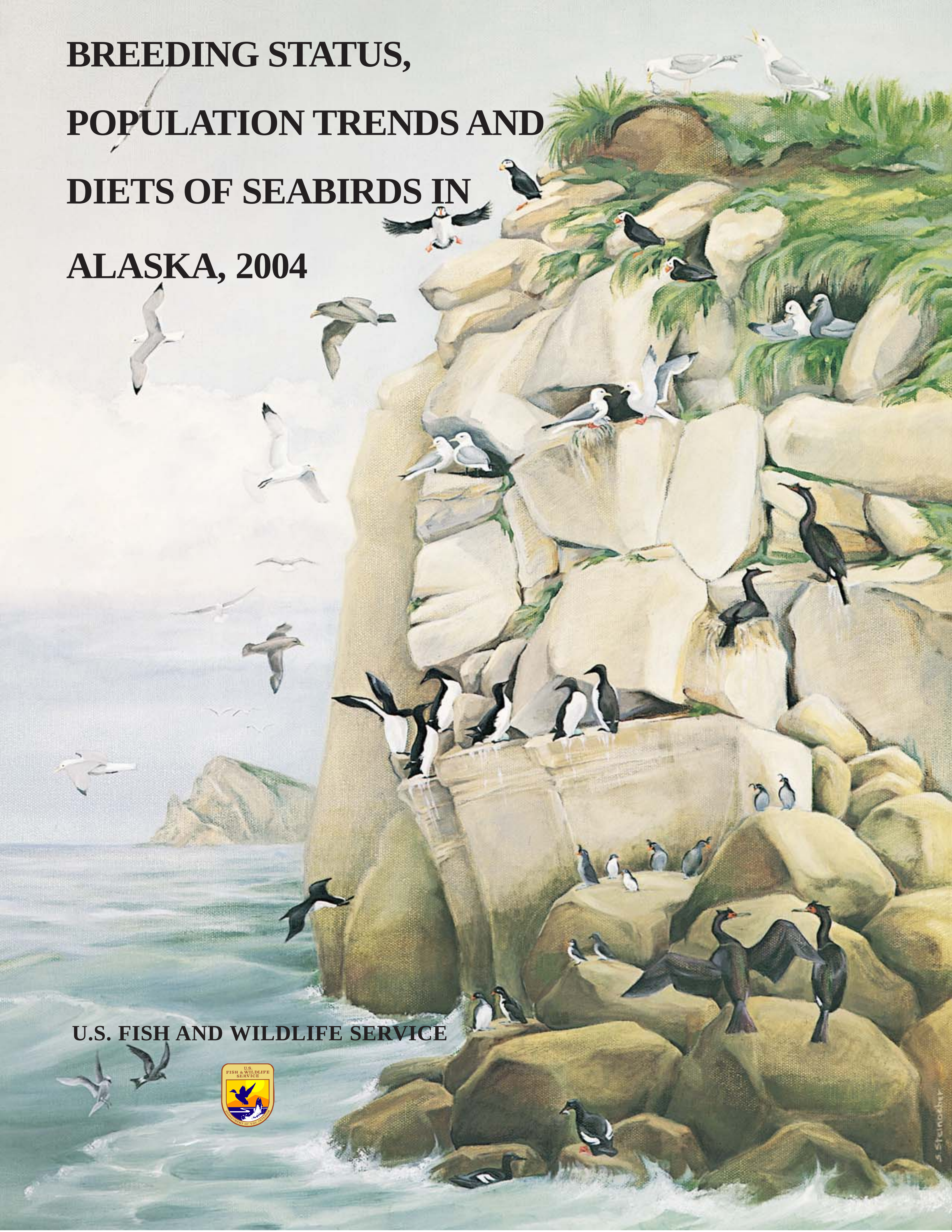
BREEDING STATUS, POPULATION TRENDS AND DIETS OF SEABIRDS IN ALASKA, 2004



U.S. FISH AND WILDLIFE SERVICE

AMNWR 07/17

BREEDING STATUS, POPULATION TRENDS AND DIETS OF SEABIRDS IN ALASKA, 2004

Compiled By:

Donald E. Dragoo, G. Vernon Byrd, and David B. Irons[a]

Key words: *Aethia*, Alaska, Aleutian Islands, ancient murrelet, Bering Sea, black-legged kittiwake, *Cepphus*, *Cerorhinca*, Chukchi Sea, common murre, crested auklet, diet, fork-tailed storm-petrel, *Fratercula*, *Fulmarus*, glaucous-winged gull, Gulf of Alaska, hatching chronology, horned puffin, *Larus*, Leach's storm-petrel, least auklet, long-term monitoring, northern fulmar, *Oceanodroma*, parakeet auklet, pelagic cormorant, *Phalacrocorax*, pigeon guillemot, population trends, Prince William Sound, productivity, red-faced cormorant, red-legged kittiwake, rhinoceros auklet, *Rissa*, seabirds, *Synthliboramphus*, thick-billed murre, tufted puffin, *Uria*, whiskered auklet.

U.S. Fish and Wildlife Service
Alaska Maritime National Wildlife Refuge
95 Sterling Highway, Suite 1
Homer, Alaska, USA 99603

November 2007

Cite as: Dragoo, D. E., G. V. Byrd, and D. B. Irons. 2007. Breeding status, population trends and diets of seabirds in Alaska, 2004. U.S. Fish and Wildl. Serv. Report AMNWR 07/17. Homer, Alaska.

[a]Dragoo (don_dragoo@fws.gov) and Byrd (vernon_byrd@fws.gov) at Alaska Maritime NWR, Homer; Irons (david_irons@fws.gov) at U. S. Fish and Wildlife Service, Migratory Bird Management, 1011 East Tudor Road, Anchorage, Alaska USA 99503

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 U. S. Fish and Wildlife Service. The strategy for colony monitoring includes estimating timing of nesting events, rates of reproductive success (e.g., chicks fledged per nest), population trends and diet composition of representative species of various foraging guilds (e.g., offshore 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. This report is the ninth in a series of annual reports summarizing the results of seabird monitoring efforts at breeding colonies on the Alaska Maritime National Wildlife Refuge (NWR) and elsewhere in Alaska.

In summer 2004 data were gathered on fulmars, storm-petrels, cormorants, glaucous-winged gulls, kittiwakes, murres, pigeon guillemots, ancient murrelets, auklets, and/or puffins at ten annual monitoring sites on the Alaska Maritime NWR, one annual monitoring site on the Togiak NWR and one site on the Becharof NWR. In addition, data were gathered at eight other refuge locations which are visited intermittently or are currently part of a research or monitoring program off refuges.

In 2004, we recorded relatively few cases of later than normal hatching chronology. Most species were within normal bounds or were earlier than average. Timing of nesting of plankton feeders (storm-petrels and auklets) was normal or early in all but two cases, the exceptions being later than normal hatching for crested auklets at St. Lawrence and Buldir islands. Fish feeders (cormorants, gulls, kittiwakes, murres, murrelets, rhinoceros auklets, puffins) were earlier than normal in 15 of 31 cases, late in seven cases and about normal in 9 cases.

Plankton feeders had average or above average rates of reproductive success in all but three cases in 2004, the exceptions being below average productivity of parakeet and crested auklets at Buldir Island, and fork-tailed storm-petrels at Ulak Island. Fish feeders had average or below average success in 39 of 47 instances. Most of the low productivity occurred in the southwestern Bering Sea and Gulf of Alaska regions. All instances of higher than average productivity occurred at southeastern Bering Sea and Chuckchi Sea sites.

Storm-petrel populations were increasing at two colonies and stable at the remaining sites. Populations of fish feeders (fulmars, cormorants, gulls, kittiwakes, murres, guillemots, rhinoceros auklets, puffins) exhibited stable populations in 36 of 69 cases. We found significant upward trends in 14 cases and significant downward trends in 19 cases (species x site). No geographic patterns were apparent with regard to population trends of fish eating seabirds.

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Introduction

This report is the ninth in a series of annual reports summarizing the results of seabird monitoring efforts at breeding colonies on the Alaska Maritime National Wildlife Refuge (NWR) and elsewhere in Alaska (see Byrd and Dragoo 1997, Byrd et al. 1998 and 1999, Dragoo et al. 2000, 2001, 2003, 2004 and 2006 for compilations of previous years' data). The seabird monitoring program in Alaska is designed to keep track of selected species of marine birds that indicate changes in the ocean 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 potential 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 (e.g., 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 offshore 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 (Fig. 1). A total of 10 sites on the Alaska Maritime NWR, located roughly 300-500 km apart, are scheduled for annual surveys (Byrd 2007), and at least some data were available from most of these in 2004. Furthermore, data are recorded annually or semiannually at other sites in Alaska (e.g., Cape Peirce, 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 2004 for each species; i.e., tables with estimates of average hatch dates and reproductive success, and maps with symbols indicating the relative timing of hatching and success at various sites. In addition, historical patterns of hatching chronology and productivity are illustrated for those sites for which we have adequate information. Population trend information is included for sites where at least five data points have been gathered. Seabird diet data from several locations are presented as well.

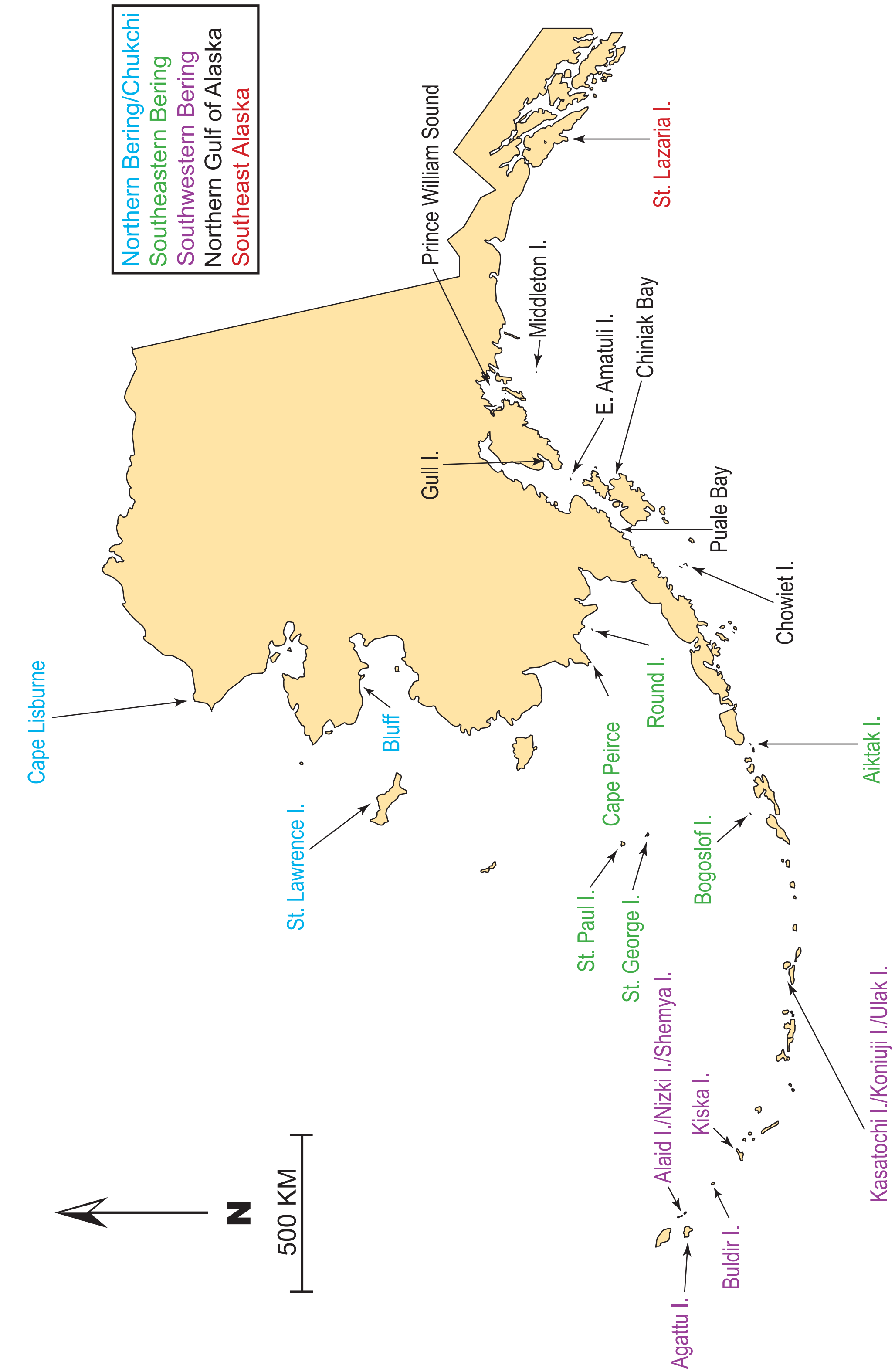


Figure 1. Map of Alaska showing the locations of seabird monitoring sites summarized in this report. Text colors indicate geographic regions.

Methods

Data collection methods generally followed protocols specified in "Standard Operating Procedures for Population Inventories" (USFWS 2000*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 were used to describe nesting chronology. Productivity typically was expressed as chicks fledged per egg, but occasionally other variables were used (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 murrelet	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 2004, and compares 2004 results with previous years. For sites with at least two years of data prior to 2004, 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 to be "normal"; larger deviations represented relatively early or late dates. For productivity, we defined significant deviations from "normal" as any that differed by more than 20% from the site or regional average. Overall population trends were analyzed using linear regression models on log-transformed data (ln). Trends were considered to be significant at the $p<0.05$ level and are reported as percent per annum increase or decline.

Seabird diet information was collected from adult and nestling birds using a variety of methods, including stomach samples from collected birds, regurgitations, bill load observations and collection of bill loads. Diets of piscivorous birds are reported as percent occurrence, while diets of planktivorous birds (auklets) are reported as percent biomass of prey types.

For diet samples from piscivorous birds, we calculated the percent occurrence for each prey item by dividing the total number of samples in which that prey was recorded by the total number of samples in the data set. When data included stomach samples, we did not include empty stomachs in either the percent occurrence calculations or in the reported sample size for that data set.

We calculated the biomass for each identifiable prey item in each data set by first estimating the mass of that prey item in each sample. We did this by multiplying the count made in the laboratory analysis (often based on extrapolation from a split sample) by the mass of a single individual of that prey type. We used a standard mass for each prey item during the biomass calculations in order to make the results comparable over locations and years. We then calculated the percent biomass by dividing the total mass of that prey item in the data set by the total estimated masses of all the identified prey items in the data set. In the event that a single prey item was recorded as “present” only, we estimated its mass by calculating the difference between the mass of all other prey items in the sample and the total sample mass measured in the field or in the lab, depending on which sample mass was provided in the data set. If more than one prey item was recorded as “present” only in a single sample, the sample was discarded from the analysis.

Data are reported in stacked bar graphs to facilitate viewing several years of data on one graph. For graphs of percent occurrence, the complete stacked bar indicates the cumulative percent occurrence of prey types in the samples and can add up to more than one hundred percent. The cumulative percent occurrence provides information on the average number of prey types per sample. For example, a cumulative percent occurrence of 200% for horned puffins indicates that on average each bird consumed two 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.

Graph titles include the sample type (chick or adult diet) followed by the collection method. Note that some chick diet information is actually based on samples collected from adults assumed to be carrying chick meals. Sample sizes are reported below each bar in each graph. In the event that more than one data type is represented in a single graph, sample sizes for each type are reported below the bars in the graph.

Results

Northern fulmar (*Fulmarus glacialis*)

Breeding chronology.–No data for 2004.

Productivity.–No data for 2004.

Populations.–We found no significant trends for northern fulmars at any monitored colony (Figure 2).

Diet.–No data.

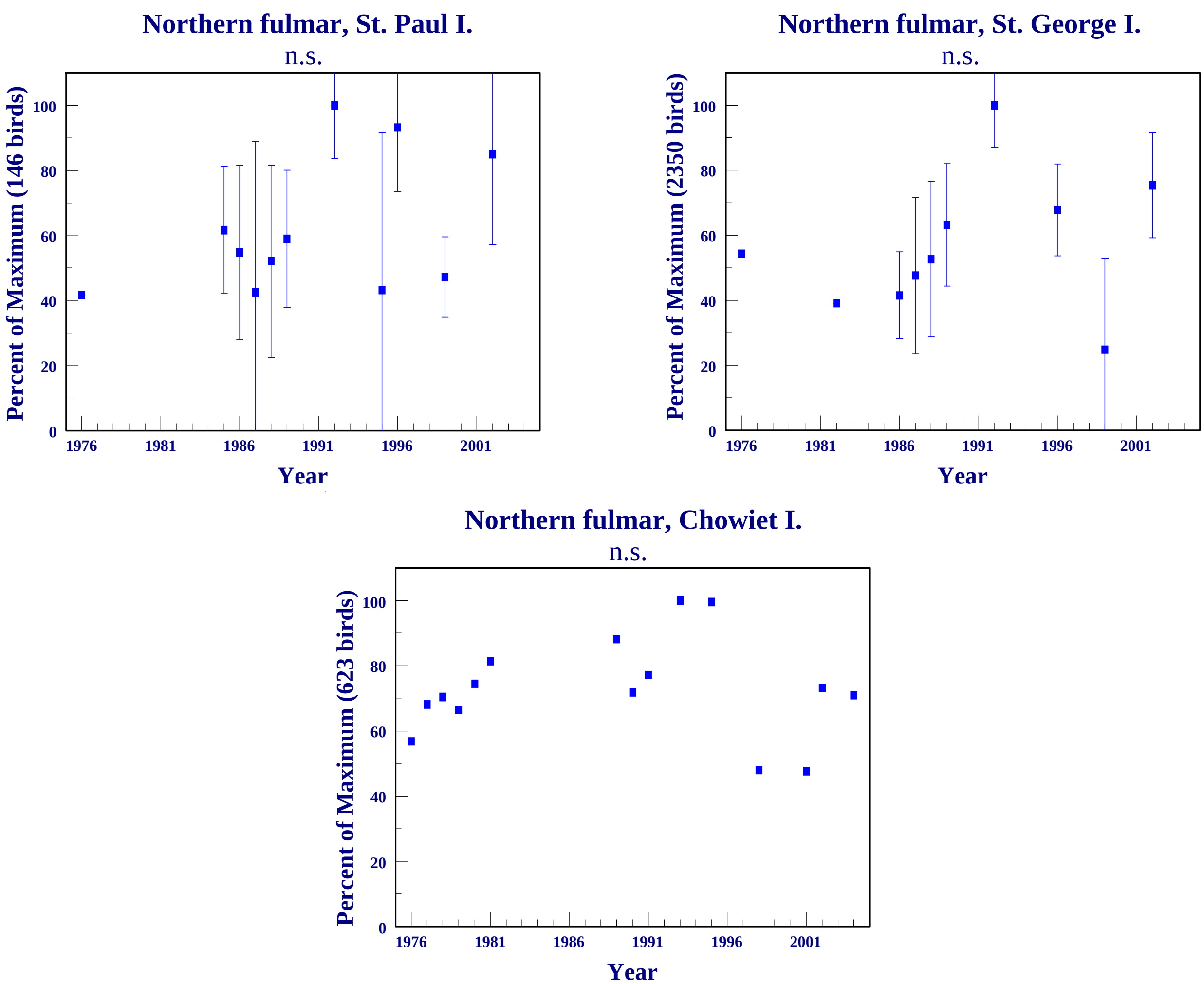


Figure 2. Trends in populations of northern fulmars at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

Fork-tailed storm-petrel (*Oceanodroma furcata)*

Breeding chronology.–The mean hatch date for fork-tailed storm-petrels was earlier than average at Aiktak and St. Lazaria islands in 2004 (Table 2, Fig. 3).

Table 2. Hatching chronology of fork-tailed storm-petrels at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	4 Jul (32)[a]	6 Jul (32)	18 Jul[b] (7)[a]	Helm and Zeman 2006
St. Lazaria I.	—	30 Jun (53)	16 Jul[b] (9)	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 2004, productivity of fork-tailed storm-petrels ranged from 79% at St. Lazaria Island to 50% at Ulak Island (Table 3, Fig. 4). Compared to previous years, this species had average or below average success at all sites where it was monitored.

Table 3. Reproductive performance of fork-tailed storm-petrels at Alaskan sites monitored in 2004.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.69	6 (64)[b]	0.72 (18)[b]	Barrett et al. 2005
Ulak I.	0.50	1 (36)	0.67 (8)	Drummond and Kissler 2004
Kasatochi I	0.60	3 (37)	N/A[c]	Drummond and Kissler 2004
Aiktak I.	0.66	N/A (35)	0.74 (7)	Helm and Zeman 2006
St. Lazaria I.	0.79	8 (140)	0.67 (10)	L. Slater Unpubl. Data

[a]Fledged chick defined as being still alive at last check in August or September.
[b]Sample size in parentheses represents the number of eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[c]Not applicable or not reported.

Populations.–Fork-tailed and Leach's storm-petrel burrows were combined at most sites for population monitoring purposes. Storm-petrel populations increased by 5.5% per annum at Aiktak Island and by 1.8% per annum at St. Lazaria Island (Fig. 5). No other monitored colonies exhibited significant trends.

Diet.–Diets of fork-tailed storm-petrels at Buldir and Kasatochi islands consisted of a majority of myctophids, other larval fish and amphipods (Fig. 6). In a small sample from Aiktak Island, diet consisted entirely of *Parathemisto* spp. and sand lance. Diets from St. Lazaria Island consisted of a majority of myctophids and other larval fish

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

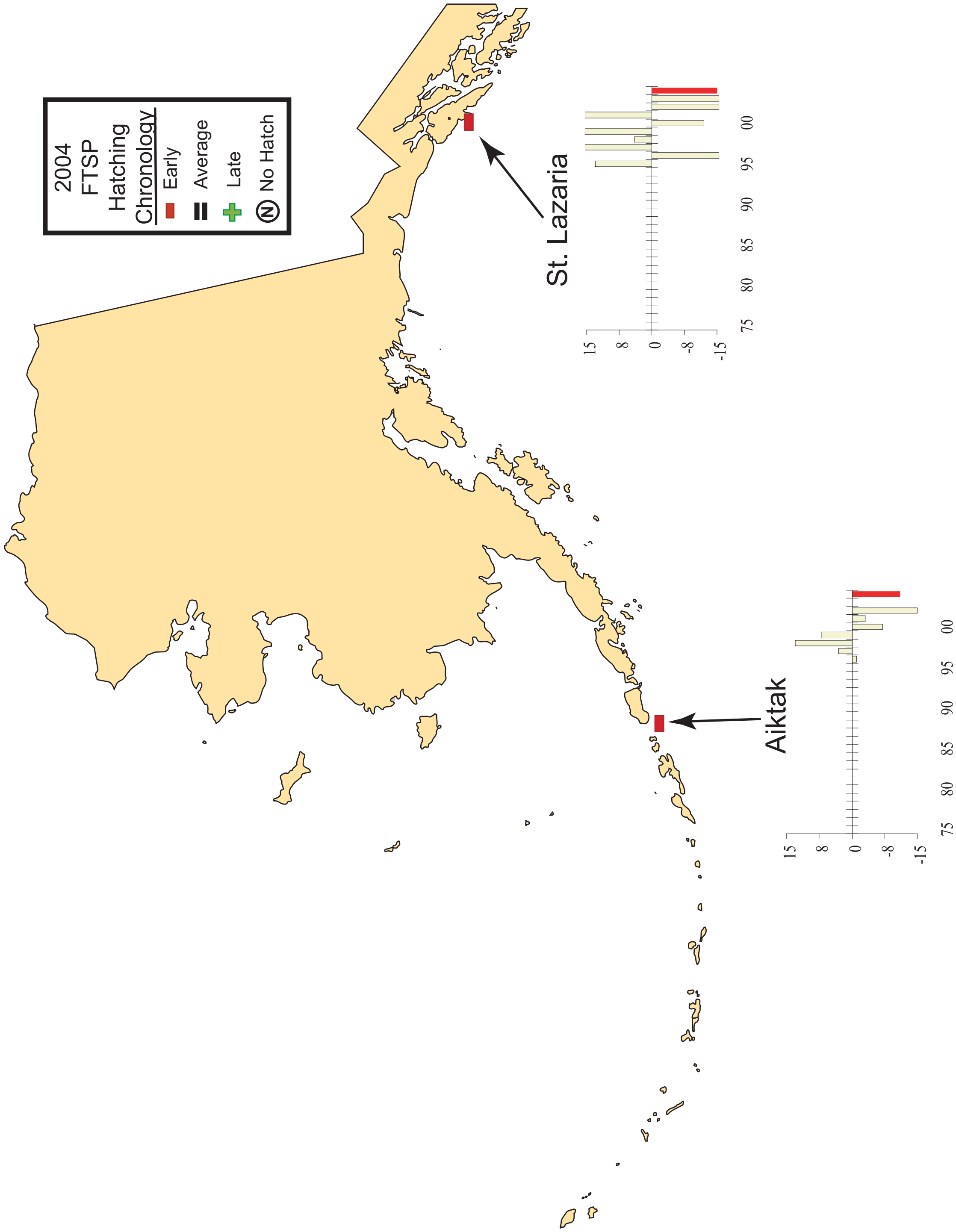


Figure 3. Hatching chronology of fork-tailed storm-petrels at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

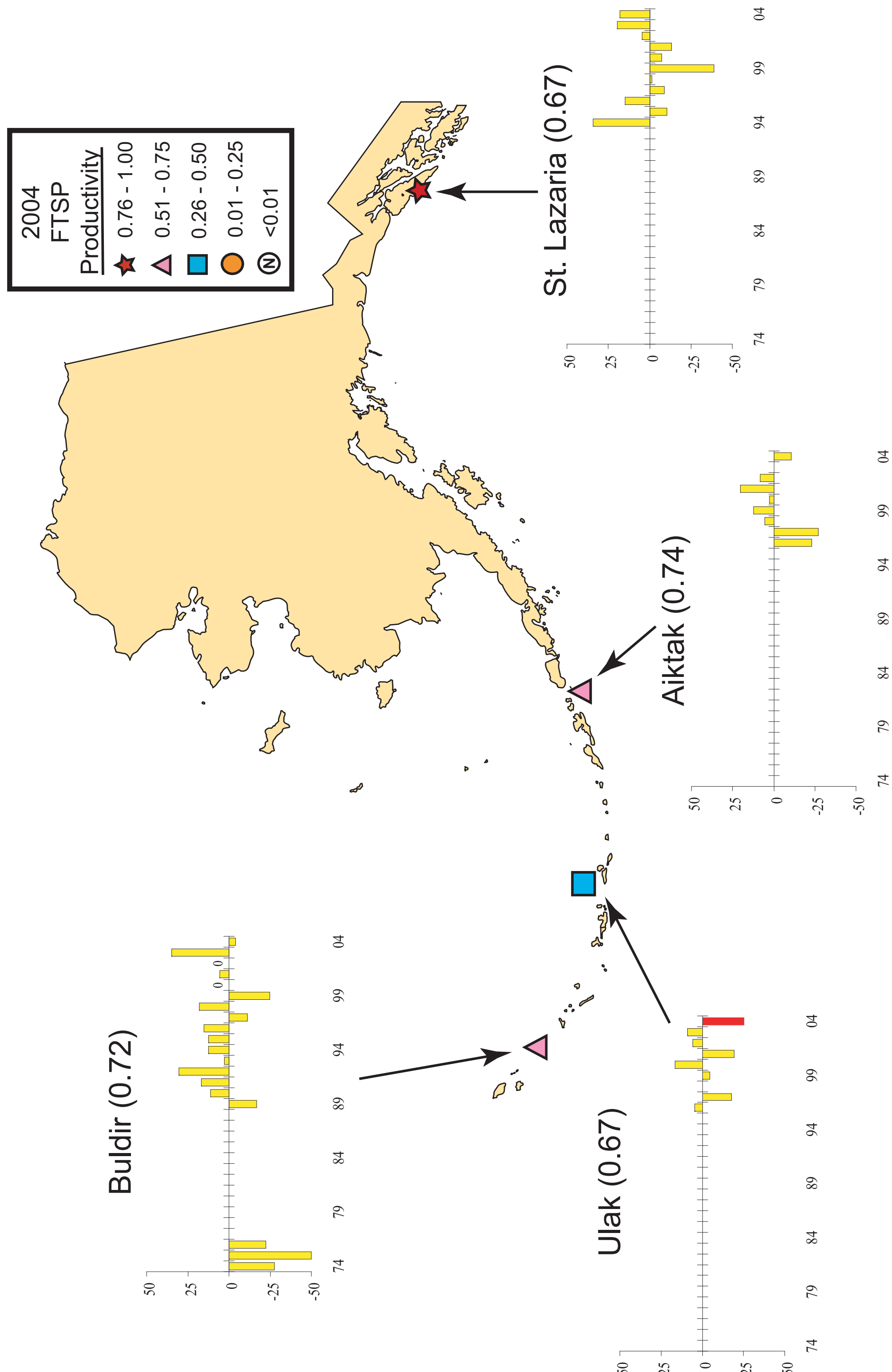


Figure 4. Productivity of fork-tailed storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

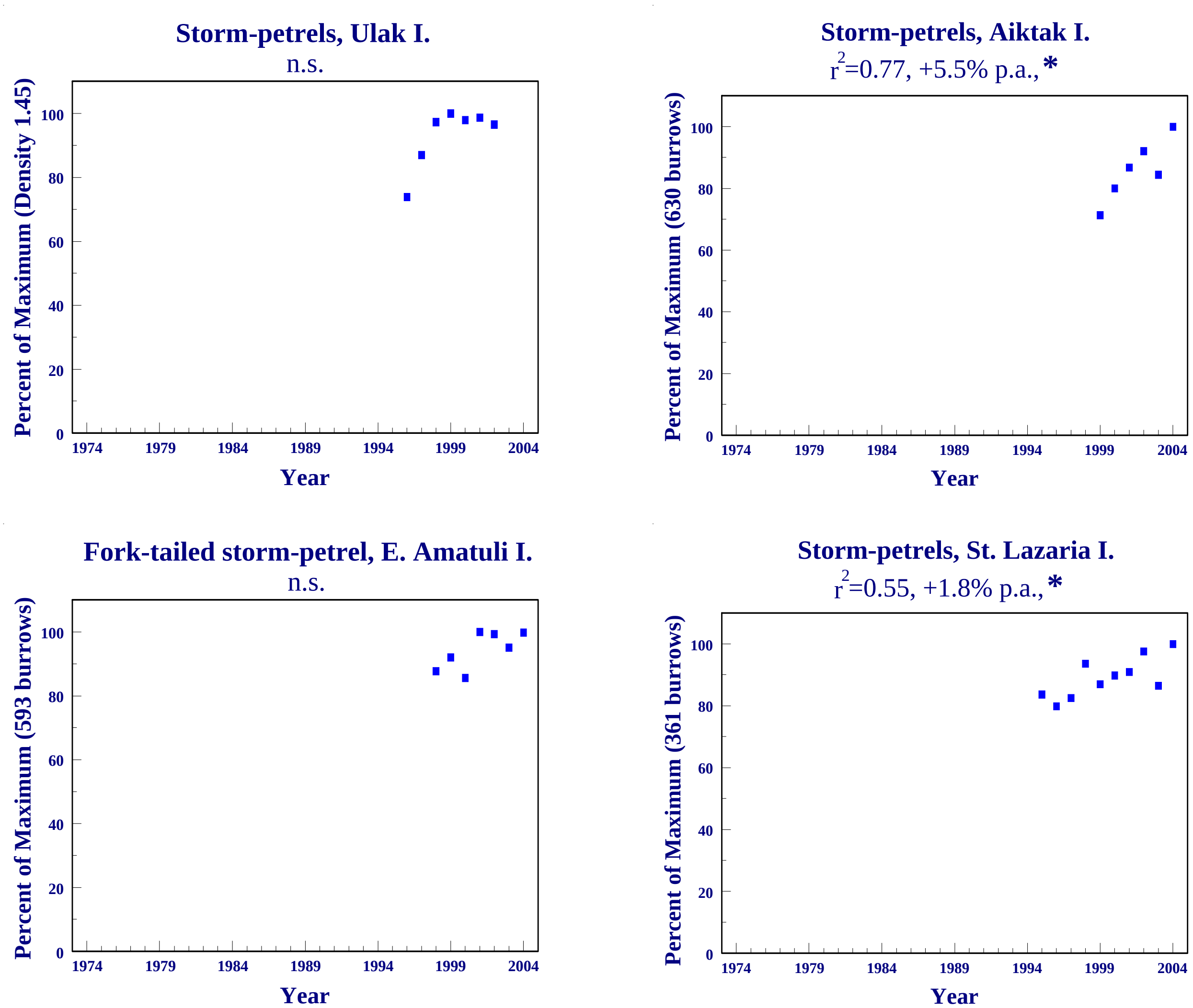


Figure 5. Trends in populations of storm-petrels at Alaskan sites. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

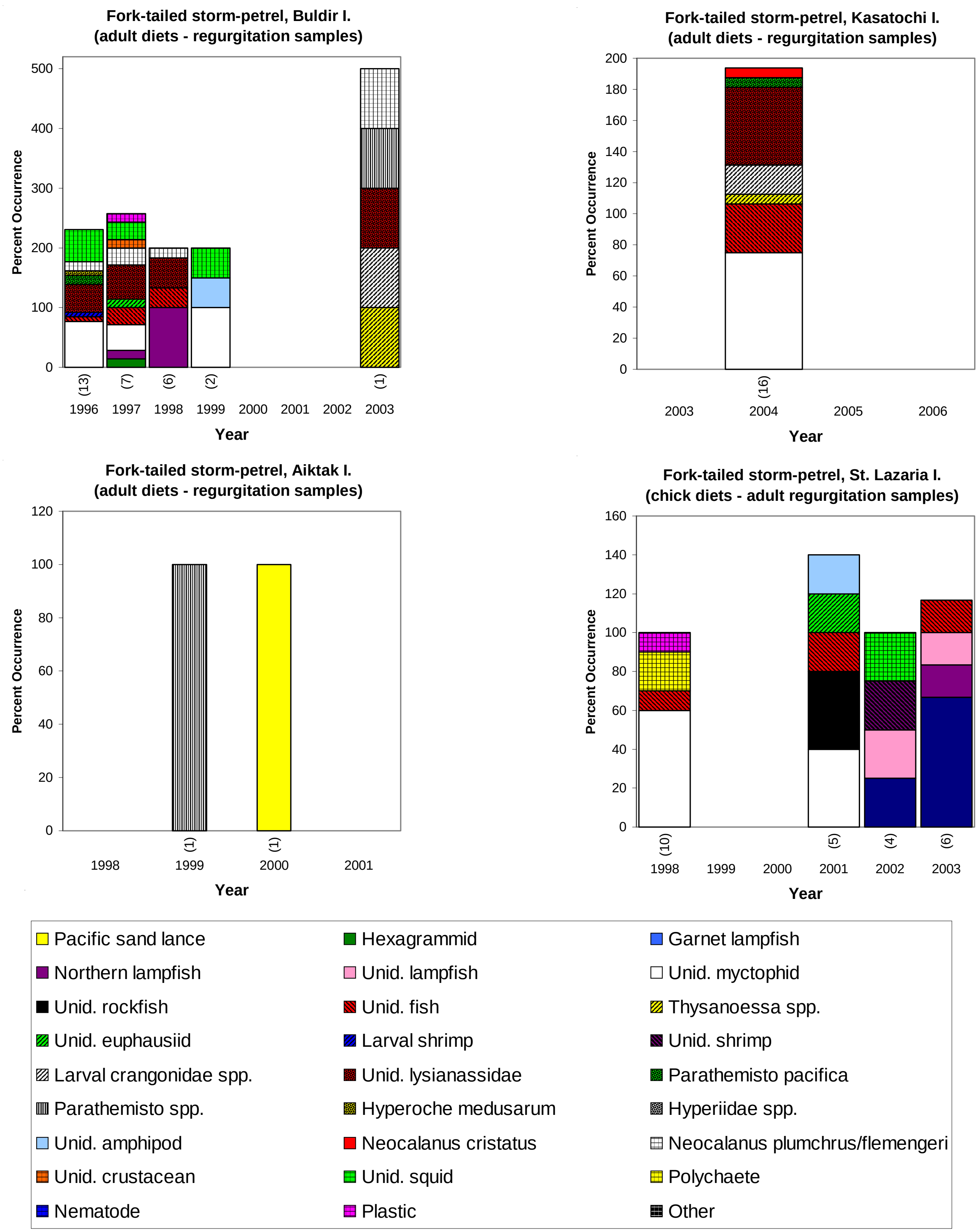


Figure 6. Diets of fork-tailed storm petrels at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Leach's storm-petrel (*Oceanodroma leucorhoa*)

Breeding chronology.–The mean hatch date for Leach's storm-petrels was earlier than average at Aiktak and St. Lazaria islands in 2004 (Table 4, Fig. 7).

