

**BIOLOGICAL MONITORING IN THE CENTRAL ALEUTIAN ISLANDS, ALASKA IN 2007: SUMMARY  
APPENDICES**



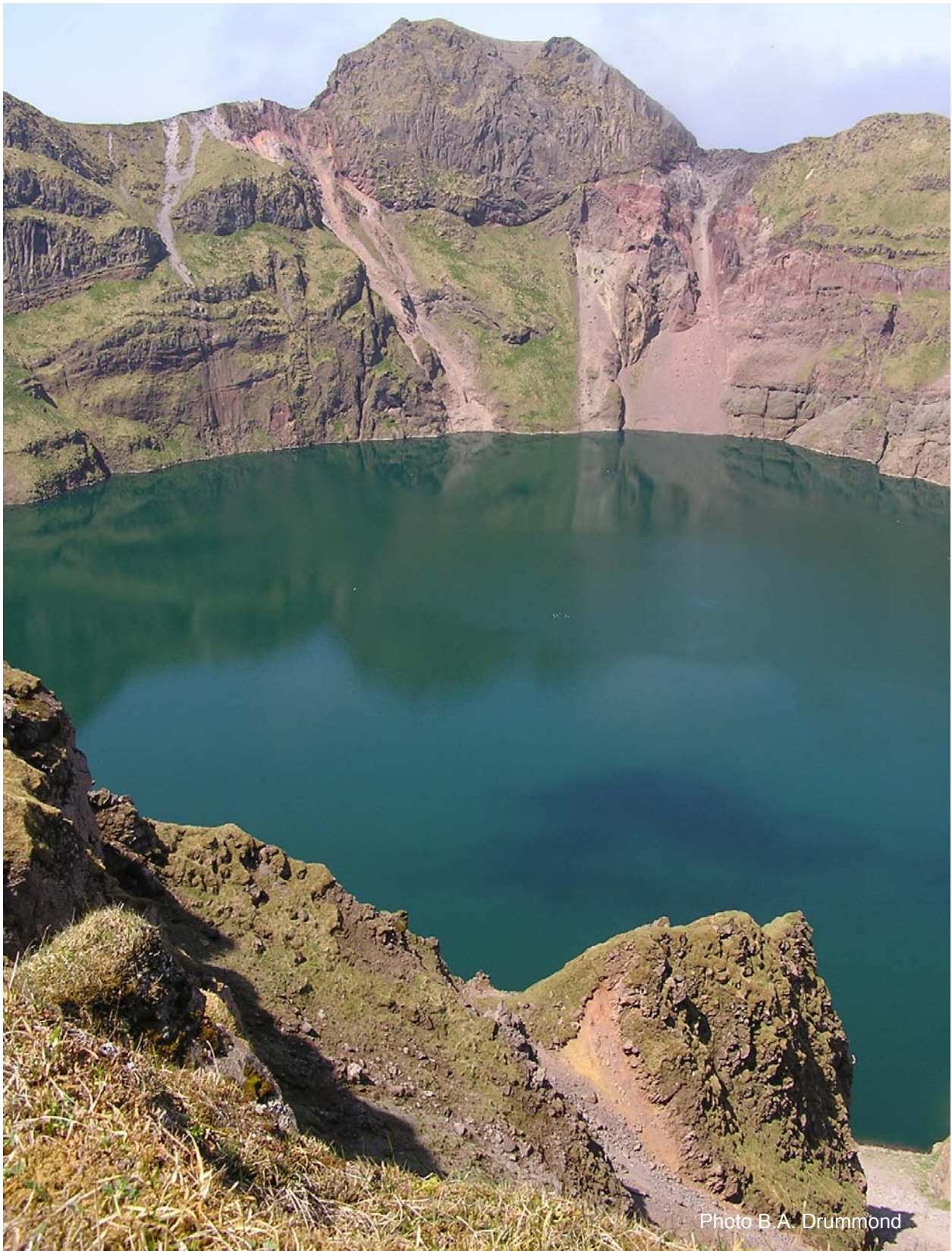
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Caldera from the east side, Kasatochi Island, Alaska

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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). Bird distributions at sea around Kasatochi, Koniuji, and Ulak were described by Drew et al. (2003).

The specific goal in 2007 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 [*Cephus 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 2007 monitoring program are contained in these appendices and archived at the AMNWR office in Homer, Alaska. Food habits data for storm-petrels and auklets will be presented in a later report, pending analysis. 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.

*Kasatochi Island.*--Located approximately 19.5 km northwest of the westernmost point of Atka Island, Kasatochi Island (52°11'N, 175°30'W) is an extinct volcanic caldera, roughly circular in shape, that encompasses approximately 287 ha and has a diameter of about 2.7 km. There are no reliable reports of the island being eruptive in historic times (Coats 1950). However, the island remains volcanically active; in 1899, steam rose from the caldera and the lake at the base disappeared (Jaggar 1927), and in 2005, the water in the caldera began bubbling (Drummond and Rehder 2005). 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 all of the 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 km 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 28 May to 23 August; Brie Drummond acted as camp leader from 28 May to 30 June and 21 July to 23 August, and was assisted by Allyson Larned from 28 May to 23 August, and Jeff Williams from 30 June to 21 July.

At Koniuji, kittiwake productivity and kittiwake and murre population data were collected by Brie Drummond, Allyson Larned, Jeff Williams, Don Dragoo, Barry Sampson, and Richard Hannan on 22 July.

At Ulak, burrow density and storm-petrel productivity data were collected on 17 June by Brie Drummond, Allyson Larned, Jeff Williams, and Lisa Matlock. Storm-petrel productivity data were also collected on 21 July by Brie Drummond, Allyson Larned, Jeff Williams, Barry Sampson, and Richard Hannan; and on 24 August by Brie Drummond, Allyson Larned, and Jeff Williams. Murre and cormorant population and cormorant productivity data were collected by Brie Drummond, Allyson Larned, Jeff Williams, Don Dragoo, Barry Sampson, and Richard Hannan on 21 July.

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

- Plots 1, 3, or 4 at Ulak Island were not checked for burrow density or occupancy during the 2007 field season due to time and personnel constraints at Ulak. Following Scharf (2000a) all burrow size classes have been lumped together due to variation in methodology for measuring burrow size over the course of the monitoring program.
- 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. A detailed description of the

collection of storm-petrel productivity data on Kasatochi can be found in the Kasatochi study plans binder until the protocols in Williams et al. (2002) can be updated.

- 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). A detailed description of these changes can be found in the Kasatochi and Ulak study plans binders until the protocols in Williams et al. (2002) can be updated.

- a) At both islands, determinants for age at fledging for storm-petrels was modified to 50 days of age or 140 mm wing chord using 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 have been reanalyzed for this report using these new determinants and should supersede productivity data presented in previous reports.

- b) At Ulak Island, data were analyzed following a set of criteria for determining fate of chicks developed in 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 were collected at Kasatochi Island following protocols for storm-petrel food collection at Buldir and Ulak islands outlined in Williams et al. (2002). A detailed description of the collection of storm-petrel food samples at Kasatochi can be found in the Kasatochi study plans binder until the protocols in Williams et al. (2002) can be updated. Food habits information for fork-tailed storm-petrels in 2007 was not analyzed in time to be included in this report. A separate report containing food habits data from all AMNWR sites may be issued, and, in addition, results from Kasatochi in 2007 will be presented in the 2008 summary appendices for the central Aleutian Islands.

- 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 Aikake'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.

- 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

- 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”, it was interpreted as having remained a “2” throughout the period.
- Counts of least and crested auklets on surface plots were conducted and summarized differently in 2007 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).
- Food habits information for parakeet, least, whiskered, and crested auklets in 2007 was not analyzed in time to be included in this report. A separate report containing food habits data from all AMNWR sites may be issued, and, in addition, results from Kasatochi in 2007 will be presented in the 2008 summary appendices for the central Aleutian Islands.
- Biomass of prey items in fork-tailed storm-petrel and least and crested auklet food samples were calculated using a new set of mass values for prey items. Previously-presented data from storm-petrels in 2004-2005 and auklets in 1996-2000 have been recalculated using these new values and should supercede biomass values presented in previous reports.

## INTERESTING OBSERVATIONS

- Red-faced cormorants (*Phalacrocorax urile*) did not attempt to breed at Kasatochi this year for the first time in 12 years. This follows two consecutive years of complete reproductive failure for the species at Kasatochi.
- A black oystercatcher (*Haematopus bachmani*) pair on Oystercatcher Beach successfully fledged a chick from a second nesting attempt following an initial nest failure earlier in the season. This was the first time at Kasatochi that oystercatchers have been documented to relay after their first nest was lost. A detailed account of the species is included in the Annotated List (Table 113).
- A glaucous-winged gull (*Larus glaucescens*) pair nested on Sud Slot, the first time gulls have nested anywhere along the western beaches since the removal of foxes. Refer to the Annotated List (Table 113) for a full description of the species.
- Glaucous-winged gulls frequently preyed upon parakeet auklets (*Aethia psittacula*) at Tundering Talus. This is in contrast to previous years, when parakeet auklets were generally ignored by gulls on the talus. However, no parakeet auklets remains were found in gull pellets collected along the beaches and at the talus (Table 29), so it is likely that parakeet auklets did not make up a major component of the diet of most gulls on the island.



- An adult common or thick-billed murre (*Uria aalge* and *U. lomvia*, respectively) was seen carrying a fish into Turr Cave in early August, and a murre fledgling was observed with two adults nearshore at Dory Slot in mid August. This is the first time that adults carrying fish or fledglings have been observed at Kasatochi since murren deserted the original colony at Turr Fjord. While breeding can not be confirmed, it is possible that a small number of birds may have bred on Kasatochi this year inside Turr Cave. More details on murren can be found in the Annotated List (Table 113).
  
- A Cassin's auklet (*Ptychoramphus aleuticus*) was heard beneath Sokolniekoff Cabin throughout June, although breeding could not be confirmed. This is the first time the species has been recorded on Kasatochi since 1996. Murie (1936) noted the presence of the species in 1936, but birds have not been documented to breed on the island since foxes were removed. A full account of Cassin's auklets is included in the Annotated List (Table 113).
  
- Horned and tufted puffin (*Fratercula corniculata* and *F. cirrhata*, respectively) nests were found on Kasatochi for the first time. Additional details are described in the Annotated List (Table 113).
  
- Stejneger's beaked whales (*Mesoplodon stejnegeri*) were observed on Kasatochi this year, after not being seen for two years. Prior to their absence in 2005 and 2006, beaked whales had been sighted for eight consecutive years. A full description of their distinctive behavior is recorded in the Annotated List (Table 113) and their occurrence and numbers are documented in Table 121.
  
- The water inside the caldera was observed bubbling for the third year in a row. Observations were made from the southern caldera rim and the gull counting hummock just north of the summit of Mt Kasatochi in early June and throughout August. The appearance and location was identical to that noted the previous two years, although slightly less widespread than originally documented in 2005. A detailed description can be found in Drummond and Rehder (2005).

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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.

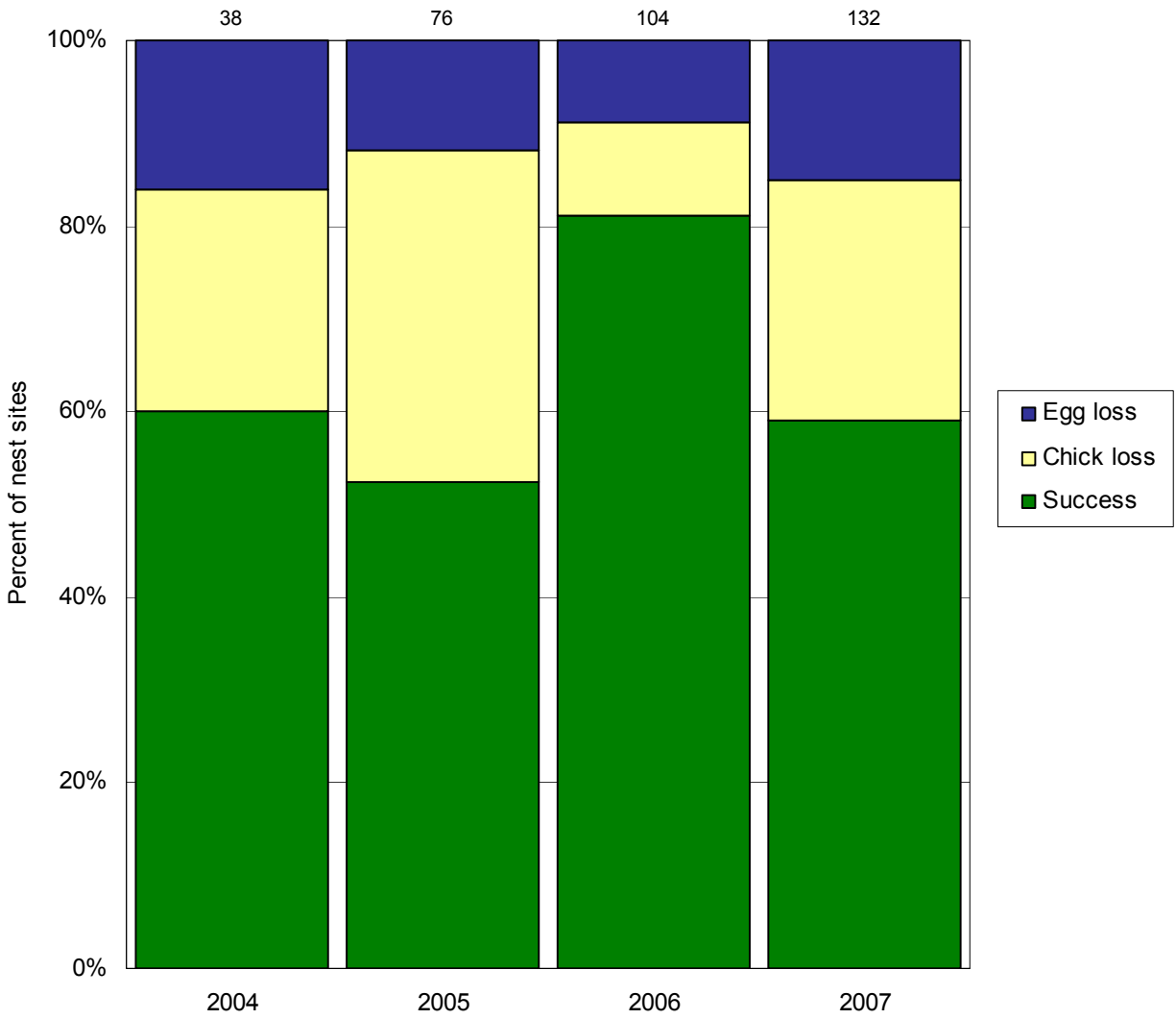


Figure 2. Reproductive performance of fork-tailed storm-petrels at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.

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

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

<sup>a</sup>Hatching and reproductive success could not be determined in 2003 because crevices were not located until after chicks hatched.

<sup>b</sup>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.

<sup>c</sup>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 fledged.

<sup>d</sup>This value represents the maximum potential, since it assumes young chicks still present at last check survived to fledging. Actual values were likely lower.



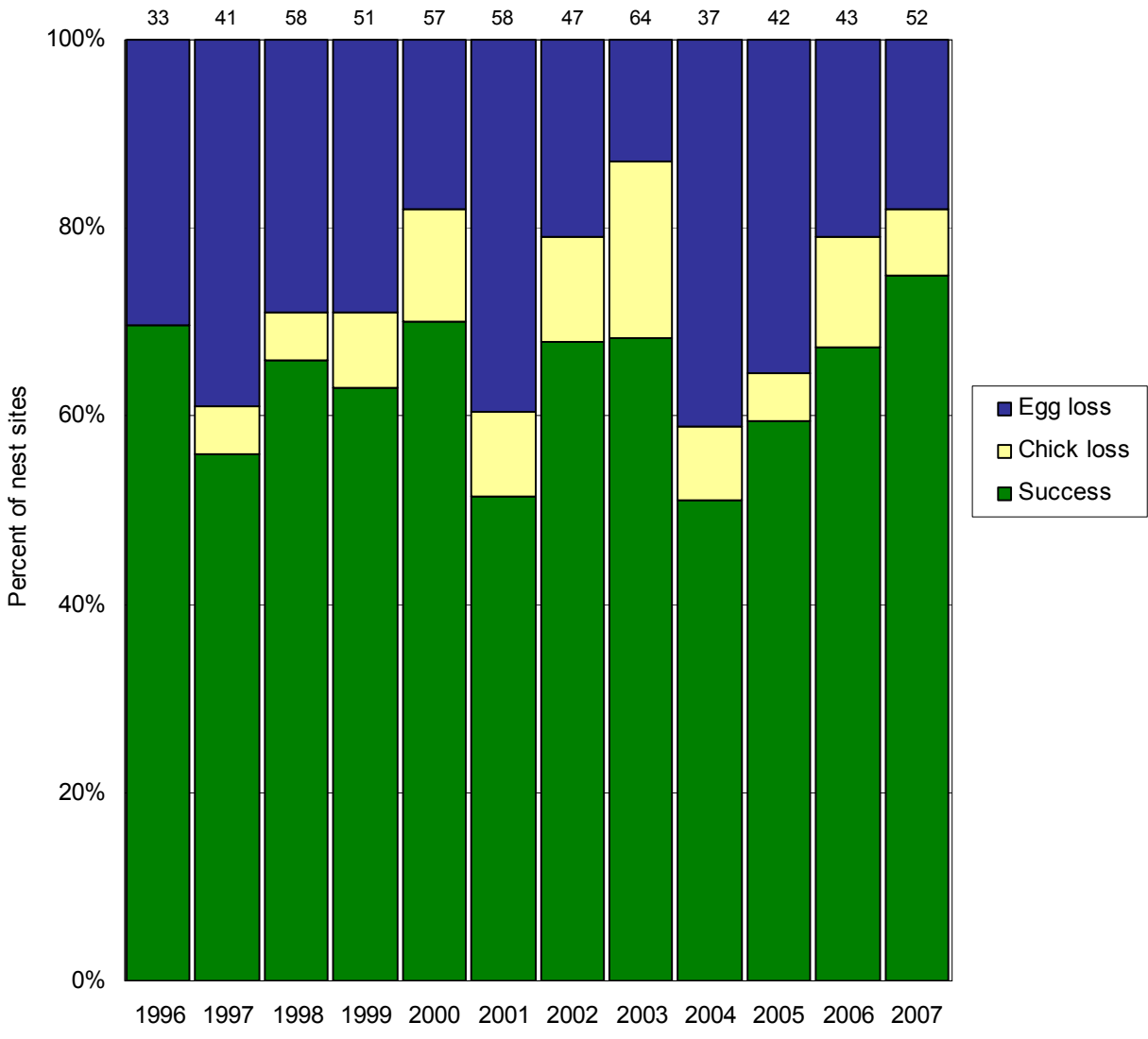


Figure 3. Reproductive performance of storm-petrels (probably all fork-tailed) at Ulak Island, Alaska. Numbers above columns indicate the number of nests.

Table 2. Reproductive performance of fork-tailed storm-petrels on plot 2 at Ulak Island, Alaska.

Parameter	1996 <sup>a</sup>	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No. burrows w/known contents (A) <sup>b</sup>	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 <sup>c</sup>	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 <sup>d</sup>	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) <sup>e</sup>	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) <sup>e</sup>	0.88	0.62	0.76	0.76	0.73	0.56	0.73	0.73	0.53	0.66	0.71	0.78

<sup>a</sup>Productivity estimates in 1996 are based on just two visits (early June and late August) and thus are probably artificially high.

<sup>b</sup>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.

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

<sup>d</sup>Chicks with wing chords predicted to be ≥140 mm at the time of disappearance using the mean chick growth rate were considered fledged.

<sup>e</sup>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.

Parameter	1996 <sup>a</sup>	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No. burrows w/known contents (A) <sup>b</sup>	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 <sup>c</sup>	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 <sup>d</sup>	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) <sup>e</sup>	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) <sup>e</sup>	0.70	0.56	0.66	0.63	0.70	0.52	0.68	0.69	0.51	0.60	0.67	0.75

<sup>a</sup>Productivity estimates in 1996 are based on just two visits (early June and late August) and thus are probably artificially high.

<sup>b</sup>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.

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

<sup>d</sup>Chicks with wing chords predicted to be ≥140 mm at the time of disappearance using the mean chick growth rate were considered fledged.

<sup>e</sup>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.

Year	<i>n</i>	Mass (g/day)			Wing chord (mm/day)			Diagonal tarsus (mm/day)		
		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 <sup>a</sup>	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 <sup>a</sup>	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

<sup>a</sup>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.

Year	<i>n</i>	Mass (g/day)			Wing chord (mm/day)		
		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

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

Year	<i>n</i>	Mass (g)			Wing chord (mm)			Diagonal tarsus (mm)		
		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
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	--	--

Table 7. Burrow density and occupancy rates on index plots at Ulak Island, Alaska. All plots were 100 m<sup>2</sup>.

Plot	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Density<sup>a</sup></b> -- date est.:	10 Jun	19 May	13 Jun	20 Jun	12 Jun	1 Jun	8 Jun	16 Jun <sup>b</sup>	9 Jun <sup>b</sup>	11 Jun <sup>b</sup>	20 Jun <sup>b</sup>	17 Jun <sup>b</sup>
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	--	--	--	--	--
<b>Occupancy<sup>c</sup></b> -- date est.:	10 Jun	28 Aug	31 Aug	2 Sep	1 Sep	3 Sep <sup>d</sup>	3 Sep <sup>d</sup>	26 Aug <sup>d</sup>	-- <sup>e</sup>	-- <sup>e</sup>	-- <sup>e</sup>	-- <sup>e</sup>
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	--	--	--	--	--	--	--

<sup>a</sup>Burrows with entrances of all sizes were lumped because of inconsistencies in classification among years.

<sup>b</sup>Density for plots 1,3,4 were not assessed in 2003-2007.

<sup>c</sup>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.

<sup>d</sup>Occupancy rates for plots 1, 3, and 4 were not assessed in 2001-2003.

<sup>e</sup>Occupancy rates for all plots were not assessed in 2004-2007.

Table 8. Burrow density and occupancy rates on index plots at Ulak Island, Alaska in 2007. Density surveys were conducted on 17 June  
Occupancy surveys were not conducted in 2007.

Plot	Area (m <sup>2</sup> )	Small (<9.5 cm)		Medium (9.5-14.5 cm)		Large (>14.5 cm)			Total	
		no.	density <sup>a</sup>	no.	density	no.	density	occ. <sup>b</sup>	no.	density
2	100	-- <sup>c</sup>	--	188	1.88	-- <sup>c</sup>	--	--	188	1.88

<sup>a</sup>Density is expressed as the number of burrows per m<sup>2</sup>.

<sup>b</sup>Occupancy rate is expressed as the number of occupied burrows divided by the total number of burrows. Large burrows were considered occupied if feathers, droppings, chicks, eggs, or eggshell fragments were observed in the entrance. Because not all burrows were relocated during the occupancy survey, the number of burrows used to calculate occupancy rates was not necessarily the same as that presented for density.

<sup>c</sup>Numbers of small, medium, and large burrow entrances were combined in plot 2, which is used to assess storm-petrel productivity, since small entrances have been artificially enlarged by arms reaching in to check burrow contents and large entrances were not measured.



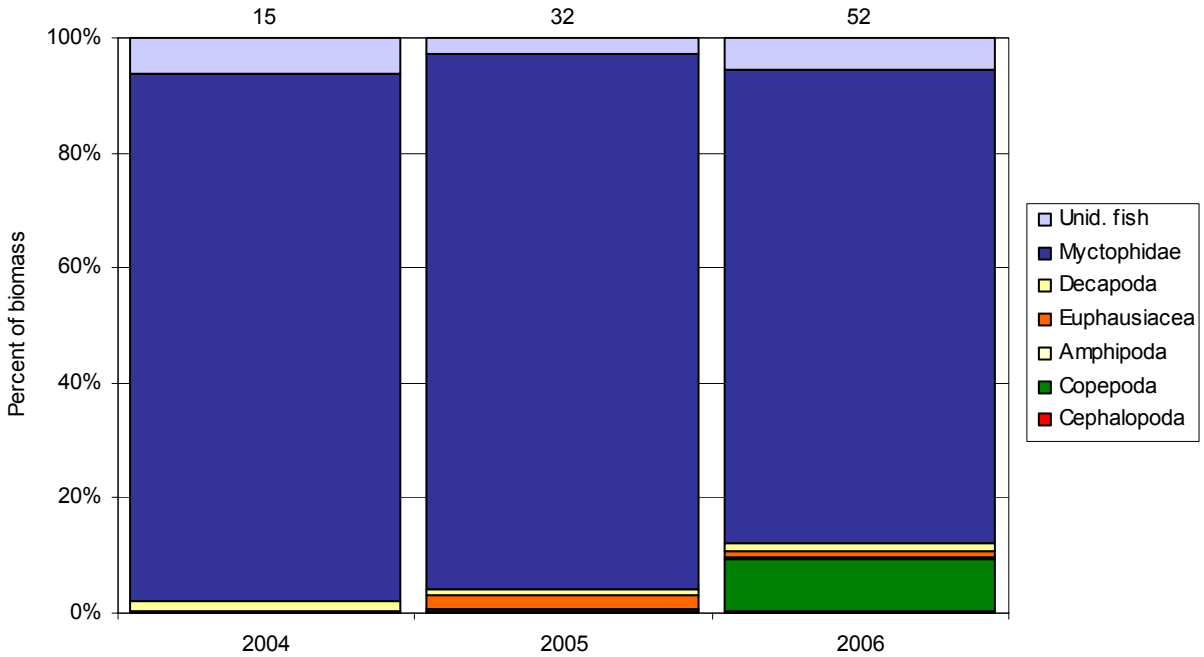


Figure 4. Relative biomass of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report.

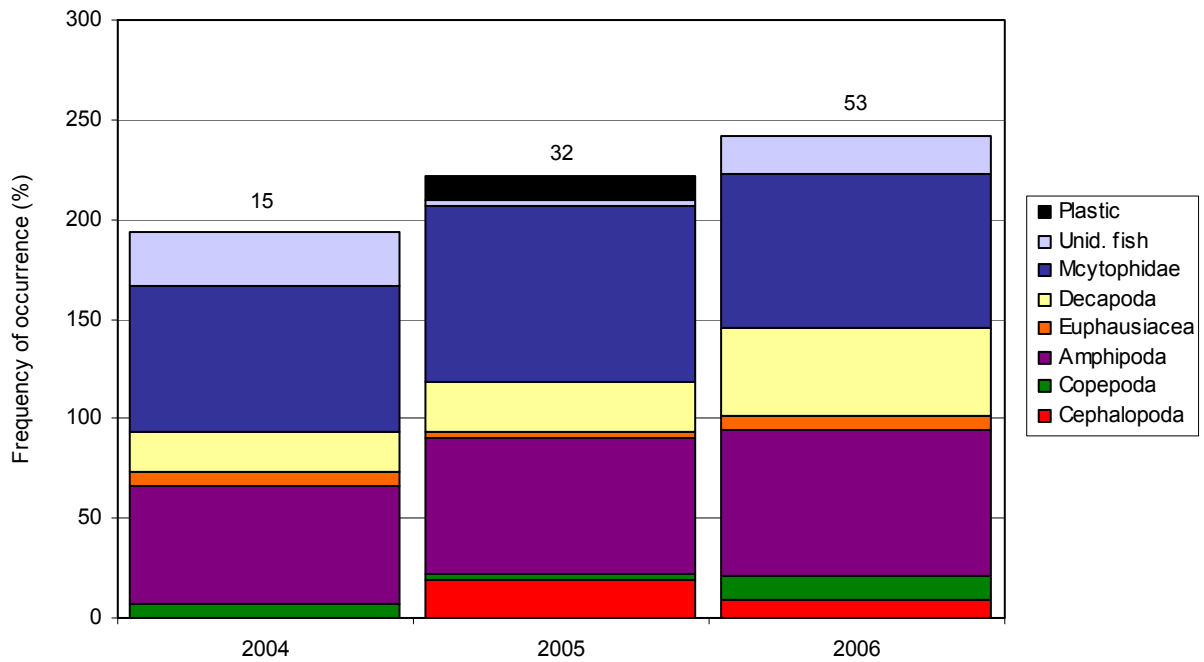


Figure 5. Frequency of occurrence of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2007 but had not been analyzed at the time of this report.

Table 9. 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.

