BREEDING STATUS, POPULATION TRENDS AND DIETS OF SEABIRDS IN ALASKA, 2000

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BREEDING STATUS, POPULATION TRENDS AND DIETS OF SEABIRDS IN ALASKA, 2000

Compiled By:

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EXECUTIVE SUMMARY

Data are being collected annually for selected species of marine birds at breeding colonies on the far-flung Alaska Maritime National Wildlife Refuge (NWR) and at other areas in Alaska to monitor the condition of the marine ecosystem and to evaluate the conservation status of species under the trust of the Fish and Wildlife Service. The strategy for colony monitoring includes estimating timing of nesting events, rates of reproductive success (e.g., chicks per nest), population trends and diet composition of representative species of various foraging guilds (e.g., off-shore diving fish-feeders, offshore surface-feeding fish-feeders, diving plankton-feeders) at geographically-dispersed breeding sites. This information enables managers to better understand ecosystem processes and respond appropriately to resource issues. It also provides a basis for researchers to test hypotheses about ecosystem change. The value of the marine bird monitoring program is enhanced by having sufficiently long time-series to describe patterns for these long-lived species.

In summer 2000 data were gathered on storm-petrels, cormorants, gulls, kittiwakes, murres, murrelets, auklets, and/or puffins at eight annual monitoring sites on the Alaska Maritime NWR and one annual monitoring site on the Togiak NWR. In addition, data were gathered at seven other locations which are visited intermittently or are currently part of an intensive research program off refuges (e.g., Exxon Valdez Trustee Council-sponsored research in Prince William Sound).

In 2000, we recorded only two cases of later than normal hatching (black-legged kittiwakes at Middleton Island and red-legged kittiwakes at Bogoslof Island). Most species were within normal bounds or were earlier than average. Surface plankton feeders (storm-petrels) were earlier than normal in three of four cases (species x site). Timing of nesting of diving plankton feeders (auklets) was normal in all but two cases. Fish feeders (cormorants, gulls, kittiwakes, murres, puffins) were earlier than normal in nine of 12 cases in the southeastern Bering Sea and in seven of 9 cases in the northern Gulf of Alaska.

Plankton feeders (storm-petrels and auklets) had average rates of reproductive success in every case where we monitored them in 2000. For surface fish feeders, gulls had average rates of success in three of four cases, but the productivity of kittiwakes varied among regions. At Chukchi and Bering Sea locations kittiwakes generally had average or above average success. In the Gulf of Alaska, success was average in four of five cases. There were no cases of below average success for kittiwakes at any site we monitored in 2000. Monitored species of diving fish feeders (cormorants, murres, and puffins) had average or above average rates of productivity at most sites in Alaska in 2000. Below average success was recorded in only two of 33 cases (species x sites), both in the southwestern Bering Sea.

Storm-petrel populations appeared to be increasing where we monitored them in 2000 (southeastern Bering Sea and Southeast Alaska). Trends for fish feeders (cormorants, gulls, kittiwakes, murres, puffins), exhibited upward, downward and level trends in nearly equal numbers of cases (species x site) throughout the study area. Diving plankton feeders (auklets) showed no trend at the only colony monitored in 2000 (southwestern Bering Sea). Seabird diet data from several locations are presented for the first time this year. These data are from past years but we hope to include more current information regarding food habits in future reports.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF FIGURES (continued)

INTRODUCTION

This report is the fifth in a series of annual reports summarizing the results of seabird monitoring surveys at breeding colonies on the Alaska Maritime National Wildlife Refuge (NWR) and elsewhere in Alaska (see Byrd and Dragoo 1997, Byrd et al. 1998, Byrd et al. 1999 and Dragoo et al. 2000 for compilations of previous years' data). This report series is patterned after the publications of the Joint Nature Conservation Committee in Britain (e.g., Upton et al. 2000). Like in Britain, the seabird monitoring program in Alaska is designed to keep track of selected species of marine birds that indicate changes in the marine environment. Furthermore, the U.S. Fish and Wildlife Service has the responsibility to conserve seabirds, and monitoring data are used to identify conservation problems. The objective is to provide long-term, time-series data from which biologically-significant changes may be detected and from which hypotheses about causes of changes may be tested.

The Alaska Maritime NWR was established specifically "To conserve marine bird populations and habitats in their natural diversity and the marine resources upon which they rely" and to "provide for an international program for research on marine resources" (Alaska National Interests Land Conservation Act of 1982). The monitoring program is an integral part of the management of this refuge, by providing data that can be used to define "normal" variability in demographic parameters and identify patterns that fall outside norms and thereby constitute conservation issues. Although approximately 80% of the seabird nesting colonies in Alaska occur on the Alaska Maritime NWR, marine bird nesting colonies occur on other public lands (national and state refuges) and on private lands as well.

The strategy for colony monitoring includes estimating timing of nesting events, reproductive success, population trends, and prey used by representative species of various foraging guilds (e.g., murres are off-shore diving fish-feeders, kittiwakes are offshore surface-feeding fish-feeders, auklets are diving plankton-feeders, etc.) at geographically dispersed breeding sites along the entire coastline of Alaska. A total of 10 sites on Alaska Maritime NWR (Fig. 1), located roughly 300-500 km apart, are scheduled for annual surveys, and data were available for most of these in 2000. Furthermore, data are recorded annually at a site on Togiak NWR. In addition, colonies near the annual sites are identified for less frequent surveys to "calibrate" the information at the annual sites. Data provided from other research projects (e.g., those associated with evaluating the impacts of oil spills on marine birds) also supplement the monitoring database.

In this report, we summarize information from 2000 for each species; i.e., tables with estimates of average hatch dates and reproductive success, and maps with symbols indicating the relative success at various sites. In addition, historical patterns of productivity are illustrated for many sites (those where we have adequate information, e.g. ≥four data points). Population trend information is included for sites where at least five data points have been gathered. Seabird diet data from several locations are presented for the first time this year. These data are from past years but we hope to include more current information regarding food habits in future reports.

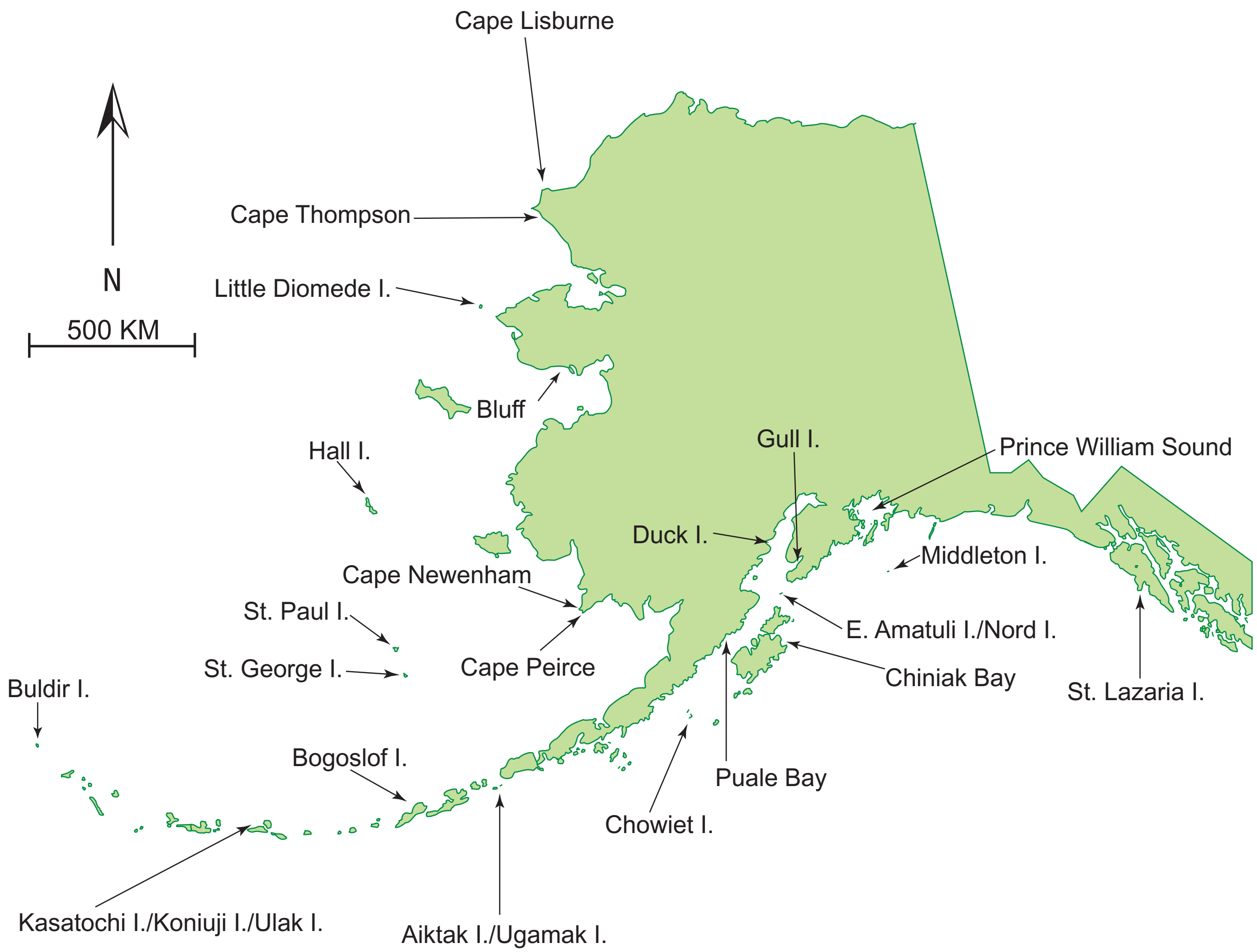


Figure 1. Map of Alaska showing the locations of seabird monitoring sites summarized in this report.

METHODS

Data collection methods generally followed protocols specified in "Standard Operating Procedures for Population Inventories" (USFWS 1997*a, b, c*). Timing of nesting events and productivity usually were based on periodic checks of samples of nests (frequently in plots) throughout the breeding season, but a few estimates of productivity were based on single visits to colonies late in the breeding season (as noted in tables). Hatch dates commonly were used to describe nesting chronology. Productivity typically was expressed as chicks fledged per egg, but occasionally other variables were used (e.g., chicks hatched per egg, chicks fledged per nest site) (Table 1). Population surveys were conducted for ledge-nesting species at times of the day and breeding season when variability in attendance was reduced. Most burrow-nester counts were made early in the season before vegetation obscured burrow entrances. Deviations from standard methods are indicated in reports from individual sites which are appropriately referenced.

Table 1. Productivity parameters used in this report.

Species	Productivity Value
Storm-petrels	Chicks Fledged/Egg (Total chicks fledged/Total eggs laid)
Cormorants	Chicks Fledged/Nest (Total chicks fledged/Total nests)
Glaucous-winged Gull	Hatching Success (Total chicks/Total eggs)
Kittiwakes	Chicks Fledged/Nest (Total chicks fledged/Total nests)
Murres	Chicks Fledged/Nest Site (Total chicks fledged/Total sites where egg was laid)
Ancient Murrelets	Hatching Success (Total chicks/Total eggs)
Auklets (except RHAU)	Chicks Fledged/Nest Site (Total chicks fledged/Total sites where egg was laid)
Rhinoceros Auklet	Chicks Fledged/Egg (Total chicks fledged/Total eggs)
Puffins	Chicks Fledged/Egg (Total chicks fledged/Total eggs)

This report summarizes monitoring data for 2000, and compares 2000 results with previous years. For sites with four or more years of data prior to 2000, site averages were used for comparisons. Otherwise, prior estimates for nearby sites were utilized for comparisons. For chronology, we considered dates within 3 days of the long-term average "normal"; larger deviations represented relatively early or late dates. For productivity, we defined significant deviations from "normal" as 20% or greater from the site or regional average. We used the phrase "slightly" above or below average to indicate smaller differences. We described overall population trends with exponential regression models.

Diets of seabirds were reported as percent occurrence of prey types in either the nestling or adult diets. Nestling diet data generally were from chick regurgitations or observations of bill loads of fish brought to the chicks. Adult diet data were from regurgitations or stomach samples. Data were reported in stacked bar graphs to facilitate having several years of data on one graph. The complete stacked bar indicates the cumulative percent occurrence of prey types in the samples and can add up to several hundred percent. The cumulative percent occurrence provides information on the average number of prey types per sample. For example, a cumulative percent occurrence of 400% for least auklets indicates that on average each bird consumed four different prey types during one foraging trip and a cumulative percent occurrence of 100% for black-legged kittiwakes indicates that on average each bird consumed one prey type during one foraging trip.

RESULTS

Northern Fulmar (*Fulmarus glacialis*)

Breeding Chronology.–No data for 2000.

Productivity.–No data for 2000.

Populations.–No data for 2000. See Figure 2 for prior years' data.

Diet.–No data.

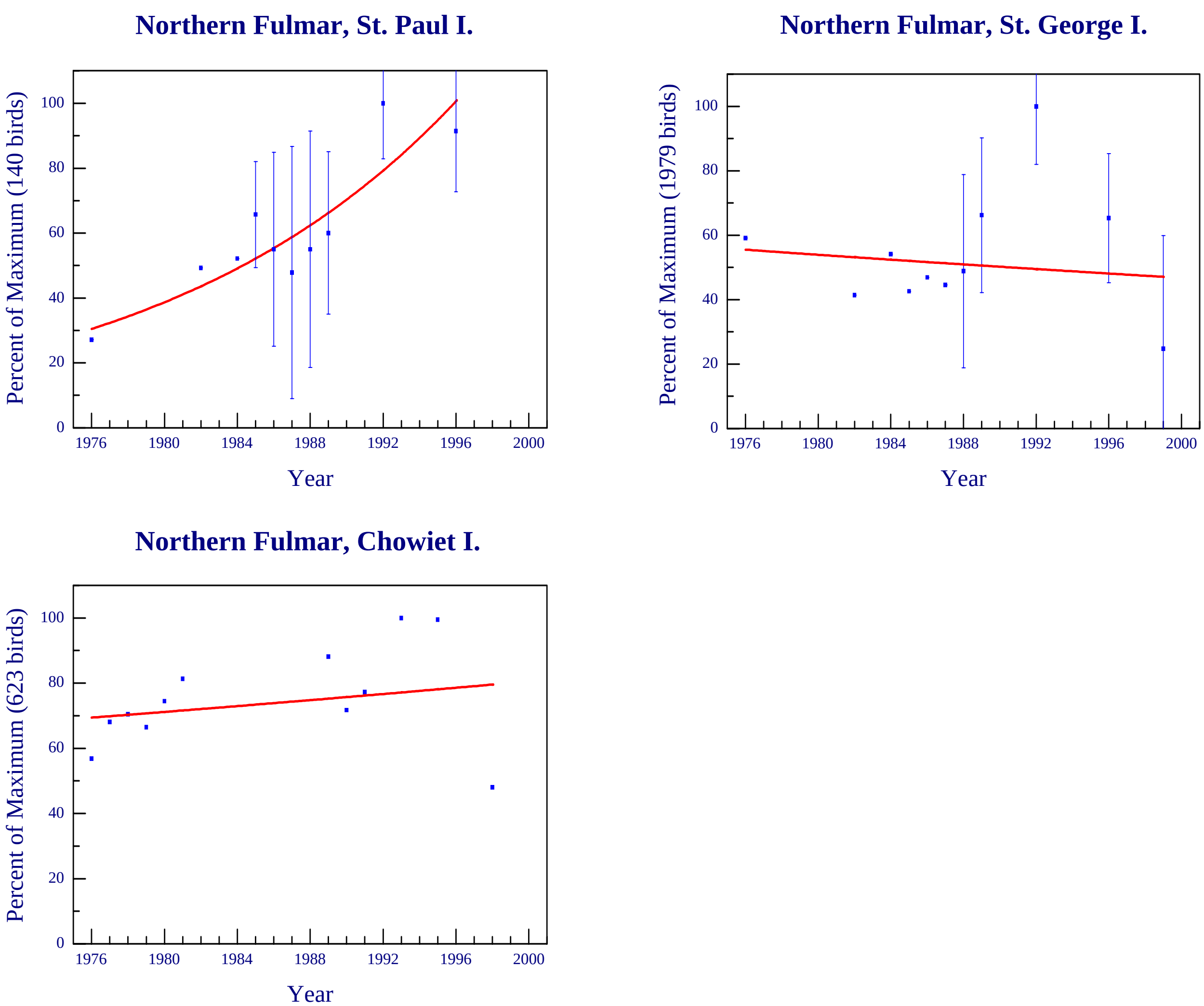


Figure 2. Trends in populations of northern fulmars at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

Fork-tailed Storm-Petrel (*Oceanodroma furcata)*

Breeding Chronology.–The mean hatching date for fork-tailed storm-petrels was earlier than the long-term average at both Aiktak and St. Lazaria islands in 2000 (Table 2).

Table 2. Hatching chronology of fork-tailed storm-petrels at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	8 Jul (34)[a]	10 Jul (34)	18 Jul[b] (3)[a]	Thomson and Smith 2000
St.Lazaria I.	30 Jun (59)	3 Jul (59)	20 Jul[b] (5)	L. Slater Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.

[b]Mean of annual means.

Productivity.–In 2000, productivity of fork-tailed storm-petrels ranged from 80% at Aiktak Island to 62% at St. Lazaria Island (Table 3, Fig. 3). Compared to previous years, this species had approximately average success at all three sites where data were available (Table 3, Fig. 3).

Table 3. Reproductive performance of fork-tailed storm-petrels at Alaskan sites monitored in 2000.

Site	Chicks Fledged[a]/egg	No. of Plots	No. of Eggs	Reference
Ulak I.	0.64	N/A[b]	69	Scharf 2000
Aiktak I.	0.80	3	40	Thomson and Smith 2000
St.Lazaria I.	0.62	13	228	L. Slater Unpubl. Data

[a]Fledged chick defined as being still alive at last check in August or September.

[b]Not applicable or not reported.

Populations.–Fork-tailed and Leach's storm-petrel burrows were combined for population monitoring purposes. In 2000, counts of burrow entrances were made in monitoring plots at St. Lazaria and Aiktak islands (both annual sites). It appeared that populations were increasing at St. Lazaria Island (Fig. 4). Burrow densities at Aiktak Island in 2000 were lower than the previous three years, but the overall trend there was up substantially since 1990.

Diet.–Myctophids dominated the diets of fork-tailed storm petrels at both Buldir and St. Lazaria islands (Fig. 5).

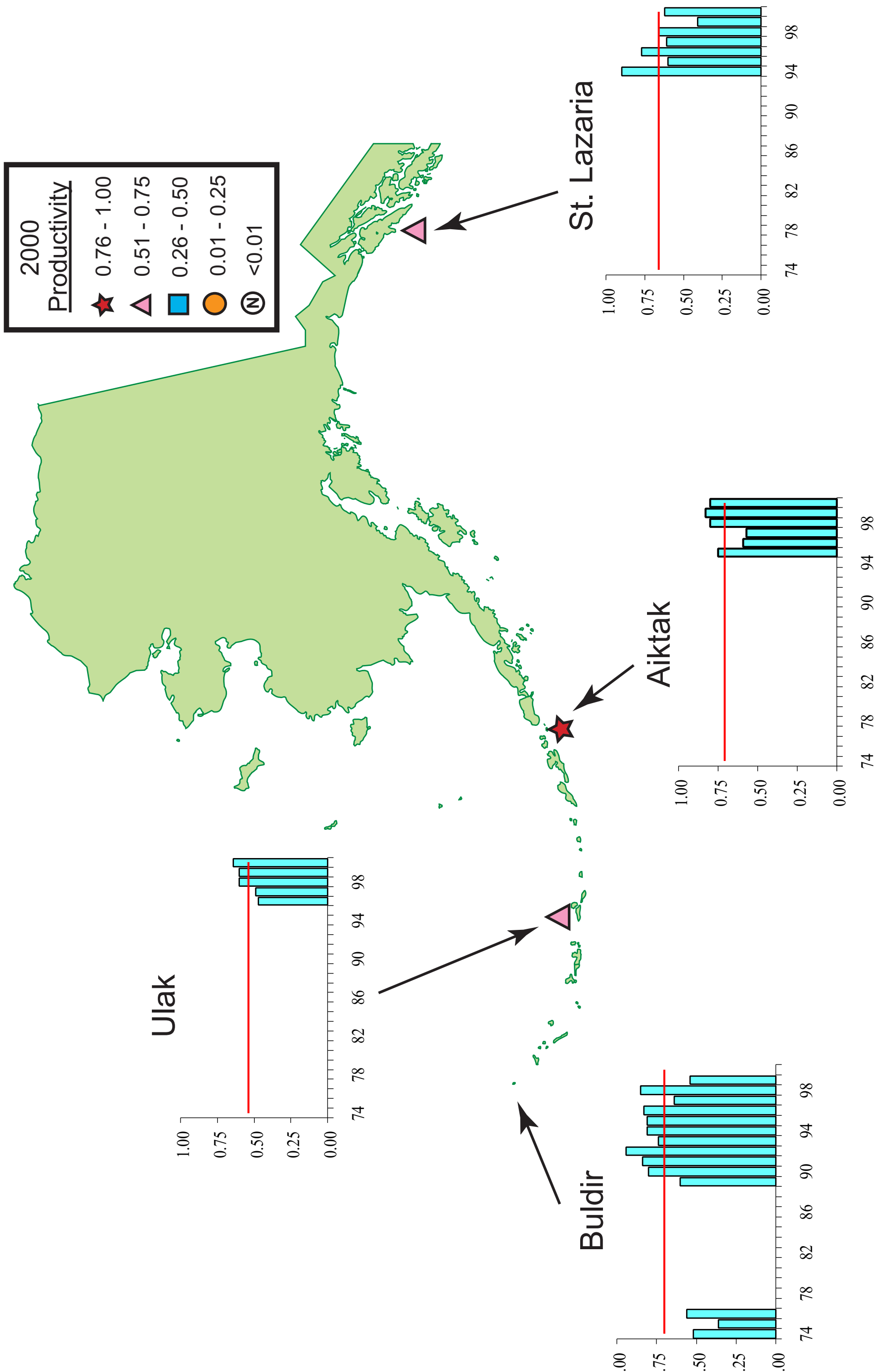


Figure 3. Productivity of fork-tailed storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

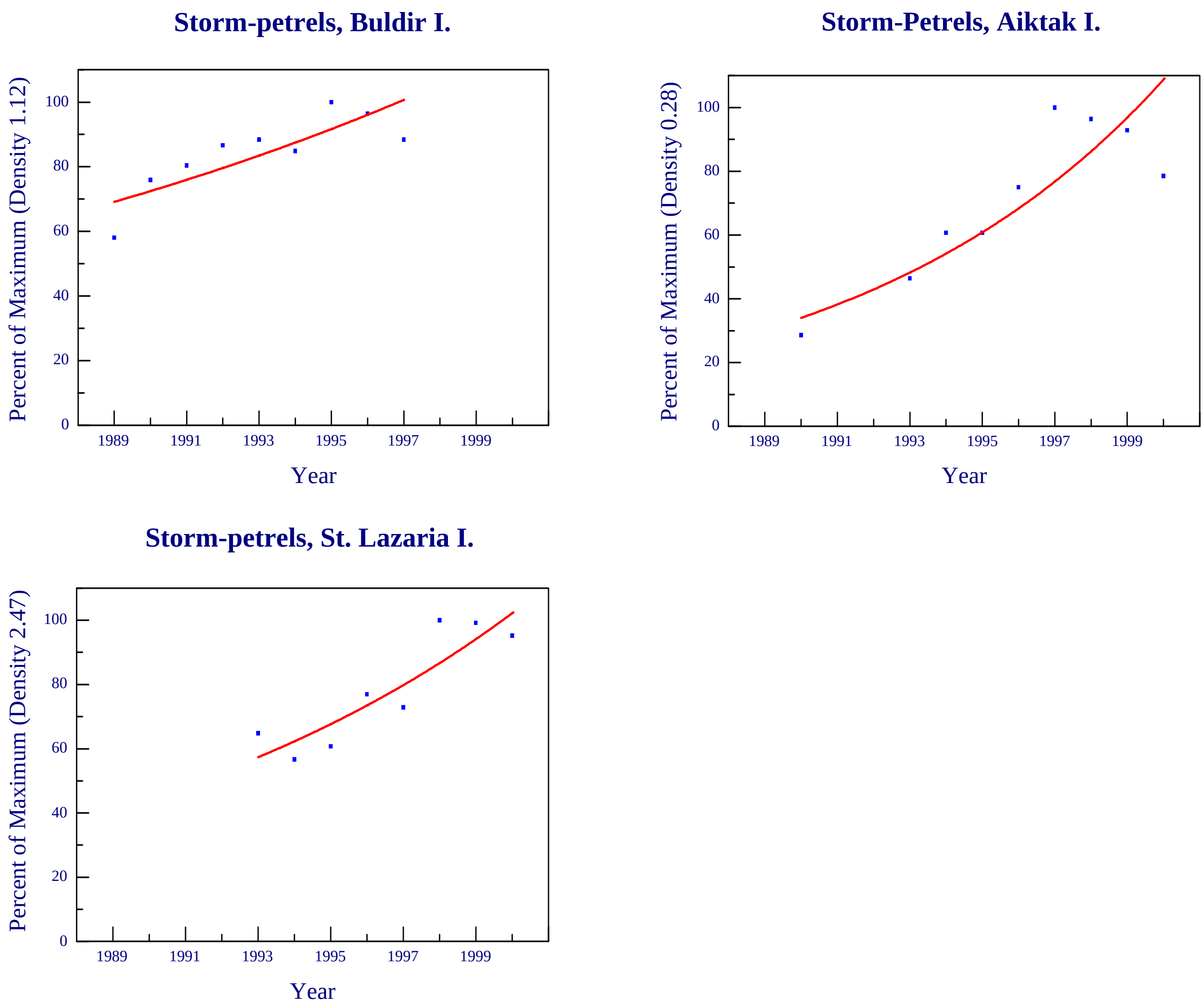


Figure 4. Trends in populations of storm-petrels at Alaskan sites.

