BREEDING STATUS AND POPULATION TRENDS OF SEABIRDS IN ALASKA IN 1999

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BREEDING STATUS AND POPULATION TRENDS OF SEABIRDS IN ALASKA IN 1999

Compiled By:

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

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U.S. Fish and Wildlife Service
Alaska Maritime National Wildlife Refuge
2355 Kachemak Bay Drive, Suite 101
Homer, Alaska, USA 99603

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[a]Byrd and Dragoo at Alaska Maritime NWR, Homer; Irons at U. S. Fish and Wildlife Service, Migratory Bird Management, 1011 East Tudor Road, Anchorage, Alaska USA 99503

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EXECUTIVE SUMMARY

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

In summer 1999 data were gathered on fulmars, storm-petrels, cormorants, gulls, kittiwakes, murres, murrelets, auklets, and/or puffins at nine annual monitoring sites on the Alaska Maritime NWR, one annual monitoring site on the Togiak NWR, and an annual monitoring site on private land (Little Diomede Island). In addition, data were gathered at seven other locations which are visited intermittently or are currently part of an intensive research program off refuges (e.g., Exxon Valdez Trustee Council-sponsored research in Prince William Sound).

In 1999, we recorded only two cases of earlier than normal hatching (red-legged kittiwakes at two sites in the southeastern Bering Sea). Instead, most species were within normal bounds or were later than average. Surface plankton feeders (storm-petrels) were later than normal in three of four cases (species x site). Timing of nesting of diving plankton feeders (auklets) was normal in all cases. Fish feeders (cormorants, gull, kittiwakes, murres, puffins) were later than normal in five of 13 cases in the southeastern Bering Sea and in 10 of 13 cases in the northern Gulf of Alaska.

Plankton feeders (storm-petrels and auklets) had average rates of reproductive success in nearly every case where we monitored them in 1999. For surface fish feeders, gulls had average rates of success in 5 of 6 cases, but the productivity of kittiwakes varied among regions. At Chukchi and Bering Sea locations kittiwakes generally had average or below average success. In the Gulf of Alaska, success was average in five of six cases. There were no cases of above average success for kittiwakes at any site we monitored in 1999. Monitored species of diving fish feeders (cormorants, murres, and puffins) had average or below average rates of productivity at most sites in Alaska in 1999. Above average success was recorded in only five of 36 cases (species x sites), all in the southwestern Bering Sea and Gulf of Alaska.

Storm-petrel populations appeared to be increasing where we monitored them in 1999 (southeastern Bering Sea and Southeast Alaska). Trends for cormorants were either down or level. For other species of fish feeders (gulls, kittiwakes, murres, puffins), we saw downward trends in nearly half of the cases (species x site) while the other half was evenly split between level and upward trends. Diving plankton feeders showed either no trend or increasing numbers at the only colony monitored in 1999 (southwestern Bering Sea).

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INTRODUCTION

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

The Alaska Maritime NWR was established specifically "To conserve marine bird populations and habitats in their natural diversity and the marine resources upon which they rely" (Alaska National Interests Land Conservation Act of 1982), and the monitoring program is an integral part of the management of this refuge. Although approximately 80% of the seabird nesting colonies in Alaska occur on the Alaska Maritime NWR, marine bird nesting colonies occur on other public lands (national and state refuges) and on private lands as well.

The strategy for colony monitoring includes estimating timing of nesting events, reproductive success, population trends, and feeding ecology of representative species of various foraging guilds (e.g., murres are off-shore diving fish-feeders, kittiwakes are offshore surface-feeding fish-feeders, auklets are diving plankton-feeders, etc.) at geographically dispersed breeding sites along the entire coastline of Alaska. A total of 12 sites, located roughly 300-500 km apart, are scheduled for annual surveys, and data were available for most of these in 1999 (Fig. 1). In addition, colonies near the annual sites are identified for less frequent surveys to "calibrate" the information at the annual sites. Furthermore, other research projects (e.g., those associated with evaluating the impacts of oil spills on marine birds) supplement the monitoring database.

In this report, we summarize information from 1999 for each species; i.e., tables with estimates of average hatch dates and reproductive success, and maps with symbols indicating the relative success at various sites. In addition, historical patterns of productivity are illustrated for most annual monitoring sites (those where we have information). Population trend information is included for sites where at least five data points have been gathered.

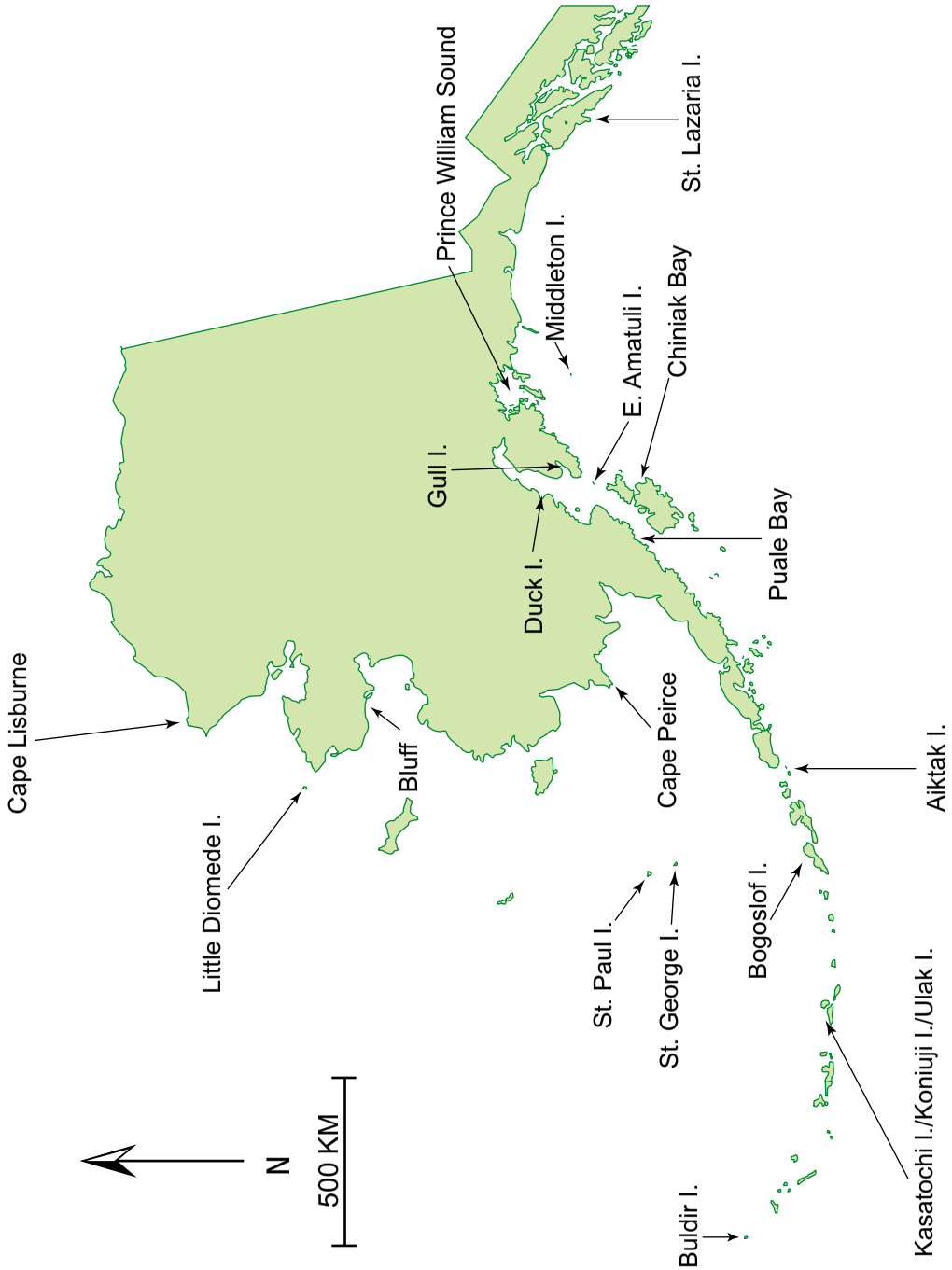


Figure 1. Map of Alaska showing the locations of seabird monitoring sites summarized in this report.

METHODS

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

Table 1. Productivity parameters used in this report.

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

This report summarizes monitoring data for 1999, and compares 1999 results with previous years. For sites with four or more years of data prior to 1999, site averages were used for comparisons. Otherwise, prior estimates for nearby sites were utilized for comparisons. For chronology, we considered dates within 3 days of the long-term average "normal"; larger deviations represented relatively early or late dates. For productivity, we defined significant deviations from "normal" as 20% or greater from the site or regional average. We used the phrase "slightly" above or below average to indicate smaller differences. We described overall population trends from exponential regression models.

RESULTS

Northern Fulmar (*Fulmarus glacialis*)

Breeding Chronology.–No data for 1999.

Productivity.–No data for 1999.

Populations.–Fewer fulmars were counted in 1999 than in previous years at St. George Island, where the long-term trend has been relatively stable (Fig. 2). Counts were made at St. Paul Island in 1999 but data were not available. No counts were conducted at Chowiet Island in 1999.

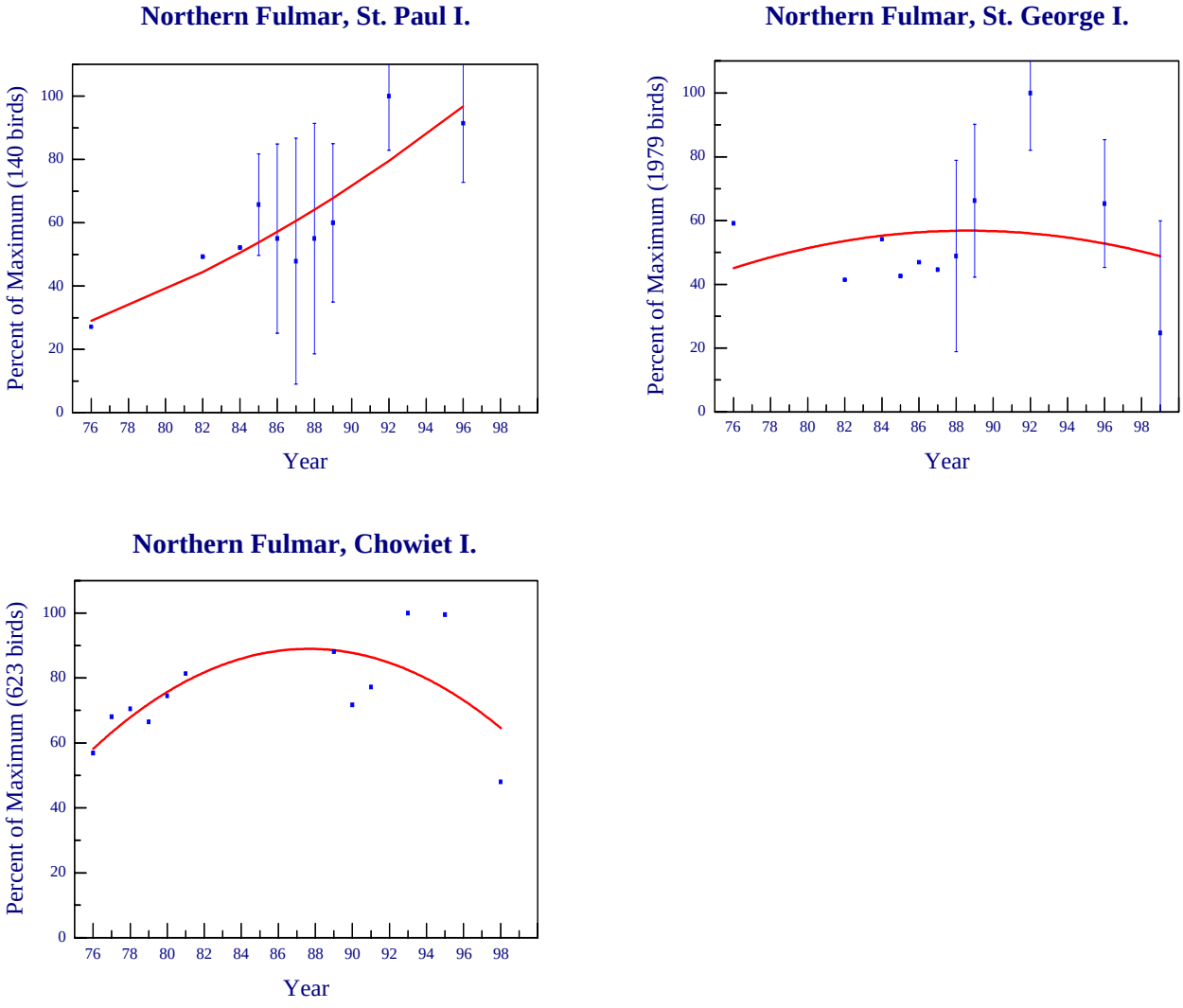


Figure 2. Trends in populations of northern fulmars at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

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

Breeding Chronology.–The mean hatching date for fork-tailed storm-petrels was later than the long-term average at both Aiktak and St. Lazaria islands in 1999 (Table 2).

Table 2. Hatching chronology of fork-tailed storm-petrels at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	24 Jul (35)[a]	24 Jul (35)	16 Jul[b] (2)[a]	Howard and Woodward 1999
Saint Lazaria I.	2 Aug (34)	2 Aug (34)	23 Jul[b] (4)	L. Slater Unpubl. Data[c]

[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]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Productivity.--In 1999, productivity of fork-tailed storm-petrels ranged from 83% at Aiktak Island to 41% at St. Lazaria Island (Table 3, Fig. 3). Compared to previous years, rates of success were lower at Buldir and St. Lazaria islands and normal at Ulak Island, but higher than average at Aiktak Island in 1999 (Fig. 3).

Table 3. Reproductive performance of fork-tailed storm-petrels at Alaskan sites monitored in 1999.

Site	Chicks Fledged[a]/egg	No. of Plots	No. of Eggs	Reference
Buldir I.	0.54	6	70	J. Williams Unpubl. Data[b]
Ulak I.	0.60	N/A[c]	53	L. Scharf Unpubl. Data[d]
Aiktak I.	0.83	N/A	40	Howard and Woodward 1999
Saint Lazaria I.	0.41	11	180	L. Slater Unpubl. Data[e]

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

[b]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[c]Not applicable or not reported.

[d]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[e]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

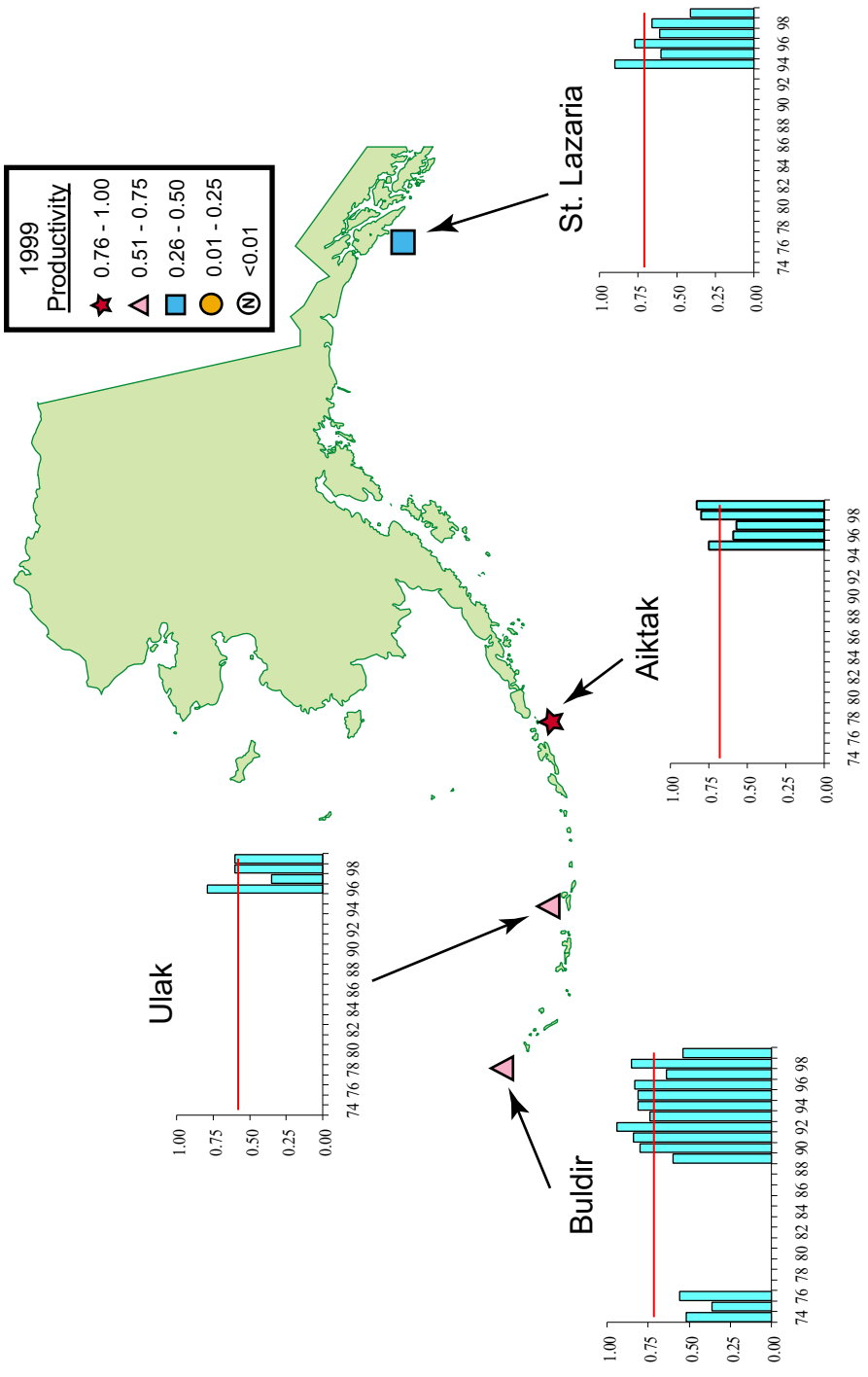


Figure 3. Productivity of fork-tailed storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Populations.--Fork-tailed and Leach's storm-petrel burrows were combined for population monitoring purposes. In 1999, counts of burrow entrances were made in monitoring plots at St. Lazaria and Aiktak islands (both annual sites). It appeared that populations were increasing at St. Lazaria Island (Fig. 4). Burrow densities at Aiktak Island in 1999 were similar to the previous two years, but the overall trend there was up substantially since 1990 similar to the trend at Buldir Island (Fig. 4).