	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			
<i>Neocalanus cristatus</i>	0.1	<0.1	9.1
Amphipoda			
Hyperiidea			
<i>Parathemisto</i> spp.	0.0	<0.1	0.0
<i>Parathemisto pacifica</i>	<0.1	<0.1	<0.1
<i>Hyperia</i> spp.	0.0	<0.1	0.0
<i>H. medusarum</i>	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			
<i>Thysanoessa longipes</i>	0.0	2.4	0.0
<i>Thysanoessa</i> 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 10. 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. Data were originally presented in Drummond 2007 but have been recalculated using new values for biomass of prey items. Prey samples were collected in 2007 but had not been analyzed at the time of this report.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	11	32	53
Total mass (g)	29.0	37.5	71.8	138.4
Cephalopoda				
Unid. squid	0.0	0.1	0.5	0.3
Copepoda				
<i>Neocalanus cristatus</i>	40.9	2.0	0.0	9.1
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.2	0.0	0.0	<0.1
<i>Hyperia medusarum</i>	0.0	0.0	<0.1	<0.1
Gammaridea				
Lysianassidae	0.2	0.1	0.2	0.2
Anoxy spp.	0.0	0.0	<0.1	<0.1
Unid. amphipod	0.0	0.0	<0.1	<0.1
Euphausiacea				
Euphausiid spp.	2.3	0.4	1.0	1.1
Decapoda				
Unid. shrimp	0.1	0.2	0.4	0.2
Atelecyclidae megalopa	4.0	0.9	0.1	1.1
Myctophiformes				
Myctophidae	50.6	95.1	87.7	81.9
Unid. fish	1.7	1.3	10.1	6.0

Table 11. Relative biomass of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska in 2005. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Drummond 2007 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	12	10	32
Total mass (g)	21.1	23.5	23.2	67.8
Cephalopoda				
Unid. squid	0.4	0.5	0.3	0.4
Copepoda				
<i>Neocalanus cristatus</i>	0.1	0.0	0.0	<0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.0	0.0	<0.1	<0.1
<i>Parathemisto</i> spp.	0.0	0.0	0.1	<0.1
<i>Hyperia</i> spp.	<0.1	0.0	0.0	<0.1
Gammaridea				
Lysianassidae	0.2	0.1	0.3	0.2
Euphausiacea				
<i>Thysanoessa longipes</i>	7.8	0.0	0.0	2.4
Decapoda				
Unid. shrimp	0.5	0.0	0.2	0.2
Atelecyclidae megalopa	1.4	1.1	0.3	0.9
Myctophiformes				
Myctophidae	89.6	98.3	90.4	92.9
Unid. fish	0.0	0.0	8.4	2.9

Table 12. Relative biomass of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska in 2004. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	0	10	5	51
Total mass (g)	0	24.7	7.3	32.0
Copepoda				
<i>Neocalanus cristatus</i>	--	0.1	0.0	0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	--	0.0	0.2	<0.1
Gammaridea				
Lysianassidae	--	0.2	0.1	0.2
Euphausiacea				
<i>Thysanoessa</i> spp.	--	0.3	0.0	0.2
Decapoda				
Atelecyclidae megalopa	--	1.9	0.4	1.5
Myctophiformes				
Myctophidae	--	93.6	86.1	91.8
Unid. fish	--	3.9	13.3	6.1

Table 13. 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.

	2004	2005	2006 <sup>a</sup>
No. samples	15	32	53
Cephalopoda			
Unid. squid	0.0	18.8	9.4
Copepoda			
<i>Neocalanus cristatus</i>	6.7	3.1	11.3
Amphipoda			
Hyperiidea			
<i>Parathemisto</i> spp.	0.0	3.1	0.0
<i>Parathemisto pacifica</i>	6.7	3.1	7.5
<i>Hyperia</i> spp.	0.0	3.1	0.0
<i>H. medusarum</i>	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			
<i>Thysanoessa longipes</i>	0.0	3.1	0.0
<i>Thysanoessa</i> 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

<sup>a</sup>From Drummond 2007.

Table 14. Frequency of occurrence of prey in diets of fork-tailed storm-petrels at Kasatochi Island, Alaska in 2006. Frequency is expressed as the percentage of food samples in which each species was present. Data from Drummond 2007. Data for 2004-2005 are presented in an earlier report (Drummond 2006). Prey samples were collected in 2007 but had not been analyzed at the time of this report.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	11	32	53
Copepoda				
<i>Neocalanus cristatus</i>	45.5	10.0	0.0	11.3
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	36.4	0.0	0.0	7.5
<i>Hyperia medusarum</i>	0.0	0.0	3.1	1.9
Gammaridea				
Lysianassidae	63.6	60.0	50.0	54.7
Anoxy spp.	0.0	0.0	12.5	7.5
Unid. amphipod	0.0	0.0	3.1	1.9
Euphausiacea				
Euphausiid spp.	18.2	10.0	3.1	7.5
Decapoda				
Atelecyclidae megalopa	63.6	40.0	21.9	34.0
Unid. shrimp	9.1	30.0	3.1	9.4
Myctophiformes				
Myctophidae	63.3	90.0	78.1	77.4
Unid. fish	9.1	10.0	25.0	18.9

Table 15. Mass of food loads collected from fork-tailed storm-petrels at Kasatochi Island, Alaska.

Chick-rearing period <sup>a</sup>	<i>n</i>	Mass of load (g)		
		mean	SD	range
<b>2007</b>				
Early	11	6.3	4.0	0.5 - 13.3
Mid	10	6.2	3.3	0.5 - 10.7
Late	10	6.6	2.6	2.6 - 10.7
Total	-----			
<b>2004</b>	16	4.3	3.3	0.3 - 10.8
<b>2005</b>	32	6.5	3.4	0.4 - 11.8
<b>2006</b>	52	8.3	3.5	2.5 - 18.4
<b>2007</b>	31	6.4	3.3	0.5 - 13.3

<sup>a</sup>In 2007, food samples were collected 26 Jul (early), 4-5 Aug (mid), and 12-13 Aug (late).



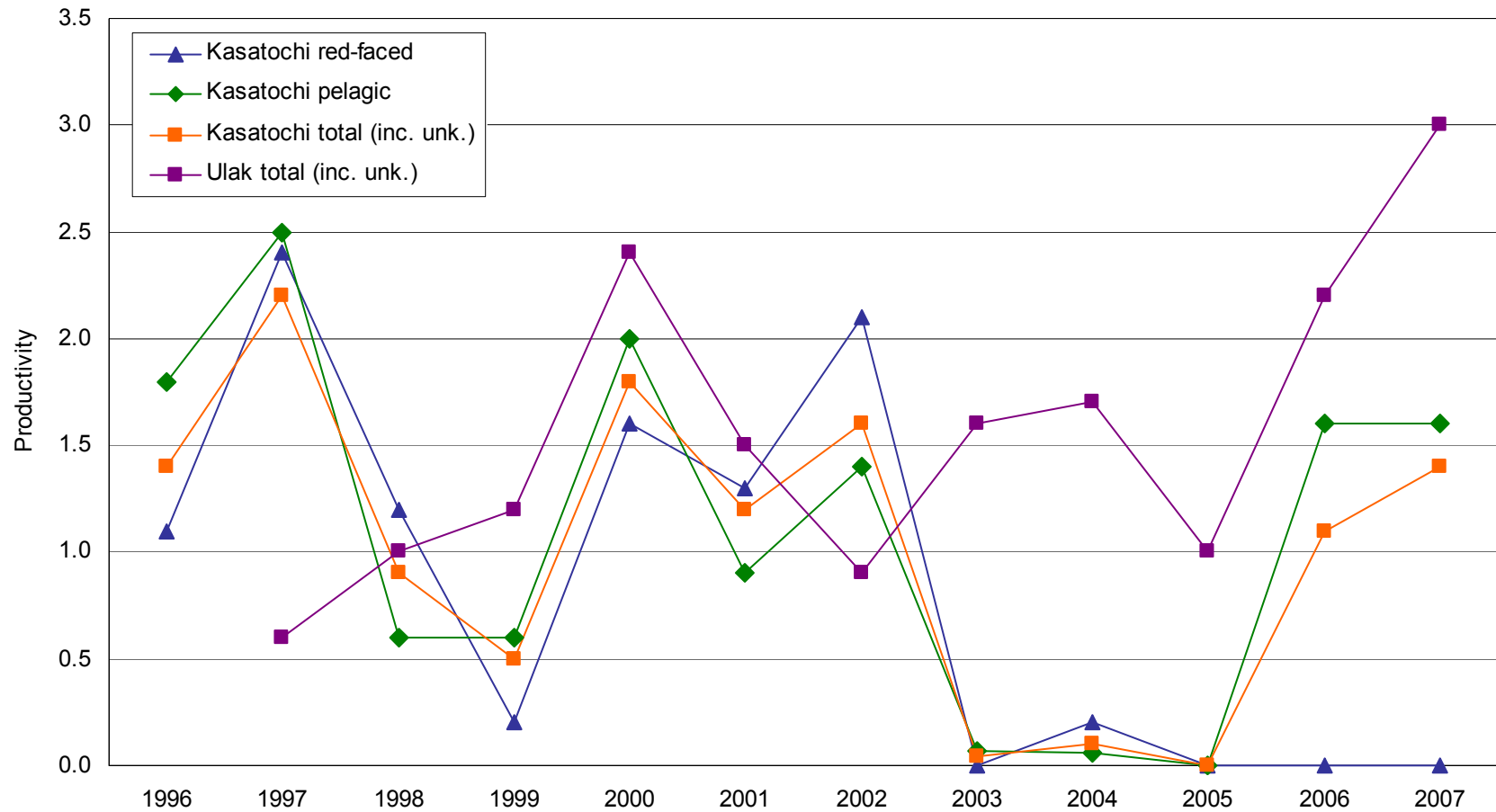


Figure 6. Overall productivity of pelagic and red-faced cormorants at Kasatochi and Ulak islands, Alaska. Productivity represents the total number of chicks divided by the total number of nests, including those without chicks.

Table 16. Minimum productivity of red-faced cormorants at Kasatochi Island, Alaska.

Parameter	1996	1997	1998 <sup>a</sup>	1999	2000	2001 <sup>b</sup>	2002	2003	2004	2005	2006	2007 <sup>c</sup>
Min. no. chicks in nest:												
0	4	1	20	7	4	6	1	16	21	2	2	0
1	4	3	0	2	0	6	1	0	4	0	0	0
2	6	5	6	0	5	5	11	0	1	0	0	0
3	0	8	4	0	3	4	8	0	0	0	0	0
4	0	2	3	0	0	0	0	0	0	0	0	0
5	0	0	1	0	0	0	0	0	0	0	0	0
Total no. nests (A) <sup>d</sup>	14	19	34	9	12	21	22	16	26	2	2	0
Min. no. chicks (B)	16	45	41	2	19	28	47	0	6	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	--	--	--
<i>n</i>	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
% 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	--

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

<sup>b</sup>In 2001, numbers were based on a single survey on 13 Aug.

<sup>c</sup>No red-faced cormorants attempted to breed on Kasatochi in 2007.

<sup>d</sup>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 17. Minimum productivity of pelagic cormorants at Kasatochi Island, Alaska.

Parameter	1996	1997	1998 <sup>a</sup>	1999	2000	2001 <sup>b</sup>	2002	2003	2004	2005	2006	2007
Min. no. chicks in nest:												
0	4	2	26	18	3	6	4	26	17	2	3	1
1	4	1	1	0	2	2	0	0	1	0	0	3
2	7	8	5	1	3	5	6	1	0	0	2	2
3	4	10	4	1	6	0	2	0	0	0	1	2
4	2	2	0	2	1	0	0	0	0	0	1	0
5	0	1	0	0	0	0	0	0	0	0	0	0
Total no. nests (A) <sup>c</sup>	21	24	36	22	15	13	13	27	18	2	7	8
Min. no. chicks (B)	38	60	23	13	30	12	18	2	1	0	11	13
% 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
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
SD	1.0	0.9	0.7	1.0	0.9	0.5	0.5	--	--	--	1.0	0.9
<i>n</i>	17	22	10	4	12	7	8	1	1	0	4	7
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
-----												
No. nests w/ brooding adults	0	1	1	0	0	1	1	4	2	2	2	0
% 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

<sup>a</sup>In 1998, several nests were never attended; we assumed they were pelagic nests based on nesting distribution in previous years.

<sup>b</sup>In 2001, numbers were based on a single survey on 13 Aug.

<sup>c</sup>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 2005-2007. In 1998, 7 nests were built in Tundering Cove; all were abandoned.

Table 18. Minimum productivity of cormorants (red-faced and pelagic, including unidentified birds) at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001 <sup>a</sup>	2002	2003	2004	2005	2006	2007
Min. no. chicks in nest:												
0	12	7	46	25	7	11	13	44	77	12	6	2
1	10	4	1	2	2	8	1	0	6	0	0	3
2	13	13	11	1	8	10	17	1	1	0	1	2
3	4	18	8	1	9	4	11	0	1	0	2	2
4	2	4	3	2	1	0	0	0	0	0	1	0
5	0	1	1	0	0	0	0	0	0	0	0	0
Total no. nests (A) <sup>b</sup>	41	47	70	31	27	33	42	45	85	12	10	9
Min. no. chicks (B)	56	105	64	15	49	40	68	2	11	0	11	13
% 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
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
SD	0.9	0.9	0.8	1.4	0.8	0.7	0.6	--	0.7	--	1.0	0.9
<i>n</i>	29	40	24	6	20	22	29	1	8	0	4	7
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
No. nests w/ brooding adults	0	2	1	0	0	1	2	6	4	2	2	0
% 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

<sup>a</sup>In 2001, numbers were based on a single survey on 13 Aug.

<sup>b</sup>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 2006-2007. In 2005, 2 nests were built in Tundering Cove.

Table 19. 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.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 <sup>a</sup>
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) <sup>b</sup>	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	--

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

<sup>b</sup>All nests with visible contents were counted, except for those containing adults in brooding posture.

Table 20. 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.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 <sup>a</sup>
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) <sup>b</sup>	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	--
<i>n</i>	--	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

<sup>a</sup>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.

<sup>b</sup>All nests with visible contents were counted, except for those containing adults in brooding posture.

Table 21. 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 2000-2007 and on two visits in 1999.

Parameter	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 <sup>a</sup>
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) <sup>b</sup>	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

<sup>a</sup>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.

<sup>b</sup>All nests with visible contents were counted, except those that contained adults in brooding posture.

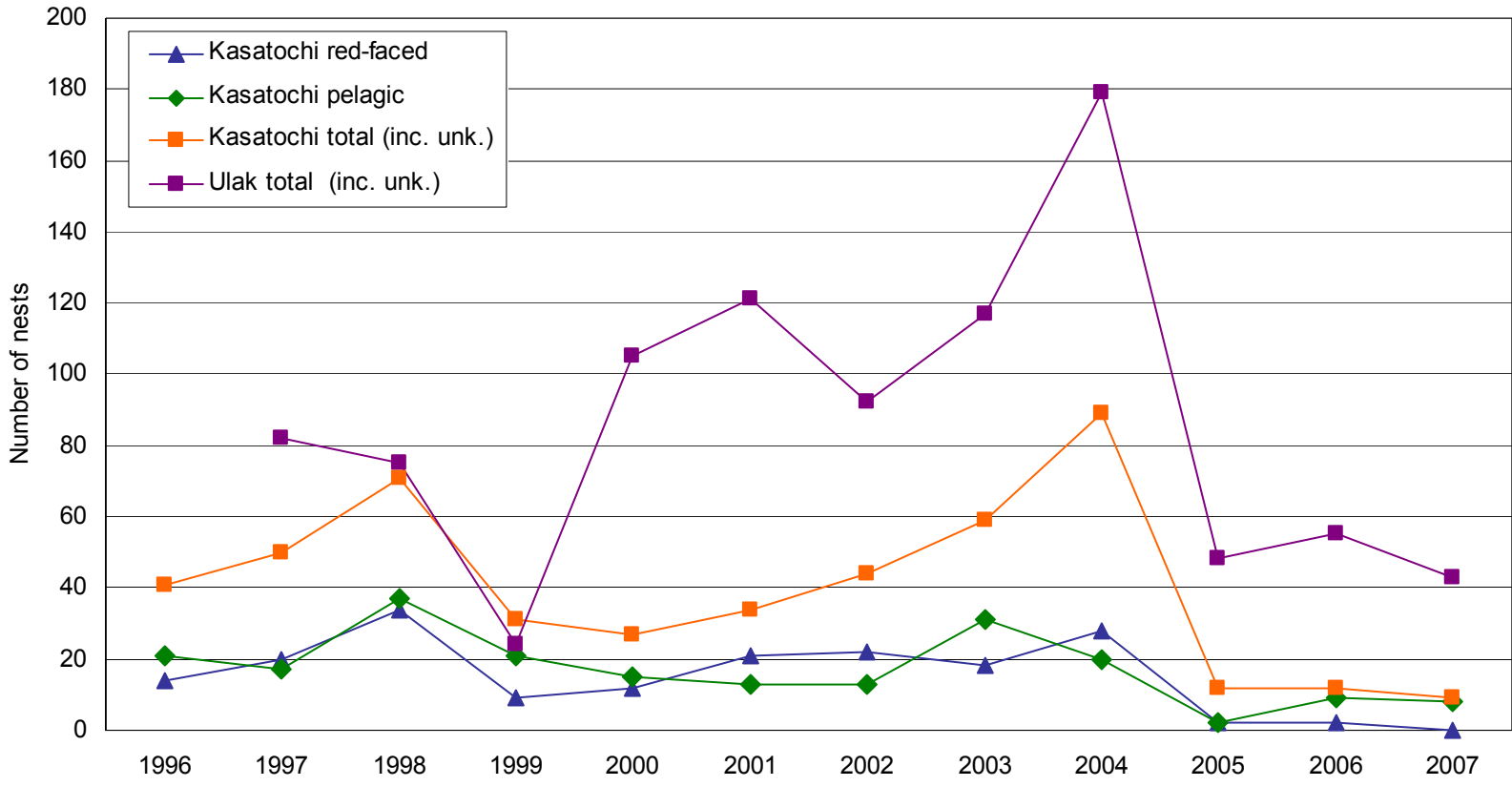


Figure 7. Numbers of red-faced and pelagic cormorants nests observed at Kasatochi and Ulak islands, Alaska.



Table 22. 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.

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

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>Birds counted on 14 and 19 Jun. Nests counted on 10 Jul.

<sup>d</sup>Birds counted on 25 Jun; nest numbers estimated based on 3 visits: 25 Jun, 2 Aug, 13 Aug.

<sup>e</sup>Birds counted on 6 Aug; nests estimated based on 3 visits: 7 and 18 Jul, 6 Aug.

<sup>f</sup>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.

<sup>g</sup>Birds counted on 5 Jul; nests estimated based on 4 visits: 5 Jul, 25 Jul, 4 Aug, 20 Aug.

<sup>h</sup>Birds counted on 22 Jun; nests estimated based on 6 visits between 22 Jun and 2 Aug.

<sup>i</sup>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.

<sup>j</sup>Birds counted on 5 Aug; nests estimated based on 4 visits: 17 Jun, 21 Jul, 23 Jul, 5 Aug.

Table 23. Numbers of red-faced and pelagic cormorants and nests (shown in parentheses) observed at Ulak Island, Alaska.

Year	Date	Survey section					Total	
		East end	A	B	C	D		E
<b>Red-faced cormorant</b>								
1997	10 Aug	NC <sup>a</sup>	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)
<b>Pelagic cormorant</b>								
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)

<sup>a</sup>Section was not counted due to poor observation conditions.

Table 24. Numbers of all cormorants (red-faced and pelagic, including unidentified species) and nests (shown in parentheses) observed at Ulak Island, Alaska.

Year	Date	Survey section					Total	
		East end	A	B	C	D		E
1997	10 Aug	NC <sup>a</sup>	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)

<sup>a</sup>Section was not counted due to poor observation conditions.

Table 25. 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 <sup>a</sup> ) 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, <i>n</i> =3)	168	--	0
1996 (1 Jun)	--	200 (100)	
1997 (27 May-20 Jun, <i>n</i> =4)	163	--	0
1997 (6 Jul)	--	407 (90)	
1998 (14-19 Jun, <i>n</i> =2)	141	--	0
1998 (31 May-12 Aug, <i>n</i> =3)	--	212 (~100)	
1999 (25 Jun)	80	--	~2
1999 (27 May-19 Jul, <i>n</i> =4)	--	81 (~20)	
2000 (6 Aug)	133	--	~7
2000 (30 May-17 Jul, <i>n</i> =2)	--	300 (~100)	
2001 (29 May-10 Aug, <i>n</i> =2)	--	266 (~134)	~11
2002 (31 May-30 Jun, <i>n</i> =3)	41	--	
2002 (28 May-27 Jul, <i>n</i> =3)	--	320 (~99)	~15
2003 (6 Jun)	89	--	
2003 (21 Jun-8 Aug, <i>n</i> =3)	--	349 (~126)	~8
2004 (5 Jun)	348	--	
2004 (23 Jun-3 Aug, <i>n</i> =3)	--	222 (~95)	~6
2005 (22 Jun)	273	--	
2005 (23 Jun-1 Aug, <i>n</i> =3)	--	169 (~87)	~3
2006 (10 Jun-3 Aug, <i>n</i> =3)	--	176 (~87)	~5
2007 (5 Aug)	168	--	
2007 (9 Jun-20 Jul, <i>n</i> =3)	--	242 (~109)	~4

<sup>a</sup>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.

Table 26. Number of glaucous-winged gulls observed in the caldera at Kasatochi Island, Alaska in 2007.

	Date			Statistics			
	9 Jun	19 Jun	20 Jul	mean	SD	range	<i>n</i>
No. gulls	202	376	148	242.0	119.1	148-376	3

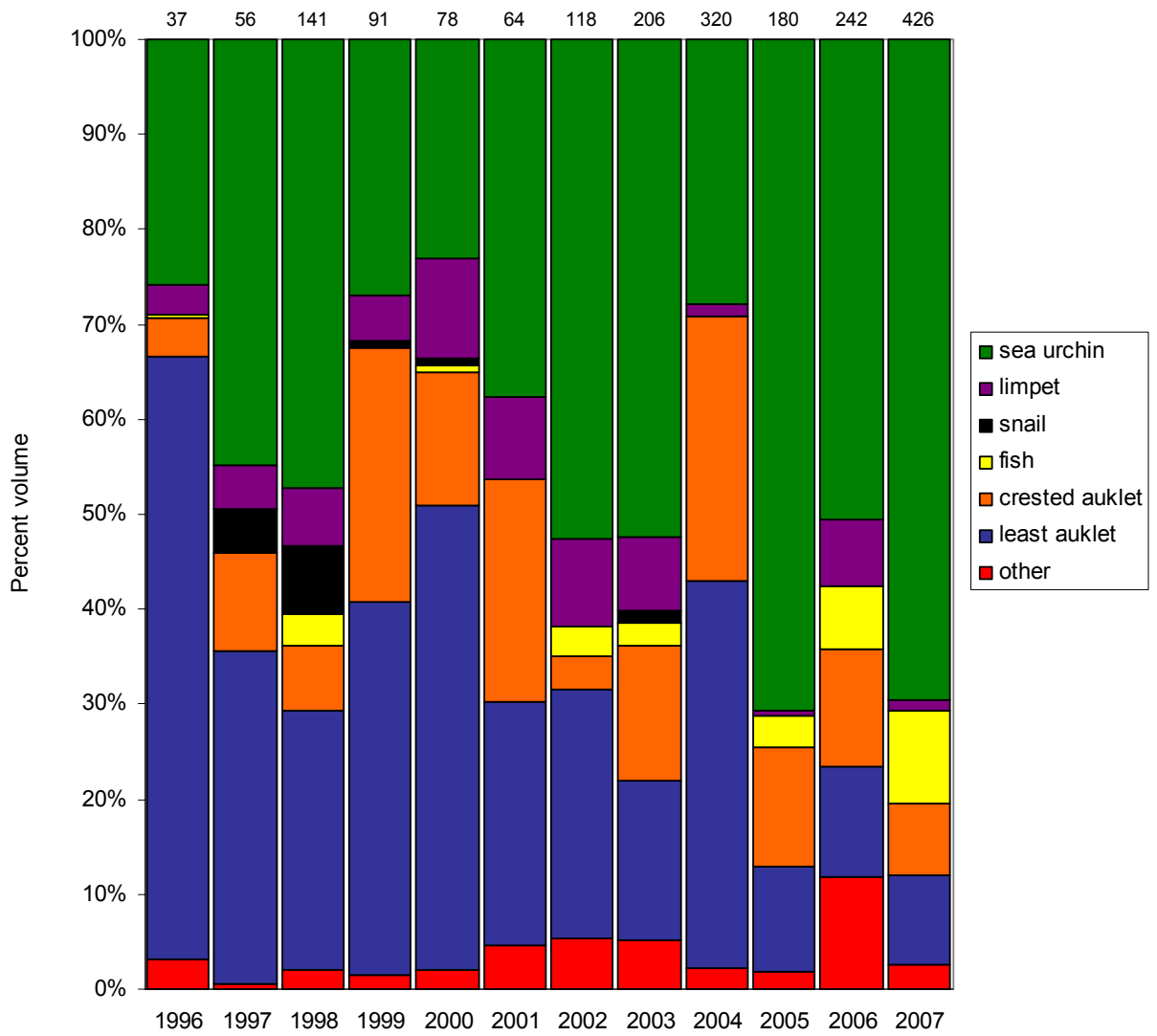


Figure 8. Percent volume of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska. Numbers above columns indicate the number of pellets.

Table 27. Percent volume of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska.

Food item	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of pellets	37	56	141	91	78	64	118	206	320	180	242	426
Invertebrates (total)	(29) <sup>a</sup>	(54)	(62)	(34)	(35)	(46)	(63)	(60)	(29)	(72)	(61)	(71)
Sea urchin	26	45	47	27	23	38	53	52	28	71	51	70
Limpet	3	5	6	5	10	9	9	8	1	1	7	1
Snail	--	5	7	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)
Birds (total)	(68)	(46)	(35)	(66)	(64)	(54)	(34)	(36)	(71)	(25)	(31)	(19)
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
Crested auklet	4	10	7	27	14	23	4	14	28	13	12	8
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)
Steller sea lion excreta/hair	2	--	--	--	--	--	--	1	--	--	1	--
Seeds	--	--	--	--	<1	--	--	<1	--	--	--	--
Small stones	--	<1	<1	<1	--	--	<1	<1	--	--	<1	--
Plastic ball (red, 4 mm diam.)	<1	--	--	--	--	--	--	--	--	--	--	--
Flagging tape (pink)	<1	--	--	--	--	--	<1	--	--	--	--	--
Miscellaneous plastic	--	--	--	--	--	--	<1	<1	--	--	--	--
Grass / plant material	--	--	--	--	--	--	--	<1	--	--	--	--
Algae	--	--	--	--	--	--	--	<1	--	--	<1	<1

<sup>a</sup>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 28. Percent occurrence of food items in regurgitated pellets of glaucous-winged gulls at Kasatochi Island, Alaska.

Food item	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of pellets	37	56	141	91	78	64	118	206	320	180	242	426
Invertebrates (total)	(49) <sup>a</sup>	(57)	(66)	(41)	(38)	(47)	(69)	(62)	(33)	(74)	(65)	(76)
Sea urchin	43	50	53	37	28	42	58	56	31	73	58	74
Limpet	11	7	15	10	17	16	15	15	3	1	13	3
Snail	--	4	10	2	1	--	1	2	--	--	<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)
Birds (total)	(78)	(52)	(39)	(70)	(64)	(55)	(38)	(38)	(73)	(26)	(35)	(22)
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
Crested auklet	5	16	9	30	15	23	4	15	35	14	13	9
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)
Steller sea lion excreta/hair	3	--	--	--	--	--	--	<1	--	--	1	--
Seeds	--	--	--	--	1	--	--	--	--	--	--	--
Small stones	--	2	2	1	--	--	2	1	--	--	<1	--
Plastic ball (red, 4 mm diam.)	3	--	--	--	--	--	--	--	--	--	--	--
Flagging tape (pink)	3	--	--	--	--	--	1	--	--	--	--	--
Miscellaneous plastic	--	--	--	--	--	--	1	<1	--	--	--	--
Grass / plant material	--	--	--	--	--	--	--	<1	--	--	--	--
Algae	--	--	--	--	--	--	--	1	--	--	<1	1

<sup>a</sup>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 29. Percent occurrence of food items in regurgitated pellets of glaucous-winged gulls at several locations on Kasatochi Island, Alaska in 2007.

Food item	Oystercatcher Beach (n=70)	Reindeer Beach (n=169)	Snegden/Guillemot Beaches (n=177)	Other <sup>a</sup> (n=10)	Total (n=426)	No. individuals per pellet	
						mean	max.
Invertebrates (total)	(89) <sup>b</sup>	(54)	(92)	(60)	(76)	--	--
Sea urchin	10	1	2	--	3	--	--
Limpet	19	3	11	--	13	3.8	12
Snail	1	--	--	--	<1	8.0	8
Blue mussel	3	1	--	--	<1	1.0	1
Crab	1	1	--	--	1	1.0	1
Fish	(11)	(19)	(61)	(10)	(12)	1.0	1
Birds (total)	(11)	(34)	(14)	(40)	(22)	1.0	2
Fork-tailed storm-petrel	--	3	1	--	2	1.0	1
Least auklet	3	20	6	20	11	1.0	1
Crested auklet	9	11	7	10	9	1.0	1
Unidentified bird	--	1	--	10	1	1.0	1
Unidentified egg	--	1	--	--	<1	1.0	1
Other (total)	(1)	(0)	1	--	(1)	1.0	1
Algae	1	--	1	--	1	1.0	1

<sup>a</sup>Other locations comprise Barabara Ridge (2 pellets), Parakeet Point (6 pellets), and Tundering Talus (2 pellets).