Table 4. Hatching chronology of Leach's storm-petrels at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	24 Jul (37)[a]	24 Jul (37)	3 Aug[b] (7)[a]	Helm and Zeman 2006
St. Lazaria I.	—	20 Jul (29)	2 Aug[b] (9)	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 2004, productivity of Leach's storm-petrels was about average at St. Lazaria Island and above average at Buldir and Aiktak islands (Table 5, Fig. 8).

Table 5. Reproductive performance of Leach's storm-petrels at Alaskan sites monitored in 2004.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.89	6 (81)[b]	0.73 (18)[b]	Barrett et al. 2005
Aiktak I.	0.83	N/A[c] (40)	0.64 (7)	Helm and Zeman 2006
St. Lazaria I.	0.62	8 (138)	0.69 (10)	L. Slater Unpubl. Data

[a]Fledged chick defined as being still alive at last check in August or September.
[b]Sample size in parentheses represents the number of eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[c]Not applicable or not reported.

Populations.–Fork-tailed and Leach's storm-petrel burrows were combined at most sites for population monitoring purposes. Storm-petrel populations increased by 5.5% per annum at Aiktak Island and by 1.8% per annum at St. Lazaria Island (Fig. 5). No other monitored colonies exhibited significant trends.

Diet.–Diets of Leach's storm-petrels at Buldir and St. Lazaria islands consisted mainly of larval fish and small crustaceans (Fig. 9). In a small sample from Aiktak Island, diet consisted entirely of fish.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

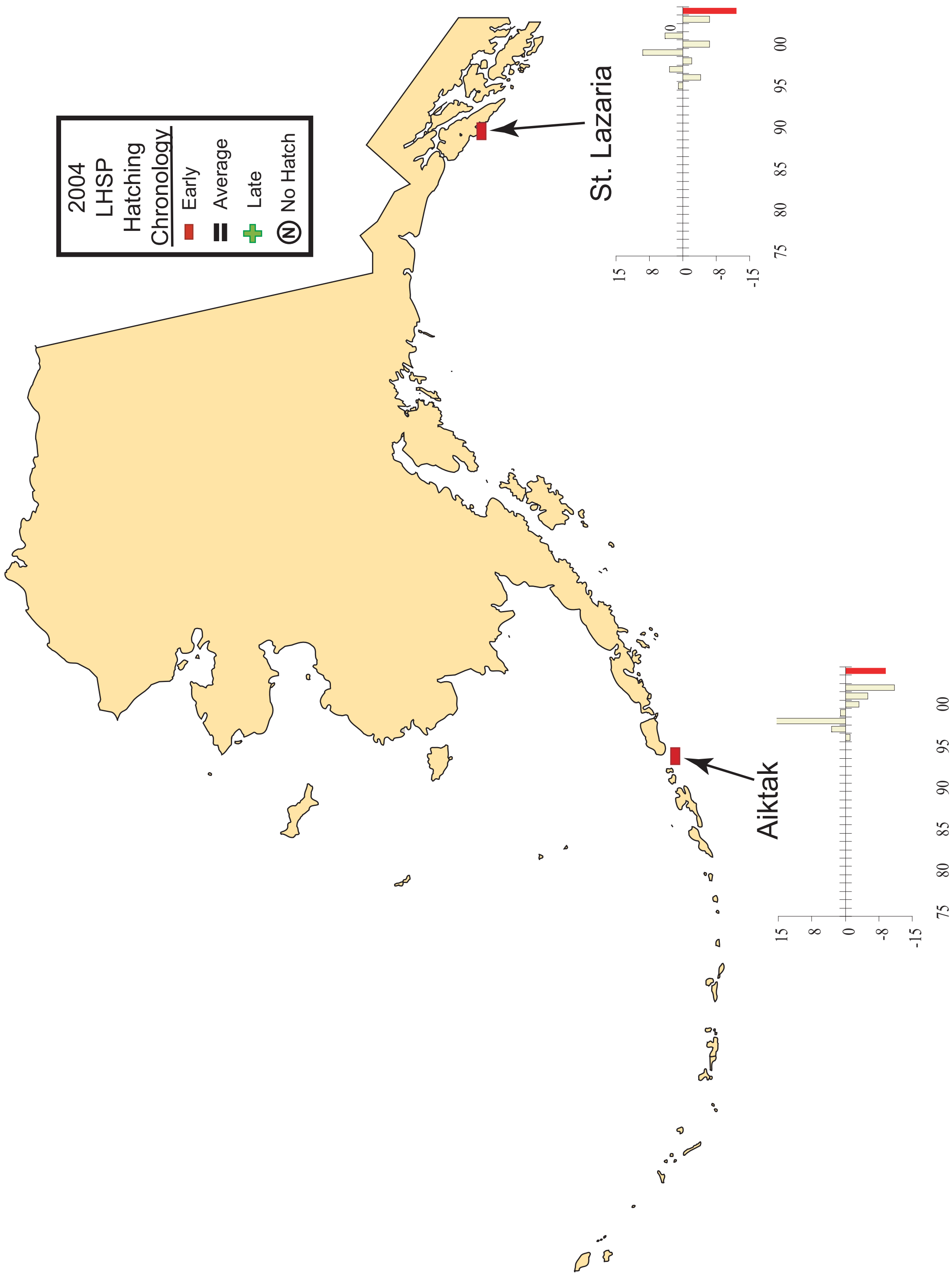


Figure 7. Hatching chronology of Leach's storm-petrels at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

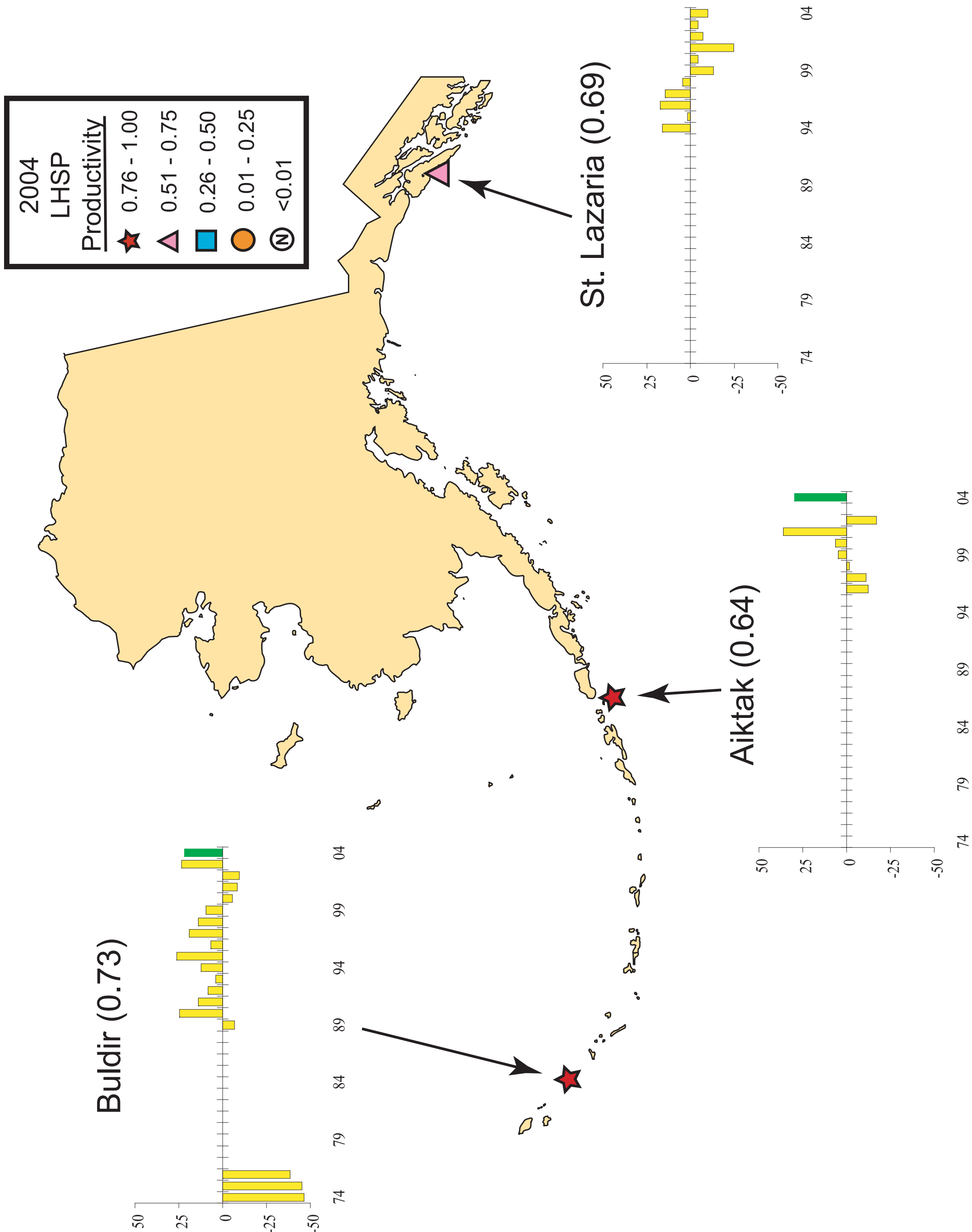


Figure 8. Productivity of Leach's storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

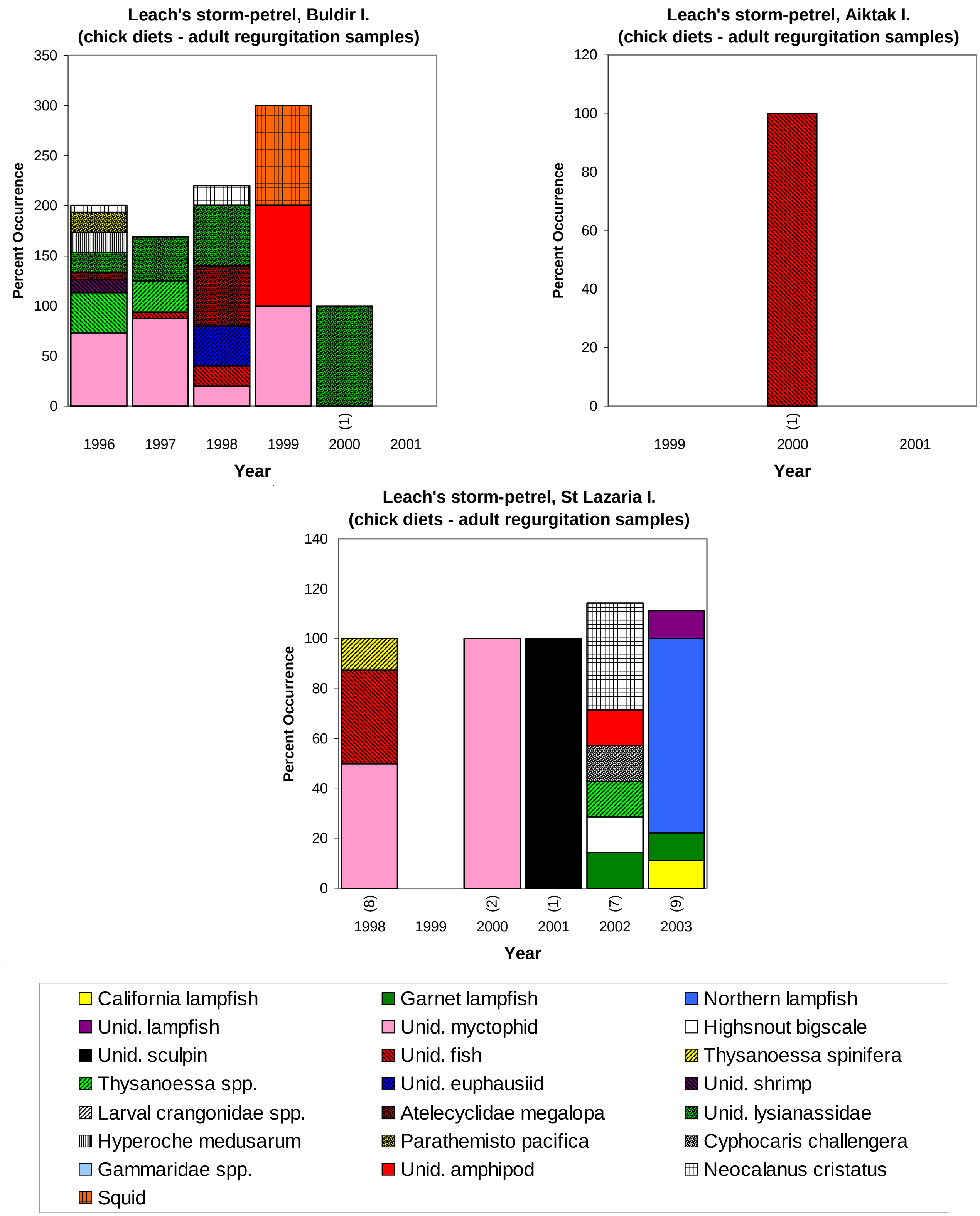


Figure 9. Diets of Leach's storm-petrels at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes, when available, are reported below each bar.

Red-faced cormorant (*Phalacrocorax urile*)

Breeding chronology.–Red-faced cormorant eggs hatched on 29 June on average at St. Paul Island in 2004 (Table 6).

Table 6. Hatching chronology of red-faced cormorants at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Paul I.	—	29 Jun (84)[a]	N/A[b]	S. Wright 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]Not applicable or not reported.

Productivity.–In 2004, productivity of red-faced cormorants ranged from complete failure at Chiniak Bay to 2.10 chicks fledged per nest at St. George Island (Table 7). Productivity in 2004 was higher than average at St. George Island, below average at Kasatochi Island and Chiniak Bay, and about average at St. Paul and Ulak islands (Fig. 10).

Table 7. Reproductive performance of red-faced cormorants at Alaskan sites monitored in 2004.

Site	Chicks Fledged/Nest	No. of Plots	Long-term Average	Reference
St. Paul I.	1.07	6 (162)[a]	1.34 (22)[a]	S. Wright Unpubl. Data
St. George I.	2.10	3 (101)	1.40 (7)	G. Levandoski Unpubl. Data
Buldir I.	1.22	N/A[b] (9)	N/A	Barrett et al. 2005
Ulak I.	1.80[c]	N/A (155)	1.61 (7)	Drummond and Kissler 2004
Kasatochi I.	0.20	N/A (26)	1.24 (8)	Drummond and Kissler 2004
Chiniak B.	0.00	N/A (9)	0.41 (15)	Kildaw et al. 2004

[a]Sample size in parentheses represents the number of nests used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[b]Not applicable or not reported.
[c]Value obtained from one time visit to colony.

Populations.–Red-faced cormorants were differentiated from other cormorants at only one colony. We found a significant annual decline of -13.3% per annum decrease at Chiniak Bay (Fig. 11). See the section covering pelagic cormorants for a discussion of general cormorant population trends at colonies where the species are combined.

Diet.–No data.

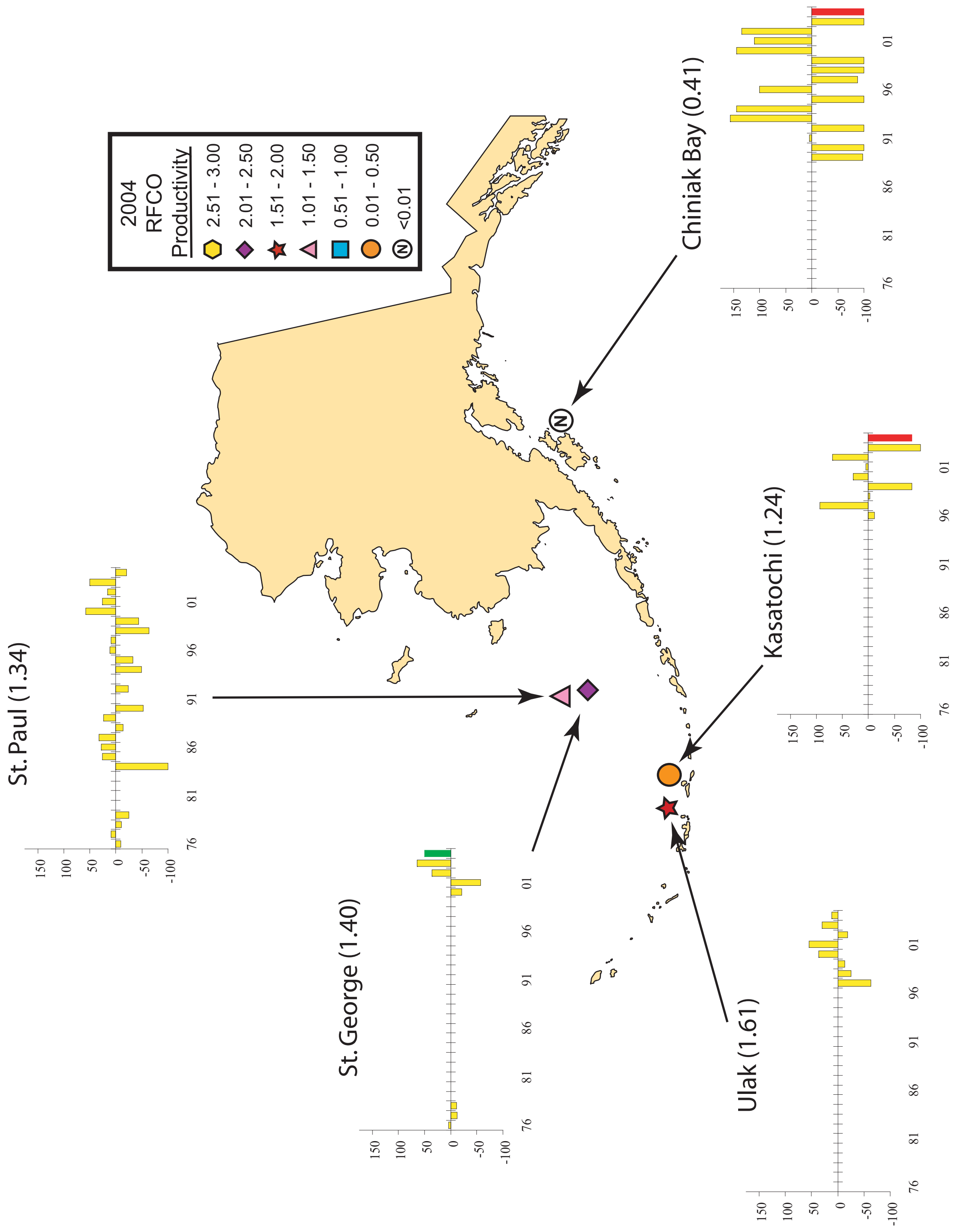


Figure 10. Productivity of red-faced cormorants (chicks fledged/nest) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

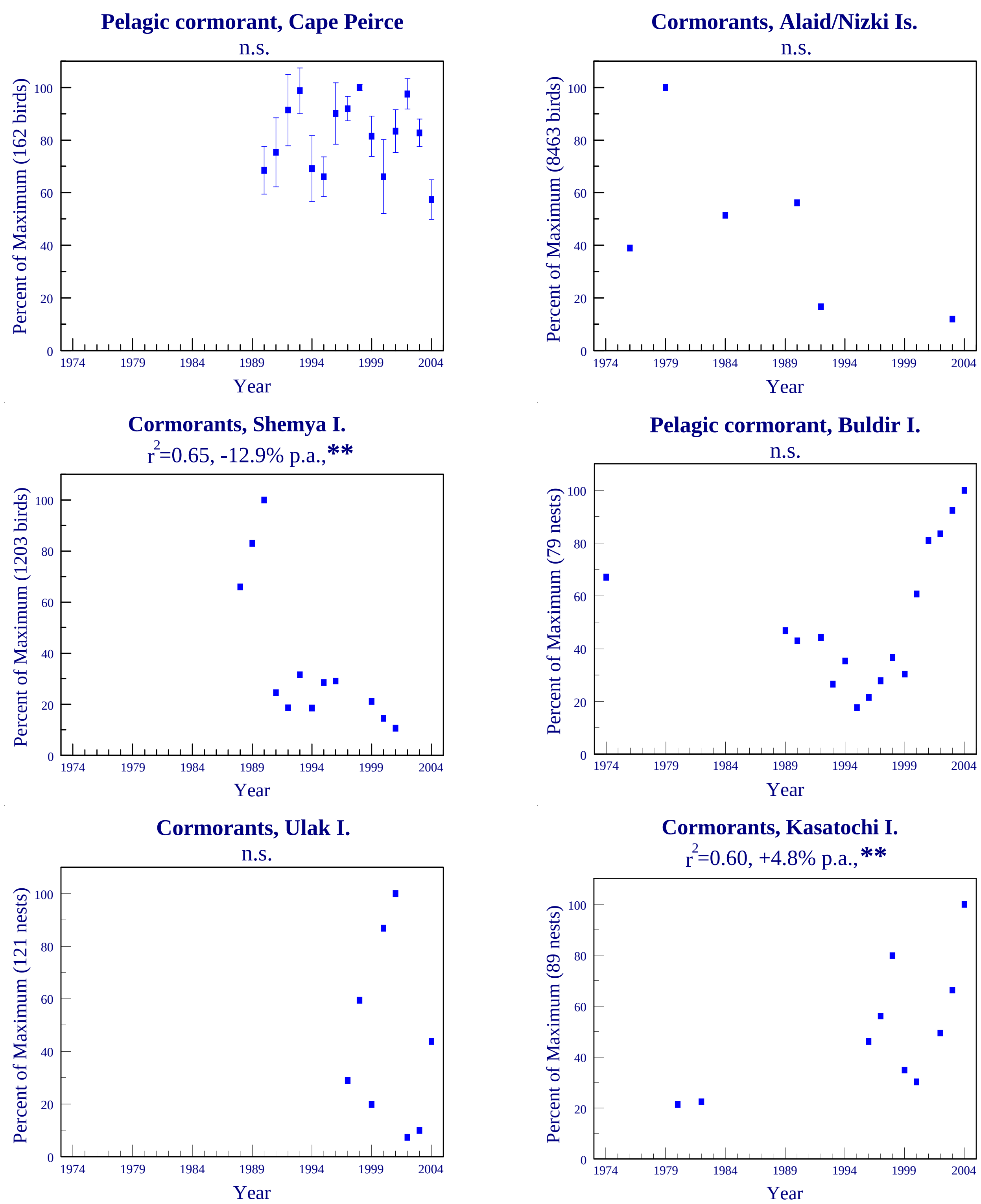


Figure 11. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

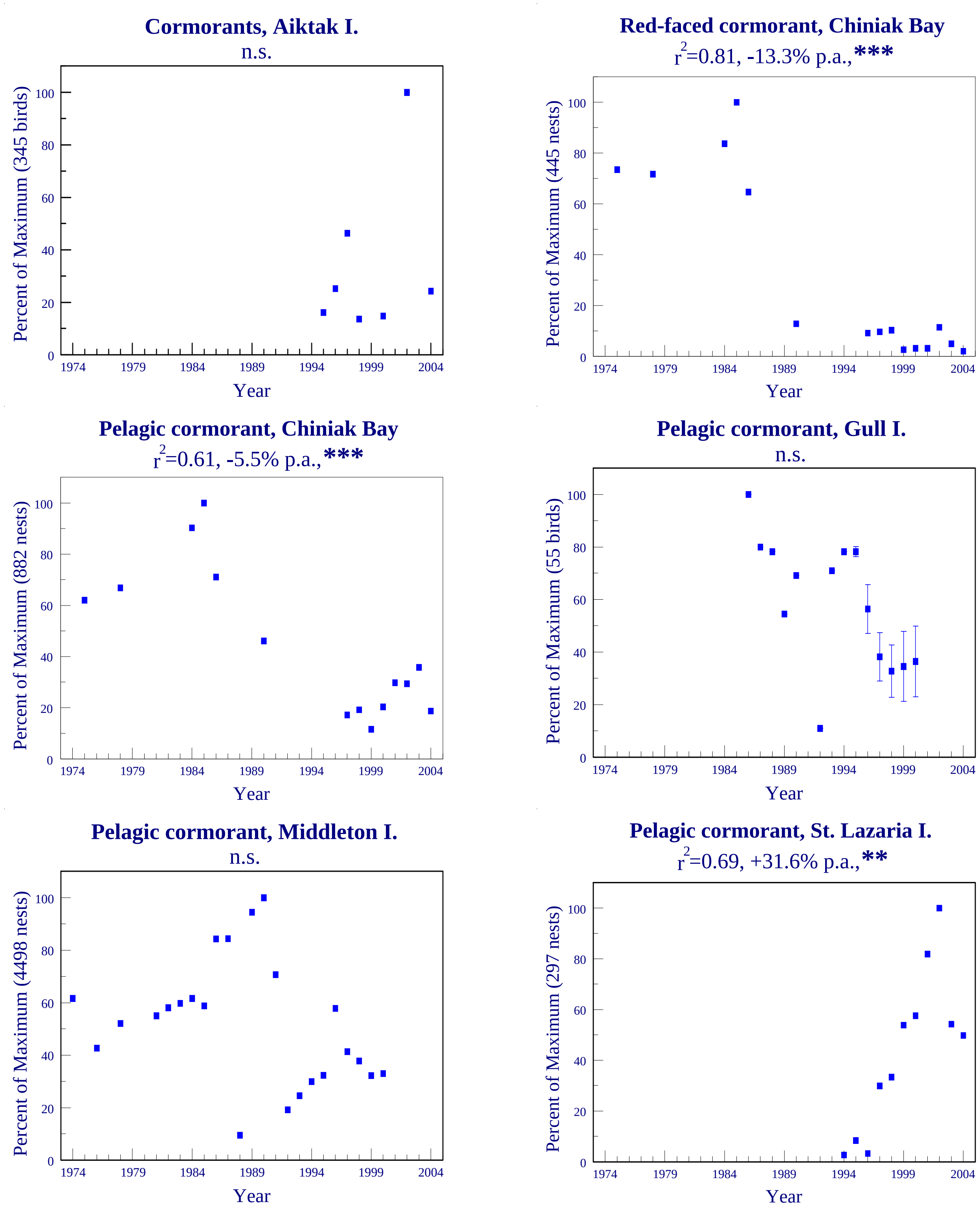


Figure 11 (continued). Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

Pelagic cormorant (*Phalacrocorax pelagicus*)

Breeding chronology.–Hatching dates for pelagic cormorants were about average at Cape Peirce in 2004 (Table 8).

Table 8. Hatching chronology of pelagic cormorants at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Cape Peirce	—	22 Jun (32)[a]	20 Jun[b] (12)[a]	R. MacDonald 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 below average at most sites monitored in 2004 (Table 9, Fig. 12). Success was about average at Cape Peirce and Buldir Island.

Table 9. Reproductive performance of pelagic cormorants at Alaskan sites monitored in 2004.

Site	Chicks Fledged/Nest	No. of Plots	Long-term Average	Reference
Bluff	2.46	N/A[a] (48)[b]	N/A	Murphy 2004
Cape Peirce	1.23	10 (48)	1.34 (18)[b]	R. MacDonald Unpubl. Data
Buldir I.	0.90	N/A (79)	1.03 (14)	Barrett et al. 2005
Ulak I.	1.30[c]	N/A (23)	1.77 (6)	Drummond and Kissler 2004
Kasatochi I.	0.06	N/A (18)	1.23 (8)	Drummond and Kissler 2004
Chiniak B.	0.03[c]	N/A (165)	0.48 (15)	Kildaw et al. 2004

[a]Not applicable or not reported.

[b]Sample size in parentheses represents the number of nests used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

[c]Value obtained from one time visit to colony.

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 remained relatively stable at most monitored sites (Fig. 11). We found a significant negative trend for pelagic cormorants at Chiniak Bay (-5.5% per annum) and an increase in pelagic cormorants at St. Lazaria Island (+31.6% per annum). Cormorants (species combined) showed no trends at most sites but declined at Shemya Island (-12.9% per annum) and exhibited a positive trend of +4.8% per annum at Kasatochi Island (Fig. 11).

Diet.–Pelagic cormorants from St. Lazaria Island predominately ate Pacific sand lance and sculpin, with lesser amounts of other fish species (Fig. 13).

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

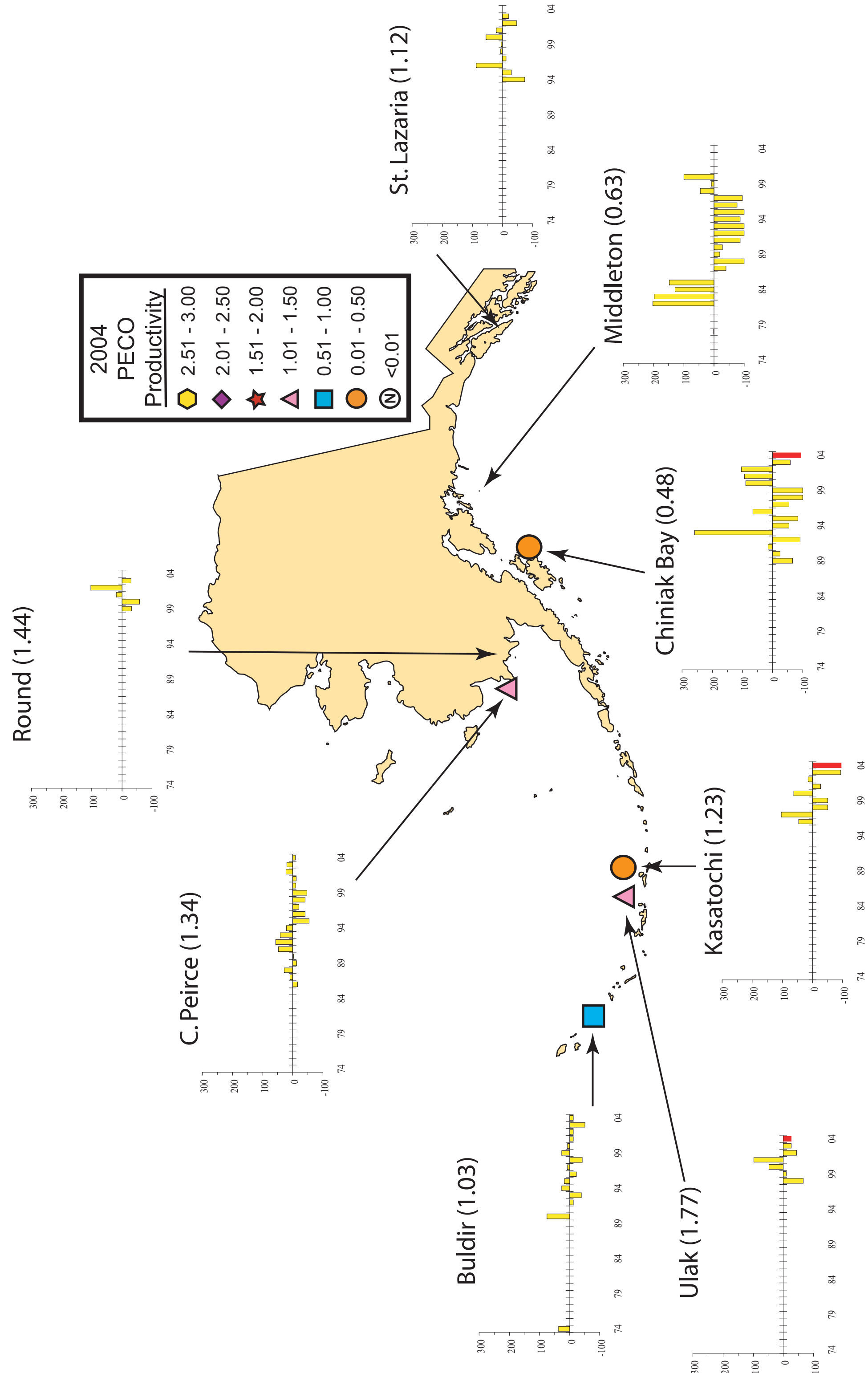


Figure 12. Productivity of pelagic cormorants (chicks fledged/nest) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

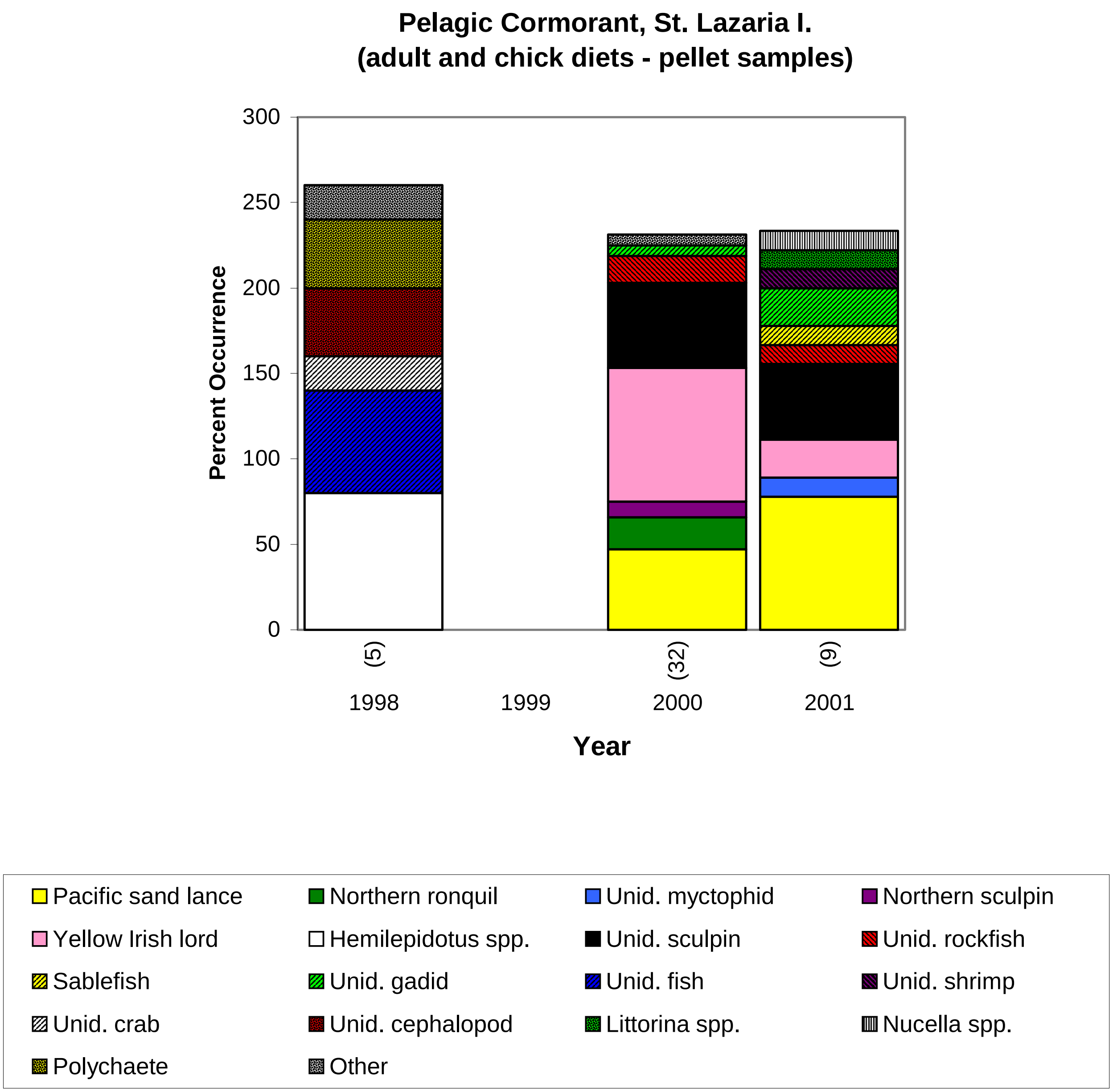


Figure 13. Diets of pelagic cormorants at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Glaucous-winged gull (*Larus glaucescens*)

Breeding chronology.–In 2004 glaucous-winged gull mean hatch date was about average at Aiktak Island (Table 10).