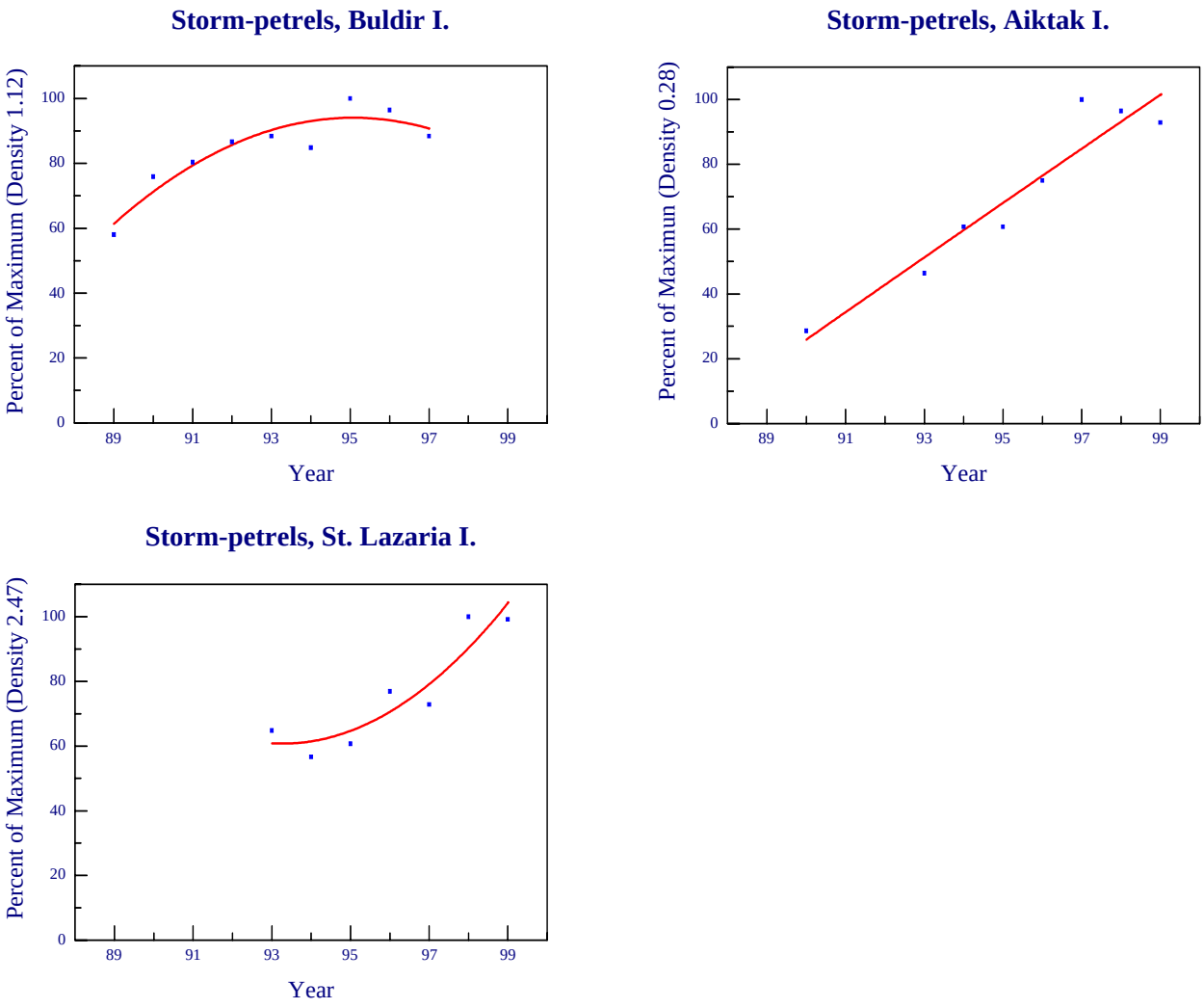


Figure 4. Trends in populations of storm-petrels at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

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

Breeding Chronology.--The mean hatching date for Leach's storm-petrels was about average at Aiktak Island and later than the long-term average at St. Lazaria Island in 1999 (Table 4).

Table 4. Hatching chronology of Leach's storm-petrels at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	1 Aug (35)[a]	3 Aug (35)	1 Aug[b] (2)[a]	Howard and Woodward 1999
Saint Lazaria I.	10 Aug (41)	10 Aug (41)	1 Aug[b] (4)	L. Slater Unpubl. Data[c]

[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]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Productivity.--In 1999, productivity of Leach's storm-petrels ranged from 77% at Aiktak Island to 60% at St. Lazaria Island (Table 5, Fig. 5). Compared to previous years, this species had approximately average success at both sites where data were available (Fig. 5).

Table 5. Reproductive performance of Leach's storm-petrels at Alaskan sites monitored in 1999.

Site	Chicks Fledged[a]/egg	No. of Plots	No. of Eggs	Reference
Aiktak I.	0.77	N/A[b]	105	Howard and Woodward 1999
Saint Lazaria I.	0.60	11	103	L. Slater Unpubl. Data[c]

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

[b]Not applicable or not reported.

[c]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Populations.--Fork-tailed and Leach's storm-petrel burrows were combined for population monitoring purposes. In 1999, counts of burrow entrances were made in monitoring plots at St. Lazaria and Aiktak islands (both annual sites). It appeared that populations were increasing at St. Lazaria Island (Fig. 4). Burrow densities at Aiktak Island in 1999 were similar to the previous two years, but the overall trend there was up substantially since 1990 (Fig. 4).

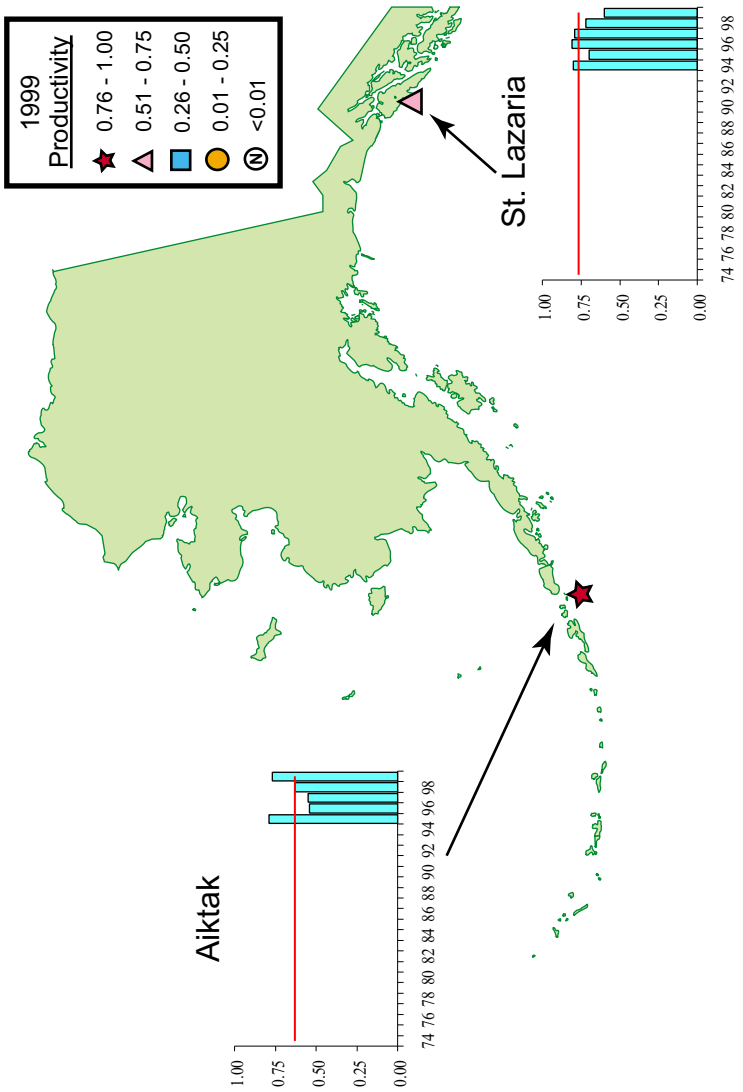


Figure 5. Productivity of Leach's storm-petrels (chicks fledged/egg) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Double-crested Cormorant (*Phalacrocorax auritus)*

Breeding Chronology.–No data for 1999.

Productivity.--Double-crested cormorants averaged fewer than one chick per nest at Duck Island in 1999 (Table 6). There is little prior information for this species at this site.

Table 6. Reproductive performance of double-crested cormorants at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Nest	No. of Nests	Reference
Duck I.	0.13	30	J. Piatt and A. Harding Unpubl. Data[a]

[a]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.

Populations.–No data for 1999.

Pelagic Cormorant (*Phalacrocorax pelagicus*)

Breeding Chronology.--Information on breeding chronology of pelagic cormorants was obtained only at Cape Peirce in 1999, where the mean hatch date was later than the long-term average (Table 7).

Table 7. Hatching chronology of pelagic cormorants at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Cape Peirce		30 Jun (28)[a]	18 Jun[b] (7)[a]	R. MacDonald Unpubl. Data[c]

[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]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.

Productivity.--Productivity varied substantially among sites in 1999 ranging from a complete failure at Chiniak Bay to a high of 1.6 chicks per nest at Ulak Island (Table 8, Fig. 6). Compared to past years, pelagic cormorant success was lower than average at Bluff, Cape Peirce, Kasatochi Island, and Chiniak Bay in 1999 but was nearly normal at Gull Island, Middleton Island and St. Lazaria Island. Productivity was above average at Buldir and Ulak islands (Fig. 6).

Table 8. Reproductive performance of pelagic cormorants at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Nest	No. of Plots	No. of Nests	Reference
Bluff	1.50	N/A[a]	12	Murphy 1999
Cape Peirce	0.71	11	48	R. MacDonald Unpubl. Data [b]
Buldir I.	1.40	N/A	33	J. Williams Unpubl. Data[c]
Kasatochi I.	0.60	N/A	22	L. Scharf Unpubl. Data[d]
Ulak I.	1.60	N/A	5	L. Scharf Unpubl. Data[d]
Chiniak Bay	0.00[e]	N/A	102	J. Benson and D. Irons Unpubl. Data[f]
Gull I.	1.48	N/A	31	J. Piatt and M. Shultz Unpubl. Data[g]
Middleton I.	0.68	11	377	S. Hatch and V. Gill Unpubl. Data[h]
Saint Lazaria I.	1.17	5	160	L. Slater Unpubl. Data[i]

[a]Not applicable or not reported.

[b]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.

[c]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[d]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

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

[f]Benson, J. and D. B. Irons, Migratory Bird Management, USFWS. Unpublished Data, 2000.

[g]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.

[h]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

[i]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

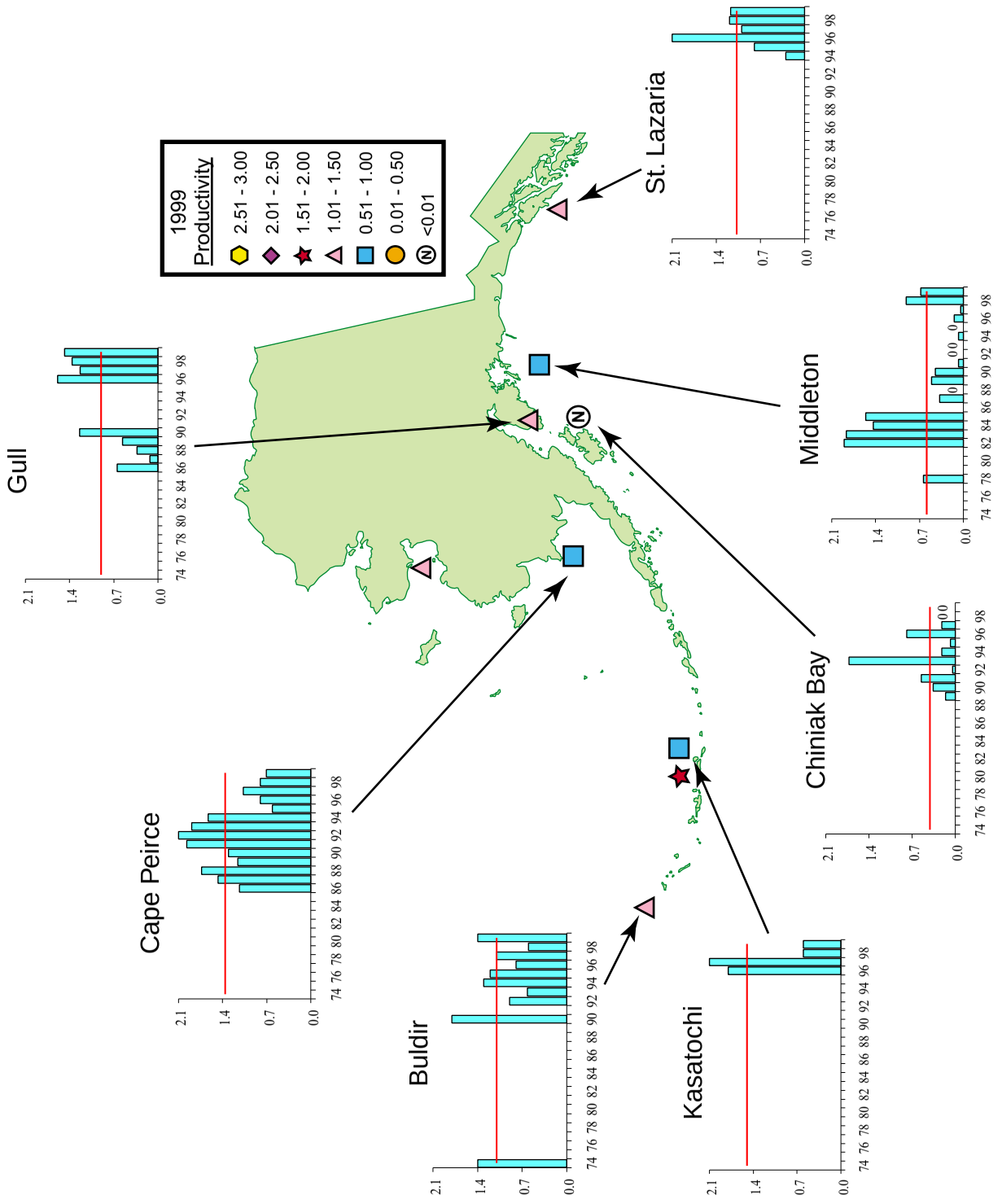


Figure 6. Productivity of pelagic cormorants (chicks fledged/nest) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Populations.--Cormorants are known to shift nesting locations between years, so it is difficult to confidently interpret changes in counts. Nevertheless, numbers of pelagic cormorants or nests (the index that has been used at some sites) have declined at sites in the western Gulf of Alaska (Chiniak Bay, Middleton Island), but were relatively stable at Cape Peirce (Fig. 7).

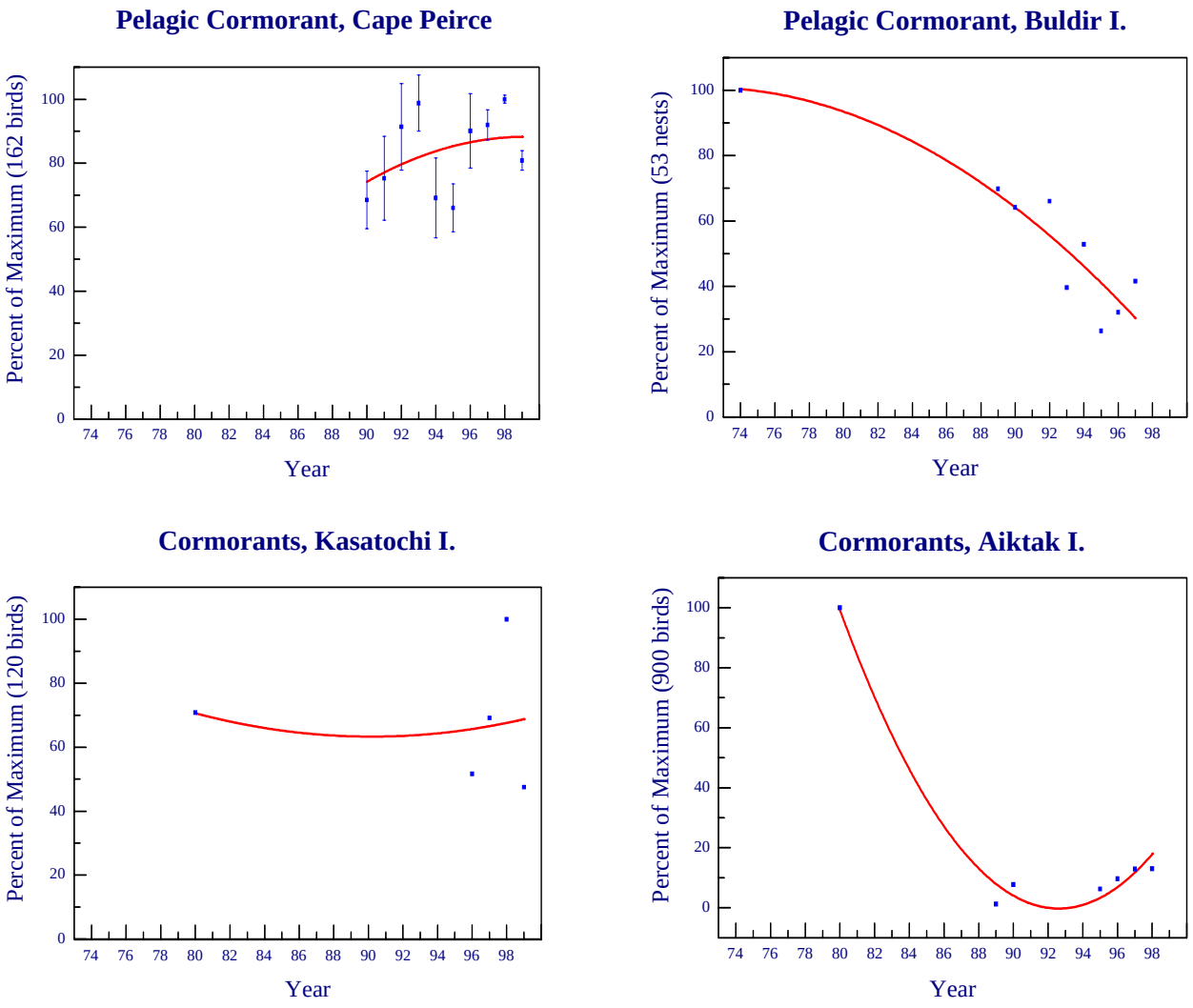


Figure 7. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

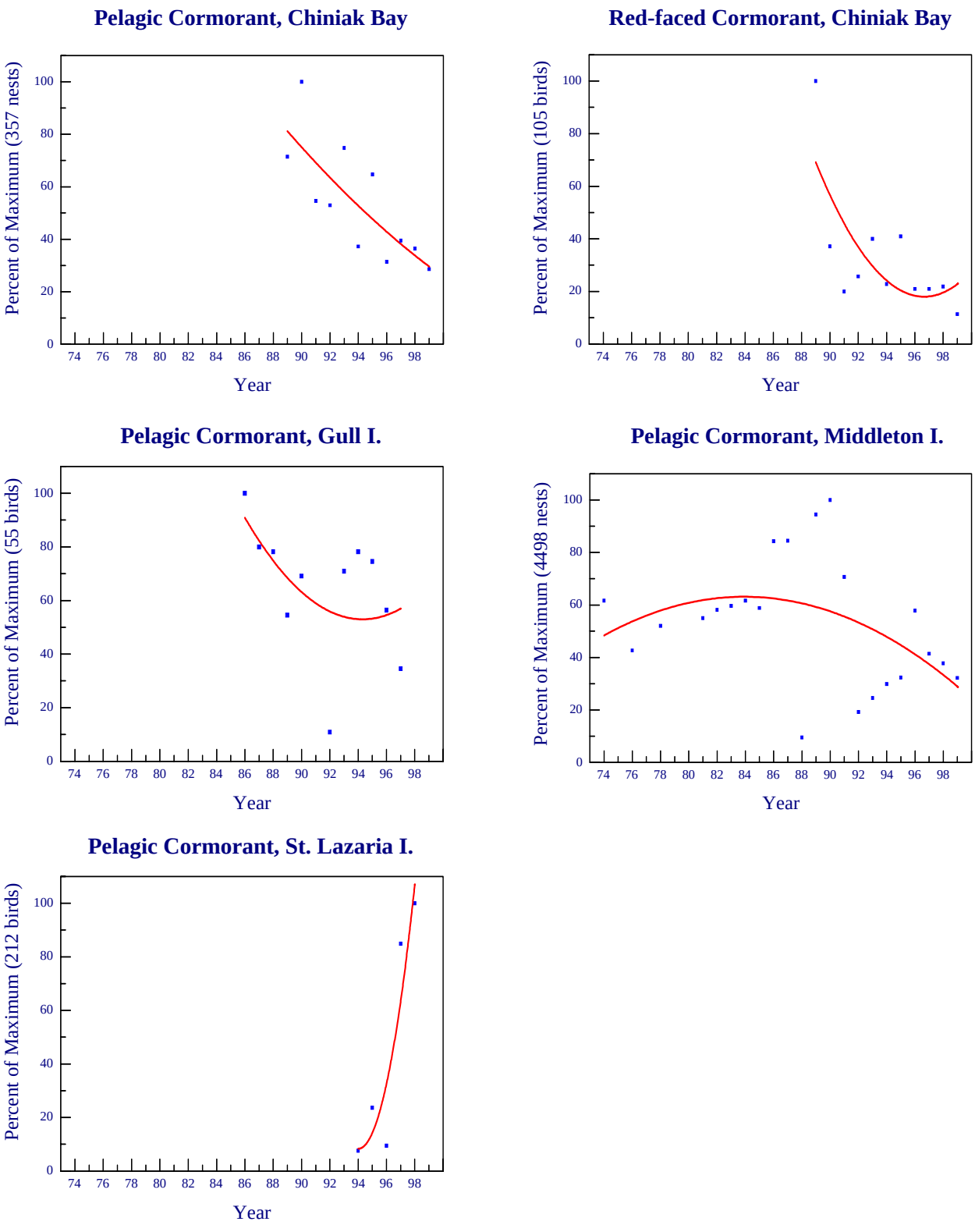


Figure 7. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

Red-faced Cormorant (*Phalacrocorax urile*)

Breeding Chronology.–No data for 1999.

