.0**	**99.9**	**100.0**	**99.9**	**99.7**	**99.6**	**100.0**	**99.8**	**99.8**	**-**
Copepoda	**79.8**	**96.8**	**96.2**	**98.0**	**96.7**	**93.6**	**96.3**	**94.5**	**93.0**	**94.9**	**84.7**	**90.0**	**88.1**	**-**
Calanidae	**79.8**	**96.8**	**96.2**	**97.8**	**96.7**	**93.6**	**96.3**	**94.4**	**92.9**	**94.9**	**84.6**	**90.0**	**87.8**	**-**
Neocalanus cristatus	5.4	4.3	3.0	3.6	1.0	11.3	2.2	0.9	0.5	1.2	6.9	2.1	3.0	-
N. plumchrus/flemengeri	74.4	76.4	78.7	94.2	95.7	82.3	94.1	93.5	92.4	93.6	77.7	87.9	84.8	-
Other Calanidae	-	16.1	14.5	-	-	-	-	-	-	-	-	-	<0.1	-
Other Copepoda	-	-	-	0.2	-	-	-	0.1	0.1	<0.1	0.1	<0.1	0.3	-
Other Invertebrates	20.2	3.2	3.8	1.7	3.3	6.3	3.6	5.5	6.8	4.8	15.3	9.8	11.7	-
Fish	-	0.1	-	0.3	<0.1	0.1	<0.1	0.1	0.3	0.4	0.2	0.2	0.2	-
Other	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-

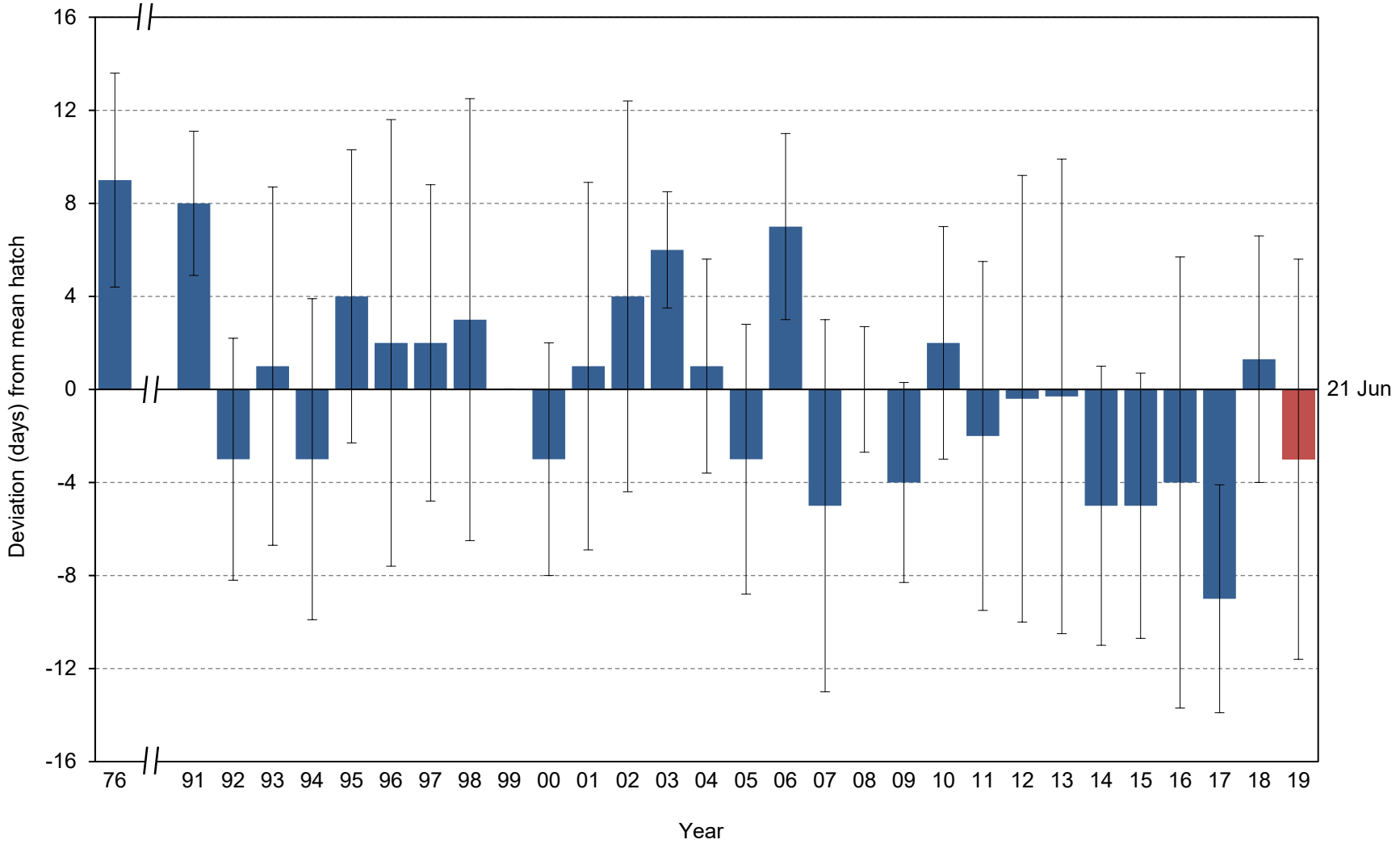

Figure 18. Yearly hatch date deviation (from the 1976-2018 average of 21 June) for whiskered auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch 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 22. 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
2018	22 Jun	5.3	34	13 Jun	6 Jul	18 Jul
2019	18 Jun	8.6	50	7 Jun	13 Jul	13 Jul

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

[b]In years when no chicks fledged before the last nest check, date of first fledge is listed as > the date of last nest check.

[c]Hatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 23. 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	05
155	-	-	-	-	-	-	-	-	-	-	-	-	-	-
156	-	-	-	-	-	-	-	-	-	-	-	-	-	-
157	-	-	-	-	-	-	-	-	-	-	-	-	-	-
158	-	-	-	-	-	-	-	-	1	-	-	-	-	-
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-
160	-	-	-	2	-	-	-	2	-	1	-	-	-	-
161	-	-	-	1	-	-	-	1	-	-	-	-	-	-
162	-	1	-	3	-	1	1	-	-	-	-	-	-	5
163	-	1	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	2	2	-	-	-	1	8	-	-	-	-	1
165	-	1	-	6	-	-	-	-	2	-	-	-	-	1
166	-	1	-	4	-	-	-	9	-	2	3	-	-	4
167	-	1	-	1	-	-	-	-	-	-	1	-	-	7
168	-	3	1	1	-	12	6	1	-	-	4	-	8	-
169	-	-	-	-	1	-	-	2	-	2	1	-	-	-
170	-	-	6	4	-	-	-	11	10	1	-	-	-	1
171	-	-	-	3	-	-	-	-	-	4	-	-	-	1
172	-	-	-	1	30	-	6	2	-	-	10	-	4	1
173	-	-	-	-	-	-	-	-	-	3	-	-	8	-
174	-	1	-	-	1	8	-	6	-	-	2	1	-	-
175	-	1	3	3	-	-	-	-	3	-	-	-	-	-
176	-	-	-	-	-	-	3	-	-	1	3	-	-	6
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	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	-	-	-	-	-	-	-	-
n	8	11	14	37	51	27	22	55	26	17	35	4	27	28

Table 23 (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													
	06	07	08	09	10	11	12	13	14	15	16	17	18	19
155	-	-	-	-	-	-	-	-	-	-	-	1	-	-
156	-	-	-	1	-	-	-	-	-	-	-	2	-	-
157	-	-	-	-	-	-	-	-	-	-	-	-	-	-
158	-	-	-	-	-	2	-	-	-	1	-	-	-	2
159	-	-	-	-	-	-	-	-	-	-	2	1	-	-
160	-	-	-	-	-	-	-	3	-	2	6	5	-	1
161	-	-	-	-	-	-	3	2	4	1	-	-	-	1
162	-	9	-	8	-	3	-	-	3	2	-	5	-	-
163	-	-	-	-	-	-	-	-	-	1	-	-	-	9
164	-	2	-	-	-	5	1	-	2	-	-	-	1	15
165	-	-	-	4	-	-	1	10	2	12	3	-	-	-
166	-	7	3	1	-	-	2	-	8	10	2	2	-	-
167	-	-	-	-	-	-	2	-	-	-	-	4	1	1
168	-	-	-	27	5	3	-	-	2	-	-	-	7	-
169	-	-	-	-	-	-	-	-	2	-	-	-	-	5
170	-	-	2	-	-	-	-	3	4	2	1	-	-	4
171	-	-	-	2	-	-	-	-	-	-	-	-	-	-
172	-	2	21	1	10	8	4	-	-	1	1	3	14	-
173	-	-	-	-	-	1	-	-	-	-	-	-	-	-
174	4	-	1	3	-	-	-	-	-	-	-	-	1	-
175	-	-	-	-	-	-	-	-	-	-	-	-	1	2
176	-	-	9	-	-	2	-	6	-	2	4	-	-	2
177	-	-	-	-	-	-	-	-	-	-	-	-	3	-
178	8	-	-	-	5	-	3	-	1	-	-	-	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-	-	-
180	-	-	-	2	1	-	-	-	-	-	-	-	-	-
181	1	-	-	-	1	-	-	1	-	1	-	-	-	-
182	1	1	-	-	1	2	-	-	-	2	-	-	5	4
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-	1
185	-	-	-	-	-	-	-	2	-	-	-	-	-	-
186	3	1	-	-	1	2	-	-	-	-	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	1	1
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	-	1	-	-	-	-	-	-	-	-	1	-	-	-
192	-	-	-	-	-	-	-	-	1	-	1	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	1
194	-	-	-	-	-	-	2	3	-	-	-	-	-	1
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	17	23	36	49	24	28	18	30	29	37	21	23	34	50

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

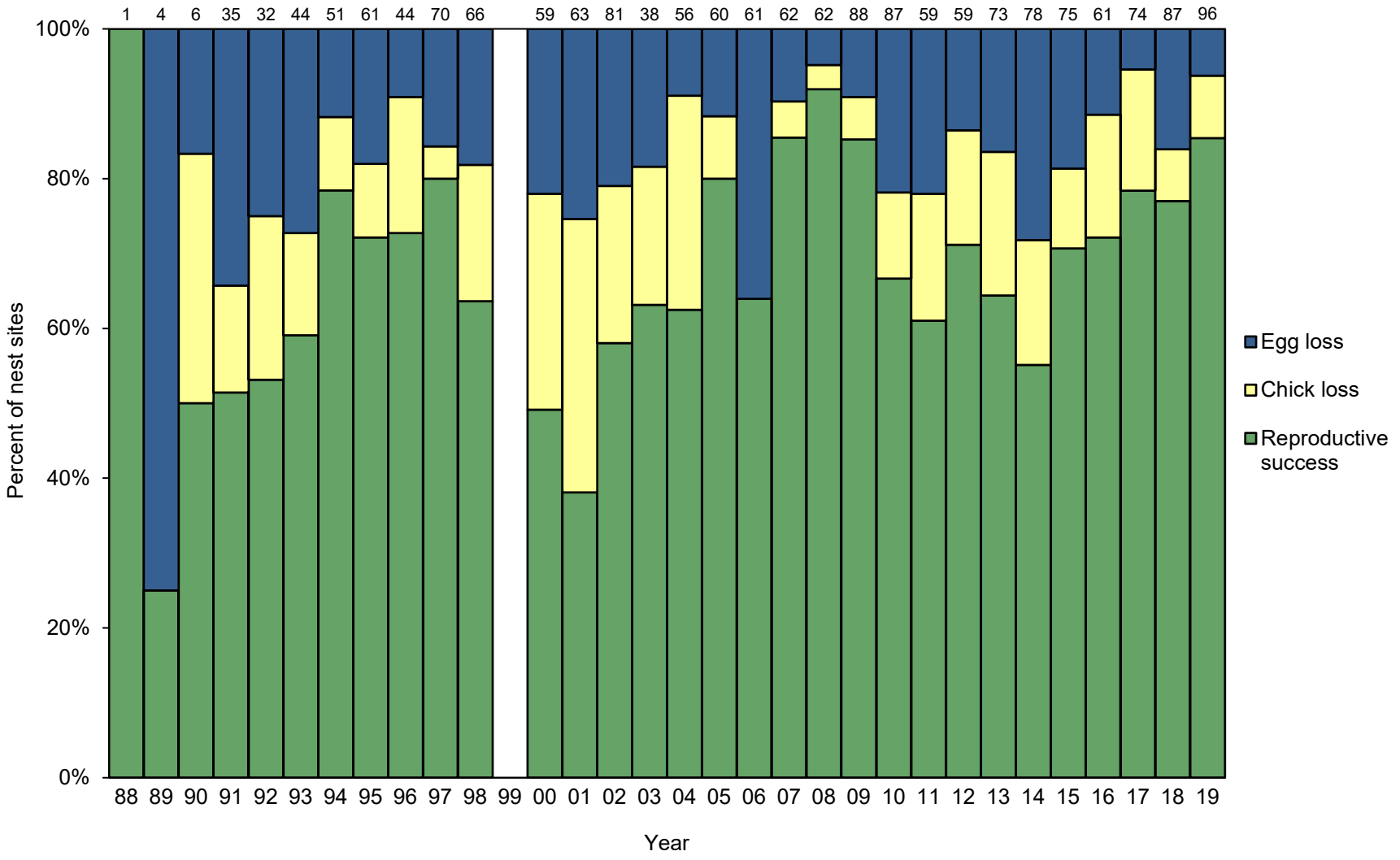

Figure 19. Reproductive performance of whiskered auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected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

Table 24. 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] Total	Nesting success (D/B)[a] SD	Fledging success (F/D)[b] Total	Fledging success (F/D)[b] SD	Reproductive success (F/B) Total	Reproductive success (F/B) SD	Sampling design[c]
1976	7	6	-	0.86	0.13	-	-	-	-	Simple random
1988	1	1	1	1.00	0.00	1.00	0.00	1.00	0.00	Simple random
1989	4	1	1	0.25	0.22	1.00	0.00	0.25	0.22	Simple random
1990	6	5	3	0.83	0.15	0.60	0.22	0.50	0.20	Simple random
1991	35	23	18	0.66	0.08	0.78	0.09	0.51	0.08	Simple random
1992	32	24	17	0.75	0.08	0.71	0.09	0.53	0.09	Simple random
1993	44	32	26	0.73	0.07	0.81	0.07	0.59	0.07	Simple random
1994	51	45	40	0.88	0.05	0.89	0.05	0.78	0.06	Simple random
1995	61	50	44	0.82	0.05	0.88	0.05	0.72	0.06	Simple random
1996	44	40	32	0.91	0.04	0.80	0.06	0.73	0.07	Simple random
1997	70	59	56	0.84	0.04	0.95	0.03	0.80	0.05	Simple random
1998	66	54	42	0.82	0.05	0.78	0.06	0.64	0.06	Simple random
2000	59	46	29	0.78	0.05	0.63	0.07	0.49	0.07	Simple random
2001	63	47	24	0.75	0.05	0.51	0.07	0.38	0.06	Simple random
2002	81	64	47	0.79	0.05	0.73	0.06	0.58	0.05	Simple random
2003	38	31	24	0.82	0.06	0.77	0.08	0.63	0.08	Simple random
2004	56	51	35	0.91	0.04	0.69	0.06	0.63	0.06	Simple random
2005	60	53	48	0.88	0.04	0.91	0.04	0.80	0.05	Simple random
2006	61	39	39	0.64	0.06	1.00	0.00	0.64	0.06	Simple random
2007	62	56	53	0.90	0.04	0.95	0.03	0.85	0.05	Simple random
2008	62	59	57	0.95	0.03	0.97	0.02	0.92	0.03	Simple random
2009	88	80	75	0.91	0.03	0.94	0.03	0.85	0.04	Simple random
2010	87	68	58	0.78	0.04	0.85	0.04	0.67	0.05	Simple random
2011	59	46	36	0.78	0.05	0.78	0.06	0.61	0.06	Simple random
2012	59	51	42	0.86	0.05	0.82	0.05	0.71	0.06	Simple random
2013	73	61	47	0.84	0.04	0.77	0.05	0.64	0.06	Simple random
2014	78	56	43	0.72	0.05	0.77	0.06	0.55	0.06	Simple random
2015	75	61	53	0.81	0.05	0.87	0.04	0.71	0.05	Simple random
2016	61	54	44	0.89	0.04	0.81	0.05	0.72	0.06	Simple random
2017	74	70	58	0.95	0.03	0.83	0.04	0.78	0.05	Simple random
2018	87	73	67	0.84	0.04	0.92	0.03	0.77	0.05	Simple random
2019	96	90	82	0.94	0.02	0.91	0.03	0.85	0.04	Simple random

[a]For 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).

[b]For 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).

[c]Sampling for auklets is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

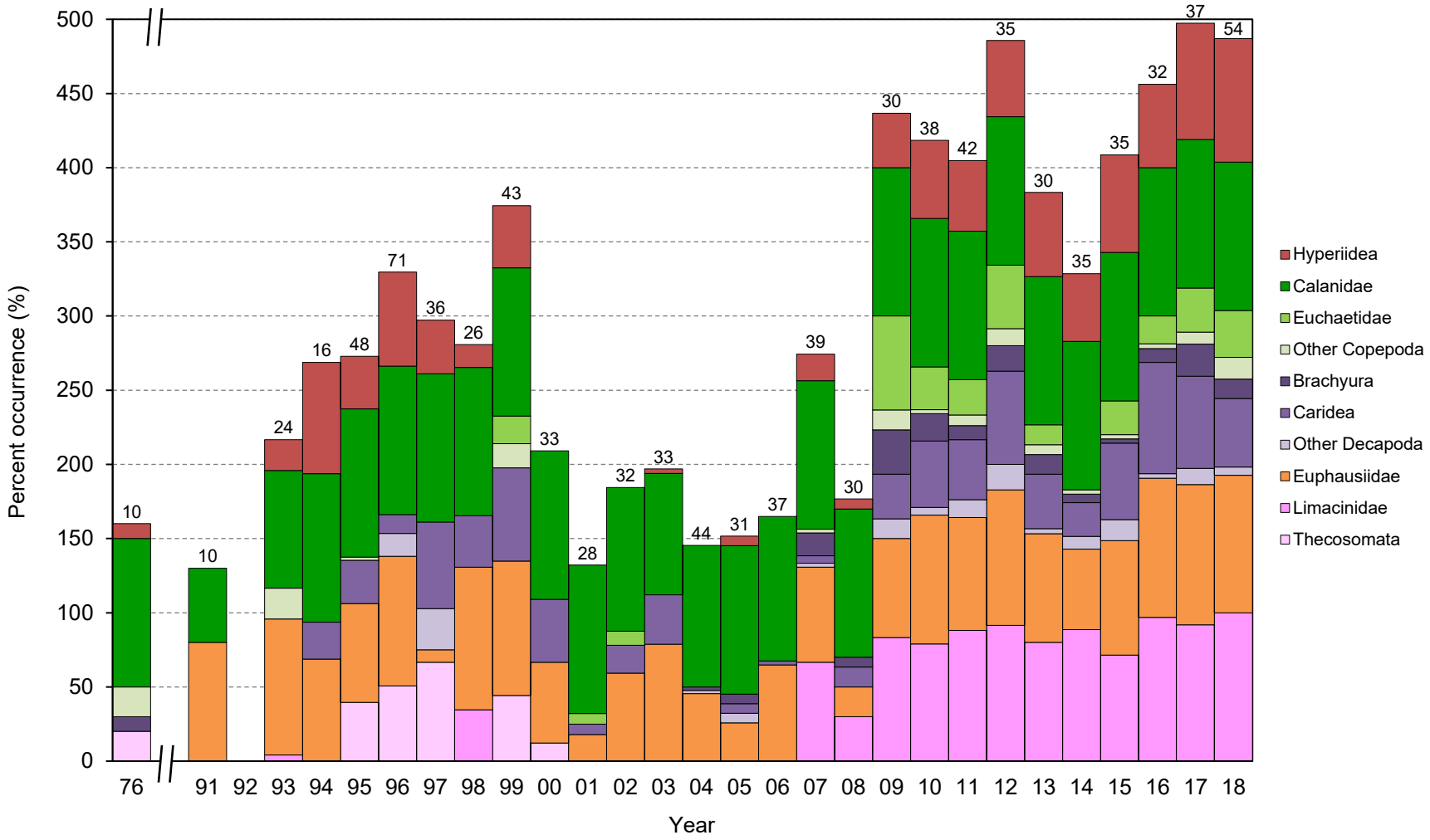

Figure 20. Frequency of occurrence of major prey items in diets of whiskered auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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 2019 but have not yet been analyzed.

Table 25. 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 2019 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	2005
No. samples	10	10	24	16	48	71	36	26	43	33	28	32	33	44	31
Invertebrates	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Amphipoda	**20.0**	**-**	**20.8**	**75.0**	**35.4**	**64.8**	**36.1**	**15.4**	**41.9**	**-**	**-**	**-**	**9.1**	**-**	**6.5**
Hyperiidea	**10.0**	**-**	**20.8**	**75.0**	**35.4**	**63.4**	**36.1**	**15.4**	**41.9**	**-**	**-**	**-**	**3.0**	**-**	**6.5**
Primno macropa	-	-	4.2	68.8	-	-	36.1	15.4	41.9	-	-	-	-	-	-
Other Hyperiidea	10.0	-	16.7	12.5	35.4	63.4	2.8	-	-	-	-	-	3.0	-	6.5
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**	**100.0**
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**	**100.0**
Neocalanus cristatus	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	35.5
N. plumchrus/flemengeri	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	100.0
Unid. Calanidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	-	4.2	-	-	-	-	42.4	-	-	-	-	-
Euchaetidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**18.6**	**-**	**7.1**	**9.4**	**-**	**-**	**-**
Paraeuchaeta elongata	-	-	-	-	-	-	-	-	18.6	-	7.1	9.4	-	-	-
Oher 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**	**12.9**
Brachyura	10.0	-	-	-	-	-	-	-	-	-	-	-	-	2.3	6.5
Caridea	**-**	**-**	**-**	**25.0**	**29.2**	**12.7**	**58.3**	**34.6**	**62.8**	**42.4**	**7.1**	**18.8**	**33.3**	**-**	**6.5**
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	-	6.5
Other Caridea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Decapoda	-	-	-	-	-	15.5	27.8	-	-	-	-	-	-	2.3	6.5
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**	**25.8**
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**	**25.8**
Euphausia pacifica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa inermis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. inspinata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. longipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. spinifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa 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	25.8
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2

Table 25 (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 2019 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	2018	2019
No. samples	37	39	30	30	38	42	35	30	35	35	32	37	54	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**	**100.0**	*pending*
Amphipoda	**-**	**17.9**	**6.7**	**40.0**	**52.6**	**47.6**	**54.3**	**66.7**	**45.7**	**65.7**	**56.3**	**78.4**	**83.3**	**-**
Hyperiidea	**-**	**17.9**	**6.7**	**36.7**	**52.6**	**47.6**	**51.4**	**56.7**	**45.7**	**65.7**	**56.3**	**78.4**	**83.3**	**-**
Primno macropa	-	15.4	-	30.0	50.0	47.6	51.4	53.3	45.7	62.9	56.3	75.7	77.8	-
Other Hyperiidea	-	2.6	6.7	16.7	5.3	4.8	2.9	6.7	-	8.6	3.1	8.1	11.1	-
Other Amphipoda	-	-	-	3.3	-	-	2.9	13.3	2.9	-	-	-	-	-
Copepoda	**97.3**	**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	**97.3**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**-**
Neocalanus cristatus	67.6	53.8	73.3	100.0	89.5	88.1	94.3	100.0	65.7	94.3	100.0	97.3	96.3	-
N. plumchrus/flemengeri	83.8	100.0	96.7	100.0	97.4	97.6	100.0	100.0	100.0	91.4	96.9	100.0	100.0	-
Unid. Calanidae	-	76.9	100.0	-	-	-	-	-	-	-	-	-	-	-
Other Calanidae	-	-	-	3.3	-	4.8	-	-	-	-	-	-	5.6	-
Euchaetidae	**-**	**-**	**-**	**63.3**	**28.9**	**23.8**	**42.9**	**13.3**	**-**	**22.9**	**18.8**	**29.7**	**31.5**	**-**
Paraeuchaeta elongata	-	-	-	-	28.9	23.8	42.9	13.3	-	22.9	18.8	29.7	31.5	-
Oher Euchaetidae	-	-	-	63.3	-	-	-	-	-	-	-	-	-	-
Other Copepoda	-	2.6	-	13.3	2.6	7.1	11.4	6.7	2.9	2.9	3.1	8.1	14.8	-
Decapoda	**2.7**	**15.4**	**20.0**	**46.7**	**52.6**	**47.6**	**71.4**	**40.0**	**28.6**	**57.1**	**78.1**	**70.3**	**53.7**	**-**
Brachyura	-	15.4	6.7	30.0	18.4	9.5	17.1	13.3	5.7	2.9	9.4	21.6	13.0	-
Caridea	**2.7**	**5.1**	**13.3**	**30.0**	**44.7**	**40.5**	**62.9**	**36.7**	**22.9**	**51.4**	**75.0**	**62.2**	**46.3**	**-**
Hippolytidae	-	2.6	3.3	26.7	34.2	28.6	54.3	23.3	17.1	22.9	43.8	40.5	27.8	-
Pandalidae	2.7	2.6	6.7	20.0	36.8	31.0	34.3	10.0	5.7	37.1	59.4	62.2	38.9	-
Unid. Caridea	-	2.6	3.3	-	2.6	4.8	5.7	6.7	-	2.9	6.3	2.7	-	-
Other Caridea	-	2.6	-	10.0	-	7.1	2.9	-	5.7	-	-	-	-	-
Other Decapoda	-	2.6	-	13.3	5.3	11.9	17.1	3.3	8.6	14.3	3.1	10.8	5.6	-
Euphausiacea	**64.9**	**64.1**	**20.0**	**66.7**	**86.8**	**76.2**	**91.4**	**73.3**	**54.3**	**77.1**	**93.8**	**94.6**	**92.6**	**-**
Euphausiidae	**64.9**	**64.1**	**20.0**	**66.7**	**86.8**	**76.2**	**91.4**	**73.3**	**54.3**	**77.1**	**93.8**	**94.6**	**92.6**	**-**
Euphausia pacifica	-	2.6	-	33.3	28.9	16.7	34.3	13.3	8.6	28.6	25.0	59.5	50.0	-
Thysanoessa inermis	-	0.0	-	33.3	5.3	38.1	42.9	-	-	-	12.5	5.4	3.7	-
T. inspinata	-	5.1	-	10.0	55.3	23.8	31.4	60.0	25.7	57.1	71.9	67.6	61.1	-
T. longipes	-	12.8	-	63.3	50.0	50.0	48.6	13.3	20.0	22.9	12.5	21.6	46.3	-
T. spinifera	-	2.6	-	3.3	2.6	-	5.7	-	-	-	34.4	64.9	38.9	
Thysanoessa spp.	-	5.1	3.3	60.0	34.2	11.9	28.6	6.7	14.3	17.1	31.3	73.0	61.1	-
Unid. Euphausiidae	64.9	46.2	20.0	-	31.6	52.4	48.6	26.7	25.7	20.0	34.4	35.1	53.7	-
Other Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 25 (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 2019 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	2005
Gastropoda	**20.0**	**-**	**4.2**	**25.0**	**39.6**	**50.7**	**66.7**	**34.6**	**44.2**	**12.1**	**-**	**-**	**-**	**-**	**-**
Limacinidae	**-**	**-**	**4.2**	**-**	**-**	**-**	**-**	**34.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Limacina helicina	-	-	4.2	-	-	-	-	-	-	-	-	-	-	-	-
Other Limacinidae	-	-	-	-	-	-	-	34.6	-	-	-	-	-	-	-
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 25 (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 2019 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	2018	2019
Gastropoda	**-**	**66.7**	**30.0**	**83.3**	**78.9**	**88.1**	**91.4**	**80.0**	**88.6**	**71.4**	**96.9**	**91.9**	**100.0**	**-**
Limacinidae	**-**	**66.7**	**30.0**	**83.3**	**78.9**	**88.1**	**91.4**	**80.0**	**88.6**	**71.4**	**96.9**	**91.9**	**100.0**	**-**
Limacina helicina	-	66.7	30.0	83.3	78.9	88.1	91.4	80.0	88.6	71.4	96.9	91.9	100.0	-
Other Limacinidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thecosomata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	2.4	-	-	-	2.9	-	-	1.9	-
Other Invertebrates	-	-	-	-	-	-	-	-	2.9	-	3.1	5.4	-	-
Fish	-	-	-	-	10.5	7.1	8.6	3.3	25.7	8.6	9.4	13.5	3.7	-
Other	-	-	-	-	-	-	-	3.3	5.7	-	3.1	-	-	-

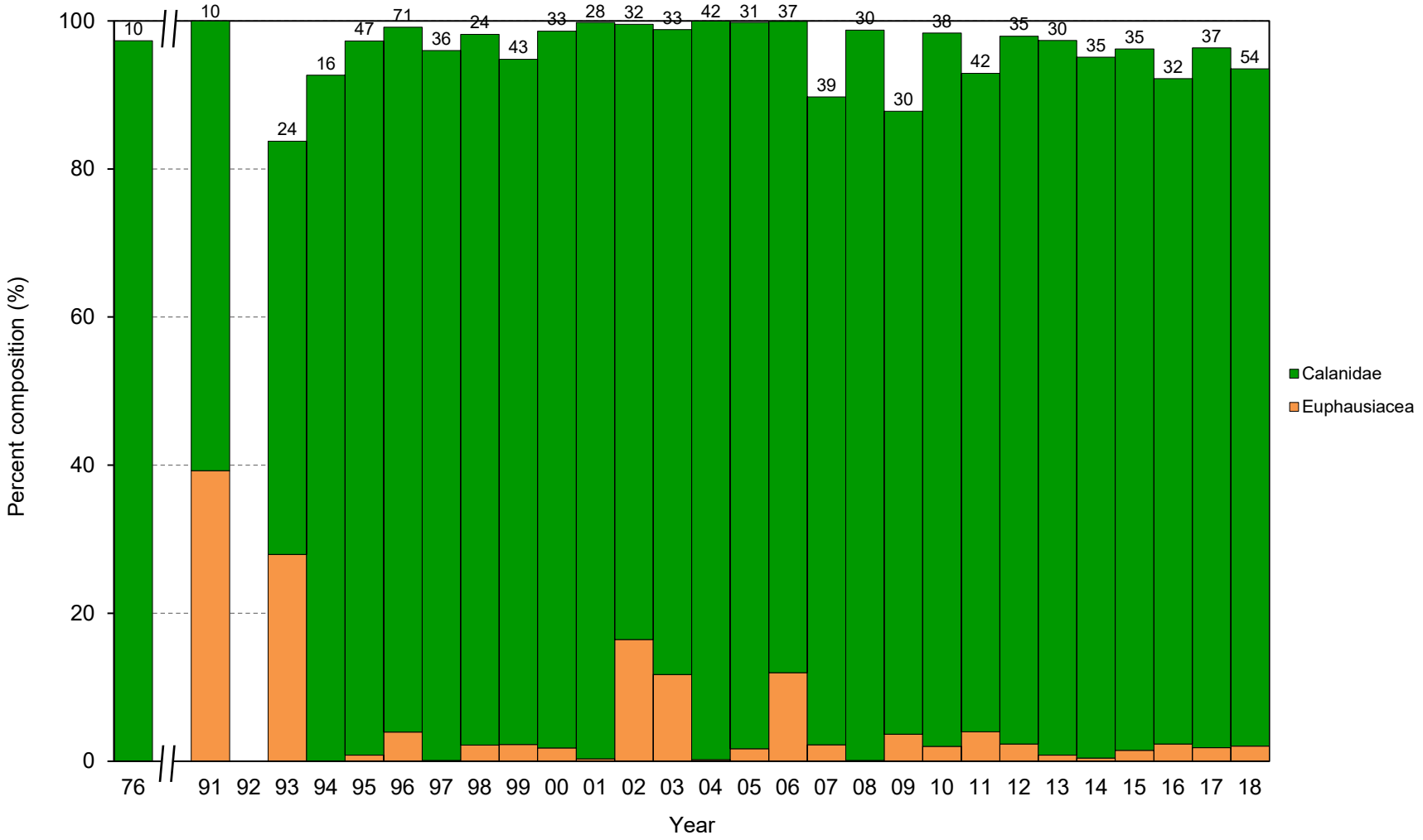

Figure 21. Percent composition of major prey items in diets of whiskered auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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 2019 but have not yet been analyzed.

Table 26. 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 2019 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	2005
No. samples	10	10	24	16	47	71	36	24	43	33	28	32	33	42	31
No. individuals	2282	920	5404	3477	32410	53729	30973	11138	20109	17217	14269	18074	13076	11163	22699
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**	**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**	**98.1**
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**	**98.1**
Neocalanus cristatus	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	4.2
N. plumchrus/flemengeri	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	93.9
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	1.7
Other Invertebrates	2.6	-	0.7	7.3	2.5	0.8	4.0	1.8	3.4	1.4	-	0.2	1.2	-	0.2
Fish	<0.1	-	<0.1	-	<0.1	-	-	-	<0.1	-	-	-	-	-	-
Other	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-

Table 26 (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 2019 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	2018	2019
No. samples	37	39	30	30	38	42	35	30	35	35	32	37	54	37
No. individuals	13085	19571	23333	57898	35681	23391	32631	27486	27836	22401	22776	56875	67083	*pending*
Invertebrates	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**99.9**	**100.0**	**100.0**	**100.0**	**100.0**	**-**
Copepoda	**88.0**	**87.5**	**98.6**	**85.0**	**96.4**	**89.2**	**95.9**	**96.6**	**94.7**	**94.8**	**90.0**	**94.6**	**91.6**	**-**
Calanidae	**88.0**	**87.5**	**98.6**	**84.1**	**96.3**	**89.0**	**95.6**	**96.5**	**94.7**	**94.7**	**89.9**	**94.5**	**91.5**	**-**
Neocalanus cristatus	20.3	2.1	12.9	7.1	5.2	15.3	6.0	4.2	0.9	15.2	18.0	5.0	7.1	-
N. plumchrus/flemengeri	67.7	73.6	67.9	76.7	91.1	73.6	89.6	92.3	93.8	79.5	71.9	89.5	84.4	-
Other Calanidae	-	11.8	17.9	0.4	-	<0.1	-	-	-	-	-	-	<0.1	-
Other Copepoda	-	<0.1	-	0.9	0.1	0.3	0.3	<0.1	<0.1	0.1	0.1	0.1	0.1	-
Euphausiacea	12.0	2.2	0.1	3.7	2.0	4.0	2.3	0.8	0.4	1.5	2.3	1.8	2.1	-
Other Invertebrates	-	12.5	1.4	15.0	3.6	10.8	4.1	3.4	5.3	5.2	10.0	3.5	6.4	-
Fish	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	-
Other	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	-	-

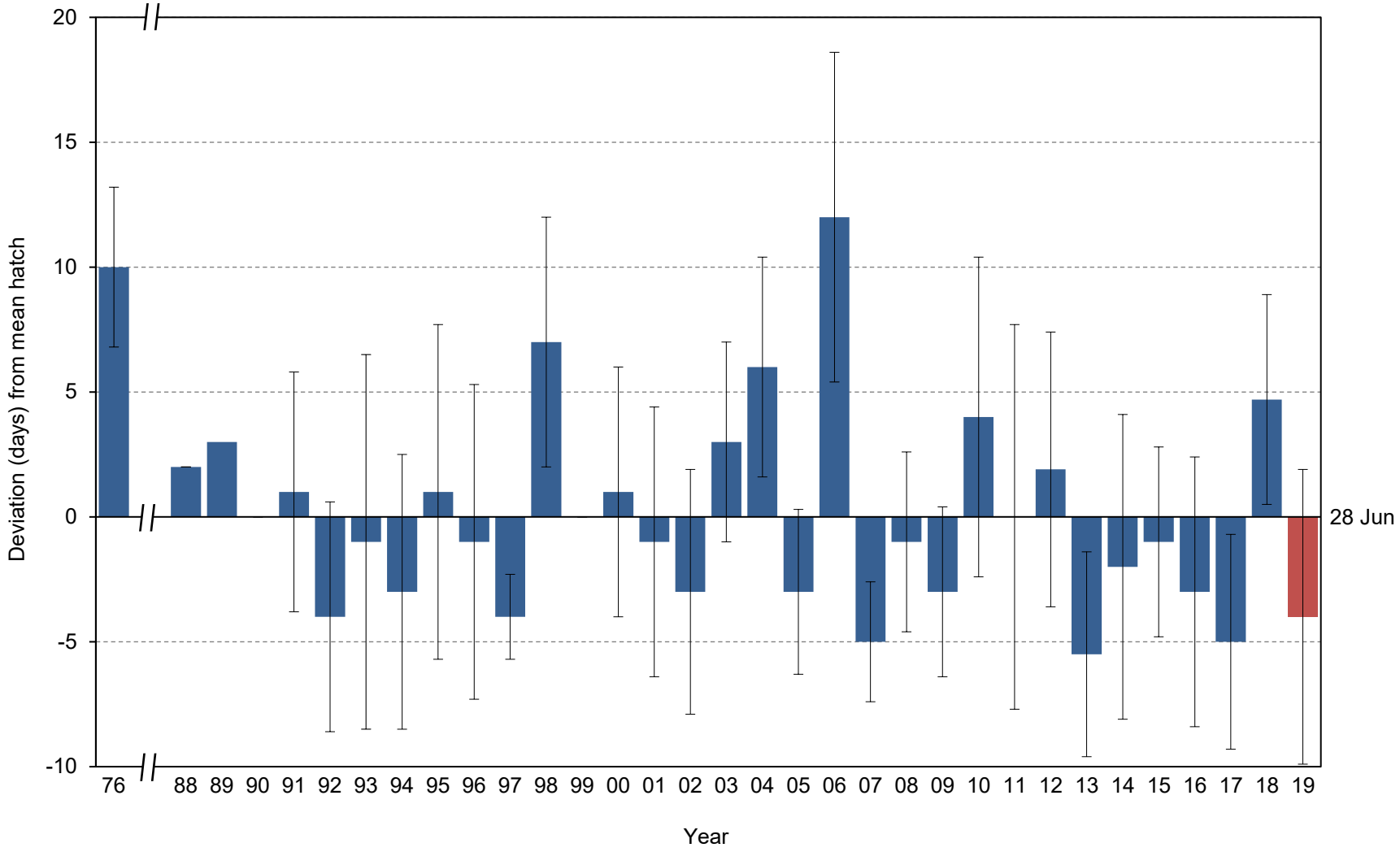

Figure 22. Yearly hatch date deviation (from the 1988-2018 average of 28 June) for crested auklets at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); 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 27. 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	-	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
2018	3 Jul	4.2	42	29 Jun	23 Jul	28 Jul
2019	24 Jun	5.9	55	7 Jun	19 Jul	13 Jul

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

[b]In years when no chicks fledged before the last nest check, date of first fledge is listed as > the date of last nest check.

[c]Hatch dates in 1976 were assumed to be the midpoint of the interval reported in Knudtson and Byrd (1982).

Table 28. 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	04
158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	1
179	-	-	-	-	-	-	-	-	-	1	10	6	-	-	-
180	-	-	-	-	-	-	-	-	-	-	-	1	2	2	-
181	-	-	-	-	-	-	1	5	-	-	-	-	1	-	1
182	3	1	-	-	-	-	-	2	-	1	-	-	1	-	8
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	2	-	-	-	8	-	-	-	6	2	-	-	-
185	-	-	-	1	-	-	-	-	-	1	-	-	-	3	-
186	-	-	1	-	-	-	-	-	-	1	-	-	2	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	-	-	-	-	-	-	-	-	-	-	-	1	-	-	6
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	1	4	1	-	-	5	1	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	3	1	6	7	10	36	48	14	5	10	20	14	23	6	18

Table 28 (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														
	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
168	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-
169	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
170	-	-	-	-	-	-	1	1	1	-	-	-	1	-	11
171	4	-	-	-	-	-	-	-	-	2	-	-	-	-	-
172	-	-	16	2	-	-	1	-	6	1	5	14	26	-	-
173	1	-	-	-	-	-	2	-	-	-	-	-	-	-	2
174	2	-	-	-	28	-	1	-	1	5	1	-	-	-	-
175	-	-	1	-	-	-	-	2	1	-	2	-	-	-	-
176	14	-	13	18	-	-	3	1	1	-	22	14	2	-	33
177	-	-	-	-	3	-	4	2	-	-	-	-	-	-	-
178	1	1	-	-	4	7	2	4	-	2	-	1	7	-	-
179	1	-	-	1	-	-	1	6	-	-	2	1	-	-	1
180	5	-	-	-	7	-	3	-	-	1	2	1	1	4	-
181	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
182	-	3	1	11	-	9	3	-	1	-	16	-	-	25	4
183	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-
184	-	-	-	-	-	-	1	1	-	1	-	-	-	2	-
185	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-
186	1	6	-	-	2	4	-	-	-	-	-	1	-	-	-
187	-	-	-	1	-	-	-	1	-	-	-	-	-	7	-
188	-	-	-	-	-	-	2	1	-	-	1	-	-	-	-
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-
192	-	10	-	-	-	-	-	1	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	2	1	-	1	-	-	1	1	1
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
n	29	26	31	34	45	24	29	27	13	14	52	35	39	42	55

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

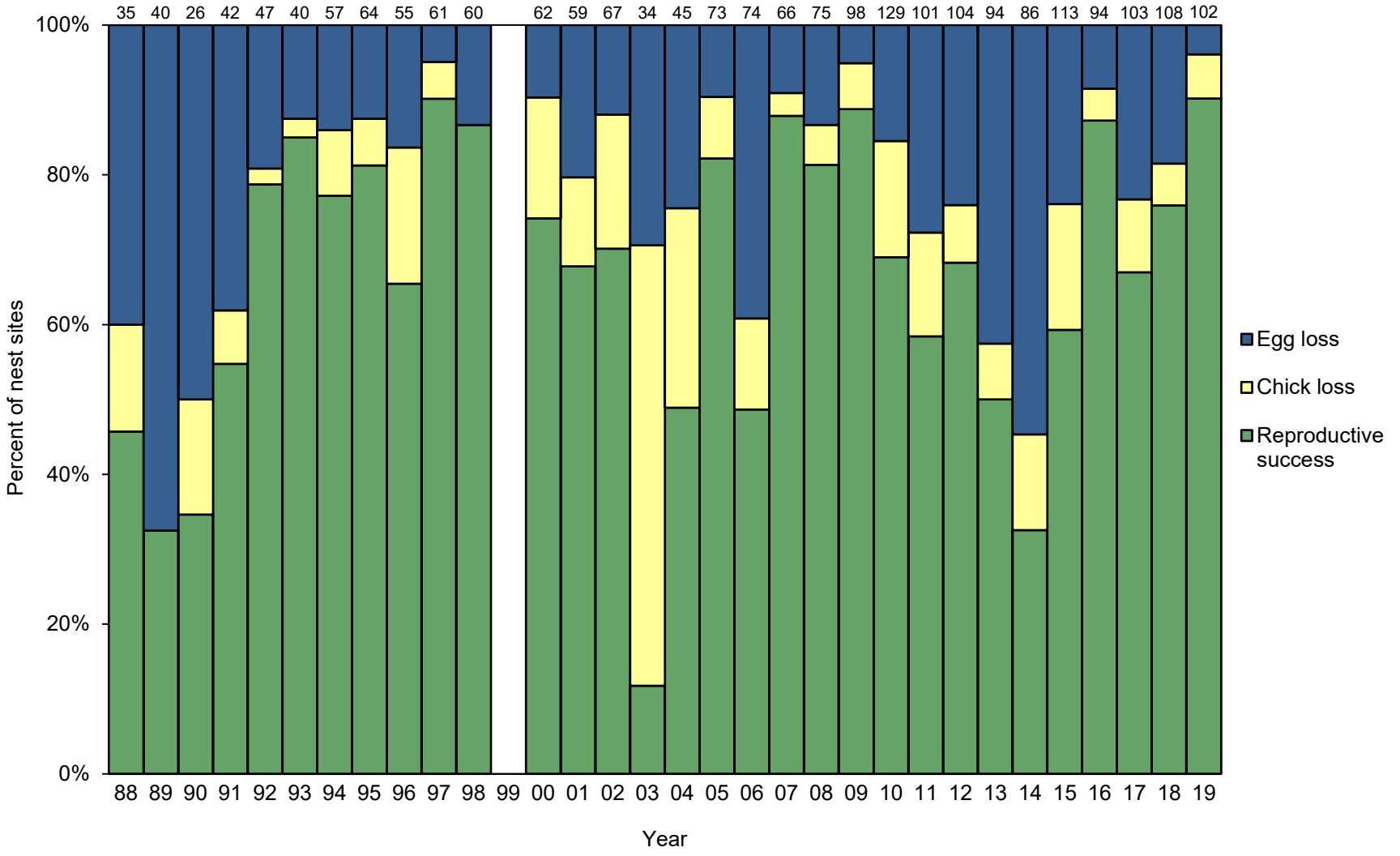

Figure 23. Reproductive performance of crested auklets at Buldir Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B). No data were collected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

Table 29. 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] Total	Nesting success (D/B)[a] SD	Fledging success (F/D)[b] Total	Fledging success (F/D)[b] SD	Reproductive success (F/B) Total	Reproductive success (F/B) SD	Sampling design[c]
1976	59	45	-	0.76	0.06	-	-	-	-	Simple random
1988	35	21	16	0.60	0.08	0.76	0.09	0.46	0.08	Simple random
1989	40	13	13	0.33	0.07	1.00	0.00	0.33	0.07	Simple random
1990	26	13	9	0.50	0.10	0.69	0.13	0.35	0.09	Simple random
1991	42	26	23	0.62	0.07	0.88	0.06	0.55	0.08	Simple random
1992	47	38	37	0.81	0.06	0.97	0.03	0.79	0.06	Simple random
1993	40	35	34	0.88	0.05	0.97	0.03	0.85	0.06	Simple random
1994	57	49	44	0.86	0.05	0.90	0.04	0.77	0.06	Simple random
1995	64	56	52	0.88	0.04	0.93	0.03	0.81	0.05	Simple random
1996	55	46	36	0.84	0.05	0.78	0.06	0.65	0.06	Simple random
1997	61	58	55	0.95	0.03	0.95	0.03	0.90	0.04	Simple random
1998	60	52	52	0.87	0.04	1.00	0.00	0.87	0.04	Simple random
2000	62	56	46	0.90	0.04	0.82	0.05	0.74	0.06	Simple random
2001	59	47	40	0.80	0.05	0.85	0.05	0.68	0.06	Simple random
2002	67	59	47	0.88	0.04	0.80	0.05	0.70	0.06	Simple random
2003	34	24	4	0.71	0.08	0.17	0.08	0.12	0.06	Simple random
2004	45	34	22	0.76	0.06	0.65	0.08	0.49	0.07	Simple random
2005	73	66	60	0.90	0.04	0.91	0.04	0.82	0.04	Simple random
2006	74	45	36	0.61	0.06	0.80	0.06	0.49	0.06	Simple random
2007	66	60	58	0.91	0.04	0.97	0.02	0.88	0.04	Simple random
2008	75	65	61	0.87	0.04	0.94	0.03	0.81	0.05	Simple random
2009	98	93	87	0.95	0.02	0.94	0.02	0.89	0.03	Simple random
2010	129	109	89	0.84	0.03	0.82	0.04	0.69	0.04	Simple random
2011	101	73	59	0.72	0.04	0.81	0.05	0.58	0.05	Simple random
2012	104	79	71	0.76	0.04	0.90	0.03	0.68	0.05	Simple random
2013	94	54	47	0.57	0.05	0.87	0.05	0.50	0.05	Simple random
2014	86	39	28	0.45	0.05	0.72	0.07	0.33	0.05	Simple random
2015	113	86	67	0.76	0.04	0.78	0.04	0.59	0.05	Simple random
2016	94	86	82	0.91	0.03	0.95	0.02	0.87	0.03	Simple random
2017	103	79	69	0.77	0.04	0.87	0.04	0.67	0.05	Simple random
2018	108	88	82	0.81	0.04	0.93	0.03	0.76	0.04	Simple random
2019	102	98	92	0.96	0.02	0.94	0.02	0.90	0.03	Simple random

[a]For 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).

[b]For 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).

[c]Sampling for auklets is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

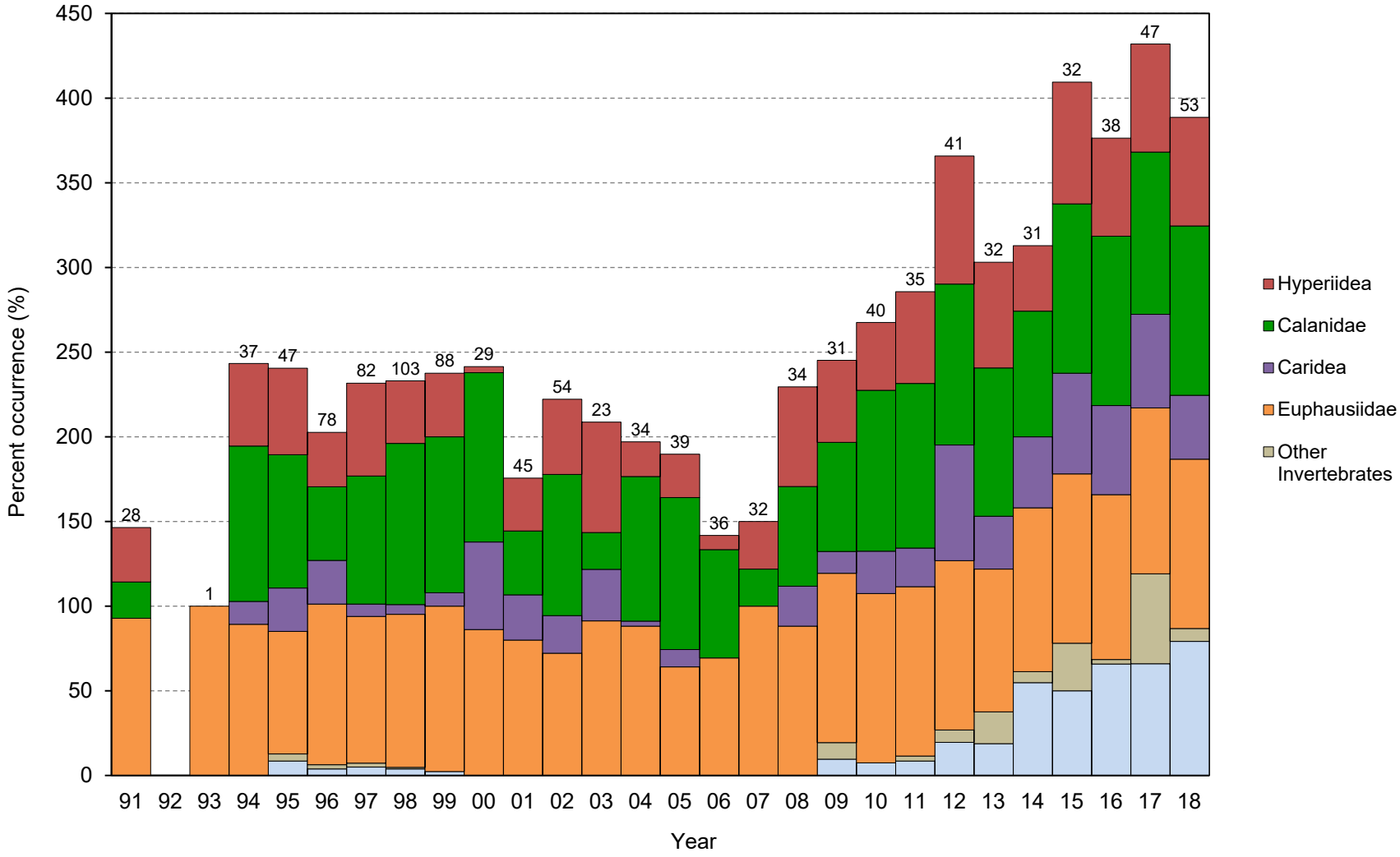

Figure 24. Frequency of occurrence of major prey items in diets of crested auklet chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of 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 2018 but have not yet been analyzed.

Table 30. 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 2019 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	2005
No. samples	28	1	37	47	78	82	103	88	29	45	54	23	34	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**	**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**	**25.6**
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**	**25.6**
Primno macropa	-	-	21.6	-	-	-	-	1.1	-	-	1.9	-	-	-
Themisto pacifica	7.1	-	43.2	51.1	32.1	54.9	36.9	37.5	3.4	15.6	25.9	-	20.6	2.6
Themisto spp.	25.0	-	-	-	-	-	-	-	-	15.6	22.2	65.2	-	23.1
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**	**89.7**
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**	**89.7**
Neocalanus cristatus	14.3	-	91.9	78.7	34.6	72.0	94.2	92.0	100.0	33.3	83.3	8.7	85.3	87.2
N. plumchrus/flemengeri	7.1	-	16.2	6.4	17.9	45.1	45.6	15.9	79.3	26.7	35.2	17.4	2.9	35.9
Other Calanidae	-	-	-	-	-	-	-	-	-	2.2	-	-	-	5.1
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**	**10.3**
Caridea	**-**	**-**	**13.5**	**25.5**	**25.6**	**7.3**	**5.8**	**8.0**	**51.7**	**26.7**	**22.2**	**30.4**	**2.9**	**10.3**
Hippolytidae	-	-	-	-	-	-	-	8.0	-	-	-	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	51.7	26.7	22.2	30.4	2.9	10.3
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**	**64.1**
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**	**64.1**
Euphausia pacifica	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa inspinata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. longipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T. spinifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thysanoessa spp.	92.9	100.0	89.2	-	-	-	-	-	-	28.9	24.1	65.2	8.8	10.3
Unid. Euphausiidae	-	-	-	72.3	94.9	86.6	90.3	97.7	69.0	55.6	63.0	26.1	73.5	56.4
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 30 (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 2019 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	2018	2019
No. samples	36	32	34	31	40	35	41	32	31	32	38	47	53	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**	**100.0**	*pending*
Amphipoda	**8.3**	**28.1**	**58.8**	**48.4**	**40.0**	**54.3**	**75.6**	**62.5**	**38.7**	**71.9**	**57.9**	**66.0**	**64.2**	**-**
Hyperiidea	**8.3**	**28.1**	**58.8**	**48.4**	**40.0**	**54.3**	**75.6**	**62.5**	**38.7**	**71.9**	**57.9**	**63.8**	**64.2**	**-**
Primno macropa	-	-	-	-	2.5	-	14.6	28.1	6.5	25.0	18.4	17.0	34.0	-
Themisto pacifica	5.6	6.3	32.4	41.9	35.0	54.3	65.9	46.9	35.5	68.8	55.3	63.8	47.2	-
Themisto spp.	2.8	25.0	14.7	-	-	-	-	3.1	3.2	-	-	-	-	-
Other Hyperiidea	-	-	17.6	12.9	5.0	-	31.7	9.4	-	-	-	-	1.9	-
Other Amphipoda	-	-	-	-	-	-	-	3.1	-	-	-	2.1	-	-
Copepoda	**63.9**	**21.9**	**58.8**	**64.5**	**95.0**	**97.1**	**95.1**	**87.5**	**74.2**	**100.0**	**100.0**	**95.7**	**100.0**	**-**
Calanidae	**63.9**	**21.9**	**58.8**	**64.5**	**95.0**	**97.1**	**95.1**	**87.5**	**74.2**	**100.0**	**100.0**	**95.7**	**100.0**	**-**
Neocalanus cristatus	61.1	21.9	50.0	64.5	92.5	97.1	92.7	81.3	32.3	100.0	100.0	95.7	100.0	-
N. plumchrus/flemengeri	8.3	-	2.9	19.4	22.5	20.0	39.0	34.4	74.2	53.1	31.6	51.1	67.9	-
Other Calanidae	-	-	20.6	-	-	2.9	2.4	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	-	2.9	9.8	-	3.2	3.1	-	-	9.4	-
Decapoda	**-**	**-**	**26.5**	**16.1**	**25.0**	**25.7**	**70.7**	**31.3**	**41.9**	**62.5**	**52.6**	**55.3**	**43.4**	**-**
Caridea	**-**	**-**	**23.5**	**12.9**	**25.0**	**22.9**	**68.3**	**31.3**	**41.9**	**59.4**	**52.6**	**55.3**	**37.7**	**-**
Hippolytidae	-	-	11.8	9.7	25.0	17.1	65.9	31.3	41.9	56.3	44.7	42.6	34.0	-
Pandalidae	-	-	8.8	6.5	5.0	-	4.9	-	-	18.8	15.8	38.3	13.2	-
Other Caridea	-	-	5.9	-	-	11.4	-	-	-	3.1	13.2	2.1	-	-
Other Decapoda	-	-	2.9	6.5	2.5	2.9	9.8	9.4	-	6.3	7.9	8.5	15.1	-
Euphausiacea	**69.4**	**100.0**	**88.2**	**100.0**	**100.0**	**100.0**	**100.0**	**84.4**	**96.8**	**100.0**	**97.4**	**97.9**	**100.0**	**-**
Euphausiidae	**69.4**	**100.0**	**88.2**	**100.0**	**100.0**	**100.0**	**100.0**	**84.4**	**96.8**	**100.0**	**97.4**	**97.9**	**100.0**	**-**
Euphausia pacifica	-	-	-	-	15.0	22.9	36.6	6.3	29.0	34.4	42.1	44.7	39.6	-
Thysanoessa inspinata	-	-	-	61.3	42.5	17.1	56.1	56.3	93.5	96.9	97.4	91.5	100.0	-
T. longipes	-	-	-	83.9	90.0	91.4	46.3	53.1	93.5	75.0	89.5	57.4	90.6	-
T. spinifera	-	-	-	35.5	2.5	20.0	26.8	-	3.2	12.5	47.4	66.0	62.3	-
Thysanoessa spp.	-	3.1	17.6	-	100.0	100.0	92.7	12.5	71.0	46.9	68.4	57.4	94.3	-
Unid. Euphausiidae	69.4	100.0	79.4	-	-	-	-	21.9	16.1	9.4	18.4	27.7	47.2	-
Other Euphausiidae	-	-	-	19.4	-	20.0	4.9	-	3.2	-	2.6	14.9	18.9	-
Other Invertebrates	-	-	-	9.7	-	2.9	7.3	18.8	6.5	28.1	2.6	53.2	7.5	-
Fish	**-**	**3.1**	**2.9**	**58.1**	**7.5**	**8.6**	**19.5**	**18.8**	**54.8**	**50.0**	**65.8**	**66.0**	**79.2**	**-**
Teleostei	**-**	**3.1**	**2.9**	**58.1**	**7.5**	**8.6**	**19.5**	**18.8**	**54.8**	**50.0**	**65.8**	**66.0**	**79.2**	**-**
Unid. Teleostei	-	-	-	9.7	7.5	8.6	19.5	18.8	54.8	50.0	65.8	66.0	79.2	-
Other Teleostei	-	3.1	2.9	51.6	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-

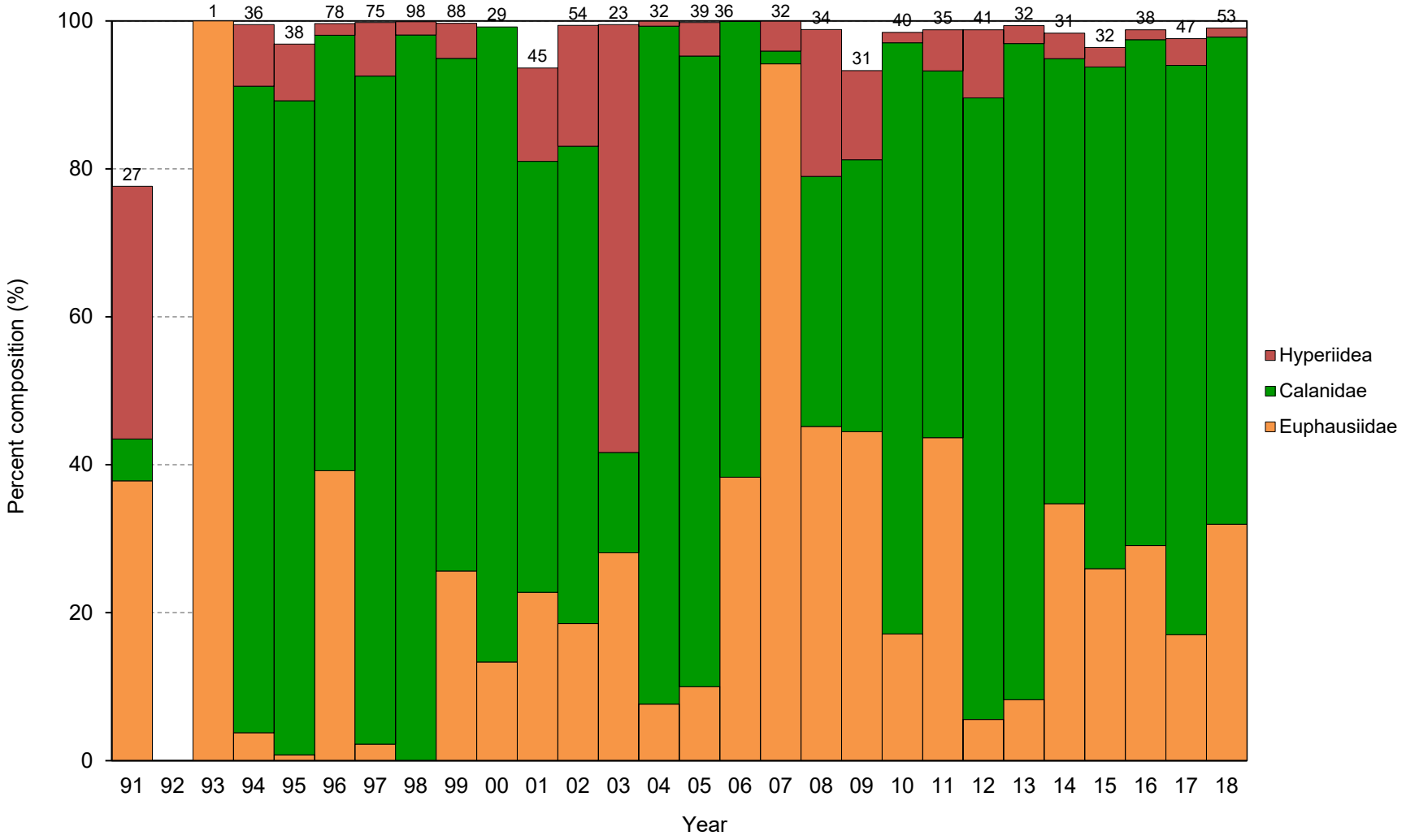

Figure 25. Percent composition of major prey items in diets of crested auklet chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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 2019 but have not yet been analyzed.