Table 10. Hatching chronology of glaucous-winged gulls at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	5 Jul (85)[a]	4 Jul (85)	8 Jul[b] (9)[a]	Helm and Zeman 2006

[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.–Glaucous-winged gull hatching success in 2004 ranged from 15 % at Chowiet Island to 67% at Aiktak Island (Table 11, Fig. 14). Success was average at Buldir and Aiktak islands, and below average at Chowiet Island in 2004.

Table 11. Reproductive performance of glaucous-winged gulls at Alaskan sites monitored in 2004.

Site	Hatching Success[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.33	N/A[b] (69)[c]	0.28 (11)[c]	Barrett et al. 2005
Aiktak I.	0.67	N/A (72)	0.80 (9)	Helm and Zeman 2006
Chowiet I.	0.15	3 (224)	0.47 (3)	Larned 2004

[a]Total chicks/Total eggs.
[b]Not applicable or not reported.
[c]Sample size in parentheses represents the number of eggs used to calculate hatching success and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–We found a significant negative trend at Buldir Island (-21.3% per annum, Fig. 15). No trends were evident at other monitored colonies.

Diet.–Glaucous-winged gulls from Buldir Island predominately ate sea urchins and avian prey, while gulls from Prince William Sound mostly ate herring, capelin and invertebrate prey at Eleanor Island, and invertebrates and salmon eggs at the Shoup Bay colony (Fig. 16). A small sample from St. Lazaria Island included *Mya* spp., sand lance and unidentified fish. Gull diet at Aiktak Island consisted primarily of fish in most years.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

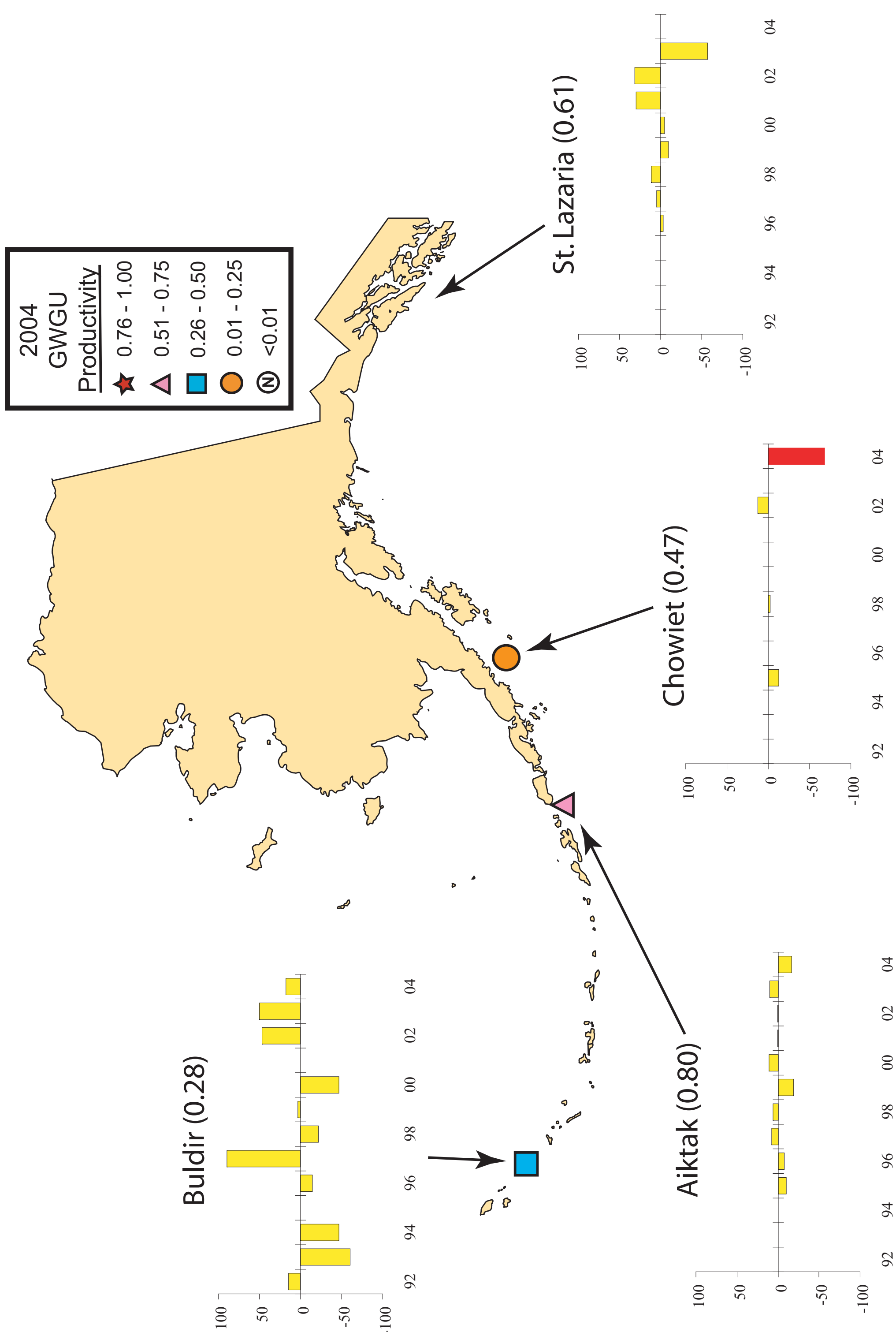


Figure 14. Productivity of glaucous-winged gulls (hatching success) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

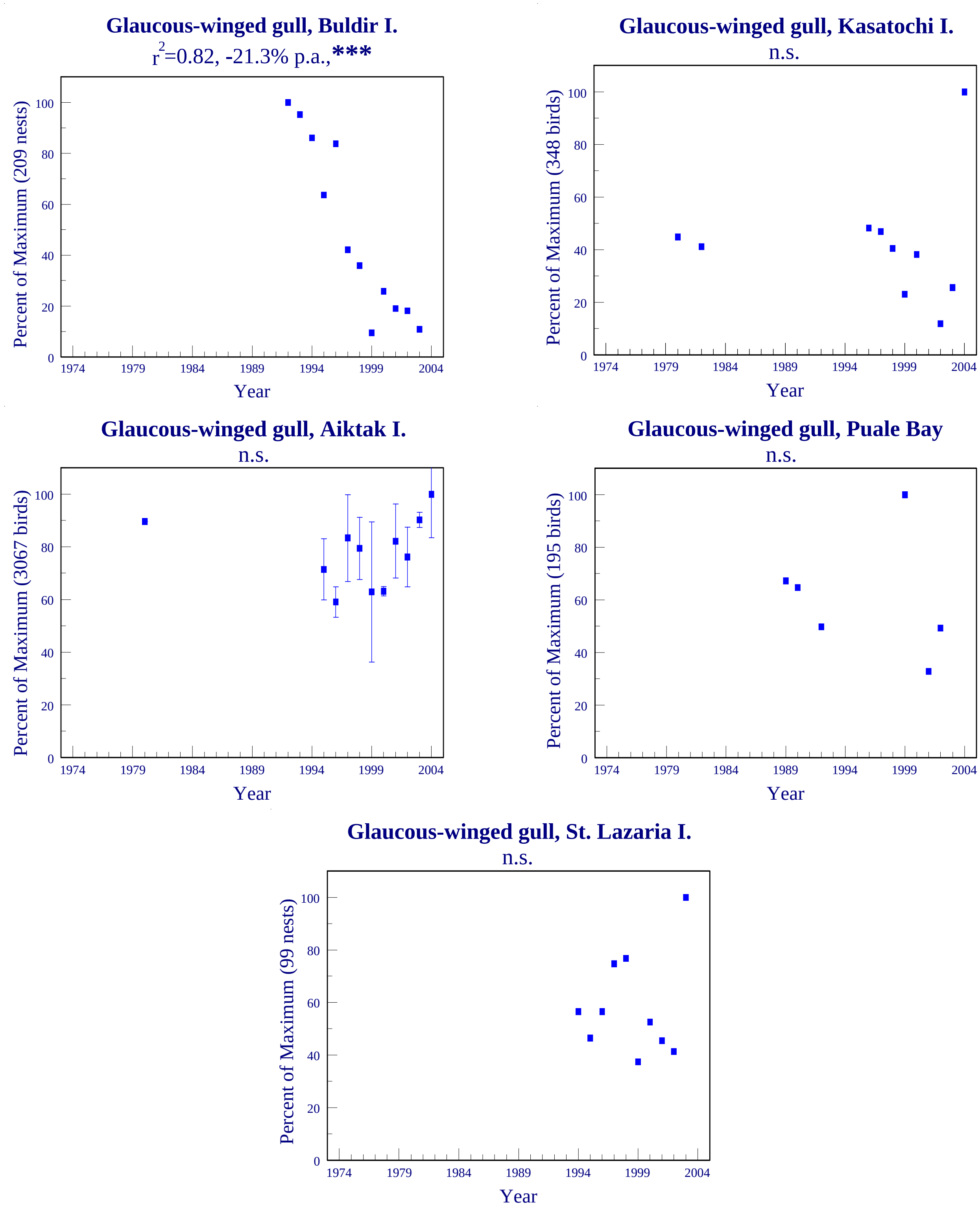


Figure 15. Trends in populations of glaucous-winged gulls at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

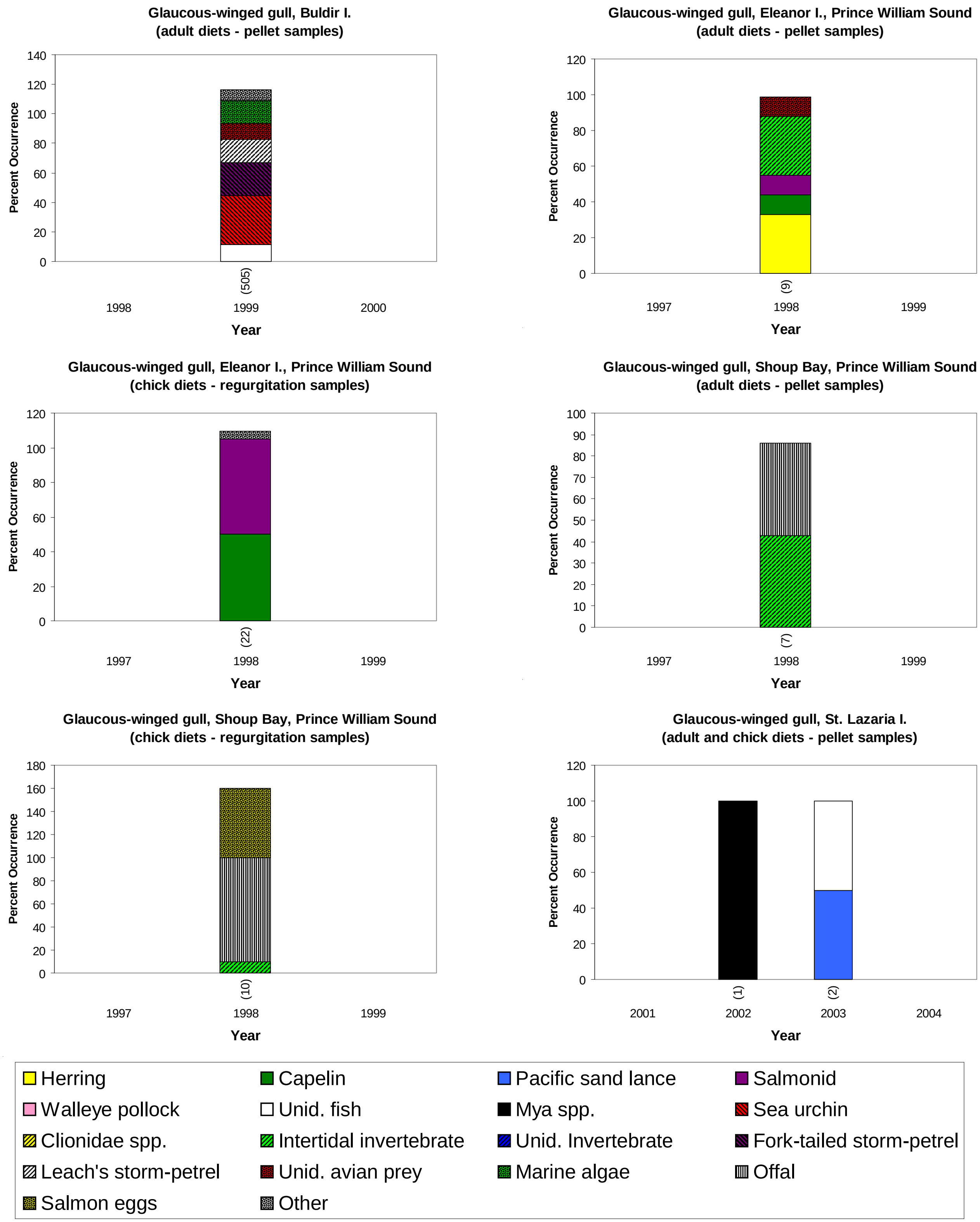
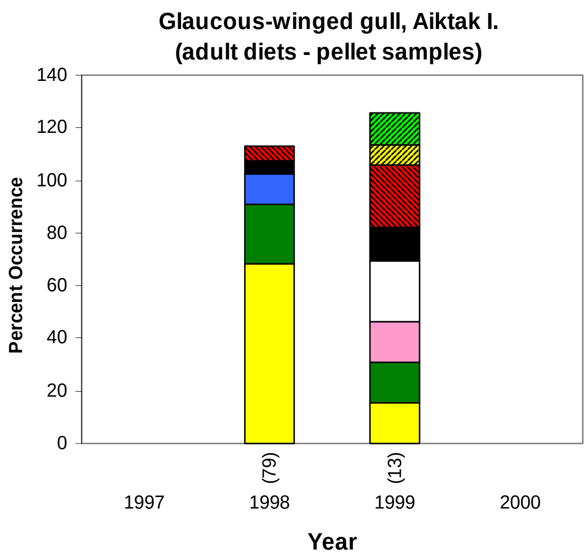
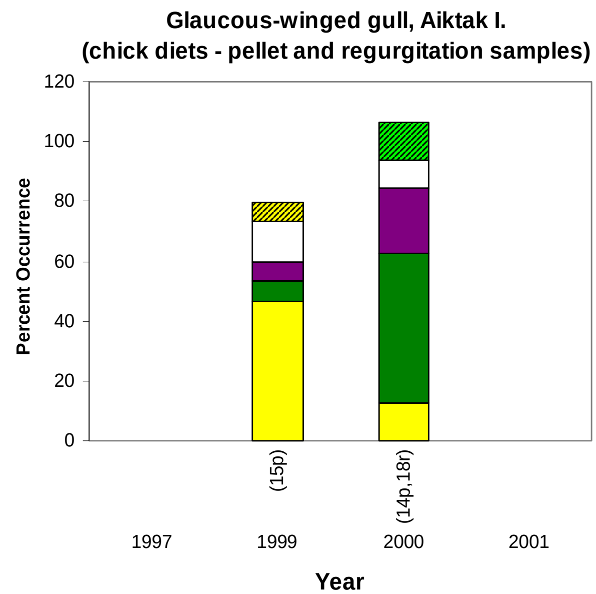


Figure 16. Diets of glaucous-winged gulls at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.





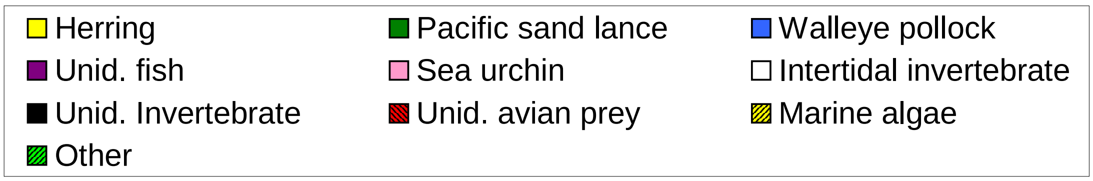


Figure 16 (continued). Diets of glaucous-winged gulls at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Black-legged kittiwake (*Rissa tridactyla*)

Breeding chronology.–In 2004, black-legged kittiwake hatching was early at seven of eight monitored sites, and was about average at E. Amatuli Island (Table 12, Fig. 17).

Table 12. Hatching chronology of black-legged kittiwakes at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Lawrence I.	11 Jul (161)[a]	—	19 Jul[b] (4)[a]	Sheffield et al. 2005
Bluff	—	15 Jul (N/A[c])	25 Jul[b] (25)	Murphy 2004
St. Paul I.	—	5 Jul (272)	21 Jul[b] (20)	S. Wright Unpubl. Data
St. George I.	—	7 Jul (41)	20 Jul[b] (20)	G. Levandoski Unpubl. Data
Cape Peirce	—	1 Jul (162)	10 Jul[b] (15)	R. MacDonald Unpubl. Data
Buldir I.	—	27 Jun (34)	6 Jul[b] (16)	Barrett et al. 2005
Chowiet I.	11 Jul (42)	13 Jul (42)	16 Jul[b] (10)	Larned 2004
E. Amatuli I.	13 Jul (22)	10 Jul (22)	12 Jul[b] (10)	A. Kettle, 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]Not applicable or not reported.

Productivity.–Productivity of black-legged kittiwakes in 2004 ranged from 0.01 chicks fledged per nest at Buldir Island and Chiniak Bay to 1.06 chicks fledged per nest at Bogoslof Island (Table 13). Productivity was average or above average at half of the monitored colonies in 2004. Success was below average at Cape Lisburne, Buldir, Koniuji, Chowiet and East Amatuli islands, and Chiniak Bay (Fig. 18).

Populations.–Significantly negative population trends occurred at St. Paul (-4.0% per annum), Chowiet (-1.8%), and Middleton (-7.5%) islands and at Cape Peirce (-6.3%, Fig. 19). Significant increases have occurred at Buldir Island (+6.6% per annum) and Prince William Sound (+1.6%). No other monitored colonies exhibited significant population changes.

Diet.–Black-legged kittiwakes from Cape Lisburne predominately ate small fish prey, including sand lance, sculpin, gadids and cod (Fig. 20). Diets from St. Paul Island included primarily myctophids, pollock, herring, squid and a variety of other small fish and invertebrates. Black-legged kittiwakes from St. George Island ate primarily myctophids, pollock, euphausiids and squid, with lesser amounts of other larval fish and small invertebrates. Chicks from Buldir Island ate predominately myctophids, greenling, euphausiids, amphipods and shrimp, with a variety of other larval fish and small invertebrates as lesser prey items. Diet samples from Koniuji Island included primarily myctophids with lesser occurrence of greenling and euphausiids. Bogoslof Island adults and chicks ate predominately myctophids along with lesser amounts of other larval fish and small crustaceans. Barren Island diet samples included capelin, smelt and sand lance for chicks and euphausiids, shrimp, amphipods and

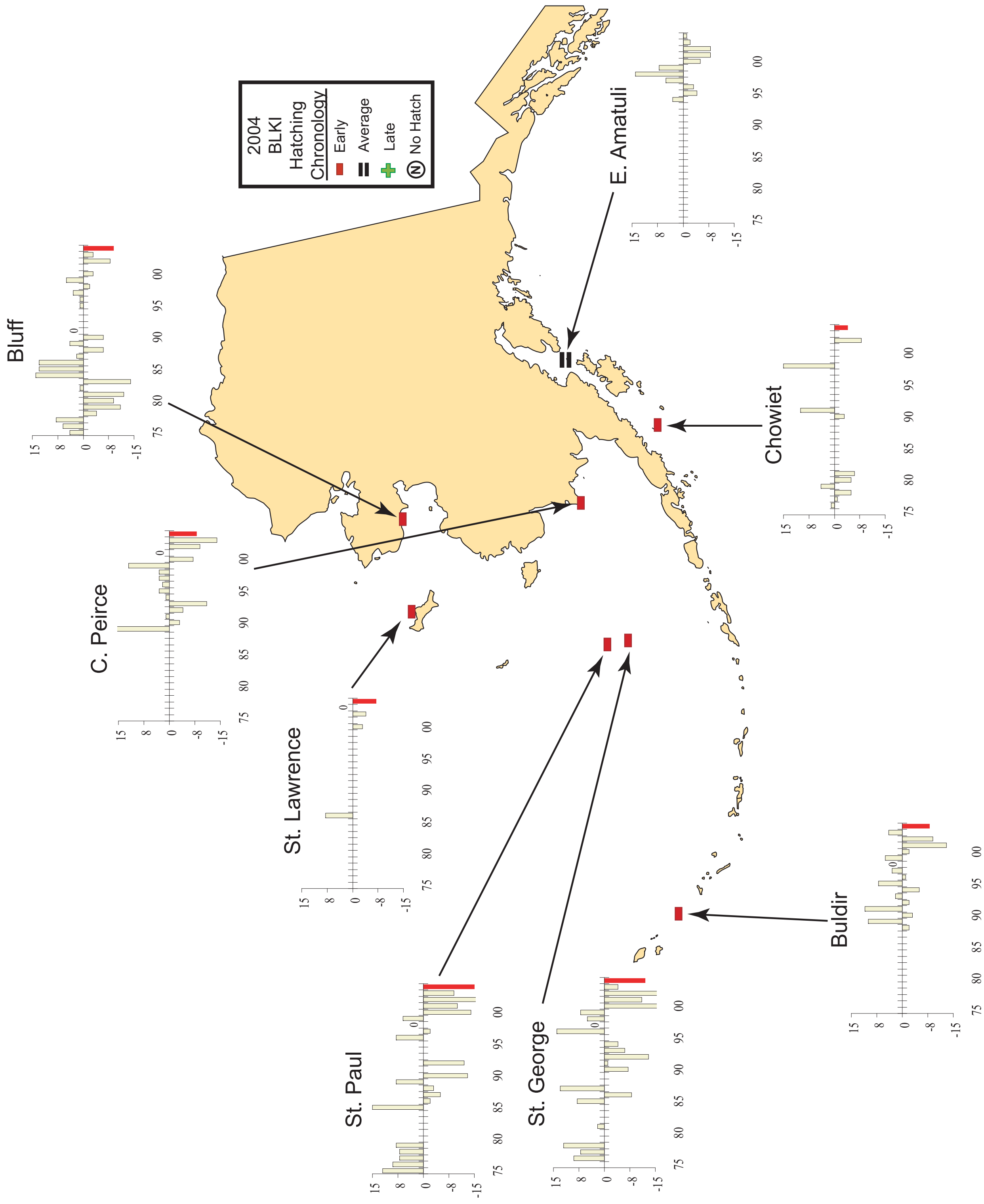


Figure 17. Hatching chronology of black-legged kittiwakes at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

copepods for a small sample of adults. Kittiwakes from the Semidi Islands and East Amatuli Island ate predominately capelin and sandlance. Shoup Bay kittiwakes ate primarily herring and sand lance.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

Table 13. Reproductive performance of black-legged kittiwakes at Alaskan sites monitored in 2004.

Site	Chicks Fledged[a]/Nest	No. of Plots	Long-term Average	Reference
C. Lisburne	0.42[b]	2 (90)[c]	0.75 (22)[c]	D. Roseneau Unpubl. Data
St. Lawrence I.	0.68	12 (146)	0.36 (4)	Sheffield et al. 2005
Bluff	0.85[b]	5 (200)	0.43 (25)	Murphy 2004
St. Paul I.	0.49	16 (425)	0.32 (24)	S. Wright Unpubl. Data
St. George I.	0.20	5 (158)	0.25 (28)	G. Levandoski Unpubl. Data
Cape Peirce	0.60	14 (242)	0.15 (21)	R. MacDonald Unpubl. Data
Buldir I.	0.01	5 (239)	0.15 (16)	Barrett et al. 2005
Koniuji I.	0.20[b]	6 (341)	0.47 (8)	Drummond and Kissler 2004
Bogoslof I.	1.06[b]	5 (340)	0.65 (7)	Byrd and Williams 2004
Chowiet I.	0.05	11 (252)	0.19 (13)	Larned 2004
Chiniak B.	0.01[b]	22 (8882)	0.28 (15)	Kildaw et al. 2004
E. Amatuli I.	0.10	10 (266)	0.42 (17)	A. Kettle Unpubl. Data

[a]Total chicks fledged/Total nests.

[b]Short visit.

[c]Sample size in parentheses represents the number of nests used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

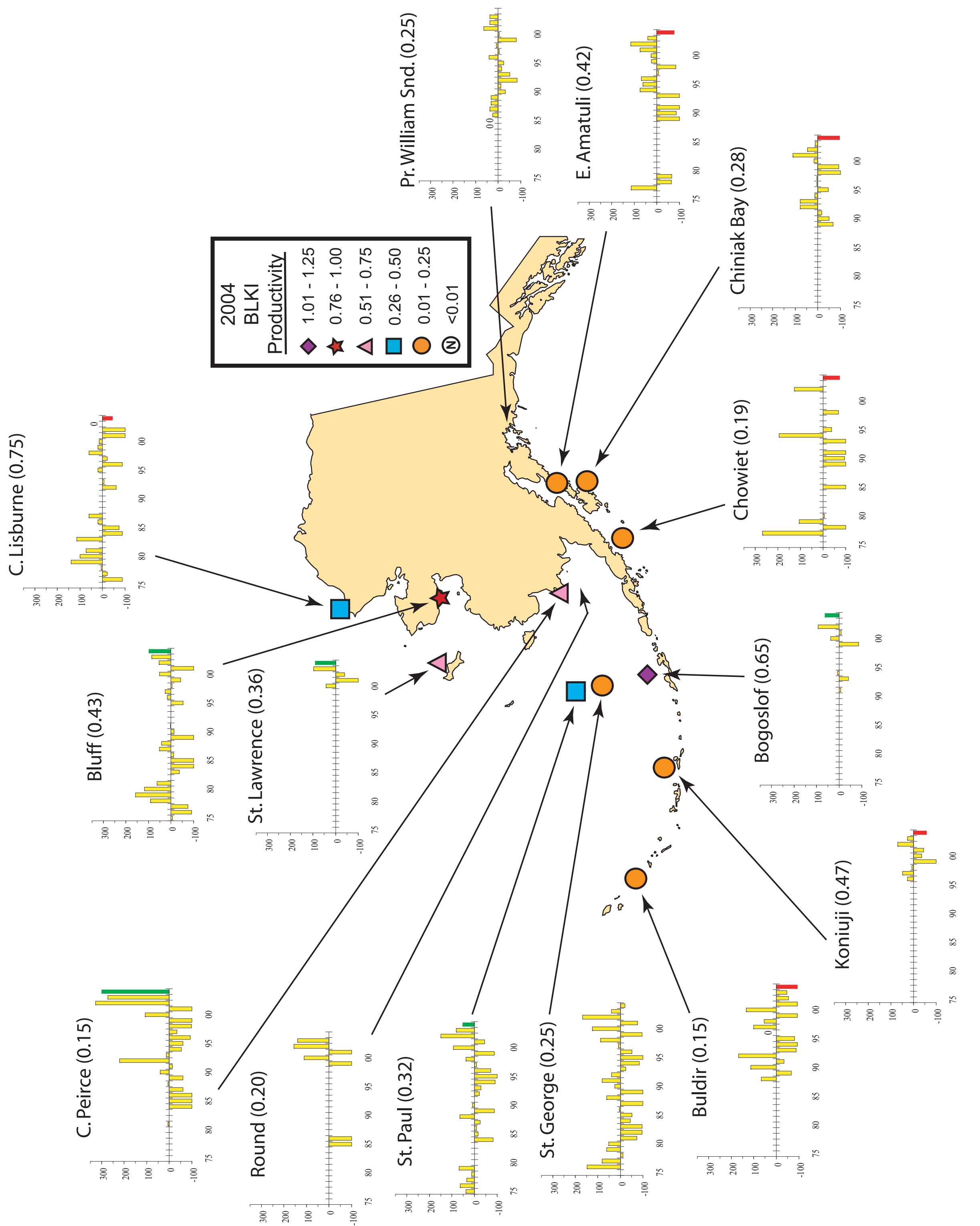


Figure 18. Productivity of black-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

