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BIOLOGICAL MONITORING IN THE CENTRAL ALEUTIAN ISLANDS, ALASKA IN 2008: SUMMARY APPENDICES

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Key words: *Aethia cristatella*, *Aethia pusilla*, Alaska, Aleutian Islands, banding, black-legged kittiwake, breeding chronology, *Cepphus columba*, common murre, crested auklet, *Eumetopias jubatus*, food habits, fork-tailed storm-petrel, Kasatochi Island, Koniuji Island, Leach's storm-petrel, least auklet, *Mesoplodon stejnegeri*, monitoring, *Oceanodroma furcata*, *Oceanodroma leucorhoa*, pelagic cormorant, *Phalacrocorax pelagicus*, *Phalacrocorax urile*, pigeon guillemot, population, red-faced cormorant, red-legged kittiwake, reproductive performance, *Rissa brevirostris*, *Rissa tridactyla*, Stejneger's beaked whale, Steller sea lion, thick-billed murre, Ulak Island, *Uria aalge*, *Uria lomvia*

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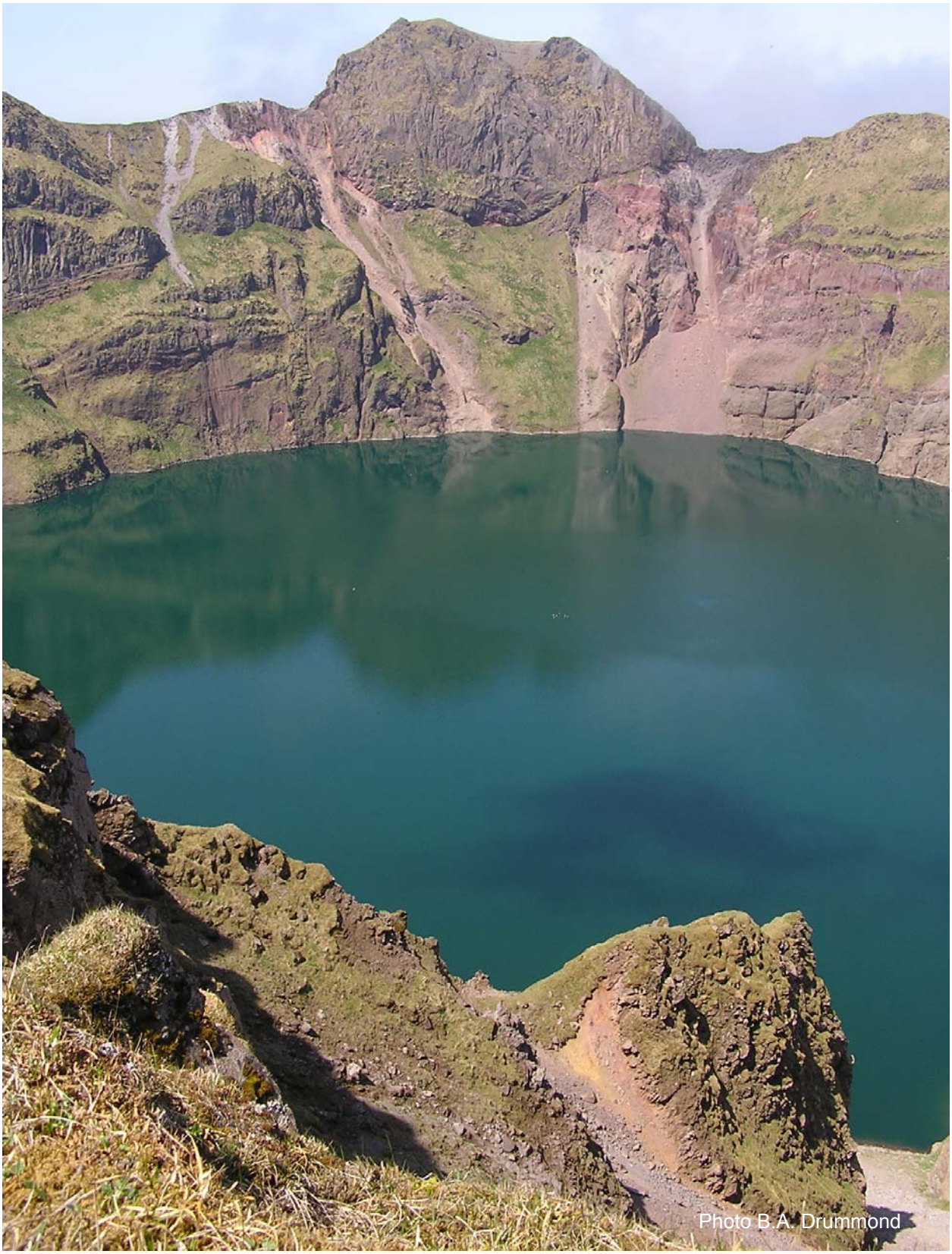

Caldera from the east side, Kasatochi Island, Alaska

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INTRODUCTION

One of the nine annual ecological monitoring sites in the Alaska Maritime National Wildlife Refuge (AMNWR) is located in the central Aleutian Islands. This "site" includes seabird monitoring plots on three nearby islands: Kasatochi, Koniuji, and Ulak. As for all nine monitoring sites, the objective is to collect baseline status and trends information for a suite of species representing piscivorous and planktivorous trophic guilds, including key species that serve as indicators of ecosystem health. By correlating data with environmental conditions and information from other sites, ecosystem processes may be better understood.

Brief visits were made to Kasatochi, Koniuji, and Ulak in the past, but 1996 was the first year that intensive, season-long monitoring occurred (Scharf et al. 1996). Previous work consisted primarily of boat-based circumnavigations (Early et al. 1981; Bailey and Trapp 1986; Byrd and Williams 1994; Byrd 1995a, 1995b). At Kasatochi, incidental seabird observations were recorded during an effort to remove introduced arctic foxes (*Alopex lagopus*) in the 1980s (Deines 1985, Deines and Willging 1985), and in 1991 crested and least auklet (*Aethia cristatella* and *A. pusilla*, respectively) population plots were set up and monitored for several days (Thomson and Wraley 1992). Since 1996, intensive season-long monitoring has been conducted each year (Scharf et al. 1996; Scharf and Williams 1997; Scharf 1998, 2000a, 2000b; Syria 2001, 2002; Barton and Lindquist 2003; Drummond and Kissler 2004; Drummond and Rehder 2005; Drummond 2006; Drummond and Larned 2007). Bird distributions at sea around Kasatochi, Koniuji, and Ulak were described by Drew et al. (2003).

This was an exceptional year at Kasatochi. The island has been volcanically quiet for over 100 years and seemed relatively benign and was not thought to pose a risk of eruption. Our field crew had a great season, but reported numerous small earthquakes beginning 2 August which increased in frequency and intensity over the next successive days. On 4 August our Adak office consulted with the Alaska Volcano Observatory (AVO), who readjusted nearby instrumentation and eventually recommended evacuating our field crew on 6 August. By this time, seismic tremors were happening at a rate of 2-3 every 5 minutes. An evacuation using a US Coast Guard helicopter fortuitously at Adak was not possible due to mechanical issues so Lisa Spitler made arrangements for a small boat to pick up our crew the next morning since by this time it was night. The small boat commanded by Al Giddings left at first light and made it to Kasatochi about 1200h and had the crew aboard and underway by 1230h. While enroute to the island, we received word from the AVO at 1030 h that seismic tremors had changed to volcanic in nature which indicated an eruption was eminent. Kasatochi erupted sometime around 1330h and twice more that day. The last eruption was significant and violent, blowing away a portion of the west rim and causing extensive pyroclastic flows which increased the coastline of the island several hundred meters out to the former 10 fathom line. Our crew made it back safely, but only escaped with a single bag each. We lost the entire contents of the camp including personal items, all camp equipment and most data. We were able to reconstruct approximately half of the data from Rite-in-the-Rain field notebooks the crew was able to take with them when they left the island. We hope to write a separate report detailing specifics of the eruption with before and after photographs.

The specific goal in 2008 was to estimate population and/or productivity parameters for nine indicator species representing the four major feeding guilds: diving fish-feeders (pelagic and red-faced cormorants [*Phalacrocorax pelagicus* and *P. urile*, respectively], common and thick-billed murres [*Uria aalge* and *U. lomvia*, respectively], pigeon guillemots [*Cepphus columba*]), surface fish-feeders (black-legged kittiwakes [*Rissa tridactyla*]), diving plankton-feeders (crested and least auklets), and surface plankton-feeders (fork-tailed storm-petrels [*Oceanodroma furcata*]). In addition, breeding chronology, chick growth, adult survival, morphology, and food habits were described for one or more of the above species.

Detailed results of the 2008 monitoring program are contained in these appendices and archived at the AMNWR office in Homer, Alaska. Food habits data for storm-petrels and auklets were collected, but lost in the eruption and are not available. Summary data were entered into the Pacific Seabird Monitoring Database and included in the AMNWR Consolidated Seabird Monitoring report.

STUDY AREA

Kasatochi, Koniuji, and Ulak islands are located in the Andreanof Island group of Alaska's central Aleutian Islands. 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 8.8°C in the summer and 4.8°C annually. Average annual precipitation is 166 cm. Snow accumulation at sea level rarely exceeds 0.5 m, and there is no permafrost. Vegetation on the islands is composed of maritime and alpine tundra and consists mostly of grasses, sedges, sphagnum mosses, lichens, and a variety of forbs. There are no erect trees or shrubs.

Kasatochi and Koniuji are located on the southern edge of the Aleutian Basin, and are bordered to the north by deep water and to the south by relatively shallow water. Ulak is surrounded by shallow water. All three islands are relatively exposed, and are often subject to rough surf conditions that restrict small boat operations.

In 1996-2007, sea surface temperatures off the coast of Kasatochi increased as the summer progressed, from around 4-5°C in late May and early June to over 6°C in early August. In 1998, the temperature increased dramatically in mid to late August, reaching highs of over 22°C. Both offshore temperature loggers in 2008 were buried by pyroclastic flows in the 7 August eruption.

Kasatochi Island.--Located approximately 19.5 km northwest of the westernmost point of Atka Island, Kasatochi Island (52°11'N, 175°30'W) is a volcanic caldera, roughly circular in shape that, prior to the eruption this year, encompassed approximately 287 ha and had a diameter of about 2.7 km. There are no reliable reports of the island being eruptive in historic times (Coats 1950), although steam rose from the caldera and the lake at the base disappeared in 1899 (Jaggar 1927), and water in the caldera was seen bubbling in 2005-2007(Drummond and Rehder 2005, Drummond 2006, Drummond and Larned 2007). The rim of the caldera rises at its highest point to 316 m, and descends sharply inward to a 0.8 km wide lake near sea level, with water about half the salinity of seawater (Bailey and Trapp 1986). The southern half of the island consists mostly of gentle grassy slopes, and the coastline is characterized by narrow sand or cobble beaches at the base of dirt cliffs up to 30 m high. High rocky bluffs are found on the west coast, rising over boulder beaches, and several grassy ravines slope from the bluffs to the caldera rim. Sheer impassable cliffs interspersed with rock slides and steep vegetated talus slopes dominate the northern coastline from Barabara Ridge on the west side to the easternmost point of the island. There are no freshwater streams or ponds during the summer months. Remnants of a house pit, probably Aleut, are on Barabara Ridge, and on the west side of the island a renovated fox trappers' cabin, originally built in 1929, serves as a base of operations for U.S. Fish and Wildlife Service personnel. Vegetation on the island was described by Scharf et al. (1996).

Arctic foxes had been introduced on Kasatochi by 1927, and were trapped for fur through at least the winter of 1935. The Service attempted to eliminate foxes in the 1960s (Jones 1963), but foxes were not removed until the 1980s (Deines 1985, Deines and Willging 1985) and by 1991 the island was fox-free (Thomson and Wraley 1992). Foxes preyed on seabirds; Murie (1936) reported finding over 100 auklets in a single fox cache. Nevertheless, foxes did not extirpate crevice and ledge-nesting seabirds. An estimated 22,000 to 36,000 seabirds, primarily crested and least auklets, were reported breeding on the

island in the 1970s and early 1980s (Sekora 1973, Bailey and Trapp 1986). In contrast, foxes may have reduced burrow-nesting seabirds to very low levels. In 1936, tufted puffins (*Fratercula cirrhata*) were described as "very numerous about the island, nesting on the grassy slopes" (Murie 1936), but from 1991-1998 the few puffins remaining were restricted to extremely rugged and inaccessible areas of cliff faces. Now that foxes are gone these populations may recover. In addition to seabirds, a Steller sea lion (*Eumetopias jubatus*) rookery occurs on the north side of the island, and a small population of harbor seals (*Phoca vitulina*) is also present. Passerines are abundant on beaches and talus slopes, and several pairs of peregrine falcons (*Falco peregrinus*) and bald eagles (*Haliaeetus leucocephalus*) nest on the island.

Koniuji Island.--Located 25.6 km east of Kasatochi and 16 km north of Atka Island, Koniuji Island (52°13'N, 175°08'W) encompasses approximately 110 ha and is about 1.3 km long and 0.9 km wide. Although volcanic in origin, the island is deeply eroded, suggesting that reports of activity in historic times were mistaken (Coats 1950, Sekora 1973). Almost the entire coastline is sheer, rising to a rugged 268 m peak on the northern end of the island. A low, flat, rocky point extends about 200 m on the northwest coast. A grassy ravine separates the north side of the island from the less precipitous southern bluffs. There is no fresh water on the island.

Although Koniuji was leased for fox farming in 1934, foxes were apparently never introduced. As a result, the island hosts a diverse and prolific seabird colony, with an estimated 30,000 breeding diurnal seabirds and probably hundreds of thousands of nocturnal seabirds, including Leach's (*Oceanodroma leucorhoa*) and fork-tailed storm-petrels, ancient murrelets (*Synthliboramphus antiquus*), and whiskered auklets (*Aethia pygmaea*) (Bailey and Trapp 1986). Thousands of kittiwakes and murres nest on the sheer coastal cliffs, and tens of thousands of tufted puffins nest on the grassy slopes above the southern bluffs. Tens of thousands of crested and least auklets can be observed circling the vegetated talus flanking the highest point on the island, and hundreds of parakeet auklets (*Aethia psittacula*) inhabit the boulder beaches along the west coast. In 1982, Bailey and Trapp (1986) noted an amazing abundance of bald eagles, counting 17 at once, though no nests were evident. They surmised that eagles were coming over from Atka to feed on seabirds.

Ulak Island.--Located 2.5 km east of Great Sitkin Island and 46 km southwest of Kasatochi, Ulak Island (52°02'N, 175°54'W) is small and rugged. Encompassing approximately 46.5 ha, the island is 1.4 km long and 0.3 k wide, with a maximum elevation of 206 m. The south side is comprised of steep slopes covered with relatively deep soil and densely vegetated with large *Leymus* hummocks. These slopes provide habitat for thousands of nesting seabirds, including storm-petrels, tufted puffins, and Cassin's auklets (*Ptychoramphus aleuticus*). The north side of the island is characterized by cliffs inhabited by cormorants, puffins, and thousands of murres. Whiskered auklets nest in abundance along the boulder beaches and on vegetated talus slopes. There is no record of foxes ever having been introduced to the island.

METHODS

Personnel.-- Two observers were present on Kasatochi from 24 May to 7 August; Ray Buchheit acted as camp leader, and was assisted by J. Chris Ford for the length of the season.

At Ulak, burrow density and storm-petrel productivity data were collected on 11 June by Ray Buchheit, J. Chris Ford, Jeff Williams, Barry Sampson, and Carlin Rausch. Storm-petrel productivity data were also collected on 21 July by Ray Buchheit, J. Chris Ford, Jeff Williams, and Grant Humphries. A

third visit was not possible in 2008 due to data lost in the 7 August eruption of Kasatochi Volcano.

Data Collection and Analysis.--We followed data collection and analysis methods outlined in Williams et al. (2002), with the following exceptions:

- All Ulak Island data (storm-petrel productivity and density estimates) was lost in the volcanic eruption.

- Productivity data were collected on fork-tailed storm-petrels nesting in crevices at Kasatochi Island using methodology similar to that outlined for other crevice-nesters (rather than burrow-nesters) in Williams et al. (2002), with nests checked at 7-day intervals. Chicks were weighed and measured using methodology similar to that outlined for fork-tailed storm-petrel monitoring on Ulak Island in the same source, but done more often because of more frequent visits to nests.

- Productivity data on fork-tailed storm-petrels nesting at Kasatochi and Ulak islands were analyzed following two sets of criteria that differ from that described in Williams et al. (2002). We report the maximum potential productivity prior to the eruption on 7 August since we are interested in using seabirds as proxies of what is happening in the marine environment, not of stochastic volcanic events. No chicks had fledged prior to the last check and almost certainly all chicks and burrows were buried and thus the ultimate productivity for the island is 0.

  a) At both islands, determinants for age at fledging for storm-petrels followed modifications made in 2007 (Drummond and Larned 2007), which were based on analysis of detailed data on fork-tailed storm-petrel ages and wing chords at fledging from Kasatochi in 2005-2006 (Drummond 2007). Following this new criterion, chicks disappearing from the nest were considered failed at less than 50 days of age or 140 mm wing chord, and successful at greater than 50 days of age or 140 mm wing chord. Data from previous years at both Kasatochi and Ulak were reanalyzed using these new determinants in 2007 (Drummond and Larned 2007) and should supersede productivity data presented in reports prior to 2007.

  b) For historic data at Ulak Island, data were analyzed following a set of criteria for determining fate of chicks developed in 2004 (Drummond and Kissler 2004), in which unknown nest status' at the last check (i.e. E-C-U) results in unknown fate and removal from analysis. Prior to 2004, nests with unknown status' at the last check were considered empty and included in the final sample; data from 1997-2003 have since been reanalyzed.

- Food samples from fork-tailed storm-petrels and least and crested auklets were collected but are entombed under pyroclastic flows on Kasatochi and thus not available.

- In analyzing survival data for least and crested auklets, birds with similar resighting histories were grouped and data were tested for heterogeneity and goodness-of-fit (GOF) to the Cormack-Jolly-Seber (CJS) model using program RELEASE (Burnham et al. 1987). Several survival and recapture models were then estimated using program MARK (Cooch and White 1998). Models estimated were evaluated by comparing Aikaike's Information Criterion (AIC), the number of parameters, and model deviance.

- Because least and crested auklet survival rate estimates are dependent upon open-ended recapture histories and not on known-fate individuals, values presented in previous reports should be considered obsolete. All our resighting data in 2008 was lost in the volcanic eruption so values for 2007 should be

considered our best final estimates for this survival project.

- Both least and crested auklet resighting data met the assumptions of the CJS model. Survival rates and recapture for both species are presented, as calculated by each of the following 4 models:

$\{\phi_t, p_t\}$	time-dependent survival and recapture
$\{\phi_t, p\}$	time-dependent survival, constant recapture
$\{\phi, p_t\}$	constant survival, time-dependent recapture
$\{\phi, p\}$	constant survival and recapture

- Historically, least auklet plumage categories of previously banded birds were recorded when resighting, occasionally as intermediate numbers (e.g., a bird that looked darker than the average “2" but lighter than the normal “3" might have been classified as a “2.5"). Similarly, birds that were resighted on one occasion as a “2" and on another day during the same summer as a “3", for example, were entered as “2.5" for that year, since plumage was evidently somewhere on the borderline between categories. When evaluating how a particular bird’s plumage changed over the years, values were rounded off in favor of continuity. Thus, if a bird showed a plumage history from 1996-2007 of “2-2-2.5-2-2.5-2-2-2.5-2-2-2", it was interpreted as having remained a “2" throughout the period. Least auklet plumage data in 2008 were lost in the eruption.

- Counts of least and crested auklets on surface plots were conducted and summarized differently in 2007-2008 than in previous years, based on recommendations from Heather Renner from an ongoing analysis of the surface-count data set. Specifically, counts were conducted only between 1000-1630h, and data were summarized using the maximum count per plot rather than the mean of the top five counts per plot (Williams et al. 2002).

- Frequency of occurrence and relative biomass of prey items were calculated for least and crested auklet food samples in 2006.

INTERESTING OBSERVATIONS

- Our island blew up.

- Red-faced cormorants (*Phalacrocorax urile*) did not attempt to breed at Kasatochi this year for the second year in a row. This follows two consecutive years of complete reproductive failure for the species at Kasatochi.

- While unloading camp on 24 May, 2 black oystercatcher (*Haematopus bachmani* chicks were observed with a pair on Oystercatcher Beach. The chicks were seen throughout the summer and fledged, along with a single chick from another pair. The second nest was likely somewhere on Parakeet Point.

- A glaucous-winged gull (*Larus glaucescens*) pair nested on Barabara Ridge and above Oystercatcher beach, the first time gulls have nested anywhere along the western beaches since the removal of foxes.

- A small mixed group of common and thick-billed murres (*Uria aalge* and *U. lomvia*) was seen in Turr

Cave during visits on 11 June and 3 August, as in recent years. There appeared to be approximately 40 individuals, but no attempted breeding.

- A marbled murrelet (*Brachyramphus marmoratus*) fledgling was seen on 3 August in the waters just north of Tundering Cove. There has not been a sighting of a marbled murrelet on Kasatochi since the inception of the current monitoring program.

- After the 7 August eruption of Kasatochi, sea lions were observed on the new southwestern shoreline, on 22, 23, and 29 August. There were between 160 and 200 adults present during those visits, but only two pups were counted on 29 August.

- A Kittlitz's murrelet (*Brachyramphus brevirostris*) was found on the M/V Tiglax early on the morning of 24 May, during the offload of the Kasatochi field camp. The bird likely landed on the ship sometime during the night and was probably not associated with Kasatochi.

ACKNOWLEDGMENTS

We have many people to thank this year, starting with Jeff Williams. His support and encouragement through the entire season were greatly appreciated. Brie Drummond answered countless questions, and her efforts made the transition to a new crew on Kasatochi as smooth as possible. The crew of the M/V Tiglax provided excellent logistical support, as well as hospitality and occasional entertainment. Chris Waythomas was an excellent guide/interpreter through the post eruption landscape on Kasatochi. Finally, we would like to extend our deepest gratitude to Lisa Spitler and Al Giddings. Had either of them not taken the actions they did, our season may not have been the only thing ending just a little too soon.

Sea lions on the post eruption pyroclastic fan deposits along the southwest coast of Kasatochi Island.

Kasatochi caldera on 6 August 2008, less than 24 hours before it erupted. Note rock slides from continual earthquakes.

Kasatochi caldera on 22 August 2008 viewed from the west coastline. Peregrine Ravine is to the right. Note small streams refilling caldera lake and fumeroles.

West side of Kasatochi Island on 22 August 2008, within 260 ft of the former cabin site. View is looking towards Peregrine Ravine.


Kasatochi actively steaming on 29 August 2008, viewed from the east.

Kasatochi as we like to remember it.

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FIGURES AND TABLES

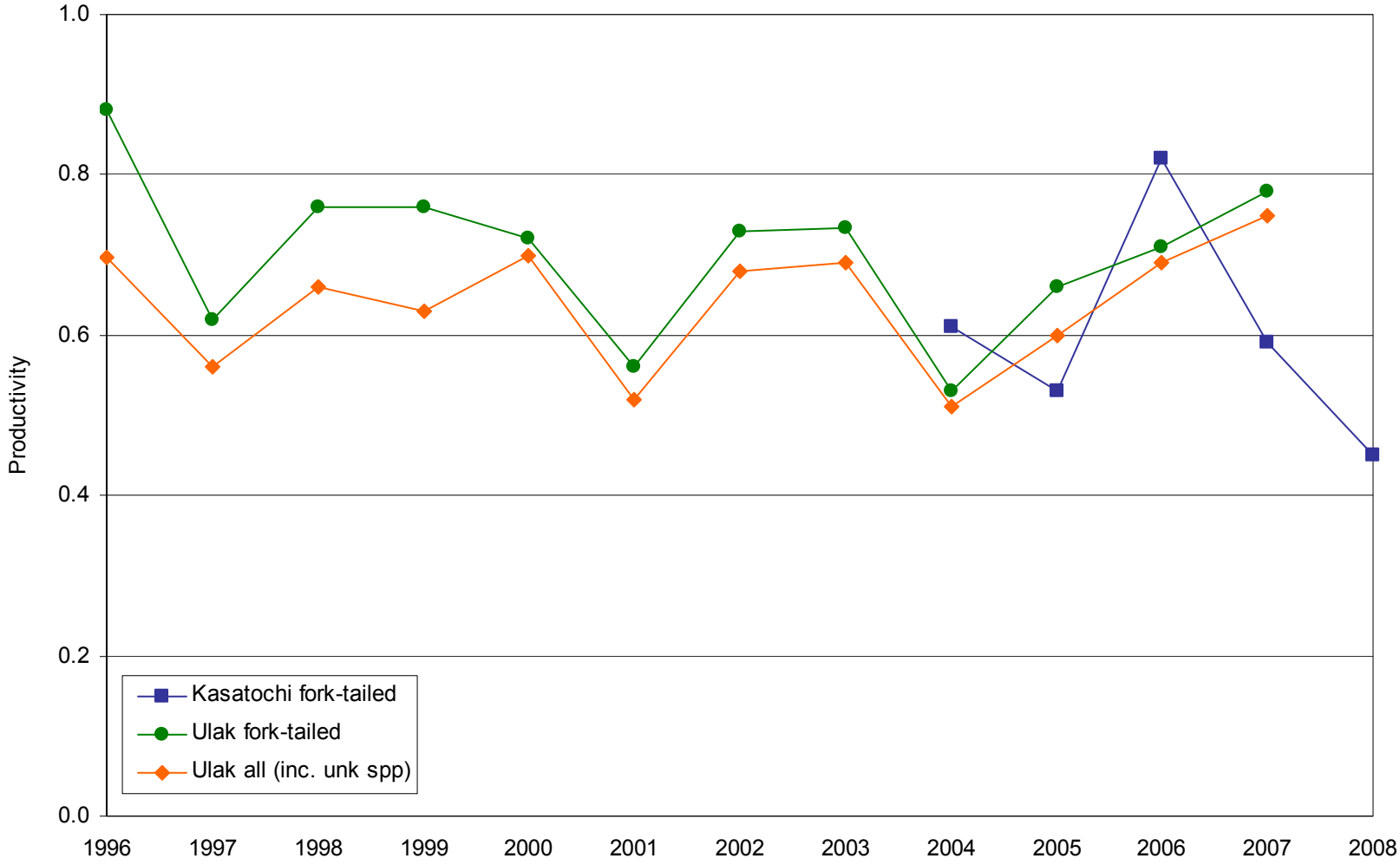


Figure 1. Overall productivity of storm-petrels at Kasatochi and Ulak islands, Alaska. Productivity represents the number of chicks potentially successful over the number of eggs with known fate. Data were collected on Ulak in 2008, but lost in the 7 August eruption.

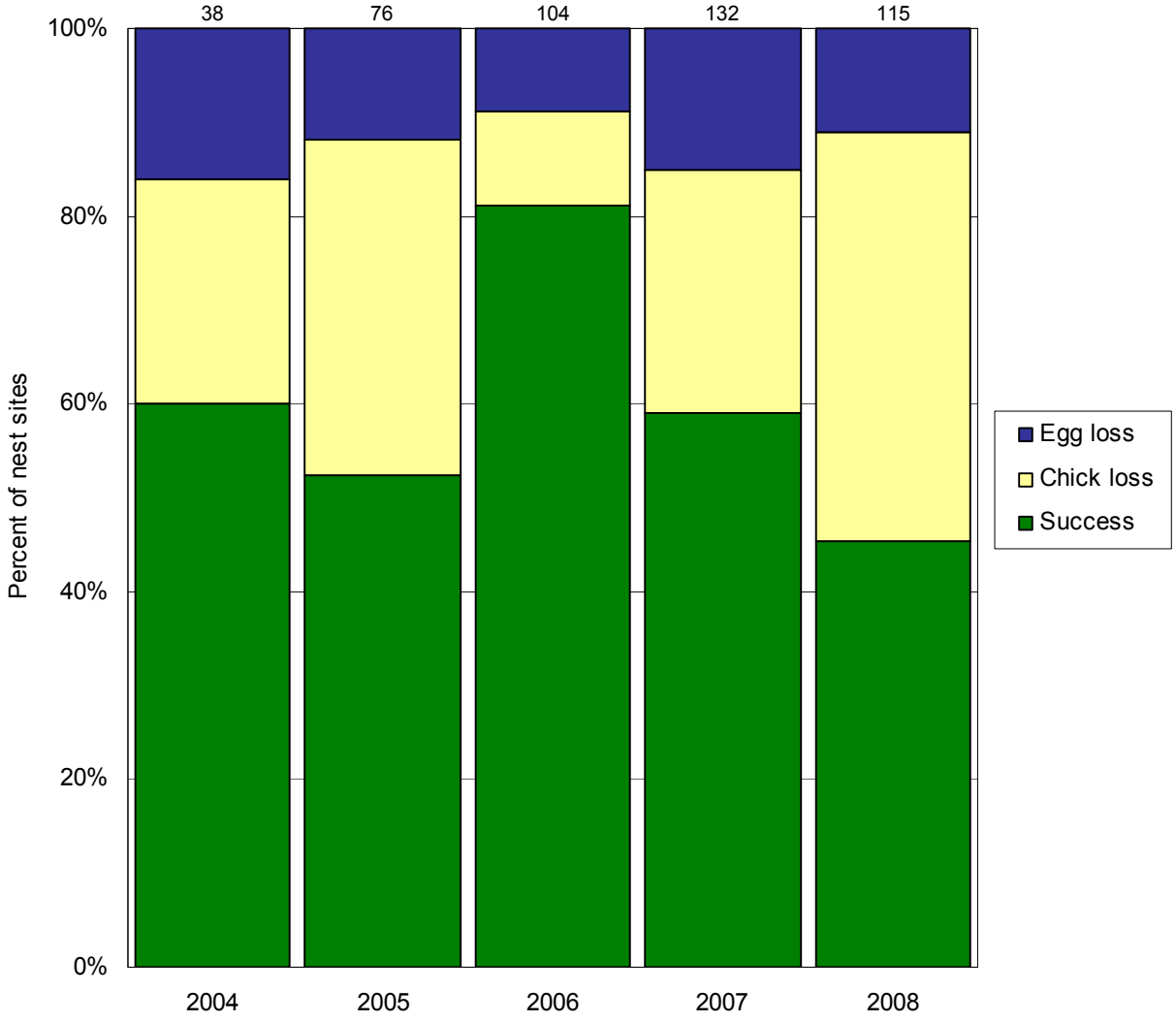


Figure 2. Reproductive performance of fork-tailed storm-petrels at Kasatochi Island, Alaska. Egg loss=(C-D)/C; Chick loss=(D-E)/C; Productivity=E/C, where C=number of eggs, D=number of eggs hatched, and E=number of chicks fledged or still alive at last check (codes come from following productivity tables). Success represents the maximum potential success, since it assumes all chicks still present at last check survived to fledging; actual values were likely lower. Numbers above columns indicate the number of nests.

Table 1. Reproductive performance of fork-tailed storm-petrels at Kasatochi Island, Alaska.

Parameter		2003[a]	2004	2005	2006	2007	2008
No. eggs w/known fate (C)		4	38	76	104	132	115
eggs lost to:	disappearance	0	2	1	3	6	8
	abandonment	3	4	7	5	11	4
	breakage	0	0	1	1	3	1
No. eggs remaining at last visit that were still potentially viable		0	0	0	0	0	0
No. chicks or membranes (D)		28	32	67	95	112	102
chicks lost to:	disappearance[b]	0	2	1	0	3	9
	death	4	7	26	10	31	41
No. chicks potentially successful (E)		24	23	40	85	78	52
chicks fledged[c]		2	8	26	39	4	0
chicks still present at last visit		22	15	14	46	74	52
Hatching success (D/C)		--	0.84	0.88	0.91	0.85	0.89
Fledging success (E/D)[d]		0.86	0.72	0.60	0.90	0.70	0.51
Reproductive success (E/C)[d]		--	0.61	0.53	0.82	0.59	0.45

[a]Hatching and reproductive success could not be determined in 2003 because crevices were not located until after chicks hatched.

[b]Chicks with ages <50 days or wing chords predicted to be <140 mm at the time of disappearance using the mean chick growth rate were considered failed.

[c]Chicks with ages $\geq$50 days or wing chords predicted to be $\geq$140 mm at the time of disappearance using the mean chick growth rate were considered fledged.

[d]This value represents the maximum potential, since it assumes young chicks still present at last check survived to fledging. Actual values were likely lower. However, in 2008 we assume that ALL these chicks still alive died in the 7 August eruption as none had fledged prior to our last check on 4 August.

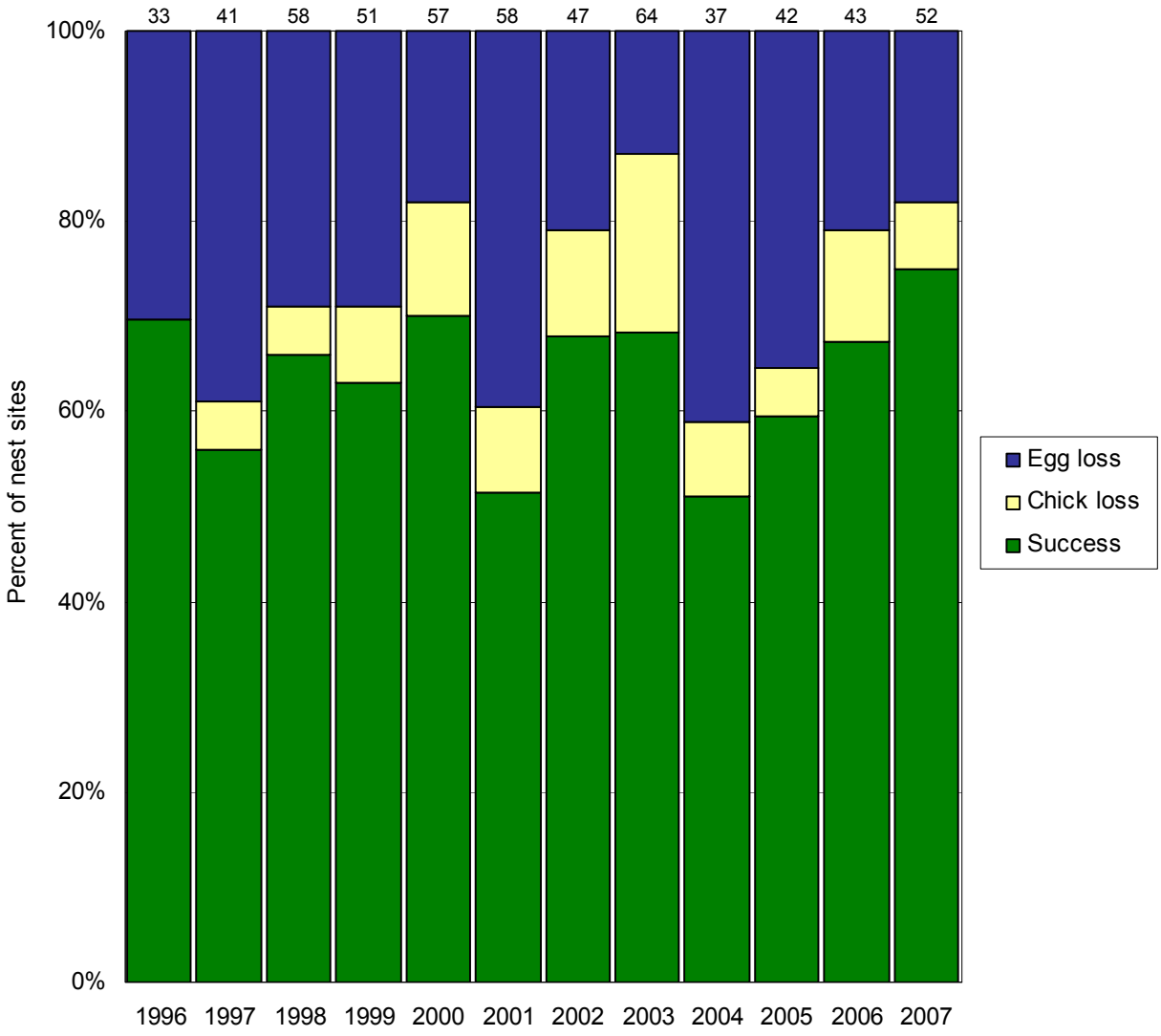


Figure 3. Reproductive performance of storm-petrels (probably all fork-tailed) at Ulak Island, Alaska. Egg loss=(C-D)/C; Chick loss=(D-E)/C; Productivity=E/C, where C=number of eggs, D=number of eggs hatched, and E=number of chicks fledged or still alive at last check (codes come from following productivity tables). Success represents the maximum potential success, since it assumes all chicks still present at last check survived to fledging; actual values were likely lower. Numbers above columns indicate the number of nests. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Table 2. Reproductive performance of fork-tailed storm-petrels on plot 2 at Ulak Island, Alaska. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Parameter	1996[a]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. burrows w/known contents (A)[b]	41	45	58	51	67	58	59	67	60	59	55	48	--
No. occupied burrows (B)	39	45	55	48	66	55	59	67	56	56	53	47	--
No. eggs w/known fate (C)	25	37	50	42	55	54	44	60	36	38	41	41	--
eggs lost to: disappearance	0	8	6	6	5	15	4	1	6	8	5	1	--
abandonment	3	2	0	1	2	3	4	1	2	3	1	4	--
breakage	0	2	3	0	1	1	0	2	6	0	1	1	--
No. eggs remaining at last visit that were still potentially viable	0	0	0	0	0	0	0	0	0	0	0	0	--
No. chicks or membranes (D)	22	25	41	35	47	35	36	56	22	27	34	35	--
chicks lost to: disappearance[c]	0	0	1	2	6	2	3	11	1	0	1	0	--
death	0	2	2	2	1	3	1	1	2	2	4	3	--
No. chicks potentially successful (E)	22	23	38	32	40	30	32	44	19	25	29	32	--
chicks fledged[d]	0	9	6	1	19	9	29	2	0	1	9	1	--
chicks still present at last visit	22	14	32	31	21	21	3	42	19	24	20	31	--
Occupancy rate (B/A)	0.95	1.0	0.95	0.94	0.99	0.95	1.00	1.00	0.93	0.95	0.96	0.98	--
Hatching success (D/C)	0.88	0.68	0.82	0.83	0.86	0.65	0.82	0.93	0.61	0.71	0.83	0.85	--
Fledging success (E/D)[e]	1.00	0.92	0.93	0.91	0.85	0.86	0.89	0.79	0.86	0.93	0.85	0.91	--
Reproductive success (E/C)[e]	0.88	0.62	0.76	0.76	0.73	0.56	0.73	0.73	0.53	0.66	0.71	0.78	--

[a]Productivity estimates in 1996 are based on just two visits (early June and late August) and thus are probably artificially high.

[b]Only those burrows that were confirmed empty (we could reach to the end of the burrow) or occupied (they contained an egg, membrane, chick, or adult) were included.

[c]Chicks with wing chords predicted to be <140 mm at the time of disappearance using the mean chick growth rate were considered failed.

[d]Chicks with wing chords predicted to be $\geq$140 mm at the time of disappearance using the mean chick growth rate were considered fledged.

[e]This value represents the maximum potential, since it assumes young chicks still present at last check survived to fledging. Actual values were likely lower, except perhaps in 1996 when only 2 visits to the plot were made and all 8 chicks that disappeared were of unknown age and considered failed.

Table 3. Reproductive performance of *Oceanodroma* spp. on plot 2 at Ulak Island, Alaska. This includes fork-tailed storm-petrels and storm-petrels unidentified to species, which were almost certainly all fork-tailed; no other species has been observed in the plot. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Parameter	1996[a]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. burrows w/known contents (A)[b]	66	102	133	155	102	100	163	106	102	93	86	90	--
No. occupied burrows (B)	53	52	63	57	73	59	62	71	64	65	55	52	--
No. eggs w/known fate (C)	33	41	58	51	57	58	47	64	37	42	43	44	--
eggs lost to: disappearance	0	11	8	11	6	19	6	5	7	11	6	1	--
abandonment	10	2	1	3	3	3	4	1	2	4	1	6	--
breakage	0	3	8	1	1	1	0	2	6	0	2	1	--
No. eggs remaining at last visit that were still potentially viable	0	0	0	0	0	0	0	0	0	0	0	0	--
No. chicks or membranes (D)	23	25	41	36	41	35	37	56	22	27	34	36	--
chicks lost to: disappearance[c]	0	0	1	2	6	2	4	11	1	0	1	0	--
death	0	2	2	2	1	3	1	1	2	2	4	3	--
No. chicks potentially successful (E)	23	23	38	32	40	30	32	44	19	25	29	33	--
chicks fledged[d]	0	9	6	1	19	9	29	2	0	1	9	1	--
chicks still present at last visit	23	14	32	31	21	21	3	42	19	24	20	32	--
Occupancy rate (B/A)	0.80	0.51	0.47	0.37	0.72	0.59	0.38	0.67	0.63	0.70	0.64	0.58	--
Hatching success (D/C)	0.70	0.61	0.71	0.71	0.83	0.60	0.79	0.88	0.60	0.64	0.79	0.82	--
Fledging success (E/D)[e]	1.00	0.92	0.93	0.89	0.85	0.86	0.87	0.79	0.86	0.93	0.85	0.92	--
Reproductive success (E/C)[e]	0.70	0.56	0.66	0.63	0.70	0.52	0.68	0.69	0.51	0.60	0.67	0.75	--

[a]Productivity estimates in 1996 are based on just two visits (early June and late August) and thus are probably artificially high.

[b]Only those burrows that were confirmed empty (we could reach to the end of the burrow) or occupied (they contained an egg, membrane, chick, or adult) were included.

[c]Chicks with wing chords predicted to be <140 mm at the time of disappearance using the mean chick growth rate were considered failed.

[d]Chicks with wing chords predicted to be $\geq$140 mm at the time of disappearance using the mean chick growth rate were considered fledged.

[e]This value represents the maximum potential, since it assumes young chicks still present at last check survived to fledging. Actual values were likely lower, except perhaps in 1996 when only 2 visits to the plot were made and all 14 chicks that disappeared were of unknown age and considered failed.

Table 4. Mean growth rates of fork-tailed storm-petrel chicks at Kasatochi Island, Alaska. Chicks were measured during the linear phase of growth (wing chord between 20-140 mm). Individual chicks measured at least 2 times were the sample units.

		Mass (g/day)			Wing chord (mm/day)			Diagonal tarsus (mm/day)		
Year	*n*	mean	SD	range	mean	SD	range	mean	SD	range
2003	7	1.3	0.8	-0.1 - 2.7	3.6	0.6	3.0 - 4.7	--	--	--
2004	16	1.1	0.7	-0.6 - 2.1	3.2	0.9	0.1 - 3.9	--	--	--
2005	24	1.4	1.9	-0.3 - 10.0	3.4	0.5	2.0 - 4.0	0.5[a]	0.1	0.4 - 0.6
2006	39	1.2	1.0	0.1 - 6.0	3.6	0.2	3.0 - 4.0	0.6[a]	0.1	0.4 - 0.8
2007	34	1.6	1.1	-0.3 - 6.3	3.4	0.4	2.2 - 4.1	0.3	0.1	0.1 - 0.8
2008	12	2.2	0.8	0.4 - 3.2	3.3	1.0	1.1 - 5.1	0.4	0.2	0.0 - 0.8

[a]Tarsal growth rates in 2005 and 2006 from Drummond 2007.

Table 5. Mean growth rates of fork-tailed storm-petrel chicks at Ulak Island, Alaska. Chicks were measured during the linear phase of growth (wing chord between 20-140 mm). Individual chicks measured at least 2 times were the sample units. Data were collected in 2008, but lost in the eruption of 7 August 2008.

		Mass (g/day)			Wing chord (mm/day)		
Year	*n*	mean	SD	range	mean	SD	range
1997	8	1.1	0.6	0.0 - 2.0	3.1	0.3	2.6 - 3.5
1998	13	1.0	0.6	0.2 - 1.8	3.2	0.3	2.6 - 3.6
1999	15	1.8	0.6	0.1 - 2.6	3.2	0.3	2.7 - 3.6
2000	10	0.8	0.7	-1.0 - 1.4	3.2	0.4	2.6 - 3.9
2001	7	0.7	1.3	-1.4 - 2.1	2.8	0.6	1.7 - 3.5
2002	2	0.2	0.3	-0.1 - 0.4	2.3	0.7	1.8 - 2.8
2003	30	1.1	0.9	-0.1 - 2.7	3.0	0.5	1.8 - 4.0
2004	5	0.7	0.8	-0.5 - 1.5	2.7	0.8	1.3 - 3.3
2006	26	1.1	0.7	-0.5 - 2.1	3.3	0.6	2.0 - 4.6
2007	3	1.2	0.2	1.1 - 1.4	3.1	0.1	3.0 - 3.2
2008	--	--	--	--	--	--	--

Table 6. Morphological measurements of adult fork-tailed and Leach's storm-petrels at Kasatochi Island, Alaska.

