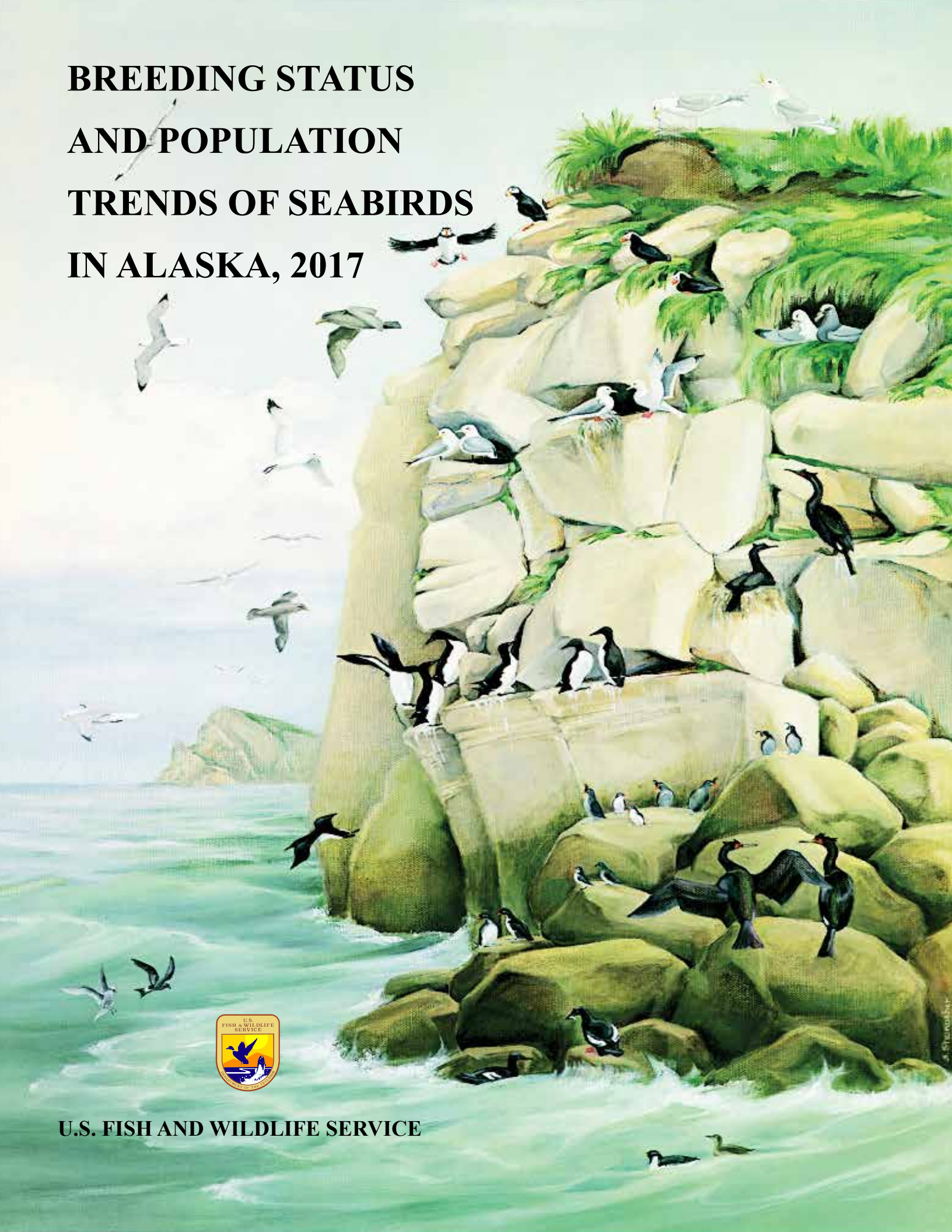
BREEDING STATUS AND POPULATION TRENDS OF SEABIRDS IN ALASKA, 2017



U.S. FISH AND WILDLIFE SERVICE

AMNWR 2018/02

BREEDING STATUS AND POPULATION TRENDS OF SEABIRDS IN ALASKA, 2017

Compiled By:

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Key words: *Aethia*, Alaska, Aleutian Islands, ancient murrelet, Bering Sea, black-legged kittiwake, *Cepphus, Cerorhinca*, Chukchi Sea, common murre, crested auklet, 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, Prince William Sound, productivity, red-faced cormorant, red-legged kittiwake, rhinoceros auklet, *Rissa*, seabirds, *Synthliboramphus,* thick-billed murre, tufted puffin, *Uria*, whiskered auklet.

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February 2018

Cite as: Dragoo, D. E., H. M. Renner, and R. S. A. Kaler. 2018. Breeding status and population trends of seabirds in Alaska, 2017. U.S. Fish and Wildlife Service Report AMNWR 2018/02. Homer, Alaska.

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Executive Summary

Data are 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, and population trends of representative species of various foraging guilds (e.g., offshore diving 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.

During the summer of 2017, seabird data were gathered at seven of the eight annual monitoring sites on the Alaska Maritime NWR. Birds were not monitored at St. Lazaria Island due to inadequate funding. The species monitored were murres, pigeon guillemots, ancient murrelets, auklets, puffins, kittiwakes, glaucous-winged gulls, northern fulmars, storm-petrels, and cormorants. In addition, data were gathered at five other locations which are visited intermittently, or were part of a research or monitoring program outside the refuge.

Timing of breeding (Table A)

• Statewide, in 2017 mean hatch date was early in 43%, average in 36%, and late in 21% of monitored species. Three of the four monitored auklets exhibited early timing in 2017, whereas murres and black-legged kittiwakes were later than average.