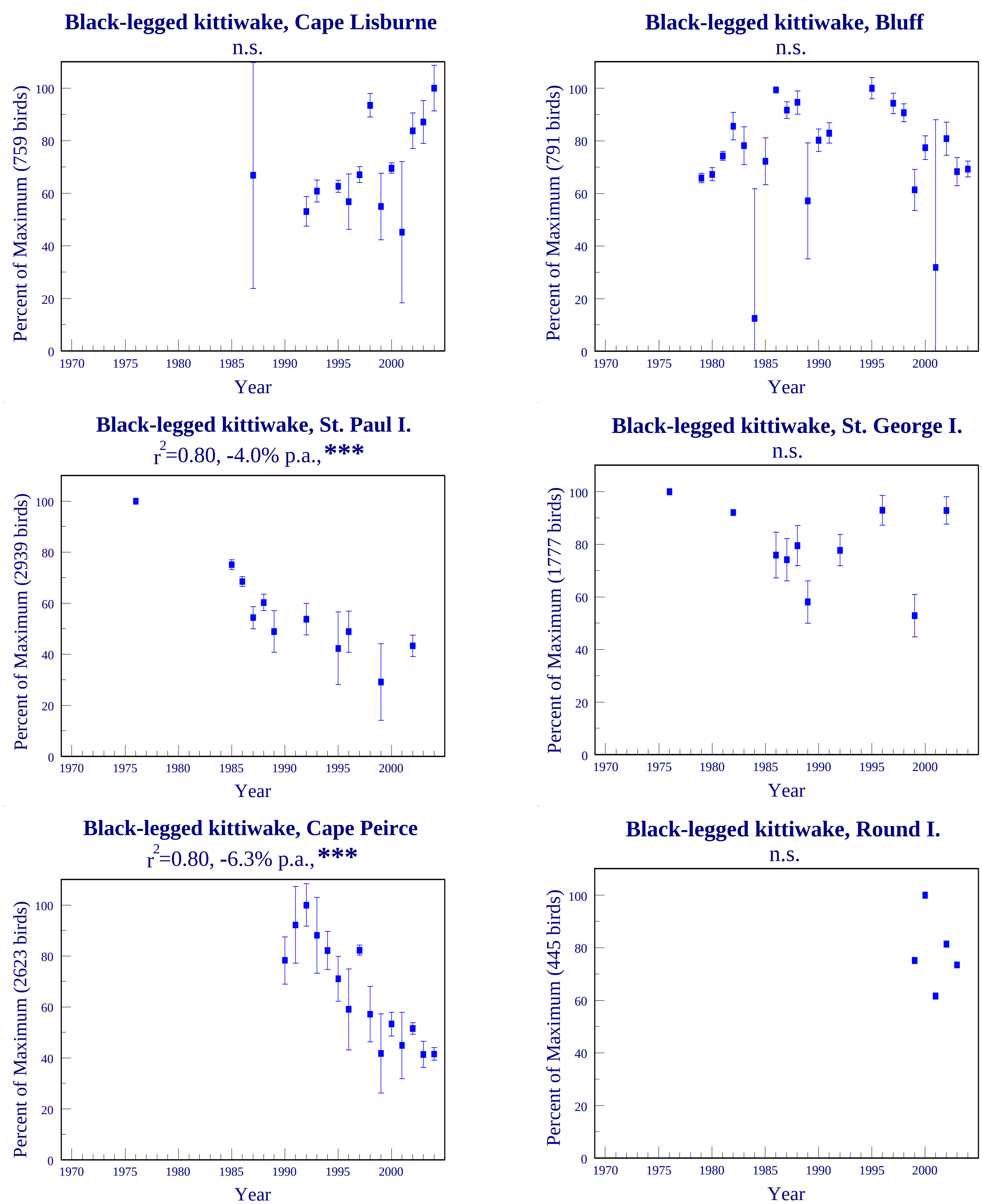


Figure 19. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

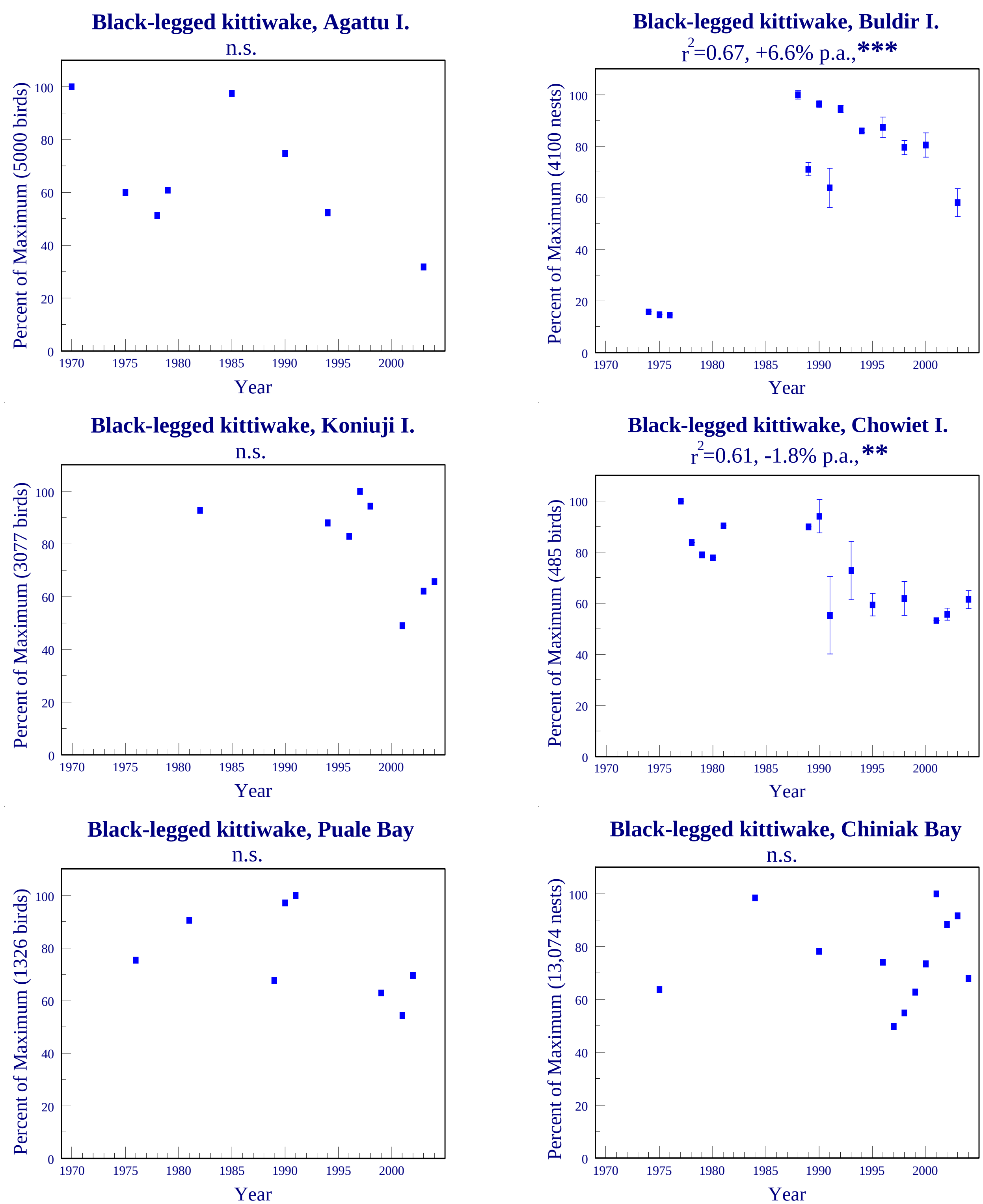


Figure 19 (continued). Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

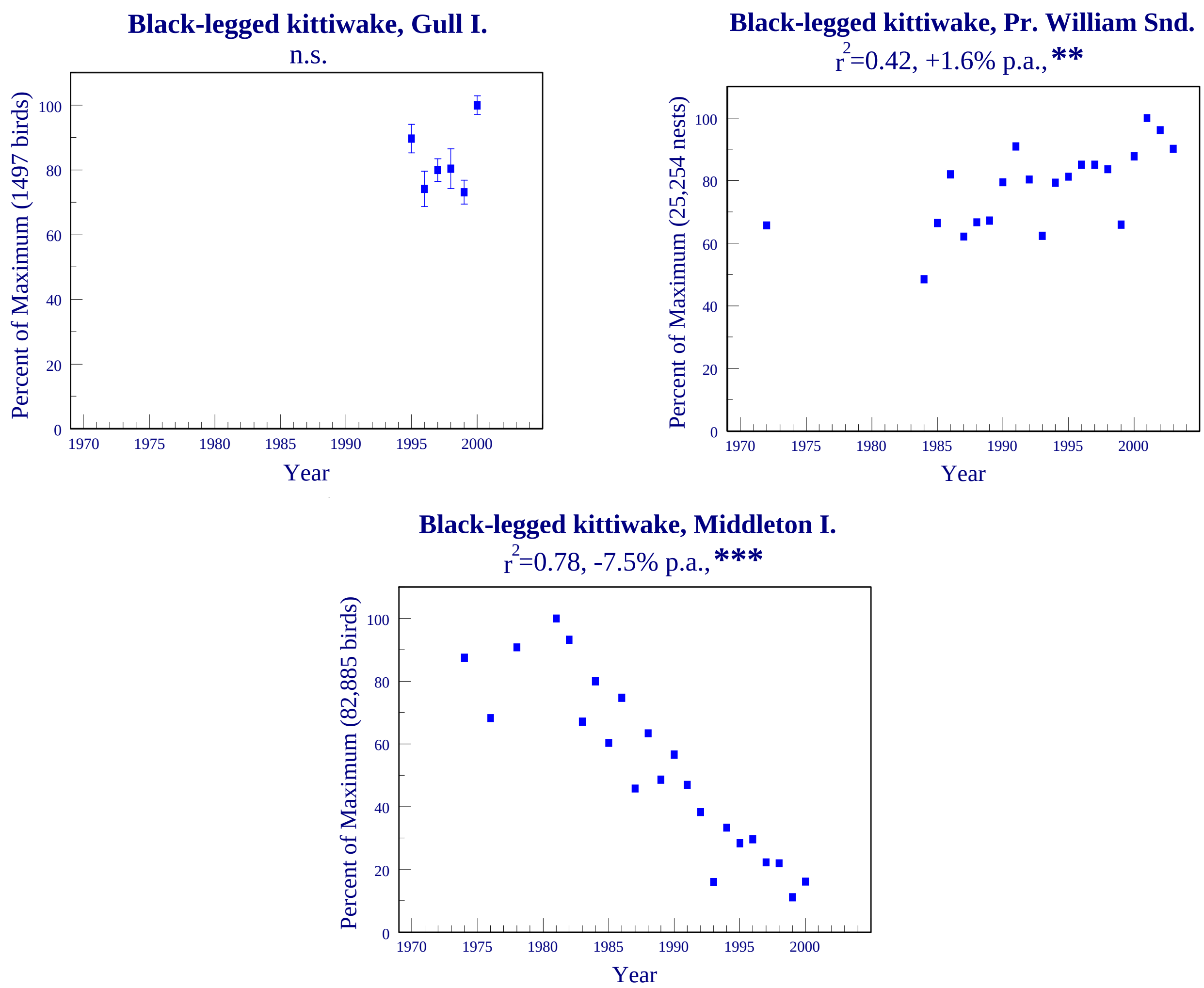


Figure 19 (continued). Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

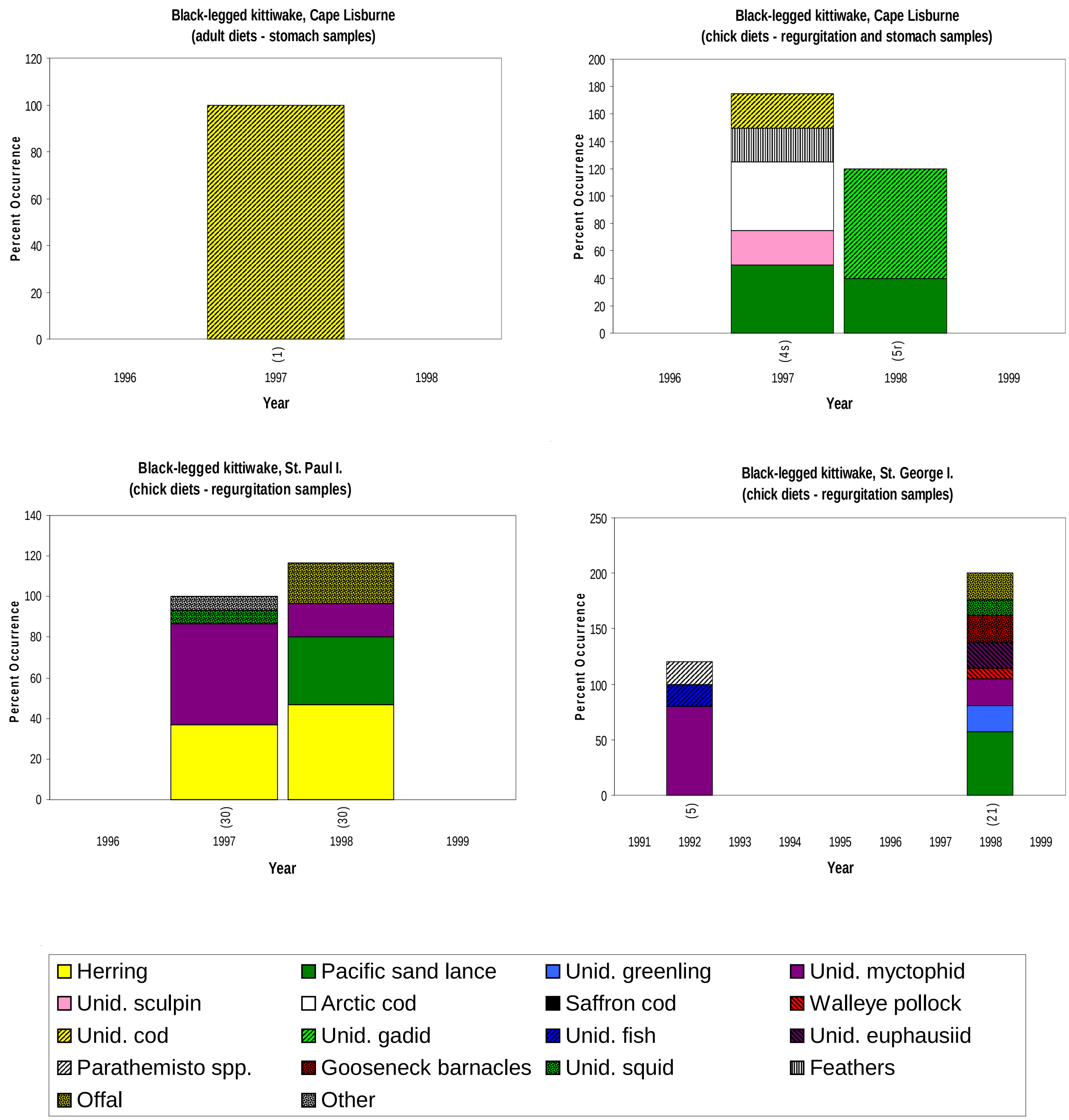


Figure 20. Diets of black-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

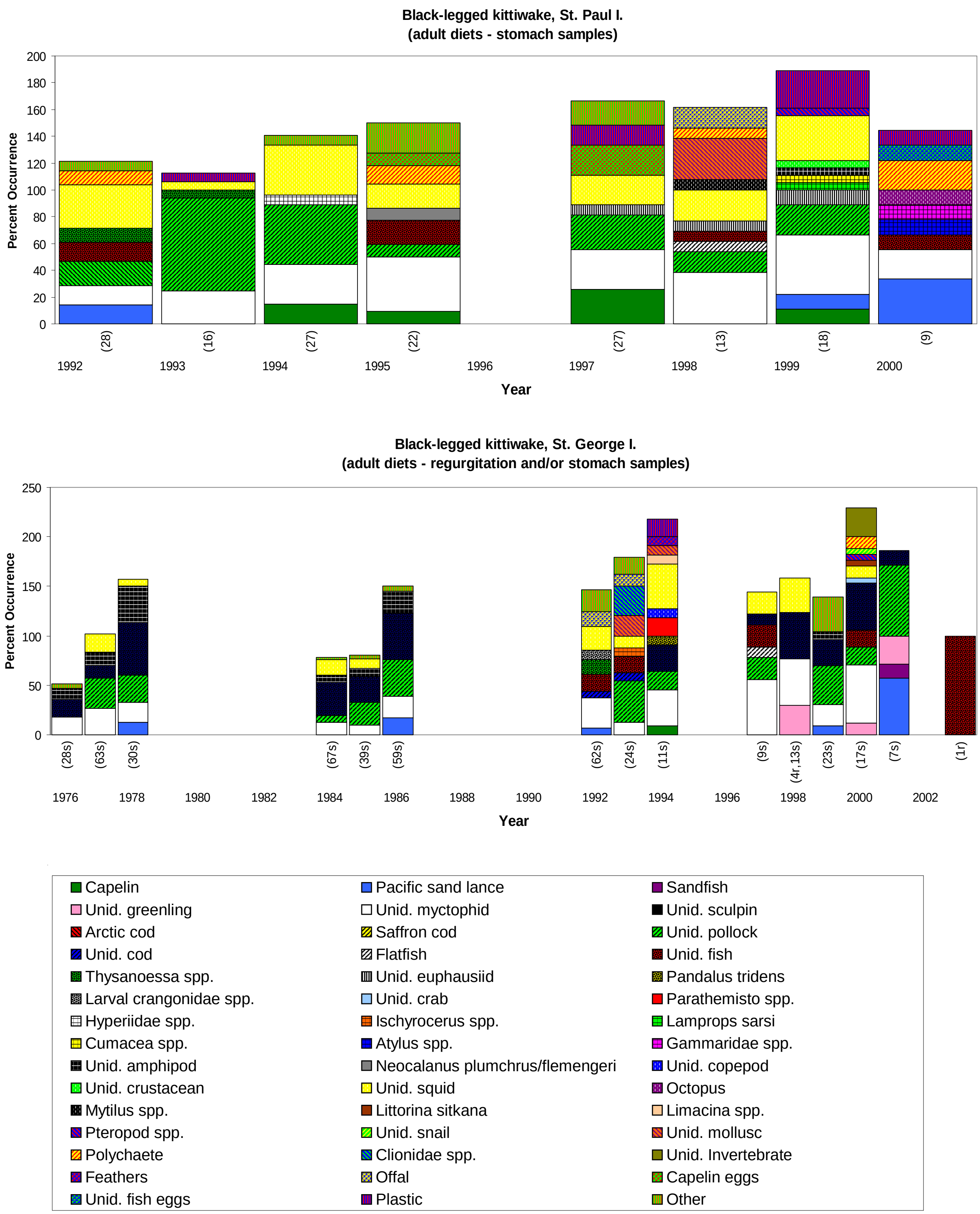


Figure 20 (continued). Diets of black-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

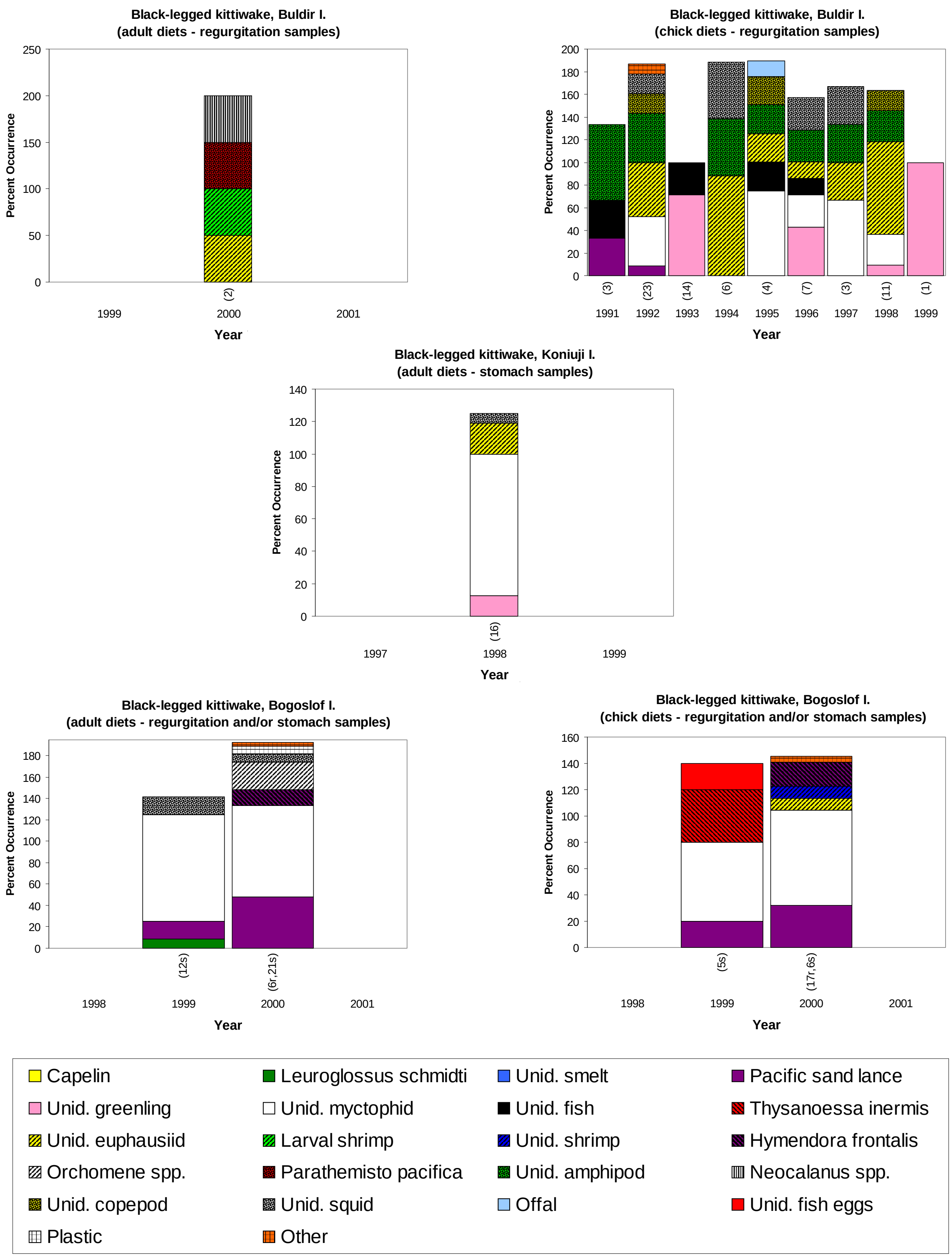


Figure 20 (continued). Diets of black-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

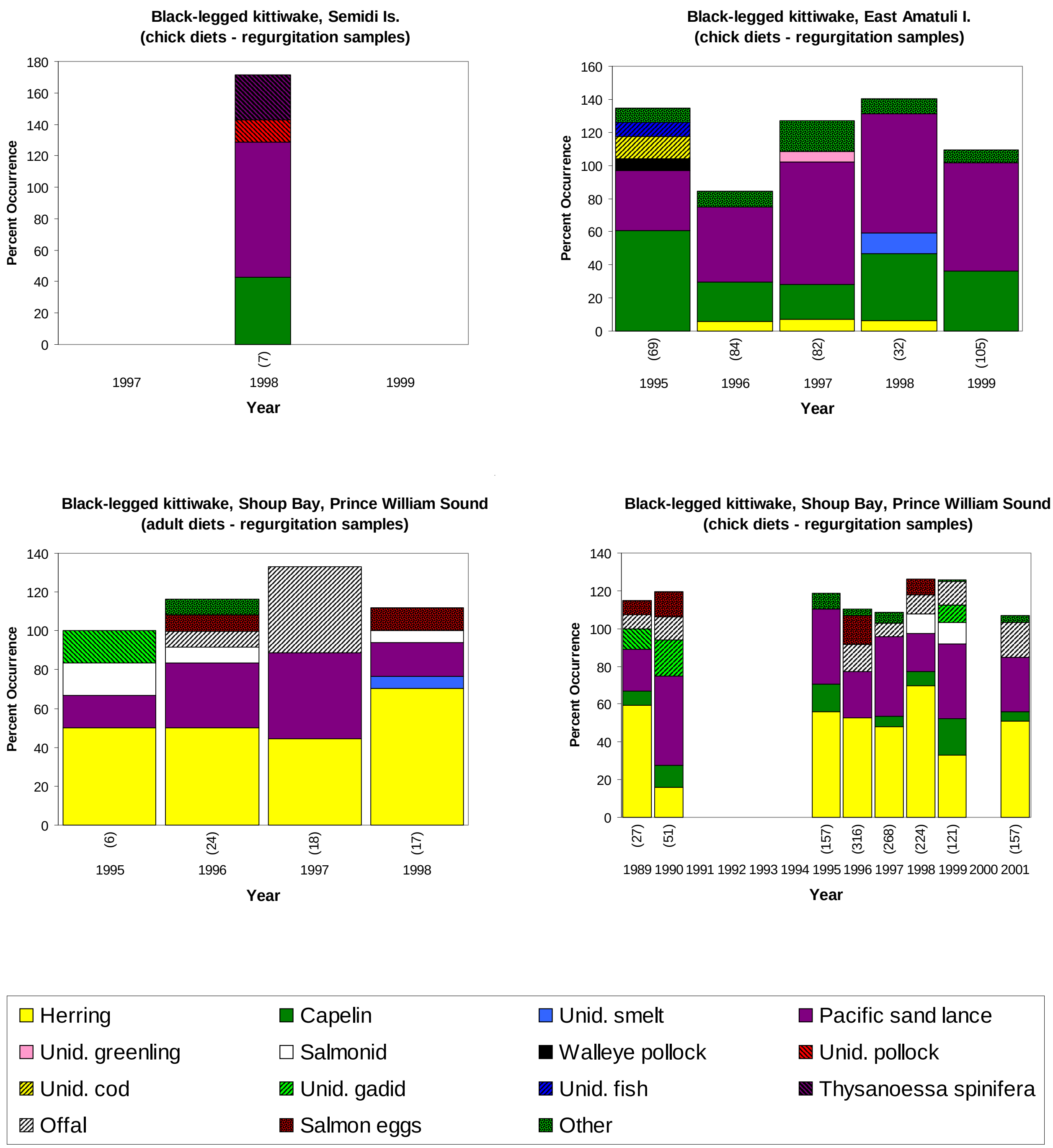


Figure 20 (continued). Diets of black-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Red-legged kittiwake (*Rissa brevirostris*)

Breeding chronology.–Hatch date was early at St. Paul and St. George islands, and about average at Buldir Island in 2004 (Table 14, Fig. 21).

Table 14. Hatching chronology of red-legged kittiwakes at Alaskan sites monitored in 2004.

Site	Mean	Long-term Average	Reference
St. Paul I.	10 Jul (20)[a]	23 Jul[b] (19)[a]	S. Wright Unpubl. Data
St. George I.	6 Jul (86)	19 Jul[b] (22)	G. Levandoski Unpubl. Data
Buldir I.	9 Jul (7)	10 Jul[b] (15)	Barrett et al. 2005

[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 2004, red-legged kittiwakes experienced about average productivity at St. George and St. Paul islands (Table 15, Fig. 22). Estimated productivity was below average at Buldir Island and above average at Bogoslof Island in 2004.

Table 15. Reproductive performance of red-legged kittiwakes at Alaskan sites monitored in 2004.

Site	Chicks Fledged[a]/Nest	No. of Plots	Long-term Average	Reference
St. Paul I.	0.25	4 (59)[b]	0.25 (24)[b]	S. Wright Unpubl. Data
St. George I.	0.25	9 (302)	0.26 (28)	G. Levandoski Unpubl. Data
Buldir I.	0.03	N/A[c] (80)	0.16 (16)	Barrett et al. 2005
Bogoslof I.	0.59	4 (34)	0.41 (7)	Byrd and Williams 2004

[a]Total chicks fledged/Total nests.
[b]Sample size in parentheses represents the number of nests used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[c]Not applicable or not reported.

Populations.–Red-legged kittiwakes declined significantly at St. Paul (-2.6% per annum) and Koniuji (-14.1%) islands . This species exhibited a positive population trend at Buldir Island (+3.2% per annum), and no trend at St. George Island (Fig. 23).

Diet.–Diets collected from St. Paul Island included pollock and other fish as well as squid and offal. Red-legged kittiwakes from St. George and Buldir islands primarily ate myctophids with lesser amounts of other small fish and invertebrates (Fig. 24). Diets from Bogoslof Island also were dominated by myctophids.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

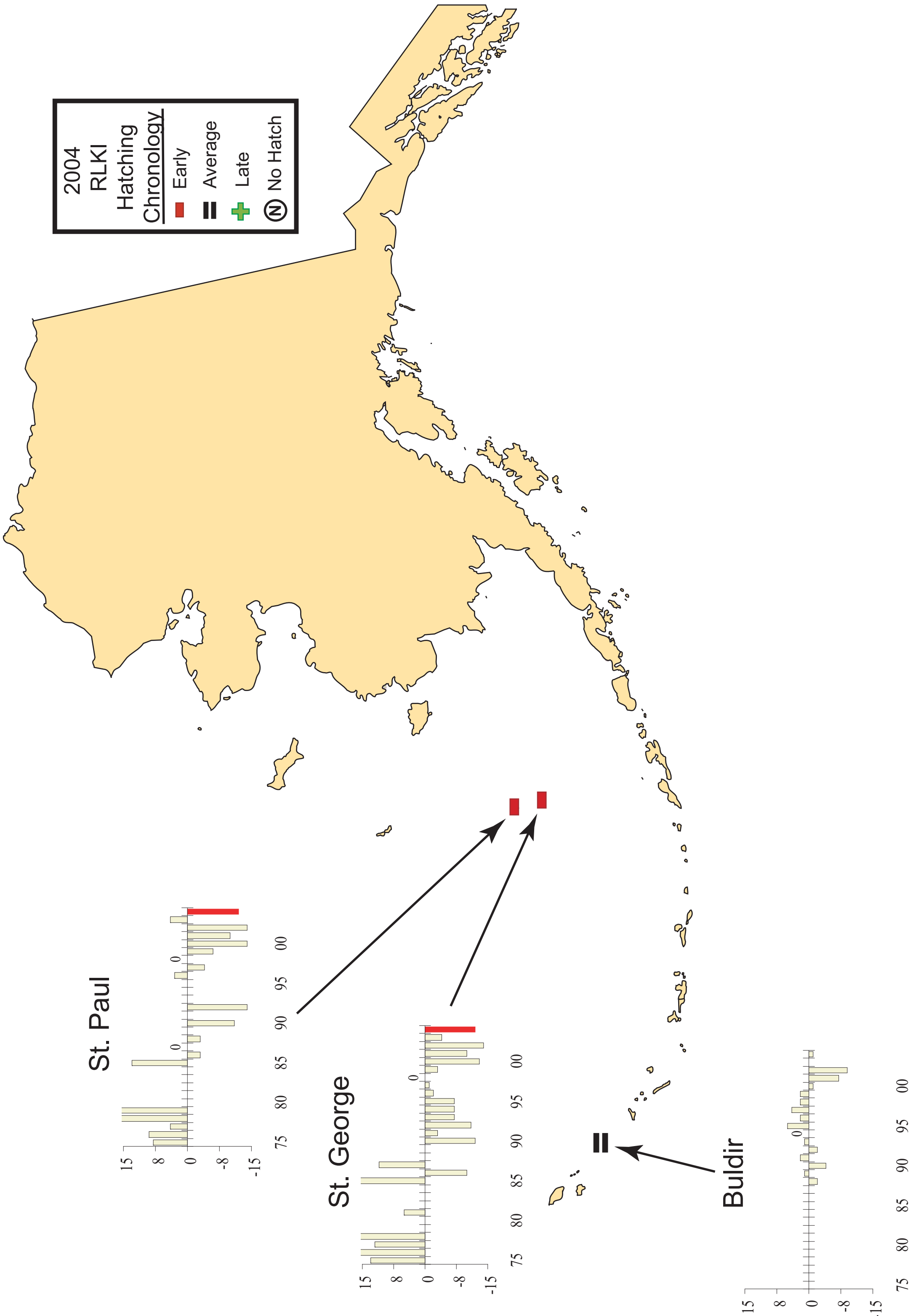


Figure 21. Hatching chronology of red-legged kittiwakes at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

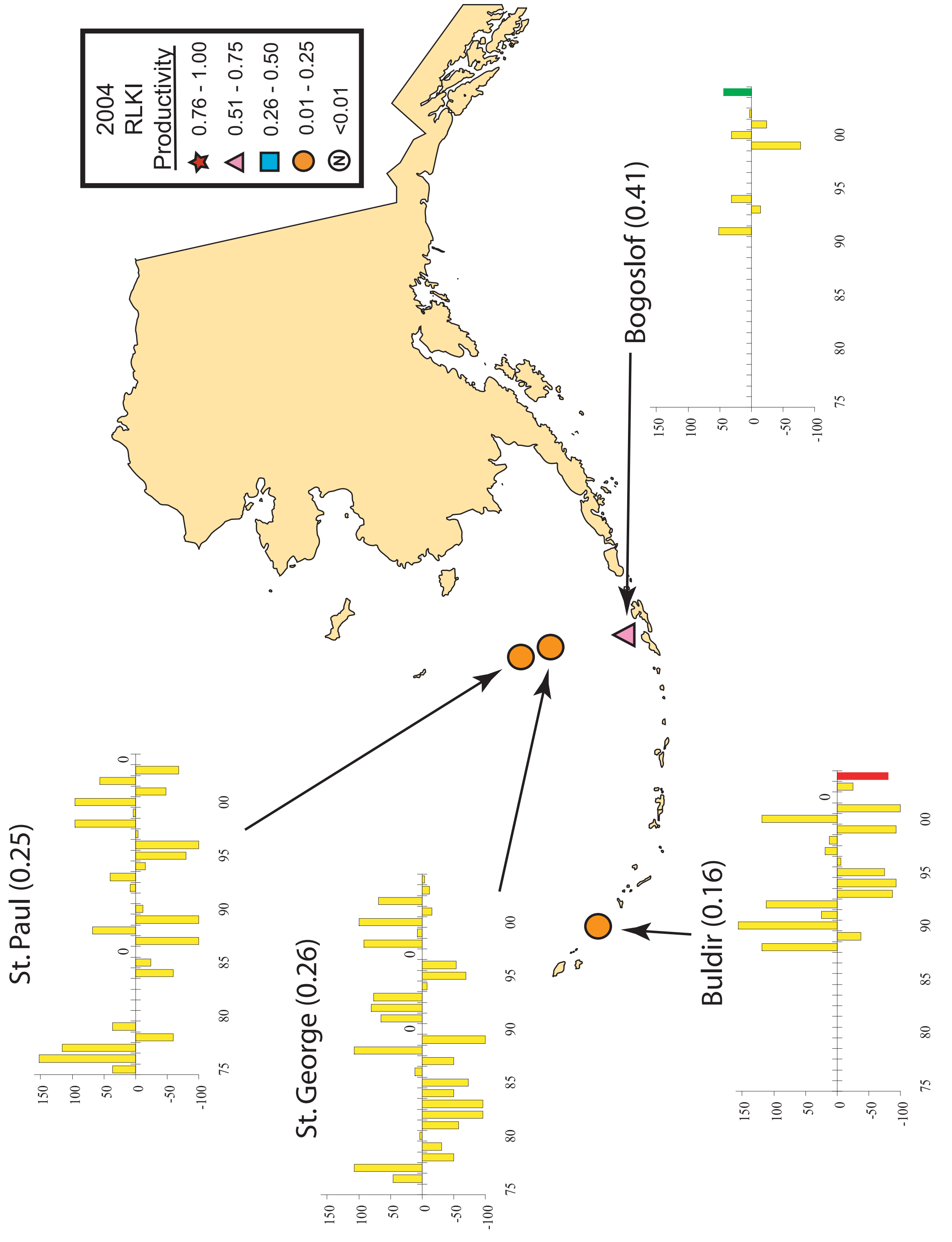


Figure 22. Productivity of red-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

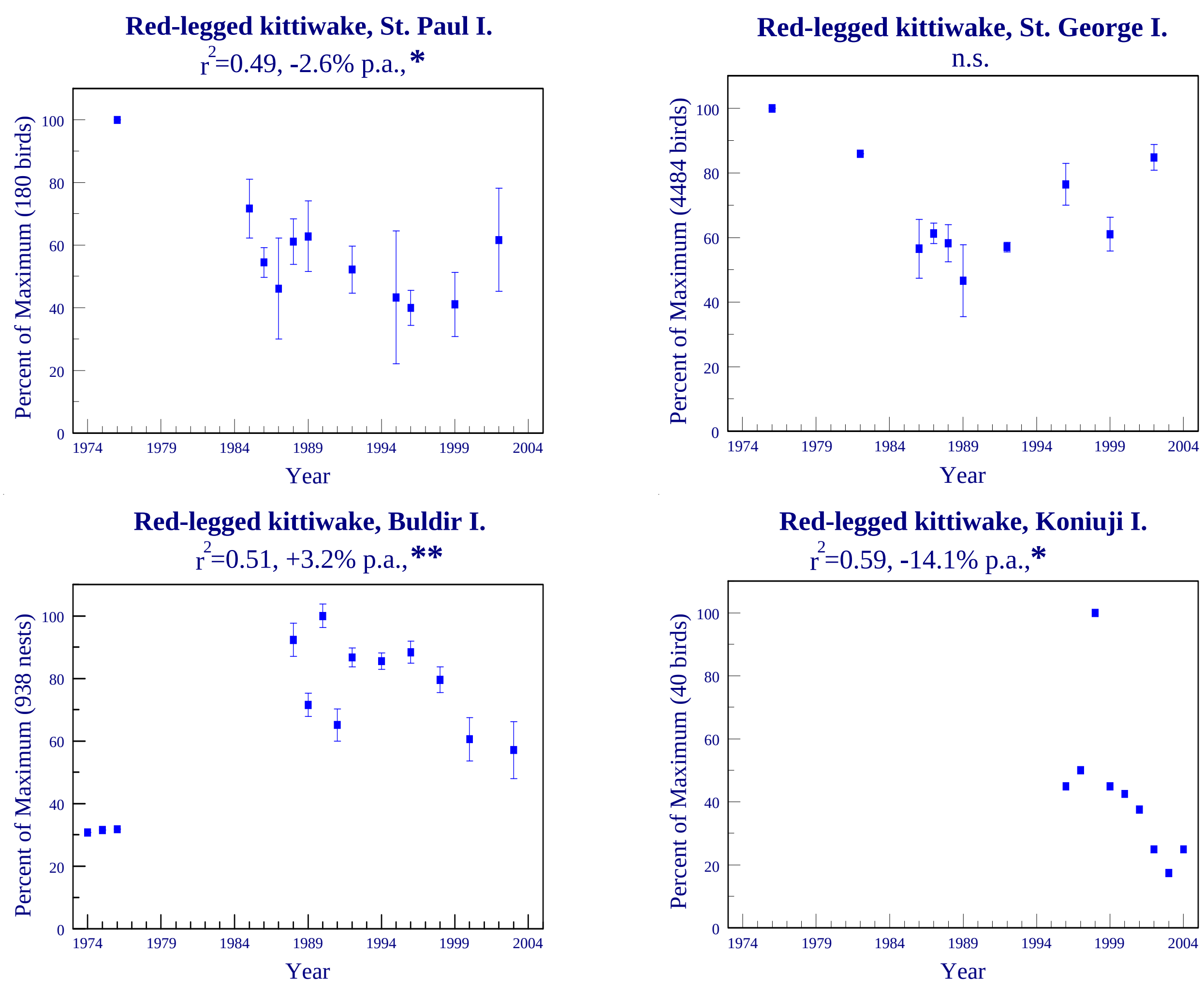


Figure 23. Trends in populations of red-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

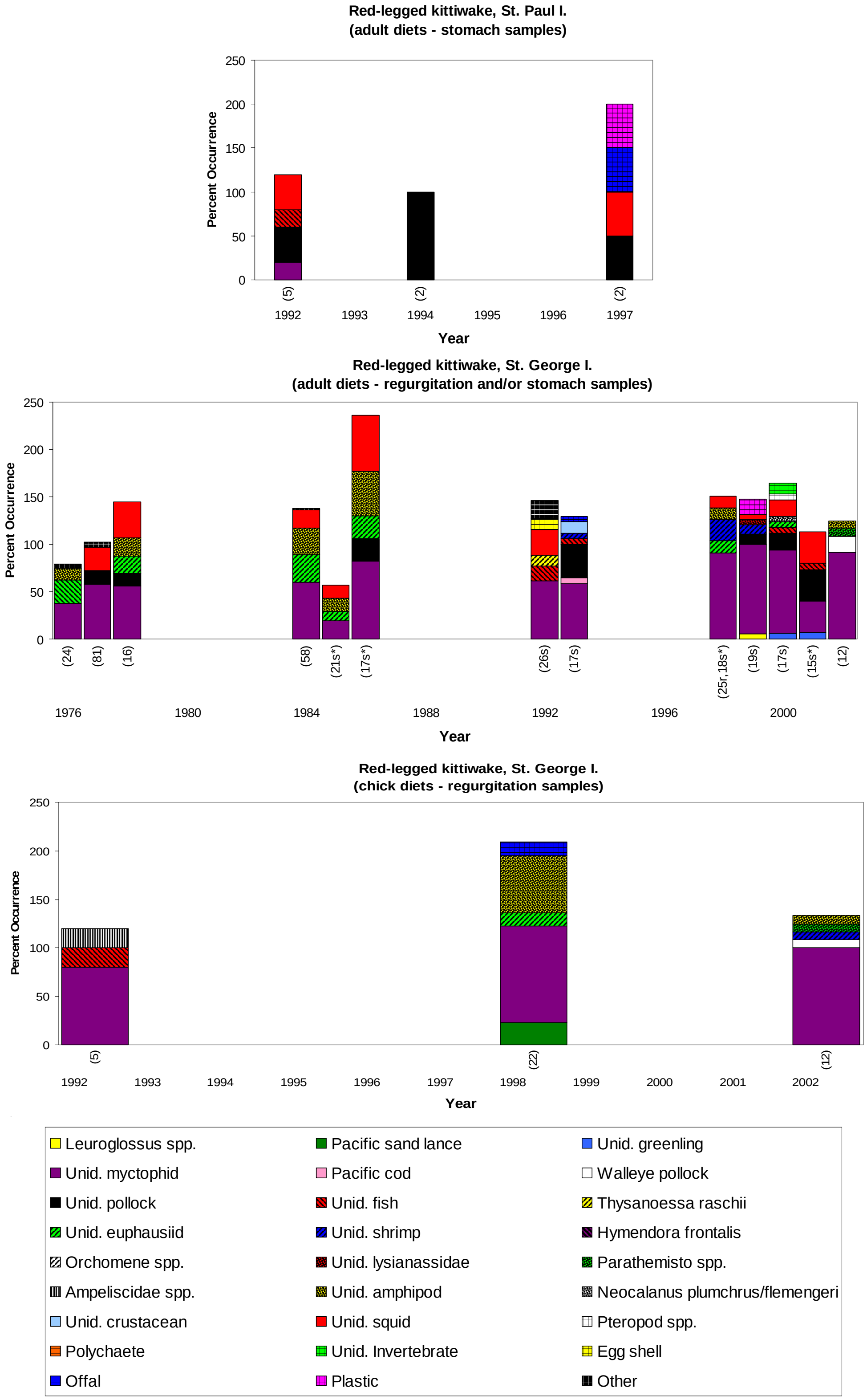


Figure 24. Diets of red-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

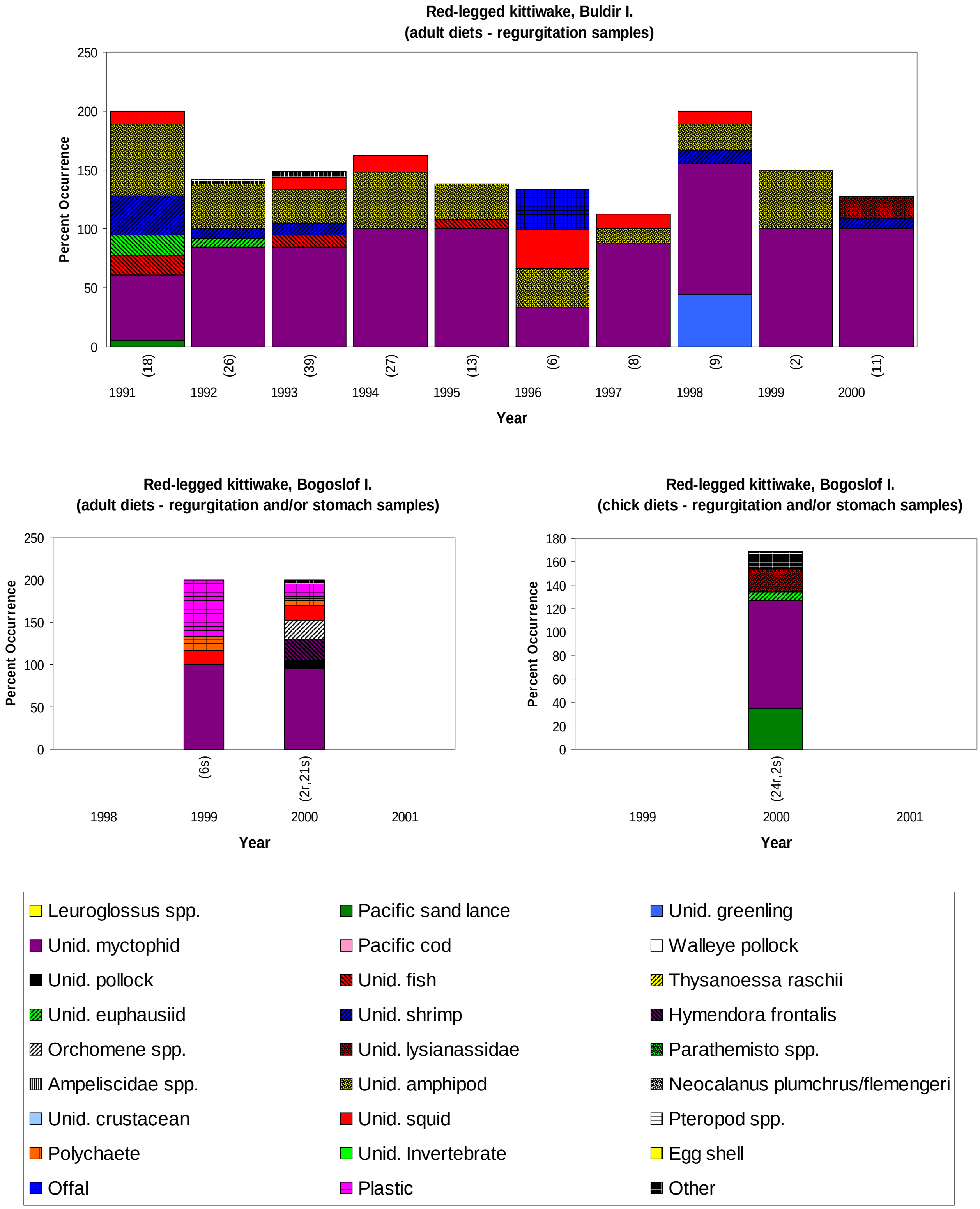


Figure 24 (continued). Diets of red-legged kittiwakes at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Common murre (*Uria aalge*)

Breeding chronology.–Timing of common murre nesting events in 2004 was earlier than average at St. Lawrence Island, Bluff and Cape Peirce, later than average at the Pribilofs and East Amatuli Island, and about average at Buldir and Chowiet islands. No eggs were laid by this species at Aiktak Island in 2004 (Table 16, Fig. 25).