Productivity.--In 1999, productivity of red-faced cormorants ranged from failure at Chiniak Bay to a relatively high rate of success (1.4 chicks per nest) at Ulak Island (Table 9). Productivity was average or higher in 1999 at St. Paul and Ulak islands when compared to the long-term means for those sites, but was lower than average at Kasatochi Island and Chiniak Bay (Fig. 8).

Table 9. Reproductive performance of red-faced cormorants at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Nest	No. of Plots	No. of Nests	Reference
Saint Paul I.	0.76	4	72	Bittner and Farence 1999
Kasatochi I.	0.20	N/A[a]	9	L. Scharf Unpubl. Data[b]
Ulak I.	1.40	N/A	9	L. Scharf Unpubl. Data[b]
Chiniak Bay	0.00[c]	N/A	12	J. Benson and D. B. Irons Unpubl. Data[d]

[a]Not applicable or not reported.
[b]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[c]Value obtained from one-time visit to colony.
[d]Irons, D. B., Migratory Bird Management, USFWS. Unpublished Data, 1999.

Populations.--As with pelagic cormorants, shifting among sites occurs in red-faced cormorants. In 1999, red-faced cormorant numbers continued to remain low compared to 1970s levels at Chiniak Bay. At Kasatochi Island, overall trends in numbers of cormorants (mostly red-faced), were approximately level (Fig. 7).

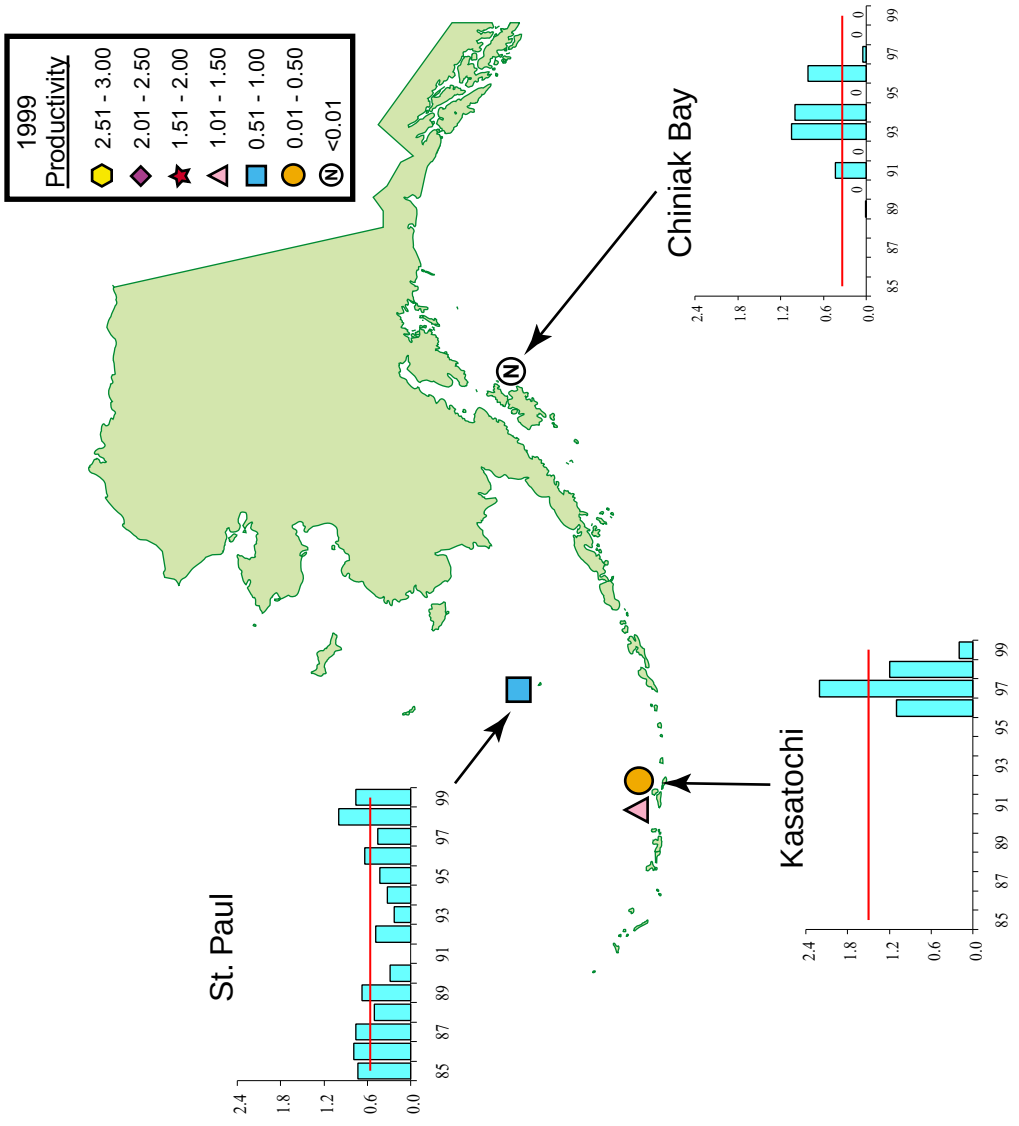
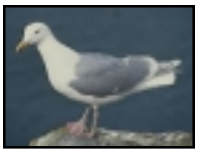


Figure 8. Productivity of red-faced cormorants (chicks fledged/nest) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).



Glaucous-winged Gull *(Larus glaucescens*)

Breeding Chronology.--Median hatch dates for gulls ranged from 21 June to 11 July in 1999 (Table 10). Nesting was normal or slightly early at Aiktak and Middleton islands, but gulls laid eggs relatively late at Gull and Duck islands in 1999.

Table 10. Hatching chronology of glaucous-winged gulls at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	11 Jul (58)[a]	12 Jul (58)	13 Jul[b] (4)[a]	Howard and Woodward 1999
Gull I.	11 Jul (21)		1 Jul[c] (4)	J. Piatt and M. Shultz Unpubl. Data[d]
Duck I.	2 Jul (14)		26 Jun[c] (2)	J. Piatt and A. Harding Unpubl. Data[e]
Middleton I.	21 Jun (44)	21 Jun (44)	29 Jun[b] (7)	S. Hatch and V. Gill Unpubl. Data[f]
St. Lazaria I.	6 Jul (76)	5 Jul (76)	N/A[g]	L. Slater Unpubl. Data[h]

[a]Sample size in parentheses represents the number of nest sites used to calculate the mean or median hatch date and the number of years used to calculate the long-term average. Current year not included in long-term average.
[b]Mean of annual means.
[c]Mean of annual medians.
[d]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.
[e]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.
[f]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.
[g]Not applicable or not reported.
[h]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Productivity.--Hatching success in 1999 ranged from 80 % at E. Amatuli Island to zero at Buldir Island (Table 11, Fig. 9). All site averages were within normal levels except at Buldir Island where rates were below average.

Table 11. Reproductive performance of glaucous-winged gulls at Alaskan sites monitored in 1999.

Site	Hatching Success[a]	No. of Plots	No. of Nests	Reference
Buldir I.	0.00	N/A[b]	20	J. Williams Unpubl. Data[c]
Aiktak I.	0.65	4	63	Howard and Woodward 1999
E. Amatuli I.	0.80	N/A	14	A. Kettle Unpubl. Data[d]
Gull I.	0.64	5	34	J. Piatt and M. Shultz Unpubl. Data[e]
Duck I.	0.45	3	38	J. Piatt and A. Harding Unpubl. Data[f]
Middleton I.	0.44	2	43	S. Hatch and V. Gill Unpubl. Data[g]
Saint Lazaria I.	0.55	6	87	L. Slater Unpubl. Data[h]

[a]Total chicks/Total eggs.
[b]Not applicable or not reported.
[c]Willams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[d]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[e]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.
[f]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.
[g]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.
[h]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Populations.--Gulls were counted in plots at four sites in 1999 (Fig. 10). Counts in 1999 indicated a positive trend at E. Amatuli Island but trends tended to be negative at Aiktak and St. Lazaria islands (Fig. 10). Gull populations at Kasatochi Island showed a recent downward trend in spite of the fact that the 1999 numbers were substantially higher than the six birds that were counted there in 1936.

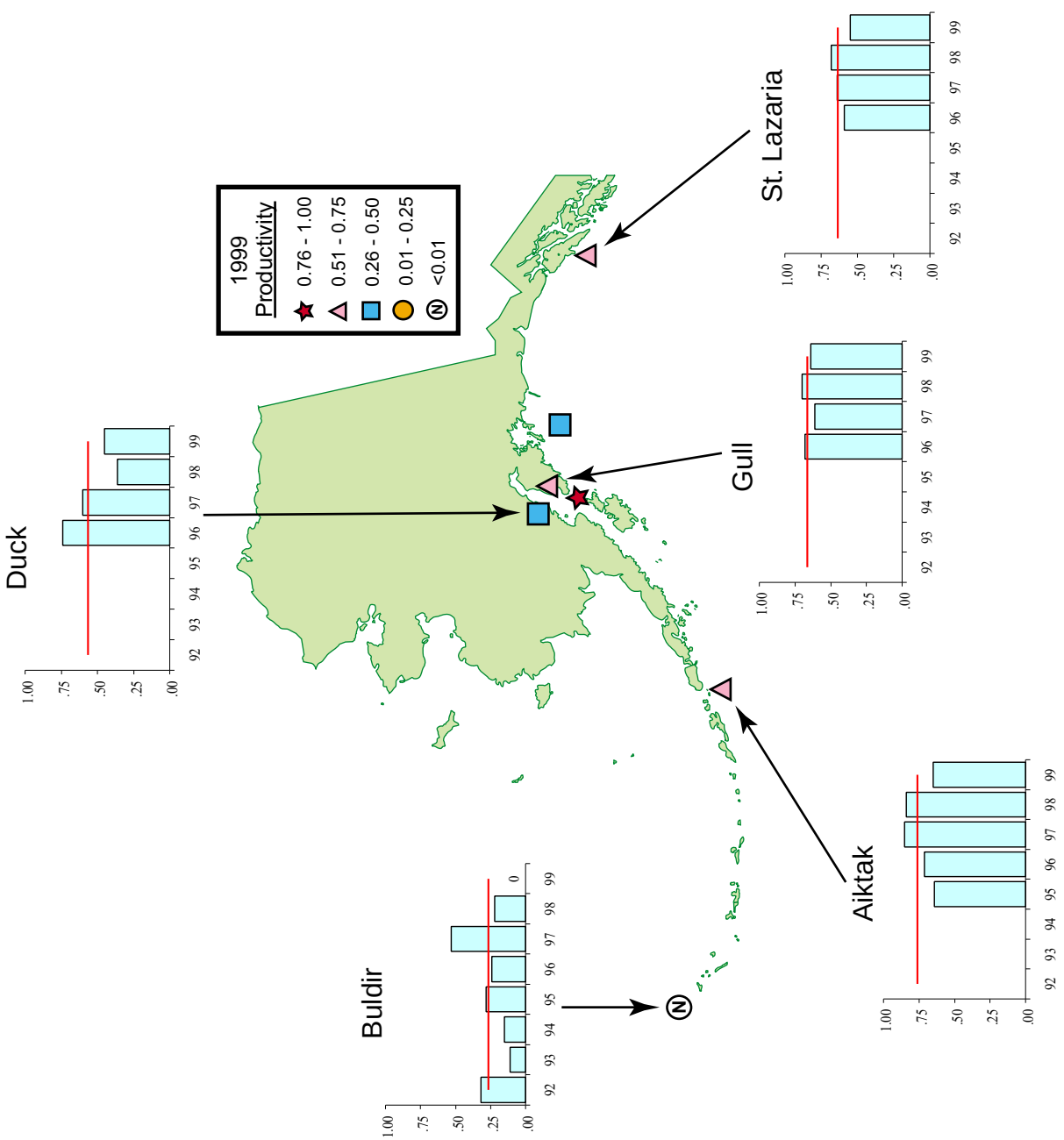


Figure 9. Productivity of glaucous-winged gulls (hatching success) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

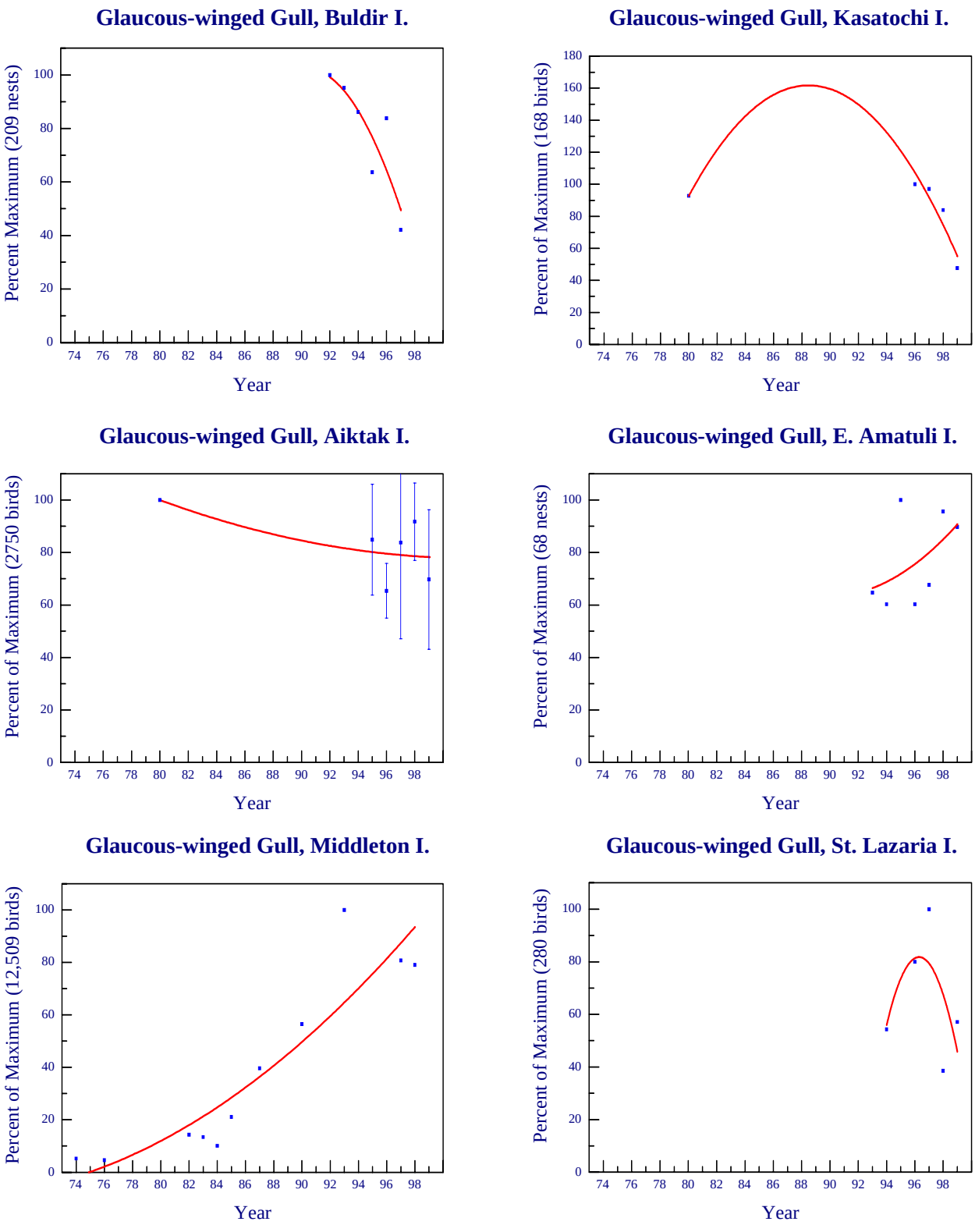


Figure 10. Trends in populations of glaucous-winged gulls at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

Black-legged Kittiwake (*Rissa tridactyla*)

Breeding Chronology.--In 1999, nesting was relatively late at Little Diomede, St. George, E. Amatuli, Duck and Middleton islands, as well as at Cape Peirce but was approximately average (within three days) at St. Paul, Buldir and Gull islands (Table 12).

Table 12. Hatching chronology of black-legged kittiwakes at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Little Diomede I.	24 Jul (203)[a]	24 Jul (203)	19 Jul[b] (3)[a]	D. B. Irons et al. Unpubl. Data[c]
Saint Paul I.		27 Jul (31)	24 Jul[d] (15)	Bittner and Farence 1999
Saint George I.		27 Jul (4)	21 Jul[d] (14)	Schindler and Kildaw 1999
Cape Peirce		23 Jul (13)	11 Jul[d] (10)	R. MacDonald Unpubl. Data [e]
Buldir I.	9 Jul (27)	11 Jul (27)	8 Jul[d] (12)	J. Williams Unpubl. Data[f]
E. Amatuli I.	19 Jul (304)	19 Jul (304)	15 Jul[d]	A. Kettle Unpubl. Data[g]
Gull I.	9 Jul (174)		7 Jul[b] (4)	J. Piatt and M. Shultz Unpubl. Data[h]
Duck I.	10 Jul (15)		5 Jul[b] (4)	J. Piatt and A. Harding Unpubl. Data[i]
Middleton I.[j]	14 Jul (35)	15 Jul (35)	4 July[d] (3)	S. Hatch and V. Gill Unpubl. Data[k]

[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]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.