<sup>b</sup>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).

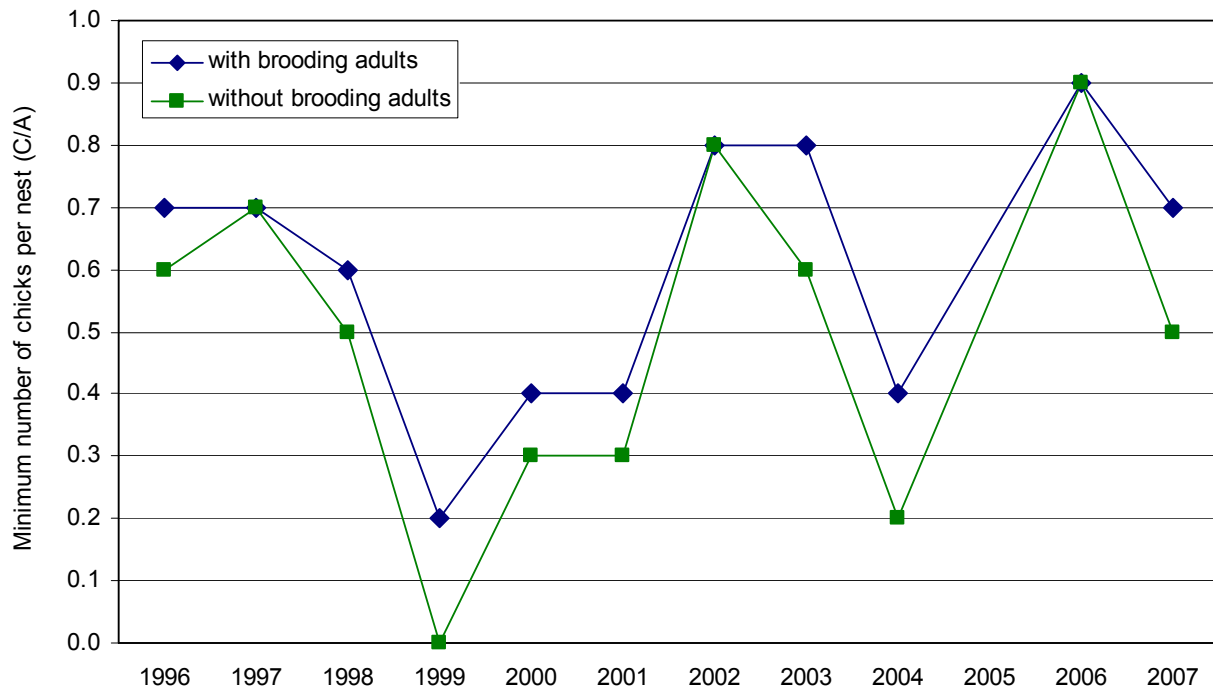


Figure 9. Reproductive performance of black-legged kittiwakes on index plots at Koniuji Island, Alaska. The minimum number of chicks per nest is presented both with and without nests containing brooding adults. Calculations with brooding adults assume those nests contained at least one chick; calculations without brooding adults omit those nests from analyses.

Table 30. Reproductive performance of black-legged kittiwakes on index plots at Koniuji Island, Alaska.

Year	Date	Brooders <sup>a</sup>	No. nests (A)	No. nests w/ chicks (B)	Min. no. chicks (C) <sup>ab</sup>	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
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

<sup>a</sup>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.

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

Table 31. Reproductive performance of black-legged kittiwakes in 8 plots at Koniuji Island, Alaska on 22 July 2007.

Parameter	Plot								Total	Statistics		
	4	5	6	8	9	10	11b	12		<i>n</i>	mean	SD
<u>Nest contents</u>												
Empty	3	15	14	4	2	0	17	7	62	--	--	--
1 chick	0	4	2	2	0	0	1	1	10	--	--	--
≥1 chick	0	1	9	13	2	9	19	15	50	--	--	--
2 chicks	0	0	0	0	0	0	0	2	2	--	--	--
Brooding bird	4	7	7	28	5	2	14	5	72	--	--	--
<u>Productivity, assuming brooding birds had 1 chick</u>												
No. nests (A)	7	27	32	47	9	2	42	39	196	--	--	--
Nests w/ chicks (B)	4	12	18	43	7	2	25	23	134	--	--	--
Min. no. chicks (C)	4	12	18	43	7	2	25	25	136	--	--	--
Proportion of nests containing chicks (B/A)	0.57	0.44	0.56	0.91	0.78	1.00	0.60	0.77	--	8	0.70	0.19
Min. no. chicks per nest with chicks (C/B)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.09	--	8	1.01	0.03
Min. no. chicks per nest (C/A)	0.57	0.44	0.56	0.91	0.78	1.00	0.60	0.83	--	8	0.71	0.20
<u>Productivity, omitting nests with brooding birds from analysis</u>												
No. nests (A')	3	20	25	19	4	0	28	25	124	--	--	--
Nests w/ chicks (B')	0	5	11	15	2	0	11	18	62	--	--	--
Min. no. chicks (C')	0	5	11	15	2	0	11	20	64	--	--	--
Proportion of nests containing chicks (B'/A')	0.00	0.25	0.44	0.79	0.50	--	0.39	0.72	--	7	0.44	0.27
Min. no. chicks per nest with chicks (C'/B')	--	1.00	1.00	1.00	1.00	--	1.00	1.11	--	6	1.02	0.05
Min. no. chicks per nest (C'/A')	0.00	0.25	0.44	0.79	0.50	--	0.39	0.80	--	7	0.45	0.28

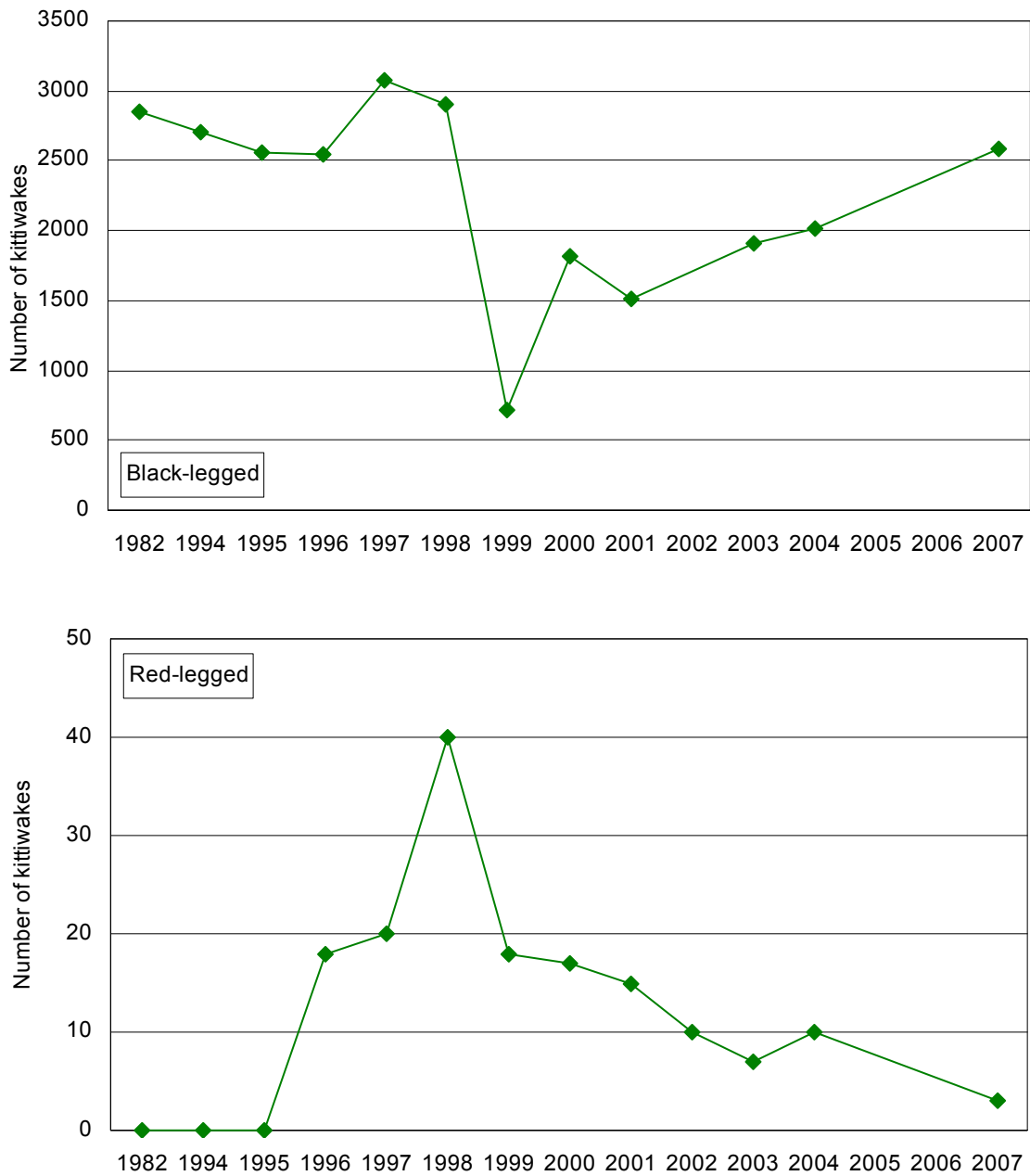


Figure 10. Numbers of black-legged and red-legged kittiwakes counted at Koniuji Island, Alaska. Because complete island surveys were not conducted in 1999 and 2000, numbers of black-legged kittiwakes for those years represent estimates based on the relative proportion of birds seen in those plots that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

Table 32. Counts of black-legged kittiwakes at Koniuji Island, Alaska. Historical data are from Bailey and Trapp (1986), Byrd and Williams (1994), and Byrd (1995).

Plot	1982	1994	1995	1996	1997	1998	1999	2000	2001	2003	2004	2007
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
<b>East side (plots 1-4)</b>	--	--	<b>510</b>	<b>609</b>	<b>549</b>	<b>594</b>	<b>NC<sup>a</sup></b>	<b>184</b>	<b>112</b>	<b>122</b>	<b>172</b>	<b>127</b>
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
<b>South side (plots 5-7)</b>	--	--	<b>825</b>	<b>568</b>	<b>483</b>	<b>473</b>	<b>NC</b>	<b>406</b>	<b>524</b>	<b>525</b>	<b>836</b>	<b>1311</b>
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
<b>West side (plots 8-11)</b>	--	--	<b>1,220</b>	<b>1,212</b>	<b>1,874</b>	<b>1,664</b>	<b>395</b>	<b>774</b>	<b>758</b>	<b>1,167</b>	<b>897</b>	<b>588</b>
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
<b>North side (plots 12-14)</b>	--	--	<b>NC</b>	<b>161</b>	<b>171</b>	<b>171</b>	<b>52</b>	<b>62</b>	<b>113</b>	<b>97</b>	<b>116</b>	<b>564</b>
<b>Total</b>	<b>2,852</b>	<b>2,707</b>	<b>2,555</b>	<b>2,550</b>	<b>3,077</b>	<b>2,902</b>	<b>447</b>	<b>1,426</b>	<b>1,507</b>	<b>1,911</b>	<b>2,021</b>	<b>2590</b>

<sup>a</sup>NC = not counted.

Table 33. Counts of black-legged kittiwake nests at Koniujji Island, Alaska. Historical data are from Bailey and Trapp (1986), Byrd and Williams (1994), and Byrd (1995).

Plot	1982	1994	1995	1996	1997	1998	1999	2000	2001	2003	2004	2007
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
<b>East side (plots 1-4)</b>	--	--	<b>510</b>	<b>293</b>	<b>300</b>	<b>166</b>	<b>NC<sup>a</sup></b>	<b>123</b>	<b>28</b>	<b>30</b>	<b>29</b>	<b>59</b>
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
<b>South side (plots 5-7)</b>	--	--	<b>825</b>	<b>373</b>	<b>309</b>	<b>179</b>	<b>NC</b>	<b>196</b>	<b>196</b>	<b>285</b>	<b>320</b>	<b>646</b>
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
<b>West side (plots 8-11)</b>	--	--	<b>291</b>	<b>645</b>	<b>778</b>	<b>723</b>	<b>147</b>	<b>337</b>	<b>502</b>	<b>496</b>	<b>282</b>	<b>275</b>
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
<b>North side (plots 12-14)</b>	--	--	<b>NC</b>	<b>102</b>	<b>97</b>	<b>55</b>	<b>0</b>	<b>35</b>	<b>50</b>	<b>63</b>	<b>29</b>	<b>238</b>
<b>Total</b>	<b>~570</b>	<b>1,165</b>	<b>1626</b>	<b>1,413</b>	<b>1,484</b>	<b>1,123</b>	<b>147</b>	<b>691</b>	<b>776</b>	<b>874</b>	<b>660</b>	<b>1218</b>

<sup>a</sup>NC = not counted.

Table 34. 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).

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 <sup>a</sup>	0 (0)	0 (0)	18 (3)	18 (3)
2000	1 Aug	0 (0)	0 (0)	0 (0)	17 (6)	17 (6) <sup>b</sup>
2001	6 Aug	0 (0)	0 (0)	0 (0)	15 (10)	15 (10) <sup>c</sup>
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)
2007	22 Jul	0 (0)	3 (0)	0 (0)	0 (0)	3 (0)

<sup>a</sup>NC = not counted.

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

<sup>c</sup>In 2001, all red-legged kittiwake nests were empty.



Table 35. Nesting chronology of common murrelets at Kasatochi Island, Alaska. No murrelets attempted to breed at Kasatochi in 2001-2007.

Parameter	1996	1997	1998 <sup>a</sup>	1999 <sup>a</sup>	2000 <sup>a</sup>
<b>Lay date<sup>b</sup></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
<i>n</i>	28	20	<20	<20	<10
<b>Hatch date<sup>b</sup></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	--	--	--
<i>n</i>	28	20	--	--	--
<b>Fledge date</b>					
median	25 Aug	24 Aug	--	--	--
mean	25 Aug	24 Aug	--	--	--
SD	0.0 d	0.0 d	--	--	--
range	25 Aug	24 Aug	--	--	--
<i>n</i>	2	3	--	--	--
<b>Nestling period<sup>c</sup> (days)</b>					
median	18.5	19	--	--	--
mean	18.5	19.0	--	--	--
SD	2.1 d	4.0 d	--	--	--
range	17-20	15-23	--	--	--
<i>n</i>	2	3	--	--	--
<b>Min. nestling period<sup>d</sup> (days)</b>					
median	17	21	--	--	--
mean	17.8	21.1	--	--	--
SD	2.0 d	2.3 d	--	--	--
range	15-21	17-25	--	--	--
<i>n</i>	12	11	--	--	--

<sup>a</sup>In 1998-2000, less than 20 eggs of unknown species were laid and quickly lost during the range of dates indicated.

<sup>b</sup>Dates do not reflect the murrelets that were still incubating eggs on our last visit to the colony (26 Aug in both 1996 and 1997).

<sup>c</sup>Numbers are for those chicks that had left the cliffs.

<sup>d</sup>Numbers are for those chicks that had reached fledging age but were still on the cliffs at our last visit.

Table 36. Nesting chronology of thick-billed murres at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2007.

Parameter	1996	1997	1998 <sup>a</sup>	1999 <sup>a</sup>	2000 <sup>a</sup>
<b>Lay date<sup>b</sup></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
<i>n</i>	127	133	<20	<20	<10
<b>Hatch date<sup>b</sup></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	--	--	--
<i>n</i>	127	133	--	--	--
<b>Fledge date</b>					
median	23 Aug	24 Aug	--	--	--
mean	23 Aug	23 Aug	--	--	--
SD	1.7 d	1.4 d	--	--	--
range	19-26 Aug	21-24 Aug	--	--	--
<i>n</i>	47	16	--	--	--
<b>Nestling period<sup>c</sup> (days)</b>					
median	18	22	--	--	--
mean	19.0	20.7	--	--	--
SD	2.8 d	2.9 d	--	--	--
range	15-26	15-23	--	--	--
<i>n</i>	47	16	--	--	--
<b>Min. nestling period<sup>d</sup> (days)</b>					
median	17	18	--	--	--
mean	18.3	18.9	--	--	--
SD	2.5 d	2.5 d	--	--	--
range	15-21	15-25	--	--	--
<i>n</i>	32	67	--	--	--

<sup>a</sup>In 1998-2000, less than 20 eggs of unknown species were laid and quickly lost during the range of dates indicated.

<sup>b</sup>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).

<sup>c</sup>Numbers are for those chicks that had left the cliffs.

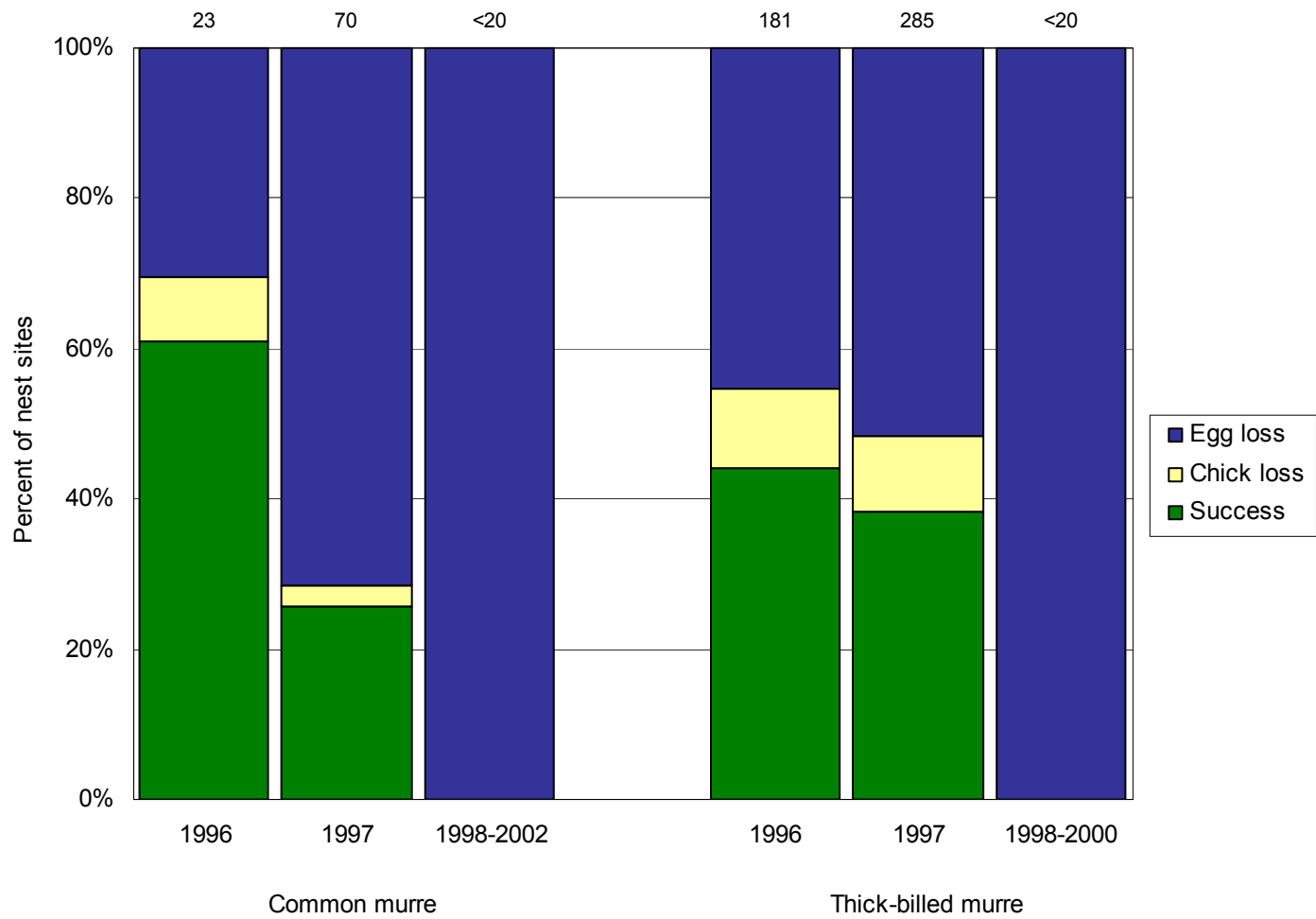


Figure 11. Reproductive performance of common and thick-billed murres at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests. No murres attempted to breed at Kasatochi in 2001-2007.

Table 37. Reproductive performance of common and thick-billed murres at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2007.

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 <sup>a</sup>
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 <sup>a</sup>
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	--

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

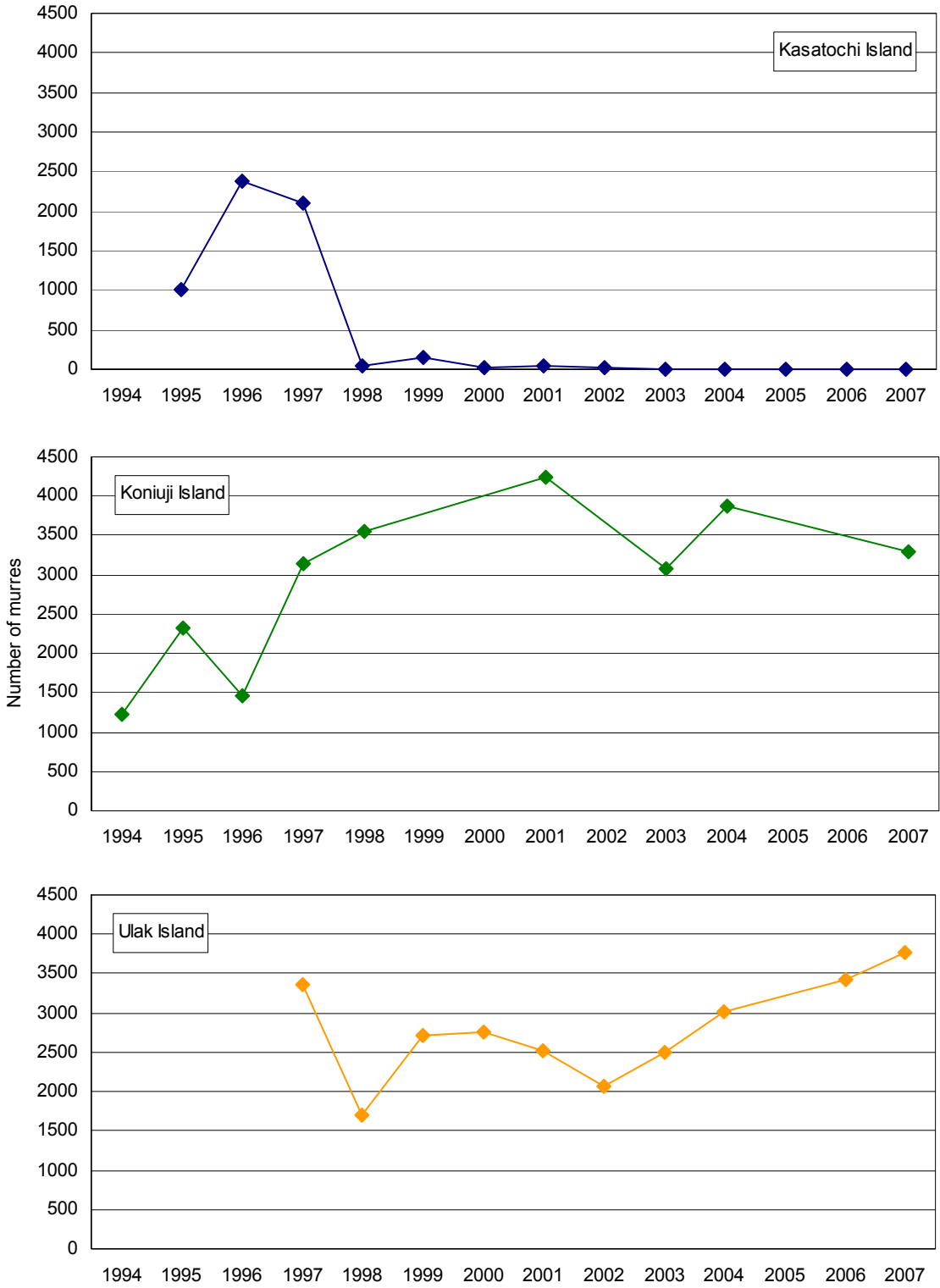


Figure 12. Numbers of common and thick-billed murre counted at Kasatochi, Koniuji, and Ulak islands, Alaska. Numbers from Kasatochi represent the mean of replicate counts made during the mid-incubation to early chick-rearing period; numbers from Koniuji and Ulak are from single surveys.

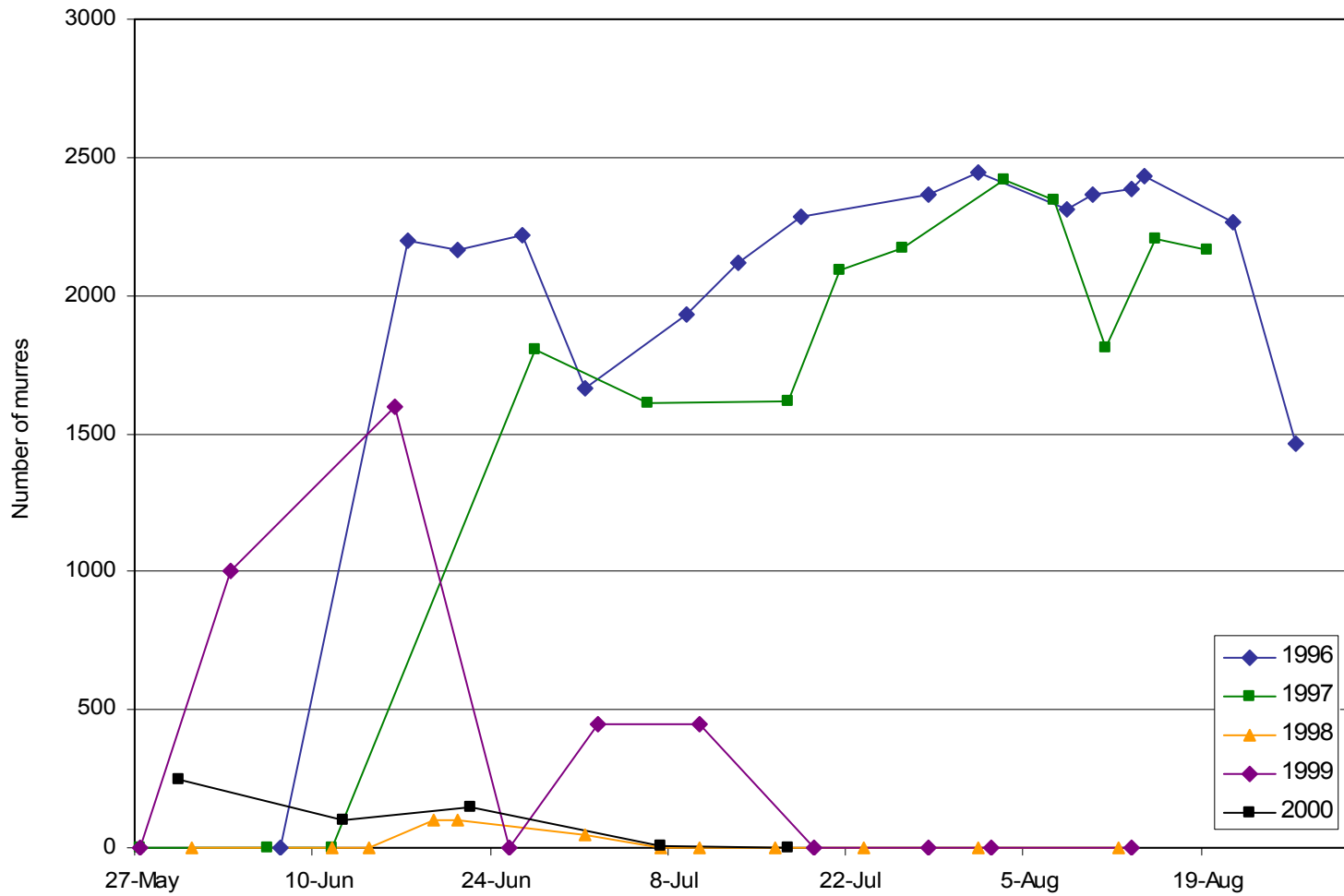


Figure 13. Numbers of common and thick-billed murres attending plots at Kasatochi Island, Alaska. No murres attempted to breed at Kasatochi in 2001-2007.

Table 38. 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 murre were present on index plots in 2001-2007.

Year	Replicate								Statistics			
	1	2	3	4	5	6	7	8	<i>n</i>	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 39. 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 murrees were present on index plots in 2001-2007.

Year	Replicate								Statistics			
	1	2	3	4	5	6	7	8	<i>n</i>	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 40. Counts of common and thick-billed murres at Koniuji Island, Alaska. Historical data are from Byrd and Williams (1994) and Byrd (1995).