• Murre and kittiwake eggs failed to hatch on study plots at several monitored colonies in 2017 (e. g., common and thick-billed murres at Aiktak Island; black-legged kittiwakes at St. Paul Island; red-legged kittiwakes at all three monitored colonies--St. Paul, St. George, and Buldir islands), probably due to nest depredation and/or nest abandonment by adults.

Table A. Regional and statewide seabird breeding chronology[a] compared to averages for past years within regions and the state of Alaska as a whole. Only regions for which there were data from 2017 are included.

Region	COMU[b]	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	HOPU	TUPU	BLKI	GWGU	FTSP	LHSP	RFCO
SE Bering	L	L	E		E			E	A		E	E	A	E
SW Bering		L		E	E	E	E	A		L	L			
N. GOA[c]	A	L		A				E	A	L	A			
Alaska	L	L	E	A	E	E	E	A	A	L	A	E	A	E

[a]Codes:
"E" and red cell color indicate hatching chronology was > 3 days earlier than the average for sites in this region.
"A" and yellow cell color indicate hatching chronology was within 3 days of average.
"L" and green cell color indicate hatching chronology was > 3 days later than the average for sites in this region.

[b]COMU=common murre, TBMU=thick-billed murre, ANMU=ancient murrelet, PAAU=parakeet auklet, LEAU=least auklet, WHAU=whiskered auklet, CRAU=crested auklet, HOPU=horned puffin, TUPU=tufted puffin, BLKI=black-legged kittiwake, GWGU=glaucous-winged gull, FTSP=fork-tailed storm-petrel, LHSP=Leach's storm-petrel, RFCO=red-faced cormorant.

[c]GOA=Gulf of Alaska.

Productivity (Table B)

• Statewide, 2017 productivity was average in 47% of monitored species and below average in 53%. No monitored species had above average productivity statewide in 2017.

• In 2017, murres, tufted puffins, and kittiwakes exhibited widespread breeding failures, although the failures were not as prevalent for murres as they were in 2016, following an extensive 2015-2016 wintertime die off event.

• However, there were exceptions, with some species exhibiting above average productivity at certain colonies in 2017 (e.g., black-legged kittiwakes at Cape Lisburne; red-faced cormorants at St. Paul Island; common and thick-billed murres, glaucous-winged gulls, and pelagic cormorants at Chowiet Island).

Table B. Regional and statewide seabird breeding productivity levels[a] compared to averages for past years within regions and the state of Alaska as a whole. Only regions for which there were data from 2017 are included.

Region[b]	COMU[c]	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	RHAU	HOPU	TUPU	BLKI	RLKI	GWGU	FTSP	LHSP	RFCO	PECO
N. BS/CS											H						
SE Bering	L	L	A		L				A	L	L	L	A	A	A	L	L
SW Bering		L		A	A	A	A		H	L	L	L	L	L	A		
N. GOA	H	H		A				A	L	L	L		H				H
Alaska	L	L	A	A	L	A	A	A	A	L	L	L	A	L	A	L	L

[a]Codes:
"L" and red cell color indicate productivity was > 20% below the average for the region.
"A" and yellow cell color indicate productivity was within 20% of average.
"H" and green cell color indicate productivity was > 20% above the average for the region.

[b]BS=Bering Sea, CS=Chukchi Sea, GOA=Gulf of Alaska.

[c]COMU=common murre, TBMU=thick-billed murre, ANMU=ancient murrelet, PAAU=parakeet auklet, LEAU=least auklet, WHAU=whiskered auklet, CRAU=crested auklet, RHAU=rhinoceros auklet, HOPU=horned puffin, TUPU=tufted puffin, BLKI=black-legged kittiwake, RLKI=red-legged kittiwake, GWGU=glaucous-winged gull, FTSP=fork-tailed storm-petrel, LHSP=Leach's storm-petrel, RFCO=red-faced cormorant, PECO=pelagic cormorant.

Population trends during 2008-2017 (Table C)

• Statewide, 19% of species showed increasing population trends, 37% were stable, and 44% declined between 2008 and 2017.

• Low colony attendance in recent years following the 2015-2016 winter die off may be a consequence of poor localized habitat conditions, and may or may not reflect true changes in population size. Birds not attending the cliffs frequently form large rafts in nearby waters.

• In some cases, the 2017 counts were a small fraction of prior years' counts. For example, the 2017 murre count at Aiktak Island was about 6% of the 2016 count there. Future counts will be needed to determine whether there was mortality, whether breeding birds emigrated out of the area, or whether they simply didn't breed in 2017.

Table C. Regional and statewide seabird population trends[a] between 2008 and 2017 within regions and the state of Alaska as a whole. Only sites for which there were data from at least two years (at least 5 years apart) within the target decade are included.

Region[b]	COMU[c]	TBMU	UNMU	PIGU	LEAU	RHAU	TUPU	BLKI	RLKI	GWGU	NOFU	FTSP	STPE	RFCO	PECO	UNCO
N. BS/CS			↑					↑								
SE Bering	↓	↔	↓		↓		↔	↓	↔	↓	↑		↑	↓	↓	↓
SW Bering			↔					↑	↑						↓	↔
N. GOA			↓	↑		↔	↓	↓		↔	↔	↔				
Southeast			↔	↔		↔				↑			↔		↑	
Alaska	↓	↔	↓	↔	↓	↔	↓	↔	↑	↔	↑	↔	↑	↓	↓	↓

[a]Codes:
↓ and red cell color indicate a negative population trend of ≥3% per annum for this site or region.
↔ and yellow cell color indicate that per annum change was within 3% of the site average.
↑ and green cell color indicate a positive population trend of ≥3% per annum for this site or region.