[d]Mean of annual means.

[e]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.

[f]Willams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[g]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[h]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.

[i]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.

[j]These BLKI were not included in the supplemental feeding study and plots did not include the tower (Gill 1999).

[k]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

Productivity.–Productivity of black-legged kittiwakes in 1999 ranged from no chicks fledged to approximately 0.89 chicks fledged per nest (Table 13). Productivity was below average at more than one third of the sites monitored this year, including Little Diomede, St. Paul, St. George, Bogoslof and Koniuji islands, as well as Chiniak Bay (Fig. 11). Reproductive success of black-legged kittiwakes was about normal at all other sites (Table 13).

Table 13. Reproductive performance of black-legged kittiwakes at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Nest[a]	No. of Plots	No. of Nests	Reference
Cape Lisburne	0.89	N/A[b]	133	D. Roseneau Unpubl. Data[c]
Little Diomede I.	0.08	22	613	D. B. Irons et al. Unpubl. Data[d]
Bluff	0.25	5	87	Murphy 1999
Saint Paul I.	0.04	11	43	Bittner and Farence 1999
Saint George I.	0.01	4	76	Schindler and Kildaw 1999
Cape Peirce	0.00	15	302	R. MacDonald Unpubl. Data[e]
Buldir I.	<0.01	8	237	J. Williams Unpubl. Data[f]
Koniuji I.	<0.10	N/A	121	L. Scharf Unpubl. Data[g]
Bogoslof I.	0.09[h]	N/A	185	Byrd and Williams 1999
Chiniak Bay	0.02[h]	N/A	8,199	J. Benson and D. B. Irons Unpubl. Data[i]
E. Amatuli I.	0.45	11	304	A. Kettle Unpubl. Data[j]
Gull I.	0.65	10	305	J. Piatt and M. Shultz Unpubl. Data[k]
Duck I.	0.00	9	129	J. Piatt and A. Harding Unpubl. Data[l]
Prince William Snd	0.05[h]	N/A	16,647	D. B. Irons Unpubl. Data[m]
Middleton I.[n]	0.01	12	181	S. Hatch and V. Gill Unpubl. Data[o]

[a]Total chicks fledged/Total nests.
[b]Not applicable or not reported.
[c]Roseneau, D., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[d]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[e]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.
[f]Willams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[g]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[h]Value obtained during a short visit to the colony in the chick-rearing period and so should be considered a maximum estimate of productivity.
[i]Benson, J. and D. B. Irons, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[j]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.
[k]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.
[l]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.
[m]Irons, D. B., Migratory Bird Management, USFWS. Unpublished Data, 2000.
[n]These BLKI were not included in the supplemental feeding study and plots did not include the tower (Gill 1999).
[o]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

Populations.--Kittiwake counts in 1999 at Cape Lisburne in the Chukchi Sea were slightly lower than in 1998, but the overall trend was positive (Fig. 12). Populations at Chiniak Bay also exhibited an upward trend, while numbers at St. Paul, St. George and Middleton islands indicated negative trends. Black-legged kittiwake populations at Bluff, Cape Peirce, Puale Bay, E. Amatuli Island and Prince William Sound appeared to be relatively stable (Fig. 12).

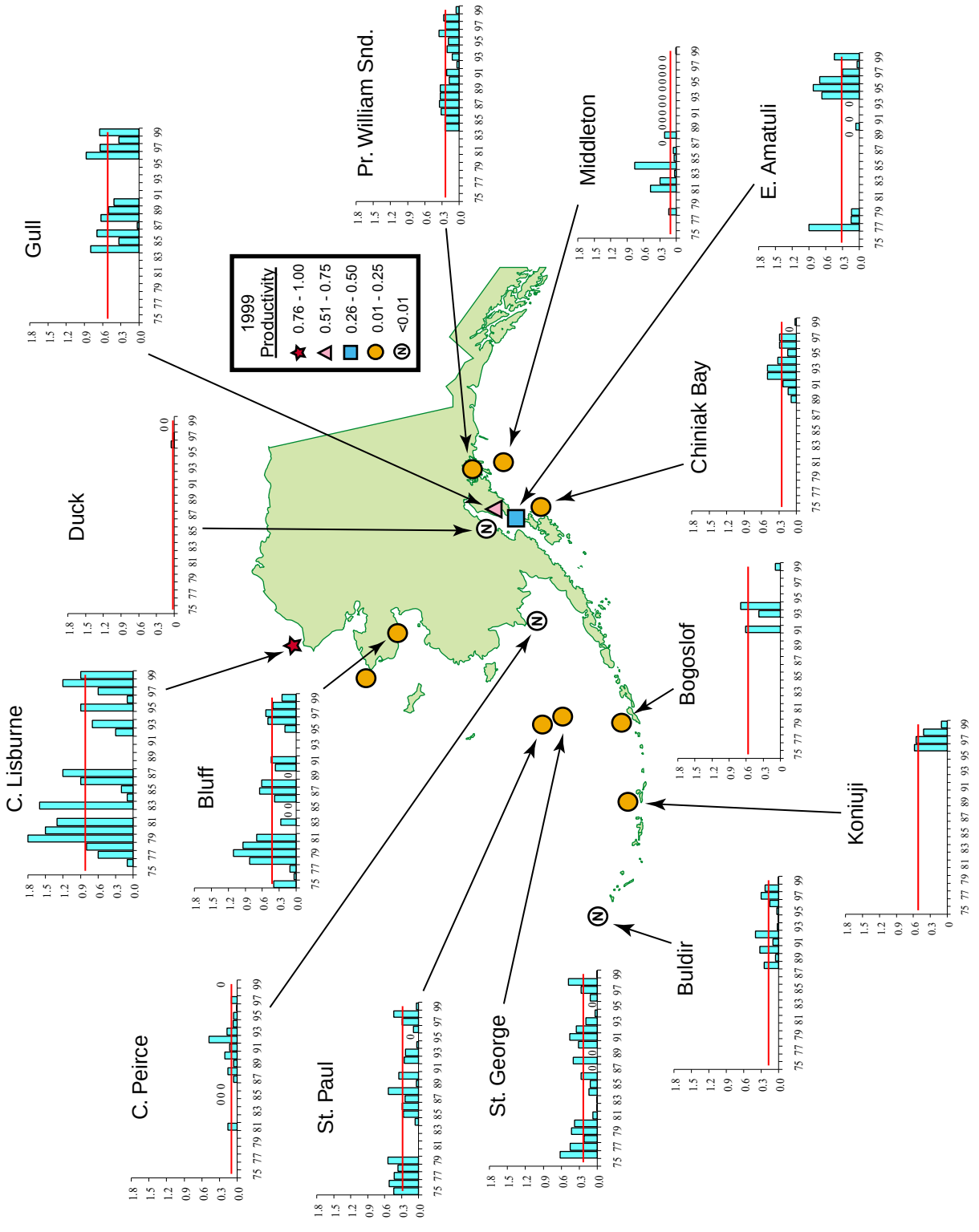


Figure 11. Productivity of black-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

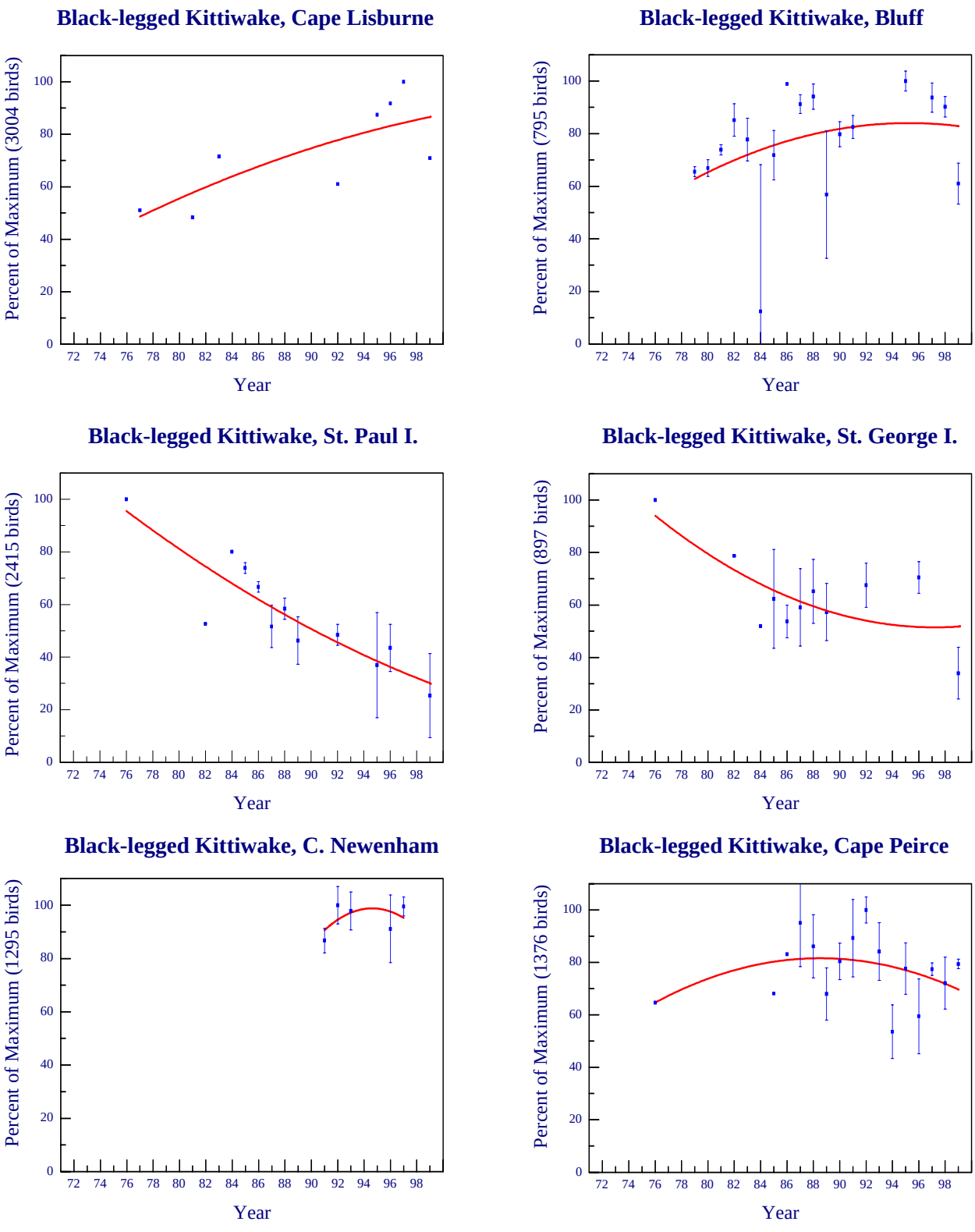


Figure 12. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

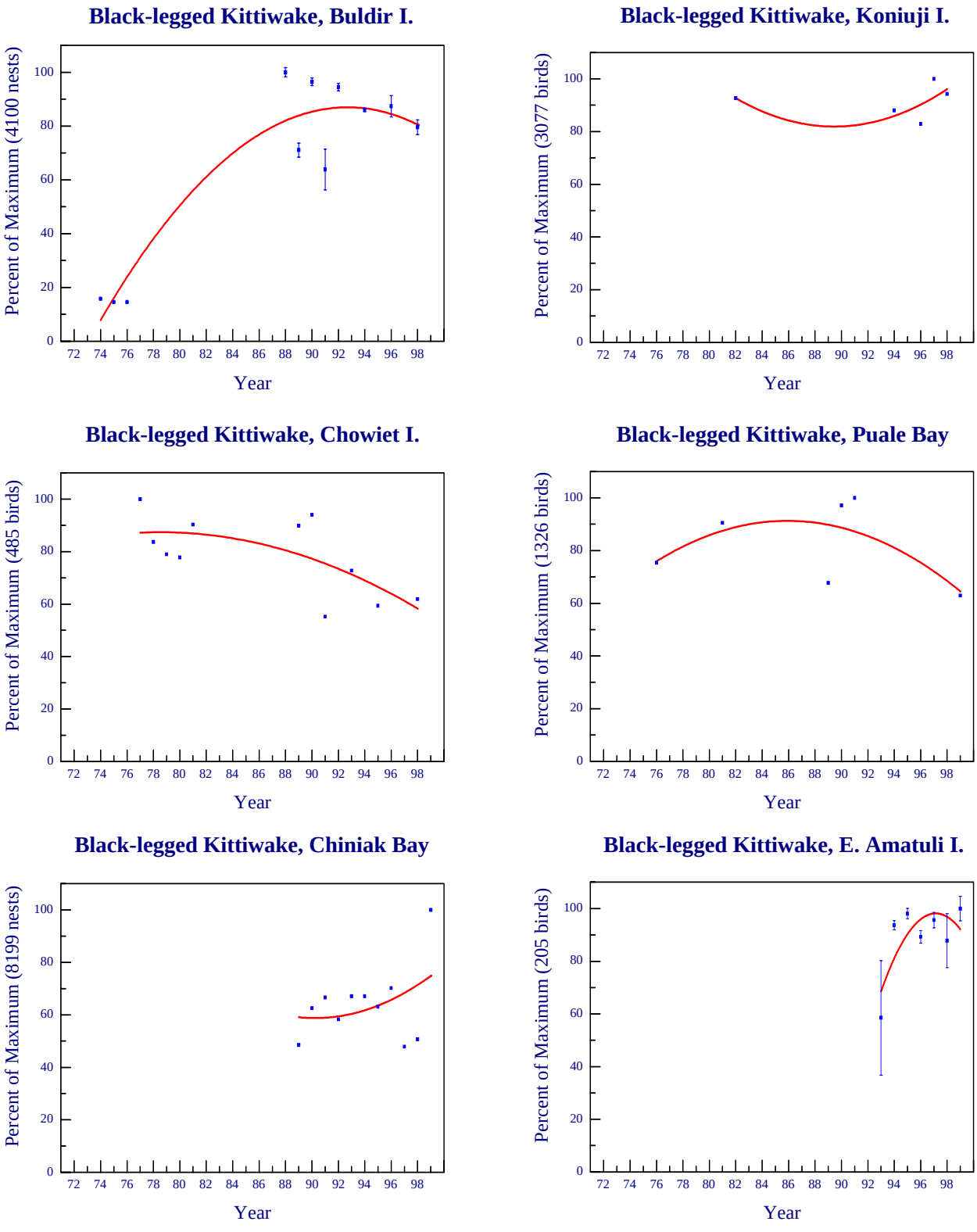


Figure 12. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

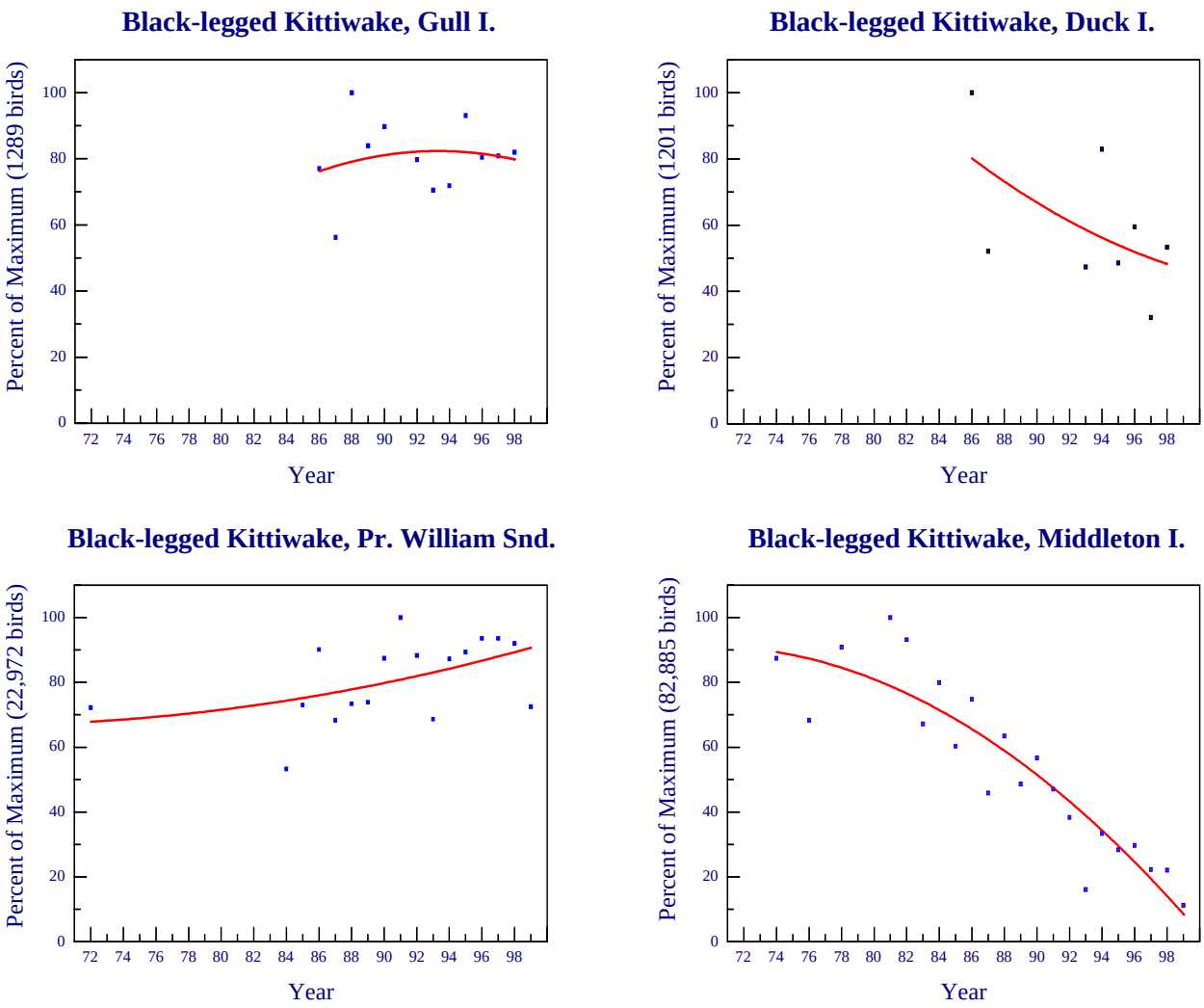
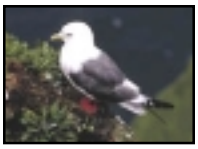


Figure 12. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).



Red-legged Kittiwake (*Rissa brevirostris*)

Breeding Chronology.--In 1999 chicks hatched in mid-July at all three sites where they were monitored (Table 14). Hatch dates at both St. Paul and St. George islands were earlier than normal in 1999. The mean hatch date was within 3 days of the site average at Buldir Island.

Table 14. Hatching chronology of red-legged kittiwakes at Alaskan sites monitored in 1999.

Site	Mean	Long-term Average	Reference
Saint Paul I.	17 Jul (18)[a]	26 Jul[b] (13)[a]	Bittner and Farence 1999
Saint George I.	16 Jul (75)	21 Jul[b] (17)	Schindler and Kildaw 1999
Buldir I.	13 Jul (18)	12 Jul[b] (12)	J. Williams Unpubl. Data[c]

[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.