Table 31. 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 2019 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	2005
No. samples	27	1	36	38	78	75	98	88	29	45	54	23	32	39
No. individuals	4262	120	9834	8155	22090	25045	28810	22275	11192	11932	23355	6308	5862	17525
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	**34.2**	**-**	**8.3**	**7.7**	**1.6**	**7.3**	**1.8**	**4.8**	**<0.1**	**12.6**	**16.4**	**57.9**	**0.7**	**4.5**
Hyperiidea	**34.2**	**-**	**8.3**	**7.7**	**1.6**	**7.3**	**1.8**	**4.8**	**<0.1**	**12.6**	**16.4**	**57.9**	**0.7**	**4.5**
Themisto pacifica	10.8	-	7.8	7.7	1.5	7.3	1.8	4.7	<0.1	11.8	15.1	-	0.7	<0.1
Other Hyperiidea	23.3	-	0.5	-	-	-	-	-	-	0.8	1.3	-	-	4.5
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**	**85.3**
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**	**85.3**
Neocalanus cristatus	0.4	-	87.0	87.6	52.3	53.0	92.9	66.5	77.9	53.8	57.4	0.9	91.4	81.7
N. plumchrus/flemengeri	5.3	-	0.3	0.9	6.6	37.3	5.2	2.8	7.9	3.5	7.1	12.7	0.3	2.8
Other Calanidae	-	-	-	-	-	-	-	-	-	0.9	-	-	-	0.8
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**	**10.0**
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**	**10.0**
Thysanoessa spp.	37.8	100.0	3.8	-	-	-	-	-	-	7.1	1.6	17.2	0.7	2.3
Unid. Euphausiidae	-	-	-	0.8	39.2	2.2	<0.1	25.6	9.4	15.7	16.9	10.8	5.6	7.7
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	-	0.2
Fish	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 31 (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 2019 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	2018	2019
No. samples	36	32	34	31	40	35	41	32	31	32	38	47	53	37
No. individuals	11403	14447	11444	11136	24415	11581	54614	11715	6572	11656	12040	18226	22327	*pending*
Invertebrates	**100.0**	**100.0**	**99.7**	**95.2**	**100.0**	**99.9**	**99.9**	**99.9**	**99.6**	**99.6**	**99.6**	**99.5**	**99.7**	**-**
Amphipoda	**0.1**	**4.0**	**19.9**	**12.1**	**1.4**	**5.5**	**9.2**	**2.4**	**3.4**	**2.6**	**1.3**	**3.6**	**1.2**	**-**
Hyperiidea	**0.1**	**4.0**	**19.9**	**12.1**	**1.4**	**5.5**	**9.2**	**2.4**	**3.4**	**2.6**	**1.3**	**3.6**	**1.2**	**-**
Themisto pacifica	<0.1	1.3	17.8	12.0	1.4	5.5	7.7	2.2	3.4	2.5	1.3	3.6	1.1	-
Other Hyperiidea	0.1	2.7	2.0	-	-	-	1.5	0.2	-	0.1	0.1	0.1	0.1	-
Other Amphipoda	-	-	-	-	-	-	-	<0.1	-	-	-	<0.1	-	-
Copepoda	**61.6**	**1.7**	**33.8**	**36.7**	**79.9**	**49.6**	**84.0**	**88.7**	**60.2**	**67.8**	**68.4**	**77.0**	**66.0**	**-**
Calanidae	**61.6**	**1.7**	**33.8**	**36.7**	**79.9**	**49.6**	**84.0**	**88.7**	**60.2**	**67.8**	**68.4**	**77.0**	**65.9**	**-**
Neocalanus cristatus	57.7	1.7	31.6	33.8	65.3	45.7	60.3	66.1	5.2	52.4	62.3	74.7	61.7	-
N. plumchrus/flemengeri	3.9	-	0.3	3.0	14.6	3.8	23.7	22.6	54.9	15.4	6.1	2.3	4.1	-
Other Calanidae	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	-	-	-	-	<0.1	<0.1	-	-	0.1	-
Euphausiacea	**38.3**	**94.2**	**45.2**	**44.5**	**17.1**	**43.7**	**5.6**	**8.2**	**34.8**	**26.0**	**29.1**	**17.0**	**32.0**	**-**
Euphausiidae	**38.3**	**94.2**	**45.2**	**44.5**	**17.1**	**43.7**	**5.6**	**8.2**	**34.8**	**26.0**	**29.1**	**17.0**	**32.0**	**-**
Thysanoessa spp.	-	0.3	4.1	-	9.0	28.2	2.7	0.1	5.0	1.1	5.5	2.0	4.7	-
Unid. Euphausiidae	38.3	93.9	41.1	-	-	-	-	0.6	0.1	0.1	0.4	0.4	0.7	-
Other Euphausiidae	-	-	-	44.5	8.1	15.4	2.8	7.6	29.6	24.8	23.2	14.7	26.5	-
Other Invertebrates	-	-	0.9	1.9	1.5	1.1	1.1	0.6	1.2	3.2	0.8	1.9	0.5	-
Fish	-	<0.1	0.3	4.8	<0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.5	0.3	-
Other	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-

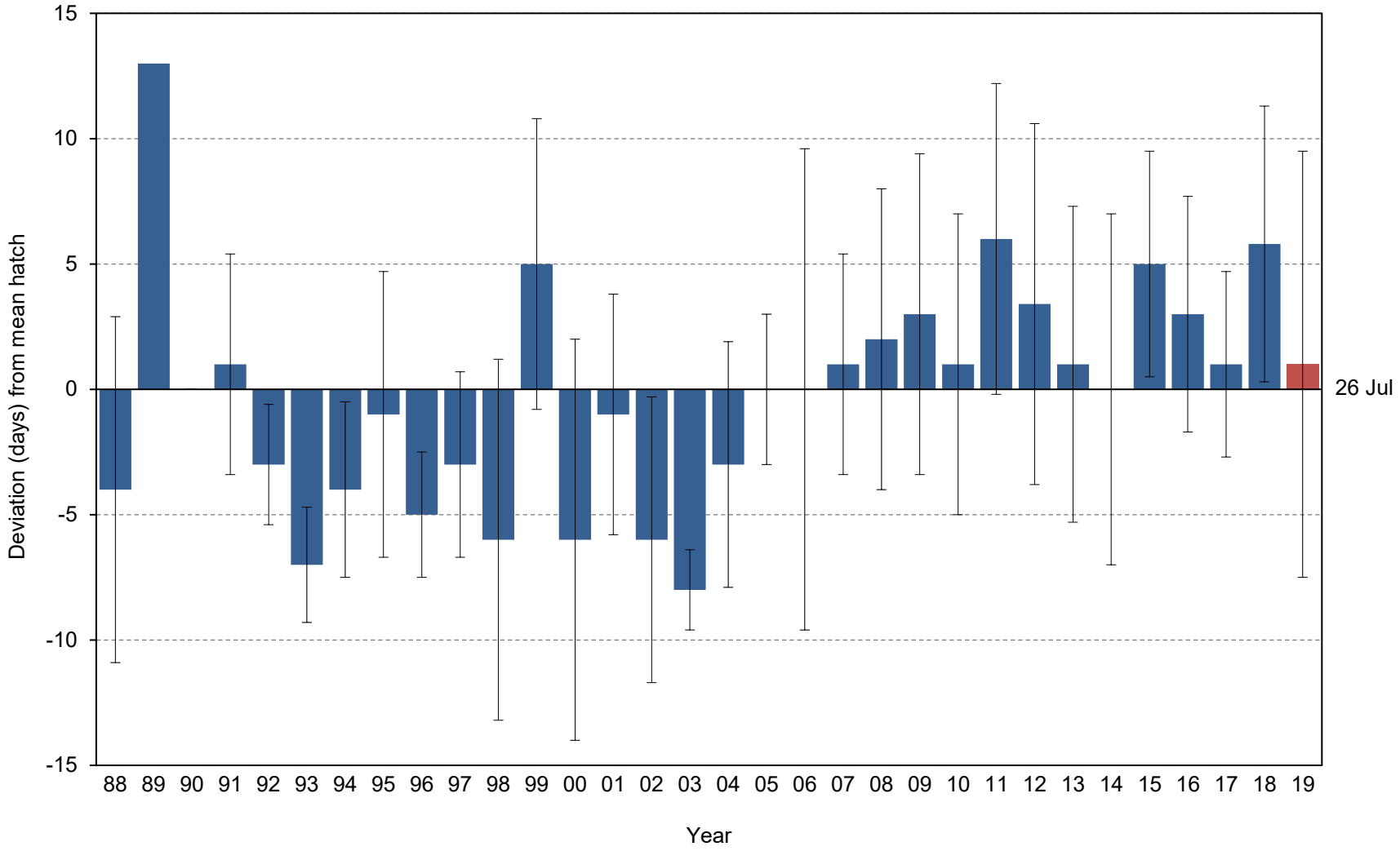

Figure 26. Yearly hatch date deviation (from the 1988-2018 average of 26 July) for horned puffins at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); red highlights the current year. No hatch dates were recorded with the appropriate egg to chick interval (≤ 7 days) in 1990.

Table 32. 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	-	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
2018	1 Aug	5.5	34	23 Jul	15 Aug	>25 Aug
2019	27 Jul	8.5	56	6 Jul	22 Aug	>25 Aug

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

[b]In 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 33. 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	04
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
199	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-
200	1	-	1	-	4	-	-	-	2	3	-	3	1	9	4	1
201	1	-	-	-	-	4	-	-	-	-	-	-	-	-	-	1
202	2	-	1	3	-	-	4	12	-	-	-	-	-	-	-	2
203	-	-	-	-	-	-	-	-	1	-	-	-	-	4	-	-
204	1	-	-	-	1	8	-	-	-	3	2	1	2	1	-	4
205	1	-	-	-	-	-	-	-	1	-	-	3	-	-	-	-
206	3	-	3	2	-	1	-	-	-	2	-	-	4	1	-	-
207	-	-	-	-	-	-	3	-	-	-	-	1	-	-	-	-
208	2	-	2	1	-	-	-	1	-	-	-	-	-	2	-	1
209	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
210	-	-	-	-	-	-	-	-	1	2	1	1	-	-	-	1
211	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
212	1	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
213	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
214	-	-	-	-	-	-	1	-	-	1	1	2	-	1	-	1
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	1	-	-	-	1	-	-	-	2	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	13	1	11	6	6	15	10	14	5	16	7	21	8	28	5	14

Table 33 (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														
	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
182	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
183	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
188	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	1	-	-	-	-	-	1	2	-	-	-	-	-
199	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3
200	-	-	-	-	1	-	-	-	1	1	-	-	1	-	6
201	-	-	-	4	-	-	-	1	-	-	-	1	-	-	-
202	1	4	1	-	3	1	-	-	6	-	-	1	-	-	1
203	-	-	-	-	-	-	-	1	-	-	-	1	3	-	1
204	-	-	1	-	-	1	3	3	4	15	5	1	3	4	12
205	-	1	3	1	-	-	-	-	2	1	-	2	-	-	-
206	3	6	1	-	4	1	-	-	5	-	2	3	6	1	-
207	-	-	3	7	-	-	1	-	-	1	-	-	2	1	4
208	1	2	2	-	6	1	1	5	-	-	-	14	12	1	2
209	-	-	1	-	1	-	1	-	-	-	13	-	-	4	-
210	1	-	-	-	1	3	-	4	-	5	6	1	1	-	6
211	-	-	1	4	-	-	1	-	-	-	-	-	1	-	-
212	1	3	2	-	-	-	4	5	4	2	1	1	4	9	4
213	-	-	-	2	1	-	-	-	-	-	-	12	-	-	-
214	-	-	-	-	3	3	-	-	2	1	12	2	4	3	7
215	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
216	-	1	2	-	1	-	1	-	2	-	3	-	-	1	1
217	-	-	-	2	1	1	-	-	-	2	1	-	-	-	-
218	-	1	-	-	-	-	2	1	1	-	1	1	1	7	-
219	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
220	-	-	-	-	-	-	-	1	-	-	3	1	-	1	2
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
222	-	-	-	-	-	-	1	2	-	-	1	-	-	1	-
223	-	1	-	-	3	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1
225	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
226	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
228	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
n	7	22	18	21	25	14	19	25	29	33	48	42	38	34	56

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

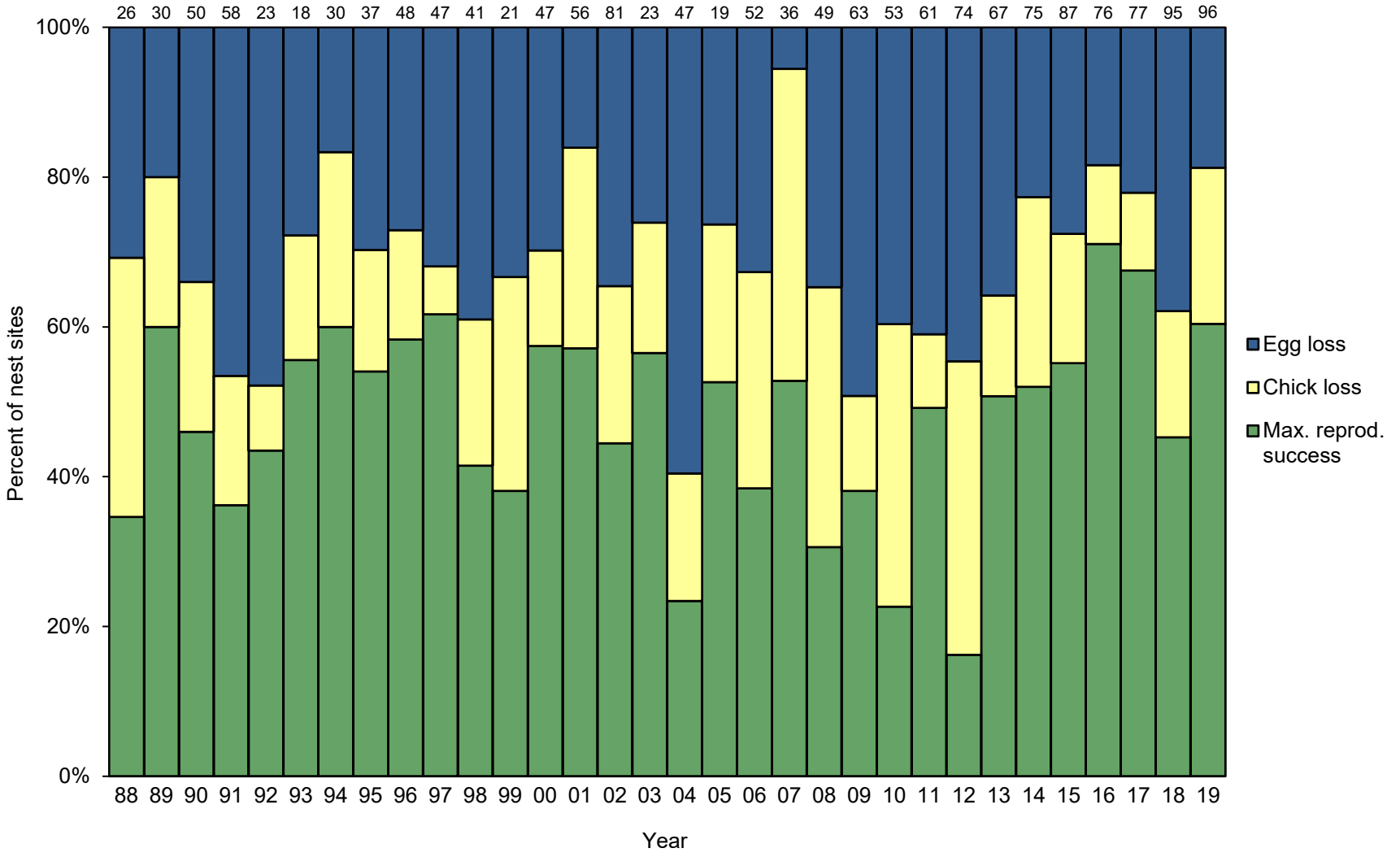

Figure 27. Reproductive performance of horned puffins at Buldir Island, Alaska. Values represent maximum potential success, including nest sites with chicks too young to consider fledged at the last check. Egg loss=[(B+H)-D+H]/(B+H); Chick loss=[(D+H)-F+H]/(B+H); Maximum potential reproductive success=[(F+H)/(B+H)], 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 34. Reproductive performance of horned puffins at Buldir Island, Alaska.

Year	Nest sites w/ eggs	Nest sites w/ chicks	Nest sites w/ chicks fledged	Nest sites w/ young chicks still present[a]	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)]		Sampling design[e]
	(B)	(D)	(F)	(H)	Total	SD	Total	SD	Total	SD	Total	SD	Total	SD	Total	SD	
1988	25	17	8	1	0.68	0.09	0.47	0.12	0.32	0.09	0.69	0.09	0.50	0.12	0.35	0.09	Simple random
1989	12	6	0	18	0.50	0.14	0.00	0.00	0.00	0.00	0.80	0.07	0.75	0.09	0.60	0.09	Simple random
1990	27	10	0	23	0.37	0.09	0.00	0.00	0.00	0.00	0.66	0.07	0.70	0.08	0.46	0.07	Simple random
1991	37	10	0	21	0.27	0.07	0.00	0.00	0.00	0.00	0.53	0.07	0.68	0.08	0.36	0.06	Simple random
1992	13	2	0	10	0.15	0.10	0.00	0.00	0.00	0.00	0.52	0.10	0.83	0.11	0.43	0.10	Simple random
1993	17	12	9	1	0.71	0.11	0.75	0.13	0.53	0.12	0.72	0.11	0.77	0.12	0.56	0.12	Simple random
1994	30	25	18	0	0.83	0.07	0.72	0.09	0.60	0.09	0.83	0.07	0.72	0.09	0.60	0.09	Simple random
1995	17	6	0	20	0.35	0.12	0.00	0.00	0.00	0.00	0.70	0.08	0.77	0.08	0.54	0.08	Simple random
1996	28	15	8	20	0.54	0.09	0.53	0.13	0.29	0.09	0.73	0.06	0.80	0.07	0.58	0.07	Simple random
1997	20	5	2	27	0.25	0.10	0.40	0.22	0.10	0.07	0.68	0.07	0.91	0.05	0.62	0.07	Simple random
1998	38	22	14	3	0.58	0.08	0.64	0.10	0.37	0.08	0.61	0.08	0.68	0.09	0.41	0.08	Simple random
1999	13	6	0	8	0.46	0.14	0.00	0.00	0.00	0.00	0.67	0.10	0.57	0.13	0.38	0.11	Simple random
2000	40	26	20	7	0.65	0.08	0.77	0.08	0.50	0.08	0.70	0.07	0.82	0.07	0.57	0.07	Simple random
2001	20	3	0	37	0.15	0.08	0.00	0.00	0.00	0.00	0.70	0.06	0.93	0.04	0.65	0.06	Simple random
2002	72	44	27	9	0.61	0.06	0.61	0.07	0.38	0.06	0.65	0.05	0.68	0.06	0.44	0.06	Simple random
2003	22	16	12	1	0.73	0.09	0.75	0.11	0.55	0.11	0.74	0.09	0.76	0.10	0.57	0.10	Simple random
2004	44	16	8	3	0.36	0.07	0.50	0.13	0.18	0.06	0.40	0.07	0.58	0.11	0.23	0.06	Simple random
2005	17	12	8	2	0.71	0.11	0.67	0.14	0.47	0.12	0.74	0.10	0.71	0.12	0.53	0.11	Simple random
2006	39	22	7	13	0.56	0.08	0.32	0.10	0.18	0.06	0.67	0.07	0.57	0.08	0.38	0.07	Simple random
2007	21	19	4	15	0.90	0.07	0.21	0.09	0.19	0.09	0.94	0.04	0.56	0.09	0.53	0.08	Simple random
2008	43	26	9	6	0.60	0.07	0.35	0.09	0.21	0.06	0.65	0.07	0.47	0.09	0.31	0.07	Simple random
2009	44	13	5	19	0.30	0.07	0.38	0.13	0.11	0.05	0.51	0.06	0.75	0.08	0.38	0.06	Simple random
2010	46	25	5	7	0.54	0.07	0.20	0.08	0.11	0.05	0.60	0.07	0.38	0.09	0.23	0.06	Simple random
2011	34	9	3	27	0.26	0.08	0.33	0.16	0.09	0.05	0.59	0.06	0.83	0.06	0.49	0.06	Simple random
2012	67	34	5	7	0.51	0.06	0.15	0.06	0.07	0.03	0.55	0.06	0.29	0.07	0.16	0.04	Simple random
2013	50	26	17	17	0.52	0.07	0.65	0.09	0.34	0.07	0.64	0.06	0.79	0.06	0.51	0.06	Simple random
2014	47	30	11	28	0.64	0.07	0.37	0.09	0.23	0.06	0.77	0.05	0.67	0.06	0.52	0.06	Simple random
2015	44	20	5	43	0.45	0.08	0.25	0.10	0.11	0.05	0.72	0.05	0.76	0.05	0.55	0.05	Simple random
2016	48	34	26	28	0.71	0.07	0.76	0.07	0.54	0.07	0.82	0.04	0.87	0.04	0.71	0.05	Simple random
2017	44	27	19	33	0.61	0.07	0.70	0.09	0.43	0.07	0.78	0.05	0.87	0.04	0.68	0.05	Simple random
2018	61	25	9	34	0.41	0.06	0.36	0.10	0.15	0.05	0.62	0.05	0.73	0.06	0.45	0.05	Simple random
2019	74	56	36	22	0.76	0.05	0.64	0.06	0.49	0.06	0.81	0.04	0.74	0.05	0.60	0.05	Simple random

[a]Chicks 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.

[b]For 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).

[c]For 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).

[d]Values 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.

[e]Sampling for puffins is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

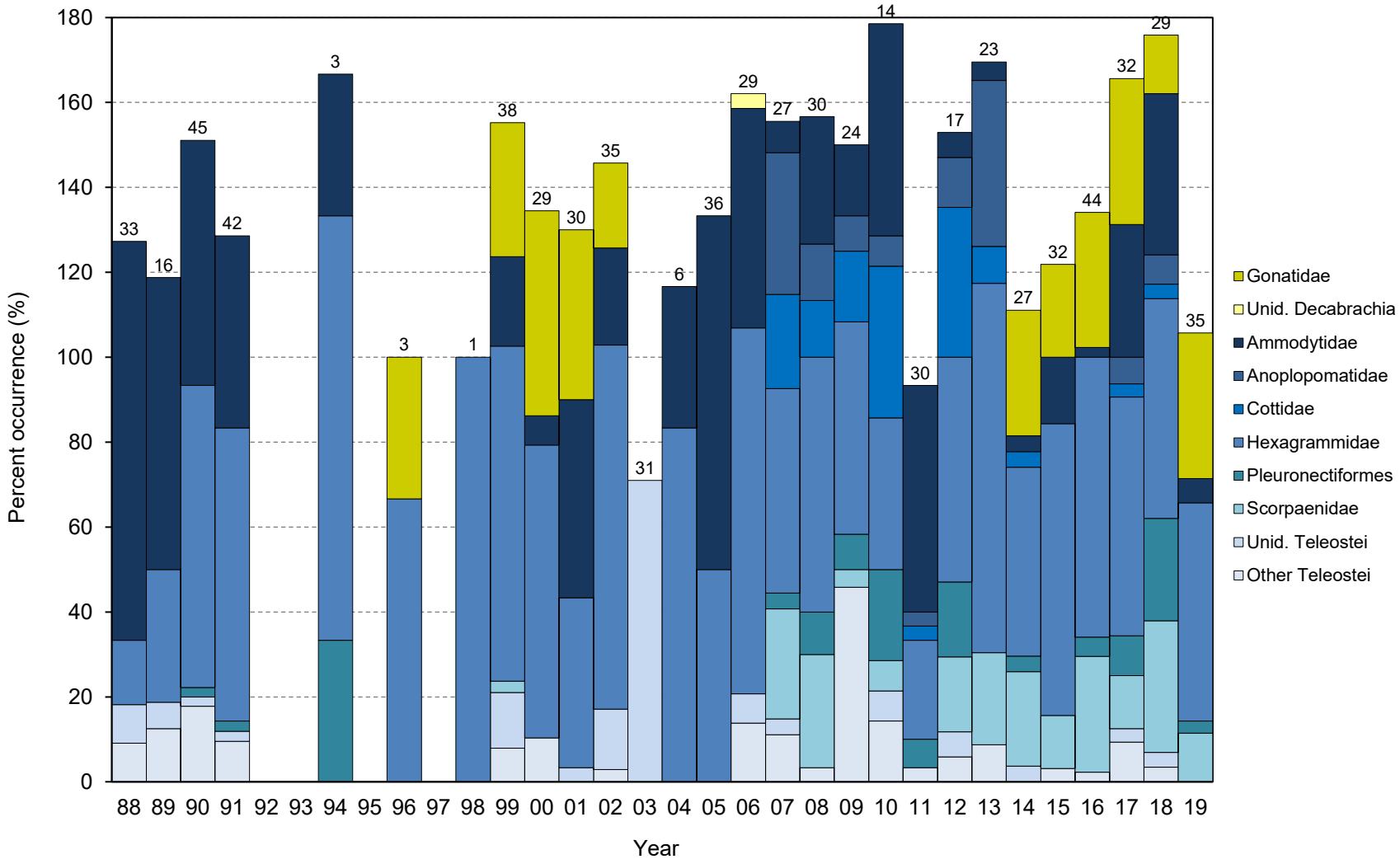

Figure 28. Frequency of occurrence of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2019) 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.

Table 35. 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 (2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997. 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	2005
No. samples	33	16	45	42	3	3	1	38	29	30	35	31	6	36
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**	**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**	**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	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**	**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**	**100.0**
Ammodytidae	**93.9**	**68.8**	**57.8**	**45.2**	**33.3**	**-**	**-**	**21.1**	**6.9**	**46.7**	**22.9**	**-**	**33.3**	**83.3**
Ammodytes spp.	93.9	68.8	57.8	45.2	33.3	-	-	21.1	6.9	46.7	22.9	-	33.3	83.3
Anoplopomatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Anoplopoma fimbria	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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**	**50.0**
Hexagrammos decagrammus	-	-	-	-	100.0	66.7	-	71.1	51.7	40.0	85.7	-	83.3	50.0
H. lagocephalus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pleurogrammus monopterygius	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 35 (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 (2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997. 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	2018	2019
No. samples	29	27	30	24	14	30	17	23	30	32	44	32	29	35
Invertebrates	**17.2**	**44.4**	**13.3**	**33.3**	**57.1**	**46.7**	**35.3**	**8.7**	**29.6**	**31.3**	**31.8**	**40.6**	**20.7**	**48.6**
Cephalopoda	**17.2**	**44.4**	**13.3**	**33.3**	**57.1**	**46.7**	**35.3**	**8.7**	**29.6**	**31.3**	**31.8**	**40.6**	**20.7**	**48.6**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**29.6**	**21.9**	**31.8**	**34.4**	**13.8**	**34.3**
Unid. Gonatidae	-	-	-	-	-	-	-	-	14.8	21.9	6.8	31.3	13.8	20.0
Other Gonatidae	-	-	-	-	-	-	-	-	18.5	-	18.2	6.3	-	17.1
Unid. Decabrachia	13.8	44.4	13.3	33.3	57.1	46.7	35.3	8.7	3.7	15.6	2.3	15.6	6.9	31.4
Other Cephalopoda	3.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	**96.6**	**77.8**	**93.3**	**95.8**	**78.6**	**70.0**	**76.5**	**100.0**	**70.4**	**84.4**	**86.4**	**84.4**	**96.6**	**68.6**
Teleostei	**96.6**	**77.8**	**93.3**	**95.8**	**78.6**	**70.0**	**76.5**	**100.0**	**70.4**	**84.4**	**86.4**	**84.4**	**96.6**	**68.6**
Ammodytidae	**51.7**	**7.4**	**30.0**	**16.7**	**50.0**	**53.3**	**5.9**	**4.3**	**3.7**	**15.6**	**2.3**	**31.3**	**37.9**	**5.7**
Ammodytes spp.	51.7	7.4	30.0	16.7	50.0	53.3	5.9	4.3	3.7	15.6	2.3	31.3	37.9	5.7
Anoplopomatidae	**-**	**33.3**	**13.3**	**8.3**	**7.1**	**3.3**	**11.8**	**39.1**	**-**	**-**	**-**	**6.3**	**6.9**	**-**
Anoplopoma fimbria	-	33.3	13.3	8.3	7.1	3.3	11.8	39.1	-	-	-	6.3	6.9	-
Cottidae	-	22.2	13.3	16.7	35.7	3.3	35.3	8.7	3.7	-	-	3.1	3.4	-
Hexagrammidae	**86.2**	**48.1**	**60.0**	**50.0**	**35.7**	**23.3**	**52.9**	**87.0**	**44.4**	**68.8**	**65.9**	**56.3**	**51.7**	**51.4**
Hexagrammos decagrammus	69.0	-	-	-	-	3.3	-	26.1	-	-	-	-	-	-
H. lagocephalus	-	25.9	-	25.0	7.1	13.3	35.3	47.8	-	-	-	-	-	-
Pleurogrammus monopterygius	-	3.7	46.7	16.7	14.3	6.7	5.9	13.0	44.4	68.8	65.9	56.3	51.7	51.4
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	9.4	24.1	2.9
Scorpaenidae	-	25.9	26.7	4.2	7.1	-	17.6	21.7	22.2	12.5	27.3	12.5	31.0	11.4
Unid. Teleostei	6.9	3.7	-	-	7.1	-	5.9	-	3.7	-	-	3.1	3.4	-
Other Teleostei	13.8	11.1	3.3	45.8	14.3	3.3	5.9	8.7	-	3.1	2.3	9.4	3.4	-

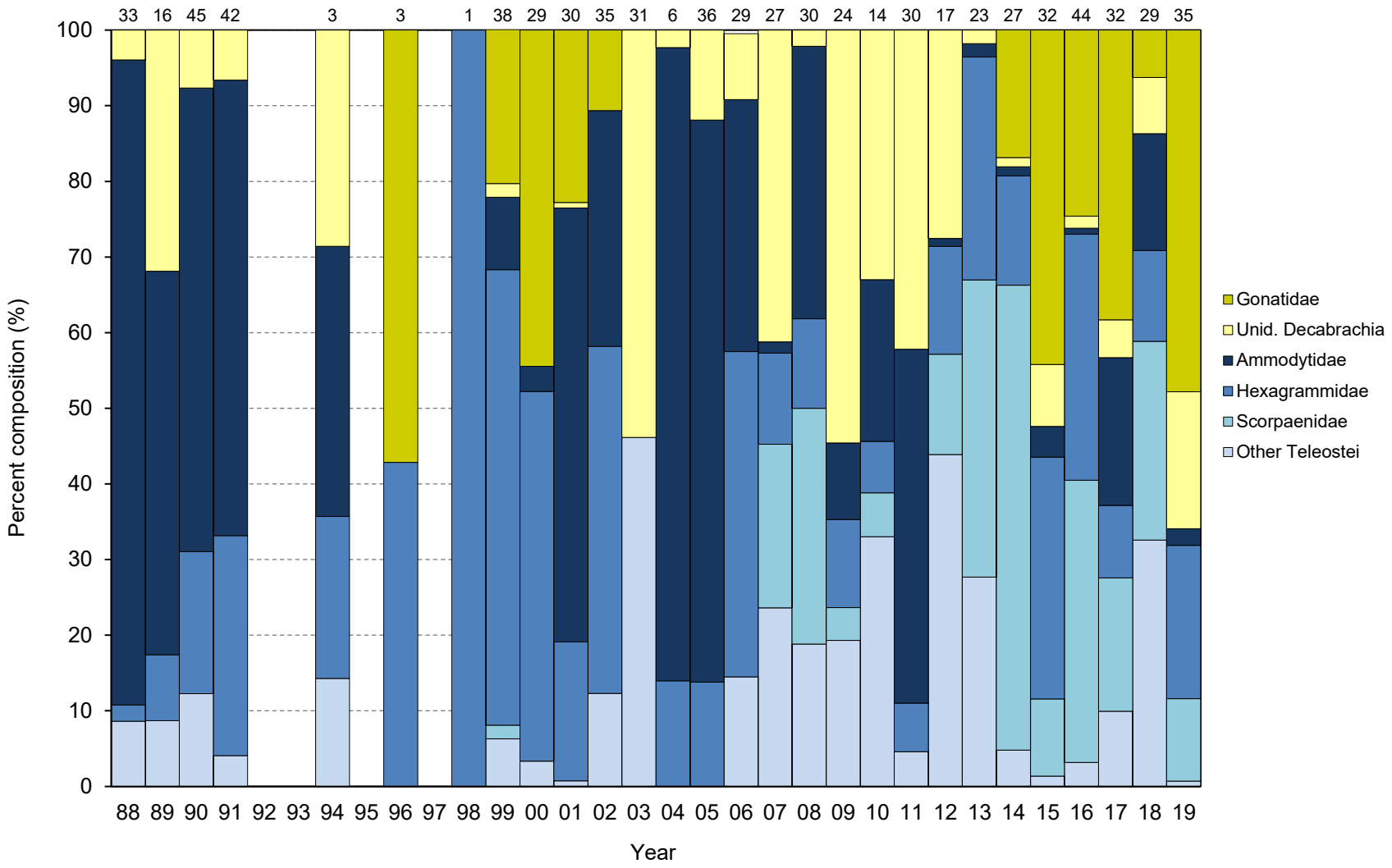

Figure 29. Percent composition of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2019) 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.

Table 36. 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 (2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997. 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	2005
No. samples	33	16	45	42	3	3	1	38	29	30	35	31	6	36
No. individuals	278	69	261	196	14	7	1	166	90	136	122	208	43	261
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**	**11.9**
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**	**11.9**
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	11.9
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**	**88.1**
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**	**88.1**
Ammodytidae	**85.3**	**50.7**	**61.3**	**60.2**	**35.7**	**-**	**-**	**9.6**	**3.3**	**57.4**	**31.1**	**-**	**83.7**	**74.3**
Ammodytes spp.	85.3	50.7	61.3	60.2	35.7	-	-	9.6	3.3	57.4	31.1	-	83.7	74.3
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**	**13.8**
Hexagrammos decagrammus	-	-	-	-	21.4	42.9	-	57.8	17.8	18.4	45.9	-	14.0	13.8
Pleurogrammus monopterygius	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**	**-**	**-**	**-**	**-**	**-**	**-**
Sebastes spp.	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-
Other Scorpaenidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Teleostei	8.6	8.7	12.3	4.1	14.3	-	-	6.3	3.3	0.7	12.3	46.2	-	-

Table 36 (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 (2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1992-1993, 1995, or 1997. 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	2018	2019
No. samples	29	27	30	24	14	30	17	23	27	32	44	32	29	35
No. individuals	207	199	186	207	103	109	98	112	83	147	126	261	175	138
Invertebrates	**9.2**	**41.2**	**2.2**	**54.6**	**33.0**	**42.2**	**27.6**	**1.8**	**18.1**	**52.4**	**26.2**	**43.3**	**13.7**	**65.9**
Cephalopoda	**9.2**	**41.2**	**2.2**	**54.6**	**33.0**	**42.2**	**27.6**	**1.8**	**18.1**	**52.4**	**26.2**	**43.3**	**13.7**	**65.9**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16.9**	**44.2**	**24.6**	**38.3**	**6.3**	**47.8**
Unid. Gonatidae	-	-	-	-	-	-	-	-	7.2	44.2	11.9	37.2	6.3	42.8
Other Gonatidae	-	-	-	-	-	-	-	-	9.6	-	12.7	1.1	-	5.1
Unid. Decabrachia	8.7	41.2	2.2	54.6	33.0	42.2	27.6	1.8	1.2	8.2	1.6	5.0	7.4	18.1
Other Cephalopoda	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	**90.8**	**58.8**	**97.8**	**45.4**	**67.0**	**57.8**	**72.4**	**98.2**	**81.9**	**47.6**	**73.8**	**56.7**	**86.3**	**34.1**
Teleostei	**90.8**	**58.8**	**97.8**	**45.4**	**67.0**	**57.8**	**72.4**	**98.2**	**81.9**	**47.6**	**73.8**	**56.7**	**86.3**	**34.1**
Ammodytidae	**33.3**	**1.5**	**36.0**	**10.1**	**21.4**	**46.8**	**1.0**	**1.8**	**1.2**	**4.1**	**0.8**	**19.5**	**15.4**	**2.2**
Ammodytes spp.	33.3	1.5	36.0	10.1	21.4	46.8	1.0	1.8	1.2	4.1	0.8	19.5	15.4	2.2
Hexagrammidae	**43.0**	**12.1**	**11.8**	**11.6**	**6.8**	**6.4**	**14.3**	**29.5**	**14.5**	**32.0**	**32.5**	**9.6**	**12.0**	**20.3**
Hexagrammos decagrammus	22.7	-	-	-	-	0.9	-	11.6	-	-	-	-	-	-
Pleurogrammus monopterygius	-	0.5	9.1	1.9	2.9	-	1.0	2.7	14.5	32.0	32.5	9.6	12.0	20.3
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**	**17.6**	**26.3**	**10.9**
Sebastes spp.	-	-	-	-	-	-	-	-	61.4	10.2	37.3	17.6	26.3	10.9
Other Scorpaenidae	-	21.6	31.2	4.3	5.8	-	13.3	39.3	-	-	-	-	-	-
Other Teleostei	14.5	23.6	18.8	19.3	33.0	4.6	43.9	27.7	4.8	1.4	3.2	10.0	32.6	0.7

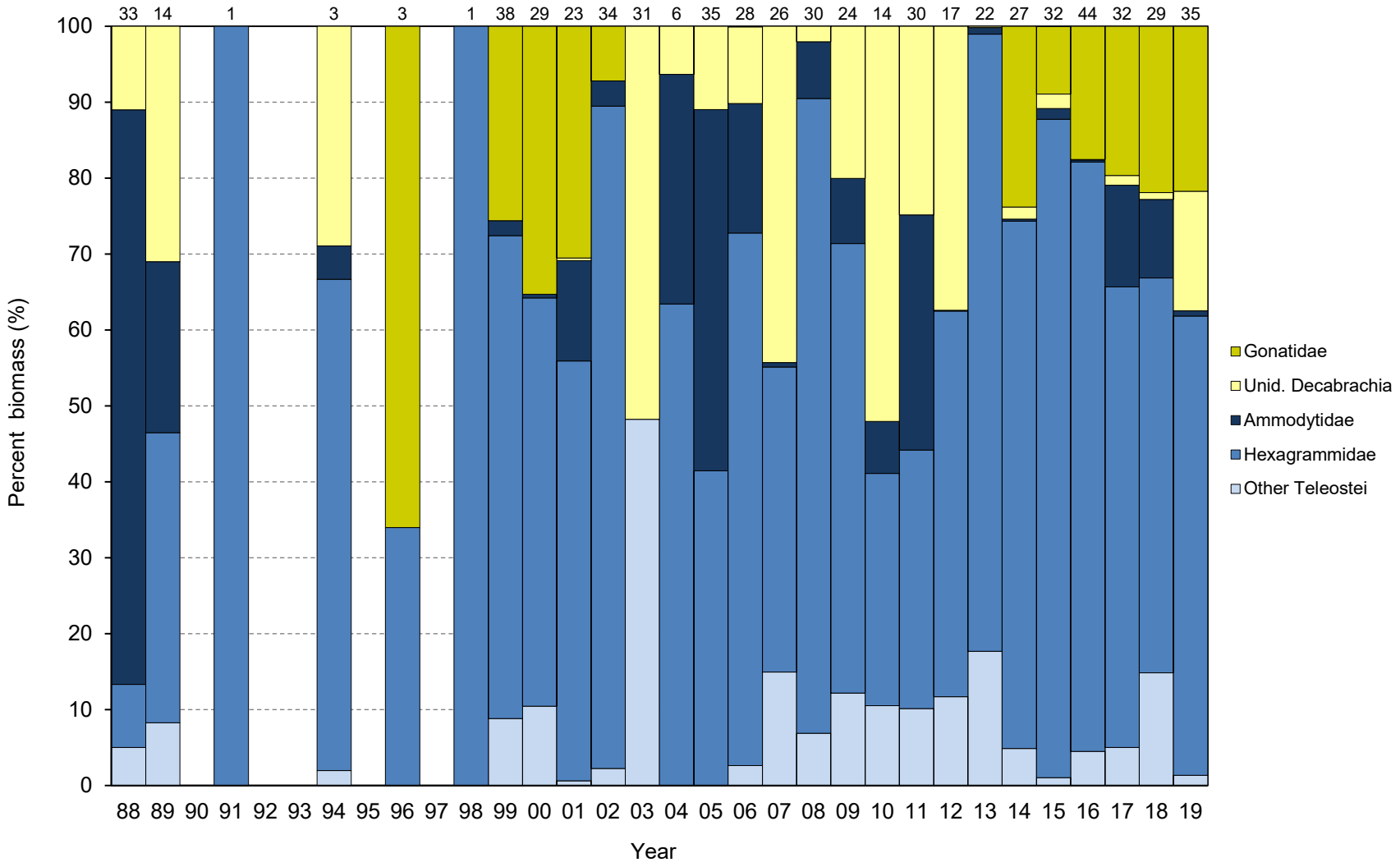

Figure 30. Relative biomass of major prey items in diets of horned puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average biomass of at least 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.

Table 37. 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 (2000-2019), 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. 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	2006
No. samples	33	14	1	3	3	1	38	29	23	34	31	6	35	28
Total mass (g)	399	90	13	20	37	6	349	206	198	468	260	39	219	303
Invertebrates	**11.0**	**31.0**	**-**	**28.9**	**66.0**	**-**	**25.6**	**35.3**	**30.9**	**7.2**	**51.8**	**6.3**	**11.0**	**10.2**
Cephalopoda	**11.0**	**31.0**	**-**	**28.9**	**66.0**	**-**	**25.6**	**35.3**	**30.9**	**7.2**	**51.8**	**6.3**	**11.0**	**10.2**
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	10.1
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
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**	**89.8**
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**	**89.8**
Ammodytidae	**75.7**	**22.5**	**-**	**4.4**	**-**	**-**	**1.9**	**0.5**	**13.2**	**3.3**	**-**	**30.3**	**47.6**	**17.1**
Ammodytes spp.	75.7	22.5	-	4.4	-	-	1.9	0.5	13.2	3.3	-	30.3	47.6	17.1
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**	**70.1**
Hexagrammos decagrammus	-	-	-	64.7	34.0	-	47.9	32.8	55.3	87.2	-	63.4	41.5	66.6
Pleurogrammus monopterygius	1.1	-	100.0	-	-	100.0	15.7	18.1	-	-	-	-	-	-
Other Hexagrammidae	7.2	38.2	-	-	-	-	-	2.9	-	-	-	-	-	3.5
Other Teleostei	5.0	8.3	-	2.0	-	-	8.8	10.4	0.6	2.2	48.2	-	-	2.6

Table 37 (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 (2000-2019), 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. 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	2018	2019
No. samples	26	30	24	14	30	17	22	27	32	44	32	29	35
Total mass (g)	150	244	146	121	146	101	120	169	209	405	204	168	228
Invertebrates	**44.3**	**2.1**	**20.0**	**52.0**	**24.9**	**37.4**	**0.2**	**25.4**	**10.8**	**17.6**	**20.9**	**22.8**	**37.5**
Cephalopoda	**44.3**	**2.1**	**20.0**	**52.0**	**24.9**	**37.4**	**0.2**	**25.4**	**10.8**	**17.6**	**20.9**	**22.8**	**37.5**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**23.8**	**8.9**	**17.6**	**19.6**	**21.9**	**21.7**
Unid. Gonatidae	-	-	-	-	-	-	-	9.7	8.9	4.4	-	21.9	7.6
Other Gonatidae	-	-	-	-	-	-	-	14.1	-	13.2	19.6	-	14.2
Unid. Decabrachia	44.3	2.1	20.0	52.0	24.9	37.4	0.2	1.6	1.9	0.1	1.3	0.9	15.8
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish	**55.7**	**97.9**	**80.0**	**48.0**	**75.1**	**62.6**	**99.8**	**74.6**	**89.2**	**82.4**	**79.1**	**77.2**	**62.5**
Teleostei	**55.7**	**97.9**	**80.0**	**48.0**	**75.1**	**62.6**	**99.8**	**74.6**	**89.2**	**82.4**	**79.1**	**77.2**	**62.5**
Ammodytidae	**0.6**	**7.5**	**8.6**	**6.9**	**31.0**	**0.1**	**0.9**	**0.3**	**1.4**	**0.3**	**13.4**	**10.4**	**0.7**
Ammodytes spp.	0.6	7.5	8.6	6.9	31.0	0.1	0.9	0.3	1.4	0.3	13.4	10.4	0.7
Hexagrammidae	**40.2**	**83.6**	**59.2**	**30.6**	**34.0**	**50.8**	**81.3**	**69.4**	**86.7**	**77.6**	**60.6**	**52.0**	**60.5**
Hexagrammos decagrammus	-	-	-	-	2.2	-	13.1	-	-	-	-	-	-
Pleurogrammus monopterygius	12.3	82.9	28.7	27.2	22.5	19.2	37.1	69.4	86.7	77.6	60.6	52.0	60.5
Other Hexagrammidae	27.9	0.7	30.5	3.4	9.3	31.5	31.0	-	-	-	-	-	-
Other Teleostei	14.9	6.9	12.2	10.5	10.1	11.7	17.7	4.9	1.0	4.5	5.0	14.8	1.4

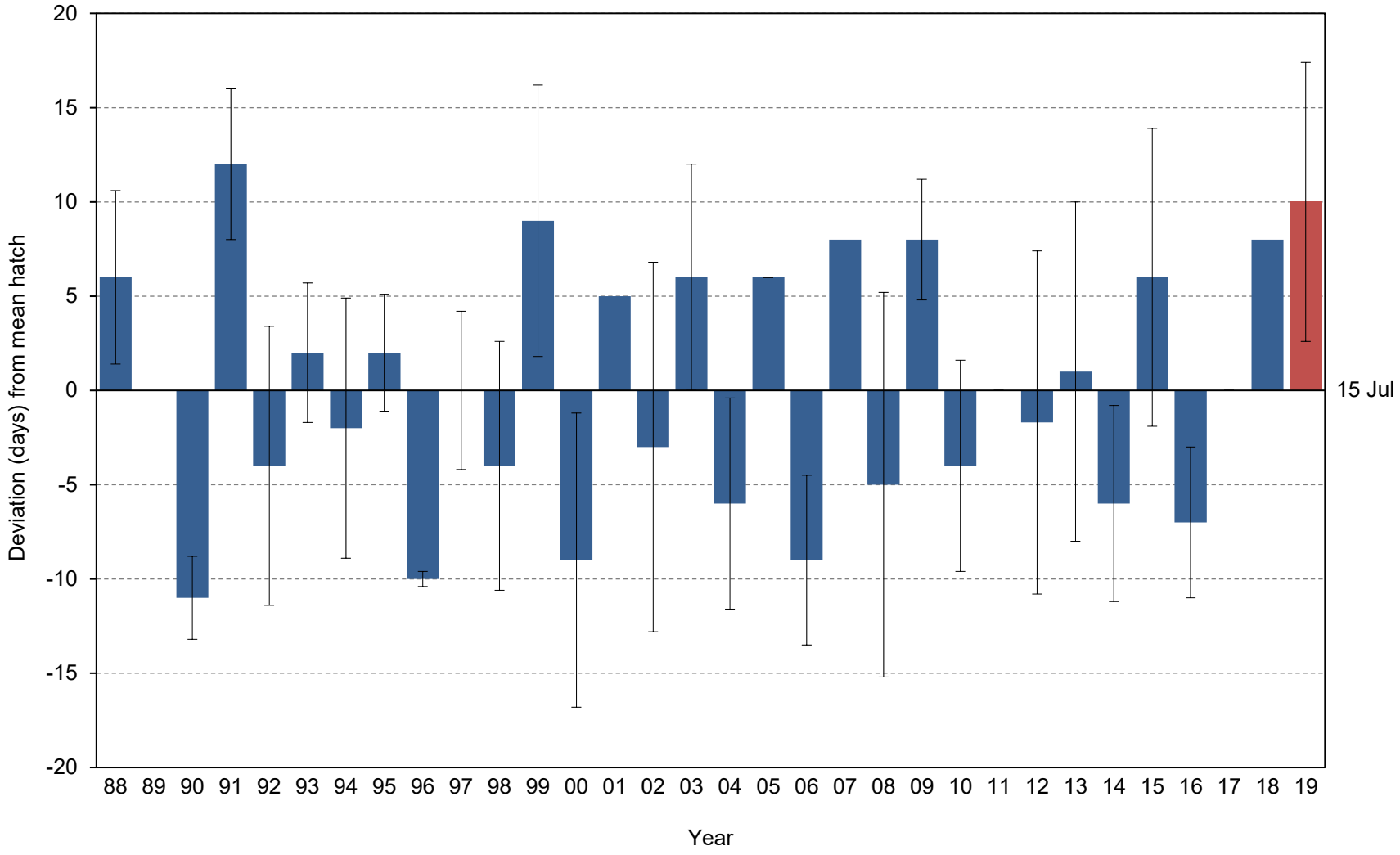

Figure 31. Yearly hatch date deviation (from the 1988-2018 average of 15 July) for tufted puffins at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); red highlights 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 38. 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	-	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	-	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	*no data (no known hatch dates)*			-	-	>27 Aug
2018	23 Jul	-	1	23 Jul	-	>25 Aug
2019	25 Jul	7.4	8	13 Jul	4 Aug	>25 Aug

[a]Sample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.
[b]In 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 39. 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	03
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	-	-	-	-	1
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	-	-	-	-	-	-	-	-	-	-	1
209	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
210	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	4	3	2	11	15	4	14	4	11	15	7	11	1	13	2

Table 39 (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													
	04	05	06	07	08	09	10	12	13	14	15	16	18	19
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	-	-	-	2
195	-	-	-	-	-	-	-	-	-	-	2	-	-	-
196	2	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	1	-	-	-	-	1	-	-
198	1	-	-	-	-	-	1	-	-	-	1	-	-	-
199	-	-	-	-	-	-	2	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	1	1	1	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	2	-	-	-	3	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	1	-	-	-	-	-	-	-	-	1	1
205	-	-	-	-	1	-	-	-	1	-	-	-	-	-
206	-	-	-	-	-	1	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	2
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	1	-	1	1	-	1	-	-	1
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	1
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	1	-	-	1
217	-	-	-	-	1	-	-	-	-	-	-	-	-	-
n	10	2	5	1	11	5	10	4	6	6	6	8	1	8

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

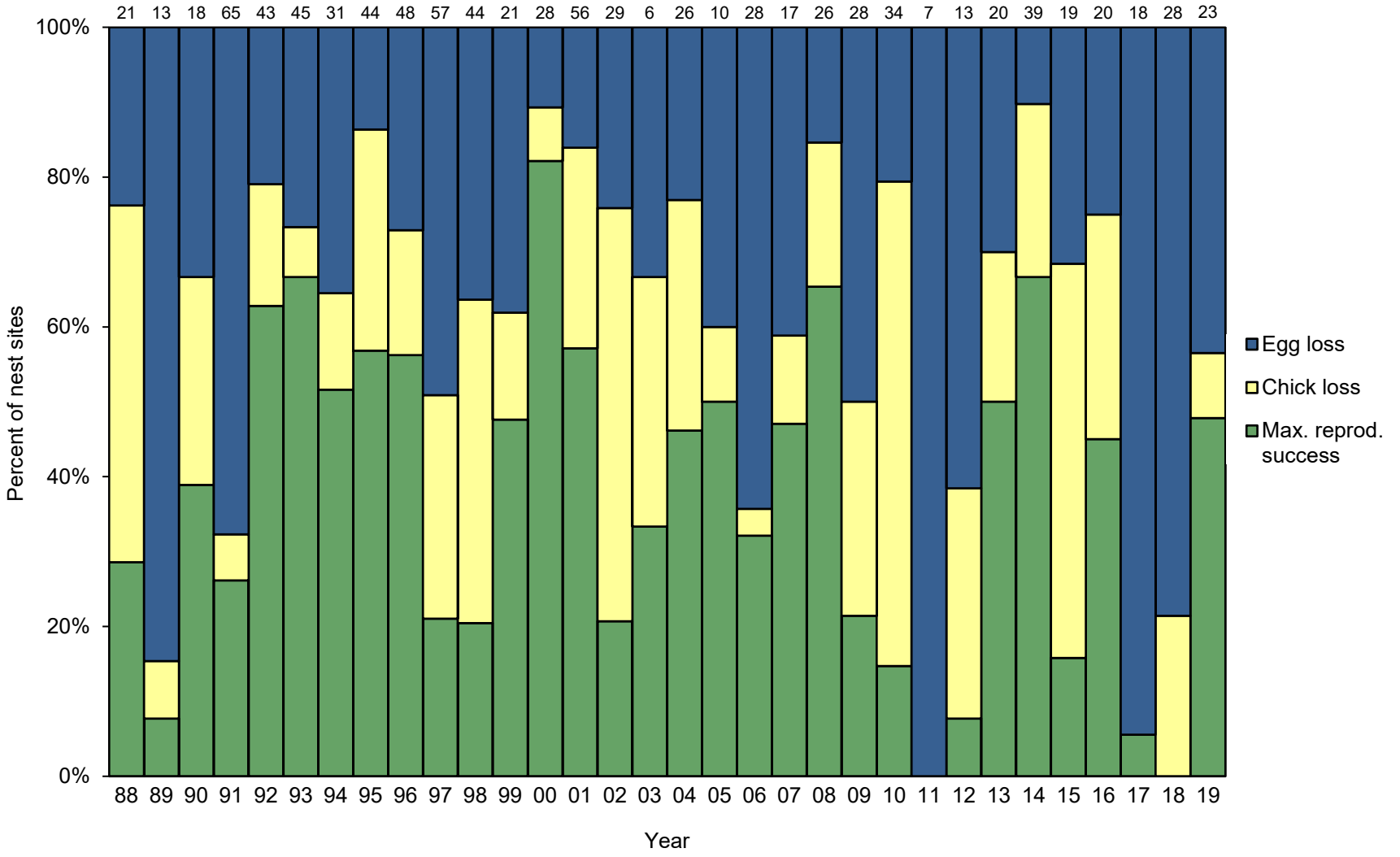

Figure 32. Reproductive performance of tufted puffins at Buldir Island, Alaska. Values represent maximum potential success, including nest sites with chicks too young to consider fledged at the last check. Egg loss=[(B+H)-D+H]/(B+H); Chick loss=[(D+H)-F+H]/(B+H); Maximum potential reproductive success=[(F+H)/(B+H)], 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 40. Reproductive performance of tufted puffins at Buldir Island, Alaska.