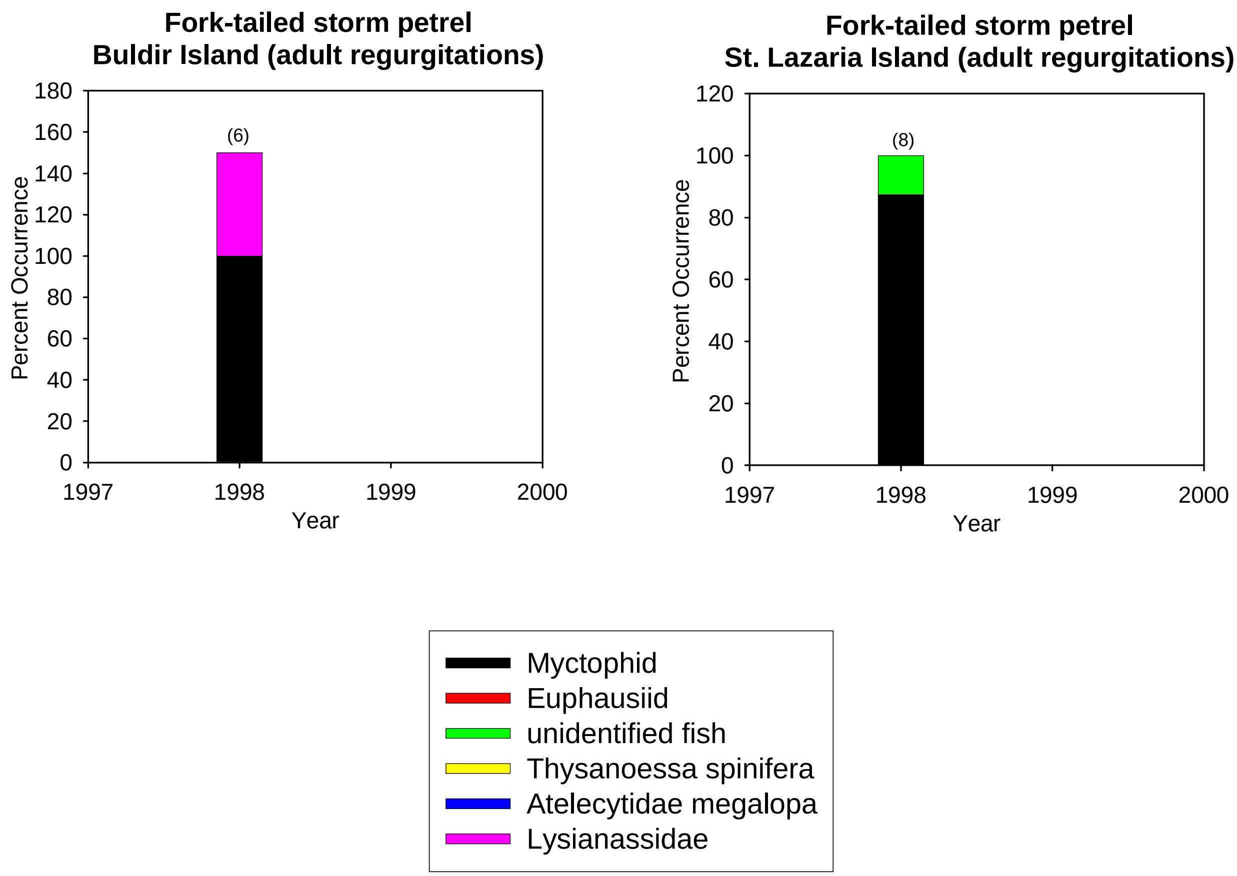


Figure 5. Diets of fork-tailed storm-petrels at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Leach's Storm-Petrel (*Oceanodroma leucorhoa*)

Breeding Chronology.–The mean hatching date for Leach's storm-petrels was about average at Aiktak Island and earlier than the long-term average at St. Lazaria Island in 2000 (Table 4).

Table 4. Hatching chronology of Leach's storm-petrels at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	28 Jul (38)[a]	30 Jul (38)	1 Aug[b] (3)[a]	Thomson and Smith 2000
St.Lazaria I.	26 Jul (26)	26 Jul (26)	3 Aug[b] (5)	L. Slater Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.–In 2000, productivity of Leach's storm-petrels ranged from 80% at Aiktak Island to 66% at St. Lazaria Island (Table 5, Fig. 6). Compared to previous years, this species had approximately average success at both sites where data were available for 2000.

Table 5. Reproductive performance of Leach's storm-petrels at Alaskan sites monitored in 2000.

Site	Chicks Fledged[a]/egg	No. of Plots	No. of Eggs	Reference
Aiktak I.	0.80	7	119	Thomson and Smith 2000
St.Lazaria I.	0.66	13	117	L. Slater Unpubl. Data

[a]Fledged chick defined as being still alive at last check in August or September.

Populations.–Fork-tailed and Leach's storm-petrel burrows were combined for population monitoring purposes. In 2000, counts of burrow entrances were made in monitoring plots at St. Lazaria and Aiktak islands (both annual sites). It appeared that populations were increasing at St. Lazaria Island (Fig. 4). Burrow densities at Aiktak Island in 2000 were lower than the previous three years, but the overall trend there was up substantially since 1990.

Diet.–The diet of Leach's storm petrels included Myctophids, Euphausiid Spp., *Lysianassidae* Spp. and *Atelecytidae megalopa* (Fig. 7).

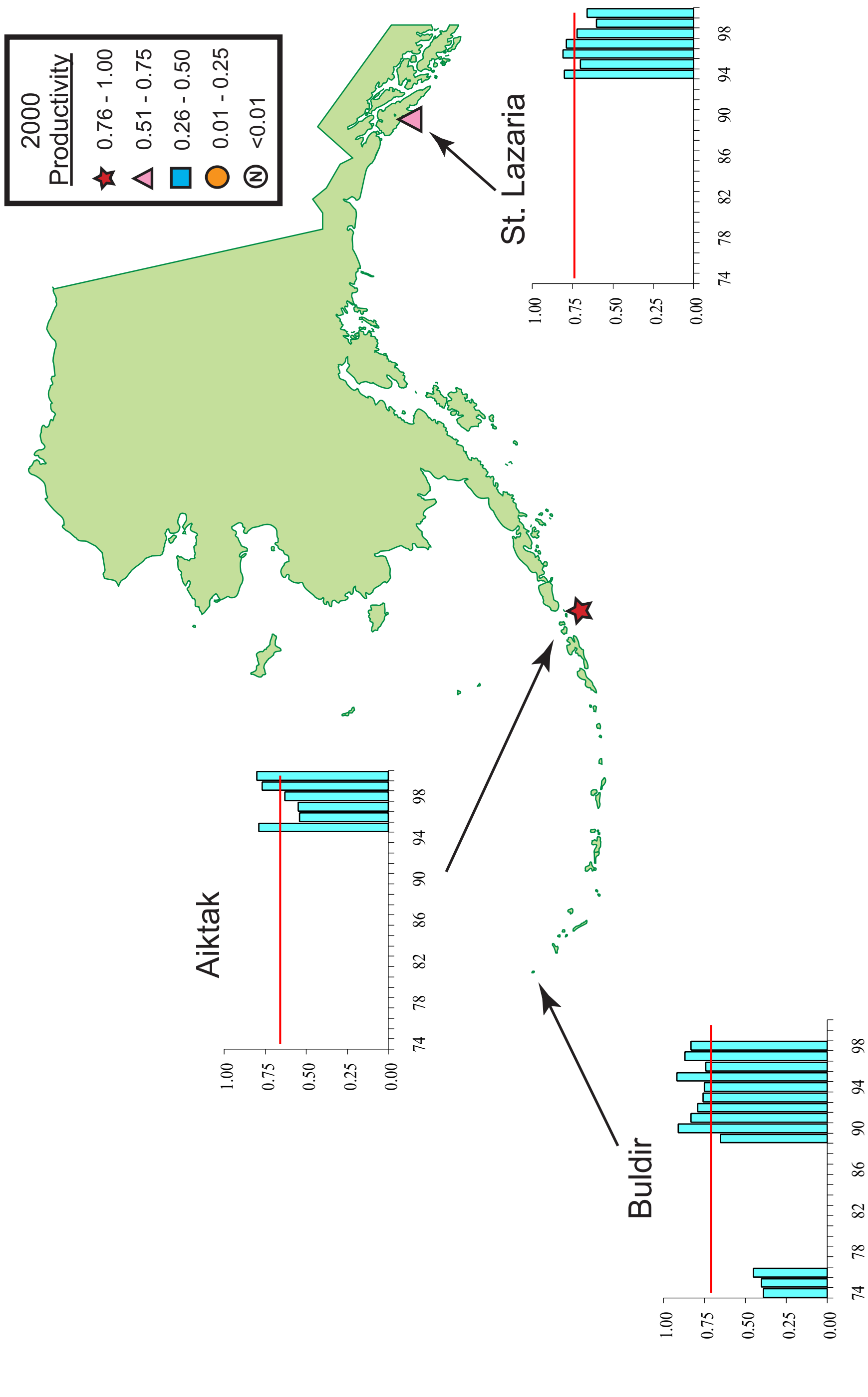


Figure 6. Productivity of Leach's storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

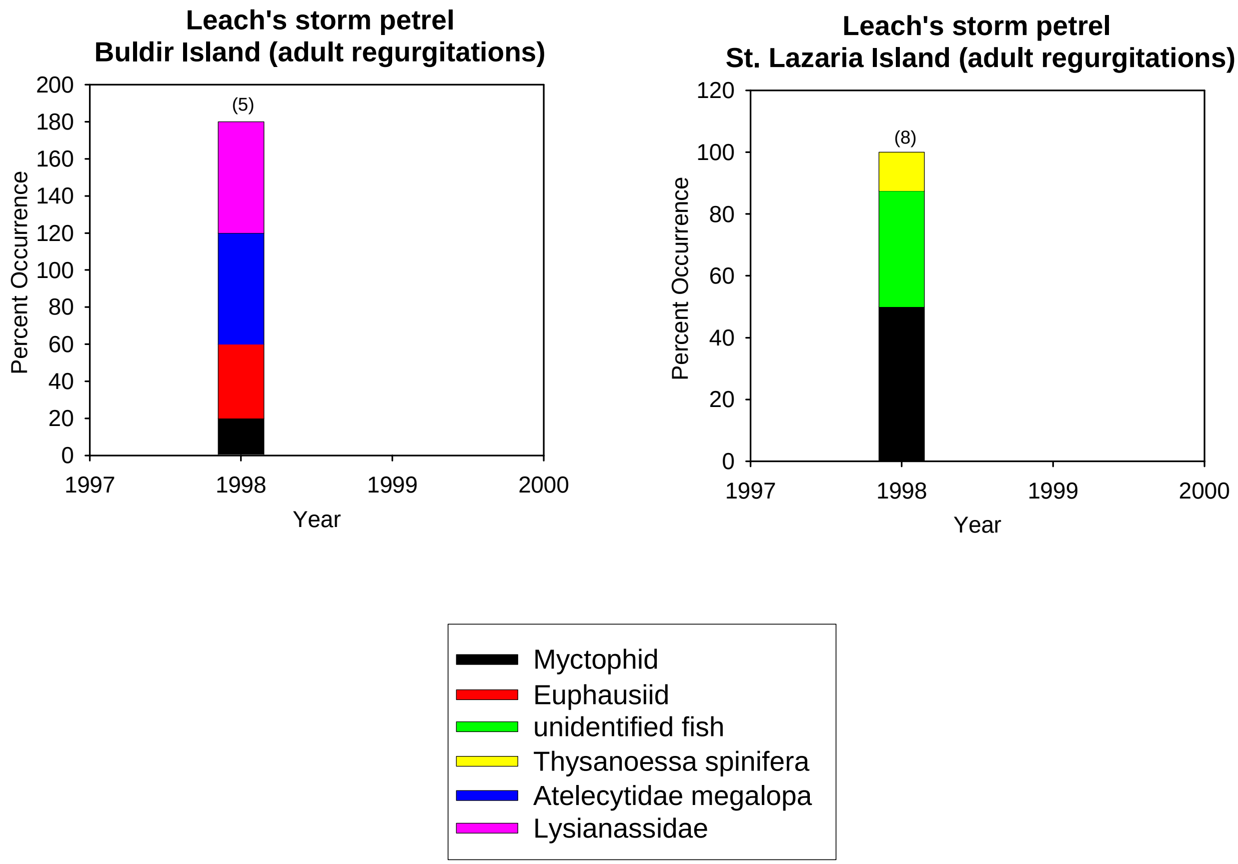


Figure 7. Diets of Leach's storm-petrels at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Double-crested Cormorant (*Phalacrocorax auritus)*

Breeding Chronology.–No data for 2000.

Productivity.–In 2000, double-crested cormorants averaged nearly two chicks per nest at Ugamak Island and more than two chicks fledged per nest at Aiktak Island (Table 6, Fig. 8). There is little prior information for this species at these sites.

Table 6. Reproductive performance of double-crested cormorants at Alaskan sites monitored in 2000.

Site	Chicks Fledged/Nest	No. of Nests	Reference
Ugamak I.	1.92	13	Thomson and Smith 2000
Aiktak I.	2.30	7	Thomson and Smith 2000

Populations.–No data for 2000.

Diet.–No data.

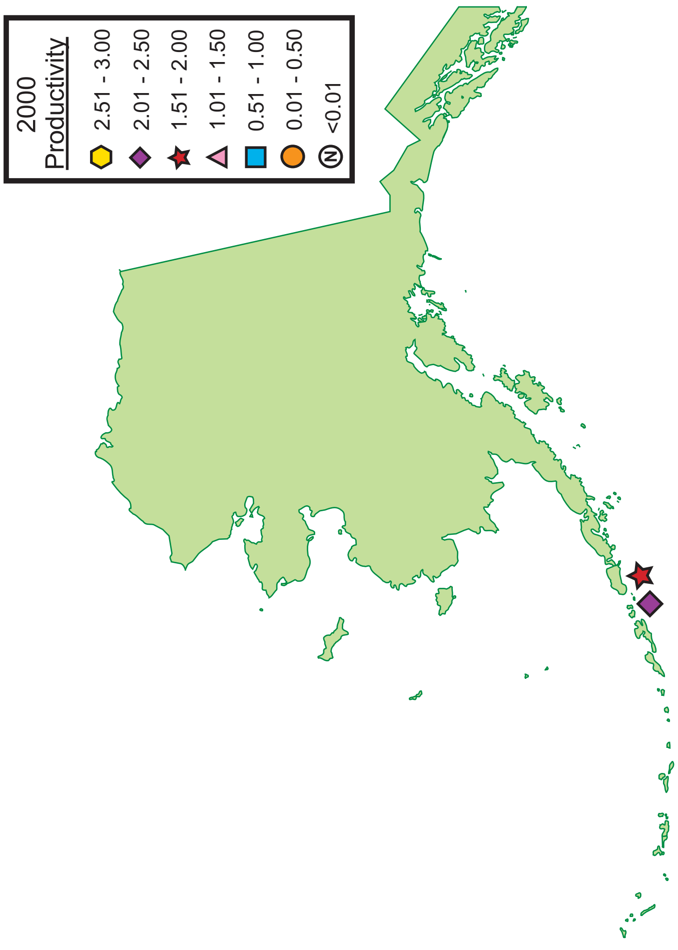
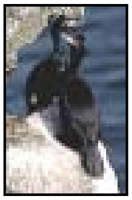


Figure 8. Productivity of double-crested cormorants (chicks fledged/nest) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).



Red-faced Cormorant (*Phalacrocorax urile*)

Breeding Chronology .–No data for 2000.

Productivity .–In 2000, productivity of red-faced cormorants ranged from 1.10 chicks fledged per nest at St. George Island to 2.20 chicks fledged at Ulak Island (Table 7). Productivity was average or higher (substantially higher in some cases) at all sites where this species was monitored in 2000 (Fig. 9).

Table 7. Reproductive performance of red-faced cormorants at Alaskan sites monitored in 2000.

Site	Chicks Fledged/Nest	No. of Plots	No. of Nests	Reference
St. Paul I.	2.11	4	46	Bittner 2001
St. George I.	1.10	2	16	Rojek and Ness 2000
Ulak I.	2.20[b]	N/A[a]	36	Scharf 2000
Kasatochi I.	1.60	N/A	12	Scharf 2000
Bogoslof I.	1.39	N/A	31	Byrd et al. 2001
Ugamak I.	1.75[b]	N/A	24	Thomson and Smith 2000

[a]Not applicable or not reported.

[b]Value obtained from one-time visit to colony.

Populations .–No counts were completed in 2000 which targeted just red-faced cormorants. See the section covering pelagic cormorants for a discussion of general cormorant population trends at colonies where the species are not differentiated.

Diet .–No data.

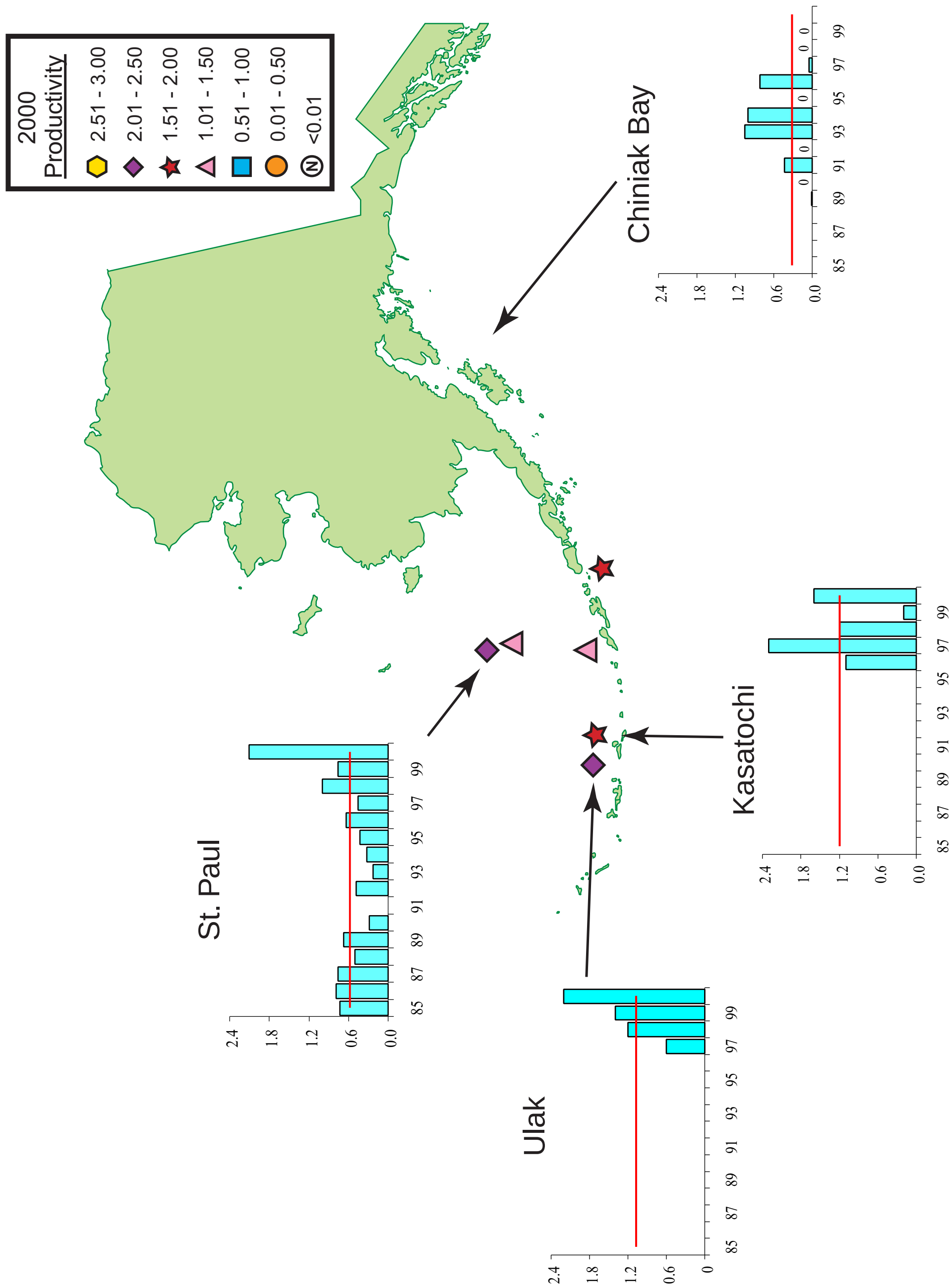


Figure 9. Productivity of red-faced cormorants (chicks fledged/nest) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Pelagic Cormorant (*Phalacrocorax pelagicus*)

Breeding Chronology .–Hatching dates for pelagic cormorants were about average at Cape Peirce and earlier than average at Middleton Island in 2000 (Table 8).

Table 8. Hatching chronology of pelagic cormorants at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Cape Peirce	—	19 Jun (36)[a]	21 Jun[b] (8)[a]	MacDonald and Courtot 2001
Middleton I.	21 June (50)	23 Jun (50)	4 Jul[b] (6)	S. Hatch and V. Gill, Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.

[b]Mean of annual means.

Productivity .–Pelagic cormorant productivity was average or above at all sites monitored in 2000 (Table 9, Fig. 10).

Table 9. Reproductive performance of pelagic cormorants at Alaskan sites monitored in 2000.

Site	Chicks Fledged/Nest	No. of Plots	No. of Nests	Reference
Cape Peirce	1.21	8	48	MacDonald and Courtot 2001
Ulak I.	2.60	N/A	24	Scharf 2000
Kasatochi I.	2.00	N/A[a]	15	Scharf 2000
Bogoslof I.	1.11	N/A	18	Byrd et al. 2001
Ugamak I.	2.45	N/A	22	Thomson and Smith 2000
Middleton I.	1.26	N/A	43	S. Hatch and V. Gill Unpubl. Data
St. Lazaria I.	1.74	9	171	L. Slater Unpubl. Data

[a]Not applicable or not reported.

Populations .–Cormorants are known to shift nesting locations between years, so it is difficult to confidently interpret changes in counts. Nevertheless, numbers of pelagic cormorants or nests (the index that has been used at some sites) have declined at sites in the western Gulf of Alaska (Gull and Middleton islands), but were relatively stable at Cape Peirce and Kasatochi Island (Fig. 11). This species has increased at St. Lazaria Island.

Diet .–No data.