[b]BS=Bering Sea, CS=Chukchi Sea, GOA=Gulf of Alaska.

[c]COMU=common murre, TBMU=thick-billed murre, UNMU=unspecified murre, PIGU=pigeon guillemot, LEAU=least auklet, RHAU=rhinoceros auklet, TUPU=tufted puffin, BLKI=black-legged kittiwake, RLKI=red-legged kittiwake, GWGU=glaucous-winged gull, NOFU=northern fulmar, FTSP=fork-tailed storm-petrel, STPE=unspecified storm-petrel, RFCO=red-faced cormorant, PECO=pelagic cormorant, UNCO=unspecified cormorant.

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Introduction

This report is the latest 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 2006-2017 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 and provides 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 surface-feeding fish-feeders, auklets are diving plankton-feeders, etc.) at geographically dispersed breeding sites along the entire coastline of Alaska (Figure 1). A total of eight sites on the Alaska Maritime NWR, located roughly 300-500 km apart, are scheduled for annual surveys (Byrd 2007). During the summer of 2017, seabird data were gathered at seven of the eight annual monitoring sites on the Alaska Maritime NWR. Birds were not monitored at St. Lazaria Island due to inadequate funding. Furthermore, data are recorded annually or semiannually at other sites in Alaska (e.g., Cape Peirce, Togiak NWR; Puale Bay, Alaska Peninsula/Becharof NWR; Round and Middleton islands; Prince William Sound). 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 invasive rodents on marine birds) also supplement the monitoring database.

In this report, we summarize information from 2017 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 reproductive success at various sites. In addition, historical patterns of hatching chronology and productivity are illustrated for those sites for which we have sufficient data. Population trend information is included for sites where adequate data are available.

Methods

Data collection methods followed standardized protocols (e.g., AMNWR 2017). Timing of nesting events and productivity usually were based on periodic checks of samples of nests (usually 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 the 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 referenced herein.

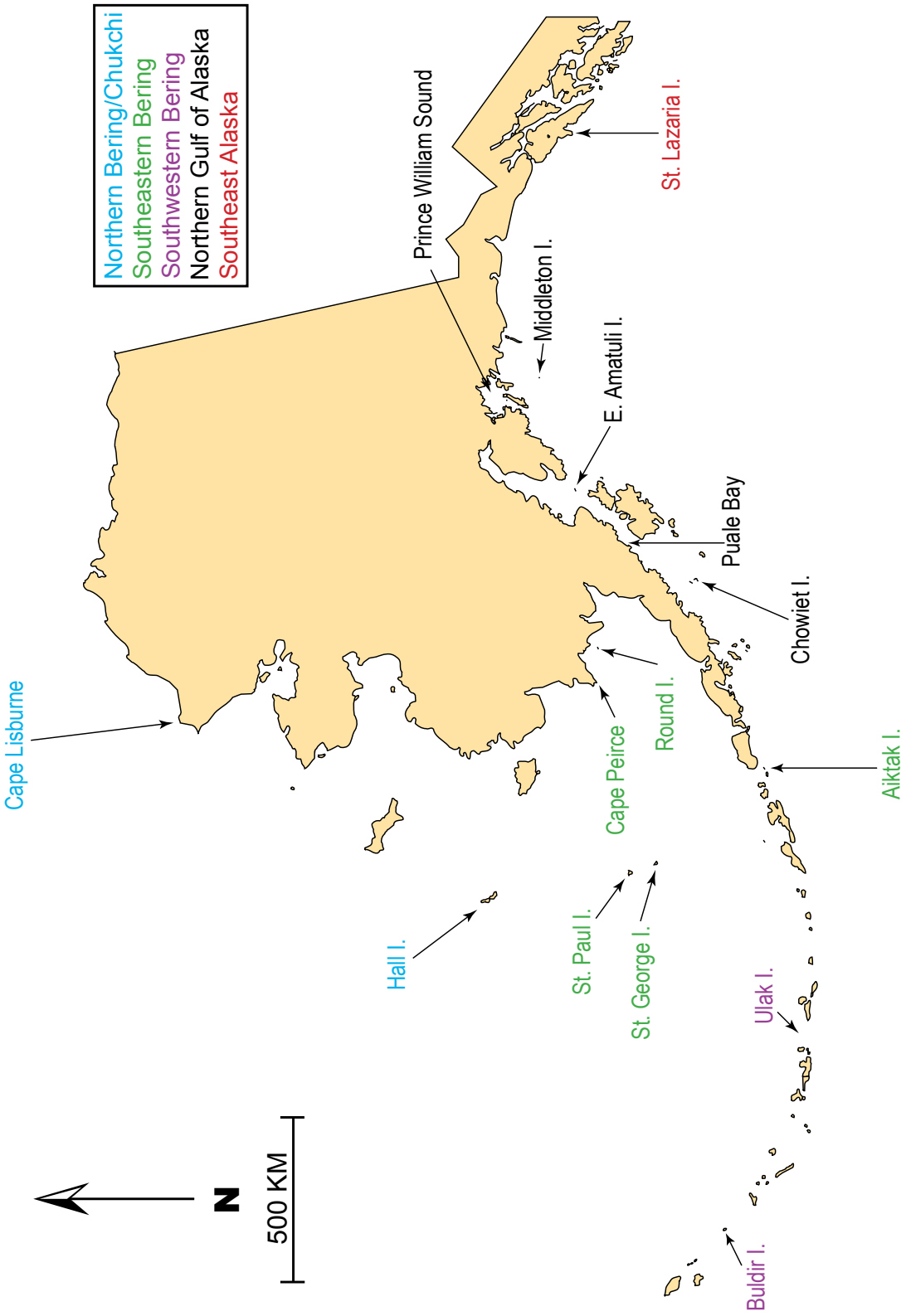


Figure 1. Map of Alaska showing the locations of seabird monitoring sites summarized in this report. Text color indicates geographic regions.