Year	Nest sites w/ eggs	Nest sites w/ chicks	Nest sites w/ chicks fledged	Nest sites w/ young chicks still present[a]	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)]		Sampling design[e]
	(B)	(D)	(F)	(H)	Total	SD	Total	SD	Total	SD	Total	SD	Total	SD	Total	SD	
1988	21	16	6	0	0.76	0.09	0.38	0.12	0.29	0.10	0.76	0.09	0.38	0.12	0.29	0.10	Simple random
1989	12	1	0	1	0.08	0.08	0.00	0.00	0.00	0.00	0.15	0.10	0.50	0.35	0.08	0.08	Simple random
1990	14	8	3	4	0.57	0.13	0.38	0.17	0.21	0.11	0.67	0.11	0.58	0.14	0.39	0.11	Simple random
1991	48	4	0	17	0.08	0.04	0.00	0.00	0.00	0.00	0.32	0.06	0.81	0.09	0.26	0.05	Simple random
1992	21	12	5	22	0.57	0.11	0.42	0.14	0.24	0.09	0.79	0.06	0.79	0.07	0.63	0.07	Simple random
1993	41	29	26	4	0.71	0.07	0.90	0.06	0.63	0.08	0.73	0.07	0.91	0.05	0.67	0.07	Simple random
1994	30	19	15	1	0.63	0.09	0.79	0.09	0.50	0.09	0.65	0.09	0.80	0.09	0.52	0.09	Simple random
1995	22	16	3	22	0.73	0.09	0.19	0.10	0.14	0.07	0.86	0.05	0.66	0.08	0.57	0.07	Simple random
1996	40	27	19	8	0.68	0.07	0.70	0.09	0.48	0.08	0.73	0.06	0.77	0.07	0.56	0.07	Simple random
1997	50	22	5	7	0.44	0.07	0.23	0.09	0.10	0.04	0.51	0.07	0.41	0.09	0.21	0.05	Simple random
1998	44	28	9	0	0.64	0.07	0.32	0.09	0.20	0.06	0.64	0.07	0.32	0.09	0.20	0.06	Simple random
1999	17	9	6	4	0.53	0.12	0.67	0.16	0.35	0.12	0.62	0.11	0.77	0.12	0.48	0.11	Simple random
2000	28	25	23	0	0.89	0.06	0.92	0.05	0.82	0.07	0.89	0.06	0.92	0.05	0.82	0.07	Simple random
2001	9	2	1	12	0.22	0.14	0.50	0.35	0.11	0.10	0.67	0.10	0.93	0.07	0.62	0.11	Simple random
2002	27	20	4	2	0.74	0.08	0.20	0.09	0.15	0.07	0.76	0.08	0.27	0.09	0.21	0.08	Simple random
2003	6	4	2	0	0.67	0.19	0.50	0.25	0.33	0.19	0.67	0.19	0.50	0.25	0.33	0.19	Simple random
2004	26	20	12	0	0.77	0.08	0.60	0.11	0.46	0.10	0.77	0.08	0.60	0.11	0.46	0.10	Simple random
2005	5	1	0	5	0.20	0.18	0.00	0.00	0.00	0.00	0.60	0.15	0.83	0.15	0.50	0.16	Simple random
2006	28	10	9	0	0.36	0.09	0.90	0.09	0.32	0.09	0.36	0.09	0.90	0.09	0.32	0.09	Simple random
2007	15	8	6	2	0.53	0.13	0.75	0.15	0.40	0.13	0.59	0.12	0.80	0.13	0.47	0.12	Simple random
2008	25	21	16	1	0.84	0.07	0.76	0.09	0.64	0.10	0.85	0.07	0.77	0.09	0.65	0.09	Simple random
2009	22	8	0	6	0.36	0.10	0.00	0.00	0.00	0.00	0.50	0.09	0.43	0.13	0.21	0.08	Simple random
2010	33	26	4	1	0.79	0.07	0.15	0.07	0.12	0.06	0.79	0.07	0.19	0.08	0.15	0.06	Simple random
2011	7	0	0	0	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	Simple random
2012	13	5	1	0	0.38	0.13	0.20	0.18	0.08	0.08	0.38	0.13	0.20	0.18	0.08	0.08	Simple random
2013	11	5	1	9	0.45	0.15	0.20	0.18	0.09	0.09	0.70	0.10	0.71	0.12	0.50	0.11	Simple random
2014	37	33	24	2	0.89	0.05	0.73	0.08	0.65	0.08	0.90	0.05	0.74	0.07	0.67	0.08	Simple random
2015	18	12	2	1	0.67	0.11	0.17	0.11	0.11	0.07	0.68	0.11	0.23	0.12	0.16	0.08	Simple random
2016	20	15	9	0	0.75	0.10	0.60	0.13	0.45	0.11	0.75	0.10	0.60	0.13	0.45	0.11	Simple random
2017	17	0	0	1	0.00	0.00	0.00	-	0.00	0.00	0.06	0.06	1.00	0.00	0.06	0.06	Simple random
2018	28	6	0	0	0.21	0.08	0.00	0.00	0.00	0.00	0.21	0.08	0.00	0.00	0.00	0.00	Simple random
2019	19	9	7	4	0.47	0.11	0.78	0.14	0.37	0.11	0.57	0.10	0.85	0.10	0.48	0.10	Simple random

[a]Chicks 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.

[b]For 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).

[c]For 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).

[d]Values 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.

[e]Sampling for puffins is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

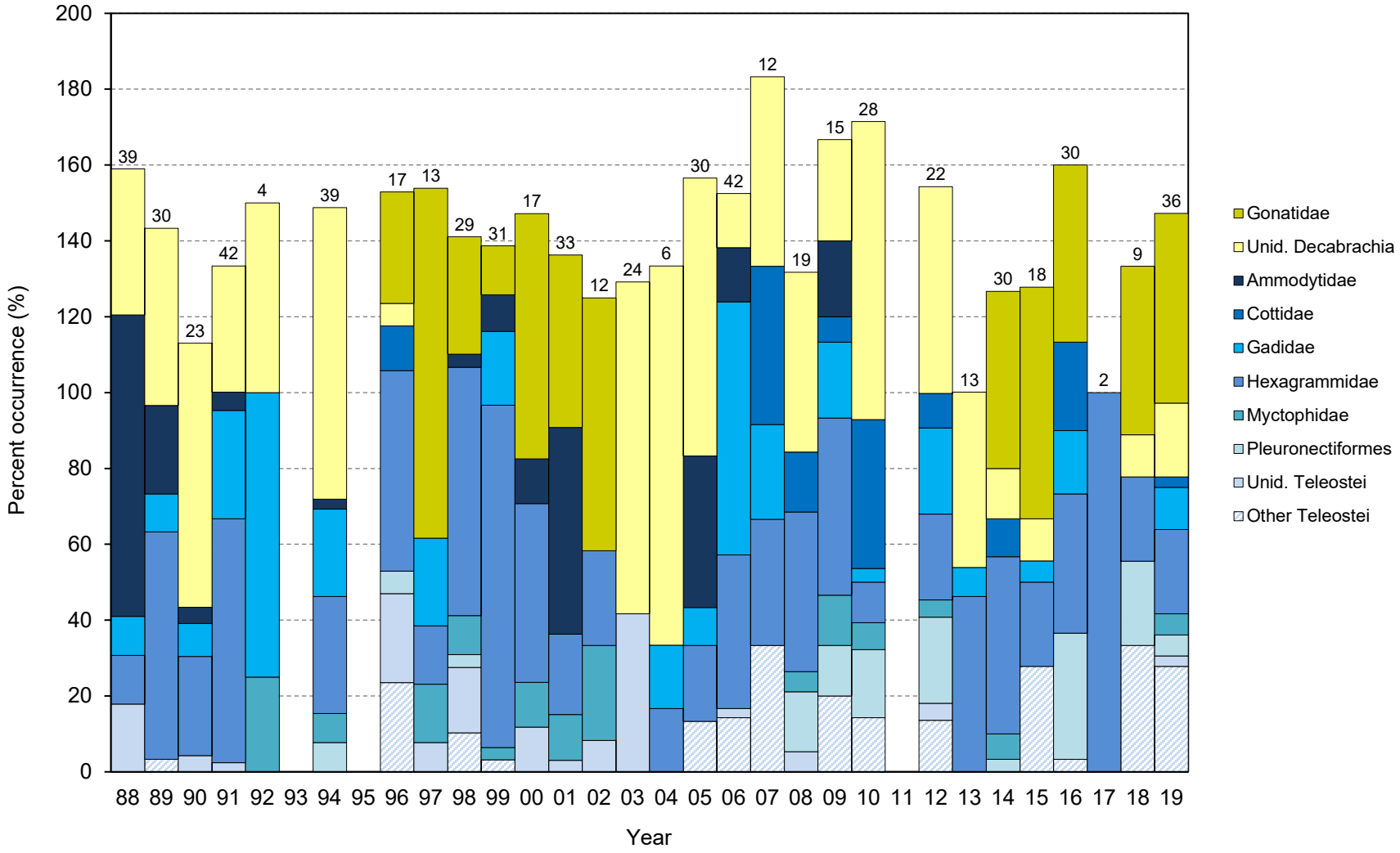

Figure 33. Frequency of occurrence of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2019) 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.

Table 41. 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, 2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011. 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	2004
No. samples	39	30	23	42	4	39	17	13	29	31	17	33	12	24	6
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**	**100.0**
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**	**100.0**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**29.4**	**92.3**	**31.0**	**12.9**	**64.7**	**45.5**	**66.7**	**-**	**-**
Gonatus kamtschaticus	-	-	-	-	-	-	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	100.0
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**	**33.3**
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**	**33.3**
Ammodytidae	**79.5**	**23.3**	**4.3**	**4.8**	**-**	**2.6**	**-**	**-**	**3.4**	**9.7**	**11.8**	**54.5**	**-**	**-**	**-**
Ammodytes 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**	**-**	**-**	**-**	**-**	**16.7**
Gadus chalcogrammus	10.3	10.0	8.7	28.6	75.0	23.1	-	23.1	-	19.4	-	-	-	-	16.7
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**	**-**	**16.7**
Hexagrammos decagrammus	-	6.7	-	-	-	30.8	47.1	15.4	51.7	25.8	11.8	21.2	25.0	-	16.7
Pleurogrammus monopterygius	-	-	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 41 (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, 2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	30	42	12	19	15	28	22	13	30	18	30	2	9	36
Invertebrates	**73.3**	**14.3**	**58.3**	**47.4**	**26.7**	**78.6**	**59.1**	**46.2**	**50.0**	**72.2**	**46.7**	**-**	**66.7**	**58.3**
Cephalopoda	**73.3**	**14.3**	**58.3**	**47.4**	**26.7**	**78.6**	**54.5**	**46.2**	**50.0**	**72.2**	**46.7**	**-**	**66.7**	**58.3**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**46.7**	**61.1**	**46.7**	**-**	**44.4**	**50.0**
Gonatus kamtschaticus	-	-	-	-	-	-	-	-	20.0	-	-	-	-	-
Unid. Gonatidae	-	-	-	-	-	-	-	-	13.3	55.6	33.3	-	44.4	44.4
Other Gonatidae	-	-	-	-	-	-	-	-	20.0	22.2	13.3	-	-	5.6
Unid. Decabrachia	73.3	14.3	50.0	47.4	26.7	78.6	54.5	46.2	13.3	11.1	-	-	11.1	19.4
Other Cephalopoda	-	-	8.3	-	-	3.6	-	-	-	5.6	-	-	11.1	-
Other Invertebrates	-	-	16.7	-	-	3.6	4.5	-	-	-	-	-	11.1	-
Fish	**66.7**	**100.0**	**83.3**	**73.7**	**100.0**	**64.3**	**59.1**	**53.8**	**63.3**	**50.0**	**80.0**	**100.0**	**55.6**	**66.7**
Teleostei	**66.7**	**100.0**	**83.3**	**73.7**	**100.0**	**64.3**	**59.1**	**53.8**	**63.3**	**50.0**	**80.0**	**100.0**	**55.6**	**66.7**
Ammodytidae	**40.0**	**14.3**	**-**	**-**	**20.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Ammodytes spp.	40.0	14.3	-	-	20.0	-	-	-	-	-	-	-	-	-
Cottidae	-	-	41.7	15.8	6.7	39.3	9.1	-	10.0	-	23.3	-	-	2.8
Gadidae	**10.0**	**66.7**	**25.0**	**-**	**20.0**	**3.6**	**22.7**	**7.7**	**-**	**5.6**	**16.7**	**-**	**-**	**11.1**
Gadus chalcogrammus	10.0	61.9	16.7	-	13.3	3.6	22.7	7.7	-	5.6	16.7	-	-	11.1
Other Gadidae	-	19.0	8.3	-	6.7	-	-	-	-	-	-	-	-	-
Hexagrammidae	**20.0**	**40.5**	**33.3**	**42.1**	**46.7**	**10.7**	**22.7**	**46.2**	**46.7**	**22.2**	**36.7**	**100.0**	**22.2**	**22.2**
Hexagrammos decagrammus	20.0	40.5	8.3	-	-	-	-	-	-	-	-	-	-	-
Pleurogrammus monopterygius	-	-	25.0	42.1	40.0	10.7	13.6	46.2	46.7	22.2	36.7	100.0	22.2	22.2
Other Hexagrammidae	-	-	8.3	-	6.7	3.6	9.1	7.7	-	-	-	-	-	-
Myctophidae	-	-	-	5.3	13.3	7.1	4.5	-	6.7	-	-	-	-	5.6
Pleuronectiformes	-	-	-	15.8	13.3	17.9	22.7	-	3.3	-	33.3	-	22.2	5.6
Unid. Teleostei	-	2.4	-	5.3	-	-	4.5	-	-	-	-	-	-	2.8
Other Teleostei	13.3	14.3	33.3	-	20.0	14.3	13.6	-	-	27.8	3.3	-	33.3	27.8
Other	-	-	-	-	-	-	4.5	-	-	-	-	-	-	-

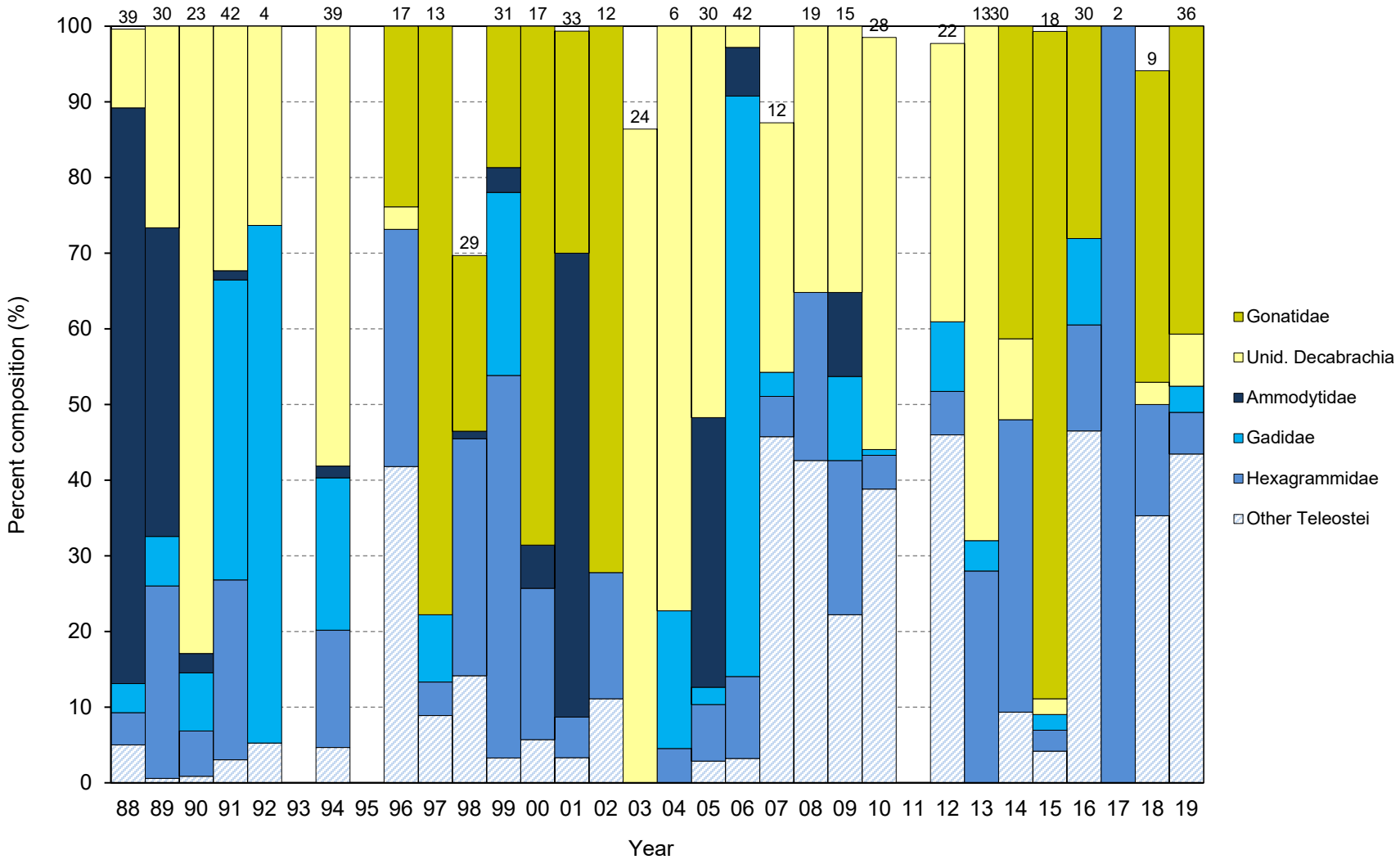

Figure 34. Percent composition of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition of at least 5% are shown. Samples consist of bill loads observed (1990) or collected (1988-1989, 1991-2019) 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.

Table 42. 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, 2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011. 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	2004
No. samples	39	30	23	42	4	39	17	13	29	31	17	33	12	24	6
No. individuals	259	169	117	164	19	129	67	45	99	87	70	150	36	103	22
Invertebrates	**10.8**	**26.6**	**82.9**	**32.3**	**26.3**	**58.1**	**26.9**	**77.8**	**53.5**	**18.7**	**68.6**	**30.0**	**72.2**	**86.4**	**77.3**
Cephalopoda	**10.4**	**26.6**	**82.9**	**32.3**	**26.3**	**58.1**	**26.9**	**77.8**	**23.2**	**18.7**	**68.6**	**29.3**	**72.2**	**86.4**	**77.3**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**23.9**	**77.8**	**23.2**	**18.7**	**68.6**	**29.3**	**72.2**	**-**	**-**
Unid. Gonatidae	-	-	-	-	-	-	-	-	23.2	18.7	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	77.3
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**	**81.3**	**31.4**	**70.0**	**27.8**	**13.6**	**22.7**
Teleostei	**89.2**	**73.4**	**17.1**	**67.7**	**73.7**	**41.9**	**73.1**	**22.2**	**46.5**	**81.3**	**31.4**	**70.0**	**27.8**	**13.6**	**22.7**
Ammodytidae	**76.1**	**40.8**	**2.6**	**1.2**	**-**	**1.6**	**-**	**-**	**1.0**	**3.3**	**5.7**	**61.3**	**-**	**-**	**-**
Ammodytes spp.	76.1	40.8	2.6	1.2	-	1.6	-	-	1.0	3.3	5.7	61.3	-	-	-
Gadidae	**3.9**	**6.5**	**7.7**	**39.6**	**68.4**	**20.2**	**-**	**8.9**	**-**	**24.2**	**-**	**-**	**-**	**-**	**18.2**
Gadus chalcogrammus	3.9	6.5	7.7	39.6	68.4	20.2	-	8.9	-	24.2	-	-	-	-	18.2
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammidae	**4.2**	**25.4**	**6.0**	**23.8**	**-**	**15.5**	**31.3**	**4.4**	**31.3**	**50.5**	**20.0**	**5.3**	**16.7**	**-**	**4.5**
Pleurogrammus monopterygius	-	-	6.0	22.6	-	-	-	-	11.1	40.7	2.9	-	-	-	-
Other Hexagrammidae	4.2	25.4	-	1.2	-	15.5	31.3	4.4	20.2	9.9	17.1	5.3	16.7	-	4.5
Other Teleostei	5.0	0.6	0.9	3.0	5.3	4.7	41.8	8.9	14.1	3.3	5.7	3.3	11.1	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 42 (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, 2000-2019), 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, 1991-2019) from adults returning to the colony to feed chicks. No diet samples were collected in 1993, 1995, or 2011. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	30	42	12	19	15	28	22	13	30	18	30	2	9	36
No. individuals	174	249	94	54	54	134	87	25	75	144	114	2	34	145
Invertebrates	**51.7**	**2.8**	**45.7**	**35.2**	**35.2**	**56.0**	**37.9**	**68.0**	**52.0**	**91.0**	**28.1**	**-**	**50.0**	**47.6**
Cephalopoda	**51.7**	**2.8**	**37.2**	**35.2**	**35.2**	**55.2**	**36.8**	**68.0**	**52.0**	**91.0**	**28.1**	**-**	**47.1**	**47.6**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**41.3**	**88.2**	**28.1**	**-**	**41.2**	**40.7**
Unid. Gonatidae	-	-	-	-	-	-	-	-	12.0	81.3	14.0	-	41.2	36.6
Other Gonatidae	-	-	-	-	-	-	-	-	29.3	6.9	14.0	-	-	4.1
Unid. Decabrachia	51.7	2.8	33.0	35.2	35.2	54.5	36.8	68.0	10.7	2.1	-	-	2.9	6.9
Other Cephalopoda	-	-	4.3	-	-	0.7	-	-	-	0.7	-	-	2.9	-
Other Invertebrates	-	-	8.5	-	-	0.7	1.1	-	-	-	-	-	2.9	-
Fish	**48.3**	**97.2**	**54.3**	**64.8**	**64.8**	**44.0**	**60.9**	**32.0**	**48.0**	**9.0**	**71.9**	**100.0**	**50.0**	**52.4**
Teleostei	**48.3**	**97.2**	**54.3**	**64.8**	**64.8**	**44.0**	**60.9**	**32.0**	**48.0**	**9.0**	**71.9**	**100.0**	**50.0**	**52.4**
Ammodytidae	**35.6**	**6.4**	**-**	**-**	**11.1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Ammodytes spp.	35.6	6.4	-	-	11.1	-	-	-	-	-	-	-	-	-
Gadidae	**2.3**	**76.7**	**3.2**	**-**	**11.1**	**0.7**	**9.2**	**4.0**	**-**	**2.1**	**11.4**	**-**	**-**	**3.4**
Gadus chalcogrammus	2.3	72.7	2.1	-	7.4	0.7	9.2	4.0	-	2.1	11.4	-	-	3.4
Other Gadidae	-	4.0	1.1	-	3.7	-	-	-	-	-	-	-	-	-
Hexagrammidae	**7.5**	**10.8**	**5.3**	**22.2**	**20.4**	**4.5**	**5.7**	**28.0**	**38.7**	**2.8**	**14.0**	**100.0**	**14.7**	**5.5**
Pleurogrammus monopterygius	-	-	3.2	22.2	18.5	3.0	3.4	24.0	38.7	2.8	14.0	100.0	14.7	5.5
Other Hexagrammidae	7.5	10.8	2.1	-	1.9	1.5	2.3	4.0	-	-	-	-	-	-
Other Teleostei	2.9	3.2	45.7	42.6	22.2	38.8	46.0	-	9.3	4.2	46.5	-	35.3	43.4
Other	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-

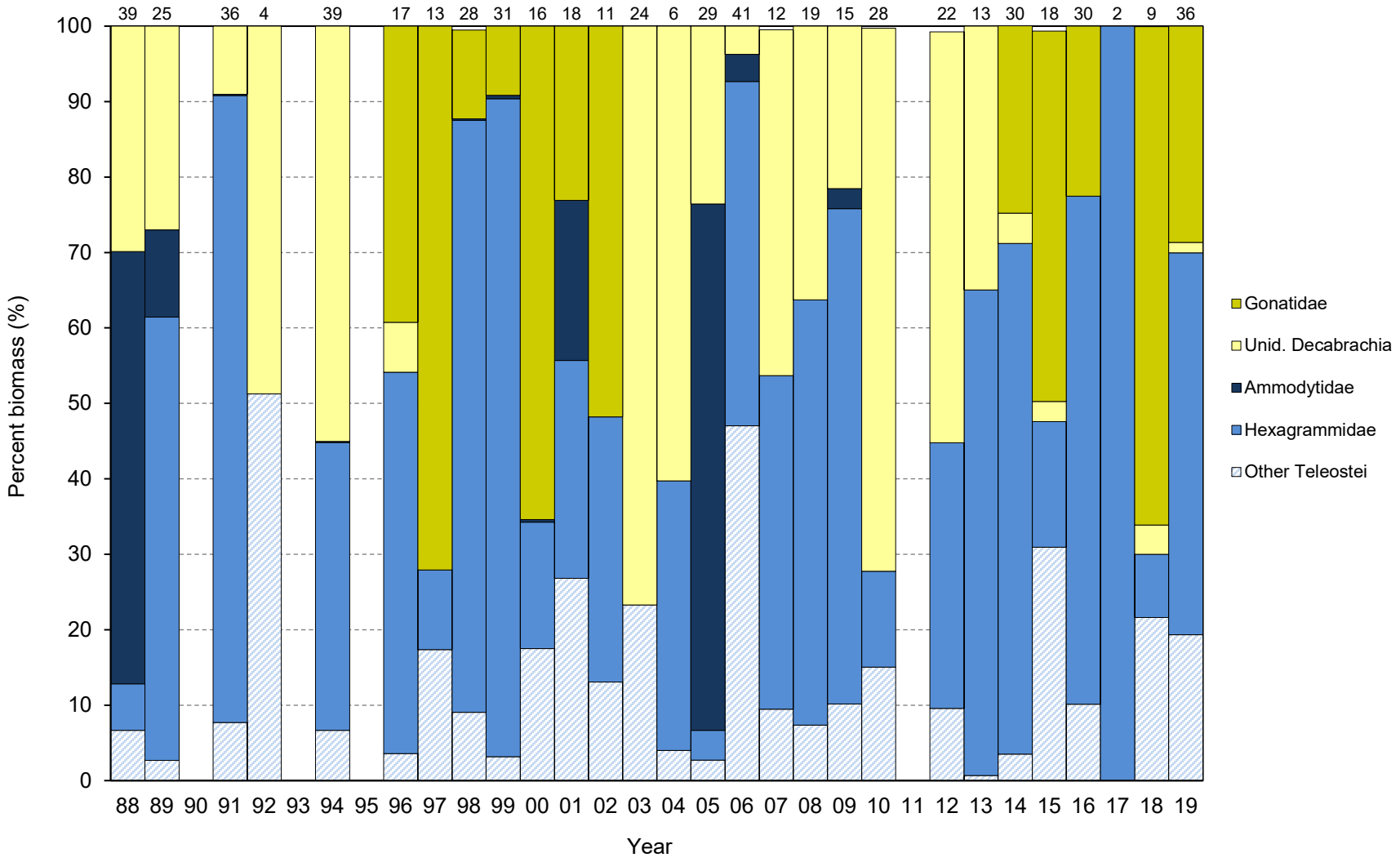

Figure 35. Relative biomass of major prey items in diets of tufted puffin chicks at Buldir Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each prey item (sums to 100% each year). Prey is grouped to family level or higher; only taxa with an among-year 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 and no biomass data exist in 1990.

Table 43. 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, 2000-2019), 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 and no biomass data exist in 1990. 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	2004
No. samples	39	25	36	4	39	17	13	28	31	16	18	11	24	6
Total mass (g)	279	381	607	30	649	196	228	360	464	135	227	234	455	68
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**	**60.3**
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**	**60.3**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**39.3**	**72.1**	**11.7**	**9.2**	**65.4**	**23.1**	**51.8**	**-**	**-**
Unid. Gonatidae	-	-	-	-	-	-	-	11.7	9.2	65.4	23.1	51.8	-	-
Other Gonatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Decabrachia	29.9	27.0	9.0	48.7	55.0	6.6	-	-	-	-	-	-	76.7	60.3
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**	**39.7**
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**	**39.7**
Ammodytidae	**57.3**	**11.6**	**0.1**	**-**	**0.2**	**-**	**-**	**0.2**	**0.5**	**0.4**	**21.2**	**-**	**-**	**-**
Ammodytes 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**	**-**	**35.7**
Hexagrammos decagrammus	-	-	-	-	38.2	49.8	10.5	30.6	5.1	8.9	28.9	35.2	-	35.7
Pleurogrammus monopterygius	-	-	82.9	-	-	-	-	47.8	82.1	6.0	-	-	-	-
Other Hexagrammidae	6.2	58.8	0.2	-	-	0.8	-	-	-	1.9	-	-	-	-
Other Teleostei	6.7	2.7	7.7	51.3	6.7	3.6	17.4	9.1	3.2	17.5	26.8	13.1	23.3	4.0
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 43 (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, 2000-2019), 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 and no biomass data exist in 1990. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	29	41	12	19	15	28	22	13	30	18	30	2	9	36
Total mass (g)	457	479	140	153	104	233	160	155	301	146	273	38	55	350
Invertebrates	**23.6**	**3.7**	**46.3**	**36.3**	**21.5**	**72.2**	**54.5**	**35.0**	**28.8**	**52.4**	**22.5**	**-**	**70.0**	**30.1**
Cephalopoda	**23.6**	**3.7**	**46.1**	**36.3**	**21.5**	**72.2**	**54.5**	**35.0**	**28.8**	**52.4**	**22.5**	**-**	**69.9**	**30.1**
Gonatidae	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**24.8**	**49.1**	**22.5**	**-**	**66.1**	**28.7**
Unid. Gonatidae	-	-	-	-	-	-	-	-	6.0	32.6	7.7	-	66.1	23.6
Other Gonatidae	-	-	-	-	-	-	-	-	18.9	16.5	14.8	-	-	5.0
Unid. Decabrachia	23.6	3.7	45.8	36.3	21.5	72.0	54.5	35.0	4.0	2.7	-	-	3.9	1.4
Other Cephalopoda	-	-	0.3	-	-	0.2	-	-	-	0.6	-	-	0.1	-
Other Invertebrates	-	-	0.2	-	-	<0.1	<0.1	-	-	-	-	-	0.1	-
Fish	**76.4**	**96.3**	**53.7**	**63.7**	**78.5**	**27.8**	**44.8**	**65.0**	**71.2**	**47.6**	**77.5**	**100.0**	**30.0**	**69.9**
Teleostei	**76.4**	**96.3**	**53.7**	**63.7**	**78.5**	**27.8**	**44.8**	**65.0**	**71.2**	**47.6**	**77.5**	**100.0**	**30.0**	**69.9**
Ammodytidae	**69.7**	**3.6**	**-**	**-**	**2.7**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Ammodytes spp.	69.7	3.6	-	-	2.7	-	-	-	-	-	-	-	-	-
Hexagrammidae	**3.9**	**45.7**	**44.2**	**56.3**	**65.6**	**12.7**	**35.2**	**64.3**	**67.7**	**16.7**	**67.4**	**100.0**	**8.4**	**50.6**
Hexagrammos decagrammus	3.9	45.7	2.4	-	-	-	-	-	-	-	-	-	-	-
Pleurogrammus monopterygius	-	-	41.7	56.3	62.8	9.8	31.0	62.1	67.7	16.7	67.4	100.0	8.4	**50.6**
Other Hexagrammidae	-	-	0.1	-	2.8	2.9	4.2	2.3	-	-	-	-	-	-
Other Teleostei	2.7	47.0	9.5	7.4	10.2	15.0	9.6	0.7	3.5	30.9	10.1	-	21.6	19.3
Other	-	-	-	-	-	-	0.7	-	-	-	-	-	-	-

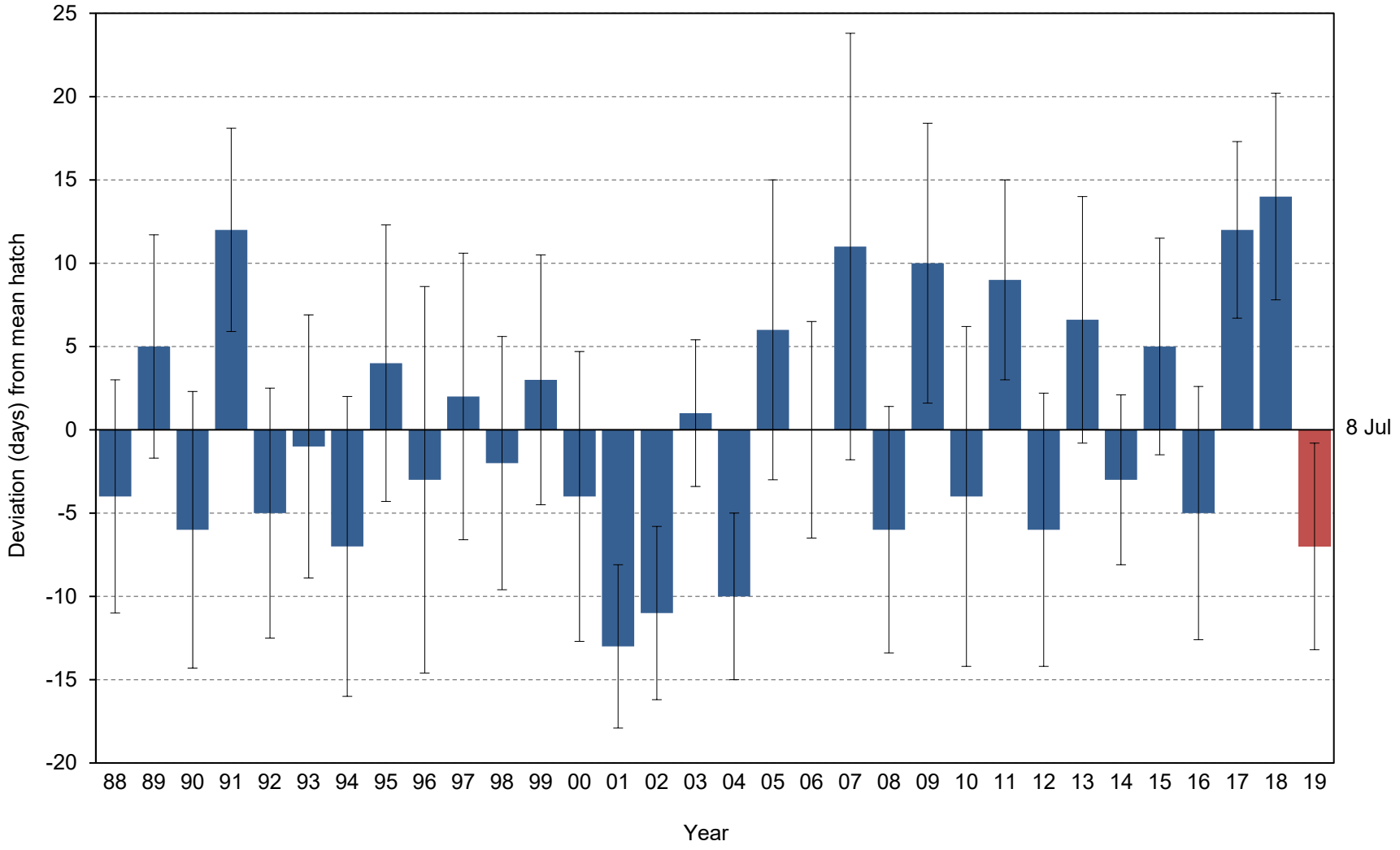

Figure 36. Yearly hatch date deviation (from the 1988-2018 average of 8 July) for black-legged kittiwakes at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 44. 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	*n*[b]	Mean hatch	SD	*n*[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
2018	-	-	-	22 Jul	6.2	51	<8 Jun	9 Jul	31 Jul	22 Aug
2019	-	-	-	1 Jul	6.2	79	<7 Jun	15 Jun	16 Jul	1 Aug

[a]In 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.

[b]Sample sizes for mean lay dates are a sub-sample of total nests for which no egg to egg interval is ≤ 7 days.

[c]Sample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

[d]In 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.

[e]In 2017, no nests were present on 5 June, but nests with eggs were present on 14 June.

Table 45. 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	03
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	2
184	-	-	-	-	-	-	-	1	31	-	-	-	-	-	26	1
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	1
189	14	5	-	-	-	-	-	-	13	1	-	-	2	-	-	11
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	-	-	-	5
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	-	-	2
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	-	-	-	-	-	-	-	-	-	-	-	-
n	236	32	192	67	348	105	117	40	217	280	157	27	176	15	149	22

Table 45 (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															
	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
168	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
169	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
170	1	-	-	-	2	-	-	-	4	-	-	-	-	-	-	-
171	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
172	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	8
173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	10	-	1	-	16	-	12	-	-	-	-	-	18	-	-	-
175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	-	-	-	-	-	-	-	-	22	-	-	-	1	-	-	1
177	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
178	-	-	-	-	-	1	14	1	-	-	-	-	14	-	-	31
179	-	-	-	-	-	-	-	-	2	-	-	-	5	-	-	-
180	13	-	13	-	17	-	-	-	-	-	-	1	-	-	-	-
181	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
182	-	-	-	-	2	-	-	-	23	-	10	-	1	-	-	2
183	-	-	1	1	-	-	-	4	-	-	-	1	-	-	-	-
184	5	2	19	-	22	1	17	-	-	-	-	-	47	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24
186	-	-	-	-	-	-	-	-	-	6	6	19	2	-	-	-
187	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
188	-	-	21	-	-	-	6	4	20	-	-	-	20	-	-	-
189	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
190	2	-	1	-	12	9	-	-	-	-	-	-	-	-	2	-
191	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	10
192	-	-	15	-	-	1	3	3	-	8	2	13	1	1	-	-
193	-	-	1	-	1	-	-	-	2	-	-	10	-	-	-	-
194	-	-	-	1	-	8	-	-	-	2	-	1	18	-	-	-
195	-	-	1	-	9	8	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	6	3	-	-	-	2	-	-	11	-
197	-	-	10	-	-	-	-	-	-	10	-	-	-	-	-	2
198	-	1	1	1	-	1	-	40	3	-	2	12	-	5	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	9	-	3	1	-	-	2	4	-	1	-
201	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-
202	-	-	3	1	-	-	6	6	5	1	-	-	-	7	17	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	1	-	10	-	-	-	10	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	1	2	-	-	6	2	-	-	2	-	-	-	-	8	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	1	-	4	-	-	-	1	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	11	2	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	1	-	3	-	-	2	-	12	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
n	32	5	90	5	87	61	71	79	83	32	21	72	137	14	51	79

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

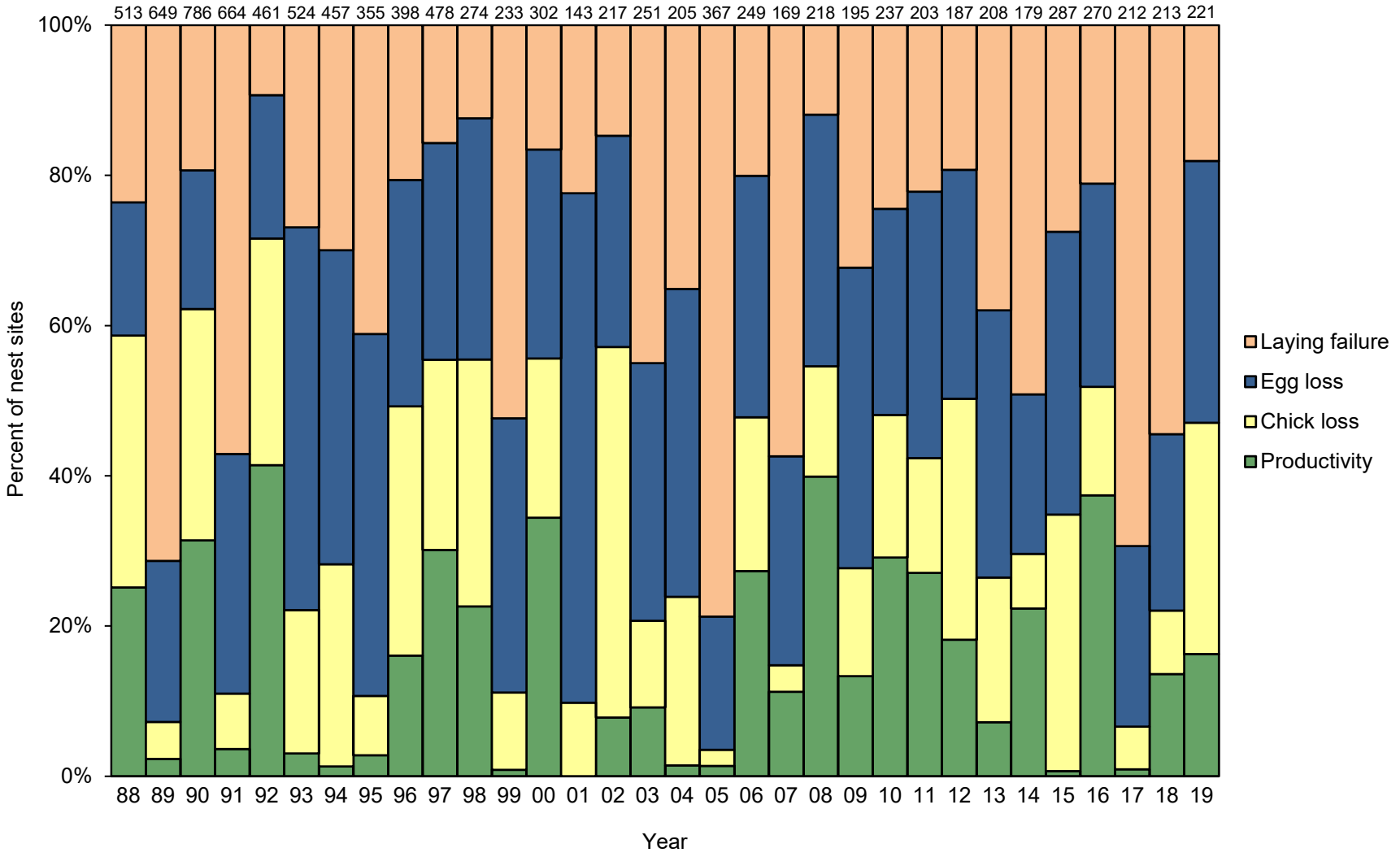

Figure 37. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns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

Table 46. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska. No data were collected in 1977-1987.

Year	Total nest starts (A)	Nest sites w/ eggs (B)	Total eggs (C)	Nest sites w/ chicks (D)	Total chicks (E)	Nest sites w/ chicks fledged (F)	Total chicks fledged (G)	Laying success (B/A)	Mean clutch size (C/B)	Nesting success (D/B)	Hatching success (E/C)	Chick success (G/E)	Egg success (G/C)	Fledging success (F/D)	Reprod. success (F/B)	Fledglings /nest start (G/A)	Prod. (F/A)
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
2018	213	97	122	47	49	29	29	0.46	1.3	0.48	0.40	0.59	0.24	0.62	0.30	0.14	0.14
2019	221	181	295	104	126	36	36	0.82	1.6	0.57	0.43	0.29	0.12	0.35	0.20	0.16	0.16

[a]Data from Byrd and Day (1986).

Table 47. Standard deviation in reproductive performance parameters of black-legged kittiwakes at Buldir Island, Alaska. No data were collected in 1977-1987. **Disclaimer: standard deviation calculation for mean clutch size is currently under review and values may be updated in a future report.**

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
2018	7	213	Cluster by plot	0.05	0.03	0.05	0.04	0.05	0.04	0.06	0.05	0.03	0.03
2019	7	221	Cluster by plot	0.02	0.04	0.07	0.07	0.03	0.03	0.05	0.05	0.04	0.04

[a]Plots that are combined for analysis are counted as a single "plot".

[b]Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available. For 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 48. 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	Nest sites w/ x eggs:				Nest sites w/ eggs	Total eggs	Mean clutch size
	(A)	0	1	2	3	(B)	(C)	(C/B)
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
2018	213	116	72	25	0	97	122	1.3
2019	221	40	67	114	0	181	295	1.6

[a]Data from Byrd and Day (1986).

Table 49. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska in 2019. All plots in 2019 were located at Spike Camp.

Parameter	Plot							Total	SD[b]
	37	39/40B[a]	40A/40C[a]	45	45A	46	47A		
Total nest starts (A)	23	37	30	34	38	31	28	221	-
Nest sites w/ eggs (B)	20	30	24	28	32	27	20	181	-
Total eggs (C)	35	48	36	46	56	44	30	295	-
Nest sites w/ chicks (D)	10	22	14	19	13	21	5	104	-
Total chicks (E)	11	26	18	28	13	24	6	126	-
Nest sites w/ chicks fledged (F)	2	6	5	10	3	9	1	36	-
Total chicks fledged (G)	2	6	5	10	3	9	1	36	-
Laying success (B/A)	0.87	0.81	0.80	0.82	0.84	0.87	0.71	0.82	0.02
Mean clutch size (C/B)	1.8	1.6	1.5	1.6	1.8	1.6	1.5	1.6	0.04
Nesting success (D/B)	0.50	0.73	0.58	0.68	0.41	0.78	0.25	0.57	0.07
Hatching success (E/C)	0.31	0.54	0.50	0.61	0.23	0.55	0.20	0.43	0.07
Chick success (G/E)	0.18	0.23	0.28	0.36	0.23	0.38	0.17	0.29	0.03
Egg success (G/C)	0.06	0.13	0.14	0.22	0.05	0.20	0.03	0.12	0.03
Fledging success (F/D)	0.20	0.27	0.36	0.53	0.23	0.43	0.20	0.35	0.05
Reproductive success (F/B)	0.10	0.20	0.21	0.36	0.09	0.33	0.05	0.20	0.05
Fledglings/nest start (G/A)	0.09	0.16	0.17	0.29	0.08	0.29	0.04	0.16	0.04
Productivity (F/A)	0.09	0.16	0.17	0.29	0.08	0.29	0.04	0.16	0.04

[a]Plots were combined for statistical purposes.
[b]Standard deviations are calculated based on plot as a sample unit.

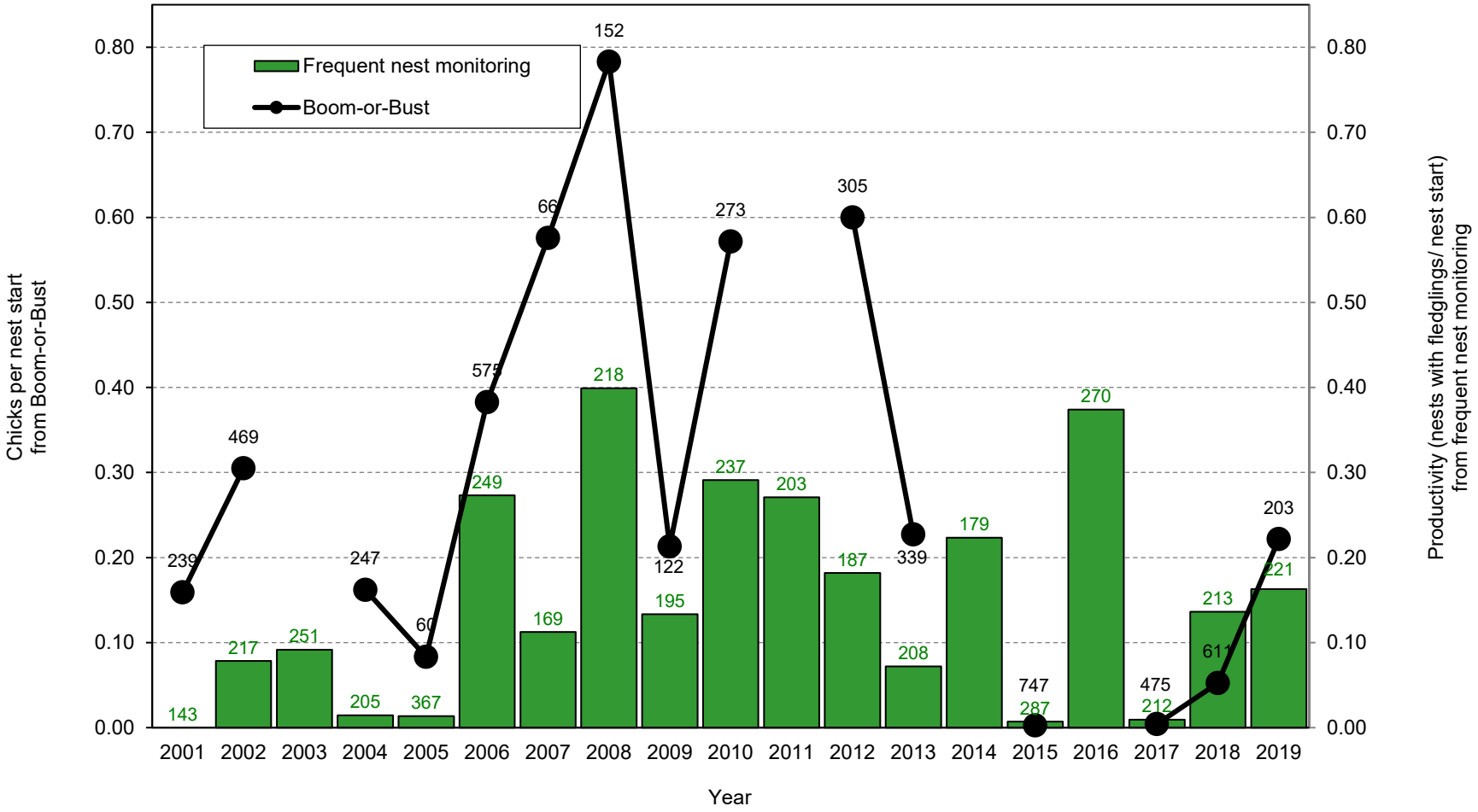

Figure 38. Reproductive performance of black-legged kittiwakes at Buldir Island, Alaska, as determined by a Boom-or-Bust methodology (black) and frequent nest monitoring (green). Reproductive success for Boom-or-Bust is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total 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 46) 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 (2015-2019) 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. In 2018 approximately 15% of kittiwake nests (both black-legged and red-legged) were removed between the nest and chick count by a large landslide.

Table 50. 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 (2015-2019). 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
2018[c]	1	611	32	0.05	27 Jun	14 Aug
2019	1	203	45	0.22	25 Jun	25 Jul

[a]Chicks/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.

[b]Data represent maximum count of nests and chicks from 15 counts between 13 June and 22 August.

[c]In 2018 approximately 15% of kittiwake nests (both black-legged and red-legged) were removed between the nest and chick count by a large landslide.

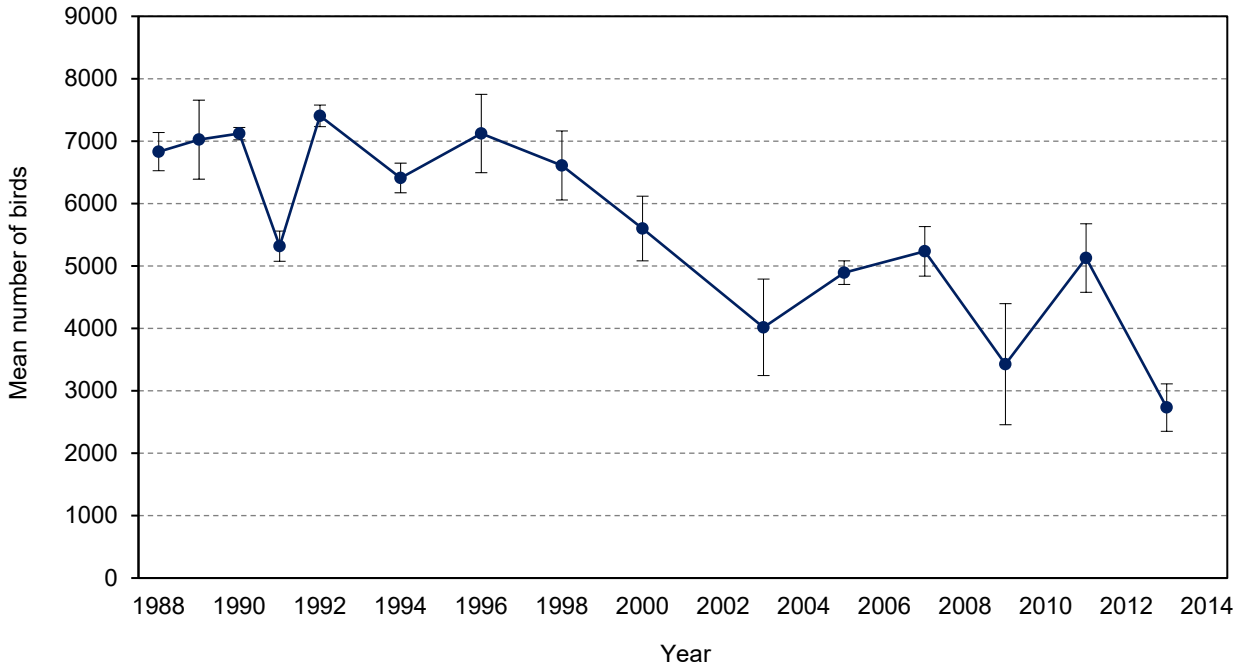

Figure 39. Mean numbers of black-legged kittiwakes counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

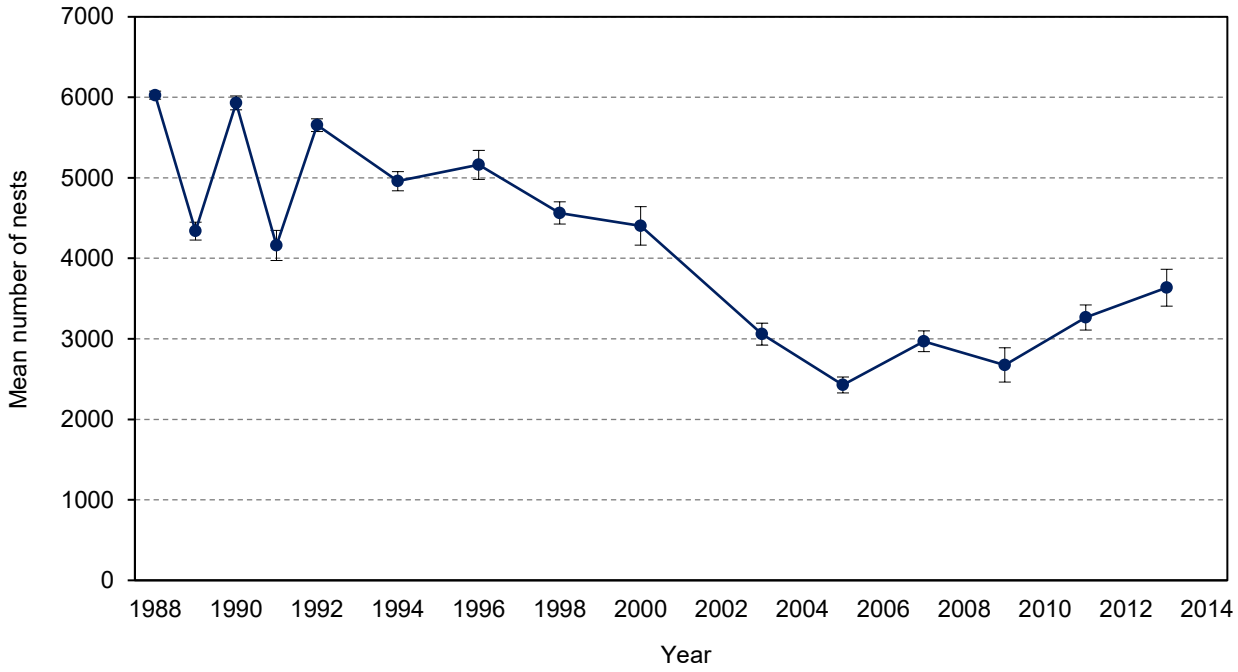

Figure 40. Mean numbers of black-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 51. 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
n	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 52. 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
n	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

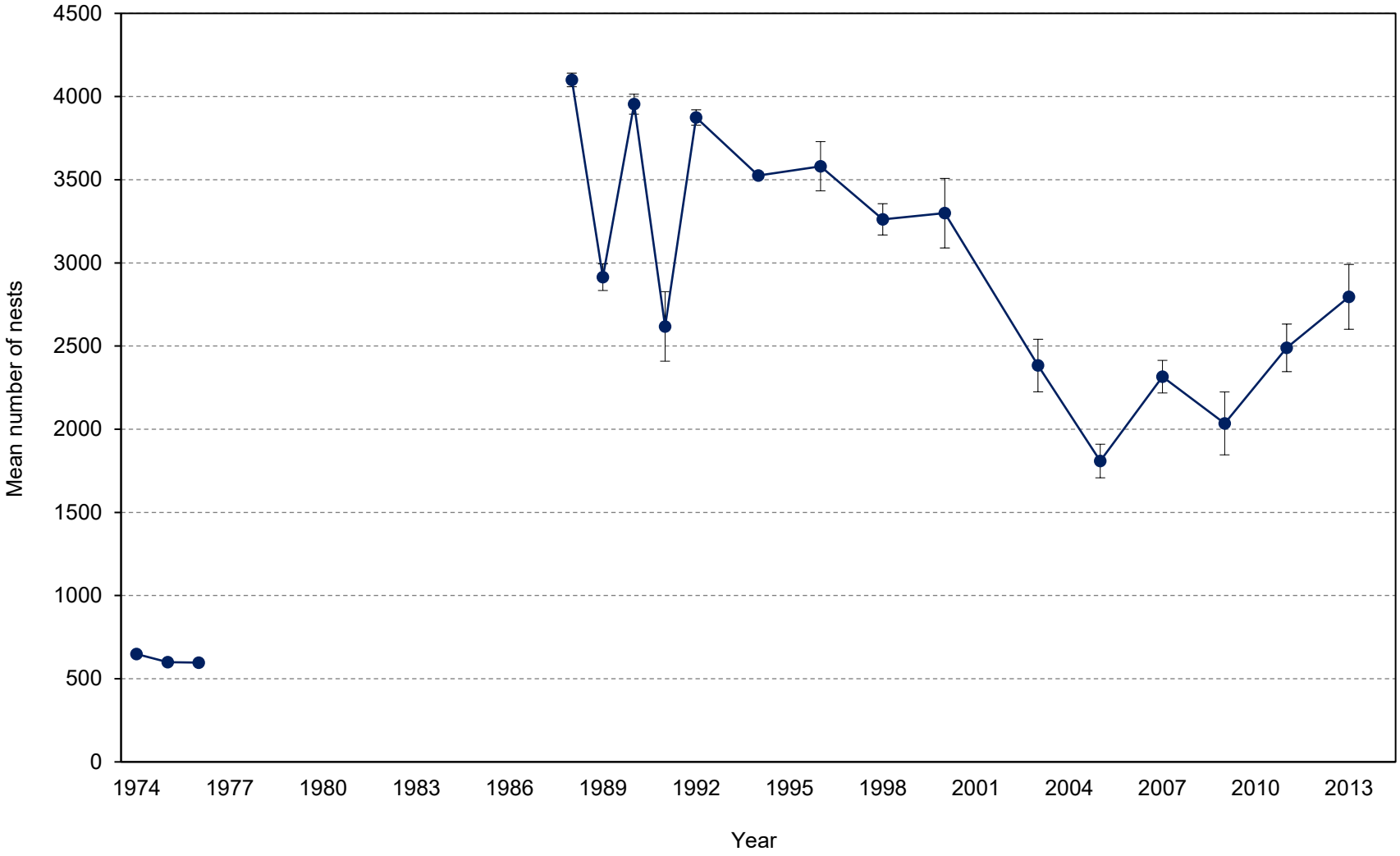

Figure 41. Mean numbers of black-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) and are a subset of total counts on all index plots. Error bars represent standard deviation.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

Table 53. 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 52) 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
n	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

[a]Includes 44 unspecified *Rissa* spp.
[b]Data come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

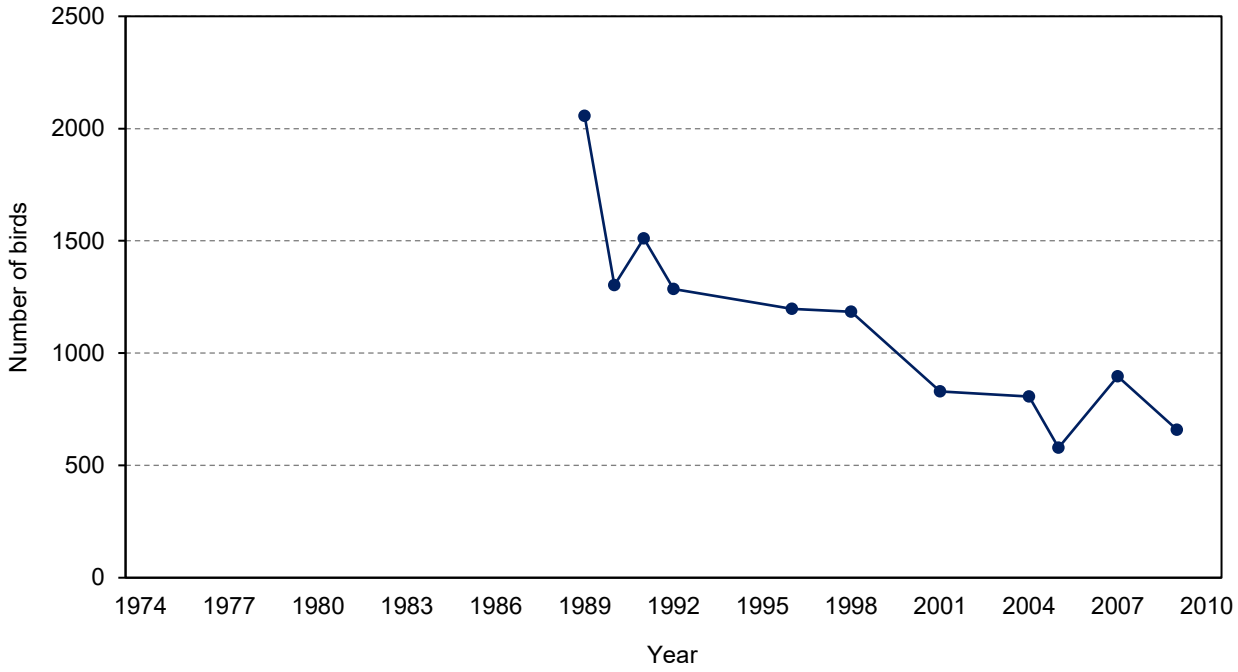

Figure 42. Numbers of black-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. Data do not include 1988 because birds were not identified to species. No counts were conducted in years not shown.