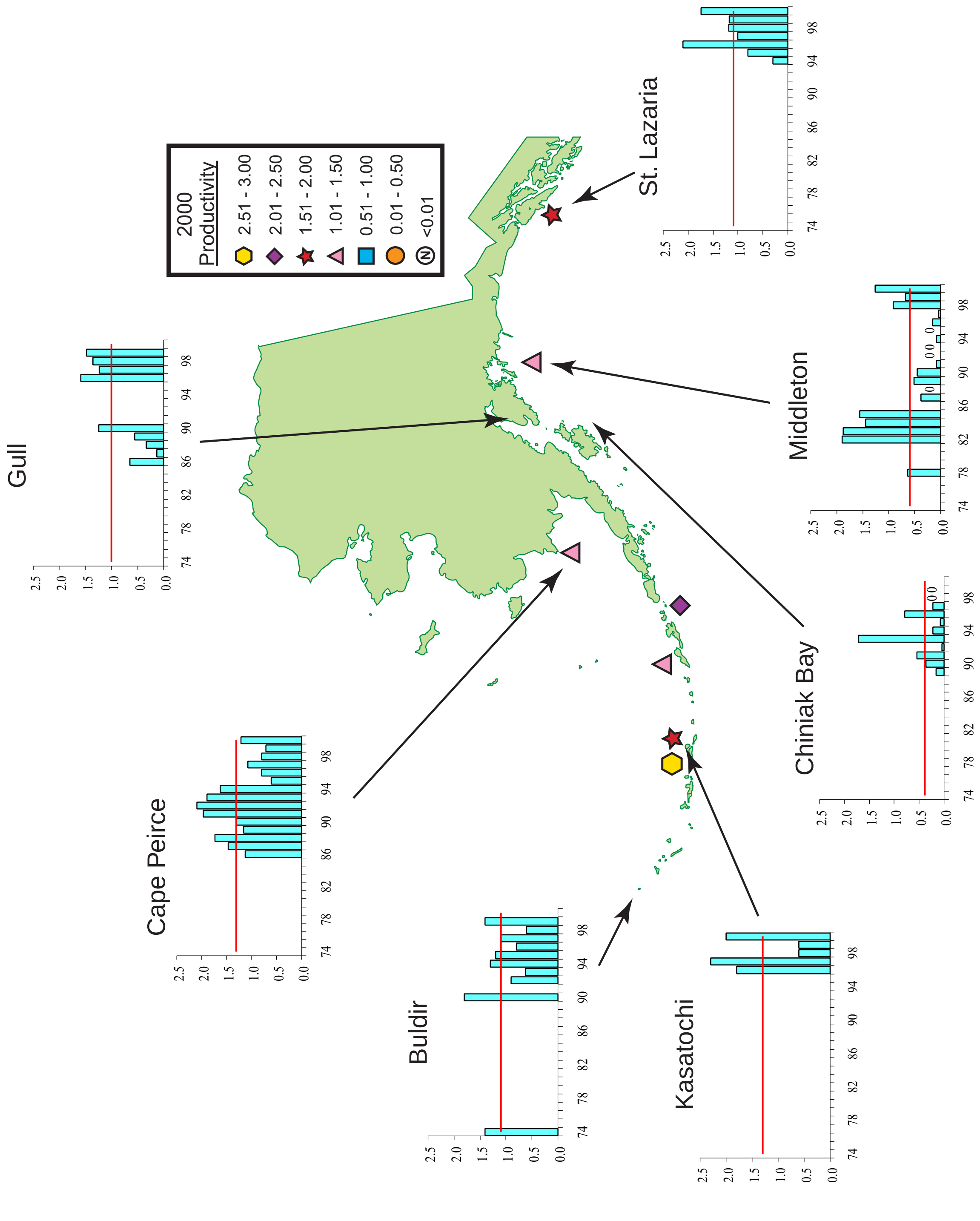


Figure 10. Productivity of pelagic cormorants (chicks fledged/nest) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

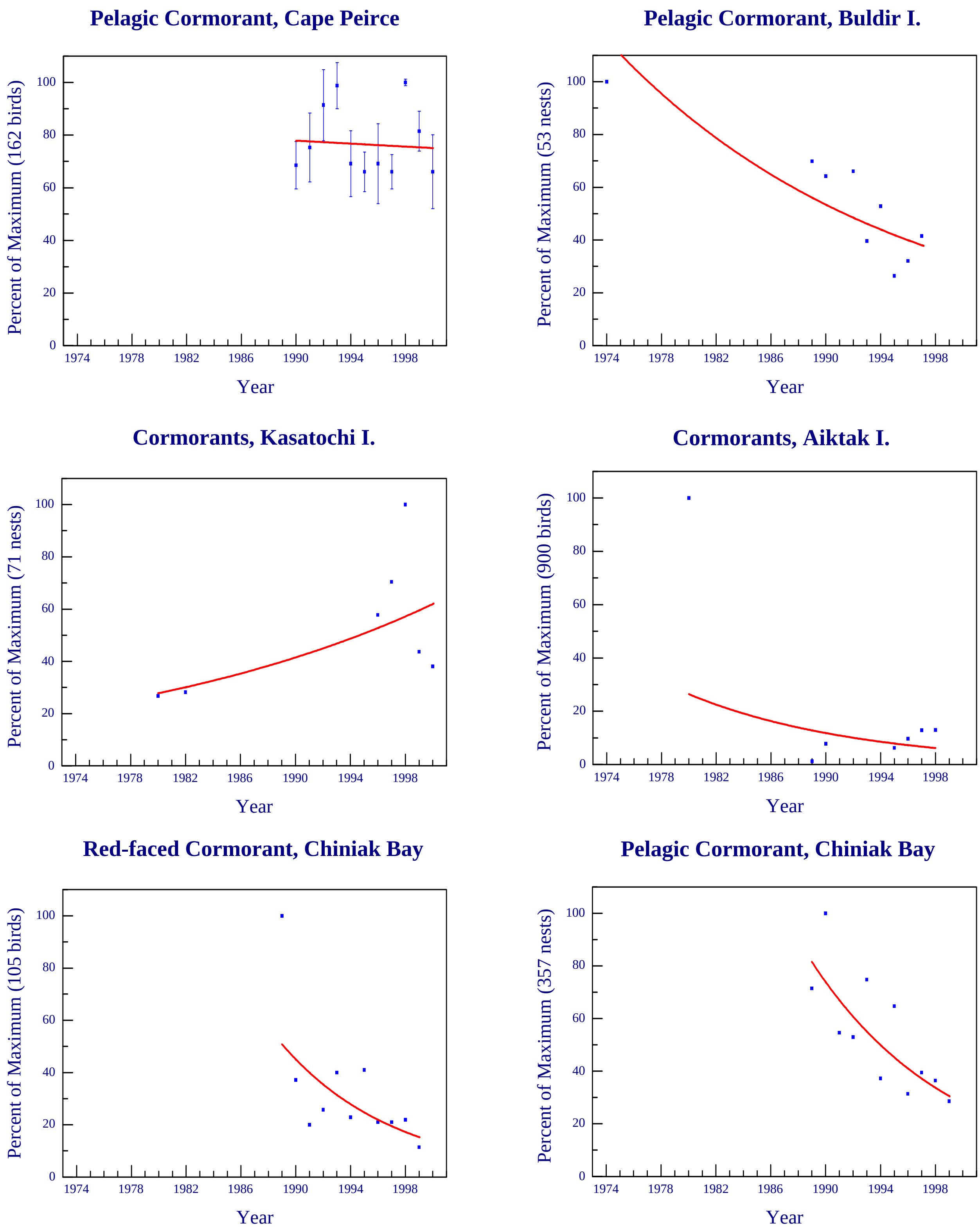


Figure 11. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

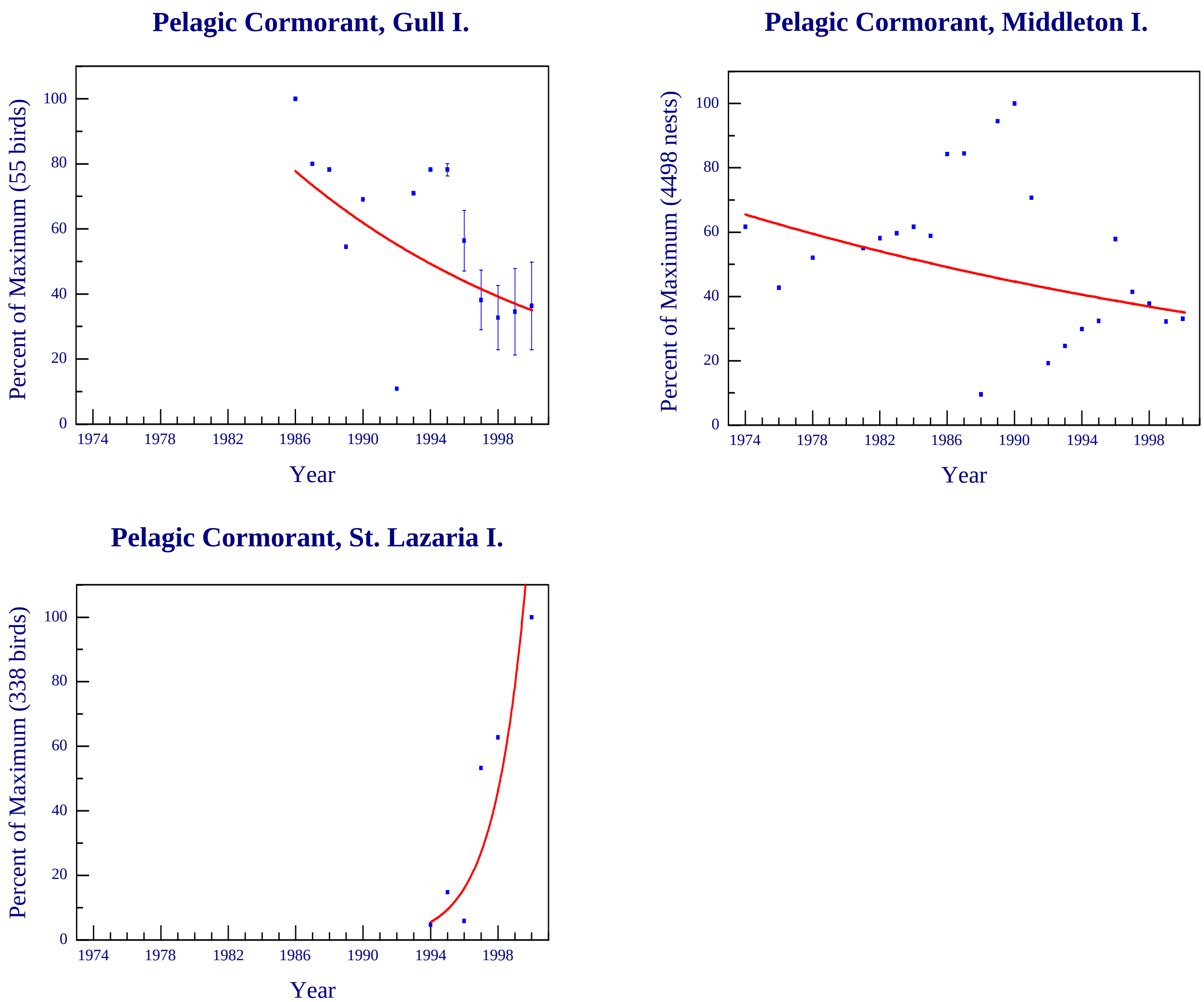


Figure 11. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

Glaucous-winged Gull *(Larus glaucescens*)

Breeding Chronology .–Mean hatch dates for gulls ranged from 22 June to 7 July in 2000 (Table 10). Nesting was early at Aiktak and Middleton islands, but about average at St. Lazaria Island in 2000.

Table 10. Hatching chronology of glaucous-winged gulls at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Bogoslof I.	—	28 Jun	N/A	Byrd et al. 2001
Aiktak I.	4 Jul (71)[a]	3 Jul (71)	13 Jul[b] (5)[a]	Thomson and Smith 2000
Middleton I.	22 Jun (85)	22 Jun (85)	27 Jun[b] (8)	S. Hatch and V. Gill Unpubl. Data
St. Lazaria I.	7 Jul (60)	7 Jul (60)	6 Jul[b] (2)	L. Slater Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.

[b]Mean of annual means.

Productivity .–Hatching success in 2000 ranged from 90 % at Middleton Island to 58% at St. Lazaria Island (Table 11, Fig. 12). All site averages were within normal ranges except at Middleton Island where rates were above average.

Table 11. Reproductive performance of glaucous-winged gulls at Alaskan sites monitored in 2000.

Site	Hatching Success[a]	No. of Plots	No. of Nests	Reference
Bogoslof I.	0.66	N/A[b]	86	Byrd et al. 2001
Aiktak I.	0.80	4	75	Thomson and Smith 2000
Middleton I.	0.90	2	85	S. Hatch and V. Gill Unpubl. Data
St.Lazaria I.	0.58	4	60	L. Slater Unpubl. Data

[a]Total chicks/Total eggs.

[b]Not applicable or not reported.

Populations .–Gulls were counted in plots at three sites in 2000 (Fig. 13). The trend tended to be negative at Aiktak Island. Numbers of gulls indicated no trends at Kasatochi and St. Lazaria islands, in spite of the fact that the 2000 numbers were substantially higher than the six birds that were counted at Kasatochi Island in 1936.

Diet .–Pacific herring occurred most frequently in the diets of glaucous-winged gulls from Aiktak Island in the eastern Aleutians (Fig. 14). Pollock and sandlance occurred less frequently while intertidal invertebrates and avian prey occurred least frequently.

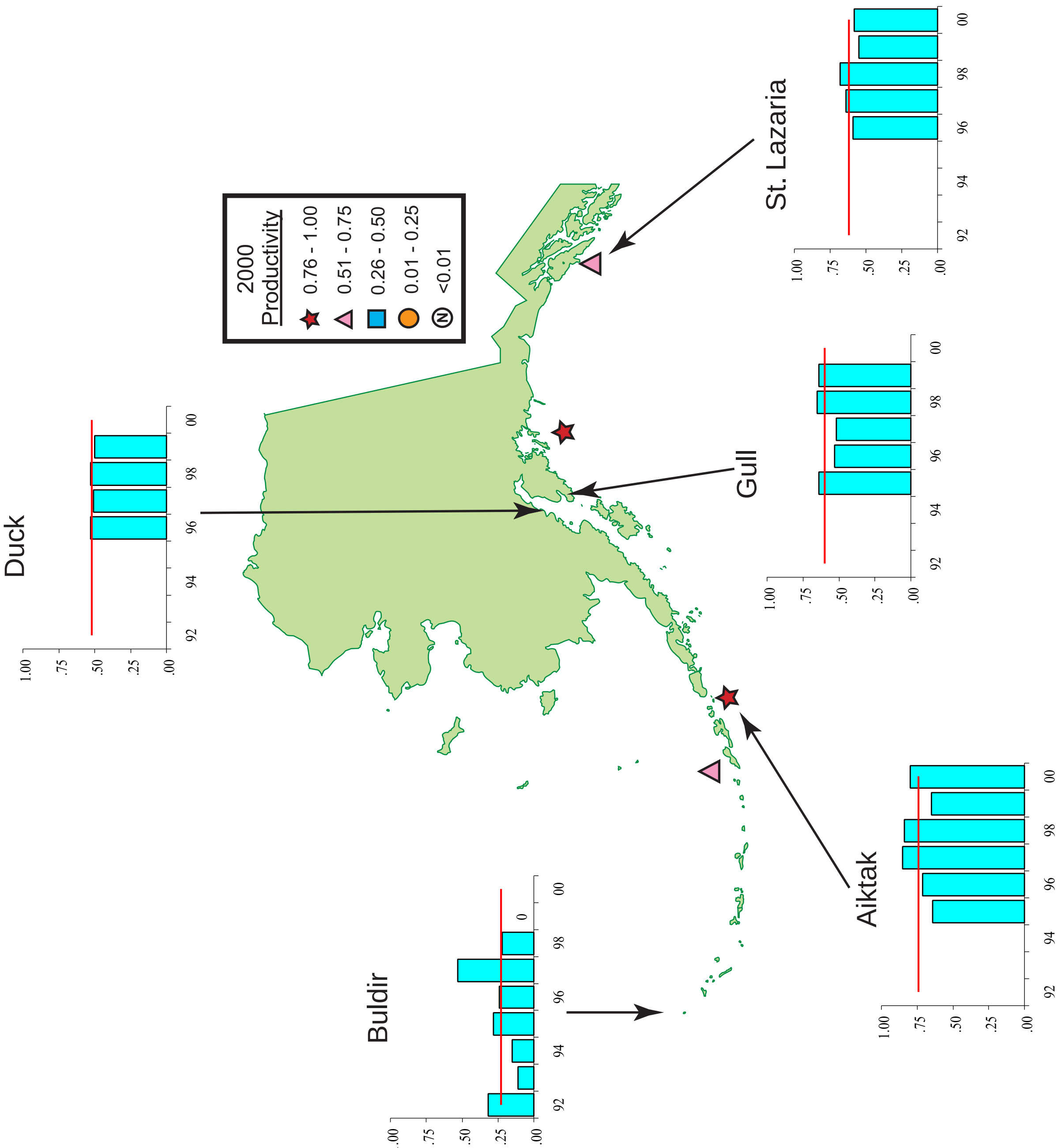


Figure 12. Productivity of glaucous-winged gulls (hatching success) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

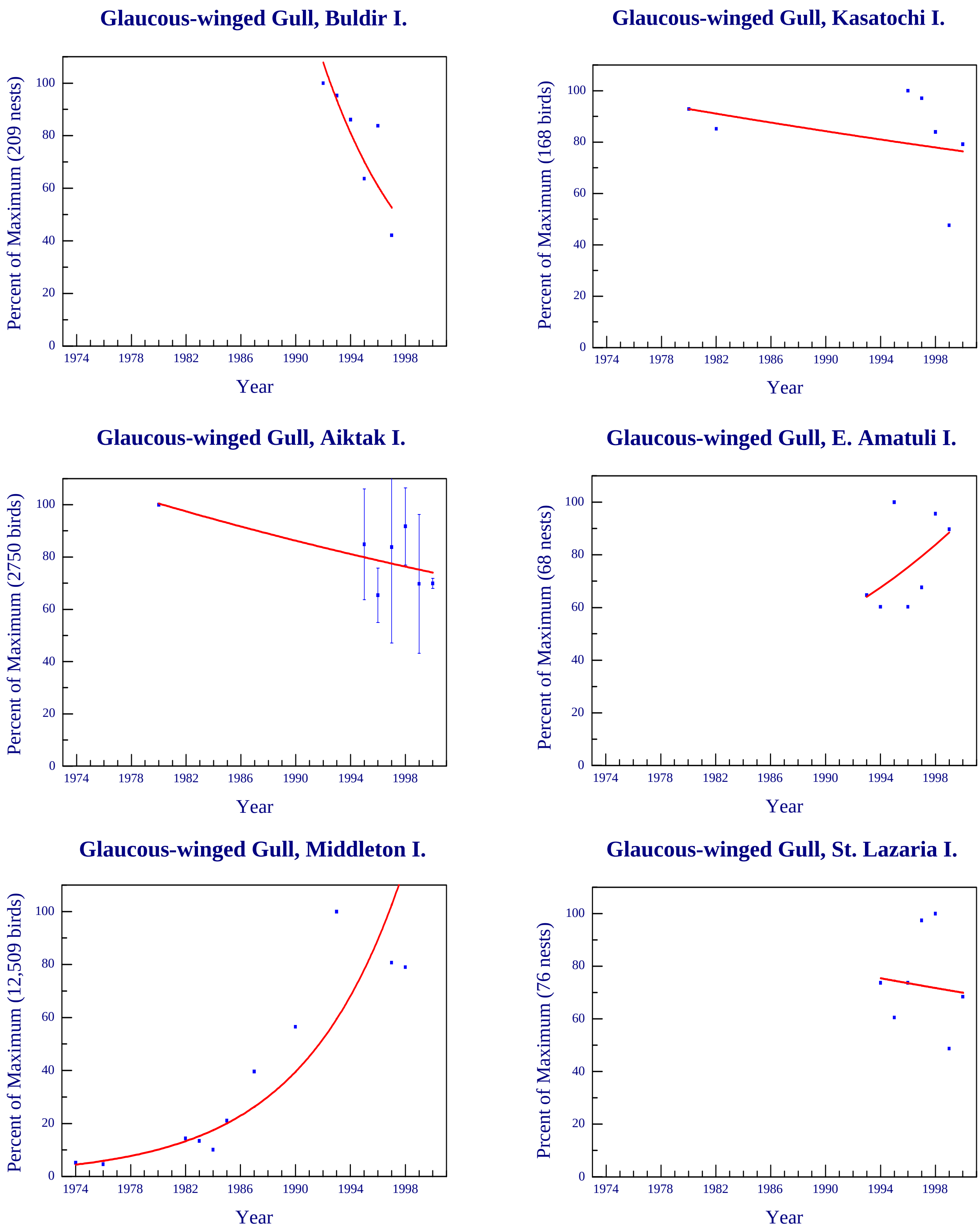


Figure 13. Trends in populations of glaucous-winged gulls at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

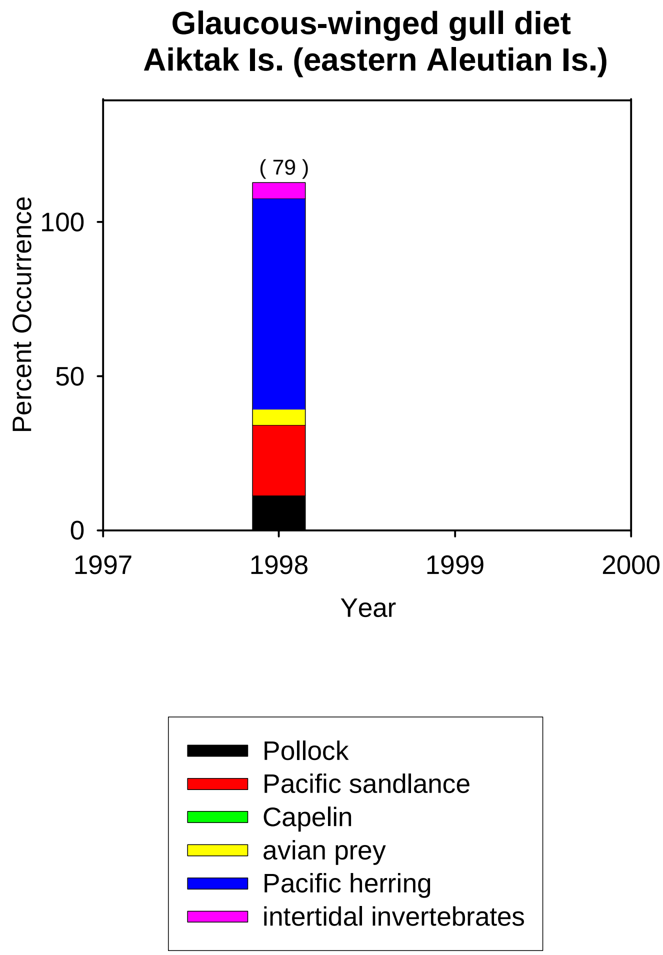


Figure 14. Diets of glaucous-winged gulls at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Black-legged Kittiwake (*Rissa tridactyla*)

Breeding Chronology .—In 2000, nesting was relatively early at five of the seven monitored sites, late at Middleton Island, and approximately average at Duck Island (Table 12).

Table 12. Hatching chronology of black-legged kittiwakes at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Bluff	—	17 Jul	N/A	Murphy 2001
St. Paul I.	—	6 Jul (236)[a]	24 Jul[b] (16)[a]	Bittner 2001
St. George I.	—	3 Jul (77)	22 Jul[b] (15)	Rojek and Ness 2000
Cape Peirce	—	2 Jul (167)	12 Jul[b] (11)	MacDonald and Courtot 2001
Buldir I.	—	2 Jul (184)	8 Jul[b] (12)	J. Williams Unpubl. Data
Bogoslof I.	—	7 Jul (277)	N/A	Byrd et al. 2001
Gull I.	3 Jul (196)	—	8 Jul[c] (5)	M. Shultz et al. Unpubl. Data
Duck I.	6 Jul (39)	—	6 Jul[c] (5)	A. Harding et al. Unpubl. Data
Middleton I.[d]	24 Jul (109)	26 Jul (109)	5 July[b] (5)	S. Hatch and V. Gill Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.

[b]Mean of annual means.

[c]Mean of annual medians.

[d]These BLKI were not included in the supplemental feeding study and plots did not include the tower.

Productivity .–Productivity of black-legged kittiwakes in 2000 ranged from 0.02 chicks fledged per nest at Duck Island to approximately 1.0 chick fledged per nest at Gull Island (Table 13). Productivity was above average at about one half of the sites monitored this year and approximately average at the remainder (Fig. 15).

Table 13. Reproductive performance of black-legged kittiwakes at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest[a]	No. of Plots	No. of Nests	Reference
C. Lisburne	0.86	N/A[b]	157	D. Roseneau Unpubl. Data
Bluff	0.65	5	198	Murphy 2001
St. Paul I.	0.62	11	289	Bittner 2001
St. George I.	0.57	5	110	Rojek and Ness 2000
Cape Peirce	0.31	12	312	MacDonald and Courtot 2001
Buldir I.	0.36	12	324	J. Williams Unpubl. Data
Koniuji I.	0.30	10	533	Scharf 2000
Bogoslof I.	0.90	10	359	Byrd et al. 2001
Chiniak Bay	0.33[c]	N/A	9,604	D. B. Irons Unpubl. Data
Gull I.	1.00	10	304	M. Shultz et al. Unpubl. Data
Duck I.	0.02	9	125	A. Harding et al. Unpubl. Data
Pr. Will. Snd.	0.24[c]	N/A	22,154	D. B. Irons Unpubl. Data
Middleton I.[d]	0.08	10	133	S. Hatch and V. Gill Unpubl. Data

[a]Total chicks fledged/Total nests.
[b]Not applicable or not reported.
[c]Short visit
[d]These BLKI were not included in the supplemental feeding study and plots did not include the tower (Gill 1999).

Populations .–Kittiwake counts in 2000 indicated a positive trend at four of six monitored colonies. (Fig. 16). Populations at Cape Peirce and Middleton Island show negative trends.

Diet .–Diets of black-legged kittiwakes from the Aleutians, Bering Sea and Chukcki Sea lacked the capelin and herring seen in the Gulf of Alaska diets (note that legends contain different prey types for the two areas). Instead, there was a greater occurrence of pollock, myctophids and euphausiids (Fig. 17). Pollock and sandlance occurred in significant amounts in the diets of Pribilof Island black-legged kittiwakes but did not occur in the diets of western Aleutian black-legged kittiwakes.

Gulf of Alaska black-legged kittiwakes relied most heavily upon sandlance and capelin. Black-legged kittiwakes in northern Prince William Sound (Shoup Bay) fed mostly on Pacific herring and sandlance (Fig. 18).