		Mass (g)			Wing chord (mm)			Diagonal tarsus (mm)		
Year	*n*	mean	SD	range	mean	SD	range	mean	SD	range
Fork-tailed storm-petrel										
2004	18	63.9	4.7	57.0 - 74.0	157.8	3.7	150 - 164	27.1	0.7	25.6 - 28.0
2005	30	63.9	3.3	58.0 - 70.5	159.6	3.8	152 - 167	27.1	0.9	25.0 - 29.1
2006	31	65.2	4.2	56.5 - 74.0	161.4	2.5	156 - 166	26.7	0.7	25.3 - 27.7
2007	32	63.2	4.3	56.5 - 79.0	161.9	3.2	155 - 168	27.0	0.7	25.6 - 28.6
2008	33	62.6	3.2	56.5 - 68.5	160.5	3.7	154 - 169	27.0	0.8	25.2 - 28.5
Leach's storm-petrel										
2005	2	42.0	2.1	40.5 - 43.5	156.0	2.8	154 - 158	24.3	0.4	24.0 - 24.6
2006	1	42.0	--	--	153.0	--	--	24.4	--	--
2007	0	--	--	--	--	--	--	--	--	--
2008	2	43.5	1.4	40.5 - 43.5	161.8	3.2	160 - 164	24.1	1.6	23.0 - 25.2

Table 7. Burrow density and occupancy rates on index plots at Ulak Island, Alaska. All plots were 100 m^2. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Plot	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Density[a] -- date est.:	10 Jun	19 May	13 Jun	20 Jun	12 Jun	1 Jun	8 Jun	16 Jun[b]	9 Jun[b]	11 Jun[b]	20 Jun[b]	17 Jun[b]	--
1	0.29	0.40	0.49	0.48	0.49	0.44	0.43	--	--	--	--	--	--
2	1.42	1.70	1.78	1.79	1.76	1.78	1.76	1.78	1.84	1.82	1.88	1.88	--
3	1.00	1.22	1.32	1.39	1.31	1.37	--	--	--	--	--	--	--
4	1.57	1.73	2.06	2.15	2.10	2.12	2.03	--	--	--	--	--	--
mean	1.07	1.26	1.41	1.45	1.42	1.43	1.40	--	--	--	--	--	--
SD	0.57	0.62	0.69	0.72	0.70	0.73	0.86	--	--	--	--	--	--
Occupancy[c] -- date est.:	10 Jun	28 Aug	31 Aug	2 Sep	1 Sep	3 Sep[d]	3 Sep[d]	26 Aug[d]	--[e]	--[e]	--[e]	--[e]	--
1	0.33	0.67	0.38	0.33	0.00	--	--	--	--	--	--	--	--
2	0.50	0.44	0.52	0.52	0.67	0.45	0.60	0.00	--	--	--	--	--
3	0.67	0.36	0.32	0.44	0.25	--	--	--	--	--	--	--	--
4	0.79	0.45	0.38	0.38	0.33	--	--	--	--	--	--	--	--
mean	0.65	0.44	0.38	0.42	0.37	--	--	--	--	--	--	--	--
SD	0.11	0.03	0.04	0.03	0.09	--	--	--	--	--	--	--	--

[a]Burrows with entrances of all sizes were lumped because of inconsistencies in classification among years.

[b]Density for plots 1,3,4 were not assessed in 2003-2008.

[c]Burrows with large entrances (>14.5 cm diameter) only. Burrows were considered occupied if feathers, droppings, chicks, eggs, or eggshell fragments were observed in the entrance. Mean and SD were calculated using a ratio estimator spreadsheet.

[d]Occupancy rates for plots 1, 3, and 4 were not assessed in 2001-2003.

[e]Occupancy rates for all plots were not assessed in 2004-2008.

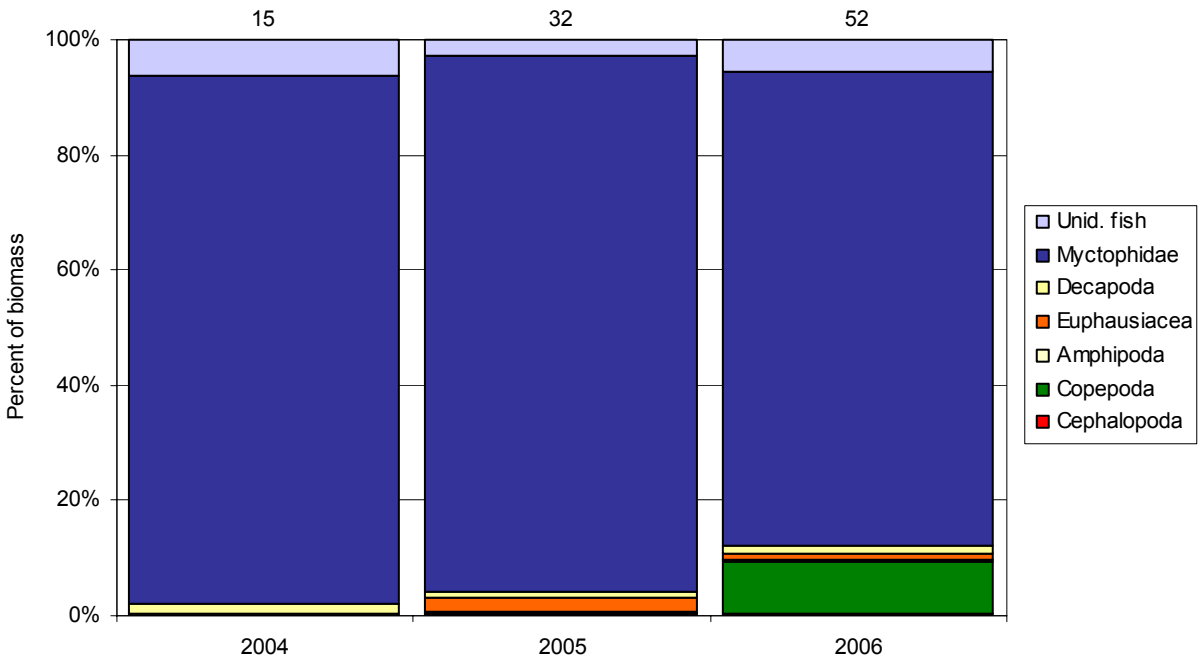


Figure 4. Relative biomass of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

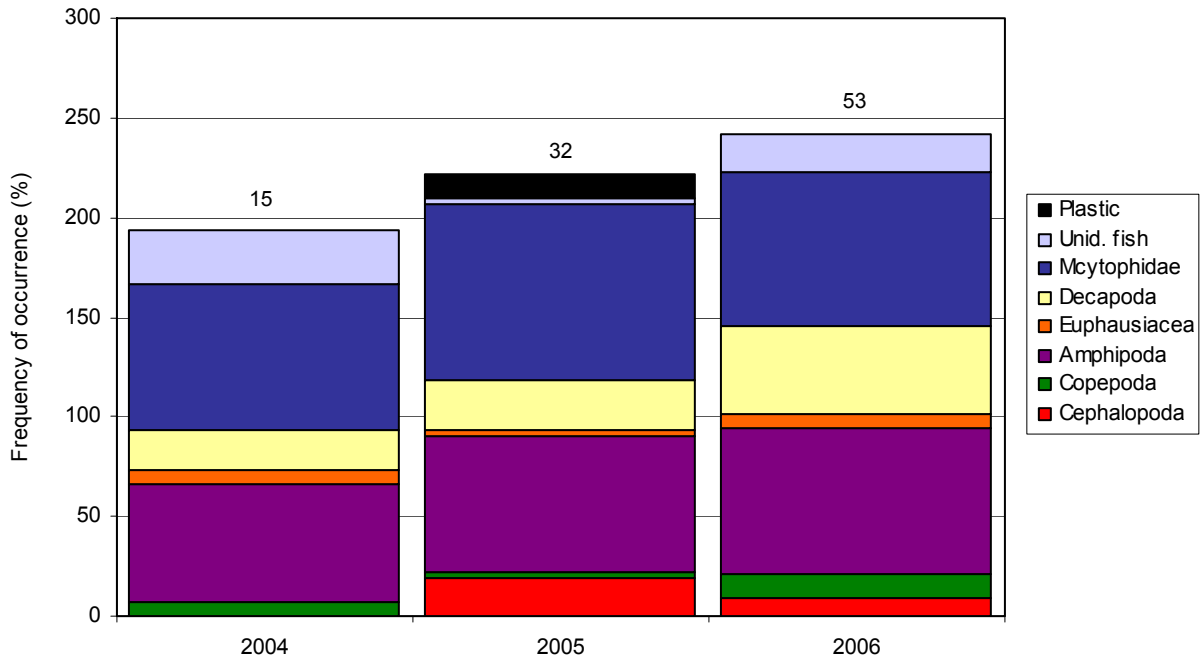


Figure 5. Frequency of occurrence of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

Table 8. Relative biomass of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska in 2006. Numbers represent the percentage of the mass of combined food samples comprised by each species. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	2004	2005	2006
No. samples	15	32	52
Total mass (g)	32.0	67.8	138.4
Cephalopoda			
Unid. squid	0.0	0.4	0.3
Copepoda			
Neocalanus cristatus	0.1	<0.1	9.1
Amphipoda			
Hyperiidea			
Parathemisto spp.	0.0	<0.1	0.0
Parathemisto pacifica	<0.1	<0.1	<0.1
Hyperia spp.	0.0	<0.1	0.0
H. medusarum	0.0	0.0	<0.1
Gammaridea			
Lysianassidae	0.2	0.3	0.2
Anoyx spp.	0.0	0.0	<0.1
Unid. amphipod	0.0	0.0	<0.1
Euphausiacea			
Thysanoessa longipes	0.0	2.4	0.0
Thysanoessa spp.	0.2	0.0	0.0
Euphausiid spp.	0.0	0.0	1.1
Decapoda			
Unid. shrimp	0.0	0.2	0.2
Atelecyclidae megalopa	1.5	0.9	1.2
Myctophiformes			
Myctophidae	91.8	92.9	81.9
Unid. fish	6.1	2.9	6.0

Table 9. Frequency of occurrence of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska. Frequency is expressed as the percentage of food samples in which each species was present. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	2004	2005	2006[a]
No. samples	15	32	53
Cephalopoda			
Unid. squid	0.0	18.8	9.4
Copepoda			
Neocalanus cristatus	6.7	3.1	11.3
Amphipoda			
Hyperiidea			
Parathemisto spp.	0.0	3.1	0.0
Parathemisto pacifica	6.7	3.1	7.5
Hyperia spp.	0.0	3.1	0.0
H. medusarum	0.0	0.0	1.9
Gammaridea			
Lysianassidae	53.3	59.4	54.7
Anoyx spp.	0.0	0.0	7.5
Unid. amphipod	0.0	0.0	1.9
Euphausiacea			
Thysanoessa longipes	0.0	3.1	0.0
Thysanoessa spp.	6.7	0.0	0.0
Euphausiid spp.	0.0	0.0	7.5
Decapoda			
Unid. shrimp	0.0	9.4	9.4
Atelecyclidae megalopa	20.0	15.6	34.0
Myctophiformes			
Myctophidae	73.3	87.5	77.4
Unid. fish	26.7	3.1	18.9
Other			
Plastic	0.0	12.5	0.0

[a]From Drummond 2007.

Table 10. Mass of food loads collected from fork-tailed storm-petrels at Kasatochi Island, Alaska.

Chick-rearing period[a]	*n*	Mass of load (g) mean	SD	range
2008				
Early	12	5.3	3.0	1.5 - 9.9
Mid	11	6.2	3.8	2.0 -15.3
Late	--	--	--	--
Total				
2004	16	4.3	3.3	0.3 - 10.8
2005	32	6.5	3.4	0.4 - 11.8
2006	52	8.3	3.5	2.5 - 18.4
2007	31	6.4	3.3	0.5 - 13.3
2008	23	5.7	3.4	1.5 - 15.4

[a]In 2008, food samples were collected 17 July (early), 29-30 July (mid). No samples were taken during the late chick-rearing period due to the eruption of 7 August 2008.

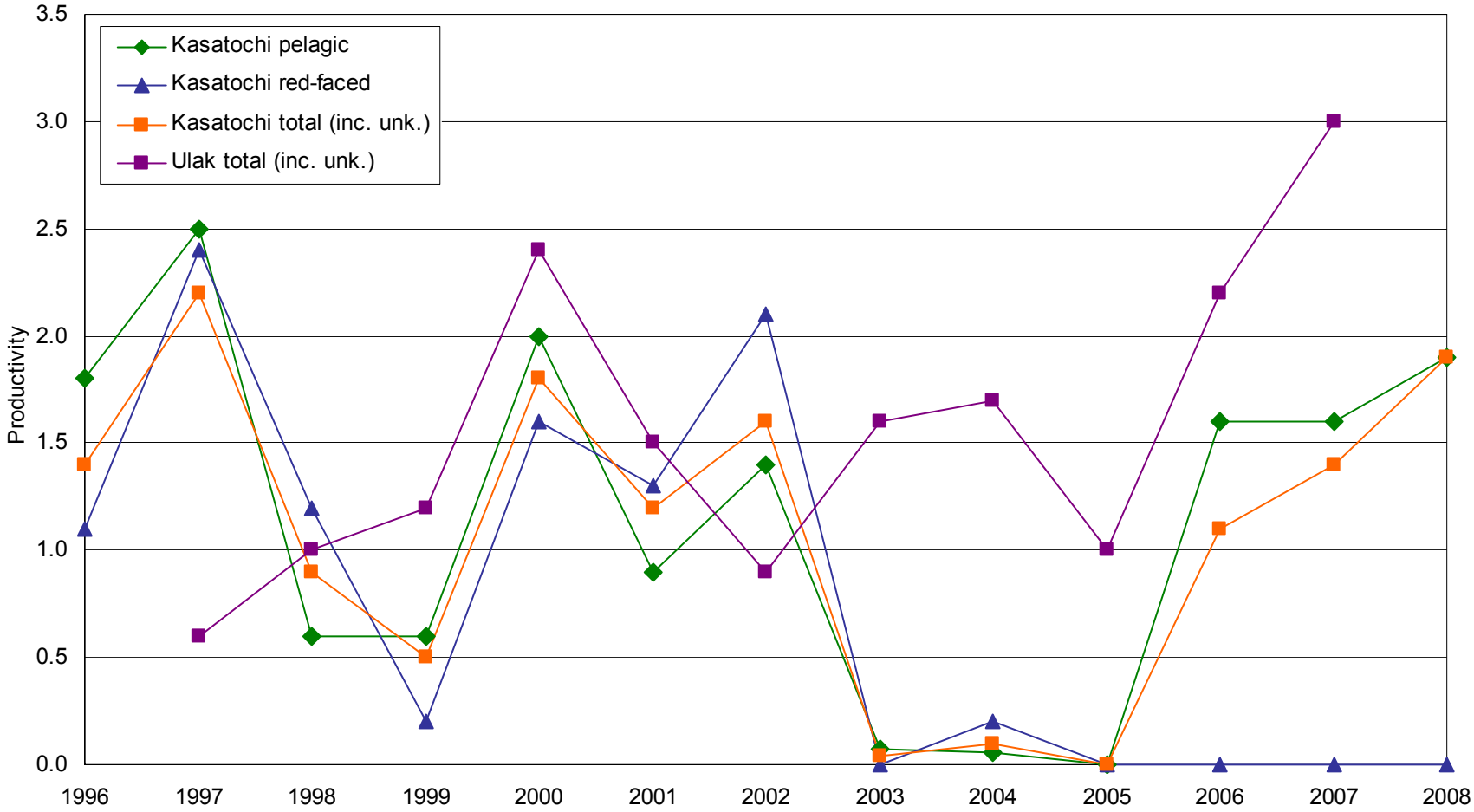


Figure 6. Overall productivity of pelagic and red-faced cormorants at Kasatochi and Ulak islands, Alaska. Productivity represents the total number of chicks divided by the total number of nests, including those without chicks. Data were not collected on Ulak in 2008.

Table 11. Minimum productivity of red-faced cormorants at Kasatochi Island, Alaska.

Parameter	1996	1997	1998[a]	1999	2000	2001[b]	2002	2003	2004	2005	2006	2007[c]	2008[c]
Min. no. chicks in nest:													
0	4	1	20	7	4	6	1	16	21	2	2	0	0
1	4	3	0	2	0	6	1	0	4	0	0	0	0
2	6	5	6	0	5	5	11	0	1	0	0	0	0
3	0	8	4	0	3	4	8	0	0	0	0	0	0
4	0	2	3	0	0	0	0	0	0	0	0	0	0
5	0	0	1	0	0	0	0	0	0	0	0	0	0
Total no. nests (A)[d]	14	19	34	9	12	21	22	16	26	2	2	0	0
Min. no. chicks (B)	16	45	41	2	19	28	47	0	6	0	0	0	0
% nests w/ chicks	71.4	94.7	41.2	22.2	66.7	71.4	90.9	0.0	19.2	0.0	0.0	--	--
Brood size:													
mean	1.6	2.5	2.9	1.0	2.4	1.9	2.4	0.0	1.2	0.0	0.0	--	--
SD	0.5	0.9	1.0	0.0	0.5	0.8	0.6	--	0.5	--	--	--	--
n	10	18	14	2	8	15	20	0	5	0	0	--	--
Productivity (B/A)	1.1	2.4	1.2	0.2	1.6	1.3	2.1	0.0	0.2	0.0	0.0	--	--
No. nests w/ brooding adults	0	1	0	0	0	0	1	2	2	0	0	0	0
% nests w/ chicks or brooding adults	71.4	95.0	41.2	22.2	66.7	71.4	95.5	11.1	25.0	0.0	0.0	--	--

[a]In 1998, a few nests were never attended; we assumed they were red-faced nests based on nesting distribution in previous years.

[b]In 2001, numbers were based on a single survey on 13 Aug.

[c]No red-faced cormorants attempted to breed on Kasatochi in 2007 and 2008.

[d]All nests with visible contents were counted, except those that still contained adults in brooding posture at the last visit. Nests were found only on the northeast side of the island 1996-2004 and 2006. In 2005, all nests were located in Tundering Cove.

Table 12. Minimum productivity of pelagic cormorants at Kasatochi Island, Alaska.

Parameter	1996	1997	1998[a]	1999	2000	2001[b]	2002	2003	2004	2005	2006	2007	2008
Min. no. chicks in nest:													
0	4	2	26	18	3	6	4	26	17	2	3	1	4
1	4	1	1	0	2	2	0	0	1	0	0	3	1
2	7	8	5	1	3	5	6	1	0	0	2	2	4
3	4	10	4	1	6	0	2	0	0	0	1	2	5
4	2	2	0	2	1	0	0	0	0	0	1	0	1
5	0	1	0	0	0	0	0	0	0	0	0	0	0
Total no. nests (A)[c]	21	24	36	22	15	13	13	27	18	2	7	8	15
Min. no. chicks (B)	38	60	23	13	30	12	18	2	1	0	11	13	28
% nests w/ chicks	81.0	91.7	27.8	18.2	80.0	58.3	61.5	3.7	5.6	0.0	57.1	87.5	73.3
Brood size:													
mean	2.2	2.7	2.3	3.3	2.5	1.7	2.3	2.0	1.0	0.0	2.8	1.9	1.9
SD	1.0	0.9	0.7	1.0	0.9	0.5	0.5	--	--	--	1.0	0.9	1.4
n	17	22	10	4	12	7	8	1	1	0	4	7	15
Productivity (B/A)	1.8	2.5	0.6	0.6	2.0	0.9	1.4	0.07	0.06	0.0	1.6	1.6	1.9
No. nests w/ brooding adults	0	1	1	0	0	1	1	4	2	2	2	0	2
% nests w/ chicks or brooding adults	81.0	92.0	29.7	18.2	80.0	61.5	69.2	16.1	16.7	100.0	66.7	87.5	86.7

[a] In 1998, several nests were never attended; we assumed they were pelagic nests based on nesting distribution in previous years.

[b] In 2001, numbers were based on a single survey on 13 Aug.

[c] All nests with visible contents were counted, except those that still contained adults in brooding posture at the last visit. Nests were found only on the northeast side of the island in 1996, 1997, 1999, 2000, 2001, 2002, and 2005-2008. In 1998, 7 nests were built in Tundering Cove; all were abandoned.

Table 13. Minimum productivity of cormorants (red-faced and pelagic, including unidentified birds) at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001[a]	2002	2003	2004	2005	2006	2007	2008
Min. no. chicks in nest:													
0	12	7	46	25	7	11	13	44	77	12	6	2	4
1	10	4	1	2	2	8	1	0	6	0	0	3	1
2	13	13	11	1	8	10	17	1	1	0	1	2	4
3	4	18	8	1	9	4	11	0	1	0	2	2	5
4	2	4	3	2	1	0	0	0	0	0	1	0	1
5	0	1	1	0	0	0	0	0	0	0	0	0	0
Total no. nests (A)[b]	41	47	70	31	27	33	42	45	85	12	10	9	15
Min. no. chicks (B)	56	105	64	15	49	40	68	2	11	0	11	13	28
% nests w/ chicks	70.7	85.1	34.2	19.4	74.1	66.7	69.0	2.2	9.4	0.0	40.0	77.8	73.3
Brood size:													
mean	1.9	2.6	2.5	2.5	2.5	1.8	2.3	2.0	1.4	0.0	2.8	1.9	1.9
SD	0.9	0.9	0.8	1.4	0.8	0.7	0.6	--	0.7	--	1.0	0.9	1.4
n	29	40	24	6	20	22	29	1	8	0	4	7	15
Productivity (B/A)	1.4	2.2	0.9	0.5	1.8	1.2	1.6	0.04	0.1	0.0	1.1	1.4	1.9
No. nests w/ brooding adults	0	2	1	0	0	1	2	6	4	2	2	0	2
% nests w/ chicks or brooding adults	70.7	85.7	35.2	19.4	74.1	67.6	70.5	13.7	13.5	16.7	50.0	77.8	86.7

[a]In 2001, numbers were based on a single survey on 13 Aug.

[b]All nests with visible contents were counted, except those that still contained adults in brooding posture at the last visit. Nests were found only on the northeast side of the island in 1996-2004 and 2006-2008. In 2005, 2 nests were built in Tundering Cove.

Table 14. Minimum productivity of red-faced cormorants at Ulak Island, Alaska. Values are based on single visits to the colony in 1997-1998 and 2000-2007 and on two visits in 1999. Data were not collected on Ulak in 2008.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007[a]	2008
Dates	10 Aug	5 Aug	13 Aug 2 Sep	4 Aug	7 Aug	4 Aug	4 Aug	23 Jul	15 Jul	7 Aug	21 Jul	--
Min. no. chicks in nest:												
0	44	8	3	6	0	9	12	48	0	0	0	--
1	22	6	3	3	0	9	8	14	0	8	0	--
2	9	4	0	11	3	11	23	35	0	9	0	--
3	1	4	2	11	3	3	27	42	0	10	0	--
4	0	0	1	5	0	1	5	14	0	2	0	--
5	0	0	0	0	0	0	0	2	0	0	0	--
6	0	0	0	0	0	0	0	0	0	0	0	--
Total no. nests (A)[b]	76	22	9	36	6	33	75	155	0	29	0	--
Min. no. chicks (B)	43	26	13	78	15	44	155	276	0	64	0	--
% nests w/ chicks	42.1	63.6	66.7	83.3	100.0	72.7	84.0	69.0	--	100.0	--	--
Brood size:												
mean	1.3	1.9	2.2	2.6	2.5	1.8	2.5	2.6	--	2.2	--	--
SD	0.5	0.9	1.3	0.9	0.5	0.8	0.8	0.9	--	0.9	--	--
n	32	14	6	30	6	24	63	107	--	29	--	--
Productivity (B/A)	0.6	1.2	1.4	2.2	2.5	1.3	2.1	1.8	--	2.2	--	--
No. nests w/ brooding adults	0	19	1	3	0	35	0	0	0	0	0	--
% nests w/ chicks or brooding adults	42.1	80.5	70.0	84.6	100.0	86.8	84.0	69.0	--	100.0	--	--

[a] Productivity could not be estimated in 2007 because chicks were too small at the time of visit to view contents in any nests.

[b] All nests with visible contents were counted, except for those containing adults in brooding posture.

Table 15. Minimum productivity of pelagic cormorants at Ulak Island, Alaska. Values are based on single visits to the colony in 1997-1998 and 2000-2007 and on two visits in 1999. Data were not collected on Ulak in 2008.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007[a]	2008
Dates	10 Aug	5 Aug	13 Aug 2 Sep	4 Aug	7 Aug	4 Aug	4 Aug	23 Jul	15 Jul	7 Aug	21 Jul	--
Min. no. chicks in nest:												
0	0	2	1	2	0	2	1	4	0	0	0	--
1	0	3	2	3	0	0	6	11	9	3	0	--
2	0	0	0	6	1	2	2	6	0	2	0	--
3	0	0	2	8	2	0	1	2	0	1	1	--
4	0	0	0	3	5	0	0	0	0	1	0	--
5	0	0	0	1	0	0	0	0	0	0	0	--
6	0	0	0	1	0	0	0	0	0	0	0	--
Total no. nests (A)[c]	0	5	5	24	8	4	10	23	9	7	1	--
Min. no. chicks (B)	--	3	8	62	28	4	13	29	9	14	3	--
% nests w/ chicks	--	60.0	80.0	91.7	100.0	50.0	90.0	82.6	100.0	100.0	100.0	--
Brood size:												
mean	--	1.0	2.0	2.8	3.5	2.0	1.4	1.5	1.0	1.0	3.0	--
SD	--	0.0	1.2	1.3	0.8	0.0	0.7	0.7	0.0	1.2	--	--
n	--	3	4	22	8	2	9	19	9	7	1	--
Productivity (B/A)	--	0.6	1.6	2.6	3.5	1.0	1.3	1.3	1.0	2.0	3.0	--
No. nests w/ brooding adults	0	4	6	1	0	0	0	0	0	0	0	--
% nests w/ chicks or brooding adults	--	77.8	90.9	92.0	100.0	50.0	90.0	82.6	100.0	100.0	100.0	--

[a]Productivity could not be estimated in 2007 because chicks were too small at the time of visit to view contents in any nests.
[b]All nests with visible contents were counted, except for those containing adults in brooding posture.

Table 16. Minimum productivity of cormorants (red-faced and pelagic, including unidentified birds) at Ulak Island, Alaska. Values are based on single visits to the colony in 1997-1998 and 2000-2008 and on two visits in 1999. Data were not collected on Ulak in 2008.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007[a]	2008
Dates	10 Aug	5 Aug	13 Aug 2 Sep	4 Aug	7 Aug	4 Aug	4 Aug	23 Jul	15 Jul	7 Aug	21 Jul	--
Min. no. chicks in nest:												
0	44	16	7	13	51	30	35	53	0	0	0	--
1	22	9	5	6	9	9	15	25	9	11	0	--
2	9	5	0	27	29	13	32	41	0	13	0	--
3	1	5	4	30	20	3	31	44	0	11	1	--
4	0	0	1	17	10	1	5	14	0	3	0	--
5	0	0	0	1	0	0	0	2	0	0	0	--
6	0	0	0	1	0	0	0	0	0	0	0	--
7	0	0	0	0	1	0	0	0	0	0	0	--
8	0	0	0	0	1	0	0	0	0	0	0	--
Total no. nests (A)[c]	76	35	17	95	121	56	117	179	9	38	1	--
Min. no. chicks (B)	43	34	21	229	182	48	192	305	9	82	3	--
% nests w/ chicks	42.1	54.3	58.8	86.3	57.9	46.4	70.9	70.4	100.0	100.0	100.0	--
Brood size:												
mean	1.3	1.8	2.1	2.8	2.8	1.8	2.3	2.4	1.0	2.2	3.0	--
SD	0.5	0.9	1.2	1.0	1.2	0.8	0.8	1.0	0.0	0.9	--	--
n	32	19	10	82	70	26	83	126	9	38	1	--
Productivity (B/A)	0.6	1.0	1.2	2.4	1.5	0.9	1.6	1.7	1.0	2.2	3.0	--
No. nests w/brooding adults	0	24	7	4	0	35	0	0	0	0	0	--
% nests w/ chicks or brooding adults	42.1	72.9	70.8	86.9	57.9	67.0	70.9	70.4	100.0	100.0	100.0	--

[a]Productivity estimate in 2007 may not be representative of actual productivity because chicks were too small at the time of visit to view contents in most nests.
[b]All nests with visible contents were counted, except those that contained adults in brooding posture.

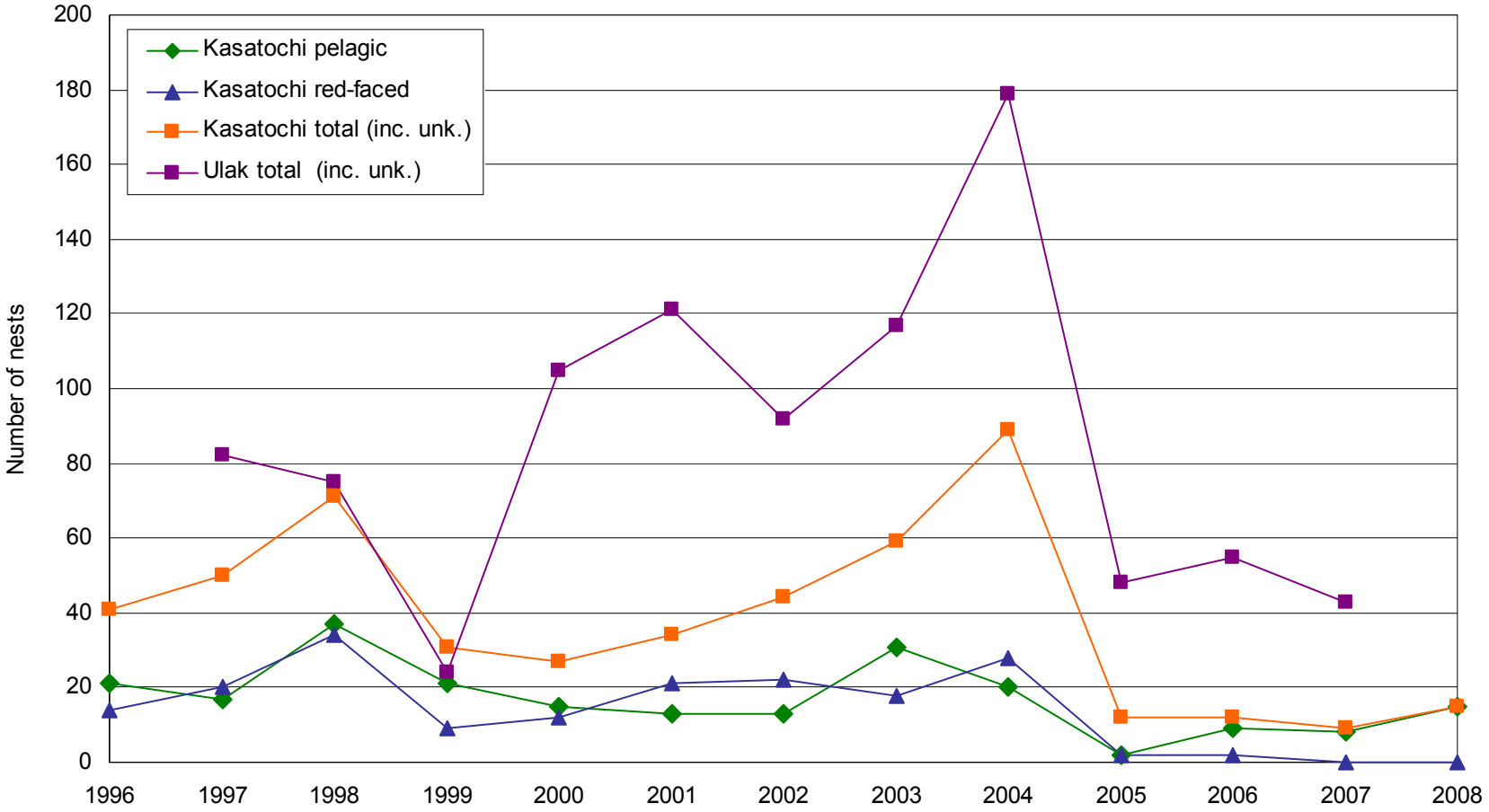


Figure 7. Numbers of red-faced and pelagic cormorants nests observed at Kasatochi and Ulak islands, Alaska. Data were not collected on Ulak in 2008.

Table 17. Numbers of red-faced and pelagic cormorants observed on circumnavigation surveys of Kasatochi Island, Alaska. Historic data are from Early et al. (1981) and Bailey and Trapp (1986). Counts in the 1980s are from single surveys, while numbers from subsequent years may reflect the mean of several counts.

		Red-faced		Pelagic		Total (incl. unk. spp.)	
Year	Date	birds	nests	birds	nests	birds	nests
1980	13 Jul	--	--	--	--	85	19
1982	2 Jun	--	20	--	--	--	20
1996	20 Jun-31Jul[a]	20	14	32	21	62	41
1997	27 May-8 Aug[b]	34	20	55	17	83	50
1998	14 Jun-10 Jul[c]	19	34	24	37	120	71
1999	25 Jun-13 Aug[d]	3	9	7	21	57	31
2000	7 Jul-6 Aug[e]	17	12	16	15	95	27
2002	31 May-7 Aug[f]	13	22	44	13	82	44
2003	6 Jun-20 Aug[g]	30	18	25	31	55	59
2004	5 Jun	77	28	62	20	173	89
2005	22 Jun-2 Aug[h]	10	2	6	2	39	12
2006	20 Jun[i]	6	2	12	9	18	12
2007	17 Jun-5 Aug[j]	0	0	16	8	36	9
2008	11 Jun-3 Aug[k]	0	0	40	15	40	15

[a]Birds identified to species and nests counted on 31 Jul. Total number of cormorants represents the mean of 4 counts between 20 Jun and 31 Jul.

[b]Birds identified to species on 24 Jul. Nests counted on 8 Aug. Total number of cormorants represents the mean of 5 counts between 27 May and 24 Jul.

[c]Birds counted on 14 and 19 Jun. Nests counted on 10 Jul.

[d]Birds counted on 25 Jun; nest numbers estimated based on 3 visits: 25 Jun, 2 Aug, 13 Aug.

[e]Birds counted on 6 Aug; nests estimated based on 3 visits: 7 and 18 Jul, 6 Aug.

[f]Birds and nests counted on 15 Jul and 7 Aug. Total number of cormorants represents the mean of 2 counts between 31 May and 30 Jun.

[g]Birds counted on 5 Jul; nests estimated based on 4 visits: 5 Jul, 25 Jul, 4 Aug, 20 Aug.

[h]Birds counted on 22 Jun; nests estimated based on 6 visits between 22 Jun and 2 Aug.

[i]Birds and nests counted during a survey of the cormorant colony only and not a complete circumnavigation; no more nests were present on the island but the number of birds may be an underestimate.

[j]Birds counted on 5 Aug; nests estimated based on 4 visits: 17 Jun, 21 Jul, 23 Jul, 5 Aug.

[k]Birds counted on 3 Aug; nests estimated based on 2 visits: 11 Jun, 3 Aug.

Table 18. Numbers of red-faced and pelagic cormorants and nests (shown in parentheses) observed at Ulak Island, Alaska. Data were not collected on Ulak in 2008.

Year	Date	Survey section						Total
		East end	A	B	C	D	E	
Red-faced cormorant								
1997	10 Aug	NC[a]	NC	-- (5)	--	-- (42)	-- (35)	-- (≥82)
1998	22 Jul-5 Aug	--	--	--	--	1 (0)	92 (52)	93 (52)
1999	13 Aug-2 Sep	--	--	--	--	--	-- (10)	-- (10)
2000	4 Aug	--	--	--	--	--	-- (43)	-- (43)
2001	7 Aug	--	--	--	--	--	42 (6)	42 (6)
2002	4 Aug	--	39 (24)	15 (8)	12 (9)	38 (27)	2 (0)	106 (68)
2003	4 Aug	--	1 (0)	--	6 (3)	137 (67)	19 (5)	163 (75)
2004	23 Jul	--	--	3 (3)	3 (1)	136(111)	75 (40)	217 (155)
2005	15 Jul	3 (0)	--	1 (0)	--	10 (0)	1 (1)	15 (1)
2006	4 Aug	6 (3)	44 (17)	--	--	30 (18)	9 (0)	89 (38)
2007	21 Jul	1 (0)	1 (0)	--	--	31 (29)	14 (1)	47 (30)
2008	--	--	--	--	--	--	--	--
Pelagic cormorant								
1997	10 Aug	NC	NC	--	--	--	--	-- (≥0)
1998	22 Jul-5 Aug	--	--	4 (1)	--	1 (0)	3 (9)	8 (10)
1999	13 Aug-2 Sep	--	--	--	--	--	-- (11)	-- (11)
2000	4 Aug	--	--	--	--	--	-- (27)	-- (27)
2001	7 Aug	--	--	--	--	--	16 (8)	16 (8)
2002	4 Aug	--	2 (2)	--	--	3 (2)	1 (1)	6 (5)
2003	4 Aug	1 (0)	--	3 (1)	--	8 (5)	5 (4)	17 (10)
2004	23 Jul	3 (1)	1 (0)	5 (4)	2 (1)	4 (4)	26 (13)	41 (23)
2005	15 Jul	10 (9)	--	13 (0)	1 (0)	--	1 (0)	25 (9)
2006	7 Aug	1 (0)	18 (10)	1 (1)	1 (0)	--	10 (3)	31 (14)
2007	21 Jul	2 (1)	--	--	--	--	20 (4)	22 (5)
2008	--	--	--	--	--	--	--	--

[a]Section was not counted due to poor observation conditions.

Table 19. Numbers of all cormorants (red-faced and pelagic, including unidentified species) and nests (shown in parentheses) observed at Ulak Island, Alaska. Data were not collected on Ulak in 2008.

Year	Date	Survey section						Total
		East end	A	B	C	D	E	
1997	10 Aug	NC[a]	NC	-- (5)	--	-- (42)	-- (35)	-- (≥82)
1998	22 Jul-5 Aug	--	0 (2)	4 (1)	--	2 (0)	95 (72)	101 (75)
1999	13 Aug-2 Sep	--	--	--	--	--	-- (24)	-- (24)
2000	4 Aug	--	--	--	--	--	-- (105)	-- (105)
2001	7 Aug	--	--	--	--	--	93 (121)	93 (121)
2002	4 Aug	--	41 (35)	21 (8)	13 (11)	41 (29)	3 (9)	119 (92)
2003	4 Aug	1 (0)	1 (0)	3 (4)	6 (3)	168 (98)	24 (12)	203 (117)
2004	23 Jul	3 (2)	1 (0)	8 (7)	5 (2)	140(115)	153 (53)	310 (179)
2005	15 Jul	13 (9)	--	14 (0)	1 (0)	16 (12)	3 (27)	47 (48)
2006	4 Aug	7 (3)	62 (29)	1 (1)	1 (0)	30 (19)	19 (3)	120 (55)
2007	21 Jul	3 (1)	2 (2)	--	--	32 (35)	34 (5)	71 (43)
2008	--	--	--	--	--	--	--	--

[a]Section was not counted due to poor observation conditions.

Table 20. Numbers of glaucous-winged gulls observed on circumnavigation surveys and within the caldera at Kasatochi Island, Alaska. Unless otherwise noted, values represent individual counts.

Date	No. gulls counted on circumnavigations	No. gulls (nests[a]) counted within caldera	No. nests outside caldera
1936 (20 Jul)	6	20	0
1980 (13 Jul)	156	--	0
1982 (17 Jul)	143	--	0
1982 (2 Jun)	--	40 (20)	
1991 (4-11 Jun)	--	6 ("some")	0
1996 (20-30 Jun, *n*=3)	168	--	0
1996 (1 Jun)	--	200 (100)	
1997 (27 May-20 Jun, *n*=4)	163	--	0
1997 (6 Jul)	--	407 (90)	
1998 (14-19 Jun, *n*=2)	141	--	0
1998 (31 May-12 Aug, *n*=3)	--	212 (~100)	
1999 (25 Jun)	80	--	~2
1999 (27 May-19 Jul, *n*=4)	--	81 (~20)	
2000 (6 Aug)	133	--	~7
2000 (30 May-17 Jul, *n*=2)	--	300 (~100)	
2001 (29 May-10 Aug, *n*=2)	--	266 (~134)	~11
2002 (31 May-30 Jun, *n*=3)	41	--	
2002 (28 May-27 Jul, *n*=3)	--	320 (~99)	~15
2003 (6 Jun)	89	--	
2003 (21 Jun-8 Aug, *n*=3)	--	349 (~126)	~8
2004 (5 Jun)	348	--	
2004 (23 Jun-3 Aug, *n*=3)	--	222 (~95)	~6
2005 (22 Jun)	273	--	
2005 (23 Jun-1 Aug, *n*=3)	--	169 (~87)	~3
2006 (10 Jun-3 Aug, *n*=3)	--	176 (~87)	~5
2007 (5 Aug)	168	--	
2007 (9 Jun-20 Jul, *n*=3)	--	242 (~109)	~4
2008 (3 Aug)[b]	155	--	
2008 (7 Jun-6 Aug, *n*=4)	--	375 (~125)	~4

[a]Because of their inaccessibility, very few actual nests were observed in the caldera 1996-2007; nest numbers are estimates based on observations from a vantage point on the caldera rim. The presence of large chicks on the grassy slopes inside the caldera and observations of fledglings on the caldera lake throughout August confirmed that gulls nested in the caldera.

[b]Circumnavigation on 3 August was not a complete circumnavigation and not necessarily comparable to previous years.

Table 21. Number of glaucous-winged gulls observed in the caldera at Kasatochi Island, Alaska in 2008.

	Date				Statistics			
	7 Jun	21 Jun	14 Jul	6 Aug	mean	SD	range	*n*
No. gulls	205	255	305	375	285.0	72.6	205-375	4

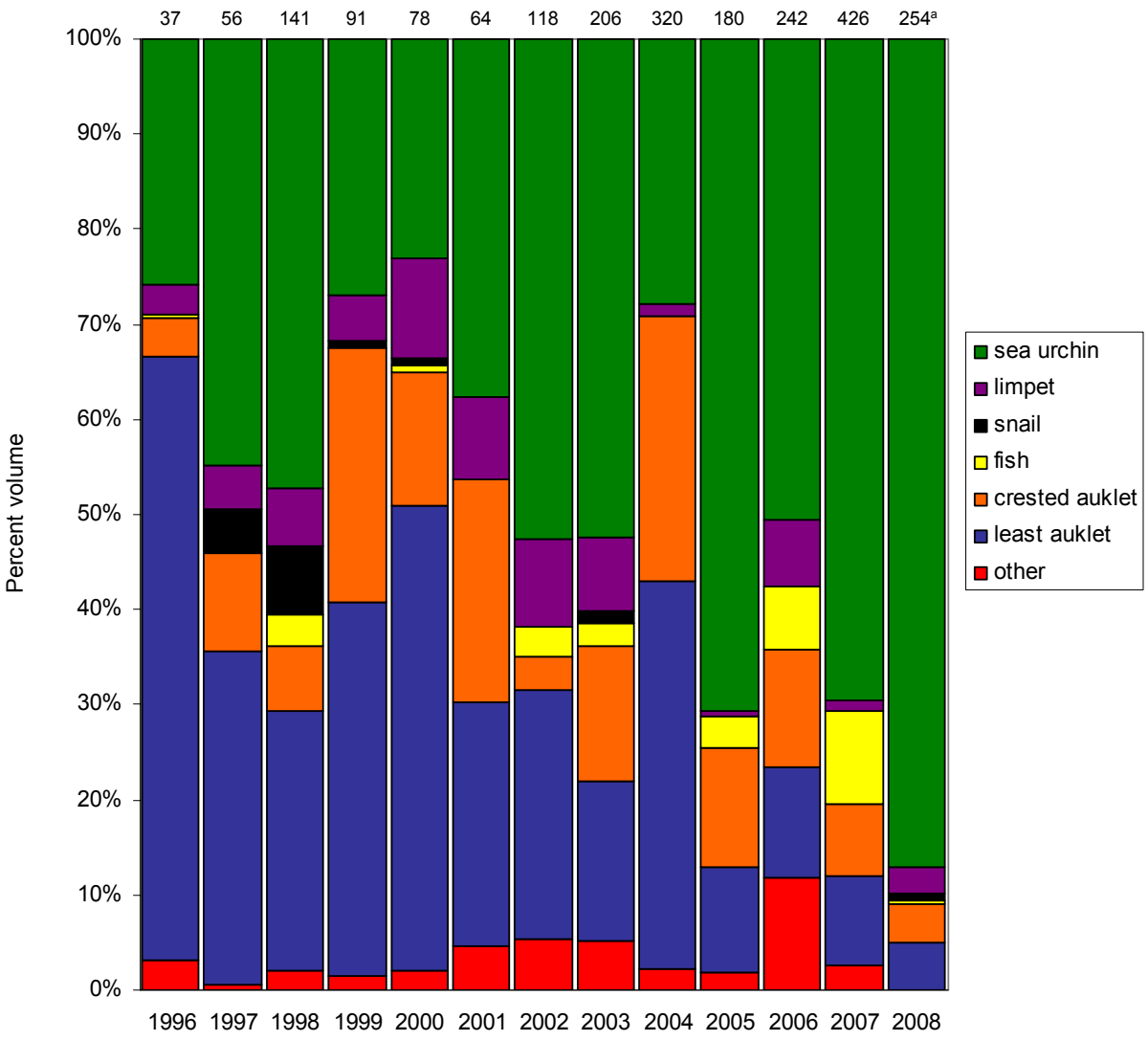


Figure 8. Percent volume of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska. Numbers above columns indicate the number of pellets. Data for 2008 are incomplete, due to the loss of some data in the eruption of 7 August 2008.