[c]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Productivity.-- In 1999, red-legged kittiwakes experienced average reproductive success at Buldir, St. Paul and St. George islands (Table 15, Fig. 13). Estimated productivity was below average at Bogoslof Island.

Table 15. Reproductive performance of red-legged kittiwakes at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Nest[a]	No. of Plots	No. of Nests	Reference
Saint Paul I.	0.26	2	43	Bittner and Farence 1999
Saint George I.	0.28	8	207	Schindler and Kildaw 1999
Buldir I.	<0.01	6	126	J. Williams Unpubl. Data[b]
Bogoslof I.	0.09[c]	N/A[d]	22	Byrd and Williams 1999

[a]Total chicks fledged/Total nests.

[b]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[c]Value obtained during a short visit to the colony in the chick-rearing period and so should be considered a maximum estimate of productivity.

[d]Not applicable or not reported.

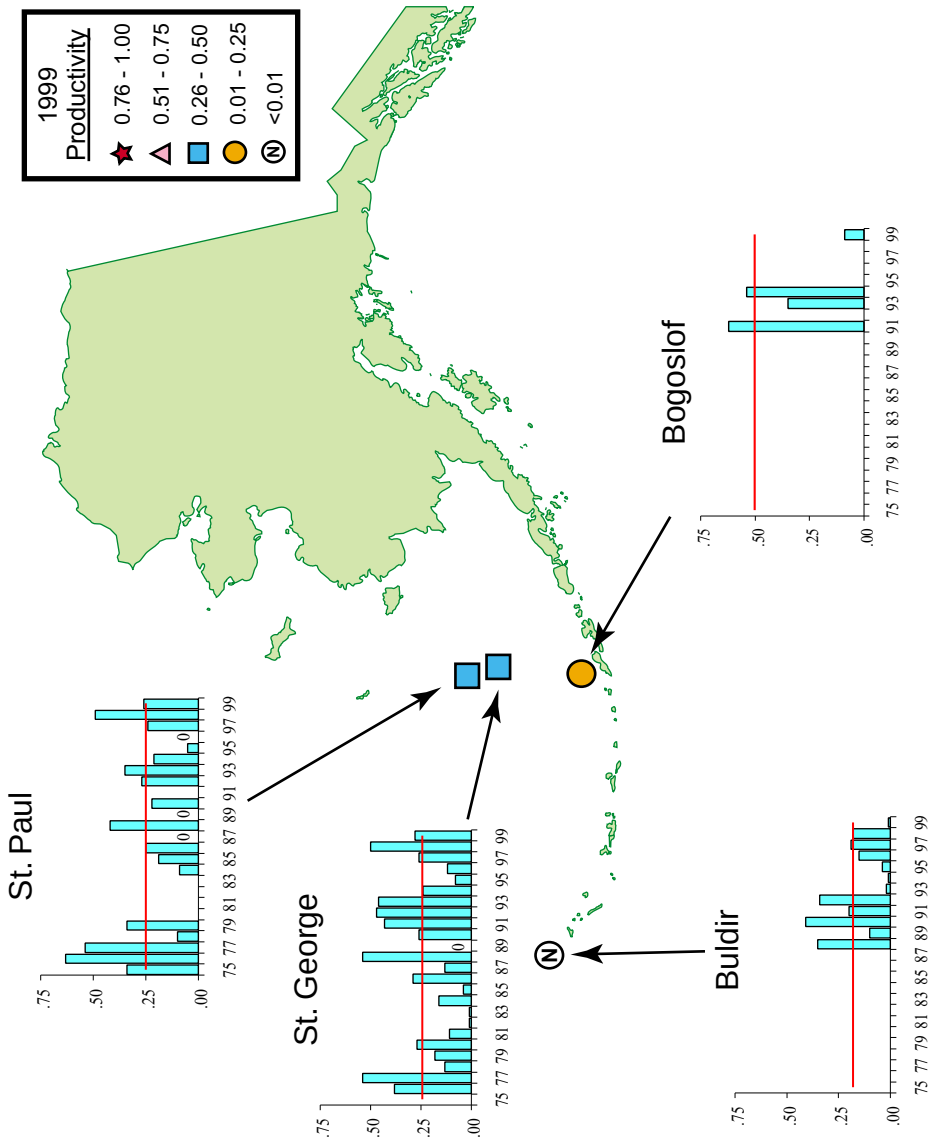


Figure 13. Productivity of red-legged kittiwakes (chicks fledged/nest) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Populations.--Numbers at both St. Paul and St. George islands have been relatively stable since the mid- to late 1980s but were lower in both cases than in the mid-1970s (Fig. 14).

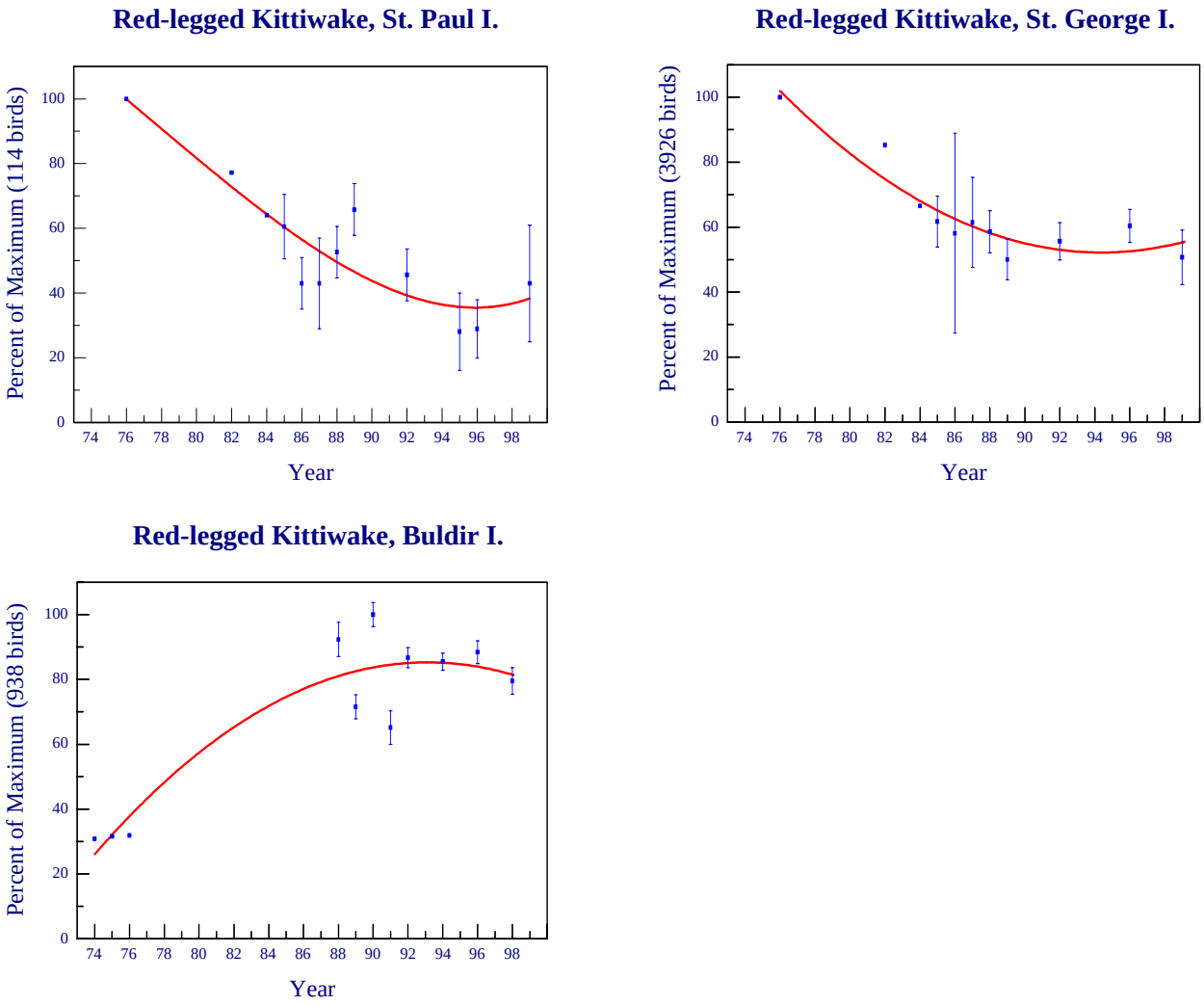


Figure 14. Trends in populations of red-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

Common Murre (*Uria aalge*)

Breeding Chronology.--Timing of nesting events was about average at Little Diomede, St. Paul, St. George, E. Amatuli and Gull islands (Table 16). Hatching was later than normal at Cape Peirce, and Duck and St. Lazaria islands.

Table 16. Hatching chronology of common murres at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Little Diomede I.	3 Aug (63)[a]	3 Aug (63)	3 Aug[b] (2)[a]	D. B. Irons et al. Unpubl. Data[c]
Saint Paul I.		8 Aug (97)	5 Aug[d] (14)	Bittner and Farence 1999
Saint George I.		6 Aug (31)	5 Aug[d] (15)	Schindler and Kildaw 1999
Cape Peirce		4 Aug (16)	24 Jul[d] (10)	R. MacDonald Unpubl. Data[e]
Buldir I.		30 Jul (2)	N/A[f]	J. Williams Unpubl. Data[g]
E. Amatuli I.	4 Aug (284)	5 Aug (284)	8 July[d] (6)	A. Kettle Unpubl. Data[h]
Gull I.	8 Aug (33)		10 Aug[b] (3)	J. Piatt and M. Shultz Unpubl. Data[i]
Duck I.	17 Aug (69)		13 Aug[b] (4)	J. Piatt and A. Harding Unpubl. Data[j]
Saint Lazaria I.	16 Aug (59)	20 Aug (59)	13 Aug[d] (5)	L. Slater Unpubl. Data[k]

[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]Median of annual medians.

[c]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.

[d]Mean of annual means.

[e]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.

[f]Not applicable or not reported.

[g]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

[h]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

[i]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.

[j]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.

[k]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Productivity.–Common murre productivity was lower than average in 1999 at nearly half of the sites monitored, including Cape Peirce, and Buldir, Aiktak, Kasatochi and Gull islands (Table 17, Fig. 15). Common murres had almost total laying failure at Aiktak Island in 1999. Success was about average at Little Diomede, St. Paul, St. George, E. Amatuli, Duck and St. Lazaria islands.

Table 17. Reproductive performance of common murres at Alaskan sites monitored in 1999.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	No. of Nest Sites	Reference
Little Diomede I.	0.64[b]	7	169	D. B. Irons et al. Unpubl. Data[c]
Saint Paul I.	0.46	7	153	Bittner and Farence 1999
Saint George I.	0.49	4	55	Schindler and Kildaw 1999
Cape Peirce	0.02	11	253	R. MacDonald Unpubl. Data[d]
Buldir I.	0.13	N/A[e]	8	J. Williams Unpubl. Data[f]
Kasatochi I.	0.00	N/A	<20	L. Scharf Unpubl. Data[g]
Aiktak I.	0.00	N/A	2	Howard and Woodward 1999
E. Amatuli I.	0.74	10	284	A. Kettle Unpubl. Data[h]
Gull I.	0.21	5	102	J. Piatt and M. Shultz Unpubl. Data[i]
Duck I.	0.63	8	98	J. Piatt and A. Harding Unpubl. Data[j]
Saint Lazaria I.	0.38	3	73	L. Slater Unpubl. Data[k]

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Monitoring was completed before actual chick fledging, therefore values should be considered maximum estimates.
[c]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[d]MacDonald, R., Togiak NWR, USFWS. Unpublished Data, 1999.
[e]Not applicable or not reported.
[f]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[g]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[h]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.
[i]Piatt, J., and M. Shultz, BRD, USGS. Unpublished Data, 2000.
[j]Piatt, J., and A. Harding, BRD, USGS. Unpublished Data, 2000.
[k]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Populations.--At sites where counts of murres are made from the water, it is difficult to accurately assign every individual to species. As a result, common and thick-billed murres are combined at these sites for population trend analysis (Fig. 16). At Cape Lisburne, numbers of murres on plots were similar to those in 1998, but the overall trend suggested an increasing population. Murre populations also seemed to be increasing at St. George and E. Amatuli islands. No trend in murre numbers was apparent at Bluff (Fig. 16). Murre numbers have exhibited negative trends at St. Paul Island, Puale Bay, and Middleton and St. Lazaria islands.

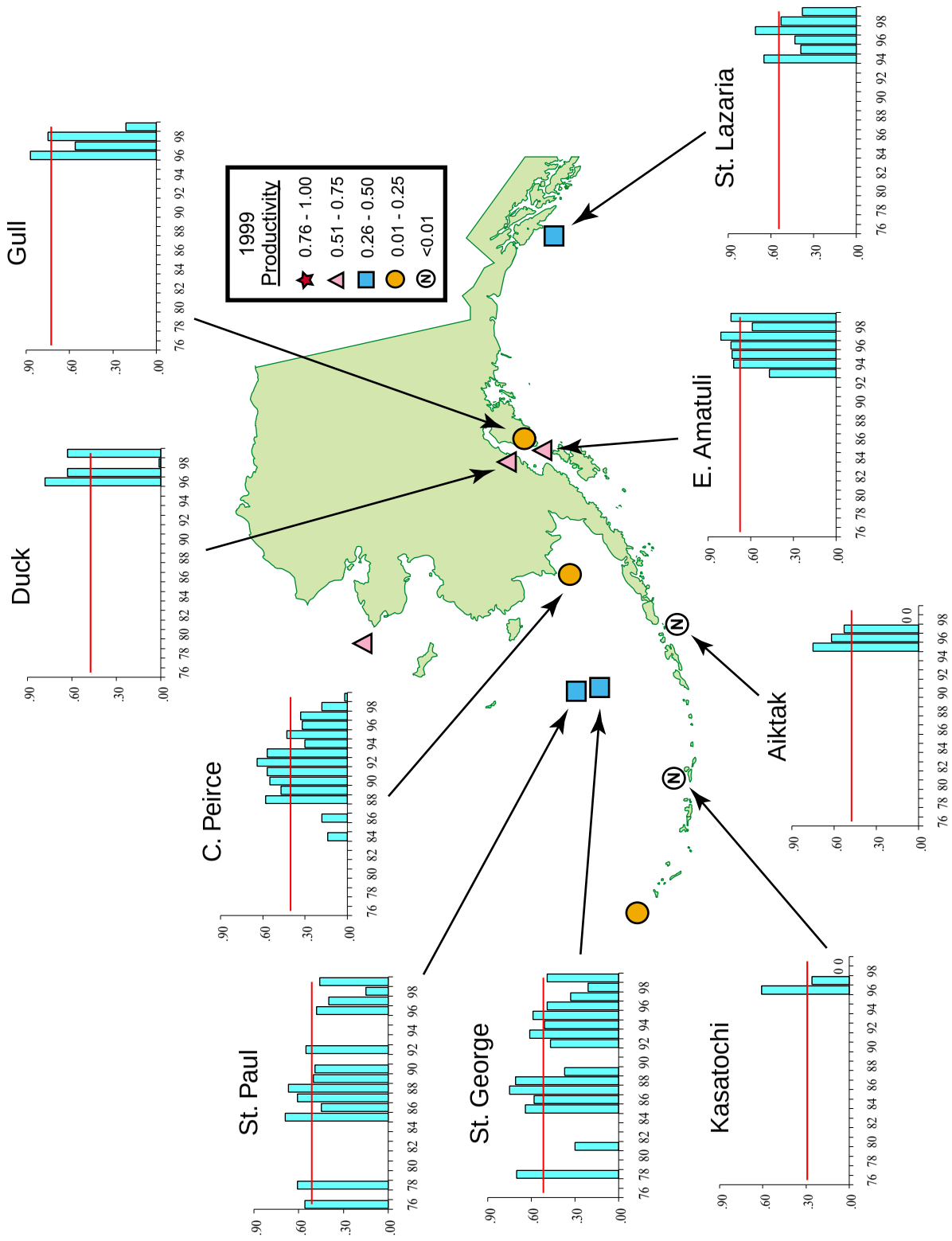


Figure 15. Productivity of common murres (chicks fledged/nest site) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