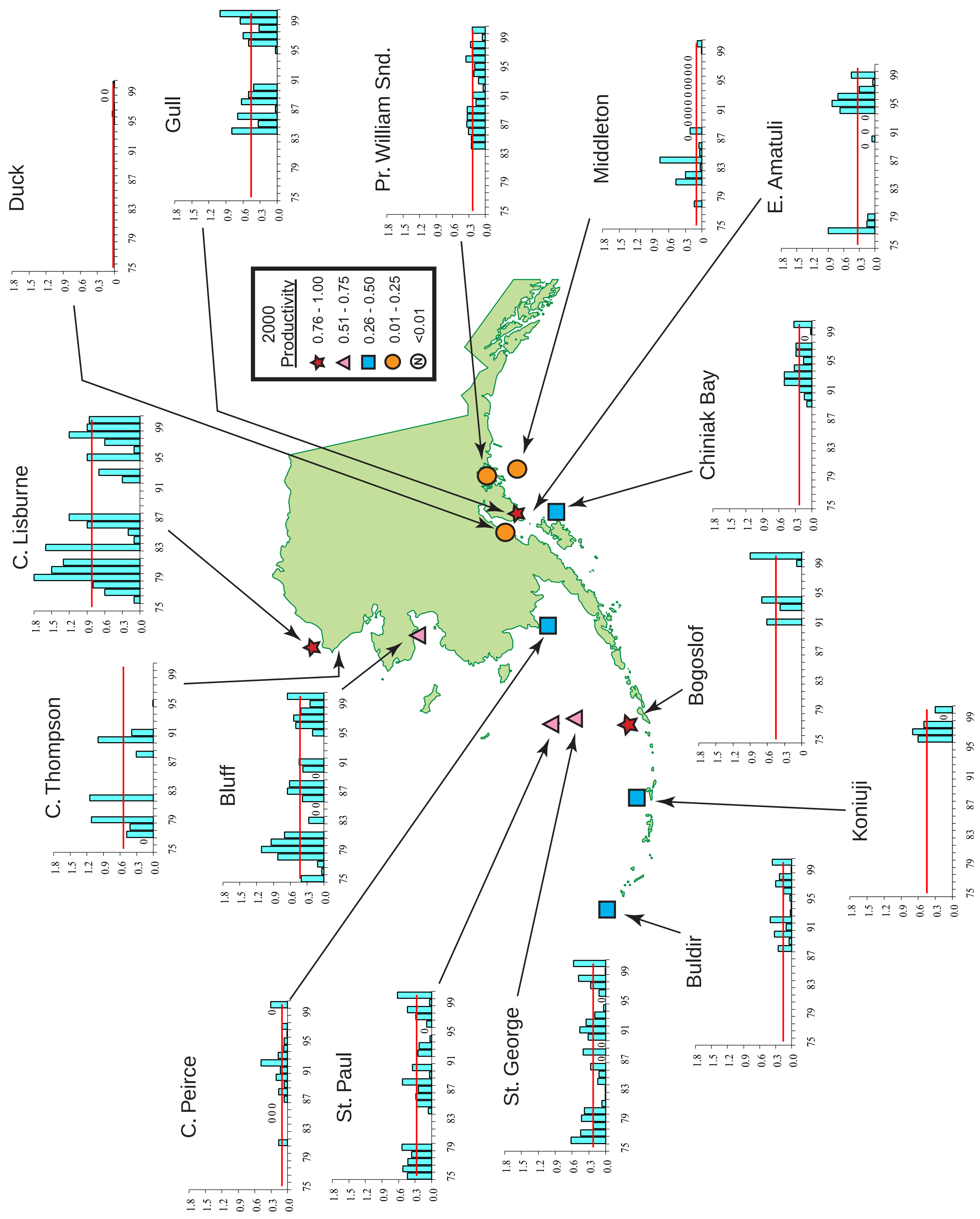


Figure 15. Productivity of black-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

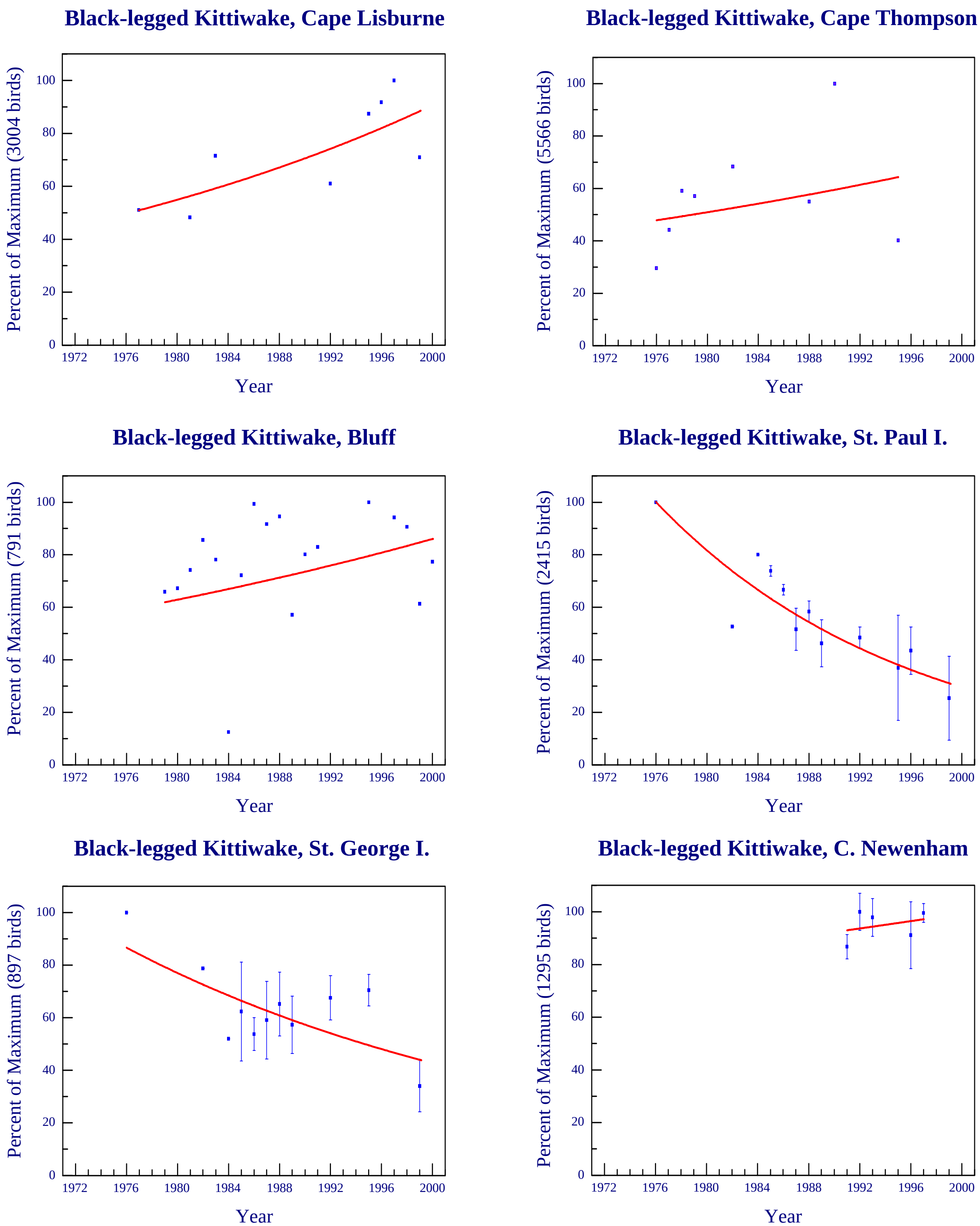


Figure 16. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

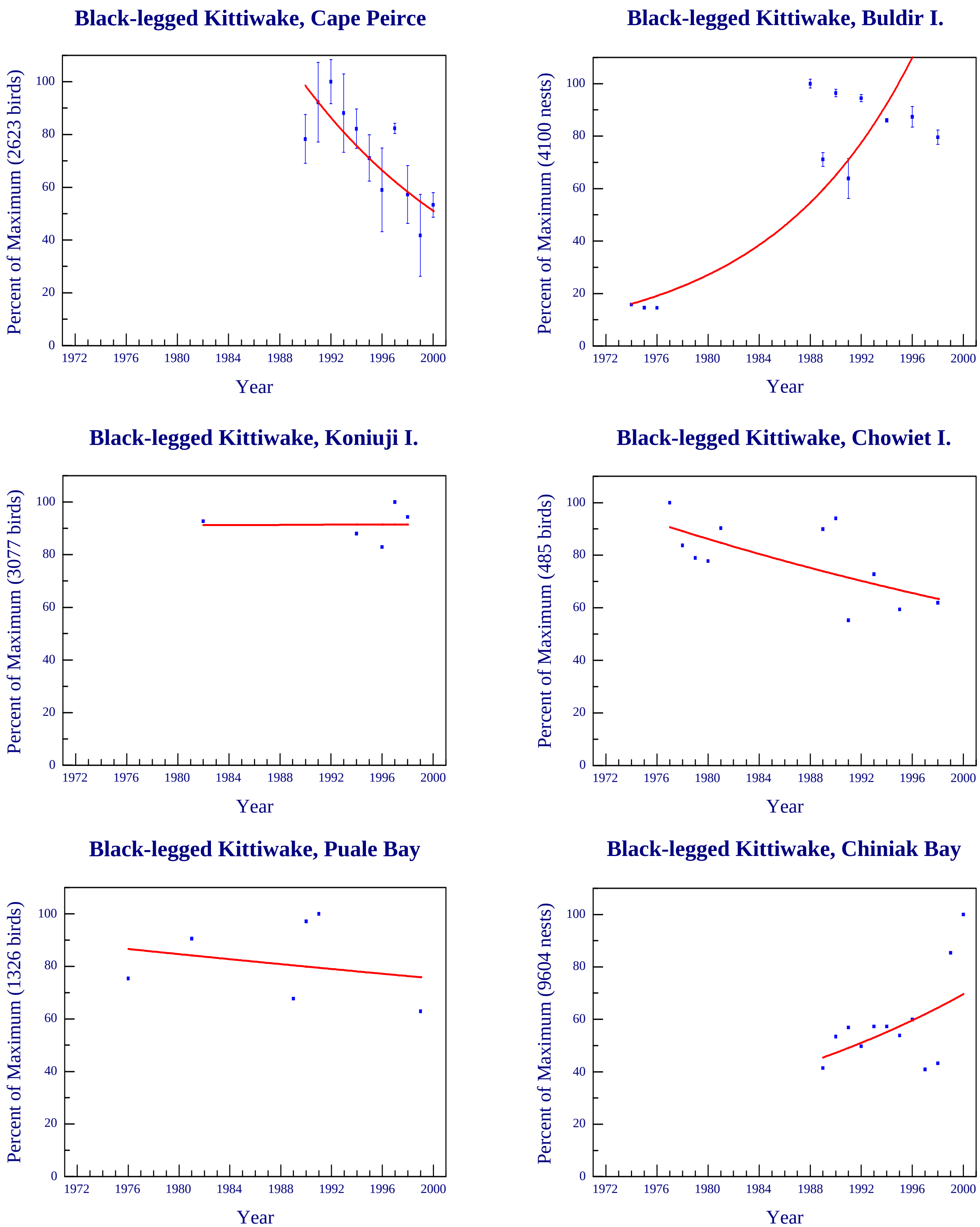


Figure 16. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

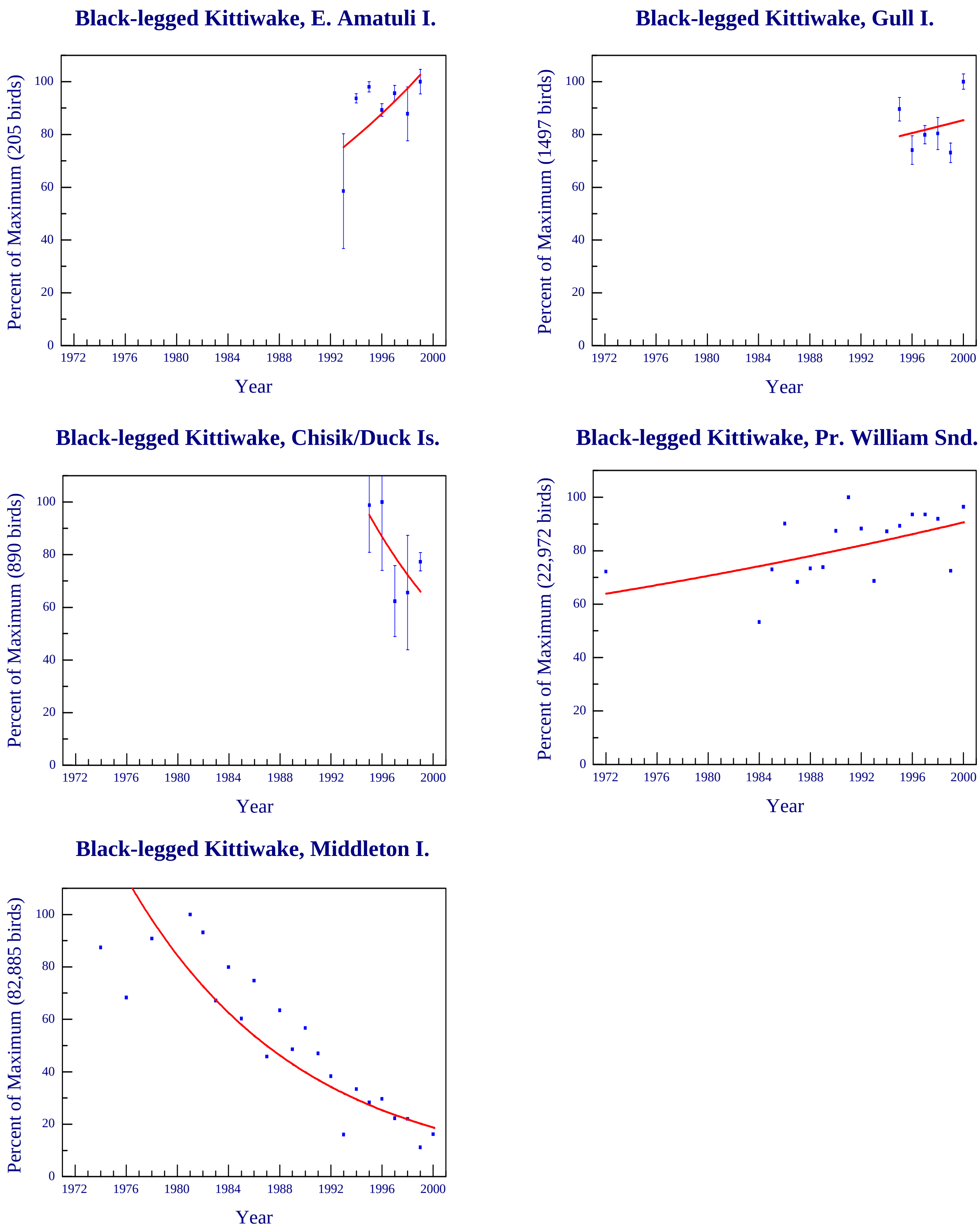


Figure 16. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

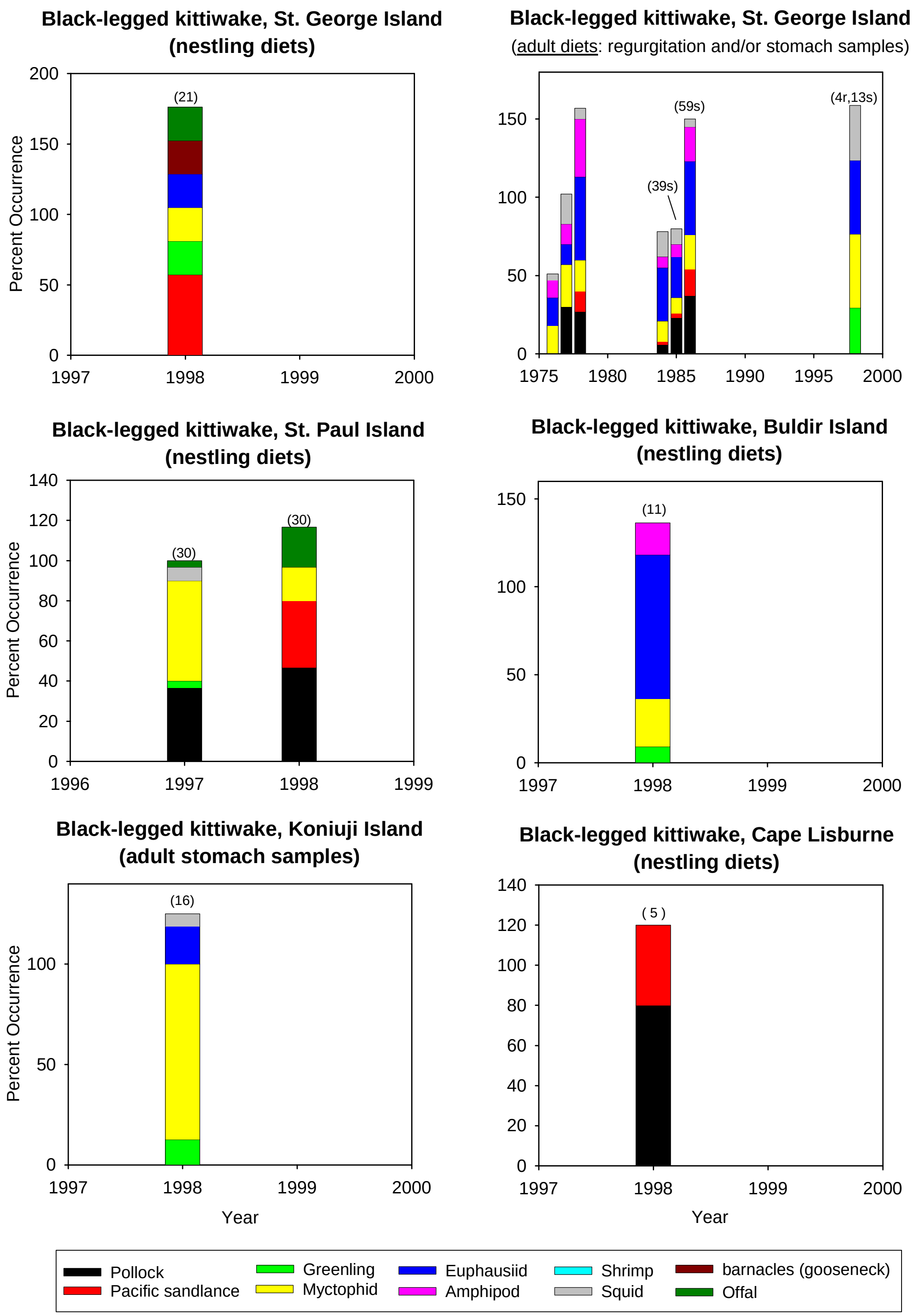


Figure 17. Diets of black-legged kittiwakes at Chukchi Sea and Bering Sea sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

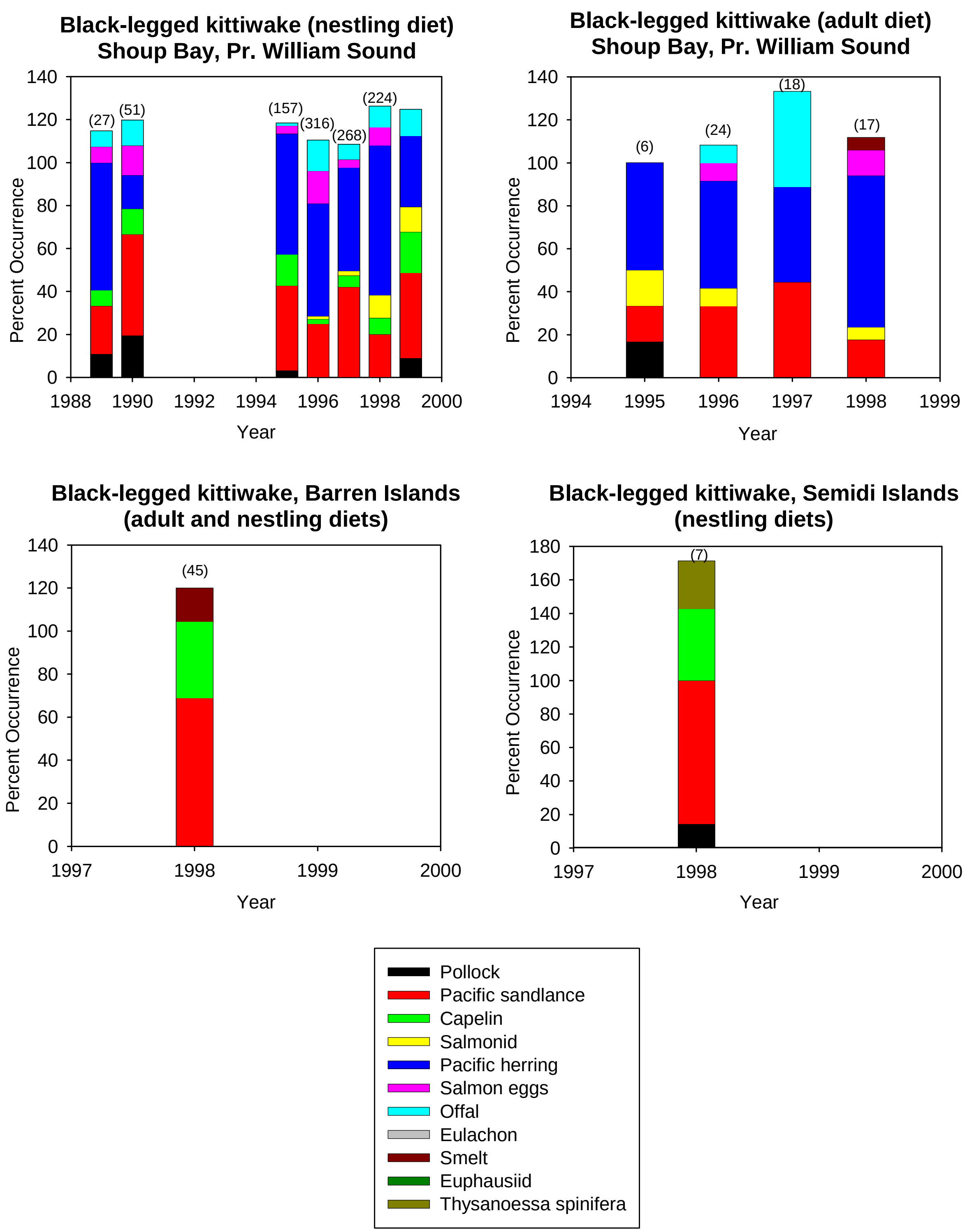
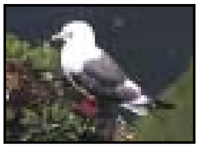


Figure 18. Diets of black-legged kittiwakes at Gulf of Alaska sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.



Red-legged Kittiwake (*Rissa brevirostris*)

Breeding Chronology .–Hatch dates at both St. Paul and St. George islands were earlier than normal in 2000 (Table 14). The mean hatch date was within 3 days of the site average at Buldir Island. Red-legged kittiwake chicks hatched later, on average, at Bogoslof Island than at the other three sites for which there are data for 2000.

Table 14. Hatching chronology of red-legged kittiwakes at Alaskan sites monitored in 2000.

Site	Mean	Long-term Average	Reference
St. Paul I.	8 Jul (23)[a]	25 Jul[b] (14)[a]	Bittner 2001
St. George I.	5 Jul (151)	21 Jul[b] (18)	Rojek and Ness 2000
Buldir I.	10 Jul (71)	12 Jul[b] (12)	J. Williams Unpubl. Data
Bogoslof I.	18 Jul (106)	N/A	Byrd et al. 2001

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.

[b]Mean of annual means.

Productivity .–In 2000, red-legged kittiwakes experienced above average reproductive success at St. Paul and St. George islands (Table 15, Fig. 19). Estimated productivity was approximately average at Buldir and Bogoslof islands. Red-legged kittiwake chicks (2 nests with chicks) were seen at Koniuji Island for the first time in 2000.

Table 15. Reproductive performance of red-legged kittiwakes at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest[a]	No. of Plots	No. of Nests	Reference
St. Paul I.	0.49	3	37	Bittner 2001
St. George I.	0.52	10	293	Rojek and Ness 2000
Buldir I.	0.35	10	134	J. Williams Unpubl. Data
Bogoslof I.	0.54	10	178	Byrd et al. 2001

[a]Total chicks fledged/Total nests.

Populations .–The only red-legged kittiwake colony that was counted in 2000 was the recently pioneered site at Koniuji Island. The 2000 count indicates that this colony may be stabilizing at around 15 to 20 birds after reaching a high of 40 individuals in 1998 (Fig. 20).

Diet .–Myctophids dominated the diets of red-legged kittiwakes (Fig. 21). Squid, amphipods, and euphausiids were of secondary importance at St. George Island and greenling was of secondary importance at Buldir Island. Pollock and sandlance occurred only in minor amounts in red-legged kittiwake diets.