Table 21. Percent volume of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska. Data for 2008 are incomplete, due to the loss of some data in the eruption of 7 August 2008.

Food item	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of pellets	37	56	141	91	78	64	118	206	320	180	242	426	254
Invertebrates (total)	(29)[a]	(54)	(62)	(34)	(35)	(46)	(63)	(60)	(29)	(72)	(61)	(71)	(91)
Sea urchin	26	45	47	27	23	38	53	52	28	71	51	70	89
Limpet	3	5	6	5	10	9	9	8	1	1	7	1	1
Snail	--	5	7	1	1	--	<1	1	--	--	<1	<1	<1
Chiton	--	--	1	1	1	--	--	--	<1	<1	1	--	--
Unidentified bivalve	<1	--	<1	--	--	--	1	--	--	--	1	--	--
Blue mussel	--	--	--	--	--	--	--	<1	--	--	<1	<1	--
Crab	<1	--	<1	--	--	--	<1	--	--	--	1	<1	--
Beetle	<1	--	--	--	--	--	--	--	--	--	--	--	--
Sponge	<1	--	--	--	--	--	--	--	--	--	--	--	--
Fish (total)	(<1)	(0)	(3)	(<1)	(1)	(0)	(3)	(2)	(<1)	(3)	(7)	(10)	(<1)
Birds (total)	(68)	(46)	(35)	(66)	(64)	(54)	(34)	(36)	(71)	(25)	(31)	(19)	(8)
Fork-tailed storm-petrel	--	--	--	--	--	--	--	1	--	1	--	2	--
Leach's storm-petrel	--	--	--	--	--	--	--	--	--	1	--	--	--
Parakeet auklet	--	--	--	--	--	--	--	--	<1	--	<1	--	--
Least auklet	63	35	27	39	49	26	26.3	16.6	41	11	12	10	5
Crested auklet	4	10	7	27	14	23	4	14	28	13	12	8	4
Tufted puffin	--	--	--	--	--	--	--	--	--	--	<1	--	--
Unidentified small bird	<1	--	--	--	--	5	4	4	1	<1	6	1	--
Unidentified bird egg	0.7	<1	<1	--	1	--	--	--	1	--	--	<1	--
Miscellaneous (total)	(2)	(<1)	(<1)	(<1)	(<1)	(0)	(<1)	(1)	(0)	(0)	(2)	(<1)	(0)
Steller sea lion excreta/hair	2	--	--	--	--	--	--	1	--	--	1	--	--
Seeds	--	--	--	--	<1	--	--	<1	--	--	--	--	--
Small stones	--	<1	<1	<1	--	--	<1	<1	--	--	<1	--	--
Plastic ball (4 mm diam.)	<1	--	--	--	--	--	--	--	--	--	--	--	--
Flagging tape (pink)	<1	--	--	--	--	--	<1	--	--	--	--	--	--
Miscellaneous plastic	--	--	--	--	--	--	<1	<1	--	--	--	--	--
Grass / plant material	--	--	--	--	--	--	--	<1	--	--	--	--	--
Algae	--	--	--	--	--	--	--	<1	--	--	<1	<1	--

[a]All values represent percent of the volume of all samples comprised by each item. Values in parentheses are composite totals for invertebrates, fish, birds, and miscellaneous.

Table 22. Percent occurrence of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska. Data for 2008 are incomplete, due to the loss of some data in the eruption of 7 August 2008.

Food item	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of pellets	37	56	141	91	78	64	118	206	320	180	242	426	254
Invertebrates (total)	(49)[a]	(57)	(66)	(41)	(38)	(47)	(69)	(62)	(33)	(74)	(65)	(76)	(92)
Sea urchin	43	50	53	37	28	42	58	56	31	73	58	74	91
Limpet	11	7	15	10	17	16	15	15	3	1	13	3	3
Snail	--	4	10	2	1	--	1	2	--	--	<1	<1	<1
Chiton	--	--	1	2	1	--	--	--	<1	1	1	--	--
Unidentified bivalve	3	--	1	--	--	--	2	--	--	--	2	--	--
Blue mussel	--	--	--	--	--	--	--	<1	--	--	1	1	--
Crab	3	--	1	--	--	--	1	--	--	--	2	1	--
Beetle	3	--	--	--	--	--	--	--	--	--	--	--	--
Sponge	3	--	--	--	--	--	--	--	--	--	--	--	--
Fish (total)	(3)	(0)	(4)	(1)	(1)	(0)	(4)	(3)	(<1)	(4)	(8)	(12)	(<1)
Birds (total)	(78)	(52)	(39)	(70)	(64)	(55)	(38)	(38)	(73)	(26)	(35)	(22)	(9)
Fork-tailed storm-petrel	--	--	--	--	--	--	--	1	--	1	--	2	--
Leach's storm-petrel	--	--	--	--	--	--	--	--	--	1	--	--	--
Parakeet auklet	--	--	--	--	--	--	--	--	<1	--	<1	--	--
Least auklet	70	46	32	43	55	27	31	18	46	12	12	11	5
Crested auklet	5	16	9	30	15	23	4	15	35	14	13	9	4
Tufted puffin	--	--	--	--	--	--	--	--	--	--	<1	--	--
Unidentified small bird	3	--	--	--	--	5	6	6	2	1	8	1	--
Unidentified bird egg	8	4	1	--	4	–	--	--	2	--	--	<1	--
Miscellaneous (total)	(8)	(2)	(2)	(1)	(1)	(0)	(5)	(3)	(0)	(0)	(2)	(1)	(0)
Steller sea lion excreta/hair	3	--	--	--	--	--	--	<1	--	--	1	--	--
Seeds	--	--	--	--	1	--	--	--	--	--	--	--	--
Small stones	--	2	2	1	--	--	2	1	--	--	<1	--	--
Plastic ball (4 mm diam.)	3	--	--	--	--	--	--	--	--	--	--	--	--
Flagging tape (pink)	3	--	--	--	--	--	1	--	--	--	--	--	--
Miscellaneous plastic	--	--	--	--	--	--	1	<1	--	--	--	--	--
Grass / plant material	--	--	--	--	--	--	--	<1	--	--	--	--	--
Algae	--	--	--	--	--	--	--	1	--	--	<1	1	--

[a]All values represent percent occurrence in total sample. Values in parentheses are composite totals for invertebrates, fish, birds, and miscellaneous. Summation of columns exceeds 100% because of overlap (i.e. occurrence of more than 1 prey species per pellet).

Table 23. Percent occurrence of food items in regurgitated pellets of glaucous-winged gulls at several locations on Kasatochi Island, Alaska in 2008. Data for 2008 are incomplete, due to the loss of some data in the eruption of 7 August 2008.

Food item	Oystercatcher Beach (*n*=254)	Reindeer Beach (*n*=0)	Snegden/Guillemot Beaches (*n*=0)	Other[a] (*n*=0)	Total (*n*=254)	No. individuals per pellet	
						mean	max.
Invertebrates (total)	(92)[a]	--	--	--	(92)		
Sea urchin	91	--	--	--	91		
Limpet	3	--	--	--	3	2.6	7
Snail	<1	--	--	--	<1	--	--
Blue mussel	--	--	--	--	--	--	--
Crab	--	--	--	--	--	--	--
Fish	(<1)	--	--	--	(<1)	1.0	1
Birds (total)	(9)	--	--	--	(9)	1.0	2
Fork-tailed storm-petrel	--	--	--	--	--	--	--
Least auklet	5	--	--	--	5	1.0	1
Crested auklet	4	--	--	--	4	1.0	1
Unidentified bird	--	--	--	--	--	--	--
Unidentified egg	--	--	--	--	--	--	--
Other (total)	--	--	--	--	--		

[a]All values represent percent occurrence in total sample. Values in parentheses are composite totals for invertebrates, fish, birds, and miscellaneous. Summation of columns exceeds 100% because of overlap (i.e. occurrence of more than 1 prey species per pellet).

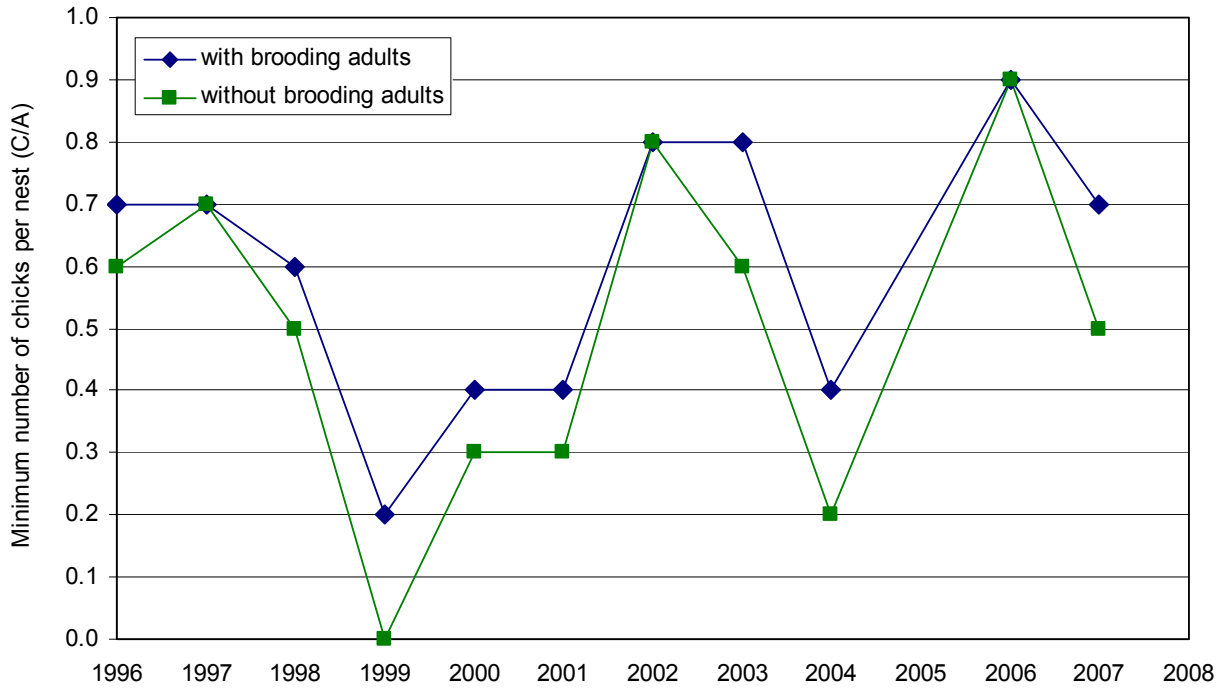


Figure 9. Reproductive performance of black-legged kittiwakes on index plots at Koniuji Island, Alaska. The minimum number of chicks per nest is presented both with and without nests containing brooding adults. Calculations with brooding adults assume those nests contained at least one chick; calculations without brooding adults omit those nests from analyses. Data were not collected in 2005 or 2008.

Table 24. Reproductive performance of black-legged kittiwakes on index plots at Koniuji Island, Alaska. Data were not collected in 2005 or 2008.

Year	Date	Brooders [a]	No. nests (A)	No. nests w/ chicks (B)	Min. no. chicks (C) [ab]	Prop. nests w/ chicks (B/A)	Min. no. chicks per nest w/ chicks (C/B)	Min. no. chicks per nest (C/A)
1996	2 Aug	(w/ brood.)	491	336	361	0.68	1.1	0.7
		(w/o)	313	158	183	0.50	1.2	0.6
1997	4 Aug	(w/ brood.)	786	484	565	0.62	1.2	0.7
		(w/o)	674	372	453	0.55	1.2	0.7
1998	5 Aug	(w/ brood.)	544	282	312	0.52	1.1	0.6
		(w/o)	455	193	223	0.42	1.2	0.5
1999	13 Aug	(w/ brood.)	142	25	25	0.18	1.0	0.2
		(w/o)	121	4	4	0.03	1.0	0.0
2000	1 Aug	(w/ brood.)	561	175	201	0.31	1.1	0.4
		(w/o)	533	147	173	0.28	1.2	0.3
2001	6 Aug	(w/ brood.)	755	244	266	0.32	1.1	0.4
		(w/o)	657	146	168	0.22	1.2	0.3
2002	5 Aug	(w/ brood.)	242	165	201	0.68	1.2	0.8
		(w/o)	228	151	187	0.66	1.2	0.8
2003	28 Jul	(w/ brood.)	238	170	179	0.71	1.1	0.8
		(w/o)	150	82	91	0.55	1.1	0.6
2004	22 Jul	(w/ brood.)	437	178	180	0.41	1.0	0.4
		(w/o)	341	82	84	0.24	1.0	0.2
2005	--	--	--	--	--	--	--	--
2006	8 Aug	(w/ brood.)	184	149	169	0.80	1.1	0.9
		(w/o)	147	112	132	0.76	1.2	0.9
2007	22 Jul	(w/ brood.)	196	134	136	0.68	1.0	0.7
		(w/o)	124	62	64	0.50	1.0	0.5
2008	--	--	--	--	--	--	--	--

[a] Chicks were not observed in a number of nests that contained brooding adults; we assumed that these nests probably contained at least 1 chick. For this table we first calculated productivity based on this assumption, then calculated it again, omitting those nests from analysis.

[b] The entire contents of some nests containing at least 1 chick could not be viewed; additional chicks may have been present.

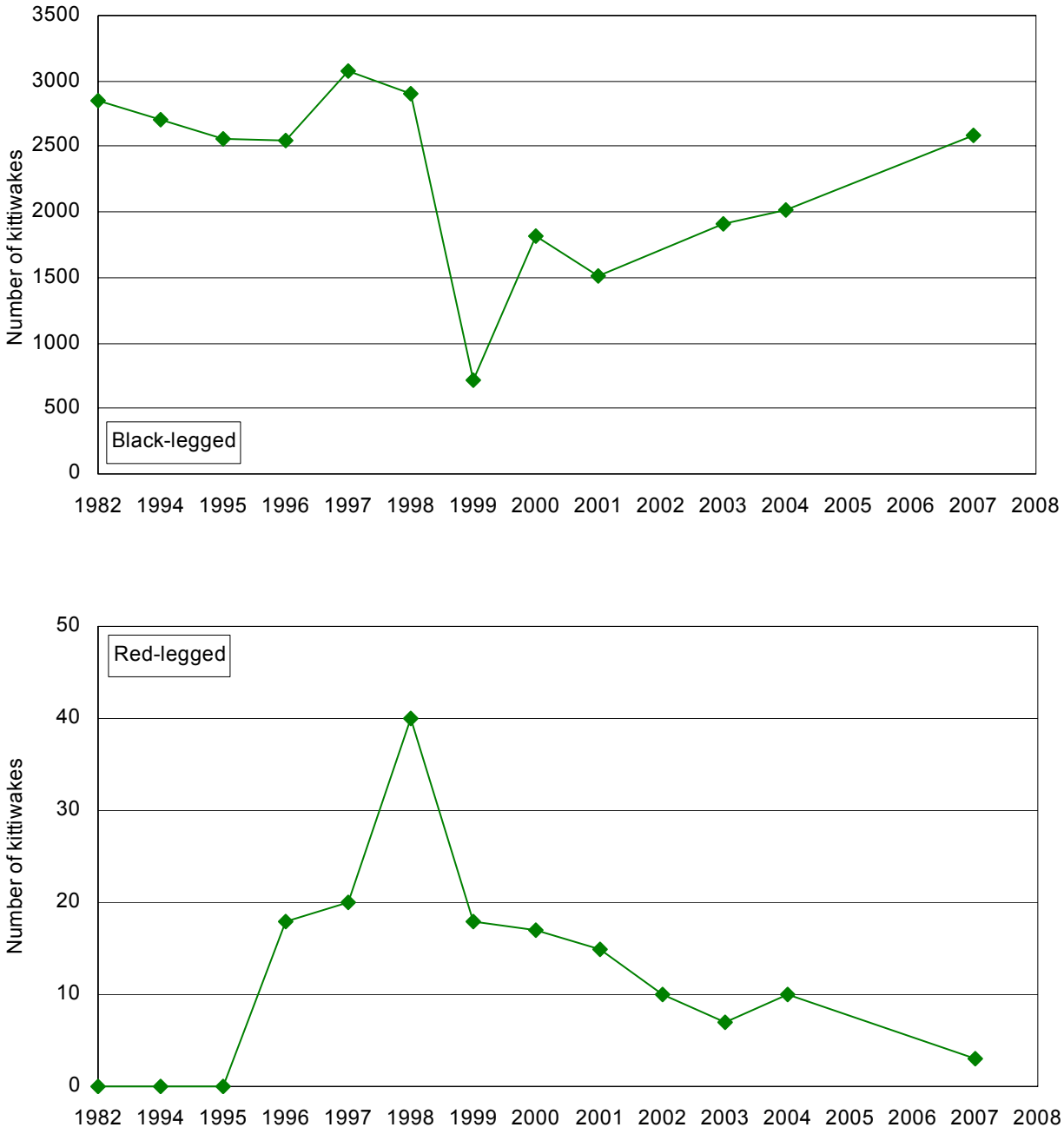


Figure 10. Numbers of black-legged and red-legged kittiwakes counted at Koniuji Island, Alaska. Because complete island surveys were not conducted in 1999 and 2000, numbers of black-legged kittiwakes for those years represent estimates based on the relative proportion of birds seen in those plots that were counted, as compared to previous years, extrapolated to the rest of the island. Data were not collected in 2002 (for black-legged only), 2005, 2006, or 2008.

Table 25. Counts of black-legged kittiwakes at Koniuji Island, Alaska. Historical data are from Bailey and Trapp (1986), Byrd and Williams (1994), and Byrd (1995). Data were not collected in 2002, 2005, 2006, or 2008.

Plot	1982	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Survey date:	19 Jul	7 Aug	17 Aug	9-11 Jun	4 Aug	5 Aug	13 Aug	1 Aug	6 Aug	--	28 Jul	22 Jul	--	--	22 Jul	--
1	--	--	--	174	89	73	--	16	9	--	7	10	--	--	75	--
2a	--	--	--	123	144	237	--	25	12	--	2	0	--	--	0	--
2b	--	--	--	71	83	75	--	34	17	--	5	0	--	--	0	--
3	--	--	--	128	111	86	--	53	36	--	65	45	--	--	19	--
4	--	--	--	113	122	123	--	56	38	--	43	117	--	--	33	--
East side (plots 1-4)	**--**	**--**	**510**	**609**	**549**	**594**	**NC[a]**	**184**	**112**	**--**	**122**	**172**	**--**	**--**	**127**	**--**
5	--	--	--	294	285	310	--	166	221	--	229	315	--	--	348	--
6	--	--	--	274	185	154	--	240	245	--	105	340	--	--	168	--
7	--	--	--	0	13	9	--	NC	58	--	191	181	--	--	795	--
South side (plots 5-7)	**--**	**--**	**825**	**568**	**483**	**473**	**NC**	**406**	**524**	**--**	**525**	**836**	**--**	**--**	**1311**	**--**
8	--	--	--	322	324	281	118	NC	263	--	690	511	--	--	430	--
9	--	--	--	65	46	49	24	NC	70	--	45	10	--	--	42	--
10	--	--	--	282	96	211	0	NC	94	--	329	217	--	--	34	--
11a	--	--	--	190	527	672	189	399	14	--	0	31	--	--	0	--
11b	--	--	--	173	162	168	52	136	213	--	64	25	--	--	82	--
11c	--	--	--	180	719	283	12	239	104	--	39	103	--	--	0	--
West side (plots 8-11)	**--**	**--**	**1,220**	**1,212**	**1,874**	**1,664**	**395**	**774**	**758**	**--**	**1,167**	**897**	**--**	**--**	**588**	**--**
12	--	--	--	134	163	171	52	62	79	--	51	64	--	--	78	--
13	--	--	--	20	7	0	NC	NC	34	--	46	36	--	--	58	--
14	--	--	--	7	1	0	NC	NC	0	--	0	16	--	--	428	--
North side (plots 12-14)	**--**	**--**	**NC**	**161**	**171**	**171**	**52**	**62**	**113**	**--**	**97**	**116**	**--**	**--**	**564**	**--**
Total	**2,852**	**2,707**	**2,555**	**2,550**	**3,077**	**2,902**	**447**	**1,426**	**1,507**	**--**	**1,911**	**2,021**	**--**	**--**	**2590**	**--**

[a]NC = not counted.

Table 26. Counts of black-legged kittiwake nests at Koniuji Island, Alaska. Historical data are from Bailey and Trapp (1986), Byrd and Williams (1994), and Byrd (1995). Data were not collected in 2002, 2005, 2006, and 2008.

Plot	1982	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Survey date:	19 Jul	7 Aug	17 Aug	9-11 Jun	4 Aug	5 Aug	13 Aug	1 Aug	6 Aug	--	28 Jul	22 Jul	--	--	22 Jul	--
1	--	--	--	58	41	24	--	14	0	--	4	4	--	--	32	--
2a	--	--	--	69	95	45	--	28	0	--	2	0	--	--	0	--
2b	--	--	--	46	41	21	--	30	7	--	4	0	--	--	0	--
3	--	--	--	48	68	29	--	30	16	--	10	6	--	--	10	--
4	--	--	--	72	55	47	--	21	5	--	10	9	--	--	17	--
East side (plots 1-4)	**--**	**--**	**510**	**293**	**300**	**166**	**NC[a]**	**123**	**28**	**--**	**30**	**29**	**--**	**--**	**59**	**--**
5	--	--	--	206	165	106	--	92	86	--	121	117	--	--	210	--
6	--	--	--	167	133	68	--	104	87	--	62	132	--	--	66	--
7	--	--	--	0	11	5	--	NC	23	--	102	71	--	--	370	--
South side (plots 5-7)	**--**	**--**	**825**	**373**	**309**	**179**	**NC**	**196**	**196**	**--**	**285**	**320**	**--**	**--**	**646**	**--**
8	--	--	--	199	202	118	1	NC	117	--	218	171	--	--	177	--
9	--	--	--	38	28	20	5	NC	22	--	27	4	--	--	17	--
10	--	--	--	95	56	63	0	NC	143	--	153	78	--	--	17	--
11a	--	--	--	125	289	369	112	161	42	--	0	14	--	--	0	--
11b	--	--	--	153	130	88	20	83	119	--	56	4	--	--	64	--
11c	--	--	--	35	73	65	9	93	59	--	42	11	--	--	0	--
West side (plots 8-11)	**--**	**--**	**291**	**645**	**778**	**723**	**147**	**337**	**502**	**--**	**496**	**282**	**--**	**--**	**275**	**--**
12	--	--	--	85	93	55	0	35	35	--	20	13	--	--	70	--
13	--	--	--	13	4	0	NC	NC	15	--	43	9	--	--	25	--
14	--	--	--	4	0	0	NC	NC	0	--	0	7	--	--	143	--
North side (plots 12-14)	**--**	**--**	**NC**	**102**	**97**	**55**	**0**	**35**	**50**	**--**	**63**	**29**	**--**	**--**	**238**	**--**
Total	**~570**	**1,165**	**1626**	**1,413**	**1,484**	**1,123**	**147**	**691**	**776**	**--**	**874**	**660**	**--**	**--**	**1218**	**--**

[a]NC = not counted.

Table 27. Counts of red-legged kittiwakes and nests at Koniuji Island, Alaska. Numbers represent the maximum number of birds (and nests in parentheses) counted in each plot, regardless of date. Annual nest totals are the sum of the maximum counts in each plot, regardless of date. However, annual totals for the number of birds represent the maximum number counted on a single date (thus, the by-plot values may not add up to the total value). Data were not collected in 2005, 2006, or 2008.

Year	Date	Plot				Total
		3	7	8	11	
1996	9-11 Jun	11 (2)	0 (0)	0 (0)	20 (10)	18 (4)
1997	14 Jun+4 Aug	0 (0)	0 (0)	0 (0)	18 (2)	20 (10)
1998	5 Aug	1 (1)	0 (0)	0 (0)	39 (13)	40 (14)
1999	13 Aug	NC[a]	0 (0)	0 (0)	18 (3)	18 (3)
2000	1 Aug	0 (0)	0 (0)	0 (0)	17 (6)	17 (6)[b]
2001	6 Aug	0 (0)	0 (0)	0 (0)	15 (10)	15 (10)[c]
2002	5 Aug	0 (0)	0 (0)	9 (4)	1 (0)	10 (4)
2003	28 Jul	0 (0)	0 (0)	7 (1)	0 (0)	7 (1)
2004	22 Jul	0 (0)	0 (0)	10 (6)	0 (0)	10 (6)
2005	--	--	--	--	--	--
2006	--	--	--	--	--	--
2007	22 Jul	0 (0)	3 (0)	0 (0)	0 (0)	3 (0)
2008	--	--	--	--	--	--

[a]NC = not counted.

[b]Of these 6 nests, 2 contained chicks--this is the first time red-legged kittiwake chicks were observed at Koniuji Island.

[c]In 2001, all red-legged kittiwake nests were empty.

Table 28. Nesting chronology of common murres at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2008.

Parameter	1996	1997	1998[a]	1999[a]	2000[a]
Lay date[b]					
median	9 Jul	4 Jul	--	--	--
mean	14 Jul	7 Jul	--	--	--
SD	8.1 d	8.0 d	--	--	--
range	4-24 Jul	30 Jun-25 Jul	1-7 Jul	10-28 Jul	17 Jun-12 Jul
n	28	20	<20	<20	<10
Hatch date[b]					
median	10 Aug	5 Aug	--	--	--
mean	15 Aug	8 Aug	--	--	--
SD	8.1 d	8.0 d	--	--	--
range	5-25 Aug	1-26 Aug	--	--	--
n	28	20	--	--	--
Fledge date					
median	25 Aug	24 Aug	--	--	--
mean	25 Aug	24 Aug	--	--	--
SD	0.0 d	0.0 d	--	--	--
range	25 Aug	24 Aug	--	--	--
n	2	3	--	--	--
Nestling period[c] (days)					
median	18.5	19	--	--	--
mean	18.5	19.0	--	--	--
SD	2.1 d	4.0 d	--	--	--
range	17-20	15-23	--	--	--
n	2	3	--	--	--
Min. nestling period[d] (days)					
median	17	21	--	--	--
mean	17.8	21.1	--	--	--
SD	2.0 d	2.3 d	--	--	--
range	15-21	17-25	--	--	--
n	12	11	--	--	--

[a]In 1998-2000, less than 20 eggs of unknown species were laid and quickly lost during the range of dates indicated.
[b]Dates do not reflect the murres that were still incubating eggs on our last visit to the colony (26 Aug in both 1996 and 1997).
[c]Numbers are for those chicks that had left the cliffs.
[d]Numbers are for those chicks that had reached fledging age but were still on the cliffs at our last visit.

Table 29. Nesting chronology of thick-billed murres at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2008.

Parameter	1996	1997	1998[a]	1999[a]	2000[a]
Lay date[b]					
median	8 Jul	4 Jul	--	--	--
mean	8 Jul	6 Jul	--	--	--
SD	6.3 d	5.0 d	--	--	--
range	28 Jun-24 Jul	30 Jun-23 Jul	1-7 Jul	10-28 Jul	17 Jun-12 Jul
n	127	133	<20	<20	<10
Hatch date[b]					
median	9 Aug	5 Aug	--	--	--
mean	9 Aug	7 Aug	--	--	--
SD	6.3 d	5.0 d	--	--	--
range	30 Jul-25 Aug	1-24 Aug	--	--	--
n	127	133	--	--	--
Fledge date					
median	23 Aug	24 Aug	--	--	--
mean	23 Aug	23 Aug	--	--	--
SD	1.7 d	1.4 d	--	--	--
range	19-26 Aug	21-24 Aug	--	--	--
n	47	16	--	--	--
Nestling period[c] (days)					
median	18	22	--	--	--
mean	19.0	20.7	--	--	--
SD	2.8 d	2.9 d	--	--	--
range	15-26	15-23	--	--	--
n	47	16	--	--	--
Min. nestling period[d] (days)					
median	17	18	--	--	--
mean	18.3	18.9	--	--	--
SD	2.5 d	2.5 d	--	--	--
range	15-21	15-25	--	--	--
n	32	67	--	--	--

[a]In 1998-2000, less than 20 eggs of unknown species were laid and quickly lost during the range of dates indicated.
[b]Dates do not reflect the murres that were still incubating eggs on our last visit to the colony (26 Aug in both 1996 and 1997).
[c]Numbers are for those chicks that had left the cliffs.
[d]Numbers are for those chicks that had reached fledging age but were still on the cliffs at our last visit.

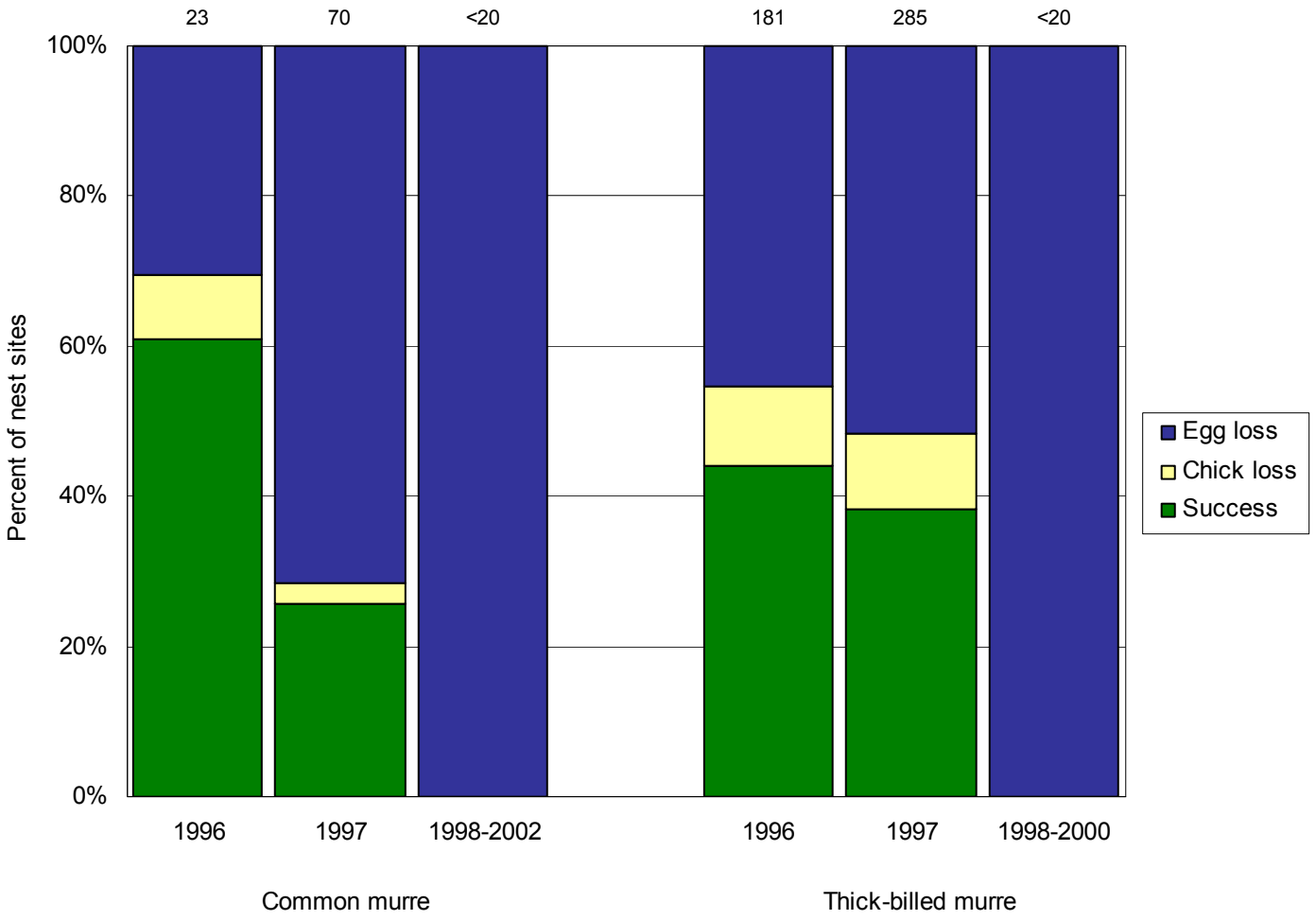


Figure 11. Reproductive performance of common and thick-billed murres at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests. No murres attempted to breed at Kasatochi in 2001-2008.

Table 30. Reproductive performance of common and thick-billed murres at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2008.

Year	No. sites w/ egg (A)	No. sites w/ chick (B)	No. sites w/ fledged chick (C)	Hatching success (B/A)	Fledging success (C/B)	Reproductive success (C/A)	No. birds on plots (D)	K value (C/D)	K' value (A/D)
Common murre									
1996	23	16	14	0.70	0.88	0.61	123.9	0.11	0.19
1997	70	20	18	0.29	0.90	0.26	281.7	0.06	0.28[a]
1998	<20	0	0	0.00	0.00	0.00	0	0.00	--
1999	<20	0	0	0.00	0.00	0.00	0	0.00	--
2000	<10	0	0	0.00	0.00	0.00	0	0.00	--
Thick-billed murre									
1996	181	99	80	0.55	0.81	0.44	914.8	0.09	0.20
1997	285	155	126	0.48	0.81	0.38	1,405.8	0.09	0.22[a]
1998	<20	0	0	0.00	0.00	0.00	0	0.00	--
1999	<20	0	0	0.00	0.00	0.00	0	0.00	--
2000	<10	0	0	0.00	0.00	0.00	0	0.00	--

[a]"A" values for these numbers include some nest sites excluded from productivity analysis (23 thick-billed and 8 common murres).

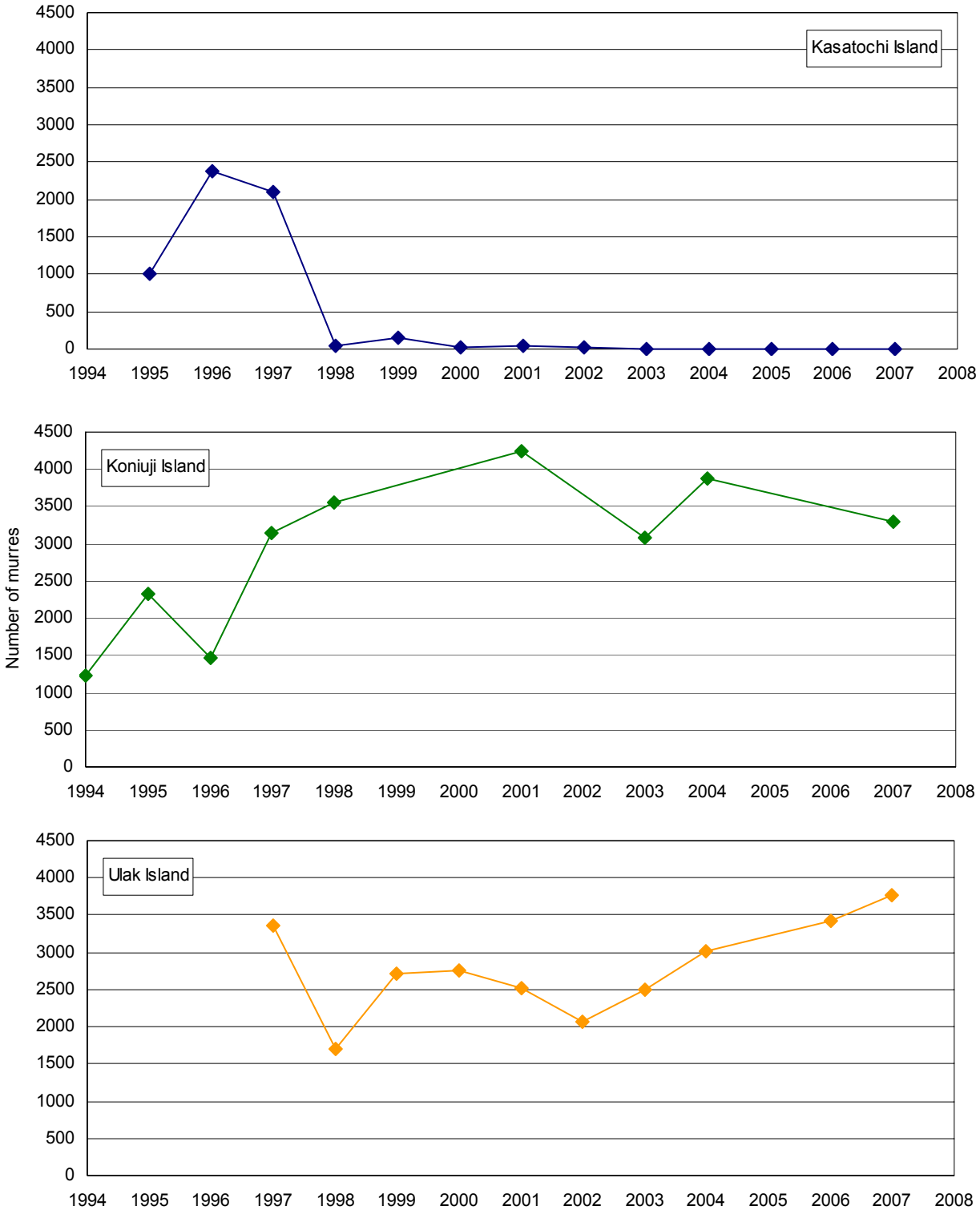


Figure 12. Numbers of common and thick-billed murres counted at Kasatochi, Koniuji, and Ulak islands, Alaska. Numbers from Kasatochi represent the mean of replicate counts made during the mid-incubation to early chick-rearing period; numbers from Koniuji and Ulak are from single surveys. No murres attempted to breed on Kasatochi 2001-2008. Complete data were not collected on Koniuji in 2002, 2005, 2006, or 2008 or on Ulak in 2005 or 2008.

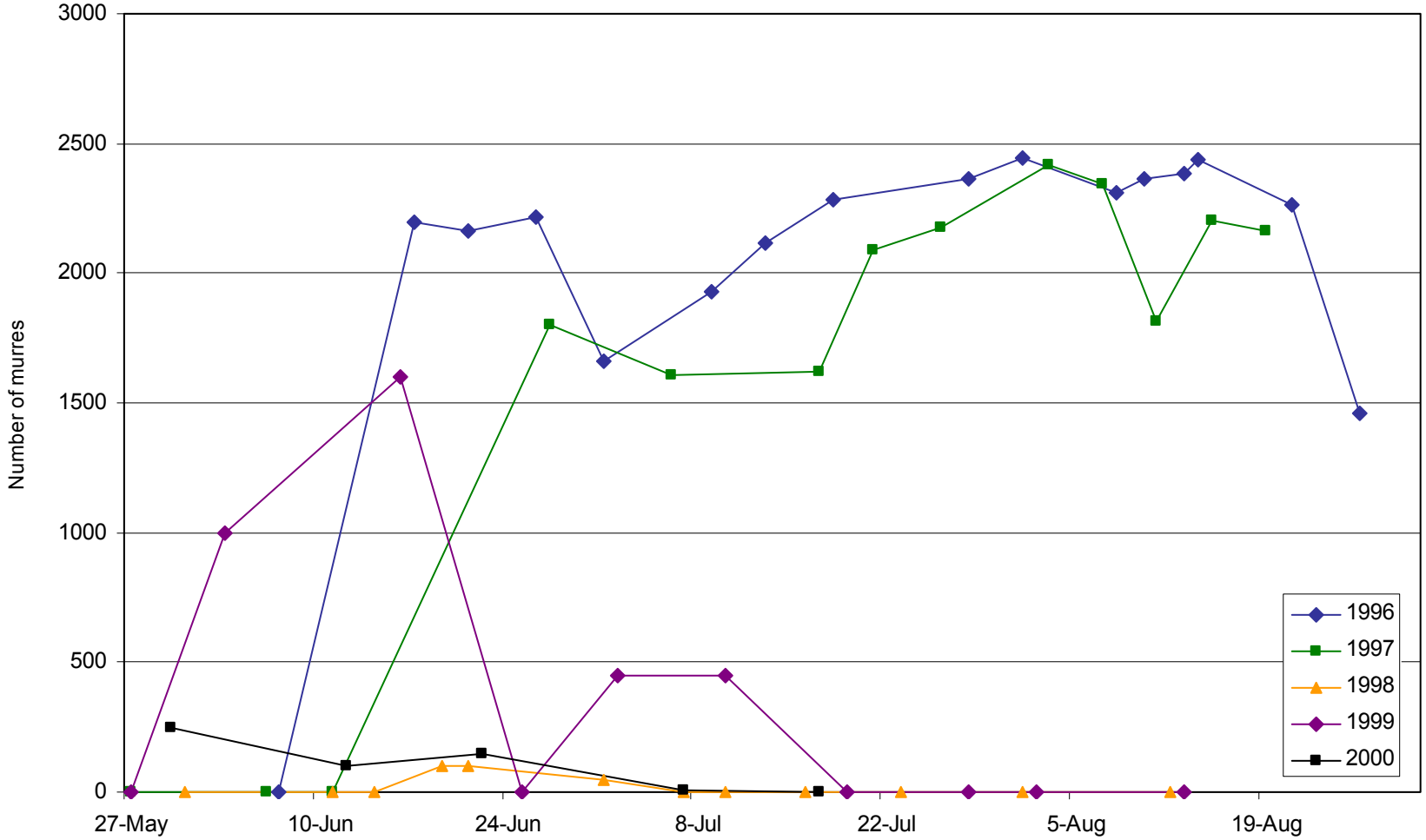


Figure 13. Numbers of common and thick-billed murres attending plots at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2008.

Table 31. Murre population counts on index plots at Kasatochi Island, Alaska. Surveys were conducted during the mid-incubation to early chick-rearing period (13 Jul 1980, 17 Jul 1982, 13 Aug 1995, 18 Jul-14 Aug 1996, 17 Jul-19 Aug 1997, 17 Jun-16 Aug 1998, 2 Jul-13 Aug 1999, and 22 Jun-6 Aug 2000). No murres were present on index plots in 2001-2008.

	Replicate								Statistics			
Year	1	2	3	4	5	6	7	8	*n*	mean	SD	range
1980	2,071	--	--	--	--	--	--	--	1	2,071	--	--
1982	1,083	--	--	--	--	--	--	--	1	1,083	--	--
1995	~1,000	--	--	--	--	--	--	--	1	~1,000	--	--
1996	2,284	2,362	2,447	2,309	2,363	2,382	2,435	--	7	2369	59.9	2,284-2,447
1997	1,620	2,088	2,174	2,417	2,345	1,813	2,203	2,166	8	2,103	265.6	1,620-2,417
1998	~200	~200	0	0	0	0	0	0	8	~50	92.6	0-200
1999	~450	~450	0	0	0	0	--	--	6	~150	232.4	0-450
2000	~150	6	0	0	0	--	--	--	5	~31	66.5	0-150

Table 32. Common and thick-billed murre population counts on index plots at Kasatochi Island, Alaska. Counts were conducted during the mid-incubation to early chick-rearing period (18 Jul-14 Aug 1996 and 17 Jul-19 Aug 1997). Counts were conducted in 1998-2000, but birds were not identified to species (see preceding table). No murres were present on index plots in 2001-2008.

	Replicate								Statistics			
Year	1	2	3	4	5	6	7	8	*n*	mean	SD	range
Common murre												
1996	264	307	320	282	307	291	324	--	7	299.3	21.5	264-324
1997	258	292	313	389	385	205	378	329	8	318.6	65.8	205-389
Thick-billed murre												
1996	1,931	1,977	2,059	1,954	1,996	2,047	2,033	--	7	1,999.6	48.6	1,931-2,059
1997	1,295	1,741	1,823	1,963	1,911	1,584	1,800	1,810	8	1,740.9	212.7	1,295-1,963

Table 33. Counts of common and thick-billed murres at Koniuji Island, Alaska. Historical data are from Byrd and Williams (1994) and Byrd (1995). Data were not collected on Koniuji in 1999, 2002, 2005, 2006, or 2008.