Plot	1994 <sup>a</sup>	1995	1996	1997	1998	2000	2001	2003	2004	2007
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
<b>East side (plots 1-4)</b>	<b>774</b>	<b>276</b>	<b>336</b>	<b>478</b>	<b>106</b>	<b>339</b>	<b>330</b>	<b>253</b>	<b>456</b>	<b>997</b>
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
<b>South side (plots 5-7)</b>	<b>--</b>	<b>935</b>	<b>67</b>	<b>1,058</b>	<b>779</b>	<b>503</b>	<b>1,100</b>	<b>1,036</b>	<b>904</b>	<b>1249</b>
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
<b>West side (plots 8-11)</b>	<b>454</b>	<b>1,112</b>	<b>1,011</b>	<b>1,353</b>	<b>2,003</b>	<b>NC</b>	<b>1,724</b>	<b>1,123</b>	<b>1,570</b>	<b>897</b>
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
<b>North side (plots 12-14)</b>	<b>--</b>	<b>NC<sup>b</sup></b>	<b>43</b>	<b>256</b>	<b>675</b>	<b>NC</b>	<b>1,096</b>	<b>661</b>	<b>945</b>	<b>148</b>
<b>Total</b>	<b>1,228</b>	<b>&gt;2,323</b>	<b>1,457</b>	<b>3,145</b>	<b>3,563</b>	<b>&gt;842</b>	<b>4,250</b>	<b>3,073</b>	<b>3,875</b>	<b>3291</b>

<sup>a</sup>During the 1994 survey, the island was divided into just 2 sections (east and west).

<sup>b</sup>NC = not counted.

Table 41. Numbers of common and thick-billed murre observed at Ulak Island, Alaska.

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
2006	7 Aug	39	198	695	119	1,976	398	3,425
2007	21 Jul	92	255	621	58	2,139	606	3,771

Table 42. Mean numbers of pigeon guillemots observed on circumnavigation surveys of Kasatochi Island, Alaska.

Year	Date	Replicate				Statistics			
		1	2	3	4	<i>n</i>	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 <sup>a</sup>	25 Jun	46	--	--	--	1	46.0	--	--
2000 <sup>b</sup>	6 Aug	96	--	--	--	1	96.0	--	--
2002	31 May-30 Jun	39	28 <sup>c</sup>	111	--	2	75.0	50.9	39-111
2003 <sup>d</sup>	6 Jun	34	--	--	--	1	34.0	--	--
2004	5 Jun	42	--	--	--	1	42.0	--	--
2005	22 Jun	72	--	--	--	1	72.0	--	--
2007 <sup>b</sup>	5 Aug	85	--	--	--	1	85.0	--	--

<sup>a</sup>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.

<sup>b</sup>Surveys were conducted late in the season so values may not be comparable with other years.

<sup>c</sup>This survey was only conducted on part of the island in less than ideal conditions.

<sup>d</sup>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.

Table 43. Numbers of pigeon guillemots observed in circumnavigation survey sections at Kasatochi Island, Alaska.

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
2002	31 May	20	0	3	16	0	0	0	39
	28 Jun <sup>a</sup>	NC <sup>b</sup>	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
2007	5 Aug	10	13	2	18	10	18	14	85

<sup>a</sup>This survey was only conducted on part of the island in less than ideal conditions.

<sup>b</sup>NC= Not counted.

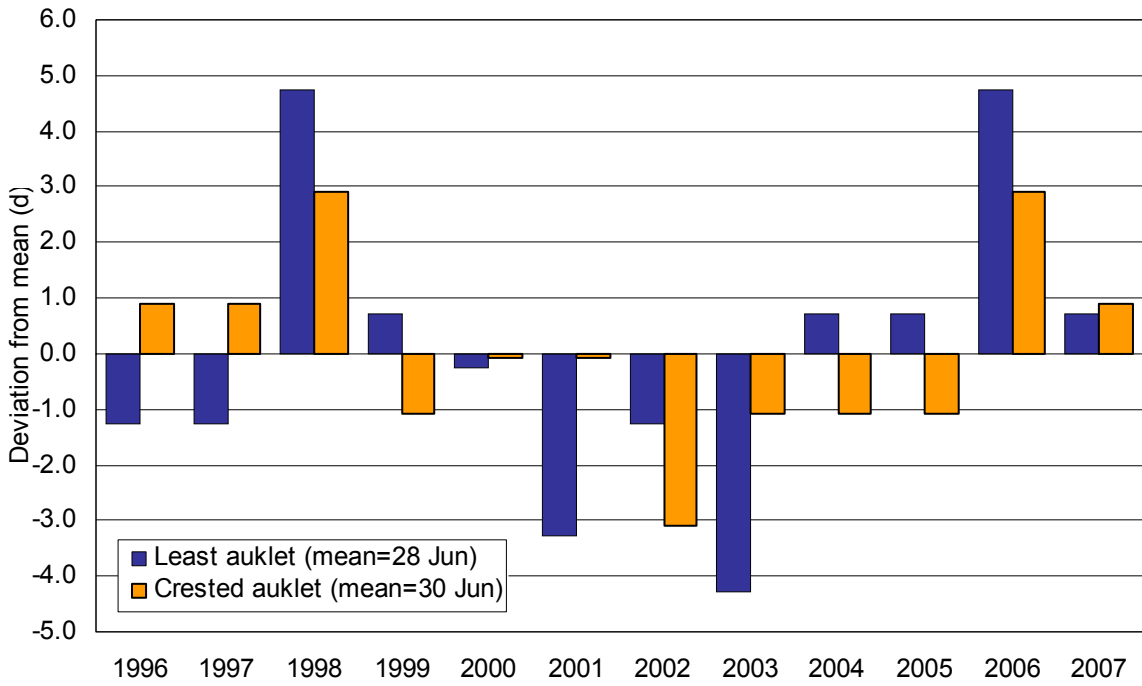


Figure 14. Deviation from mean of median hatch dates for least and crested auklets at Kasatochi Island, Alaska. Numbers below the mean indicate earlier hatch dates, positive numbers indicate later hatch dates.

Table 44. Nesting chronology of parakeet auklets at Kasatochi Island, Alaska.

Parameter	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Lay date<sup>a</sup></b>										
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
<i>n</i>	1	1	3	2	2	2	2	1	2	4
<b>Hatch date</b>										
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
<i>n</i>	1	1	3	2	2	2	2	1	2	4
<b>Fledge date</b>										
median	4 Aug	2 Aug	4 Aug	--	--	16 Aug	11 Aug	31 Jul	8 Aug	4 Aug
mean	4 Aug	2 Aug	2 Aug	--	--	16 Aug	5 Aug	31 Jul	9 Aug	5 Aug
SD	--	0 d	2.9 d	--	--	--	18.2 d	2.8 d	5.0 d	1.8 d
min	4 Aug	2 Aug	29 Jul	--	--	16 Aug	16 Jul	29 Jul	4 Aug	4 Aug
max	4 Aug	2 Aug	4 Aug	--	--	16 Aug	20 Aug	2 Aug	14 Aug	8 Aug
<i>n</i>	1	2	3	--	--	1	3	2	5	6
<b>Nesting period (days)</b>										
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
<i>n</i>	1	1	3	--	--	1	1	1	1	3

<sup>a</sup>Lay dates are estimated by subtracting 30 days from hatch dates.

Table 45. Nesting chronology of least auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Lay date<sup>a</sup></b>												
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
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
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
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
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
<i>n</i>	36	74	65	76	90	50	68	35	31	55	42	69
<b>Hatch date</b>												
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
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
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
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
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
<i>n</i>	36	74	65	76	90	50	68	35	31	55	42	69
<b>Fledge date</b>												
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
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
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
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
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
<i>n</i>	46	59	47	46	76	53	46	22	42	31	25	52
<b>Nesting period (days)</b>												
median	30	30	28	30	30	29	29	31	30	29	28	29
mean	30	29	29	30	29	31	30	30	30	29	29	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
min	26	25	25	26	25	25	25	25	27	26	26	25
max	34	34	36	36	39	41	40	35	34	37	32	38
<i>n</i>	24	59	47	46	76	53	45	22	17	31	25	52

<sup>a</sup>Lay dates are estimated by subtracting 30 days from hatch dates.

Table 46. Frequency distribution of hatch dates for least auklets at Kasatochi Island, Alaska.

Julian Date	No. nests hatching on Julian date											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
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
177	-	1	-	-	22	22	1	-	-	-	-	2
178	15	35	-	-	1	-	-	-	-	2	-	24
179	-	-	3	2	10	-	18	4	1	1	-	-
180	-	1	15	26	4	2	-	2	11	18	8	2
181	-	-	-	-	17	7	1	-	-	-	-	-
182	8	12	-	1	1	-	-	1	-	-	1	23
183	-	3	3	4	1	1	11	2	-	1	-	-
184	-	-	20	17	-	-	-	-	1	-	12	-
185	-	1	-	-	10	4	1	-	3	3	-	1
186	-	-	-	-	2	-	-	-	-	-	-	4
187	-	7	-	-	2	-	9	1	-	-	1	-
188	-	-	9	8	-	-	-	-	-	-	8	-
189	-	-	-	-	-	4	-	-	4	-	-	-
190	-	-	-	-	1	-	1	-	-	3	-	-
191	-	1	1	-	1	-	1	-	-	-	3	-
192	-	-	3	1	1	-	-	1	-	-	-	6
193	-	-	-	-	-	3	-	-	1	-	1	-
194	-	-	-	-	2	-	-	-	-	1	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	3	1	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	1	-
199	-	-	1	-	-	-	-	-	-	-	-	-
200	-	-	1	-	-	-	-	-	-	2	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	1	-	1	-	-	-
203	-	-	-	-	1	-	-	-	-	-	-	-
204	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	1	-	-	-	-	-	-	-



Table 47. Nesting chronology of whiskered auklets at Kasatochi Island, Alaska.

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

<sup>a</sup>Lay dates are estimated by subtracting 30 days from hatch dates.

Table 48. Nesting chronology of crested auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Lay date <sup>a</sup>												
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
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
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
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
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
<i>n</i>	33	80	72	95	98	73	70	46	33	63	55	71
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
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
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
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
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
<i>n</i>	33	80	72	95	98	73	70	46	33	63	55	71
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
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
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
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
max	8 Aug	12 Aug	>16 Aug	14 Aug	12 Aug	10 Aug	11 Aug	16 Aug	11 Aug	12 Aug	14 Aug	12 Aug
<i>n</i>	39	49	67	76	91	57	52	31	72	46	39	62
Nestling period (days)												
median	31	34	32	34	34	33	34	35	34	34	32	34
mean	32	34	33	33	33	33	34	34	35	33	33	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
min	26	26	26	26	26	27	28	27	26	26	28	26
max	39	42	37	42	43	38	41	41	44	40	38	42
<i>n</i>	25	49	67	76	90	57	50	31	31	46	39	62

<sup>a</sup>Lay dates are estimated by subtracting 34 days from hatch dates.

Table 49. Frequency distribution of hatch dates for crested auklets at Kasatochi Island, Alaska.

Julian Date	No. nests hatching on Julian date											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
170	-	-	-	-	-	-	2	-	-	-	-	-
171	-	-	-	3	-	-	-	-	-	-	-	-
172	-	-	-	-	-	-	3	-	-	-	-	-
173	-	-	-	-	3	-	-	-	-	-	-	-
174	-	-	-	-	-	-	14	-	-	1	-	2
175	-	-	-	-	1	-	-	1	3	-	-	-
176	-	-	-	12	1	-	1	-	9	16	-	1
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
181	-	-	-	-	29	29	2	-	-	-	-	3
182	9	3	-	-	-	-	8	1	-	-	-	23
183	-	28	2	1	-	-	-	7	-	-	4	-
184	-	-	30	17	1	-	1	5	2	2	23	-
185	-	-	-	-	9	10	-	-	4	4	-	1
186	10	1	3	-	-	-	9	1	-	-	1	8
187	-	-	5	1	-	-	-	3	-	-	4	-
188	-	26	16	7	-	1	-	2	-	-	13	-
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
193	-	-	-	-	-	3	-	-	1	-	4	-
194	2	-	-	-	2	-	1	-	-	3	-	-
195	-	1	1	-	-	-	-	-	-	-	-	-
196	-	2	3	-	-	-	-	-	-	-	-	-
197	-	-	-	1	-	-	-	-	-	-	-	-
198	-	-	-	-	1	-	-	-	-	-	2	3
199	1	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	1	-	-	-	-	-	-

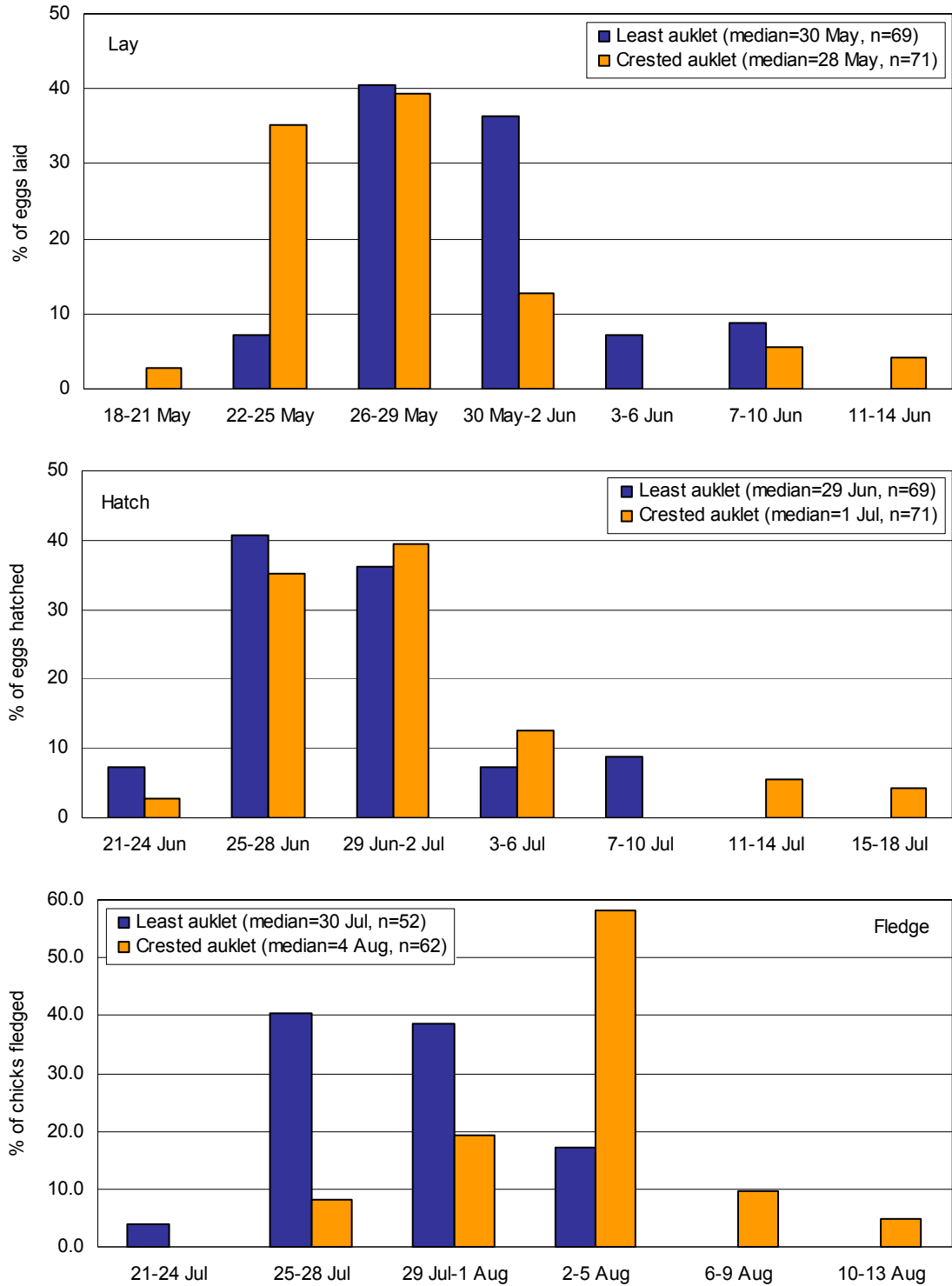


Figure 15. Distribution of lay, hatch, and fledge dates for least and crested auklets at Kasatochi Island, Alaska in 2007.

Table 50. Hatching dates of least and crested auklets at Kasatochi Island, Alaska, 2007. 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.

Species	June												July																			
	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			5		2x	2	24		2x	23		x	1	4			x			6			x							x
Crested		x			2		1x	3	21		2x	3	23		x	1	8			x			4			x				3		x

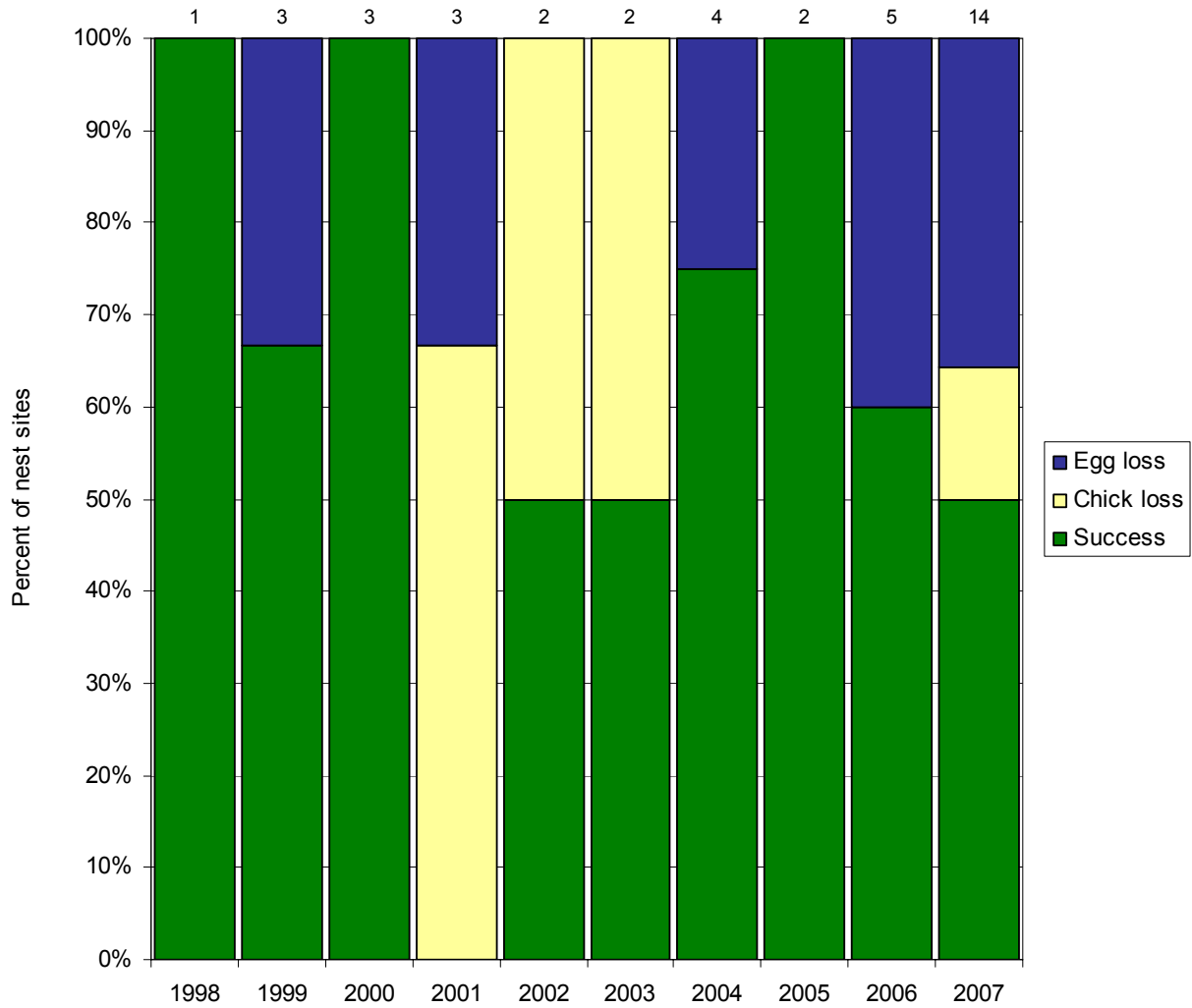


Figure 16. Reproductive performance of parakeet auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.

Table 51. Reproductive performance of parakeet auklets at Kasatochi Island, Alaska.

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

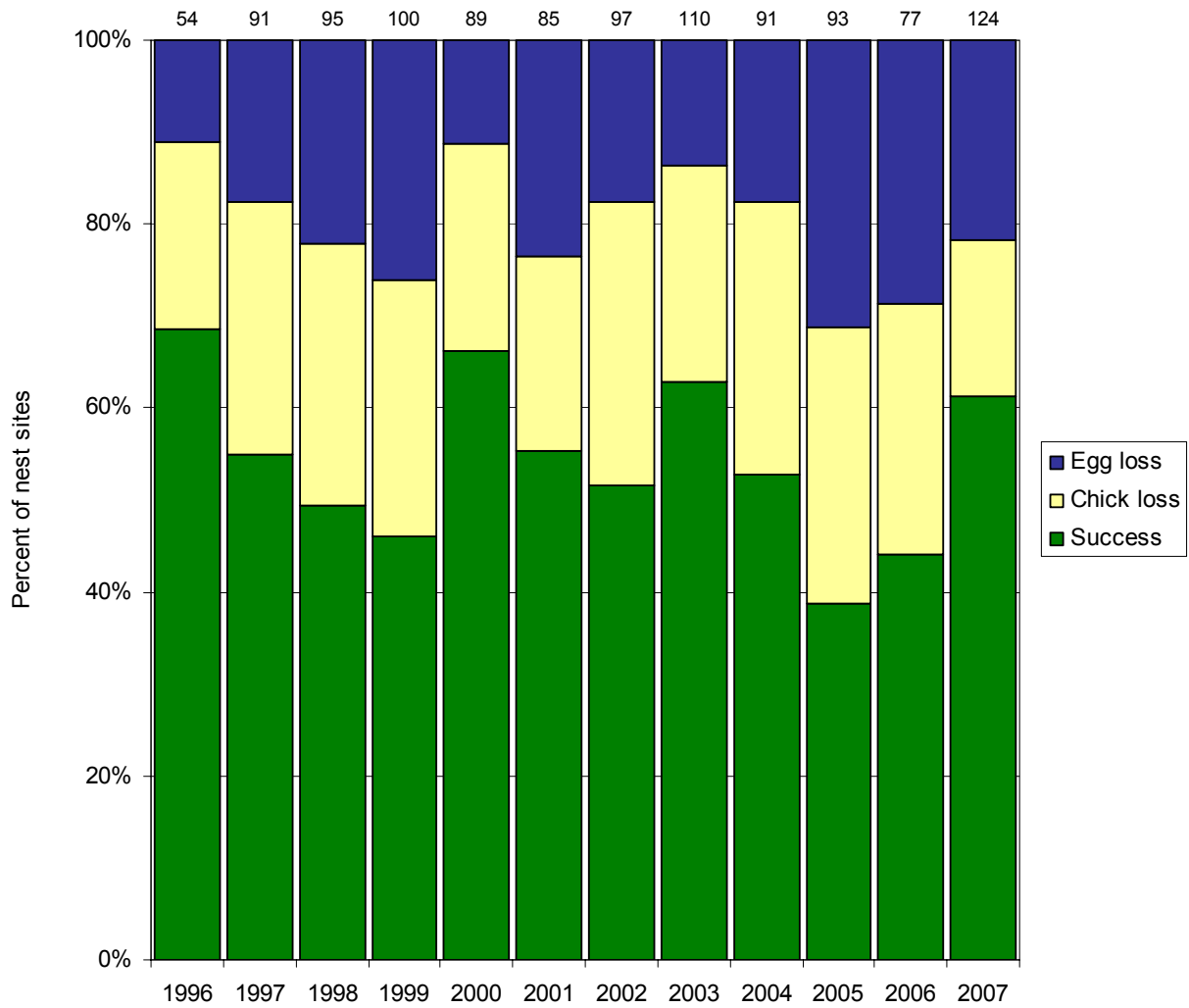


Figure 17. Reproductive performance of least auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.



Table 52. Reproductive performance of least auklets at Kasatochi Island, Alaska.

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

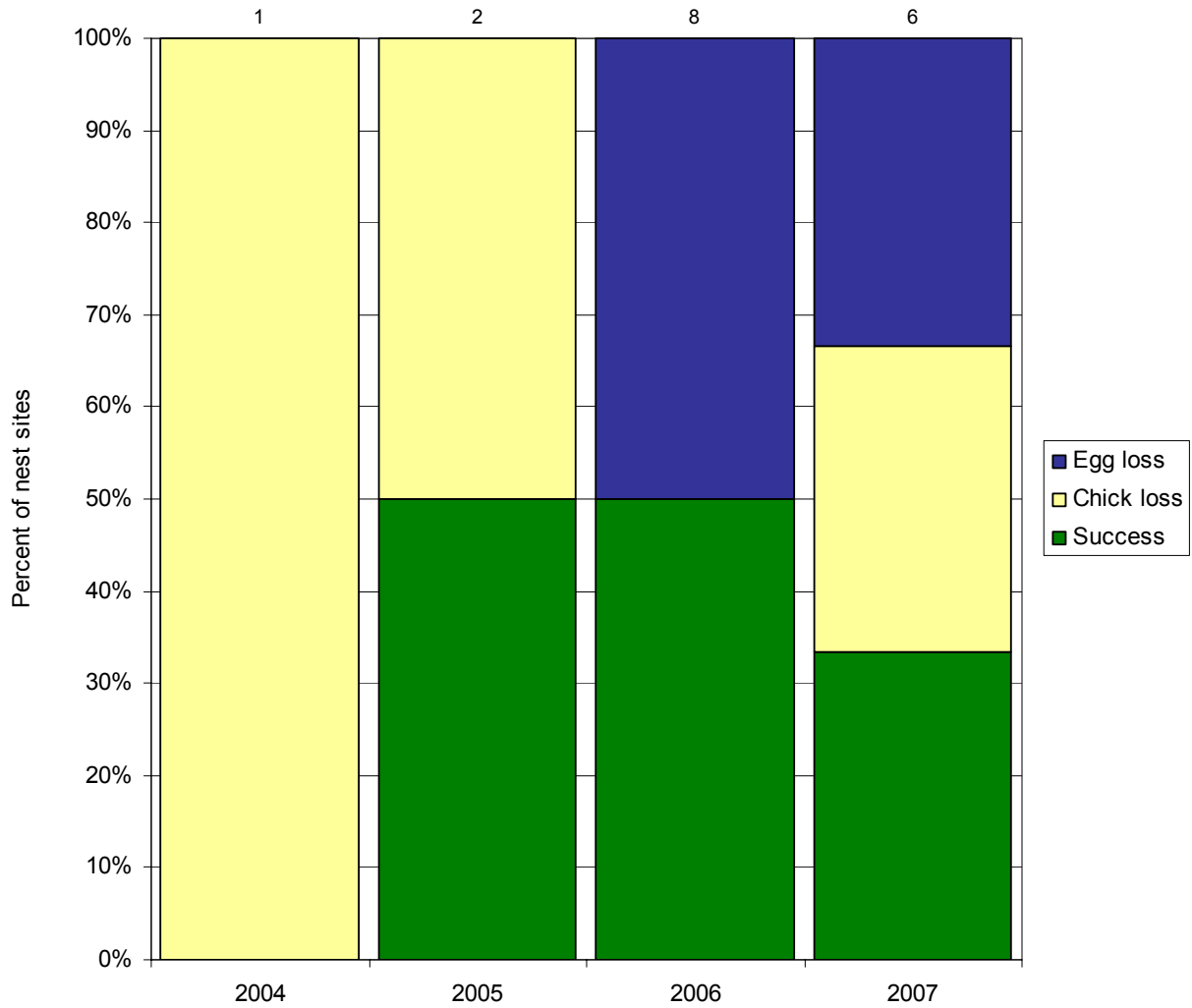


Figure 18. Reproductive performance of whiskered auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.

Table 53. Reproductive performance of whiskered auklets at Kasatochi Island, Alaska.