Table 16. Hatching chronology of common murres at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Lawrence I.	21 Jul (25)[a]	—	31 Jul[b] (5)[a]	Sheffield et al. 2005
Bluff	19 Jul (N/A[c])	—	27 Jul[b] (27)	Murphy 2004
St. Paul I.	—	10 Aug (40)	5 Aug[d] (19)	S. Wright Unpubl. Data
St. George I.	—	10 Aug (41)	4 Aug[d] (20)	G. Levandoski Unpubl. Data
Cape Peirce	—	11 Jul (83)	22 Jul[d] (15)	R. MacDonald Unpubl. Data
Buldir I.	13 Jul (6)	15 Jul (6)	19 Jul[d] (7)	Barrett et al. 2005
Chowiet I.	18 Jul (118)	19 Jul (118)	23 Jul[d] (9)	Larned 2004
E. Amatuli I.	12 Aug (183)	12 Aug (183)	7 Aug[d] (11)	A. Kettle 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 medians.
[c]Not applicable or not reported.
[d]Mean of annual means.

Productivity.–Common murre productivity was average or above average at all but one of the sites monitored in 2004, the exception being Aiktak Island where success was below average and murres did not attend the cliffs (Table 17, Fig. 26). The former murre colony at Kasatochi Island is no longer viable and has been dropped from consideration.

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 often are combined at these colonies for population trend analysis. We found significant negative trends in common murre numbers at St. Paul Island and Cape Peirce (-3.6% and -4.2% per annum, respectively). We found a positive trend for this species at Gull Island (+7.1% per annum, Fig. 27). Where murres were not identified to species, we found significant negative trends at Aiktak, Middleton and St. Lazaria islands (-6.4%, -4.9% and -3.2 % per annum, respectively). Significant positive trends were evident for murres at Cape Lisburne (+4.4% per annum), and Agattu, Koniuji and Chowiet islands (+2.7%, +10.6% and +1.0% per annum, respectively, Fig. 27).

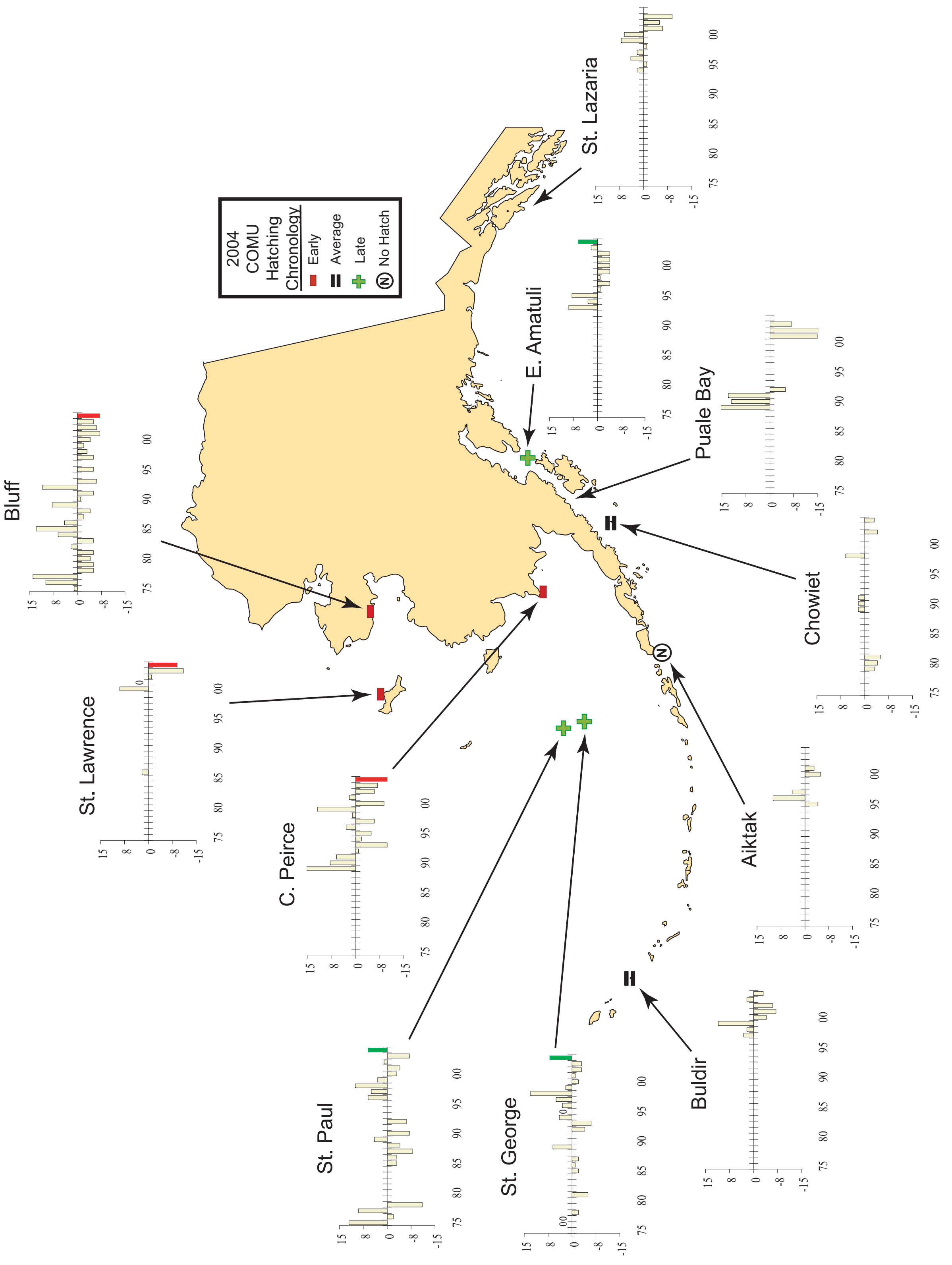


Figure 25. Hatching chronology of common murres at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

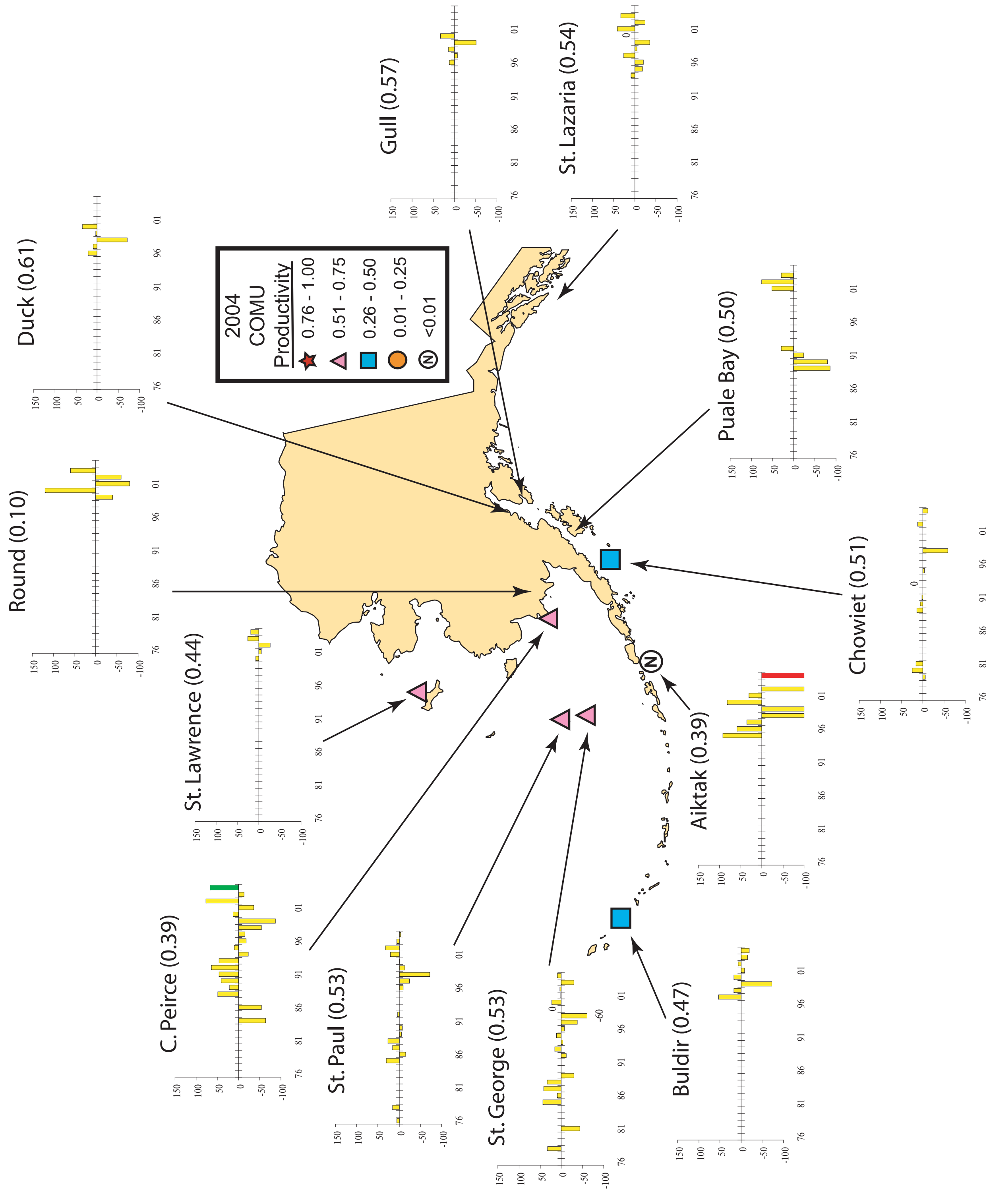


Figure 26. Productivity of common murres (chicks fledged/nest site) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

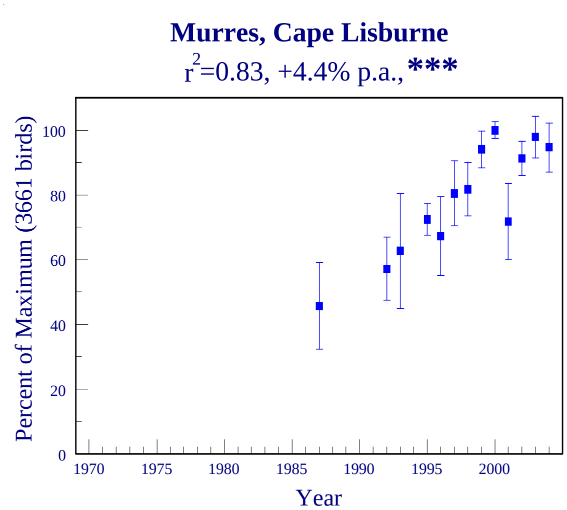
Table 17. Reproductive performance of common murres at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Lawrence I.	0.52	6 (42)[b]	0.44 (4)[b]	Sheffield et al. 2005
St. Paul I.	0.51	6 (119)	0.53 (17)	S. Wright Unpubl. Data
St. George I.	0.58	6 (126)	0.53 (19)	G. Levandoski Unpubl. Data
Cape Peirce	0.65	9 (113)	0.39 (18)	R. MacDonald Unpubl. Data
Buldir I.	0.38	N/A[c] (16)	0.47 (7)	Barrett et al. 2005
Aiktak I.	0.00	N/A	0.39 (8)	J. Williams Unpubl. Data
Chowiet I.	0.45	10 (291)	0.51 (10)	Larned 2004

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[c]Not applicable or not reported.

Diet.–Diets collected from Cape Lisburne included a variety of small fish (Fig. 28). Common murres at St. George Island ate predominately pollock and other small fish. Diets from Chowiet Island consisted primarily of capelin, sand lance and pollock. Murres from the Barren Islands ate predominately capelin (Fig. 28). Samples from Buldir and Koniuji Islands contained primarily squid, pollock and herring. Bogoslof Island diets consisted primarily of polychaetes, sand lance and other fish. Common murres from Aiktak Island ate predominately sand lance and pollock.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.



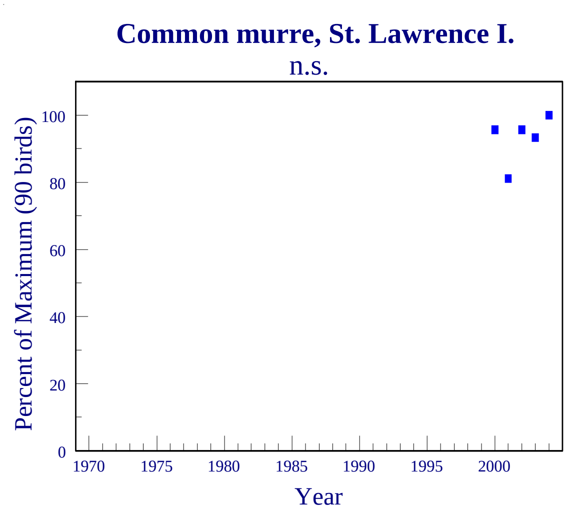


Figure 27. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

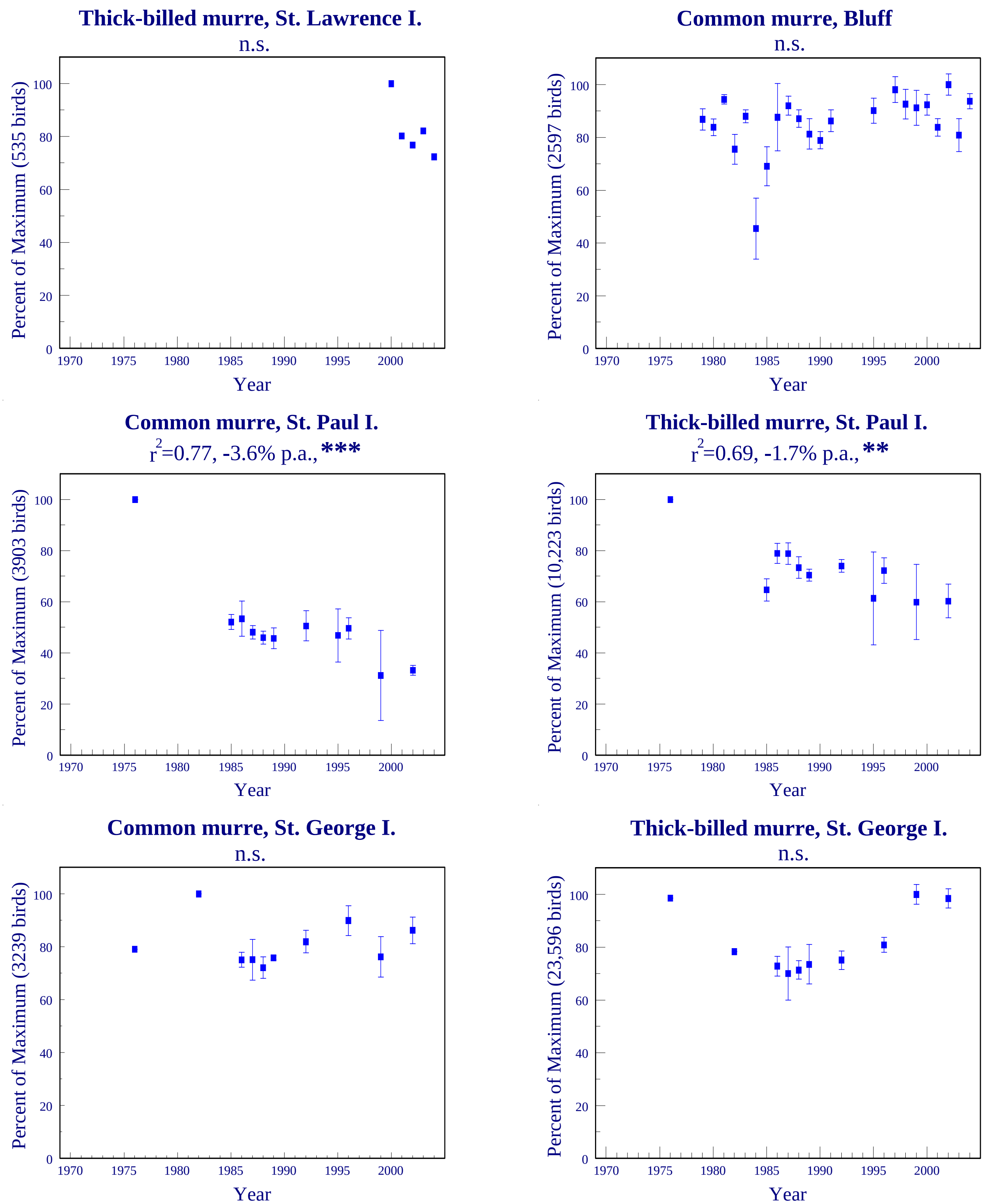


Figure 27 (continued). Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

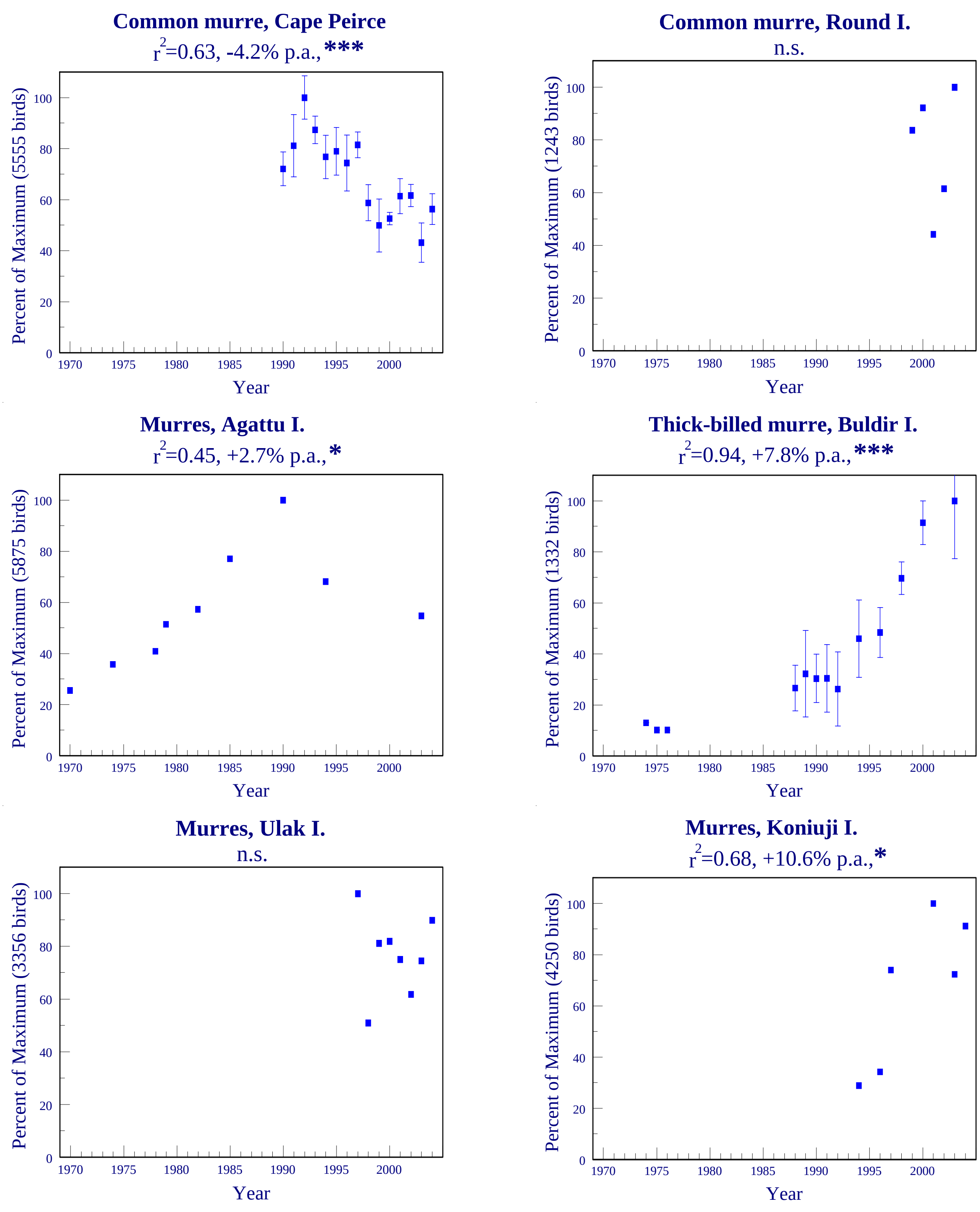


Figure 27 (continued). Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

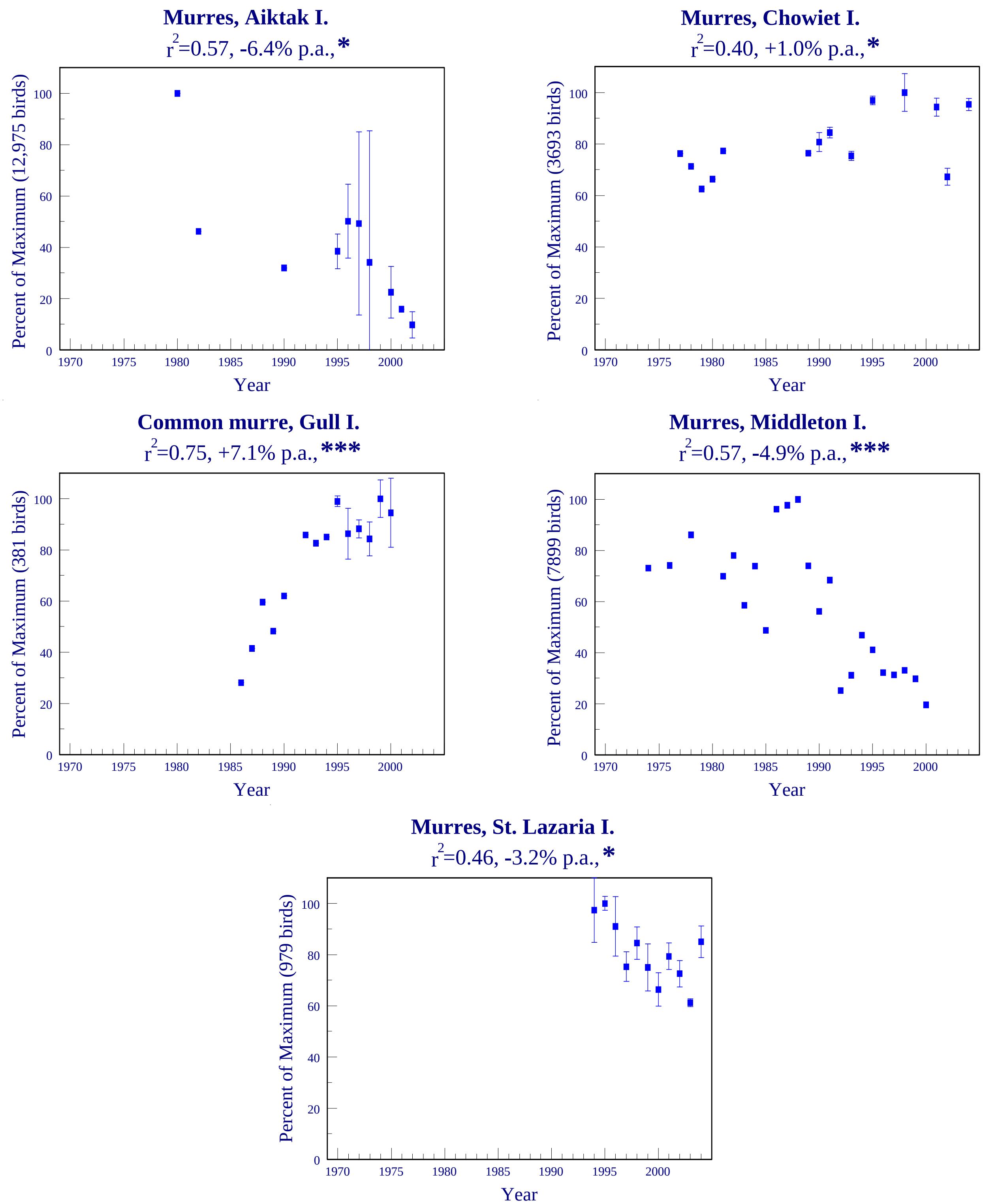


Figure 27 (continued). Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

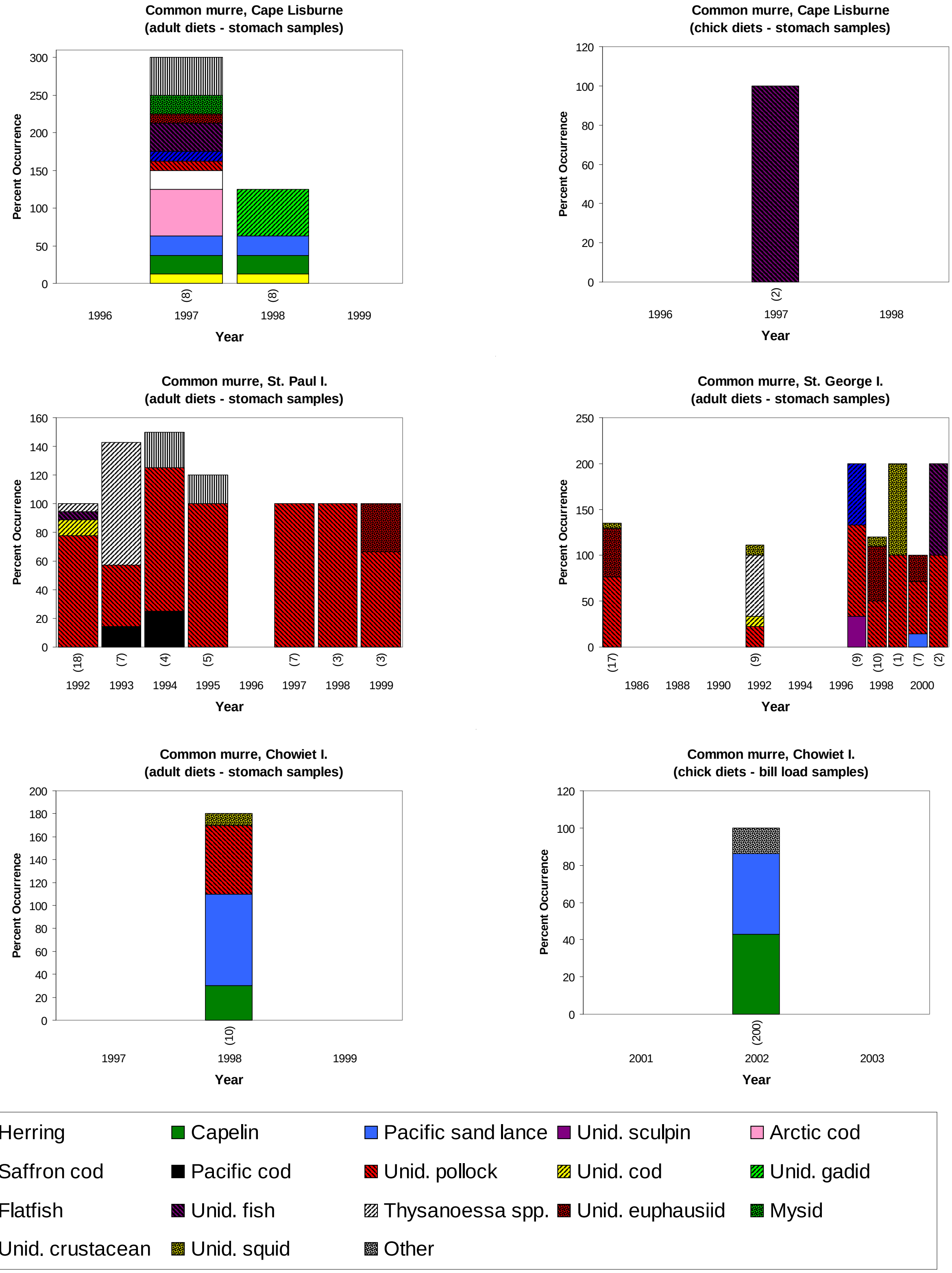


Figure 28. Diets of common murres at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

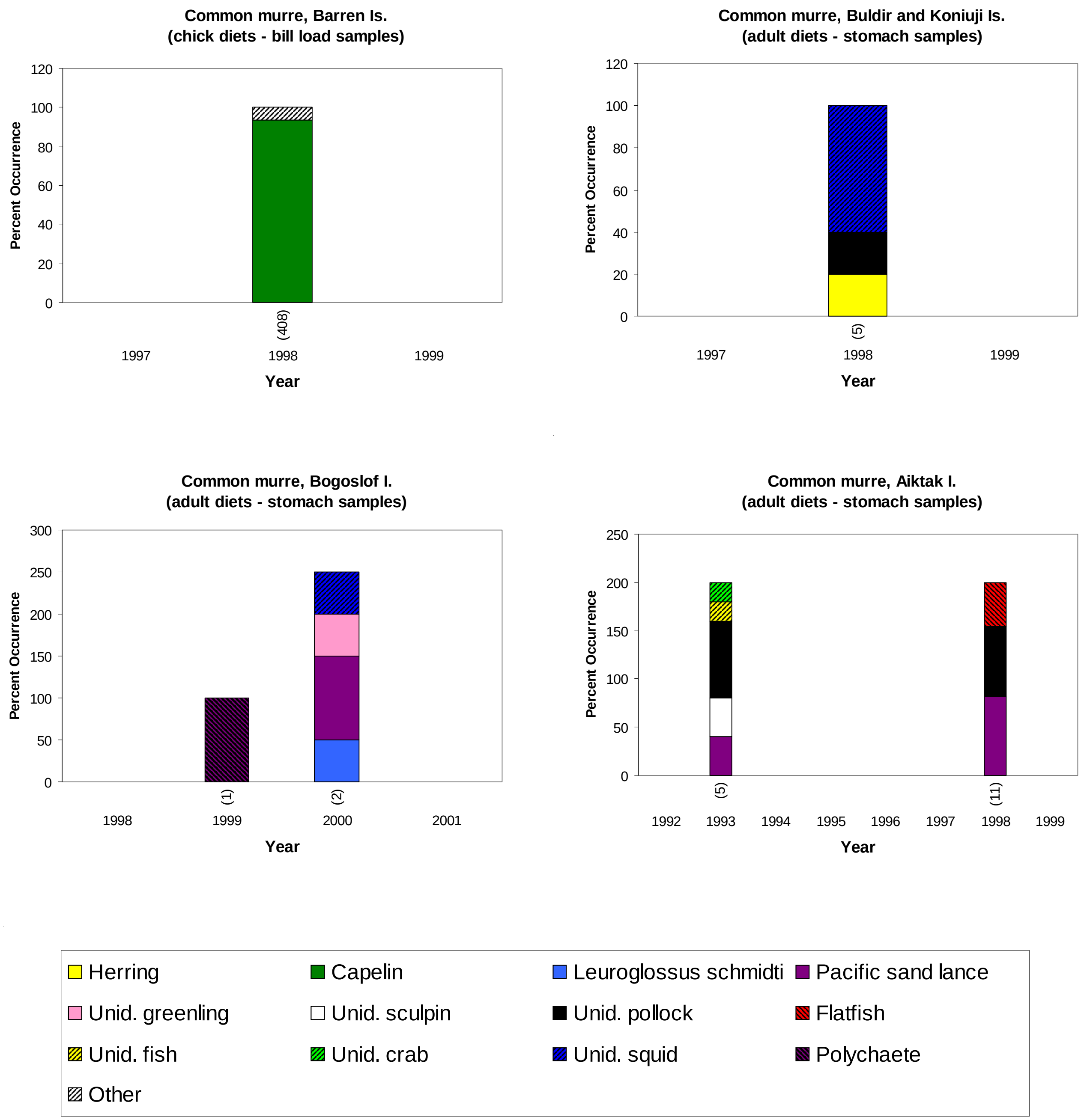


Figure 28 (continued). Diets of common murres at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Thick-billed murre (*Uria lomvia*)

Breeding chronology.–In 2004, thick-billed murre chicks hatched later than average at the Pribilof Islands and Buldir Island, were early at St. Lawrence Island and about average at Chowiet Island. No eggs were laid by this species at Aiktak Island in 2004 (Table 18, Fig. 29).

Table 18. Hatching chronology of thick-billed murres at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Lawrence I.	23 Jul (96)[a]	—	30 Jul[b] (5)[a]	Sheffield et al. 2005
St. Paul I.	—	17 Aug (192)	5 Aug[c] (19)	S. Wright Unpubl. Data
St. George I	—	3 Aug (82)	31 Jul[c] (22)	G. Levandoski Unpubl. Data
Buldir I.	19 Jul (97)	20 Jul (97)	17 Jul[c] (16)	Barrett et al. 2005
Chowiet I.	18 Jul (46)	18 Jul (46)	20 Jul[c] (8)	Larned 2004

[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 medians
[c]Mean of annual means.

Productivity.–Thick-billed murre rates of success in 2004 were average or below average at all monitored colonies (Table 19, Fig. 30). Murres did not attend the cliffs at Aiktak Island in 2004. The former murre colony at Kasatochi Island is no longer viable and has been dropped from consideration.

Table 19. Reproductive performance of thick-billed murres at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Lawrence I.	0.53	9 (168)[b]	0.51 (4)[b]	Sheffield et al. 2005
St. Paul I.	0.31	16 (386)	0.48 (18)	S Wright Unpubl. Data
St. George I.	0.46	12 (310)	0.53 (22)	G. Levandoski Unpubl. Data
Buldir I.	0.56	7 (213)	0.66 (16)	Barrett et al. 2005
Aiktak I.	0.00	N/A[c]	0.34 (8)	J. Williams Unpubl. Data
Chowiet I.	0.27	7 (167)	0.43 (10)	Larned 2004

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.
[c]Not applicable or not reported.