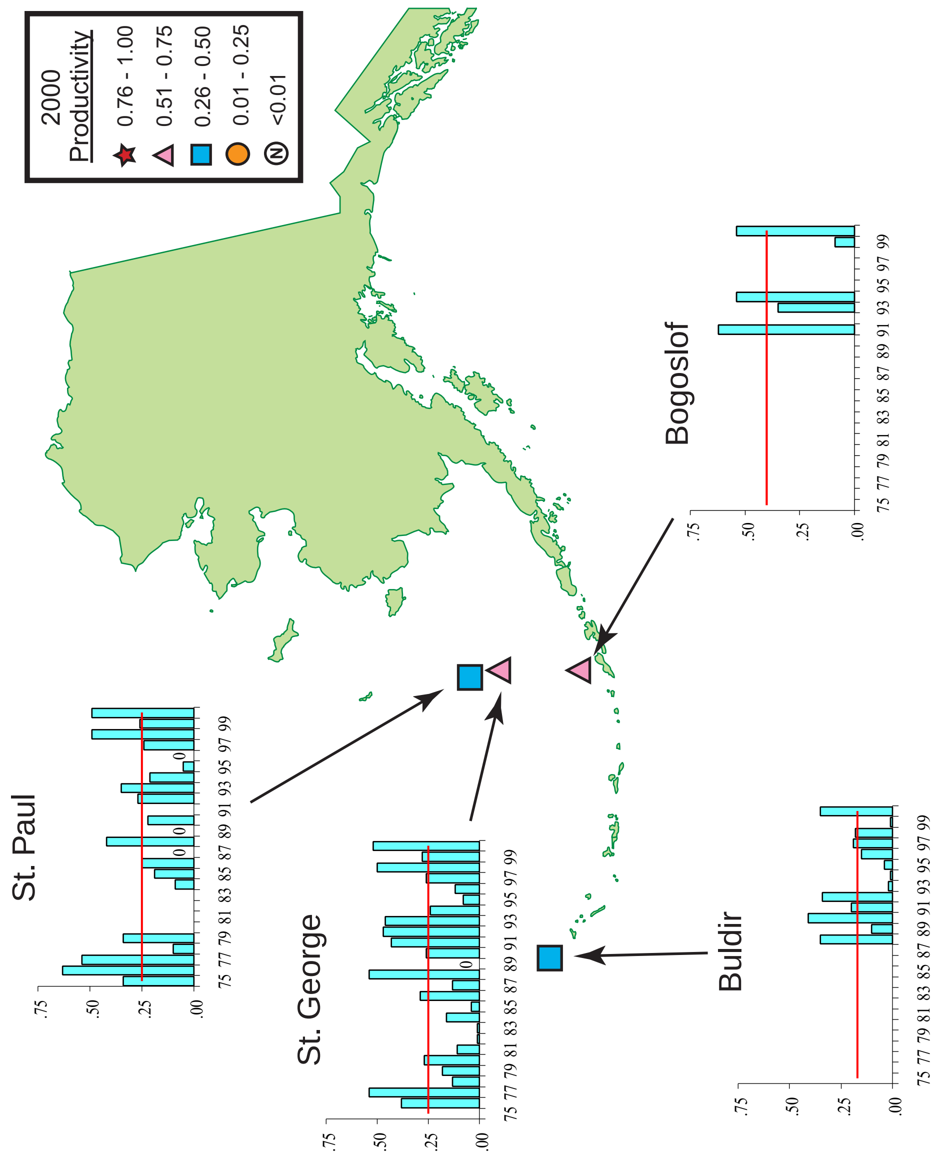


Figure 19. Productivity of red-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

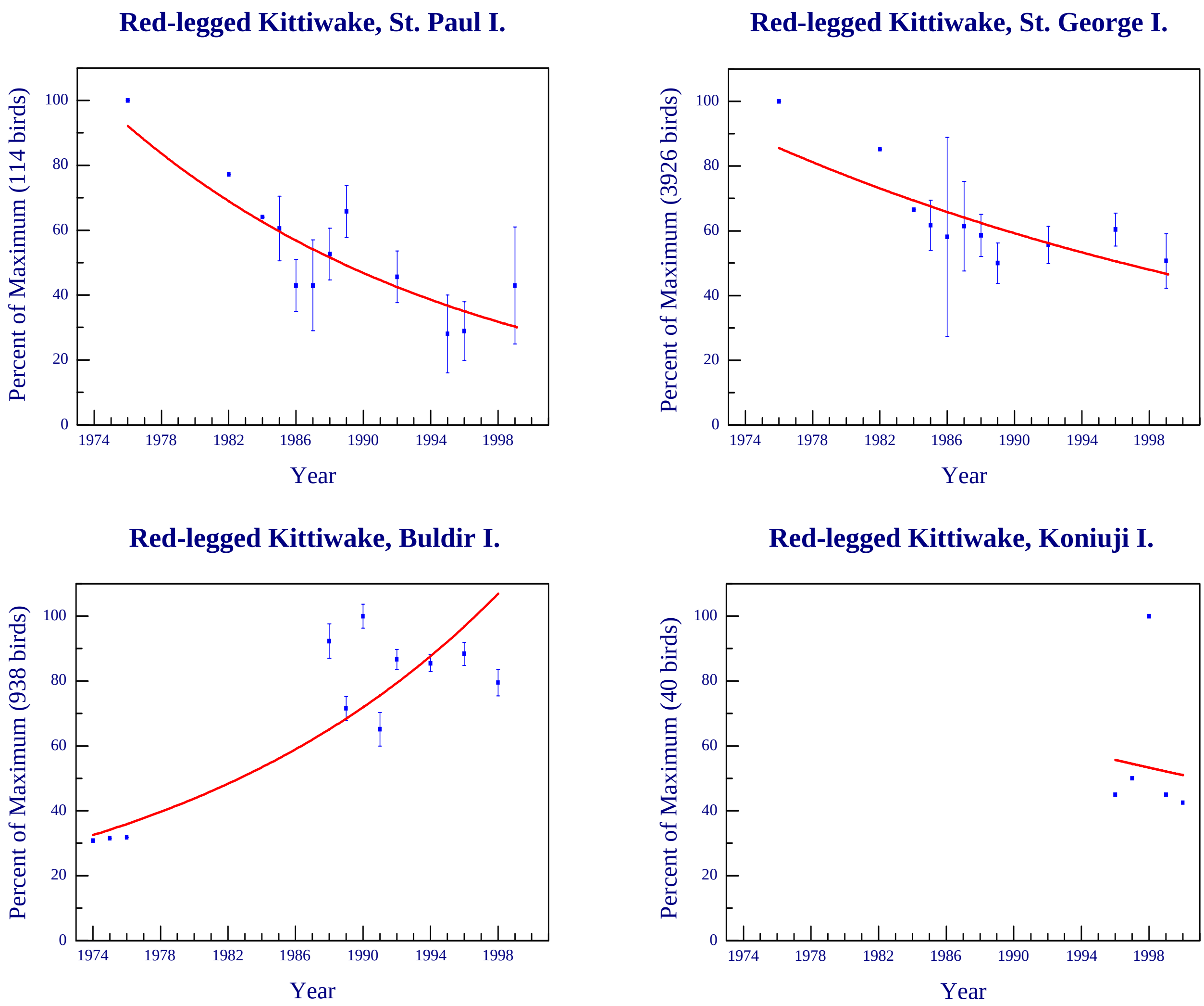


Figure 20. Trends in populations of red-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

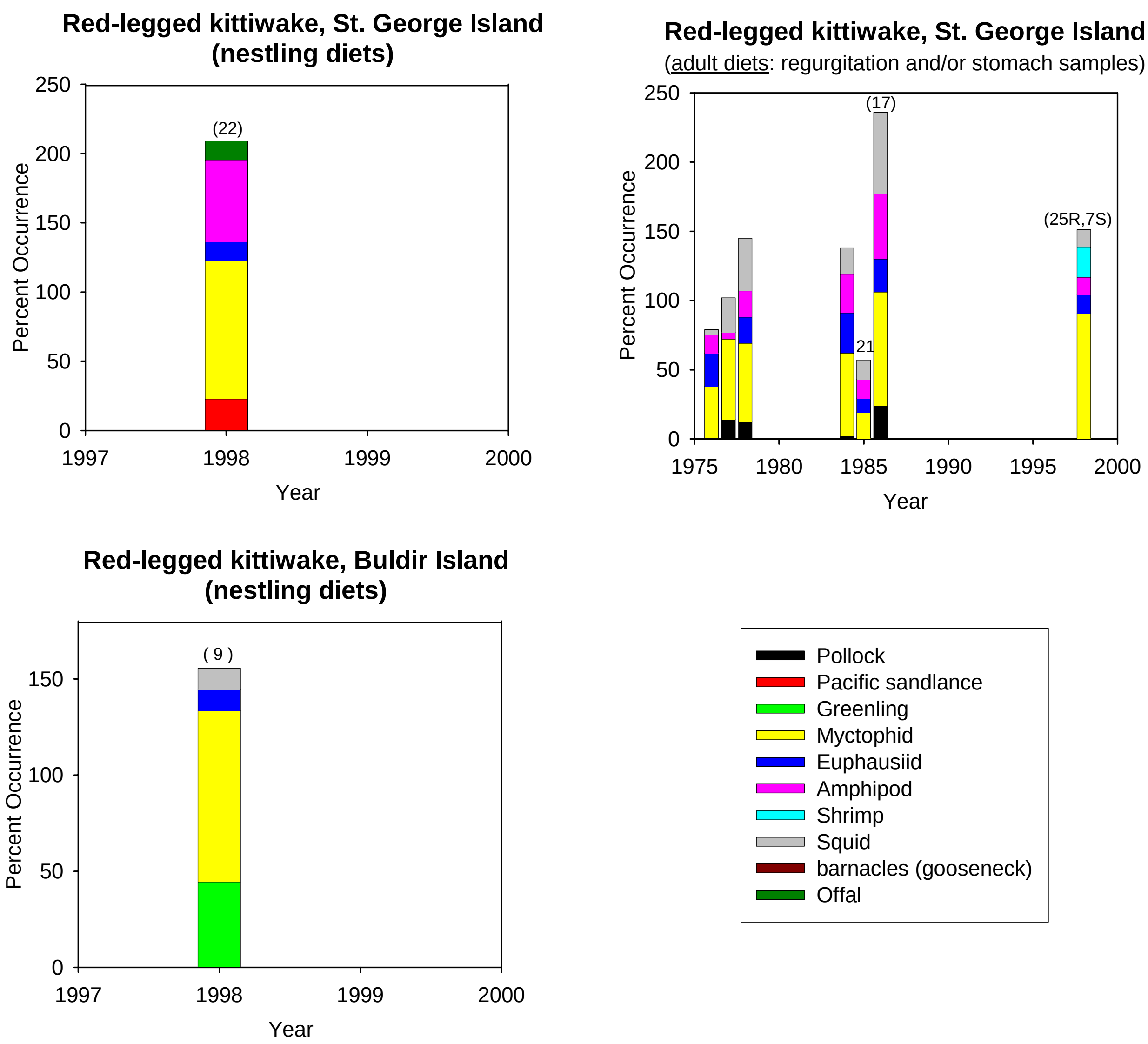


Figure 21. Diets of red-legged kittiwakes at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Common Murre (*Uria aalge*)

Breeding Chronology .–Timing of common murre nesting events in 2000 was earlier than average at all but one site for which comparisons could be drawn, the exception being St. Lazaria Island at which this species had average timing (Table 16).

Table 16. Hatching chronology of common murres at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
St. Paul I.	—	1 Aug (107)[a]	5 Aug[b] (15)[a]	Bittner 2001
St. George I.	—	1 Aug (40)	5 Aug[b] (16)	Rojek and Ness 2000
Cape Peirce	—	14 Jul (84)	24 Jul[b] (11)	MacDonald and Courtot 2001
Buldir I.	10 Jul (15)	14 Jul (15)	21 Jul[b] (2)	J. Williams Unpubl. Data
Bogoslof I.	—	26 Jul (89)	N/A	Byrd et al. 2001
Aiktak I.	4 Aug (36)	6 Aug (36)	N/A	Thomson and Smith 2000
Gull I.	29 Jul (89)	—	10 Aug[c] (4)	M. Shultz et al. Unpubl. Data
Duck I.	30 Jul (154)	—	14 Aug[c] (5)	A. Harding et al. Unpubl. Data
St. Lazaria I.	19 Aug (31)	18 Aug (31)	15 Aug[c] (6)	L. Slater Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.
[c]Median of annual medians.

Productivity .–Common murre productivity was average or above average at most sites monitored in 2000 (Table 17, Fig. 22). A notable exception being Kasatochi Island where very few murres laid eggs and no chicks were produced for the third consecutive year.

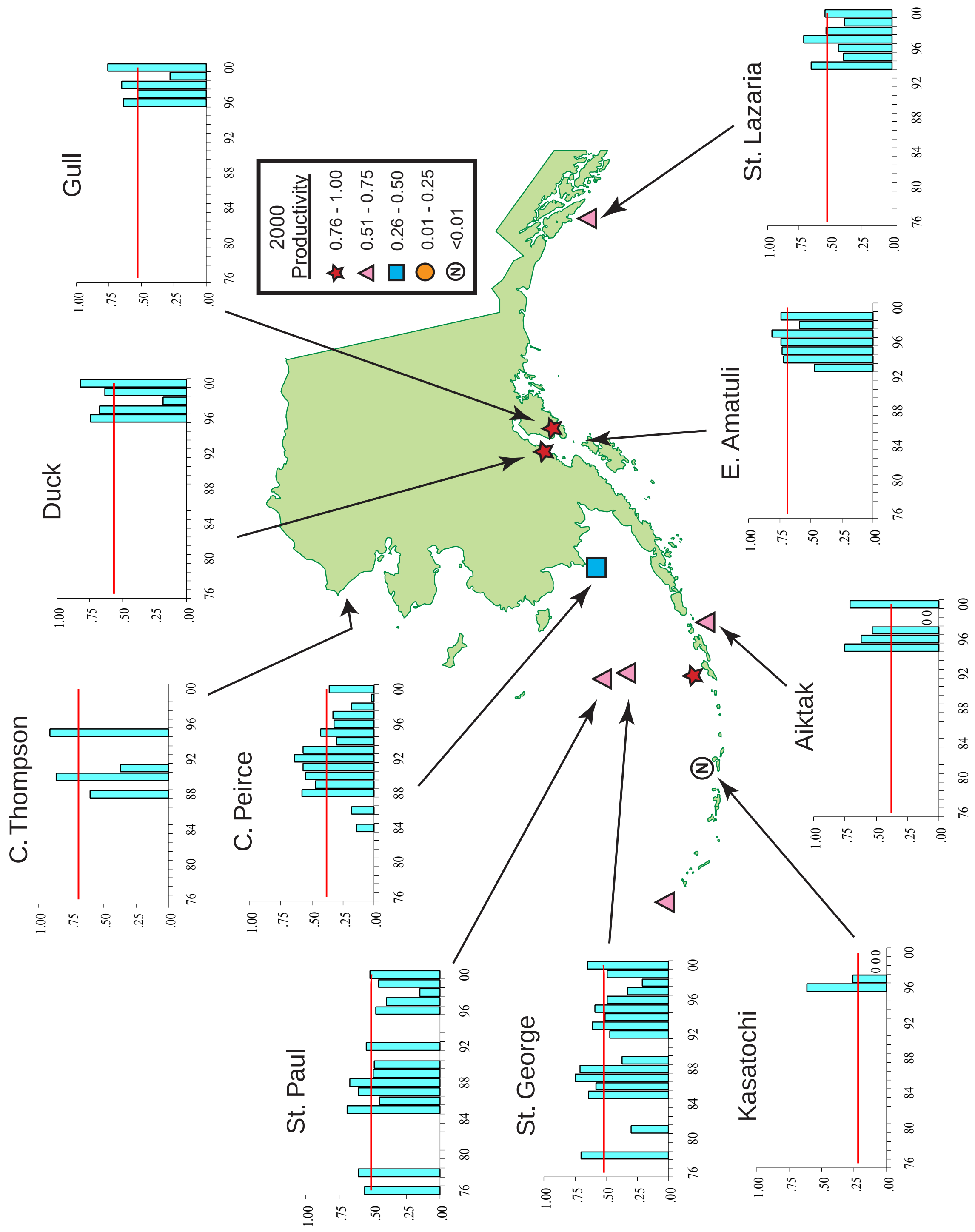


Figure 22. Productivity of common murres (chicks fledged/nest site) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Table 17. Reproductive performance of common murres at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	No. of Nest Sites	Reference
St. Paul I.	0.52	7	163	Bittner 2001
St. George I.	0.65	5	129	Rojek and Ness 2000
Cape Peirce	0.36	7	172	MacDonald and Courtot 2001
Buldir I.	0.55	N/A[b]	22	J. Williams Unpubl. Data
Kasatochi I.	0.00	N/A	<10	Scharf 2000
Bogoslof I.	0.80	4	107	Byrd et al. 2001
Aiktak I.	0.71	3	70	Thomson and Smith 2000
Gull I.	0.76	5	99	M. Shultz et al. Unpubl. Data
Duck I.	0.82	9	206	A. Harding et al. Unpubl. Data
St. Lazaria I.	0.54	3	39	L. Slater Unpubl. Data

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Not applicable or not reported.

Populations .–At sites where counts of murres are made from the water, it is difficult to accurately assign every individual to a species. As a result, common and thick-billed murres are often combined at these sites for population trend analysis. Common murre numbers appeared to be increasing at Bluff and Gull Island, and declining at Cape Peirce (Fig. 23). No trend in murre numbers was apparent at Aiktak Island. Murre numbers exhibited negative trends at Middleton and St. Lazaria islands.

Diet .–Common murre diets exhibited significant geographic variability (Fig. 24). St. George Island common murres ate euphausiids and pollock with lesser amounts of squid. Common murres from Buldir and Koniuji islands ate predominantly squid with lesser amounts of pollock and herring. Common murres at Aiktak and Chowiet islands ate mostly sandlance and pollock.

Barren Islands common murres fed their chicks almost exclusively capelin. Note that the Barren Islands data were from a large number of bill load observations while the other locations had smaller numbers of adult stomach samples. The prey items brought to chicks may differ from the prey adults select for themselves.