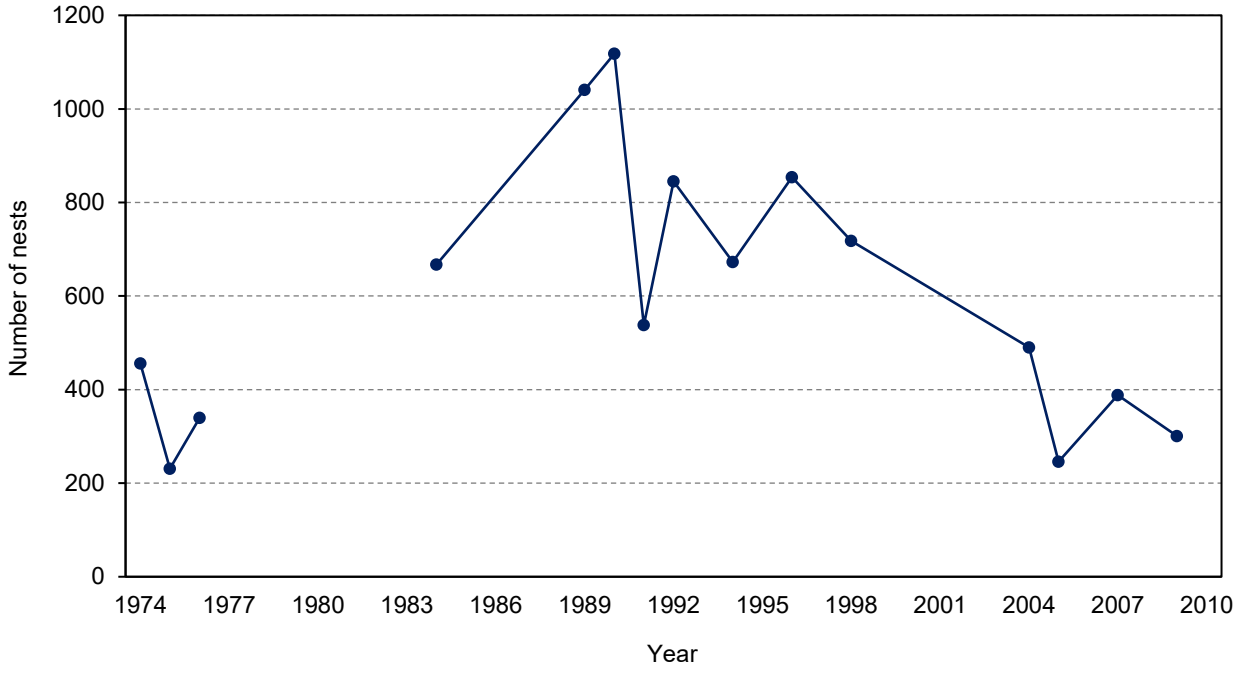

Figure 43. Numbers of black-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because nests were not identified to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

Table 54. 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 51) 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

[a]Count included both kittiwake species.

Table 55. 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 52) 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

[a]Count included both kittiwakes species.
[b]Partial count, not for comparison.

Table 56. 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

[a]Bird previously banded with metal band only and given color band(s) for inclusion in survival dataset.
[b]Bird previously banded with color band recaptured and given new color band(s); does not add to number of birds color-banded.

Table 57. 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	0	0.00
2003	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	4	6	4	4	3	2	2	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 57 (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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a]Birds banded in current year are not resighted until following year and not included in current year totals.
[b]Value 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.
[c]Survival should be considered a minimum estimate because it is likely not all birds present were observed each year.
[d]Resighting 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.
[e]Resighting 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 58. 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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
Green	11	794-35109	1988		y	0	y	y	0	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	y	0	0	y	y	0	0	0	0	0	1	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
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
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
Green	E9	794-35043	1991		-	-	-	0	y	0	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	G2	794-35044	1991		-	-	-	0	y	0	y	y	0	y	0	y	0	y	y	y	y	1	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
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
Green	G6	794-35048	1991		-	-	-	y	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
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
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
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
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
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
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
Green	O1	794-35106	1988		y	0	0	y	y	y	y	y	y	y	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
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
Green	P1	794-35251	1992		-	-	-	-	0	0	0	y	y	y	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	y	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
Green	P6	794-35254	1992		-	-	-	-	y	0	y	y	y	y	y	y	0	y	y	0	y	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
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
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
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
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
Green	R5	794-35260	1992		-	-	-	-	y	0	y	0	0	0	0	0	y	y	y	y	y	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
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

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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
Green	R9	794-35265	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	0	y	0	0	0	2	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
Green	S2	794-35267	1992		-	-	-	-	y	0	0	y	y	y	y	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0
Green	S3	794-35268	1992		-	-	-	-	y	0	y	y	0	0	0	y	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	y	y	2	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
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
Green	S7	794-35272	1992		-	-	-	-	y	0	y	y	y	y	0	y	y	y	y	0	0	2	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
Green	S9	794-35274	1992		-	-	-	-	y	0	0	0	y	y	y	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0
Green	T2	794-35275	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	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
Green	T4	794-35277	1992		-	-	-	-	y	0	y	y	y	y	y	y	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
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
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
Green	T8	794-35281	1992		-	-	-	-	y	0	y	y	y	y	0	y	0	y	0	0	0	1	2	1	0	0	0	0	0	0
Green	T9	794-35282	1992		-	-	-	-	y	0	y	0	y	y	y	y	0	0	y	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
Green	U2	794-35284	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	y	y	y	y	1	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
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
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
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
Green	U8	794-35290	1992		-	-	-	-	0	0	0	y	y	y	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
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
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
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
Green	Y5	794-35295	1992		-	-	-	-	y	0	y	y	y	y	y	y	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
Green	Y7	794-35298	1992		-	-	-	-	y	0	0	y	y	y	y	y	y	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	y	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	0	1	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

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
Green	Z2	794-35302	1992		-	-	-	-	0	0	y	0	y	0	0	0	0	y	0	0	y	0	0	0	0	0	0	0	0	0
Green	Z3	794-35297	1992		-	-	-	-	y	0	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Z4	794-35100	1992		-	-	-	-	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Z5	794-35303	1992		-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Z6	794-35304	1992		-	-	-	-	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Z7	794-35305	1992		-	-	-	-	y	0	y	y	y	0	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	Z8	794-35306	1992		-	-	-	-	y	0	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Z9	794-35307	1992		-	-	-	-	0	0	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	3	0	0	0	0
Red	11	794-35435	1993		-	-	-	-	-	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	12	794-35444	1993		-	-	-	-	-	0	y	0	y	0	0	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Red	13	794-35452	1993		-	-	-	-	-	0	y	y	y	y	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Red	16	794-35453	1993		-	-	-	-	-	0	y	y	y	y	y	y	y	y	0	y	y	0	0	0	2	0	0	0	0	0
Red	17	794-35454	1993		-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	18	794-35455	1993		-	-	-	-	-	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	19	794-35456	1993		-	-	-	-	-	0	y	0	y	y	0	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Red	20	794-35457	1993		-	-	-	-	-	0	y	0	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0
Red	21	794-35459	1993		-	-	-	-	-	0	y	y	y	y	y	y	0	y	y	y	y	5	2	0	0	2	1	0	0	0
Red	22	794-35486	1993		-	-	-	-	-	0	y	y	0	y	0	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Red	23	794-35493	1993		-	-	-	-	-	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	25	794-35203	1993		-	-	-	-	-	0	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	27	794-35205	1993		-	-	-	-	-	0	0	0	0	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	28	794-35209	1993		-	-	-	-	-	0	y	y	y	y	0	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Red	29	794-35206	1993		-	-	-	-	-	0	y	y	y	y	y	y	y	0	y	y	0	6	0	0	0	0	0	0	0	0
Red	30	794-35207	1993		-	-	-	-	-	0	0	y	0	y	0	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0
Red	32	794-35208	1993		-	-	-	-	-	0	y	y	y	y	y	y	y	y	y	0	y	4	0	0	1	0	0	0	0	0
Red	33	714-10030	1994		-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	35	714-10038	1994		-	-	-	-	-	-	y	y	0	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	37	714-10039	1994		-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	38	714-10043	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0
Red	39	714-10046	1994		-	-	-	-	-	-	0	0	y	0	0	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0
Red	40	714-10062	1994		-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	42	714-10074	1994		-	-	-	-	-	-	y	y	y	y	0	y	y	y	y	y	y	6	2	1	3	0	0	0	0	0
Red	43	714-10075	1994		-	-	-	-	-	-	y	y	0	0	y	0	y	0	0	0	0	0	0	0	0	1	0	0	0	0
Red	44	794-35211	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Red	49	794-35212	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	1	0	0
Red	50	794-35221	1995		-	-	-	-	-	-	-	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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	51	794-35220	1995		-	-	-	-	-	-	-	y	y	y	0	y	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	y	0	y	0	1	0	0	3	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
Red	55	794-35230	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	y	y	y	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
Red	58	794-35240	1995		-	-	-	-	-	-	-	y	0	0	0	y	0	y	0	y	0	2	3	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
Red	63	794-62512	1996		-	-	-	-	-	-	-	-	y	y	y	y	y	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
Red	65	794-62515	1996		-	-	-	-	-	-	-	-	y	0	0	y	y	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
Red	69	794-62517	1996		-	-	-	-	-	-	-	-	y	0	y	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	y	0	y	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
Red	72	794-62520	1996		-	-	-	-	-	-	-	-	y	0	y	0	0	0	0	y	0	0	0	0	0	0	1	0	1	0
Red	73	794-62523	1996		-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	4	0	0	1	1	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
Red	75	794-62527	1996		-	-	-	-	-	-	-	-	y	y	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
Red	77	794-62528	1996		-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	0	0	1	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
Red	82	794-62532	1996		-	-	-	-	-	-	-	-	y	y	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
Red	84	794-62536	1996		-	-	-	-	-	-	-	-	y	y	y	y	y	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
Red	92	794-35309	1997		-	-	-	-	-	-	-	-	-	0	0	0	0	y	0	0	0	2	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
Red	94	794-35316	1997		-	-	-	-	-	-	-	-	-	0	Y	y	0	y	0	y	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
Red	A2	794-35334	1998		-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	2	2	0	4	1	0	3	0	0
Red	A5	794-35344	1998		-	-	-	-	-	-	-	-	-	-	0	0	0	y	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
Red	A7	794-35351	1998		-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	2	1	1	2	3	2	1	2	0
Red	A8	794-35352	1998		-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Red	A9	794-35360	1998		-	-	-	-	-	-	-	-	-	-	0	y	0	0	y	0	y	3	3	2	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

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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	C2	794-35369	1998		-	-	-	-	-	-	-	-	-	-	0	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	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	y	0	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	2	3	1	1	0	0	0	0	0
Red	D4	1704-01305	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	y	0	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	1	0	0	0	0	0	0	0	0
Red	D8	1704-01310	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	0	0	0	0	0	1	0	0	0	0	0
Red	D9	1704-01313	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	3	3	0	0	0	1	1	0	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	y	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	y	0	1	0	2	0	1	0	0	0
Red	H7	714-10076	2005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	1	0	0	0	1	0	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
Red	N3	794-35380	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	2	0	1	3	1	0
Red	N4	794-35381	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	2	0	0	0	0	0
Red	N6	794-35382	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	3	1	0	2	1
Red	N8	794-35384	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	2	2	1	0	0	0
Red	N9	794-35385	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	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
Red	O4	794-35413	1993		-	-	-	-	-	0	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	1	0	0

Table 58 (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

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DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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	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
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
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
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
Red	P1	794-35386	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	1	2	0	2	0
Red	P5	794-35387	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	2	0	2	0	0	0
Red	P8	794-35391	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	P9	794-35390	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	3	1	0	0	0	0
Red	R1	794-62552	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	4	0	2	0	0
Red	R2	794-62551	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	0
Red	R3	794-62550	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	0	1	0	0	0
Red	R8	794-62555	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	R9	794-62556	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	S3	794-62558	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	S7	794-62559	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3	0	1	0	0	0
Red	S9	794-62563	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	1	0	0	0	0
Red	T4	794-62565	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	T6	794-62567	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Red	T8	794-62569	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	2	0	0	0	0
Red	T9	794-62570	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	0	1	0	0
Red	U1	794-62571	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	1	3	0	0	0
Red	U4	794-62573	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	1	2	1	0
Red	U5	794-62575	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	6	1	1	2	4	1
Red	U6	794-62574	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	1	0	0	0	0	0
Red	U7	794-62576	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	3	0	0	0	0	0
Red	U9	794-62577	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	2	4	0	2	1	1
Red	Y1	794-62578	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	3	1	0	0	0	0
Red	Z1	794-62588	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	1	0	0	0	0
Red	Z2	794-62590	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2	0	1	0	0
Red	Z3	794-62591	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	0	0	0
Red	Z4	794-62594	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	3	0	0	0	0
Red	Z6	794-62595	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	2	1	1	0	0
Red	Z7	794-62602	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	2	0	1	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
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
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

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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	P2	794-62522	1996		-	-	-	-	-	-	-	-	y	y	y	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	y	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
Yellow	Y6	794-35313	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	0	0	0	y	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
BK	BK/BK	794-62623	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	1	0	1	0
BK	BK/O	794-62627	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	0
BK	BK/W	794-62621	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	0	0	0
BK	DB/DB	584-00279	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	1	0	0
BK	DB/O	584-00293	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0
BK	O/DB	584-00297	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	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
BK	W/O	794-62618	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
BK	W/Y	794-62615	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0	0	0	0
BK	Y/DB	714-10078	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0	0	0
BK	Y/W	794-62628	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	4	4	6	1
DB	BK/DB	1704-01328	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	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
DB	DG/DG	1704-01376	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DB	DG/LB	1704-01379	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
DB	DG/O	1704-01381	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DB	DG/R	1704-01384	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DB	DG/W	1704-01393	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0
DB	DG/Y	1704-01333	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0
DB	O/BK	714-10089	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	2	0
DB	O/O	714-10091	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	0
DB	O/Y	714-10090	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	2	0
DB	R/BK	1704-01478	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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	0
O	BK/R	1704-01441	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
O	Bk/W	794-62612	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	0	0
O	Bk/Y	794-62608	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	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 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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
O	O/DG	1704-01450	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
O	O/O	794-62650	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	4	0	0
O	O/W	794-62642	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	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
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
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
W	DB/DB	584-00278	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3	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
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	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 58 (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

BK = black LB = light blue W = white
DB = dark blue O = orange Y = yellow
DG = dark green R = red

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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
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

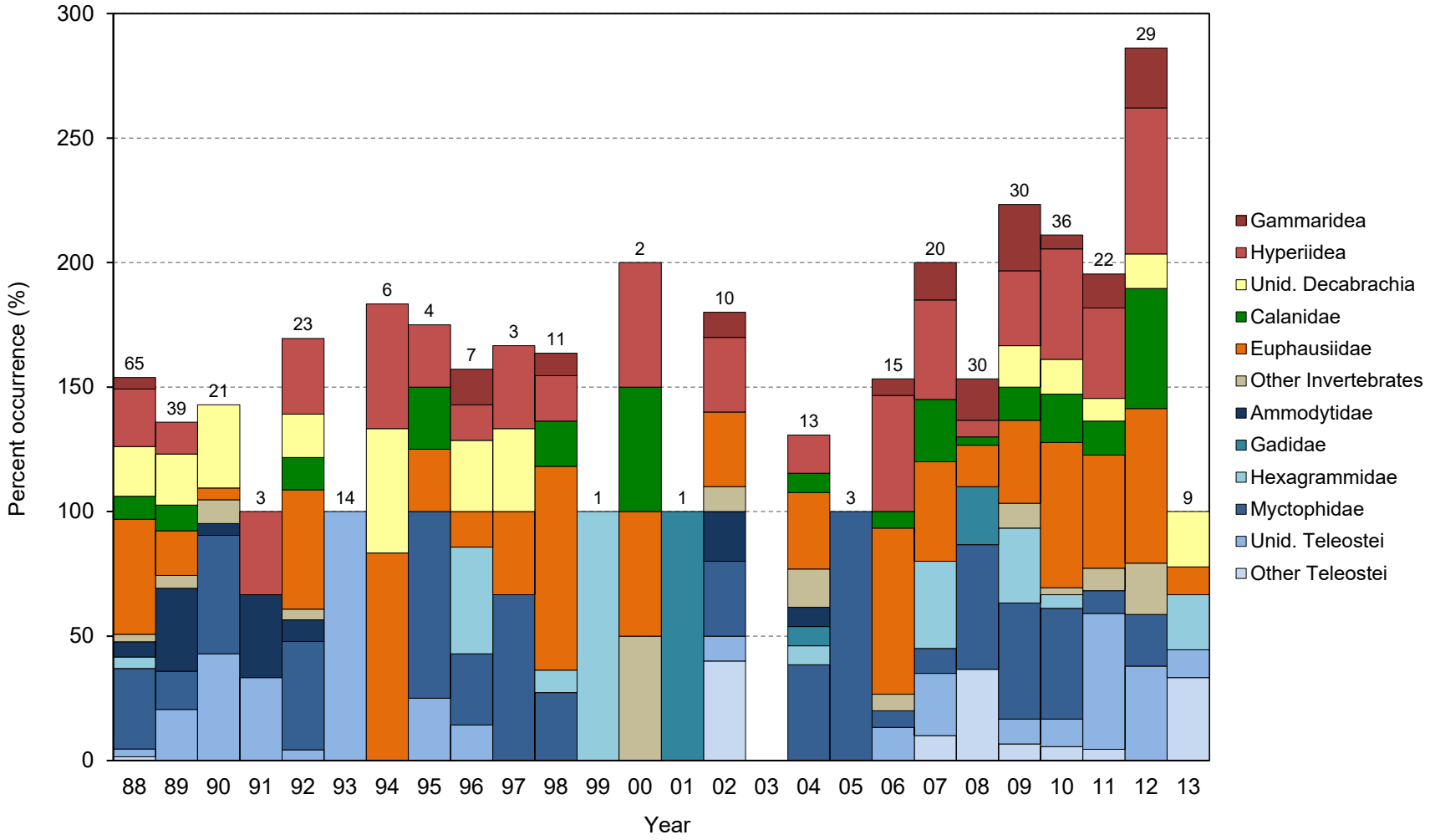

Figure 44. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average 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 59. 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**
Themisto pacifica	21.5	12.8	-	-	13.0	-	50.0	25.0	14.3	33.3	18.2	-	50.0
Themisto 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**
Neocalanus cristatus	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**
Thysanoessa 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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Ammodytes 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**	**-**
Hexagrammos 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 59 (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**	**-**
Themisto pacifica	-	30.0	-	-	-	-	6.7	30.0	30.6	13.6	37.9	-
Themisto 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**	**-**
Neocalanus cristatus	-	-	-	-	-	-	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**
Thysanoessa 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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Ammodytes 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**
Hexagrammos 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	-

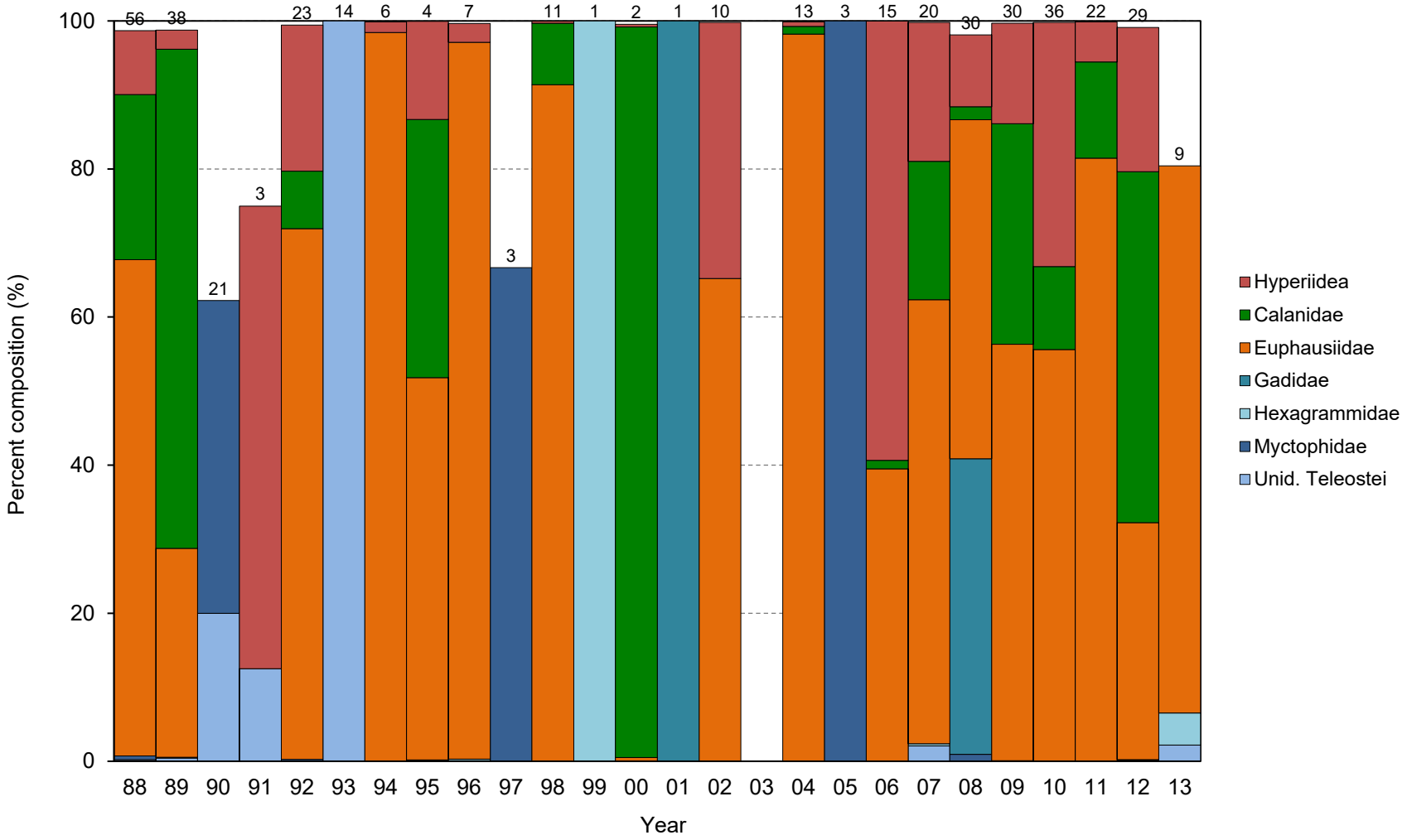

Figure 45. Percent composition of major prey items in diets of black-legged kittiwake adults and chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year 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. Numbers above columns indicate sample sizes. No diet samples were collected in 2003 or after 2013.

Table 60. 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**
Themisto pacifica	8.6	2.6	-	-	12.7	-	1.4	13.3	2.6	-	0.3	-	0.3
Themisto 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**
Neocalanus cristatus	0.7	4.8	-	-	7.8	-	-	-	-	-	8.3	-	93.6
N. plumchrus/flemengeri	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**
Thysanoessa 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 60 (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**	**-**
Themisto pacifica	-	34.6	-	-	-	-	9.7	13.6	28.4	5.1	9.3	-
Themisto 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**	**-**
Neocalanus cristatus	-	-	-	-	-	-	1.8	<0.1	9.6	1.5	18.4	-
N. plumchrus/flemengeri	-	-	-	-	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**
Thysanoessa 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	-

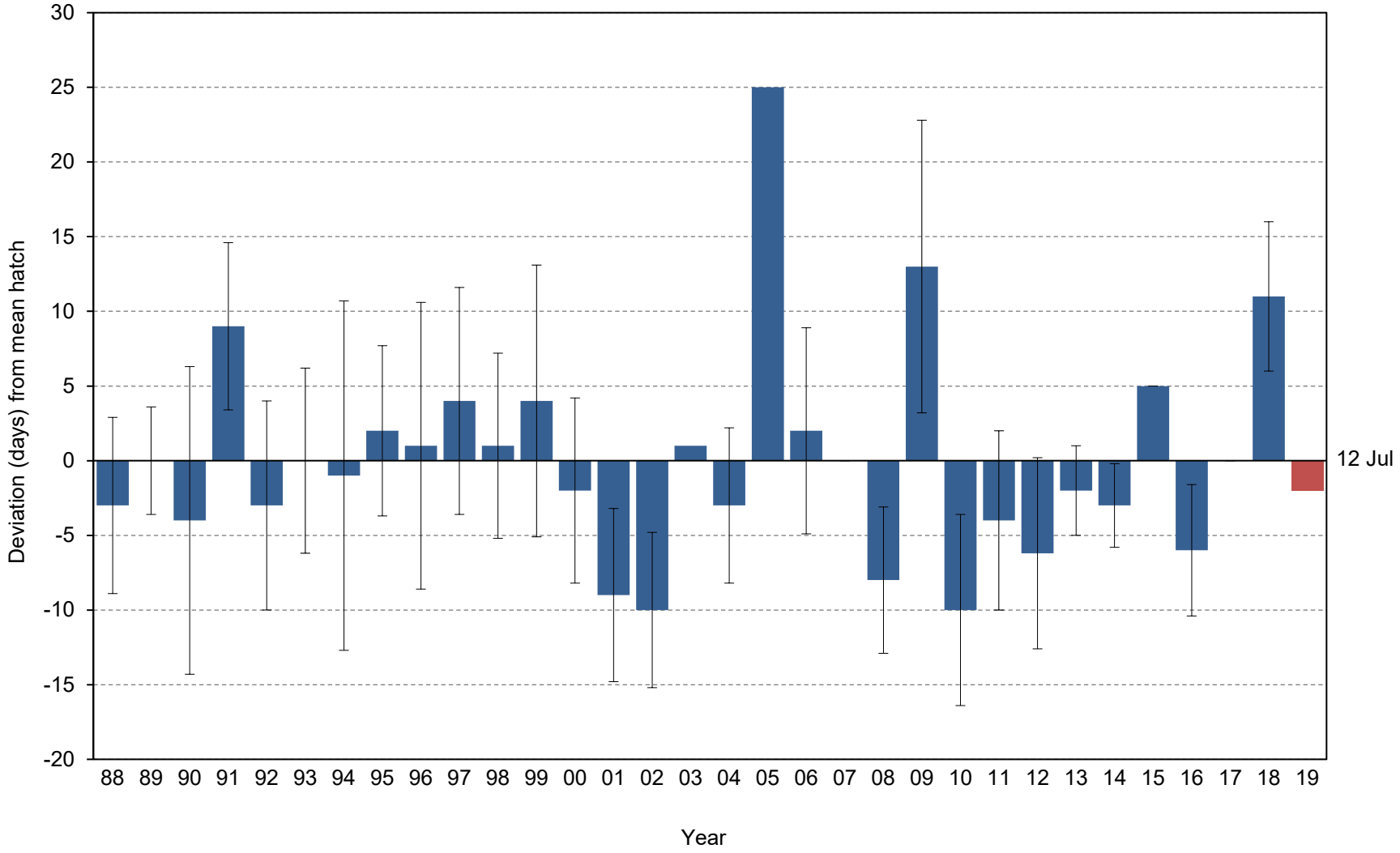

Figure 46. Yearly hatch date deviation (from the 1988-2018 average of 12 July) for red-legged kittiwakes at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); red highlights 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 61. 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	*n*[b]	Mean hatch	SD	*n*[c]	First lay[a]	First hatch	Last hatch	First fledge[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	-	1	<17 Jun	13 Jul	-	>29 Aug
2004	-	-	-	8 Jul	5.2	7	<14 Jun	2 Jul	18 Jul	>18 Aug
2005	-	-	-	6 Aug	-	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	-	1	-	-	-	23 Jun	-	-	-
2018	24 Jun	5.7	24	23 Jul	5.0	14	13 Jun	15 Jul	5 Aug	>24 Aug
2019	-	-	-	10 Jul	-	1	<7 Jun	10 Jul	-	22 Aug

[a]In 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.

[b]Sample sizes for mean lay dates are a sub-sample of total nests for which no egg to egg interval is ≤ 7 days.

[c]Sample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

[d]In 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 62. 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	03
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	-	-	-	1
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n	57	33	40	25	133	35	18	30	62	75	61	15	69	14	23	1

Table 62 (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													
	04	05	06	08	09	10	11	12	13	14	15	16	18	19
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	-	-	-	-	-	-	-	-	-	-	-	-	-	1
192	-	-	6	-	-	-	1	-	2	2	-	-	-	-
193	-	-	1	-	-	-	-	4	-	-	-	-	-	-
194	1	-	-	-	-	-	-	-	1	-	-	3	-	-
195	-	-	-	1	1	-	1	-	-	-	-	-	-	-
196	-	-	-	-	-	1	-	-	-	-	-	-	2	-
197	-	-	3	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	1	-	-	-	2	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	1	-	1	-	-	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	2	-	-	-	-	1	-	-	-	-	5	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	1	-
206	-	-	2	-	4	-	-	-	-	-	-	-	4	-
207	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	1	-
209	-	-	1	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	1	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	1	-
218	-	1	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	1	-	-	-	-	-	-	-	-	-
n	7	1	22	13	8	6	8	19	4	3	2	13	14	1

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

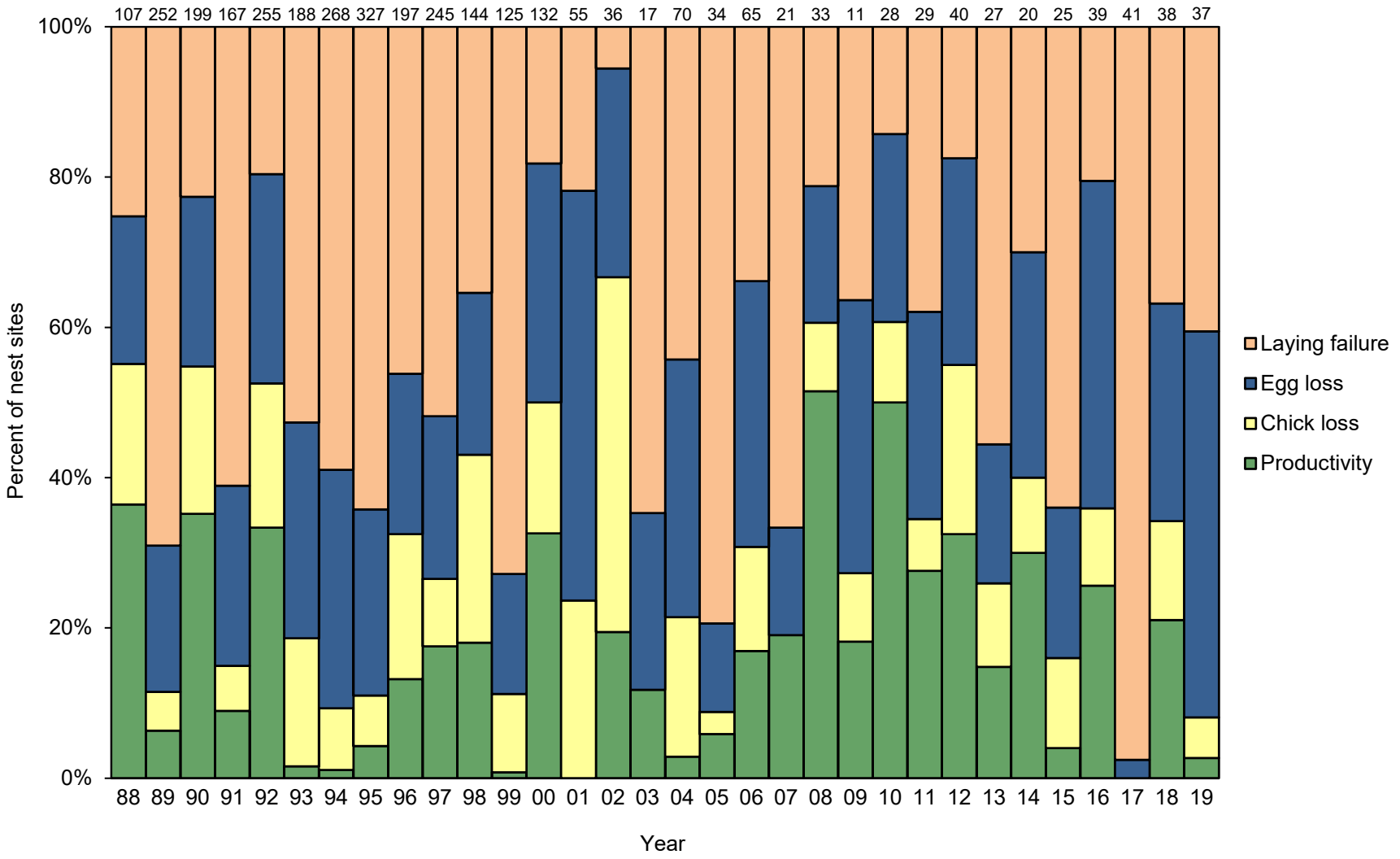

Figure 47. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate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

Table 63. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska.

Year	Total nest starts (A)	Nest sites w/ eggs (B)	Total eggs (C)	Nest sites w/ chicks (D)	Total chicks (E)	Nest sites w/ chicks fledged (F)	Total chicks fledged (G)	Laying success (B/A)	Mean clutch size (C/B)	Nesting success (D/B)	Hatching success (E/C)	Chick success (G/E)	Egg success (G/C)	Fledging success (F/D)	Reprod. success (F/B)	Fledglings /nest start (G/A)	Prod. (F/A)
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
2018	38	24	24	13	13	8	8	0.63	1.0	0.54	0.54	0.62	0.33	0.62	0.33	0.21	0.21
2019	37	22	22	3	3	1	1	0.59	1.0	0.14	0.14	0.33	0.05	0.33	0.05	0.03	0.03

Table 64. Standard deviation in reproductive performance parameters of red-legged kittiwakes at Buldir Island, Alaska.

Year	No. plots[a]	Total nest starts	Sampling design[b]	Laying success	Mean clutch size[c]	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
1988	13	107	Simple random	0.04	-	0.05	0.05	0.06	0.06	0.06	0.06	0.05	0.05
1989	15	252	Simple random	0.03	xx[d]	0.05	0.05	0.09	0.04	0.09	0.05	0.01	0.01
1990	15	199	Simple random	0.03	xx	0.04	0.04	0.05	0.04	0.05	0.04	0.03	0.03
1991	18	167	Simple random	0.04	xx	0.06	0.06	0.10	0.05	0.10	0.05	0.02	0.02
1992	19	255	Simple random	0.03	xx	0.03	0.03	0.04	0.03	0.04	0.03	0.03	0.03
1993	9	188	Simple random	0.04	xx	0.05	0.05	0.05	0.02	0.05	0.02	0.01	0.01
1994	13	268	Simple random	0.03	-	0.04	0.04	0.06	0.02	0.06	0.02	0.01	0.01
1995	17	327	Simple random	0.03	-	0.04	0.04	0.08	0.03	0.08	0.03	0.01	0.01
1996	14	197	Simple random	0.04	xx	0.05	0.05	0.06	0.04	0.06	0.04	0.02	0.02
1997	21	245	Simple random	0.03	-	0.05	0.05	0.06	0.04	0.06	0.04	0.02	0.02
1998	9	144	Simple random	0.04	xx	0.05	0.05	0.06	0.05	0.06	0.05	0.03	0.03
1999	8	125	Simple random	0.04	-	0.08	0.08	0.07	0.03	0.07	0.03	0.01	0.01
2000	9	132	Simple random	0.03	xx	0.05	0.05	0.06	0.04	0.06	0.05	0.04	0.04
2001	4	55	Simple random	0.06	xx	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00
2002	4	36	Simple random	0.04	-	0.08	0.08	0.09	0.07	0.09	0.07	0.07	0.07
2003	8	17	Simple random	0.12	-	0.19	0.19	0.00	0.19	0.00	0.19	0.08	0.08
2004	7	70	Simple random	0.06	xx	0.08	0.08	0.09	0.03	0.09	0.03	0.02	0.02
2005	5	34	Simple random	0.07	-	0.19	0.19	0.27	0.17	0.27	0.17	0.04	0.04
2006	7	65	Simple random	0.06	-	0.08	0.08	0.11	0.07	0.11	0.07	0.05	0.05
2007	3	21	Simple random	0.10	-	0.19	0.19	0.00	0.19	0.00	0.19	0.09	0.09
2008	5	33	Simple random	0.07	-	0.08	0.08	0.08	0.09	0.08	0.09	0.09	0.09
2009	3	11	Simple random	0.14	-	0.19	0.19	0.27	0.17	0.27	0.17	0.12	0.12
2010	4	28	Simple random	0.07	-	0.09	0.09	0.09	0.10	0.09	0.10	0.09	0.09
2011	4	29	Simple random	0.09	-	0.12	0.12	0.13	0.12	0.13	0.12	0.08	0.08
2012	4	40	Simple random	0.06	-	0.08	0.08	0.10	0.08	0.10	0.08	0.07	0.07
2013	2	27	Simple random	0.10	-	0.14	0.14	0.19	0.14	0.19	0.14	0.07	0.07
2014	5	20	Simple random	0.10	-	0.13	0.13	0.15	0.13	0.15	0.13	0.10	0.10
2015	4	25	Simple random	0.10	-	0.17	0.17	0.22	0.10	0.22	0.10	0.04	0.04
2016	6	39	Simple random	0.07	-	0.09	0.09	0.12	0.08	0.12	0.08	0.07	0.07
2017	6	41	Simple random	0.02	-	0.00	0.00	-	0.00	-	0.00	0.00	0.00
2018	6	38	Simple random	0.08	-	0.10	0.10	0.13	0.10	0.13	0.10	0.07	0.07
2019	6	37	Simple random	0.08	-	0.07	0.07	0.27	0.05	0.27	0.05	0.03	0.03

[a]Plots that are combined for analysis are counted as a single "plot".

[b]Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available. For 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.

[c]For mean clutch size, standard deviation is not available in years with only clutch size of one observed.

[d]xx indicates data potentially exist but have not yet been summarized.

Table 65. Clutch sizes of red-legged kittiwakes at Buldir Island, Alaska. Sample units consist of total nest sites, not plots.

Year	Total nest starts	Nest sites w/ x eggs:			Nest sites w/ eggs	Total eggs	Mean clutch size
	(A)	0	1	2	(B)	(C)	(C/B)
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
2018	38	14	24	0	24	24	1.0
2019	37	15	22	0	22	22	1.0

Table 66. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska in 2019. All plots in 2019 were located at Spike Camp.

Parameter	Plot						Total	SD[a]
	40A/40C	40B	45	45A	46	47A		
Total nest starts (A)	3	2	2	20	5	5	37	-
Nest sites w/ eggs (B)	1	1	2	13	3	2	22	-
Total eggs (C)	1	1	2	13	3	2	22	-
Nest sites w/ chicks (D)	0	0	1	0	2	0	3	-
Total chicks (E)	0	0	1	0	2	0	3	-
Nest sites w/ chicks fledged (F)	0	0	0	0	1	0	1	-
Total chicks fledged (G)	0	0	0	0	1	0	1	-
Laying success (B/A)	0.33	0.50	1.00	0.65	0.60	0.40	0.59	0.08
Mean clutch size (C/B)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-
Nesting success (D/B)	0.00	0.00	0.50	0.00	0.67	0.00	0.14	0.07
Hatching success (E/C)	0.00	0.00	0.50	0.00	0.67	0.00	0.14	0.07
Chick success (G/E)	-	-	0.00	-	0.50	-	0.33	0.27
Egg success (G/C)	0.00	0.00	0.00	0.00	0.33	0.00	0.05	0.05
Fledging success (F/D)	-	-	0.00	-	0.50	-	0.33	0.27
Reproductive success (F/B)	0.00	0.00	0.00	0.00	0.33	0.00	0.05	0.05
Fledglings/nest start (G/A)	0.00	0.00	0.00	0.00	0.20	0.00	0.03	0.03
Productivity (F/A)	0.00	0.00	0.00	0.00	0.20	0.00	0.03	0.03

[a]Due 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.

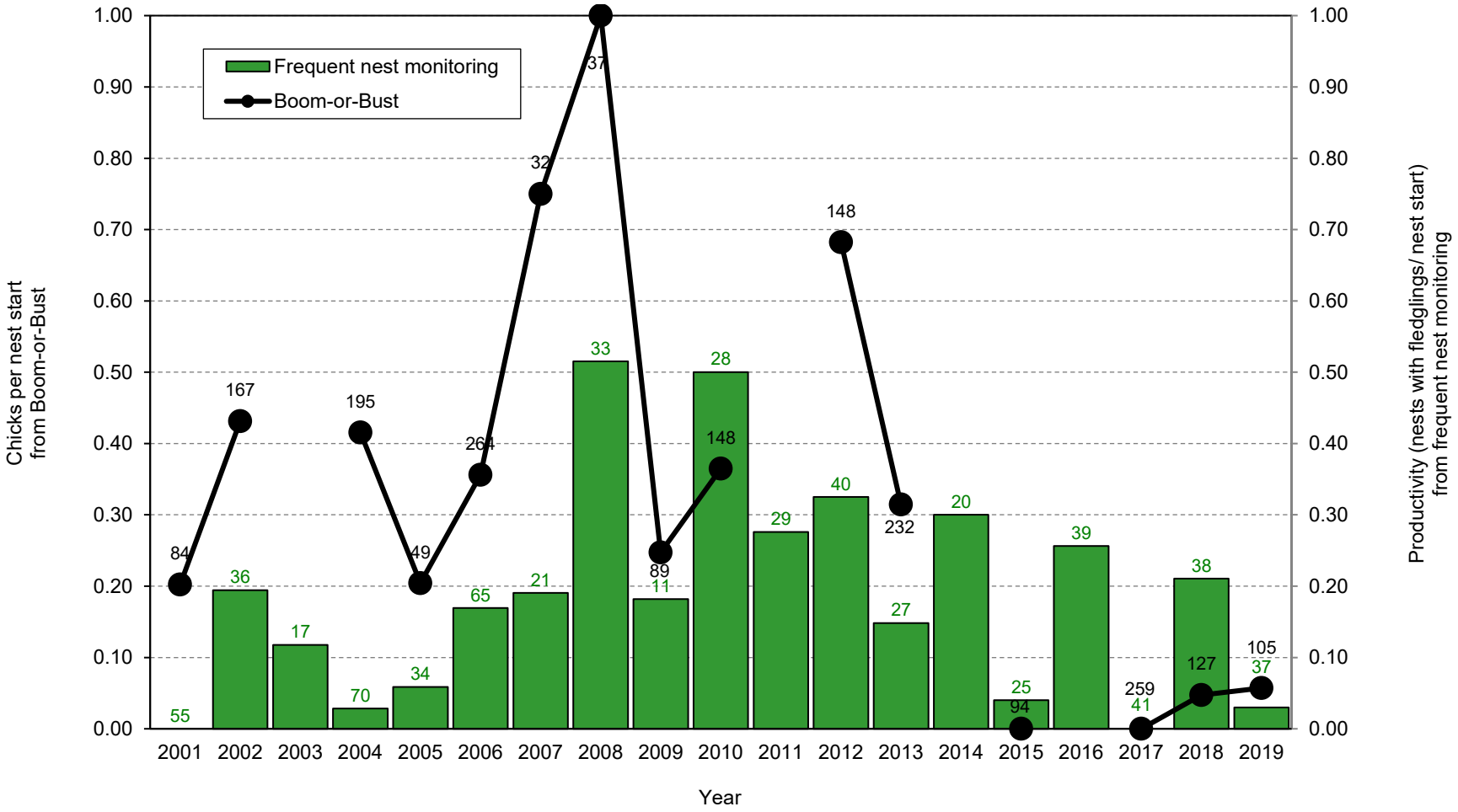

Figure 48. Reproductive performance of red-legged kittiwakes at Buldir Island, Alaska, as determined by a Boom-or-Bust methodology (black) and frequent nest monitoring (green). Reproductive success for Boom-or-Bust is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total 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 63) 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 (2015-2019) 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. In 2018 approximately 15% of kittiwake nests (both black-legged and red-legged) were removed between the nest and chick count by a large landslide.

Table 67. 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 (2015-2019). 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
2018[c]	1	127	6	0.05	27 Jun	14 Aug
2019	1	105	6	0.06	25 Jun	25 Jul

[a]Chicks/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.

[b]Data represent maximum count of nests and chicks from 15 counts between 13 June and 22 August.

[c]In 2018 approximately 15% of kittiwake nests (both black-legged and red-legged) were removed between the nest and chick count by a large landslide.

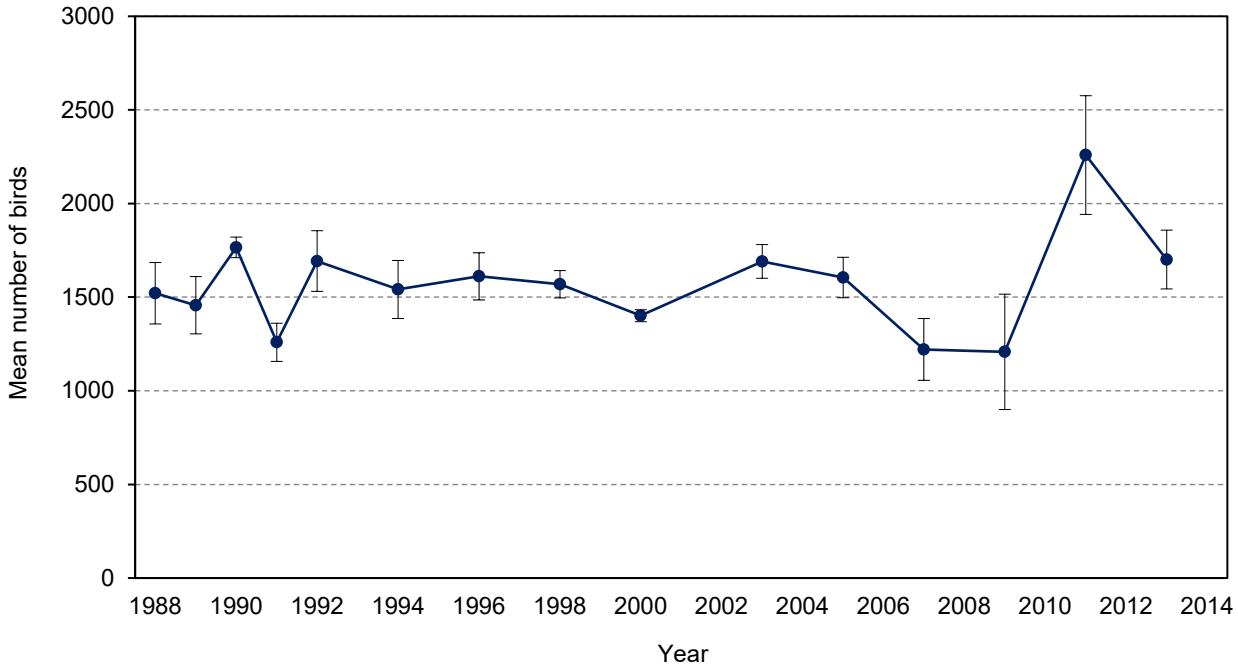

Figure 49. Mean numbers of red-legged kittiwakes counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

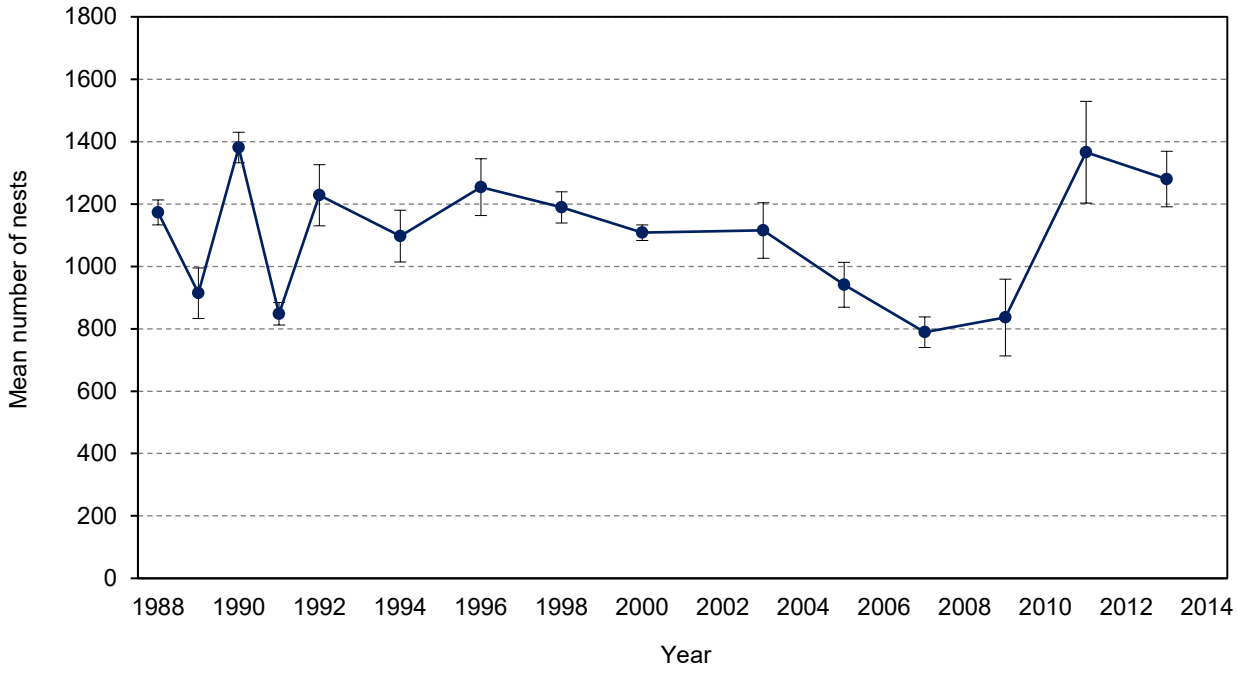

Figure 50. Mean numbers of red-legged kittiwake nests counted on index plots at Buldir Island, Alaska. Error bars represent standard deviation. No counts were conducted in years not shown.

Table 68. 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
n	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 69. 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
n	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

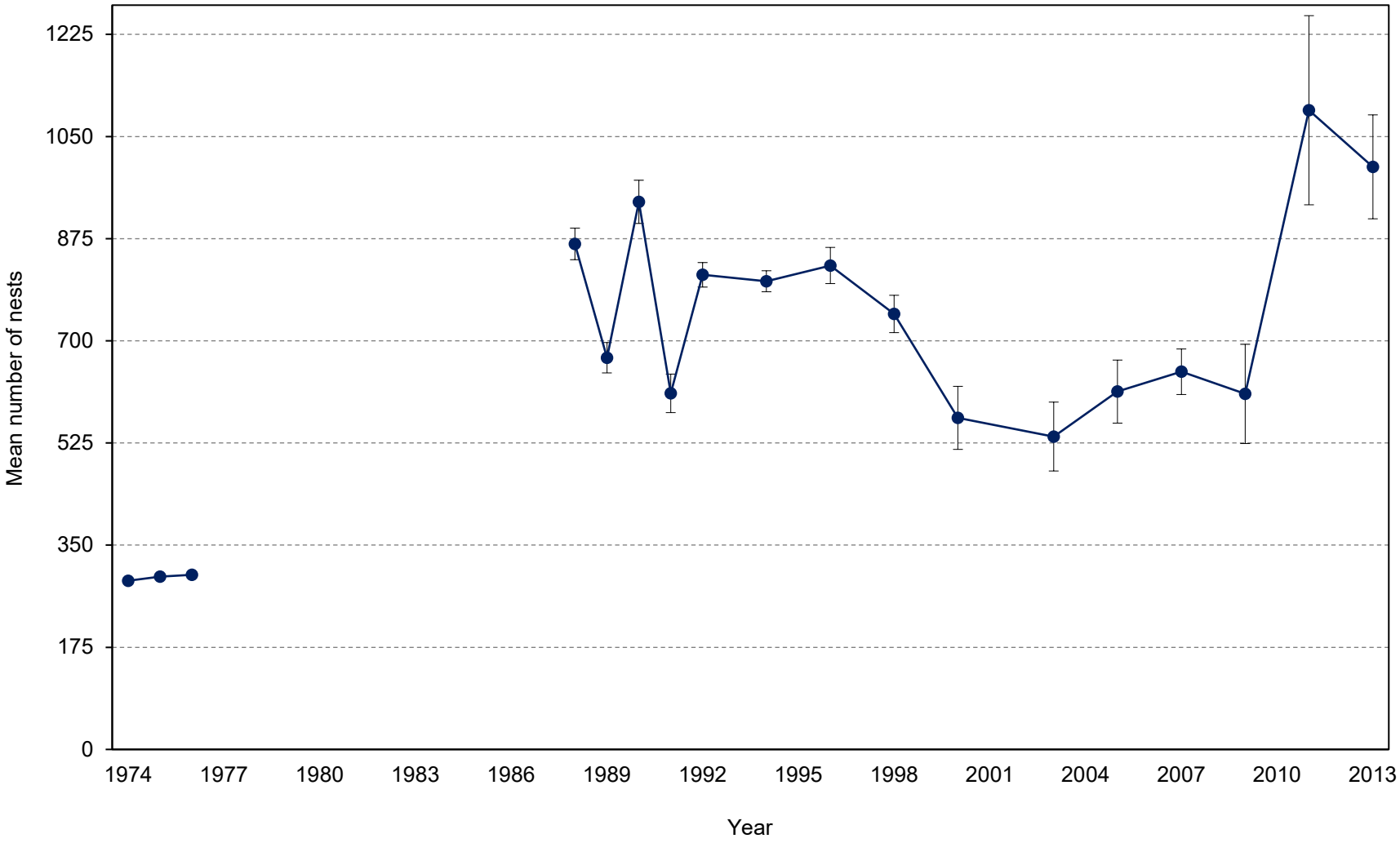

Figure 51. Mean numbers of red-legged kittiwake nests counted on index plots at Kittiwake Lane, Buldir Island, Alaska. Data include only plots in Kittiwake Lane East (15-18) and Kittiwake Lane West (19-29) and are a subset of total counts on all index plots. Error bars represent standard deviation. No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

Table 70. 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 69) 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
n	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

[a]Data come from single counts made early to mid-July 1974, 1975, and 1976; from Byrd (1978).