Populations.–Thick-billed murres declined at St. Paul Island (-1.7% per annum) and increased at Buldir Island (+7.8% per annum, Fig. 27).

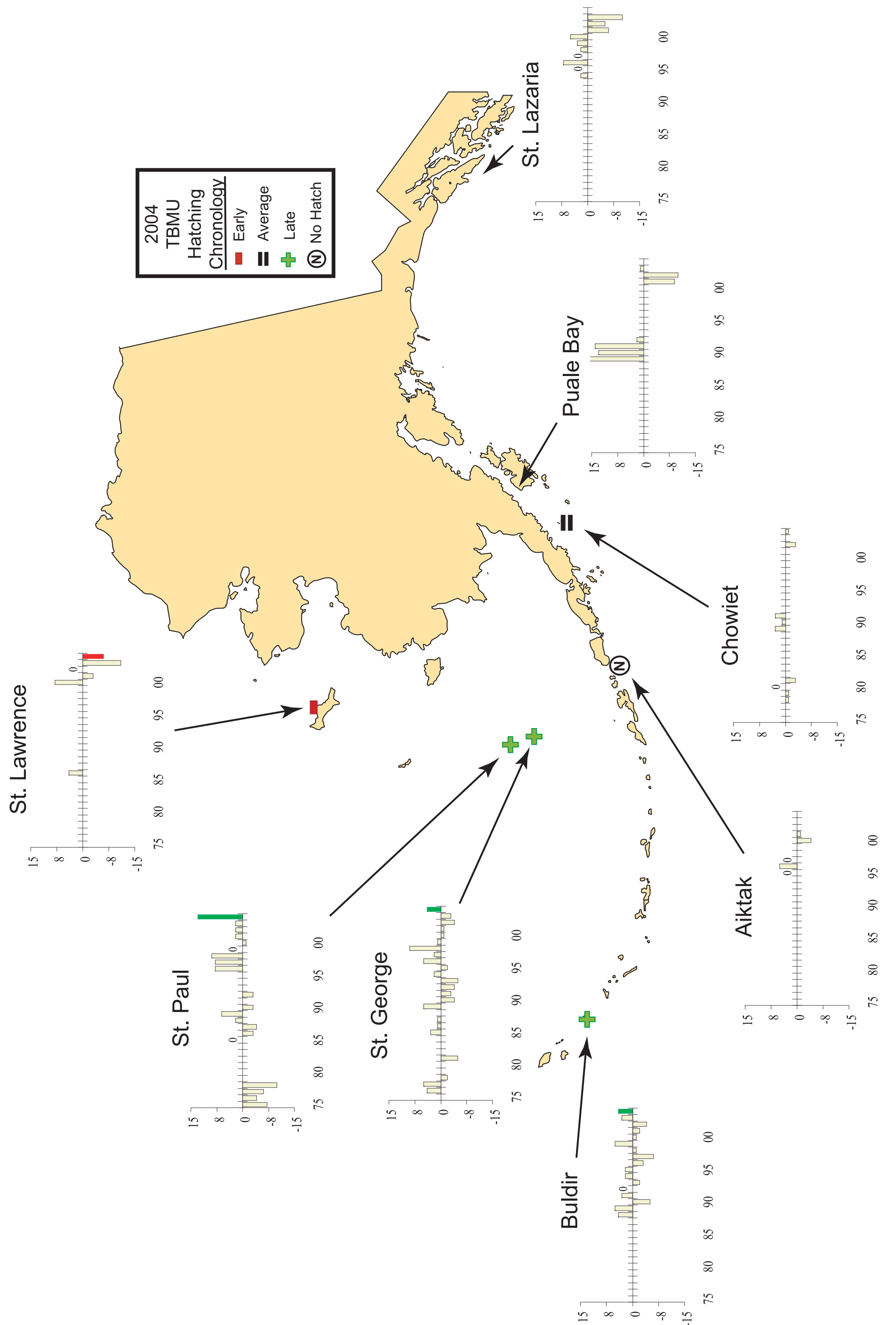


Figure 29. Hatching chronology of thick-billed murres at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

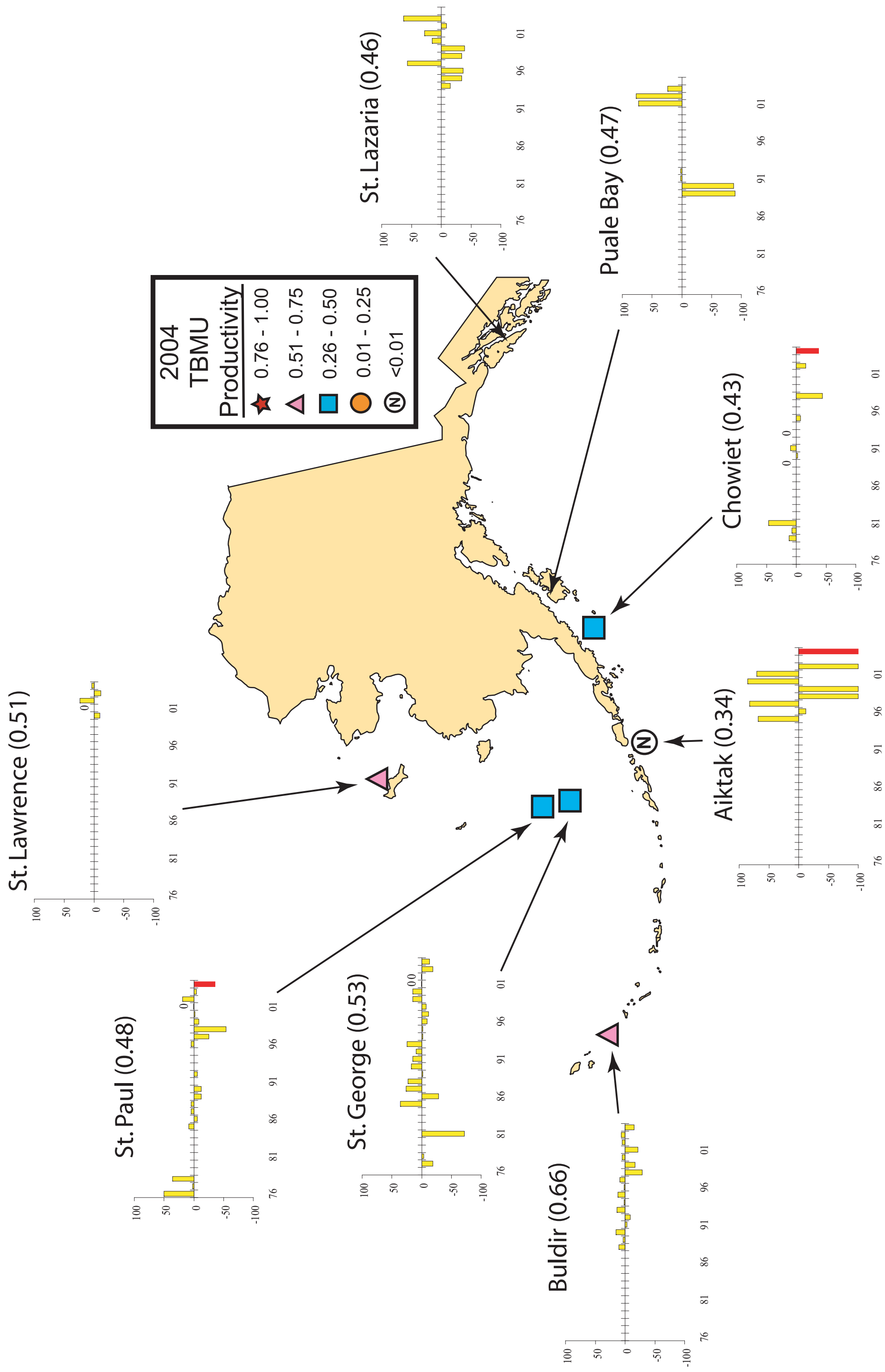


Figure 30. Productivity of thick-billed murres (chicks fledged/nest site) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

Diet.–Murres at Aiktak Island ate primarily pollock (Fig. 31). Diet samples from Buldir Island included large numbers of squid, while samples from Bogoslof Island included both squid and small fish. Diets collected from Cape Lisburne included a wide variety of small fish and invertebrates (Fig. 31). Diets from St. Paul Island consisted of predominately pollock, other small fish, small crustaceans and squid. Thick-billed murres from St. George Island ate primarily pollock, euphausiids and squid.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

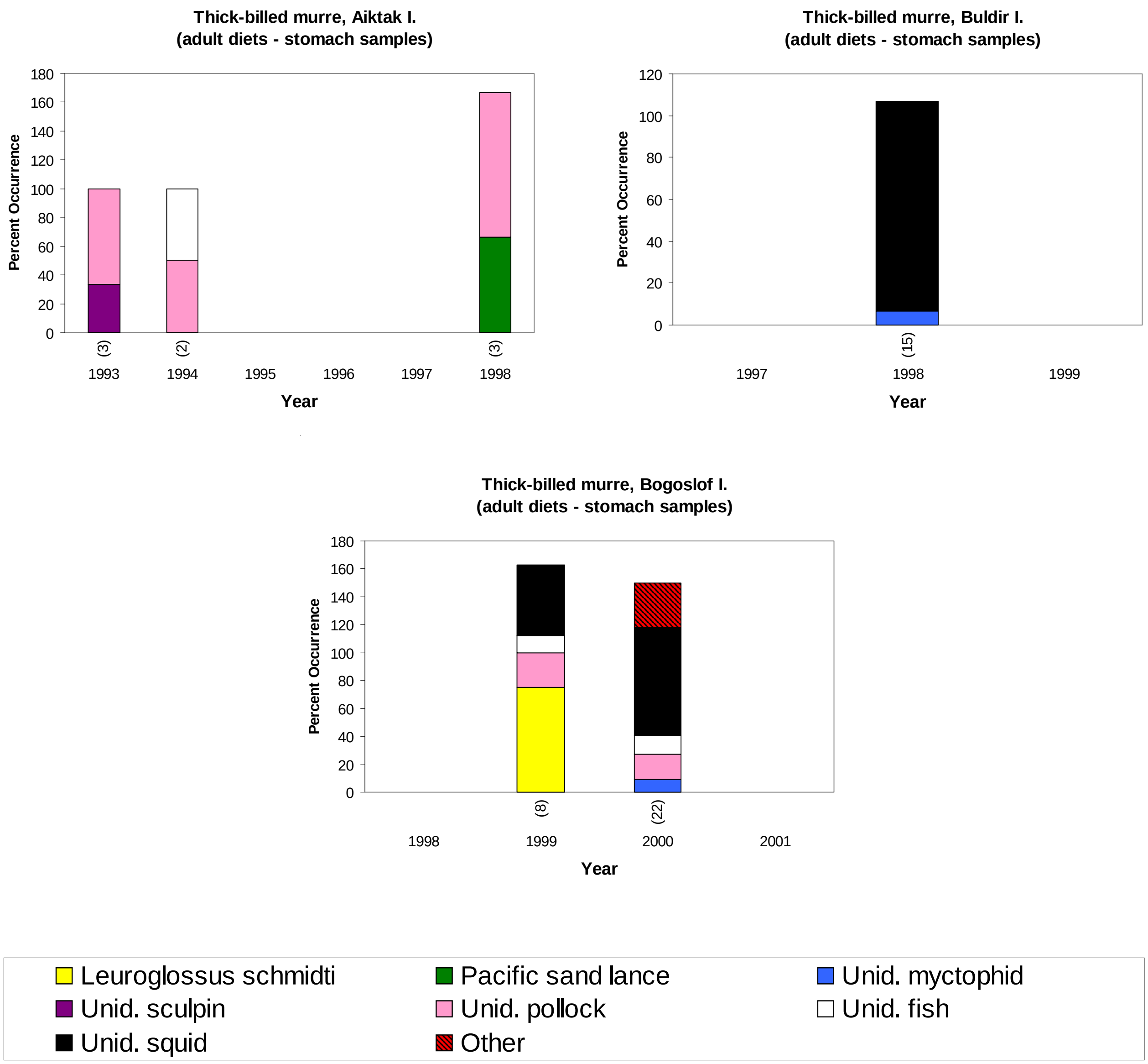


Figure 31. Diets of thick-billed murres at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

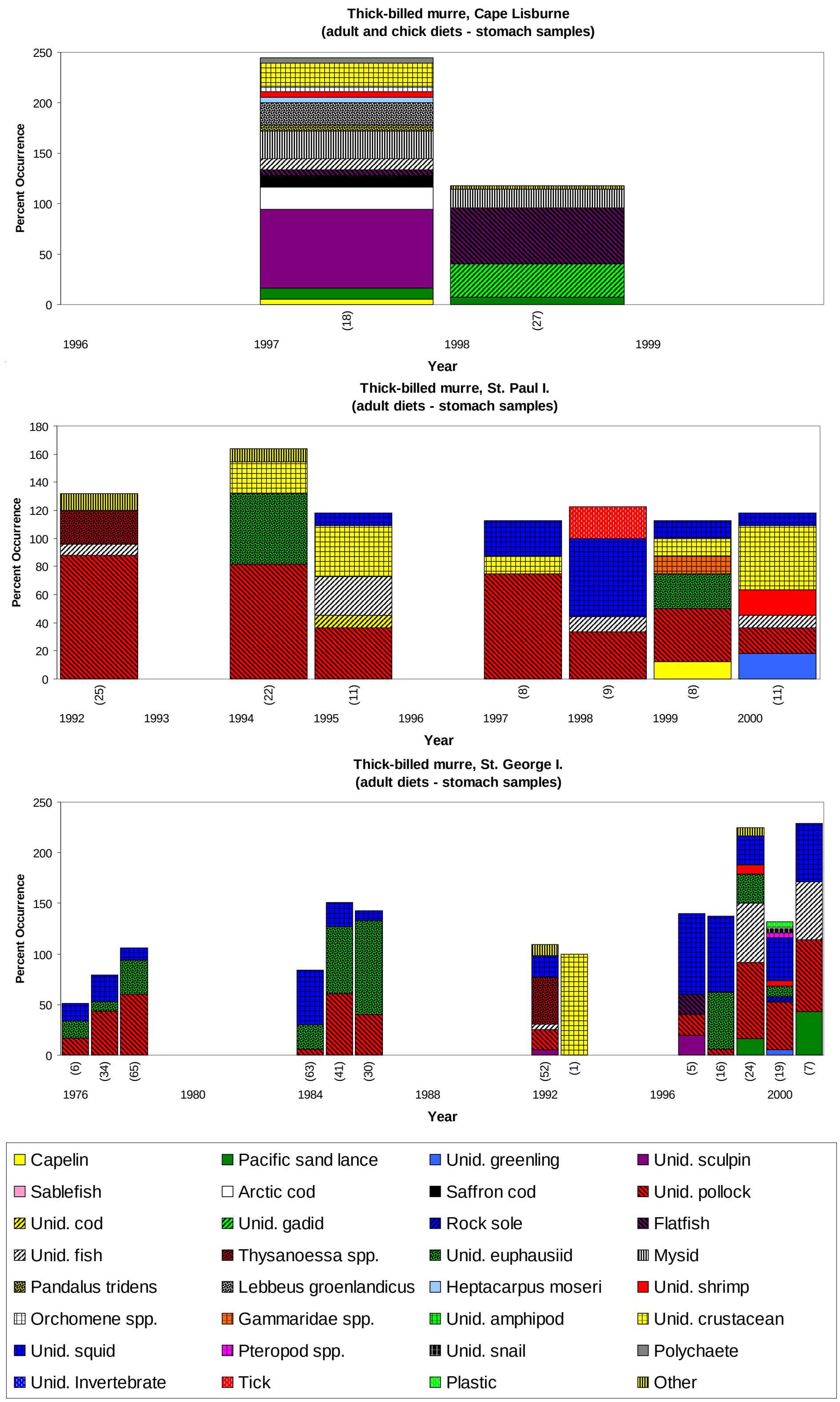


Figure 31 (continued). Diets of thick-billed murres at Cape Lisburne, and St. Paul and St. George islands. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Pigeon guillemot (*Cepphus columba*)

Breeding chronology.–No data.

Productivity.–No data.

Populations.–We found a significant negative population trend for pigeon guillemots in Prince William Sound (-6.3% per annum), but not for populations at other sites (Fig. 32).

Diet.–Diets collected from a small sample of birds from Aiktak Island included pollock, greenling, unidentified fish, and invertebrates. Identified bill loads from Prince William Sound consisted almost entirely of fish; the predominate taxa were smelt, gunnel, and gadid (Fig. 33).

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

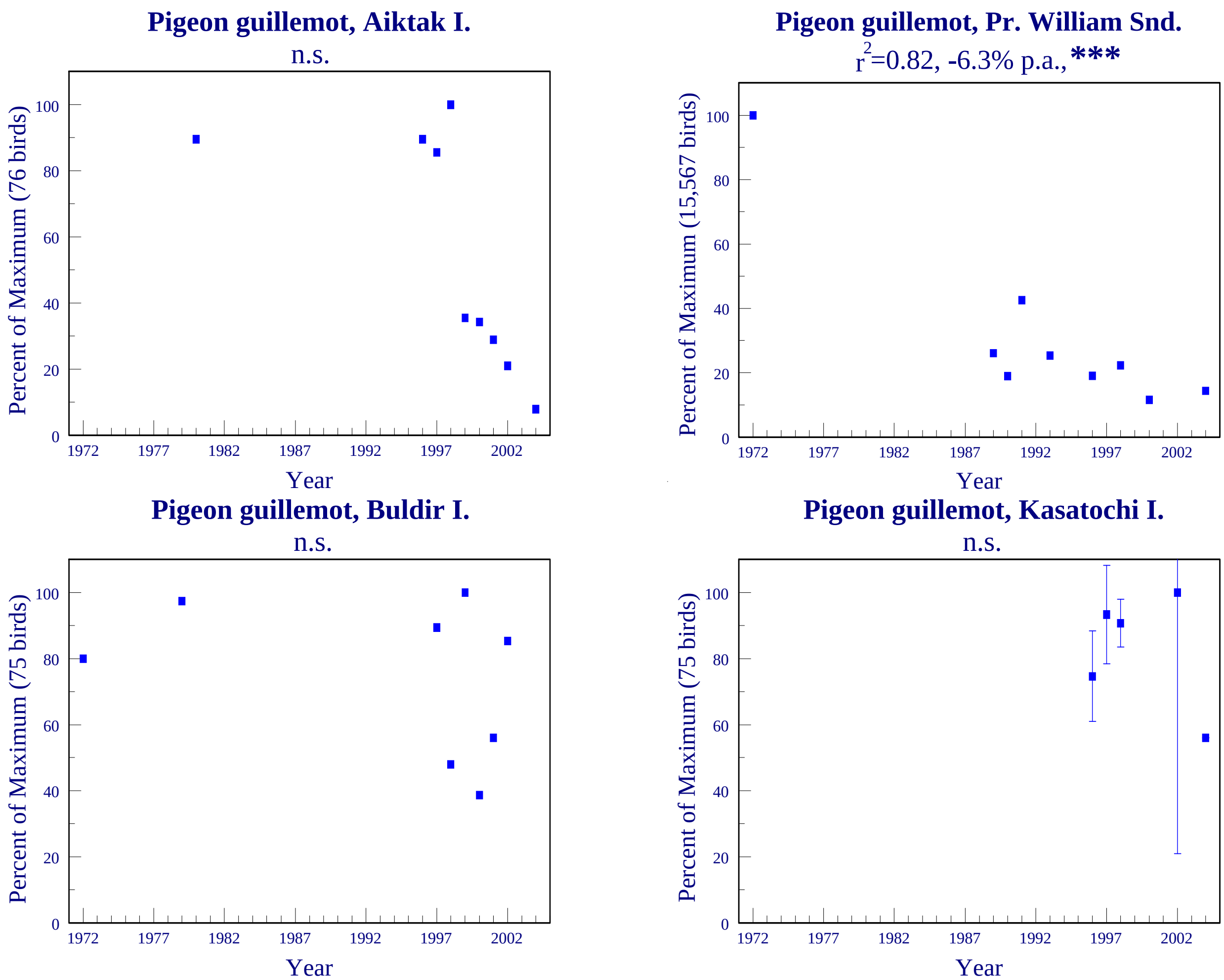


Figure 32. Trends in populations of pigeon guillemots at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

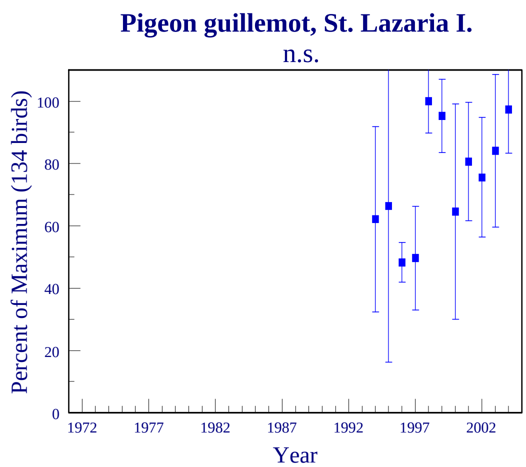
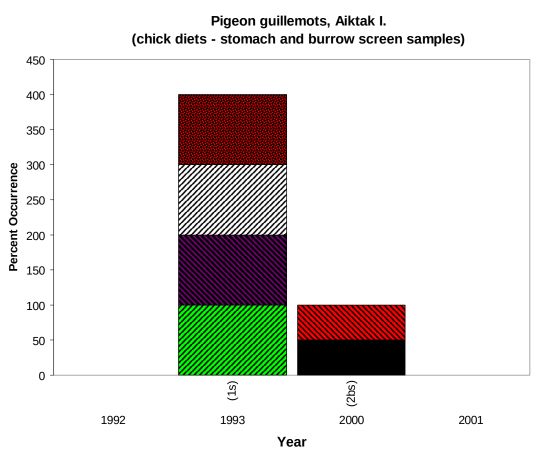
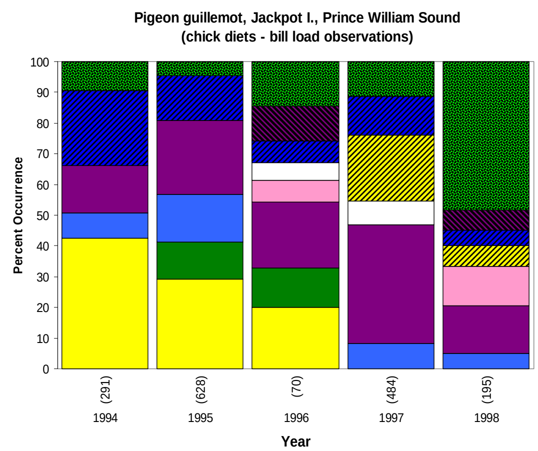
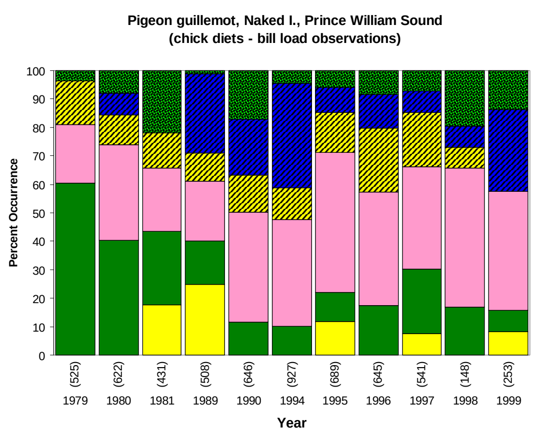


Figure 32 (continued). Trends in populations of pigeon guillemots at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).







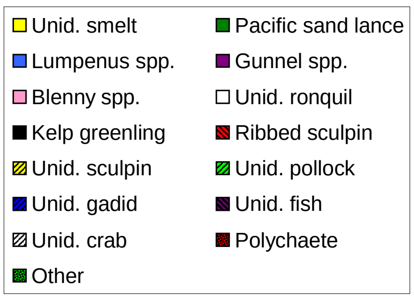


Figure 33. Diets of pigeon guillemots at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar. Because Prince William Sound samples were reported as bill load observations, and because each bird carries only one fish per observation, the total percent occurrence for each year was 100%.

Ancient murrelet (*Synthliboramphus antiquus*)

Breeding chronology.–The mean hatching date for ancient murrelets was about average at Aiktak Island, the only site monitored in 2004 (Table 20).

Table 20. Hatching chronology of ancient murrelets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	—	1 Jul (23)[a]	5 Jul[b] (7)[a]	Helm and Zeman 2006

[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.–Seventy percent of ancient murrelet eggs hatched at Aiktak Island in 2004, about average for this site (Table 21).

Table 21. Reproductive performance of ancient murrelets at Alaskan sites monitored in 2004.

Site	Hatching Success[a]	No. of Plots	Long-term Average	Reference
Aiktak I.	0.70	N/A[b] (31)[c]	0.75 (7)[c]	Helm and Zeman 2006

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

[b]Not applicable or not reported.

[c]Sample size in parentheses represents the number of known-fate eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–No data.

Parakeet auklet (*Aethia psittacula*)

Breeding chronology.–Parakeet auklets were monitored only at Buldir Island in 2004, where hatching chronology was about average (Table 22).

Table 22. Hatching chronology of parakeet auklets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	4 Jul (12)[a]	3 Jul (12)	4 Jul[b] (12)[a]	Barrett et al. 2005

[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 2004, parakeet auklet productivity at Buldir Island was below average (Table 23).

Table 23. Reproductive performance of parakeet auklets at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.30	N/A[b] (37)[c]	0.48 (12)[c]	Barrett et al. 2005

[a]Nest site is defined as a site where an egg was laid.
[b]Not applicable or not reported
[c]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–Parakeet auklets at Buldir Island primarily ate the copepod *Neocalanus cristatus;* euphausiids were also an important prey type (Fig. 34). In a single sample from Kasatochi Island, diet consisted entirely of *Neocalanus cristatus*.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

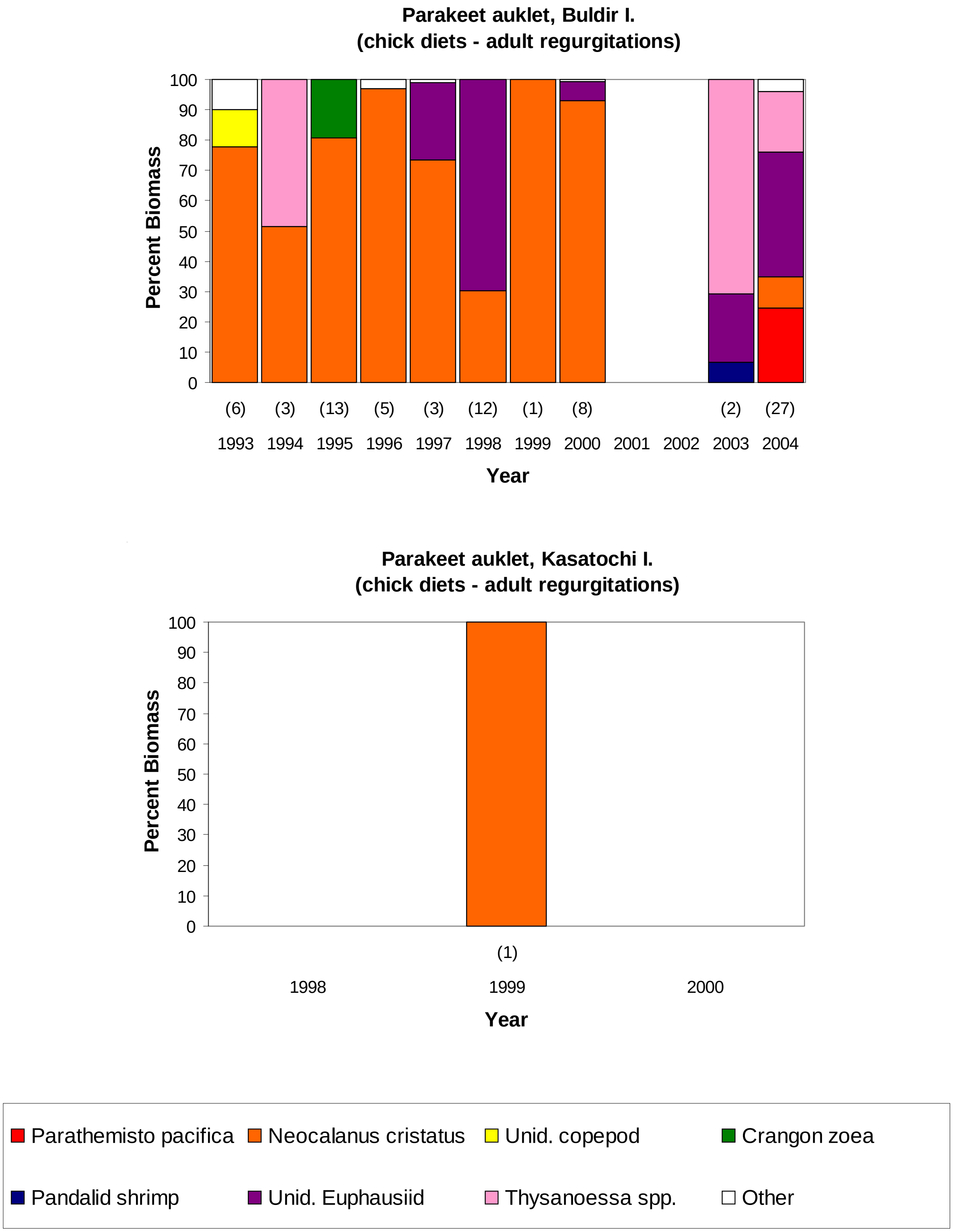


Figure 34. Diets of parakeet auklets at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent biomass of prey type in the diet. Sample sizes are reported below each bar.

Least auklet (*Aethia pusilla*)

Breeding chronology.–The dates of hatching for least auklets were early at St. Lawrence Island, and about average at Buldir and Kasatochi islands in 2004 (Table 24, Fig. 35).

Table 24. Hatching chronology of least auklets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Lawrence I.	23 Jul (113)[a]	—	29 Jul[b] (5)[a]	Sheffield et al. 2005
Buldir I.	27 Jun (22)	28 Jun (22)	28 Jun[c] (14)	Barrett et al. 2005
Kasatochi I.	28 Jun (31)	30 Jun (31)	28 Jun[c] (8)	Drummond and Kissler 2004

[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 medians.
[c]Mean of annual means.

Productivity.–Least auklets exhibited average or above average reproductive success at all monitored sites in 2004 (Table 25, Fig. 36).

Table 25. Reproductive performance of least auklets at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Lawrence I.	0.74	N/A[b] (124)[c]	0.69 (4)[c]	Sheffield et al. 2005
Buldir I.	0.53	N/A (81)	0.52 (14)	Barrett et al. 2005
Kiska I.	0.52	3 (197)	0.25 (3)	Jones et al. 2004
Kasatochi I.	0.53	N/A (91)	0.58 (8)	Drummond and Kissler 2004

[a]Nest site is defined as a site where an egg was laid.
[b]Not applicable or not reported.
[c]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–Diet samples from least auklets at St. Lawrence Island consisted of the copepods *Neocalanus plumchrus/flemengeri, N. cristatus* and the amphipod *Parathemisto libelulla* (Fig. 37). Least auklets at St. Paul Island showed a great deal of yearly variation in diet; *Neocalanus plumchrus/ flemengeri* dominated in some years, the copepod *Calanus marshallae* and euphausiids dominated in others. Diet samples from St. George Island consisted primarily of copepods; euphausiids were also an important prey item. Least auklets at Buldir, Kiska, Kasatochi, Gareloi, and the Semidi islands ate mostly copepods, primarily *Neocalanus plumchrus/flemengeri* in most years (Fig. 37).