Parameter	2004	2005	2006	2007
No. eggs found (A)	1	2	8	6
No. eggs lost to:				
disappearance	0	0	0	0
abandonment/non-hatch	0	0	3	2
breakage	0	0	1	0
No. eggs hatched (B)	1	2	4	4
No. chicks lost to:				
disappearance	0	0	0	1
death	1	1	0	1
No. chicks fledged (C)	0	1	4	2
Hatching success (B/A)	1.00	1.00	0.50	0.67
Fledging success (C/B)	0.00	0.50	1.00	0.50
Reproductive success (C/A)	0.00	0.50	0.50	0.33

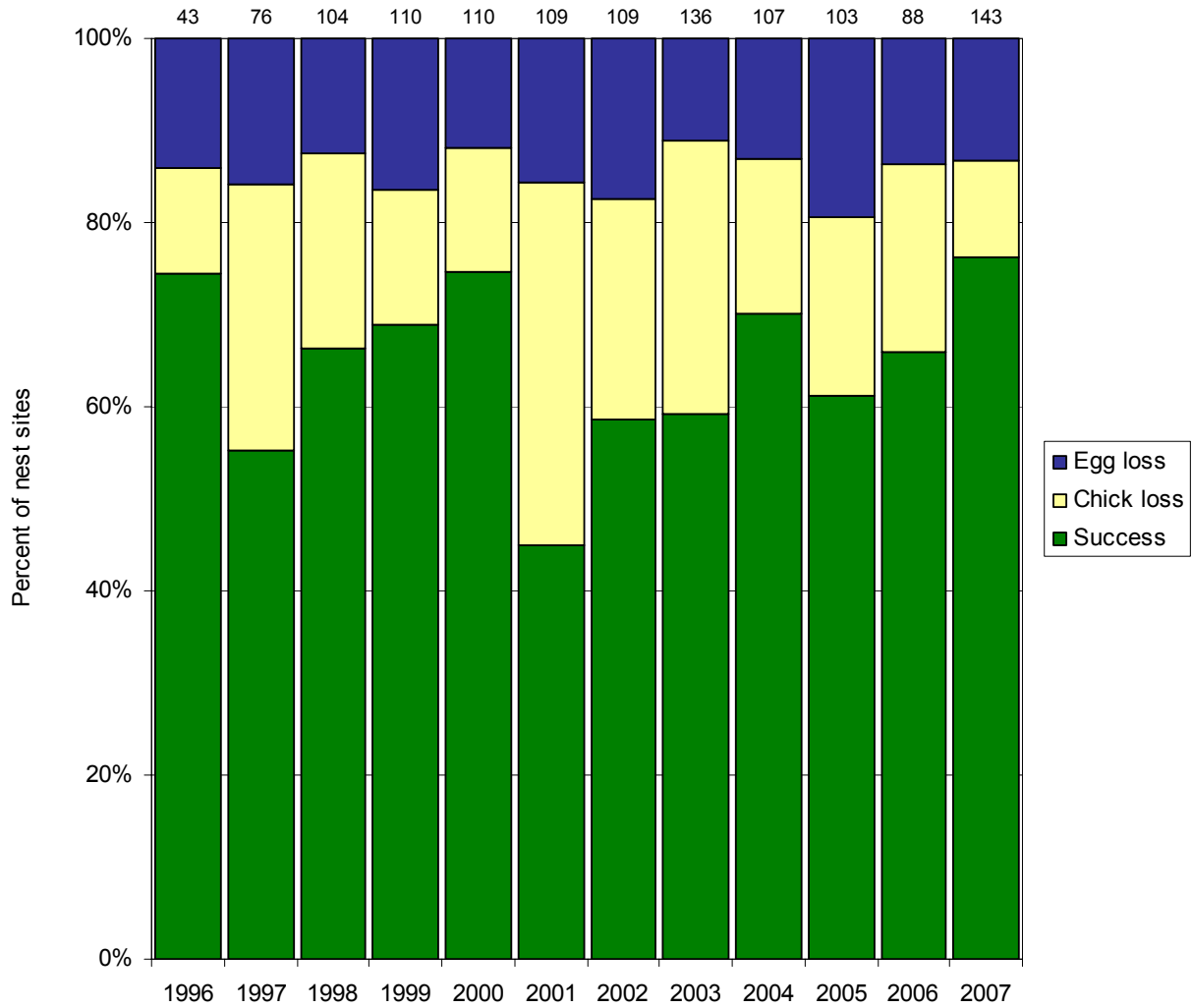


Figure 19. Reproductive performance of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of nests.

Table 54. Reproductive performance of crested auklets at Kasatochi Island, Alaska.

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No. eggs found (A)	43	76	104	110	110	109	109	136	107	103	88	143
No. eggs lost to:												
disappearance	2	4	2	5	7	8	6	2	5	8	6	2
abandonment/non-hatch	3	8	11	12	6	6	10	10	5	11	3	16
breakage	1	0	0	1	0	3	3	4	4	1	3	1
No. eggs hatched (B)	37	64	91	92	97	91	90	120	93	83	76	124
No. chicks lost to:												
disappearance	2	13	14	11	9	22	13	10	12	7	11	7
death	3	9	8	5	6	21	13	24	6	13	7	8
No. chicks fledged (C)	32	42	69	76	82	49	64	86	75	63	58	109
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
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
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

Table 55. 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.

Year	<i>n</i>	Mass (g/day)			Wing chord (mm/day)			Tarsus length (mm/day)		
		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

Table 56. 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.

Year	<i>n</i>	Mass (g/day)			Wing chord (mm/day)			Tarsus length (mm/day)		
		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

Table 57. 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  $\phi$ , recapture probability by  $p$ , and time-dependence by a  $t$  subscript.

Model	AICc	$\Delta$ AICc	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 58. Estimates of annual survival probability ( $\phi$ ) generated by different models, as calculated by program MARK, for least auklets at Kasatochi Island, Alaska.

Year	$\{\phi_t, p_t\}$		$\{\phi, p_t\}$		$\{\phi_t, p\}$		$\{\phi, p\}$	
	$\phi$	SE	$\phi$	SE	$\phi$	SE	$\phi$	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 <sup>a</sup>	0.0000 <sup>a</sup>						
all years			0.8437	0.0076			0.8422	0.0074

<sup>a</sup>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 59. Estimates of annual recapture probabilities ( $p$ ) generated by different models, as calculated by program MARK, for least auklets at Kasatochi Island, Alaska.

Year	$\{\phi_t, p_t\}$		$\{\phi, p_t\}$		$\{\phi_t, p\}$		$\{\phi, p\}$	
	$p$	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 <sup>a</sup>	0.0000 <sup>a</sup>	0.8141	0.0383				
all years					0.8600	0.0086	0.8575	0.0086

<sup>a</sup>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 60. 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  $\phi$ , recapture probability by  $p$ , and time-dependence by a  $t$  subscript.

Model	AICc	$\Delta$ AICc	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 61. Estimates of annual survival probability ( $\phi$ ) generated by different models, as calculated by program MARK, for crested auklets at Kasatochi Island, Alaska.

Year	$\{\phi, p_t\}$		$\{\phi_t, p_t\}$		$\{\phi, p\}$		$\{\phi_t, p\}$	
	$\phi$	SE	$\phi$	SE	$\phi$	SE	$\phi$	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 <sup>a</sup>	67.6113 <sup>a</sup>			0.7080	0.0844
all years	0.8483	0.0144			0.8378	0.0141		

<sup>a</sup>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 62. Estimates of annual recapture probability ( $p$ ) generated by different models, as calculated by program MARK, for crested auklets at Kasatochi Island, Alaska.

Year	$\{\phi, p_t\}$		$\{\phi_t, p_t\}$		$\{\phi, p\}$		$\{\phi_t, p\}$	
	$p$	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 <sup>a</sup>	67.6158 <sup>a</sup>				
all years					0.6489	0.0213	0.6497	0.0222

<sup>a</sup>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 63. Fates of batches of least auklets banded at Kasatochi Island, Alaska.

		number alive in:											
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
fates of batches:	1996	<b>139<sup>a</sup></b>	127	94	79	74	69	63	50	38	32	26	21
	1997		<b>122</b>	89	72	59	53	42	31	26	21	18	13
	1998			<b>73</b>	60	49	33	35	20	17	14	13	12
	1999				<b>46</b>	39	31	24	14	16	13	14	14
	2000					<b>27</b>	25	18	11	19	13	11	8
	2001						<b>14</b>	11	9	8	8	9	6
	2002							<b>40</b>	24	21	17	18	13
	2003								<b>20</b>	17	19	17	12
	2004									<b>45</b>	34	31	23
	2005										<b>32</b>	29	19
	2006											<b>36</b>	28
	2007												<b>38</b>
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

<sup>a</sup>Numbers in bold indicate number of auklets marked that year.

Table 64. Fates of batches of crested auklets banded at Kasatochi Island, Alaska.

		number alive in:											
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
fates of batches:	1996	<b>51<sup>a</sup></b>	35	33	24	20	10	7	2	1	1	4	1
	1997		<b>35</b>	26	22	14	14	11	4	4	4	5	3
	1998			<b>21</b>	14	10	7	4	2	0	1	1	1
	1999				<b>15</b>	12	10	9	3	3	2	3	4
	2000					<b>9</b>	8	8	5	4	3	4	2
	2001						<b>4</b>	4	3	3	4	3	3
	2002							<b>12</b>	10	9	10	6	6
	2003								<b>3</b>	4	4	3	2
	2004									<b>15</b>	12	6	3
	2005										<b>13</b>	6	4
	2006											<b>26</b>	16
	2007												<b>27</b>
	marked population		51	70	80	75	65	53	55	32	43	54	67
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

<sup>a</sup>Numbers in bold indicate number of auklets marked that year.

Table 65. Least auklet plumage changes at Kasatochi Island, Alaska between 1996 and 2007.

Beginning plumage <sup>a</sup>	<i>n</i>	% 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 <sup>b</sup>	52	11	19	18

<sup>a</sup>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.

<sup>b</sup>Total number of birds having at least two plumage measurements.

Table 66. Summary of least auklet morphometric information collected during banding at Kasatochi Island, Alaska.

Parameter		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		
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	99	104	99	
		<i>n</i>	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	
		<i>n</i>	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
<i>n</i>			--	--	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	
		<i>n</i>	--	--	55	38	20	12	32	25	18	38	31	44	

Table 67. Summary of least auklet brood patch, web damage, and plumage information collected during banding at Kasatochi Island, Alaska.

Year	Brood Patch			Web Damage			Plumage		
	(% of birds with none - partial - full; <i>n</i> )			(% of birds with none - some - severe; <i>n</i> )			(% of birds with 0 - 1 - 2 - 3 - 4 <sup>a</sup> ; <i>n</i> )		
	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	

<sup>a</sup>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 68. Summary of crested auklet morphometric information collected during banding at Kasatochi Island, Alaska.

Parameter		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		
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	284	175	308	294	289
		<i>n</i>	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	
		<i>n</i>	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	
		<i>n</i>	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	
		<i>n</i>	--	--	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	
		<i>n</i>	--	--	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	
		<i>n</i>	--	--	5	2	--	--	--	--	2	5	--	16	

Table 69. Summary of crested auklet brood patch and web damage information collected during banding at Kasatochi Island, Alaska.

Year	Brood Patch				Web Damage			
	(% of birds with none-partial - full; <i>n</i> )				(% of birds with none - some - severe; <i>n</i> )			
	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

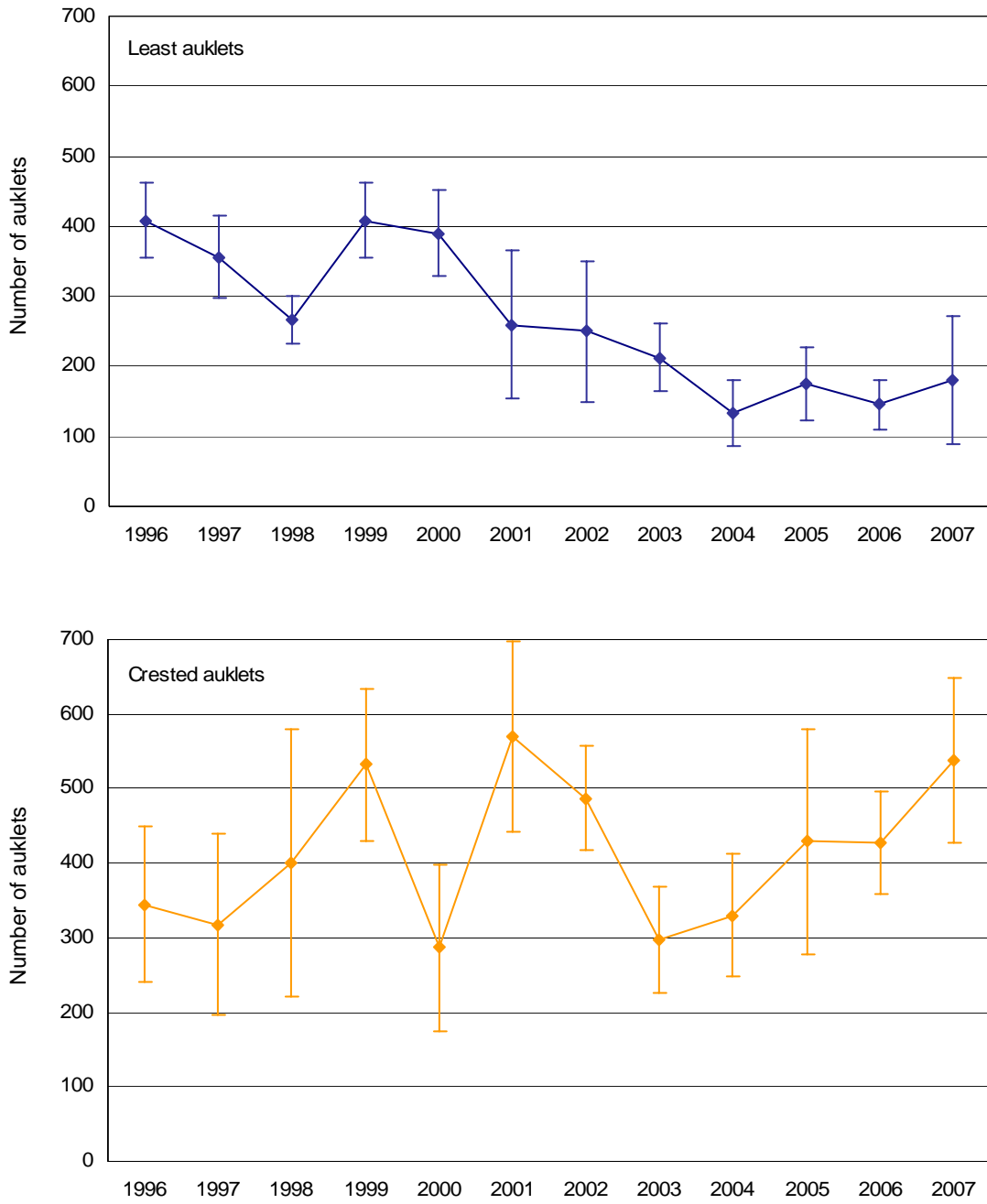


Figure 20. Numbers of least and crested auklets observed on index plots at Kasatochi Island, Alaska. Values represent the mean of the sums of the maximum counts for each of 8 index plots for counts conducted during 20 days before to 10 days after the mean hatch date.

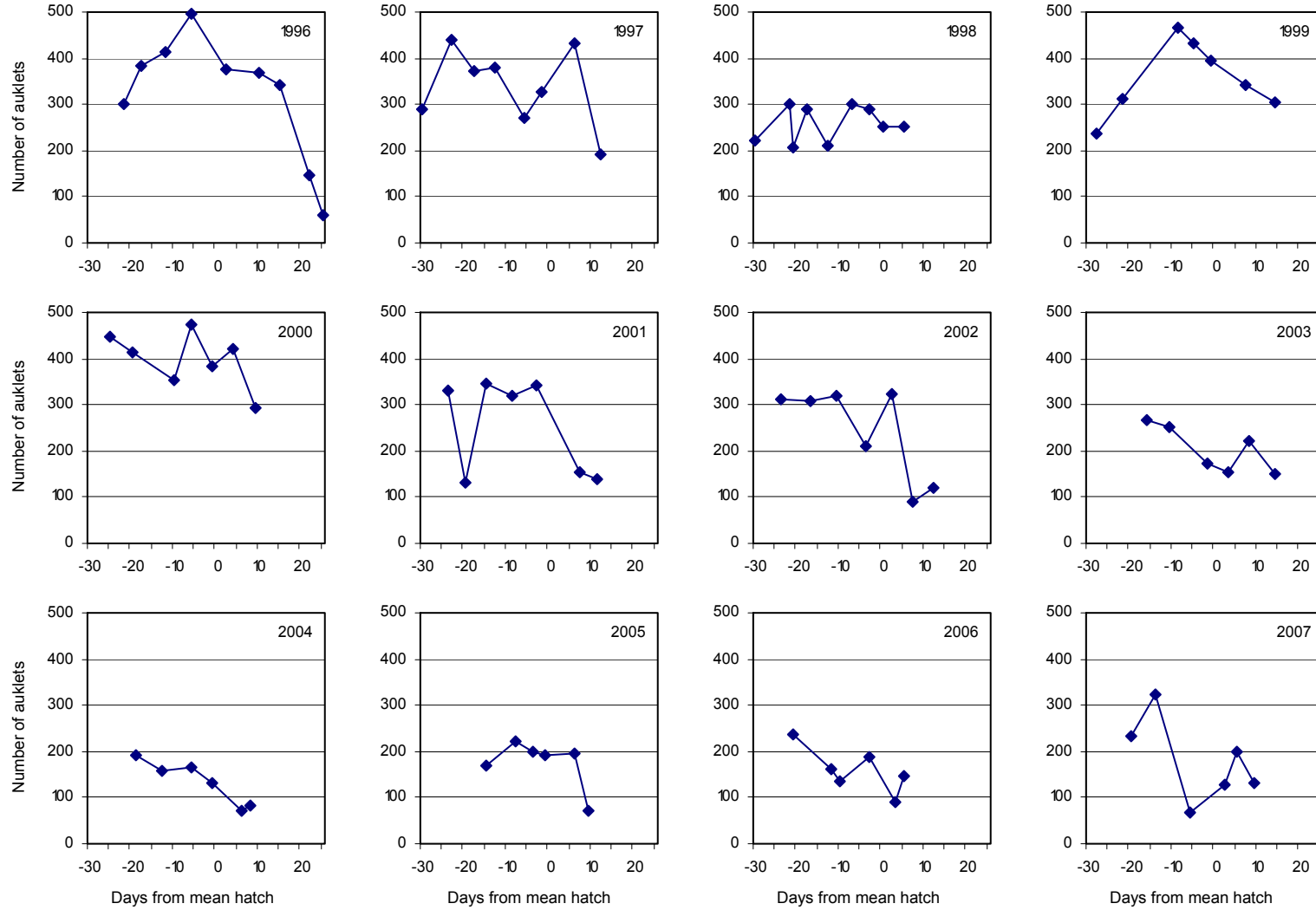


Figure 21. Numbers of least auklets observed on 8 index plots at Kasatochi Island, Alaska. Values represent the sum of the maximum count per plot. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

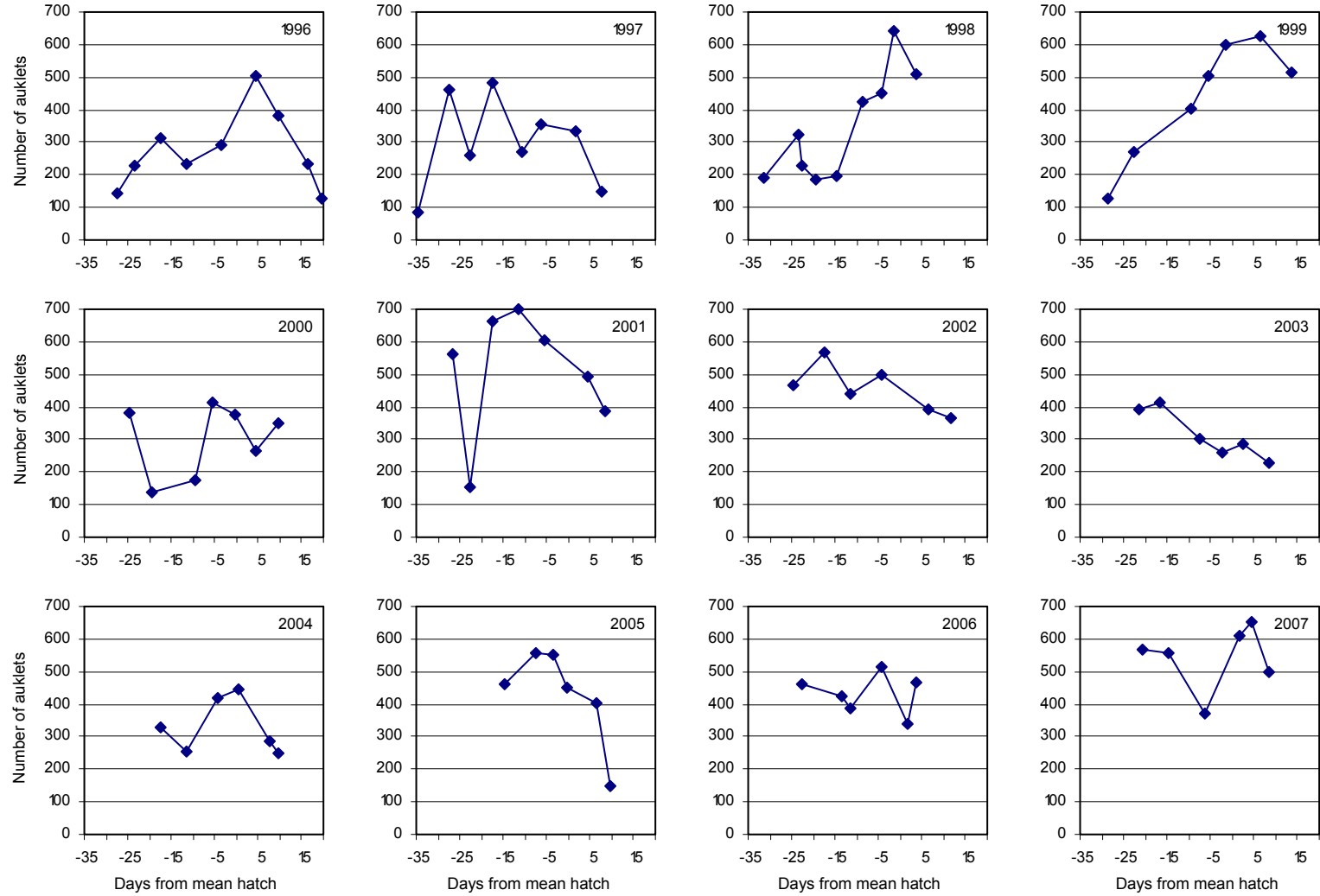


Figure 22. Numbers of crested auklets observed on 8 index plots at Kasatochi Island, Alaska. Values represent the sum of the maximum count per plot. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

Table 70. 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
All <sup>a</sup>	1	393	301	291	220	238	447	329	312	268	191	171	238	232
	2	479	385	440	302	311	415	133	308	251	157	221	161	325
	3	537	414	371	208	465	352	347	318	172	164	198	137	68
	4	456	498	381	291	433	473	321	210	153	132	190	187	129
	5	--	375	272	211	393	384	342	325	220	72	196	92	200
	6	--	369	327	299	341	421	154	90	152	84	72	148	131
	7	--	341	431	289	304	294	140	119	--	--	--	--	--
	8	--	148	192	251	--	--	--	--	--	--	--	--	--
	9	--	61	--	252	--	--	--	--	--	--	--	--	--
<u>Statistics</u>														
	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
	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
	n	4	9	8	9	7	7	7	7	6	6	6	6	6
-----														
20 d. before to 10 d. after mean hatch <sup>b</sup>	1	-- <sup>c</sup>	385	371	291	465	415	133	308	268	191	171	161	232
	2	--	414	381	211	433	352	347	318	251	157	221	137	325
	3	--	498	272	299	393	473	321	210	172	164	198	187	68
	4	--	375	327	289	341	384	342	325	153	132	190	92	129
	5	--	369	431	251	--	421	154	90	220	72	196	148	200
	6	--	--	--	252	--	294	--	--	--	84	72	--	131
<u>Statistics</u>														
	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
	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
	n	--	5	5	6	4	6	5	5	5	6	6	5	6

<sup>a</sup>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, and 10 Jun-9 Jul 2007.

<sup>b</sup>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, and 10 Jun-9 Jul 2007.

<sup>c</sup>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 71. 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
All <sup>a</sup>	1	586	303	355	614	412	434	425	254	253	326	308
	2	540	397	423	514	159	412	412	210	316	236	447
	3	541	308	631	432	471	472	301	265	279	166	90
	4	371	401	558	664	456	392	251	213	267	295	192
	5	461	291	587	546	453	486	328	119	289	126	315
	6	624	429	496	594	206	134	232	149	99	225	204
	7	392	463	470	440	195	175	--	--	--	--	--
	8	--	382	--	--	--	--	--	--	--	--	--
	9	--	390	--	--	--	--	--	--	--	--	--
<u>Statistics</u>												
	mean	502.1	373.8	502.9	543.4	336.0	357.9	324.8	201.7	250.5	229.0	259.3
	SD	96.5	60.0	96.5	87.6	141.5	143.1	80.3	57.5	77.2	75.4	124.1
	<i>n</i>	7	9	7	7	7	7	6	6	6	6	6
-----												
20 d. before to 10 d. after mean hatch <sup>b</sup>	1	540	401	631	514	159	412	425	254	253	236	308
	2	541	291	558	432	471	472	412	210	316	166	447
	3	371	429	587	664	456	392	301	265	279	295	90
	4	461	463	496	546	453	486	251	213	267	126	192
	5	624	382	--	594	206	134	328	119	289	225	315
	6	--	390	--	440	--	--	--	149	99	--	204
<u>Statistics</u>												
	mean	507.4	392.7	568.0	531.7	349.0	379.2	343.4	201.7	250.5	209.6	259.3
	SD	95.6	58.0	56.6	89.7	153.1	142.6	74.1	57.5	77.2	65.4	124.1
	<i>n</i>	5	6	4	6	5	5	5	6	6	5	6

<sup>a</sup>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, and 10 Jun-9 Jul 2007.

<sup>b</sup>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, and 10 Jun-9 Jul 2007.

Table 72. 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
All <sup>a</sup>	1	129	142	85	189	129	383	560	465	392	328	464	460	567
	2	378	230	462	325	271	138	153	566	413	256	558	424	556
	3	319	312	258	229	401	175	664	442	302	417	549	389	370
	4	234	231	482	184	504	413	699	497	258	443	452	517	608
	5	--	291	270	197	598	375	607	537	286	289	404	338	654
	6	--	505	357	422	625	266	495	394	226	247	146	466	499
	7	--	384	333	450	516	350	388	365	--	--	--	--	--
	8	--	233	148	642	--	--	--	--	--	--	--	--	--
	9	--	127	--	509	--	--	--	--	--	--	--	--	--
	<u>Statistics</u>													
	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
	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
	n	4	9	8	9	7	7	7	7	6	6	6	6	6
20 d. before to 10 d. after mean hatch <sup>b</sup>	1	-- <sup>c</sup>	312	482	184	401	138	664	566	413	328	464	424	556
	2	--	231	270	197	504	175	699	442	302	256	558	389	370
	3	--	291	357	422	598	413	607	497	258	417	549	517	608
	4	--	505	333	450	625	375	495	537	286	443	452	338	654
	5	--	384	148	642	--	266	388	394	226	289	404	466	499
	6	--	--	--	509	--	350	--	--	--	247	146	--	--
	<u>Statistics</u>													
	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
	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
	n	--	5	5	6	4	6	5	5	5	6	6	5	5

<sup>a</sup>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, and 10 Jun-9 Jul 2007.

<sup>b</sup>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, and 16 Jun-9 Jul 2007.

<sup>c</sup>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 73. 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
All <sup>a</sup>	1	520	216	156	475	679	656	467	363	532	550	702
	2	289	397	332	161	153	696	523	280	642	543	719
	3	576	320	505	225	779	519	359	534	637	444	473
	4	352	221	663	480	892	630	309	533	566	664	716
	5	476	253	770	453	755	701	374	399	492	448	779
	6	429	578	814	377	620	512	333	318	229	579	649
	7	215	619	731	500	544	477	--	--	--	--	--
	8	--	781	--	--	--	--	--	--	--	--	--
	9	--	658	--	--	--	--	--	--	--	--	--
<u>Statistics</u>												
	mean	408.1	449.2	567.3	381.6	631.7	598.7	394.2	404.5	516.3	538.0	673.0
	SD	129.3	213.2	247.1	135.9	239.4	93.9	83.1	107.7	152.5	83.3	106.4
	<i>n</i>	7	9	7	7	7	7	6	6	6	6	6
-----												
20 d. before to 10 d. after mean hatch <sup>b</sup>	1	576	221	505	161	779	696	523	363	532	543	719
	2	352	253	663	225	892	519	359	280	642	444	473
	3	476	578	770	480	755	630	309	534	637	664	716
	4	429	619	814	453	620	701	374	533	566	448	779
	5	215	781	--	377	544	512	333	399	492	579	649
	6	--	658	--	500	--	--	--	318	229	--	--
<u>Statistics</u>												
	mean	409.6	518.3	688.0	366.0	718.0	611.6	379.6	404.5	516.3	535.6	667.2
	SD	135.7	228.5	137.5	141.8	137.2	92.1	83.9	107.7	152.5	92.9	117.9
	<i>n</i>	5	6	4	6	5	5	5	6	6	5	5

<sup>a</sup>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, and 10 Jun-9 Jul 2007.

<sup>b</sup>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, and 16 Jun-9 Jul 2007.