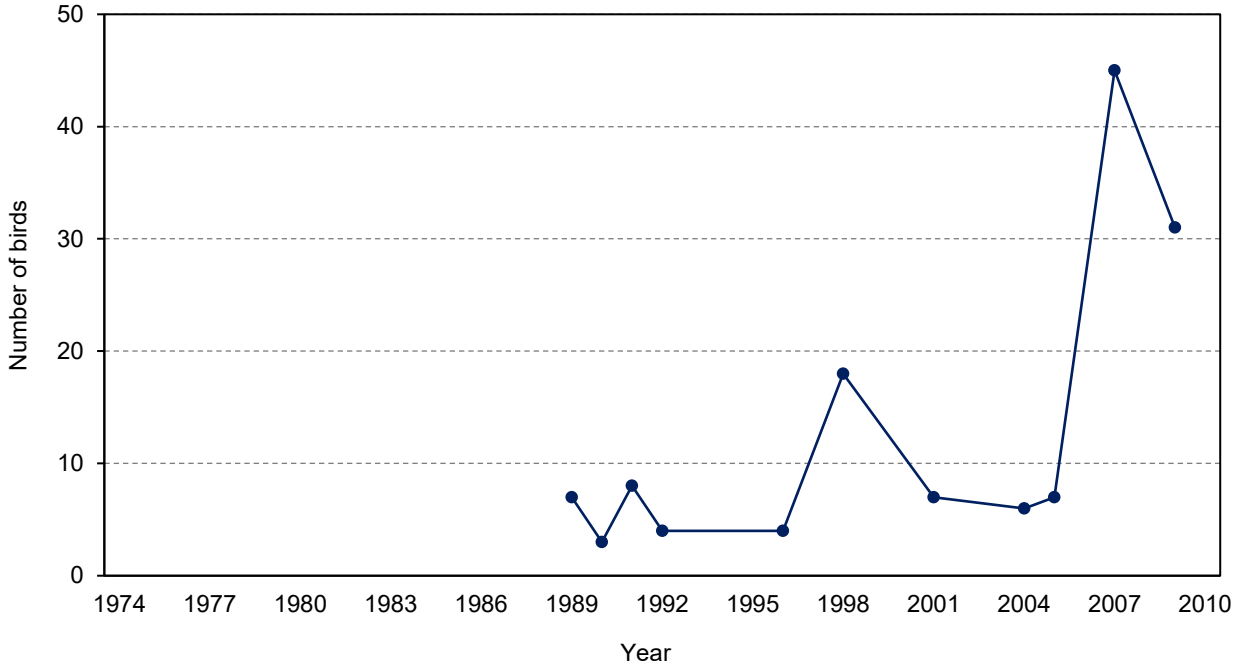

Figure 52. Numbers of red-legged kittiwakes counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because birds were not identified to species.

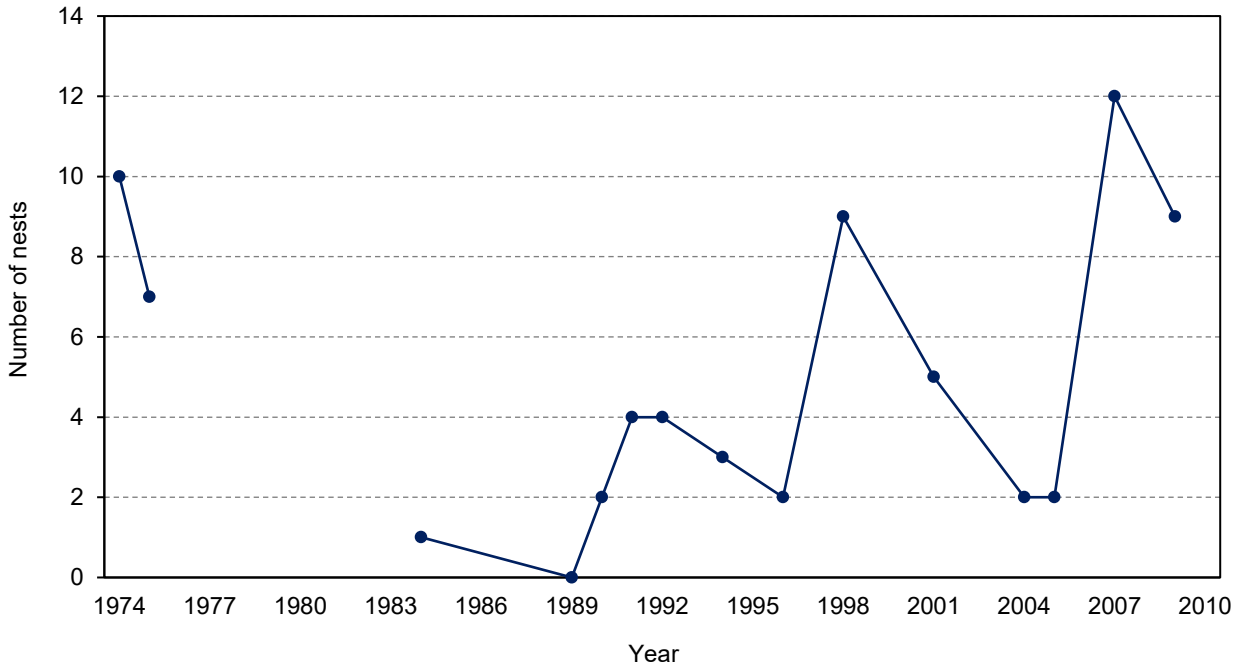

Figure 53. Numbers of red-legged kittiwake nests counted at Middle Rock, Buldir Island, Alaska. Counts at Middle Rock are separate from island-wide population counts on index plots. No counts were conducted in years not shown except 1988 when data were excluded because nests were not identified to species.

Table 71. 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 68) 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

[a]Count in 1988 not broken down to species, see black-legged kittiwakes counts (Table 68).

Table 72. 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 69) 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

[a]Count in 1988 not broken down to species, see black-legged kittiwakes counts (Table 69).

Table 73. 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

[a]Bird previously banded with metal band only and given color band(s) for inclusion in survival dataset.
[b]Bird previously banded with color band recaptured and given new color band(s); does not add to number of birds color-banded.

Table 74. 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	4	0.20
2007	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	13	11	12	8	6	4	0.29
2008	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	15	12	11	10	4	0.22
2009	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	12	6	9	3	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 74 (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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a]Birds banded in current year are not resighted until following year and not included in current year totals.
[b]Value 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.
[c]Survival should be considered a minimum estimate because it is likely not all birds present were observed each year.
[d]Resighting 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.
[e]Resighting 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 75. 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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
Blue	10	794-35358	1998		-	-	-	-	-	-	-	-	-	-	y	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	0
Blue	15	794-35362	1998		-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	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	0
Blue	18	794-35364	1998		-	-	-	-	-	-	-	-	-	-	y	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	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	0
Blue	21	794-35367	1998		-	-	-	-	-	-	-	-	-	-	0	y	y	y	y	0	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	0
Blue	25	794-35372	1998		-	-	-	-	-	-	-	-	-	-	0	0	y	0	y	y	0	0	0	0	0	0	0	0	0	0
Blue	27	794-35357	1998		-	-	-	-	-	-	-	-	-	-	y	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	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	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0
Blue	41	794-35395	1999		-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	6	0	0	0	0	0	0	0	0
Blue	42	794-35397	1999		-	-	-	-	-	-	-	-	-	-	-	0	y	y	y	y	y	3	0	1	4	1	0	0	0	0
Blue	46	794-62540	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	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	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	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	0
Blue	54	1704-01311	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	y	y	y	0	1	0	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	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	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	69	1704-01318	2000		-	-	-	-	-	-	-	-	-	-	-	-	y	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	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	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	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
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	0
Blue	77	794-35450	1993	A (Y 48; 00)	-	-	-	-	-	y	y	y	y	0	0	0	0	y	0	0	y	3	0	0	0	0	0	0	0	0
Blue	79	794-35488	1993	A (Y 84; 00)	-	-	-	-	-	0	0	0	0	0	0	y	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	0
Blue	83	794-35054	1991	A (G H3; 00)	-	-	-	y	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	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	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	y	y	0	0	0	0	1	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	0
Green	17	584-01612	1988		y	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	y	0	y	y	y	y	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	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	y	y	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	y	y	0	y	0	0	0	0	0	0	0	0	0	0
Green	32	584-01620	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	0
Green	37	584-00243	1989		-	0	y	y	y	y	y	y	y	y	y	y	0	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	0
Green	39	584-01621	1988		y	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	y	y	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	y	0	y	0	0	0	y	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	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	y	y	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	y	y	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	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	y	y	0	y	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	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	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	y	y	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	0
Green	75	584-00258	1990		-	-	0	0	y	y	y	y	y	y	y	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	78	584-00265	1990		-	-	0	y	y	y	y	y	y	y	y	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	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	y	y	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	y	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
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	0	0
Green	88	584-00262	1990		-	-	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	90	584-00253	1989		-	y	y	y	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	95	584-00254	1990		-	-	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	97	584-01625	1990		-	-	y	y	y	y	y	y	y	0	y	y	0	y	y	y	y	4	1	1	0	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	0	0
Green	A3	584-01607	1991		-	-	-	y	y	y	0	0	y	0	0	0	y	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	0	0
Green	A6	794-35014	1991		-	-	-	y	y	y	y	y	y	y	y	y	y	y	y	0	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	0	0
Green	A8	794-35016	1991		-	-	-	y	y	y	y	y	y	y	0	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	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	C1	794-35018	1991		-	-	-	y	y	y	0	0	0	0	0	y	0	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	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	C3	794-35020	1991		-	-	-	y	y	y	y	y	0	0	y	y	y	y	y	0	y	2	1	0	3	2	0	0	0	0
Green	C4	794-35021	1991		-	-	-	y	y	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	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	y	0	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	0	0
Green	D1	794-35026	1991		-	-	-	y	y	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	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	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	0	0
Green	D5	794-35030	1991		-	-	-	y	y	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	y	0	0	y	y	y	y	1	1	0	0	0	1	0	0	0
Green	D7	794-35032	1991		-	-	-	y	y	y	0	y	y	y	y	0	y	y	0	0	0	0	0	0	1	0	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	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	0	0
Green	E1	794-35034	1991		-	-	-	0	y	y	0	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	E2	794-35036	1991		-	-	-	y	y	y	y	y	y	0	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	y	y	0	0	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	y	x	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	y	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	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	0	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
Green	H5	794-35056	1991		-	-	-	y	0	y	y	0	0	y	y	y	y	0	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	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	J2	794-35062	1992		-	-	-	-	0	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	1	0	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	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	0	0
Green	J5	794-35065	1992		-	-	-	-	y	y	y	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	J6	794-35066	1992		-	-	-	-	y	y	y	y	0	0	0	0	0	y	0	y	0	4	0	0	4	1	0	0	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	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	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	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	0	0
Green	K4	794-35073	1992		-	-	-	-	y	y	y	y	y	y	y	0	0	y	0	0	0	2	0	2	2	2	3	0	0	0
Green	K5	794-35074	1992		-	-	-	-	y	y	y	y	y	0	y	y	y	y	y	0	y	0	1	0	0	0	0	0	0	0
Green	K6	794-35075	1992		-	-	-	-	y	y	y	y	y	y	y	0	y	y	y	0	0	0	0	0	0	0	0	0	0	0
Green	K8	794-35077	1992		-	-	-	-	y	y	y	y	y	y	0	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	y	0	y	y	y	y	0	0	1	0	0	0	0	0	0	0	0
Green	L1	794-35079	1992		-	-	-	-	y	y	y	y	0	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	y	6	0	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	0	0
Green	L5	794-35082	1992		-	-	-	-	y	y	y	y	y	y	y	y	y	0	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	y	0	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	y	0	0	1	1	1	0	0	0	0	0
Green	L8	794-35085	1992		-	-	-	-	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	L9	584-00260	1990	A (G 83; 92)	-	-	y	y	y	y	0	y	0	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	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	y	0	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	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	y	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	y	0	0	y	y	y	y	y	x	x	x	x	x	x	x	x	x
Green	M8	794-35091	1992		-	-	-	-	y	y	y	y	y	y	y	0	y	y	0	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	y	0	y	0	0	0	0	0	0	0	0	0	0
Green	N2	794-35093	1992		-	-	-	-	y	y	y	y	y	0	0	y	y	y	y	0	0	0	0	0	0	0	0	1	0	0
Green	N3	794-35094	1992		-	-	-	-	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Green	N4	794-35095	1992		-	-	-	-	y	y	y	y	y	0	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	0	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
Green	N7	794-35097	1992		-	-	-	-	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	N8	794-35098	1992		-	-	-	-	y	y	y	y	y	y	0	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	0	0
Green	O6	584-01609	1988		0	y	y	y	y	y	y	y	y	y	y	0	y	0	0	0	0	1	0	0	0	0	0	0	0	0
Green	O7	584-01608	1988		y	y	y	y	y	y	y	y	y	y	0	y	y	y	y	0	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	y	0	0	0	y	0	0	0	1	0	0	3	0	2	0	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	y	0	y	0	y	1	0	0	2	1	0	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
Red	N2	794-35379	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	4	1	1	0	0	0
Red	N7	794-35383	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	2	0	0	0	0
Red	02	794-35102	1988		0	0	0	0	y	y	y	y	y	y	0	y	0	y	0	0	y	3	2	0	0	0	0	0	0	0
Red	P2	794-35388	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	0	0	0	0
Red	P6	794-35389	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	3	4	5	2	1	0
Red	R5	794-62553	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	0	0	0	0
Red	R6	794-62554	2006		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	0	1	0	0	0
Red	R7	794-35464	1993	A (Y 55; 06)	-	-	-	-	-	y	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

Table 75 (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:

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- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
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- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	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	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	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	y	0	y	y	2	1	0	1	0	0	0	0	0
Yellow	15	794-35417	1993		-	-	-	-	-	y	0	y	0	0	y	0	y	y	0	0	0	0	0	0	0	0	1	0	0	0
Yellow	16	794-35418	1993		-	-	-	-	-	0	y	y	y	y	y	0	y	0	0	y	y	0	0	1	1	0	0	0	0	0
Yellow	17	794-35419	1993		-	-	-	-	-	y	0	y	y	y	0	y	y	0	0	0	0	0	0	1	0	0	0	0	0	0
Yellow	18	794-35420	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	0	y	3	0	0	0	0	0	0	0	0
Yellow	19	794-35421	1993	B (97)	-	-	-	-	-	y	y	y	y	0	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0
Yellow	20	794-35422	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	0	1	0	0	1	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	1	0	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	y	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	y	0	y	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	y	0	0	0	0	0	0	0	1	0	0	0	0	0
Yellow	29	794-35431	1993		-	-	-	-	-	y	0	0	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	30	794-35432	1993		-	-	-	-	-	y	y	y	y	y	y	y	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
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
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

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	35	794-35438	1993		-	-	-	-	-	y	y	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	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	37	794-35440	1993		-	-	-	-	-	y	y	y	y	y	y	y	0	y	0	0	0	0	0	1	0	0	0	0	0	0
Yellow	40	794-35441	1993		-	-	-	-	-	y	y	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	y	0	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	y	y	y	4	0	0	2	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	0	0
Yellow	45	794-35447	1993		-	-	-	-	-	y	y	y	y	y	y	0	y	y	0	0	y	0	1	1	2	2	0	0	0	0
Yellow	46	794-35448	1993		-	-	-	-	-	y	y	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	x	x
Yellow	49	794-35451	1993		-	-	-	-	-	0	0	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	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	51	794-35460	1993		-	-	-	-	-	y	y	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	y	0	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	y	3	2	0	2	3	1	0	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	0	0
Yellow	56	794-35465	1993		-	-	-	-	-	y	y	y	y	0	y	y	y	y	0	0	y	3	1	0	0	0	0	0	0	0
Yellow	57	794-35466	1993		-	-	-	-	-	y	y	y	y	y	0	0	0	0	y	y	0	0	0	0	0	0	0	0	0	0
Yellow	58	794-35467	1993		-	-	-	-	-	y	y	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	y	0	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	62	794-35469	1993		-	-	-	-	-	y	y	y	y	y	0	y	y	0	0	0	y	0	0	0	0	0	0	0	0	0
Yellow	63	794-35470	1993		-	-	-	-	-	y	0	0	0	0	0	0	y	0	0	0	0	0	0	0	2	2	1	0	0	0
Yellow	65	794-35471	1993		-	-	-	-	-	y	y	y	y	y	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	66	794-35472	1993		-	-	-	-	-	0	0	0	0	y	0	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	67	794-35473	1993		-	-	-	-	-	0	0	0	y	0	0	y	0	0	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	0	0
Yellow	69	794-35475	1993		-	-	-	-	-	y	y	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	0	0
Yellow	73	794-35478	1993		-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Yellow	74	794-35479	1993		-	-	-	-	-	y	y	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	y	y	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	76	794-35481	1993		-	-	-	-	-	y	y	y	y	y	y	0	y	0	y	y	y	0	0	0	0	0	0	0	0	0
Yellow	77	794-35482	1993		-	-	-	-	-	y	y	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	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	0	0

Table 75 (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:

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- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
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Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	82	794-35485	1993		-	-	-	-	-	y	y	y	y	y	y	0	y	y	0	0	0	0	1	0	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	0	0
Yellow	85	794-35489	1993		-	-	-	-	-	y	y	y	y	0	y	y	y	y	y	0	0	6	0	0	1	1	2	0	0	0
Yellow	86	794-35490	1993		-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	0	0	0	1	0	0	0	0	0	0	0
Yellow	87	794-35491	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	1	0	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	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	0	0
Yellow	93	794-35495	1993		-	-	-	-	-	y	y	y	y	y	y	y	y	0	0	0	0	1	0	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	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	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	0	0
Yellow	A1	794-35411	1993	A (Y 13; 94)	-	-	-	-	-	y	y	y	y	0	y	0	0	0	0	0	0	1	0	0	1	3	0	0	0	0
Yellow	A3	794-35101	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	y	0	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	0	0
Yellow	A5	714-10020	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	7	3	0	4	4	4	0	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	0	0
Yellow	A7	714-10022	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	y	0	0	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	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	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	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	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	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	0	0
Yellow	C5	714-10029	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow	C6	714-10031	1994		-	-	-	-	-	-	y	y	y	y	y	0	y	y	y	y	0	0	0	0	0	0	0	0	0	0
Yellow	C7	714-10032	1994		-	-	-	-	-	-	y	y	y	y	y	0	y	0	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	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	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	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	0	0
Yellow	D3	714-10037	1994		-	-	-	-	-	-	y	y	y	y	y	0	y	y	0	y	0	6	1	0	0	1	0	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	0	0
Yellow	D5	714-10041	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	y	5	0	2	1	0	0	0	0	0
Yellow	D6	714-10042	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	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	0	y	0	0	0	0	0	0	0	0	0

Table 75 (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:

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- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	D8	714-10045	1994		-	-	-	-	-	-	y	y	y	0	y	0	0	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	0	0
Yellow	E1	714-10048	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	y	y	y	5	0	3	1	0	0	0	0	0
Yellow	E2	714-10049	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	y	y	0	y	2	0	0	0	0	0	0	0	0
Yellow	E3	714-10050	1994		-	-	-	-	-	-	y	y	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	0	0
Yellow	E5	714-10052	1994		-	-	-	-	-	-	y	y	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	y	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	y	0	4	0	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	x	x
Yellow	E9	714-10056	1994		-	-	-	-	-	-	y	0	y	y	y	0	y	y	0	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	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	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	0	0
Yellow	G5	714-10061	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	0	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	0	0
Yellow	G7	714-10064	1994		-	-	-	-	-	-	y	y	y	y	y	y	y	0	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	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	0	0
Yellow	H1	714-10067	1994		-	-	-	-	-	-	y	y	y	y	y	y	0	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	0	0
Yellow	H3	714-10069	1994		-	-	-	-	-	-	0	0	0	0	0	y	0	0	0	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	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	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	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	0	0
Yellow	H8	794-35213	1995		-	-	-	-	-	-	-	y	y	y	0	0	y	y	0	y	y	1	1	0	0	0	0	0	0	0
Yellow	H9	794-35214	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	6	0	0	0	0	1	0	0	0
Yellow	J1	794-35215	1995		-	-	-	-	-	-	-	y	y	y	0	0	0	y	y	0	y	0	0	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	0	0
Yellow	J3	794-35217	1995		-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Yellow	J5	794-35222	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	y	0	0	0	0	0	0	1	0	0
Yellow	J6	794-35223	1995		-	-	-	-	-	-	-	y	y	y	y	0	y	y	0	y	0	0	0	0	0	0	0	0	0	0
Yellow	J7	794-35430	1993	A (Y 28; 95)	-	-	-	-	-	0	y	y	y	y	0	y	y	y	0	y	0	1	1	0	2	0	0	0	1	0
Yellow	J8	794-35224	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	y	0	y	y	1	0	1	4	4	2	3	2	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	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	0
Yellow	K5	794-35235	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	y	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	0
Yellow	K7	794-35237	1995		-	-	-	-	-	-	-	0	y	0	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	0	0	1	0	0	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	0
Yellow	M1	794-35241	1995		-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	0	4	0	1	0	0	0	0	0	0
Yellow	M2	794-35242	1995		-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	y	y	1	0	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	0
Yellow	M4	794-35246	1995		-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Yellow	M5	794-35247	1995		-	-	-	-	-	-	-	y	y	y	y	0	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	0
Yellow	M8	794-62513	1996		-	-	-	-	-	-	-	-	y	y	y	0	0	y	y	0	0	0	0	0	0	0	0	0	0	0
Yellow	M9	794-62521	1996		-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	3	0	0	3	0	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	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	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	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	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	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	0
Yellow	OO	794-35401	1993		-	-	-	-	-	y	y	y	y	0	y	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	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	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	0
Yellow	P5	584-00264	1990	A (G 93; 96)	-	-	y	y	0	y	y	y	y	y	y	y	y	y	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	0
Yellow	P7	794-62530	1996		-	-	-	-	-	-	-	-	y	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	y	2	3	0	2	1	4	1	2	0
Yellow	P9	794-62535	1996		-	-	-	-	-	-	-	-	y	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	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	0	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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	y	0	0	0	0	0	0	0	0	0	0
Yellow	R6	794-35340	1998		-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	0	1	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	y	2	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	0
Yellow	T4	794-35332	1997		-	-	-	-	-	-	-	-	-	y	y	0	0	y	0	y	y	2	2	0	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	0
Yellow	T6	794-35330	1997		-	-	-	-	-	-	-	-	-	y	y	0	y	y	y	y	0	1	0	0	1	3	0	0	0	0
Yellow	T7	794-35329	1997		-	-	-	-	-	-	-	-	-	y	y	y	0	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	0
Yellow	T9	794-35327	1997		-	-	-	-	-	-	-	-	-	y	0	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	0
Yellow	U3	794-35325	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	5	2	0	4	2	0	1	0	0
Yellow	U4	794-35324	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	0	0	1	0	1	0	0	0	0	0
Yellow	U5	794-35323	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	0	0	0	0	0	0	1	0	0	0
Yellow	U6	794-35322	1997		-	-	-	-	-	-	-	-	-	y	y	y	0	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	0
Yellow	U9	794-35320	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	0	3	0	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	0
Yellow	Y2	794-35318	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	0	0	0	0	0	0	0	0	0	1	0	0
Yellow	Y3	794-35317	1997		-	-	-	-	-	-	-	-	-	y	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Yellow	Y4	794-35315	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	0	y	0	0	1	0	0	0	0	0	0
Yellow	Y5	794-35314	1997		-	-	-	-	-	-	-	-	-	y	y	y	y	0	0	0	0	0	0	0	0	0	1	0	0	0
Yellow	Y7	794-35312	1997		-	-	-	-	-	-	-	-	-	y	y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	DB/W	584-00283	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0
BK	BK/DB	794-35218	1995	A (Y J4; 09)	-	-	-	-	-	-	-	y	y	y	y	y	y	y	y	y	y	3	2	0	1	3	1	0	0	0

Table 75 (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

BK = black
DB = dark blue
DG = dark green
LB = light blue
O = orange
R = red
W = white
Y = yellow

Notes

A = rebanded from original color band(s) (original band; year rebanded)
B = bird missing color band (year)
C = bird died (year)
D = bird with broken foot (year)

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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	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
BK	O/Y	794-62646	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	7	2	2	0
BK	R/DB	1704-01485	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
BK	R/DG	1704-01495	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
BK	W/BK	794-62592	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	3	1	0	2	0
BK	W/W	794-62601	2007		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	0	0
BK	Y/BK	794-70195	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	1	0
BK	Y/O	794-62638	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	2	0	0
BK	Y/Y	794-62635	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	0	0	0
DB	BK/BK	794-35013	1991	A (G A4; 91)	-	-	-	y	y	y	y	y	y	y	y	y	y	y	y	0	0	0	0	0	0	1	2	0	0	0
DB	BK/DG	1704-01356	2011		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0
DB	BK/LB	1704-01430	2013		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
DB	BK/O	714-10083	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	1	0
DB	BK/Y	794-86877	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0	0
DB	DB/DB	714-10092	2010		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0	0
DB	DB/DG	1704-01404	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
DB	DB/LB	1704-01397	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0
DB	DB/Y	714-10060	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	0	0	0
DB	DG/BK	1704-01411	2012		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0

Table 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
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	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 75 (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

BK = black
DB = dark blue
DG = dark green
LB = light blue
O = orange
R = red
W = white
Y = yellow

Notes

A = rebanded from original color band(s) (original band; year rebanded)
B = bird missing color band (year)
C = bird died (year)
D = bird with broken foot (year)

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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
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	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 O5; 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 75 (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
- BK = black
- DB = dark blue
- DG = dark green
- LB = light blue
- O = orange
- R = red
- W = white
- Y = yellow

Notes
- A = rebanded from original color band(s) (original band; year rebanded)
- B = bird missing color band (year)
- C = bird died (year)
- D = bird with broken foot (year)

Resight history
- y = resighted at least once (# times unknown)
- 0 = not resighted
- x = band no longer resightable (dead, removed)

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
W	DB/W	584-00282	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	2	0
W	DB/Y	794-35241	2009		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	0	1	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
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	y	0	y	2	0	1	1	3	0	1	0	0
W	Y/O	794-62637	2008		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	3	0	3	0

Table 75 (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

BK = black
DB = dark blue
DG = dark green
LB = light blue
O = orange
R = red
W = white
Y = yellow

Notes

A = rebanded from original color band(s) (original band; year rebanded)
B = bird missing color band (year)
C = bird died (year)
D = bird with broken foot (year)

Resight history

y = resighted at least once (# times unknown)
0 = not resighted
x = band no longer resightable (dead, removed)

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	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	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

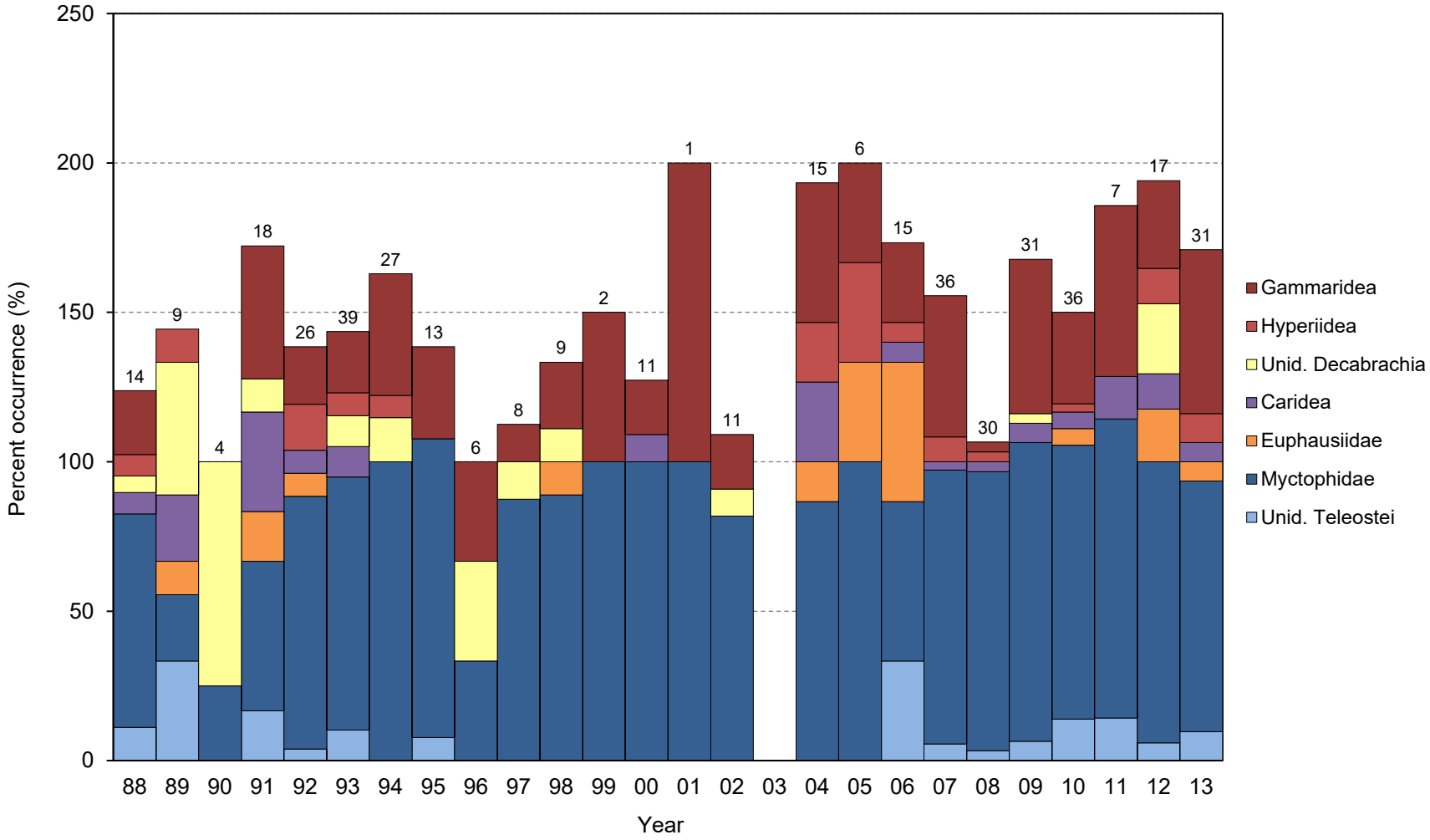

Figure 54. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average 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 76. 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
Orchomene spp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyperiidea	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**
Stenobrachius leucopsarus	-	-	-	-	-	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 76 (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
Orchomene 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**
Stenobrachius leucopsarus	-	-	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

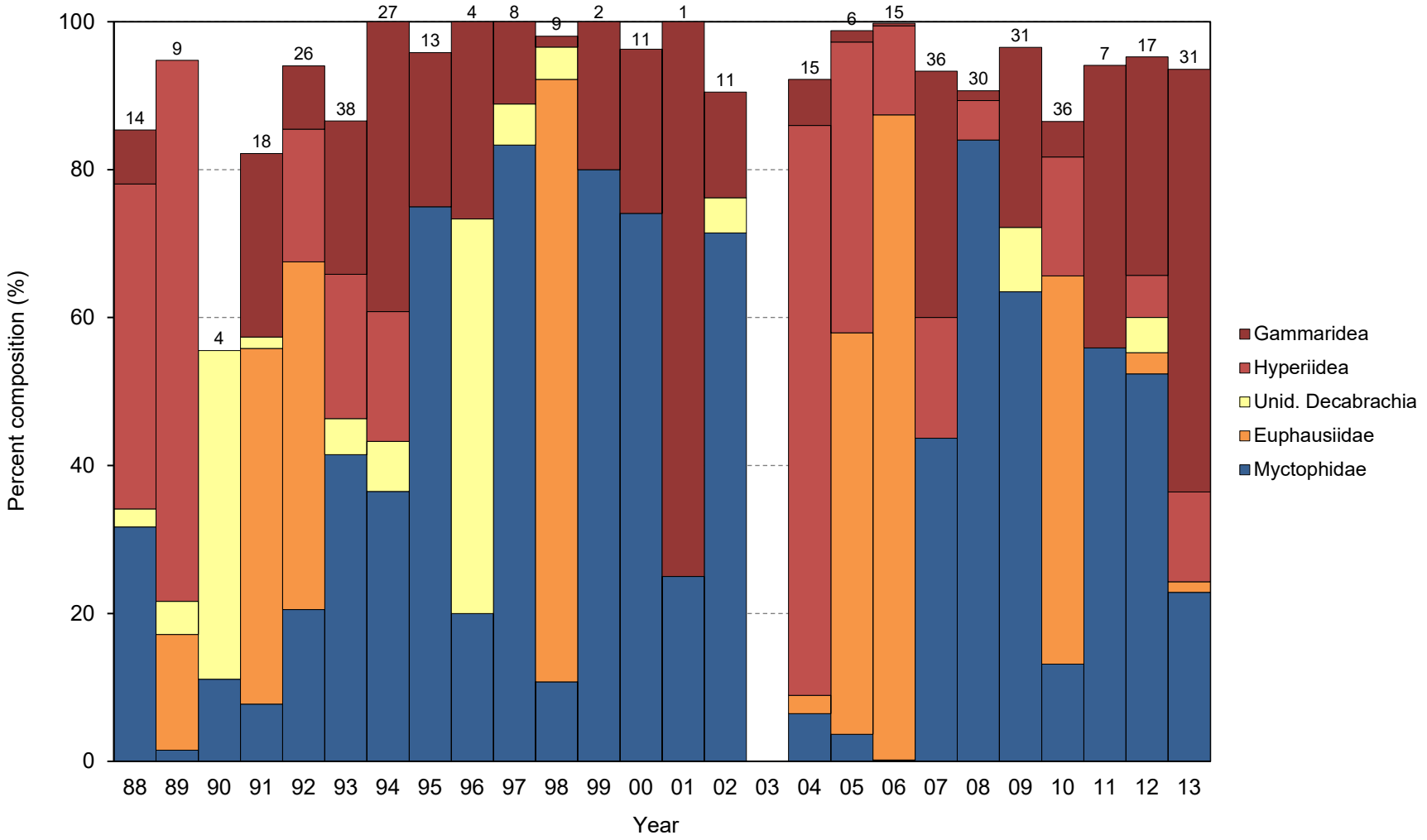

Figure 55. Percent composition of major prey items in diets of red-legged kittiwake adults and chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average 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 77. 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**	**-**	**-**	**-**	**-**	**-**	**-**
Themisto pacifica	43.9	-	-	-	-	-	17.6	-	-	-	-	-	-
Themisto 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**
Stenobrachius leucopsarus	-	-	-	-	-	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 77 (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**
Themisto pacifica	-	-	38.3	39.3	12.1	16.3	5.3	0.0	16.1	-	4.8	11.4
Themisto 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**
Stenobrachius leucopsarus	-	-	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

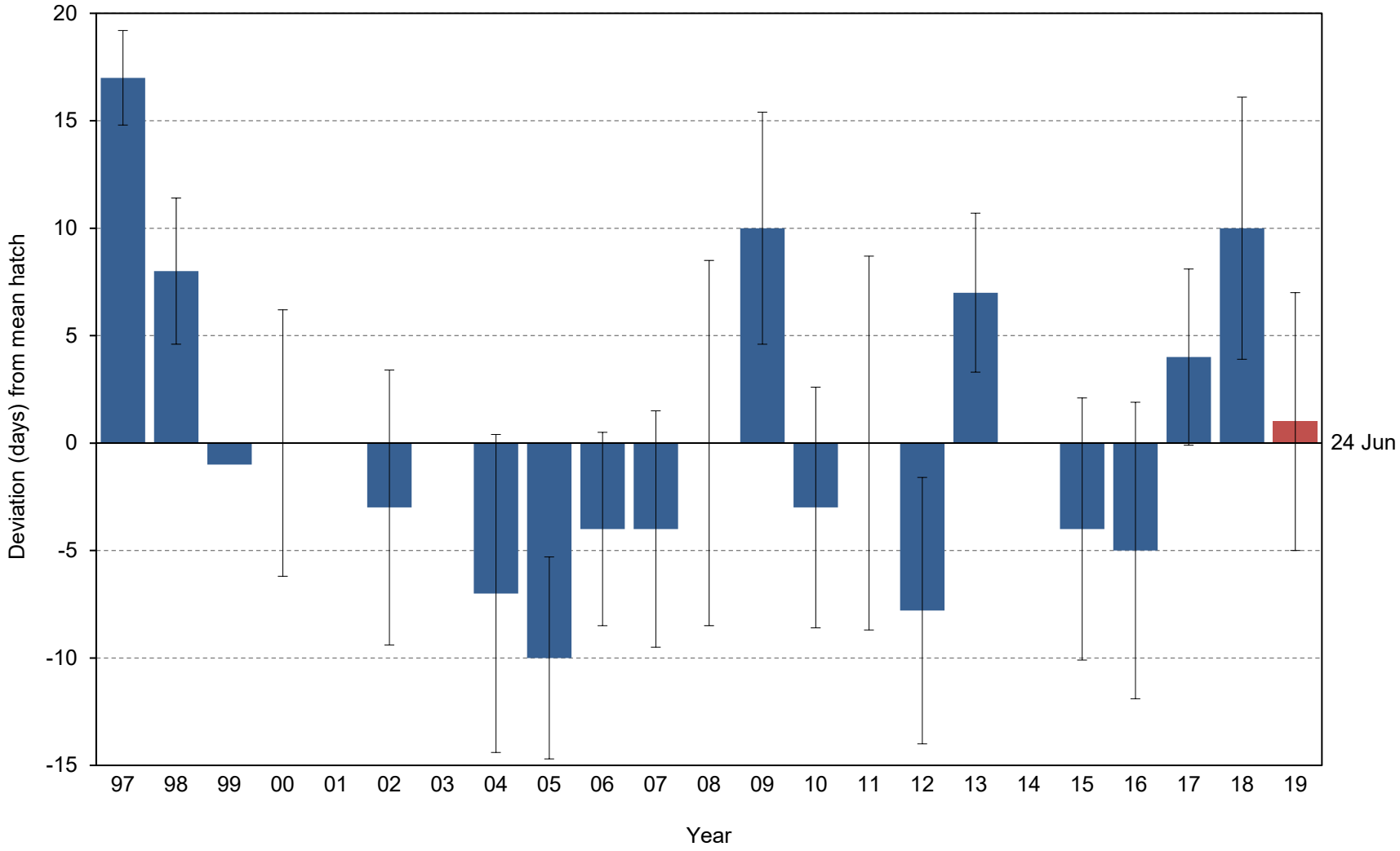

Figure 56. Yearly hatch date deviation (from the 1997-2018 average of 24 June) for glaucous-winged gulls at Buldir Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date (years without error bars have sample size of one); 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 78. 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
2018	-	-	-	4 Jul	6.1	8	<31 May	26 Jun	14 Jul
2019	-	-	-	25 Jun	6.0	26	<3 Jun	16 Jun	6 Jul

[a]In 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.
[b]Sample sizes for mean lay dates are a sub-sample of total nests for which no egg to egg interval is ≤ 7 days.
[c]Sample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.
[b]xx indicates data potentially exist but have not yet been summarized.
[e]Outlier not included in mean hatch calculation.
[f]Chicks present at first check in 2001, 2003, and 2014 so mean and distribution of hatch dates could not be determined.

Table 79. 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	18	19
Before 1st 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	-	-	-	-	3
168	-	-	-	2	xx	1	xx	-	-	1	-	-	-	3	-	3	-	xx	1	2	-	-	-
169	-	-	-	-	xx	-	xx	-	-	5	-	-	-	1	1	-	-	xx	3	1	-	-	2
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	-	1
173	-	-	-	-	xx	-	xx	-	-	-	-	-	-	2	-	-	-	xx	1	1	-	-	2
174	-	-	1	2	xx	-	xx	-	-	-	4	-	-	3	-	1	-	xx	3	2	-	-	-
175	-	-	-	-	xx	2	xx	-	-	2	-	-	-	1	-	-	-	xx	-	-	-	-	9
176	-	1	-	-	xx	-	xx	2	-	1	-	-	1	5	-	4	-	xx	2	6	1	-	-
177	-	-	-	-	xx	-	xx	-	-	-	4	-	-	1	-	1	-	xx	-	-	-	2	-
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	-	-	-	4
182	-	-	-	-	xx	-	xx	2	-	-	-	-	1	-	-	-	1	xx	-	-	3	1	1
183	-	1	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-	-	-
184	-	1	-	-	xx	-	xx	-	-	-	-	4	-	1	-	-	1	xx	-	-	-	-	1
185	-	-	-	1	xx	-	xx	-	-	-	-	-	1	-	1	-	-	xx	-	-	-	-	1
186	-	6	-	-	xx	-	xx	-	-	-	-	-	2	-	-	-	1	xx	-	-	-	2	-
187	-	-	-	-	xx	-	xx	-	-	-	-	-	-	-	-	-	-	xx	-	-	-	-	2
188	-	-	-	-	xx	-	xx	-	-	-	-	-	2	-	-	-	-	xx	-	-	-	2	-
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	-	-	-	1	-
196	-	-	-	-	xx	-	xx	-	-	-	-	-	1	-	-	-	-	xx	-	-	-	-	-
n	5	13	1	7	xx	14	xx	18	12	14	22	22	10	29	3	27	5	xx	25	25	6	8	26

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.
[b]xx indicates data potentially exist but have not yet been summarized.

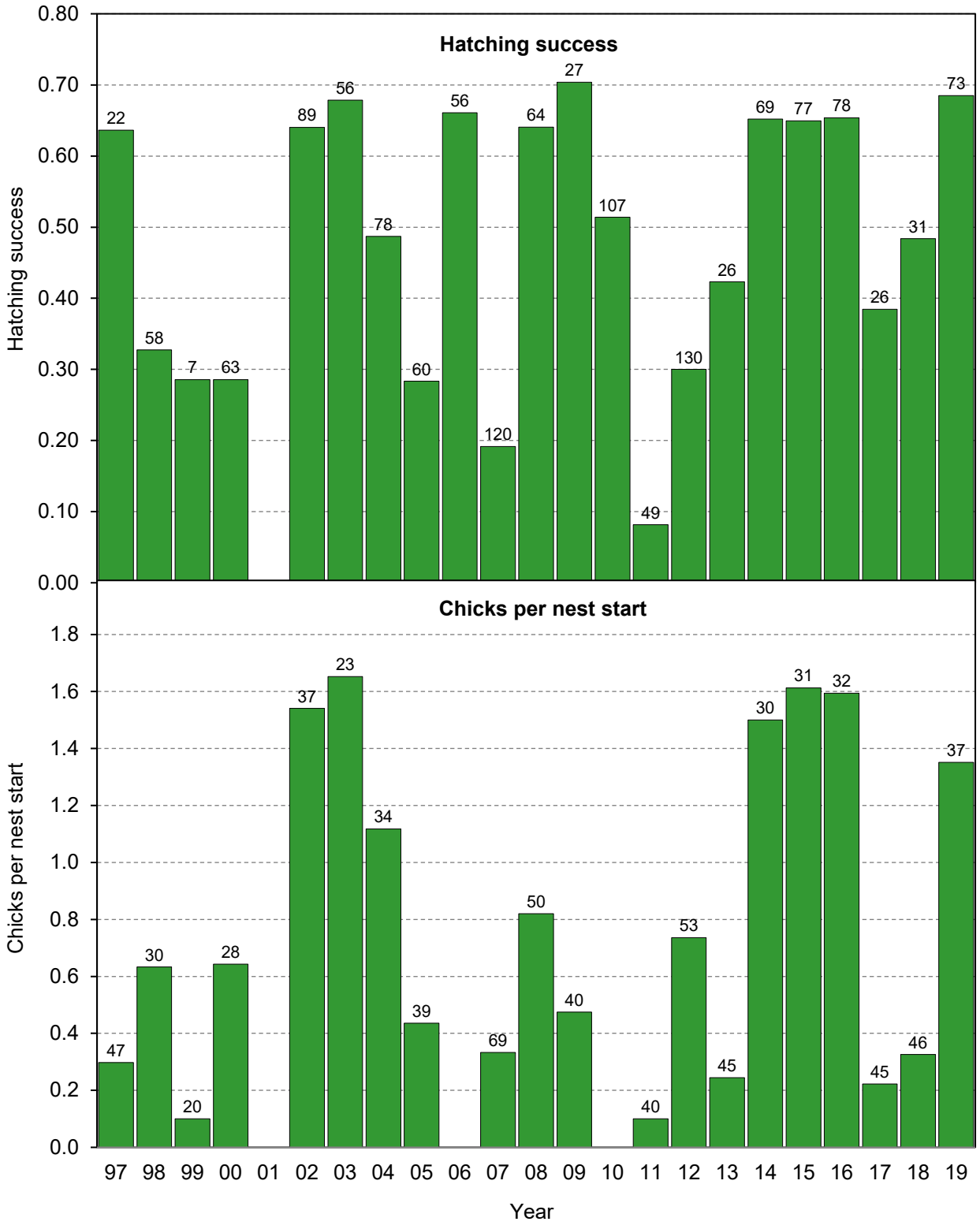

Figure 57. Reproductive performance of glaucous-winged gulls at Buldir Island, Alaska. Hatching success=E/C; Chicks per nest start=E/A; where A=total nest starts, C=total eggs; E=total chicks. Numbers above columns indicate sample sizes ([C] for hatching success, [A] for chicks per nest start). No data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

Table 80. 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 82). 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	Nest sites w/ x eggs:					Nest sites w/ eggs	Total eggs	Nest sites w/ x chicks:			Nest sites w/ chicks	Total chicks	Laying success	Mean clutch size	Mean brood size	Nesting success	Hatching success	Prop. nest sites w/ chicks	Chicks/ nest start
	(A)[a]	0	1	2	3	4	(B)	(C)	1	2	3	(D)	(E)	(B/A)	(C/B)	(E/D)	(D/B)	(E/C)	(D/A)[b]	(E/A)[b]
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	0.3
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	0.6
1999	20	17	0	2	1	0	3	7	-	-	-	1	2	0.15	2.3	2.0	0.33	0.29	0.05	0.1
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	0.6
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	1.5
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	1.7
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	1.1
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	0.4
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	0.3
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	0.8
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	0.5
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	0.1
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	0.7
2013	45	31	1	5	5	0	11	26	1	5	0	6	11	0.24	2.4	1.8	0.55	0.42	0.13	0.2
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	1.5
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	1.6
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	1.6
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	0.2
2018	46	29	5	10	2	0	17	31	2	5	1	8	15	0.37	1.8	1.9	0.47	0.48	0.17	0.3
2019	37	7	3	11	16	0	30	73	7	14	5	26	50	0.81	2.4	1.9	0.87	0.68	0.70	1.4

[a]Number of nests represents maximum number of nests during the season.

[b]Proportion 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.

[c]Chicks were present on the first visit in 2003.

[d]Empty nest bowls were not counted in 2006 and 2010.

[e]Gull nests were monitored between North Bight Beach and West Main Talus in 2010.

Table 81. Standard deviation in reproductive performance parameters of glaucous-winged gulls at Buldir Island, Alaska, as determined by a nest-monitoring methodology (also called the Nest Method). No data were collected in 2001.

Year	No. plots[a]	Total nest starts	Sampling design[b]	Laying success	Mean clutch size	Mean brood size	Nesting success	Hatching success	Prop. nest sites w/ chicks	Chicks/ nest start
1997	1	47	Simple random	0.06	xx[c]	xx	0.13	0.10	0.05	xx
1998	1	30	Simple random	0.06	xx	xx	0.10	0.06	0.09	xx
1999	1	20	Simple random	0.08	xx	xx	0.27	0.17	0.05	xx
2000	1	28	Simple random	0.07	xx	xx	0.10	0.06	0.09	xx
2002	1	37	Simple random	0.06	xx	xx	0.06	0.05	0.07	xx
2003	1	23	Simple random	0.04	xx	xx	0.06	0.06	0.07	xx
2004	1	34	Simple random	0.07	xx	xx	0.09	0.06	0.09	xx
2005	1	39	Simple random	0.08	xx	xx	0.10	0.06	0.08	xx
2006	1	-	Simple random	-	xx	xx	0.10	0.06	-	xx
2007	1	69	Simple random	0.05	xx	xx	0.06	0.04	0.05	xx
2008	1	50	Simple random	0.07	xx	xx	0.08	0.06	0.07	xx
2009	1	40	Simple random	0.07	xx	xx	0.11	0.09	0.07	xx
2010	1	-	Simple random	-	xx	xx	0.07	0.05	-	xx
2011	1	40	Simple random	0.08	xx	xx	0.08	0.04	0.04	xx
2012	1	53	Simple random	0.05	xx	xx	0.07	0.04	0.07	xx
2013	1	45	Simple random	0.06	xx	xx	0.15	0.10	0.05	xx
2014	1	30	Simple random	0.05	xx	xx	0.08	0.06	0.08	xx
2015	1	31	Simple random	0.05	xx	xx	0.06	0.05	0.07	xx
2016	1	32	Simple random	0.06	xx	xx	0.05	0.05	0.07	xx
2017	1	45	Simple random	0.06	xx	xx	0.15	0.10	0.05	xx
2018	1	46	Simple random	0.07	xx	xx	0.12	0.09	0.06	xx
2019	1	37	Simple random	0.06	xx	xx	0.06	0.05	0.08	xx

[a]Plots that are combined for analysis are counted as a single "plot".

[b]Sampling for gulls is clustered by plot except when sample sizes per plot are too small or plot data are not available. For 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.

[c]xx indicates data potentially exist but have not yet been summarized.

Table 82. 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 80); 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	Nest sites w/ x eggs:				Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Laying success	Mean clutch size	Mean brood size	Nesting success	Hatching success	Prop. nest sites w/ chicks	Chicks/ nest start
	(A)[a]	1	2	3	4	(B)	(C)	(D)	(E)	(B/A)	(C/B)	(E/D)	(D/B)	(E/C)	(D/A)[b]	(E/A)[b]
1979[b]	-	1	10	56	0	67	-	-	-	-	2.8	-	-	-	-	0.6
1992	209	28	48	84	0	160	376	-	122	0.77	2.4	-	-	0.32	-	0.2
1993	199	26	35	72	0	133	312	-	35	0.67	2.3	-	-	0.11	-	0.3
1994	180	15	40	75	1	131	324	-	49	0.73	2.5	-	-	0.15	-	0.3
1995	133	5	20	26	0	51	123	-	34	0.38	2.4	-	-	0.28	-	0.5
1996	175	15	35	85	0	135	340	-	83	0.77	2.5	-	-	0.24	-	0.3
1997	88	6	10	9	0	25	53	-	28	0.28	2.1	-	-	0.53	-	0.4
1998	75	8	26	22	0	56	126	-	28	0.75	2.3	-	-	0.22	-	0.1
1999	20	0	2	1	0	3	7	-	2	0.15	2.3	-	-	0.29	-	0.3
2000	54	3	10	30	0	43	113	-	17	0.80	2.6	-	-	0.15	-	0.3
2001	40	3	12	19	0	34	84	-	12	0.85	2.5	-	-	0.14	-	0.9
2002	38	0	6	23	0	29	81	-	33	0.76	2.8	-	-	0.41	-	1.0
2003	23	3	4	14	0	21	53	-	22	0.91	2.5	-	-	0.42	-	0.7
2004	31	1	5	21	0	27	74	-	23	0.87	2.7	-	-	0.31	-	0.4
2005	39	3	3	15	0	21	54	-	17	0.54	2.6	-	-	0.31	-	0.6
2006	9	2	0	3	0	5	11	-	5	0.56	2.2	-	-	0.45	-	-
2007[c]	4	0	0	3	0	3	9	-	-	0.75	3.0	-	-	-	-	0.9
2008	38	3	11	10	0	24	55	-	33	0.63	2.3	-	-	0.60	-	0.3
2009[d]	19	0	3	1	0	4	9	3	6	0.21	2.3	2.0	0.75	0.67	0.16	-[e]
2010[d]	-[e]	0	2	16	0	18	52	15	27	-[e]	2.9	1.8	0.83	0.52	-[e]	0.0
2011	7	1	2	3	0	6	14	0	0	0.86	2.3	0.0	0.00	0.00	0.00	-
2012	17	0	2	9	0	11	31	-	-	0.65	2.8	-	-	-	-	0.6
2013	7	0	1	1	0	2	5	2	4	0.29	2.5	2.0	1.00	0.80	0.29	0.0
2014	9	0	2	6	0	8	22	0	0	0.88	2.8	0.0	0.00	0.00	0.00	0.6

[a]Proportion 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.

[b]Data 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.

[c]In 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 80).

[d]Values 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.

[e]Empty nest bowls were not counted in 2006 and 2010.

Table 83. Standard deviation in reproductive performance parameters of glaucous-winged gulls at Buldir Island, Alaska, as determined by a count methodology (also called the Egg Method). 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	No. plots[a]	Total nest starts	Sampling design[b]	Laying success	Mean clutch size	Mean brood size	Nesting success	Hatching success	Prop. nest sites w/ chicks	Chicks/ nest start
1979	1	-	Simple random	-	xx[c]	xx	-	-	-	xx
1992	1	209	Simple random	0.03	xx	xx	-	0.02	-	xx
1993	1	199	Simple random	0.03	xx	xx	-	0.02	-	xx
1994	1	180	Simple random	0.03	xx	xx	-	0.02	-	xx
1995	1	133	Simple random	0.04	xx	xx	-	0.04	-	xx
1996	1	175	Simple random	0.03	xx	xx	-	0.02	-	xx
1997	1	88	Simple random	0.05	xx	xx	-	0.07	-	xx
1998	1	75	Simple random	0.05	xx	xx	-	0.04	-	xx
1999	1	20	Simple random	-	xx	xx	-	0.17	-	xx
2000	1	54	Simple random	0.05	xx	xx	-	0.03	-	xx
2001	1	40	Simple random	0.06	xx	xx	-	0.04	-	xx
2002	1	38	Simple random	0.07	xx	xx	-	0.05	-	xx
2003	1	23	Simple random	-	xx	xx	-	0.07	-	xx
2004	1	31	Simple random	0.06	xx	xx	-	0.05	-	xx
2005	1	39	Simple random	0.08	xx	xx	-	0.06	-	xx
2006	1	9	Simple random	0.17	xx	xx	-	0.15	-	xx
2007	1	4	Simple random	0.22	xx	xx	-	-	-	xx
2008	1	38	Simple random	0.08	xx	xx	-	0.07	-	xx
2009	1	19	Simple random	0.09	xx	xx	0.22	0.16	0.08	xx
2010	1	-	Simple random	-	xx	xx	0.09	0.07	-	xx
2011	1	7	Simple random	0.13	xx	xx	0.00	0.00	0.00	xx
2012	1	17	Simple random	0.12	xx	xx	-	-	-	xx
2013	1	7	Simple random	0.17	xx	xx	0.00	0.18	0.17	xx
2014	1	9	Simple random	0.11	xx	xx	0.00	0.00	0.00	xx

[a]Plots that are combined for analysis are counted as a single "plot".

[b]Sampling for gulls is clustered by plot except when sample sizes per plot are too small or plot data are not available. For 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.

[c]xx indicates data potentially exist but have not yet been summarized.