Plot	1994[a]	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Date surveyed	7 Aug	13 Aug	2 Aug	4 Aug	5 Aug	--	1 Aug	6 Aug	--	28 Jul	22 Jul	--	--	22 Jul	--
1	--	145	312	2	270	--	249	--	--	224	410	--	--	963	--
2a	--	2	117	80	39	--	67	--	--	12	30	--	--	24	--
2b	--	151	0	0	0	--	0	--	--	13	0	--	--	0	--
3	--	18	11	5	5	--	0	--	--	0	0	--	--	1	--
4	--	20	38	19	25	--	14	--	--	4	16	--	--	9	--
East side (plots 1-4)	**774**	**276**	**336**	**478**	**106**	**--**	**339**	**330**	**--**	**253**	**456**	**--**	**--**	**997**	**--**
5	--	28	586	483	429	--	596	--	--	530	661	--	--	1207	--
6	--	39	53	3	74	--	504	--	--	108	96	--	--	42	--
7	--	0	419	293	NC	--	0	--	--	398	147	--	--	0	--
South side (plots 5-7)	**--**	**935**	**67**	**1,058**	**779**	**--**	**503**	**1,100**	**--**	**1,036**	**904**	**--**	**--**	**1249**	**--**
8	--	0	5	0	--	--	0	--	--	0	1	--	--	0	--
9	--	11	57	52	--	--	41	--	--	34	0	--	--	61	--
10	--	982	1,288	1,935	--	--	1,677	--	--	1,084	1,560	--	--	836	--
11a	--	18	3	16	--	--	0	--	--	0	9	--	--	0	--
11b	--	0	0	0	--	--	6	--	--	5	0	--	--	0	--
11c	--	0	0	0	--	--	0	--	--	0	0	--	--	0	--
West side (plots 8-11)	**454**	**1,112**	**1,011**	**1,353**	**2,003**	**--**	**NC**	**1,724**	**--**	**1,123**	**1,570**	**--**	**--**	**897**	**--**
12	--	12	12	0	--	--	0	--	--	0	0	--	--	0	--
13	--	31	179	22	--	--	1,096	--	--	658	57	--	--	0	--
14	--	0	65	653	--	--	0	--	--	3	888	--	--	148	--
North side (plots 12-14)	**--**	**NC[b]**	**43**	**256**	**675**	**--**	**NC**	**1,096**	**--**	**661**	**945**	**--**	**--**	**148**	**--**
Total	**1,228**	**>2,323**	**1,457**	**3,145**	**3,563**	**--**	**>842**	**4,250**	**--**	**3,073**	**3,875**	**--**	**--**	**3291**	**--**

[a]During the 1994 survey, the island was divided into just 2 sections (east and west).
[b]NC = not counted.

Table 34. Numbers of common and thick-billed murres observed at Ulak Island, Alaska. Data were not collected in 2005 or 2008.

Year	Date	Survey section						Total
		East end	A	B	C	D	E	
1997	10 Aug	15	261	1,693	6	1,371	10	3,356
1998	22 Jul	49	109	444	251	725	129	1,707
1999	13 Aug	30	232	772	75	1,417	195	2,721
2000	4 Aug	54	288	601	109	1,671	25	2,748
2001	7 Aug	71	208	547	130	1,527	32	2,515
2002	4 Aug	31	66	476	158	1,266	76	2,073
2003	4 Aug	44	113	604	84	1,575	79	2,499
2004	23 Jul	107	855	106	0	1,841	107	3,016
2005	--	--	--	--	--	--	--	--
2006	7 Aug	39	198	695	119	1976	398	3,425
2007	21 Jul	92	255	621	58	2139	606	3,771
2008	--	--	--	--	--	--	--	--

Table 35. Mean numbers of pigeon guillemots observed on circumnavigation surveys of Kasatochi Island, Alaska. Circumnavigation surveys were not conducted in 2001 or 2006.

		Replicate				Statistics			
Year	Date	1	2	3	4	*n*	mean	SD	range
1996	12-30 Jun	69	48	51	54	4	55.5	9.3	48-69
1997	27 May-20 Jun	52	79	79	69	4	69.8	12.7	52-79
1998	14-19 Jun	65	71	--	--	2	68.0	4.2	65-71
1999[a]	25 Jun	46	--	--	--	1	46.0	--	--
2000[b]	6 Aug	96	--	--	--	1	96.0	--	--
2001	--	--	--	--	--	--	--	--	--
2002	31 May-30 Jun	39	28[c]	111	--	2	75.0	50.9	39-111
2003[d]	6 Jun	34	--	--	--	1	34.0	--	--
2004	5 Jun	42	--	--	--	1	42.0	--	--
2005	22 Jun	72	--	--	--	1	72.0	--	--
2006	--	--	--	--	--	--	--	--	--
2007[b]	5 Aug	85	--	--	--	1	85.0	--	--
2008[e]	3 Aug	55	--	--	--	1	55.0	--	--

[a]The survey in 1999 was conducted in the evening rather than early morning, as in other years. Because of this, and the lack of replicates, the value should be regarded as a minimum estimate.

[b]Surveys in 2000 and 2007 were conducted late in the season so values may not be comparable with other years.

[c]This survey was only conducted on part of the island in less than ideal conditions.

[d]Data from 2003 should be considered a minimum estimate, as we conducted only 1 survey early in the season, during the afternoon rather than the early morning.

[e]Data from 2008 should be considered a minimum estimate, as we conducted only 1 (incomplete) survey late in the season, during the afternoon rather than the early morning.

Table 36. Numbers of pigeon guillemots observed in circumnavigation survey sections at Kasatochi Island, Alaska. Circumnavigation surveys were not conducted in 2001 or 2006.

Year	Date	Survey section							Total
		A-B	B-C	C-D	D-E	E-F	F-G	G-A	
1996	12 Jun	6	0	0	42	17	2	2	69
	20 Jun	14	3	12	6	7	0	6	48
	29 Jun	4	22	1	5	9	5	5	51
	30 Jun	2	0	5	12	7	20	8	54
1997	27 May	13	2	3	4	6	19	5	52
	2 Jun	10	0	0	32	20	9	8	79
	6 Jun	12	2	0	30	25	4	6	79
	20 Jun	6	4	10	15	11	6	17	69
1998	14 Jun	11	0	4	22	10	14	4	65
	19 Jun	12	9	9	21	7	10	3	71
1999	25 Jun	5	5	6	6	10	6	8	46
2000	6 Aug	16	20	24	10	9	12	5	96
2001	--	--	--	--	--	--	--	--	--
2002	31 May	20	0	3	16	0	0	0	39
	28 Jun[a]	NC[b]	6	4	12	3	3	NC	28
	30 Jun	19	20	4	32	16	11	9	111
2003	6 Jun	6	9	7	11	0	0	1	34
2004	5 Jun	1	9	3	12	8	5	4	42
2005	22 Jun	7	13	6	12	19	5	10	72
2006	--	--	--	--	--	--	--	--	--
2007	5 Aug	10	13	2	18	10	18	14	85
2008[c]	3 Aug	--	--	--	--	--	--	--	55

[a]This survey was only conducted on part of the island in less than ideal conditions.
[b]NC= Not counted.
[c]Circumnavigation data were lost in the eruption of 7 August 2008; total count come from daily journal notes.

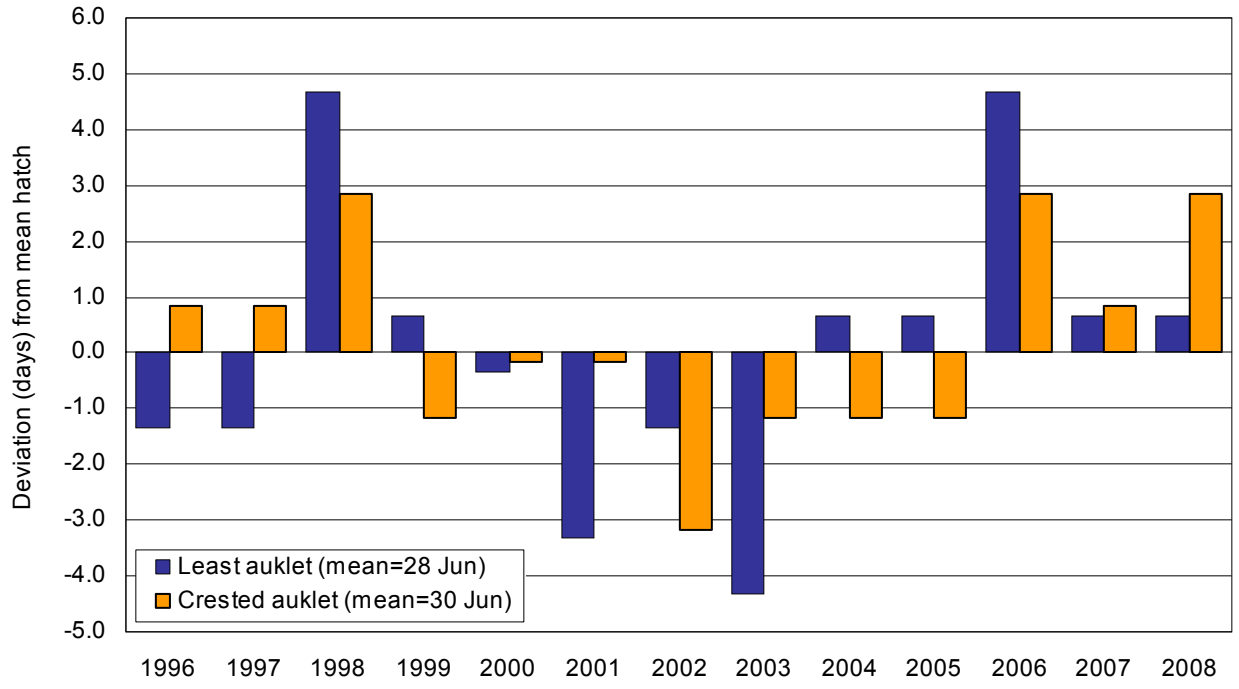


Figure 14. Deviation from mean of median hatch dates for least and crested auklets at Kasatochi Island, Alaska. Numbers below the mean indicate earlier hatch dates, positive numbers indicate later hatch dates.

Table 37. Nesting chronology of parakeet auklets at Kasatochi Island, Alaska.

Parameter	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Lay date[a]											
median	2 Jun	~3 Jun	28 May	27 May	~7 Jun	2 Jul	2 Jun	4 Jun	10 Jun	30 May	--
mean	2 Jun	~3 Jun	28 May	27 May	~7 Jun	2 Jul	2 Jun	4 Jun	10 Jun	30 May	--
SD	--	--	2.0 d	5.7 d	--	5.7 d	0 d	--	9.2 d	2.3 d	--
min	2 Jun	~3 Jun	26 May	23 May	≤5 Jun	29 May	2 Jun	4 Jun	4 Jun	28 May	--
max	2 Jun	~3 Jun	30 May	31 May	≤9 Jun	6 Jun	2 Jun	4 Jun	17 Jun	1 Jun	--
n	1	1	3	2	2	2	2	1	2	4	0
Hatch date											
median	2 Jul	~3 Jul	27 Jun	26 Jun	~7 Jul	2 Jul	2 Jul	4 Jul	11 Jul	29 Jun	--
mean	2 Jul	~3 Jul	27 Jun	26 Jun	~7 Jul	2 Jul	2 Jul	4 Jul	11 Jul	29 Jun	--
SD	--	--	2.0 d	5.7 d	--	5.7 d	0 d	--	9.2 d	2.3 d	--
min	2 Jul	~3 Jul	25 Jun	22 Jun	≤5 Jul	28 Jun	2 Jul	4 Jul	4 Jul	27 Jun	--
max	2 Jul	~3 Jul	29 Jun	30 Jun	≤9 Jul	6 Jul	2 Jul	4 Jul	17 Jul	1 Jul	--
n	1	1	3	2	2	2	2	1	2	4	0
Fledge date											
median	4 Aug	2 Aug	4 Aug	--	--	16 Aug	11 Aug	31 Jul	8 Aug	4 Aug	1 Aug
mean	4 Aug	2 Aug	2 Aug	--	--	16 Aug	5 Aug	31 Jul	9 Aug	5 Aug	30 Jul
SD	--	0 d	2.9 d	--	--	--	18.2 d	2.8 d	5.0 d	1.8 d	3.9 d
min	4 Aug	2 Aug	29 Jul	--	--	16 Aug	16 Jul	29 Jul	4 Aug	4 Aug	25 July
max	4 Aug	2 Aug	4 Aug	--	--	16 Aug	20 Aug	2 Aug	14 Aug	8 Aug	3 Aug
n	1	2	3	0	0	1	3	2	5	6	4
Nestling period (days)											
median	33	~33	35	--	--	41	40	29	31	34	--
mean	33	~33	35	--	--	41	40	29	31	35	--
SD	--	--	1.5 d	--	--	--	--	--	--	2.3	--
min	33	~33	34	--	--	41	40	29	31	34	--
max	33	~33	37	--	--	41	40	29	31	38	--
n	1	1	3	0	0	1	1	1	1	3	0

[a]Lay dates are estimated by subtracting 30 days from hatch dates.

Table 38. Nesting chronology of least auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001[b]	2002	2003	2004	2005	2006	2007	2008[b]
Lay date[a]													
median	27 May	28 May	3 Jun	30 May	28 May	27 May	28 May	25 May	29 May	30 May	3 Jun	30 May	29 May
mean	26 May	29 May	3 Jun	31 May	29 May	30 May	28 May	26 May	31 May	30 May	3 Jun	31 May	31 May
SD	3.7 d	4.2 d	5.3 d	4.2 d	6.0 d	5.8 d	5.6 d	5.4 d	6.4 d	6.4 d	5.3 d	4.5 d	5.0 d
min	17 May	21 May	26 May	26 May	20 May	19 May	20 May	16 May	21 May	20 May	26 May	24 May	25 May
max	31 May	10 Jun	19 Jun	15 Jun	23 Jun	12 Jun	21 Jun	11 Jun	20 Jun	19 Jun	17 Jun	11 Jun	14 Jun
n	36	74	65	76	90	50	68	35	31	55	42	69	46
Hatch date													
median	26 Jun	27 Jun	3 Jul	29 Jun	27 Jun	26 Jun	27 Jun	24 Jun	28 Jun	29 Jun	3 Jul	29 Jun	28 Jun
mean	25 Jun	28 Jun	3 Jul	30 Jun	28 Jun	28 Jun	27 Jun	25 Jun	30 Jun	29 Jun	3 Jul	30 Jun	30 Jun
SD	3.7 d	4.2 d	5.3 d	4.2 d	6.0 d	5.8 d	5.6 d	5.4 d	6.4 d	6.4 d	5.3 d	4.5 d	4.8 d
min	16 Jun	20 Jun	25 Jun	25 Jun	19 Jun	18 Jun	19 Jun	15 Jun	20 Jun	19 Jun	25 Jun	23 Jun	24 June
max	30 Jun	10 Jul	19 Jul	15 Jul	23 Jul	12 Jul	21 Jul	11 Jul	20 Jul	19 Jul	17 Jul	11 Jul	14 Jul
n	36	74	65	76	90	50	68	35	31	55	42	69	46
Fledge date													
median	25 Jul	27 Jul	31 Jul	29 Jul	26 Jul	28 Jul	25 Jul	22 Jul	28 Jul	25 Jul	31 Jul	30 Jul	30 Jul
mean	24 Jul	28 Jul	31 Jul	30 Jul	27 Jul	>28 Jul	26 Jul	24 Jul	27 Jul	23 Jul	30 Jul	29 Jul	>29 Jul
SD	3.8 d	4.7 d	4.2 d	3.5 d	5.7 d	3.5 d	3.9 d	6.1 d	4.4 d	4.0 d	3.9 d	3.6 d	3.3 d
min	12 Jul	18 Jul	23 Jul	23 Jul	16 Jul	19 Jul	17 Jul	18 Jul	20 Jul	19 Jul	21 Jul	21 Jul	22 Jul
max	4 Aug	8 Aug	8 Aug	6 Aug	16 Aug	>11 Aug	3 Aug	8 Aug	11 Aug	2 Aug	4 Aug	4 Aug	>3 Aug
n	46	59	47	46	76	53	46	22	42	31	25	52	45
Nestling period (days)													
median	30	30	28	30	30	29	29	31	30	29	28	29	30
mean	30	29	29	30	29	31	30	30	30	29	29	30	30
SD	2.3 d	2.4 d	2.3 d	2.7 d	3.0 d	3.9 d	2.9 d	2.0 d	2.9 d	2.0 d	1.9 d	2.6 d	2.5 d
min	26	25	25	26	25	25	25	25	27	26	26	25	28
max	34	34	36	36	39	41	40	35	34	37	32	38	36
n	24	59	47	46	76	53	45	22	17	31	25	52	26

[a]Lay dates are estimated by subtracting 30 days from hatch dates.

[b]Fledge data is likely incomplete in 2001 and 2008 because some chicks were still in nests at last check (on 8 August in 2001 and 5 August in 2008) and there would probably have been later fledge dates.

Table 39. Frequency distribution of hatch dates for least auklets at Kasatochi Island, Alaska.

Julian	No. nests hatching on Julian date												
Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
166	-	-	-	-	-	-	-	1	-	-	-	-	-
167	-	-	-	-	-	-	-	-	-	-	-	-	-
168	2	-	-	-	-	-	-	2	-	-	-	-	-
169	-	-	-	-	-	2	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-	5	-	-	-
171	-	1	-	-	1	-	2	3	-	-	-	-	-
172	-	2	-	-	-	-	-	7	2	-	-	-	-
173	-	9	-	-	12	5	-	-	-	-	-	-	-
174	11	-	-	-	-	-	1	1	-	-	-	5	-
175	-	-	-	-	-	-	21	8	-	-	-	-	-
176	-	1	8	16	-	-	-	2	7	19	7	2	8
177	-	1	-	-	22	22	1	-	-	-	-	2	-
178	15	35	-	-	1	-	-	-	-	2	-	24	-
179	-	-	3	2	10	-	18	4	1	1	-	-	1
180	-	1	15	26	4	2	-	2	11	18	8	2	15
181	-	-	-	-	17	7	1	-	-	-	-	-	-
182	8	12	-	1	1	-	-	1	-	-	1	23	1
183	-	3	3	4	1	1	11	2	-	1	-	-	-
184	-	-	20	17	-	-	-	-	1	-	12	-	12
185	-	1	-	-	10	4	1	-	3	3	-	1	-
186	-	-	-	-	2	-	-	-	-	-	-	4	-
187	-	7	-	-	2	-	9	1	-	-	1	-	-
188	-	-	9	8	-	-	-	-	-	-	8	-	5
189	-	-	-	-	-	4	-	-	4	-	-	-	-
190	-	-	-	-	1	-	1	-	-	3	-	-	-
191	-	1	1	-	1	-	1	-	-	-	3	-	-
192	-	-	3	1	1	-	-	1	-	-	-	6	2
193	-	-	-	-	-	3	-	-	1	-	1	-	-
194	-	-	-	-	2	-	-	-	-	1	-	-	1
195	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	3	1	-	-	-	-	-	-	-	-	1
197	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	1	-	-
199	-	-	1	-	-	-	-	-	-	-	-	-	-
200	-	-	1	-	-	-	-	-	-	2	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	1	-	1	-	-	-	-
203	-	-	-	-	1	-	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	1	-	-	-	-	-	-	-	-
n	36	74	67	76	90	50	68	35	31	55	42	69	46

Table 40. Nesting chronology of whiskered auklets at Kasatochi Island, Alaska.

Parameter	2005	2006	2007	2008
Lay date[a]				
median	17 May	23 May	13 May	16 May
mean	17 May	23 May	17 May	16 May
SD	--	3.5 d	8.5 d	0.0 d
min	17 May	20 May	13 May	16 May
max	17 May	23 Jun	30 May	16 May
n	1	2	4	2
Hatch date				
median	16 Jun	22 Jun	12 Jun	15 Jun
mean	16 Jun	22 Jun	16 Jun	15 Jun
SD	--	3.5 d	8.5 d	0.0 d
min	16 Jun	19 Jun	12 Jun	15 Jun
max	16 Jun	24 Jun	29 Jun	15 Jun
n	1	2	4	2
Fledge date				
median	23 Jul	27 Jul	26 Jul	26 Jul
mean	23 Jul	27 Jul	26 Jul	26 Jul
SD	--	3.7 d	--	0.0 d
min	23 Jul	22 Jul	26 Jul	26 Jul
max	23 Jul	27 Jul	26 Jul	26 Jul
n	1	4	1	2
Nestling period (days)				
median	37	33	44	41
mean	37	33	44	41
SD	--	0	--	--
min	37	33	44	41
max	37	33	44	41
n	1	2	1	1

[a]Lay dates are estimated by subtracting 30 days from hatch dates.

Table 41. Nesting chronology of crested auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998[b]	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008[b]
Lay date[a]													
median	27 May	28 May	30 May	26 May	26 May	27 May	24 May	26 May	25 May	26 May	30 May	28 May	29 May
mean	28 May	30 May	1 Jun	28 May	25 May	28 May	25 May	28 May	26 May	26 May	1 Jun	28 May	28 May
SD	5.2 d	4.3 d	3.8 d	4.9 d	4.9 d	4.6 d	5.1 d	3.9 d	4.6 d	5.1 d	4.1 d	5.2 d	4.5 d
min	23 May	24 May	26 May	17 May	18 May	23 May	17 May	21 May	20 May	20 May	26 May	20 May	21 May
max	13 Jun	10 Jun	11 Jun	12 Jun	12 Jun	15 Jun	9 Jun	14 Jun	7 Jun	9 Jun	13 Jun	13 Jun	9 Jun
n	33	80	72	95	98	73	70	46	33	63	55	71	51
Hatch date													
median	30 Jun	1 Jul	3 Jul	29 Jun	29 Jun	30 Jun	27 Jun	29 Jun	28 Jun	29 Jun	3 Jul	1 Jul	2 Jul
mean	1 Jul	3 Jul	5 Jul	1 Jul	28 Jun	1 Jul	28 Jun	1 Jul	29 Jun	29 Jun	5 Jul	1 Jul	1 Jul
SD	5.2 d	4.3 d	3.8 d	4.9 d	4.9 d	4.6 d	5.1 d	3.9 d	4.6 d	5.1 d	4.1 d	5.2 d	4.1 d
min	26 Jun	27 Jun	29 Jun	20 Jun	21 Jun	26 Jun	19 Jun	24 Jun	23 Jun	23 Jun	29 Jun	23 Jun	24 Jun
max	17 Jul	14 Jul	15 Jul	16 Jul	16 Jul	19 Jul	13 Jul	18 Jul	11 Jul	13 Jul	17 Jul	17 Jul	1 Jul
n	33	80	72	95	98	73	70	46	33	63	55	71	51
Fledge date													
median	31 Jul	8 Aug	8 Aug	2 Aug	3 Aug	2 Aug	29 Jul	3 Aug	1 Aug	2 Aug	8 Aug	4 Aug	3 Aug
mean	31 Jul	6 Aug	>6 Aug	3 Aug	1 Aug	2 Aug	31 Jul	3 Aug	1 Aug	2 Aug	7 Aug	3 Aug	>2 Aug
SD	3.9 d	4.2 d	3.1 d	4.4 d	4.2 d	3.9 d	5.1 d	6.1 d	4.9 d	5.1 d	4.1 d	3.9 d	2.3 d
min	22 Jul	27 Jul	31 Jul	29 Jul	21 Jul	25 Jul	21 Jul	25 Jul	20 Jul	23 Jul	31 Jul	26 Jul	26 Jul
max	8 Aug	12 Aug	>16 Aug	14 Aug	12 Aug	10 Aug	11 Aug	16 Aug	11Aug	12 Aug	14 Aug	12 Aug	>3 Aug
n	39	49	67	76	91	57	52	31	72	46	39	62	43
Nestling period (days)													
median	31	34	32	34	34	33	34	35	34	34	32	34	32
mean	32	34	33	33	33	33	34	34	35	33	33	34	34
SD	3.7 d	3.6 d	3.1 d	3.8 d	3.7 d	2.9 d	3.9 d	4.4 d	3.8 d	3.3 d	3.1 d	3.8 d	2.9 d
min	26	26	26	26	26	27	28	27	26	26	28	26	28
max	39	42	37	42	43	38	41	41	44	40	38	42	40
n	25	49	67	76	90	57	50	31	31	46	39	62	22

[a]Lay dates are estimated by subtracting 34 days from hatch dates.

[b]Fledge data is likely incomplete in 1998 and 2008 because some chicks were still in nests at last check (on 13 August in 1998 and 5 August in 2008) and there would probably have been later fledge dates.

Table 42. Frequency distribution of hatch dates for crested auklets at Kasatochi Island, Alaska.

Julian	No. nests hatching on Julian date												
Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
170	-	-	-	-	-	-	2	-	-	-	-	-	-
171	-	-	-	3	-	-	-	-	-	-	-	-	-
172	-	-	-	-	-	-	3	-	-	-	-	-	-
173	-	-	-	-	3	-	-	-	-	-	-	-	-
174	-	-	-	-	-	-	14	-	-	1	-	2	-
175	-	-	-	-	1	-	-	1	3	-	-	-	-
176	-	-	-	12	1	-	1	-	9	16	-	1	5
177	-	-	-	-	42	14	-	-	-	-	-	3	-
178	11	-	-	4	-	-	26	2	-	3	-	21	-
179	-	12	-	3	1	1	-	16	1	9	-	-	-
180	-	-	6	39	-	9	-	5	18	19	2	2	18
181	-	-	-	-	29	29	2	-	-	-	-	3	-
182	9	3	-	-	-	-	8	1	-	-	-	23	1
183	-	28	2	1	-	-	-	7	-	-	4	-	1
184	-	-	30	17	1	-	1	5	2	2	23	-	19
185	-	-	-	-	9	10	-	-	4	4	-	1	-
186	10	1	3	-	-	-	9	1	-	-	1	8	-
187	-	-	5	1	-	-	-	3	-	-	4	-	1
188	-	26	16	7	-	1	-	2	-	-	13	-	2
189	-	-	-	-	-	4	-	-	1	-	-	-	-
190	-	1	-	2	8	-	3	-	-	5	-	-	-
191	-	1	1	-	-	-	-	2	1	-	1	-	-
192	-	5	5	5	-	1	-	1	1	1	1	4	3
193	-	-	-	-	-	3	-	-	1	-	4	-	-
194	2	-	-	-	2	-	1	-	-	3	-	-	1
195	-	1	1	-	-	-	-	-	-	-	-	-	-
196	-	2	3	-	-	-	-	-	-	-	-	-	-
197	-	-	-	1	-	-	-	-	-	-	-	-	-
198	-	-	-	-	1	-	-	-	-	-	2	3	-
199	1	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	1	-	-	-	-	-	-	-
n	33	80	72	95	98	73	70	46	41	63	55	71	51

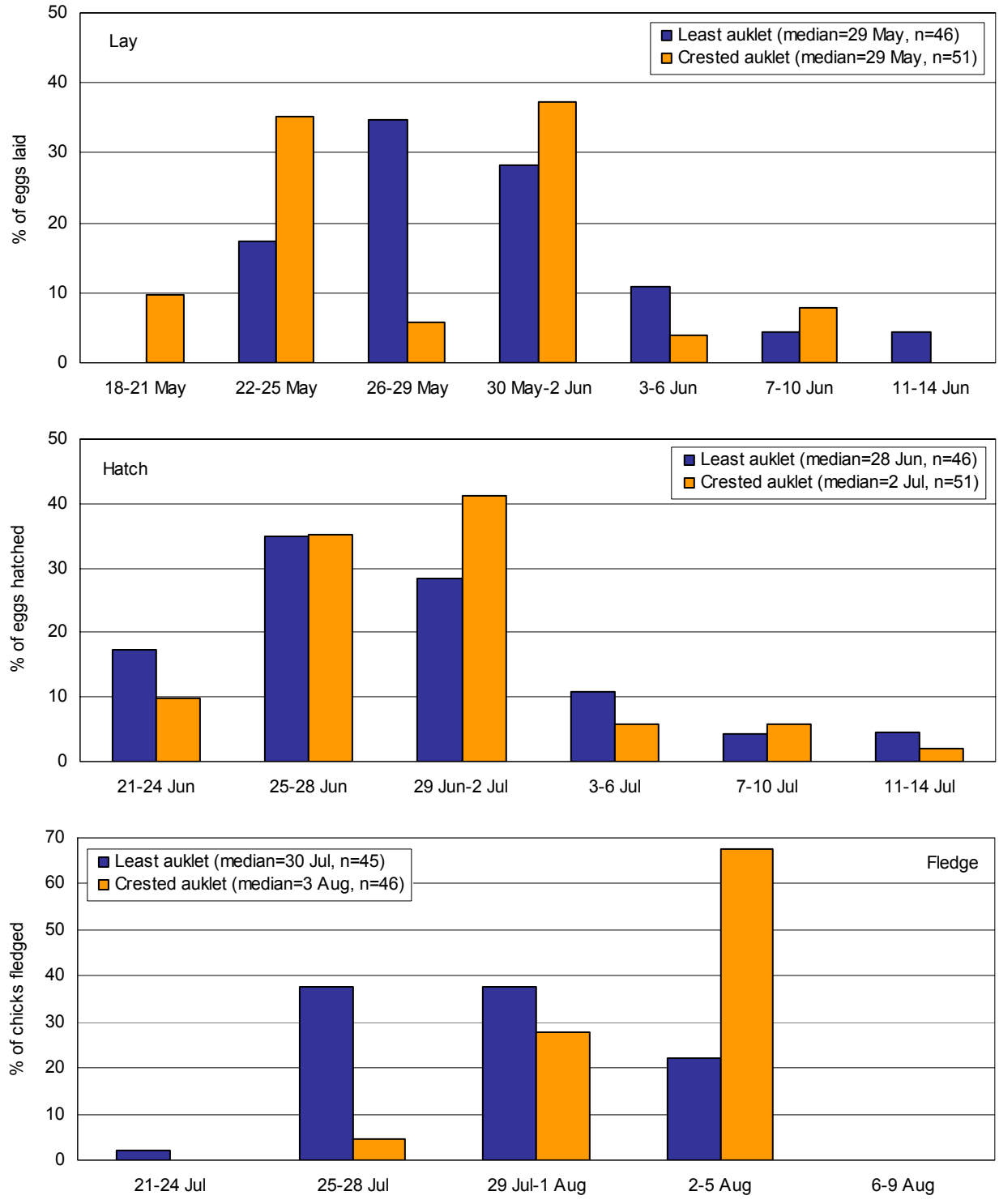


Figure 15. Distribution of lay, hatch, and fledge dates for least and crested auklets at Kasatochi Island, Alaska in 2008. Fledge date data is likely incomplete because the season was truncated by the eruption of 7 August 2008; some chicks were still in nests at last check on 5 August and there would likely have been later fledge dates.

Table 43. Hatching dates of least and crested auklets at Kasatochi Island, Alaska, 2008. Crevice visits are represented by x. Hatching dates are the midpoint or, if no midpoint, the even Julian date between crevice visits. If a pipped egg was observed, the hatch date was considered to be the following day, and if a wet chick was observed, it was assumed to have hatched that day.

	June												July																			
Species	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Least				x		8		x	1	15		1x		12		x		5		x		2		1x		1		x				x
Crested				x		5		x		18		1x	1	19		x	1	2		x		3		1x				x				x

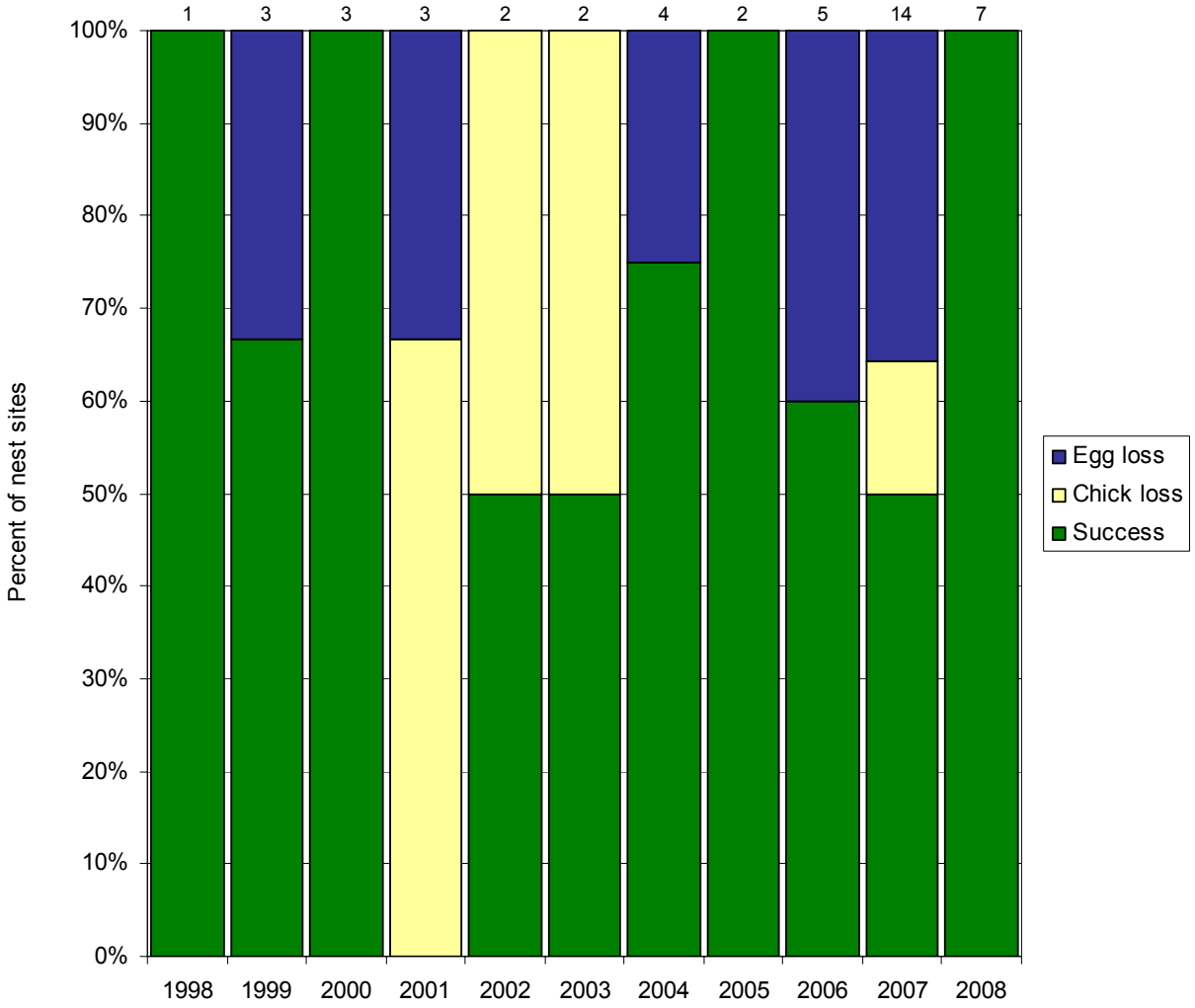


Figure 16. Reproductive performance of parakeet auklets at Kasatochi Island, Alaska. Values represent maximum potential success in 2008 because 40% of chicks were still present at last check, with one under fledge age, due to early departure because of the eruption of 7 August 2008. Numbers above columns indicate the number of nests.

Table 44. Reproductive performance of parakeet auklets at Kasatochi Island, Alaska.

Parameter	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. eggs found (A)	1	3	3	3	2	2	4	2	5	14	7
No. eggs lost to:											
disappearance	0	0	0	0	0	0	0	0	1	2	0
abandonment/non-hatch	0	1	0	1	0	0	1	0	0	0	0
breakage	0	0	0	0	0	0	0	0	1	3	0
No. eggs hatched (B)	1	2	3	2	2	2	3	2	3	9	7
No. chicks lost to:											
disappearance	0	0	0	0	0	0	0	0	1	0	0
death	0	0	0	2	1	1	0	0	0	2	0
No. chicks fledged (C)	1	2	3	0	1	1	3	2	2	7	7
departed (over fledge age)[a]	1	2	3	0	1	1	3	2	2	7	4
still present (over fledge age)	--	--	--	--	--	--	--	--	--	--	2
still present (under fledge age)	--	--	--	--	--	--	--	--	--	--	1
Hatching success (B/A)	1.00	0.67	1.00	0.67	1.00	1.00	0.75	1.00	0.60	0.64	1.00
Fledging success (C/B)	1.00	1.00	1.00	0.00	0.50	0.50	1.00	1.00	0.67	0.78	1.00[b]
Reproductive success (C/A)	1.00	0.67	1.00	0.00	0.50	0.50	0.75	1.00	0.40	0.50	1.00[b]

[a]Fledge age is defined as ≥29 days at departure or ≥26 days if still present at last check.

[b]Values represent maximum potential success in 2008 because 40% of chicks were still present at last check, with one under fledge age, due to early departure because of the eruption of 7 August 2008.

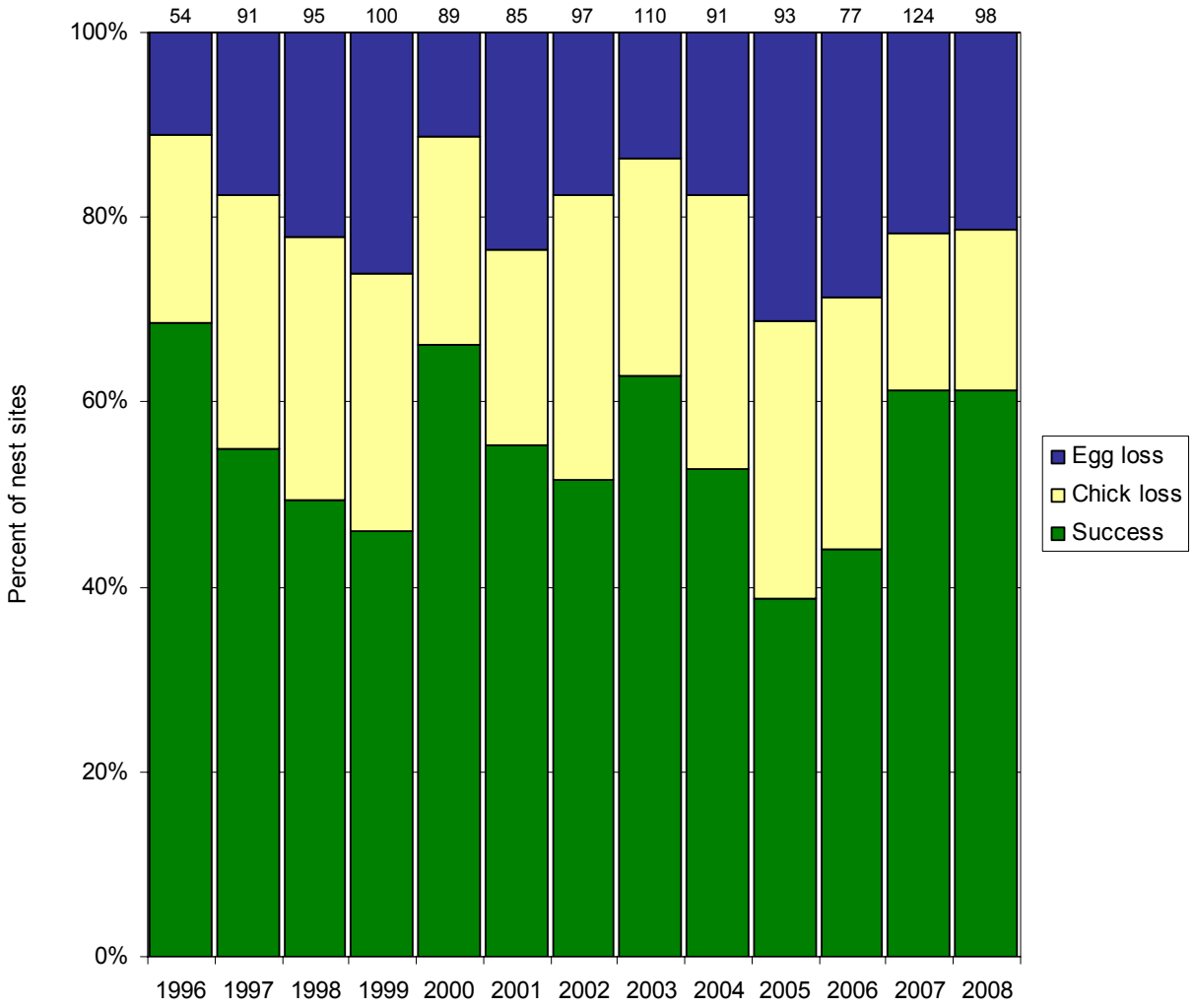


Figure 17. Reproductive performance of least auklets at Kasatochi Island, Alaska. Values represent maximum potential success in 2008 because 15% of chicks were still present in nests at last check due to early departure because of the eruption of 7 August 2008. Numbers above columns indicate the number of nests.

Table 45. Reproductive performance of least auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. eggs found (A)	54	91	95	100	89	85	97	110	91	93	77	124	98
No. eggs lost to:													
disappearance	2	3	10	7	3	4	2	4	0	5	5	6	4
abandonment/non-hatch	4	12	9	15	4	11	14	5	11	15	13	16	11
breakage	0	1	2	4	3	5	1	6	5	9	4	5	6
No. eggs hatched (B)	48	75	74	74	79	65	80	95	75	64	55	97	77
No. chicks lost to:													
disappearance	7	19	18	23	15	14	20	15	19	12	14	8	9
death	4	6	9	5	5	4	10	11	8	16	7	13	8
No. chicks fledged (C)	37	50	47	46	59	47	50	69	48	36	34	76	60
departed (over fledge age)[a]	37	50	47	46	59	46	50	69	48	36	34	76	51
still present (over fledge age)	--	--	--	--	--	1	--	--	--	--	--	--	9
still present (under fledge age)	--	--	--	--	--	0	--	--	--	--	--	--	0
Hatching success (B/A)	0.89	0.82	0.78	0.74	0.89	0.77	0.83	0.86	0.82	0.69	0.71	0.78	0.78
Fledging success (C/B)	0.77	0.67	0.64	0.62	0.75	0.72[b]	0.63	0.73	0.64	0.56	0.62	0.78	0.78[b]
Reproductive success (C/A)	0.69	0.55	0.49	0.46	0.66	0.55[b]	0.52	0.63	0.53	0.39	0.44	0.61	0.61[b]

[a]Fledge age is defined as ≥25 days at departure or ≥21 days if still present at last check.

[b]Values represent maximum potential success in 2008 because 15% of chicks were still present in nests at last check due to early departure because of the eruption of 7 August 2008.

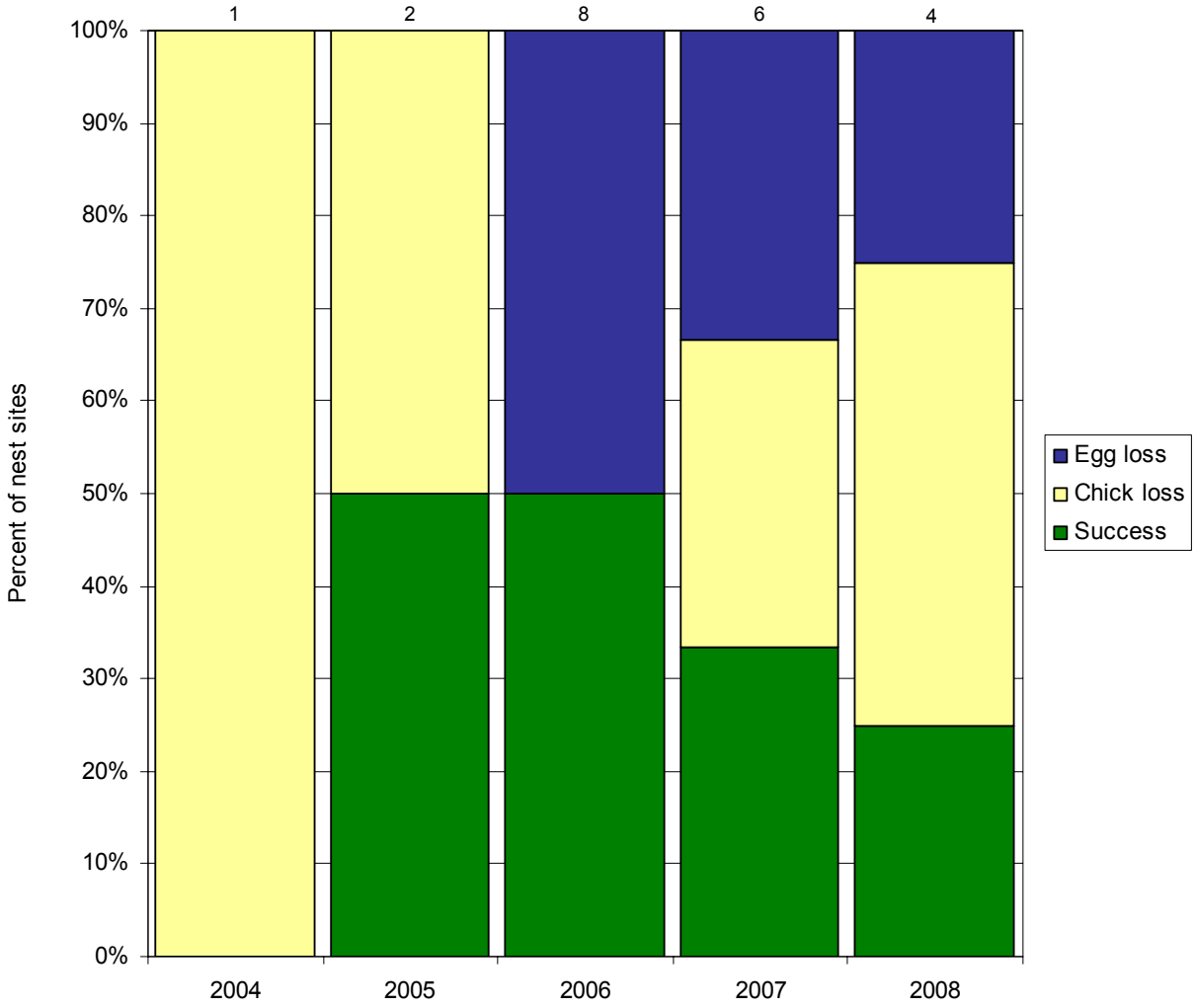


Figure 18. Reproductive performance of whiskered auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.