Table 74. Counts of least and crested auklets on index plots at Kasatochi Island, Alaska in 2007. Numbers represent the sum of the maximum counts for each of 8 or 10 plots.

Date	Least auklet			Crested auklet		
	Days from mean hatch date <sup>a</sup>	Counts		Days from mean hatch date	Counts	
		8 plots	10 plots		8 plots	10 plots
10 Jun	-20	232	308	-21	567	702
16 Jun	-14	325	447	-15	556	719
24 Jun	-6	68	90	-7	370	473
2 Jul	2	129	192	1	608	716
5 Jul	5	200	315	4	654	779
9 Jul	9	131	204	8	499	649
<hr/>						
All	mean	180.8	259.3		542.3	673.0
	SD	91.3	124.1		99.2	106.4
	<i>n</i>	6	6		6	6
20 d. before to 10 d. after mean hatch	mean	180.8	259.3		537.4	667.2
	SD	91.3	124.1		110.0	117.9
	<i>n</i>	6	6		5	5

<sup>a</sup>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 2007).

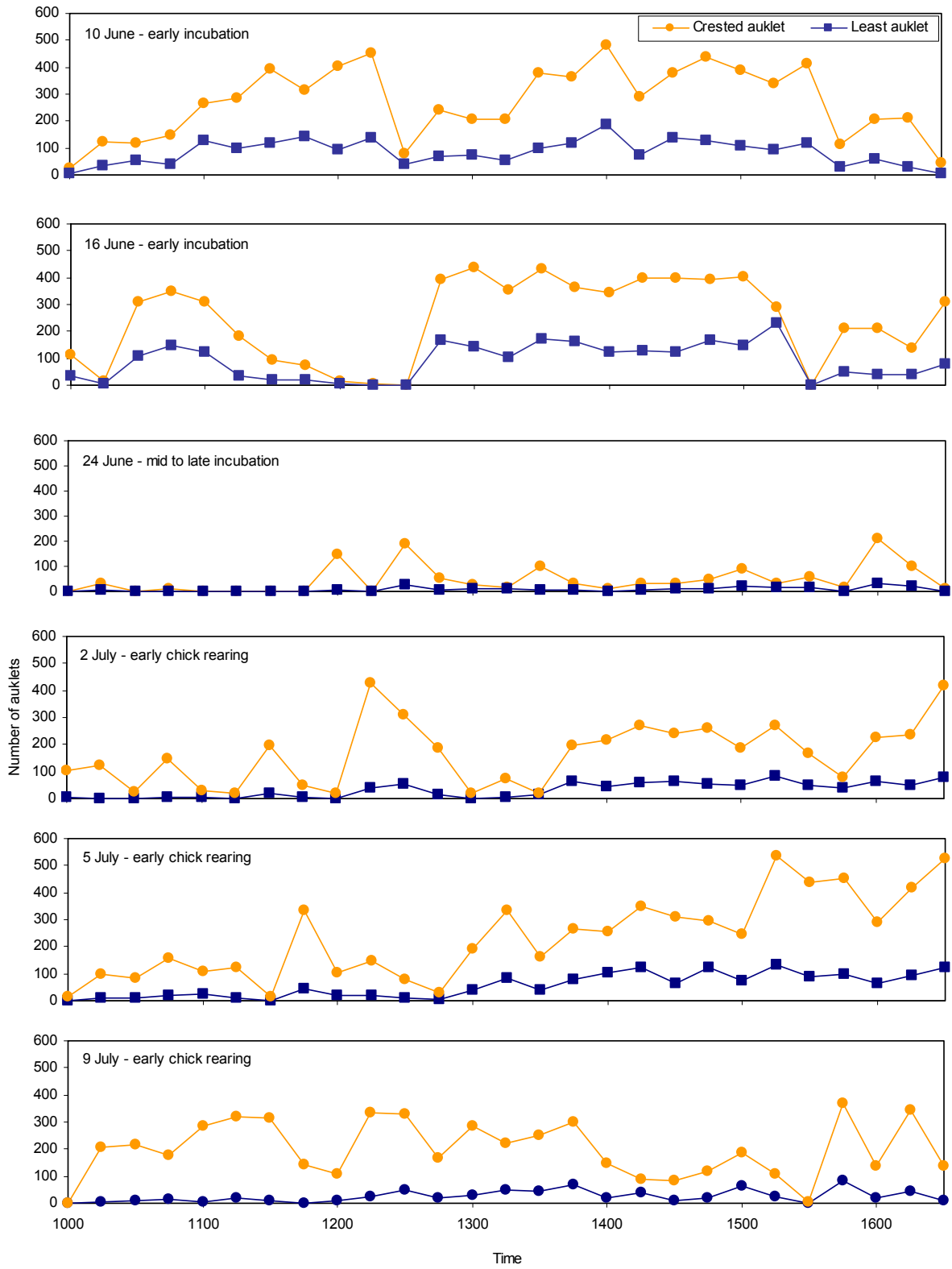


Figure 23. Attendance patterns of least and crested auklets on 8 index plots at Kasatochi Island, Alaska in 2007.

Table 75. Counts of least and crested auklets on index plots at Kasatochi Island, Alaska in 2007. Numbers represent the maximum count on each plot each day.

Date	Days from mean hatch date <sup>a</sup>	Plot									
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5
<b><u>Least auklet</u></b>											
10 Jun	-20	37	23	15	13	52	48	41	29	26	24
16 Jun	-14	38	32	19	10	76	135	28	34	29	46
24 Jun	-6	11	9	8	1	15	6	14	10	9	7
2 Jul	2	29	18	18	2	49	28	13	7	14	14
5 Jul	5	46	20	24	5	76	39	23	19	24	39
9 Jul	9	16	21	10	2	44	27	18	18	19	29
<b><u>Crested auklet</u></b>											
10 Jun	-21	43	59	67	12	65	114	74	82	116	70
16 Jun	-15	48	34	63	8	95	129	78	80	116	68
24 Jun	-7	20	20	25	3	33	38	56	59	149	70
2 Jul	1	100	23	98	8	49	102	60	72	145	59
5 Jul	4	86	43	114	7	74	102	77	105	120	51
9 Jul	8	41	31	81	10	70	89	72	78	97	80

<sup>a</sup>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 2007).

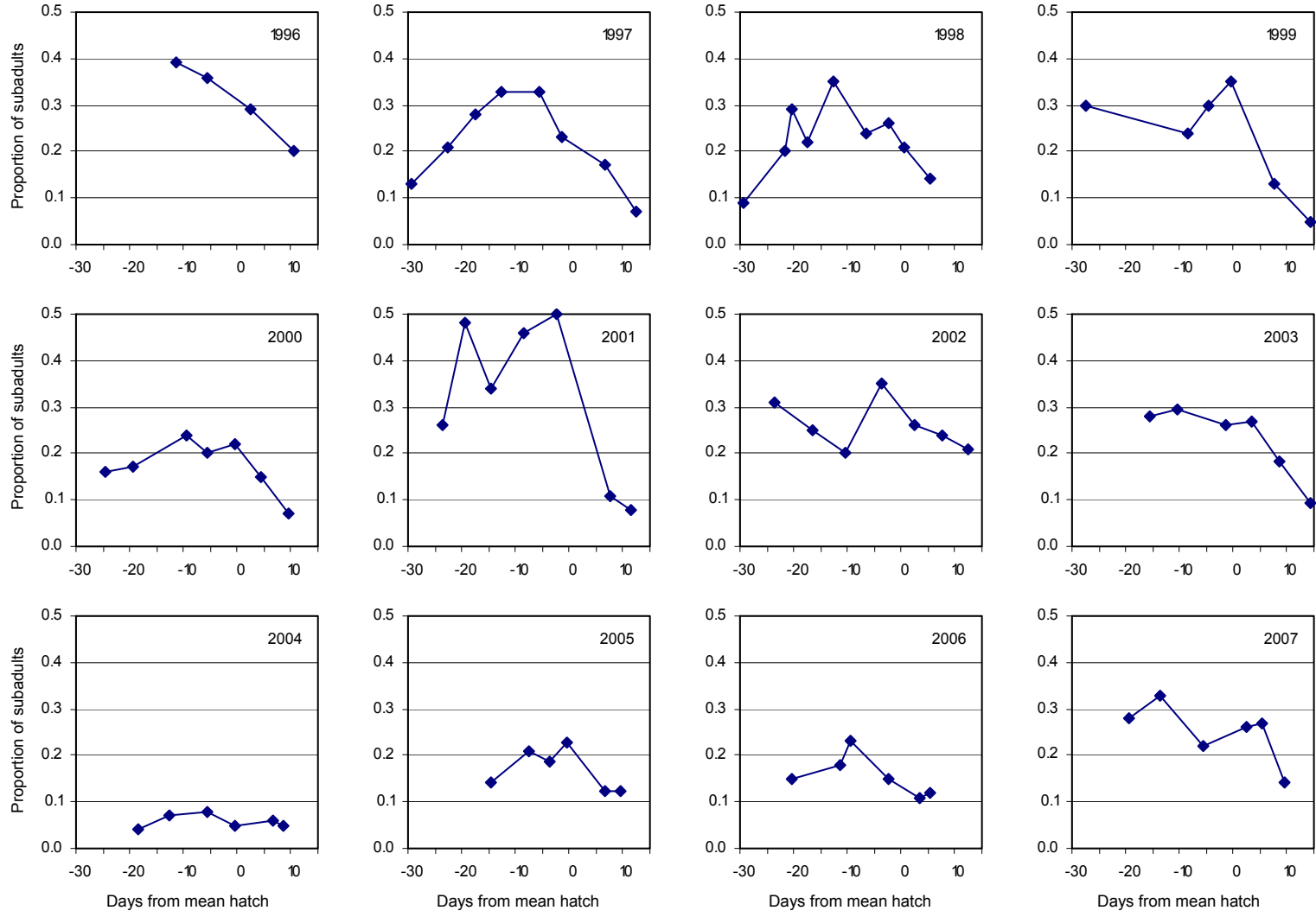


Figure 24. Proportion of least auklets that were subadults on index plots at Kasatochi Island, Alaska. Negative and positive values along the x-axis represent the number of days before and after the mean hatch date, respectively, for that year.

Table 76. Proportion of least auklets that were subadults on index plots at Kasatochi Island, Alaska.

Period	Date	Days from mean hatch date <sup>a</sup>	<i>n</i> <sup>b</sup>	Proportion of subadults		
				mean	SD	range
<b>2007</b>						
Early incubation	10 Jun	-20	74	0.28	0.13	0.00 - 0.69
	16 Jun	-14	85	0.33	0.14	0.00 - 0.67
Mid- to late incubation	24 Jun	-6	4	0.22	0.12	0.09 - 0.38
Early chick rearing	2 Jul	2	22	0.26	0.16	0.12 - 0.90
	5 Jul	5	47	0.27	0.09	0.00 - 0.45
	9 Jul	9	15	0.14	0.13	0.00 - 0.50
Mid-incubation to early chick rearing	<b>1996</b>		52	0.30	0.10	0.12 - 0.54
	<b>1997</b>		251	0.25	0.15	0.00 - 0.90
	<b>1998</b>		316	0.23	0.12	0.00 - 0.68
	<b>1999</b>		92	0.26	0.13	0.00 - 0.61
	<b>2000</b>		80	0.15	0.01	0.00 - 0.31
	<b>2001</b>		258	0.37	0.20	0.00 - 1.00
	<b>2002</b>		337	0.26	0.11	0.00 - 0.53
	<b>2003</b>		340	0.22	0.08	0.00 - 0.69
	<b>2004</b>		137	0.06	0.01	0.00 - 0.26
	<b>2005</b>		172	0.17	0.05	0.00 - 0.59
	<b>2006</b>		195	0.15	0.10	0.00 - 0.64
<b>2007</b>		88	0.24	0.13	0.00 - 0.90	

<sup>a</sup>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 2007).

<sup>b</sup>Sample unit was an individual count on an index plot when at least 10 auklets were present.

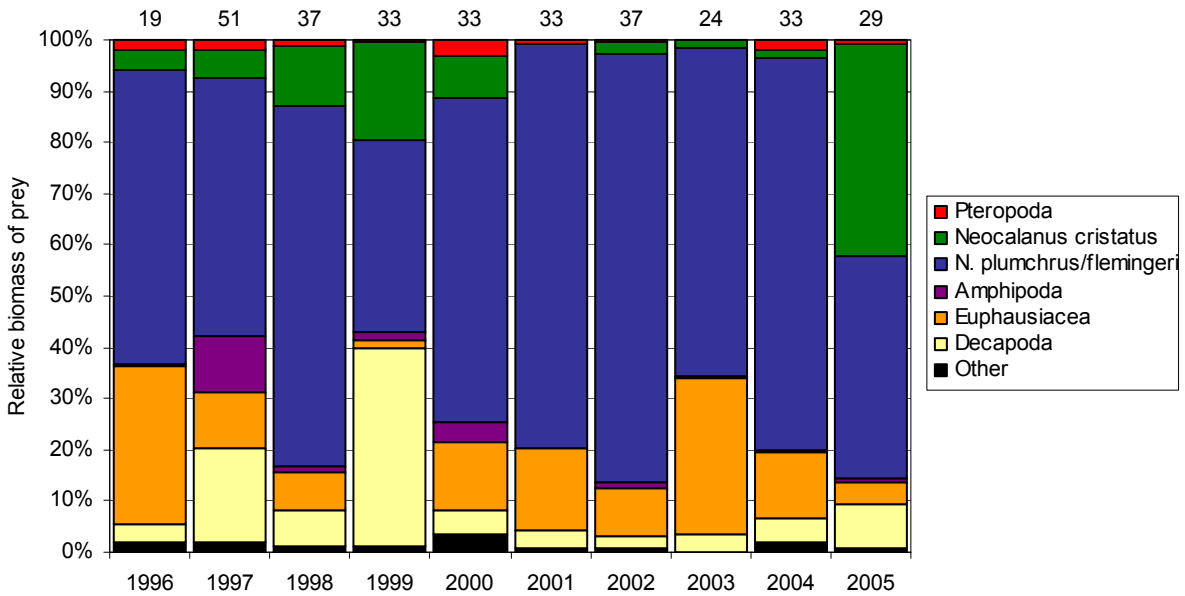


Figure 25. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.

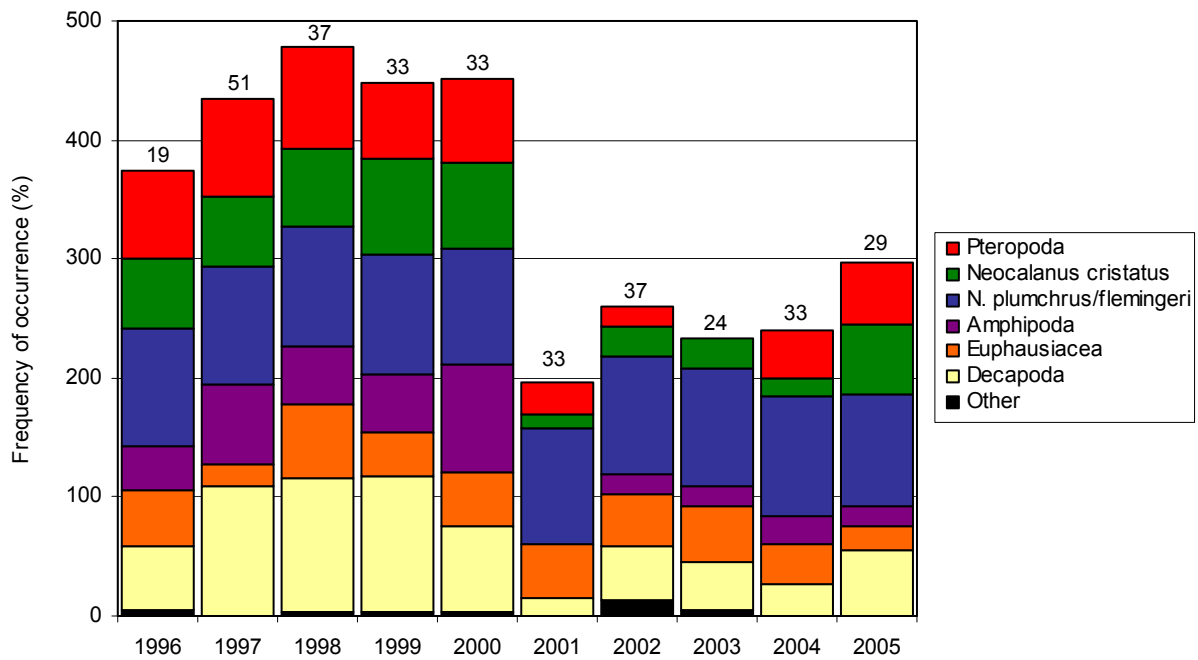


Figure 26. Frequency of occurrence of prey in diets of least auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.

Table 77. 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 2006-2007 but had been analyzed at the time of this report.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. samples	19	51	37	33	33	33	37	24	33	29
Total mass (g)	29.3	54.9	55.8	66.5	62.7	57.2	49.5	26.0	29.7	45.4
Gastropoda										
Pteropoda	1.9	2.0	0.0	0.0	3.2	0.6	0.3	0.0	2.1	0.9
<i>Limacina</i> spp.	0.0	0.0	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda										
<i>Neocalanus cristatus</i>	4.2	5.4	12.0	19.0	8.4	0.2	2.4	1.4	1.4	41.5
<i>N. plumchrus/flemingeri</i>	58.3	51.7	71.1	37.7	65.3	79.5	84.0	64.0	78.6	44.1
<i>Calanus marshallae</i>	0.0	0.0	<0.1	0.0	0.0	0.0	0.3	0.1	0.0	0.0
Amphipoda										
Hyperiidea										
<i>Hyperoche medusarum</i>	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Parathemisto</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.5	0.1	0.4
<i>P. pacifica</i>	<0.1	0.1	0.7	0.2	1.4	0.0	0.0	0.0	0.0	0.0
<i>Primno macropa</i>	0.0	0.3	0.0	<0.1	0.0	0.0	0.0	0.0	<0.1	0.0
Gammaridea										
Gammaridae	0.0	10.1	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
Talitridae	<0.1	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
<i>Pontogeneia</i> spp.	0.0	0.0	0.0	0.1	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
<i>Erichthonius</i> spp.	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Ischyrocerus</i> spp.	0.0	0.0	0.0	<0.1	0.0	0.0	0.4	0.1	0.2	0.1
Calliopiidae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Halirages bungei</i>	0.0	0.0	0.0	1.4	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
Tanaidacea	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Euphausiacea										
<i>Thysanoessa</i> spp.	31.3	11.1	0.4	1.1	0.1	0.0	0.6	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
Euphausiid furcilla	0.0	0.0	7.1	0.6	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	1.7	0.4	1.5	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
Hippolytidae juvenile	0.0	0.0	0.0	38.4	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
Paguridae zoea	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.0	0.0
Paguridae glaucothoe	0.0	0.0	0.2	0.2	<0.1	0.0	0.0	0.2	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
Unid. Crustacean	0.1	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



Table 78. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2005. Numbers represent the percentage of the mass of combined food samples comprised by each species. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	10	8	29
Total mass (g)	9.0	18.9	17.5	45.4
Gastropoda				
Pteropoda	0.7	1.2	0.6	0.9
Copepoda				
<i>Neocalanus cristatus</i>	6.8	34.9	66.4	41.5
<i>N. plumchrus/flemingeri</i>	74.6	45.8	26.7	44.1
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	0.2	0.9	<0.1	0.4
Gammaridea				
Ischyroceridae				
<i>Ischyrocerus</i> spp.	0.0	0.1	0.1	0.1
Euphausiacea				
Euphausiid spp. (small)	9.6	1.7	5.2	4.6
Decapoda				
Larval shrimp	7.9	15.5	1.0	8.4
Atelecyclidae megalopa	0.2	0.0	0.0	<0.1

Table 79. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2004. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	12	10	11	33
Total mass (g)	9.1	10.3	10.4	29.7
Gastropoda				
Pteropoda	1.4	4.1	0.6	2.1
Copepoda				
<i>Neocalanus cristatus</i>	0.0	2.2	1.9	1.4
<i>N. plumchrus/flemingeri</i>	69.1	90.9	74.7	78.6
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	0.0	0.0	0.2	0.1
<i>Primno macropa</i>	0.0	0.0	<0.1	<0.1
Gammaridea				
Ischyroceridae				
<i>Ischyrocerus</i> spp.	0.0	0.2	0.3	0.2
Euphausiacea				
Euphausiid spp. (small)	20.5	1.3	18.4	13.1
Decapoda				
Larval shrimp	9.0	1.4	2.7	4.2
Atelecyclidae megalopa	0.0	0.0	1.3	0.5

Table 80. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2003. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	10	3	24
Total mass (g)	6.7	10.9	8.4	26.0
Copepoda				
<i>Neocalanus cristatus</i>	1.9	1.5	1.0	1.4
<i>N. plumchrus/flemingeri</i>	72.3	83.0	32.8	64.0
<i>Calanus marshallae</i>	0.3	0.0	0.0	0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	0.0	0.0	1.6	0.5
<i>Primno macropa</i>	<0.1	0.0	0.0	<0.1
Gammaridea				
Ischyroceridae				
<i>Ischyrocerus</i> spp.	0.6	0.0	0.0	0.1
Euphausiacea				
Euphausiid spp. (small)	16.7	12.5	64.6	30.4
Decapoda				
Pandalid shrimp	5.8	0.0	0.0	1.5
Larval shrimp	2.0	2.5	0.0	1.6
Paguridae zoea	0.1	0.0	0.0	<0.1
Paguridae glaucothoe	0.5	0.3	0.0	0.2
Atelecyclidae megalopa	0.0	0.3	0.0	0.1

Table 81. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2002. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	15	14	8	37
Total mass (g)	16.0	18.3	15.2	49.5
Gastropoda				
Pteropoda	0.3	0.4	0.3	0.3
Copepoda				
<i>Neocalanus cristatus</i>	1.7	4.0	1.3	2.4
<i>N. plumchrus/flemingeri</i>	79.8	81.1	91.7	84.0
<i>Calanus marshallae</i>	0.8	0.1	0.0	0.3
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	1.5	<0.1	0.5	0.7
Gammaridea				
Ischyroceridae				
<i>Ischyrocerus</i> spp.	0.0	1.1	0.0	0.4
Euphausiacea				
<i>Thysanoessa</i> spp.	0.5	1.3	0.0	0.6
Euphausiid spp. (small)	10.5	9.7	5.4	8.6
Decapoda				
Pandalid shrimp	0.0	0.8	0.3	0.4
Larval shrimp	4.8	1.3	0.5	2.2
Paguridae zoea	<0.1	0.0	0.0	<0.1
Atelecyclidae megalopa	0.0	0.3	0.0	0.1

Table 82. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2001. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	10	12	33
Total mass (g)	17.0	19.0	21.3	57.2
Gastropoda				
Pteropoda	0.0	0.2	1.4	0.6
Copepoda				
<i>Neocalanus cristatus</i>	0.5	0.0	0.3	0.2
<i>N. plumchrus/flemingeri</i>	69.2	76.4	90.3	79.5
Euphausiacea				
Euphausiid spp. (small)	21.8	19.6	7.7	15.8
Decapoda				
Pandalid shrimp	5.7	0.0	0.0	1.7
Larval shrimp	2.8	3.5	0.3	2.1
Paguridae zoea	0.0	<0.1	0.0	<0.1
Atelecyclidae megalopa	0.0	0.3	0.0	0.1

Table 83. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 2000. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	11	12	33
Total mass (g)	9.2	29.2	24.2	62.7
Gastropoda				
Pteropoda				
Limancia spp.	1.4	5.2	1.5	3.2
Copepoda				
<i>Neocalanus cristatus</i>	2.4	7.6	11.6	8.4
<i>N. plumchrus/flemingeri</i>	62.7	75.0	54.6	65.3
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	1.2	2.3	0.4	1.4
Gammaridea				
Eusiridae	1.1	5.1	0.2	2.6
Ischyroceridae	0.1	0.4	0.1	0.2
Tanaidacea	0.0	1.4	0.0	0.6
Euphausiacea				
<i>Thysanoessa</i> spp.	0.0	0.0	0.3	0.1
Euphausiid spp. (small)	17.0	0.4	27.9	13.5
Decapoda				
Larval shrimp	12.7	2.4	3.3	4.3
Paguridae glaucothoe	0.0	0.0	<0.1	<0.1
Atelecyclidae megalopa	1.3	0.2	0.0	0.3

Table 84. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 1999. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf 2000a but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	12	11	10	33
Total mass (g)	12.6	29.7	24.1	66.5
Gastropoda				
Pteropoda				
<i>Limancia</i> spp.	1.1	0.2	0.4	0.5
Copepoda				
<i>Neocalanus cristatus</i>	17.0	30.8	5.5	19.0
<i>N. plumchrus/flemingeri</i>	30.8	21.1	61.7	37.7
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.0	0.0	0.5	0.2
<i>Primno macropa</i>	0.0	<0.1	0.1	<0.1
Gammaridea				
Eusiridae				
<i>Pontogeneia</i> spp.	0.4	0.0	0.0	0.1
Ischyroceridae				
<i>Ischyrocerus</i> spp	0.0	0.0	<0.1	<0.1
Calliopiidae				
<i>Halirages bungei</i>	0.0	0.0	3.9	1.4
Euphausiacea				
<i>Thysanoessa</i> spp.	1.3	1.3	0.7	1.1
Euphausiid furcilla	0.0	0.8	0.8	0.6
Decapoda				
Hippolytidae juvenile	45.3	45.3	26.2	38.4
Crab zoea	0.0	0.1	0.0	0.1
Paguridae glaucothoe	0.0	0.3	0.1	0.2
Atelecyclidae megalopa	0.2	0.0	0.1	0.1
Unid. fish	3.8	0.0	0.0	0.7

Table 85. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 1998. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf 1998 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	12	14	11	37
Total mass (g)	10.1	19.2	26.6	55.8
Gastropoda				
Pteropoda				
<i>Limancia</i> spp.	0.9	1.3	0.9	1.1
Copepoda				
<i>Neocalanus cristatus</i>	8.3	13.0	12.7	12.0
<i>N. plumchrus/flemingeri</i>	59.0	73.5	74.0	71.1
<i>Calanus marshallae</i>	<0.1	0.0	0.0	<0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.0	0.1	1.5	0.7
Gammaridea				
Ischyroceridae				
<i>Erichthonius</i> spp	1.5	0.2	0.3	0.5
Euphausiacea				
<i>Thysanoessa</i> spp.	0.0	0.4	0.6	0.4
Euphausiid furcilla	18.0	6.8	3.2	7.1
Decapoda				
Larval shrimp	11.1	4.0	6.6	6.5
Crab zoea	0.4	0.2	0.2	0.2
Paguridae glaucothoe	0.5	0.2	0.0	0.2
Atelecyclidae megalopa	0.4	0.3	<0.1	0.2

Table 86. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 1997. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf and Williams 1997 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	14	21	16	51
Total mass (g)	10.7	25.7	18.4	54.9
Gastropoda				
Pteropoda	1.6	1.6	2.9	2.0
Copepoda				
<i>Neocalanus cristatus</i>	3.5	4.7	7.6	5.4
<i>N. plumchrus/flemingeri</i>	39.2	44.3	69.2	51.7
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.1	0.2	0.1	0.1
<i>Primno macropa</i>	0.1	0.5	0.1	0.3
Gammaridea				
Gammaridae	31.2	5.6	4.1	10.1
Stenothoidae	0.0	0.0	1.1	0.4
Euphausiacea				
<i>Thysanoessa</i> spp.	8.8	18.4	2.2	11.1
Decapoda				
Larval shrimp	15.3	21.4	11.9	17.0
Crab zoea	0.0	0.9	0.0	0.4
Atelecyclidae megalopa	0.3	2.2	1.0	1.4

Table 87. Relative biomass of prey in diets of least auklets at Kasatochi Island, Alaska in 1996. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf and Williams 1997 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	4	4	19
Total mass (g)	11.8	11.7	5.8	29.3
Gastropoda				
Pteropoda	2.4	1.2	2.1	1.9
Copepoda				
<i>Neocalanus cristatus</i>	2.5	4.3	7.7	4.2
<i>N. plumchrus/flemingeri</i>	77.6	31.9	72.4	58.3
Amphipoda				
Hyperiidea				
<i>Hyperoche medusarum</i>	1.1	0.0	0.0	0.5
<i>Parathemisto pacifica</i>	0.1	0.0	0.0	<0.1
Gammaridea				
Talitridae	<0.1	0.0	<0.1	<0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	12.1	62.2	8.2	31.3
Decapoda				
Larval shrimp	1.8	0.4	7.4	2.4
Crab zoea	0.3	0.0	0.2	0.2
Atelecyclidae megalopa	1.8	0.0	2.1	1.1
Unid. Crustacean	0.3	0.0	0.0	0.1

Table 88. 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 2006-2007 but had not been analyzed at the time of this report.

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

<sup>a</sup>Most likely *P. pacifica*.

<sup>b</sup>Most likely a Hippolytidae.