Table 1. Productivity parameters used in this report (see AMNWR 2017).

Species	Productivity Value
Murres	Chicks Fledged/Nest Site (Total chicks fledged/Total sites where egg was laid)
Ancient murrelet	Chicks Fledged/Egg (Total chicks fledged/Total eggs)
Auklets (except RHAU)	Chicks Fledged/Nest Site (Total chicks fledged/Total sites where egg was laid)
Rhinoceros auklet	Overall Residency Index (Late apparent occupancy/Early apparent occupancy)
Horned puffin	Chicks Fledged/Egg (Total chicks fledged/Total eggs)
Tufted puffin	Overall Residency Index (Late apparent occupancy/Early apparent occupancy)
Kittiwakes	Chicks Fledged/Nest (Total chicks fledged/Total nests)
Glaucous-winged gull	Hatching Success (Total chicks/Total eggs)
Storm-petrels	Chicks Fledged/Egg (Total chicks fledged/Total eggs)
Cormorants	Chicks Fledged/Nest (Total chicks fledged/Total nests)

This report summarizes monitoring data for 2017, and compares 2017 results with previous years. For sites with at least two years of data prior to 2017, site averages were used 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 average. Population trends were analyzed using linear regression models on log-transformed data (ln) to calculate the slope of the line. The resultant slope is equivalent to the annual rate of population change. A trend was defined as any change greater than or equal to a three percent per annum increase or decline (≥3% p.a.). Population counts were analyzed using two time frames: 1) data from all available years, and 2) data from the last decade (2008-2017 for this report). A percent per annum change was calculated for each data set during both time periods, if sufficient data were available. We also summarized seabird phenology and productivity, as well as recent population trends (from 2008-2017), by region and for the entire state.

Chronology was calculated for each species in a region using data from all colonies. Each colony was weighted equally within each region. The chronology was averaged for all sites within each region resulting in a value for each species, thus producing one statewide value for each species.

Productivity was calculated for each species in a region using data from all colonies. Each colony was weighted equally within each region. The productivity was averaged for all sites within each region resulting in a value for each species. Species productivities were then averaged to calculate a statewide value for each species.

Population trends were calculated for each species in a region using data from all colonies. Each colony was weighted equally within each region. Trends (line slopes) were averaged for all sites within each region resulting in a regional value for each species. Only sites for which there were data from at least two years (at least 5 years apart) between 2008 and 2017 were included.

Results

Common murre (*Uria aalge*)

Table 2. Hatching chronology of common murres at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
St. Paul I.	14 Aug (3)[a]	3 Aug (29)[a]	Mong and Romano 2017
St. George I.	8 Aug (9)	3 Aug (32)	Pollom et al. 2018
Chowiet I.	20 Jul (124)	23 Jul (20)	Evans et al. 2017

[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.

Table 3. Reproductive performance of common murres at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Paul I.	0.02	3 (48)[b]	0.49 (30)[b]	Mong and Romano 2017
St. George I.	0.33	4 (39)	0.48 (33)	Pollom et al. 2018
Round I.	0.00	3 (36)	0.18 (16)	E. Weiss Unpubl. Data
Aiktak I.	0.00	NA[c] (0)	0.23 (20)	N. Rojek Unpubl. Data
Chowiet I.	0.66	11 (233)	0.49 (22)	Evans et al. 2017
E. Amatuli I.	0.15	4 (26)	0.54 (19)	A. Kettle Unpubl. Data

[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.