Table 46. Reproductive performance of whiskered auklets at Kasatochi Island, Alaska.

Parameter	2004	2005	2006	2007	2008
No. eggs found (A)	1	2	8	6	4
No. eggs lost to:					
disappearance	0	0	0	0	1
abandonment/non-hatch	0	0	3	2	0
breakage	0	0	1	0	0
No. eggs hatched (B)	1	2	4	4	3
No. chicks lost to:					
disappearance	0	0	0	1	1
death	1	1	0	1	1
No. chicks fledged (C)	0	1	4	2	1
departed (over fledge age)[a]	0	1	4	2	1
still present (over fledge age)	--	--	--	--	--
still present (under fledge age)	--	--	--	--	--
Hatching success (B/A)	1.00	1.00	0.50	0.67	0.75
Fledging success (C/B)	0.00	0.50	1.00	0.50	0.33
Reproductive success (C/A)	0.00	0.50	0.50	0.33	0.25

[a]Fledge age is defined as $\geq$32 days at departure or $\geq$29 days if still present at last check.

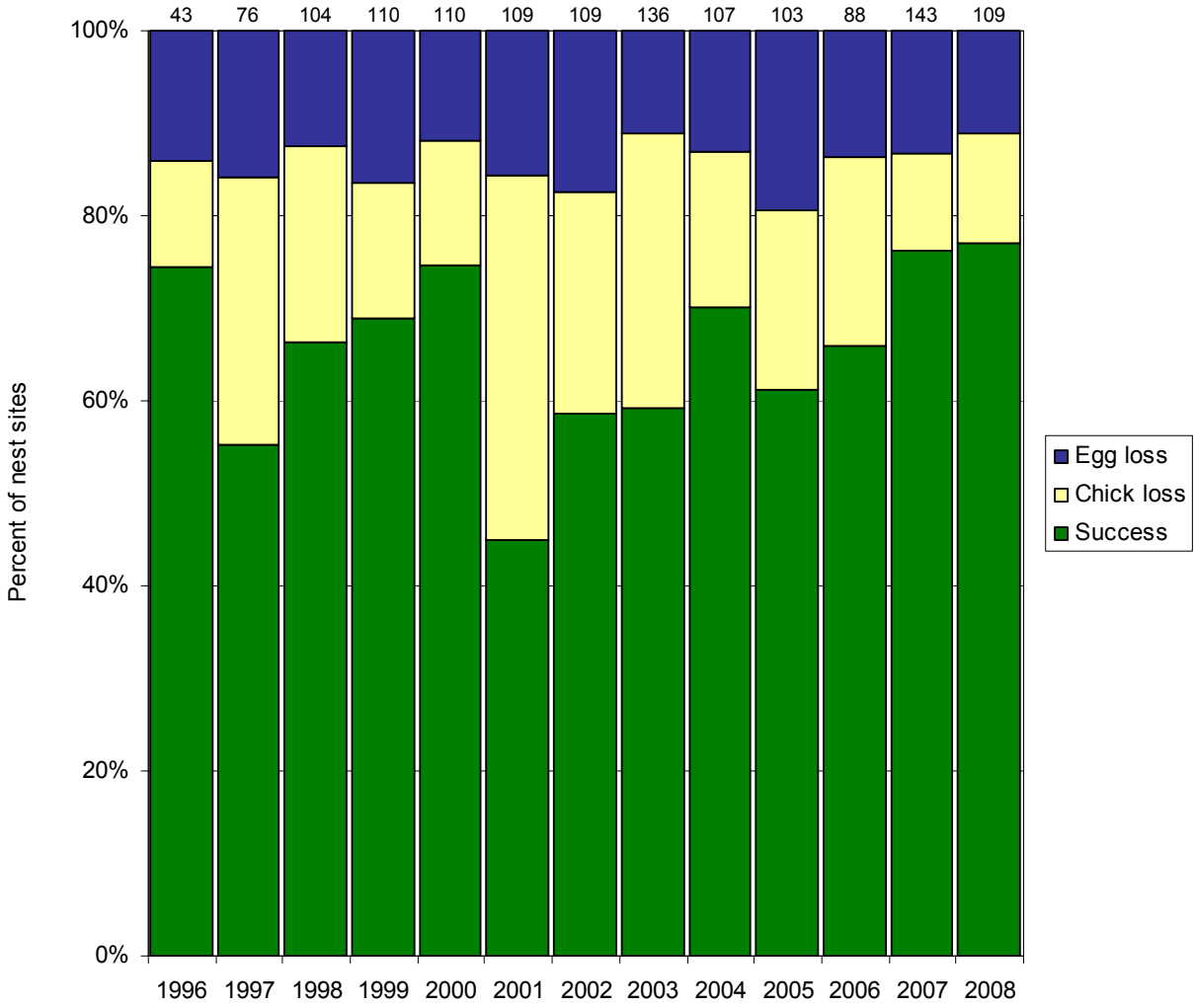


Figure 19. Reproductive performance of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests. Values represent maximum potential success in 2008 because nearly 40% of chicks were still present in nests at last check due to early departure because of the eruption of 7 August 2008.

Table 47. Reproductive performance of crested auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. eggs found (A)	43	76	104	110	110	109	109	136	107	103	88	143	109
No. eggs lost to:													
disappearance	2	4	2	5	7	8	6	2	5	8	6	2	3
abandonment/non-hatch	3	8	11	12	6	6	10	10	5	11	3	16	7
breakage	1	0	0	1	0	3	3	4	4	1	3	1	2
No. eggs hatched (B)	37	64	91	92	97	91	90	120	93	83	76	124	97
No. chicks lost to:													
disappearance	2	13	14	11	9	22	13	10	12	7	11	7	10
death	3	9	8	5	6	21	13	24	6	13	7	8	3
No. chicks fledged (C)	32	42	69	76	82	49	64	86	75	63	58	109	84
departed (over fledge age)[a]	32	41	67	76	82	49	64	86	75	63	58	109	53
still present (over fledge age)	--	1	2	--	--	--	--	--	--	--	--	--	31
still present (under fledge age)	--	0	0	--	--	--	--	--	--	--	--	--	0
Hatching success (B/A)	0.86	0.84	0.88	0.84	0.88	0.84	0.83	0.88	0.87	0.81	0.86	0.87	0.89
Fledging success (C/B)	0.86	0.66	0.76	0.83	0.85	0.54	0.71	0.72	0.81	0.76	0.76	0.88	0.87[b]
Reproductive success (C/A)	0.74	0.55	0.66	0.69	0.75	0.45	0.59	0.63	0.70	0.61	0.66	0.76	0.77[b]

[a]Fledge age is defined as ≥26 days at departure or ≥22 days if still present last check .
[b]Values represent maximum potential success in 2008 because nearly 40% of chicks were still present in nests at last check due to early departure because of the eruption of 7 August 2008.

Table 48. Mean growth rates of least auklet chicks at Kasatochi Island, Alaska. Chicks were measured during the linear phase of growth. Individual chicks measured at least 2 times were the sample units.

		Mass (g/day)			Wing chord (mm/day)			Tarsus length (mm/day)		
Year	*n*	mean	SD	range	mean	SD	range	mean	SD	range
1996	10	3.7	0.6	2.7 - 4.7	3.1	0.3	2.6 - 3.5	0.2	0.1	0.2 - 0.3
1997	13	3.9	1.4	0.3 - 5.6	3.0	0.5	1.7 - 3.6	0.2	0.1	<0.1 - 0.4
1998	7	4.1	0.8	3.1 - 5.4	3.3	0.6	2.6 - 4.3	0.2	0.1	0.1 - 0.4
1999	9	3.9	1.2	2.2 - 6.1	3.4	0.3	3.1 - 4.0	0.2	<0.1	0.1 - 0.2
2000	10	4.2	1.0	2.9 - 5.9	3.3	0.4	2.5 - 4.0	0.3	0.1	0.1 - 0.4
2001	10	4.4	0.9	3.4 - 6.2	2.6	0.9	1.6 - 3.6	0.2	0.1	<0.1 - 0.4
2002	10	4.4	0.7	3.6 - 5.4	3.8	0.6	3.0 - 5.1	0.3	0.1	<0.1 - 0.4
2003	14	4.1	1.7	-1.5 - 5.8	2.7	1.1	0.5 - 4.3	0.3	0.1	0.1 - 0.4
2004	13	3.4	1.9	-0.3 - 7.3	2.6	0.7	1.3 - 3.5	0.2	0.1	0.1 - 0.7
2005	11	4.3	1.5	0.8 - 6.4	2.7	0.8	0.8 - 3.8	0.2	0.1	<0.1 - 0.4
2006	11	3.3	1.6	0.4 - 6.0	2.6	1.4	0.7 - 6.3	0.3	0.2	0.1 - 0.6
2007	13	4.1	0.4	3.5 - 4.8	2.9	0.6	1.5 - 3.7	0.3	0.1	<0.0 - 0.4
2008	5	2.7	1.3	1.0 - 4.3	2.6	1.3	0.4 - 4.0	0.0	0.3	-0.4 - 0.3

Table 49. Mean growth rates of crested auklet chicks at Kasatochi Island, Alaska. Chicks were measured during the linear phase of growth. Individual chicks measured at least 2 times were the sample units.

		Mass (g/day)			Wing chord (mm/day)			Tarsus length (mm/day)		
Year	*n*	mean	SD	range	mean	SD	range	mean	SD	range
1996	8	10.1	2.1	7.7 - 14.4	3.8	0.5	3.2 - 4.8	0.4	0.1	0.3 - 0.6
1997	10	7.9	2.1	4.8 - 10.6	3.2	0.5	1.9 - 3.7	0.3	0.1	0.2 - 0.5
1998	9	12.1	1.7	9.3 - 15.3	3.7	0.3	3.1 - 4.1	0.4	0.2	0.3 - 0.6
1999	10	9.1	2.7	4.3 - 13.6	3.9	0.7	2.3 - 4.9	0.3	0.1	0.2 - 0.4
2000	10	12.6	2.6	8.9 - 17.5	4.1	0.5	3.4 - 5.0	0.3	0.2	<0.1 - 0.7
2001	10	9.5	1.6	5.5 - 11.6	2.5	0.9	1.4 - 3.9	0.3	0.2	<0.1 - 0.5
2002	9	10.2	1.8	6.9 - 11.9	3.5	1.1	1.6 - 5.0	0.5	0.2	0.2 - 0.7
2003	18	8.7	2.0	4.9 - 13.8	2.6	0.9	0.5 - 4.0	0.5	0.2	0.1 - 1.0
2004	13	11.3	1.8	9.0 - 15.3	3.1	0.8	1.3 - 4.4	0.5	0.2	0.4 - 0.9
2005	12	12.5	3.3	6.4 - 17.4	3.1	0.7	2.0 - 4.4	0.4	0.2	0.1 - 0.7
2006	11	9.1	2.3	4.0 - 13.1	3.0	0.8	1.8 - 4.3	0.4	0.1	0.3 - 0.6
2007	13	10.1	2.2	4.5 - 12.8	3.6	0.4	3.0 - 4.4	0.4	0.2	0.1 - 1.0
2008	7	11.6	3.3	8.0 - 17.8	3.2	0.8	2.3 - 4.0	0.4	0.4	0.0 - 1.3

Table 50. Comparison of different survival-recapture models for least auklets at Kasatochi Island, Alaska, as calculated by program MARK. In the models, survival is represented by ϕ, recapture probability by p, and time-dependence by a t subscript. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Model	AICc	ΔAICc	AIC wt.	No. parameters	Deviance
$\{\phi_t, p_t\}$	3587.20	0.00	0.9710	21	774.18
$\{\phi, p_t\}$	3594.22	7.02	0.0290	12	799.46
$\{\phi_t, p\}$	3647.65	60.45	0.0000	12	852.89
$\{\phi, p\}$	3652.14	64.93	0.0000	2	877.50

Table 51. Estimates of annual survival probability (ϕ) generated by different models, as calculated by program MARK, for least auklets at Kasatochi Island, Alaska. Data were collected in 2008, but lost in the eruption of 7 August 2008.

	$\{\phi_t, p_t\}$		$\{\phi, p_t\}$		$\{\phi_t, p\}$		$\{\phi, p\}$	
Year	ϕ	SE	ϕ	SE	ϕ	SE	ϕ	SE
1996-97	0.9314	0.0263			0.9590	0.0272		
1997-98	0.7944	0.0277			0.7916	0.0286		
1998-99	0.8512	0.0241			0.8515	0.0245		
1999-00	0.8657	0.0231			0.8685	0.0236		
2000-01	0.8486	0.0245			0.8476	0.0250		
2001-02	0.8677	0.0249			0.8672	0.0252		
2002-03	0.8693	0.0281			0.8418	0.0261		
2003-04	0.8922	0.0334			0.8777	0.0260		
2004-05	0.7633	0.0329			0.7809	0.0291		
2005-06	0.7998	0.0301			0.8275	0.0293		
2006-07	0.8867[a]	0.0000[a]						
2007-08	--	--						
all years			0.8437	0.0076			0.8422	0.0074

[a]The survival estimate for 2006-2007 is confounded in model $\{\phi_t, p_t\}$ and should not be considered to be an actual estimate.

Table 52. Estimates of annual recapture probabilities (p) generated by different models, as calculated by program MARK, for least auklets at Kasatochi Island, Alaska. Data were collected in 2008, but lost in the eruption of 7 August 2008.

	$\{\phi_t, p_t\}$		$\{\phi, p_t\}$		$\{\phi_t, p\}$		$\{\phi, p\}$	
Year	p	SE	p	SE	p	SE	p	SE
1997	0.9860	0.0139	0.9882	0.0117				
1998	0.9042	0.0235	0.8968	0.0246				
1999	0.8959	0.0220	0.8940	0.0220				
2000	0.9039	0.0209	0.9056	0.0203				
2001	0.8957	0.0220	0.8940	0.0220				
2002	0.8861	0.0239	0.8865	0.0234				
2003	0.7219	0.0333	0.7246	0.0319				
2004	0.7254	0.0353	0.7522	0.0317				
2005	0.8167	0.0306	0.8100	0.0303				
2006	0.9324	0.0217	0.9212	0.0244				
2007	0.7823[a]	0.0000[a]	0.8141	0.0383				
2008	--	--						
all years					0.8600	0.0086	0.8575	0.0086

[a]The recapture probability estimate for 2007 is confounded in model $\{\phi_t, p_t\}$ and should not be considered to be an actual estimate.

Table 53. Comparison of different survival-recapture models for crested auklets at Kasatochi Island, Alaska, as calculated by program MARK. In the models, survival is represented by ϕ, recapture probability by p, and time-dependence by a t subscript. Data were collected in 2008, but lost in the eruption of 7 August 2008.

Model	AICc	ΔAICc	AIC wt.	No. parameters	Deviance
$\{\phi, p_t\}$	1339.84	0.00	0.9929	12	466.45
$\{\phi_t, p_t\}$	1349.72	9.87	0.0071	21	457.30
$\{\phi, p\}$	1368.82	28.98	0.0000	2	515.93
$\{\phi_t, p\}$	1375.20	35.36	0.0000	12	501.81

Table 54. Estimates of annual survival probability (ϕ) generated by different models, as calculated by program MARK, for crested auklets at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

	$\{\phi, p_t\}$		$\{\phi_t, p_t\}$		$\{\phi, p\}$		$\{\phi_t, p\}$	
Year	ϕ	SE	ϕ	SE	ϕ	SE	ϕ	SE
1996-97			0.9450	0.0598			0.9442	0.0600
1997-98			0.8186	0.0560			0.8583	0.0621
1998-99			0.8355	0.0484			0.8372	0.0562
1999-00			0.8853	0.0550			0.8756	0.0576
2000-01			0.7769	0.0618			0.7922	0.0633
2001-02			0.8519	0.0775			0.8147	0.0715
2002-03			0.7528	0.0850			0.7068	0.0670
2003-04			0.8687	0.0885			0.8835	0.0624
2004-05			0.9350	0.0768			0.9190	0.0590
2005-06			1.0000	<0.0001			0.8992	0.0725
2006-07			0.6415[a]	67.6113[a]			0.7080	0.0844
2007-08			--	--			--	--
all years	0.8483	0.0144			0.8378	0.0141		

[a]The survival estimate for 2006-2007 is confounded in model $\{\phi_t, p_t\}$ and should not be considered to be an actual estimate.

Table 55. Estimates of annual recapture probability (p) generated by different models, as calculated by program MARK, for crested auklets at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

	$\{\phi, p_t\}$		$\{\phi_t, p_t\}$		$\{\phi, p\}$		$\{\phi_t, p\}$	
Year	p	SE	p	SE	p	SE	p	SE
1997	0.7509	0.0746	0.7297	0.0805				
1998	0.8817	0.0484	0.8833	0.0488				
1999	0.8002	0.0516	0.8055	0.0524				
2000	0.7225	0.0545	0.7018	0.0602				
2001	0.7335	0.0581	0.7489	0.0602				
2002	0.6341	0.0670	0.6319	0.0743				
2003	0.4005	0.0650	0.4386	0.0734				
2004	0.4574	0.0685	0.4857	0.0732				
2005	0.5550	0.0643	0.5448	0.0684				
2006	0.5537	0.0634	0.4781	0.0590				
2007	0.5419	0.0634	0.6416[a]	67.6158[a]				
2008			--	--				
all years					0.6489	0.0213	0.6497	0.0222

[a]The recapture probability estimate for 2007 is confounded in model $\{\phi_t, p_t\}$ and should not be considered to be an actual estimate.

Table 56. Fates of batches of least auklets banded at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

		number alive in:												
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
fates of batches:	1996	**139**[a]	127	94	79	74	69	63	50	38	32	26	21	--
	1997		**122**	89	72	59	53	42	31	26	21	18	13	--
	1998			**73**	60	49	33	35	20	17	14	13	12	--
	1999				**46**	39	31	24	14	16	13	14	14	--
	2000					**27**	25	18	11	19	13	11	8	--
	2001						**14**	11	9	8	8	9	6	--
	2002							**40**	24	21	17	18	13	--
	2003								**20**	17	19	17	12	--
	2004									**45**	34	31	23	--
	2005										**32**	29	19	--
	2006											**36**	28	--
	2007												**38**	--
	2008													--
marked population		139	249	275	279	227	239	226	179	207	203	222	207	--
no. missing in year x		0	12	66	45	36	37	32	74	17	36	17	53	--
cumulative no. missing		0	12	59	101	180	182	228	302	319	355	372	425	--
cumulative no. banded		139	261	334	380	407	421	461	481	526	558	594	632	--
resighting efforts:														
resighting days		5	11	18	26	16	26	26	14	17	17	20	21	--
banding days		11	15	11	7	4	4	7	7	7	6	5	4	--

[a]Numbers in bold indicate number of auklets marked that year.

Table 57. Fates of batches of crested auklets banded at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

		number alive in:												
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
fates of batches:	1996	**51**[a]	35	33	24	20	10	7	2	1	1	4	1	--
	1997		**35**	26	22	14	14	11	4	4	4	5	3	--
	1998			**21**	14	10	7	4	2	0	1	1	1	--
	1999				**15**	12	10	9	3	3	2	3	4	--
	2000					**9**	8	8	5	4	3	4	2	--
	2001						**4**	4	3	3	4	3	3	--
	2002							**12**	10	9	10	6	6	--
	2003								**3**	4	4	3	2	--
	2004									**15**	12	6	3	--
	2005										**13**	6	4	--
	2006											**26**	16	--
	2007												**27**	--
	2008													--
marked population		51	70	80	75	65	53	55	32	43	54	67	72	--
no. missing in year x		0	16	11	20	19	16	10	26	4	2	13	22	--
cumulative no. missing		0	16	27	47	66	82	92	118	122	124	137	159	--
cumulative no. banded		51	86	107	122	131	135	147	150	165	178	204	231	--
resighting efforts:														
resighting days		5	11	18	26	16	26	26	14	17	17	20	21	--
banding days		11	15	11	7	4	4	7	7	7	6	5	4	--

[a]Numbers in bold indicate number of auklets marked that year.

Table 58. Least auklet plumage changes at Kasatochi Island, Alaska between 1996 and 2007. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Beginning plumage[a]	*n*	% of birds that: stayed the same	got lighter	got darker	went back and forth
0	4	25	0	50	25
1	33	6	3	64	27
2	330	54	5	22	19
3	137	61	26	0	13
All birds	504[b]	52	11	19	18

[a]Plumage classes were based on the amount of dark flecking on white breasts (0: pure white; 1: 15% flecking; 2: 16-50% flecking; 3: >50% flecking; 4: >95% flecking, appeared black). No birds of category 4 have ever been observed.

[b]Total number of birds having at least two plumage measurements.

Table 59. Summary of least auklet morphometric information collected during banding at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Parameter			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total no. birds banded			184	198	140	88	59	29	72	71	71	73	75	82	--
No. color combinations (adults only)			152	149	84	54	28	17	40	31	58	33	44	38	--
Mass (g)	adults:	mean	85.0	84.5	85.1	86.1	83.9	83.8	82.5	82.7	81.8	81.7	86.5	83.3	--
		SD	6.6	5.5	5.7	5.7	5.7	7.7	6.4	5.8	6.0	4.4	6.9	5.9	--
		min	65	71	72	75	74	59	70	73	68	73	75	73	--
		max	104	98	98	101	97	97	96	102	99	91	104	99	--
		n	151	147	84	61	33	31	40	31	57	33	44	38	--
	subadults:	mean	80.2	78.6	79.2	78.9	78.9	80.4	78.6	79.2	76.2	80.0	77.9	80.6	--
		SD	5.5	3.9	5.1	3.9	4.6	4.5	3.9	3.6	5.0	4.8	4.1	3.8	--
		min	69	70	67	70	70	72	68	72	64	66	70	70	--
		max	93	86	85	87	90	88	87	89	84	96	87	89	--
		n	32	48	56	39	31	12	32	40	18	40	31	44	--
Tarsus (mm)	adults:	mean	--	--	19.9	20.7	20.0	18.6	19.5	18.3	18.0	18.7	20.1	18.8	--
		SD	--	--	0.8	0.6	0.7	0.4	0.8	0.8	0.8	0.7	1.1	0.7	--
		min	--	--	18.2	19.3	19.1	17.5	18.1	17.2	16.1	17.5	17.9	17.4	--
		max	--	--	21.9	21.7	21.5	19.3	21.4	19.8	19.6	19.9	22.8	20.1	--
		n	--	--	83	53	9	29	38	21	57	31	44	38	--
	subadults:	mean	--	--	19.8	20.6	20.6	18.3	19.2	18.4	17.8	18.3	19.3	19.0	--
		SD	--	--	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.7	--
		min	--	--	18.1	18.9	19.2	16.4	18.0	17.1	16.9	15.9	17.7	17.0	--
		max	--	--	20.9	22.0	21.8	18.9	21.8	19.8	19.7	19.9	21.6	20.3	--
		n	--	--	55	38	20	12	32	25	18	38	31	44	--

Table 60. Summary of least auklet brood patch, web damage, and plumage information collected during banding at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Year	Brood Patch (% of birds with none - partial - full; *n*)			Web Damage (% of birds with none - some - severe; *n*)			Plumage (% of birds with 0 - 1 - 2 - 3 - 4[a]; *n*)	
	total	adults	subadults	total	adults	subadults	adults	subadults
1996	23-10-67; 180	8-11-81; 148	94-6-0; 32	89-9-3; 179	--	--	1-10-75-15; 151	0-0-42-58; 31
1997	41-11-47; 196	27-10-63; 147	84-16-0; 49	78-17-5; 196	78-16-6; 147	76-22-2; 49	0-7-7-22; 147	0-0-16-84; 49
1998	37-16-46; 140	5-18-77; 84	86-14-0; 56	71-18-11; 139	70-18-12; 83	73-18-9; 56	2-4-82-12; 84	0-0-5-95; 56
1999	49-11-40; 88	18-12-69; 50	87-10-3; 38	74-20-6; 88	82-10-8; 50	64-33-3; 38	0-8-67-24; 50	0-0-5-95; 38
2000	53-8-39; 59	11-7-82; 28	90-10-0; 31	85-5-10; 59	79-7-14; 28	90-3-6; 31	4-4-79-14; 28	0-0-3-97; 31
2001	23-12-65; 30	0-10-90; 18	83-17-0; 12	63-26-12; 30	61-32-6; 18	67-8-25; 12	0-0-7-25; 17	0-0-75-25; 12
2002	39-18-43; 67	3-17-80; 36	81-19-0; 31	82-1-7; 72	80-15-5; 40	84- 6-10; 32	0-0-70-30; 40	0-3-31-66; 32
2003	27-8-65; 70	17-2-63; 30	100-0-0; 40	96-3-1; 70	97-0-3; 30	94-3-3; 40	0-0-52-48; 31	0-0-25-75; 40
2004	21-20-59; 70	4-19-77; 52	78-22-0; 18	93-4-3; 70	91-5-4; 52	100-0-0; 18	0-3-39-58; 52	0-0-33-67; 18
2005	53-10-37; 71	0-21-79; 33	100-0-0; 38	83-13-4; 72	85-12-3; 33	82-13-5; 39	0-3-52-45; 33	0-0-41-59; 39
2006	52-11-36; 74	20-18-61; 44	100-0-0; 30	81-12-7; 75	80-14-17; 44	84-10-6; 31	0-0-45-55; 44	0-0-29-71; 31
2007	49-13-38; 82	0-18-82; 38	89-9-2 44	72-18-10; 82	66-24-11; 38	77-14-8; 44	0-0-55-45; 38	0-0-16-84; 44
2008	--	--	--	--	--	--	--	--

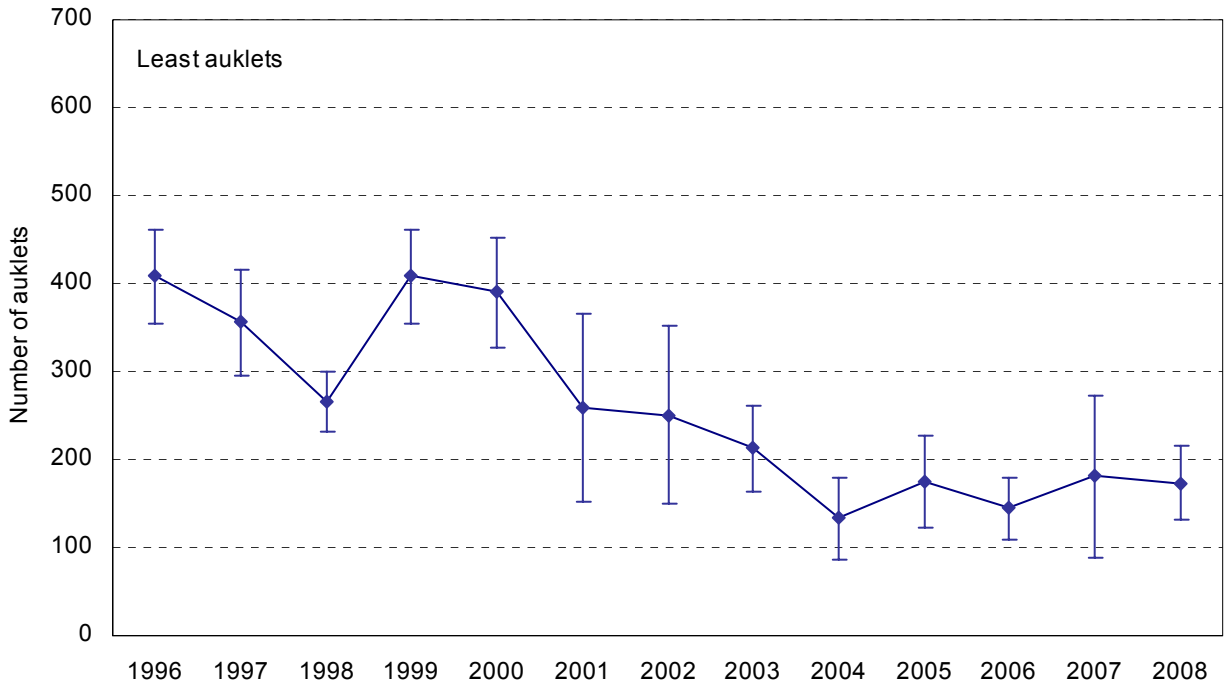
[a]Plumage classes were based on the amount of dark flecking on white breasts (0:pure white; 1:<15% flecking; 2:16-50% flecking; 3:>50% flecking; 4:>95% flecking, appeared black). No birds of category 4 have ever been observed.

Table 61. Summary of crested auklet morphometric information collected during banding at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Parameter			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. color combinations (adults only)			62	53	41	22	12	11	15	7	23	23	34	37	--
% males - females			49 - 51	38 - 62	34 - 66	50 - 50	58 - 42	55 - 45	64 - 36	44 - 55	61 - 39	57 - 43	59 - 41	57 – 43	--
Mass (g)	males:	mean	269.1	257.2	258.4	264.6	241.3	245.6	269.6	277.0	267.0	263.7	266.9	268.5	--
		SD	17.6	18.7	12.8	15.8	15.7	10.1	18.5	6.1	14.6	23.0	15.0	15.5	--
		min	234	220	234	245	215	230	244	273	235	218	240	233	--
		max	304	287	276	290	260	256	301	284	175	308	294	289	--
		n	29	20	14	11	7	5	9	3	13	13	20	20	--
	females:	mean	261.7	248.8	247.4	244.0	236.4	229.3	249.8	250.0	261.0	247.2	254.9	246.6	--
		SD	13.6	15.2	16.2	20.4	15.1	14.3	20.8	7.0	30.8	13.8	17.6	12.3	--
		min	224	218	224	219	211	211	228	245	224	222	225	224	--
		max	280	275	277	278	248	255	278	258	317	272	279	274	--
		n	29	33	27	10	5	6	5	3	9	10	14	15	--
	subadults:	mean	231.0	223.7	230.2	233.5	--	--	--	250.5	241.0	246.3	--	241.8	--
		SD	12.7	8.7	5.1	4.9	--	--	--	29.0	9.9	28.5	--	20.2	--
		min	219	214	223	230	--	--	--	230	234	208	--	215	--
		max	242	231	235	237	--	--	--	271	248	288	--	297	--
		n	4	3	5	2	--	--	--	2	2	7	--	16	--
Tarsus (mm)	males:	mean	--	--	28.5	29.6	26.8	27.5	28.0	--	26.2	27.6	28.6	28.0	--
		SD	--	--	1.2	0.9	1.1	0.75	0.9	--	1.3	1.0	1.2	0.9	--
		min	--	--	26.7	28.2	26.0	26.5	26.4	--	24.2	26.1	27.3	26.4	--
		max	--	--	30.2	31.1	27.6	28.2	29.1	--	28.2	29.6	31.0	30.5	--
		n	--	--	14	7	2	5	8	--	14	13	14	20	--
	females:	mean	--	--	28.6	29.0	28.4	26.6	28.0	--	25.2	27.1	28.0	27.6	--
		SD	--	--	1.0	1.5	0.5	0.7	1.9	--	1.0	0.9	1.4	1.5	--
		min	--	--	26.8	26.2	28.0	25.9	25.5	--	4.4	25.8	25.8	25.2	--
		max	--	--	31.1	31.7	28.7	27.9	30.1	--	27.5	28.3	30.3	30.7	--
		n	--	--	27	10	2	6	4	--	9	9	14	15	--
	subadults:	mean	--	--	28.7	28.0	--	--	--	--	27.7	27.6	--	27.3	--
		SD	--	--	1.2	0.8	--	--	--	--	1.8	1.5	--	1.2	--
		min	--	--	27.2	27.4	--	--	--	--	26.4	25.2	--	25.4	--
		max	--	--	30.1	28.5	--	--	--	--	28.9	28.8	--	29.1	--
		n	--	--	5	2	--	--	--	--	2	5	--	16	--

Table 62. Summary of crested auklet brood patch and web damage information collected during banding at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Year	Brood Patch (% of birds with none-partial - full; *n*)				Web Damage (% of birds with none - some - severe; *n*)			
	total	males	females	subadults	total	males	females	subadults
1996	37-6-57; 62	31-3-66; 27	23-10-6; 30	100-0-0; 5	95-2-3; 62	--	--	--
1997	41-9-50; 57	20-15-65; 20	48-6-45; 33	100-0-0; 4	96-4-0; 57	100-0-0; 20	94-6-0; 33	100-0-0; 4
1998	65-9-26; 45	64-14-21; 14	59-7-33; 27	100-0-0; 4	89-7-4; 45	86-7-7; 14	89-7-4; 27	100-0-0; 4
1999	50-4-46; 24	27-0-73; 11	64-9-27; 11	100-0-0; 2	79-17-4; 24	73-7-9; 11	82-18-0; 11	100-0-0; 2
2000	58-0-42; 12	43-0-57; 7	80-0-20; 5	--	100-0-0; 12	100-0-0; 7	100-0-0; 5	--
2001	9-18-73; 11	0-0-100; 2	17-50-33; 9	--	100-0-0; 11	100-0-0; 2	100-0-0; 9	--
2002	13-13-74; 7	0-17-83; 6	0-0-100; 1	--	100-0-0; 13	100-0-0; 8	100-0-0; 5	--
2003	33-11-56; 9	25-0-75; 4	0-33-67; 3	100-0-0; 2	89-11-0; 9	75-25-0; 4	100-0-0; 3	100-0-0; 2
2004	32-28-40; 25	36-29-36; 14	11-33-56; 9	100-0-0; 2	96-0-4; 25	93-0-7; 14	100-0-0; 9	100-0-0; 2
2005	24-38-38; 29	0-46-54; 13	10-50-40; 10	100-0-0; 6	87-10-3; 30	77-23-0; 13	100-0-0; 10	86-0-14; 7
2006	29-21-50; 34	30-25-45; 20	29-14-57; 14	--	91-6-3; 34	90-5-5; 20	93-7-0; 14	--
2007	32-19-51; 53	0-20-80; 20	13-27-60; 15	94-6-0; 16	91-9-2; 53	90-10-0; 20	80-20-0; 15	94-0-6; 16
2008	--	--	--	--	--	--	--	--



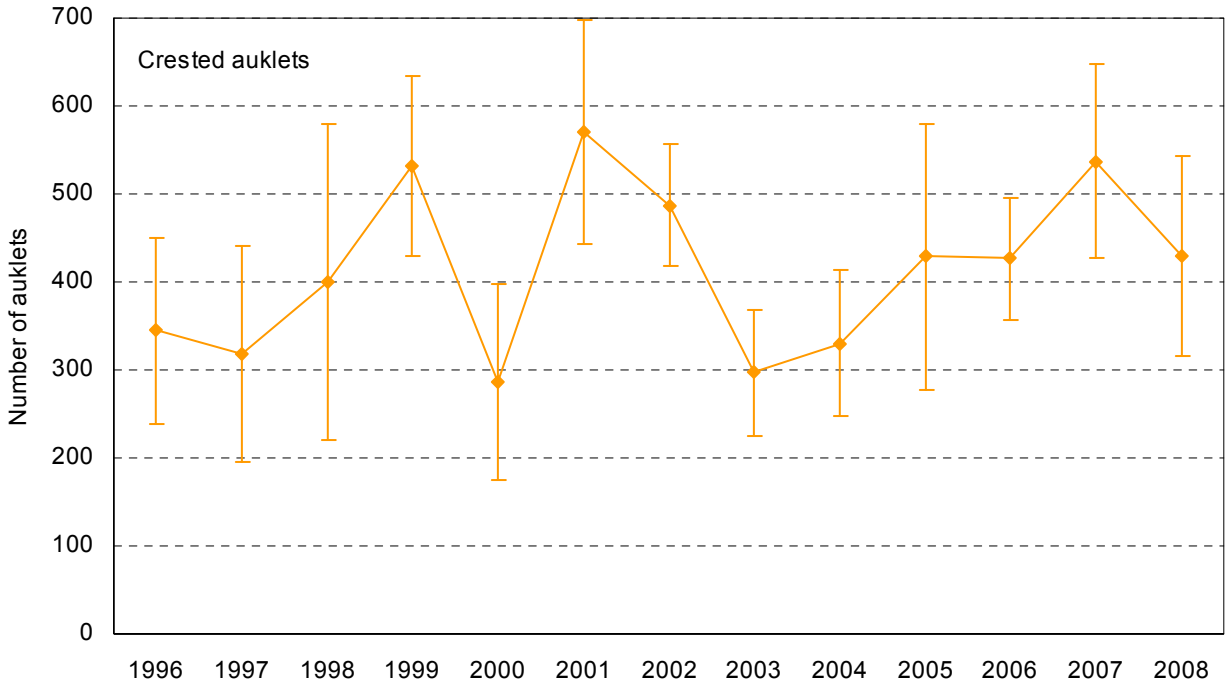


Figure 20. Numbers of least and crested auklets observed on index plots at Kasatochi Island, Alaska. Values represent the mean of the sums of the maximum counts for each of 8 index plots for counts conducted during 20 days before to 10 days after the mean hatch date.

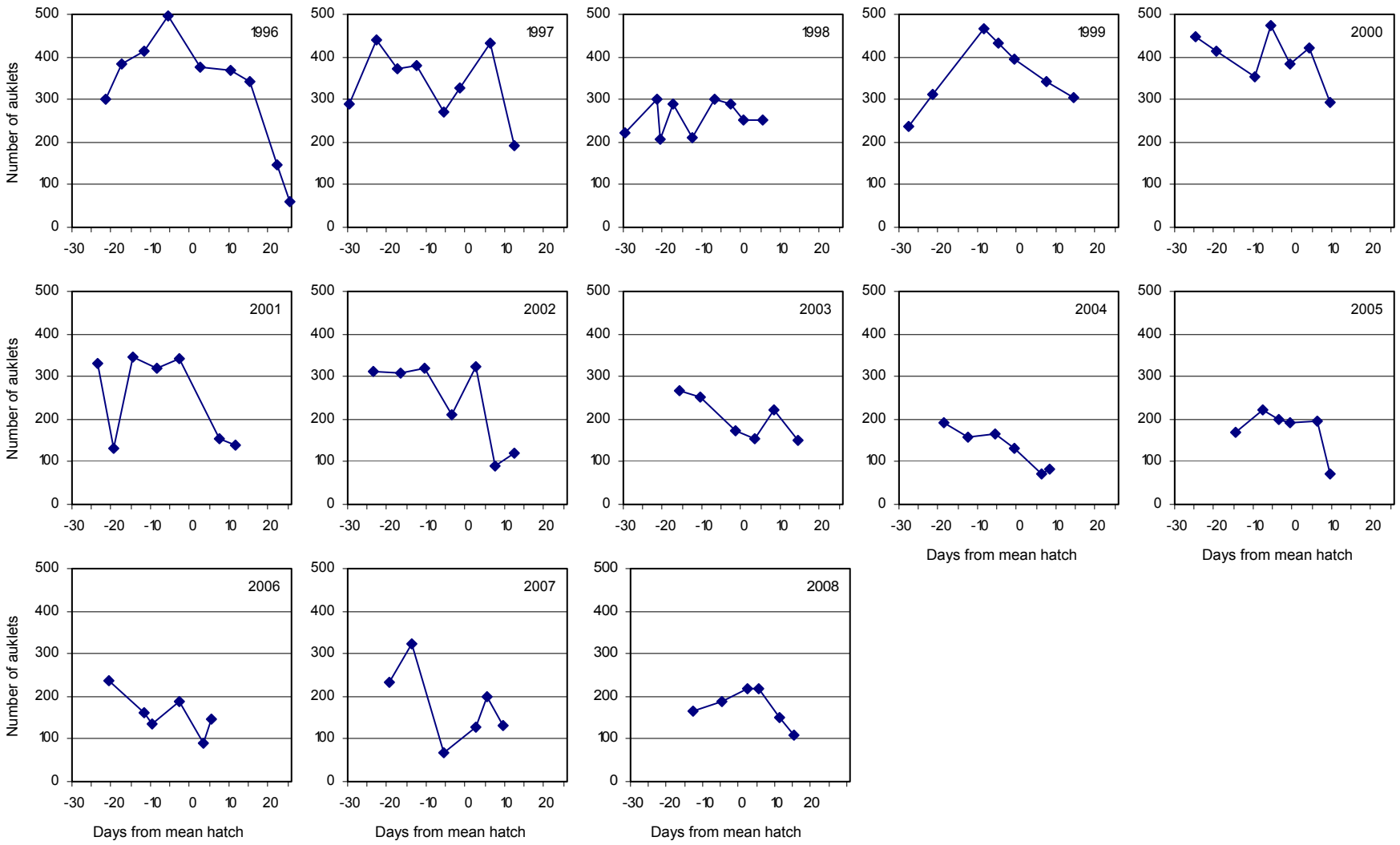


Figure 21. Numbers of least auklets observed on 8 index plots at Kasatochi Island, Alaska. Values represent the sum of the maximum count per plot. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

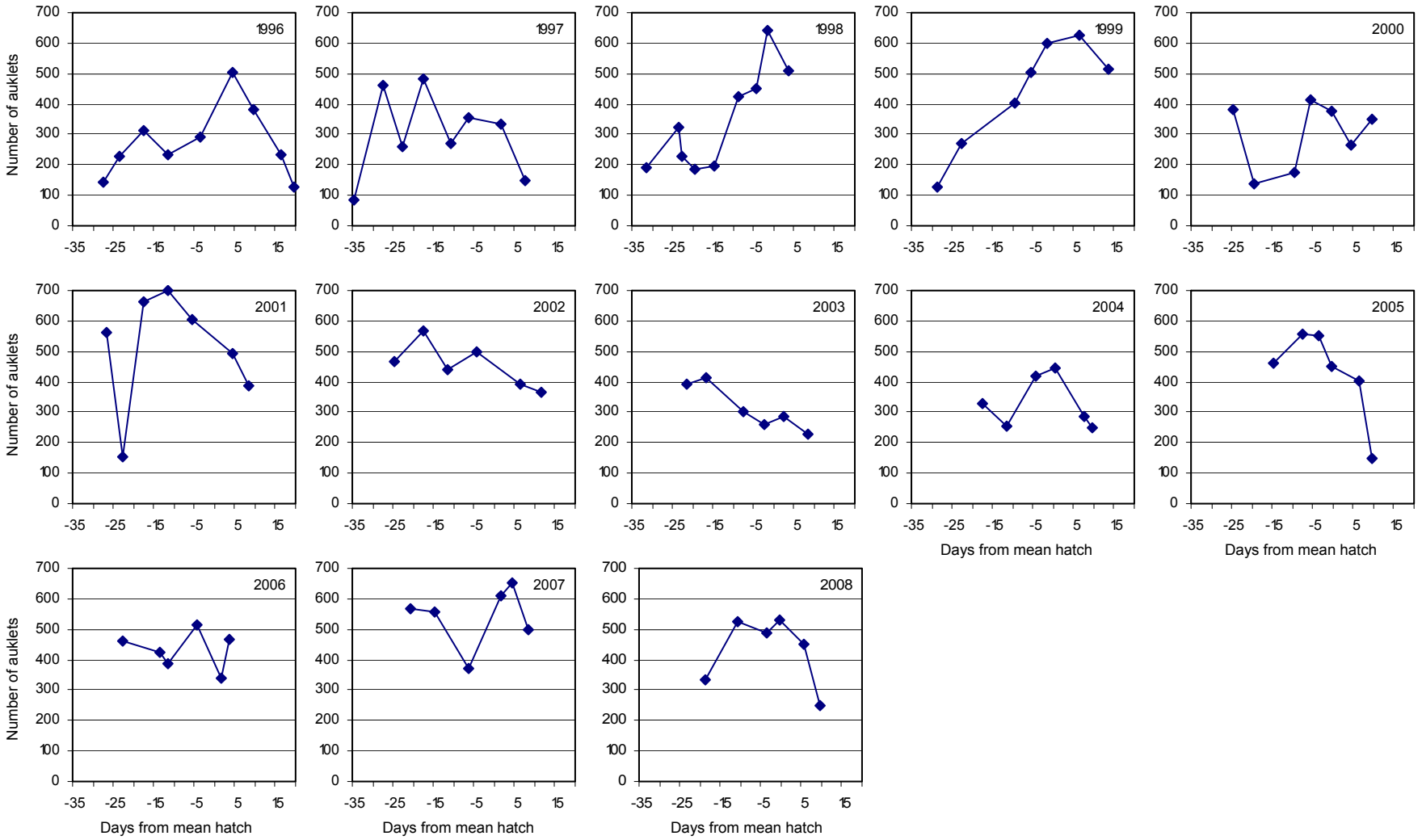


Figure 22. Numbers of crested auklets observed on 8 index plots at Kasatochi Island, Alaska. Values represent the sum of the maximum count per plot. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

Table 63. Numbers of least auklets counted on index plots at Kasatochi Island, Alaska. Numbers represent the sum of the maximum counts for each of 8 plots. Historical data from 1991 are from Thomson and Wraley (1992).