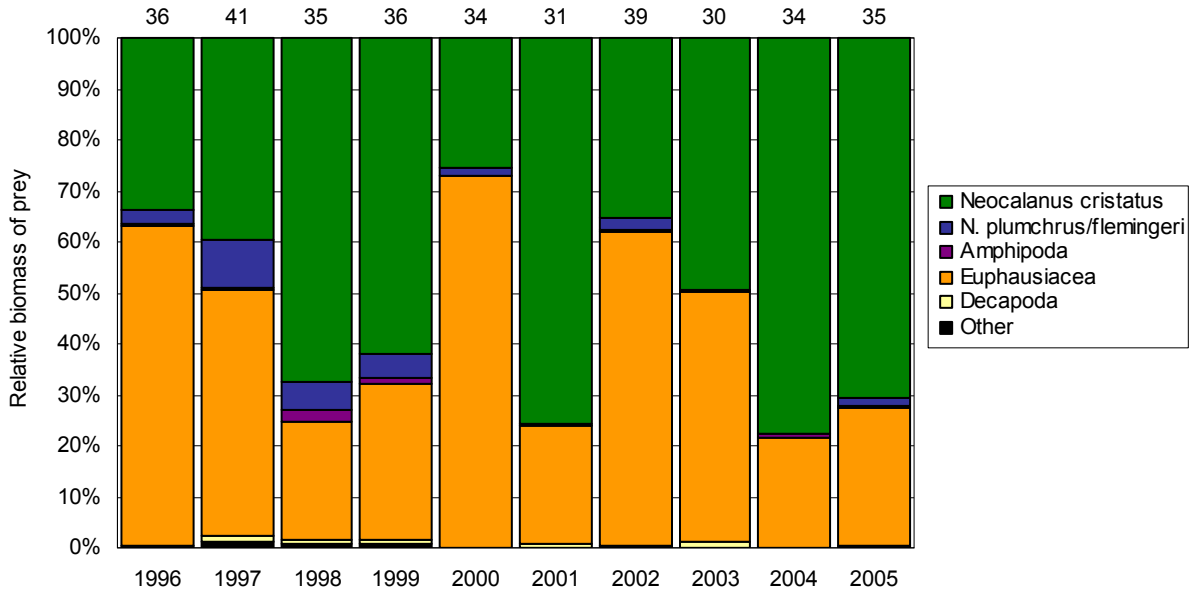


Figure 27. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.

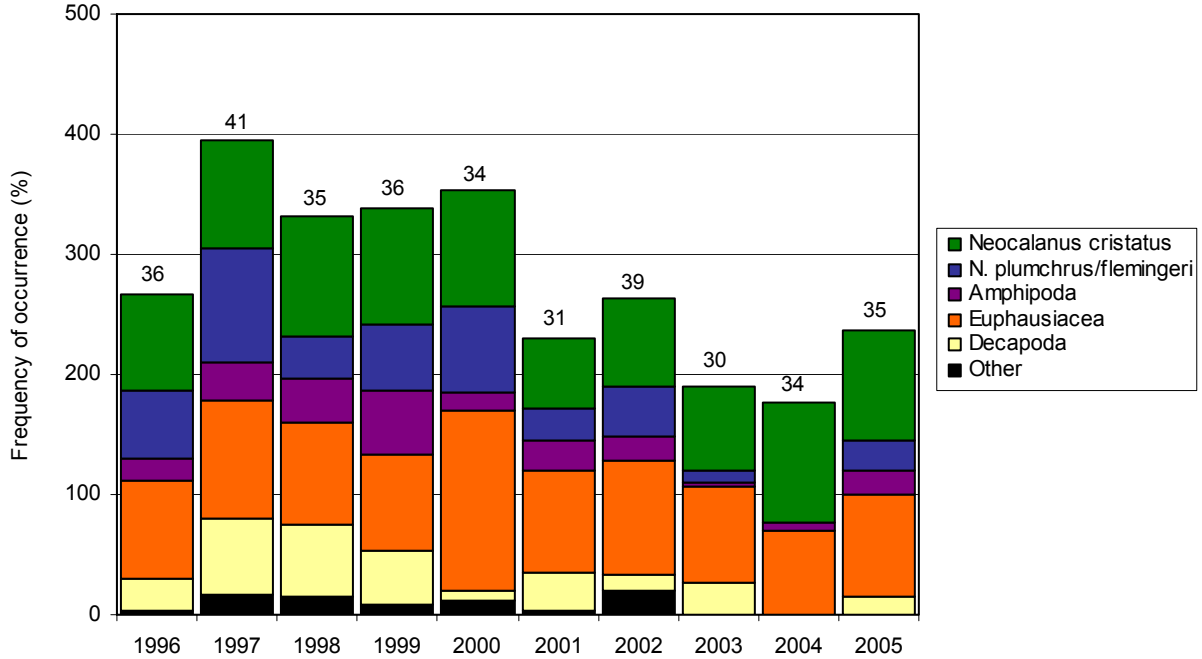


Figure 28. Frequency of occurrence of prey in diets of crested auklets at Kasatochi Island, Alaska. Numbers above columns indicate the number of samples. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.



Table 89. 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 2006-2007 but had been analyzed at the time of this report.

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

<sup>a</sup>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 90. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2005. Numbers represent the percentage of the mass of combined food samples comprised by each species. Prey samples were collected in 2006-2007 but had not been analyzed at the time of this report.

	Chick-rearing period			total
	early	mid	late	
No. samples	14	10	11	35
Total mass (g)	67.8	93.0	85.8	246.6
Copepoda				
<i>Neocalanus cristatus</i>	72.2	55.5	85.9	70.7
<i>N. plumchrus/flemingeri</i>	1.1	0.8	2.9	1.6
Amphipoda				
Hyperiid				
<i>Parathemisto</i> spp.	0.4	<0.1	0.1	0.2
Euphausiacea				
<i>Thysanoessa</i> spp.	2.6	4.4	0.0	2.4
Euphausiid spp. (small)	23.1	39.1	11.1	24.9
Decapoda				
Larval shrimp	0.5	0.3	0.0	0.2
Paguridae glaucothoe	<0.1	0.0	<0.1	<0.1
Atelecyclidae megalopa	0.1	0.0	0.1	0.1

Table 91. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2004. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	9	10	15	34
Total mass (g)	34.1	56.5	95.7	186.2
Copepoda				
<i>Neocalanus cristatus</i>	72.2	67.4	85.3	77.5
Amphipoda				
Hyperiid				
<i>Parathemisto</i> spp.	0.0	0.0	1.6	0.8
Euphausiacea				
Euphausiid spp. (small)	27.8	32.6	13.2	21.7

Table 92. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2003. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	10	10	30
Total mass (g)	47.8	61.7	47.6	157.0
Copepoda				
<i>Neocalanus cristatus</i>	55.8	81.4	2.2	49.6
<i>N. plumchrus/flemingeri</i>	0.4	0.2	0.1	0.2
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	0.0	0.1	0.0	<0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	40.6	1.3	7.6	15.2
Euphausiid spp. (small)	3.0	15.2	88.3	33.7
Decapoda				
Pandalid shrimp	0.2	1.9	0.0	0.8
Larval shrimp	0.0	0.0	1.7	0.5
Paguridae zoea	0.0	0.0	<0.1	<0.1
Paguridae glaucothoe	0.0	<0.1	0.0	<0.1
Atelecyclidae megalopa	0.0	0.0	0.1	<0.1

Table 93. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2002. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	16	13	39
Total mass (g)	77.5	125.5	102.3	305.3
Copepoda				
<i>Neocalanus cristatus</i>	78.8	33.5	5.1	35.5
<i>N. plumchrus/flemingeri</i>	2.6	3.0	0.2	2.0
<i>Calanus marshallae</i>	0.2	0.2	<0.1	0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	0.1	0.1	1.2	0.5
<i>P. pacifica</i>	0.0	0.3	0.0	0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	0.0	0.0	8.3	2.8
Euphausiid spp. (small)	16.7	63.1	85.1	58.7
Decapoda				
Pandalid shrimp	1.3	0.0	0.0	0.3
Larval shrimp	0.3	0.0	0.0	0.1

Table 94. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2001. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	10	10	11	31
Total mass (g)	58.3	115.2	47.7	221.2
Copepoda				
<i>Neocalanus cristatus</i>	83.5	97.8	12.4	75.6
<i>N. plumchrus/flemingeri</i>	0.5	0.2	0.3	0.3
Unid. Copepod	<0.1	0.0	0.0	<0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto</i> spp.	<0.1	0.1	0.1	0.1
<i>P. pacifica</i>	<0.1	<0.1	0.0	<0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	2.7	0.0	2.0	1.1
Euphausiid spp. (small)	12.1	1.8	83.4	22.1
Decapoda				
Pandalid shrimp	0.0	0.0	1.0	0.2
Larval shrimp	1.2	0.1	0.9	0.6
Atelecyclidae megalopa	<0.1	0.0	0.0	<0.1

Table 95. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 2000. Numbers represent the percentage of the mass of combined food samples comprised by each species.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	12	11	34
Total mass (g)	76.0	172.4	115.2	363.7
Copepoda				
<i>Neocalanus cristatus</i>	42.1	34.5	1.6	25.7
<i>N. plumchrus/flemingeri</i>	3.3	1.2	0.4	1.4
<i>Calanus marshallae</i>	0.1	0.0	0.0	<0.1
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.3	<0.1	0.0	0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	53.0	35.8	4.2	29.4
Euphausiid spp. (small)	1.1	28.5	93.8	43.5
Decapoda				
Larval shrimp	0.2	<0.1	<0.1	0.1

Table 96. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 1999. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf 1998 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	11	10	15	36
Total mass (g)	46.6	72.0	112.4	231.0
Copepoda				
<i>Neocalanus cristatus</i>	54.1	74.8	56.7	61.8
<i>N. plumchrus/flemingeri</i>	0.7	0.2	9.4	4.8
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.4	2.2	1.1	1.3
Euphausiacea				
<i>Thysanoessa</i> spp.	41.0	21.3	31.8	30.4
Euphausiid spp. (small)	0.0	0.0	0.1	0.1
Decapoda				
Hippolytidae juvenile	1.7	0.8	0.3	0.7
Crab zoea	<0.1	0.1	0.4	0.2
Paguridae glaucothoe	0.0	<0.1	0.2	0.1
Unid. Fish	2.1	0.7	0.0	0.6

Table 97. Relative biomass of prey in diets of crested auklets at Kasatochi Island, Alaska in 1997. Numbers represent the percentage of the mass of combined food samples comprised by each species. Data were originally presented in Scharf and Williams 1997 but have been recalculated using new values for biomass of prey items.

	Chick-rearing period			total
	early	mid	late	
No. samples	19	4	16	39
Total mass (g)	86.8	27.9	132.2	246.9
Pterodpoda	<0.1	<0.1	0.0	<0.1
Cephalopoda	0.7	2.2	0.0	0.5
Ostracoda	0.0	0.0	0.0	0.1
Copepoda				
<i>Neocalanus cristatus</i>	50.1	61.2	11.9	31.1
<i>N. plumchrus/flemingeri</i>	10.4	16.0	3.5	7.3
Amphipoda				
Hyperiidea				
<i>Parathemisto pacifica</i>	0.2	0.0	0.1	0.1
<i>Primno macropa</i>	<0.1	0.0	0.0	<0.1
Gammaridea				
Gammaridae	0.1	0.0	0.0	<0.1
Euphausiacea				
<i>Thysanoessa</i> spp.	23.7	16.7	51.5	37.8
Decapoda				
Larval shrimp	0.7	2.4	0.5	0.8
Crab zoea	0.1	0.0	<0.1	<0.1
Atelecyclidae megalopa	0.3	0.1	<0.1	0.1
Unid. Fish	1.1	0.0	0.0	0.4

Table 98. 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 2006-2007 but had not been analyzed at the time of this report.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. samples	36	41	35	36	34	31	39	30	34	35
Pteropoda	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda - squid	0.0	4.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ostracoda	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda										
<i>Neocalanus cristatus</i>	80.6	90.2	100.0	97.2	97.1	58.1	74.4	70.0	100.0	91.4
<i>N. plumchrus/flemingeri</i>	55.6	95.1	34.3	55.6	70.6	25.8	41.0	10.0	0.0	25.7
<i>Calanus marshallae</i>	0.0	0.0	0.0	0.0	11.8	0.0	20.5	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
Amphipoda										
Hyperiidea										
<i>Parathemisto pacifica</i>	19.4	24.4	37.1	52.8	14.7	6.5	2.6	0.0	0.0	0.0
<i>Parathemisto</i> spp. <sup>a</sup>	0.0	0.0	0.0	0.0	0.0	19.4	17.9	3.3	5.9	20.0
<i>Primno macropa</i>	0.0	4.9	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
Euphausiacea										
<i>Thysanoessa</i> spp.	80.6	97.6	85.7	77.8	73.5	9.7	10.3	33.3	0.0	8.6
Euphausiid furcilla	0.0	0.0	0.0	2.8	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
Decapoda										
Larval shrimp <sup>b</sup>	13.9	46.3	45.7	0.0	8.8	22.6	7.7	6.7	0.0	0.0
Pandalid shrimp	0.0	0.0	0.0	0.0	0.0	6.5	5.1	10.0	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
Crab zoea	8.3	4.9	2.9	19.4	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
Paguridae glaucothoe	0.0	0.0	5.7	8.3	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
Atelecyclidae megalopa	5.6	12.2	5.7	0.0	0.0	3.2	0.0	3.3	0.0	8.6
Fish	0.0	4.9	11.4	8.3	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

<sup>a</sup>Most likely *P. pacifica*.

<sup>b</sup>Most likely a Hippolytidae.

Table 99. Mass of food loads collected from parakeet auklets at Kasatochi Island, Alaska.

Chick-rearing period <sup>a</sup>	<i>n</i>	Mass of load (g)		
		mean	SD	range
<b>2007</b>				
Early	0	--	--	--
Mid	2	4.2	2.8	2.2 - 6.3
Late	0	--	--	--
Total-----				
<b>2007</b>	2	4.2	2.8	2.2 - 6.3

<sup>a</sup>In 2007, food samples were collected 13-14 Jul (mid).

Table 100. Mass of food loads collected from least auklets at Kasatochi Island, Alaska.

Chick-rearing period <sup>a</sup>	<i>n</i>	Mass of load (g)		
		mean	SD	range
<b>2007</b>				
Early	8	4.5	1.8	2.2 - 8.2
Mid	12	4.5	1.9	1.1 - 7.8
Late	10	5.0	1.4	2.2 - 6.7
Total-----				
<b>1996</b>	11	2.7	0.9	1.2 - 4.1
<b>1997</b>	39	2.7	1.5	0.7 - 7.2
<b>1998</b>	32	3.5	1.6	0.8 - 6.5
<b>1999</b>	31	2.8	1.7	0.3 - 7.5
<b>2000</b>	32	3.4	1.7	1.1 - 6.7
<b>2001</b>	26	4.3	1.5	2.3 - 7.5
<b>2002</b>	34	3.9	2.0	1.0 - 11.8
<b>2003</b>	21	4.1	1.9	1.1 - 11.4
<b>2004</b>	30	3.5	1.4	0.2 - 5.8
<b>2005</b>	28	4.2	2.8	0.4 - 9.8
<b>2006</b>	26	4.6	2.1	0.5 - 10.6
<b>2007</b>	30	4.7	1.7	1.1 - 8.2

<sup>a</sup>In 2007, food samples were collected 7 Jul (early), 18 Jul (mid), and 25 Jul (late).

Table 101. Mass of food loads collected from whiskered auklets at Kasatochi Island, Alaska.

Chick-rearing period <sup>a</sup>	<i>n</i>	Mass of load (g)		
		mean	SD	range
<b>2007</b>				
Early	0	--	--	--
Mid	4	10.3	4.5	6.3 - 16.3
Late	0	--	--	--
Total-----				
<b>2007</b>	4	10.3	4.5	6.3 - 16.3

<sup>a</sup>In 2007, food samples were collected 13 Jul (mid).

Table 102. Mass of food loads collected from crested auklets at Kasatochi Island, Alaska.

Chick-rearing period <sup>a</sup>	<i>n</i>	Mass of load (g)		
		mean	SD	range
<b>2007</b>				
Early	9	15.4	5.5	6.7 - 23.8
Mid	12	11.8	5.6	5.6 - 21.1
Late	11	17.9	5.7	9.4 - 26.5
Total-----				
<b>1996</b>	23	9.7	5.5	2.4 - 21.8
<b>1997</b>	28	9.3	4.4	1.7 - 21.3
<b>1998</b>	26	9.9	5.2	2.2 - 19.5
<b>1999</b>	31	10.0	4.9	0.6 - 19.6
<b>2000</b>	31	10.6	5.1	2.7 - 25.7
<b>2001</b>	27	10.8	4.9	2.8 - 21.5
<b>2002</b>	34	13.2	4.5	6.0 - 25.1
<b>2003</b>	27	10.1	4.5	2.1 - 18.8
<b>2004</b>	32	9.5	5.2	1.5 - 22.8
<b>2005</b>	32	11.3	6.3	1.5 - 27.9
<b>2006</b>	34	9.9	4.2	4.6 - 20.4
<b>2007</b>	32	14.3	5.8	5.6 - 26.5

<sup>a</sup>In 2007, food samples were collected 7 Jul (early), 18 Jul (mid), and 25 Jul (late).



Table 103. 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 2007 are from single surveys, while numbers for 1996-1998 and 2002 reflect the mean of several counts.

Species	1980	1982	1996	1997	1998	1999	2000	2002	2003	2004	2005	2007
Date of survey	13 Jul	17 Jul	12-30 Jun <sup>a</sup>	27 May-20 Jun <sup>b</sup>	14-19 Jun <sup>c</sup>	25 Jun <sup>d</sup>	6 Aug <sup>ef</sup>	31 May-30 Jun <sup>g</sup>	6 Jun	5 Jun	22 Jun <sup>h</sup>	5 Aug <sup>f</sup>
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 (nests)	--	33 (7)	20 (14)	34 (20)	18.5 (34)	3 (9)	17 (12)	13 (22)	16 (0)	77 (28)	10 (2)	0 (0)
Pelagic cormorant (nests)	--	89 (36)	32 (21)	55 (17)	23.5 (37)	7 (22)	16 (15)	44 (13)	3 (0)	62 (20)	6 (2)	16 (7)
Total, all cormorant spp. (nests)	85 (19)	129 (43)	62.0 (41)	83.0 (50)	120.0 (71)	57 (31)	95 (27)	82 (44)	55 (0)	173 (41)	23 (8)	20 (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. <sup>i</sup>	NC <sup>j</sup>	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	--	--	--	--

<sup>a</sup>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,  $n=3$ .

<sup>b</sup>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,  $n=4$ .

<sup>c</sup>Cormorant nests were counted on 10 July. Parakeet auklets were counted only on 14 June. For all other species,  $n=2$ .

<sup>d</sup>Cormorant nest numbers were based on observations from 25 Jun, 2 Aug, and 13 Aug.

<sup>e</sup>Cormorant nest numbers were based on observations from 7 Jul, 18 Jul, and 6 Aug.

<sup>f</sup>Surveys were conducted late in season and may not be comparable to other years.

<sup>g</sup>Cormorant nest numbers were based on observations from 15 Jul and 7 Aug.

<sup>h</sup>Cormorant nests numbers were based on observations from 22 Jun-2 Aug.

<sup>i</sup>Murres were not counted prior to 2004.

<sup>j</sup>NC=not counted.

Table 104. 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 <sup>a</sup>
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)	--

<sup>a</sup>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 105. 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 <sup>a</sup>	1996 <sup>b</sup>	2003 <sup>b</sup>	2006 <sup>b</sup>	2007 <sup>b</sup>
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)	--

<sup>a</sup>Aerie at southern base of Mt. Kasatochi.

<sup>b</sup>Aerie in Peregrine Ravine.

Table 106. 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.

Species	1997	1998	1999	2000	2001	2002	2003	2005	2006	2007
Date	1 Jun	2 Jun	1 Jun	2 Jun	2 Jun	1 Jun	7 Jun	3 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) <sup>b</sup>	3 (80) <sup>b</sup>
Thick-billed murre	--	--	--	1	--	--	--	--	--	--
Pigeon guillemot	--	2	2	--	3	1	--	--	1	--
Parakeet auklet	2	++ <sup>a</sup>	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

<sup>a</sup>This symbol indicates that numerous birds were heard calling but could not be seen or counted.

<sup>b</sup>Parentheses indicate number of gulls counted inside caldera at last survey at >150m.

Table 107. Numbers of birds detected on off-road point count route number 331, Kasatochi Island, Alaska, on 2 June 2007. For those species marked with an asterisk, we observed nests, pairs, distraction displays, and/or territorial males.

Species	Point no.												Total on points	% of points spp. observed
	1	2	3	4	5	6	7	8	9	10	11	12		
Cormorant spp.	1	--	--	--	--	--	--	--	--	--	--	--	1	8
Peregrine falcon*	--	1	2	--	--	2	--	--	--	--	--	2	7	33
Black oystercatcher	1	--	--	--	--	--	--	--	--	--	--	--	1	8
Rock sandpiper	--	--	--	--	1	--	--	--	1	--	1	--	3	25
Glaucous-winged gull	1	--	--	--	--	1	--	1	--	--	--	(80) <sup>a</sup>	3 (80) <sup>a</sup>	3
Winter wren	2	2	1	--	--	--	4	2	1	--	--	--	12	50
Lapland longspur* - total	1	3	4	8	8	6	4	6	8	9	5	2	64	100
male	--	1	1	1	--	1	--	--	--	1	--	--	5	42
female	--	--	1	1	--	--	--	--	2	1	--	--	5	33
unknown	1	2	2	6	8	5	4	6	6	7	5	2	54	100
Rosy finch	--	3	4	1	1	--	3	1	--	3	1	1	18	75

<sup>a</sup>Parentheses indicate number of gulls counted inside caldera at last survey at >150m.

Table 108. Mean numbers of birds detected on transect surveys along Oystercatcher Beach, Kasatochi Island, Alaska.

Species	1999			2000			2001			2002			2003		
	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range
<i>n</i>	3			3			6			5			4		
Survey dates	6-13 Jun			26 May-14 Jun			28 May-24 Jun			3-14 Jun			6-16 Jun		
Harlequin duck	12.0	11.8	2-25	0.0	0.0	--	0.0	0.0	--	1.4	2.6	1-6	0.8	1.0	0-2
Bald eagle	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Peregrine falcon	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
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
Common sandpiper	0.3	0.6	0-1	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Rock sandpiper	0.0	0.0	--	0.3	0.6	0-1	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Common raven	1.0	1.7	0-3	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	1.0	1.2	0-2
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
Harbor seal	0.3	0.6	0-1	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--

Table 108 continued. Mean numbers of birds detected on transect surveys along Oystercatcher Beach, Kasatochi Island, Alaska.

Species	2004			2005			2006			2007		
	mean	SD	range	mean	SD	range	mean	SD	range	mean	SD	range
<i>n</i>	4			4			5			5		
Survey dates	2-13 Jun			2-8 Jun			3-12 Jun			1-13 Jun		
Harlequin duck	0.0	0.0	--	0.0	0.0	--	0.6	1.3	0-3	0.6	1.3	0-3
Bald eagle	0.3	0.5	0-1	0.0	0.0	--	0.4	0.5	0-1	0.2	0.4	0-1
Peregrine falcon	1.0	1.4	0-3	0.5	1.0	0-2	0.2	0.4	0-1	0.8	0.8	0-1
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
Common sandpiper	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Rock sandpiper	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
Common raven	2.5	2.4	0-5	0.0	0.0	--	0.6	1.3	0-3	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
Harbor seal	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--

Table 109. Numbers of birds detected on transect surveys along Oystercatcher Beach, Kasatochi Island, Alaska in 2007.

Species	Date in June					Statistics	
	1	4	8	10	13	mean	SD
Harlequin duck	0	0	0	3	0	0.6	1.3
Bald eagle	0	0	0	0	1	0.2	0.4
Peregrine falcon	1	1	0	2	0	0.8	0.8
Black oystercatcher	2	0	4	4	2	2.4	1.7
Winter wren	3	7	6	6	6	5.6	1.5
Song sparrow	7	8	6	7	8	7.2	0.8
Lapland longspur	4	2	4	7	9	5.2	2.8
Rosy finch	3	0	0	0	11	2.8	4.8

Table 110. 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 <sup>a</sup>	--	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 <sup>b</sup> 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 <sup>c</sup>	--	--	376	--	Sease and Loughlin (1999)
1993	15 Mar	--	--	127	--	NMFS unpubl. data
1994	Jun <sup>c</sup>	--	--	288 <sup>d</sup>	--	Sease and Loughlin (1999)
	8 Jul	--	--	--	215 <sup>e</sup>	Sease and Loughlin (1999)
1996	18 Jun	--	--	331 <sup>d</sup>	--	Sease and Loughlin (1999)
	7, 21 Jun <sup>c</sup>	36	211	247	220 <sup>f</sup>	Scharf et al. (1996)
1997	11, 27 Jun <sup>c</sup>	39	318	357	266 <sup>f</sup>	Scharf and Williams (1997)
	1 Jul	--	--	--	268 <sup>e</sup>	Sease and Loughlin (1999)
1998	14 Jun	--	--	351 <sup>d</sup>	--	Sease and Loughlin (1999)
	21 Jun	58	330	388	241 <sup>f</sup>	Scharf (1998)
	1 Jul	--	--	--	247 <sup>e</sup>	Sease and Loughlin (1999)
1999	16 Jun	55	345	400	271 <sup>f</sup>	Scharf (2000b)
2000	18 Jun	--	--	390 <sup>d</sup>	--	NMFS unpubl. data
	22 Jun	33	313	346	231 <sup>f</sup>	Scharf (2000a)
2001	11, 22 Jun <sup>c</sup>	43	418	461	241 <sup>f</sup>	Syria (2001)
2002	? Jun	--	--	656 <sup>g</sup>	--	NMFS unpubl. data
	15 Jun	65	433	498	300 <sup>f</sup>	Syria (2002)
	19 Jun	--	--	529 <sup>d</sup>	--	NMFS unpubl. data
	28 Jun	--	--	--	302 <sup>e</sup>	NMFS unpubl. data
2003	21 Jun	56	491	547	278 <sup>f</sup>	Barton and Lindquist (2003)
2004	? Jun	--	--	667 <sup>g</sup>	--	NMFS unpubl. data
	20 Jun	--	--	--	354 <sup>e</sup>	NMFS unpubl. data
	23 Jun	57	545	602	303 <sup>f</sup>	Drummond and Kissler (2004)
2005	6, 23 Jun <sup>c</sup>	60	452	511	322 <sup>f</sup>	Drummond and Rehder (2005)
2006	10, 29 Jun <sup>c</sup>	75	624	699	352 <sup>f</sup>	Drummond (2006)
2007	19 Jun	87	576	663	313 <sup>f</sup>	this study

<sup>a</sup>Number includes pups.

<sup>b</sup>Natl. Mar. Fish. Serv./Natl. Oceanic and Atmos. Adm., Seattle, Wash.

<sup>c</sup>Numbers for non-pups represent the mean of several counts (unknown dates in Jun in 1992 and 1994).

<sup>d</sup>Counts from 35 mm format aerial photography.

<sup>e</sup>Counts from rookery walk-throughs.

<sup>f</sup>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, and 20 Jul 2007).

<sup>g</sup>Counts from medium format aerial photography.

Table 111. 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)

Table 112. Numbers of Steller sea lions observed at the rookery on the north side of Kasatochi Island, Alaska in 2007.

Date	Time	Large bulls	Females and subadult males	Total non-pups	Pups
19 Jun	1130	87	576	663	299
20 Jul	1415	53	323	376	313
mean		70	450	520	306
max.		87	576	663	313



Table 113. Annotated list of species observed at Kasatochi Island, Alaska, 28 May-23 August 2007, with notes on incidental observations at other central Aleutian islands.

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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 114.

## Birds

Aleutian cackling goose (*Branta hutchinsii leucopareia*).--Uncommon. Large flocks of geese were seen flying over the island on several occasions early in the season. On 29 May, a group of 40-50 individuals was observed flying over the west side of the island heading towards Adak; the same group probably returned about a half hour later, flying in the opposite direction. Two flocks were observed on 3 June, one containing about 40 birds flying along Oystercatcher Beach from north to south, and another of seven individuals flying over the cabin from east to west. On 9 June, a flock of seven birds was again observed flying over the cabin to the west. Throughout late May and early June, droppings were observed all over the island, most plentifully on Romney Dale, but did not appear to be fresh.

Eurasian wigeon (*Anas penelope*).--Rare. A male and female were observed in nearshore waters off Sud Slot on 28 May.

Eurasian green-winged teal (*Anas crecca*).--Rare. A group of five individuals, consisting of three males in breeding plumage and two females, was observed in the kelp beds off Snegden Beach on 26 May, and again loafing on the rocks at the north end of Oystercatcher Beach on 28 May.

Common eider (*Somateria mollissima*).--Rare. On 26 May, a male and a female were observed foraging in the kelp beds off Sud Slot. The male remained in the nearshore waters along Snegden Beach until 4 June.