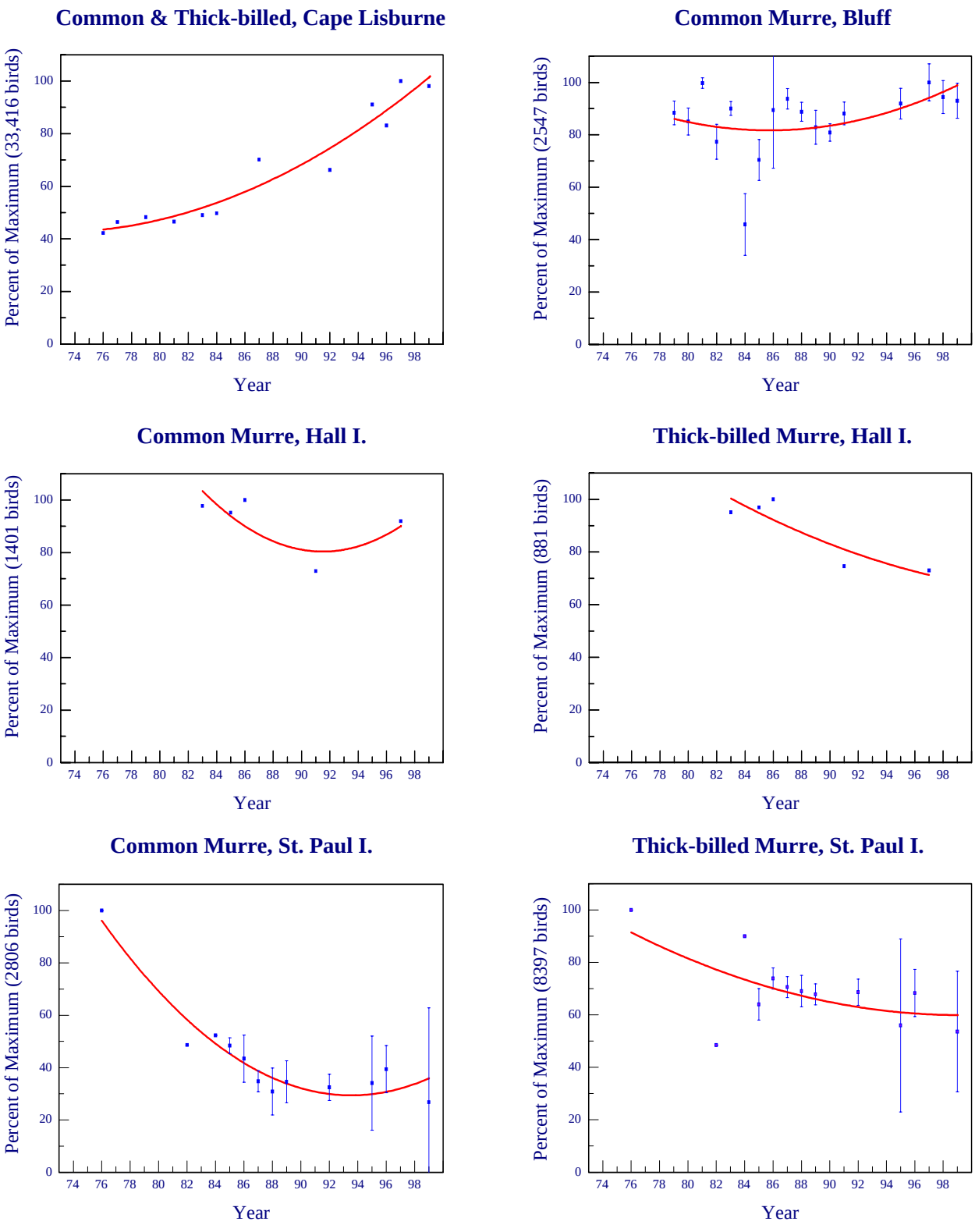


Figure 16. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

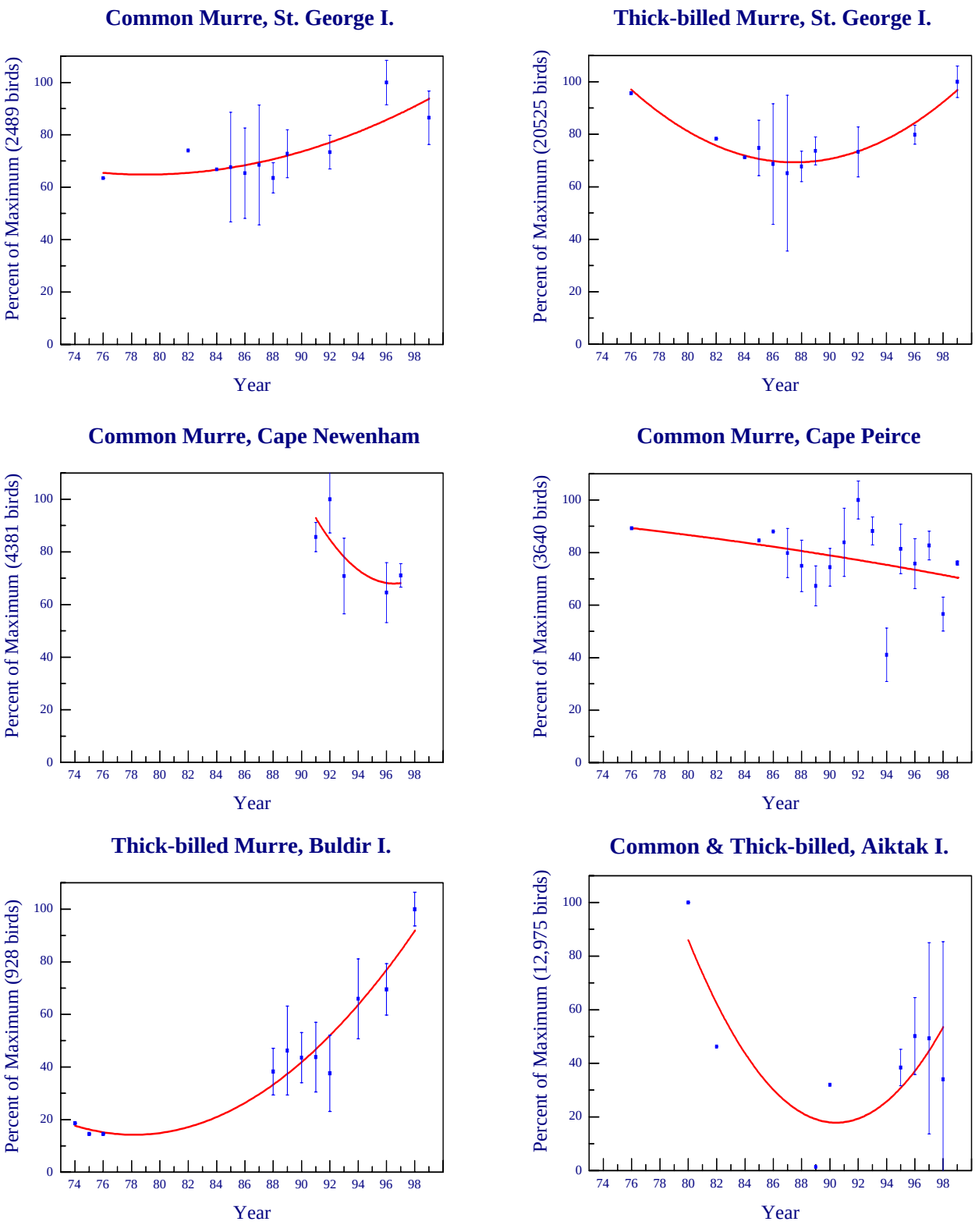


Figure 16. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

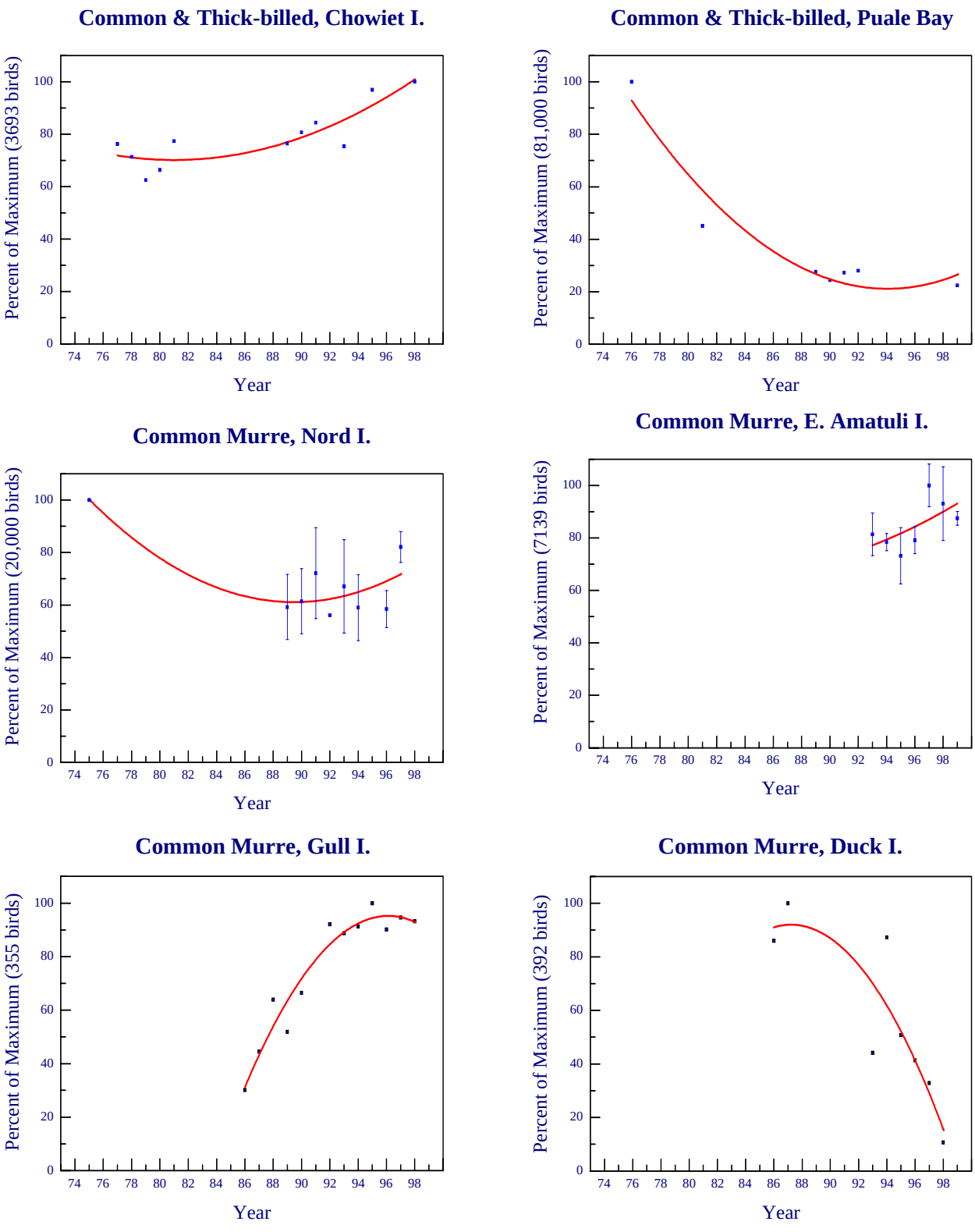
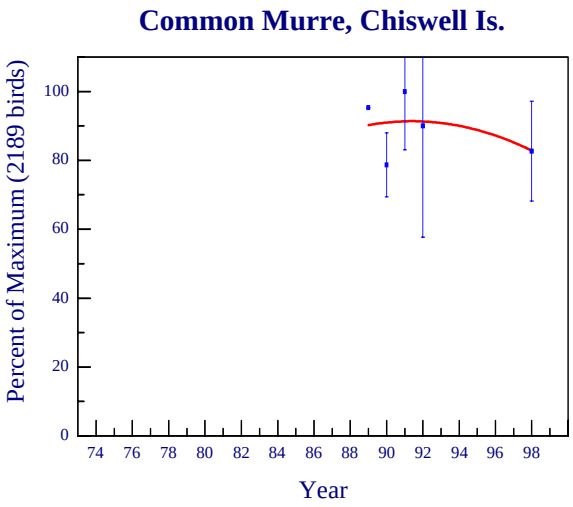
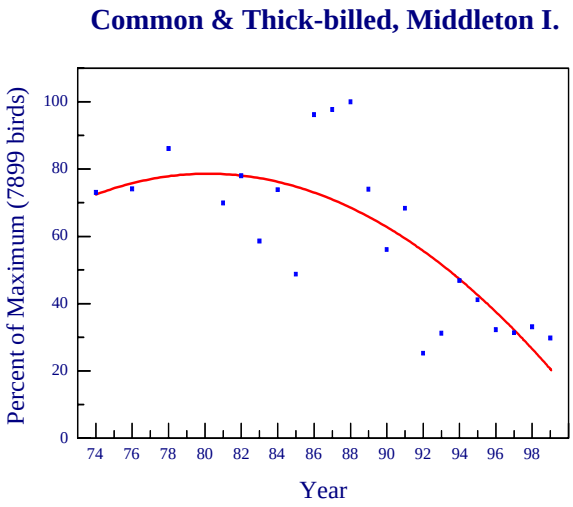


Figure 16. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).





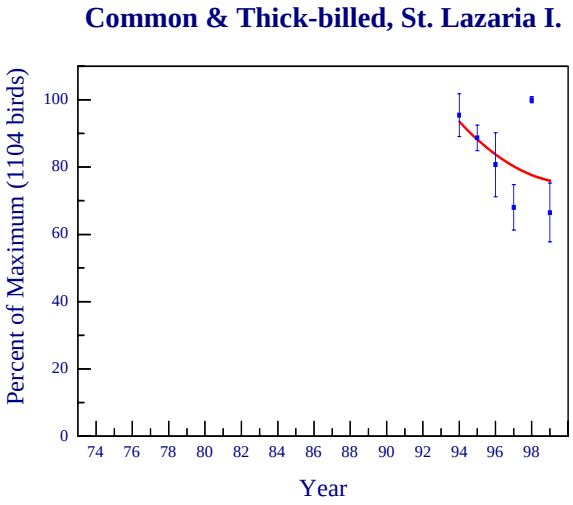


Figure 16. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts (continued).

Thick-billed Murre (*Uria lomvia*)

Breeding Chronology.-- In 1999, thick-billed murre chicks hatched on about the normal dates at Little Diomede, St. Paul, St. George and St. Lazaria islands (Table 18). Hatching was slightly later than normal at Buldir Island.

Table 18. Hatching chronology of thick-billed murres at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Little Diomede I.	2 Aug (61)[a]	2 Aug (61)	4 Aug[b] (2)[a]	D. B. Irons et al. Unpubl. Data[c]
Saint Paul I.		5 Aug (241)	5 Aug[d] (15)	Bittner and Farence 1999
Saint George I.		1 Aug (162)	1 Aug[d] (17)	Schindler and Kildaw 1999
Buldir I.		22 Jul (31)	17 Jul[d] (11)	J. Williams Unpubl. Data[e]
Saint Lazaria I.	13 Aug (22)	13 Aug (22)	11 Aug[d] (5)	L. Slater Unpubl. Data[f]

[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]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[d]Mean of annual means.
[e]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[f]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Productivity.--Rates of success in 1999 were about average at St. Paul, St. George, Buldir, and St. Lazaria islands (Table 19, Fig. 17). In contrast, thick-billed murres failed to produce any young, for the second year in a row, at Aiktak and Kasatochi islands, and had lower success than in 1998 at Little Diomede Island.

Table 19. Reproductive performance of thick-billed murres at Alaskan sites monitored in 1999.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	No. of Nest Sites	Reference
Little Diomede I.	0.53[b]	8	40	D. B. Irons et. al. Unpubl. Data[c]
Saint Paul I.	0.44	17	434	Bittner and Farence 1999
Saint George I.	0.61	11	243	Schindler and Kildaw 1999
Buldir I.	0.55	9	268	J. Williams Unpubl. Data[d]
Kasatochi I.	0.00	N/A[e]	<20	L. Scharf Unpubl. Data[f]
Aiktak I.	0.00	N/A	3	Howard and Woodward 1999
Saint Lazaria I.	0.38	3	58	L. Slater Unpubl. Data[g]

[a]Since murres do not build nests, nest sites were defined as sites where eggs were laid.
[b]Monitoring was completed before actual chick fledging, therefore values should be considered maximum estimates.
[c]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[d]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[e]Not applicable or not reported.
[f]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[g]Slater, L., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.

Populations.--Thick-billed murres were included with common murres at all sites where they were counted in 1999 except St. Paul and St. George islands (Fig. 16). This year's count was among the lowest on record at St. Paul Island where a slight downward trend was indicated. At St. George Island numbers were higher in 1999 than in any previous year, and the increasing trend since the late 1980s continued (Fig. 16).

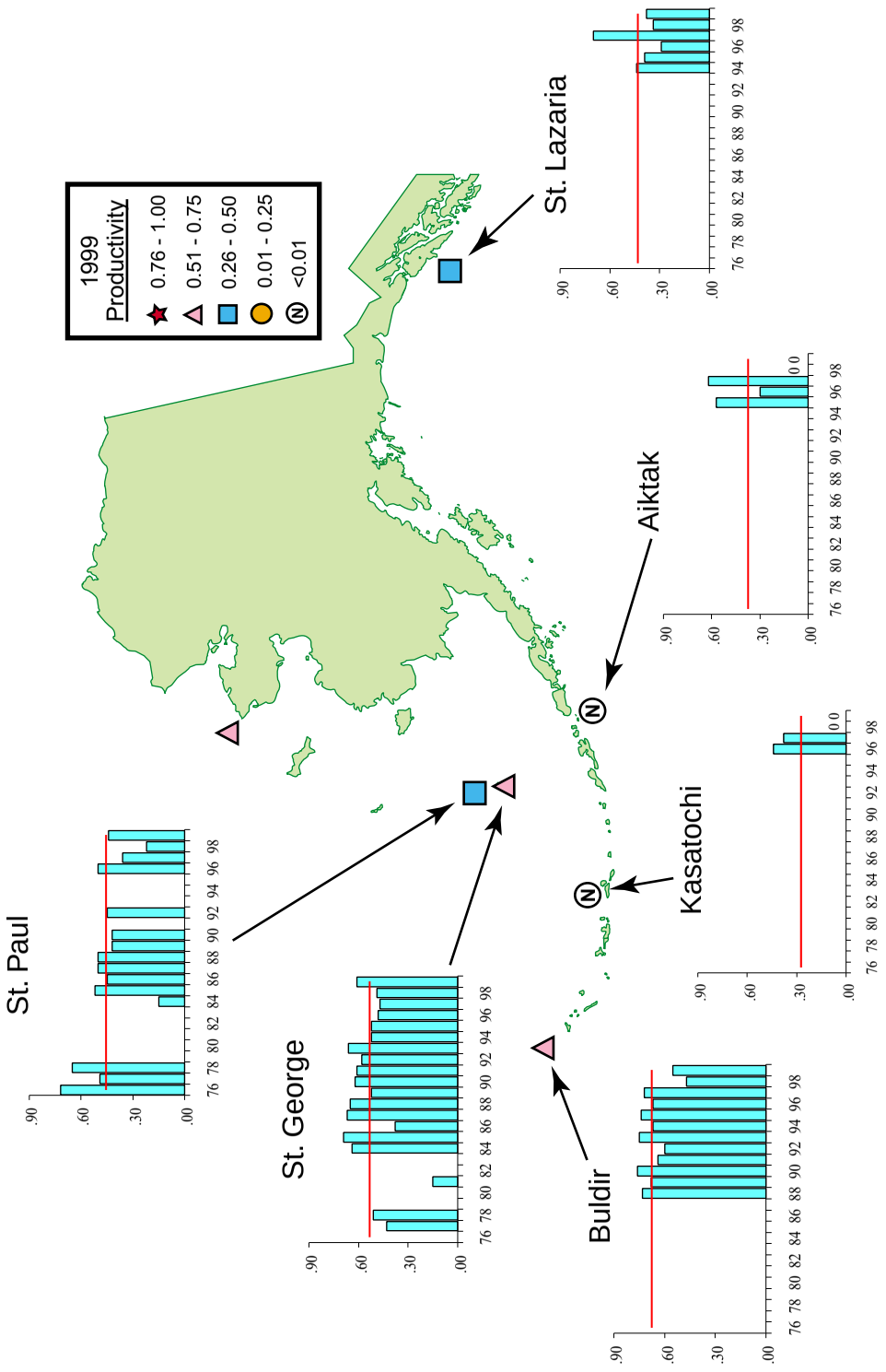


Figure 17. Productivity of thick-billed murres (chicks fledged/nest site) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Ancient Murrelet (*Synthliboramphus antiquus*)

Breeding Chronology.–The mean hatching date for ancient murrelets at Aiktak Island, the only site monitored in 1999, was 10 July (Table 20). No previous breeding chronology data are available for this species at this site.

Table 20. Hatching chronology of ancient murrelets at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Aiktak I.	11 Jul (21)[a]	10 Jul (21)	N/A[b]	Howard and Woodward 1999

[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.-- Slightly more than three-quarters of ancient murrelet eggs hatched at Aiktak Island in 1999 (Table 21). No previous productivity data are available for this species at this site but Gaston (1992) reported hatching success of 96% from a colony in Canada's Queen Charlotte Islands.

Table 21. Reproductive performance of ancient murrelets at Alaskan sites monitored in 1999.

Site	Hatching Success[a]	No. of Nest Sites	Reference
Aiktak I.	0.76	28	Howard and Woodward 1999

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

Populations.–No data in 1999.

Parakeet Auklet (*Cyclorrhynchus psittacula*)

Breeding Chronology.–This species was monitored at only one site (Kasatochi Island) in 1999, where hatch dates were obtained for only two eggs. The mean and median hatch date was 3 July 1999.

Productivity.-- In 1999, productivity was monitored only at Kasatochi Island where two of three eggs monitored, hatched.

Populations.--We currently know of no method of monitoring populations of parakeet auklets. Research is needed to develop a method that could be employed at annual monitoring sites in the Aleutian, Pribilof, and Semidi islands.

Least Auklet (*Aethia pusilla*)

Breeding Chronology.---The dates of hatching for least auklets were about average at both Little Diomede and Kasatochi islands in 1999 (Table 22).