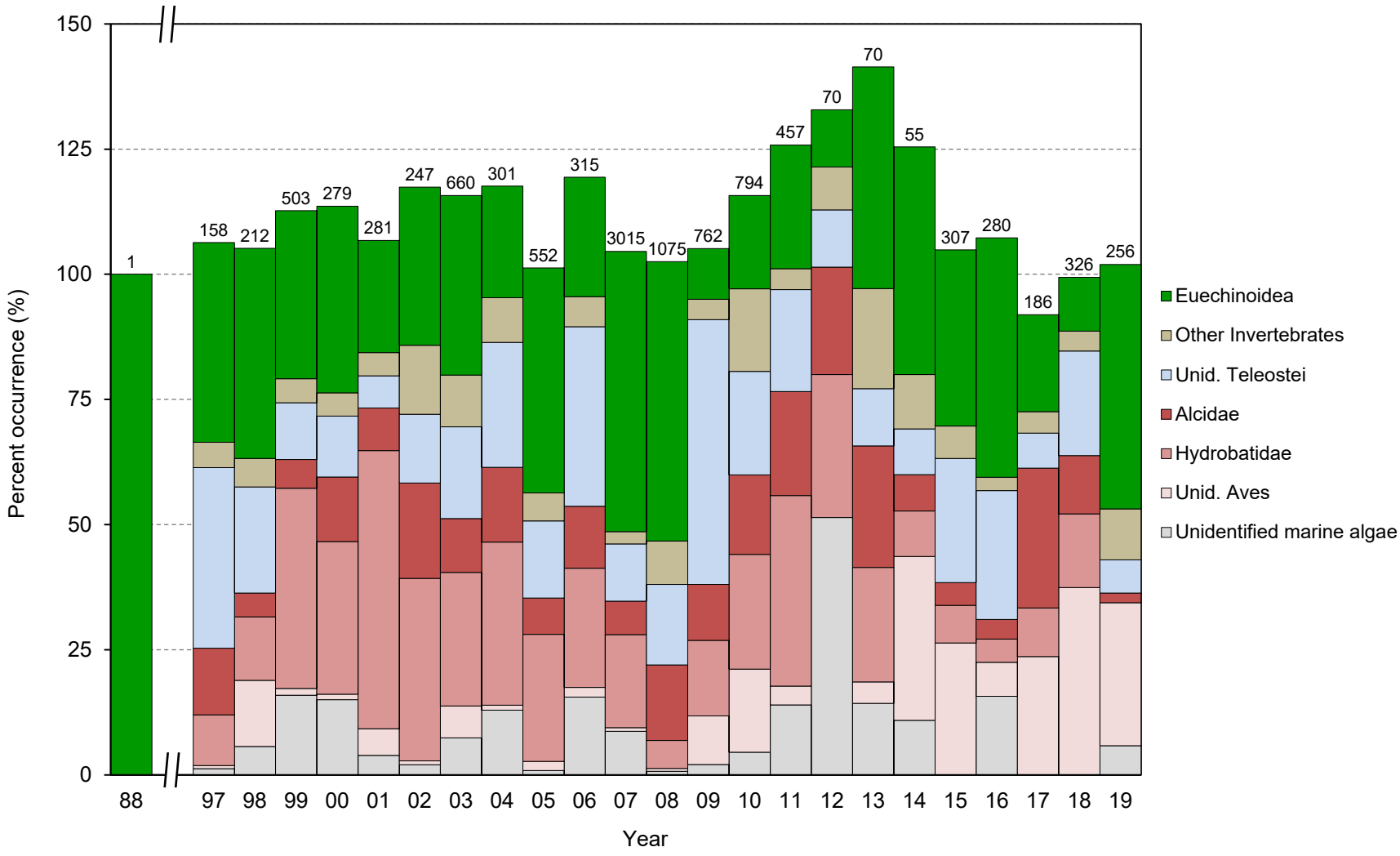

Figure 58. Frequency of occurrence of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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 (1997-2019). 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 (1997-2019) 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 (1997-2019). 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	2018	2019
No. samples	1	158	212	503	279	281	247	660	301	552	315	3015	1075	762	794	457	70	70	55	307	280	186	326	256
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**	**13.8**	**58.2**
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**	**10.7**	**48.8**
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	10.7	48.8
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	4.0	10.2
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**	**20.9**	**6.6**
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**	**20.9**	**6.6**
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	20.9	6.6
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**	**64.7**	**30.5**
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**	**11.7**	**2.0**
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	11.7	2.0
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**	**14.7**	**-**
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**	**14.7**	**-**
Hydrobates furcatus	-	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	4.9	-
H. leucorhous	-	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	9.2	-
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	0.6	-
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	37.4	28.5
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	2.1	-
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**	**9.8**	**5.9**
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	-	-	5.9
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	9.8	-

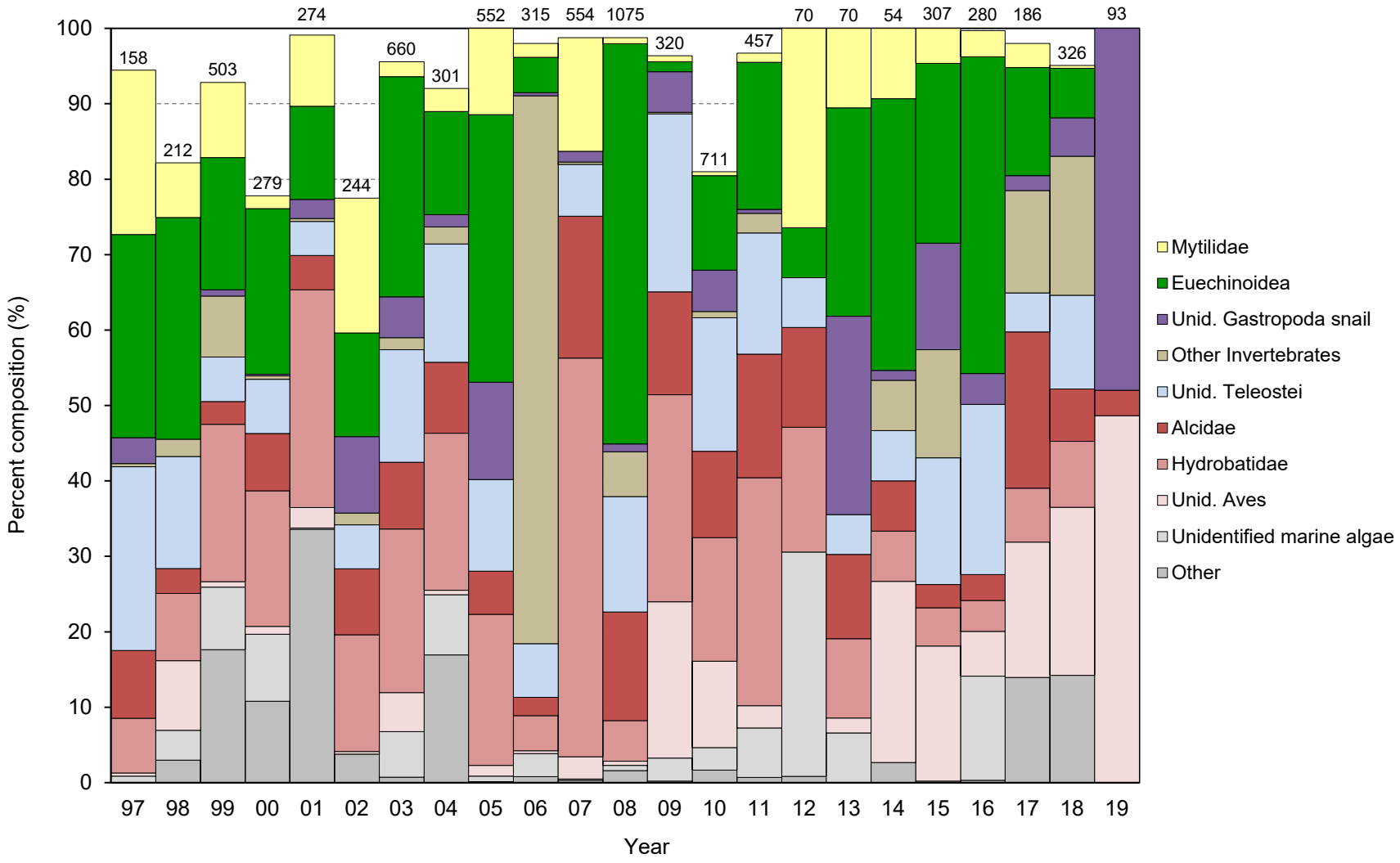

Figure 59. Percent composition of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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	2018	2019
No. samples	158	212	503	279	274	244	660	301	552	315	554	1075	320	711	457	70	70	54	307	280	186	326	93
No. individuals	234	303	964	473	551	582	812	490	699	1608	638	1131	521	1204	579	121	152	75	453	319	251	548	150
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**	**34.1**	**48.0**
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**	**0.4**	**-**
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**	**0.4**	**-**
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	0.4	-
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**	**6.6**	**-**
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	6.6	-
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**	**8.8**	**48.0**
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	5.1	48.0
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	-	-	-	-	-	-	3.6	-
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	18.4	-
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**	**12.4**	**-**
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**	**17.8**	**16.1**	**6.6**	**5.3**	**6.7**	**16.8**	**22.6**	**5.2**	12.4	-
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	12.4	-
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**	**39.2**	**52.0**
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**	**6.9**	**52.0**
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	6.9	3.3
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**	**8.8**	**-**
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**	**8.8**	**-**
Hydrobates furcatus	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	2.9	-
H. leucorhous	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	5.5	-
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	0.4	-
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	22.3	48.7
Other Birds	-	1.0	0.8	0.2	0.2	1.9	2.0	1.6	-	0.1	0.3	0.5	-	1.0	2.8	-	-	-	-	0.3	2.0	1.3	-
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**	**14.2**	**-**
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	-	2.7	0.2	0.3	13.9	14.2	-

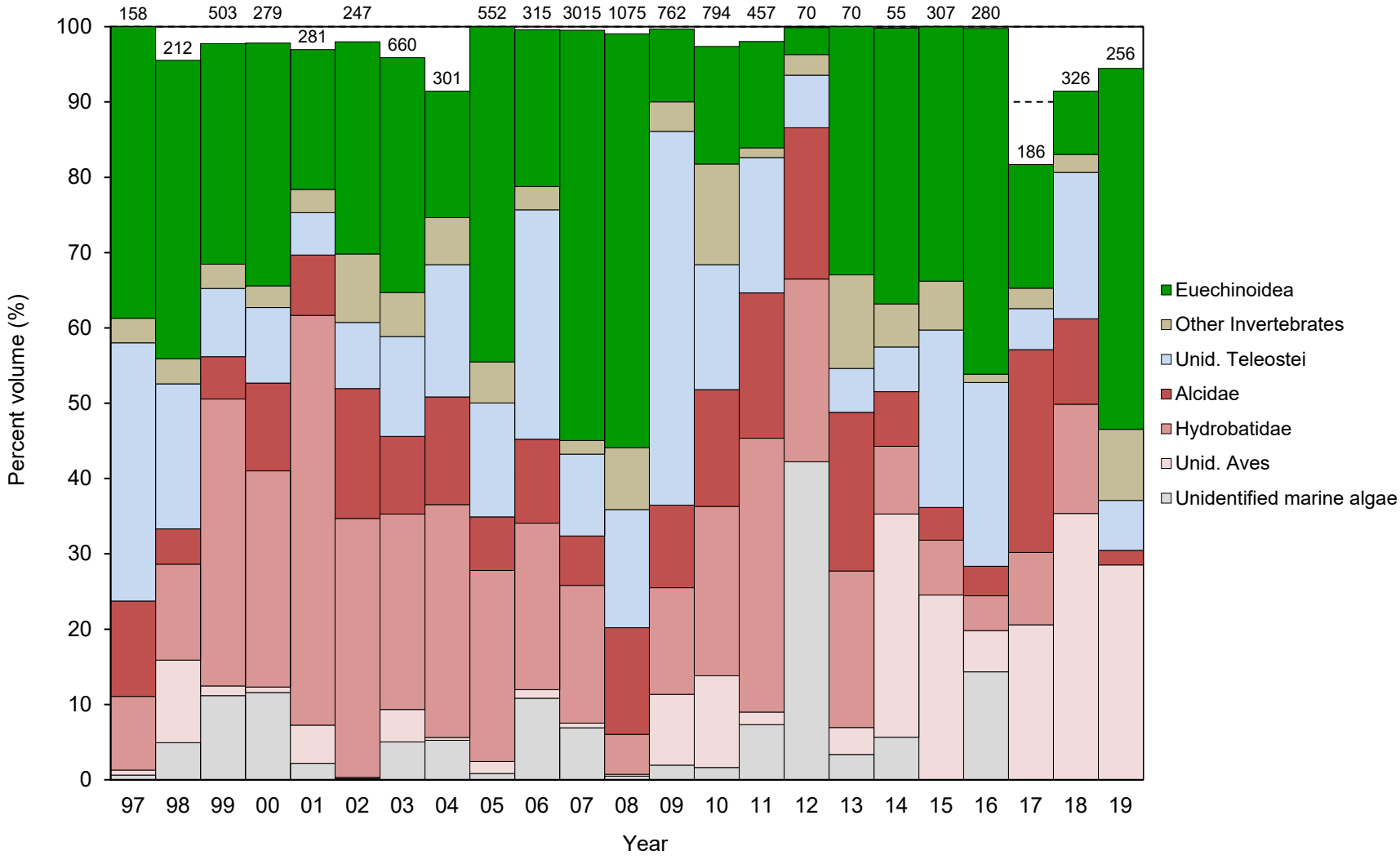

Figure 60. Percent volume of major prey items in diets of glaucous-winged gull adults at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets. Prey is grouped to family level or higher; only taxa with an among-year average volume of at least 5% are shown. Samples 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	2018	2019
No. samples	158	212	503	279	281	247	660	301	552	315	3015	1075	762	794	457	70	70	55	307	280	186	326	256
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**	**10.8**	**57.3**
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**	**8.4**	**47.9**
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	8.4	47.9
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	2.4	9.4
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**	**19.4**	**6.6**
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**	**19.4**	**6.6**
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	19.4	6.6
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**	**62.5**	**30.5**
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**	**11.4**	**2.0**
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	11.4	2.0
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**	**14.5**	**-**
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**	**14.5**	**-**
Hydrobates furcatus	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	4.7	-
H. leucorhous	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	9.2	-
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	0.6	-
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	35.4	28.5
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	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**	**7.3**	**5.5**
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	7.3	5.5

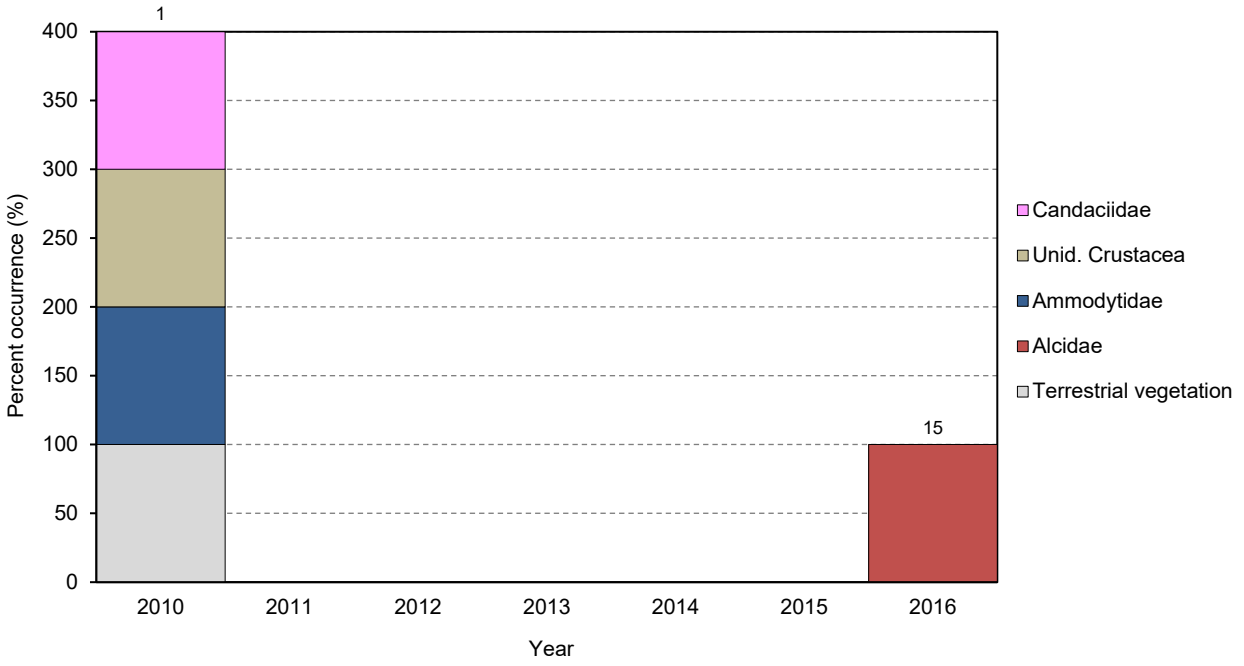

Figure 61. Frequency of occurrence of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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**	**-**
Candacia columbia	100.0	-
Unid. Crustacea	100.0	-
Fish	**100.0**	**-**
Teleostei	**100.0**	**-**
Ammodytidae	**100.0**	**-**
Ammodytes spp.	100.0	-
Birds	**-**	**100.0**
Charadriiformes	**-**	**100.0**
Alcidae	**-**	**100.0**
Uria spp. egg	-	100.0
Other	**100.0**	**-**
Terrestrial vegetation	100.0	-

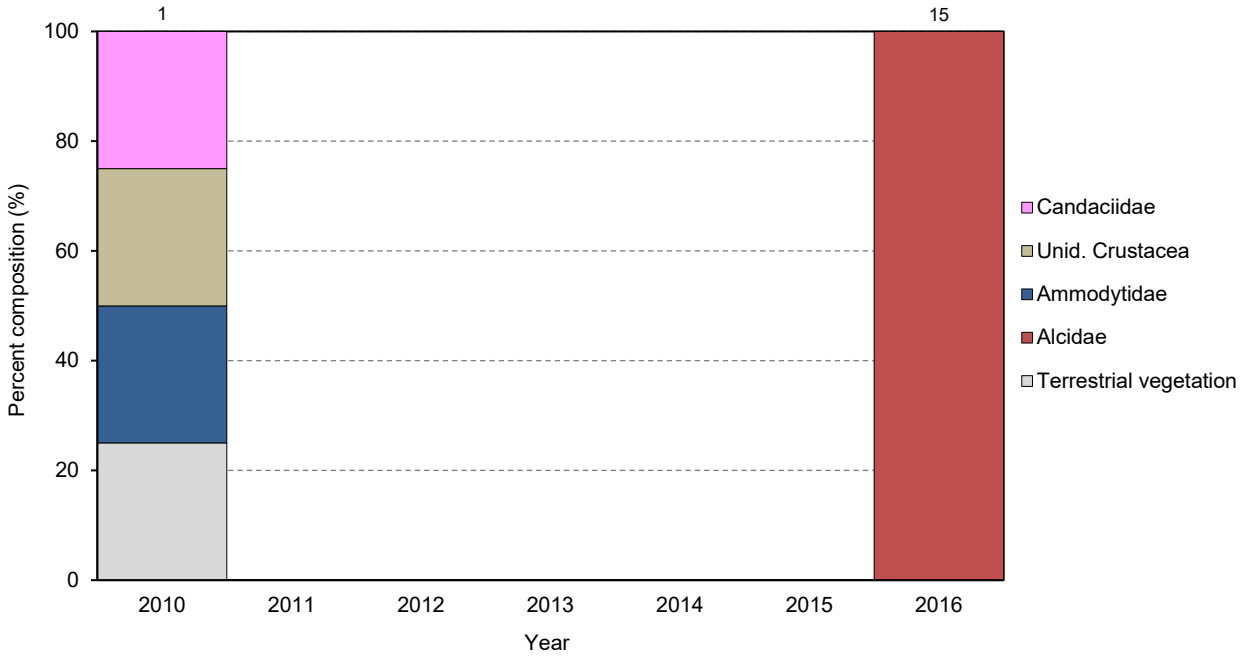

Figure 62. Percent composition of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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**	**-**
Candacia columbia	25.0	-
Unid. Crustacea	25.0	-
Fish	**25.0**	**-**
Teleostei	**25.0**	**-**
Ammodytidae	**25.0**	**-**
Ammodytes spp.	25.0	-
Birds	**-**	**100.0**
Charadriiformes	**-**	**100.0**
Alcidae	**-**	**100.0**
Uria spp. egg	-	100.0
Other	**25.0**	**-**
Terrestrial vegetation	25.0	-

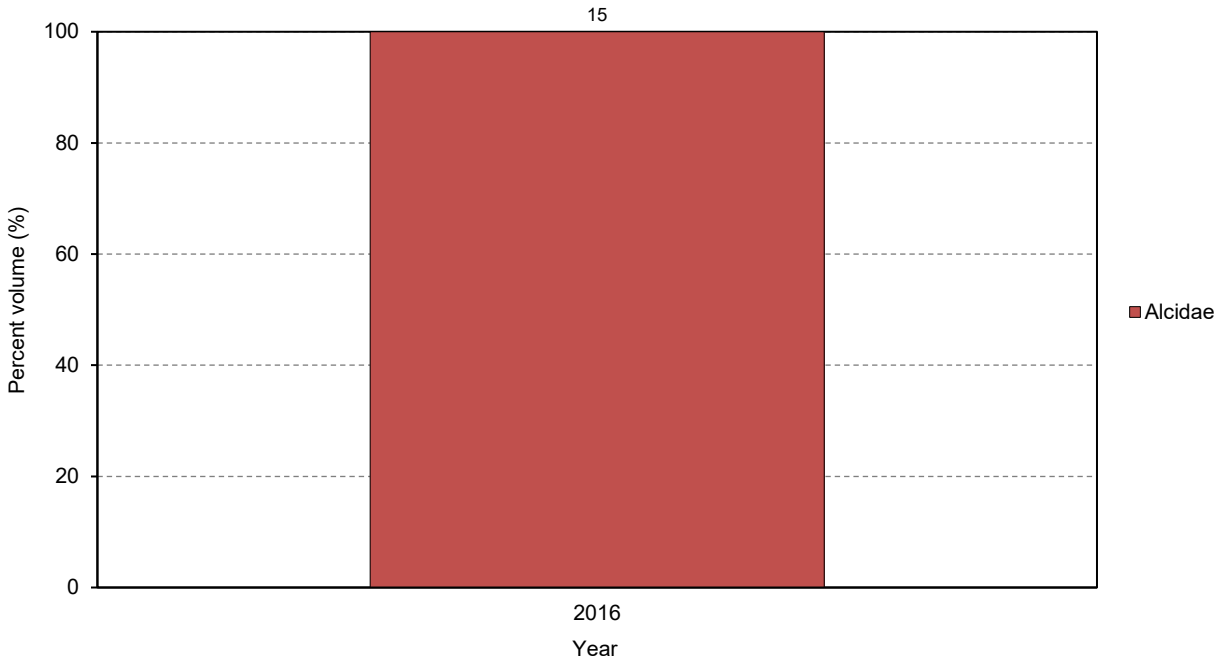

Figure 63. Percent volume of major prey items in diets of glaucous-winged gull chicks at Buldir Island, Alaska. Values represent the average percent volume of a prey item in all pellets. Prey is grouped to family level or higher; only taxa with an among-year average volume of at least 5% are shown. Samples 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**
Uria spp. egg	100.0

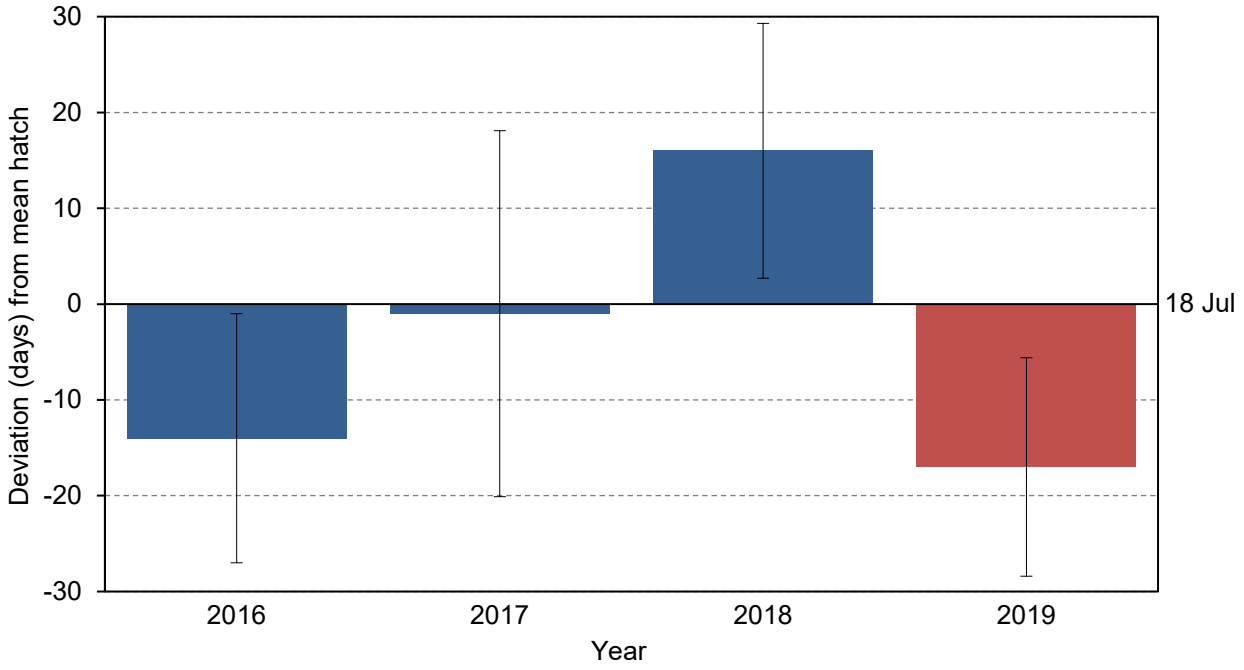

Figure 64. Yearly hatch date deviation (from the 2016-2018 average of 18 July) for fork-tailed storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. Negative values indicate earlier than mean hatch date, positive values indicate later than 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	*n*[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
2018	3 Aug	13.3	11	15 Jul	23 Aug	>25 Aug
2019	1 Jul	11.4	18	14 Jun	1 Aug	20 Aug

[a]Sample 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	2018	2019
165	-	-	-	2
166	1	-	-	-
167	-	-	-	-
168	-	-	-	-
169	-	-	-	-
170	-	-	-	-
171	-	-	-	1
172	4	-	-	-
173	-	-	-	-
174	-	-	-	-
175	-	-	-	-
176	-	-	-	-
177	-	-	-	7
178	2	2	-	-
179	-	-	-	-
180	-	-	-	-
181	-	-	-	-
182	3	-	-	-
183	-	-	-	3
184	-	4	-	-
185	-	-	-	-
186	-	-	-	-
187	3	-	-	-
188	-	-	-	-
189	-	-	-	3
190	-	1	-	-
191	-	-	-	-
192	-	-	-	-
193	2	-	-	-
194	-	-	-	-
195	-	-	-	-
196	-	1	2	-
197	-	-	-	-
198	-	-	-	-
199	-	-	-	-
200	1	-	-	-
201	-	-	-	1
202	-	1	1	-
203	-	-	-	-
204	-	-	-	-
205	1	-	-	-
206	-	-	-	-
207	-	-	-	-
208	-	-	2	-
209	-	-	-	-
210	-	-	-	-
211	-	-	-	-

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	2018	2019
212	-	-	-	-
213	-	-	-	1
214	-	1	-	-
215	-	-	1	-
216	1	-	-	-
217	-	-	-	-
218	-	-	-	-
219	-	-	-	-
219	-	-	-	-
220	-	-	2	-
221	-	-	-	-
222	-	-	-	-
223	-	-	-	-
224	-	2	-	-
224	-	-	-	-
225	-	-	-	-
226	-	-	-	-
227	-	-	-	-
228	-	-	-	-
229	-	-	-	-
230	-	-	-	-
231	-	-	2	-
232	-	-	-	-
233	-	-	-	-
234	-	-	-	-
235	-	-	1	-
236	-	1	-	-
n	18	13	11	18

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

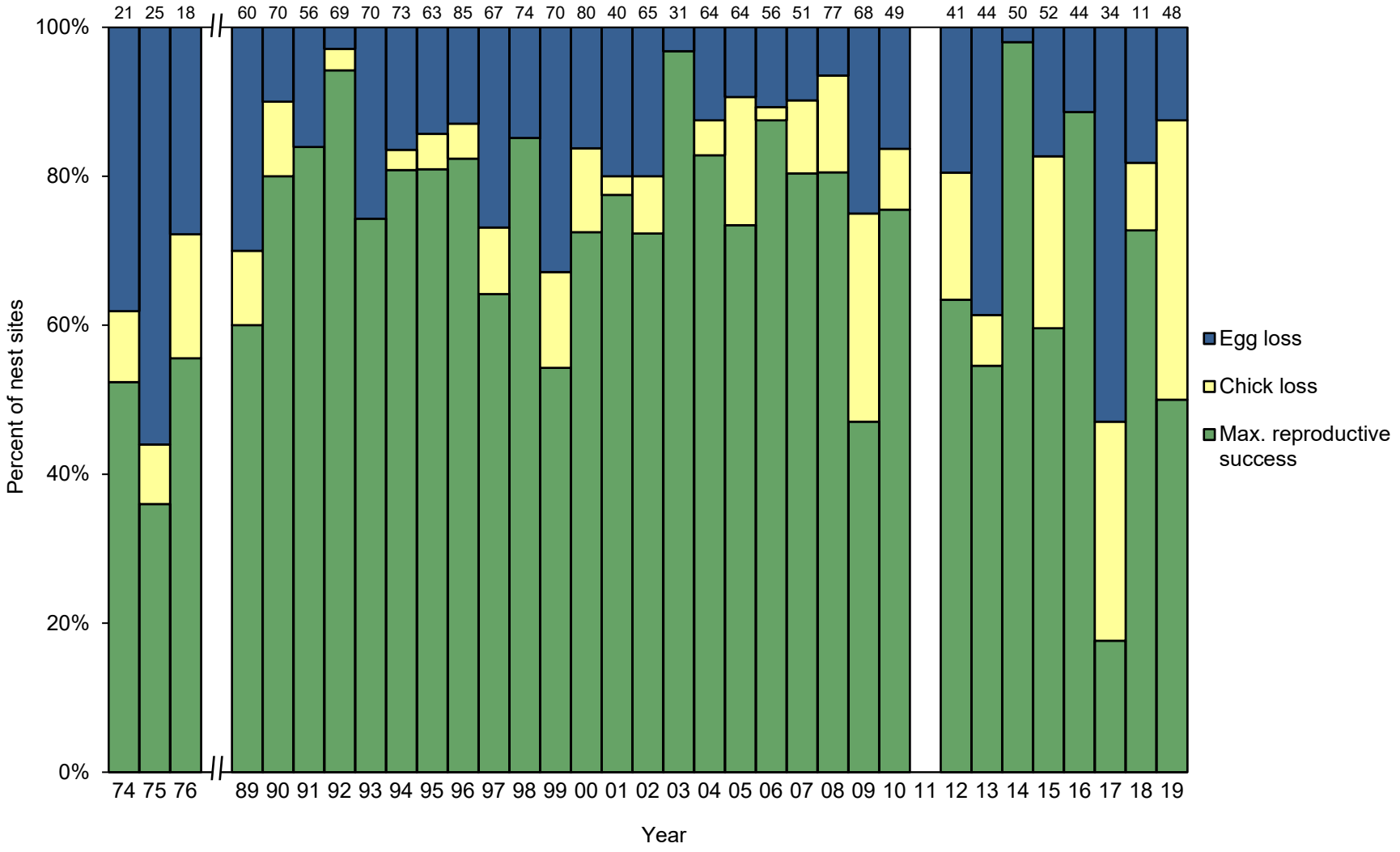

Figure 65. Reproductive performance of fork-tailed storm-petrels at Buldir Island, Alaska. Egg loss=[(B+H)-(D+H)]/(B+H); Chick loss=[(D+H)-(F+H)]/(B+H); Maximum potential reproductive success= (F+H)/(B+H), where B+H=maximum nest sites with eggs; D+H=maximum nest sites with chicks; F+H=maximum nest sites 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
1974	21	13	11	-	0.62	xx[g]	0.85	xx	0.52	xx	xx	xx
1975	25	11	9	-	0.44	xx	0.82	xx	0.36	xx	xx	xx
1976	18	13	10	-	0.72	xx	0.77	xx	0.56	xx	xx	xx
1989	60	42	36	7	0.70	xx	0.86	xx	0.60	xx	xx	xx
1990	70	63	56	4	0.90	xx	0.89	xx	0.80	xx	xx	xx
1991	56	47	47	11	0.84	xx	1.00	xx	0.84	xx	xx	xx
1992	69	67	65	4	0.97	xx	0.97	xx	0.94	xx	xx	xx
1993	70	52	52	11	0.74	xx	1.00	xx	0.74	xx	xx	xx
1994	73	61	59	5	0.84	xx	0.97	xx	0.81	xx	xx	xx
1995	63	54	51	11	0.86	xx	0.94	xx	0.81	xx	xx	xx
1996	85	74	70	5	0.87	xx	0.95	xx	0.82	xx	xx	xx
1997	67	49	43	2	0.73	xx	0.88	xx	0.64	xx	xx	xx
1998	74	63	63	4	0.85	xx	1.00	xx	0.85	xx	xx	xx
1999	70	47	38	1	0.67	xx	0.81	xx	0.54	xx	xx	xx
2000	80	67	58	1	0.84	xx	0.87	xx	0.73	xx	xx	xx
2001	40	32	31	0	0.80	xx	0.97	xx	0.78	xx	xx	xx
2002	65	52	47	0	0.80	xx	0.90	xx	0.72	xx	xx	xx
2003	31	30	30	0	0.97	xx	1.00	xx	0.97	xx	xx	xx
2004	64	56	53	0	0.88	xx	0.95	xx	0.83	xx	xx	xx
2005	64	58	47	0	0.91	xx	0.81	xx	0.73	xx	xx	xx
2006	56	50	49	1	0.89	xx	0.98	xx	0.88	xx	xx	xx
2007	51	46	41	4	0.90	xx	0.89	xx	0.80	xx	xx	xx
2008	77	72	62	0	0.94	xx	0.86	xx	0.81	xx	xx	xx
2009	68	51	32	3	0.75	0.09	0.63	0.17	0.47	0.13	5	Cluster by plot
2010	49	41	37	2	0.84	0.05	0.90	0.04	0.76	0.07	5	Cluster by plot
2011	59	-	-	-	-	-	-	-	-	-	5	-
2012	41	33	26	0	0.80	0.05	0.79	0.08	0.63	0.08	5	Cluster by plot
2013	44	27	24	0	0.61	0.09	0.89	0.04	0.55	0.10	5	Cluster by plot
2014	50	49	49	0	0.98	0.03	1.00	0.00	0.98	0.03	5	Cluster by plot
2015	52	43	31	0	0.83	0.07	0.72	0.07	0.60	0.09	7	Cluster by plot
2016	44	39	39	0	0.89	0.05	1.00	0.00	0.89	0.05	5	Cluster by plot

Table 92 (continued). 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
2017	34	16	6	2	0.47	0.12	0.38	0.14	0.18	0.07	5	Cluster by plot
2018	11	9	8	4	0.82	0.07	0.89	0.09	0.73	0.12	5	Cluster by plot
2019	48	42	24	0	0.88	0.06	0.57	0.07	0.50	0.08	5	Cluster by plot

[a]F+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).

[b]Eggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

[c]For 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).

[d]For 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).

[e]Plots that are combined for analysis are counted as a single "plot".

[f]Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. For sampling clustered by plot, standard deviation values are calculated based on plot as a sample unit; for simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

[g]xx indicates data potentially exist but have not yet been summarized.

Table 93. Reproductive performance of fork-tailed storm-petrels at Buldir Island, Alaska in 2019.

Parameter	Plot					Total	SD[a]
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	5	11	6	14	12	48	-
Max. nest sites w/ chicks (D+H)	3	11	6	11	11	42	-
Max. nest sites w/ chicks fledged (F+H)[b]	1	8	2	6	7	24	-
Nest sites w/ viable eggs at last visit[c]	0	0	0	0	0	0	-
Max. potential nesting success[(D+H)/(B+H)][d]	0.60	1.00	1.00	0.79	0.92	0.88	0.06
Max. potential fledging success [(F+H)/(D+H)][e]	0.33	0.73	0.33	0.55	0.64	0.57	0.07
Max. potential reproductive success [(F+H)/(B+H)]	0.20	0.73	0.33	0.43	0.58	0.50	0.08

[a]Standard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

[b]F+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).

[c]Eggs 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.

[d]For 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).

[e]For 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).

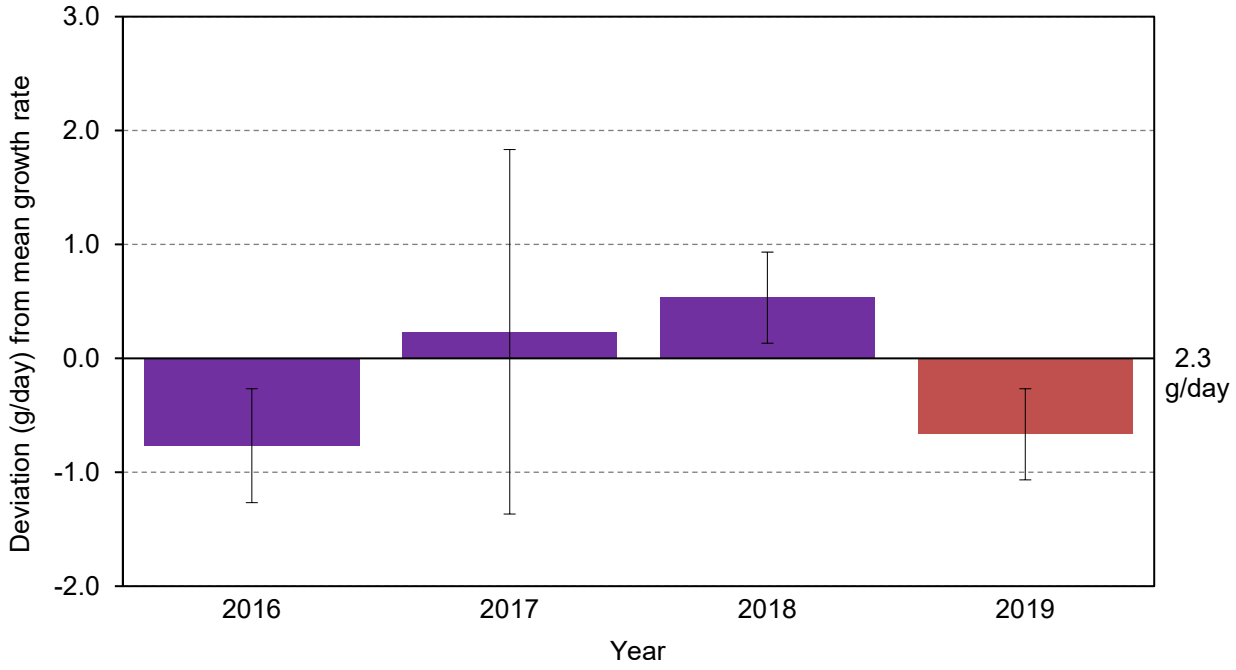

Figure 66. Yearly chick growth rate deviation (from the 2016-2018 average of 2.3 g/day) for fork-tailed storm-petrels at Buldir Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent standard deviation around each year's mean growth rate; red highlights the current year. No known data exist before 2016.

Table 94. 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	*n*	Mean	SD	Range	*n*
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
2018	2.8	0.6	2.1-3.8	8	3.6	0.3	3.1-4.1	7
2019	1.6	0.4	0.9-1.9	10	2.9	0.4	2.3-3.5	10

[a]All rates of growth are based on relaxed wing chord measurements.

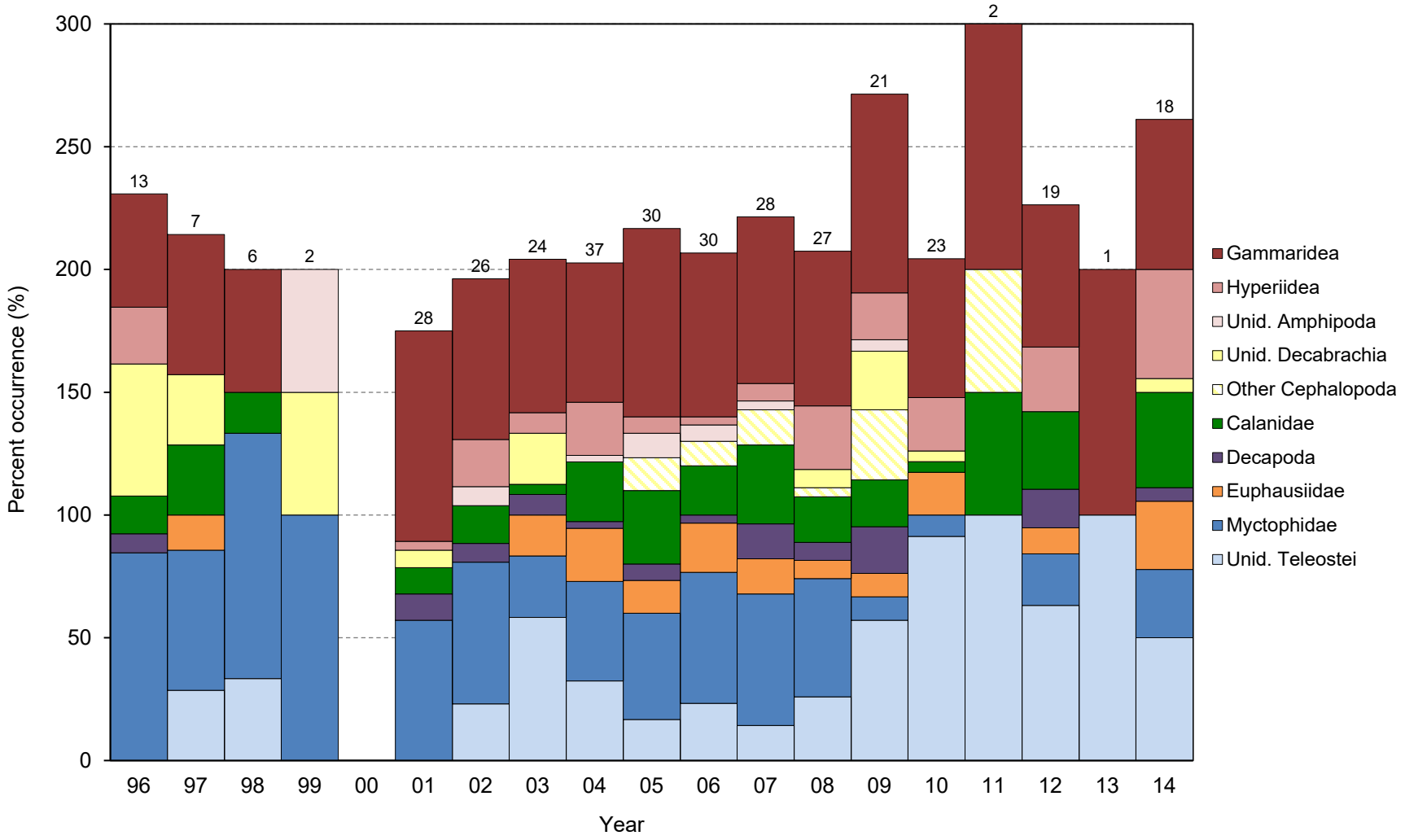

Figure 67. Frequency of occurrence of major prey items in diets of fork-tailed storm-petrel chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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 2015-2019 but have not yet been analyzed.

Table 95. 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 2015-2019 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	2008
No. samples	13	7	6	2	28	26	24	37	30	30	28	27
Invertebrates	**76.9**	**85.7**	**66.7**	**50.0**	**92.9**	**73.1**	**79.2**	**83.8**	**86.7**	**83.3**	**89.3**	**77.8**
Amphipoda	**61.5**	**57.1**	**50.0**	**50.0**	**85.7**	**73.1**	**66.7**	**70.3**	**83.3**	**73.3**	**75.0**	**66.7**
Gammaridea	**46.2**	**57.1**	**50.0**	**-**	**85.7**	**65.4**	**62.5**	**56.8**	**76.7**	**66.7**	**67.9**	**63.0**
Lysianassidae	46.2	57.1	50.0	-	85.7	65.4	62.5	56.8	76.7	50.0	21.4	-
Paracallisoma coecum	-	-	-	-	-	-	-	-	-	16.7	50.0	59.3
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-	7.4
Hyperiidea	**23.1**	**-**	**-**	**-**	**3.6**	**19.2**	**8.3**	**21.6**	**6.7**	**3.3**	**7.1**	**25.9**
Themisto pacifica	15.4	-	-	-	-	19.2	4.2	8.1	6.7	-	7.1	14.8
Other Hyperiidea	7.7	-	-	-	3.6	-	4.2	13.5	-	3.3	-	11.1
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**	**11.1**
Unid. Decabrachia	53.8	28.6	-	50.0	7.1	-	20.8	-	-	-	-	7.4
Other Cephalopoda	-	-	-	-	-	-	-	-	13.3	10.0	14.3	3.7
Copepoda	**15.4**	**28.6**	**16.7**	**-**	**10.7**	**15.4**	**4.2**	**24.3**	**30.0**	**20.0**	**32.1**	**18.5**
Calanidae	**15.4**	**28.6**	**16.7**	**-**	**10.7**	**15.4**	**4.2**	**24.3**	**30.0**	**20.0**	**32.1**	**18.5**
Neocalanus plumchrus/flemingeri	15.4	28.6	16.7	-	7.1	11.5	4.2	18.9	23.3	6.7	32.1	18.5
Unid. Calanidae	-	-	-	-	-	-	-	18.9	26.7	13.3	25.0	-
Other Calanidae	-	-	-	-	7.1	3.8	-	5.4	10.0	16.7	7.1	7.4
Other Copepoda	-	-	-	-	7.1	3.8	-	-	-	-	-	-
Decapoda	7.7	-	-	-	10.7	7.7	8.3	2.7	6.7	3.3	14.3	7.4
Euphausiacea	**-**	**14.3**	**-**	**-**	**-**	**-**	**16.7**	**21.6**	**13.3**	**20.0**	**14.3**	**7.4**
Euphausiidae	-	14.3	-	-	-	-	16.7	21.6	13.3	20.0	14.3	7.4
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**	**70.4**
Teleostei	**84.6**	**100.0**	**100.0**	**100.0**	**57.1**	**80.8**	**83.3**	**75.7**	**63.3**	**76.7**	**67.9**	**70.4**
Myctophidae	**84.6**	**57.1**	**100.0**	**100.0**	**57.1**	**57.7**	**25.0**	**40.5**	**43.3**	**53.3**	**53.6**	**48.1**
Stenobrachius leucopsarus	-	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	48.1
Other Myctophidae	-	-	-	-	-	-	-	2.7	-	-	-	-
Unid. Teleostei	-	28.6	33.3	-	-	23.1	58.3	32.4	16.7	23.3	14.3	25.9
Other Teleostei	-	14.3	-	-	-	-	-	2.7	3.3	-	-	-
Other	-	14.3	-	-	-	-	-	-	-	-	-	14.8

Table 95 (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 2015-2019 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	21[a]	23	2	19	1	18	12	20	3	6	7
Invertebrates	**100.0**	**78.3**	**100.0**	**94.7**	**100.0**	**94.4**	*pending*	*pending*	*pending*	*pending*	*pending*
Amphipoda	**90.5**	**65.2**	**100.0**	**78.9**	**100.0**	**77.8**	**-**	**-**	**-**	**-**	**-**
Gammaridea	**81.0**	**56.5**	**100.0**	**57.9**	**100.0**	**61.1**	**-**	**-**	**-**	**-**	**-**
Lysianassidae	-	-	-	-	-	-	-	-	-	-	-
Paracallisoma coecum	81.0	56.5	100.0	57.9	100.0	-	-	-	-	-	-
Other Gammaridea	-	-	-	-	-	61.1	-	-	-	-	-
Hyperiidea	**19.0**	**21.7**	**-**	**26.3**	**-**	**44.4**	**-**	**-**	**-**	**-**	**-**
Themisto pacifica	14.3	8.7	-	15.8	-	44.4	-	-	-	-	-
Other Hyperiidea	4.8	13.0	-	10.5	-	-	-	-	-	-	-
Unid. Amphipoda	4.8	-	-	-	-	-	-	-	-	-	-
Cephalopoda	**52.4**	**4.3**	**50.0**	**-**	**-**	**5.6**	**-**	**-**	**-**	**-**	**-**
Unid. Decabrachia	23.8	4.3	-	-	-	5.6	-	-	-	-	-
Other Cephalopoda	28.6	-	50.0	-	-	-	-	-	-	-	-
Copepoda	**19.0**	**8.7**	**50.0**	**36.8**	**-**	**50.0**	**-**	**-**	**-**	**-**	**-**
Calanidae	**19.0**	**4.3**	**50.0**	**31.6**	**-**	**38.9**	**-**	**-**	**-**	**-**	**-**
Neocalanus plumchrus/flemingeri	19.0	4.3	50.0	15.8	-	38.9	-	-	-	-	-
Unid. Calanidae	-	-	-	5.3	-	-	-	-	-	-	-
Other Calanidae	4.8	-	-	10.5	-	5.6	-	-	-	-	-
Other Copepoda	-	4.3	-	5.3	-	22.2	-	-	-	-	-
Decapoda	19.0	-	-	15.8	-	5.6	-	-	-	-	-
Euphausiacea	**9.5**	**17.4**	**-**	**10.5**	**-**	**27.8**	**-**	**-**	**-**	**-**	**-**
Euphausiidae	9.5	17.4	-	10.5	-	27.8	-	-	-	-	-
Other Invertebrates	-	4.3	-	5.3	-	11.1	-	-	-	-	-
Fish	**66.7**	**95.7**	**100.0**	**84.2**	**100.0**	**66.7**	**-**	**-**	**-**	**-**	**-**
Teleostei	**66.7**	**95.7**	**100.0**	**84.2**	**100.0**	**66.7**	**-**	**-**	**-**	**-**	**-**
Myctophidae	**9.5**	**8.7**	**-**	**21.1**	**-**	**27.8**	**-**	**-**	**-**	**-**	**-**
Stenobrachius leucopsarus	-	-	-	-	-	27.8	-	-	-	-	-
Unid. Myctophidae	9.5	8.7	-	21.1	-	-	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	57.1	91.3	100.0	63.2	100.0	50.0	-	-	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-
Other	14.3	4.3	-	15.8	-	-	-	-	-	-	-

[a]One sample is still pending analysis.

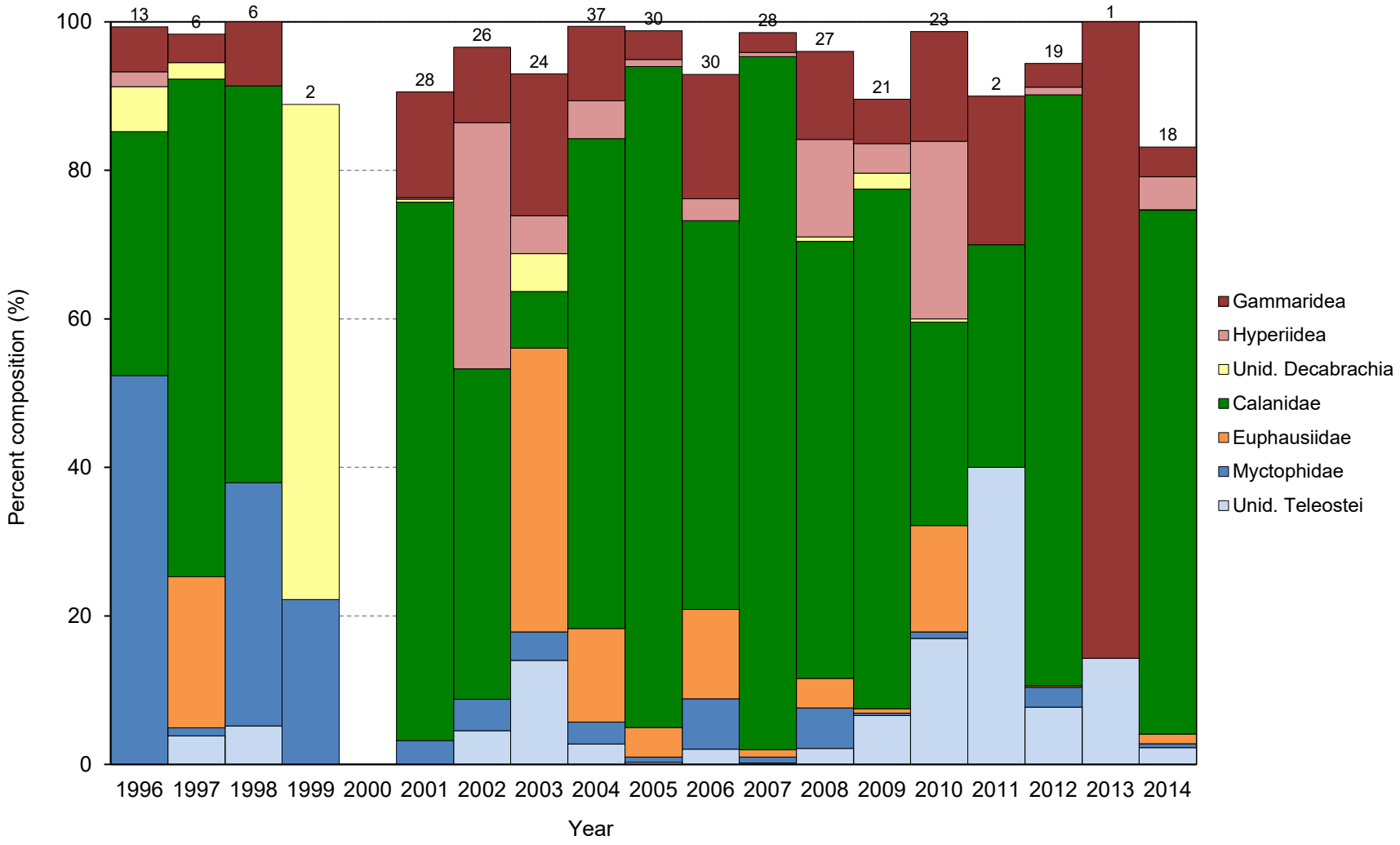

Figure 68. Percent composition of major prey items in diets of fork-tailed storm-petrel chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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 2015-2019 but have not yet been analyzed.

Table 96. 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 2015-2019 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	2008
No. samples	13	6	6	2	28	26	24	37	30	30	28	27
No. individuals	149	182	58	9	498	353	157	508	1849	340	2140	328
Invertebrates	**47.7**	**94.0**	**62.1**	**77.8**	**96.8**	**91.2**	**82.2**	**94.1**	**99.0**	**91.2**	**99.0**	**91.2**
Amphipoda	**8.1**	**3.8**	**8.6**	**11.1**	**14.5**	**43.9**	**24.2**	**15.4**	**5.1**	**20.6**	**3.3**	**25.0**
Gammaridea	**6.0**	**3.8**	**8.6**	**-**	**14.3**	**10.2**	**19.1**	**10.0**	**3.9**	**16.8**	**2.7**	**11.9**
Lysianassidae	6.0	3.8	8.6	-	14.3	10.2	19.1	10.0	3.9	14.1	1.4	-
Paracallisoma coecum	-	-	-	-	-	-	-	-	-	2.6	1.3	11.3
Other Gammaridea	-	-	-	-	-	-	-	-	-	-	-	0.6
Hyperiidea	2.0	-	-	-	0.2	33.1	5.1	5.1	0.9	2.9	0.6	13.1
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**	**2.1**
Unid. Decabrachia	6.0	2.2	-	66.7	0.4	-	5.1	-	-	-	-	0.6
Other Cephalopoda	-	-	-	-	-	-	-	-	0.2	5.9	1.0	1.5
Copepoda	**32.9**	**67.0**	**53.4**	**-**	**78.9**	**46.2**	**7.6**	**65.9**	**89.0**	**52.4**	**93.4**	**58.8**
Calanidae	**32.9**	**67.0**	**53.4**	**-**	**72.5**	**44.5**	**7.6**	**65.9**	**89.0**	**52.4**	**93.4**	**58.8**
Neocalanus plumchrus/flemingeri	32.9	67.0	53.4	-	71.9	44.2	7.6	49.4	59.5	10.3	76.6	49.7
Other Calanidae	-	-	-	-	0.6	0.3	-	16.5	29.5	42.1	16.7	9.1
Other Copepoda	-	-	-	-	6.4	1.7	-	-	-	-	-	-
Euphausiacea	**-**	**20.3**	**-**	**-**	**-**	**-**	**38.2**	**12.6**	**4.0**	**12.1**	**1.0**	**4.0**
Euphausiidae	-	20.3	-	-	-	-	38.2	12.6	4.0	12.1	1.0	4.0
Other Invertebrates	0.7	0.5	-	-	3.0	1.1	7.0	0.2	0.6	0.3	0.4	1.2
Fish	**52.3**	**5.5**	**37.9**	**22.2**	**3.2**	**8.8**	**17.8**	**5.9**	**1.0**	**8.8**	**1.0**	**7.6**
Teleostei	**52.3**	**5.5**	**37.9**	**22.2**	**3.2**	**8.8**	**17.8**	**5.9**	**1.0**	**8.8**	**1.0**	**7.6**
Myctophidae	**52.3**	**1.1**	**32.8**	**22.2**	**3.2**	**4.2**	**3.8**	**3.0**	**0.7**	**6.8**	**0.8**	**5.5**
Unid. Myctophidae	52.3	0.5	-	22.2	3.2	4.2	3.8	2.4	0.7	6.8	0.8	5.5
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	2.1
Other Teleostei	-	0.5	-	-	-	-	-	0.2	0.1	-	-	-
Other	-	0.5	-	-	-	-	-	-	-	-	-	1.2

Table 96 (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 2015-2019 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
No. samples	21[a]	23	2	19	1	18	12	20	3	6	7
No. individuals	653	230	10	896	7	1371	*pending*	*pending*	*pending*	*pending*	*pending*
Invertebrates	**91.9**	**81.3**	**60.0**	**89.2**	**85.7**	**97.2**	**-**	**-**	**-**	**-**	**-**
Amphipoda	**10.1**	**38.7**	**20.0**	**4.2**	**85.7**	**8.5**	**-**	**-**	**-**	**-**	**-**
Gammaridea	**6.0**	**14.8**	**20.0**	**3.2**	**85.7**	**4.0**	**-**	**-**	**-**	**-**	**-**
Lysianassidae	-	-	-	-	-	-	-	-	-	-	-
Paracallisoma coecum	6.0	14.8	20.0	3.2	85.7	-	-	-	-	-	-
Other Gammaridea	-	-	-	-	-	4.0	-	-	-	-	-
Hyperiidea	4.0	23.9	-	1.0	-	4.4	-	-	-	-	-
Other Amphipoda	0.2	-	-	-	-	-	-	-	-	-	-
Cephalopoda	**10.3**	**0.4**	**10.0**	**-**	**-**	**0.1**	**-**	**-**	**-**	**-**	**-**
Unid. Decabrachia	2.1	0.4	-	-	-	0.1	-	-	-	-	-
Other Cephalopoda	8.1	-	10.0	-	-	-	-	-	-	-	-
Copepoda	**70.0**	**27.4**	**30.0**	**79.6**	**-**	**87.0**	**-**	**-**	**-**	**-**	**-**
Calanidae	**70.0**	**27.4**	**30.0**	**79.6**	**-**	**70.5**	**-**	**-**	**-**	**-**	**-**
Neocalanus plumchrus/flemingeri	69.5	27.4	30.0	72.8	-	68.9	-	-	-	-	-
Other Calanidae	0.5	-	-	6.8	-	1.6	-	-	-	-	-
Other Copepoda	-	-	-	-	-	16.5	-	-	-	-	-
Euphausiacea	**0.6**	**14.3**	**-**	**0.2**	**-**	**1.3**	**-**	**-**	**-**	**-**	**-**
Euphausiidae	0.6	14.3	-	0.2	-	1.3	-	-	-	-	-
Other Invertebrates	0.9	0.4	-	5.1	-	0.4	-	-	-	-	-
Fish	**6.9**	**17.8**	**40.0**	**10.4**	**14.3**	**2.8**	**-**	**-**	**-**	**-**	**-**
Teleostei	**6.9**	**17.8**	**40.0**	**10.4**	**14.3**	**2.8**	**-**	**-**	**-**	**-**	**-**
Myctophidae	**0.3**	**0.9**	**-**	**2.7**	**-**	**0.5**	**-**	**-**	**-**	**-**	**-**
Unid. Myctophidae	0.3	0.9	-	2.7	-	-	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	0.5	-	-	-	-	-
Unid. Teleostei	6.6	17.0	40.0	7.7	14.3	2.3	-	-	-	-	-
Other Teleostei	-	-	-	-	-	-	-	-	-	-	-
Other	1.2	0.4	-	0.3	-	-	-	-	-	-	-

[a]One sample is still pending analysis.