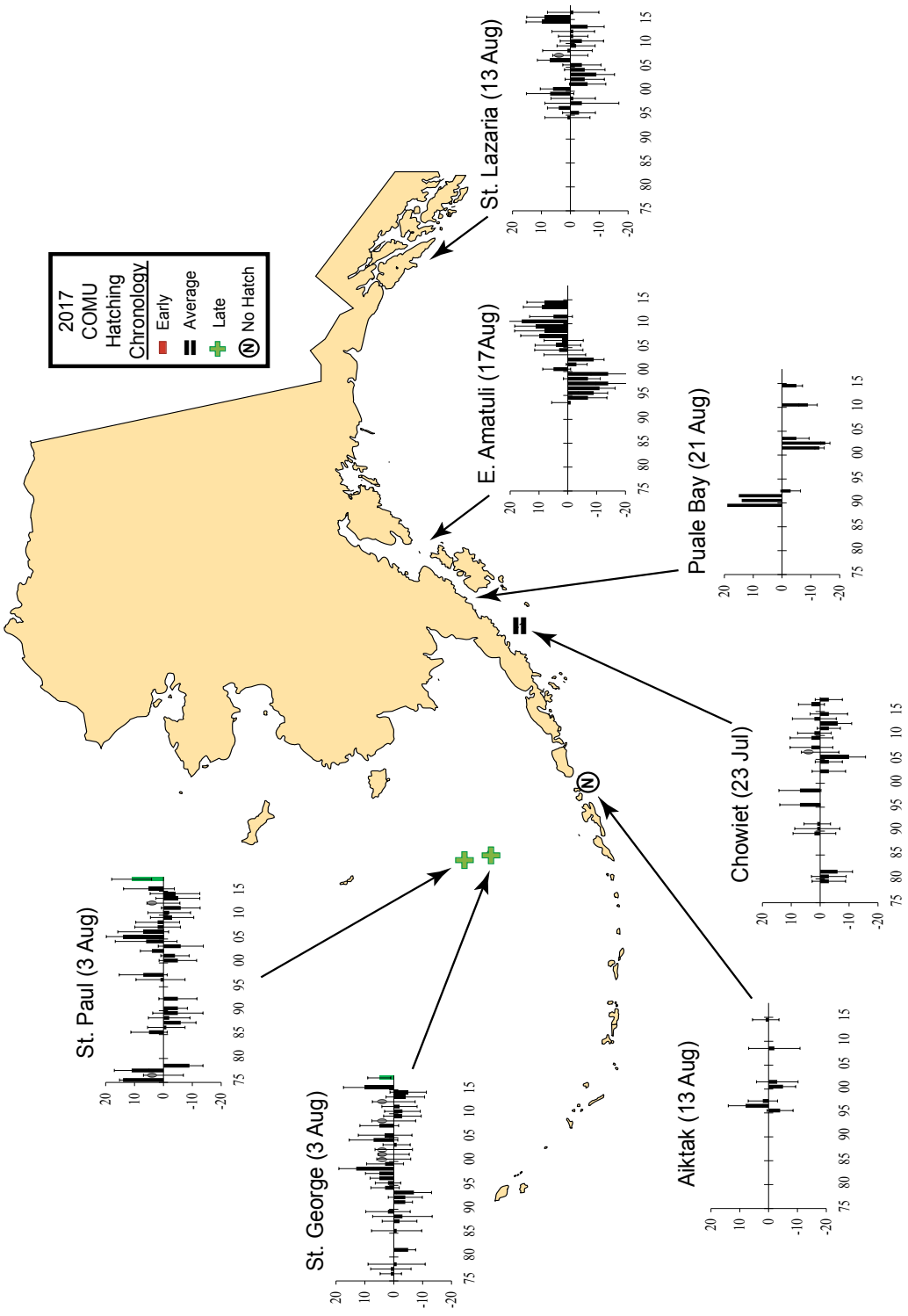


Figure 2. Hatching chronology of common murres at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

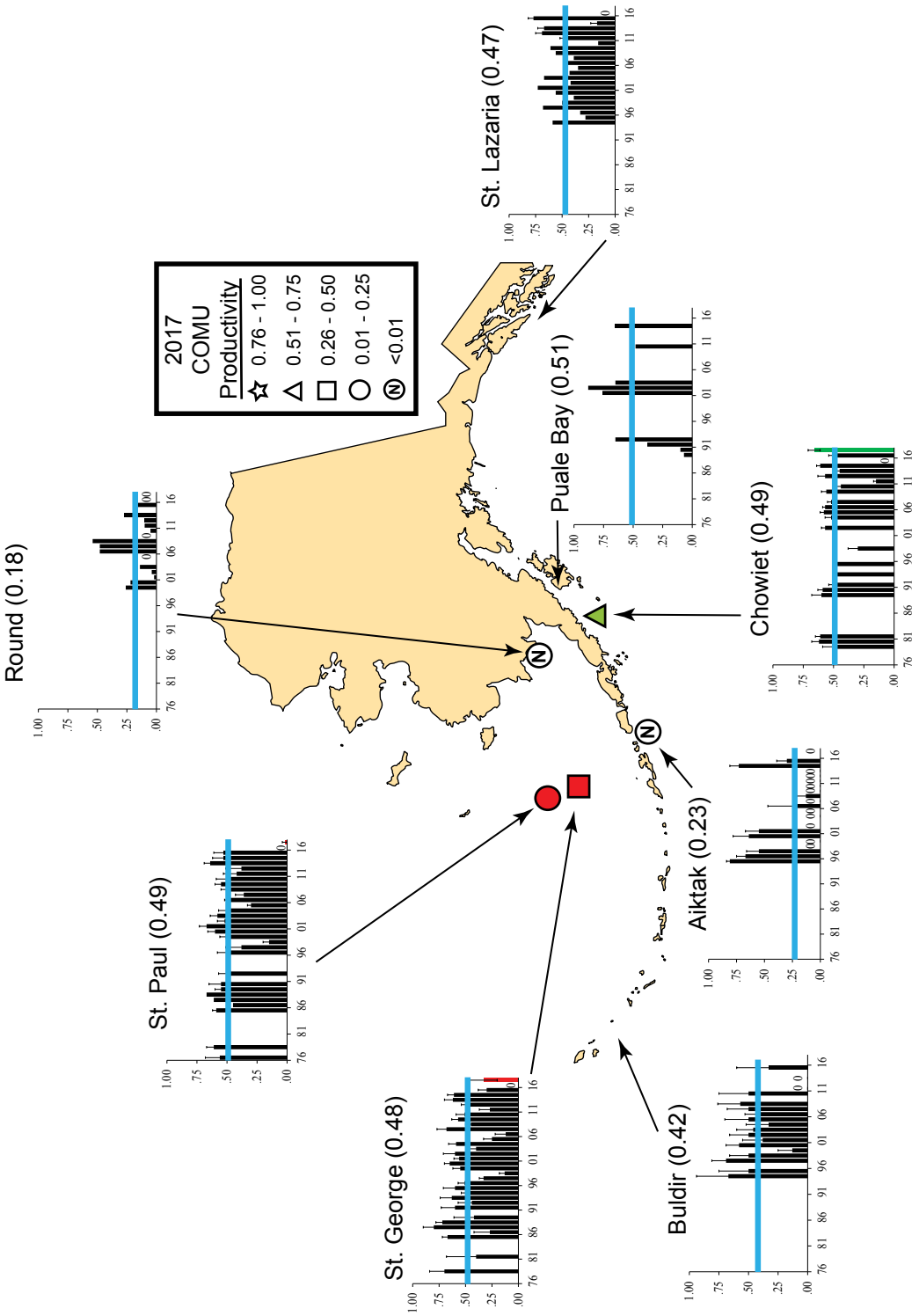


Figure 3. Productivity of common murres (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