Table 22. Hatching chronology of least auklets at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Little Diomede I.	3 Aug (18)[a]	3 Aug (18)	5 Aug[b] (3)[a]	D. B. Irons et al. Unpubl. Data[c]
Kasatochi I.	29 Jun (76)	30 Jun (76)	29 Jun[d] (3)	L. Scharf Unpubl. Data[e]

[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]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.

[d]Mean of annual means.

[e]Scharf, L. Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Productivity.–Least auklets exhibited about average reproductive success in 1999 at both Little Diomede and Kasatochi islands (Table 23, Fig. 18).

Table 23. Reproductive performance of least auklets at Alaskan sites monitored in 1999.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Little Diomede I.	0.29	62	D. B. Irons et al. Unpubl. Data[b]
Kasatochi I.	0.46	100	L. Scharf Unpubl. Data[c]

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

[b]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.

[c]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Populations.--In 1999, least auklet populations were monitored only at Kasatochi Island. There appeared to be a declining trend of this species at this site since 1991 (Fig. 19).

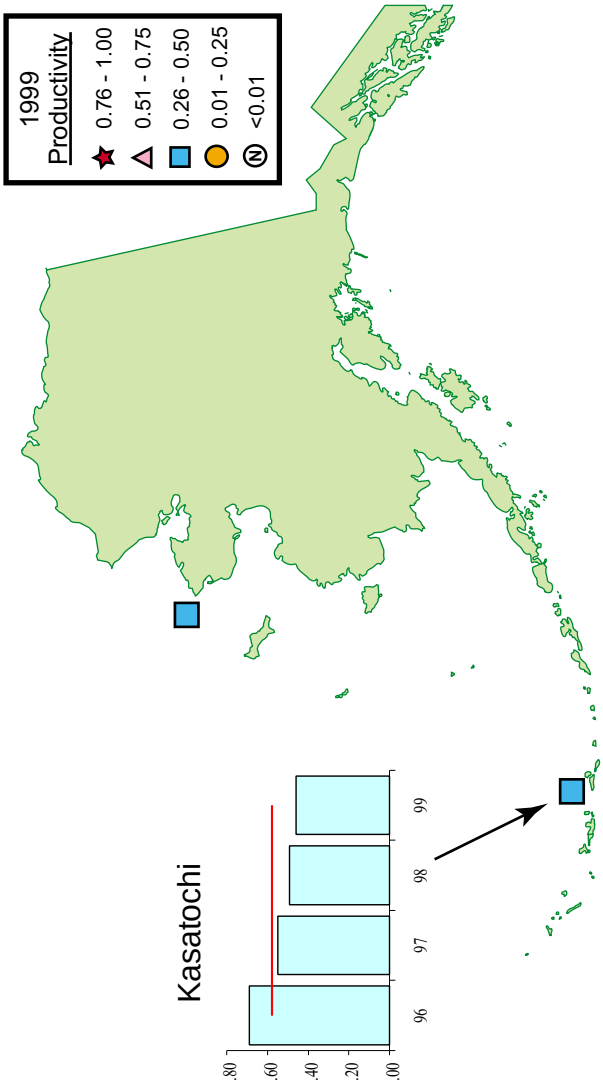


Figure 18. Productivity of least auklets (chicks fledged/nest site) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

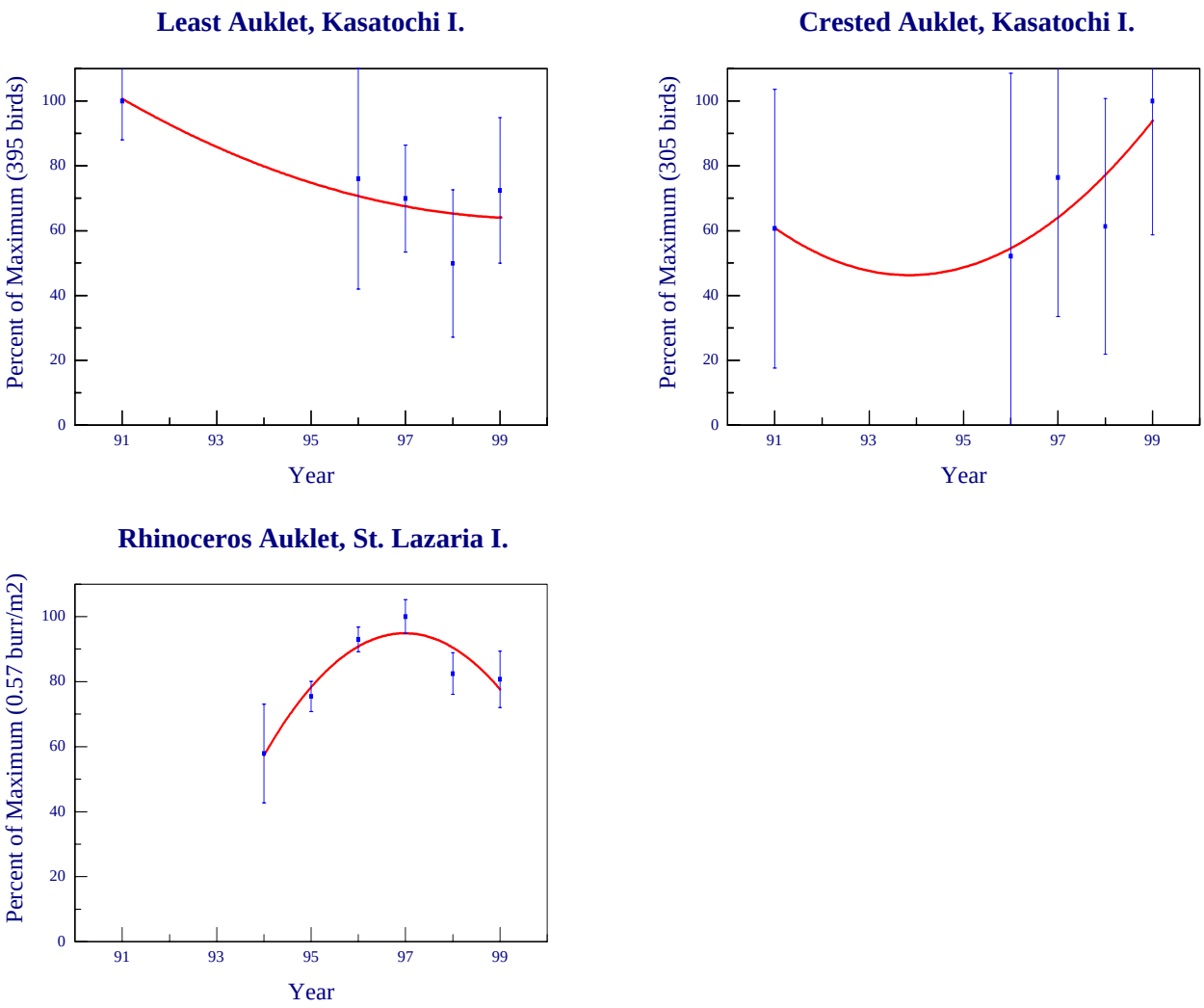


Figure 19. Trends in populations of auklets at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

Crested Auklet (*Aethia cristatella*)

Breeding Chronology.--The average date of hatching for crested auklets in 1999 was about average at both Little Diomede and Kasatochi islands (Table 24).

Table 24. Hatching chronology of crested auklets at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Little Diomede I.	11 Aug (15)[a]	11 Aug (15)	9 Aug[b] (3)[a]	D. B. Irons et al. Unpubl. Data[c]
Kasatochi I.	29 Jun (95)	1 Jul (95)	3 Jul[d] (3)	L. Scharf Unpubl. Data[e]

[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]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[d]Mean of annual means.
[e]Scharf, L. Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Productivity.–Crested auklets had about average rates of success at both Little Diomede and Kasatochi islands in 1999 (Table 25, Fig. 20).

Table 25. Reproductive performance of crested auklets at Alaskan sites monitored in 1999.

Site	Chicks Fledged/ Nest Site[a]	No. of Nest Sites	Reference
Little Diomede I.	0.38	40	D. B. Irons et al. Unpubl. Data[b]
Kasatochi I.	0.69	110	L. Scharf Unpubl. Data[c]

[a]Nest site is defined as a site where an egg was laid.
[b]Irons, D. B., L. G. Greffenius, and J. Benson, Migratory Bird Management, USFWS. Unpublished Data, 2000.
[c]Scharf, L., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.

Populations.--Counts of crested auklets at Kasatochi Island, the only location where they were monitored in 1999, were higher than in previous years. Nevertheless, variability among counts was so high within each year that strong conclusions about trends are not warrented (Fig. 19).

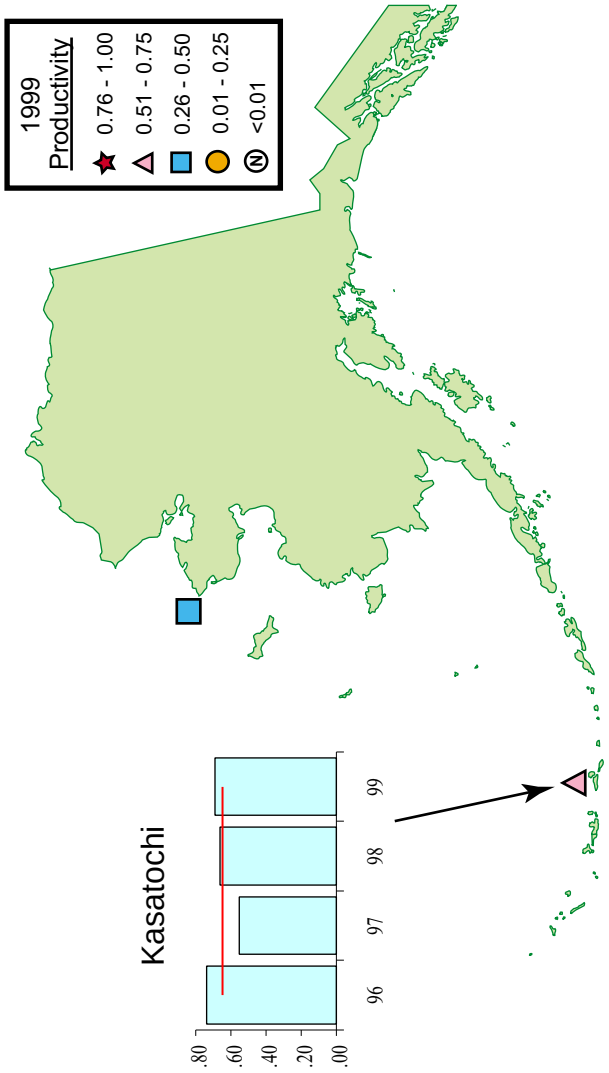


Figure 20. Productivity of crested auklets (chicks fledged/nest site) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Rhinoceros Auklet (*Cerorhinca monocerata*)

Breeding Chronology.--In 1999, the mean hatch date of rhinoceros auklets at Middleton Island was 1 July, nearly three weeks later than normal (Table 26).

Table 26. Hatching chronology of rhinoceros auklets at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Middleton I.	1 Jul (41)[a]	1 Jul (41)	11 Jun[b] (8)[a]	S. Hatch and V. Gill Unpubl. Data[c]

[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]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

Productivity.–Rhinoceros auklet productivity at Middleton Island was fairly high (Table 27, Fig. 21). Prior data were not available for this site.

Table 27. Reproductive performance of rhinoceros auklets at Alaskan sites monitored in 1999.

Site	Chicks Fledged/Egg	No. of Eggs	Reference
Middleton I.	0.83	47	S. Hatch and V. Gill Unpubl. Data[a]

[a]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

Populations.–Rhinoceros auklet nest burrow entrances were counted at a study area at St. Lazaria Island between 1994 and 1999 (Fig. 19). Burrow density was about the same in 1999 as in 1998, both years being lower than the previous two counts. On the whole, there appeared to be no trend in populations of this species at St. Lazaria Island.

Tufted Puffin (*Fratercula cirrhata*)

Breeding Chronology.--Hatch dates for tufted puffins were later than normal at Aiktak and Buldir islands (Table 28). Timing was slightly earlier than average at E. Amatuli Island. Data from previous years are not available for Middleton Island.

Table 28. Hatching chronology of tufted puffins at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Buldir I.	23 Jul (10)[a]	24 Jul (10)	13 Jul[b] (10)[a]	J. Williams Unpubl. Data[c]
Aiktak I.	7 Aug (5)	7 Aug (5)	28 Jul[b](3)	Howard and Woodward 1999
E. Amatuli I.	19 Jul (53)	19 Jul (53)	23 Jul[b] (5)	A. Kettle Unpubl. Data[d]
Middleton I.	15 Jul (45)	16 Jul (45)	N/A[e]	S. Hatch and V. Gill Unpubl. Data[f]

[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]Williams, J.,Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[d]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 2000.
[e]Not applicable or not reported.
[f]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

Productivity.–Tufted puffin productivity was about average in 1999 at Buldir and Aiktak islands, and above average at E. Amatuli Island (Table 29, Fig. 21). Data from previous years were not available for Middleton Island.

Table 29. Reproductive performance of tufted puffins at Alaskan sites monitored in 1999.

Site	Chicks Fledged[a]/Egg	No. of Eggs	Reference
Buldir I.	0.42	24	J. Williams Unpubl. Data[b]
Aiktak I.	0.46	71	Howard and Woodward 1999
E. Amatuli I.	0.70	38	A. Kettle Unpubl. Data[c]
Middleton I.	0.73	56	S. Hatch and V. Gill Unpubl. Data[d]

[a]Fledged chick defined as being still alive at last check in August or September.
[b]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[c]Kettle, A., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[d]Hatch, S., and V. Gill, BRD, USGS. Unpublished Data, 2000.

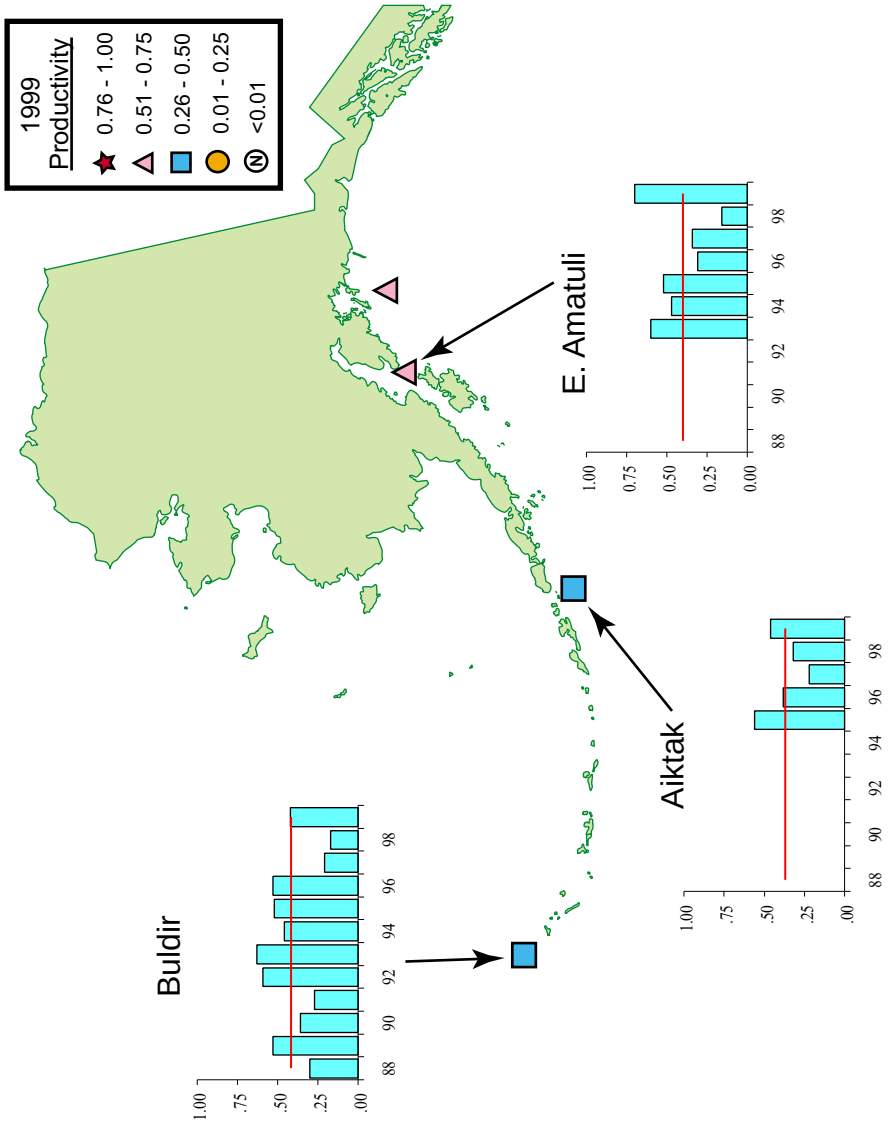


Figure 21. Productivity of tufted puffins (chicks fledged/egg) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

Populations.--Plots for monitoring changes in numbers of nesting tufted puffins were surveyed only at Aiktak Island in 1999. Burrow density at Aiktak Island exhibited a positive trend since 1989 (Fig. 22).

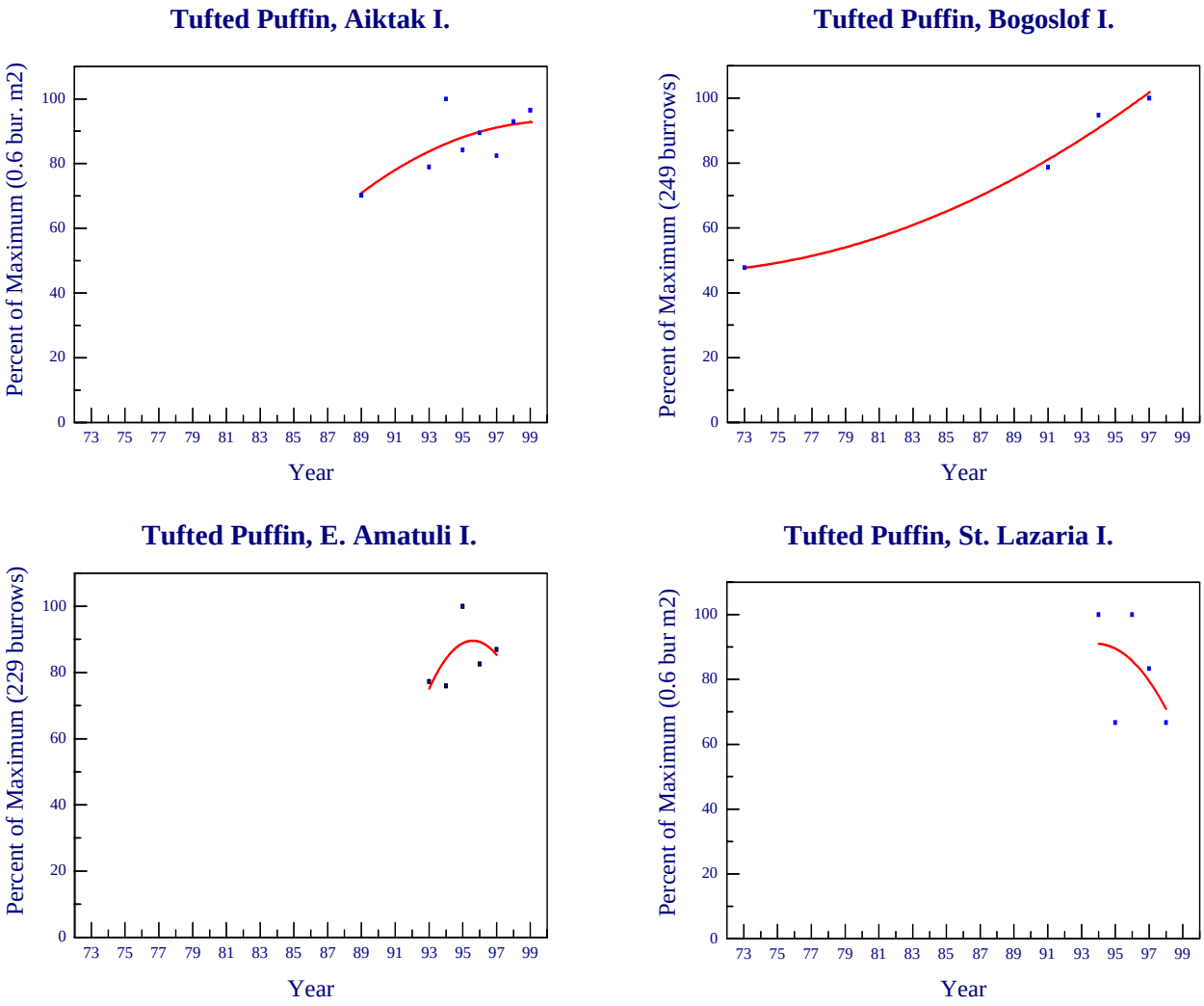


Figure 22. Trends in populations of tufted puffins at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts.