Table 97. 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	*n*	Mean	SD	Range	*n*	Mean	SD	Range	*n*
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
2018	62.2	5.5	55.0-70.0	13	161	2.6	157-165	14	27.0	1.3	24.1-29.6	14
2019	65.5	4.1	61.0-75.0	13	163	3.3	157-168	13	27.4	0.8	26.0-29.0	13

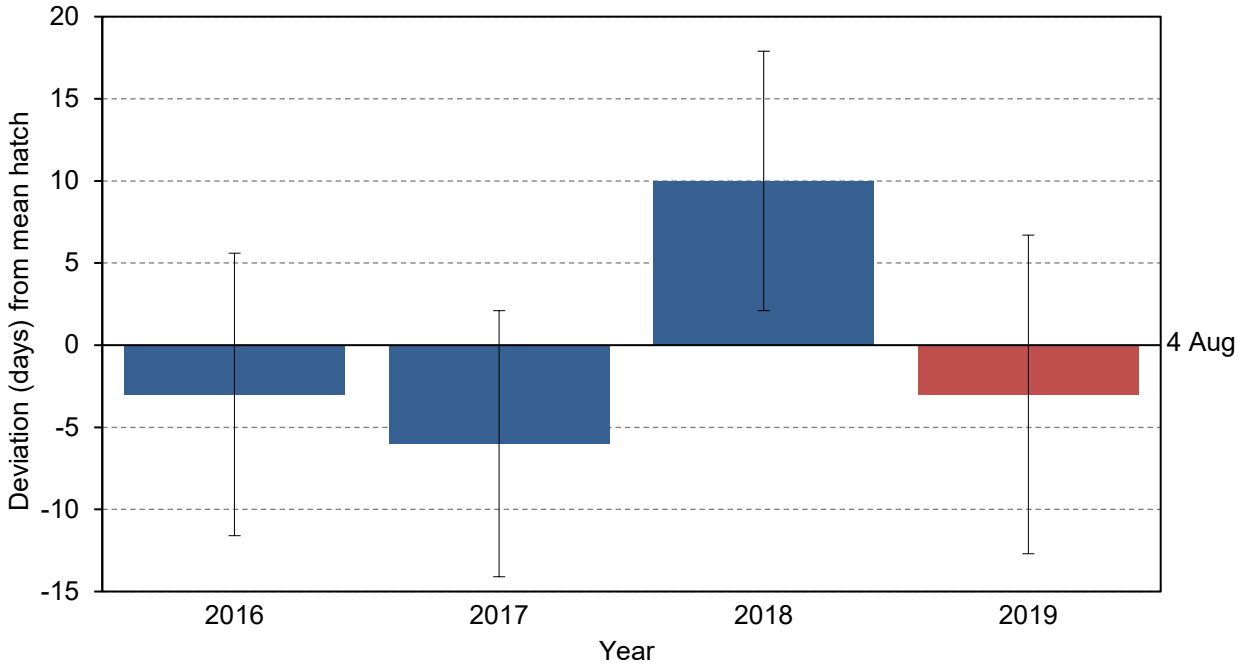

Figure 69. Yearly hatch date deviation (from the 2016-2018 average of 4 August) for Leach's storm-petrels at Buldir Island, Alaska. Data include only chronology plots monitored on an interval of about 7 days. Negative values indicate earlier than mean hatch date, positive values indicate later than mean 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 98. 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	*n*[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
2018	14 Aug	7.9	19	27 Jul	23 Aug	>25 Aug
2019[c]	1 Aug	9.7	26	14 Jul	>26 Aug	>26 Aug

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

[b]In 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.

[c]In 2019, two viable eggs were still present and unhatched as of last check on 26 August.

Table 99. 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	2018	2019
190	-	1	-	-
191	-	-	-	-
192	-	-	-	-
193	-	-	-	-
194	-	-	-	-
195	-	-	-	1
196	-	-	-	-
197	-	-	-	-
198	-	-	-	-
199	-	-	-	-
200	-	-	-	-
201	-	-	-	4
202	-	3	-	-
203	-	-	-	-
204	-	-	-	-
205	3	-	-	-
206	-	-	-	-
207	-	-	-	6
208	-	8	1	-
209	-	-	-	-
210	1	-	-	-
211	-	-	-	-
212	-	-	-	-
213	-	-	-	5
214	-	5	-	-
215	-	-	3	-
216	-	-	-	-
217	-	-	-	-
218	-	-	-	-
219	-	-	-	-
220	-	2	1	3
221	-	-	-	-
222	3	-	-	-
223	-	-	-	-
224	-	-	-	-
225	-	-	-	-
226	-	-	5	7
227	-	-	-	-
228	-	-	-	-
229	-	-	-	-
230	-	1	-	-
231	-	-	5	-
232	-	-	-	-
233	-	-	-	-
234	-	-	-	-
235	-	-	4	-
n	7	20	19	26

[a]In leap years, hatch dates are calculated using a leap year-specific Julian date calendar.

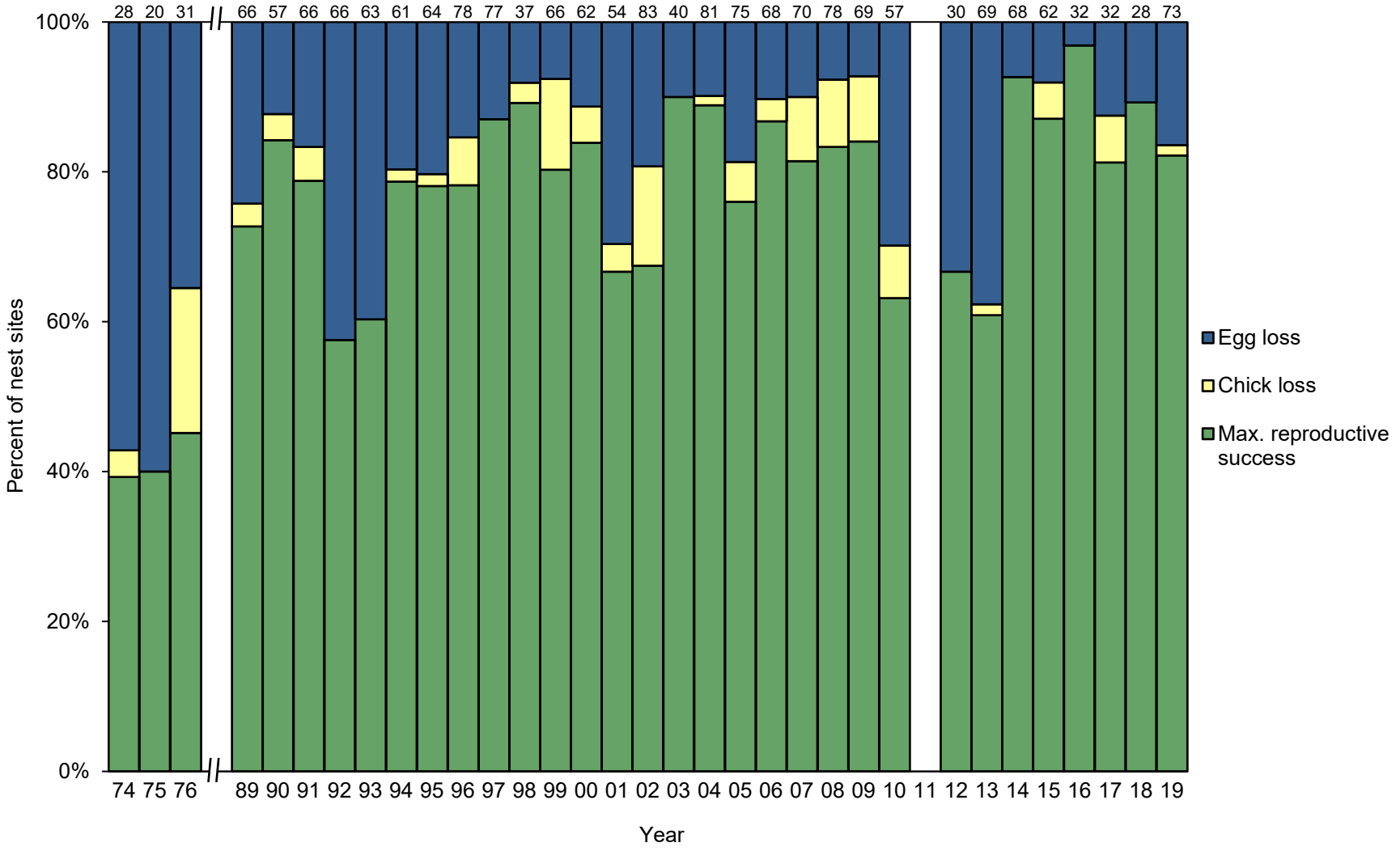

Figure 70. Reproductive performance of Leach's storm-petrels at Buldir Island, Alaska. Egg loss=[(B+H)-(D+H)]/(B+H); Chick loss=[(D+H)-(F+H)]/(B+H); Maximum potential reproductive success= (F+H)/(B+H), where B+H=maximum nest sites with eggs; D+H=maximum nest sites with chicks; F+H=maximum nest sites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

Table 100. 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
1974	28	12	11	-	0.43	xx[g]	0.92	xx	0.39	xx	xx	xx
1975	20	8	8	-	0.40	xx	1.00	xx	0.40	xx	xx	xx
1976	31	20	14	-	0.65	xx	0.70	xx	0.45	xx	xx	xx
1989	66	50	48	18	0.76	xx	0.96	xx	0.73	xx	xx	xx
1990	57	50	48	18	0.88	xx	0.96	xx	0.84	xx	xx	xx
1991	66	55	52	18	0.83	xx	0.95	xx	0.79	xx	xx	xx
1992	66	38	38	16	0.58	xx	1.00	xx	0.58	xx	xx	xx
1993	63	38	38	39	0.60	xx	1.00	xx	0.60	xx	xx	xx
1994	61	49	48	11	0.80	xx	0.98	xx	0.79	xx	xx	xx
1995	64	51	50	11	0.80	xx	0.98	xx	0.78	xx	xx	xx
1996	78	66	61	10	0.85	xx	0.92	xx	0.78	xx	xx	xx
1997	77	67	67	7	0.87	xx	1.00	xx	0.87	xx	xx	xx
1998	37	34	33	14	0.92	xx	0.97	xx	0.89	xx	xx	xx
1999	66	61	53	17	0.92	xx	0.87	xx	0.80	xx	xx	xx
2000	62	55	52	7	0.89	xx	0.95	xx	0.84	xx	xx	xx
2001	54	38	36	1	0.70	xx	0.95	xx	0.67	xx	xx	xx
2002	83	67	56	2	0.81	xx	0.84	xx	0.67	xx	xx	xx
2003	40	36	36	0	0.90	xx	1.00	xx	0.90	xx	xx	xx
2004	81	73	72	4	0.90	xx	0.99	xx	0.89	xx	xx	xx
2005	75	61	57	2	0.81	xx	0.93	xx	0.76	xx	xx	xx
2006	68	61	59	4	0.90	xx	0.97	xx	0.87	xx	xx	xx
2007	70	63	57	2	0.90	xx	0.90	xx	0.81	xx	xx	xx
2008	78	72	65	0	0.92	xx	0.90	xx	0.83	xx	xx	xx
2009	69	64	58	10	0.93	0.09	0.91	0.11	0.84	0.15	5	Cluster by plot
2010	57	40	36	4	0.70	0.11	0.90	0.06	0.63	0.13	5	Cluster by plot
2011	49	-	-	-	-	-	-	-	-	-	5	-
2012	30	20	20	4	0.67	0.06	1.00	0.00	0.67	0.06	5	Cluster by plot
2013	69	43	42	4	0.62	0.03	0.98	0.02	0.61	0.03	5	Cluster by plot
2014	68	63	63	0	0.93	0.03	1.00	0.00	0.93	0.03	5	Cluster by plot
2015	62	57	54	6	0.92	0.01	0.95	0.01	0.87	0.01	5	Cluster by plot
2016	32	31	31	3	0.97	0.03	1.00	0.00	0.97	0.03	5	Cluster by plot

Table 100 (continued). 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
2017	32	28	26	2	0.88	0.03	0.93	0.03	0.81	0.03	5	Cluster by plot
2018	28	25	25	5	0.89	0.11	1.00	0.00	0.89	0.11	5	Cluster by plot
2019	73	61	60	8	0.84	0.05	0.98	0.02	0.82	0.05	5	Cluster by plot

[a]F+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).

[b]Eggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

[c]For 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).

[d]For 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).

[e]Plots that are combined for analysis are counted as a single "plot".

[f]Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. For sampling clustered by plot, standard deviation values are calculated based on plot as a sample unit; for simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

[g]xx indicates data potentially exist but have not yet been summarized.

Table 101. Reproductive performance of Leach's storm-petrels at Buldir Island, Alaska in 2019.

Parameter	Plot					Total	SD[a]
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	5	19	6	21	22	73	-
Max. nest sites w/ chicks (D+H)	5	18	4	16	18	61	-
Max. nest sites w/ chicks fledged (F+H)[b]	5	18	4	15	18	60	-
Nest sites w/ viable eggs at last visit[c]	0	3	0	4	1	8	-
Max. potential nesting success[(D+H)/(B+H)][d]	1.00	0.95	0.67	0.76	0.82	0.84	0.05
Max. potential fledging success [(F+H)/(D+H)][e]	1.00	1.00	1.00	0.94	1.00	0.98	0.02
Max. potential reproductive success [(F+H)/(B+H)]	1.00	0.95	0.67	0.71	0.82	0.82	0.05

[a]Standard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

[b]F+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).

[c]Eggs 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.

[d]For 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).

[e]For 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).

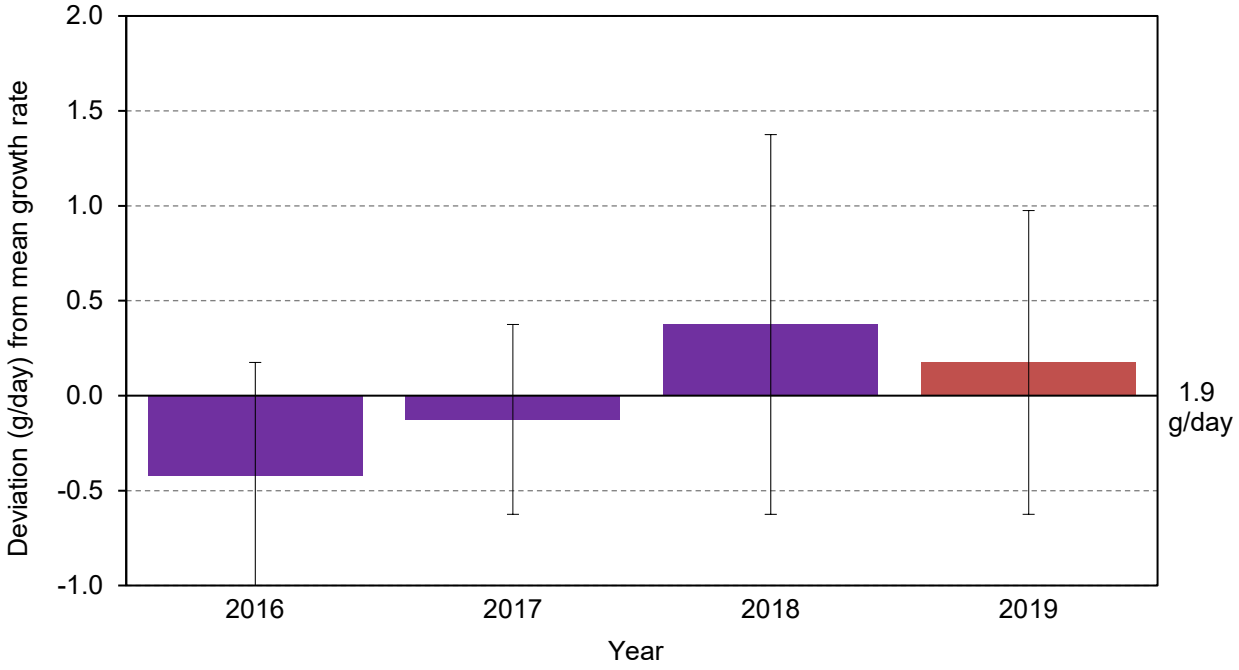

Figure 71. Yearly chick growth rate deviation (from the 2016-2018 average of 1.9 g/day) for Leach's storm-petrels at Buldir Island, Alaska. Negative values indicate less than the mean growth rate, positive values exceed the mean growth rate. Error bars represent standard deviation around each year's mean growth rate; red highlights the current year. No known data exist before 2016.

Table 102. 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	*n*	Mean	SD	Range	*n*
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
2018	2.3	1.0	0.9-3.9	7	4.6	1.2	3.8-5.5	2
2019	2.1	0.8	1.1-4.0	16	2.3	0.5	1.4-3.1	6

[a]All rates of growth are based on relaxed wing chord measurements.

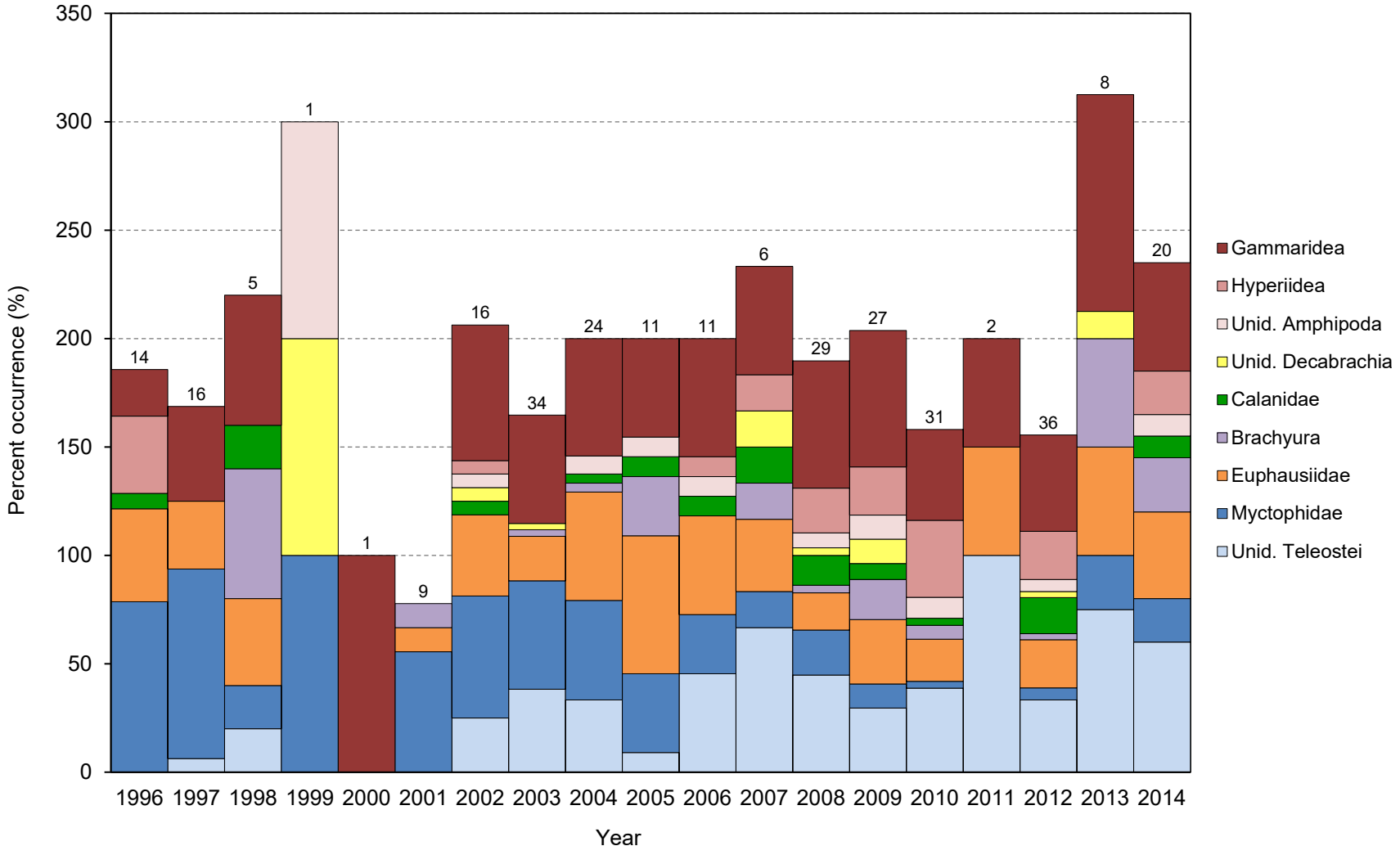

Figure 72. Frequency of occurrence of major prey items in diets of Leach's storm-petrel chicks at Buldir Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence 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 2015-2019 but have not yet been analyzed.

Table 103. 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 2015-2019 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	2007
No. samples	14	16	5	1	1	9	16	34	24	11	11	6
Invertebrates	**71.4**	**68.8**	**80.0**	**100.0**	**100.0**	**33.3**	**81.3**	**58.8**	**83.3**	**90.9**	**81.8**	**83.3**
Amphipoda	**57.1**	**43.8**	**60.0**	**100.0**	**100.0**	**-**	**68.8**	**50.0**	**58.3**	**54.5**	**63.6**	**50.0**
Gammaridea	**21.4**	**43.8**	**60.0**	**-**	**100.0**	**-**	**62.5**	**50.0**	**54.2**	**45.5**	**54.5**	**50.0**
Lysianassidae	21.4	43.8	60.0	-	100.0	-	62.5	44.1	54.2	36.4	-	50.0
Paracallisoma coecum	-	-	-	-	-	-	-	-	-	-	54.5	-
Unid. Gammaridea	-	-	20.0	-	-	-	-	-	-	-	-	16.7
Other Gammaridea	-	-	-	-	-	-	-	8.8	-	9.1	-	-
Hyperiidea	**35.7**	**-**	**-**	**-**	**-**	**-**	**6.3**	**-**	**-**	**-**	**9.1**	**16.7**
Themisto pacifica	21.4	-	-	-	-	-	6.3	-	-	-	-	16.7
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	-	-	-	16.7
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-
Copepoda	**7.1**	**-**	**20.0**	**-**	**-**	**-**	**6.3**	**-**	**4.2**	**9.1**	**9.1**	**16.7**
Calanidae	7.1	-	20.0	-	-	-	6.3	-	4.2	9.1	9.1	16.7
Other Copepoda	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda	**14.3**	**-**	**60.0**	**-**	**-**	**22.2**	**6.3**	**2.9**	**8.3**	**27.3**	**-**	**16.7**
Brachyura	**-**	**-**	**60.0**	**-**	**-**	**11.1**	**-**	**2.9**	**4.2**	**27.3**	**-**	**16.7**
Cheiragonidae/Atelecyclidae[b]	-	-	60.0	-	-	11.1	-	2.9	4.2	27.3	-	-
Other Brachyura	-	-	-	-	-	-	-	-	-	-	-	16.7
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**	**33.3**
Euphausiidae	**42.9**	**31.3**	**40.0**	**-**	**-**	**11.1**	**37.5**	**20.6**	**50.0**	**63.6**	**45.5**	**33.3**
Thysanoessa 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	33.3
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**	**83.3**
Teleostei	**78.6**	**93.8**	**40.0**	**100.0**	**-**	**88.9**	**81.3**	**85.3**	**83.3**	**45.5**	**72.7**	**83.3**
Myctophidae	**78.6**	**87.5**	**20.0**	**100.0**	**-**	**55.6**	**56.3**	**50.0**	**45.8**	**36.4**	**27.3**	**16.7**
Unid. Myctophidae	78.6	68.8	-	100.0	-	55.6	56.3	50.0	45.8	36.4	27.3	16.7
Other Myctophidae	-	18.8	20.0	-	-	-	-	-	-	-	-	-
Unid. Teleostei	-	6.3	20.0	-	-	-	25.0	38.2	33.3	9.1	45.5	66.7
Other Teleostei	-	-	-	-	-	33.3	-	-	4.2	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-

Table 103 (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 2015-2019 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	2018	2019
No. samples	29	27	31	2[a]	36	8	20	29	31	33	21	10
Invertebrates	**86.2**	**92.6**	**90.3**	**100.0**	**83.3**	**100.0**	**85.0**	*pending*	*pending*	*pending*	*pending*	*pending*
Amphipoda	**72.4**	**85.2**	**77.4**	**50.0**	**69.4**	**100.0**	**70.0**	**-**	**-**	**-**	**-**	**-**
Gammaridea	**58.6**	**63.0**	**41.9**	**50.0**	**44.4**	**100.0**	**50.0**	**-**	**-**	**-**	**-**	**-**
Lysianassidae	-	-	3.2	-	-	-	-	-	-	-	-	-
Paracallisoma coecum	55.2	55.6	29.0	50.0	36.1	100.0	-	-	-	-	-	-
Unid. Gammaridea	-	11.1	12.9	-	8.3	12.5	10.0	-	-	-	-	-
Other Gammaridea	3.4	11.1	-	-	-	62.5	50.0	-	-	-	-	-
Hyperiidea	**20.7**	**22.2**	**35.5**	**-**	**22.2**	**-**	**20.0**	**-**	**-**	**-**	**-**	**-**
Themisto pacifica	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. Decabrachia	3.4	11.1	-	-	2.8	12.5	-	-	-	-	-	-
Other Cephalopoda	-	7.4	-	-	2.8	12.5	-	-	-	-	-	-
Copepoda	**17.2**	**7.4**	**6.5**	**-**	**22.2**	**-**	**25.0**	**-**	**-**	**-**	**-**	**-**
Calanidae	13.8	7.4	3.2	-	16.7	-	10.0	-	-	-	-	-
Other Copepoda	3.4	-	3.2	-	5.6	-	15.0	-	-	-	-	-
Decapoda	**6.9**	**18.5**	**12.9**	**-**	**5.6**	**50.0**	**30.0**	**-**	**-**	**-**	**-**	**-**
Brachyura	**3.4**	**18.5**	**6.5**	**-**	**2.8**	**50.0**	**25.0**	**-**	**-**	**-**	**-**	**-**
Cheiragonidae/Atelecyclidae[b]	-	3.7	-	-	-	37.5	20.0	-	-	-	-	-
Other Brachyura	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	**17.2**	**29.6**	**19.4**	**50.0**	**22.2**	**50.0**	**40.0**	**-**	**-**	**-**	**-**	**-**
Euphausiidae	**17.2**	**29.6**	**19.4**	**50.0**	**22.2**	**50.0**	**40.0**	**-**	**-**	**-**	**-**	**-**
Thysanoessa spp.	13.8	11.1	12.9	-	5.6	25.0	5.0	-	-	-	-	-
Unid. Euphausiidae	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	**65.5**	**37.0**	**41.9**	**100.0**	**38.9**	**87.5**	**75.0**	**-**	**-**	**-**	**-**	**-**
Teleostei	**65.5**	**37.0**	**41.9**	**100.0**	**38.9**	**87.5**	**75.0**	**-**	**-**	**-**	**-**	**-**
Myctophidae	**20.7**	**11.1**	**3.2**	**-**	**5.6**	**25.0**	**20.0**	**-**	**-**	**-**	**-**	**-**
Unid. Myctophidae	20.7	11.1	3.2	-	5.6	25.0	-	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	20.0	-	-	-	-	-
Unid. Teleostei	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	-	-	-	-	-

[a]One additional sample is still pending analysis.
[b]Most likely Cheiragonidae but recent changes in taxonomy of Atelecyclidae and Cheiragonidae makes historic identification not entirely certain.

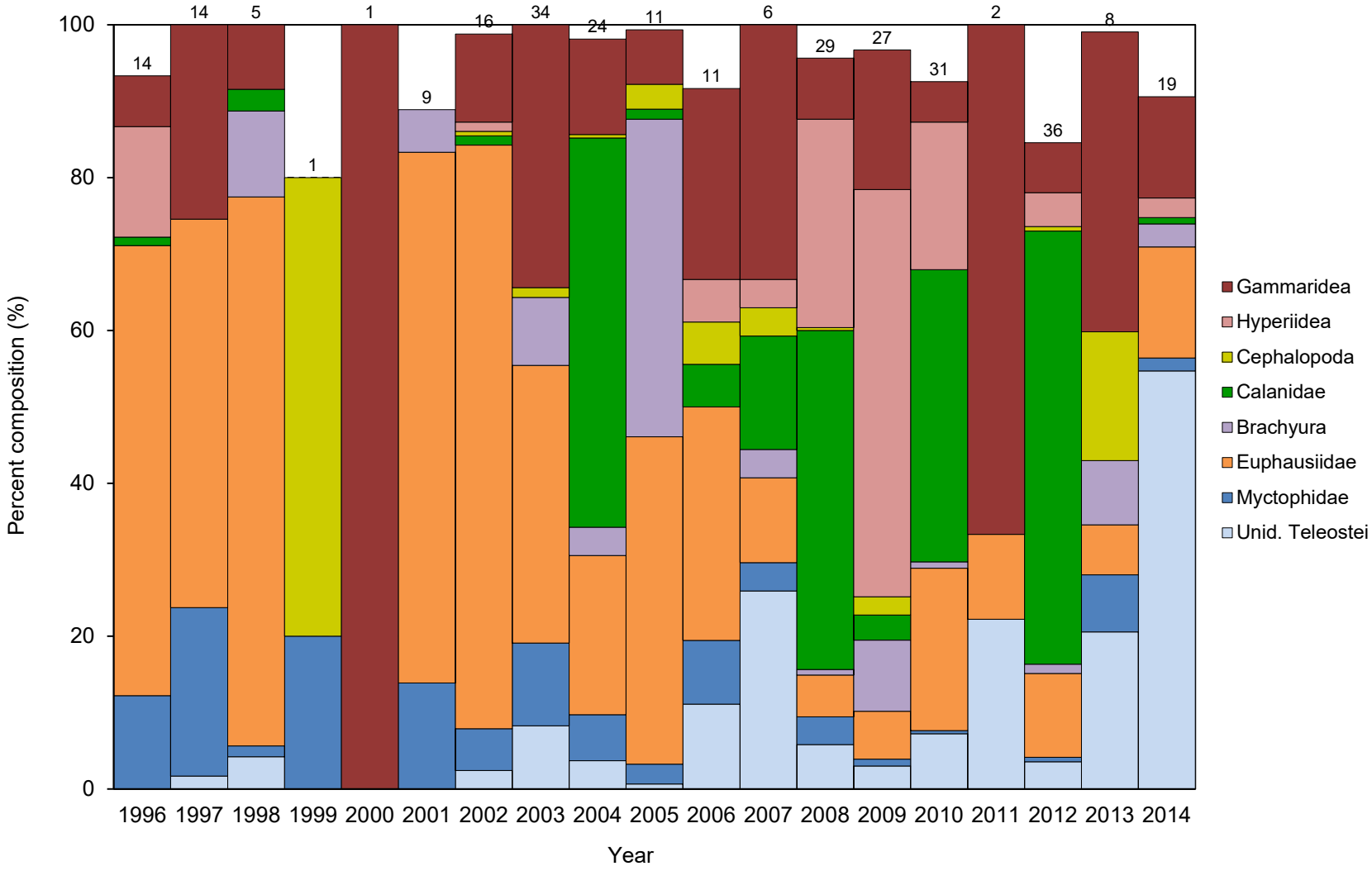

Figure 73. Percent composition of major prey items in diets of Leach's storm-petrel chicks at Buldir Island, Alaska. Values are expressed as the percentage of total individual prey items comprised by each prey item. Prey is grouped to family level or higher; only taxa with an among-year average composition 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 2015-2019 but have not yet been analyzed.

Table 104. 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 2015-2019 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	2007
No. samples	14	14	5	1	1	9	16	34	24	11	11	6
No. individuals	90	59	71	5	1	36	165	157	216	154	36	27
Invertebrates	**87.8**	**76.3**	**94.4**	**80.0**	**100.0**	**77.8**	**92.1**	**80.9**	**89.8**	**96.8**	**80.6**	**70.4**
Amphipoda	**21.1**	**25.4**	**8.5**	**20.0**	**100.0**	**-**	**13.3**	**34.4**	**13.4**	**7.8**	**38.9**	**37.0**
Gammaridea	**6.7**	**25.4**	**8.5**	**-**	**100.0**	**-**	**11.5**	**34.4**	**12.5**	**7.1**	**25.0**	**33.3**
Lysianassidae	6.7	25.4	7.0	-	100.0	-	11.5	32.5	12.5	5.2	-	29.6
Paracallisoma coecum	-	-	-	-	-	-	-	-	-	-	25.0	-
Other Gammaridea	-	-	1.4	-	-	-	-	1.9	-	1.9	-	3.7
Hyperiidea	14.4	-	-	-	-	-	1.2	-	-	-	5.6	3.7
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	3.7
Copepoda	**1.1**	**-**	**2.8**	**-**	**-**	**-**	**1.2**	**-**	**50.9**	**1.3**	**5.6**	**14.8**
Calanidae	**1.1**	**-**	**2.8**	**-**	**-**	**-**	**1.2**	**-**	**50.9**	**1.3**	**5.6**	**14.8**
Neocalanus plumchrus/flemengeri	-	-	-	-	-	-	-	-	38.0	1.3	-	14.8
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**	**-**	**3.7**
Brachyura	-	-	11.3	-	-	5.6	-	8.9	3.7	41.6	-	3.7
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**	**11.1**
Euphausiidae	**58.9**	**50.8**	**71.8**	**-**	**-**	**69.4**	**76.4**	**36.3**	**20.8**	**42.9**	**30.6**	**11.1**
Unid. Euphausiidae	58.9	50.8	71.8	-	-	69.4	76.4	36.3	8.3	37.7	27.8	11.1
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**	**29.6**
Teleostei	**12.2**	**23.7**	**5.6**	**20.0**	**-**	**22.2**	**7.9**	**19.1**	**10.2**	**3.2**	**19.4**	**29.6**
Myctophidae	**12.2**	**22.0**	**1.4**	**20.0**	**-**	**13.9**	**5.5**	**10.8**	**6.0**	**2.6**	**8.3**	**3.7**
Unid. Myctophidae	12.2	15.3	-	20.0	-	13.9	5.5	10.8	6.0	2.6	8.3	3.7
Other Myctophidae	-	6.8	1.4	-	-	-	-	-	-	-	-	-
Unid. Teleostei	-	1.7	4.2	-	-	-	2.4	8.3	3.7	0.6	11.1	25.9
Other Teleostei	-	-	-	-	-	8.3	-	-	0.5	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-

Table 104 (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 2015-2019 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	2018	2019
No. samples	29	27	31	2[a]	36	8	19	29	31	33	21	10
No. individuals	275	334	471	9	337	107	234	*pending*	*pending*	*pending*	*pending*	*pending*
Invertebrates	**89.1**	**93.7**	**90.9**	**77.8**	**93.5**	**72.0**	**40.2**	**-**	**-**	**-**	**-**	**-**
Amphipoda	**36.0**	**72.5**	**25.3**	**66.7**	**11.6**	**39.3**	**16.7**	**-**	**-**	**-**	**-**	**-**
Gammaridea	**8.0**	**18.3**	**5.3**	**66.7**	**6.5**	**39.3**	**13.2**	**-**	**-**	**-**	**-**	**-**
Lysianassidae	-	-	0.2	-	-	-	-	-	-	-	-	-
Paracallisoma coecum	7.6	15.9	4.2	66.7	5.6	32.7	-	-	-	-	-	-
Other Gammaridea	0.4	2.4	0.8	-	0.9	6.5	13.2	-	-	-	-	-
Hyperiidea	27.3	53.3	19.3	-	4.5	-	2.6	-	-	-	-	-
Other Amphipoda	0.7	0.9	0.6	-	0.6	-	0.9	-	-	-	-	-
Cephalopoda	0.4	2.4	-	-	0.6	16.8	-	-	-	-	-	-
Copepoda	**45.1**	**3.3**	**38.4**	**-**	**66.5**	**-**	**5.1**	**-**	**-**	**-**	**-**	**-**
Calanidae	**44.4**	**3.3**	**38.2**	**-**	**56.7**	**-**	**0.9**	**-**	**-**	**-**	**-**	**-**
Neocalanus plumchrus/flemengeri	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	**1.1**	**9.3**	**4.9**	**-**	**1.8**	**9.3**	**3.4**	**-**	**-**	**-**	**-**	**-**
Brachyura	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	**5.5**	**6.3**	**21.2**	**11.1**	**11.0**	**6.5**	**14.5**	**-**	**-**	**-**	**-**	**-**
Euphausiidae	**5.5**	**6.3**	**21.2**	**11.1**	**11.0**	**6.5**	**14.5**	**-**	**-**	**-**	**-**	**-**
Unid. Euphausiidae	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	**9.5**	**3.9**	**7.6**	**22.2**	**4.2**	**28.0**	**59.4**	**-**	**-**	**-**	**-**	**-**
Teleostei	**9.5**	**3.9**	**7.6**	**22.2**	**4.2**	**28.0**	**59.4**	**-**	**-**	**-**	**-**	**-**
Myctophidae	**3.6**	**0.9**	**0.4**	**-**	**0.6**	**7.5**	**1.7**	**-**	**-**	**-**	**-**	**-**
Unid. Myctophidae	3.6	0.9	0.4	-	0.6	7.5	-	-	-	-	-	-
Other Myctophidae	-	-	-	-	-	-	1.7	-	-	-	-	-
Unid. Teleostei	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	-	-	-	-	-

[a]One additional sample is still pending analysis.

Table 105. 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	*n*	Mean	SD	Range	*n*	Mean	SD	Range	*n*
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	4.3	148-166	55	24.3	0.8	22.5-26.1	55
2018	42.8	2.8	37.0-48.0	37	156	4.1	149-168	38	24.5	0.9	22.4-25.8	38
2019	42.2	3.2	38.0-53.0	110	158	4.1	147-167	110	24.5	0.8	22.5-26.0	110

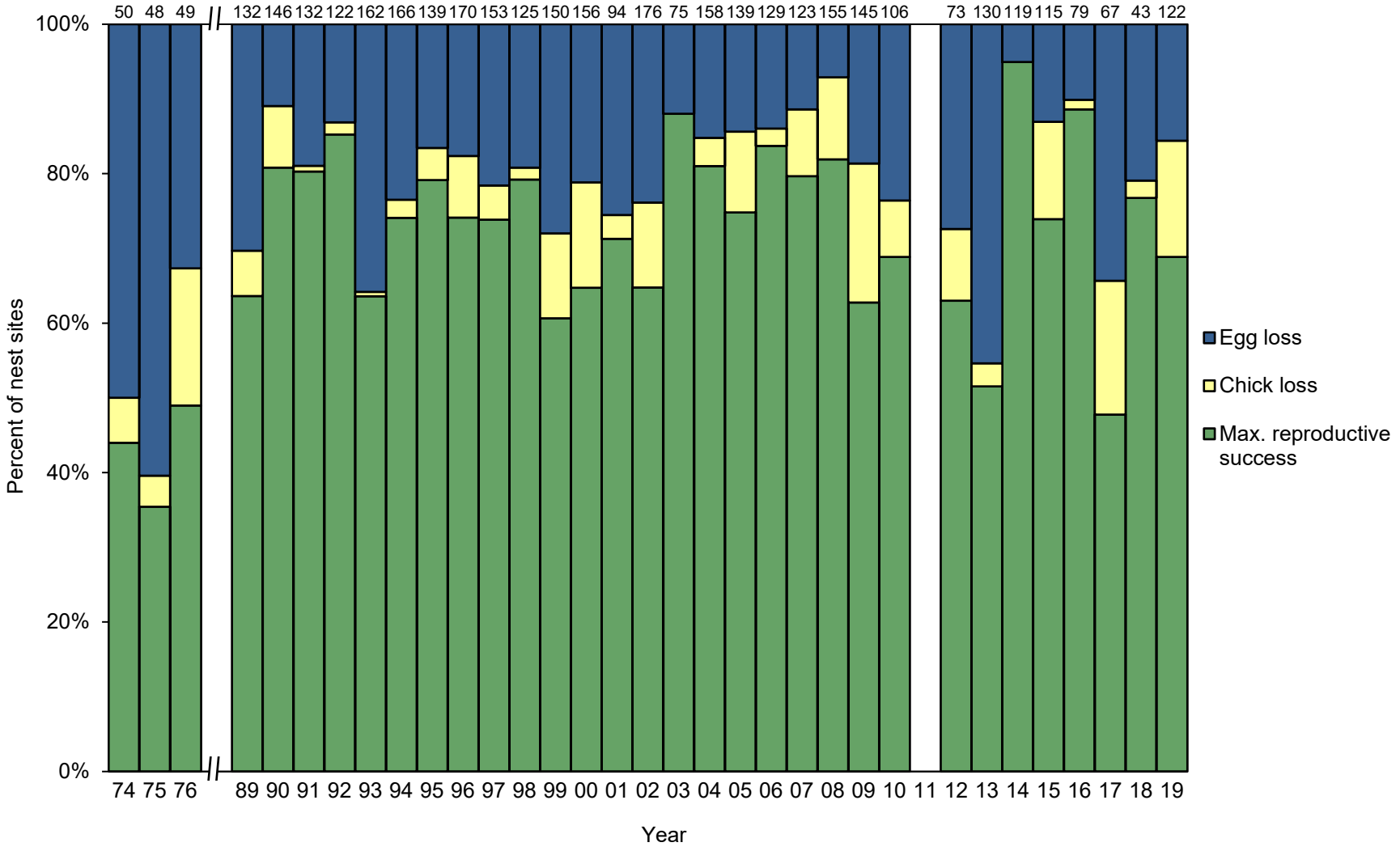

Figure 74. Reproductive performance of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska. Egg loss=[(B+H)-(D+H)]/(B+H); Chick loss=[(D+H)-(F+H)]/(B+H); Maximum potential reproductive success= (F+H)/(B+H), where B+H=maximum nest sites with eggs; D+H=maximum 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 106. 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
1974	50	25	22	-	0.50	xx[g]	0.88	xx	0.44	xx	xx	xx
1975	48	19	17	-	0.40	xx	0.89	xx	0.35	xx	xx	xx
1976	49	33	24	7	0.67	xx	0.73	xx	0.49	xx	xx	xx
1989	132	92	84	4	0.70	xx	0.91	xx	0.64	xx	xx	xx
1990	146	130	118	0	0.89	xx	0.91	xx	0.81	xx	xx	xx
1991	132	107	106	0	0.81	xx	0.99	xx	0.80	xx	xx	xx
1992	122	106	104	1	0.87	xx	0.98	xx	0.85	xx	xx	xx
1993	162	104	103	0	0.64	xx	0.99	xx	0.64	xx	xx	xx
1994	166	127	123	0	0.77	xx	0.97	xx	0.74	xx	xx	xx
1995	139	116	110	7	0.83	xx	0.95	xx	0.79	xx	xx	xx
1996	170	140	126	17	0.82	xx	0.90	xx	0.74	xx	xx	xx
1997	153	120	113	9	0.78	xx	0.94	xx	0.74	xx	xx	xx
1998	125	101	99	20	0.81	xx	0.98	xx	0.79	xx	xx	xx
1999	150	108	91	16	0.72	xx	0.84	xx	0.61	xx	xx	xx
2000	156	123	101	8	0.79	xx	0.82	xx	0.65	xx	xx	xx
2001	94	70	67	1	0.74	xx	0.96	xx	0.71	xx	xx	xx
2002	176	134	114	3	0.76	xx	0.85	xx	0.65	xx	xx	xx
2003	75	66	66	0	0.88	xx	1.00	xx	0.88	xx	xx	xx
2004	158	134	128	5	0.85	xx	0.96	xx	0.81	xx	xx	xx
2005	139	119	104	2	0.86	xx	0.87	xx	0.75	xx	xx	xx
2006	129	111	108	5	0.86	xx	0.97	xx	0.84	xx	xx	xx
2007	123	109	98	7	0.89	xx	0.90	xx	0.80	xx	xx	xx
2008	155	144	127	0	0.93	xx	0.88	xx	0.82	xx	xx	xx
2009	145	118	91	15	0.81	0.07	0.77	0.12	0.63	0.15	5	Cluster by plot
2010	113	81	73	6	0.72	0.07	0.90	0.04	0.72	0.09	5	Cluster by plot
2011	118	-	-	-	-	-	-	-	-	-	5	-
2012	73	53	46	4	0.72	0.04	0.87	0.06	0.63	0.06	5	Cluster by plot
2013	130	71	67	4	0.55	0.05	0.94	0.01	0.52	0.05	5	Cluster by plot
2014	119	113	113	0	0.95	0.03	1.00	0.00	0.95	0.03	5	Cluster by plot
2015	115	100	85	6	0.87	0.04	0.85	0.04	0.74	0.06	7	Cluster by plot
2016	79	71	70	3	0.90	0.04	0.99	0.01	0.89	0.05	5	Cluster by plot

Table 106 (continued). 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 2015-2019. 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)]		No. plots[e]	Sampling design[f]
					Total	SD	Total	SD	Total	SD		
2017	67	44	32	4	0.66	0.04	0.73	0.09	0.48	0.04	5	Cluster by plot
2018	43	34	33	10	0.79	0.09	0.97	0.03	0.77	0.10	5	Cluster by plot
2019	122	103	84	8	0.84	0.05	0.82	0.04	0.69	0.07	5	Cluster by plot

[a]F+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).

[b]Eggs still present and apparently viable at last check are considered unknown fate and are not included in sample sizes or success estimates.

[c]For 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).

[d]For 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).

[e]Plots that are combined for analysis are counted as a single "plot".

[f]Sampling for storm-petrels is clustered by plot except when sample sizes per plot are too small or plot data are not available. For sampling clustered by plot, standard deviation values are calculated based on plot as a sample unit; for simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

[g]xx indicates data potentially exist but have not yet been summarized.

Table 107. Reproductive performance of all storm-petrels (fork-tailed, Leach's, and unknown storm-petrel species) at Buldir Island, Alaska in 2019.

Parameter	Plot					Total	SD[a]
	1	2	3	4	7		
Max. nest sites w/ eggs (B+H)	10	30	12	36	34	122	-
Max. nest sites w/ chicks (D+H)	8	29	10	27	29	103	-
Max. nest sites w/ chicks fledged (F+H)[b]	6	26	6	21	25	84	-
Nest sites w/ viable eggs at last visit[c]	0	3	0	4	1	8	-
Max. potential nesting success[(D+H)/(B+H)][d]	0.80	0.97	0.83	0.75	0.85	0.84	0.05
Max. potential fledging success [(F+H)/(D+H)][e]	0.75	0.90	0.60	0.78	0.86	0.82	0.04
Max. potential reproductive success [(F+H)/(B+H)]	0.60	0.87	0.50	0.58	0.74	0.69	0.07

[a]Standard deviations are calculated from ratio estimator spreadsheets, based on plot as a sample unit.

[b]F+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).

[c]Eggs 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.

[d]For 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).

[e]For 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).

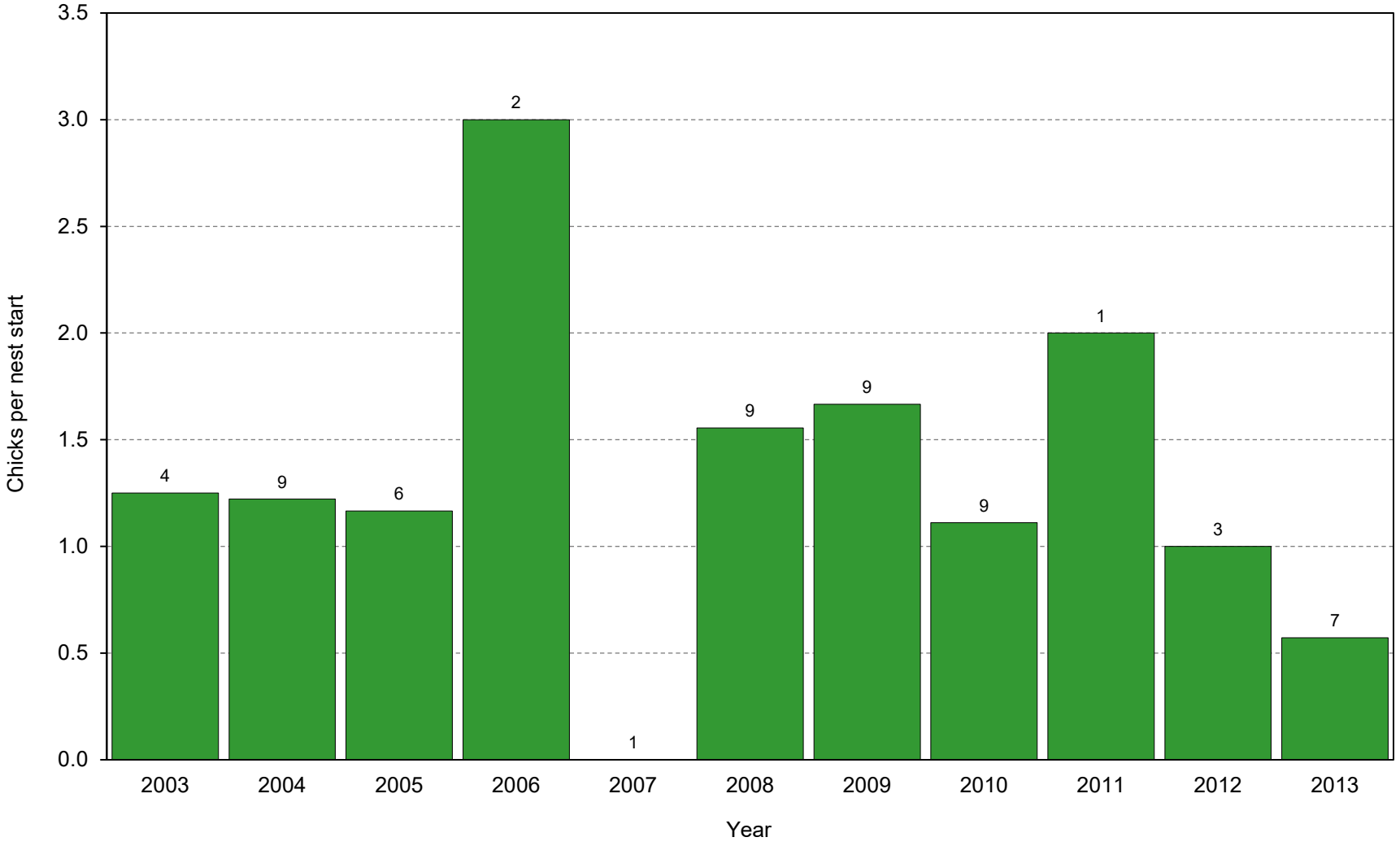

Figure 75. Reproductive performance of red-faced cormorants at Buldir Island, Alaska. Success is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A). No data were collected after 2013.

Table 108. 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 after 2013.

Year	Total nest starts	Nest sites w/ x chicks[a]:				Nest sites w/ chicks	Total chicks	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	Sampling design[c]
	(A)	1	2	3	4	(D)	(E)	Total	SD	Total	SD	Total	SD			
2003	4	1	2	0	0	3	5	1.7	xx[d]	0.75	0.22	1.3	xx	19 Jun	25 Jun	Simple random
2004	9	1	2	2	0	5	11	2.2	xx	0.55	0.17	1.2	xx	17 Jun	3 Aug	Simple random
2005	6	1	1	1	0	3	7	2.3	xx	0.50	0.20	1.2	xx	8 Jun	2 Aug	Simple random
2006	2	0	0	2	0	2	6	3.0	xx	1.00	0.00	3.0	xx	17 Jun	4 Aug	Simple random
2007	1	0	0	0	0	0	0	-	xx	0.00	0.00	0.0	xx	-	-	Simple random
2008	9	0	1	4	0	5	14	2.8	xx	0.55	0.17	1.6	xx	10 Jun	22 Aug	Simple random
2009	9	0	0	5	0	5	15	3.0	xx	0.55	0.17	1.7	xx	4 Jul	6 Aug	Simple random
2010	9	0	2	2	0	5	10	2.0	xx	0.55	0.17	1.1	xx	17 Jul	7 Aug	Simple random
2011	1	0	1	0	0	1	2	2.0	xx	1.00	0.00	2.0	xx	11 Jun	31 Jul	Simple random
2012	3	0	0	1	0	1	3	3.0	xx	0.33	0.27	1.0	xx	7 Jun	29 Jul	Simple random
2013	7	0	2	0	0	2	4	2.0	xx	0.29	0.17	0.6	xx	10 Jun	21 Aug	Simple random

[a]Numbers of chicks may represent a minimum count as not all may have been visible.

[b]Proportion 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.

[c]Sampling for cormorants with Boom-or-Bust methodology is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

[d]xx indicates data potentially exist but have not yet been summarized.

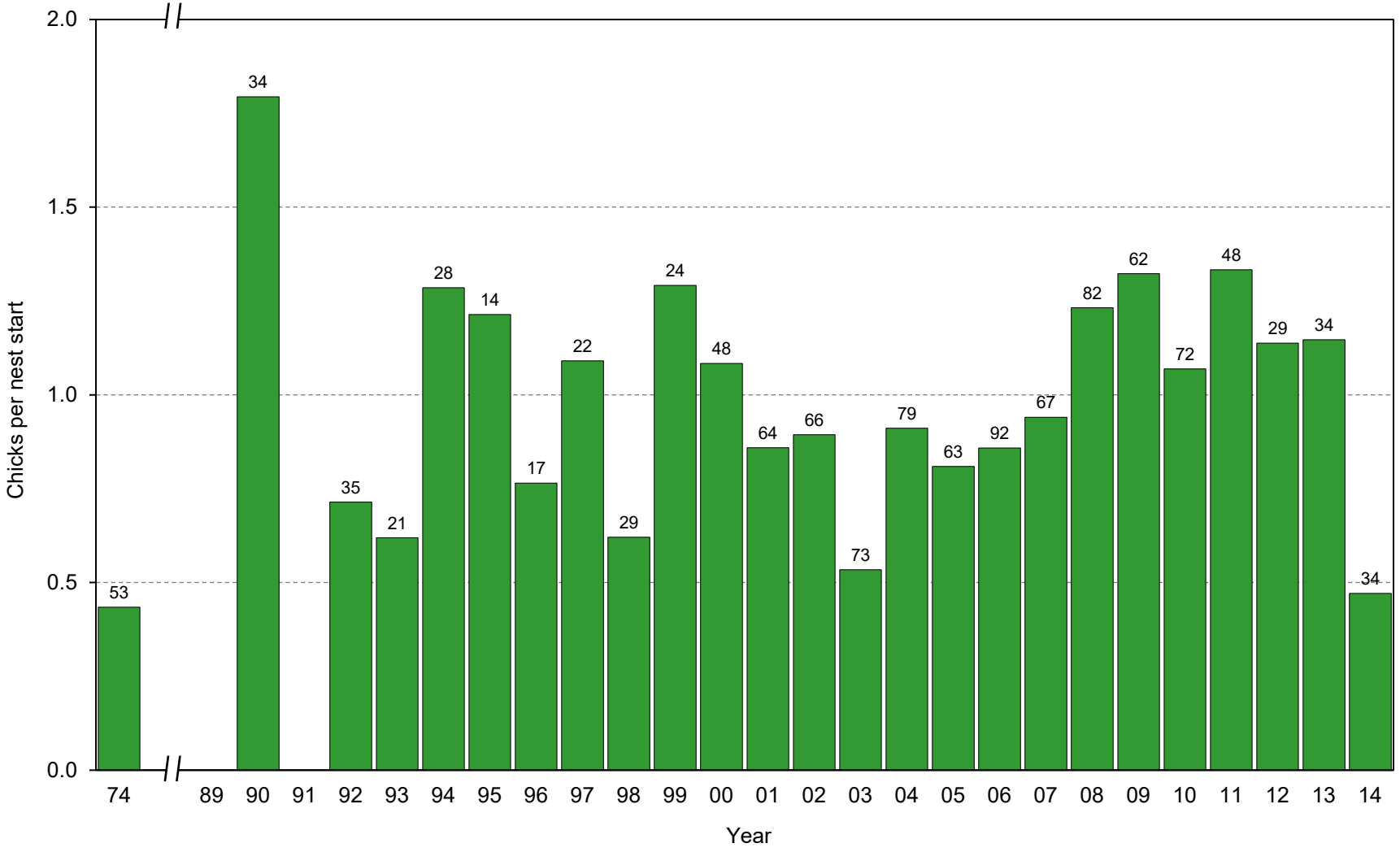

Figure 76. Reproductive performance of pelagic cormorants at Buldir Island, Alaska. Success is measured by the number of chicks per nest start (E/A), where E=total chicks and A=total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A). No data were collected in 1975-1988, 1991, or after 2014.

Table 109. 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 after 2014.