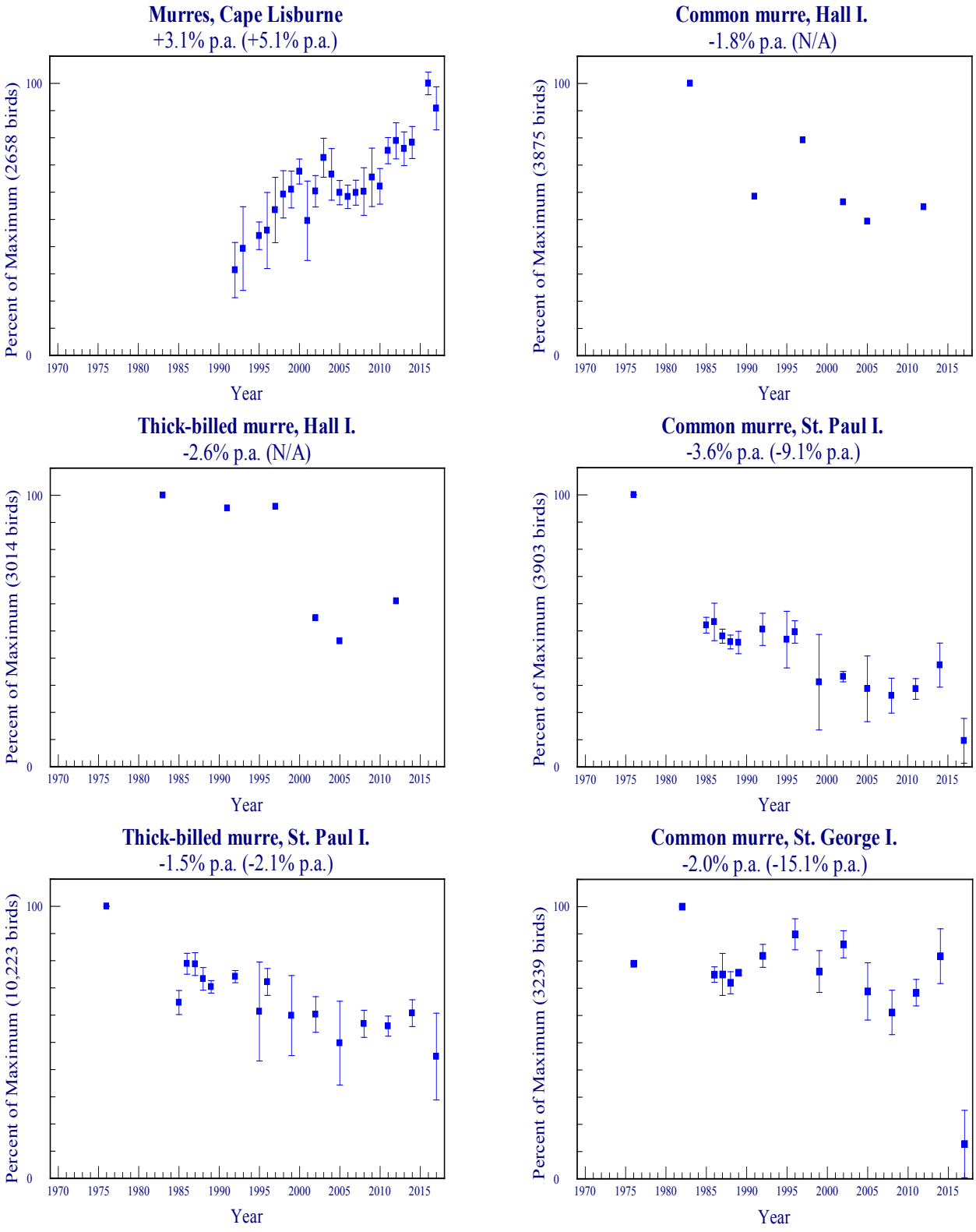
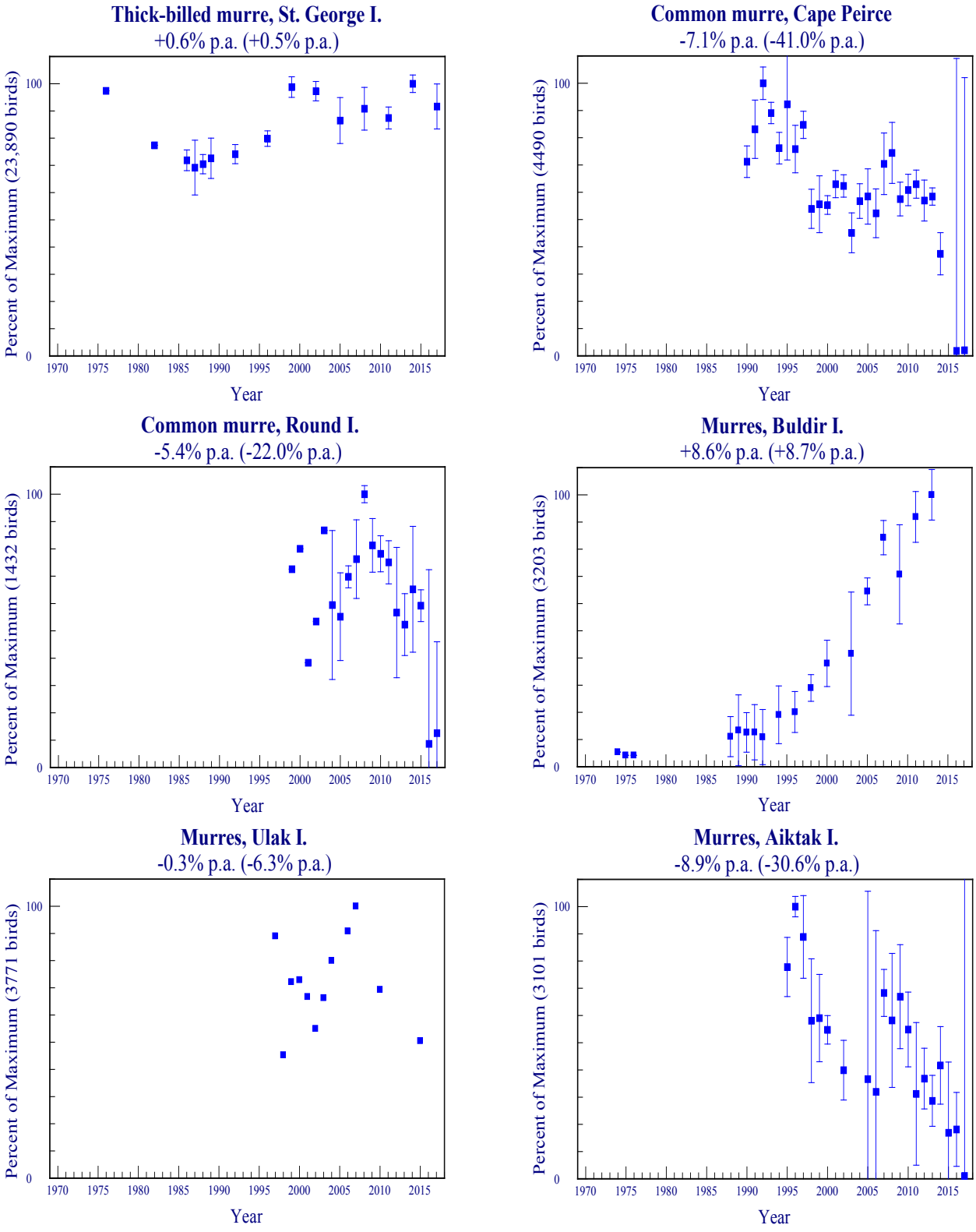