Horned Puffin (*Fratercula corniculata*)

Breeding Chronology.--The mean hatch date for horned puffins was later than normal at Buldir Island and about average at Duck Island in 1999 (Table 30).

Table 30. Hatching chronology of horned puffins at Alaskan sites monitored in 1999.

Site	Median	Mean	Long-term Average	Reference
Buldir I.		28 Jul (13)[a]	23 Jul[b] (11)[a]	J. Williams Unpubl. Data[c]
Duck I.	26 Jul	28 Jul	26 Jul[d] (4)	A. Harding and J. Piatt Unpubl. Data[e]

[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]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[d]Mean of annual medians and annual means (mixed).
[e]Harding, A., and J. Piatt, BRD, USGS. Unpublished Data, 2000.

Productivity.–Success rates of horned puffins were about average at Buldir Island and above average at Duck Island in 1999 (Table 31, Fig. 23).

Table 31. Reproductive performance of horned puffins at Alaskan sites monitored in 1999.

Site	Chicks Fledged[a]/Egg	No. of Eggs	Reference
Buldir I.	0.36	25	J. Williams Unpubl. Data[b]
Duck I.	0.72	47	A. Harding and J. Piatt Unpubl. Data[c]

[a]Fledged chick defined as being still alive at last check in August or September.
[b]Williams, J., Alaska Maritime NWR, USFWS. Unpublished Data, 1999.
[c]Harding, A., and J. Piatt, BRD, USGS. Unpublished Data, 2000.

Populations.--Although plots have been set up at Buldir Island to monitor trends in horned puffins, no accepted method of monitoring has been developed, and no counts were made in 1999.

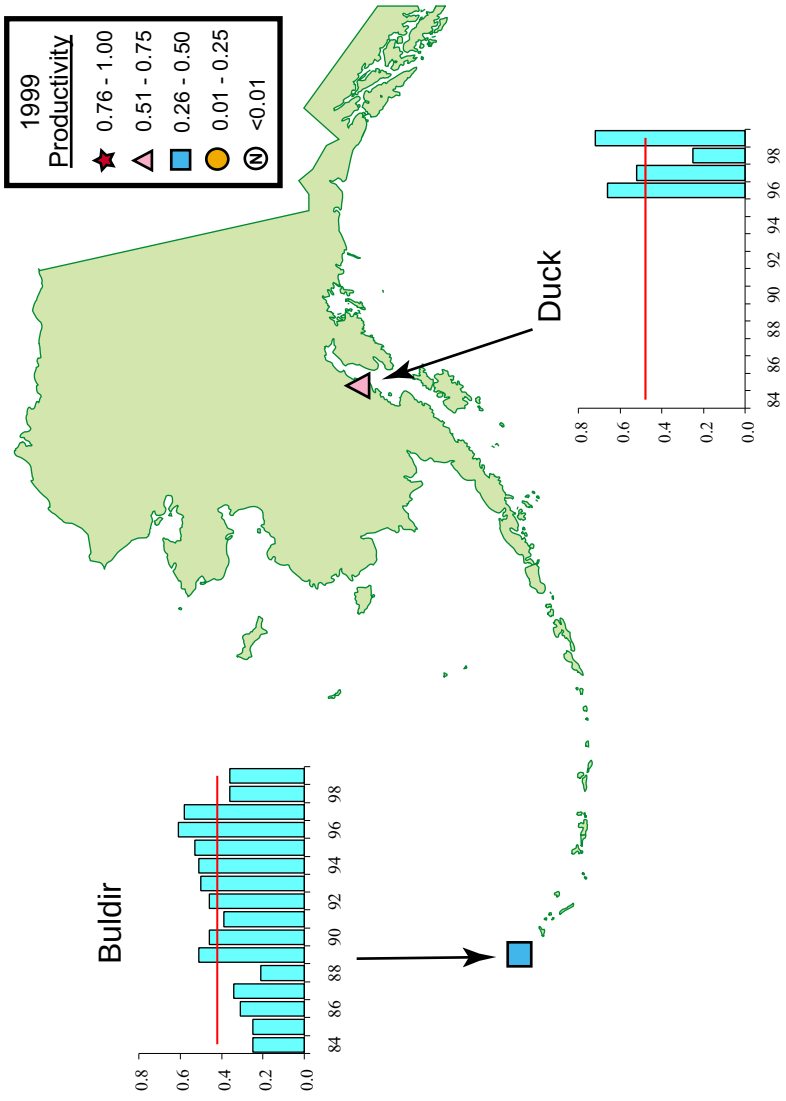


Figure 23. Productivity of horned puffins (chicks fledged/egg) at Alaskan sites monitored in 1999. Lack of bars on graphs indicates that no data were gathered in those years. Red line is the mean productivity at the site in all years for which there are data (current year not included).

CONCLUSIONS

Species Differences

Surface Plankton-Feeders.--In 1999, the timing of hatching for fork-tailed storm-petrels (FTSP) was late at Aiktak and St. Lazaria islands (Table 32). Timing for leach's storm-petrels (LHSP) was relatively late at Aiktak Island but about average at St. Lazaria Island. Both species of storm-petrels had approximately average rates of reproductive success everywhere we monitored them in 1999; with the exception of fork-tailed storm-petrels at St. Lazaria Island, for which productivity was below average (Table 33). Based on the sites where population indices were measured in 1999, it appears storm-petrel (STPE) burrow densities (both species combined) have been increasing recently (Table 34).

Surface Fish-Feeders.--Glaucous-winged gulls (GWGU) are treated here, although they are opportunistic feeders taking other birds as well as fish for prey. In 1999, gull eggs hatched earlier than average at one Gulf of Alaska site (Middleton Island) but were average or late at two other sites in the Gulf of Alaska, as well as at Aiktak Island in the southeastern Bering Sea (Table 32). Gulls had average success in 1999 at all the sites we monitored except Buldir Island (Table 33). Gull populations showed downward trends at two Aleutian Island sites and in Southeast Alaska (Table 34). Numbers apparently have increased in the Gulf of Alaska.

Black-legged kittiwakes (BLKI) had later hatch dates in 1999 than normal in the Chukchi Sea (Little Diomede Island). Nesting chronology apparently also was late at two of four sites in the Bering Sea and three of the four sites in the Gulf of Alaska (Table 32). Timing of hatch was about average at the other sites in the Bering Sea and Gulf of Alaska. Complete or nearly complete (less than 0.1 chicks fledged per nest) reproductive failures occurred in 1999 at one site in the N. Bering/Chukchi as well as most sites in the Bering Sea and Gulf of Alaska. Exceptions were Cape Lisburne in the north, Bluff in the Bering Sea, and E. Amatuli and Gull islands in the Gulf of Alaska, where success was within normal bounds (Table 33). Population trends at most colonies we monitored in 1999 have been relatively stable or increasing over the past decade. Exceptions were two sites in the Bering Sea (St. Paul and St. George islands), and one site in the Gulf of Alaska (Middleton Island) where recent declines are suggested by counts on index plots (Table 34).

Red-legged kittiwake (RLKI) eggs hatched earlier than average in the Pribilofs (St. Paul and St. George islands), whereas hatch dates were about average at Buldir Island in 1999 (Table 32). Reproductive success was average at three of the four sites monitored in 1999, Bogoslof Island being the exception with lower than average productivity (Table 33). Although the breeding populations at both St. Paul and St. George islands were lower than in the 1970s, counts since the mid-1980s have been relatively stable (Table 34).

Diving Fish-Feeders (nearshore).--Timing of nesting events has been monitored long enough for comparisons at only one site for pelagic cormorants (PECO). Hatching was later than normal at Cape Peirce in the eastern Bering Sea in 1999 (Table 32).

Productivity for at least one species of cormorant was monitored in every region. Like other nearshore feeders, reproductive success of cormorants may be based on very local

Table 32. Seabird relative breeding chronology compared to averages for past years within regions[a].

Region	Site	FTSP	LHSP	PECO	GWGU	BLKI	RLKI	COMU	TBMU	LEAU	CRAU	RHAU	TUPU	HOPU
N. Bering/ Chukchi	L. Diomede I.					+		=	=	=	=			
SE Bering	St. Paul I.					=	–	=	=					
	St. George I.					+	–	=	=					
	C. Peirce			+		+		+						
	Aiktak I.	+	=		=								+	
SW Bering	Buldir I.					=	=		+				+	+
	Kasatochi I.									=	=			
Gulf of Alaska	E. Amatuli I.					+		+					+	
	Gull I.				+	=		=						
	Duck I.				+	+		+						=
	Middleton I.				+	+						+		
Southeast	St. Lazaria I.	+	+					+	=					

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

Table 33. Seabird relative productivity levels compared to averages for past years within regions[a].

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

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

Table 34. Seabird population trends compared within regions[a]. Only sites which were counted in 1999 are included.

Region	Site	NOFU	STPE	PECO	RFCO	UNCO	GWGU	BLKI	RLKI	COMU	TBMU	UNMU	LEAU	CRAU	RHAU	TUPU
N. Bering/ Chukchi	C. Lisburne							+				+				
	Bluff							=		=						
SE Bering	St. Paul I.							–	–	–	–					
	St. George I.	=						–	–	+	+					
	C. Peirce			=				=		=						
	Aiktak I.		+				–									+
SW Bering	Kasatochi I.					=	–						=	+		
Alaska Peninsula	Puale Bay							=				–				
Gulf of Alaska	Chiniak Bay			–	–			+								
	E. Amatuli I.						+	=		+						
	P. William Snd							=								
	Middleton I.			–				–				–				
Southeast	St. Lazaria I.		+				–					–			=	

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

conditions which may not prevail region-wide. Pelagic cormorants had below average success at Bluff in the northern Bering Sea, Cape Peirce in the southeastern Bering Sea, Kasatochi Island in the southwestern Bering Sea and Chiniak Bay in the Gulf of Alaska in 1999 (Table 33). Pelagic cormorant productivity was above average at Buldir and Ulak islands in the southwestern Bering Sea, and average at Gull and Middleton islands in the Gulf of Alaska and at St. Lazaria in southeast Alaska.

Red-faced cormorants (RFCO) had average or better success in the Pribilofs (St. Paul Island) and in the Aleutians, except at Kasatochi Island where rates were below average in 1999. Productivity of red-faced cormorants also was relatively low at Chiniak Bay in the Gulf of Alaska (Table 33).

At colonies in the Bering Sea where we made counts in 1999, evidence suggested that since the late 1980s, pelagic cormorant numbers have remained stable (Table 34). This species showed a downward trend at Chiniak Bay and Middleton Island in the Gulf of Alaska. A negative trend also was evident for red-faced cormorants at Chiniak Bay.

Diving Fish-Feeders (offshore).--Murres had average hatch dates at most sites in 1999 (Table 32). Common murres (COMU) were late at Cape Pierce in the southeastern Bering Sea, Duck Island in the Gulf of Alaska and St. Lazaria Island in southeastern Alaska. Thick-billed murres were relatively late at Buldir Island in the southwestern Bering Sea.

Common murres exhibited average reproductive success at one site in the Chukchi and northern Bering sea region, two sites in the southeastern Bering Sea, two sites in the Gulf of Alaska and one location in southeastern Alaska in1999 (Table 33). This species had lower than average productivity at two sites in the southeastern Bering Sea, two sites in the southwestern Bering Sea and one location in the Gulf of Alaska. Thick-billed murres (TBMU) had below-average success at one site in the northern Bering Sea and Chukchi region, one site in the southeastern Bering Sea and one site in the southwestern Bering Sea in 1999 (Table 33). Average success was achieved by this species at all other sites where it was monitored. Trends in numbers of murres at sites we monitored in 1999 have been either increasing or remaining relatively stable everywhere except St. Paul Island in the Southeastern Bering Sea, Puale Bay on the Alaska Peninsula, Middleton Island in the Gulf of Alaska and St. Lazaria Island in southeastern Alaska. (Table 34).

Rhinoceros auklets (RHAU) exhibited later than normal hatching in 1999 at Middleton Island (Table 32). There was no discernable trend in populations of this species at St. Lazaria Island (Table 34).

Tufted puffin (TUPU) eggs hatched later than normal in the western and central Aleutians (Buldir and Aiktak islands) but were early in the Gulf of Alaska (E. Amatuli Island) in 1999 (Table 32). Horned puffin eggs hatched relatively late at Buldir Island in the southwestern Bering Sea and during the normal period at Duck Island in the Gulf of Alaska in 1999 (Table 32).

Reproductive success for tufted puffins was about average in the western and central Aleutian Islands (Buldir and Aiktak islands) but was higher than average in the Gulf of Alaska (E. Amatuli Island) in 1999 (Table 33). Horned puffins (HOPU) had normal rates of success at Buldir Island in the southwestern Bering Sea whereas success was above average at Duck Island in the Gulf of Alaska. An upward population trend was evident for tufted puffins at Aiktak Island in the

southeastern Bering Sea region, the only colony where counts were conducted for this species in 1999 (Table 34).

Diving Plankton-Feeders.--Least (LEAU) and crested (CRAU) auklets had approximately average nesting chronologies at both sites where they were monitored in 1999, one site in the northern Bering and Chukchi region and one in the southwestern Bering Sea region (Table 32). Productivity also was average for these species at both monitoring sites in 1999 (Table 33). The only data on population trends are for least and crested auklets at Kasatochi Island where least auklet numbers appeared to be relatively stable and crested auklet counts indicated a slight upward trend (Table 34).

Regional Differences

N. Bering/Chukchi.--The timing of nesting events in 1999 for diving murres and auklets was normal at all sites, but surface-feeding kittiwakes were late at the only site monitored in this region (Table 32). In five of eight estimates of productivity, values were about normal, but three were lower than average (Table 33). The only population trend data are for offshore fish-feeders (kittiwakes and murres), and these species either were relatively stable or increasing (Table 34).

SE Bering.--Hatch dates for fork-tailed storm-petrels at Aiktak Island were late, whereas Leach's storm-petrel nesting chronology was average at this site in 1999 (Table 32). All species of fish-feeders exhibited normal or late timing in this region except for red-legged kittiwakes at the Pribilofs, which were earlier than normal.

Storm-petrels apparently had adequate plankton available for normal reproduction in 1999 (Table 33). Gulls and puffins also found enough fish for normal rates of productivity in the region in 1999. Kittiwakes exhibited variable success in this region with black-legged kittiwakes having below average productivity at three of the four sites monitored, including Bogoslof Island. Red-legged kittiwake success was low at Bogoslof Island as well but was average at the Pribilofs. Murres had problems at some colonies in the southeastern Bering Sea, experiencing below average rates of success at half of the sites in the region. Murre productivity was average at the Pribilofs in 1999.

Northern fulmars (NOFU) showed no trend at St. George Island. Storm-petrel populations appeared to be increasing in the eastern Aleutians (Aiktak Island). There were no clear patterns among fish-feeders in this region (Table 34): 1) cormorants showed no trend at the only site monitored in 1999; 2) gull numbers appeared to be down slightly at Aiktak Island, as were those of black- and red-legged kittiwakes at both St. Paul and St. George islands 3) murres were up at one site, down at another and showed no trend at a third, and 4) puffins appeared to be increasing at Aiktak Island, the only site monitored for this species 1999.

SW Bering.–Murres and puffins initiated nesting later than usual in 1999, but timing of kittiwakes was normal (Table 32). Plankton-feeders (auklets) also exhibited normal breeding chronology in this region.

Plankton feeders, both surface (storm-petrels) and divers (auklets) had average success in 1999 in all cases in this region (Table 33). Surface feeders (gulls and kittiwakes) exhibited average

or below average success, while diving fish-feeders (cormorants, murres and puffins) showed a mixed bag: 1) cormorants had better than average success at Buldir and Ulak islands, but low productivity at Kasatochi Island, 2) common murres exhibited low success at both Buldir and Kasatochi islands, whereas thick-billed murres had low productivity at Kasatochi Island but average success at Buldir Island, 3) puffins showed average productivity at Buldir Island.

We monitored populations at only one colony (Kasatochi Island) in this region in 1999. Cormorants (UNCO) and least auklets showed no trends, whereas gulls declined and crested auklets increased (Table 34).

Alaska Peninsula.--Populations were monitored at only one colony (Puale Bay) in this region in 1999. Black-legged kittiwakes exhibited no trend but murre (UNMU) counts indicated a decline (Table 34).

N. Gulf of Alaska.--Fork-tailed storm-petrels normally are monitored at E. Amatuli Island, but data were not available for 1999 at the time of this report, therefore, only fish-feeding species are compared. Two species nested earlier than normal in 1999, tufted puffins at E. Amatuli Island and glaucous-winged gulls at Middleton Island (Table 32). Otherwise, surface feeders were later than average in five of six cases. Murres had average timing in two of three instances, and horned puffins exhibited average timing at the only site where they were monitored in this region in 1999.

Productivity was normal for most the species we monitored in this region in 1999. Exceptions included higher than average success for tufted puffins at E. Amatuli Island and horned puffins at Duck Island, and lower than normal productivity of common murres at Gull Island (Table 33). All three species monitored at Chiniak Bay in 1999 showed below average success.

Although cormorant populations appeared to be declining at the two sites we monitored in the region in 1999, overall patterns were not so clear for the other foraging guilds. Declines have occurred for kittiwakes at Middleton Island, where murres also have declined. Elsewhere, kittiwakes have increased (Chiniak Bay) or remained stable. Glaucous-winged gull and murre numbers were up at E. Amatuli Island (Table 34).

Southeast.–Storm-petrel and common murre eggs hatched early whereas thick-billed murre eggs hatched at average dates at St. Lazaria Island, the only site monitored in this region in 1999 (Table 32).

Productivity rates in 1999 were average for every species except fork-tailed storm-petrels which had below-average success (Table 33).

Storm-petrel numbers appeared to be increasing at St. Lazaria Island (Table 34). Glaucous-winged gulls and murres showed negative trends but no trend was apparent for rhinoceros auklets.

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