Period	Replicate	1991	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All[a]	1	393	301	291	220	238	447	329	312	268	191	171	238	232	164
	2	479	385	440	302	311	415	133	308	251	157	221	161	325	187
	3	537	414	371	208	465	352	347	318	172	164	198	137	68	217
	4	456	498	381	291	433	473	321	210	153	132	190	187	129	218
	5	--	375	272	211	393	384	342	325	220	72	196	92	200	149
	6	--	369	327	299	341	421	154	90	152	84	72	148	131	108
	7	--	341	431	289	304	294	140	119	--	--	--	--	--	--
	8	--	148	192	251	--	--	--	--	--	--	--	--	--	--
	9	--	61	--	252	--	--	--	--	--	--	--	--	--	--
	Statistics														
	mean	466.3	321.3	338.1	258.1	355.0	398.0	252.3	240.3	202.7	133.3	174.7	160.5	180.8	173.8
	SD	59.6	135.8	84.5	38.6	79.6	60.5	103.4	101.0	50.8	47.0	52.8	49.2	91.3	42.5
	n	4	9	8	9	7	7	7	7	6	6	6	6	6	6
20 d. before to 10 d. after mean hatch[b]	1	--[c]	385	371	291	465	415	133	308	268	191	171	161	232	164
	2	--	414	381	211	433	352	347	318	251	157	221	137	325	167
	3	--	498	272	299	393	473	321	210	172	164	198	187	68	217
	4	--	375	327	289	341	384	342	325	153	132	190	92	129	218
	5	--	369	431	251	--	421	154	90	220	72	196	148	200	149
	6	--	--	--	252	--	294	--	--	--	84	72	--	131	108
	Statistics														
	mean	--	408.2	356.4	265.5	408.0	389.8	259.4	250.2	212.8	133.3	174.7	145.0	180.8	173.8
	SD	--	53.1	59.9	33.7	53.5	61.9	106.5	101.0	49.5	47.0	52.8	35.0	91.3	42.5
	n	--	5	5	6	4	6	5	5	5	6	6	5	6	6

[a]Counts were conducted 8-11 June 1991, 3 Jun-20 Jul 1996, 29 May-10 Jul 1997, 3 Jun-8 Jul 1998, 2 Jun-14 Jul 1999, 3 Jun-7 Jul 2000, 4 Jun-9 Jul 2001, 3 Jun-9 Jul 2002, 9 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 12 Jun-9 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[b]Counts were conducted 8-11 June 1991, 7 Jun-5 Jul 1996, 10 Jun-4 Jul 1997, 15 Jun-8 Jul 1998, 21 Jun-7 Jul 1999, 8 Jun-7 Jul 2000, 8 Jun-5 Jul 2001, 10 Jun-4 Jul 2002, 9 Jun-3 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 21 Jun-8 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[c]Hatch date data are not known for 1991 so the number of counts that fall within the interval of 20 days before to 10 days after mean hatch date can not be determined.

Table 64. Numbers of least auklets counted on index plots at Kasatochi Island, Alaska. Numbers represent the sum of the maximum counts for each of 10 plots.

Period	Replicate	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All[a]	1	586	303	355	614	412	434	425	254	253	326	308	217
	2	540	397	423	514	159	412	412	210	316	236	447	260
	3	541	308	631	432	471	472	301	265	279	166	90	295
	4	371	401	558	664	456	392	251	213	267	295	192	295
	5	461	291	587	546	453	486	328	119	289	126	315	212
	6	624	429	496	594	206	134	232	149	99	225	204	141
	7	392	463	470	440	195	175	--	--	--	--	--	--
	8	--	382	--	--	--	--	--	--	--	--	--	--
	9	--	390	--	--	--	--	--	--	--	--	--	--
	Statistics												
	mean	502.1	373.8	502.9	543.4	336.0	357.9	324.8	201.7	250.5	229.0	259.3	237.2
	SD	96.5	60.0	96.5	87.6	141.5	143.1	80.3	57.5	77.2	75.4	124.1	58.2
	n	7	9	7	7	7	7	6	6	6	6	6	6
20 d. before to 10 d. after mean hatch[b]	1	540	401	631	514	159	412	425	254	253	236	308	217
	2	541	291	558	432	471	472	412	210	316	166	447	260
	3	371	429	587	664	456	392	301	265	279	295	90	295
	4	461	463	496	546	453	486	251	213	267	126	192	295
	5	624	382	--	594	206	134	328	119	289	225	315	212
	6	--	390	--	440	--	--	--	149	99	--	204	141
	Statistics												
	mean	507.4	392.7	568.0	531.7	349.0	379.2	343.4	201.7	250.5	209.6	259.3	237.2
	SD	95.6	58.0	56.6	89.7	153.1	142.6	74.1	57.5	77.2	65.4	124.1	58.2
	n	5	6	4	6	5	5	5	6	6	5	6	6

[a]Counts were conducted 5 Jun-10 Jul 1997, 3 Jun-8 Jul 1998, 2 Jun-14 Jul 1999, 3 Jun-7 Jul 2000, 4 Jun-9 Jul 2001, 3 Jun-9 Jul 2002, 9 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 12 Jun-9 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[b]Counts were conducted 10 Jun-4 Jul 1997, 15 Jun-8 Jul 1998, 21 Jun-7 Jul 1999, 8 Jun-7 Jul 2000, 8 Jun-5 Jul 2001, 10 Jun-4 Jul 2002, 9 Jun-3 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 21 Jun-8 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

Table 65. Numbers of crested auklets counted on index plots at Kasatochi Island, Alaska. Numbers represent the sum of the maximum counts for each of 8 plots. Historical data from 1991 are from Thomson and Wraley (1992).

Period	Replicate	1991	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All[a]	1	129	142	85	189	129	383	560	465	392	328	464	460	567	334
	2	378	230	462	325	271	138	153	566	413	256	558	424	556	526
	3	319	312	258	229	401	175	664	442	302	417	549	389	370	489
	4	234	231	482	184	504	413	699	497	258	443	452	517	608	531
	5	--	291	270	197	598	375	607	537	286	289	404	338	654	449
	6	--	505	357	422	625	266	495	394	226	247	146	466	499	250
	7	--	384	333	450	516	350	388	365	--	--	--	--	--	--
	8	--	233	148	642	--	--	--	--	--	--	--	--	--	--
	9	--	127	--	509	--	--	--	--	--	--	--	--	--	--
	Statistics														
	mean	265.0	272.8	299.4	349.7	434.9	300.0	509.4	466.6	312.8	330.0	428.8	432.3	537.4	429.8
	SD	108.2	118.2	139.2	165.0	180.6	108.6	188.8	73.0	74.4	82.9	150.7	63.1	110.0	114
	n	4	9	8	9	7	7	7	7	6	6	6	6	6	6
20 d. before to 10 d. after mean hatch[b]	1	--[c]	312	482	184	401	138	664	566	413	328	464	424	556	334
	2	--	231	270	197	504	175	699	442	302	256	558	389	370	526
	3	--	291	357	422	598	413	607	497	258	417	549	517	608	489
	4	--	505	333	450	625	375	495	537	286	443	452	338	654	531
	5	--	384	148	642	--	266	388	394	226	289	404	466	499	449
	6	--	--	--	509	--	350	--	--	--	247	146	--	--	250
	Statistics														
	mean	--	344.6	318.0	400.7	532.0	286.2	570.6	487.2	297.0	330.0	428.8	426.8	537.4	429.8
	SD	--	105.0	122.3	179.6	101.6	112.0	128.1	69.8	71.0	82.9	150.7	68.9	110.0	114
	n	--	5	5	6	4	6	5	5	5	6	6	5	5	6

[a]Counts were conducted 8-11 June 1991, 3 Jun-20 Jul 1996, 29 May-10 Jul 1997, 3 Jun-8 Jul 1998, 2 Jun-14 Jul 1999, 3 Jun-7 Jul 2000, 4 Jun-9 Jul 2001, 3 Jun-9 Jul 2002, 9 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 12 Jun-9 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[b]Counts were conducted 8-11 June 1991, 13 Jun-10 Jul 1996, 15 Jun-10 Jul 1997, 15 Jun-8 Jul 1998, 21 Jun-7 Jul 1999, 8 Jun-7 Jul 2000, 13 Jun-9 Jul 2001, 10 Jun-4 Jul 2002, 14 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 21 Jun-8 Jul 2006, 16 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[c]Hatch date data are not known for 1991 so the number of counts that fall within the interval of 20 days before to 10 days after mean hatch date can not be determined.

Table 66. Numbers of crested auklets counted on index plots at Kasatochi Island, Alaska. Numbers represent the sum of the maximum counts for each of 10 plots.

Period	Replicate	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All[a]	1	520	216	156	475	679	656	467	363	532	550	702	415
	2	289	397	332	161	153	696	523	280	642	543	719	625
	3	576	320	505	225	779	519	359	534	637	444	473	563
	4	352	221	663	480	892	630	309	533	566	664	716	650
	5	476	253	770	453	755	701	374	399	492	448	779	527
	6	429	578	814	377	620	512	333	318	229	579	649	356
	7	215	619	731	500	544	477	--	--	--	--	--	--
	8	--	781	--	--	--	--	--	--	--	--	--	--
	9	--	658	--	--	--	--	--	--	--	--	--	--
	Statistics												
	mean	408.1	449.2	567.3	381.6	631.7	598.7	394.2	404.5	516.3	538.0	673.0	522.7
	SD	129.3	213.2	247.1	135.9	239.4	93.9	83.1	107.7	152.5	83.3	106.4	116
	n	7	9	7	7	7	7	6	6	6	6	6	6
20 d. before to 10 d. after mean hatch[b]	1	576	221	505	161	779	696	523	363	532	543	719	415
	2	352	253	663	225	892	519	359	280	642	444	473	625
	3	476	578	770	480	755	630	309	534	637	664	716	563
	4	429	619	814	453	620	701	374	533	566	448	779	650
	5	215	781	--	377	544	512	333	399	492	579	649	527
	6	--	658	--	500	--	--	--	318	229	--	--	356
	Statistics												
	mean	409.6	518.3	688.0	366.0	718.0	611.6	379.6	404.5	516.3	535.6	667.2	522.7
	SD	135.7	228.5	137.5	141.8	137.2	92.1	83.9	107.7	152.5	92.9	117.9	116
	n	5	6	4	6	5	5	5	6	6	5	5	6

[a]Counts were conducted 5 Jun-10 Jul 1997, 3 Jun-8 Jul 1998, 2 Jun-14 Jul 1999, 3 Jun-7 Jul 2000, 4 Jun-9 Jul 2001, 3 Jun-9 Jul 2002, 9 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 12 Jun-9 Jul 2006, 10 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

[b]Counts were conducted 15 Jun-10 Jul 1997, 15 Jun-8 Jul 1998, 21 Jun-7 Jul 1999, 8 Jun-7 Jul 2000, 13 Jun-9 Jul 2001, 10 Jun-4 Jul 2002, 14 Jun-9 Jul 2003, 11 Jun-8 Jul 2004, 14 Jun-8 Jul 2005, 21 Jun-8 Jul 2006, 16 Jun-9 Jul 2007, and 12 Jun-10 Jul 2008.

Table 67. Counts of least and crested auklets on index plots at Kasatochi Island, Alaska in 2008. Numbers represent the sum of the maximum counts for each of 8 or 10 plots.

			Least auklet			Crested auklet	
	Days from		Counts		Days from	Counts	
Date	mean hatch date[a]		8 plots	10 plots	mean hatch date	8 plots	10 plots
12 Jun	-18		164	217	-19	334	415
19 Jun	-10		187	260	-11	526	625
27 Jun	-3		217	295	-4	489	563
30 Jun	0		218	295	-1	531	650
6 Jul	6		149	212	5	449	527
10 Jul	10		108	144	9	250	356
All		mean	173.8	237.2		429.8	522.7
		SD	42.5	58.2		114	116
		n	6	6		6	6
20 d. before to 10 d.		mean	173.8	237.2		429.8	522.7
after mean hatch		SD	42.5	58.2		114	116
		n	6	6		6	6

[a]Negative numbers represent days before mean hatch date; positive numbers represent days after mean hatch date (30 Jun for least auklets and 1 Jul for crested auklets in 2008).

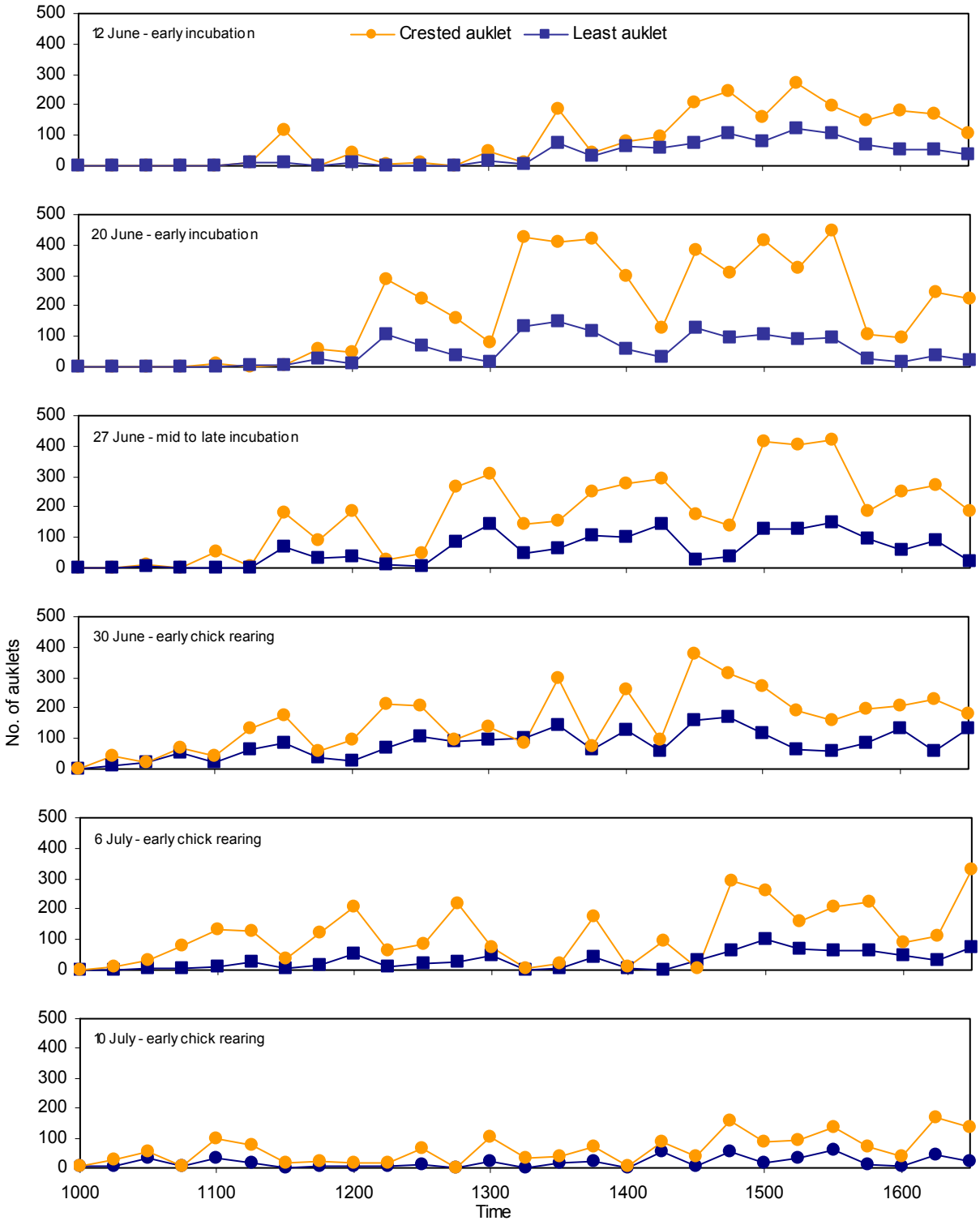


Figure 23. Attendance patterns of least and crested auklets on 8 index plots at Kasatochi Island, Alaska in 2008.

Table 68. Counts of least and crested auklets on index plots at Kasatochi Island, Alaska in 2008. Numbers represent the maximum count on each plot each day.

Date	Days from mean hatch date[a]	Plot									
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
Least auklet											
12 Jun	-18	34	24	31	3	34	18	16	18	20	19
19 Jun	-10	34	27	19	9	49	30	22	18	28	24
27 Jun	-3	47	29	22	7	51	35	36	18	23	27
30 Jun	0	58	31	46	9	64	18	14	28	14	13
6 Jul	6	23	17	17	5	48	27	28	14	18	15
10 Jul	10	26	5	14	2	19	8	23	20	10	17
Crested auklet											
12 Jun	-19	43	21	40	9	44	38	64	48	71	37
19 Jun	-11	67	36	59	10	51	87	78	65	124	48
27 Jun	-4	72	27	62	9	48	97	74	52	96	26
30 Jun	-1	29	25	8	6	53	78	122	60	127	55
6 Jul	5	45	43	53	5	58	79	65	49	110	20
10 Jul	9	27	14	33	4	76	40	53	19	60	30

[a]Negative numbers represent days before mean hatch date; positive numbers represent days after mean hatch date (30 Jun for least auklets and 1 Jul for crested auklets in 2008).

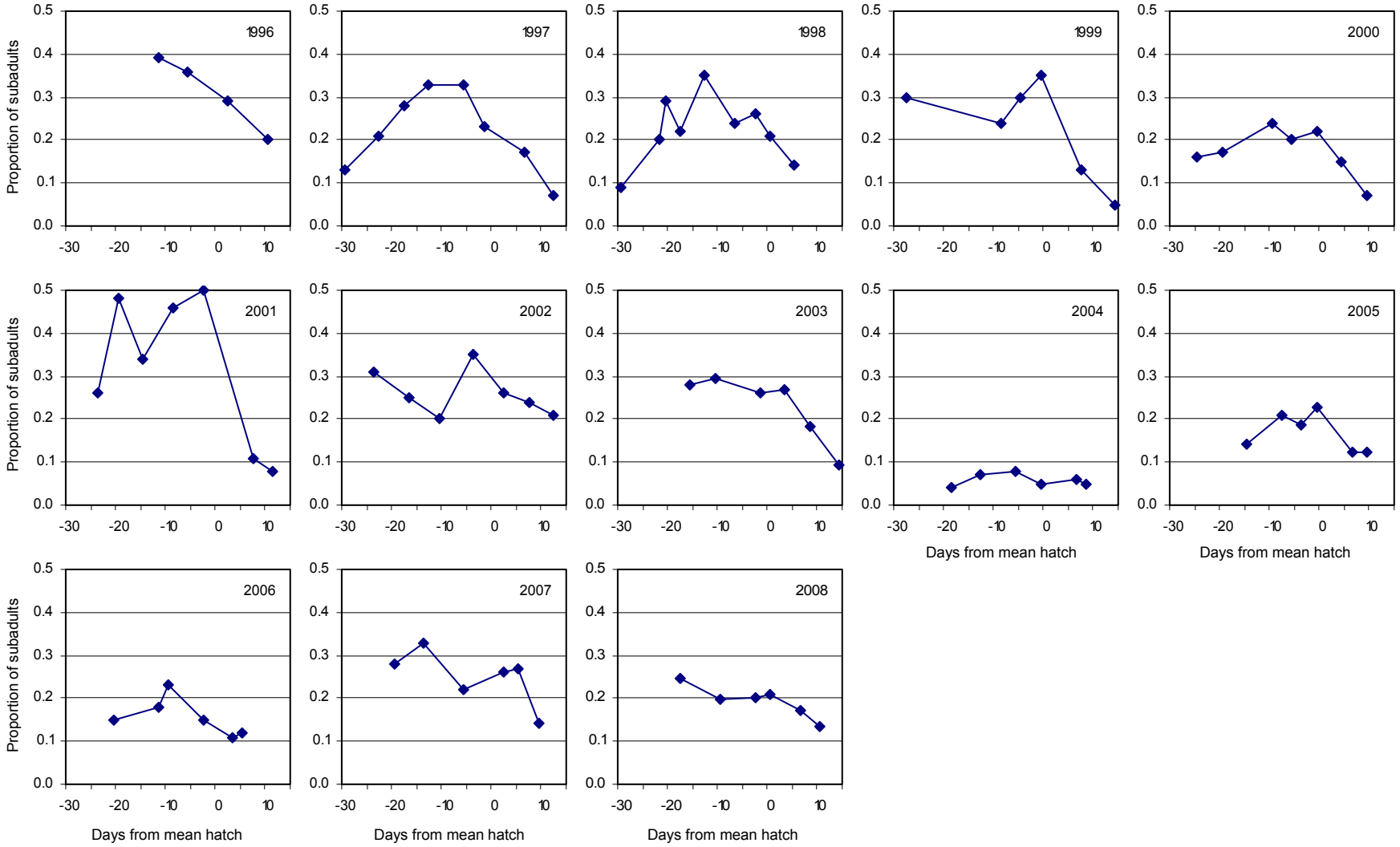


Figure 24. Proportion of least auklets that were subadults on index plots at Kasatochi Island, Alaska. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

Table 69. Proportion of least auklets that were subadults on index plots at Kasatochi Island, Alaska.

Period	Date	Days from mean hatch date[a]	*n* [b]	Proportion of subadults mean	SD	range
	2008					
Early incubation	12 Jun	-18	33	0.25	0.15	0.00 - 0.64
	20 Jun	-11	37	0.20	0.12	0.00 - 0.58
Mid- to late incubation	27 Jun	-3	43	0.20	0.11	0.00 - 0.55
	30 Jun	-0	33	0.21	0.06	0.13 - 0.39
Early chick rearing	6 Jul	6	27	0.17	0.08	0.00 - 0.31
	10 Jul	10	18	0.14	0.07	0.00 - 0.29
Mid-incubation to early chick rearing	**1996**		52	0.30	0.10	0.12 - 0.54
	1997		251	0.25	0.15	0.00 - 0.90
	1998		316	0.23	0.12	0.00 - 0.68
	1999		92	0.26	0.13	0.00 - 0.61
	2000		80	0.15	0.01	0.00 - 0.31
	2001		258	0.37	0.20	0.00 - 1.00
	2002		337	0.26	0.11	0.00 - 0.53
	2003		340	0.22	0.08	0.00 - 0.69
	2004		137	0.06	0.01	0.00 - 0.26
	2005		172	0.17	0.05	0.00 - 0.59
	2006		195	0.15	0.10	0.00 - 0.64
	2007		88	0.24	0.13	0.00 - 0.90
	2008		121	0.19	0.09	0.00 - 0.55

[a]Negative numbers represent days before mean hatch date; positive numbers represent days after mean hatch date (30 Jun for least auklets and 1 Jul for crested auklets in 2008).

[b]Sample unit was an individual count on an index plot when at least 10 auklets were present.

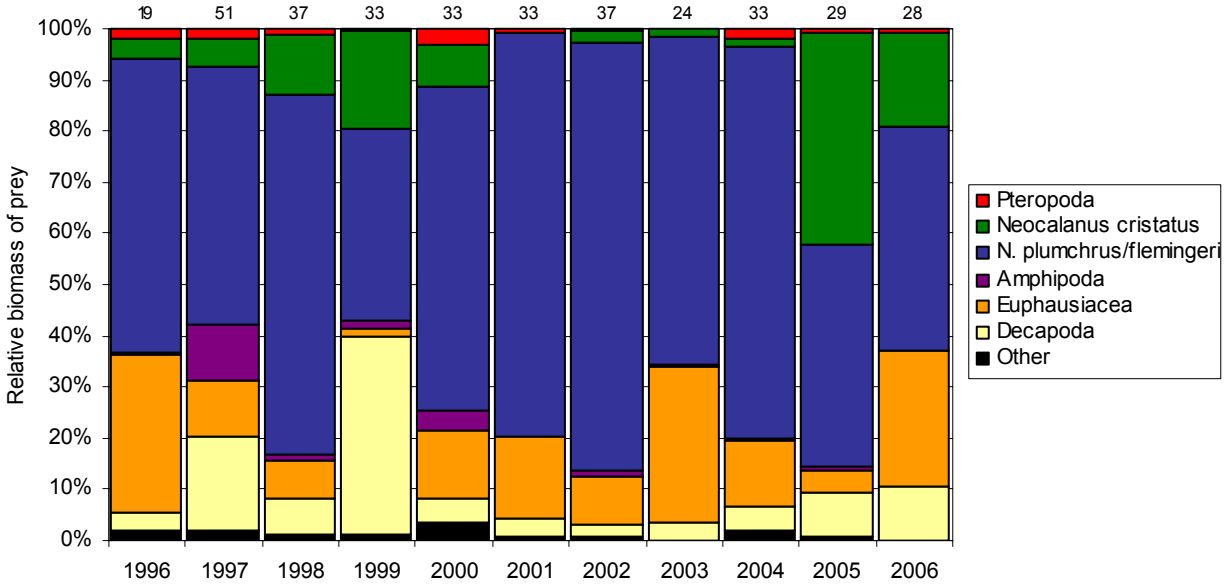


Figure 25. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

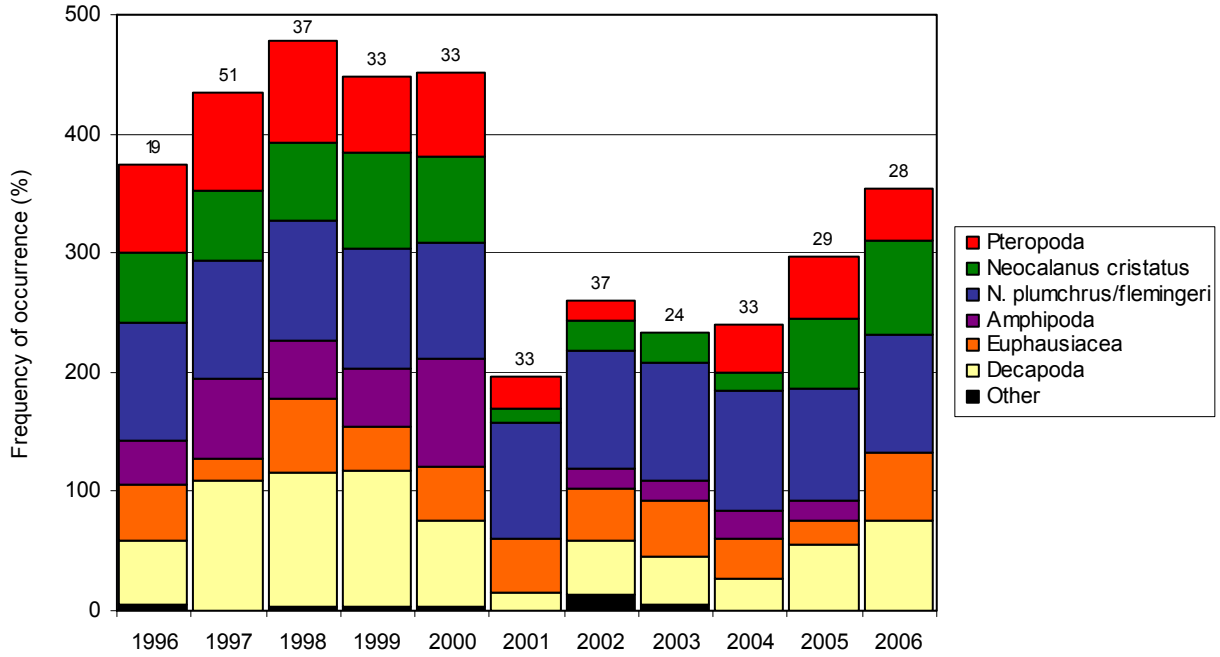


Figure 26. Frequency of occurrence of prey in diets of least auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples were collected in 2008 were lost in the eruption of 7 August 2008.

Table 70. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each species. Prey samples were collected in 2007 but had been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	19	51	37	33	33	33	37	24	33	29	28
Total mass (g)	29.3	54.9	55.8	66.5	62.7	57.2	49.5	26.0	29.7	45.4	53.8
Gastropoda											
Pteropoda	1.9	2.0	0.0	0.0	3.2	0.6	0.3	0.0	2.1	0.9	0.9
Limacina spp.	0.0	0.0	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda											
Neocalanus cristatus	4.2	5.4	12.0	19.0	8.4	0.2	2.4	1.4	1.4	41.5	18.4
N. plumchrus/flemingeri	58.3	51.7	71.1	37.7	65.3	79.5	84.0	64.0	78.6	44.1	43.5
Calanus marshallae	0.0	0.0	<0.1	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0
Amphipoda											
Hyperiidea											
Hyperoche medusarum	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parathemisto spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.5	0.1	0.4	0.0
P. pacifica	<0.1	0.1	0.7	0.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Primno macropa	0.0	0.3	0.0	<0.1	0.0	0.0	0.0	0.0	<0.1	0.0	0.0
Gammaridea											
Gammaridae	0.0	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stenothoidae	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Talitridae	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eusiridae	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
Pontogeneia spp.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ischyroceridae	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Erichthonius spp.	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ischyrocerus spp.	0.0	0.0	0.0	<0.1	0.0	0.0	0.4	0.1	0.2	0.1	0.0
Calliopiidae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Halirages bungei	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unid. Amphipoda	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tanaidacea	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Euphausiacea											
Thysanoessa spp.	31.3	11.1	0.4	1.1	0.1	0.0	0.6	0.0	0.0	0.0	0.0
Euphausiid spp. (small)	0.0	0.0	0.0	0.0	13.5	15.8	8.6	30.4	13.1	4.6	26.8
Euphausiid furcilla	0.0	0.0	7.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	00
Decapoda											
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	1.7	0.4	1.5	0.0	0.0	0.0
Larval shrimp	2.4	17.0	6.5	0.0	4.3	2.1	2.2	1.6	4.2	8.4	10.4
Hippolytidae juvenile	0.0	0.0	0.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crab zoea	0.2	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae zoea	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.0	0.0	<0.1
Paguridae glaucothoe	0.0	0.0	0.2	0.2	<0.1	0.0	0.0	0.2	0.0	0.0	0.0
Atelecyclidae megalopa	1.1	1.4	0.2	0.1	0.3	0.1	0.1	0.1	0.5	<0.1	0.1
Unid. Crustacean	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fish	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 71. Frequency of occurrence of prey in diets of least auklets at Kasatochi Island, Alaska. Frequency is expressed as the percentage of food samples in which each species was present. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in eruption of the 7 August 2008.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	19	51	37	33	33	33	37	24	33	29	28
Pteropoda	73.7	82.4	0.0	0.0	69.7	27.3	16.2	0.0	39.4	51.7	42.9
Limacina spp.	0.0	0.0	86.5	63.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda											
Neocalanus cristatus	57.9	58.8	64.9	81.8	72.7	12.1	24.3	25.0	15.2	58.6	78.6
N. plumchrus/flemingeri	100.0	100.0	100.0	100.0	97.0	97.0	100.0	100.0	100.0	93.1	100.0
Calanus marshallae	0.0	0.0	2.7	0.0	0.0	0.0	13.5	4.2	0.0	0.0	0.0
Amphipoda											
Hyperiidea											
Hyperoche medusarum	15.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parathemisto pacifica	10.5	11.8	18.9	15.2	42.4	0.0	0.0	0.0	0.0	0.0	0.0
Parathemisto spp.[a]	0.0	0.0	0.0	0.0	0.0	0.0	13.5	4.2	3.0	10.3	0.0
Primno macropa	0.0	27.5	0.0	15.2	0.0	0.0	0.0	4.2	3.0	0.0	0.0
Gammaridea											
Gammaridae	0.0	25.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stenothoidae	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Talitridae	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eusiridae	0.0	0.0	0.0	0.0	18.2	0.0	0.0	0.0	0.0	0.0	0.0
Pontogeneia spp.	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ischyroceridae	0.0	0.0	0.0	0.0	30.3	0.0	0.0	0.0	0.0	0.0	0.0
Erichthonius spp.	0.0	0.0	29.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ischyrocerus spp.	0.0	0.0	0.0	3.0	0.0	0.0	2.7	8.3	18.2	6.9	0.0
Calliopiidae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Halirages bungei	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unid. Amphipoda	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tanaidacea	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausiacea											
Thysanoessa spp.	47.4	17.6	5.4	12.1	3.0	0.0	10.8	0.0	0.0	0.0	0.0
Euphausiid spp. (small)	0.0	0.0	0.0	0.0	42.4	45.5	32.4	45.8	33.3	20.7	57.1
Euphausiid furcilla	0.0	0.0	56.8	24.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda											
Larval shrimp[b]	26.3	70.6	64.9	0.0	57.6	24..2	27.0	16.7	24.2	51.7	67.9
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	3.0	8.1	8.3	0.0	0.0	0.0
Hippolytidae juvenile	0.0	0.0	0.0	87.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crab zoea	10.5	7.8	13.5	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae zoea	0.0	0.0	0.0	0.0	0.0	6.1	5.4	4.2	0.0	0.0	3.6
Paguridae glaucothoe	0.0	0.0	21.6	12.1	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae juvenile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0
Atelecyclidae megalopa	15.8	31.4	13.5	9.1	12.1	6.1	5.4	4.2	3.0	3.4	3.6
Unid. Crustacean	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fish	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a]Most likely *P. pacifica.*
[b]Most likely a Hippolytidae.

Table 72. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2006. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data from 1996-2005 are presented in a previous report (Drummond and Larned 2007). Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples from 2008 were lost in eruption of the 7 August 2008.

	Chick-rearing period			
	early	mid	late	total
No. samples	11	10	7	28
Total mass (g)	22.3	20.3	11.2	53.8
Gastropoda				
Pteropoda	1.4	0.6	0.2	0.9
Copepoda				
Neocalanus cristatus	16.7	6.0	44.0	18.4
N. plumchrus/flemingeri	37.4	52.0	40.2	43.5
Amphipoda				
Hyperiidea				
Parathemisto spp.	0.0	0.0	0.0	0.0
Gammaridea				
Ischyroceridae				
Ischyrocerus spp.	0.0	0.0	0.0	0.0
Euphausiacea				
Euphausiid spp. (small)	35.1	28.0	8.1	26.8
Decapoda				
Larval shrimp	9.2	13.3	7.6	10.4
Pagurid crab zoea	0.0	<0.1	0.0	<0.1
Atelecyclidae megalopa	0.3	0.0	0.0	0.1

Table 73. Frequency of occurrence of prey in diets of least auklets at Kasatochi Island, Alaska in 2006. Frequency is expressed as the percentage of food samples in which each species was present. Data from 1996-2005 are presented in previous reports (Scharf and Williams 1997; Scharf 1998, 2000a; Drummond 2006). Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	Chick-rearing period			
	early	mid	late	total
No. samples	11	10	7	28
Gastropoda				
Pteropoda	36.4	60.0	28.6	42.9
Copepoda				
Neocalanus cristatus	81.8	70.0	85.7	78.6
N. plumchrus/flemingeri	100.0	100.0	100.0	100.0
Amphipoda				
Hyperiidea				
Parathemisto spp.	0.0	0.0	0.0	0.0
Gammaridea				
Ischyroceridae				
Ischyrocerus spp.	0.0	0.0	0.0	0.0
Euphausiacea				
Euphausiid spp. (small)	72.7	60.0	28.6	57.1
Decapoda				
Larval shrimp	45.5	80.0	85.7	65.9
Pagurid crab zoea	0.0	10.0	0.0	3.6
Atelecyclidae megalopa	9.1	0.0	0.0	3.6

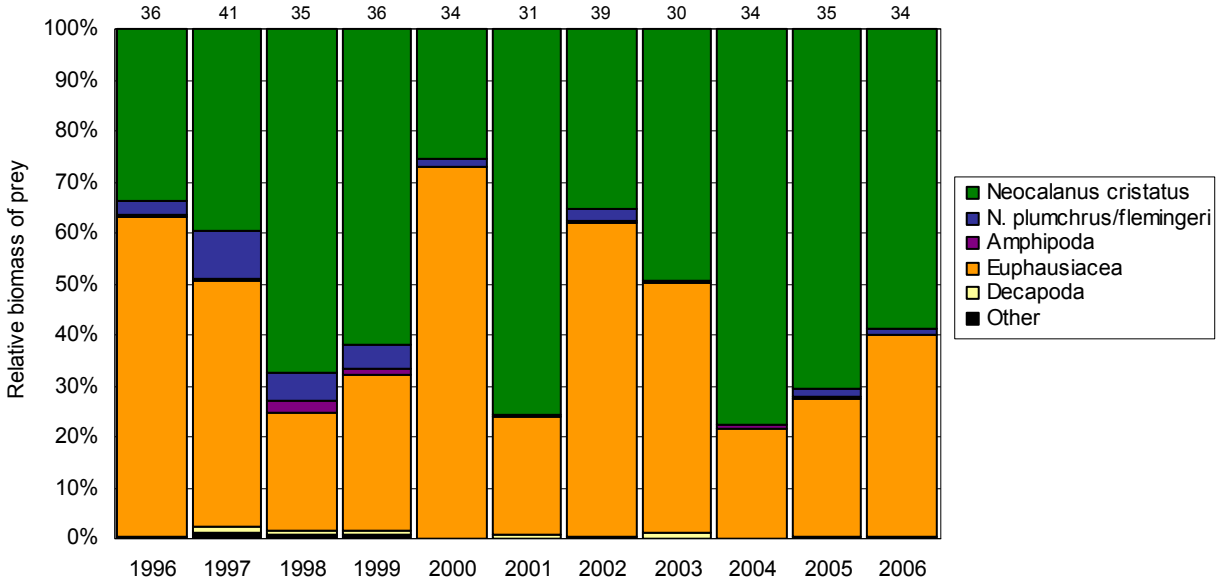


Figure 27. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

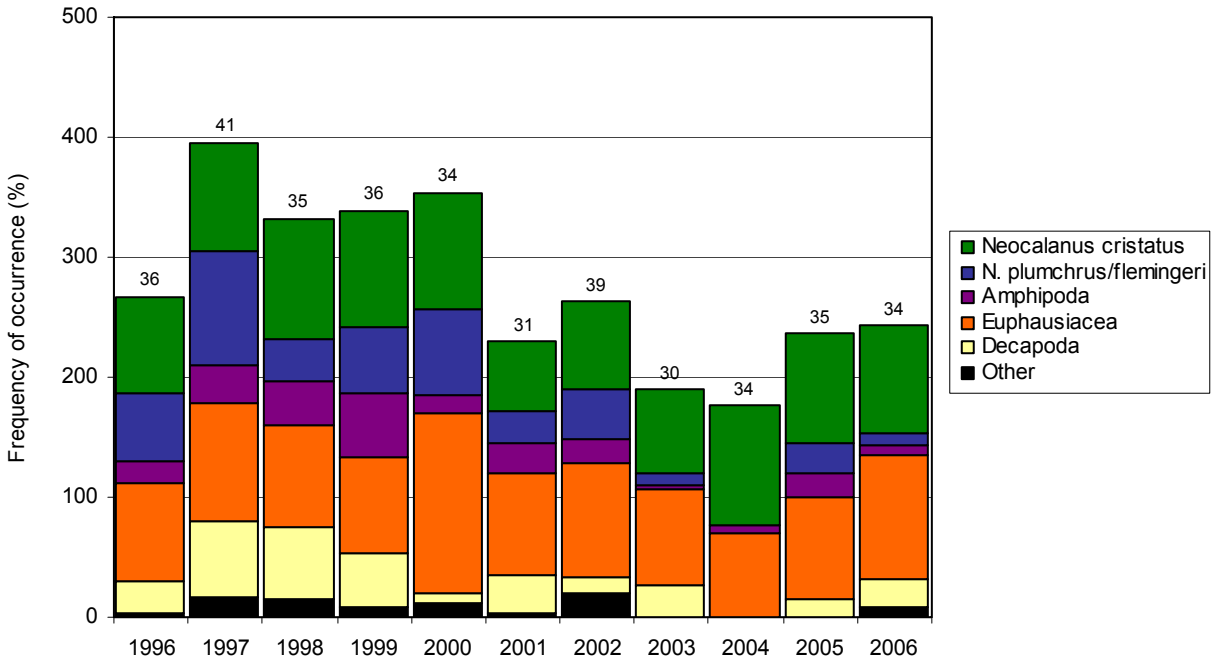


Figure 28. Frequency of occurrence of prey in diets of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

Table 74. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska. Numbers represent the percentage of the mass of combined food samples comprised by each species. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	36	41	35	36	34	31	39	30	34	35	34
Total mass (g)	346.9	246.9	326.3	231.0	363.7	221.2	305.3	157.0	186.2	246.6	222.9
Pteropoda	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1
Cephalopoda - squid	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1
Ostracoda	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda											
Neocalanus cristatus	33.5	31.1	67.6	61.8	25.7	75.6	35.5	49.6	77.5	70.7	58.4
N. plumchrus/flemingeri	3.1	7.3	5.4	4.8	1.4	0.3	2.0	0.2	0.0	1.6	1.3
Calanus marshallae	0.0	0.0	0.0	0.0	<0.1	0.0	0.1	0.0	0.0	0.0	0.0
Unid. Copepoda	<0.1	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0
Amphipoda											
Hyperiidea											
Parathemisto spp.	0.0	0.0	0.0	0.0	0.0	0.1	0.5	<0.1	0.8	0.2	<0.1
P. pacifica	0.1	0.1	2.1	1.3	0.1	<0.1	0.1	0.0	0.0	0.0	<0.1
Primno macropa	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gammaridea											
Gammaridae	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausiacea											
Thysanoessa spp.	63.0	37.8	23.4	30.4	29.4	1.1	2.8	15.2	0.0	2.4	5.0
Euphausiid spp. (small)	0.0	0.0	0.0	0.0	43.5	22.1	58.7	33.7	21.7	24.9	34.2
Euphausiid furcilla	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda											
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.8	0.0	0.0	0.0
Larval shrimp	0.2	0.8	0.7	0.0	0.1	0.6	0.1	0.5	0.0	0.2	0.1
Hippolytidae juvenile	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crab zoea	<0.1	<0.1	<0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae zoea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0
Paguridae glaucothoe	0.0	0.0	0.1	0.1	0.0	0.0	0.0	<0.1	0.0	<0.1	0.0
Atelecyclidae megalopa	<0.1	0.1	0.1	0.0	0.0	<0.1	0.0	<0.1	0.0	0.1	0.2
Unid. Fish	0.0	0.4	0.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a]Biomass values in 1998 were calculated using percent composition in prey samples rather than specific counts of prey items like other years and thus and may not be comparable to other years.

Table 75. Frequency of occurrence of prey in diets of crested auklets at Kasatochi Island, Alaska. Frequency is expressed as the percentage of food samples in which each species was present. Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No. samples	36	41	35	36	34	31	39	30	34	35	34
Pteropoda	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
Cephalopoda - squid	0.0	4.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Ostracoda	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda											
Neocalanus cristatus	80.6	90.2	100.0	97.2	97.1	58.1	74.4	70.0	100.0	91.4	91.2
N. plumchrus/flemingeri	55.6	95.1	34.3	55.6	70.6	25.8	41.0	10.0	0.0	25.7	8.8
Calanus marshallae	0.0	0.0	0.0	0.0	11.8	0.0	20.5	0.0	0.0	0.0	0.0
Unid. Copepoda	2.8	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0
Amphipoda											
Hyperiidea											
Parathemisto pacifica	19.4	24.4	37.1	52.8	14.7	6.5	2.6	0.0	0.0	0.0	5.9
Parathemisto spp.[a]	0.0	0.0	0.0	0.0	0.0	19.4	17.9	3.3	5.9	20.0	2.9
Primno macropa	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gammaridea											
Gammaridae	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausiacea											
Thysanoessa spp.	80.6	97.6	85.7	77.8	73.5	9.7	10.3	33.3	0.0	8.6	23.5
Euphausiid furcilla	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausiid-small	0.0	0.0	0.0	0.0	76.5	74.2	84.6	46.7	70.6	77.1	79.4
Decapoda											
Larval shrimp[b]	13.9	46.3	45.7	0.0	8.8	22.6	7.7	6.7	0.0	0.0	17.6
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	6.5	5.1	10.0	0.0	0.0	0.0
Hippolytidae juvenile	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crab zoea	8.3	4.9	2.9	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae zoea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0
Paguridae glaucothoe	0.0	0.0	5.7	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paguridae juvenile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	5.7	0.0
Atelecyclidae megalopa	5.6	12.2	5.7	0.0	0.0	3.2	0.0	3.3	0.0	8.6	5.9
Fish	0.0	4.9	11.4	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Ticks - probably not prey)	0.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a]Most likely *P. pacifica.*
[b]Most likely a Hippolytidae.