Figure 4. Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). "NA" indicates that insufficient data were available.



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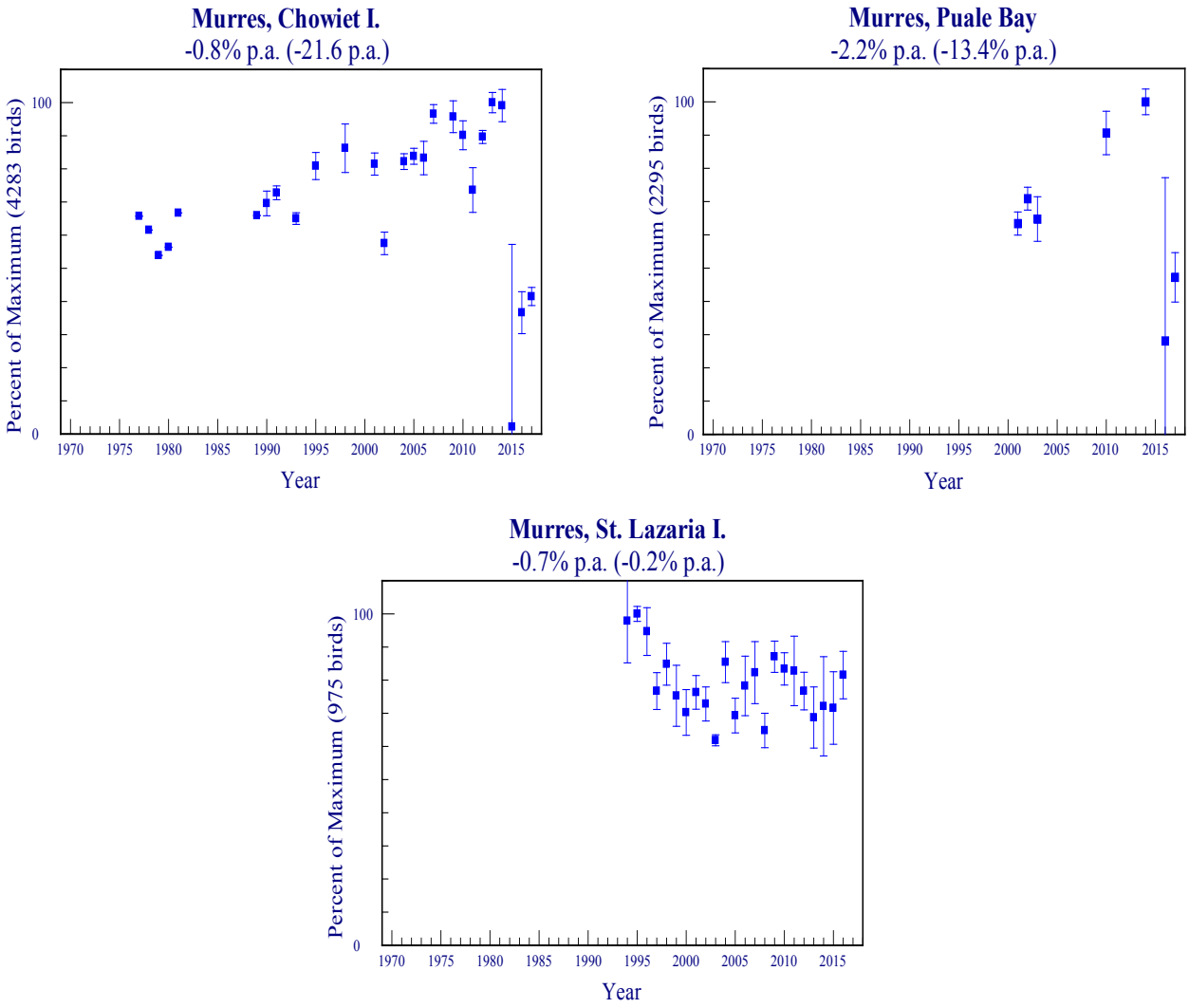


Figure 4 (continued). Trends in populations of murres at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). "NA" indicates that insufficient data were available.