Year	Total nest starts	Nest sites w/ x chicks[a]:				Nest sites w/ chicks	Total chicks	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	Sampling design[c]
	(A)	1	2	3	4	(D)	(E)	Total	SD	Total	SD	Total	SD			
1974[d]	53	-	-	-	-	-	23	-	xx[e]	0.69[f]	0.06	0.4	xx	?	19 Aug	Simple random
1989[d]	37	-	-	-	-	-	-	-	xx	-	-	-	xx	16 Jun	-	Simple random
1990	34	4	12	11	0	27	61	2.3	xx	0.79	0.07	1.8	xx	13 Aug	13 Aug	Simple random
1992	35	0	5	5	0	10	25	2.5	xx	0.29	0.08	0.7	xx	11 Jun	2 Aug	Simple random
1993	21	3	2	2	0	7	13	1.9	xx	0.33	0.10	0.6	xx	12 Jun	19 Aug	Simple random
1994	28	6	6	6	0	18	36	2.0	xx	0.64	0.09	1.3	xx	15 Jun	9 Aug	Simple random
1995	14	3	4	2	0	9	17	1.9	xx	0.64	0.13	1.2	xx	13 Jun	10 Aug	Simple random
1996	17	3	5	0	0	8	13	1.6	xx	0.47	0.12	0.8	xx	1 Aug	5 Aug	Simple random
1997	22	0	3	6	-	9	24	2.7	xx	0.41	0.10	1.1	xx	25 May	10 Aug	Simple random
1998	29	0	6	2	-	8	18	2.3	xx	0.28	0.08	0.6	xx	22 Jun	7 Aug	Simple random
1999	24	2	8	5	-	15	31	2.1	xx	0.63	0.10	1.3	xx	24 Jun	12 Aug	Simple random
2000	48	8	10	0	-	25	52	2.1	xx	0.52	0.07	1.1	xx	6 Jun	4 Aug	Simple random
2001	64	9	18	3	-	33	55	1.7	xx	0.52	0.06	0.9	xx	10 Jun	29 Aug	Simple random
2002	66	9	19	4	-	32	59	1.8	xx	0.48	0.06	0.9	xx	16 Jun	5 Jul	Simple random
2003	73	8	11	3	-	22	39	1.8	xx	0.30	0.05	0.5	xx	13 Jun	1 Aug	Simple random
2004	79	2	15	12	1	30	72	2.4	xx	0.38	0.05	0.9	xx	27 Jun	3 Aug	Simple random
2005	63	4	10	4	-	23	51	2.2	xx	0.37	0.06	0.8	xx	8 Jun	7 Aug	Simple random
2006	92	8	17	11	1	37	79	2.1	xx	0.40	0.05	0.9	xx	17 Jun	4 Aug	Simple random
2007	67	6	9	10	0	25	63	2.5	xx	0.37	0.06	0.9	xx	25 May	14 Aug	Simple random
2008	82	2	25	15	1	47	101	2.1	xx	0.57	0.05	1.2	xx	10 Jun	6 Aug	Simple random
2009	62	2	12	14	0	34	82	2.4	xx	0.55	0.06	1.3	xx	23 Jun	11 Aug	Simple random
2010	72	5	17	10	0	33	77	2.3	xx	0.46	0.06	1.1	xx	23 Jun	12 Aug	Simple random
2011	48	6	14	10	0	30	64	2.1	xx	0.63	0.07	1.3	xx	11 Jun	15 Aug	Simple random
2012	29	4	7	5	0	16	33	2.1	xx	0.55	0.09	1.1	xx	7 Jun	5 Aug	Simple random
2013	34	5	9	4	1	19	39	2.1	xx	0.56	0.09	1.2	xx	24 Jun	21 Aug	Simple random
2014	34	5	4	1	0	10	16	1.6	xx	0.29	0.08	0.5	xx	15 Jun	17 Aug	Simple random

[a]Numbers of chicks may represent a minimum count as not all may have been visible.

[b]Proportion 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.

[c]Sampling for cormorants with Boom-or-Bust methodology is based on nests as the sample unit. For simple random sampling, standard deviation values are calculated using $\sqrt{\rho * (1-\rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

[d]Nest contents were not recorded in 1974 or 1989; data from 1974 from Byrd (1978).

[e]xx indicates data potentially exist but have not yet been summarized.

[f]From a subsample of 16 nests.

Table 110. 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

[a]A=5-minute counts, < and > 50m; B=5-minute counts, distance estimation out to 400m.
[b]xx indicates data potentially exist but have not yet been summarized.

Table 111. 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
Harlequin duck	N/A[a]	N/A	xx[b]	N/A	N/A	N/A	3	N/A	N/A	N/A	N/A[a]
Horned grebe	0	0	xx	0	0	0	<1	0	0	0	0
Common ringed plover	0	0	xx	0	0	0	0	0	0	0	0
Lesser sand (Mongolian) plover	0	0	xx	<1	0	0	0	0	0	<1	0
Whimbrel	0	0	xx	0	0	0	<1	0	0	0	0
Bar-tailed godwit	0	0	xx	0	<1	0	0	0	0	0	0
Ruddy turnstone	0	0	xx	<1	0	0	1	0	0	0	1
Red-necked stint	0	0	xx	0	0	0	<1	0	0	0	0
Dunlin	0	<1	xx	0	0	0	0	0	0	0	0
Rock sandpiper	0	<1	xx	0	0	0	0	0	0	0	0
Common sandpiper	0	0	xx	0	0	0	0	0	0	0	0
Gray-tailed tattler	0	0	xx	0	0	0	0	0	0	0	0
Wandering tattler	0	0	xx	<1	0	0	0	0	0	0	1
Wood sandpiper	0	0	xx	0	0	0	1	0	0	0	0
Parasitic jaeger	0	0	xx	0	0	0	0	0	0	0	<1
Black-backed woodpecker	0	<1	xx	0	0	0	0	0	0	0	0
Pacific wren	2	2	xx	3	4	5	2	3	7	6	3
Lanceolated warbler	0	0	xx	0	0	0	0	0	<1	0	0
Gray-streaked flycatcher	0	0	xx	0	0	0	0	0	0	0	0
Eastern yellow wagtail	0	1	xx	<1	<1	0	0	<1	0	0	0
Gray-crowned rosy-finch	<1	1	xx	2	0	0	3	1	1	2	4
Lapland longspur	0	1	xx	1	<1	2	3	2	3	1	1
Song sparrow	8	2	xx	3	3	2	5	4	9	6	8
n	5	5	xx	5	4	5	5	5	4	3	5
First survey	6 Jun	4 Jun	xx	5 Jun	1 Jun	8 Jun	7 Jun	2 Jun	7 Jun	4 Jun	2 Jun
Last survey	16 Jun	9 Jun	xx	12 Jun	14 Jun	14 Jun	16 Jun	12 Jun	14 Jun	8 Jun	14 Jun

[a]N/A indicates species may not have been counted during surveys, so presence is unknown.
[b]xx indicates data potentially exist but have not yet been summarized.

Table 111 (continued). 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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Harlequin duck	N/A	N/A	N/A	4	0	N/A	N/A	N/A	N/A	N/A
Horned grebe	0	0	0	0	0	N/A	N/A	N/A	N/A	N/A
Common ringed plover	0	0	0	0	0	0	<1	0	0	0
Lesser sand (Mongolian) plover	0	0	0	0	0	1	<1	0	0	0
Whimbrel	0	0	0	0	0	0	3	0	0	0
Bar-tailed godwit	0	0	0	0	2	0	0	0	0	0
Ruddy turnstone	0	0	0	0	0	0	0	0	<1	0
Red-necked stint	0	0	0	0	0	0	2	0	0	0
Dunlin	0	0	0	0	0	0	0	0	0	0
Rock sandpiper	0	0	0	0	0	0	0	0	0	0
Common sandpiper	0	0	0	0	0	0	0	<1	1	0
Gray-tailed tattler	0	0	0	0	0	0	0	0	<1	1
Wandering tattler	0	0	0	<1	0	0	<1	0	0	0
Wood sandpiper	0	0	0	<1	0	2	<1	<1	0	0
Parasitic jaeger	0	0	0	0	0	N/A	N/A	N/A	N/A	N/A
Black-backed woodpecker	0	0	0	0	0	0	0	0	0	0
Pacific wren	8	8	7	7	6	7	3	9	9	10
Lanceolated warbler	0	0	0	0	0	0	0	0	0	0
Gray-streaked flycatcher	0	0	0	0	0	0	0	0	<1	0
Eastern yellow wagtail	1	0	0	0	0	0	0	0	<1	0
Gray-crowned rosy-finch	6	8	8	8	5	7	1	1	4	3
Lapland longspur	0	3	2	2	<1	0	1	1	0	<1
Song sparrow	6	11	7	7	5	8	3	3	8	7
n	4	5	5	5	5	5	5	5	5	4
First survey	1 Jun	6 Jun	7 Jun	7 Jun	4 Jun	4 Jun	30 May	29 May	30 May	5 Jun
Last survey	13 Jun	19 Jun	15 Jun	13 Jun	10 Jun	11 Jun	5 Jun	2 Jun	5 Jun	16 Jun

[a]N/A indicates species may not have been counted during surveys, so presence is unknown.

Table 112. Numbers of birds detected on beach transect along North Bight Beach, Buldir Island, Alaska in 2019.

Species	Date				Mean	SD
	5 Jun	13 Jun	15 Jun	16 Jun		
Gray-tailed tattler	0	1	0	1	1	1
Pacific wren	9	12	10	7	10	2
Gray-crowned rosy-finch	1	2	7	3	3	2
Lapland longspur	1	0	0	0	<1	<1
Song sparrow	10	9	5	4	7	3
Start time (ALST)	0721	0654	0651	0654	-	-
End time (ALST)	0802	0735	0721	0721	-	-

Table 113. 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		2012	
	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	1.3	-	-	-	-	-	-	-	-	-	-
Northern pintail	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greater scaup	-	-	-	-	-	-	-	-	-	-	0.2	1.0	-	-
Common eider	-	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.2	1.8	-	-	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.2	1.5	0.3	1.3	-	-	-	-
Unidentified murre	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2
Pigeon guillemot	-	-	0.5	0.6	-	-	-	-	-	-	-	-	-	-
Ancient murrelet	-	-	-	-	0.5	0.9	0.4	0.5	0.2	0.2	-	-	1.1	1.5
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	0.6	1.3
Least auklet	-	-	-	-	-	-	-	-	0.3	0.6	-	-	-	-
Whiskered auklet	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crested auklet	1.0	1.3	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified auklet	-	-	-	-	0.5	0.9	-	-	-	-	0.2	0.8	0.2	0.3
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	-	-	-	-	0.2	0.5
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	1.4	3.3
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	1.0	1.3	0.3	0.6	-	-	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	0.2	1.8	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	0.3	0.8	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	0.2	0.3	0.5	0.6	-	-	-	-
Northern fulmar	1.0	1.3	-	-	-	-	-	-	-	-	-	-	0.2	0.3
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-
Peregrine falcon	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified bird	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 113 (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	2013		2014		2015		2016		2017		2018		2019	
	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	-	-	-	-	-	-	-	-	0.2	0.8	0.3	2.3	-	-
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	-	-	-	-
Red-breasted merganser	-	-	-	-	-	-	-	-	-	-	0.2	1.3	-	-
Common murre	-	-	-	-	-	-	0.3	1.3	-	-	-	-	-	-
Thick-billed murre	-	-	-	-	0.0	0.3	0.2	0.2	0.3	0.8	0.2	0.2	-	-
Unidentified murre	0.3	1.3	-	-	-	-	-	-	-	-	-	-	-	-
Pigeon guillemot	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-
Ancient murrelet	-	-	-	-	0.2	0.3	0.8	1.9	1.0	2.3	-	-	-	-
Cassin's auklet	-	-	-	-	-	-	-	-	0.2	0.6	-	-	-	-
Parakeet auklet	-	-	0.2	0.8	0.4	1.0	0.8	1.9	2.2	4.8	0.5	0.6	1.5	3.4
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	0.8	1.0	0.3	0.8	1.5	4.6	0.3	0.4	0.5	0.6
Horned puffin	-	-	-	-	-	-	-	-	0.2	0.6	-	-	0.3	0.3
Tufted puffin	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	0.2	0.4	0.5	1.6
Herring gull	-	-	-	-	0.2	0.8	-	-	-	-	-	-	-	-
Glaucous-winged gull	0.3	0.9	1.6	2.3	0.6	2.3	0.7	1.7	0.2	1.0	0.5	2.7	0.8	2.2
Large immature gull	-	-	-	-	0.4	1.5	0.2	1.3	0.2	0.4	-	-	-	-
Unidentified gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	-	-	0.2	1.0	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	0.2	0.3	0.2	0.6	0.3	1.3	0.2	0.2	-	-
Leach's storm-petrel	-	-	-	-	-	-	0.3	1.3	0.8	1.3	0.7	1.7	-	-
Northern fulmar	-	-	-	-	0.2	0.3	0.2	1.3	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	0.2	0.3	-	-	-	-	0.7	3.8	-	-
Unidentified shearwater	-	-	-	-	0.2	0.3	-	-	-	-	-	-	-	-
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pelagic cormorant	-	-	-	-	-	-	-	-	0.2	0.8	0.5	2.3	-	-
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Unidentified bird	-	-	-	-	0.4	1.3	-	-	-	-	-	-	-	-

Table 113 (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	2006		2007		2008		2009		2010		2011		2012	
	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
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	3.6	7.3
n	1		4		5		5		6		5		5	
First survey	15 Aug		7 Jun		31 May		4 Jun		5 Jun		10 Jun		1 Jun	
Last survey	-		25 Aug		2 Aug		19 Aug		20 Aug		17 Aug		9 Aug	

Table 113 (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	2013		2014		2015		2016		2017		2018		2019	
	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
All species	1.8	4.4	2.4	4.2	4.6	11.8	5.2	14.6	9.3	26.5	4.3	16.0	3.5	8.1
n	4		6		5		6		6		6		4	
First survey	8 Jun		15 Jun		8 Jun		30 May		31 May		3 Jun		29 Jun	
Last survey	8 Aug		11 Aug		3 Aug		16 Aug		17 Aug		19 Aug		12 Aug	

Table 114. 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		2012	
	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	0.2	0.8	-	-	-	-	0.2	1.2	0.2	0.2	0.2	0.8	0.2	0.3
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	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.3
Unidentified waterfowl	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	3.6	10.8
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	-	-	0.3	0.5	-	-	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	0.3	1.0	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern fulmar	0.2	0.4	0.3	1.5	-	-	0.4	3.6	0.3	0.4	-	-	0.2	0.3
Short-tailed shearwater	0.2	0.4	-	-	-	-	0.2	1.2	0.2	0.2	-	-	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-	-

Table 114 (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	2013		2014		2015		2016		2017		2018		2019	
	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	-	-	-	-	0.2	2.0	-	-	0.5	2.7	-	-	-	-
Greater scaup	-	-	-	-	0.2	1.2	-	-	-	-	-	-	-	-
Common eider	-	-	-	-	-	-	0.2	1.7	-	-	0.2	0.7	-	-
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified waterfowl	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.5
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	0.2	2.0	-	-
Ancient murrelet	-	-	-	-	0.4	0.8	1.0	3.3	2.3	10.3	2.0	9.3	-	-
Parakeet auklet	0.3	0.5	0.2	0.4	0.6	1.6	1.3	4.7	1.8	5.7	0.8	3.0	-	-
Whiskered auklet	-	-	-	-	0.2	0.4	1.3	3.3	4.7	10.7	0.8	1.7	-	-
Crested auklet	-	-	-	-	0.2	0.4	0.5	1.7	1.5	3.3	0.3	1.7	-	-
Unidentified auklet	-	-	0.8	3.6	1.4	3.2	1.8	5.0	6.3	15.0	2.2	4.3	0.3	0.5
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	0.2	0.3	-	-
Black-legged kittiwake	0.3	0.5	0.2	0.4	-	-	0.8	5.0	0.5	3.3	0.2	1.3	0.5	3.0
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	2.5	9.5	1.3	5.6	1.0	4.0	1.5	8.7	1.5	12.0	1.0	7.0	0.8	3.5
Large immature gull	-	-	-	-	1.6	4.8	0.8	4.3	0.2	1.0	0.3	2.3	-	-
Unidentified gull	-	-	-	-	-	-	-	-	0.7	3.3	-	-	-	-
Laysan albatross	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	0.4	0.8	0.2	0.3	0.2	0.3	2.0	6.3	-	-
Leach's storm-petrel	-	-	-	-	0.6	1.2	0.7	1.7	0.7	1.7	1.2	3.7	-	-
Unidentified storm-petrel	-	-	-	-	-	-	-	-	0.2	0.3	-	-	-	-
Northern fulmar	-	-	-	-	-	-	0.2	1.3	0.2	0.3	1.0	5.7	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	0.3	2.7	0.8	4.0	-	-
Unidentified shearwater	-	-	-	-	0.2	1.2	-	-	-	-	-	-	-	-
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pelagic cormorant	0.3	0.5	-	-	-	-	-	-	0.2	2.0	0.2	1.0	-	-
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	0.2	0.8	-	-	0.2	1.3	-	-	-	-	-	-
Unidentified bird	-	-	0.2	0.4	0.4	0.8	-	-	-	-	-	-	0.3	0.5

Table 114 (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	2006		2007		2008		2009		2010		2011		2012	
	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
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	4.2	12.0
n	5		4		4		5		6		5		5	
First survey	17 Jun		7 Jun		31 May		4 Jun		5 Jun		10 Jun		1 Jun	
Last survey	15 Aug		25 Aug		2 Aug		19 Aug		20 Aug		17 Aug		9 Aug	

Table 114 (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	2013		2014		2015		2016		2017		2018		2019	
	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
All species	3.8	11.0	2.6	11.6	9.0	28.0	12.0	49.3	22.3	79.0	13.3	54.3	2.0	8.0
n	4		5		5		6		6		6		4	
First survey	8 Jun		14 Jun		8 Jun		30 May		1 Jun		3 Jun		29 Jun	
Last survey	8 Aug		11 Aug		3 Aug		17 Aug		15 Aug		19 Aug		15 Aug	

Table 115. 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		2012	
	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	0.8	-	-	0.3	0.4	-	-	-	-
Northern shoveler	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common eider	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pigeon guillemot	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-	0.2	0.2
Unidentified auklet	-	-	-	-	1.3	2.3	-	-	-	-	-	-	-	-
Horned puffin	-	-	-	-	-	-	0.2	1.0	-	-	-	-	0.4	0.4
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	0.6	0.6
Glaucous gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large immature gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified gull	-	-	0.3	0.8	-	-	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern fulmar	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	1.2	1.2
n	1		4		4		5		6		5		5	
First survey	15 Aug		13 Jun		31 May		4 Jun		5 Jun		11 Jun		1 Jun	
Last survey	-		20 Aug		2 Aug		19 Aug		20 Aug		17 Aug		9 Aug	

Table 115 (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	2013		2014		2015		2016		2017		2018		2019	
	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	-	-	-	-	0.2	0.4	-	-	-	-	-	-	-	-
Northern shoveler	-	-	-	-	-	-	-	-	-	-	0.2	0.8	-	-
Common eider	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.3
Pigeon guillemot	-	-	-	-	-	-	-	-	-	-	0.2	0.2	-	-
Ancient murrelet	-	-	-	-	-	-	-	-	0.7	0.8	0.2	0.2	-	-
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	0.5	0.5	0.3	0.5
Whiskered auklet	-	-	-	-	-	-	0.2	0.4	1.3	1.5	0.7	0.7	-	-
Crested auklet	-	-	-	-	1.0	1.4	1.0	1.4	0.8	1.2	1.2	1.7	-	-
Unidentified auklet	-	-	0.8	1.4	-	-	1.4	4.4	2.7	3.0	3.2	4.7	0.8	0.8
Horned puffin	-	-	-	-	0.2	0.2	0.4	1.2	-	-	0.2	0.2	-	-
Tufted puffin	-	-	0.4	0.8	0.6	1.8	0.2	0.6	0.2	0.8	-	-	0.5	0.8
Unidentified puffin	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-
Red-legged kittiwake	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-
Unidentified kittiwake	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glaucous-winged gull	0.5	1.3	1.8	2.8	0.2	0.8	1.2	1.6	0.5	0.8	-	-	0.3	0.5
Glaucous gull	-	-	-	-	-	-	0.2	0.8	-	-	-	-	-	-
Large immature gull	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-
Unidentified gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	-	-	-	-	-	-	0.2	0.5	-	-
Leach's storm-petrel	-	-	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	-	-
Northern fulmar	-	-	-	-	0.4	1.2	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	0.2	0.3	-	-
Red-faced cormorant	-	-	-	-	-	-	-	-	-	-	0.2	1.0	-	-
Pelagic cormorant	-	-	-	-	-	-	0.2	0.6	0.2	0.8	0.2	0.8	-	-
Unidentified cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	-	-	0.2	0.8	-	-	-	-	-	-	-	-	-	-
Unidentified bird	-	-	0.2	0.2	-	-	-	-	-	-	-	-	-	-
											-	-	-	-
All species	0.5	1.3	3.6	6.2	3.8	8.4	5.4	11.8	7.3	10.7	7.0	11.8	2.0	2.8
n	4		5		5		5		6		6		4	
First survey	8 Jun		15 Jun		8 Jun		6 Jun		2 Jun		6 Jun		5 Jul	
Last survey	12 Aug		12 Aug		3 Aug		18 Aug		17 Aug		19 Aug		23 Aug	

Table 116. 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	-	-	-	-	-	-
Fork-tailed storm-petrel	-	-	-	-	0.3	0.7	-	-	0.2	0.4
Leach's storm-petrel	-	-	-	-	-	-	-	-	0.2	0.2
Northern fulmar	-	-	-	-	0.3	0.3	1.0	1.3	0.2	0.6
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
n	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 117. 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	-	-	-	-
Fork-tailed storm-petrel	1.0	0.7	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	-	-	-
Leach's storm-petrel	-	-	-	-	-	-	-	-	-	-	0.3	0.4	-	-	-	-	-	-
Northern fulmar	-	-	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-	-	-
Short-tailed shearwater	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	-	-
Unidentified shearwater	-	-	-	-	-	-	-	-	0.2	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
n	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 118. Numbers of birds found during COASST surveys along Transect A, Buldir Island, Alaska in 2019. 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]	
	29 Jun	15 Jul	29 Jul	12 Aug	Total	Mean	SD	Total	Enc. rate[c]
Parakeet auklet	0 (0)	3 (0)	2 (3)	1 (2)	6	1.5	1.3	11	3.4
Unidentified auklet	0 (0)	0 (0)	2 (0)	0 (0)	2	0.5	1.0	2	0.6
Horned puffin	0 (0)	1 (0)	0 (0)	0 (0)	1	0.3	0.5	1	0.3
Black-legged kittiwake	1 (0)	0 (1)	1 (1)	0 (1)	2	0.5	0.6	5	1.6
Glaucous-winged gull	2 (0)	0 (2)	1 (1)	0 (1)	3	0.8	1.0	7	2.2
Total new individuals	3	4	6	1	14	3.5	0.9	-	-
Total encounters	3	7	11	5	-	-	-	26	8.1

[a]Individuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.
[b]Encounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.
[c]Encounter rate = number of birds encountered / km beach surveyed (0.8 km for Transect A) / number of surveys.

Table 119. Numbers of birds found during COASST surveys along Transect B, Buldir Island, Alaska in 2019. 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]	
	29 Jun	17 Jul	1 Aug	15 Aug	Total	Mean	SD	Total	Enc. rate[c]
Unidentified waterfowl	1 (0)	0 (0)	0 (0)	0 (0)	1	0.3	0.5	1	0.5
Unidentified auklet	0 (0)	1 (0)	0 (0)	0 (0)	1	0.3	0.5	1	0.5
Black-legged kittiwake	1 (0)	1 (1)	0 (2)	0 (1)	2	0.5	0.6	6	3.0
Glaucous-winged gull	0 (0)	1 (0)	2 (1)	0 (3)	3	0.8	1.0	7	3.5
Unidentified bird	1 (0)	0 (0)	0 (0)	0 (0)	1	0.3	0.5	1	0.5
Total new individuals	3	3	2	0	8	2.0	0.6	-	-
Total encounters	3	4	5	4	-	-	-	16	8.0

[a]Individuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.
[b]Encounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.
[c]Encounter rate = number of birds encountered / km beach surveyed (0.5 km for Transect B) / number of surveys.

Table 120. Numbers of birds found during COASST surveys along Transect C, Buldir Island, Alaska in 2019. 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]	
	5 Jul	21 Jul	7 Aug	23 Aug	Total	Mean	SD	Total	Enc. rate[c]
Common eider	0 (0)	0 (0)	0 (0)	1 (0)	1	0.3	0.5	1	0.3
Parakeet auklet	0 (0)	1 (0)	0 (0)	0 (1)	1	0.3	0.5	2	0.5
Unidentified auklet	0 (0)	0 (0)	0 (0)	3 (0)	3	0.8	1.5	3	0.8
Tufted puffin	0 (0)	0 (0)	2 (0)	0 (1)	2	0.5	1.0	3	0.8
Glaucous-winged gull	0 (0)	0 (0)	1 (0)	0 (1)	1	0.3	0.5	2	0.5
Total new individuals	0	1	3	4	8	2.0	0.8	-	-
Total encounters	0	1	3	7	-	-	-	11	2.8

[a]Individuals represent new birds seen on surveys only and do not include birds still present and re-encountered on surveys.
[b]Encounters represent all birds seen on surveys, including both new individuals and all instances of re-encountered birds.
[c]Encounter rate = number of birds encountered / km beach surveyed (1 km for Transect C) / number of surveys.

Table 121. 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

[a]Aerial count conducted in less than ideal conditions.
[b]Includes one male and three females with pups.
[c]Includes five females with pups and four lone adults along the north coast of the island (A-B and B-C).
[d]Partial count by boat around Northwest Point only.
[e]Partial count by boat.
[f]Includes 36 adults and 4 pups (1 pup each in segments A-B, D-E, E-F, F-A).
[g]Partial count by boat from East Cape to Peregrine Point only (approximately C-D and D-E); includes 75 adults and 20 pups.
[h]Includes two pups.
[i]Partial count by boat from A to Bull Point only.

Annotated list of wildlife species observed at Buldir Island, Alaska in 2019 (2 June to 27 August).

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 probable** (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)

Note that categories are general and should not change based on deviations in a single year.

BIRDS

Aleutian cackling goose (*Branta hutchinsii leucopareia*). Abundant breeder. Frequently observed in large numbers during 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. The first goslings were seen during the second hike to Spike on 13 June.

Northern shoveler (*Spatula clypeata*). Irregular migrant. A male individual was observed from North Bight Beach on 5 June and 9 June.

Falcated duck *(Mareca falcata).* Accidental vagrant. A single male was observed just off North Bight Beach on 5 June and 9 June (Figure B1). This is the second known record of the species at Buldir Island since annotated lists have been summarized in the report.

Eurasian wigeon (*Mareca penelope*). Uncommon to common spring migrant. Birds were observed on four occasions near camp and in Bean Goose Pond during June. A total of five birds were detected in 2019. A male and female were observed near North Bight Beach on 15 June, but no evidence of nesting was found.

Northern pintail (*Anas acuta*). Uncommon spring migrant and rare summer resident non-breeder. A single female was seen flying over South Marsh on 26 June.

Aleutian green-winged teal (*Anas crecca nimia*). Common migrant and rare summer resident breeder. Birds were common throughout June with only two records in July and three in August. Most often observed in Bean Goose Pond and North Marsh, but detected in Glissade Valley in August.

Common eider (*Somateria mollissima*). Common breeder. Birds were seen regularly throughout the season. Nests with eggs were present on 3 June and chicks were first observed on 20 June. Young chicks were observed into late August. Multiple broods of two to six were seen around the north part of the island.

Harlequin duck (*Histrionicus histrionicus*). Common resident non-breeder. Single birds, pairs, and groups of four were commonly seen on near shore waters throughout the season.

Common goldeneye (*Bucephala clangula*). Rare migrant. Groups of up to four birds (two males and two females) were observed on seven occasions throughout June and July.

Red-breasted merganser (*Mergus serrator*). Uncommon resident non-breeder. A single individual was observed flying off North Bight Beach on 29 June.

Ruddy turnstone (*Arenaria interpres*). Uncommon spring and common fall migrant. No individuals were observed in the spring. Fall migrants started to show up on North Bight Beach in mid-August with a high count of five individuals on 22 August.

Long-billed dowitcher (*Limnodromus scolopaceus*). Casual vagrant. A single individual was first heard on 22 August, then seen flying through the fog above North Marsh. It was not identified until several photos were taken in the same area on 23 August (Figure B2).

Gray-tailed tattler (*Tringa brevipes*). Rare migrant. Single birds were observed on North Bight Beach twice in mid-June and once on 18 August (Figure B3). All were identified by either call or the length of the nasal groove relative to the bill length.

Wandering tattler (*Tringa incana*). Uncommon migrant. Single individuals were observed on 7 and 22 August.

Wood sandpiper (*Tringa glareola*). Uncommon migrant. Individuals were observed from North Bight Beach on five occasions in June (Figure B4). No fall migrants were observed in 2019.

Red-necked phalarope *(Phalaropus lobatus).* Casual migrant. A single individual was observed offshore from North Bight Beach on 4 June.

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 murres nest sympatrically with thick-billed murres, but in much smaller numbers. Only one egg was observed in productivity plots in 2019. A large rockslide disturbed a group of birds attending the productivity cliffs early in the season.

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. Reproductive success in 2019 (67%) was within the range of average for this species on Buldir; this was a notable increase after seven years of lower than average reproductive success.

Pigeon guillemot (*Cepphus columba*). Uncommon breeder. Pigeon guillemots were regularly seen on near shore waters around the island. Bill loads of fish were commonly observed beginning in early July.

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 from mid-June until late 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.

Parakeet auklet (*Aethia psittacula*). Abundant breeder. Parakeet auklets nest in crevices or burrows at many lower elevation sites across the island. In 2019, parakeet auklets experienced higher than average reproductive success (68%).

Least auklet (*Aethia pusilla*). Abundant breeder. This auklet, the second most abundant on Buldir, is most common at Main Talus. Least auklets bread earlier than normal this year, with the mean hatch date for monitored nests occurring five days earlier than average for Buldir; reproductive success (69%) was within the range of average.

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. Reproductive success (85%) was above average for this species on Buldir.

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 300 m ridge above Bottle Hill at Spike Camp. A large group of birds was also seen often flushing from Outer Rock. Reproductive success (90%) was above average for this species on Buldir, matching the previous highest year in 1997; mean hatch date was four days earlier than the long-term mean.

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. Reproductive success (60%) was above average for this species on Buldir.

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. After two years of nearly complete failure, the nests monitored this year had relatively high reproductive success (48%), within the range of average for this species on Buldir.

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. Although most of the nests monitored this year did not produce a fledgling, reproductive success (16%) was within the range of average for this species on Buldir. Breeding efforts began early this year, with the mean hatch occurring seven days earlier than the long-term average.

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. Only one chick survived to fledge in productivity plots in 2019 and only six chicks were counted out of 105 nest starts during boom-bust surveys at Spike Camp.

Glaucous-winged gull (*Larus glaucescens*). Abundant breeder. Nests were recorded from the boulder beaches to the high alpine tundra. Glaucous-winged gulls had a very good reproductive season. Nests monitored this year had a relatively high number of chicks per nest start (1.4) and the second highest hatching success (68%) recorded on Buldir.

Glaucous gull (*Larus hyperboreus*). Irregular migrant. A single adult was spotted amongst the glaucous-winged gulls on North Bight Beach on 8 and 9 June.

Red-throated loon (*Gavia stellata*). Rare migrant/summer resident non-breeder. A single individual was spotted on Kittiwake Lake on 24 August.

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.

Fork-tailed storm-petrel (*Hydrobates furcatus*). Abundant breeder. Nests in burrows and crevices throughout lower elevations of the island. In 2019, maximum potential reproductive success was lower than average for this species.

Leach's storm-petrel (*Hydrobates leucorhous*). Abundant breeder. Nests sympatrically with fork-tailed storm-petrel. In 2019, maximum potential reproductive success was average for this species.

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

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.

Snowy owl (*Nyctea scandiaca*). Casual occasional breeder. An individual was encountered during a hike to Spike Camp on 7 July.

Peregrine falcon (*Falco peregrinus*). Uncommon breeder. Adults were observed throughout the season. Areas of activity included Peregrine Point, Crested Point, Northwest Ridge and Main Talus. Newly fledged birds were observed at Peregrine Point, Main Talus, Northwest Ridge and Crested Point from mid-July onwards. As many as six individuals were seen at one time on 2 August.

Common raven (*Corvus corax*). Causal resident. A single individual was seen at various locations around the island throughout the season. While ravens are common throughout the Aleutian Islands this represents the seventh known record for Buldir Island.

Barn swallow (*Hirundo rustica*). Uncommon non-resident. One pale breasted individual was first seen foraging in near the main cabin on 5 June. It was observed frequently in June, on seven occasions in July, and once on 19 August. Its noticeably white underside and longer tail suggest that it was likely the Eurasian subspecies (Figure B5).

Pacific wren (*Troglodytes pacificus*). Abundant breeder. Adults were observed carrying nesting material in early June. Bill loads of insects were first observed on 16 June. Adults were still provisioning second or possibly third broods of nestlings in late August.

Common rosefinch (*Carpodacus erythrinus*). Casual vagrant. A single female was observed foraging in the path near Spike Cabin on 19 June and 24 June. Photo documentation was essential for confirming the identification of this bird (Figure B6).

Gray-crowned rosy-finch (*Leucosticte tephrocotis*). Common breeder across the island. The first fledglings were observed on 19 June.

Lapland longspur (*Calcarius lapponicus*). Abundant breeder. This species is present in a wider variety of habitats than song sparrow. 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. The first fledglings were observed on 18 June.

MARINE MAMMALS

Sea otter (*Enhydra lutris*). No sea otters were observed in 2019.

Steller sea lion (*Eumetopias jubatus*). Sea lions were rarely seen during the 2019 season. All sightings were of lone individuals swimming off of Spike Beach or off of North Bight Beach. From the island we never saw more than one at a time; however two were observed at East Cape during a skiff ride on 2 June. During a sea lion survey conducted by NOAA NMFS on 21 June no sea lions were observed on Northwest Rocks but weather and sea conditions were poor.

Harbor seal (*Phoca vitulina*). Only lone individual harbor seals were seen in 2019. They were observed off North Bight beach 18 times throughout the season. One individual was found dead on the beach during a COASST survey of Beach A on 29 June.

Humpback whale *(Megaptera novaeangliae)*. An adult and a large calf were seen around the island five times in late July. A large pod of orca were observed harassing the humpbacks during this time. Only the adult humpback was seen on 27 and 28 July.

Orca (*Orcinus orca*). A pod of six orca was first observed on 24 July. They were present around the island for four consecutive days. Approximately 30 individuals could be viewed off North Bight Beach from the cabin porch on 27 July. Males, females, and juveniles were present in this pod. Around 10 individuals were last observed from the Spike Camp ledges on 30 July. The orcas appeared to be harassing a pair of humpback whales from 24 to 26 June. During a sea lion survey conducted by NOAA NMFS on 21 June two orcas were observed offshore of Northwest Rocks.

Table 122. 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 represent observations made each year and therefore may not necessarily match general breeding status categories reported in the annotated list. Historic information comes 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	18	19
Emperor goose	X	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-	X	-	-	-	X	-
Greater white-fronted goose	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	-	-	X	-	-
Bean goose	-	X	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	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	X	X
Falcated duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X
Eurasian wigeon	X	X	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	-	-	-	-	-	-	-	-	-	X	-
Mallard	X	-	P	X	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	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	P	P
American green-winged teal	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-
Common pochard	-	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Tufted duck	-	-	-	-	-	-	X	-	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	B	B
Harlequin duck	X	X	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	-	-	-	-	-	-	X	-
Long-tailed duck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
Bufflehead	-	-	X	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-
Common goldeneye	-	-	-	-	X	-	-	-	X	-	-	X	X	X	X	-	-	-	-	-	-	X
Smew	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-
Common merganser	-	-	X	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	X	X
Horned grebe	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	X	X	-
Red-necked grebe	X	-	-	-	-	-	-	X	-	X	-	X	-	-	X	-	-	-	-	-	-	-
Common cuckoo	-	-	X	-	-	X	X	X	X	X	-	-	-	-	-	X	X	X	-	-	X	-
Cuckoo sp.	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	X	-	-
Sandhill crane	-	-	X	-	X	-	-	X	X	-	X	-	X	-	-	X	-	-	X	-	X	-
Eurasian oystercatcher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Black oystercatcher	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Black-bellied plover	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 122 (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 represent observations made each year and therefore may not necessarily match general breeding status categories reported in the annotated list. Historic information comes 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	18	19
American golden-plover	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pacific golden-plover	-	-	-	-	X	X	-	-	-	X	-	X	-	-	-	X	X	-	X	-	-	-
Common ringed plover	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Semipalmated plover	X	-	X	X	-	-	-	-	X	-	-	-	X	X	-	X	-	-	-	-	-	-
Lesser sand-(Mongolian) plover	X	X	X	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	X	-	X	-
Whimbrel	X	X	X	X	X	-	-	X[a]	X	-	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	-	-	X	-
Ruddy turnstone	X	X	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	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	X	-	-
Rock sandpiper	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Little stint	X	-	-	-	-	-	-	-	X	-	X	X	-	-	-	-	-	-	-	X	-	-
Buff-breasted sandpiper	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Pectoral sandpiper	-	-	-	X	-	-	X	-	-	X	X	-	X	-	X	X	-	-	-	-	X	-
Western sandpiper	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Long-billed dowitcher	-	-	-	X	-	-	-	-	-	-	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	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	X	-
Gray-tailed tattler	X	-	X	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	X	X
Common greenshank	-	-	X	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	X	X
Marsh sandpiper	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Red-necked phalarope	-	-	-	-	-	-	-	-	-	-	X	-	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	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	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	B	B
Pigeon guillemot	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Table 122 (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 represent observations made each year and therefore may not necessarily match general breeding status categories reported in the annotated list. Historic information comes 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	18	19
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	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	B	B
Parakeet auklet	B	B	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	B	B
Whiskered auklet	B	B	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	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	B	B
Tufted puffin	B	B	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	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	B	B
Black-headed gull	X	-	X	X	X	X	X	X	X	X	-	X	X	-	X	X	X	X	X	X	X	-
Black-tailed gull	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Kamchatka common 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	X	-
Glaucous-winged gull	B	B	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	-	-	-	-	X
Least tern	-	-	-	-	-	-	-	?[b]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-throated loon	-	-	X	X	X	-	-	-	-	X	-	X	X	X	X	X	X	X	X	X	X	X
Arctic loon	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Pacific loon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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	X	X
Black-footed albatross	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-	-	X	-	-	-	-	-
Short-tailed albatross	-	-	-	-	-	-	-	-	-	-	-	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	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	B	B
Northern fulmar	B	B	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	-	-	-	-	-	-	-	-	-
Red-faced cormorant	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	X/B?	X/B?	X/B?	X/B?	X/B?
Pelagic cormorant	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	X/B?	X/B?	X/B?
Bittern sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Great egret	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-
Intermediate egret	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Little egret	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-crowned night-heron	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-

Table 122 (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 represent observations made each year and therefore may not necessarily match general breeding status categories reported in the annotated list. Historic information comes from annotated lists in annual refuge monitoring reports; data were collected before 1998 but have not yet been summarized from historic sources.

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Species	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
Bald eagle	X	X	B	X	B	B	B	B	B	B	B	B	P	B	B	B	B	B	B	B	B	B
Steller's sea eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(X)[c]	X	-	-	-	-
Rough-legged hawk	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Snowy owl	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	-	-	X
Long-eared owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Short-eared owl	-	X	X	X	X	X	-	-	X	X	X	-	-	X	X	-	X	X	-	-	-	-
Gyrfalcon	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Peregrine falcon	B	B	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	-	-	-	-	X	X
Bank swallow	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-
Tree swallow	X	-	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-
Barn swallow	-	-	-	-	-	-	X	-	-	X	X	-	-	-	X	-	-	-	-	-	-	X
Cliff swallow	-	-	-	-	-	-	-	-	-	-	-	-	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	B	B
Phylloscopus warbler[d]	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-
Middendorff's grasshopper-warbler	-	-	-	-	-	X	-	X[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lanceolated warbler	-	-	-	-	-	-	-	-	-	B	-	-	-	-	-	-	-	-	-	-	-	-
Gray-streaked flycatcher	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Asian brown flycatcher	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dark-sided (Siberian) flycatcher	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Siberian rubythroat	-	-	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	X	-
Eastern yellow wagtail	X	-	X	X	X	X	X	X	X	X	-	-	X	X	X	X	-	-	X	-	X	-
Gray wagtail	-	-	X	X	-	X	X	-	X	-	-	X	-	-	-	-	-	-	X	-	X	-
White wagtail	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-
Olive-backed pipit	X	-	X	-	X	-	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	-
Pechora pipit	X	-	-	X	-	-	-	X[a]	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Red-throated pipit	X	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-
American pipit	-	-	-	X	-	-	-	X[a]	X	-	-	-	-	-	-	-	-	-	-	-	X	-
Brambling	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	X	-
Common rosefinch	-	-	X	-	-	-	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	B	B
Oriental greenfinch	-	-	-	-	-	-	-	X	-	X	-	-	-	-	X[e]	-	-	-	-	-	-	-

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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	B	B
Snow bunting	B	-	B	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	-	-	-	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	B	B
Sea otter	B	B	B	NR[f]	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	X	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	P	X
Humpback whale	-	-	-	NR	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
Orca	X	-	X	NR	X	-	-	-	X	X	X	-	X	X	X	X	X	X	X	X	X	X
Dall's porpoise	-	-	-	NR	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	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	27 May-26 Aug	28 May-26 Aug	2 Jun-28 Aug	29 May-29 Aug	25 May-27 Aug	28 May-26 Aug	2 Jun-27 Aug

[a]Species not recorded by monitoring crew but observed by Ian Jones and Sampath Seneviratne 29 May-6 June 2005.
[b]"?" 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.
[c]Animal very likely seen and misidentified as a white-tailed sea eagle.
[d]In 2010 Arctic warbler was split into three species. There is much variation in plumage coloration and vocalization is the best tool for identification.
[e]Species not recorded by monitoring crew but observed only by Ian Jones.
[f]Mammals not recorded (NR) in all years.

Table 123. 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	2018
Lycopodiaceae	*Lycopodium selago selago*	-	-	-	-	-	-
	Lycopodium annotinum annotinum	-	-	-	-	-	-
Equisetaceae	*Equisetum arvense*	-	-	-	-	-	-
	Athyrium felix-femma cyclosorum	-	-	-	-	-	-
Graminae	*Poa*spp.	-	-	-	-	-	-
	Bromus sitchensis	-	15 Aug	-	-	-	-
	Leymus mollis	30 Jun	5 Jul	-	-	-	-
	Calamagrostis canadensis	-	-	-	-	-	-
	Calamagrostis nutkatensis	-	7 Aug	-	-	-	-
	Festuca rubra aucta	-	10 Aug	-	-	-	-
	Phleum commutatum americanum	-	28 Jun	-	-	-	-
	Puccinella langeana	-	13 Jun	-	-	-	-
Cyperacea	*Carex macrochaeta*	23 Jun	28 Jun	-	-	-	-
	Carex lyngbyaei	2 Jul	13 Jun	-	-	-	13 Jun
	Carex kelloggi	-	-	late Jun	-		-
Juncaceae	*Luzula multiflora multiflora*	-	-	late Jun	-	-	-
	Luzula multiflora Kobayasii	-	-	-	-	-	-
	Luzula spp.	24 Jun	22 Jun	-	-	-	-
	Juncus arcticus sitchensis	23 Jul	-	-	-	-	-
Liliaceae	*Fritillaria camschatcensis*	28 Jun	14 Jun	21 Jun	25 Jun	21 Jun	8 Jun
	Streptopus amplexifolius	21 Jun	4 Jul	-	-	-	7 Jul
Orchidaceae	*Platanthera convallariaefolia*	5 Jul	5 Jul	-	mid Jul	20 Jul	7 Jul
	Platanthera dilatata	-	1 Jul	-	-	-	-
	Listera chordata	-	20 Aug	-	-	-	-
Salicaceae	*Salix arctica crassijulis*	19 Jun	31 May	10 Jul	30 Jun	-	20 Jun
	Salix rotundifolia	-	31 May	-	-	-	20 Jun
Polygonaceae	*Oxyria digyna*	29 Jul	20 Jun	-	-	-	16 Jul
	Rumex fenestratus	22 Jul	15 Jul	-	-	-	19 Jul
	Polygonum viviparum	-	-	-	-	-	<18 Jul
	Koenigia islandica	-	-	-	-	-	4 Aug
Portulaceae	*Claytonia sibirica*	early Jun	11 Jun	-	-	24 Jun	4 Jun
	Montia fontana Fontana	-	-	-	-	-	29 Jun
Caryophyllaceae	*Honkenya peploides major*	5 Jul	-	-	-	1 Jul	15 Jul
	Cerastium beeringianum grandiflorum	-	-	-	-	-	-
	Cerastium fischerianum	-	-	-	-	-	-
	Moehringia lateriflora	-	-	-	-	-	-
	Stellaria calycantha	-	-	-	-	-	29 Jul
	Stellaria crispa	-	-	-	-	-	13 Jul
	Stellaria media	-	-	-	-	-	-
	Stellaria ruscifolia	-	-	-	-	-	-
	Sagina crassicaulis	-	-	-	-	18 Jun	-
	Cerastium aleuticum	-	1 Jul	-	-	-	1 Jul

Table 123 (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	2018
Caryophyllaceae (con'd)	*Cerastium fisherianum*	-	5 Jul	-	-	-	-
Ranunculaceae	*Coptis trifolia*	-	17 Jul	-	30 Jun	-	20 Jun
	Ranunculus hyperboreus	-	-	-	-	14 Jun	-
	Ranunculus occidentalis	-	9 Jun	9 Jun	-	14 Jun	4 Jun
	Ranunculus eschscholtzii	-	-	-	-	-	27 Jun
	Ranunculus grandis	-	4 Jul	-	-	-	30 Jun
	Anemone narcissiflora villosissiflora	-	-	-	-	-	-
Cruciferae	*Draba hyperborea*	8 Jun	6 Jun	-	1 Jul	-	7 Jun
	Draba borealis	8 Jun	6 Jun	-	-	-	-
	Cardemine umbellata	17 Jun	6 Jun	-	1 Jul	-	4 Jun
	Cochlearia officialis oblongifolia	13 Jun	6 Jul	-	-	-	16 Jul
Saxifragaceae	*Saxifraga punctata insularis*	16 Jun	31 May	26 Jun	-	-	5 Jun
	Saxifraga bracteata	2 Jun	28 May	3 Jun	25 Jun	4 Jun	-
	Saxifraga aleutica	-	28 May	-	-	-	-
	Chrysosplenium wrightii	-	29 May	-	-	-	-
Rosaceae	*Rubus arcticus stellatus*	16 Jul	19 Jun	25 Jun	30 Jun	30 Jun	13 Jun
	Rubus chamaemorus	-	11 Jun	-	-	12 Jun	9 Jun
	Sibbaldia procumens	4 Jul	9 Jul	-	-	-	20 Jun
	Potentilla villosa	4 Jul	15 Jul	-	-	-	25 Jun
	Potentilla egeaii	-	26 Jun	-	-	-	15 Jul
	Potentilla hyperarctica	-	7 Jul	-	-	-	15 Jul
	Geum macrophyllum	-	12 Jun	-	23 Jun	-	13 Jun
	Geum calthifolium	-	17 Jul	10 Jul	-	-	10 Jun
	Geum rossii	-	6 Jul	-	-	-	<1 Jul
Geraniaceae	*Geranium erianthum*	27 Jun	17 Jun	-	23 Jun	30 Jun	13 Jun
Violaceae	*Viola epipsila repens*	-	-	21 Jun	18 Jun		-
	Viola langsdorffii	7 Jul	12 Jun	-	-	30 Jun	9 Jun
Onagraceae	*Epilobium glandulosum*	<28 Aug	17 Jul	-	-	-	13 Jul
	Epilobium behringianum	-	17 Jul	18 Jul	19 Jul	-	-
Apiaceae	*Heracleum lanatum*	21 Jul	30 Jul	-	-	29 May	12 Jul
	Angelica lucida	2 Jul	11 Jul	-	-	-	<7 Jul
	Ligusticum scoticum-Hultenii	16 Jul	25 Jul	-	-	-	25 Jul
	Conioselinum chinense	21 Jul	4 Aug	-	-	-	3 Aug
Cornaceae	*Cornus suecica*	7 Jul	12 Jun	21 Jun	18 Jun	-	13 Jun
	Cornus canadensis	-	-	-	-	-	-
Pyrolaceae	*Pyrola minor*	-	-	-	-	-	28 Jul
Ericaceae	*Rhododendron camtschaticum*	-	5 Aug	-	-	-	-
	Cassiope lycopioides	-	16 Jul	15 Jul	-	-	27 Jun
	Vaccinum vitis-idaea minus	-	-	20 Jul	-	-	-
	Loiseleuria procumbens	-	17 Jul	-	-	-	20 Jun
	Phyllodoce aleutica	-	13 Jul	-	-	-	-
Empetraceae	*Empetrum nigrum*	mid Jul	-	-	-	-	-

Table 123 (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	2018
Primulaceae	*Trientalis europaea arctica*	-	1 Jul	20 Jul	-	-	1 Jul
	Primula cuneifolia	19 Jun	11 Jun	26 Jun	-	8 Jun	8 Jun
Gentianaceae	*Gentiana amarelle acuta*	-	-	-	-	-	-
	Gentiana aleutica	-	15 Aug	-	-	-	14 Aug
Scrophulariaceae	*Veronica stelleri*	-	17 Jun	24 Jun	30 Jun	-	13 Jul
	Veronica grandiflora	4 Jul	22 Jun	20 Jun	29 Jun	-	20 Jun
	Veronica serpyllifolia humifusa	-	21 Jun	-	6 Jul	-	30 Jun
	Veronica americana	-	19 Aug	-	-	-	7 Aug
	Rhinanthus minor boreales	-	8 Aug	-	-	-	7 Aug
Plantaginaceae	*Plantago macrocarpa*	-	19 Jun	-	-	-	-
Hippuridaceae	*Hippuris montana*	-	-	-	-	-	-
Rubiaceae	*Galium trifidum*	-	-	-	-	-	28 Jul
Campanulaceae	*Campanula lasiocarpa lasiocarpa*	-	8 Aug	-	16 Aug	-	28 Jul
Asteraceae	*Achillea borealis*	16 Jul	29 Jul	-	19 Jul	-	13 Jul
	Senecio pseudo-arnica	16 Jul	17 Jul	20 Jul	19 Jul	-	10 Jul
	Arnica unalaskanesis	-	25 Jul	-	-	-	15 Jul
	Erigeron peregrinus	mid Jul	9 Jul	14 Jul	6 Jul	-	29 Jun
	Artemesia unalaskensis aleutica	-	7 Aug	15 Aug	-	-	11 Aug
	Chrysanthemum articum	12 Jul	14 Jul	early Aug	23 Jul	-	8 Jul
	Cacalia auriculata kamtschatica	-	-	16 Aug	-	-	-
	Anaphalis margaritacea	-	7 Aug	-	-	-	27 Jul
	Tataxicum trigonolobum	-	19 Jun	-	-	-	<1 Jul

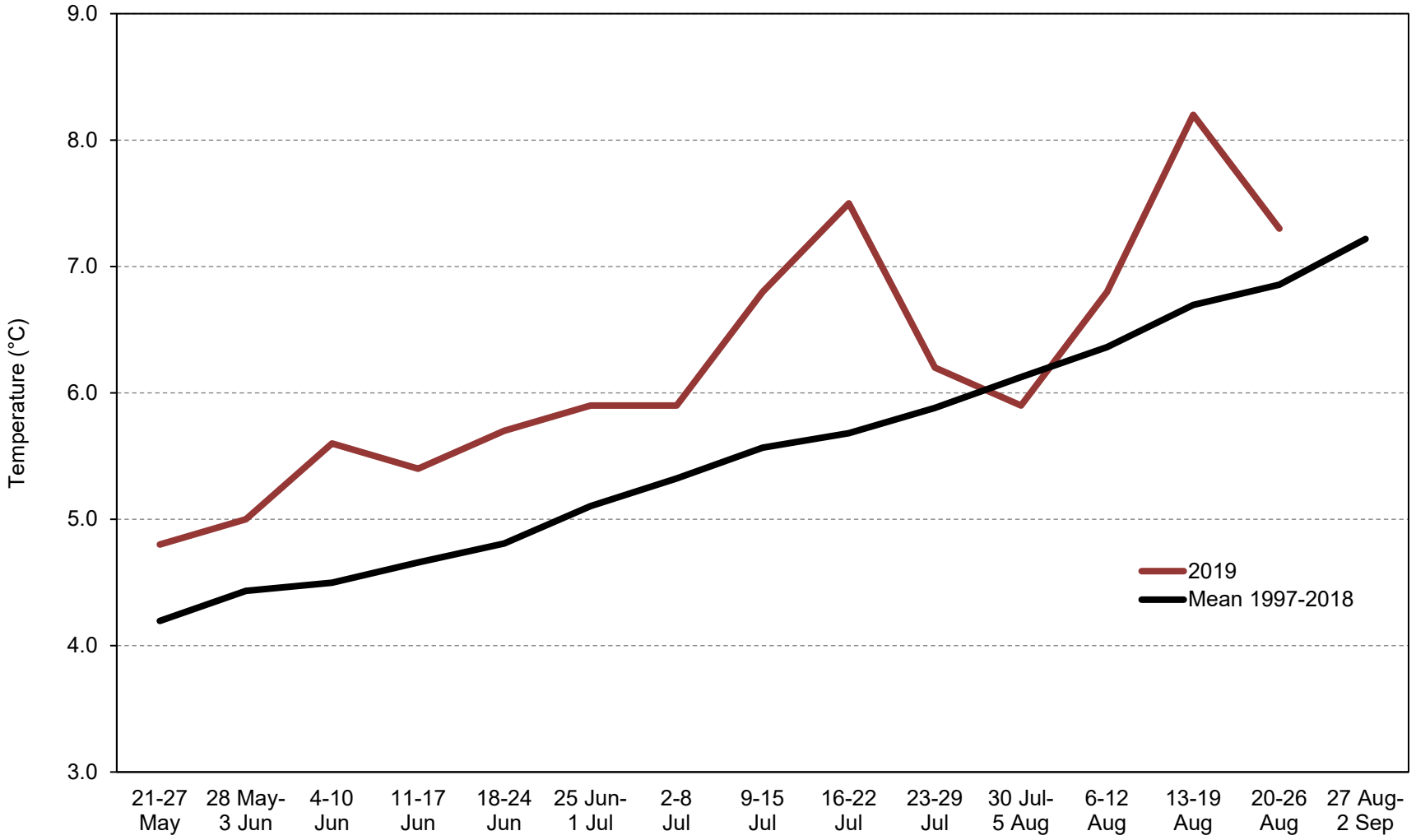

Figure 77. Mean weekly sea surface temperatures (°C) at Buldir Island, Alaska.

Table 124. 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	2018	2019
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	4.5	4.8
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	4.8	5.0
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	5.1	5.6
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	5.1	5.4
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	5.3	5.7
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	5.7	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	6.1	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	5.6	6.8
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	6.1	7.5
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	6.4	6.2
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	6.3	5.9
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	6.7	6.8
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	7.0	8.2
27 Aug-2 Sep	-	-	5.7	6.9	7.1	7.7	6.8	-	6.3	8.5	-	-	-	-	-	-	-	-	6.8	8.6	8.2	6.8	7.3
3-9 Sep	-	-	-	-	7.1	5.9	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 125. 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	25-27Jun	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 Dragoo, Dana Bradley	15
	28 Jul-30 Jul	ACG capture	8	Mike Amaral, Fred Deines, Don Dragoo, 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 Dragoo, Natasha Kline, Leslie Slater, Susan Steinacher, Fred Zeillemaker	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 McClellen, 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 Pfost, 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	
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	

Table 125 (continued). History of official visits to Buldir Island, Alaska.

Year	Dates	Type of work	Number	Names	Source
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 Garroutte	
2011	28 May-28 Aug	Refuge monitoring	2	John Warzybok, David Cockerill	
	28 May-5 Aug	Refuge monitoring	1	Jaime Neill	
	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 Garroutte	
2012	25 May-30 Aug	Refuge monitoring	2	John Warzybok, Matt Henschen	

Table 125 (continued). History of official visits to Buldir Island, Alaska.

Year	Dates	Type of work	Number	Names	Source
	25 May-11 Aug	Refuge monitoring	1	Ronan Dugan	
2012	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	Refutge 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	
2018	28 May-27 Aug	Refuge monitoring	3	Kevin Pietrzak, McKenzie Mudge, Brianna Bode	
	17 Jun-19 Jun	Kittiwake biology	3	Nora Rojek, Dean Kildaw, Anthony DeGange	
	17 Jun-19 Jun	Photography	1	Gerrit Vyn (Cornell Lab of Ornithology)	
2019	2 Jun-27 Aug	Refuge monitoring	3	Stacie Evans, Daniel Schultz, Reina Galvan (Stacie Evans off island 7-16 June)	
	2 & 9 Jun	Videography	3	Ian Shive, Paul Wildman, Dante Fernandes (Tandem Stills & Motion, Inc.)	
	9 Jun-17 Jun	Refuge monitoring	1	Nora Rojek	

* 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 2019 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, 2003-2018, (2019)	Y
Least auklet	Adult	Stomach	1988, 1990	N
Least auklet	Chick	Regurgitation	1991, 1994-2018, (2019)	Y
Whiskered auklet	Adult	Stomach	1976, 1988-1989	N
Whiskered auklet	Chick	Gular	1976	Y
Whiskered auklet	Chick	Regurgitation	1991, 1993-2018, (2019)	Y
Crested auklet	Adult	Stomach	1988, 1990	N
Crested auklet	Chick	Regurgitation	1991, 1993-2018, (2019)	Y
Horned puffin	Adult	Stomach	1988, 1990	N
Horned puffin	Chick	Bill load	1990-1991, 1994, 1996, 1998-2019	Y
Tufted puffin	Adult	Stomach	1988-1990	N
Tufted puffin	Chick	Bill load	1988-1992, 1994, 1996-2019	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	1997-2019	Y
Glaucous-winged gull	Chick	Regurgitation	2010, 2016	Y
Fork-tailed storm-petrel	Adult	Stomach	1989	N
Fork-tailed storm-petrel	Chick	Regurgitation	1996-1999, 2001-2014, (2015-2019)	Y
Leach's storm-petrel	Adult	Stomach	1989-1990	N
Leach's storm-petrel	Chick	Regurgitation	1996-2014, (2015-2019)	Y
Northern fulmar	Adult	Stomach	1989	N
Short-tailed shearwater	Adult	Stomach	1990	N
Pelagic cormorant	Chick	Bolus	2006	N
Red-faced cormorant	Adult	Stomach	1990	N

Appendix B. Photos of Interest.

Figure B1. Male falcated duck.
Photo by Reina Galvan.

Figure B2. Long-billed dowitcher.
Photo by Reina Galvan.

Figure B3. Gray-tailed tattler.
Photo by Reina Galvan.

Figure B4. Wood sandpiper.
Photo by Daniel Schultz.

Figure B5. Barn swallow (Eurasian subspecies).
Photo by Daniel Schultz.

Figure B6. Female common rosefinch.
Photo by Reina Galvan.