Table 76. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2006. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data from 1996-2005 are presented in a previous report (Drummond and Larned 2007). Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in eruption of the 7 August 2008.

	Chick-rearing period			
	early	mid	late	total
No. samples	10	12	12	34
Total mass (g)	47.5	83.7	91.6	222.9
Gastropoda				
Pteropoda	0.0	<0.1	0.0	<0.1
Cephalopoda				
Unid. squid	0.0	0.0	0.1	<0.1
Copepoda				
Neocalanus cristatus	38.4	49.9	76.5	58.4
N. plumchrus/flemingeri	2.8	1.6	0.2	1.3
Amphipoda				
Hyperiidea				
Parathemisto pacifica.	0.2	0.0	0.0	<0.1
Parathemisto spp.	0.3	0.0	0.0	<0.1
Euphausiacea				
Thysanoessa spp.	16.8	0.4	3.1	5.0
Euphausiid spp. (small)	38.7	47.3	19.9	34.2
Decapoda				
Larval shrimp	2.5	0.6	0.0	0.8
Paguridae glaucothoe	0.0	0.0	0.0	0.0
Atelecyclidae megalopa	0.4	0.2	0.1	0.2

Table 77. Frequency of occurrence of prey in diets of crested auklets at Kasatochi Island, Alaska in 2006. Frequency is expressed as the percentage of food samples in which each species was present. Data from 1996-2005 are presented in previous reports (Scharf and Williams 1997; Scharf 1998, 2000a; Drummond 2006). Prey samples were collected in 2007 but had not been analyzed at the time of this report. Samples collected in 2008 were lost in the eruption of 7 August 2008.

	Chick-rearing period			
	early	mid	late	total
No. samples	10	12	12	34
Gastropoda				
Pteropoda	0.0	16.7	0.0	5.9
Cephalopoda				
Unid. squid	0.0	0.0	8.3	2.9
Copepoda				
Neocalanus cristatus	100.0	83.3	91.7	91.2
N. plumchrus/flemingeri	10.0	8.3	8.3	8.8
Amphipoda				
Hyperiidea				
Parathemisto pacifica.	20.0	0.0	0.0	5.9
Parathemisto spp.	10.0	0.0	0.0	2.9
Euphausiacea				
Thysanoessa spp.	50.0	8.3	16.7	23.5
Euphausiid spp. (small)	60.0	83.3	91.7	79.4
Decapoda				
Larval shrimp	40.0	16.7	0.0	17.6
Paguridae glaucothoe	0.0	0.0	0.0	0.0
Atelecyclidae megalopa	0.0	8.3	8.3	5.9

Table 78. Mass of food loads collected from parakeet auklets at Kasatochi Island, Alaska. No food loads were collected from parakeet auklets in 2008.

Chick-rearing period	*n*	Mass of load (g) mean	SD	range
2008				
Early	0	--	--	--
Mid	0	--	--	--
Late	0	--	--	--
Total				
2007	2	4.2	2.8	2.2 - 6.3
2008	0	**--**	**--**	**--**

Table 79. Mass of food loads collected from least auklets at Kasatochi Island, Alaska.

Chick-rearing period[a]	*n*	Mass of load (g) mean	SD	range
2008				
Early	2	3.9	1.2	3.0 – 4.7
Mid	11	4.4	1.6	1.3 – 6.3
Late	12	4.1	1.0	2.5 – 5.8
Total				
1996	11	2.7	0.9	1.2 - 4.1
1997	39	2.7	1.5	0.7 - 7.2
1998	32	3.5	1.6	0.8 - 6.5
1999	31	2.8	1.7	0.3 - 7.5
2000	32	3.4	1.7	1.1 - 6.7
2001	26	4.3	1.5	2.3 - 7.5
2002	34	3.9	2.0	1.0 - 11.8
2003	21	4.1	1.9	1.1 - 11.4
2004	30	3.5	1.4	0.2 - 5.8
2005	28	4.2	2.8	0.4 - 9.8
2006	26	4.6	2.1	0.5 - 10.6
2007	30	4.7	1.7	1.1 - 8.2
2008	25	4.2	1.3	1.3 - 6.3

[a]In 2008, food samples were collected 7 and 8 Jul (early), 18 and 19 Jul (mid), and 25-27 Jul (late).

Table 80. Mass of food loads collected from whiskered auklets at Kasatochi Island, Alaska. No food loads were collected from whiskered auklets in 2008.

Chick-rearing period[a]	*n*	Mass of load (g) mean	SD	range
2008				
Early	--	--	--	--
Mid	--	--	--	--
Late	--	--	--	--
Total				
2007	4	10.3	4.5	6.3 - 16.3
2008	0	--	--	--

Table 81. Mass of food loads collected from crested auklets at Kasatochi Island, Alaska.

Chick-rearing period[a]	*n*	Mass of load (g) mean	SD	range
2008				
Early	10	10.9	5.6	2.0 - 21.6
Mid	11	15.2	6.4	9.3 - 31.7
Late	10	13.9	5.2	8.9 - 24.2
Total				
1996	23	9.7	5.5	2.4 - 21.8
1997	28	9.3	4.4	1.7 - 21.3
1998	26	9.9	5.2	2.2 - 19.5
1999	31	10.0	4.9	0.6 - 19.6
2000	31	10.6	5.1	2.7 - 25.7
2001	27	10.8	4.9	2.8 - 21.5
2002	34	13.2	4.5	6.0 - 25.1
2003	27	10.1	4.5	2.1 - 18.8
2004	32	9.5	5.2	1.5 - 22.8
2005	32	11.3	6.3	1.5 - 27.9
2006	34	9.9	4.2	4.6 - 20.4
2007	32	14.3	5.8	5.6 - 26.5
2008	31	13.4	6.1	2.0 - 31.7

[a]In 2008, food samples were collected 7 & 8 Jul (early), 18 Jul (mid), and 25 Jul (late).

Table 82. Numbers of species observed on circumnavigation surveys of Kasatochi Island, Alaska. Data from the 1980s are from Early et al. (1981), Bailey and Trapp (1986), and unpublished field notes archived at Adak. Counts in the 1980s, 1999-2000, 2003-2005, and 2007are from single surveys, while numbers for 1996-1998 and 2002 reflect the mean of several counts. No complete survey was conducted in 2001, 2006, or 2008.

Species		1980	1982	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Date of survey		13 Jul	17 Jul	12-30 Jun[a]	27 May-20 Jun[b]	14-19 Jun[c]	25 Jun[d]	6 Aug[ef]	--	31May-30 Jun[g]	6 Jun	5 Jun	22 Jun[h]	--	5 Aug[f]	--
Eurasian wigeon		--	--	--	0.3	--	--	--	--	--	--	--	--	--	--	--
Harlequin duck		8	32	18.8	75.3	28.0	24	38	--	16.0	19	9	--	--	--	--
Bufflehead		--	--	--	0.5	--	--	--	--	--	--	--	--	--	--	--
Red-breasted merganser		--	--	0.3	--	--	--	--	--	--	--	--	--	--	--	--
Northern fulmar		--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
Red-faced cormorant:	birds	--	--	33	20	34	18.5	3	17	--	13	16	77	10	--	0
	nests	--	7	14	20	34	9	12	--	22	0	28	2	--	0	--
Pelagic cormorant :	birds	--	89	32	55	23.5	7	16	--	44	3	62	6	--	16	--
	nests	--	36	21	17	37	22	15	--	13	0	20	2	--	7	--
All cormorant spp.	birds	85	129	62.0	83.0	120.0	57	95	--	82	55	173	23	--	20	--
	nests	19	43	41	50	71	31	27	--	44	0	41	8	--	0	--
Bald eagle		--	4	1.3	7.0	6.0	1	2	--	5.6	1	2	3	--	2	--
Peregrine falcon		2	7	1.3	1.3	2.5	2	7	--	1.7	--	3	4	--	11	--
Black oystercatcher		--	--	0.3	0.5	1.5	1	4	--	2.3	--	7	3	--	2	--
Glaucous-winged gull		156	143	168.3	162.8	140.5	80	133	--	41	89	348	273	--	168	--
Black-legged kittiwake		3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Murre spp.[i]		NC[j]	NC	NC	NC	NC	NC	NC	--	NC	NC	50	50	--	57	--
Pigeon guillemot		16	11	55.5	69.8	68.0	46	96	--	59.3	34	42	72	--	85	--
Ancient murrelet		1	--	6.0	17.8	10.0	9	--	--	2	5	--	10	--	--	--
Parakeet auklet		533	700	NC	NC	575	NC	NC	--	NC	NC	NC	NC	--	NC	--
Horned puffin		11	8	75.3	73.0	67.5	111	147	--	68.3	94	53	75	--	190	--
Tufted puffin		18	17	15.7	43.8	34.5	143	90	--	32.3	91	26	69	--	103	--
Common raven		1	1	0.3	2.0	2.0	3	5	--	2.7	--	--	--	--	1	--
Harbor seal		2	7	--	--	--	--	6	--	1.3	--	--	--	--	--	--

[a]Cormorants were identified to species and nests were counted on 31 July, and total numbers of cormorants (including unidentified spp.) were counted 4 times between 20 June and 31 July. For pigeon guillemots and harlequin ducks, *n*=4. For all other species, *n*=3.

[b]Cormorants identified were to species on 24 July, nests were counted 8 August, and total numbers of cormorants were counted 27 May-20 June and 24 July (*n*=5). For all other species, *n*=4.

[c]Cormorant nests were counted on 10 July. Parakeet auklets were counted only on 14 June. For all other species, *n*=2.

[d]Cormorant nest numbers were based on observations from 25 Jun, 2 Aug, and 13 Aug.

[e]Cormorant nest numbers were based on observations from 7 Jul, 18 Jul, and 6 Aug.

[f]Surveys were conducted late in season and may not be comparable to other years.

[g]Cormorant nest numbers were based on observations from 15 Jul and 7 Aug.

[h]Cormorant nests numbers were based on observations from 22 Jun-2 Aug.

[i]Murres were not counted prior to 2004.

[j]NC=not counted.

Table 83. Description of bald eagle prey remains collected at Kasatochi Island, Alaska. Values represent the percent of total nest contents (by number of individuals) comprised by each species, followed by the minimum number of individuals in parentheses. Prey remains from 1997-1999 were collected at a feeding perch near the Rye Point bald eagle aerie; those in 2005 were collected from the nest of a new aerie at the base of Rye Point.

Prey species	1997	1998	1999	2005[a]
Northern fulmar	6 (1)	14 (3)	27 (3)	--
Kittiwake spp.	--	--	9 (1)	--
Murre spp.	31 (5)	10 (2)	9 (1)	--
Ancient murrelet	--	5 (1)	--	--
Least auklet	6 (1)	--	--	15 (2)
Crested auklet	31 (5)	62 (13)	36 (4)	85 (11)
Puffin spp.	25 (4)	10 (2)	18 (2)	--

[a]Prey remains reported represent those collected in early August when chicks were of fledging age. Remains of 3 Atka mackerel were found at the nest in late May, when chicks were approximately 8-13 days old.

Table 84. Description of peregrine falcon prey remains collected at a peregrine aerie at Kasatochi Island, Alaska. Values represent the percent of total nest contents (by number of individuals) comprised by each species, followed by the minimum number of individuals in parentheses. Data from 1996 include prey remains from two separate nests.

Prey species	1996[a]	1996[b]	2003[b]	2006[b]	2007[b]
Fork-tailed storm-petrel	12 (2)	--	--	3 (1)	--
Parakeet auklet	6 (1)	--	--	--	--
Least auklet	47 (8)	65 (20)	60 (20)	55 (17)	46 (22)
Crested auklet	35 (6)	35 (11)	27 (9)	35 (11)	44 (21)
Song sparrow	--	--	3 (1)	--	--
Unidentified songbird	--	--	--	--	10 (5)
Unidentified bird	--	--	--	6 (2)	--

[a]Aerie at southern base of Mt. Kasatochi.
[b]Aerie in Peregrine Ravine.

Table 85. Numbers of birds detected on off-road point count route number 331, Kasatochi Island, Alaska. Values represent the number of individuals observed at the 12 survey points. Data were not collected in 2004; data in 2008 were collected, but lost in the eruption of 7 August 2008.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Date	1 Jun	2 Jun	1 Jun	2 Jun	2 Jun	1 Jun	7 Jun	--	3 Jun	2 Jun	2 Jun	2 Jun
Harlequin duck	--	17	19	--	--	--	--	--	--	2	--	--
Cormorant spp.	--	--	3	--	1	1	--	--	--	2	1	--
Bald eagle	2	--	4	1	1	--	1	--	5	--	--	--
Peregrine falcon	2	2	3	3	2	4	7	--	2	7	7	--
Rock sandpiper	10	12	6	25	5	--	--	--	2	2	3	--
Glaucous-winged gull	>17	>9	30	27	9	32	5	--	4	8 (110)[a]	3 (80)[a]	--
Thick-billed murre	--	--	--	1	--	--	--	--	--	--	--	--
Pigeon guillemot	--	2	2	--	3	1	--	--	--	1	--	--
Parakeet auklet	2	++[b]	1	++	--	++	--	--	--	--	--	--
Least auklet	++	--	++	++	--	++	--	--	--	++	--	--
Crested auklet	++	++	++	++	--	++	--	--	--	++	--	--
Tufted puffin	--	1	1	--	--	--	--	--	--	--	--	--
Common raven	--	--	1	--	2	--	--	--	--	3	--	--
Winter wren	17	13	8	5	3	8	6	--	15	24	12	--
Song sparrow	7	1	3	2	--	3	1	--	8	15	--	--
Lapland longspur - total	117	107	95	98	58	104	78	--	67	83	64	--
male	56	49	40	47	18	45	40	--	15	43	5	--
female	3	10	7	7	11	6	7	--	4	11	5	--
unknown	58	48	48	44	29	53	31	--	48	29	54	--
Snow bunting	7	--	--	--	--	--	--	--	--	--	--	--
Rosy finch	12	2	12	10	17	4	6	--	14	13	18	--

[a]Parentheses indicate number of gulls counted inside caldera at last survey at >150m.
[b]This symbol indicates that numerous birds were heard calling but could not be seen or counted.

Table 86. Mean numbers of birds detected on beach transect surveys along Oystercatcher Beach, Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption 7 August 2008.

	1999			2000			2001			2002			2003		
Species	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range
n	3			3			6			5			4		
Survey dates	6-13 Jun			26 May-14 Jun			28 May-24 Jun			3-14 Jun			6-16 Jun		
Black oystercatcher	2.0	0.0	2-2	1.7	1.5	0-3	3.2	1.3	1-4	2.0	0.0	2-2	3.5	1.0	2-4
Rock sandpiper	0.0	0.0	--	0.3	0.6	0-1	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Winter wren	1.0	1.7	0-3	3.0	1.0	2-4	2.7	1.2	1-4	4.6	0.9	4-6	6.3	1.5	4-7
Song sparrow	8.7	1.5	7-10	3.7	0.6	3-4	4.5	1.6	3-7	3.4	0.9	2-4	11.8	1.7	10-14
Lapland longspur	2.3	1.5	1-4	3.7	1.5	2-5	2.2	1.2	2-3	6.0	2.1	4-9	2.8	1.7	1-5
Snow bunting	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.4	0.5	0-1	0.0	0.0	--
Rosy finch	1.7	2.1	0-4	2.0	2.0	0-4	2.2	1.0	1-3	2.8	0.8	2-4	1.0	1.4	0-3

Table 86 continued. Mean numbers of birds detected on beach transect surveys along Oystercatcher Beach, Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption 7 August 2008.

	2004			2005			2006			2007			2008		
Species	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range
n	4			4			5			5			5		
Survey dates	2-13 Jun			2-8 Jun			3-12 Jun			1-13 Jun			1-15 Jun		
Black oystercatcher	2.3	0.5	2-3	1.8	0.5	1-2	2.6	0.9	2-4	2.4	1.7	0-4	--	--	--
Rock sandpiper	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	--	--	--
Winter wren	3.0	1.8	1-5	8.0	2.4	5-11	1.2	0.8	1-2	5.6	1.5	3-7	--	--	--
Song sparrow	16.0	2.9	13-20	14.3	3.9	10-18	5.8	1.6	4-8	7.2	0.8	6-8	--	--	--
Lapland longspur	2.8	3.1	0-7	3.0	2.9	0-6	4.2	1.3	3-6	5.2	2.8	2-9	--	--	--
Snow bunting	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	--	--	--
Rosy finch	4.0	2.4	2-7	1.5	3.0	0-6	2.0	2.3	0-5	2.8	4.8	0-11	--	--	--

Table 87. Counts of Steller sea lions at Kasatochi Island, Alaska.

Year	Date	Large bulls	Females/ subadults	Total non-pups	Pups	Source
1959	19-27 May	--	--	200	--	Kenyon and Rice (1961)
1962	7 Apr	--	--	2,000	--	Kenyon (1962)
1969-1972	?	--	--	1,200	--	Sekora (1973)
1979	25 Jun	79	1,874	1,953	213	Fiscus (1981)
1980	13 Jul	62	950	1,012	269	Early et al. (1981)
1982	17 Jul	--	--	1,444[a]	--	USFWS unpubl. data
1984	16-19 Jun	--	--	>1,000	--	Deines and Willging (1985)
1985	12 Jun	--	--	1,170	892	Merrick et al. (1987)
1987	3 May	--	--	--	769	NMFS[b] unpubl. data
1989	17 Jun	--	--	659	--	NMFS unpubl. data
1990	20 Jun	--	--	641	178	NMFS unpubl. data
1991	19 Jun	--	--	466	--	Sease and Loughlin (1999)
1992	Jun[c]	--	--	376	--	Sease and Loughlin (1999)
1993	15 Mar	--	--	127	--	NMFS unpubl. data
1994	Jun[c]	--	--	288[d]	--	Sease and Loughlin (1999)
	8 Jul	--	--	--	215[e]	Sease and Loughlin (1999)
1996	18 Jun	--	--	331[d]	--	Sease and Loughlin (1999)
	7, 21 Jun[c]	36	211	247	220[f]	Scharf et al. (1996)
1997	11, 27 Jun[c]	39	318	357	266[f]	Scharf and Williams (1997)
	1 Jul	--	--	--	268[e]	Sease and Loughlin (1999)
1998	14 Jun	--	--	351[d]	--	Sease and Loughlin (1999)
	21 Jun	58	330	388	241[f]	Scharf (1998)
	1 Jul	--	--	--	247[e]	Sease and Loughlin (1999)
1999	16 Jun	55	345	400	271[f]	Scharf (2000b)
2000	18 Jun	--	--	390[d]	--	NMFS unpubl. data
	22 Jun	33	313	346	231[f]	Scharf (2000a)
2001	11, 22 Jun[c]	43	418	461	241[f]	Syria (2001)
2002	? Jun	--	--	656[g]	--	NMFS unpubl. data
	15 Jun	65	433	498	300[f]	Syria (2002)
	19 Jun	--	--	529[d]	--	NMFS unpubl. data
	28 Jun	--	--	--	302[e]	NMFS unpubl. data
2003	21 Jun	56	491	547	278[f]	Barton and Lindquist (2003)
2004	? Jun	--	--	667[g]	--	NMFS unpubl. data
	20 Jun	--	--	--	354[e]	NMFS unpubl. data
	23 Jun	57	545	602	303[f]	Drummond and Kissler (2004)
2005	6, 23 Jun[c]	60	452	511	322[f]	Drummond and Rehder (2005)
2006	10, 29 Jun[c]	75	624	699	352[f]	Drummond (2006)
2007	19 Jun	87	576	663	313[f]	Drummond and Larned (2007)
2008	7, 28 Jun	46	302	347	303[f]	this report
	22 Aug[h]	--	--	162	0	USFWS unpubl. data
	23 Aug[h]	--	--	170	0	USFWS unpubl. data
	29 Aug[h]	--	--	206	2	USFWS unpubl. data

[a]Number includes pups.

[b]Natl. Mar. Fish. Serv./Natl. Oceanic and Atmos. Adm., Seattle, Wash.

[c]Numbers for non-pups represent the mean of several counts (unknown dates in Jun in 1992 and 1994).

[d]Counts from 35 mm format aerial photography.

[e]Counts from rookery walk-throughs.

[f]Number represents the maximum count (13 Aug 1996, 17 Jul 1997, 7 Jul 1998, 10 Jul 1999, 17 Jul 2000, 22 Jun 2001, 8 Jul 2002, 17 Jul 2003, 23 Jun 2004, 23 Jun 2005, 29 Jun 2006, 20 Jul 2007, and 14 Jul 2008).

[g]Counts from medium format aerial photography.

[h]Counts from high resolution digital pictures taken from a helicopter (22 Aug) and the M/V Tiglax (23 and 29 August).

Table 88. Maximum numbers of Steller sea lions observed at the rookery on the north side of Kasatochi Island, Alaska. Numbers represent the maximum observed for each category, followed by the date in parentheses.

Year	Large bulls	Females and subadult males	Total non-pups	Pups
1996	46 (21 Jun)	310 (21 Aug)	324 (21 Aug)	220 (13 Aug)
1997	39 (27 Jun)	456 (7 Aug)	484 (7 Aug)	266 (17 Jul)
1998	58 (21 Jun)	425 (16 Jul)	477 (16 Jul)	241 (7 Jul)
1999	55 (16 Jun)	484 (19 Jul)	516 (19 Jul)	271 (10 Jul)
2000	35 (17 Jul)	568 (17 Jul)	603 (17 Jul)	231 (17 Jul)
2001	49 (29 May)	482 (1 Jul)	529 (1 Jul)	241 (22 Jun)
2002	96 (8 Jul)	535 (21 Jul)	609 (21 Jul)	300 (8 Jul)
2003	56 (21 Jun)	491 (21 Jun)	547 (21 Jun)	278 (17 Jul)
2004	57 (23 Jun)	545 (23 Jun)	602 (23 Jun)	303 (23 Jun)
2005	66 (23 Jun)	479 (6 Jun)	532 (6 Jun)	322 (23 Jun)
2006	80 (10 Jun)	633 (29 Jun)	703 (29 Jun)	352 (29 Jun)
2007	87 (19 Jun)	576 (19 Jun)	663 (19Jun)	313 (20 Jul)
2008	72 (14 Jul)	351 (28 Jun)	399 (28 Jun)	303 (14 Jul)

Table 89. Numbers of Steller sea lions observed at the rookery on the north side of Kasatochi Island, Alaska in 2008.

Date	Time	Large bulls	Females and subadult males	Total non-pups	Pups
7 Jun	Early afternoon	44	252	296	117
28 Jun	Early afternoon	47	351	399	270
14 Jul	Late afternoon	72	317	389	303
30 Jul	Early afternoon	41	179	220	187
mean		51	275	326	219
max.		72	351	399	303

Table 90. Annotated list of species observed at Kasatochi Island, Alaska, 24 May-7 August 2008, with notes on incidental observations at other central Aleutian islands.

Abundance categories were defined at Kasatochi Island as follows:

Abundant: ≥50 individuals per day or 6 per hour
Common: 10-49 individuals per day or 2-5 per hour
Fairly common: 5-9 individuals per day or 1 per hour
Uncommon: 2-4 individuals per day or <1 per hour
Rare: ≤1 individual per day

For breeding status, please refer to Table 91.

Birds

Aleutian cackling goose (*Branta hutchinsii leucopareia*).--Uncommon. Early in the season at least one flock of birds was seen on several occasions. On 27 May, we observed a flock of about 30 geese flying overhead on Oystercatcher Beach from north to south. The same flock (assumed) of approximately 30 birds was seen again on 28 May throughout the day south of the cabin in the flat area below Troll Talus. On 26 June a flock of 9 geese was seen in the morning at the top of Tundering Talus. Later in the afternoon, a group of 19 was observed flying over Tundering Cove.

Eurasian wigeon (*Anas penelope*).--Rare. A single drake in full breeding plumage was occasionally observed off of Oystercatcher Beach in early to mid June. Sightings occurred on 2, 3, and 15 June, all near the north end of the beach.

Common eider (*Somateria mollissima*).--Rare. On 27 May, a male (eclipse plumage) and two females were observed loafing on rocks near Good Head Rock. The same group of three was seen again on 28 May, and the male and one female were observed again on 31 May. A full breeding plumage drake was seen on the north end of the island below the Monkey's Forehead on 7 June. On 31 July, a male in eclipse plumage and a female were observed foraging in the kelp near Dory Slot.

Harlequin duck (*Histrionicus histrionicus*).--Common. Groups of 2 to 50+ birds were observed regularly throughout the summer between Good Head Rock and Tundering Cove, feeding in nearshore waters or loafing on the rocks. Harlequin ducks were never really seen north of Tundering cove. Males were in breeding plumage from late May through late June but by 11 July, most had entered eclipse plumage.

Laysan albatross (*Phoebastria immutabilis*).--Uncommon. Small numbers of birds were regularly observed flying offshore throughout the summer. Although primarily seen on windy days with rough seas, they were also observed occasionally in calm conditions.

Northern fulmar (*Fulmarus glacialis*).--Fairly common. Small numbers of birds were regularly observed flying offshore throughout the summer, primarily on windy days with rough seas. Birds were observed from the Tiglax, on trips to Ulak on 11 June and 21 July. A single dead individual was discovered during the season on Oystercatcher Beach.

Fork-tailed storm-petrel (*Oceanodroma furcata*).--Abundant. Hundreds of birds were regularly heard at

night in the areas around Troll Talus, Peregrine Ravine, and the slopes behind Sokolniekoff Cabin; populations have been estimated during numerous nocturnal ramblings at a minimum of 500 on Troll Talus, at least 500-600 in Peregrine Ravine (Drummond 2006), and approximately 400 on Tundering Talus (Drummond and Kissler 2004). Birds were also documented nesting underneath and on the slopes behind Sokolniekoff Cabin, along the bluff above Guillemot Beach, on the slopes of Mt. Kasatochi, and at The Ladder at the north caldera rim. All nest sites monitored for productivity on Kasatochi were located in rock crevices, many composed of a mixture of rock and soil. Although composition of nests varied greatly, most nests were predominantly rock with a small soil component, often at the bottom of the nest. Murie (1936, 1959) reported that fork-tailed storm-petrels nested on the island in 1936, and that one of 46 arctic fox pellets collected in 1936-37 contained fork-tailed storm-petrel remains. Since the removal of foxes, no storm-petrels have been found nesting in entirely soil burrows. It is likely that decades of predation by foxes selected for birds that nested in deep rock crevices rather than dirt burrows.

The first chick hatched on Kasatochi on about 10 June, similar to previous years. As usual, hatching appeared highly asynchronous, with a few chicks still hatching in late July. While hatching success was relatively high at 89%, reproductive success was the lowest it has been since the inception of the current monitoring program at 45%.

Although data were collected during visits to Ulak on 11 June and 21 July, they were lost in the 7 August eruption of Kasatochi. It seemed to be a late year on Ulak; chicks were still small enough on 21 July that wing cord measurements were not taken for many of them.

Leach's storm-petrel (*Oceanodroma leucorhoa*).--Uncommon. Small numbers of birds were heard at night in the vicinity of Troll Talus. No Leach's were found during nest searches throughout the summer. However, during food sample collections for fork-tailed storm petrels on 29 July, we captured two individuals showing full brood patches, confirming that Leach's storm-petrels attempted to breed on Kasatochi in 2008 for the fourth year in a row. Since 1996, Leach's storm-petrels have been heard calling at night on Kasatochi but prior to 2005, when an individual with a full brood patch was caught in a mist-net at Troll Talus, breeding status was not confirmed. Murie (1936) did not report finding Leach's storm-petrels nesting on the island in 1936 and no Leach's remains were found in arctic fox pellets collected on the island in 1936-37. No nests with viewable contents have ever been located on the island.

Red-faced and pelagic cormorant (*Phalacrocorax urile* and *P. pelagicus*, respectively).--Absent and fairly common, respectively. Red-faced cormorants were not observed at Kasatochi, failing to attempt to breed on the island for the second year in a row. We observed a new nesting area near the sea lion rookery in addition to those in Turr Cave. Eight out of nine nests in Turr Cave contained between two and four chicks. All nests observed on 3 August had at least two chicks, and some had four. Chicks were fairly large on that date. Productivity of pelagic cormorants at Kasatochi was similar to last year and relatively high compared to many previous years, with 1.9 chicks per nest.

Bald eagle (*Haliaeetus leucocephalus*).--Uncommon. A single pair was present on Kasatochi, attending an aerie above Good Head Rock. However, no chicks were ever observed, and the adults were seen sporadically throughout late June and July, often hunting auklets on Tundering Talus. The nest near plot 2 on Ulak contained at least two large chicks on 21 July.

Peregrine falcon (*Falco peregrinus*).--Fairly common. At least five territorial pairs were present on the

island: on the cliffs at Tundering Talus, in Peregrine Ravine, in the vicinity of Turr Fjord, on the bluffs above the west end of Reindeer Beach, and along the eastern rim of the caldera. Adults, and later, fledglings, were frequently seen hunting both crested and least auklets at Tundering Talus, taking auklets in the air and off the surface of the water. While on the talus, falcons were chased and harassed constantly by glaucous-winged gulls. The nest in Peregrine Ravine was not used in 2008. There were no nests with viewable contents. During late July and August, 2-10 fledglings were seen daily at Tundering Talus and along Oystercatcher Beach, swooping on all manner of animals with varying success.

Black oystercatcher (*Haematopus bachmani*).--Fairly common. In 2008, at least two pairs of oystercatchers bred on Kasatochi. While unloading camp on 24 May, two chicks, likely less than a week old, were observed with the pair halfway down oystercatcher beach. The chicks were seen throughout the season and assumed to be fledged around 27 June, when they were observed taking short, hop flights for the first time. At Sud Slot, a single egg was found on 15 June in the area defended by that pair. We continued to monitor it, but it appeared abandoned. We saw a fledgling on 16 July, but having never seen a chick, we were unsure if it was a product of this pair. However, we did observe three fledglings between the two locations in a single trip down oystercatcher that day. Consequently, at least two nests were successful on Kasatochi this year. Before the removal of introduced arctic foxes, no oystercatchers were observed in 1980 or 1982 (Early et al. 1981, Bailey and Trapp 1986).

Rock sandpiper (*Calidris ptilocnemis*).--Uncommon. Individuals or groups of 2-4 birds were seen on the southern part of the island mainly on or around Romney Dale. Also, just north of the cabin, an individual or pair was routinely seen, but no nest was ever located. There was a possible sighting of a fledgling on the southern end of Guillemot Beach next to Good Head Rock on 6 August, but it was not confirmed.

Glaucous-winged gull (*Larus glaucescens*).--Abundant. A maximum of about 125 pairs appeared to nest on the grassy ledges inside the caldera, with a maximum of 375 individuals counted on 6 August. Gulls continued to nest in small numbers outside of the caldera for the tenth year in a row. A single nest with two eggs was found at the very rim of the caldera on 2 June near point 12 on point count route number 331. The nest was never located again. Two other nests were found on Barabara Ridge on 28 June, each containing two eggs. A chick nearing fledging size was observed near the location of one of these nests on 30 July. A fourth nest was also found in the rocks above the south end of Tundering Cove on 2 July. No chicks were ever observed near this nest; however, the eggs had disappeared by 20 July. The first fledglings were observed on 27 July on Oystercatcher Beach, and flying above Tundering Cove. On 6 August, 35-40 fledglings were observed on the SSW rim of the caldera, loafing with adults.

As in previous years, gulls patrolled the talus and nearshore waters of Tundering Cove, creating a significant disturbance to auklets during the socializing period by repeatedly flushing thousands of birds from huge sections of the talus. About 10-20 gulls regularly hunted on the talus and numerous instances of gull predation on both crested and least auklets were observed.

Black-legged and red-legged kittiwake (*Rissa tridactyla* and *R. brevirostris*, respectively).--Rare. A single observation of kittiwakes was made on Kasatochi in 2008. On 7 June below the Monkey's Forehead on the north side of the island, three kittiwakes were seen at a distance, but identification to the

species level was not possible.

Common and thick-billed murre (*Uria aalge* and *U. lomvia*, respectively).--Fairly common. Small numbers of individuals were seen frequently offshore throughout the summer but no birds were observed at the original colony at Turr Fjord, which declined in 1998 and was completely abandoned by 2001. However, as in the last few years, a small remnant population appeared to summer inside Turr Cave on the east side of the island. A small group (30-40) was observed on the ledges above Turr Cave on both 11 June and 3 August. No fledglings or birds showing incubation posture were ever observed in 2008.

Pigeon guillemot (*Cepphus columba*).--Common. On 3 August, 55 individuals were counted during an incomplete circumnavigation. This number should be considered a minimum estimate because it was conducted late in the season, and only on the northern part of the island. Throughout the summer, guillemots were most highly concentrated around the southern end of Guillemot Beach, where 15-20 individuals were regularly seen. Two nests were found in 2008, one at each at the northern and southern ends of Guillemot Beach. The nest at the northern end was found on 25 June, and contained two eggs. On 10 July, the nest had hatched a single chick. The other egg hatched by 17 July, and the nest contained two chicks, but one had died. The nest at the southern end of Guillemot beach was found on 3 July with two eggs. This nest also contained one chick and one egg on 10 July. The other egg had hatched by the next visit, and at the time we left the island on 7 August, both chicks from this nest, and the single chick from the nest at the northern end of the beach were likely within a week of fledging. At least two pairs appeared to nest in Tundering Cove, where a maximum of 11 birds were counted, and it is likely that there were additional nests on the north and northeast parts of the island. Birds were observed carrying fish into crevices by late June and were still carrying fish on our departure from the island on 7 August. The first fledgling was seen in the water off Dory Slot on 3 August.

Ancient murrelet (*Synthliboramphus antiquus*). -- Fairly common. Ancient murrelets were confirmed as having bred successfully on Kasatochi for the fifth year in a row, with several nests located on Troll Talus producing eggshells and or membranes. However, no fledglings were ever actually observed. Although a single individual was found within the wall of the cabin on 27 May, there were no nests underneath the cabin in 2008. All nests were located in rocky habitat and composed of a mixture of rock and soil. No ancient murrelets have ever been found in soil burrows on Kasatochi, presumably because of the island's history of foxes. Murie (1959) reported finding ancient murrelet remains in 2 of 46 arctic fox pellets collected in 1936-37, suggesting that ancient murrelets nested on Kasatochi in the past.

Kittlitz's murrelet (*Brachyramphus brevirostrus*). –Rare. An adult Kittlitz's murrelet was found onboard the M/V Tiglax the morning of the Kasatochi offload. The bird likely landed on the ship during the night and was probably not associated with Kasatochi. This is the first sighting of a marbled murrelet on Kasatochi since the current monitoring program began in 1996.

Kittlitz's murrelet onboard M/V Tiglax 24 May 2008

Marbled murrelet (*Brachyramphus marmoratus*).--Rare. A single fledgling was seen off of Dory Slot on 3 August 2008. This is the first sighting of a marbled murrelet on Kasatochi since the current monitoring program began in 1996.

Marbled murrelet fledgling observed 3 August 2008

Cassin's auklet (*Ptychoramphus aleuticus*).--Absent. Not observed on Kasatochi in 2008. As in past years, Cassin's auklets occupied several burrows in plot 2 at Ulak Island. However, the data collected on Ulak were lost in the 7 August eruption of Kasatochi.

Parakeet auklet (*Aethia psittacula*).--Abundant. Small nearshore rafts of birds were observed all around the northern half of the island from Dory Slot to Rye Point, and on the southwest coast near Good Head Rock. Over 100 individuals were commonly seen in Tundering Cove. Birds were seen landing onshore and entering crevices among the beach boulders in Tundering Talus and the north side of Barabara Ridge, flying singly to and from the water without the protection of huge swarming flocks. On several occasions, parakeet auklets landed on the banding plot with flocks of crested and least auklets and stood around looking interested in the surrounding activity for several minutes before returning to the water. Unlike 2007, Glaucous-winged gulls were not observed preying on parakeet auklets. Seven nests were monitored for productivity on Guillemot Beach and Tundering Talus. All seven nests were successful and either the chicks had fledged, or the nests contained chicks old enough to be considered fledged by the time we departed the island on 7 August.

Least auklet (*A. pusilla*).--Abundant. The average maximum number of least auklets attending surface plots was comparable to recent years but overall patterns continue to exhibit a general trend of decreased numbers of least auklets on index plots since 1999. Least auklets comprised from 28-34% of auklets observed on surface count plots, and on almost all surface count plots throughout the summer there were fewer least auklets than crested auklets. The number of birds attending surface count plots peaked on 27 and 30 June, later than last year and even with the peak of crested auklets this year. Subadults comprised an average of 19% of the least auklets counted on surface count plots, slightly lower than last year and levels counted in 1996-1999 and 2001-2003, but similar to the previous three years. Daily social activity on the surface was highly variable and changed throughout the season; in early June, birds socialized on the talus from about 1000-1500h, and gradually extended social hours until almost 1800h by mid July. Chicks hatched between 24 June and 14 July, although some chicks likely hatched before that, as an adult was first observed carrying food on 22 June. The median hatch date was 28 June, one day later than the mean of previous years. The first fledgling was observed bumbling its way through the talus to the sea on 20 July, while chicks in nests monitored for productivity began fledging by 22 July and continued through 3 August. There were still chicks present in our productivity crevices upon our departure. It is probable that there would be later fledge dates for least auklets had our season not been truncated by the 7 August eruption of Kasatochi. For known-fate nest sites, overall reproductive success was 61%, identical to last year, and the highest since 2000.

Whiskered auklet (*A. pygmaea*).--Common. Dozens of adults, and later chicks, were frequently heard calling from crevices at night on Guillemot Beach, in Peregrine Ravine, and on Troll Talus throughout June and July. Murie (1959) reported finding whiskered auklet remains in one of 46 arctic fox pellets collected in 1936-37, suggesting that the birds nested on Kasatochi in the past. Of five crevices monitored for productivity on Troll Talus, and the Whiskering Rocks, one egg was lost to disappearance; four eggs hatched between 16 and 22 June, but only one chick survived to fledge.

At Ulak Island, birds were not heard calling from the beach below plot 2, although they had been heard in previous years.

Crested auklet (*A. cristatella*).--Abundant. The average maximum number of crested auklets attending

surface plots was lower than last year, but comparable to the numbers recorded in 2005-2006. Crested auklets comprised from 66-72% of the sum of maximum auklets counted each day, and on almost all surface count plots throughout the summer there were more crested auklets than least auklets. The number of crested auklets attending surface count plots peaked on 30 June, about a week earlier than last year, but similar to 2006. As with least auklets, daily social activity on the surface was highly variable and changed throughout the season, becoming later as the season progressed. There was also notable spatial variable in surface activity, with the birds at the northern end of the talus near the Copper Cliffs consistently beginning socialization earlier in the day and remaining on the surface later in the evening compared to birds elsewhere on the talus. Chicks hatched between 24 June and 12 July, with a median hatch date of 2 July, one day later than the mean of previous years. Adults began losing their bill plates about the time chicks began hatching. The first fledgling was observed bumbling its way through the talus to the sea on 20 July, although chicks in nests monitored for productivity began fledging by 26 July and continued through 3 August. There were still chicks present in our productivity crevices upon our departure. It is probable that there would be later fledge dates for crested auklets had our season not been truncated by the 7 August eruption of Kasatochi. For known-fate nest sites, overall reproductive success was 77%, the highest success ever recorded for crested auklets on Kasatochi

Horned puffin (*Fratercula corniculata*).--Abundant. Horned puffins were observed on the water, circling the cliffs, and perched on boulders and ledges around the northern half of the island and Good Head Rock. At Tundering Talus, birds were regularly observed in the nearshore waters and at the base of the cliffs, although none were seen entering crevices in the cliffs or on the talus itself. Birds were first observed carrying food in Tundering Cove on 25 July.

Tufted puffin (*F. cirrhata*).--Abundant. Tufted puffins were observed in the waters and perched on boulders and cliffs around the north half of the island. About 30-100 birds were regularly observed on the nearshore waters of Tundering Cove and circling the cliffs above Tundering Talus, where individuals were seen entering cracks and perched on ledges throughout the summer. As in the five previous years, several birds were observed entering and exiting crevices in Tundering Talus itself and in the small rubble piles at the base of the cliffs, suggesting puffins are re-inhabiting non-cliff areas since the removal of arctic foxes. At least five pairs of tufted puffins nested on the north end of Tundering Talus. Although the nests themselves were never found, there were five distinct places puffins were seen delivering food to in the general vicinity of TUPU Rock. Puffins were also observed circling the cliffs beyond the west end of Reindeer Beach towards Good Head Rock, and on the water, circling the cliffs, and perched on boulders and ledges along the north and east sides of the island. Adults were first observed carrying food in Tundering Cove on 25 July.

At Ulak Island, birds were carrying food on 21 August.

Common raven (*Corvus corax*).--Fairly common. Two individuals were seen almost daily throughout the summer, primarily from Troll Talus to Tundering Talus, flying together in a playful manner with frequent loud vocalizations. Birds were often observed kleptoparasitizing gulls and peregrine falcons at Tundering Talus, and were seen eating auklets on several occasions. A single pair of ravens was also regularly observed caching food in the bluffs above Oystercatcher Beach, and around Whiskering Rocks after making multiple trips back and forth to Tundering Talus to get auklet eggs or chicks. On 15 July a cache was found towards the top of Whiskering Rocks, when a raven was observed flying with a crested auklet chick. The chick was found expired, but still warm, wedged in

between a large rock and the vegetation.

Winter wren (*Troglodytes troglodytes*).--Abundant. Birds were observed most frequently along boulder beaches and on talus fields. First fledglings were seen on 11 July, between Sokolniekoff cabin and Troll Talus. Thereafter, broods with attendant adults were common through the end of the season. Three nests were found on Tundering Talus, and two others were found on the slope meeting the beach below Troll Talus. Throughout July adults were regularly seen bringing food back to nests, as well as to fledglings.

Song sparrow (*Melospiza melodia*).--Abundant. Birds were observed all around the island, but were most common on boulder beaches, talus fields, and around Sokolniekoff Cabin. A nest was found half way down Oystercatcher Beach in the bank. It contained three small chicks on 2 June, and had fledged by 15 June. The first fledgling was observed on 11 June below Sokolniekoff Cabin on the beach. Throughout the later half of the summer, fledglings were frequently heard practicing their songs along Oystercatcher Beach. On 5 June, near Rye Point, we observed an individual that appeared to be a partial albino. The bird was about 25% white overall. There was a small amount of white on the head, in addition to the rump, upper tail coverts, and about one half of the tail being predominantly white.

Lapland longspur (*Calcarius lapponicus*).--Abundant. Birds were observed primarily on grassy slopes all around the island, and less frequently along the beach. The first fledgling was observed on 15 June in the grassy area above Oystercatcher Beach.

Snow bunting (*Plectrophenax nivalis*).--Rare. On 9 July, two males were observed on the eastern rim of the caldera However, no nests or fledglings were ever observed.

Gray-crowned rosy finch (*Leucosticte grisenucha*).--Abundant. Birds were observed regularly all over the island, but were most numerous in rocky areas, such as along boulder beaches and among the rocks on Troll Talus, in Peregrine Ravine, and on Tundering Talus. Nests were found in the soil banks on Oystercatcher and Guillemot Beaches; in the vegetation on the slopes of Whiskering Rocks and Peregrine Ravine; and near the top of Tundering Talus. The first fledgling was seen on 6 June in Peregrine Ravine. Throughout July and August, fledglings were numerous in Peregrine Ravine and on Troll Talus and Oystercatcher Beach, often accompanied by adults. Groups of 18-23 birds were regularly seen at the north end of Oystercatcher Beach after mid July.

Mammals

Sea otter (*Enhydra lutris*).--Absent. No sea otters were seen in 2008. In 2003, an otter was observed in Tundering Cove on 12 and 14 July, actively foraging very close to shore. In 2001, a single individual was seen in the kelp bed in front of the cabin on 18 June. In contrast to previous observations, and despite an abundance of dense kelp beds and urchins, no sea otters were observed from 1996-2000. In April 1992, five otters were observed during an aerial survey (Evans et al. 1997). In June 1991, up to 13 otters were seen daily along the west coast (Thomson and Wraley 1992). In 1984, Deines and Willging (1985) reported sea otters were numerous in offshore kelp beds; in 1982, 15 were counted (Bailey and Trapp 1986); and in 1980, 20 adult sea otters and five pups were counted around the entire island at a density of 2.6 otters per km of shoreline (Early et al. 1981). No sea

otters were observed in 1961 (Kenyon and Rice 1961).