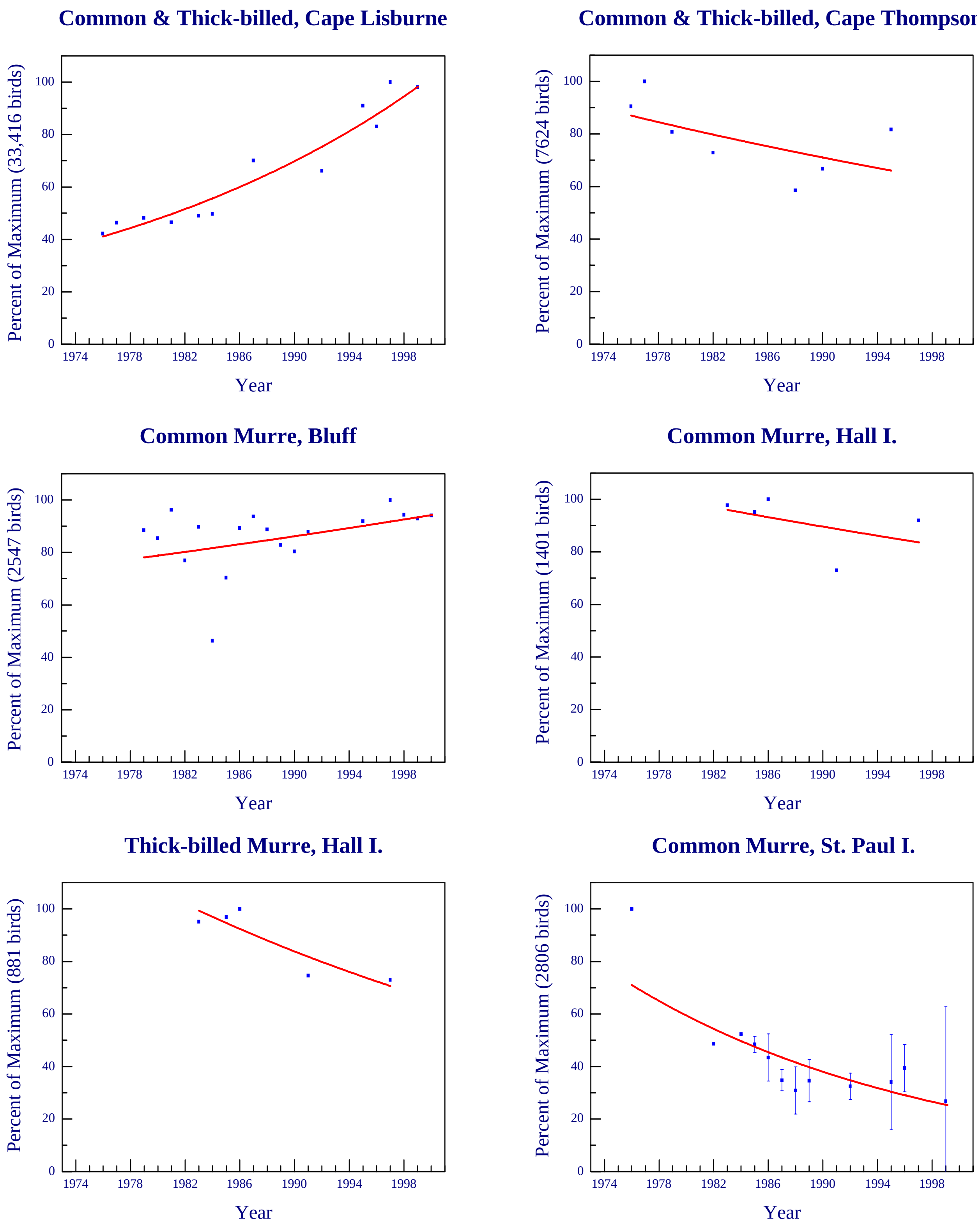


Figure 23. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

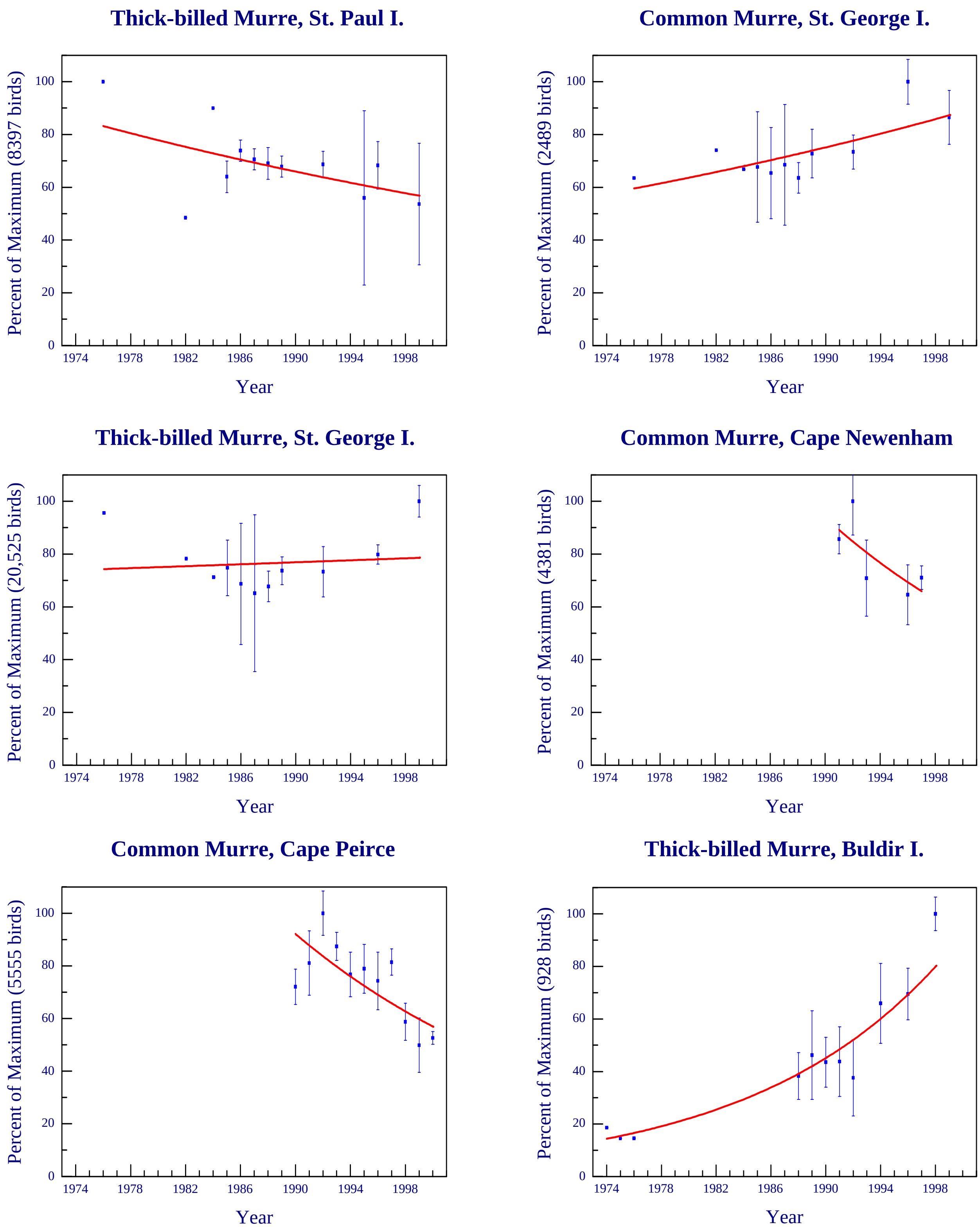


Figure 23. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

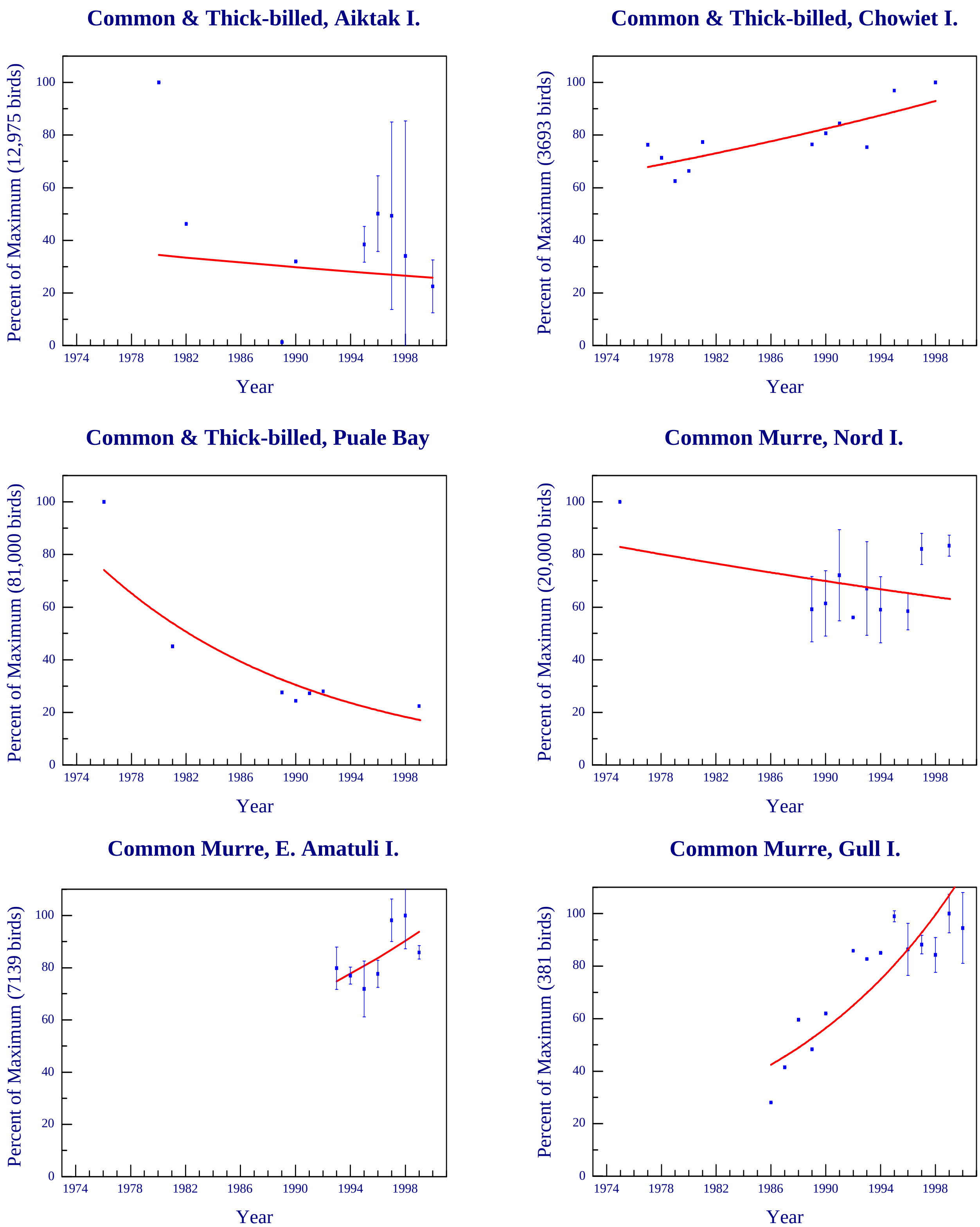


Figure 23. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

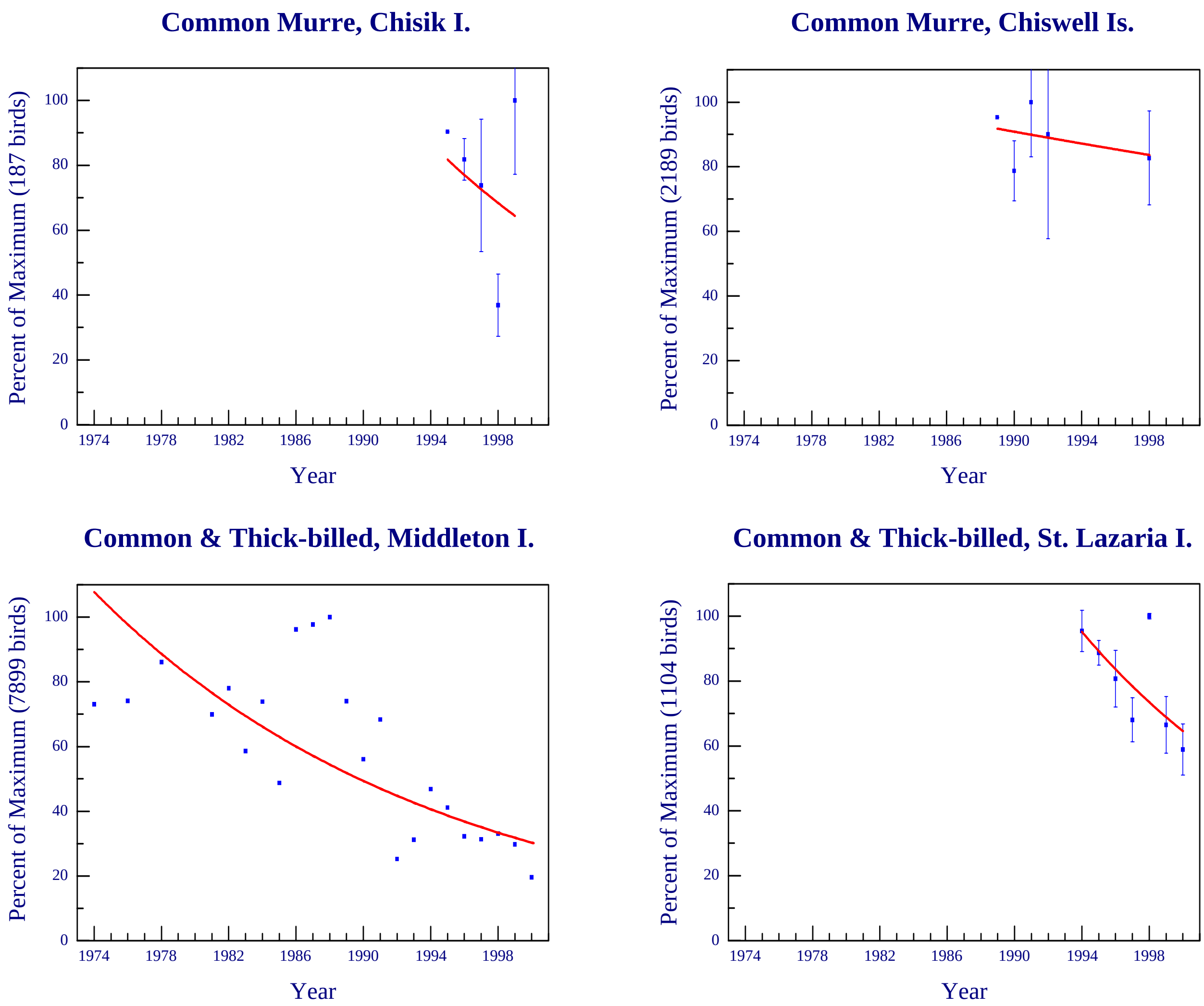


Figure 23. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

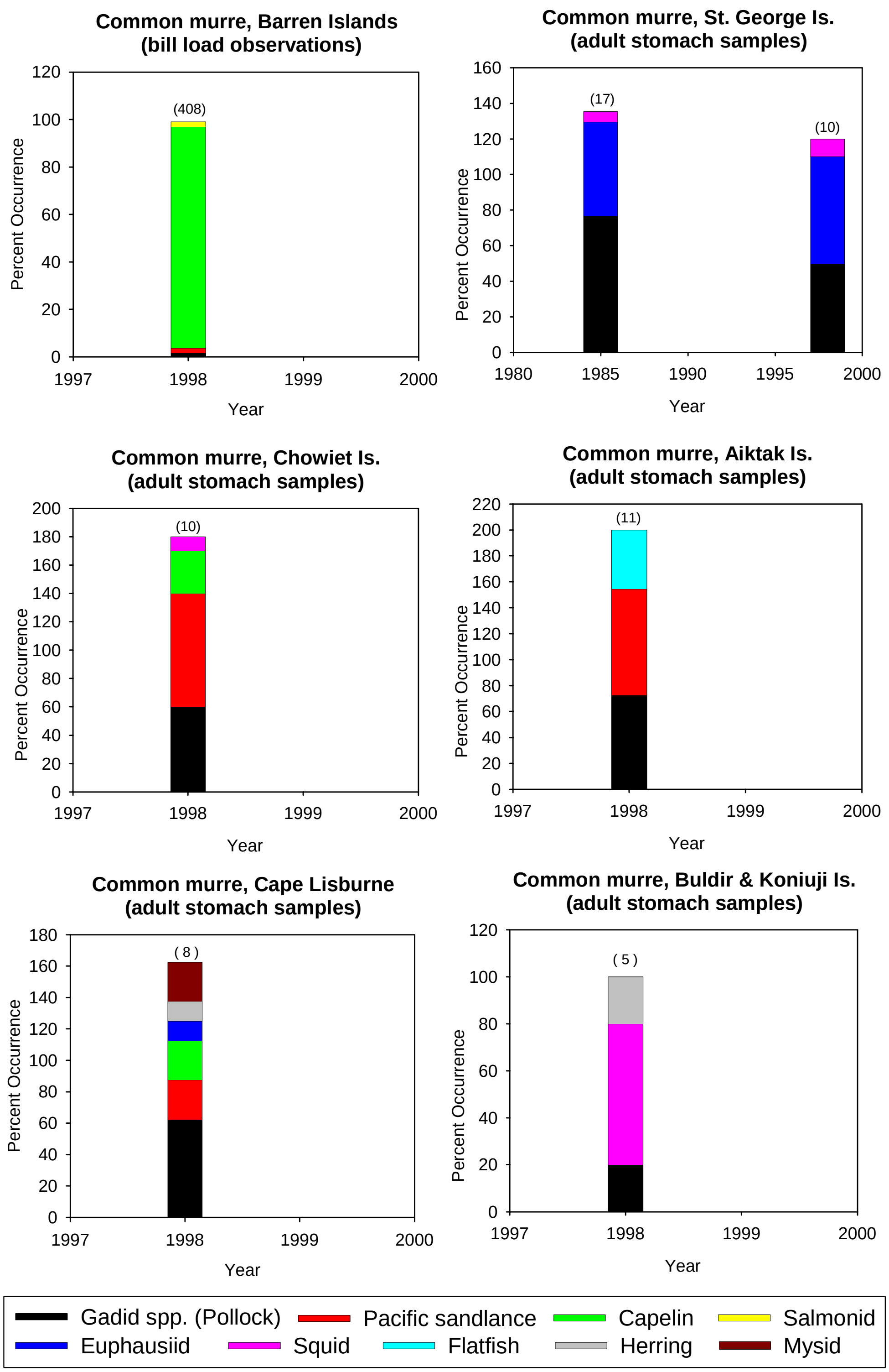


Figure 24. Diets of common murres at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Thick-billed Murre (*Uria lomvia*)

Breeding Chronology .–In 2000, thick-billed murre chicks hatched on about the normal dates at all sites (Table 18).

Table 18. Hatching chronology of thick-billed murres at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
St. Paul I.	—	3 Aug (321)[a]	5 Aug[b] (16)[a]	Bittner 2001
St. George I.	—	29 Jul (168)	1 Aug[b] (18)	Rojek and Ness 2000
Buldir I.	10 Jul (36)	14 Jul (36)	17 Jul[b] (12)	J. Williams Unpubl. Data
Bogoslof I.	—	22 Jul (99)	N/A	Byrd et al. 2001
Aiktak I.	6 Aug (47)	3 Aug (47)	N/A	Thomson and Smith 2000
St. Lazaria I.	14 Aug (25)	14 Aug (25)	11 Aug[b] (6)	L. Slater Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity .–Rates of success in 2000 were average or above at all monitored colonies except one (Table 19, Fig. 25). Thick-billed murres laid very few eggs and failed to produce any young, for the third year in a row, at Kasatochi Island.

Table 19. Reproductive performance of thick-billed murres at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	No. of Nest Sites	Reference
St. Paul I.	0.47	18	546	Bittner 2001
St. George I.	0.62	13	364	Rojek and Ness 2000
Buldir I.	0.69	12	329	J. Williams Unpubl. Data
Kasatochi I.	0.00	N/A[b]	<10	Scharf 2000
Bogoslof I.	0.74	5	126	Byrd et al. 2001
Aiktak I.	0.63	3	80	Thomson and Smith 2000
St. Lazaria I.	0.53	3	36	L. Slater Unpubl. Data

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Not applicable or not reported.

Populations .–No data for 2000. See Figure 23 for prior years' data.

Diet .–Cape Lisburne thick-billed murre diets consisted of a majority of flatfish/sculpin and pollock. Thick-billed murre diets at St. George Island consisted entirely of pollock, euphausiids and squid (Fig 26). The frequency at which these prey groups occurred varied widely among years. At Buldir Island, thick-billed murres ate almost exclusively squid with some myctophids. Thick-billed murre diets at Aiktak Island emphasized pollock and sandlance.

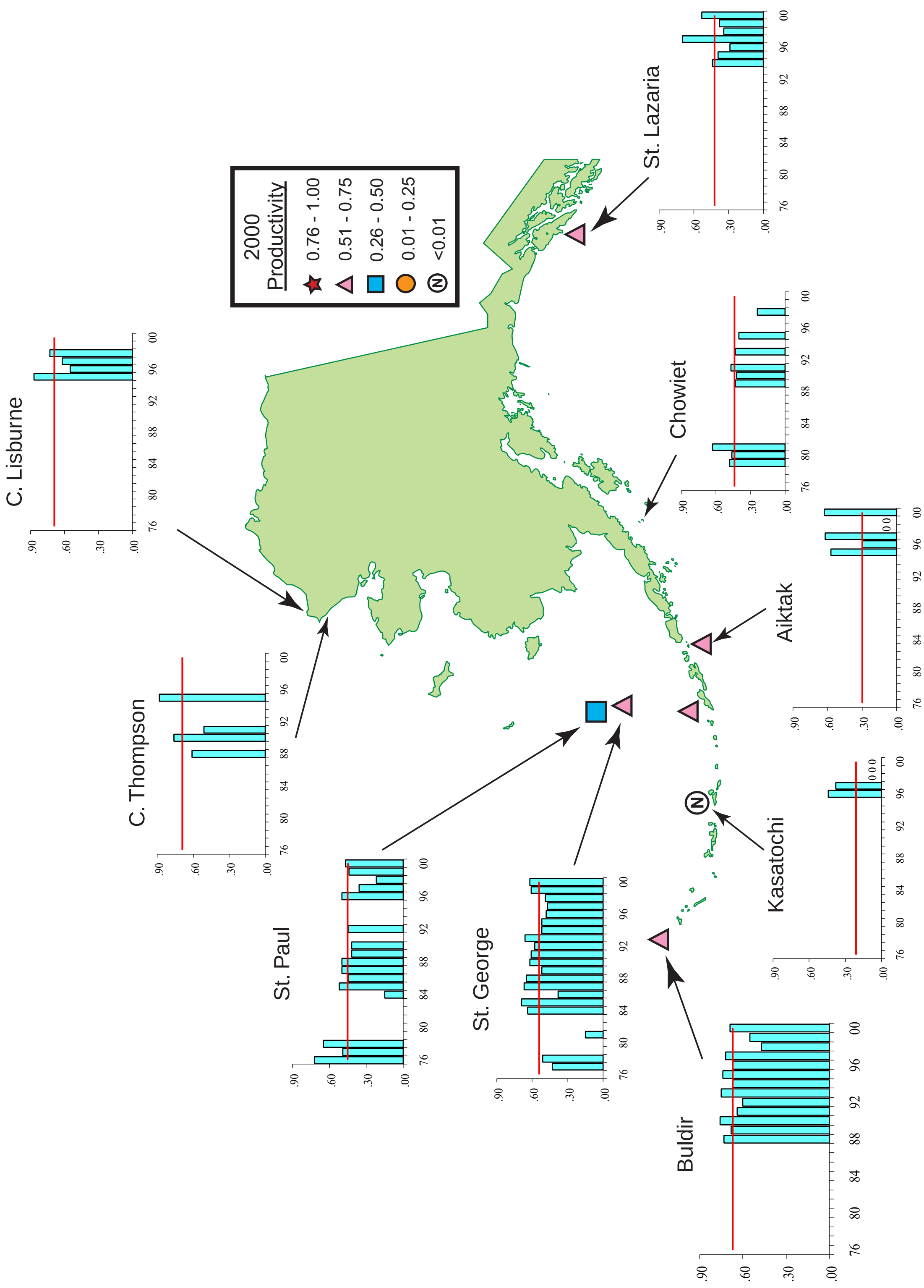


Figure 25. Productivity of thick-billed murres (chicks fledged/nest site) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

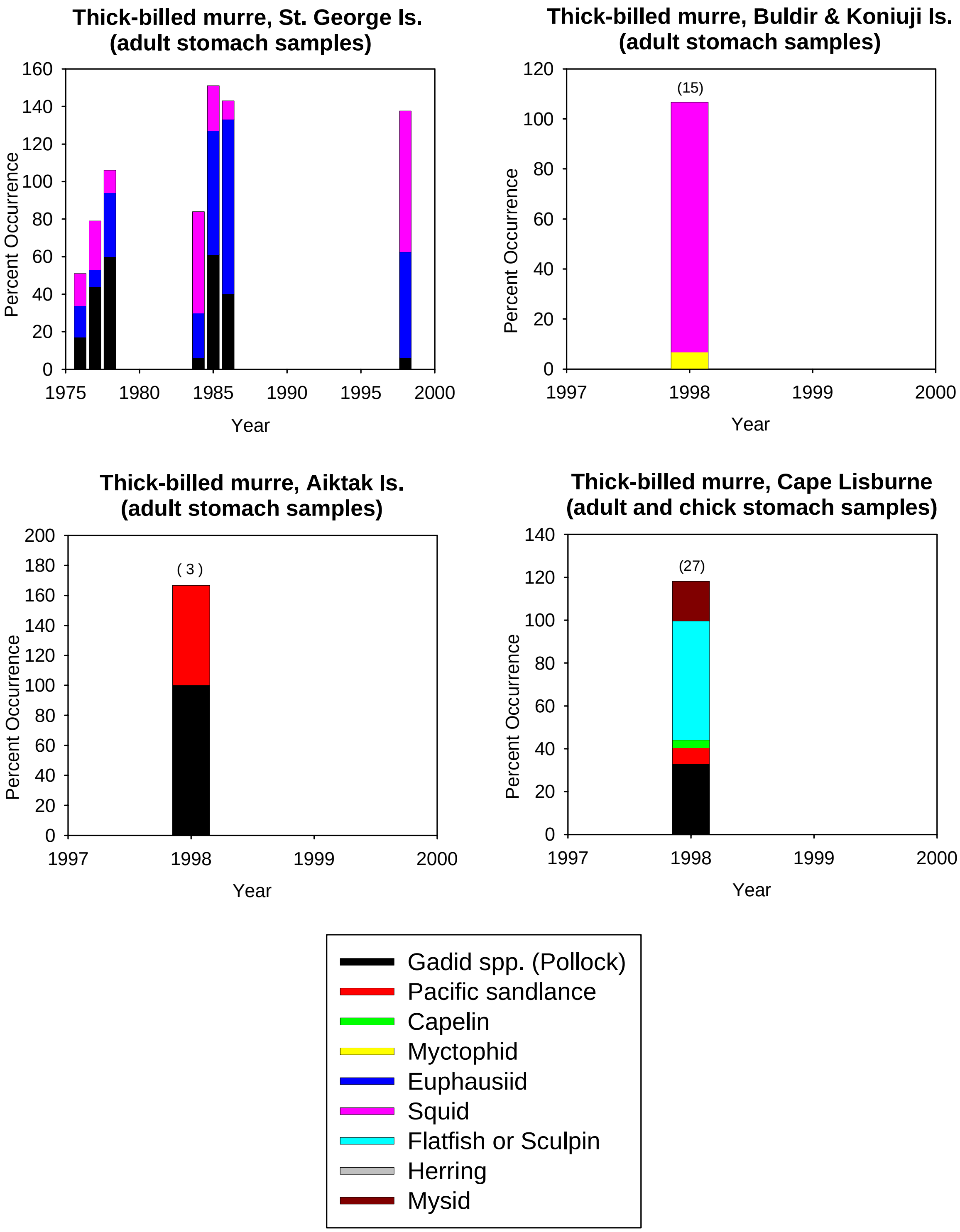


Figure 26. Diets of thick-billed murres at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Ancient Murrelet (*Synthliboramphus antiquus*)

Breeding Chronology.–The mean hatching date for ancient murrelets at Aiktak Island, the only site monitored in 2000, was 3 July (Table 20). This was about one week earlier than the hatching date in 1999 at this site.

Table 20. Hatching chronology of ancient murrelets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	4 Jul (24)[a]	3 Jul (24)	N/A[b]	Thomson and Smith 2000

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date.
[b]Not applicable or not reported.

Productivity.–Slightly more than three-quarters of ancient murrelet eggs hatched at Aiktak Island in 2000 (Table 21), similar to 1999 at this site.

Table 21. Reproductive performance of ancient murrelets at Alaskan sites monitored in 2000.

Site	Hatching Success[a]	No. of Nest Sites	Reference
Aiktak I.	0.78	29	Thomson and Smith 2000

[a]Total chicks hatched/Total known-fate eggs.

Populations.–No data in 2000.

Diet.–No data.

Parakeet Auklet (*Cyclorrhynchus psittacula*)

Breeding Chronology.–This species was monitored at only one site (Buldir Island) in 2000 (Table 22). The median hatch date was earlier than the long-term average.

Table 22. Hatching chronology of parakeet auklets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	27 Jun (22)[a]	28 Jun (22)	5 Jul[b] (8)[a]	J. Williams Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.— In 2000, productivity was monitored only at Buldir Island (Table 23), where it was similar to the long term average.

Table 23. Reproductive performance of parakeet auklets at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Buldir I.	0.45	65	J. Williams Unpubl. Data

[a]Nest site is defined as a site where an egg was laid.

Populations.—Methods for monitoring populations of parakeet auklets need to be developed and used at annual monitoring sites in the Aleutian, Pribilof, and Semidi islands.

Diet.–Diets of parakeet auklets were examined at Buldir Island in 1998 and consisted entirely of two prey types *Neocalanus cristatus* and euphausiids (Fig. 27).

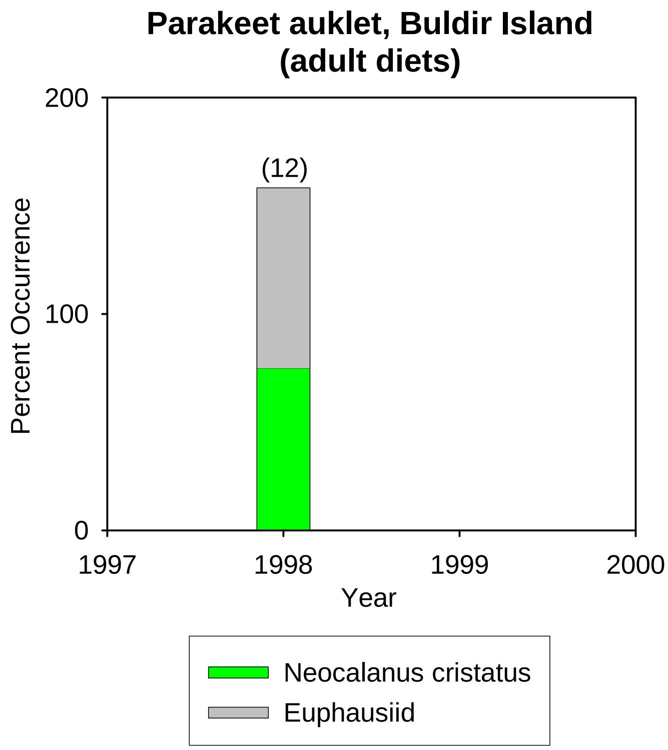


Figure 27. Diets of parakeet auklets at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Least Auklet (*Aethia pusilla*)

Breeding Chronology.–The dates of hatching for least auklets were about average at both Buldir and Kasatochi islands in 2000 (Table 24).

Table 24. Hatching chronology of least auklets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	23 Jun (30)[a]	26 Jun (30)	28 Jun[b] (10)[a]	J. Williams Unpubl. Data
Kasatochi I.	27 Jun (90)	28 Jun (90)	28 Jun[b] (5)	Scharf 2000

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.–Least auklets exhibited about average reproductive success in 2000 at both Buldir and Kasatochi islands (Table 25, Fig. 28).

Table 25. Reproductive performance of least auklets at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Buldir I.	0.47	69	J. Williams Unpubl. Data
Kasatochi I.	0.66	89	Scharf 2000

[a]Nest site is defined as a site where an egg was laid.

Populations.–In 2000, least auklet populations were monitored only at Kasatochi Island where numbers appeared to be fairly stable in recent years (Fig. 29).

Diet.–Least auklets are planktivorous and feed on several types of prey (Fig. 30). Copepods *(Calanus marshallae*, *Neocalanus plumchrus*, *Neocalanus cristatus)* and euphausiids were generally the most common prey. Diets at the Pribilof Islands and Kasatochi Island were more diverse than at Buldir Island and had up to an average of four prey species in each sample (indicated by the cumulative "Percent Occurrence" being up to 400%).

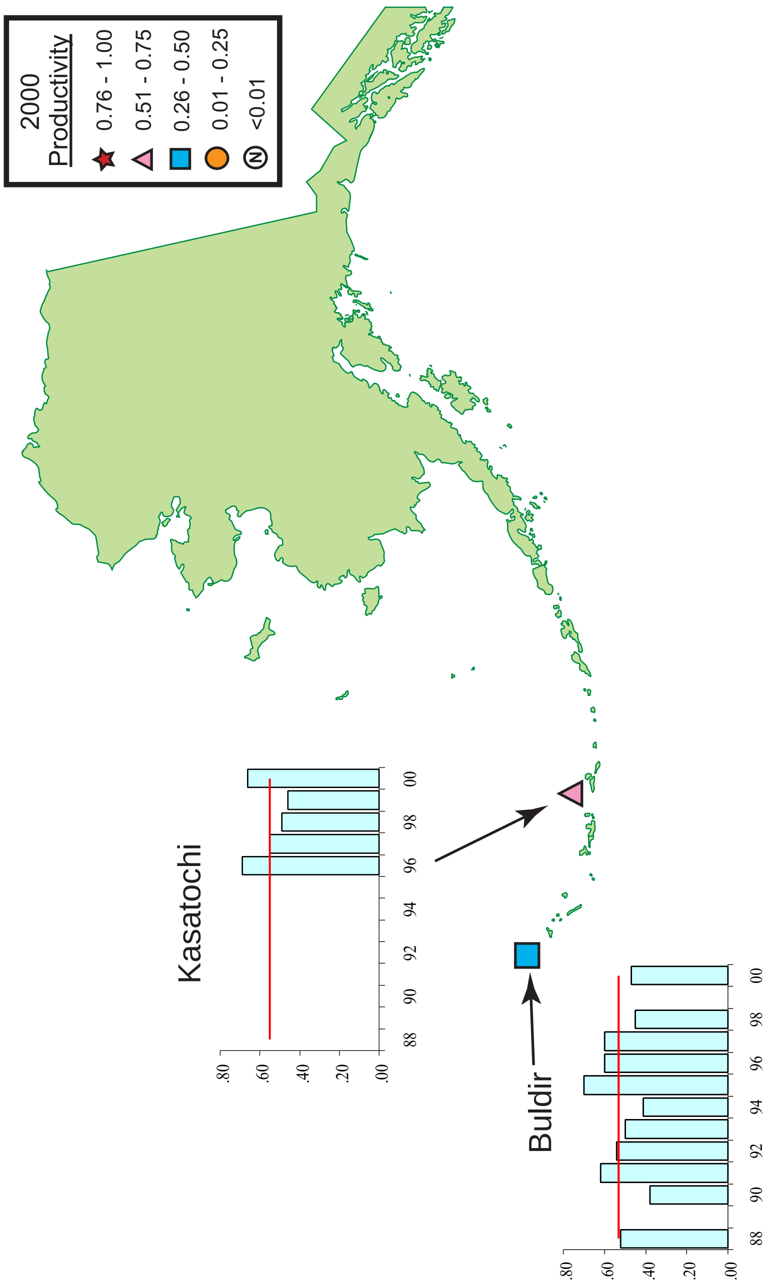


Figure 28. Productivity of least auklets (chicks fledged/nest site) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