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

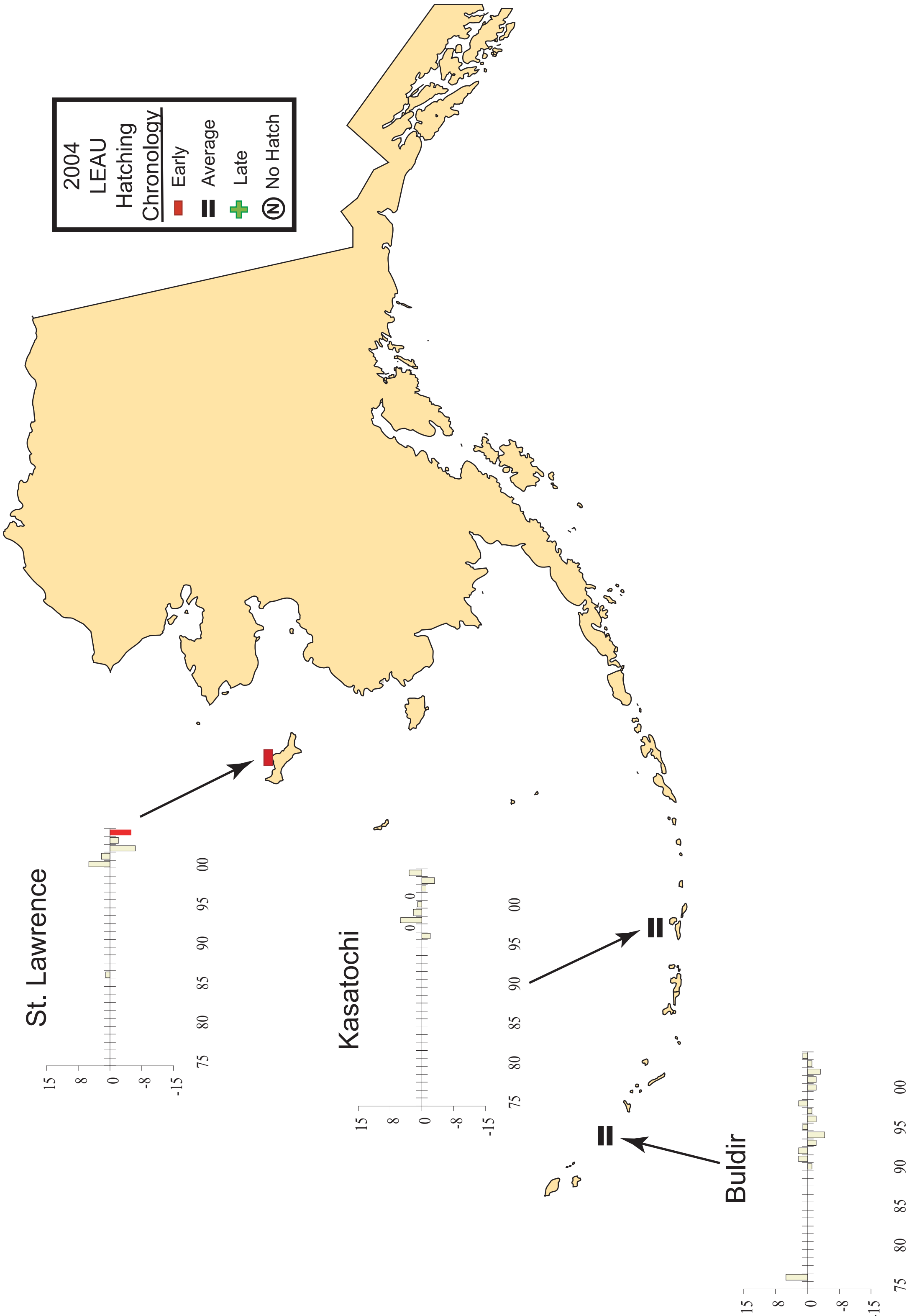


Figure 35. Hatching chronology of least auklets at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

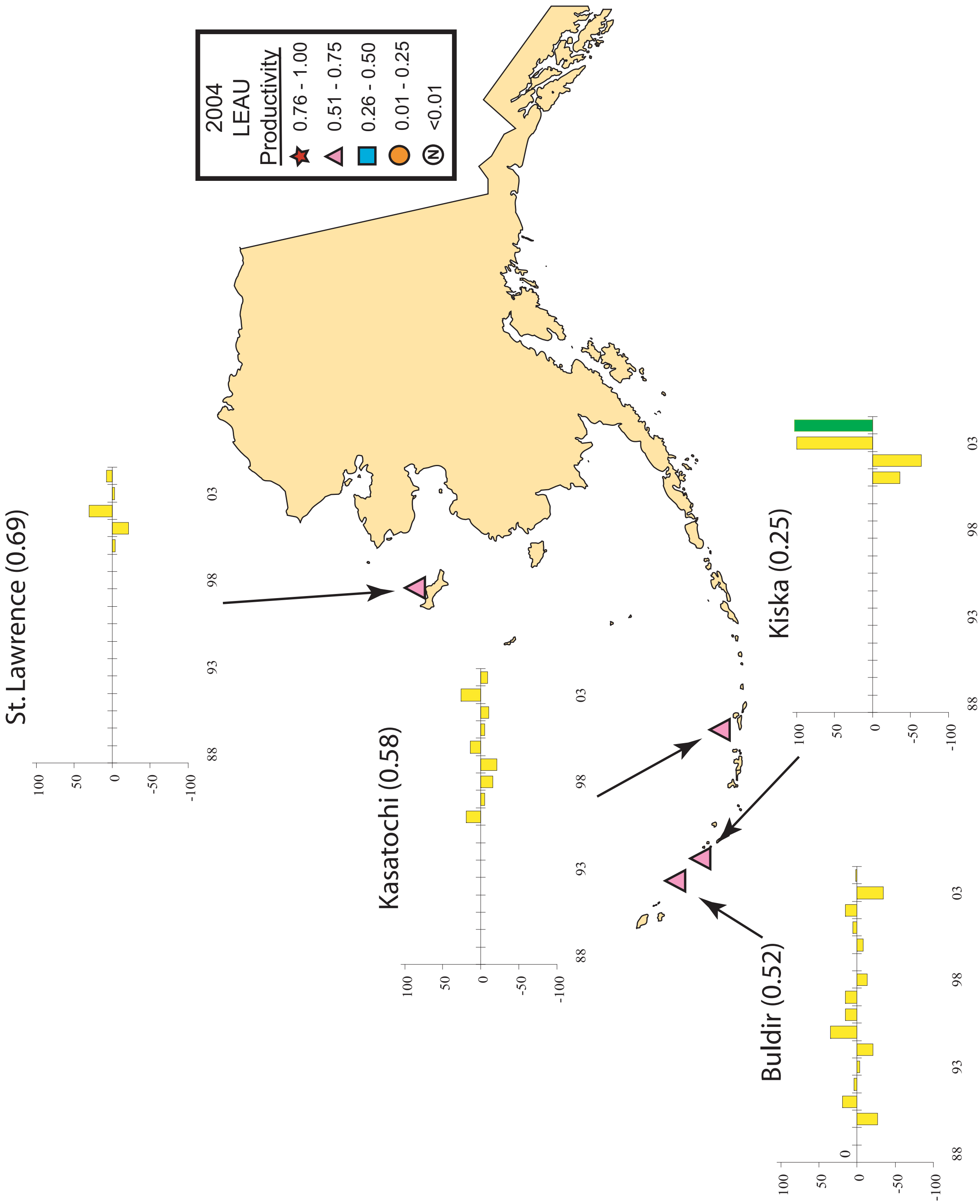


Figure 36. Productivity of least auklets (chicks fledged/nest site) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

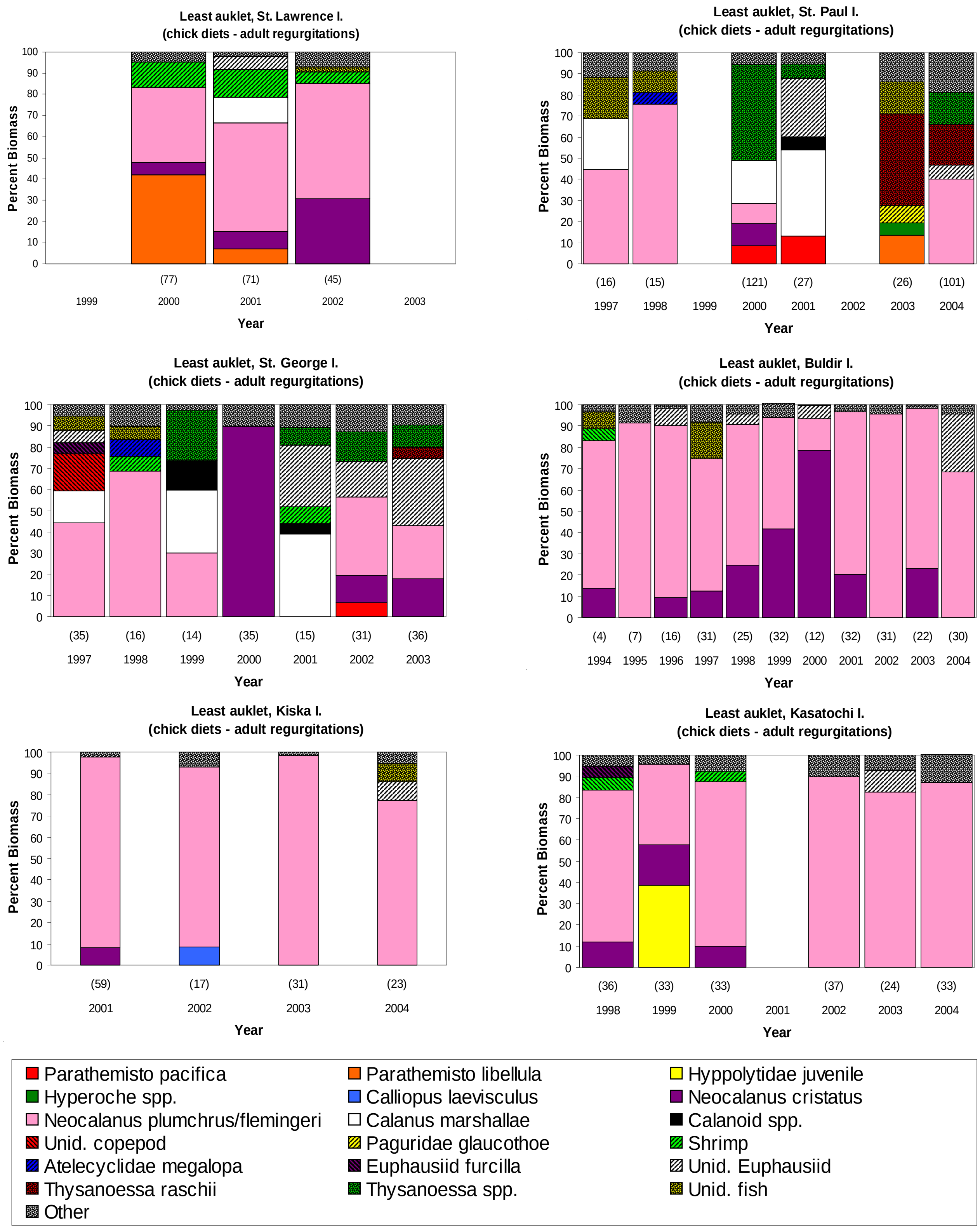


Figure 37. Diets of least auklets at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent biomass of prey type in the diet. Sample sizes are reported below each bar.

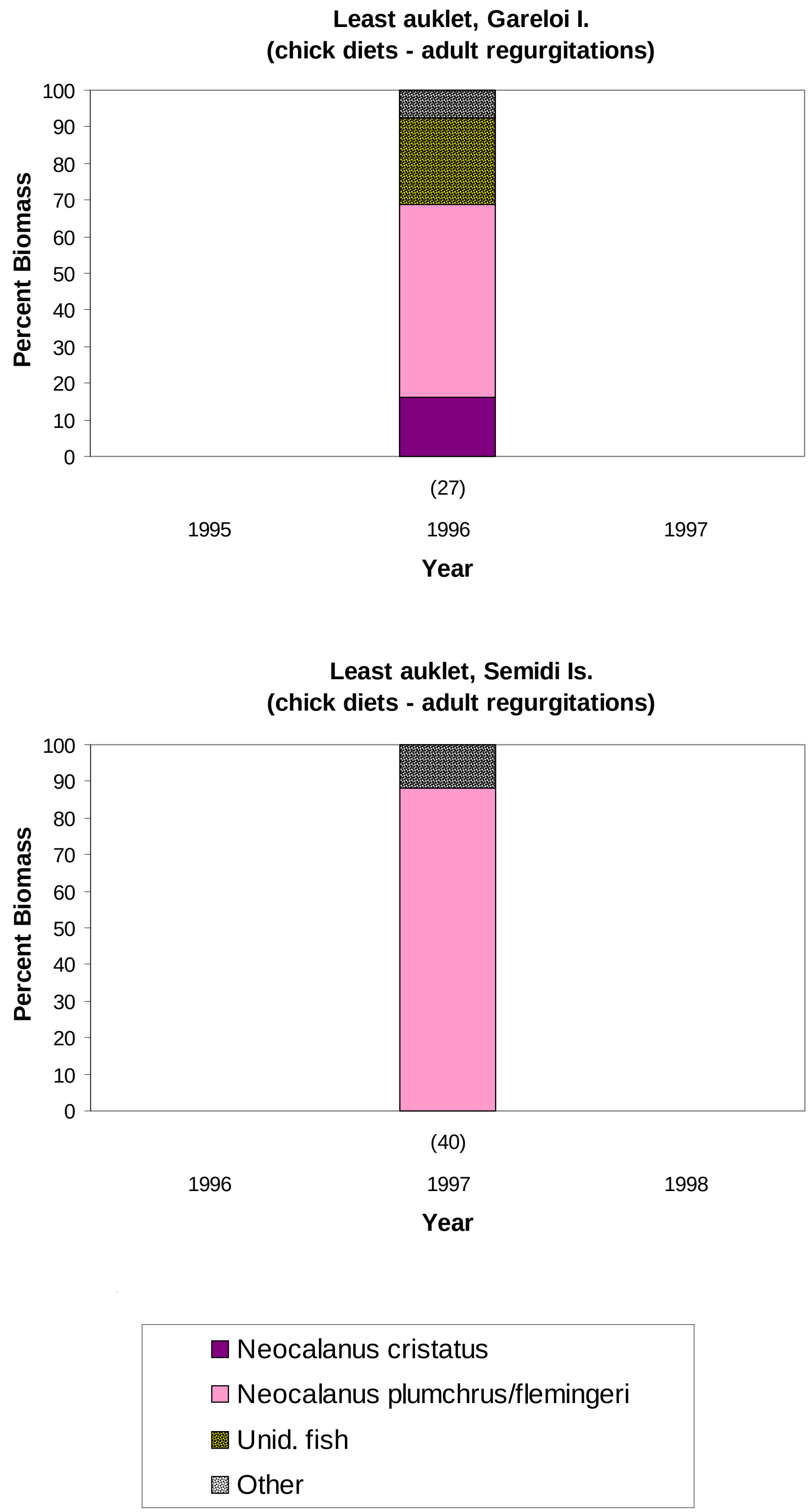


Figure 37 (continued). Diets of least auklets at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent biomass of prey type in the diet. Sample sizes are reported below each bar.

Whiskered auklet (*Aethia pygmaea*)

Breeding chronology.–The mean hatching date for whiskered auklets was about average at Buldir Island, the only site where this species was monitored in 2004 (Table 26).

Table 26. Hatching chronology of whiskered auklets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	21 Jun (28)[a]	21 Jun (28)	23 Jun[b] (14)[a]	Barrett et al. 2005

[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 about average for this species at the only site at which it was monitored in 2004 (Table 27).

Table 27. Reproductive performance of whiskered auklets at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.53	N/A[b] (66)[c]	0.57 (13)[c]	Barrett et al. 2005

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

[b]Not applicable or not reported.

[c]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–Diet samples from whiskered auklets at Buldir Island were dominated in most years by the copepods *Neocalanus cristatus* and *Neocalanus plumchrus/flemengeri*, although in several years euphausiids were the dominant prey type (Fig 38).

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

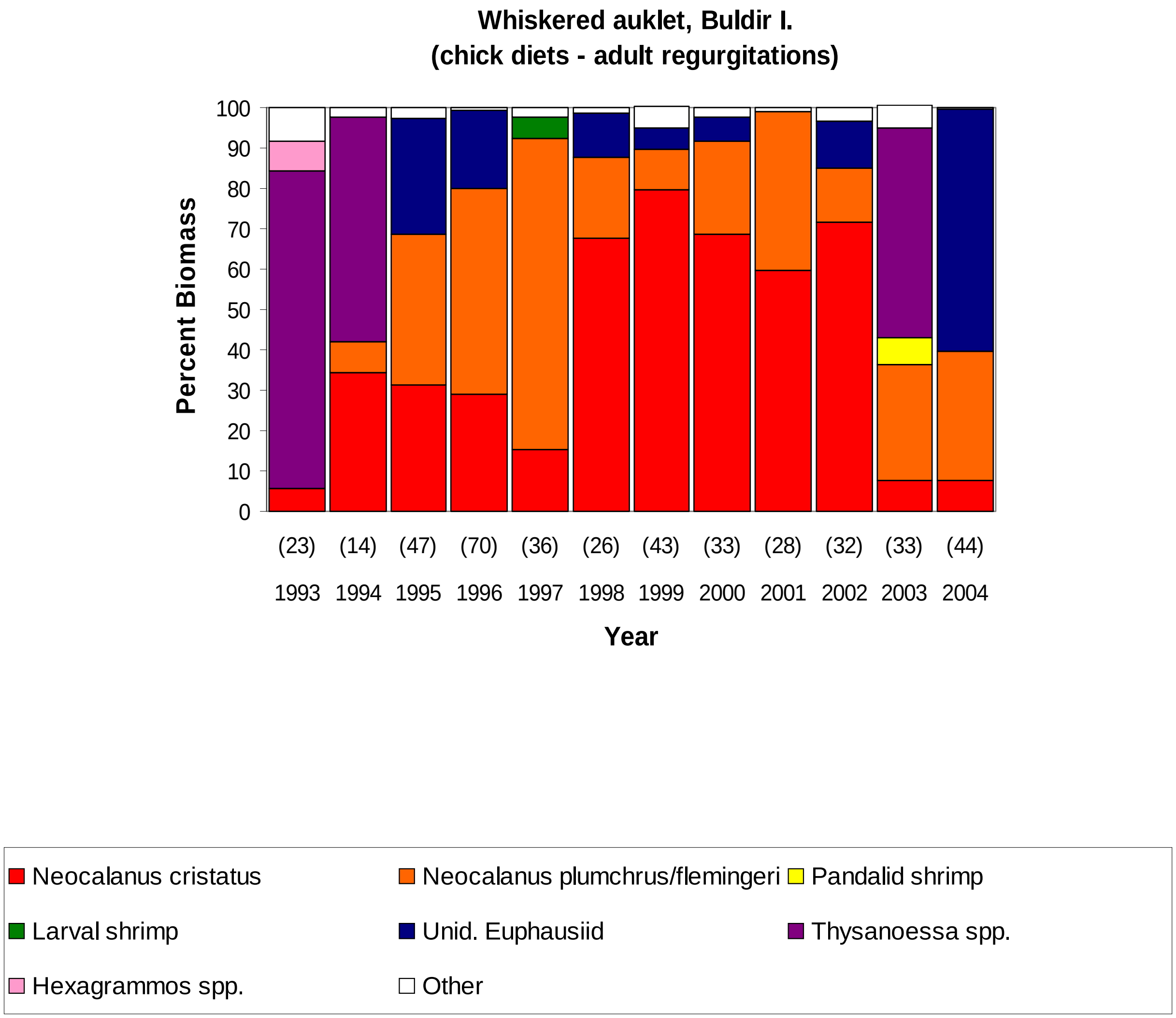
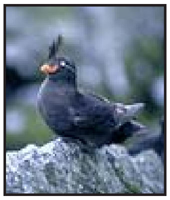


Figure 38. Diets of whiskered auklets at Buldir Island. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent biomass of prey type in the diet. Sample sizes are reported below each bar.



Crested auklet (*Aethia cristatella*)

Breeding chronology.–The mean date of hatching for crested auklets in 2004 was late at St. Lawrence and Buldir islands and about average at Kasatochi Island (Table 28, Fig. 39).

Table 28. Hatching chronology of crested auklets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
St. Lawrence I.	3 Aug (105)[a]	—	31 Jul[b] (5)[a]	Sheffield et al. 2005
Buldir I.	7 Jul (17)	5 Jul (17)	29 Jun[c] (14)	Barrett et al. 2005
Kasatochi I.	28 Jun (33)	28 Jun (33)	1 Jul[c] (8)	Drummond and Kissler 2004

[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 medians.

[c]Mean of annual means.

Productivity.–Crested auklets exhibited average or above average productivity in 2004 at all monitored sites except Buldir Island, where success was below normal (Table 29, Fig. 40).

Table 29. Reproductive performance of crested auklets at Alaskan sites monitored in 2004.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Lawrence I.	0.71	N/A[b] (131)[c]	0.71 (4)[c]	Sheffield et al. 2005
Buldir I.	0.45	N/A (67)	0.61 (14)	Barrett et al. 2005
Kiska I.	0.68	3 (31)	0.42 (3)	Jones et al. 2004
Kasatochi I.	0.70	N/A (107)	0.63 (8)	Drummond and Kissler 2004

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

[b]Not applicable or not reported.

[c]Sample size in parentheses represents the number of nest sites used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–Diet samples from crested auklets at St. Lawrence Island consisted primarily of the euphausiid genus *Thysanoessa* (primarily *T. rashii*, Fig. 41). Crested auklets from Buldir ate predominately the copepod *Neocalanus cristatus* and euphausiids, but in 1997 larval shrimp were the dominant prey type. Diets at Kiska Island consisted mainly of euphausiids. Samples from Kasatochi Island were dominated by *Neocalanus cristatus* and euphausiids.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

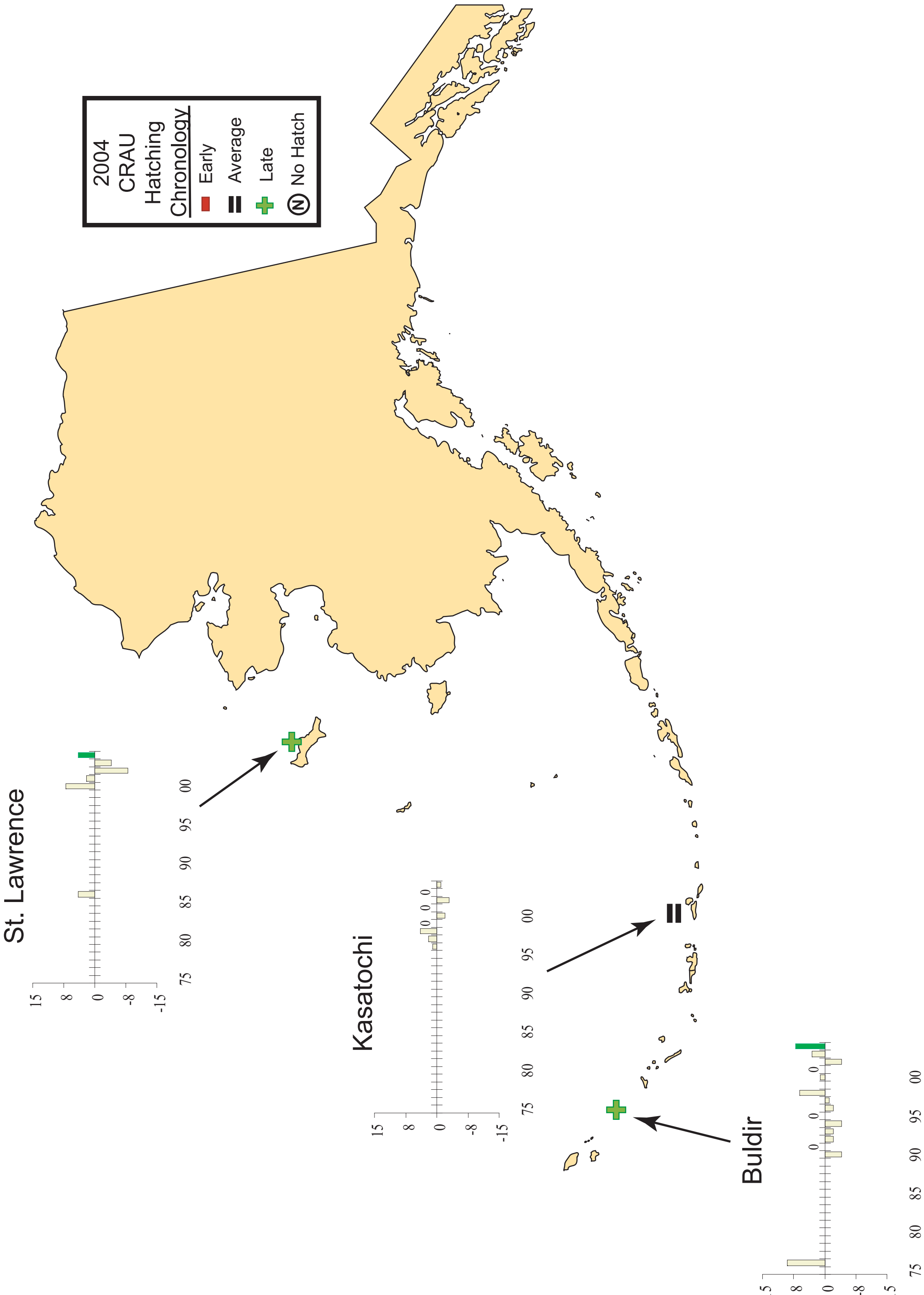


Figure 39. Hatching chronology of crested auklets at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

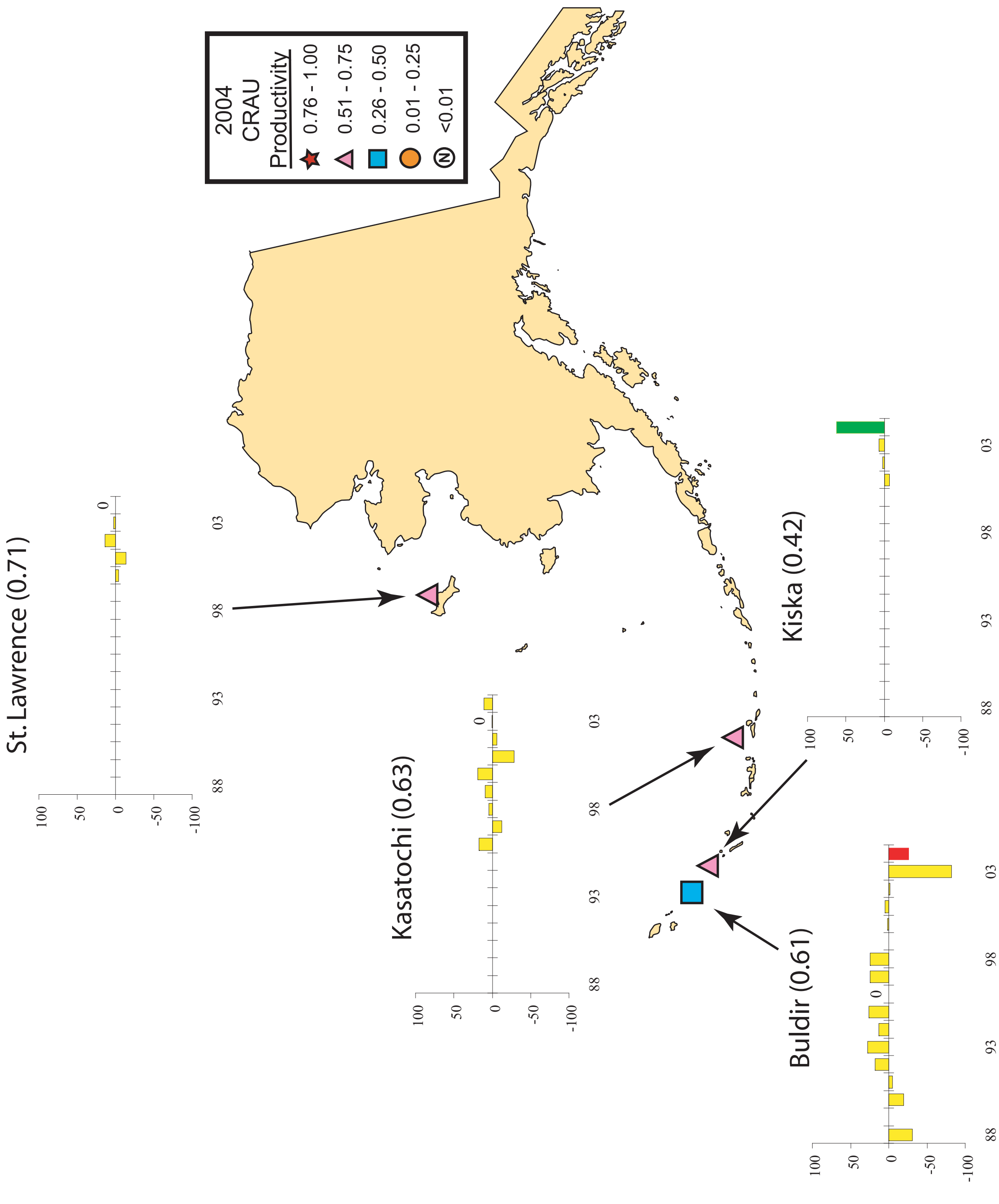


Figure 40. Productivity of crested auklets (chicks fledged/nest site) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

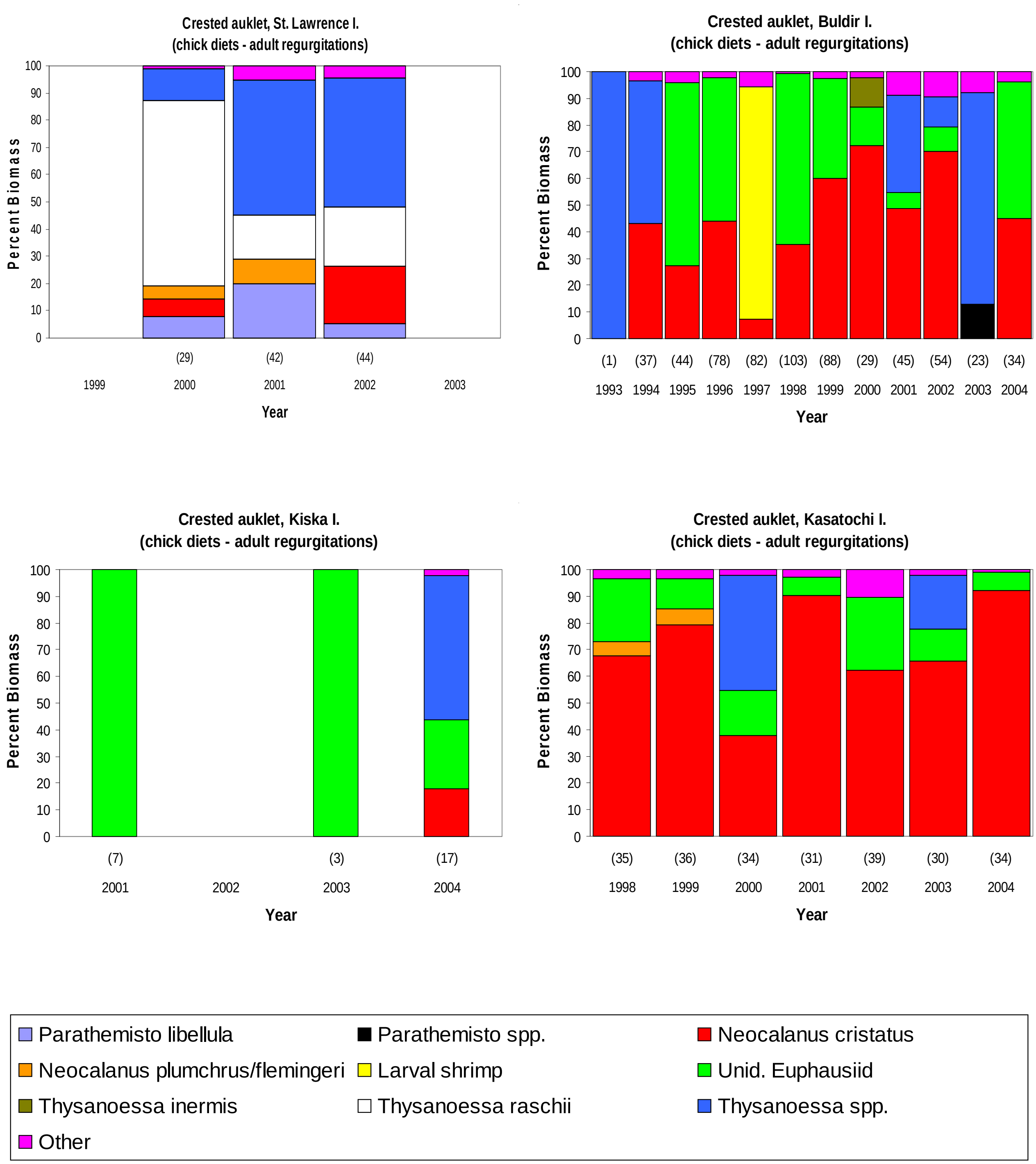


Figure 41. Diets of crested auklets at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent biomass of prey type in the diet. Sample sizes are reported below each bar.

Rhinoceros auklet (*Cerorhinca monocerata*)

Breeding chronology.–Mean hatch date was later than average at Chowiet Island in 2004 (Table 30).

Table 30. Hatching chronology of rhinoceros auklets at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Chowiet I.	3 Jul (13)[a]	2 Jul (13)	29 Jun[b] (2)[a]	Larned 2004

[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 was lower than average at Chowiet Island in 2004 (Table 31).

Table 31. Reproductive performance of rhinoceros auklets at Alaskan sites monitored in 2004.

Site	Chicks Fledged/Egg	No. of Plots	Long-term Average	Reference
Chowiet I.	0.00	N/A[a] (35)[b]	0.34 (5)[b]	Larned 2004

[a]Not applicable or not reported.
[b]Sample size in parentheses represents the number of eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–We found a significant positive trend (+5.3% per annum) in populations of rhinoceros auklets at St. Lazaria Island (Fig. 42).

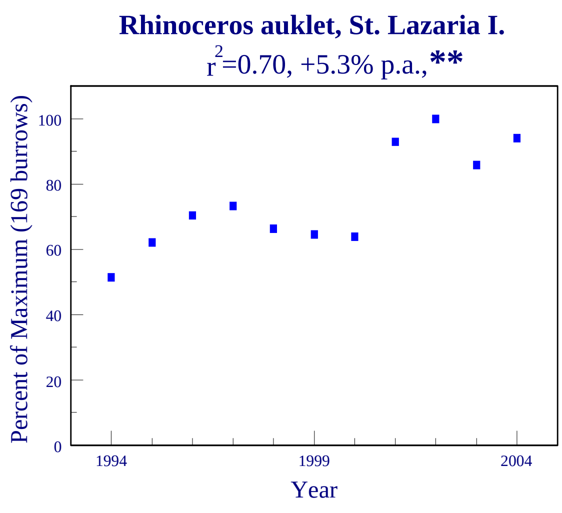


Figure 42. Trends in populations of rhinoceros auklets at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

Diet.–Diet samples from rhinoceros auklets at Chowiet and Middleton islands consisted primarily sand lance (Fig. 43). Rhinoceros auklets from St. Lazaria Island ate primarily a combination of sand lance, capelin, and herring in most years.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the "other" category.

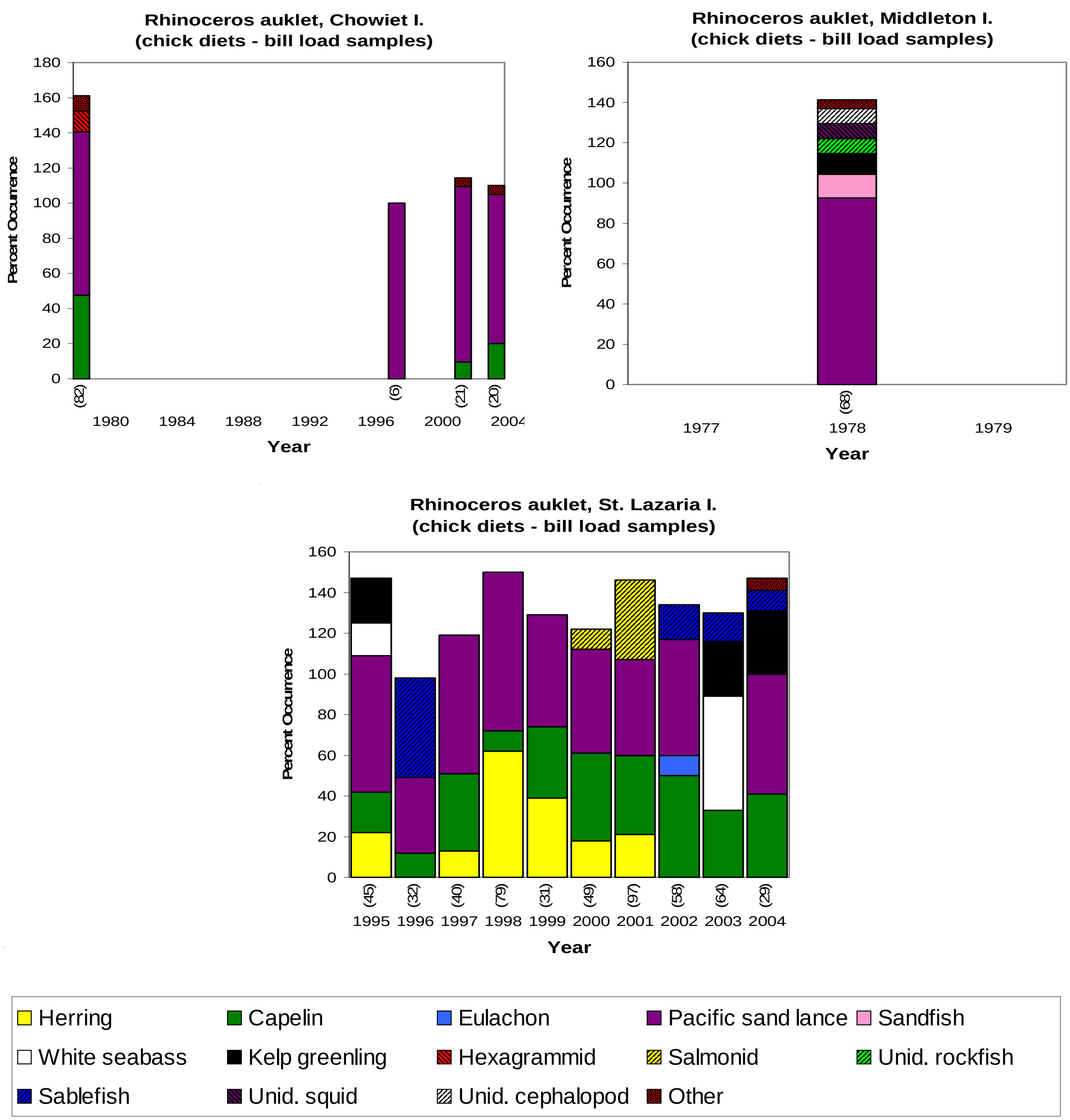
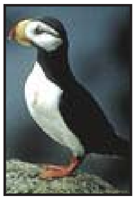


Figure 43. Diets of rhinoceros auklets at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.



Horned puffin (*Fratercula corniculata*)

Breeding chronology.–Mean hatch date was about average for this species at Buldir Island in 2004. Hatching chronology was similar at Chowiet Island to that at Buldir Island in 2004 (Table 32).

Table 32. Hatching chronology of horned puffins at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	23 Jul (15)[a]	24 Jul (15)	23 Jul[b] (16)[a]	Barrett et al. 2005
Chowiet I.	24 Jul (12)	25 Jul (12)	N/A[c]	Larned 2004

[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]Not applicable or not reported.

Productivity.–Horned puffins exhibited below average productivity at Buldir Island in 2004 (Table 33).

Table 33. Reproductive performance of horned puffins at Alaskan sites monitored in 2004.

Site	Chicks Fledged/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.21	N/A[a] (53)[b]	0.43 (20)[b]	Barrett et al. 2005
Chowiet I.	0.08	N/A (12)	N/A	Larned 2004

[a]Not applicable or not reported.
[b]Sample size in parentheses represents the number of eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–No data.

Diet.–Diet from a small sample of horned puffins at Cape Lisburne consisted entirely of unidentified fish prey. Horned puffins at Buldir Island ate predominately sand lance, and kelp and rock greenling. A small sample from Aiktak Island showed that pollock and sand lance were important prey items (Fig. 44).