Harlequin duck (*Histrionicus histrionicus*).--Common. Groups of 2-49 birds were observed regularly throughout the summer between Good Head Rock and Tundering Cove, feeding in nearshore waters or loafing on the rocks. Males were in breeding plumage from late May through late June but by 8 July, many 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.

Black-footed albatross (*Phoebastria nigripes*).--Rare. Two birds were seen flying about half a mile offshore from Dory Slot on 19 August, one day after a fierce storm when winds were still strong.

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. On 14 August, over a thousand individuals were seen flying about a mile offshore, streaming from south to north in a long, continuous line of birds. Two dead fulmars were discovered during the season on Oystercatcher Beach.

At Ulak Island, at least 18 fulmars were seen in the grass at the tops of cliffs and circling cliff-tops above plot A on the northern side of the island, where fulmars have previously been seen. This suggests that the species likely bred on Ulak, which was first documented in 2004, and was the highest number of fulmars counted at the island since they were first observed on land there in 2003.

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 1 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 16 June, similar to last year. As usual, hatching appeared highly asynchronous, with a few chicks still hatching in early August. No fledglings were observed at night in late August on Troll Talus or the Whiskering Rocks as in previous years. Four birds in nests monitored for productivity fledged on 19 August, including an unusual chick that hatched without any feet. Most chicks, however, were still in their nests on our departure from the island on 23 August. Reproductive success on Kasatochi was lower than last year but comparable to 2004-2005, with an overall success of 59%.

At Ulak, productivity was 78%, at the high end of the range of previous years. Two tiny chicks attended by brooding adults were present on our first visit to Ulak on 17 June. As on Kasatochi, hatching on Ulak appeared asynchronous, with a wide range of chick sizes on our second visit on 21 July. Like Kasatochi, most chicks were still present in nests on our last visit on 24 August. Over four years of concurrent data, productivity of fork-tailed storm-petrels on Kasatochi and Ulak does not appear to track together over time, but differences in the frequency of visits likely makes it difficult to directly compare data from the two islands.

Leach's storm-petrel (*Oceanodroma leucorhoa*).--Uncommon. Small numbers of birds were heard at night with more numerous fork-tailed storm-petrels throughout the summer in Peregrine Ravine, on Troll Talus, and from Sokolniekoff Cabin. Although no Leach's were found during nest searches throughout the summer, an individual was heard vocalizing from a deep crevice in the Whiskering Rocks on 6 July, confirming that the species bred on Kasatochi for the third 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.

On Ulak, no Leach's storm-petrels were found in plot 2 and no birds were heard vocalizing on the island. In 2005, Leach's were confirmed breeding on Ulak for the first time, when a single individual was heard vocalizing continuously from a burrow directly adjacent to plot 2.

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 first time since the monitoring program began. This follows two consecutive years of complete breeding failure in 2005 and 2006. However, productivity of pelagic cormorants at Kasatochi was similar to last year and relatively high compared to many previous years, with 1.6 chicks per nest. Numbers of pelagic cormorants and nests were comparable to last year but lower than many past years. As usual, cormorants nested entirely on the northeast side of the island; of eight pelagic cormorant nests, all but one were located within Turr Cave, with the remaining nest on the boulder beach between Turr Cave and Greg's Mighty Rock.

At Ulak Island, productivity could not be estimated for red-faced cormorants and may not be representative of actual productivity for pelagic cormorants because chicks were too small at our visit on 21 July to view contents in most nests. Numbers of nesting pelagic and red-faced cormorants at Ulak were lower than last year but within the range of previous years.

Bald eagle (*Haliaeetus leucocephalus*).--Uncommon. Two pairs attended aeries on opposite sides of the island, one on the pinnacle above Good Head Rock and the second on a low cliff at the water's edge on the northeast side of the island. Both nests appeared to fail; no chicks were ever observed, and adults had ceased attending the aerie at Good Head Rock by mid June and on the northeast side of the island by late July. Throughout the season, adults were often observed hunting auklets at Tundering Talus, where birds were constantly harassed by glaucous-winged gulls, peregrine falcons, and common ravens. At Ulak Island, a pair attended the aerie on the ridge just west of plot 2.

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 contained three tiny downy chicks only a few days old, with eyes opened only as slits, and an unhatched egg on 29 May. The fourth chick hatched soon after, and throughout June the nest was ferociously defended by a pair of attendant adults. On 6 July, two chicks fledged from the nest and flew across the ravine before crash-landing into the ground, while a third chick stood on the edge of the nest. By mid July the nest was empty, and throughout the remainder of our stay on the island four curious fledglings were frequently observed sporting around the ravine and the cabin. The nest at Tundering Talus contained at least two chicks on 14 July, when a pair of adults were observed bringing food to the nest. During late July and August, 2-11 fledglings were seen daily at Tundering Talus and along Oystercatcher Beach, swooping on all manner of animals with varying success. On 4 August, a pair of adults and two fledglings were observed above the beach bluffs along Reindeer Beach. Similar to previous years, prey remains at the nest in Peregrine Ravine consisted primarily of least and crested

auklet carcasses.

Black oystercatcher (*Haematopus bachmani*).--Fairly common. For the second year in a row, two pairs of oystercatchers bred on Oystercatcher Beach, the first midway towards Barabara Ridge in the same area as a nest was observed in 1991 and 1996-2006, and the second at Sud Slot. On our arrival on 27 May, nests contained one and two eggs, respectively, and were both raucously defended by attendant adults. The single-egg nest midway down Oystercatcher Beach appeared abandoned by 4 June; however, soon afterwards the pair laid a replacement clutch about one meter away from the first nest, depositing eggs on 11 June and 14 June. Both nests hatched two chicks, on 16 June at Sud Slot and on 10 July midway down the beach. Neither chick from the nest at Sud Slot appeared to survive to fledging; one disappeared on 20 July, after appearing stuck in the surf down in Sud Slot and unable to get out, while the second disappeared in late July and was assumed to have perished. The nest on Oystercatcher Beach successfully fledged one chick; by 9 August, the chick was nearly fully feathered, with a pale orange bill, and by 19 August the chick was fully feathered and capable of short flights. It remained in association with the adults along the bedrock section of Oystercatcher Beach throughout our departure from the island on 23 August. The areas frequented by the oystercatchers on Oystercatcher Beach and Sud Slot were littered with hundreds of limpets. A third territorial pair was frequently observed at the end Parakeet Point, although a nest was never located. 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. Small numbers of individuals were occasionally flushed from the grassy slopes on the south side of the island or found foraging in the intertidal around Sud Slot and along Oystercatcher Beach. However, no fledglings were ever observed and breeding could not be confirmed.

Glaucous-winged gull (*Larus glaucescens*).--Abundant. Approximately 109 pairs appeared to nest on the grassy ledges inside the caldera, with a maximum of 376 individuals counted on 19 June. Gulls continued to nest in small numbers outside of the caldera for the ninth year in a row. Prior to 1999, gulls were not known to nest outside of the caldera; however, from 1999-2006 nests were found or suspected on the grassy swales above the cliffs on the northeast side of the island, at the top of Tundering Talus, on small ledges on the cliffs of the talus, on Barabara Ridge, and on Reindeer Beach. In 2007, two active nests were located at the top of Tundering Talus, and a third on Sud Slot, the first time a gull nest has been found along Oystercatcher Beach. The remains of a fourth nest were discovered on the east end of Reindeer Beach on 4 August. Both nests at Tundering Talus contained two eggs on 1 June, and had each hatched a single chick by 25 June. However, no chicks from the talus nests appeared to survive to fledge; large chicks or fledglings were never observed at the talus, and a dead chick was found in the B-Plots on 9 July. The nest at Sud Slot was initiated on 14 June, with second and third eggs added to the clutch on 16 and 19 June, respectively. All three eggs disappeared on 20 July, possibly predated by another gull. The nest at Reindeer Beach may have been unsuccessful as well, as there was no evidence of eggshells, membranes, or chicks on 4 August, although a pair of fledglings was observed on the beach on 21 August. The first fledgling was observed on 13 August on the lake inside the caldera and between 21 and 23 August, at our departure from the island, three fledglings were regularly present at Dory Slot, calling piteously to nearby adults. In previous years, fledglings were numerous on the beaches by our departure, suggesting that either phenology may have been delayed compared to other years

or reproductive success may have been lower than in previous seasons.

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. In contrast to other years when parakeet auklets were generally ignored by gulls on the talus, frequent acts of gull predation on parakeet auklets were also noted, with gulls often observed picking half-heartedly at parakeet auklet carcasses floating just off the south end of the talus. However, no parakeet auklet remains were found in gull pellets, which were dominated by urchins; during minus tides, gulls frequently congregated in the intertidal on Oystercatcher and Snegden Beaches in groups of 20-40.

Black-legged and red-legged kittiwake (*Rissa tridactyla* and *R. brevirostris*, respectively).--Absent. A single red-legged kittiwake was observed flying over the *M/V Tiglax* about 4 miles offshore Kasatochi on 23 July. At Koniuji Island, a total of 2,590 black-legged kittiwakes were counted on 22 July, showing a pattern of increasing numbers since 1998. Productivity of black-legged kittiwakes at Koniuji appeared to be relatively high, with 70% of nests containing chicks. Three red-legged kittiwakes, but no nests, were observed at Koniuji on 22 July, although in a different plot than where the species has been found in previous years.

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. About 100 birds were observed rafting outside Turr Cave on 19 June, and 20-40 murre were seen inside the cave during the summer, scattered from the cave entrance into the far dark reaches beyond sight. On 5 August, a single bird was observed in incubating posture but did not actually appear to be incubating a chick. That same day, an adult was seen flying into the depths of the cave carrying a fish in its bill. On 16 August, a murre fledgling was seen just outside the kelp beds at Dory Slot, calling to two nearby adults. This is the first time a murre carrying fish or a murre fledgling has been observed at Kasatochi since the colony deserted Turr Fjord, and is suggestive that birds may have bred on Kasatochi this year for the first time since 2001. However, it is unknown whether the bird carrying fish actually had a chick, or whether the fledgling observed came from Turr Cave or from colonies at nearby Ulak and Koniuji islands, so breeding cannot ultimately be confirmed.

At Ulak Island, 3,771 birds were counted on 21 July, higher than any other year and continuing a pattern of increase in murre numbers at Ulak since 2002. At Koniuji Island, 3,291 murre were counted on 22 July, within the range of recent years; based on a concurrent increase in murre populations at Koniuji Island as the colony at Kasatochi declined, it appears likely that murre abandoned Kasatochi and reestablished on Koniuji.

Pigeon guillemot (*Cephus columba*).--Common. A total of 85 individuals was counted during a circumnavigation on 5 August, which should be considered a minimum estimate because it was conducted late in the season. Throughout the summer, guillemots were most highly concentrated around the southern end of Guillemot Beach, where a maximum of 39 birds was counted on 10 August. A nest containing one egg was found on 24 July midway down Guillemot Beach; the chick

hatched on 4 August and was still present on our departure from the island on 23 August. 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 23 August. The first fledgling was seen in the water off Dory Slot on 17 August.

Ancient murrelet (*Synthliboramphus antiquus*).--Fairly common. Ancient murrelets were confirmed as having bred successfully on Kasatochi for the fourth year in a row, with active nests located on Troll Talus and underneath Sokolniekoff Cabin. The first fledglings were heard on 7 July, after which small numbers of adults and fledglings were often seen or heard at night throughout July as adults led chicks to sea. Five active nests were found on Troll Talus and all appeared to fledge two chicks, three on 3 July, one on 9 July, and one on 21 July. Additionally, two pairs of ancient murrelets nested underneath Sokolniekoff Cabin and were frequently heard vocalizing underneath the floorboards. Both appeared to fledge chicks, one on 8 July and the other by mid July. With the exception of those beneath the cabin, 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.

At Ulak, an adult incubating two eggs was found in a burrow in plot 2 on 17 June; the burrow contained fresh membranes on 21 July, suggesting both chicks fledged.

Cassin's auklet (*Ptychoramphus aleuticus*).--Rare. An adult Cassin's auklet was heard vocalizing raucously from beneath Sokolniekoff Cabin almost every night throughout June. No chicks were ever heard, however, and there was no evidence of successful breeding. This is the first time the species has been documented at Kasatochi since 1996, when a fledgling that appeared killed by a peregrine was found on Oystercatcher Beach (Scharf et al. 1996). In addition, a single individual was heard at Tundering Talus in 1991 (Thompson and Wraley 1992). Murie reported seeing "great numbers" of Cassin's auklets on the water around Kasatochi in 1936 (Murie 1936) and it is likely that they used to nest on the island but were extirpated by foxes. Now that foxes have been removed, it is possible that Cassin's auklets may eventually recolonize Kasatochi.

At Ulak Island, Cassin's auklets occupied eight burrows in plot 2. Three eggs failed to hatch, while five presumably fledged successfully. Two chicks had hatched by 17 June and disappeared by 21 July, where as the remaining three had hatched and were large but still downy on 21 July and had disappeared by 24 August.

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. However, unlike previous years when parakeet auklets were virtually ignored by the gulls that preyed heavily on crested and least auklets, this year gull predation on parakeet auklets was observed every few days throughout June and July. Parakeet auklet remains were not

found in any gull pellets, however, as had been documented in 2004 and 2006. Fourteen nests were monitored for productivity on Guillemot Beach and Tundering Talus; on Guillemot Beach, five eggs were lost and five chicks fledged, while on Tundering Talus, all four eggs hatched but only two chicks survived to fledge. Hatch dates ranged from 27 June to 1 July and fledge dates from 4 to 8 August. The first fledgling was seen on 6 August just about a meter offshore on Guillemot Beach.

Least auklet (*A. pusilla*).--Abundant. The average maximum number of least auklets attending surface plots was marginally higher than in 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 16-38% 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 16 June, comparable to last year and two weeks before the peak of crested auklets this year. Subadults comprised an average of 24% of the least auklets counted on surface count plots, substantially higher than the previous three years and similar to levels counted in 1996-1999 and 2001-2003. 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 23 June and 11 July, although some chicks likely hatched before that, as an adult was first observed carrying food on 22 June. The median hatch date was 29 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 28 July, although chicks in nests monitored for productivity began fledging by 21 July and continued through 4 August. After 6 August, no least auklets were seen on the talus or in nearshore waters. For known-fate nest sites, overall reproductive success was 61%, 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. A single late bird was still heard vocalizing from the rocks at Troll Talus on 13 August. Murie (1959) reported finding whiskered auklet remains in 1 of 46 arctic fox pellets collected in 1936-37, suggesting that the birds nested on Kasatochi in the past. Of six crevices monitored for productivity on Guillemot Beach, Troll Talus, and the Whiskering Rocks, two eggs were abandoned; four eggs hatched between 12 and 29 June, but only two chicks survived to fledge. One of the chicks on Guillemot Beach was missing an eye and appeared to be blind. The first fledgling was observed on the water outside Turr Cave on 23 July. On 26 July, a fledgling was seen on the trail in front of Troll Talus at night.

At Ulak Island, birds were not heard calling from the beach below plot 2, although they had been heard in previous years. At Koniuji Island, two fledglings came aboard the M/V Tiglax when anchored offshore during the night of 21 July, and a fledgling was observed on the water on 22 July.

Crested auklet (*A. cristatella*).--Abundant. The average maximum number of crested auklets attending surface plots was higher than in recent years, continuing a general trend of increased numbers of crested auklets on index plots since 2003. Crested auklets comprised from 62-84% 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 5 July, about a week later than last year; however, there did not appear to be a consistent pattern to variation in crested auklet numbers on plots throughout the season. 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 23 June and 17 July, with a median hatch date of 1 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 28 July, although chicks in nests monitored for productivity began fledging by 26 July and continued through 12 August. By 9 August, there were only about 50 adults remaining in nearshore waters in Tundering Cove, although many chicks could still be heard calling from crevices. By 15 August, the talus appeared completely abandoned. For known-fate nest sites, overall reproductive success was 76%, the highest success ever recorded for crested auklets on Kasatochi. Interestingly, flocks of 100-200 crested auklets were occasionally observed flying around inside the caldera and socializing on the surface of the caldera lake, as had been noted in 2005 for the first time.

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. A nest was located on Guillemot Beach on 29 June, in a crevice among the beach boulders originally occupied by a parakeet auklet, but the egg appeared abandoned by our departure on 23 August. Birds were first observed carrying food at the south end of Guillemot Beach on 19 August.

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, and a nest was located in the boulders on the north side of the talus in mid June. A tufted puffin nest was located in mid June in the beach boulders at the base of the north end of Tundering Talus, although the ultimate fate of the nest was unknown. 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; at least 300 individuals were counted on Whisky Cover on 13 August. Adults were first observed carrying food at the south end of Guillemot Beach on 19 August.

At Ulak Island, birds were carrying food on 24 August.

Common raven (*Corvus corax*).--Fairly common. Up to five individuals were regularly seen throughout the summer, primarily from Troll Talus to Tundering Talus, flying in small groups 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.

Winter wren (*Troglodytes troglodytes*).--Abundant. Birds were observed most frequently along boulder beaches and on talus fields. First fledglings were seen on 22 June, when a pair of adults with at least three fledglings were observed at the north end of Oystercatcher Beach. Thereafter, broods



with attendant adults were common through the end of the season. On 31 July, adults were observed carrying food to a nest on Troll Talus that contained five feathered nestlings. The chicks fledged on 4 August but routinely returned to the nest at night for several days thereafter, continuing as late as 10 August when at least four of the fledglings sheltered in the nest during a storm.

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 with three eggs was found in Peregrine Ravine on 29 May, and had hatched three chicks by 9 June. It is likely that other nests hatched before that, as an adult was observed depositing a fecal sack on the rocks of Sud Slot on 2 June. The first fledgling was observed on 21 June at Sokolniekoff Cabin. Throughout the later half of the summer, fledglings were frequently heard practicing their songs along Oystercatcher Beach.

Lapland longspur (*Calcarius lapponicus*).--Abundant. Birds were observed primarily on grassy slopes all around the island, and less frequently along the beach. On 19 June, an incubating female was flushed from a nest containing five eggs; the chicks had hatched by 23 June, had pin feathers by 1 July, and had fledged by 10 July. The first fledgling was observed on 19 June at Sud Slot. By 19 August, birds began forming large flocks along the beaches and exhibiting apparent pre-migratory anxiety. On 21 August, longspurs were noticeably scarce on the upper slopes and the swales of south side of the island where they had once been abundant, with just four birds seen between Sokolniekoff Cabin and Rye Point.

Snow bunting (*Plectrophenax nivalis*).--Uncommon. On 2 June, three males and a female were observed at the southern caldera rim. 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. Fresh eggshells were found on Troll Talus on 31 May, and the first fledgling was observed on 12 June on Oystercatcher Beach. Throughout July and August, fledglings were numerous in Peregrine Ravine and on Troll Talus and Oystercatcher Beach, often accompanied by adults. On 20 June, two dead fledglings were found along Oystercatcher Beach.

## Mammals

Sea otter (*Enhydra lutris*).--Absent. No sea otters were seen in 2007. 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 within the range of animals observed during the past five years. Peak counts were 87 large bulls and 663 females and subadult males on 19 June, and 313 pups on 20 July. 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. On 4 August, 104 individuals, including at least six pups, were counted at the far west end of Reindeer Beach. However, no sea lions were observed along the southern shore during a circumnavigation survey the following day. On 21 August, about 150-200 animals were hauled out at the eastern end of the beach and remained through departure on 23 August. 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.

Northern fur seal (*Callorhinus ursinus*).--Rare. A small juvenile was observed cavorting in the kelp beds offshore Sokolniekoff Cabin on 23 July.

At Koniuji Island, a juvenile fur seal was observed hauled out on the rocks at the shoreline on 22 July, and may have been the same individual seen at Kasatochi the following day.

Harbor seal (*Phoca vitulina*).--Uncommon. Two to five 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.

At Ulak Island, an adult and pup were seen in the water below plot 2 on 17 June.

Minke whale (*Balaenoptera acutorostrata*).--Rare. One animal was observed swimming south to north across the entrance of Tundering Cove on 10 June.

Near Ulak Island, a single individual was seen from plot 2 on both 17 June and 22 July.

Stejneger's beaked whale (*Mesoplodon stejnegeri*).--Rare. 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 (*Orinus orca*).--Uncommon. On 14 June, two large males and two smaller individuals were seen crossing Tundering Cove from south to north; one of the smaller whales lob-tailed several times. Two separate pods were observed from Tundering Talus on 16 June, one several miles offshore consisting of at least 12 individuals, including two large males and one small calf; and a second just under a mile offshore with 9-10 animals, including two large males and several calves. On 5 July, single male was observed leaving Tundering Cove, heading towards Dory Slot. On 21 August, a pod of five individuals was seen from Sokolniekoff Cabin, traveling north to south about two miles offshore.

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. At least three individuals were observed apparently feeding in Tundering Cove, about 200 m offshore, on 9 June. On 14 and 30 June, three animals were briefly seen transiting across the entrance of the cove.

Table 114. 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
Aleutian cackling goose	--	X-2	X-2	X-2	X-2	X-2	X-2	X-1	X-1	X-2	--	X-2
Falcatad teal	--	--	X-1	--	--	--	--	--	--	--	--	--
Eurasian wigeon	--	X-1	--	--	--	--	--	--	X-1	--	--	X-1
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
Ancient murrelet	X-2	X-3	X-3	X-3	X-2	--	X-2	C-2	C-2	C-4	C-3	C-3
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
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
Whiskered auklet	C-3	C-2	--	C-2	--	C-2	C-3	C-4	C-4	C-4	C-4	C-4
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
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
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
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
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
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
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
Snow bunting	P-2	C-2	--	P-2	--	--	C-2	C-2	P-2	C-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
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
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
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
Sperm whale	--	--	--	X-1	X-1	X-1	X-1	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

Table 115. 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
Fork-tailed storm-petrel	--	--	?	--	?	?	?	?	20 Aug	?	15 Aug	?
Black oystercatcher <sup>a</sup>	8 Jun	4 Jun	10 Jun	1 Jun	25 May	21 May	23 Jun	30 May	31 May	27 May	29 Jun	late 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
Common murre	25 Aug	24 Aug	--	--	--	--	--	--	--	--	--	--
Thick-billed murre	19 Aug	21 Aug	--	--	--	--	--	--	--	--	--	--
Murre spp.	--	--	--	--	--	--	--	--	--	--	--	16 Aug <sup>b</sup>
Pigeon guillemot	29 Jun	8 Aug	late Aug	17 Aug	late Aug	?	12 Aug	12 Aug	14 Aug	14 Aug	1 Sep	17 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
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
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
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
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
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
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

<sup>a</sup>Dates for black oystercatchers in some years may represent the appearance of first chick.

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

Table 116. Flowering chronology of commonly observed plants at Kasatochi Island, Alaska.

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

Table 116 continued. Flowering chronology of commonly observed plants at Kasatochi Island, Alaska.

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



Table 117. Mean monthly high and low temperatures (°C) at Kasatochi Island, Alaska.

	late May		June		July		August	
High (range; <i>n</i> )								
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)
Low (range; <i>n</i> )								
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)

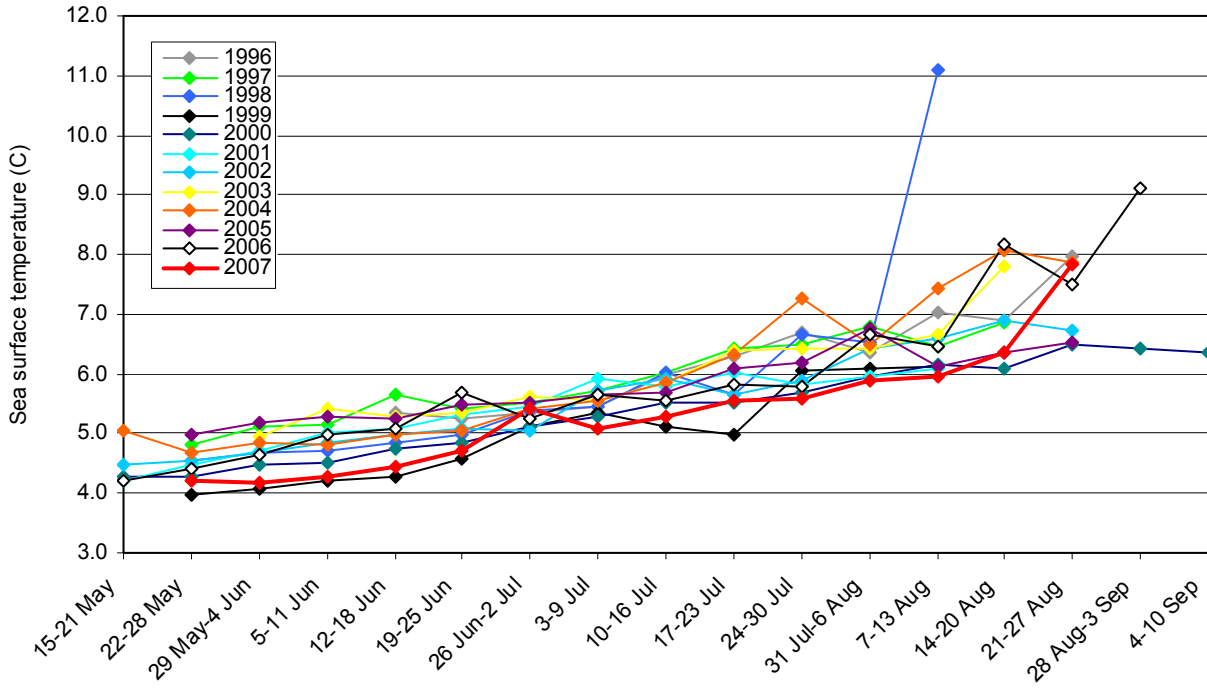


Figure 29. Weekly mean sea surface temperature (°C) at Kasatochi Island, Alaska.

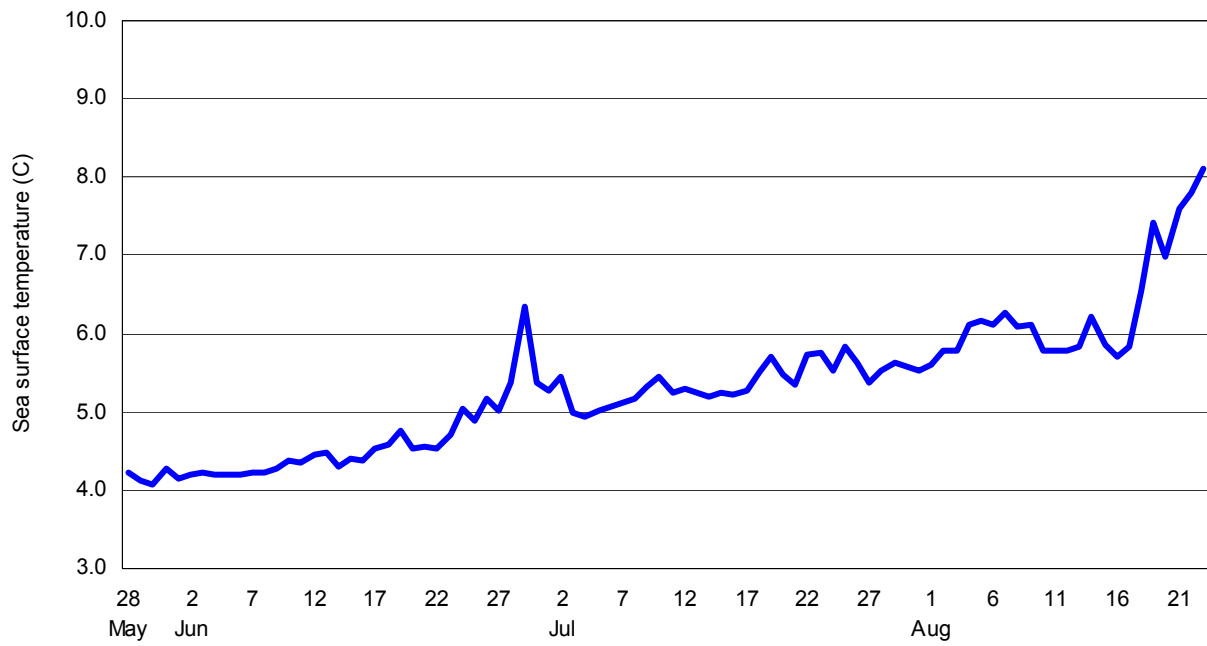


Figure 30. Daily mean sea surface temperature (°C) at Kasatochi Island, Alaska in 2007.

Table 118. 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 2003-2007).

Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
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 119. GPS coordinates of observation points and index plots (coordinates are for plot centers) at Kasatochi Island, Alaska in 1997.

Site	GPS coordinates (N/W)	±m	Elevation (m)
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 120. Vegetation and substrate characteristics of surface count plots at Kasatochi Island, Alaska.

Approximate % cover	Plot									
	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5
<b>Bare rock</b>										
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
<b>Short vegetation</b>										
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
<b>Leymus/lumbel</b>										
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

Table 121. Stejneger's beaked whale sightings from Kasatochi Island, Alaska.

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