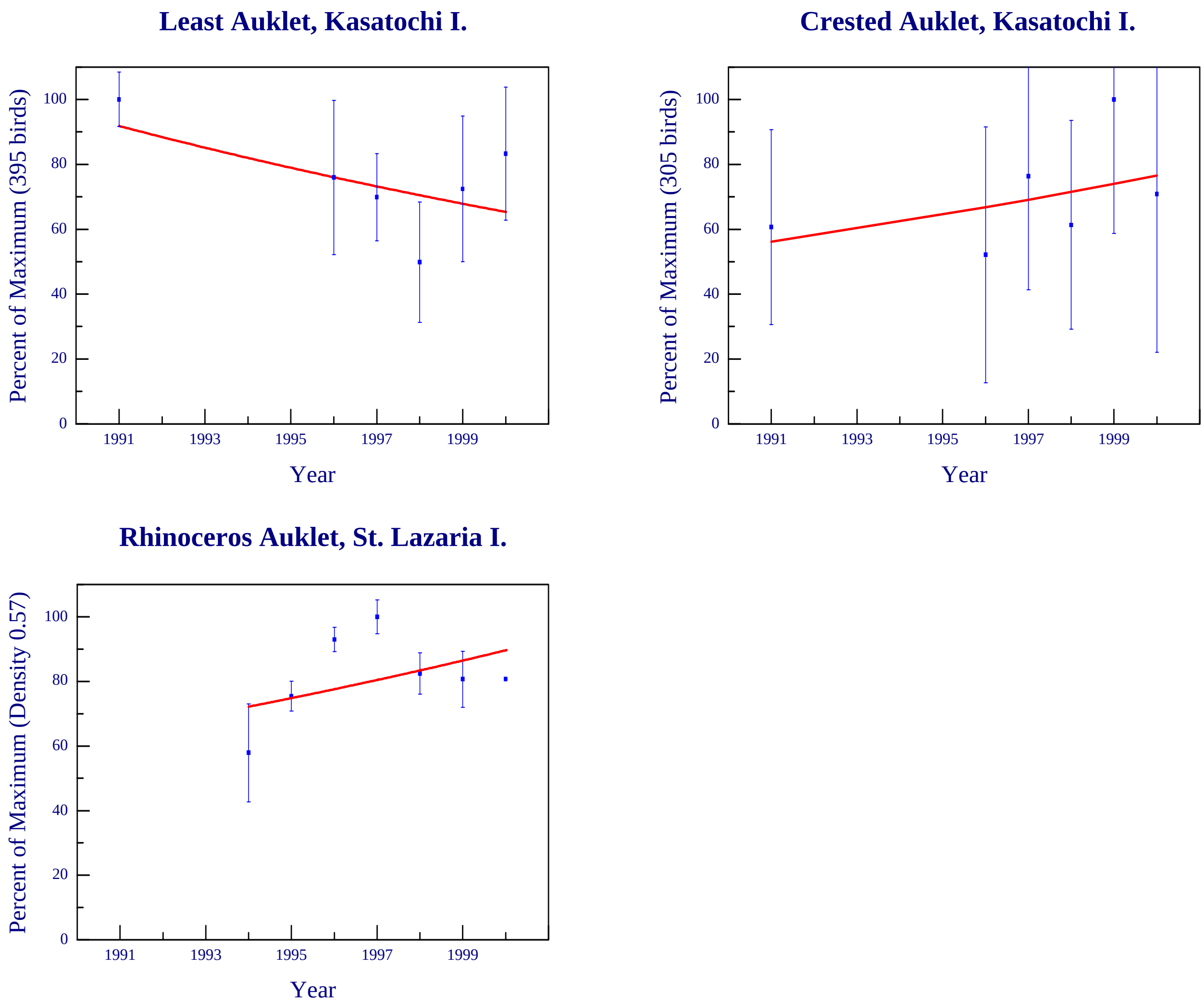


Figure 29. Trends in populations of auklets at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

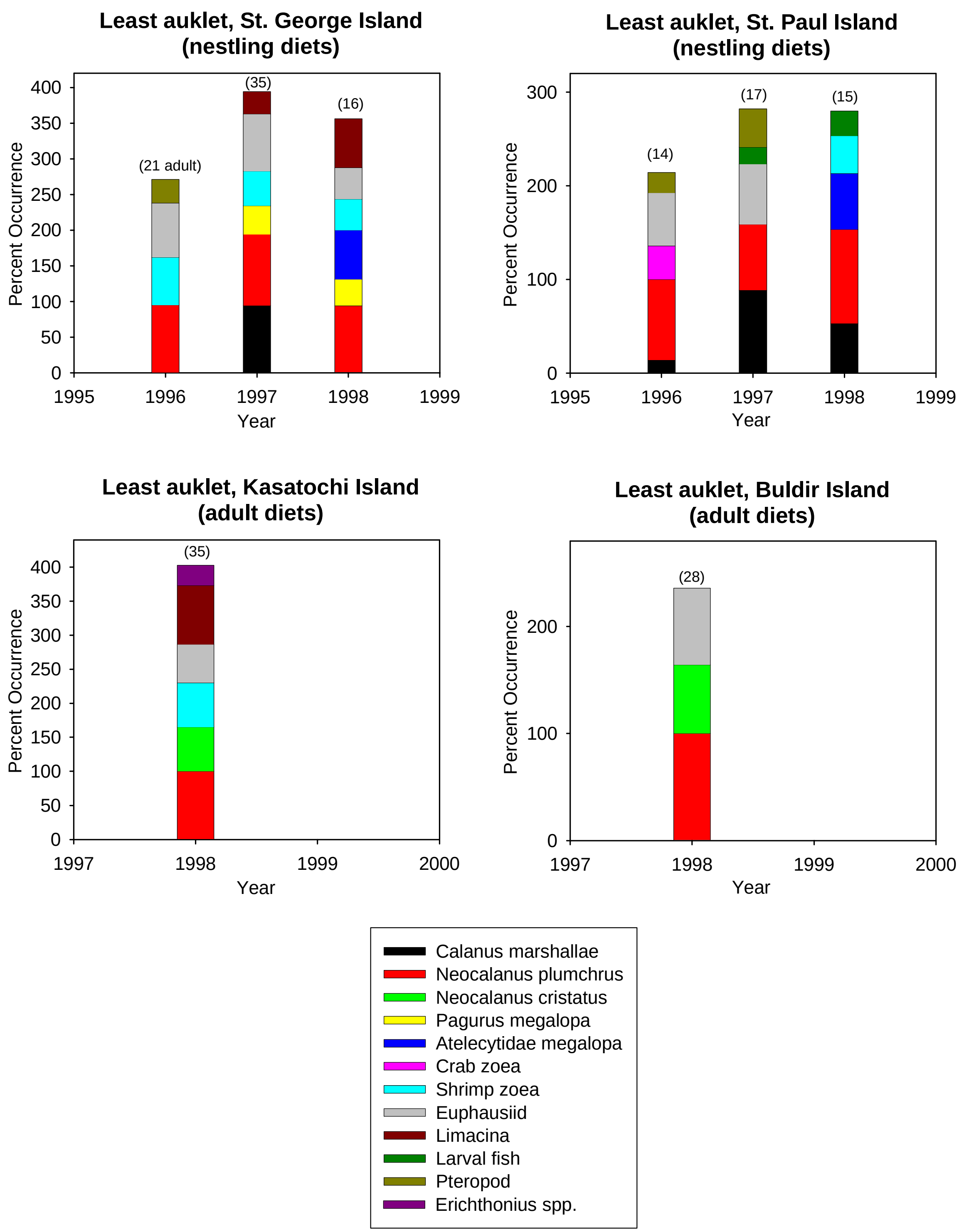


Figure 30. Diets of least auklets at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Whiskered Auklet (*Aethia pygmaea*)

Breeding Chronology.–The mean hatching date for whiskered auklets at Buldir Island in 2000 was earlier than average (Table 26).

Table 26. Hatching chronology of whiskered auklets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	18 Jun (27)[a]	17 Jun (27)	23 Jun[b] (10)[a]	J. Williams Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means

Productivity.–Productivity of whiskered auklets at Buldir Island was approximately average for this species at the only site at which it was monitored in 2000 (Table 27).

Table 27. Reproductive performance of whiskered auklets at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Buldir I.	0.46	70	J. Williams Unpubl. Data

[a]Nest site is defined as a site where an egg was laid.

Populations.–Although experiments are being conducted with capture-recapture methods (J. Williams and I. Jones, Unpubl. Data), no accepted approach for monitoring population trends has yet been developed. Once methods are developed, it might be possible to monitor whiskered auklets at Buldir, Kasatochi/Koniuji/Ulak islands, and at several less-frequently visited sites.

Diet.–Whiskered Auklet diets were examined only at Buldir Island in 1998 (Fig. 31). Their diet was made up of copepods (*Neocalanus plumchrus, Neocalanus cristatus)* and euphausiids.

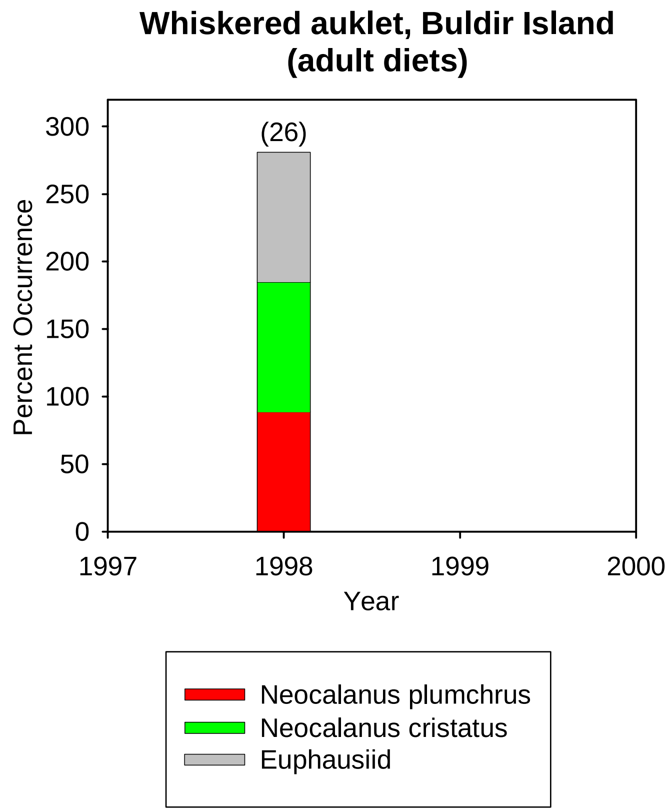
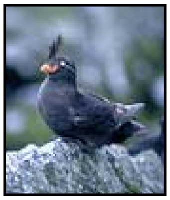


Figure 31. Diets of whiskered auklets at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.



Crested Auklet (*Aethia cristatella*)

Breeding Chronology.–The average date of hatching for crested auklets in 2000 was about average at both Buldir and Kasatochi islands (Table 28).

Table 28. Hatching chronology of crested auklets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	27 Jun (19)[a]	29 Jun (19)	29 Jun[b] (10)[a]	J. Williams Unpubl. Data
Kasatochi I.	29 Jun (98)	28 Jun (98)	30 Jun[b] (5)	Scharf 2000

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.–Crested auklets had about average rates of success at both Buldir and Kasatochi islands in 2000 (Table 29, Fig. 32).

Table 29. Reproductive performance of crested auklets at Alaskan sites monitored in 2000.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Buldir I.	0.61	78	J. Williams Unpubl. Data
Kasatochi I.	0.75	110	Scharf 2000

[a]Nest site is defined as a site where an egg was laid.

Populations.–In 2000, crested auklet populations were monitored only at Kasatochi Island where numbers appeared to be fairly stable in recent years (Fig. 29).

Diet.–Crested auklet diet data were collected only at Kasatochi Island in 1998 where they fed mainly on *Neocalanus cristatus* and euphausiids (Fig. 33).

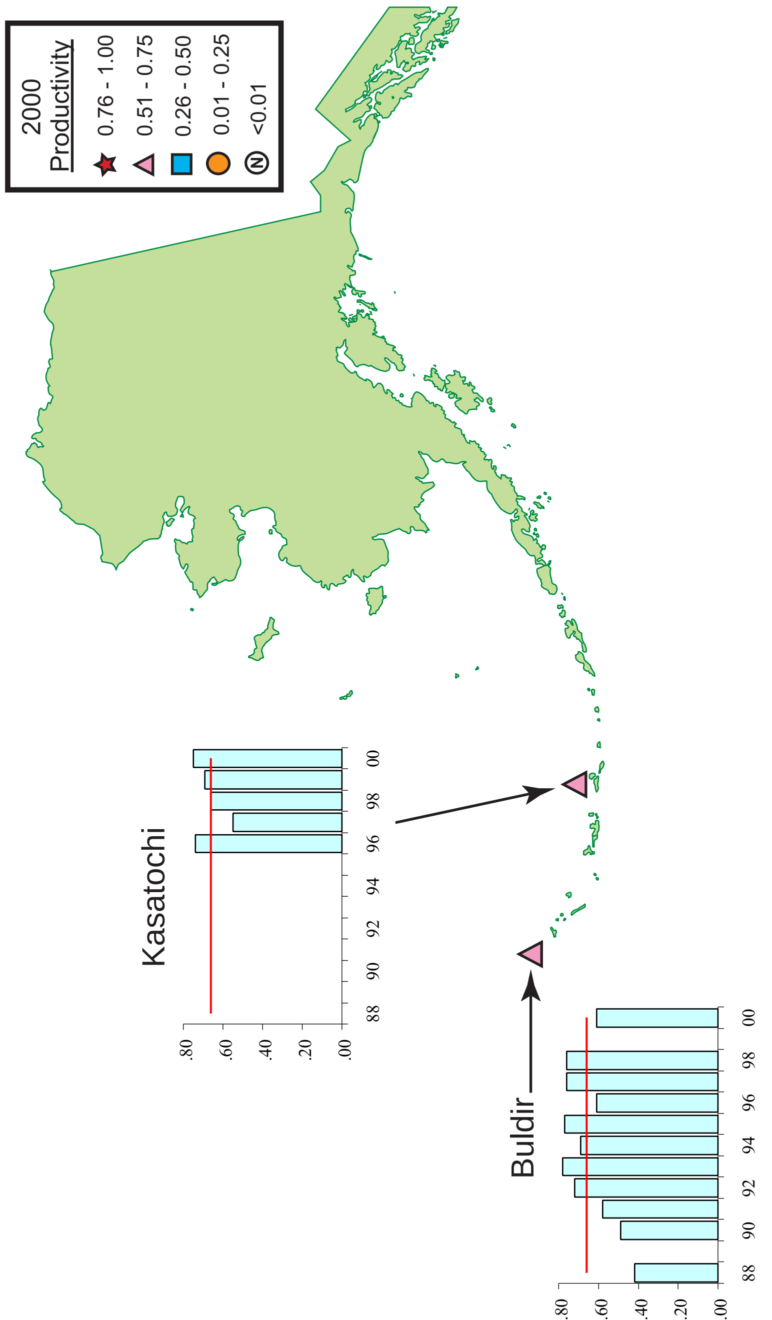


Figure 32. Productivity of crested auklets (chicks fledged/nest site) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

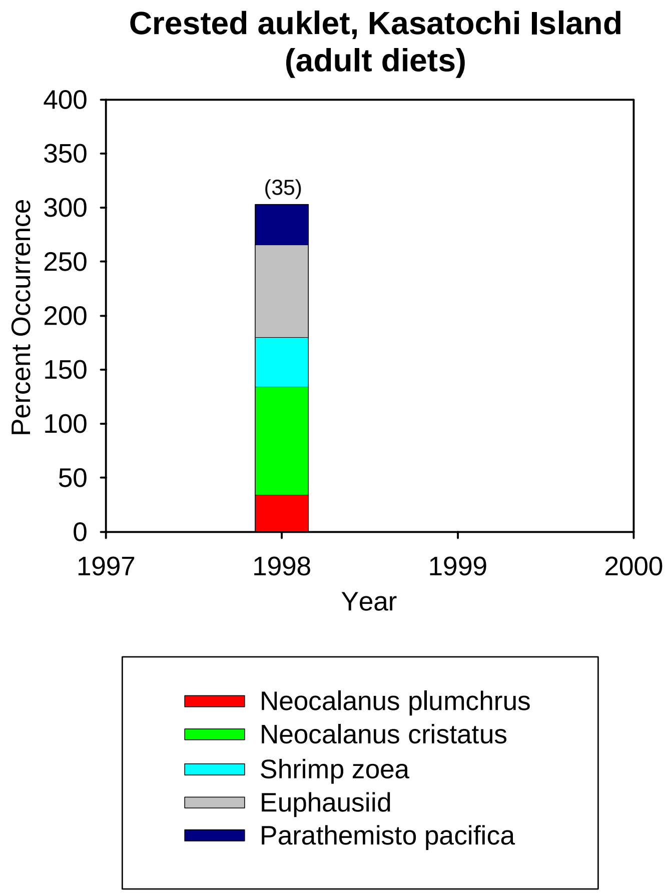


Figure 33. Diets of crested auklets at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Rhinoceros Auklet (*Cerorhinca monocerata*)

Breeding Chronology.–In 2000, the mean hatch date of rhinoceros auklets at Middleton Island was earlier than normal (Table 30).

Table 30. Hatching chronology of rhinoceros auklets at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Middleton I.	22 Jun (38)[a]	23 Jun (38)	27 Jun[b] (10)[a]	S. Hatch and V. Gill Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.–Rhinoceros auklet productivity at Middleton Island in 2000 was similar to 1999 (Table 31).

Table 31. Reproductive performance of rhinoceros auklets at Alaskan sites monitored in 2000.

Site	Chicks Fledged/Egg	No. of Eggs	Reference
Middleton I.	0.69	54	S. Hatch and V. Gill Unpubl. Data

Populations.–Rhinoceros auklet nest burrow density was about the same in 2000 as in the previous two years (Fig. 29). On the whole, there appeared to be no trend in populations of this species at St. Lazaria Island.

Diet.–In 1998, a small sample of rhinoceros auklet diets from Chowiet Island consisted entirely of Pacific sandlance (Fig. 34).

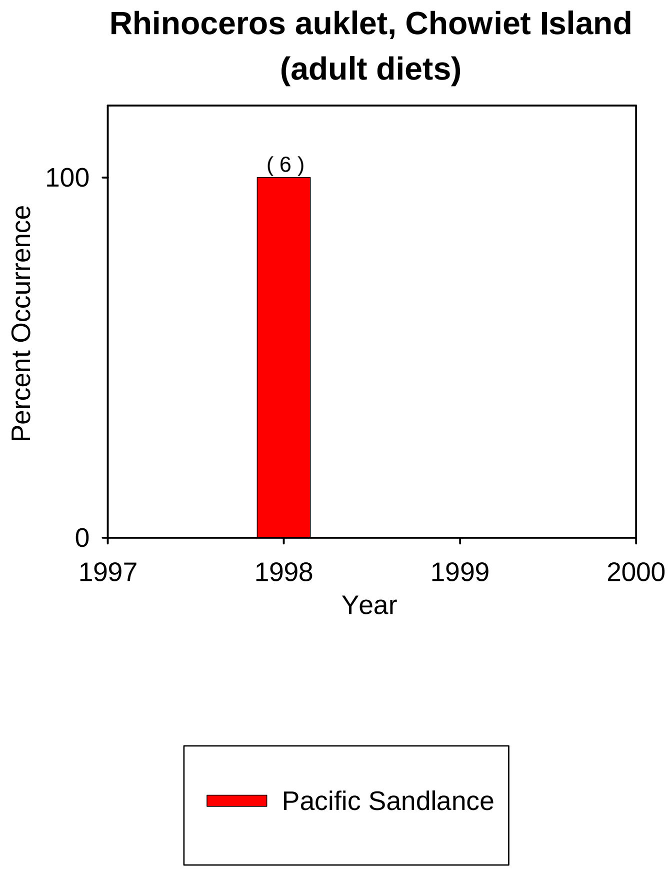


Figure 34. Diets of rhinoceros auklets at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

Horned Puffin (*Fratercula corniculata*)

Breeding Chronology.–No data for 2000.

Productivity.–No data for 2000. See Figure 35 for prior years' data

Populations.–Although plots have been set up at Buldir Island to monitor trends in horned puffins, no accepted method of monitoring has been developed, and no counts were made in 2000.

Diet.–No data.

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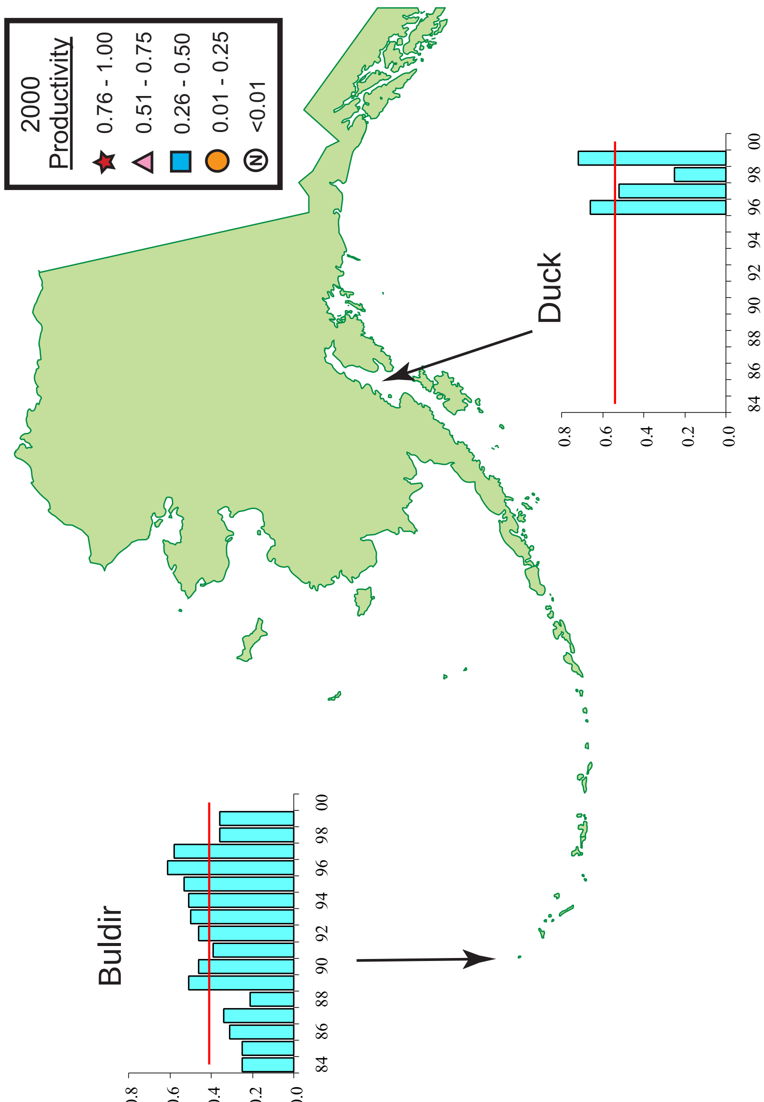

Figure 35. Productivity of horned puffins (chicks fledged/egg) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Tufted Puffin (*Fratercula cirrhata*)

Breeding Chronology.–Hatch dates for tufted puffins were earlier than normal at Aiktak and Middleton islands in 2000 (Table 32).

Table 32. Hatching chronology of tufted puffins at Alaskan sites monitored in 2000.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	17 Jul (57)[a]	18 Jul (57)	31 Jul[b](4)[a]	Thomson and Smith 2000
Middleton I.	7 Jul (30)	6 Jul (30)	14 Jul[b] (9)	S. Hatch and V. Gill Unpubl. Data

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.

Productivity.–Tufted puffin productivity was about average in 2000 at Bogoslof and Middleton islands, and above average at Aiktak Island (Table 33, Fig. 36).

Table 33. Reproductive performance of tufted puffins at Alaskan sites monitored in 2000.

Site	Chicks Fledged[a]/Egg	No. of Eggs	Reference
Bogoslof I.	0.52	82	Byrd et al. 2001
Aiktak I.	0.66	94	Thomson and Smith 2000
Middleton I.	0.67	48	S. Hatch and V. Gill Unpubl. Data

[a]Fledged chick defined as being still alive at last check in August or September.

Populations.–The numbers of tufted puffin burrows apparently are increasing at both Bogoslof and Aiktak islands (Fig. 37).

Diet.–In 1998, the most frequently occurring prey species at Aiktak Island was pollock (Fig. 38). Tufted puffins at the Barren Islands caught predominantly capelin with lesser amounts of pollock and sandlance.