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

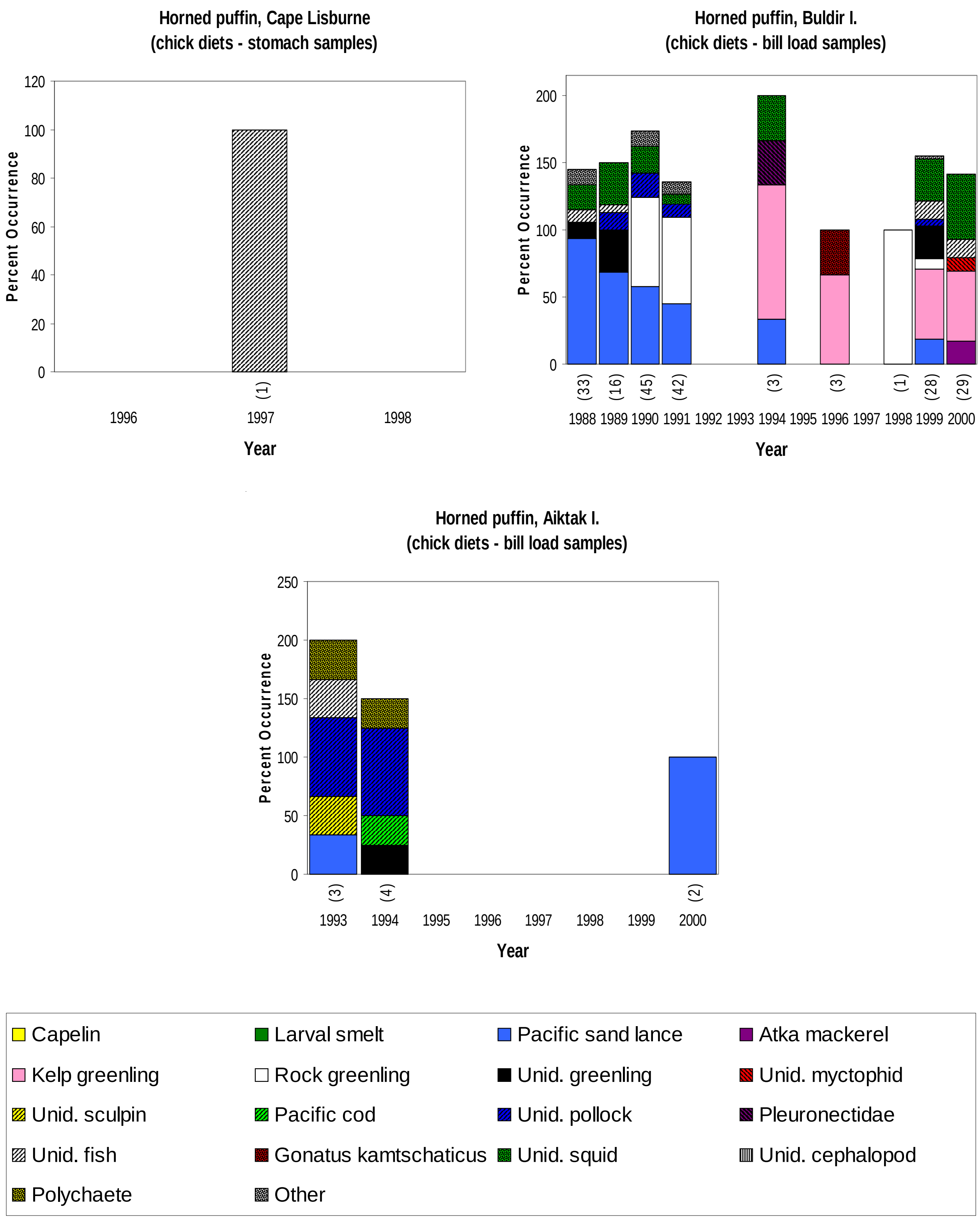


Figure 44. Diets of horned puffins at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Tufted puffin (*Fratercula cirrhata*)

Breeding chronology.–Hatch dates for tufted puffins were earlier than normal at Buldir and Aiktak islands in 2004 (Table 34, Fig. 45).

Table 34. Hatching chronology of tufted puffins at Alaskan sites monitored in 2004.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	11 Jul (11)[a]	8 Jul (11)	15 Jul[b] (15)[a]	Barrett et al. 2005
Aiktak I.	26 Jul (46)	28 Jul (46)	5 Aug[b] (8)	Helm and Zeman 2006

[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 2004, tufted puffin productivity was about average at Buldir Island and below average at Aiktak Island (Table 35, Fig. 46).

Table 35. Reproductive performance of tufted puffins at Alaskan sites monitored in 2004.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.43	N/A[b] (30)[c]	0.42 (16)[c]	Barrett et al. 2005
Aiktak I.	0.32	N/A (65)	0.47 (8)	Helm and Zeman 2006

[a]Fledged chick defined as being still alive at last check in August or September.
[b]Not applicable or not reported.
[c]Sample size in parentheses represents the number of eggs used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

Populations.–We found significant positive population trends at Bogoslof and Aiktak islands (+3.0%, +1.5% per annum, respectively), significant negative trends at E. Amatuli and St. Lazaria islands (-2.2% and -7.8% per annum, respectively), and no trend at Buldir Island (Fig 47).

Diet.–Tufted puffins at Buldir and Aiktak islands ate a wide variety of prey items, including sand lance, pollock, greenling and squid (Fig. 48). Diets from the Barren Islands consisted predominately of capelin and pollock. Puffins from Middleton Island consumed mostly sand lance and cephalopods.

Only prey that occurred in 5% or more of the samples in a given year are displayed in the bar for that year. Taxa appearing in <5% of the samples are grouped in the “other” category.

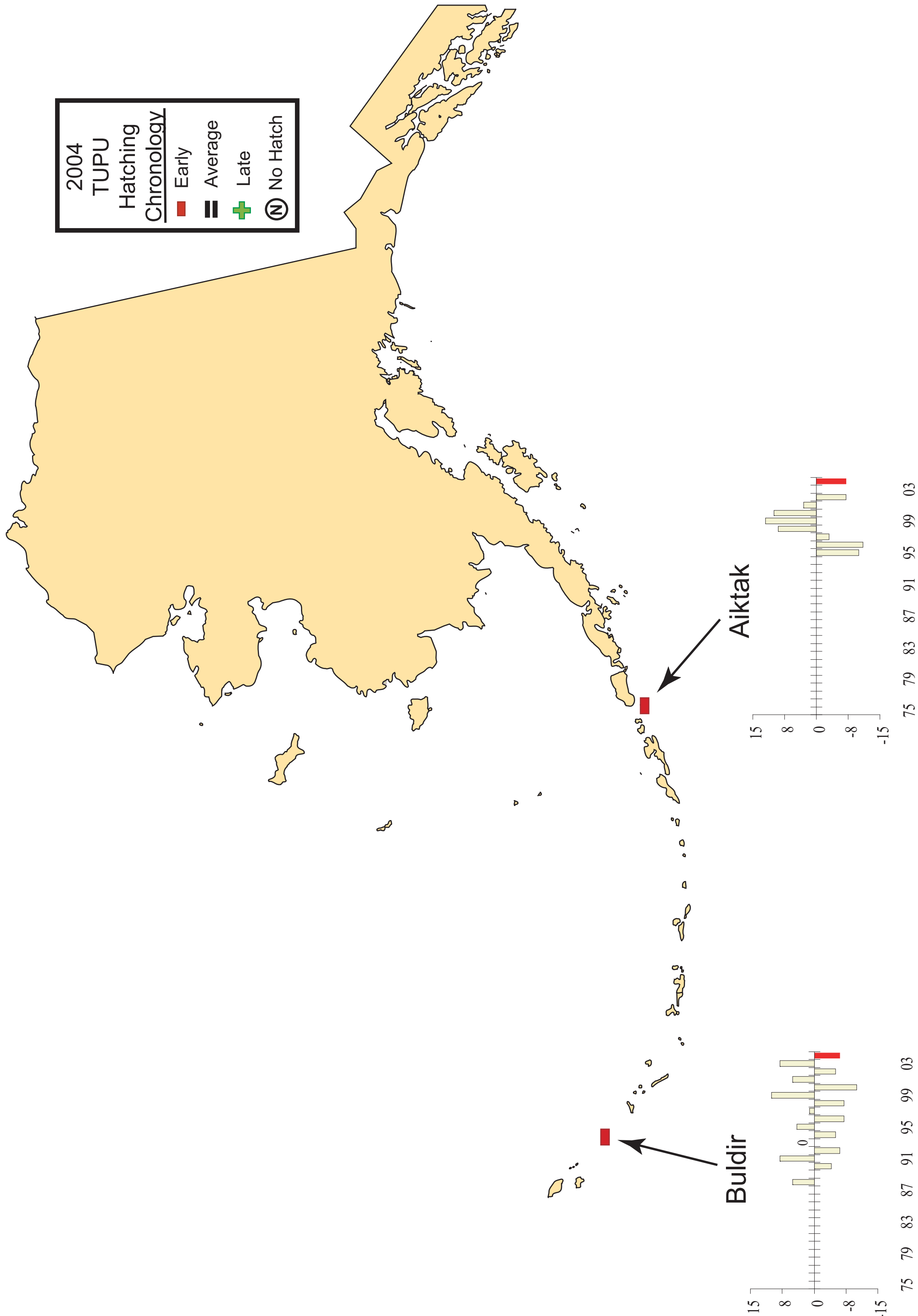


Figure 45. Hatching chronology of tufted puffins at Alaskan sites monitored in 2004. Graphs indicate the departure (if any), in days, from the site mean (current year not included).

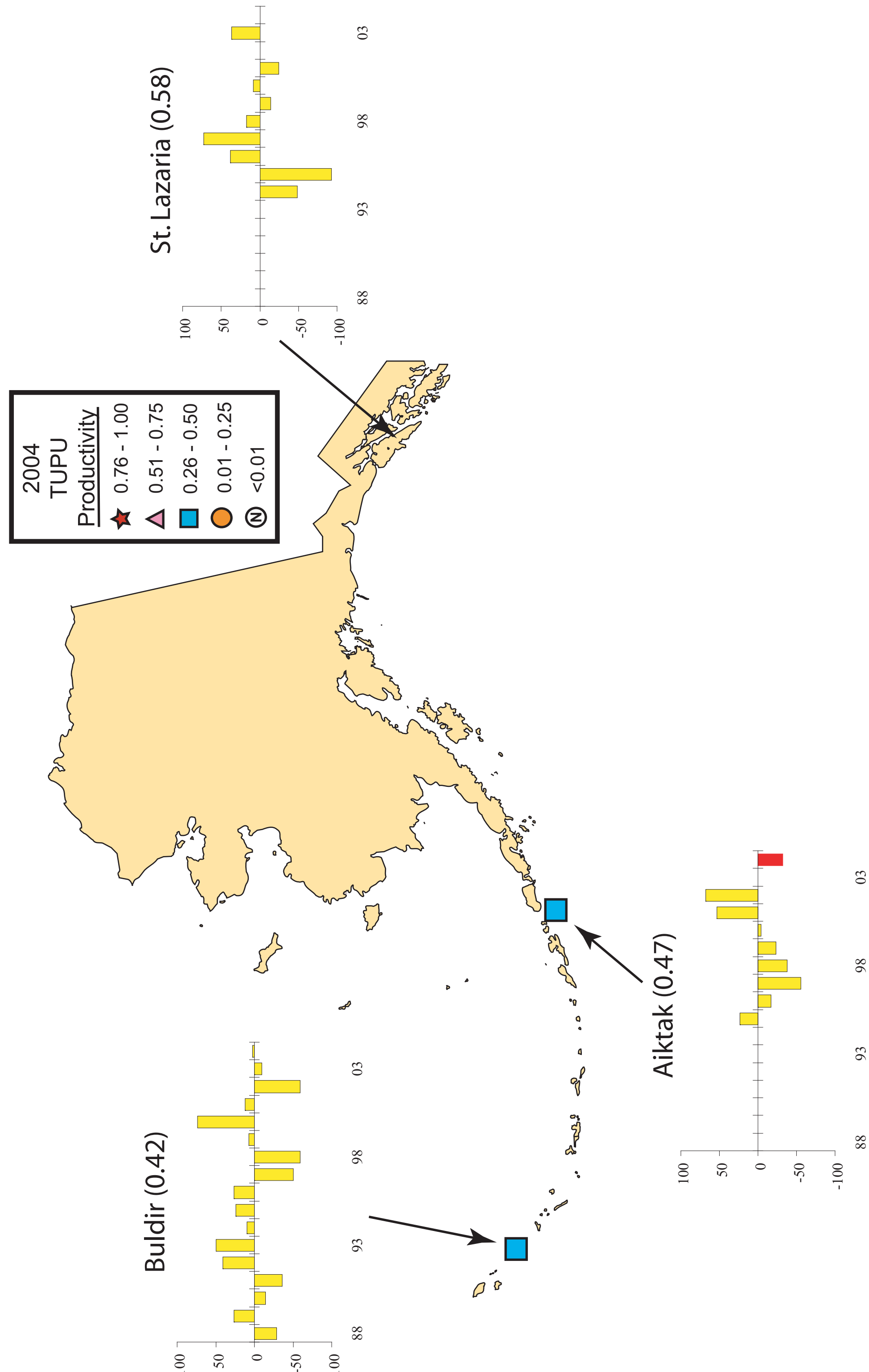


Figure 46. Productivity of tufted puffins (chicks fledged/egg) at Alaskan sites monitored in 2004. Graphs indicate the percent departure (if any) from the site mean (in parentheses; current year not included).

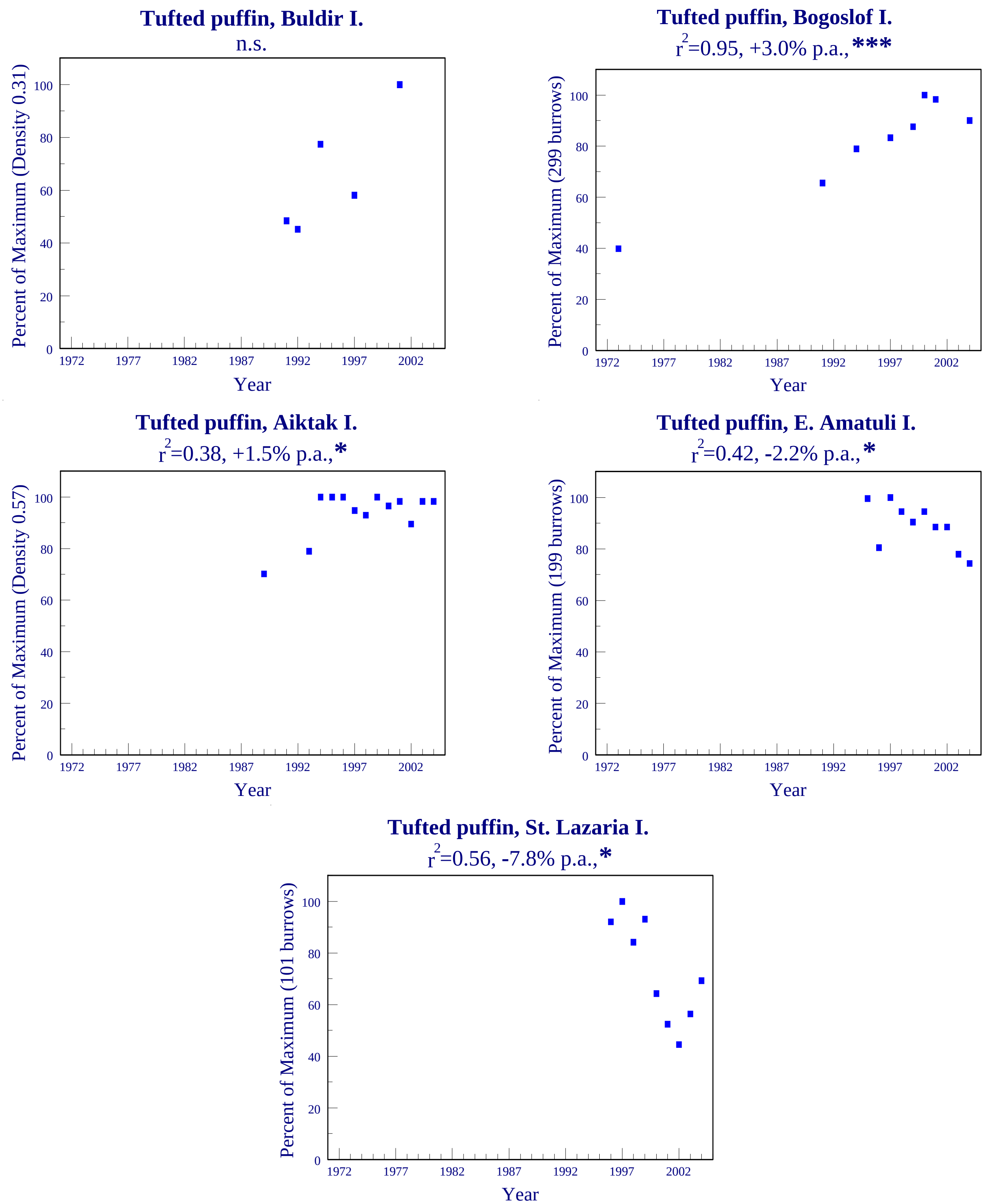


Figure 47. Trends in populations of tufted puffins at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Significance of trends indicated as: n.s. p>= 0.05 (not significant), * p<0.05, ** p<0.01, *** p<0.001. Rates of increase or decline are reported as percent change per annum (p.a.).

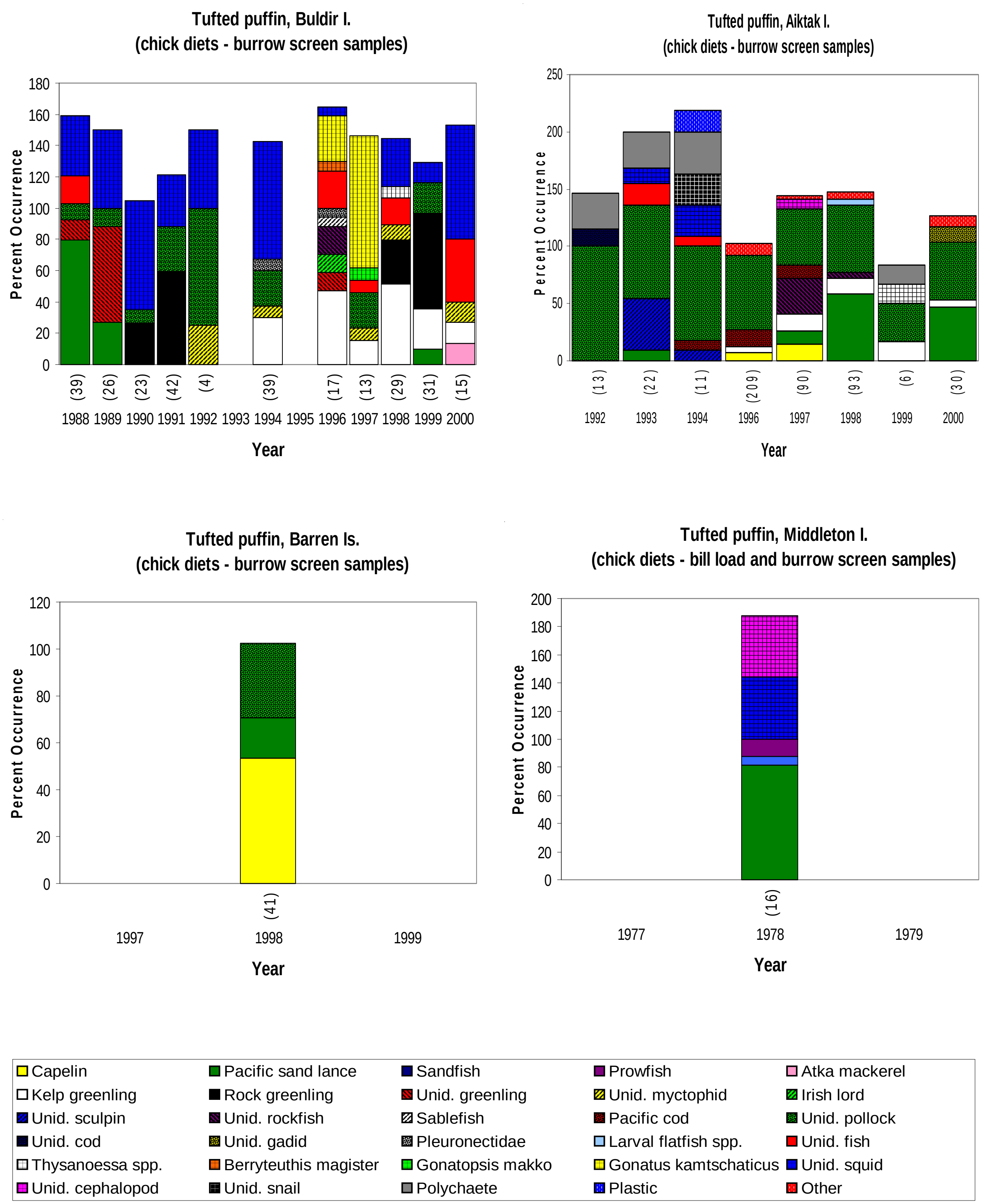


Figure 48. Diets of tufted puffins at Alaskan sites. Source of samples (adult or chick) and sample type are indicated in the graph title. Data are reported as percent occurrence of prey type in the diet. Sample sizes are reported below each bar.

Summary

Species differences

Surface plankton-feeders.–In 2004, timing of hatching was early for both fork-tailed and Leach's storm-petrels at Aiktak and St. Lazaria islands (Table 36). Fork-tailed storm-petrels (FTSP) had average reproductive success at Buldir, Aiktak and St. Lazaria islands and below average productivity at Ulak Island in 2004 (Table 37). Leach's storm-petrel (LHSP) productivity was above average at Buldir and Aiktak islands, and average at St. Lazaria Island. Storm-petrel (STPE) burrow densities and counts (both species combined) have increased or remained stable in recent years (Table 38).

Surface fish-feeders.–We found no significant trends for northern fulmar (NOFU) populations at the Pribilof Islands or at Chowiet Island (Table 38).

Glaucous-winged gulls (GWGU) are treated here, although they are opportunistic feeders taking other birds as well as fish for prey. In 2004, gull mean hatch date was about average at Aiktak Island, the only site where this variable was monitored (Table 36). Gulls had below average success at Chowiet Island, and average reproduction at Buldir and Aiktak islands in 2004 (Table 37). Gull populations showed stable trends at all but one colony (Table 38). Numbers of this species have declined significantly at Buldir Island.

Black-legged kittiwake (BLKI) hatch dates were earlier than normal at seven of eight monitored sites in 2004 (Table 36). Black-legged kittiwake productivity was average or above at half of the monitored sites and below average at the remainder in 2004 (Table 37). Black-legged kittiwake populations exhibited stable trends at nine sites, significant declines at four colonies and significant positive trends at two locations (Table 38).

Red-legged kittiwake (RLKI) hatching chronology was average or early at monitored colonies in 2004 (Table 36). Reproductive success was below average at Buldir Island, about average at St. Paul and St. George islands, and above average at Bogoslof Island in 2004 (Table 37). This species exhibited significant negative population trends at St. Paul and Koniuji islands, no trend at St. George Island and a significant increase at Buldir Island (Table 38).

Diving fish-feeders (nearshore).–Timing of hatching was about average for pelagic cormorants (PECO) at Cape Peirce in 2004 (Table 36). Red-faced cormorants (RFCO) had above average reproductive success at St. George Island, and average or below average productivity elsewhere in 2004 (Table 37). Pelagic cormorant success was average or below at all monitored sites in 2004 (Table 37). We found significant declines of red-faced cormorants at Chiniak Bay (Table 38). Pelagic cormorants showed no significant trends at most monitored colonies although numbers of this species were increasing significantly at St. Lazaria Island and declining at Chiniak Bay. Unspecified cormorant (UNCO) populations were stable at three of the five monitored colonies, declining at Shemya Island and increasing at Kasatochi Island.

Pigeon guillemot (PIGU) numbers showed significant declines in Prince William Sound but no trends at Buldir, Kasatochi , Aiktak or St. Lazaria islands (Table 38).

Table 36. Seabird relative breeding chronology compared to averages for past years within regions[a]. Only sites for which there were data from 2004 are included.

Region	Site	FTSP	LHSP	PECO	GWGU	BLKI	RLKI	COMU	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	RHAU	HOPU	TUPU
N. Bering/ Chukchi	St. Lawrence I.					–		–	–			–		+			
	Bluff					–		–									
SE Bering	St. Paul I.					–	–	+	+								
	St. George I.					–	–	+	+								
	C. Peirce			=		–		–									
	Aiktak I.	–	–		=					=							–
SW Bering	Buldir I.					–	=	=	+		=	=	=	+		=	–
	Kasatochi I.											=		=			
Gulf of Alaska	Chowiet I.					–		=	=						+		
	E. Amatuli I.					=		+									
Southeast	St. Lazaria I.	–	–														

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

Table 37. Seabird relative productivity levels compared to averages for past years within regions[a]. Only sites for which there were data from 2004 are included.

Region	Site	FTSP	LHSP	RFCO	PECO	GWGU	BLKI	RLKI	COMU	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	RHAU	HOPU	TUPU
N. Bering/ Chukchi	C. Lisburne						–											
	St. Lawrence I.						+		=	=			=		=			
	Bluff						+											
SE Bering	St. Paul I.			=			+	=	=	–								
	St. George I.			+			=	=	=	=								
	C. Peirce				=		+		+									
	Bogoslof I.						+	+										
	Aiktak I.	=	+			=			–	–	=							–
SW Bering	Buldir I.	=	+		=	=	–	–	=	=		–	=	=	–		–	=
	Kiska I.												+		+			
	Ulak I.	–		=	–													
	Kasatochi I.			–	–								=		=			
	Koniuji I.						–											
Gulf of Alaska	Chowiet I.					–	–		=	–						–		
	Chiniak Bay			–	–		–											
	E. Amatuli I.						–											
Southeast	St. Lazaria I.	=	=															

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

Table 38. Seabird population trends compared within regions[a].

Region	Site	NOFU	STPE	RFCO	PECO	UNCO	GWGU	BLKI	RLKI	COMU	TBMU	UNMU	PIGU	RHAU	TUPU
N. Bering/ Chukchi	C. Lisburne							=				+			
	St. Lawrence I.									=	=				
	Bluff							=		=					
SE Bering	St. Paul I.	=						–	–	–	–				
	St. George I.	=						=	=	=	=				
	C. Peirce				=			–		–					
	Round I.							=		=					
	Bogoslof I.														+
	Aiktak I.		+			=	=					–	=		+
SW Bering	Agattu I							=				+			
	Alaid/Nizki Is.					=									
	Shemya I.					–									
	Buldir I.				=		–	+	+		+		=		=
	Ulak I.		=			=						=			
	Kasatochi I.					+	=						=		
	Koniuji I							=	–			+			
Gulf of Alaska	Chowiet I.	=						–				+			
	Puale Bay						=	=							
	Chiniak Bay			–	–			=							
	E. Amatuli I.		=												–
	Gull I.				=			=		+					
	P. William Snd							+					–		
	Middleton I.				=			–				–			
Southeast	St. Lazaria I.		+		+		=					–	=	+	–

[a]Codes:
"– " indicates a significant (p<0.05) negative population trend for this site or region,
"=" indicates no significant trend(p>=0.05)
"+" indicates a significant (p<0.05) positive population trend for this site or region.

Diving fish-feeders (offshore).–Timing of common murre (COMU) hatching in 2004 was early or average at five of eight monitored sites and late at the others (Table 36). Thick-billed murre (TBMU) chronology was earlier than average at St. Lawrence Island, average at Chowiet Island, and late at St. Paul, St. George and Buldir islands in 2004.

Common murres exhibited average or below average reproductive success at all sites except Cape Peirce, where success was above normal (Table 37). Thick-billed murres exhibited average or below average productivity at all monitored sites in 2004.

Numbers of common murres showed significant increasing trends at one colony (Gull Island), declines at two sites and remained relatively stable at four locations (Table 38). Thick-billed murre populations exhibited significant declining trends at one site, increases at one colony and stable numbers at two locations. At colonies where murres were not identified to species during counts (UNMU), numbers significantly increased or remained stable at five sites and showed significant negative trends at three locations (Table 38).

Ancient murrelet (ANMU) hatching chronology and productivity were about average at Aiktak Island in 2004 (Tables 36 and 37).

Rhinoceros auklet (RHAU) eggs hatched relatively late at Chowiet Island in 2004 (Table 36). This species had below average productivity at Chowiet Island in 2004 (Table 37). We found a significant increase in populations of rhinoceros auklets at St. Lazaria Island (Table 38).

Horned puffins (HOPU) exhibited normal hatching chronology and below average productivity at Buldir Island in 2004 (Tables 36 and 37).

Tufted puffin (TUPU) eggs hatched earlier than the norm at Buldir and Aiktak islands in 2004 (Table 36). Reproductive success for this species was average at Buldir Island and below average at Aiktak Island in 2004 (Table 37). Tufted puffin populations increased at two sites, declined at two colonies and remained unchanged at one location (Table 38).

Diving plankton-feeders.–Parakeet (PAAU), least (LEAU), whiskered (WHAU) and crested (CRAU) auklets had approximately average nesting chronologies at most sites where they were monitored in 2004 (Table 36). Productivity was below average for parakeet auklets at Buldir Island in 2004 (Table 37). Least, whiskered and crested auklets had average success at most monitored sites. Productivity was above average for least and crested auklets at Kiska Island. Crested auklets exhibited lower than normal success at Buldir Island in 2004 (Table 37).

Regional differences

Northern Bering/Chukchi.–All monitored species hatched earlier than normal in this region in 2004 with the exception of later than average hatching of crested auklets at St. Lawrence Island (Table 36). Reproductive success was below average for black-legged kittiwakes at Cape Lisburne and above average at St. Lawrence Island and Bluff in 2004 (Table 37). Murre and auklet productivity was about average at St. Lawrence Island. The only population trend data from this region were for offshore fish-feeders (kittiwakes and murres). We found no significant trends in black-legged kittiwake numbers (Table 38). Common murre populations exhibited no trend at St. Lawrence Island or Bluff. Thick-billed murre populations showed no trend at St. Lawrence Island but unspecified murres increased significantly at Cape Lisburne.

Southeastern Bering.–Eggs from both species of storm-petrels hatched earlier than average at Aiktak Island in 2004 (Table 36). Cormorants, gulls and ancient murrelets exhibited about average hatching chronology, whereas kittiwake chronology was early in this region. Timing of murre hatching was early at Cape Peirce and late at the Pribilof Islands. Tufted puffin eggs hatched earlier than normal at Aiktak Island in 2004.

Storm-petrel reproductive success was average or above in this region in 2004 (Table 37). Cormorants and glaucous-winged gulls experienced average or above average productivity. Kittiwakes exhibited higher than normal productivity in most instances in this region in 2004. Murre productivity was average or above average in four of seven instances in this region in 2004. Common murres had lower than normal success at St. Paul Island and both species experienced relatively poor success at Aiktak Island. Ancient murrelet productivity was average at Aiktak Island while tufted puffin success was below average there in 2004.

Northern fulmar numbers appeared to be stable at both monitored colonies in this region (Table 38). Storm-petrel populations increased significantly in the eastern Aleutians (Aiktak Island). There were no clear patterns in population trends among fish-feeders in this region: 1) neither pelagic nor unspecified cormorants showed a trend; 2) glaucous-winged gull numbers appeared to be stable at Aiktak Island; 3) we found significant negative trends for black-legged kittiwakes at St. Paul Island and Cape Peirce but no trends for this species at the two other monitored sites; 4) red-legged kittiwakes exhibited a significant decline at St. Paul Island but not at St. George Island; 5) we found significant negative population trends for common murres at St. Paul Island and Cape Peirce, for thick-billed murres at St. Paul Island, and for unspecified murres at Aiktak Island. Murre numbers showed no trends at other monitored sites; 6) pigeon guillemot populations exhibited no trend at Aiktak Island; and 7) tufted puffin population trends were significantly positive at both Bogoslof and Aiktak islands.

Southwestern Bering.–Kittiwake hatch dates were either average or early while murre breeding chronology was either later than usual or about average in 2004 (Table 36). Plankton-feeders (auklets) also exhibited normal breeding chronology in this region, except that crested auklet eggs hatched later than average at Buldir Island in 2004. Horned puffin chronology was about average at Buldir Island. Tufted puffins exhibited earlier than normal hatching chronology at that colony in 2004.

Fork-tailed storm-petrels had average or below average success, and Leach's storm-petrels exhibited above average productivity in this region in 2004 (Table 37). Cormorant success was below average or average at all of the sites monitored in this region. Glaucous-winged gull productivity was average at Buldir Island. Black-legged kittiwakes experienced below average production at Buldir and Koniuji islands in 2004. Red-legged kittiwakes also had below average productivity at Buldir Island. Common and thick-billed murre productivity was about average at Buldir Island. Auklets exhibited average or below average productivity at southwestern Bering Sea colonies monitored in 2004, with the exception of above average success for both least and crested auklets at Kiska Island. Puffins had average or below average productivity at Buldir Island.

Storm-petrel populations were stable at Ulak Island (Table 38). We found no significant trends in cormorant populations at Nizki/Alaid islands, Buldir Island or Ulak Island but cormorants significantly increased at Kasatochi Island and declined at Shemya Island. Glaucous-winged gulls showed a significant negative population trend at Buldir Island and no trend at Kasatochi Island. Both black- and red-legged kittiwakes increased significantly at Buldir Island but the former species exhibited no trend at Agattu Island. No trends were evident for black-legged kittiwakes at Koniuji Island but red-legged kittiwakes showed a significant decline at that small colony. Murres were either stable or increasing in this region and pigeon guillemots exhibited no trends. We found no significant trend in tufted puffin populations at Buldir Island.

Northern Gulf of Alaska.–Breeding chronology was normal or earlier than normal for kittiwakes and murres breeding in this region in 2004, with the exception of later than average chronology for common murres at East Amatuli Island (Table 36). Rhinoceros auklet eggs hatched later than normal at Chowiet Island in 2004.

Productivity was below average for most species monitored in this region in 2004, the exception being average success for common murres at Chowiet Island (Table 37).

Northern fulmars showed no trend in populations at Chowiet Island (Table 38). The same can be said for storm-petrels at East Amatuli Island. We found no significant population trends for either red-faced or pelagic cormorants in this region with the exception of a significant decline of both species at Chiniak Bay. Glaucous-winged gull counts indicated no trends at Puale Bay. Black-legged kittiwake numbers were significantly down at two sites, up at one location and exhibited no trends at the remaining three colonies. We found significant positive trends for murre populations at Chowiet and Gull islands and a decline at Middleton Island. Pigeon guillemot populations declined in Prince William Sound. Tufted puffin numbers showed a significant negative trend at East Amatuli Island.

Southeast Alaska.–Storm-petrels exhibited earlier than normal nesting chronology at St. Lazaria Island in 2004 (Table 36). Productivity was average for storm-petrels in this region in 2004 (Table 37). Storm-petrel and pelagic cormorant numbers increased significantly at St. Lazaria Island (Table 38). Glaucous-winged gull and pigeon guillemot populations were stable whereas murre and tufted puffin numbers showed a significant negative trend at this colony. Rhinoceros auklet populations were up significantly at St. Lazaria Island.

Acknowledgments

The data summarized in this report were gathered by many people, most of whom are cited in the references section. We appreciate their efforts. We would like to thank Arthur Kettle (Alaska Maritime NWR), Greg Levandoski (Alaska Maritime NWR), Rob MacDonald (Togiak NWR), David Roseneau (Alaska Maritime NWR), Leslie Slater (Alaska Maritime NWR), Jeff Williams (Alaska Maritime NWR) and Sadie Wright (Alaska Maritime NWR) for the unpublished data they kindly provided. Diet samples were identified by Kathy Turco and Alan Springer. Diet graphs and text were compiled by Aly McKnight. Finally, we would like to extend our thanks to the staff of the Alaska Maritime NWR for their assistance during both the data collection and writing phases of this project.

All photographs used in this report are Fish and Wildlife Service pictures except those of the fork-tailed storm-petrel, parakeet auklet, least auklet, tufted puffin and horned puffin which were taken by Ian Jones, and the ancient murrelet taken by Fiona Hunter, and used with permission. Cover art by Susan Steinacher.

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