A single otter was observed at Ulak Island on 22 July 1998.

Steller sea lion (*Eumetopias jubatus*).--Abundant. Numbers of sea lions attending the rookery on the north side of the island appeared lower than observed during the past five years. Peak counts were 78 large bulls and 303 pups on 14 July, and 376 females and subadult males on 28 June. Pups were born throughout June and were swimming in unprotected waters by mid July. About 100-200 animals appeared to move from the rookery to sandy areas on Reindeer Beach by early August, but their location on the beach varied. Individuals and small groups were sighted frequently around the island, hauled out or patrolling nearshore waters. Small numbers of boisterous animals were heard growling and playing in the surf below the cabin nearly every night. Sea lions were occasionally observed tearing apart large unidentified fish in Tundering Cove. On 27 June, a subadult male was observed eating a large octopus in Tundering Cove.

22 August SW coast

After the 7 August eruption, groups of sea lions were observed from a helicopter on 22 August and from the M/V Tiglax on 23and 29 August. Counts from high resolution digital photographs yielded approximately 162 adults on 22 August; 170 adults on 23 August, and 206 on 29 August. Only two pups were seen on 29 August, and not on any other visit.

Harbor seal (*Phoca vitulina*).--Uncommon. One to three individuals, including one pup, were occasionally observed on Oystercatcher and Reindeer beaches, swimming in the nearshore waters or hauled out on the rocks at the water's edge. A dead pup was found in late July at the very southern end of Guillemot Beach. The carcass was too decayed to determine a cause.

Minke whale (*Balaenoptera acutorostrata*).--Absent. Several potential sightings in 2008, but at too great a distance to be confirmed.

Stejneger's beaked whale (*Mesoplodon stejnegeri*).--Absent. Not observed on Kasatochi in 2008.

Previous observations:

In 2007, three individuals were observed at close range in Tundering Cove throughout the day on 25 June. Some aspects of appearance and behavior were similar to what has been observed in previous years (see below). The whales were first seen at approximately 1000h, about 60 m offshore in front of the blind. Between 1000h and 1615h, they surfaced at 15 to 25-minute intervals a total of 20 times, ranging from 60-100 m offshore. Around 1715h, the animals were observed just past the edge of Parakeet Point, heading away from the island, after which they were not observed again. All three whales were approximately five meters in length. Two individuals were dark brown, with numerous small, round, light tan spots scattered across their bodies. One of the dark brown animals also had two large tan-colored blotches on its upper back, behind the head, along either

side of the spine. The third individual was primarily tan colored, except for dark brown coloration with tan spots from the dorsal fin to tail, and a small area of dark brown coloration behind the melon. All three exhibited numerous scars of thin, lighter-colored lines running horizontally across their backs, perpendicular to their length. Breathing was loud and distinctive and could be heard over the chatter of hundreds of thousands of auklets; it sounded somewhat explosive, as if someone was blowing short, sharp breaths into a tube. No spray or plumes were ever observed from their blows. As noted in previous years, the whales surfaced and dove in unison, generally remaining on the surface for a minute or less in between dives, which lasted about 15-25 minutes. When on the surface, they floated high in the water, with the bulbous part of their heads entirely out of water and much of their upper backs exposed, although never their dorsal fins. When cruising slowly on the surface, the three whales often traveled abreast and in very close proximity, within several meters of each other, although a few times the animals were slightly more spread out, forming a diagonal line. Even when swimming more dispersed, the whales always traveled in the same direction and changed direction together. There did not appear to be an obvious pattern of organization of individual whales within the group (i.e. no one whale always appeared in the middle, or in front). Before diving, whales appeared to bob their bodies up and down several times. On the dive, their heads disappeared underwater first, slowly followed by their long bodies, with dorsal fins appearing just before the whales completely disappeared under surface. Flukes were never seen on dives. The light colored whale was sometimes delayed just seconds behind the dives of the other two.

Photo B.A. Drummond

No beaked whales were observed at Kasatochi in 2005-2006. However, prior to 2005, Stejneger's beaked whales had been observed very close to shore for eight years in a row (Table 120). The following detailed descriptions of behavior and appearance come from previous years. Length was estimated at about five m in 1998, and in 1999 two distinctly different sizes were noticed - the smaller whales seemed to be about five meters, and the larger whales one or two meters longer. From cliffs looking down on the whales less than 50 m from shore in 1999, they were observed to be aligned perfectly "asnout" of one another, apparently in three pairs, each consisting of one larger and one smaller whale. Some animals in 1999 were a tawny silver-gray, and others were a darker tawny slate; some appeared to have paler blotches, and all had many long white

scratches or scrapes. The behavior and appearance of the whales was similar in 1997-1999, and in 1999 a detailed account of behavior was described: a pod of whales surfaced all abreast within a few seconds of each other, their bulbous foreheads showing as they surfaced. They then remained nearly motionless at the surface, still abreast of each other, and breathed loudly for one to two minutes, with little or no forward movement. Unless their foreheads dipped below the surface of the water, their breaths after the first surface blow were invisible. While at the surface, occasionally a snout would be visible, but not clearly enough to see the protruding teeth apparent in illustrations of the species. After a couple of minutes at the surface, the whales simultaneously humped their backs two to three times such that their dorsal fins were visible, then all dove in unison; their flukes did not show above the surface of the water when they dove. The pre-dive humping movements varied in their level of exuberance; sometimes it was a gentle buoyant bouncing, and others it was a bounding splashy affair reminiscent of porpoising, except that the whales were not moving forward. Typically the whales stayed down for 5-15 minutes for several dives, spending one to two minutes at the surface between dives, and then dove for an unknown but presumably longer period of time, apparently departing the area underwater, since despite vigilant observation, they were rarely seen again the same day. Flukes were never seen, even when the whales made their final long dives. Occasionally when the whales surfaced they were in a close-knit circle, all facing the center, but once they were all on the surface they immediately rearranged themselves into a single line, abreast of each other. In 2000, one of the whales exhibited unusual behavior, snorting loudly like a horse, lifting its head and tail out of the water, and flopping sideways into the water with huge splashes. In 2002, whales were observed staying down for longer periods of time when they dove, up to 30 minutes. In 2003, five individuals were observed at extremely close range from the rocks above Dory Slot. One individual was a distinctly tawny color varying greatly from the other four darker gray individuals. During one hour of observation the whales would surface in near unison in a line formation with the tawny individual in the middle of the four gray individuals. Before diving some of the animals would break off from the line and dive in a distinctly different direction. After approximately 10 minutes they would resurface with the tawny animal always in the central position. In 2004, a group of four whales was observed on the north end of Tundering Cove, floating at the surface for several minutes before diving. The whales reappeared five minutes later, traveling south across Tundering Cove in a tight group, breathing heavily with explosive force, and disappeared beyond view past Parakeet Slot.

Orca (*Orincus orca*).--Uncommon. On clear days, small groups were occasionally seen to the WNW of Kasatochi. On 25 May, two adults with two calves were observed In Tundering Cove, heading from south to north. A single whale was seen to the WNW of the island during an auklet surface count on 12 June. On 15 July, a group of at least nine individuals, including three calves, was observed just past the kelp bed in front of the cabin. They traveled in a tight pod from north to south, but then headed west and out view into the fog.

Sperm whale (*Physeter macrocephalus*).--Uncommon. On clear days, up to two individuals were frequently seen to the north and to the west of Tundering Talus.

Dall's porpoise (*Phocoenoides dalli*).--Uncommon. On 24 May, at least three individuals were observed from the M/V Tiglax prior to offloading the camp. On 30 July a small group of individuals (<10) was seen, apparently feeding, approximately one mile NNW of Tundering Cove.

Table 91. Breeding status and abundance of birds (and marine mammals) observed at Kasatochi Island, Alaska. Breeding status codes: C=confirmed (observations of current nests, eggs, or chicks, adults carrying nesting materials or food to nests or chicks, recently fledged young, distraction displays), P=probable (observations of pairs or territorial behavior), X=possible but not likely (species seen or heard, but no other evidence for breeding). Abundance codes: 5=abundant (>50/day or 6/hr), 4=common (10-50/day or 2-5/hr), 3=fairly common (5-9/day or 1/hr), 2=uncommon (2-4/day or <1/hr), 1=rare (1/day). Dashes indicate the species was not seen that year.

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Aleutian cackling goose	--	X-2	X-2	X-2	X-2	X-2	X-2	X-1	X-1	X-2	--	X-2	X-2
Falcated teal	--	--	X-1	--	--	--	--	--	--	--	--	--	--
Eurasian wigeon	--	X-1	--	--	--	--	--	--	X-1	--	--	X-1	X-2
Northern pintail	--	--	--	X-1	--	--	--	--	X-1	--	--	--	--
Green-winged teal	--	--	--	X-1	--	X-1	--	--	--	--	X-1	X-1	--
Common eider	--	X-1	X-1	--	--	--	--	X-1	X-1	X-1	X-1	X-1	X-2
Harlequin duck	X-4	X-4	X-4	X-4	X-4	X-3	X-4	X-3	X-3	X-3	X-4	X-4	X-4
Bufflehead	--	X-1	--	--	--	--	--	--	--	--	--	--	--
Red-breasted merganser	X-1	--	--	--	--	X-1	--	--	--	--	--	--	--
Rock ptarmigan	--	--	--	--	--	X-1	--	--	--	--	--	--	--
Salvin's (Shy) albatross	--	--	--	--	--	--	--	X-1	--	--	--	--	--
Laysan albatross	--	--	X-1	X-2	X-2	X-2	X-2	X-1	X-2	X-2	X-2	X-2	X-2
Black-footed albatross	--	--	--	--	--	--	--	--	--	X-1	--	X-1	--
Short-tailed albatross	--	--	--	--	--	--	--	X-1	--	--	--	--	--
Northern fulmar	X-1	X-1	X-1	X-3	X-2	X-2	X-2	X-2	X-2	X-3	X-3	X-3	X-3
Shearwater spp.	--	X-1	X-1	X-2	X-2	X-2	X-2	X-1	X-1	X-1	X-1	--	--
Short-tailed shearwater	--	--	--	--	--	--	--	--	--	X-1	--	--	--
Fork-tailed storm-petrel	X-4	X-4	C-4	P-4	C-4	C-4	C-4	C-5	C-5	C-5	C-5	C-5	C-5
Leach's storm-petrel	X-2	X-2	--	X-2	P-2	X-2	X-2	P-2	P-2	C-2	C-2	C-2	C-2
Red-faced cormorant	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-3	C-4	C-3	C-3	--	--
Pelagic cormorant	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-3	C-4	C-3	C-3	C-3	C-3
Bald eagle	C-2	C-3	C-3	C-3	C-3	P-3	C-3	C-2	C-3	C-3	C-2	C-2	C-2
Peregrine falcon	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-4	C-4	C-3	C-3	C-4
Black oystercatcher	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3	C-3
Common sandpiper	--	--	--	X-1	--	--	--	--	--	X-1	--	--	--
Wandering tattler	--	--	--	--	--	--	--	--	--	X-1	--	--	--
Wood sandpiper	--	--	X-1	--	--	--	--	--	--	--	--	--	--
Rock sandpiper	C-3	C-3	C-3	C-3	C-3	C-2	C-2	C-2	--	C-2	P-2	P-2	P-2
Glaucous-winged gull	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
Black-legged kittiwake	--	--	--	X-1	X-1	--	--	--	--	--	--	--	--
Dovekie	--	--	--	X-1	--	X-1	--	--	--	--	--	--	--
Common murre	C-5	C-5	C-5	C-5	C-5	C-4	C-4	X-2	X-4	X-4	X-3	P-3	X-2
Thick-billed murre	C-5	C-5	C-5	C-5	C-5	C-4	C-4	X-2	X-4	X-4	X-3	P-3	X-2
Pigeon guillemot	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4
Ancient murrelet	X-2	X-3	X-3	X-3	X-2	--	X-2	C-2	C-2	C-4	C-3	C-3	C-3
Marbled murrelet	--	--	--	--	--	--	--	--	--	--	--	--	X-1
Cassin's auklet	X-1	--	--	--	--	--	--	--	--	--	--	X-1	--
Parakeet auklet	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
Least auklet	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
Whiskered auklet	C-3	C-2	--	C-2	--	C-2	C-3	C-4	C-4	C-4	C-4	C-4	C-5
Crested auklet	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
Horned puffin	X-4	C-4	C-4	C-4	C-4	C-4	C-4	C-3	C-4	C-4	C-4	C-5	C-5
Tufted puffin	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-5	C-5	C-5	C-5	C-5	C-5
Short-eared owl	--	--	--	--	--	X-1	--	--	--	--	--	--	--
Common raven	X-3	C-3	C-3	P-3	P-3	P-2	P-3	P-2	P-3	P-3	P-3	P-3	P-3
Winter wren	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-5	C-5	C-5	C-5
Siberian flycatcher	--	--	--	--	--	--	--	X-1	--	--	--	--	--
Eye-browed thrush	--	--	--	--	--	--	--	X-1	--	--	--	--	--
Yellow wagtail	--	--	X-1	--	--	X-1	--	--	--	--	--	--	--
Grey wagtail	--	--	--	--	--	--	--	X-1	--	--	--	--	--
Song sparrow	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-5	C-5	C-5	C-5
Lapland longspur	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-5	C-4	C-5	C-5	C-5	C-5
Snow bunting	P-2	C-2	--	P-2	--	--	C-2	C-2	P-2	C-2	P-2	P-2	P-2
Brambling	--	--	--	--	--	X-2	--	X-1	X-1	X-1	--	--	--
Rosy finch	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-4	C-5	C-5	C-5	C-5
Common redpoll	--	--	--	--	--	X-1	--	--	--	--	--	--	--

Sea otter	--	--	--	--	--	X-1	--	X-1	--	--	--	--	--
Steller sea lion	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
Northern fur seal	--	--	--	--	--	--	--	--	--	X-1	--	X-1	--
Harbor seal	X-3	X-3	X-2	X-2	X-3	X-3	X-3	X-2	P-2	C-3	X-2	X-2	X-2
Minke whale	--	X-1	--	--	--	--	--	--	X-1	X-1	X-1	X-1	--
Stejneger's beaked whale	--	X-3	X-3	X-3	X-3	X-3	X-3	X-3	X-1	--	--	X-1	--
Orca	--	--	X-2	X-2	--	X-1	X-2	X-2	X-2	X-2	X-2	X-2	X-2
Sperm whale	--	--	--	X-1	X-1	X-1	X-1	X-2	X-2	X-2	X-2	X-2	X-2
Dall's porpoise	--	--	X-3	--	--	X-2	X-3	X-1	X-2	--	X-2	X-2	X-2

Table 92. Appearance of first fledglings at Kasatochi Island, Alaska. Dashes indicate the species did not breed successfully that year; question marks indicate fledglings were not observed.

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fork-tailed storm-petrel	--	--	?	--	?	?	?	?	20 Aug	?	15 Aug	?	--
Black oystercatcher[a]	8 Jun	4 Jun	10 Jun	1 Jun	25 May	21 May	23 Jun	30 May	31 May	27 May	29 Jun	late Jun	mid Jun
Glaucous-winged gull	8 Aug	7 Aug	12 Aug	13 Aug	6 Aug	1 Aug	27 Jul	16 Jul	18 Jul	21 Jul	27 Jul	13 Aug	27 Jul
Common murre	25 Aug	24 Aug	--	--	--	--	--	--	--	--	--	--	--
Thick-billed murre	19 Aug	21 Aug	--	--	--	--	--	--	--	--	--	--	--
Murre spp.	--	--	--	--	--	--	--	--	--	--	--	16 Aug[b]	--
Pigeon guillemot	29 Jun	8 Aug	late Aug	17 Aug	late Aug	?	12 Aug	12 Aug	14 Aug	14 Aug	1 Sep	17 Aug	3 Aug
Ancient murrelet	--	--	--	--	--	--	--	--	5 Jul	30 Jun	20 Jul	7 Jul	--
Parakeet auklet	?	?	4 Aug	2 Aug	29 Jul	?	15 Aug	25 Jul	18 Aug	5 Aug	?	6 Aug	--
Whiskered auklet	?	?	--	?	--	?	?	15 Jul	?	?	?	23 Jul	--
Crested auklet	22 Jul	27 Jul	31 Jul	29 Jul	21 Jul	25 Jul	21 Jul	26 Jul	4 Aug	27 Jul	29 Jul	28 Jul	20 Jul
Least auklet	12 Jul	18 Jul	23 Jul	23 Jul	16 Jul	19 Jul	17 Jul	24 Jul	18 Jul	16 Jul	24 Jul	28 Jul	20 Jul
Bald eagle	--	late Aug	early Jul	early Aug	late Aug	--	6 Aug	10 Jul	26 Jul	4 Aug	24 Jul	--	--
Peregrine falcon	3 Jul	?	14 Jul	?	16 Jul	9 Jul	25 Jun	3 Jul	11 Jul	29 Jun	6 Jul	6 Jul	8 July
Winter wren	28 Jun	11 Jul	9 Jul	9 Jul	27 Jun	6 Jul	7 Jul	8 Jul	30 Jun	28 Jun	5 Jul	22 Jun	11 July
Song sparrow	9 Jun	8 Jun	19 Jun	25 Jun	24 Jun	8 Jul	3 Jul	13 Jun	16 Jun	1 Jun	14 Jun	21 Jun	11 Jun
Lapland longspur	9 Jul	3 Jul	late Jun	mid Aug	1 Aug	8 Jul	8 Jul	10 Jul	13 Jul	28 Jun	6 Aug	19 Jun	15 Jun
Snow bunting	--	--	--	--	--	--	18 Jul	17 Jul	--	1 Aug	--	--	--
Rosy finch	13 Jun	10 Jul	14 Jul	16 Jun	5 Jul	17 Jun	20 Jun	14 Jun	22 Jun	19 Jun	28 Jun	12 Jun	6 Jun

[a]Dates for black oystercatchers in some years may represent the appearance of first chick.

[b]Murre species could not be identified in 2007. In addition, breeding success of murres on Kasatochi could not be confirmed, and it is unknown whether the fledgling came from Kasatochi or a nearby island.

Table 93. Flowering chronology of commonly observed plants at Kasatochi Island, Alaska. Data in 2008 were collected, but most were lost in the eruption of 7 August 2008.

Family	Scientific name	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Lycopodiaceae	*Lycopodium selago selago*	--	--	--	--	11 Jun	8 Jul	--	late Jul	--	--	--	--
	L. annotinum annotinum	--	--	--	--	11 Jun	--	--	--	--	--	--	--
Athyriaceae	*Cystopteris fragilis fragilis*	--	--	--	--	30 Jun	--	<27 Jun	early Aug	--	--	--	--
	Athyrium filix-femina cyclosorum	--	--	--	--	21 Jun	--	< 7 Jul	early Aug	--	--	--	--
Polypodiaceae	*Polypòdium vulgàre occidentàle*	--	--	--	--	21 Jun	--	--	--	--	--	--	--
Graminae	*Poa* spp.	--	--	--	mid Jul	11 Jun	mid Jun	--	early Jul	--	--	23 Jun	--
	Leymus arenarius mollis	mid Jul	--	mid Jul	--	14 Jun	25 Jun	--	early Jul	24 Jun	26 Jun	26 Jun	--
	Calamagrostis spp.	--	--	--	--	14 Jun	--	--	--	--	--	--	--
	Festuca rubra aucta	--	--	--	--	14 Jun	30 May	late Jun	early Jul	--	--	--	--
	Phleum commutatum americanum	late Jul	--	mid Jul	--	11 Jun	--	late Jun	late Jul	18 Jul	27 Jun	26 Jun	--
Cyperaceae	*Carex* spp.	late Jun	--	24 Jun	--	11 Jun	1 Jun	--	3 Aug	late Jun	--	28 Jun	--
Juncaceae	*Luzula multiflora multiflora*	late Jul	--	mid Jul	--	29 May	--	7 Jun	early Jul	--	--	--	--
	L. multiflora kobayasii	late Jul	--	mid Jul	--	15 Jun	mid Jun	--	--	--	--	--	--
	Juncus spp.	--	--	--	16 Jul	21 Jun	--	--	--	--	--	--	--
Orchidaceae	*Platanthera convallariaefolia*	<29 May	6 Jul	26 Jun	4 Jul	21 Jun	25 Jun	22 Jun	5 Jul	25 Jun	23 Jun	1 Jul	--
	P. dilatata	6 Jul	--	26 Jun	4 Jul	22 Jun	15 Jun	25 Jun	5 Jul	25 Jun	24 Jun	29 Jun	--
	Listera cordata	--	--	10 Jul	10 Jul	21 Jun	5 Jun	7 Jun	5 Jul	--	27 Jun	--	--
Salicaceae	*Salix arctica*	16 Jul	--	24 Jun	--	30 Jun	1 Jun	--	--	1 Aug	12 Jul	20 Jul	--
Polygonaceae	*Oxyria digyna*	22 Jul	--	--	--	11 Jun	8 Jul	17 Jul	14 Aug	--	--	4 Aug	--
Portulacaceae	*Claytonia sibirica*	<29 May	19 Jun	10 Jun	1 Jun	2 Jun	5 Jun	2 Jun	11 Jun	30 May	25 May	9 Jun	--
Caryophyllaceae	*Honckenya peploides major*	13 Jun	23 Jun	29 Jun	20 Jun	7 Jun	7 Jun	27 Jun	3 Jul	30 Jun	13 Jun	7 Jun	--
	Cerastium fischerianum	27 Jun	--	16 Jun	20 Jun	31 May	12 Jun	21 Jun	5 Jul	1 Jul	10 Jun	23 Jun	--
	Sagina saginoides	2 Aug	--	9 Jul	6 Jul	3 Jul	25 Jun	early Jun	--	--	--	--	--
Ranunculaceae	*Aconitum maximum*	23 Jul	12 Aug	late Aug	mid Aug	10 Aug	9 Aug	--	3 Aug	27 Jul	27 Jul	13 Aug	--
	Ranunculus grandis	<29 May	6 Jun	23 May	<21 May	<21 May	<19 May	<29 May	<23 May	<25 May	22 May	<26 May	--
	Anemone narcissiflora villosissiflora	<29 May	6 Jun	6 Jun	30 May	<21 May	<19 May	<29 May	<23 May	<25 May	26 May	<26 May	27 May
Cruciferae	*Draba hyperborea*	<29 May	15 Jun	3 Jun	1 Jun	25 May	mid Jun	7 Jun	2 Jun	2 Jun	6 Jun	27 May	--
	D. borealis	10 Jun	15 Jun	2 Jun	30 May	25 May	26 May	<1 Jun	4 Jun	13 Jun	4 Jun	--	31 May
	D. aleutica	--	--	30 May	15 Jun	1 Jun	mid Jun	--	--	13 Jun	26 May	--	--
	Cochlearia officinalis oblongifolia	11 Jun	11 Jun	--	7 Jun	4 Jun	3 Jul	15 Jun	early Jul	--	--	1 Jun	--
	Cardamine umbellata	14 Jun	22 Jun	2 Jun	4 Jun	23 May	27 May	20 Jun	--	6 Jul	22 Jun	--	--
Saxifragaceae	*Parnassia kotzebuei*	23 Jul	--	--	--	3 Jul	12 Jul	4 Jun	--	21 Jul	8 Jul	14 Jul	--
	Saxifraga punctata insularis	23 Jun	early Jul	2 Jul	17 Jul	15 Jun	10 Jul	8 Jun	14 Jul	18 Jul	20 Jul	16 Jul	--
	S. bracteata	26 Jun	--	17 Jun	20 Jun	12 Jun	16 Jun	18 Jun	--	5 Jul	22 Jun	--	--
Rosaceae	*Sibbaldia procumbens*	mid Aug	--	10 Jul	early Aug	--	10 Jul	late Jun	--	--	--	--	--
	Potentilla villosa	<29 May	18 Jun	13 Jun	15 Jun	26 May	late May	<29 May	6 Jun	15 Jun	8 Jun	28 May	--
	Geum macrophyllum	--	--	--	--	--	--	--	--	18 Jul	26 Jun	29 Jun	--
Leguminosae	*Lupinus nootkatensis*	<29 May	14 Jun	5 Jun	9 Jun	22 May	<19 May	<29 May	24 May	<25 May	<21 May	27 May	--
Violaceae	*Viola langsdorffii*	10 Jun	21 Jun	24 Jun	6 Jul	11 Jun	15 Jun	7 Jun	13 Jun	4 Jun	4 Jun	9 Jun	--
Onagraceae	*Epilobium glandulosum*	20 Jul	--	30 Jun	6 Jul	19 Jun	26 Jun	27 Jun	early Jul	8 Jul	5 Jul	13 Jul	--
Umbelliferae	*Heracleum lanatum*	23 Jul	28 Jun	16 Jul	17 Jul	15 Jul	10 Jul	6 Jun	16 Jul	4 Jul	11 Jul	13 Jul	1 Jul
	Angelica lucida	23 Jul	28 Jun	16 Jul	20 Jun	19 Jun	16 Jun	26 Jun	16 Jul	1 Jul	23 Jun	15 Jun	--
	Ligusticum scoticum-Hultenii	23 Jul	7 Jul	5 Jul	10 Jul	30 Jun	3 Jul	28 Jun	mid Jul	4 Jul	28 Jun	24 Jun	--
	Conioselinum chinense	4 Jul	31 Jul	7 Aug	15 Jul	22 Jul	19 Jul	8 Jun	21 Jul	17 Jul	24 Jul	30 Jun	--

Table 93 continued. Flowering chronology of commonly observed plants at Kasatochi Island, Alaska. Data in 2008 were collected, but most were lost in the eruption of 7 August 2008.

Family	Scientific name	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Empetraceae	*Empetrum nigrum* (first ripe berries)	late Jul	mid Aug	late Aug	13 Aug	11 Jul	11 Aug	17 Jul	--	4 Aug	12 Aug	4 Aug	14 Jul
Primulaceae	*Trientalis europaea*	9 Jul	early Aug	28 Jul	--	22 Jun	8 Jul	17 Jul	--	27 Jul	12 Jul	20 Jul	--
	Primula cuneifolia saxifragifolia	17 Jun	7 Jul	19 Jul	17 Jul	22 Jun	15 Jun	17 Jul	--	--	29 Jun	--	--
Gentianaceae	*Gentiana amarella acuta* var. *plebeja*	1 Aug	--	11 Aug	29 Jul	27 Jul	25 Jul	late Jun	4 Aug	21 Jul	4 Aug	28 Jul	--
Scrophulariaceae	*Rhinanthus minor borealis*	31 Jul	--	6 Aug	31 Jul	27 Jul	--	23 Jul	4 Aug	21 Jul	27 Jul	4 Aug	--
	Mimulus guttatus	1 Aug	--	--	--	--	--	--	--	--	--	--	--
	Veronica serpyllifolia humifusa	22 Jul	--	16 Jul	--	30 Jun	8 Jul	--	14 Aug	27 Jul	12 Jul	12 Jul	--
	V. stelleri	22 Jul	--	28 Jul	17 Jul	11 Jul	8 Jul	--	3 Aug	27 Jul	12 Jul	20 Jul	14 Jul
Campanulaceae	*Campanula lasiocarpa lasiocarpa*	9 Jul	early Aug	12 Aug	mid Aug	21 Jul	21 Jul	17 Jul	3 Aug	27 Jul	--	20 Jul	--
Compositae	*Petasites frigidus*	<29 May	21 Jun	23 May	30 May	26 May	22 May	17 Jul	mid Jul	26 May	26 May	31 May	--
	Achillea borealis	15 Jun	26 Jun	7 Jul	20 Jun	28 Jun	22 Jun	--	28 Jun	1 Jul	25 Jun	29 Jun	--
	Senecio pseudo-arnica	29 Jul	--	16 Jul	21 Jul	16 Jul	18 Jul	24 Jun	5 Jul	2 Jul	10 Jul	10 Jul	--
	Anaphalis margaritacea	9 Jul	early Aug	late Aug	15 Aug	10 Aug	30 Jul	1 Jul	4 Aug	18 Jul	23 Jul	4 Aug	--
	Erigeron perefrinus peregrinus	--	--	--	--	--	21 Jul	--	--	--	--	--	--
	Arnica unalaschcensis	--	--	--	--	--	--	--	--	4 Aug	12 Aug	13 Aug	--
	Taraxacum trigonolobum	29 Jun	--	24 Jun	16 Jul	11 Jun	12 Jun	26 Jun	28 Jun	21 Jun	21 Jun	9 Jun	27 Jun
	Hieracium triste	22 Jul	--	28 Jul	--	30 Jun	27 Jul	17 Jul	3 Aug	27 Jul	12 Jul	4 Aug	--
Polypodiaceae	*Polypodium vulgare occidentale*	--	--	--	--	--	--	16 Jul	--	--	--	--	--

Table 94. Mean monthly high and low temperatures (°C) at Kasatochi Island, Alaska.

	late May		June		July		August	
High (range;*n*)								
1998	7.2	(5.6-8.3; 3)	12.1	(6.7-17.2; 30)	13.5	(10.0-18.3; 29)	17.2	(12.8-21.7; 15)
1999	10.3	(5.6-13.9; 8)	12.8	(5.6-23.3; 30)	13.4	(8.3-19.4; 31)	12.0	(8.9-14.4; 12)
2000	8.9	(7.2-12.8; 10)	9.8	(5.6-15.6; 30)	12.7	(7.8-17.2; 29)	13.5	(7.8-17.8; 26)
2001	10.4	(8.3-11.7; 10)	10.9	(6.7-16.1; 30)	13.2	(10.0-18.3; 30)	12.9	(10.6-16.1; 12)
2002	9.9	(6.7-13.9; 11)	9.9	(6.1-15.0; 30)	12.1	(8.8-17.2; 31)	12.3	(8.8-16.1; 27)
2003	--	--	9.4	(5.6-13.9; 27)	12.5	(10.0-16.1; 29)	14.7	(11.1-20.0; 12)
2004	7.5	(4.4-11.7; 11)	9.9	(4.4-13.9; 30)	12.7	(7.8-19.4; 27)	13.5	(10.0-17.8; 22)
2005	10.0	(5.6-13.3; 3)	10.9	(7.2-15.6; 24)	12.4	(8.9-14.4; 29)	11.8	(8.9-16.1; 22)
2006	12.2	(7.8-20.6; 9)	14.3	(9.4-18.9; 27)	14.9	(10.6-21.7; 30)	15.7	(13.3-18.9; 27)
2007	10.6	(7.8-12.8; 5)	11.3	(6.7-16.1; 26)	13.3	(7.2-18.9; 28)	13.8	(10.0-20.6; 22)
2008	10.0	(9.0-11.0; 2)	11.5	(8.0-15.0; 25)	14.2	(8.0-19.0; 27)	15.8	(13.0-18.0; 5)
Low (range;*n*)								
1998	3.7	(2.2-3.3; 3)	4.3	(0.6-5.6; 30)	6.7	(3.9-9.4; 29)	7.9	(6.7-10.0; 15)
1999	1.7	(0.0-2.8; 8)	3.3	(-1.1-5.6; 30)	5.3	(3.9-6.7; 31)	5.8	(4.4-6.7; 12)
2000	1.7	(-1.1-2.8; 10)	2.8	(1.7-3.9; 30)	6.0	(3.9-8.3; 29)	7.6	(5.6-9.4; 26)
2001	2.4	(-1.1-4.4; 10)	4.8	(1.7-7.2; 30)	7.2	(3.3-9.4; 30)	8.0	(6.1-9.4; 12)
2002	1.2	(0.0-3.9; 11)	4.5	(1.1-6.1; 30)	6.1	(3.9-7.2; 31)	7.3	(5.0-9.4; 27)
2003	--	--	4.7	(2.2-6.7; 27)	6.0	(2.8-7.2; 29)	7.4	(4.4-9.4; 12)
2004	3.2	(2.2-8.9; 11)	4.2	(2.2-7.8; 30)	5.9	(2.2-8.3; 27)	7.0	(3.3-8.9; 22)
2005	5.9	(5.6-6.7; 3)	4.7	(3.3-5.6; 24)	6.1	(3.3-7.8; 29)	7.5	(5.6-10.0; 22)
2006	3.5	(0.0-7.2; 9)	3.8	(2.2-6.7; 27)	6.9	(5.6-8.9; 30)	7.9	(5.6-11.1; 27)
2007	2.2	(1.7-3.3; 5)	4.5	(2.8-7.2; 26)	6.1	(3.3-8.9; 28)	8.0	(5.0-10.6; 22)
2008	3.5	(3.0-4.0; 2)	4.5	(3.0-6.0; 25)	6.0	(4.0-8.0; 27)	6.8	(4.0-8.0; 5)

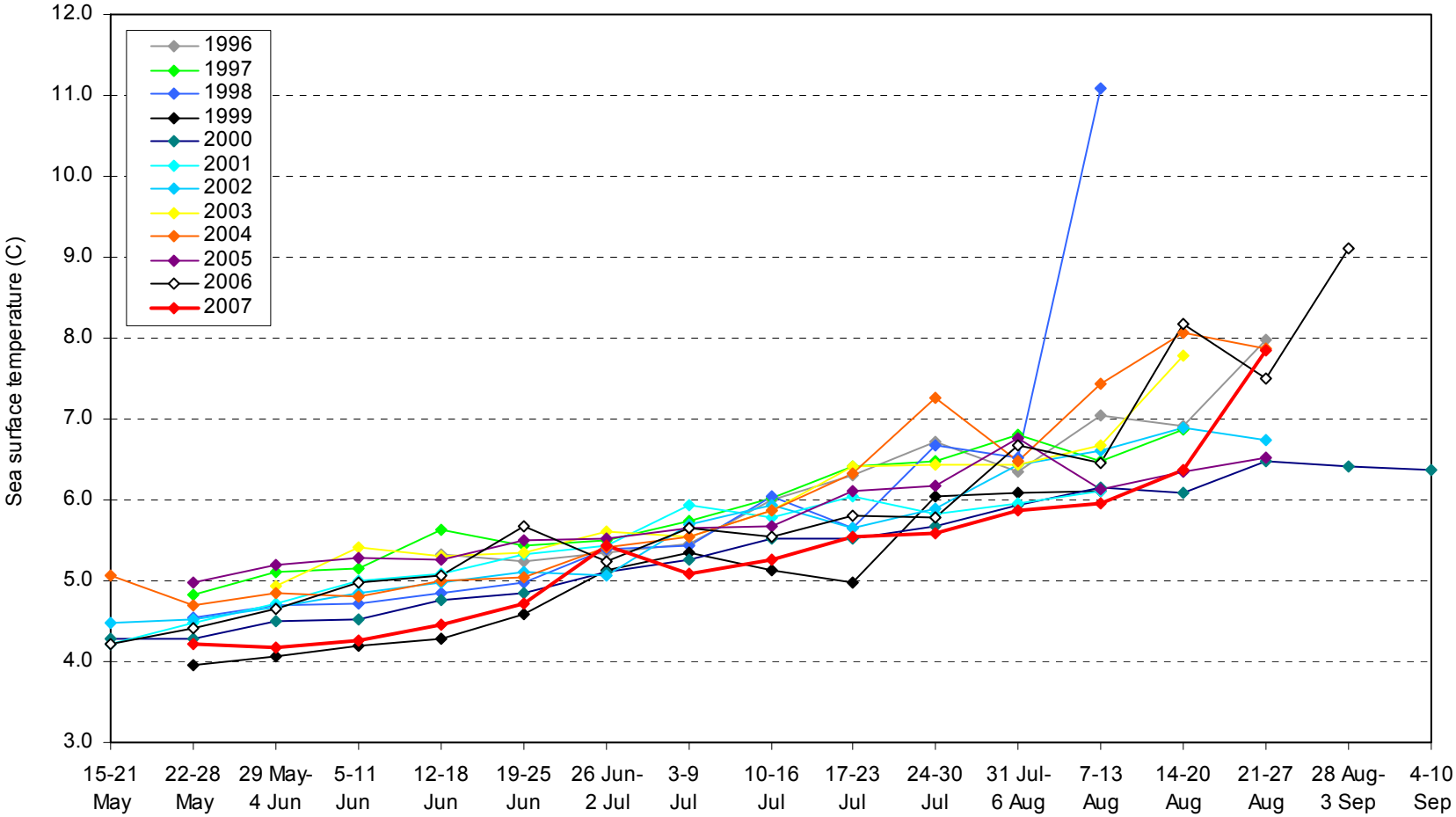


Figure 29. Weekly mean sea surface temperature (°C) at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008 which buried the underwater loggers.

Table 95. Weekly mean sea surface temperature (°C) at Kasatochi Island, Alaska. Values are based on mean daily temperatures (readings taken at intervals of 72 min in 1996, 24 min in 1997-1998, 48 min in 2000, 120 min in 2002, and 60 min in 1999, 2001, and 2003-2008). Data in 2008 were collected, but lost in the eruption of 7 August 2008 which buried the underwater loggers.

Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
15-21 May	--	--	--	--	4.3	4.2	4.5	--	5.1	--	4.2	--	--
22-28 May	--	4.8	4.5	4.0	4.3	4.5	4.5	--	4.7	5.0	4.4	4.2	--
29 May-4 Jun	--	5.1	4.7	4.1	4.5	4.7	4.7	4.9	4.8	5.2	4.6	4.2	--
5-11 Jun	--	5.1	4.7	4.2	4.5	5.0	4.8	5.4	4.8	5.3	5.0	4.3	--
12-18 Jun	5.3	5.6	4.8	4.3	4.8	5.1	5.0	5.3	5.0	5.3	5.1	4.4	--
19-25 Jun	5.2	5.4	5.0	4.6	4.9	5.3	5.1	5.4	5.0	5.5	5.7	4.7	--
26 Jun-2 Jul	5.3	5.5	5.4	5.1	5.1	5.4	5.1	5.6	5.4	5.5	5.2	5.4	--
3-9 Jul	5.5	5.7	5.4	5.4	5.3	5.9	5.7	5.5	5.5	5.7	5.6	5.1	--
10-16 Jul	6.0	6.0	6.0	5.1	5.5	5.8	5.9	5.9	5.9	5.7	5.5	5.3	--
17-23 Jul	6.3	6.4	5.6	5.0	5.5	6.0	5.6	6.4	6.3	6.1	5.8	5.5	--
24-30 Jul	6.7	6.5	6.7	6.0	5.7	5.8	5.9	6.4	7.3	6.2	5.8	5.6	--
31 Jul-6 Aug	6.3	6.8	6.5	6.1	5.9	5.9	6.4	6.4	6.5	6.8	6.7	5.9	--
7-13 Aug	7.0	6.5	11.1	6.1	6.1	6.1	6.6	6.7	7.4	6.1	6.5	6.0	--
14-20 Aug	6.9	6.9	--	--	6.1	--	6.9	7.8	8.1	6.3	8.2	6.4	--
21-27 Aug	8.0	--	--	--	6.5	--	6.7	--	7.9	6.5	7.5	7.8	--
28 Aug-3 Sep	--	--	--	--	6.4	--	--	--	--	--	9.1	--	--
4-10 Sep	--	--	--	--	6.4	--	--	--	--	--	--	--	--

Table 96. GPS coordinates of observation points and index plots (coordinates are for plot centers) at Kasatochi Island, Alaska in 1997. Datum NAD 27 Alaska.

Site	GPS coordinates (N/W)	±m	Elevation (m)
Solkoniekof Cabin	52°10'22.00"/175°31'31.70"	--	--
Fresno auklet banding plot	52°10'49.97"/175°31'23.64"	16	7
Surface count plots			
A-observation point	52°10'45.95"/175°31'22.65"	14	65
A-1	52°10'45.24"/175°31'22.85"	15	56
A-2	52°10'45.55"/175°31'24.43"	15	37
A-3	52°10'45.96"/175°31'23.44"	14	50
A-4	52°10'46.74"/175°31'22.48"	14	62
A-5	52°10'46.06"/175°31'22.20"	16	67
B-observation point	52°10'48.08"/175°31'21.05"	24	92
B-1	52°10'47.79"/175°31'20.58"	23	105
B-2	52°10'48.33"/175°31'20.62"	22	98
B-3	52°10'48.48"/175°31'21.82"	25	71
B-4	52°10'47.94"/175°31'22.85"	26	74
B-5	52°10'47.79"/175°31'21.20"	23	89
Sea lion observation point	52°11'07.22"/175°30'54.96"	15	93
Murres - A-observation point	52°11'06.44"/175°30'39.65"	24	105
Murres - B-observation point	52°11'06.93"/175°30'42.88"	16	93
Off-road point count route no. 331			
Point 1	52°10'22.26"/175°31'36.27"	11	29
Point 2	52°10'16.14"/175°31'22.62"	21	55
Point 3	52°10'10.71"/175°31'11.70"	13	128
Point 4	52°10'08.73"/175°30'58.61"	13	205
Point 5	52°10'02.99"/175°30'44.93"	11	242
Point 6	52°09'52.25"/175°30'39.20"	12	141
Point 7	52°09'44.45"/175°30'27.15"	15	49
Point 8	52°09'46.11"/175°30'09.41"	12	72
Point 9	52°09'54.77"/175°30'14.00"	12	136
Point 10	52°10'03.05"/175°30'20.51"	10	199
Point 11	52°10'11.08"/175°30'28.29"	12	270
Point 12	52°10'16.53"/175°30'44.60"	14	302
Mt. Kasatochi	52°10'43.49"/175°31'02.70"	19	322

Table 97. Vegetation and substrate characteristics of surface count plots at Kasatochi Island, Alaska. Data in 2008 were collected, but lost in the eruption of 7 August 2008.

Approximate	Plot									
% cover	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5
Bare rock										
1997	20	50	10	5	47	5	10	10	25	25
1998	5	33	20	5	15	10	15	15	20	20
1999	20	35	35	15	51	10	15	8	10	13
2000	5	25	15	15	20	5	9	5	20	10
2001	20	30	5	10	50	5	17	5	35	10
2002	5	25	15	5	30	0	15	7	20	10
2003	5	20	5	5	35	10	10	10	15	15
2004	5	50	10	1	10	5	5	5	5	5
2005	10	25	10	5	40	10	10	10	30	20
2006	20	30	15	5	30	0	5	5	20	5
2007	15	25	5	<1	25	20	10	10	20	20
2008	--	--	--	--	--	--	--	--	--	--
Short vegetation										
1997	80	35	20	55	50	95	90	90	50	75
1998	70	33	20	45	80	90	85	85	50	80
1999	77	35	25	20	48	85	85	90	45	85
2000	80	25	15	15	70	80	90	90	45	85
2001	70	30	20	10	50	85	83	90	30	85
2002	45	5	20	5	65	10	80	85	30	85
2003	70	25	10	5	45	85	90	85	65	80
2004	30	10	10	0	70	90	90	80	45	80
2005	80	25	5	5	40	70	70	50	10	70
2006	70	50	25	10	50	90	75	70	30	85
2007	70	20	5	5	50	75	70	60	30	70
2008	--	--	--	--	--	--	--	--	--	--
***Leymus*/umbel**										
1997	<1	15	70	40	3	0	0	0	25	<1
1998	25	33	60	50	5	0	0	0	30	0
1999	3	30	40	65	1	5	0	2	45	2
2000	15	50	60	80	10	15	1	5	35	5
2001	10	40	75	80	0	10	0	5	35	0
2002	50	70	70	90	5	90	5	8	50	5
2003	25	45	85	90	20	5	0	5	20	5
2004	65	40	80	99	20	5	5	15	40	10
2005	10	40	85	90	20	20	20	40	60	10
2006	10	0	60	85	20	10	20	25	50	10
2007	15	55	90	95	25	5	20	30	50	10
2008	--	--	--	--	--	--	--	--	--	--

Table 98. Stejneger's beaked whale sightings from Kasatochi Island, Alaska. Whales were not observed in 2005, 2006, or 2008.

Year	Date	No. Individuals	Location	Notes
1997	5 Jul	7	Tundering Cove	traveling in close-knit pod
1998	2 Jul	8	Tundering Cove	traveling abreast, diving in unison
	7 Jul	8	Tundering Cove	traveling abreast, diving in unison
	10 Jul	8	Tundering Cove	traveling abreast, diving in unison
1999	25 Jun	15	Tundering Cove	two tight pods of 10 and 5
	29 Jun	15	Dory Slot	observed twice on this date 0930 and 1630h
	10 Jul	6	Turr Fjord	close-knit pod
2000	17 Jul	1	Tundering Cove	
	19 Jul	8	Tundering Cove	
	25 Jul	4	Tundering Cove	
2001	12 Jul	15	Tundering Cove	
2002	24 Jun	4	Tundering Cove	
	10 Jul	4	Turr Fjord	
2003	17 Jun	8	Tundering Cove	traveling NW in a close-knit pod
	21 Jun	5	Dory Slot	logging at the surface in line formation very near shore
	9 Jul	1	Tundering Cove	
	27 Jul	8	Tundering Cove	traveling NW in a close-knit pod
2004	29 Jun	4	Tundering Cove	traveling S in close-knit pod
2007	25 Jun	3	Tundering Cove	traveling abreast or in tight pod, diving in unison; observed over 20 times between 1000h and 1715h