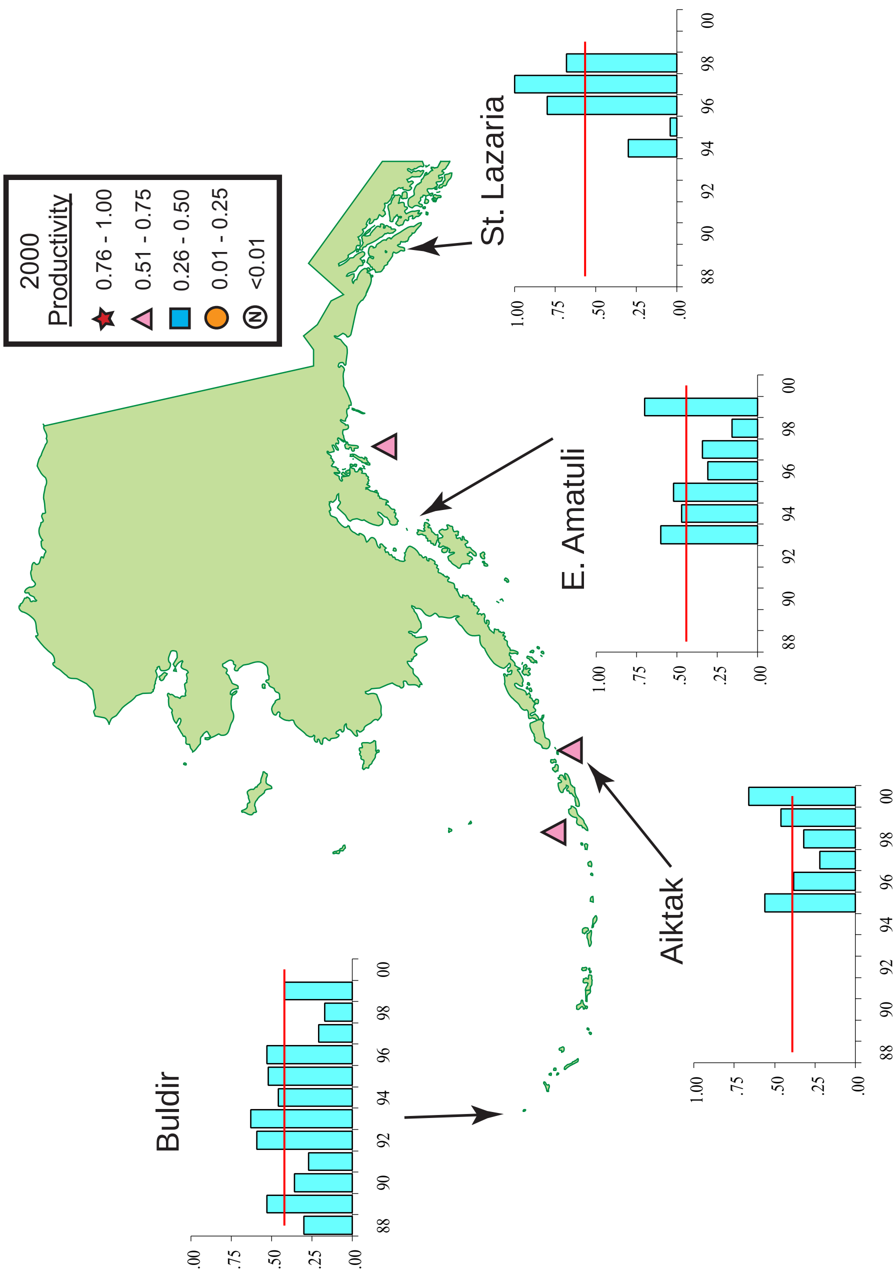

Figure 36. Productivity of tufted puffins (chicks fledged/egg) at Alaskan sites monitored in 2000. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

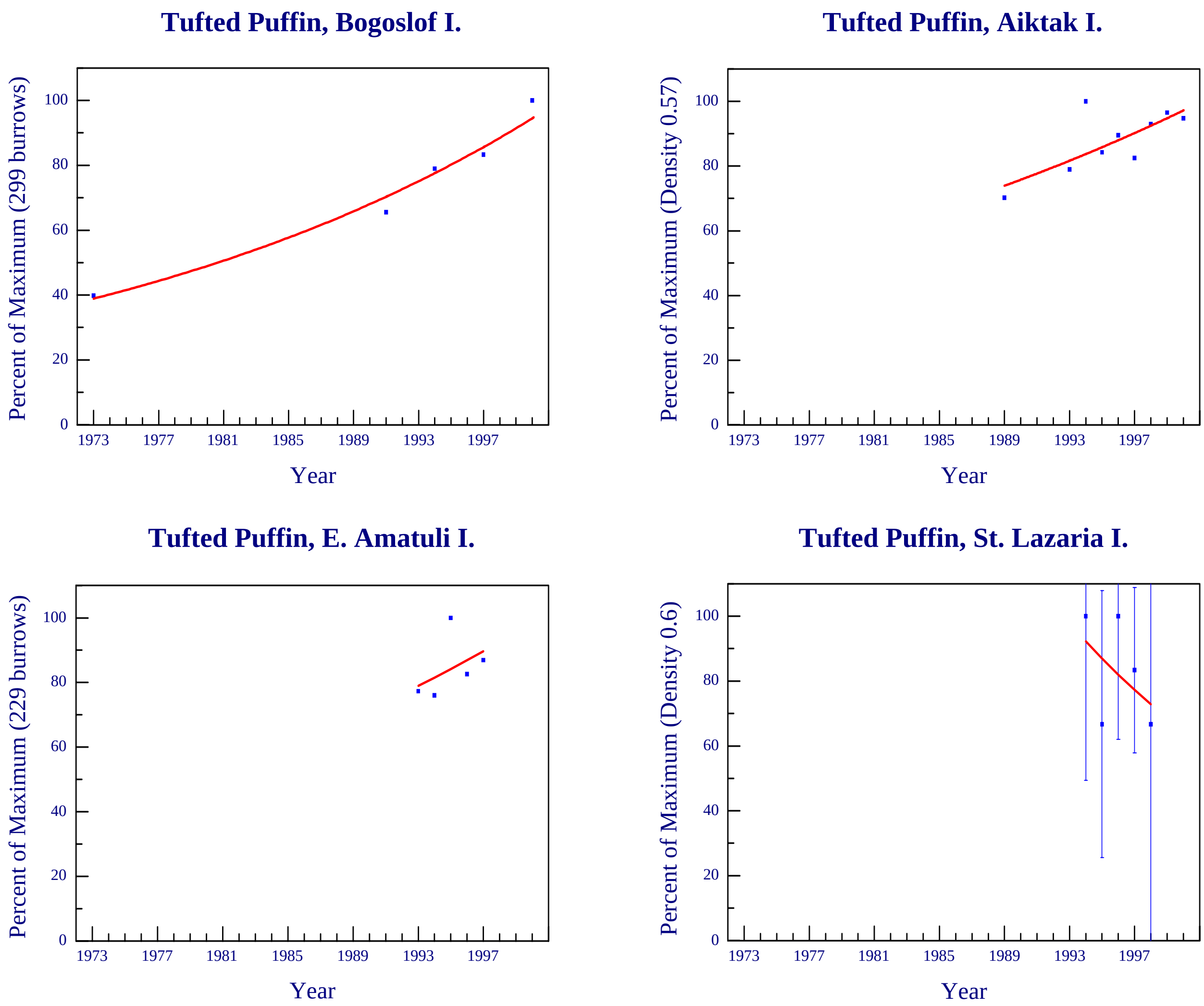

Figure 37. Trends in populations of tufted puffins at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

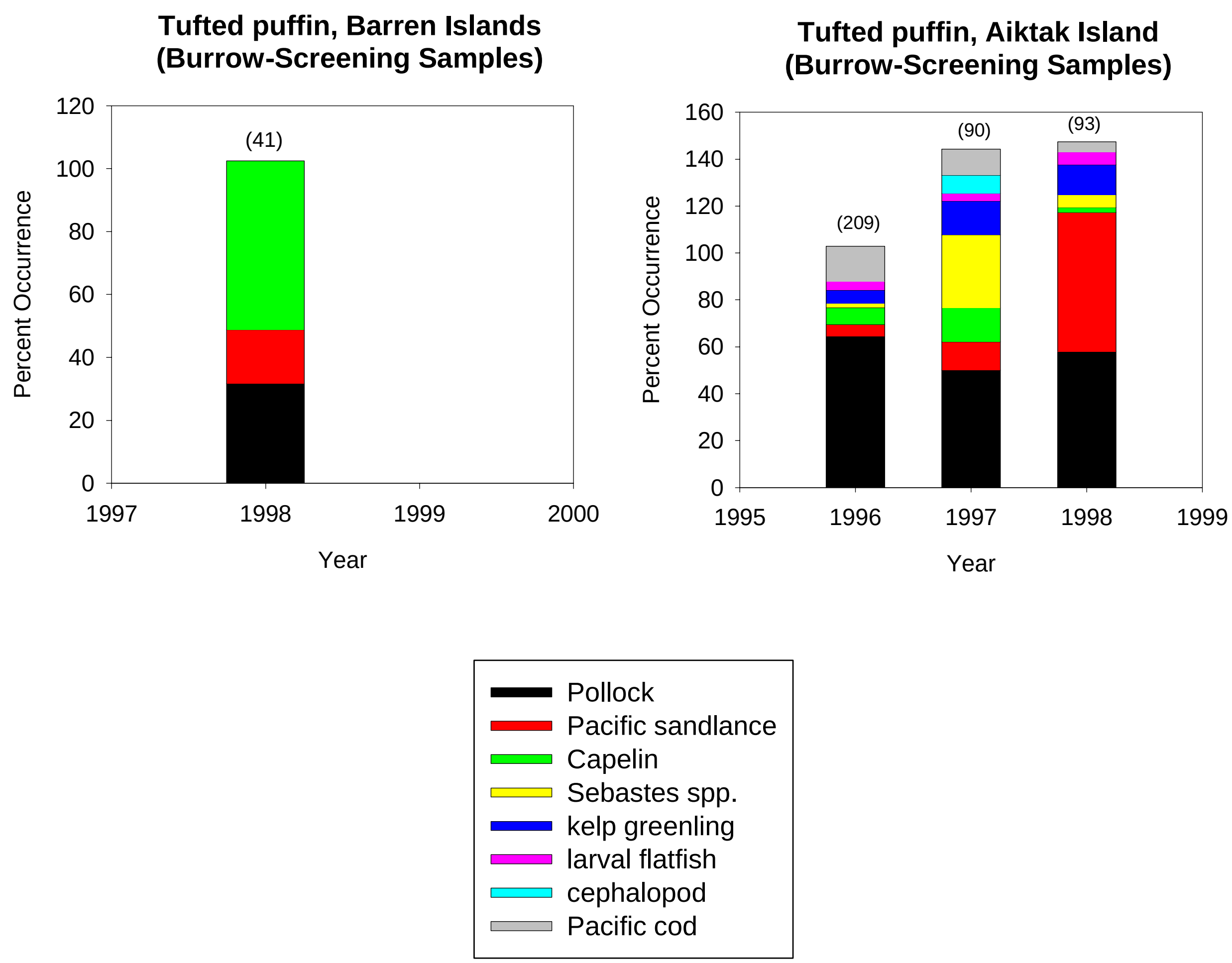

Figure 38. Diets of tufted puffins at Alaskan sites. Sample sizes are indicated by the number above the stacked bars. Source of samples (adult or chick) is indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Cumulative percent occurrence generally adds to more than100% because birds ate more than one prey type per foraging trip.

CONCLUSIONS

Species Differences

Surface Plankton-Feeders.–In 2000, the timing of hatching for fork-tailed storm-petrels (FTSP) was early at Aiktak and St. Lazaria islands (Table 34). Timing for leach's storm-petrels (LHSP) was about average at Aiktak Island but early at St. Lazaria Island. Both species of storm-petrels had approximately average rates of reproductive success everywhere we monitored them in 2000 (Table 35). Based on the sites where population indices were measured in 2000, it appears storm-petrel (STPE) burrow densities (both species combined) have been increasing in recent years (Table 36). Fork-tailed storm-petrels ate Myctophids more frequently than Leach's storm-petrels, the latter's diet being more diverse than its congener.

Surface Fish-Feeders.–Glaucous-winged gulls (GWGU) are treated here, although they are opportunistic feeders taking other birds as well as fish for prey. In 2000, gull eggs hatched earlier than average at two of the sites monitored (Aiktak and Middleton islands), whereas timing was about average at St. Lazaria Island (Table 34). Gulls had average success in 2000 at all the sites we monitored except Middleton Island, where productivity was above average (Table 35). Gull populations showed no trends at sites monitored in 2000 (Table 36). Pacific herring and Pacific sandlance were the two most common prey items in this species.

Black-legged kittiwakes (BLKI) had earlier than normal hatch dates in 2000 in the Bering Sea. Hatching was early or average at two Gulf of Alaska colonies (Gull and Duck islands) but about two weeks late at Middleton Island, also in the Gulf of Alaska (Table 34). Average or above average productivity occurred in 2000 at one site in the N. Bering/Chukchi as well as most sites in the Bering Sea, with six of eight colonies experiencing above average success (Table 35). This species had average productivity at most colonies in the Gulf of Alaska. The one exception was Gull Island where success was above normal in 2000. Population trends at most colonies we monitored in 2000 indicated increasing trends. Exceptions were one site in the Bering Sea (Cape Peirce), and one site in the Gulf of Alaska (Middleton Island) where recent declines are suggested by counts on index plots (Table 36). Black-legged kittiwake diets in the Gulf of Alaska differed significantly from the black-legged kittiwakes of the Aleutian Islands, Bering Sea and Chukchi Sea. Gulf of Alaska black-legged kittiwakes relied most heavily upon sandlance and capelin. Black-legged kittiwakes in northern Prince William Sound (Shoup Bay) fed mostly on Pacific herring and sandlance. Diets of black-legged kittiwakes from the Aleutians, Bering Sea and Chukcki Sea lacked the capelin and herring seen in the Gulf of Alaska diets. Instead, there was a greater occurrence of pollock, myctophids and euphausiids. Pollock and sandlance occurred in significant amounts in the diets of Pribilof Island black-legged kittiwakes but did not occur in the diets of western Aleutian black-legged kittiwakes.

Red-legged kittiwake (RLKI) eggs hatched earlier than average in 2000 at the Pribilof Islands (St. Paul and St. George islands), and at about the average time at Buldir Island (Table 34). Hatching chronology was somewhat late at Bogoslof Island in comparison to the other colonies where this species was monitored in 2000. Reproductive success was higher than average at the Pribilof Islands, and about average at Bogoslof and Buldir islands in 2000 (Table 35). The small colony on Koniuji Island appears to have stabilized at about 15 to 20 birds (Table

Table 34. Seabird relative breeding chronology compared to averages for past years within regions[a]. Only sites for which there were data from 2000 are included

Region	Site	FTSP	LHSP	PECO	GWGU	BLKI	RLKI	COMU	TBMU	PAAU	LEAU	WHAU	CRAU	RHAU	TUPU
SE Bering	St. Paul I.					–	–	–	=						
	St. George I.					–	–	–	=						
	C. Peirce			=		–		–							
	Aiktak I.	–	=		–										–
SW Bering	Buldir I.					–	=	–	=	–	=	–	=		
	Kasatochi I.										=		=		
	Bogoslof I.						+								
Gulf of Alaska	Gull I.					–		–							
	Chisik/Duck Is.					=		–							
	Middleton I.			–	–	+								–	–
Southeast	St. Lazaria I.	–	–		=			=	=						

[a] Codes:
"–" indicates hatching chronology was > 3 days earlier than average for this site or region,
"=" indicates within 3 days of average
"+" indicates hatching chronology was > 3 days later than average for this site or region.

Table 35. Seabird relative productivity levels compared to averages for past years within regions[a]. Only sites for which there were data from 2000 are included.

Region	Site	FTSP	LHSP	RFCO	PECO	GWGU	BLKI	RLKI	COMU	TBMU	PAAU	LEAU	WHAU	CRAU	RHAU	TUPU
N. Bering/ Chukchi	C. Lisburne						=									
	Bluff						+									
SE Bering	St. Paul I.			+			+	+	=	=						
	St. George I.			=			+	+	=	=						
	C. Peirce				=		+		=							
	Bogoslof I.			=	=	=	+	=	+	+						=
	Aiktak/ Ugamak Is.	=	=	=	+	=			+	+						+
SW Bering	Buldir I.						+	=		=	=	=	=	=		
	Ulak I.	=		+	+											
	Kasatochi I.			+	+				–	–		=		=		
	Koniuji I.						=									
Gulf of Alaska	Chiniak Bay						=									
	Gull I.						+		+							
	Chisik/Duck Is.						=		+							
	Pr. Will. Snd.						=									
	Middleton I.				+	+	=								=	=
Southeast	St. Lazaria I.	=	=		+	=			=	=						

[a] Codes:
"–" indicates productivity was > 20% below average for this site or region,
"=" indicates within 20% of average
"+" indicates productivity was > 20% above average for this site or region.

Table 36. Seabird population trends compared within regions[a]. Only sites which were counted in 2000 are included.

Region	Site	STPE	PECO	UNCO	GWGU	BLKI	RLKI	COMU	UNMU	LEAU	CRAU	RHAU	TUPU
N. Bering/ Chukchi	Bluff					+		+					
SE Bering	C. Peirce		=			–		–					
	Bogoslof I.												+
	Aiktak I.	+			=				=				+
SW Bering	Kasatochi I.			=	=					=	=		
	Koniuji I						=						
Gulf of Alaska	Chiniak Bay					+							
	Gull I.		–			+		+					
	P. William Snd					+							
	Middleton I.		–			–			–				
Southeast	St. Lazaria I.	+	+		=				–			=	

[a]Codes:
"– " indicates negative population trend for this site or region,
"=" indicates no discernable trend
"+" indicates positive population trend for this site or region.

36). Myctophids dominated the diets of red-legged kittiwakes. Squid, amphipods, and euphausiids were of secondary importance at St. George Island and greenling was of secondary importance at Buldir Island. Contrasting with black-legged kittiwakes, pollock and sandlance occurred only in minor amounts in red-legged kittiwake diets.

Diving Fish-Feeders (nearshore).–Timing of hatching was about average for pelagic cormorants (PECO) at Cape Peirce in the eastern Bering Sea and was early at Middleton Island in the Gulf of Alaska in 2000 (Table 34).

Productivity for at least one species of cormorant was monitored in four of five regions in 2000. Like other near shore feeders, reproductive success of cormorants may be based on very local conditions which may not prevail region-wide. Red-faced cormorants (RFCO) had average or better success in the Pribilof Islands and in the Aleutian Islands (Table 35). Pelagic cormorants also exhibited average or above average success in the Bering Sea (Table 35). Pelagic cormorant productivity was above average at Middleton Island in the Gulf of Alaska and at St. Lazaria in southeast Alaska.

Pelagic cormorants showed a downward trend at Gull and Middleton islands in the Gulf of Alaska, whereas numbers of this species appear to be increasing at St. Lazaria Island in Southeast Alaska (Table 36). At colonies in the Bering Sea where we made counts in 2000, evidence suggested that since the late 1980s, cormorant (UNCO) numbers have remained stable.

Diving Fish-Feeders (offshore).–Murres had average or early hatch dates at most sites in 2000 (Table 34). Common murres (COMU) were early at all colonies except St. Lazaria Island in southeastern Alaska, where timing was average. Thick-billed murre (TBMU) timing was approximately average at all sites (Table 34).

Common murres exhibited average or above average reproductive success at all sites except Kasatochi Island in the southwestern Bering Sea, where this species failed completely (Table 35). Thick-billed murres also failed at Kasatochi Island in 2000 (Table 35). Average or above average success was achieved by this species at all other sites where it was monitored.

Numbers of murres at sites we monitored in 2000 showed either increasing trends or remained relatively stable everywhere except Cape Peirce in the southeastern Bering Sea, Middleton Island (UNMU) in the Gulf of Alaska and St. Lazaria Island in southeastern Alaska, where declining trends were evident (Table 36).

Common murre diets exhibited significant geographic variability. Barren Islands common murres fed their chicks almost exclusively capelin. Common murres at Chowiet and Aiktak islands ate mostly sandlance and pollock. Common murres from Buldir and Koniuji islands ate predominantly squid with lesser amounts of pollock and herring. St. George Island common murres ate euphausiids and pollock with lesser amounts of squid. Thick-billed murre diets at St. George Island closely matched the diets of common murres except for the greater percentage of squid consumed by the thick-billed murres. At Buldir Island, thick-billed murres ate almost exclusively squid with some myctophids, while common murres preyed mostly on squid and pollock. Thick-billed murre diets at Aiktak Island matched those of common murres with an emphasis on pollock and sandlance. Cape Lisburne thick-billed murre diets consisted of a majority of flatfish/sculpin and pollock compared to the common murre diets at Cape Lisburne which contained more pollock, sandlance, and capelin.

Rhinoceros auklets (RHAU) exhibited earlier than normal hatching and average productivity in 2000 at Middleton Island (Table 34). There was no discernable trend in populations of this species at St. Lazaria Island (Table 36). In 1998, a small sample of rhinoceros auklet diets from Chowiet Island consisted entirely of Pacific sandlance.

Tufted puffin (TUPU) eggs hatched earlier than normal in the central Aleutians (Aiktak Island) and Gulf of Alaska (Middleton Island) in 2000 (Table 34). Reproductive success for tufted puffins was average or above average in the central and eastern Aleutian Islands (Aiktak and Bogoslof islands) and in the Gulf of Alaska (Middleton Island) in 2000 (Table 35). An upward population trend was evident for tufted puffins at Bogoslof and Aiktak islands in the southeastern Bering Sea region (Table 36).

In 1998, tufted puffins at the Barren Islands caught predominantly capelin with lesser amounts of pollock and sandlance. The most frequently occurring prey species at Aiktak Island was pollock. Unlike tufted puffin diets from the Barren Islands, capelin only occurred in small amounts at Aiktak Island, where sixty percent of deliveries contained sandlance in 1998.

Diving Plankton-Feeders.–Least (LEAU) and crested (CRAU) auklets had approximately average nesting chronologies at both southwestern Bering Sea region sites where they were monitored in 2000 (Table 34). Timing was early for parakeet (PAAU) and whiskered (WHAU) auklets at Buldir Island in the same region. Productivity also was average for these species at monitoring sites in 2000 (Table 35). The only data on population trends are for least and crested auklets at Kasatochi Island where numbers of both appeared to be relatively stable (Table 36).

Least auklet diets at the Pribilof Islands and Kasatochi Island were more diverse than at Buldir Island and had up to an average of four prey species in each sample. Least and crested auklets generally had more diverse diets than parakeet and whiskered auklets. These planktivorous birds consumed many more prey species per foraging trip than did the piscivorus birds.

Regional Differences

N. Bering/Chukchi.–There were no data concerning timing of nesting events and very little productivity or population data in 2000 for this area. Reproductive success was average for black-legged kittiwakes in the region in 2000 (Table 35). The only population trend data were for offshore fish-feeders (kittiwakes and murres), and these species were increasing at Bluff (Table 36). Gadids (including pollock), flatfish, sculpin and Pacific sandlance made up a large part of the diets of murres at Cape Lisburne.

SE Bering.–Hatch dates for fork-tailed storm-petrels at Aiktak Island were early, whereas Leach's storm-petrel nesting chronology was average at this site in 2000 (Table 34). All species of fish-feeders exhibited early or normal timing in this region, with 11 of 15 cases resulting in earlier than normal breeding chronology.

Storm-petrels apparently had adequate plankton available for normal reproduction in 2000 (Table 35). All other species exhibited either average or above average productivity in 2000, with nearly half of the cases being above average. Relatively high productivity was especially evident in the diving fish feeders of this region.

Storm-petrel populations appeared to be increasing in the eastern Aleutians (Aiktak Island). There were no clear patterns among fish-feeders in this region (Table 36): 1) cormorants showed no trend at the only site monitored in 2000; 2) glaucous-winged gull numbers appeared to be fairly stable, while black-legged kittiwakes seem to be declining at Cape Peirce; 3) common murres also exhibit a declining trend at Cape Peirce; and 4) puffins showed an increasing trend at both Bogoslof and Aiktak islands.

Gulls and kittiwakes had a varied diet in this region. Pacific herring and Pacific sandlance were major portions of the diet for Glaucous-winged gulls at Aiktak Island. Pollock were fairly common in diets of adult kittiwakes at St. George Island but did not occur in nestling diets there. Myctophids were found in samples from both adult and nestling kittiwakes from the Pribilof Islands. Amphipods and euphausiids also were common in kittiwake diets in this region. Gadids (including pollock), euphausiids and squid were important components of murre diets in the southeastern Bering Sea. Calanoid copepods, euphausiids, and larval shrimp and crabs made up major portions of least auklet diets at the Pribilof Islands. Auklet diets differed to some extent between St. Paul and St. George islands, even in the same year. Pollock, Pacific sandlance, Pacific cod and other fishes made up the bulk of the species found in samples from tufted puffins at Aiktak Island.

SW Bering.–Kittiwake and murre breeding chronology was either earlier than usual or about average in 2000, with the exception of late timing for red-legged kittiwakes at Bogoslof Island (Table 34). Plankton-feeders (auklets) also exhibited early or normal breeding chronology in this region.

Plankton feeders, both surface (storm-petrels) and divers (auklets) had average success in 2000 in all cases in this region (Table 35). All other species, regardless of feeding guild, exhibited average or above average success, except that murres had low productivity at Kasatochi Island.

We monitored populations at only one area (Kasatochi and Koniuji islands) in this region in 2000. None of the monitored populations showed a trend (Table 36).

Myctophids and amphipods were major prey items for both species of storm-petrel in this region. Crab larvae and euphausiids also occurred in Leach’s storm-petrel diets at Buldir Island, but not in samples from its congener there. Myctophids were major components of kittiwake diets in this region, especially for black-legged kittiwakes at Koniuji Island and red-legged kittiwake nestlings at Buldir Island. Greenling and euphausiids also occurred in kittiwake samples from every site in this region. Squid were the most important component in the diets of murres in the central Aleutian Islands. Calanoid copepods and euphausiids occurred in the diets of all four auklet species sampled in this region.

N. Gulf of Alaska.–Fork-tailed storm-petrels normally are monitored at E. Amatuli Island, but data were not available for 2000, therefore, only fish-feeding species are compared. Breeding chronology was earlier than normal (seven of nine cases) or average for all species in 2000, with the exception of late nesting black-legged kittiwakes at Middleton Island (Table 34).

Productivity was normal for about half of the species we monitored in this region in 2000. Exceptions included higher than average success for pelagic cormorants and glaucous-winged gulls at Middleton Island, black-legged kittiwakes at Gull Island and common murres at Gull and Duck islands (Table 35).

Although cormorant populations appeared to be declining at the two sites we monitored in the region in 2000, overall patterns were not so clear for the other foraging guilds. Declines have occurred for kittiwakes at Middleton Island, where murres also have declined. Elsewhere, kittiwakes have increased at Chiniak Bay, Gull Island and Prince William Sound (Table 36). Common murre numbers have increased at Gull Island as well.

Black-legged kittiwakes ate a more varied diet in Prince William Sound than at colonies in other parts of the northern Gulf of Alaska. Pacific herring, salmonids and offal were among the items found in Prince William Sound birds but not in samples from either the Barren or Semidi islands. Pacific sandlance remains occurred in kittiwake samples from all three areas, in both adult and nestling diets. Capelin were found in adult kittiwakes from the Semidi and Barren islands, as well as nestlings from Prince William Sound, but not in Prince William Sound adults. Capelin were found in most common murre samples from the Barren Islands in 1998. This species also consumed capelin at the Semidi Islands that year but at a much lower frequency. Pacific sandlance and gadids were more prevalent in murres at the latter site. Pacific sandlance was the only prey item found in rhinoceros auklet samples from the Semidi Islands. Tufted puffins at the Barren Islands also consumed sandlance, but to a lesser degree. Capelin and pollock were more common in puffin diets.

Southeast.–Storm-petrel eggs hatched early whereas gull and murre eggs hatched at average dates at St. Lazaria Island, the only site monitored in this region in 2000 (Table 34).

Productivity rates in 2000 were average for every species except pelagic cormorant which had above average success (Table 35).

Storm-petrel and pelagic cormorant numbers appeared to be increasing at St. Lazaria Island (Table 36). Glaucous-winged gull and rhinoceros auklet numbers were stable whereas common murres showed a negative trend at this colony.

Myctophids and other fishes were the most common items found in storm-petrel diet samples from St. Lazaria Island. Euphausiids also occurred in Leach’s storm-petrel samples but not in those from fork-tailed storm-petrels at this southeastern Alaska colony.

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