Thick-billed murre (*Uria lomvia*)

Table 4. Hatching chronology of thick-billed murres at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
St. Paul I.	11 Aug (18)[a]	6 Aug (32)[a]	Mong and Romano 2017
St. George I.	8 Aug (74)	1 Aug (35)	Pollom et al. 2018
Buldir I.	27 Jul (117)	19 Jul (29)	Pietrzak et al. 2017
Chowiet I.	25 Jul (59)	21 Jul (19)	Evans et al. 2017

[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.

Table 5. Reproductive performance of thick-billed murres at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. Paul I.	0.07	12 (243)[b]	0.45 (32)[b]	Mong and Romano 2017
St. George I.	0.15	16 (392)	0.50 (36)	Pollom et al. 2018
Buldir I.	0.46	9 (271)	0.66 (29)	Pietrzak et al. 2017
Aiktak I.	0.00	NA[c] (0)	0.27 (16)	N. Rojek Unpubl. Data
Chowiet I.	0.53	5 (124)	0.40 (22)	Evans et al. 2017

[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.

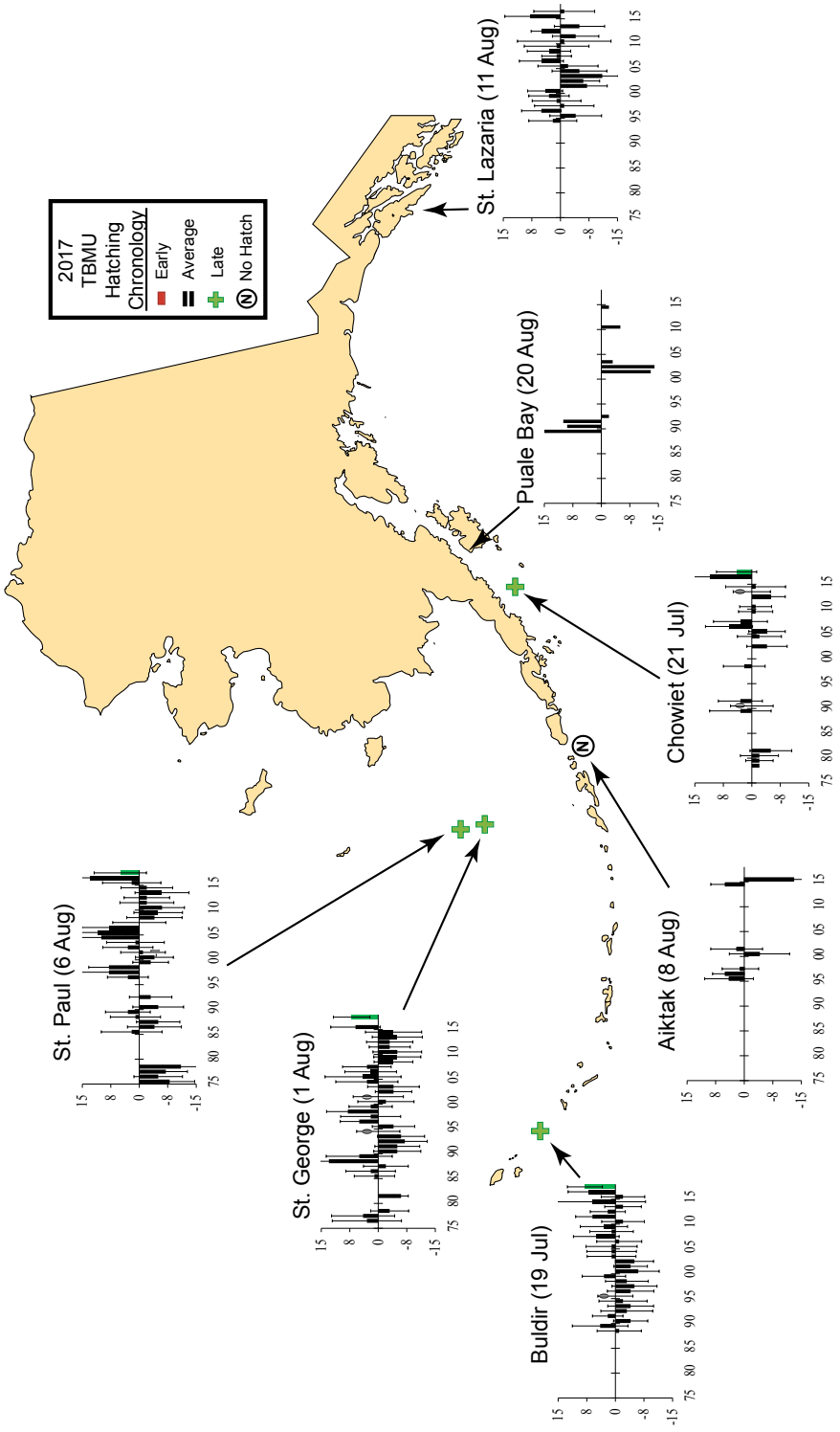


Figure 5. Hatching chronology of thick-billed murres at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

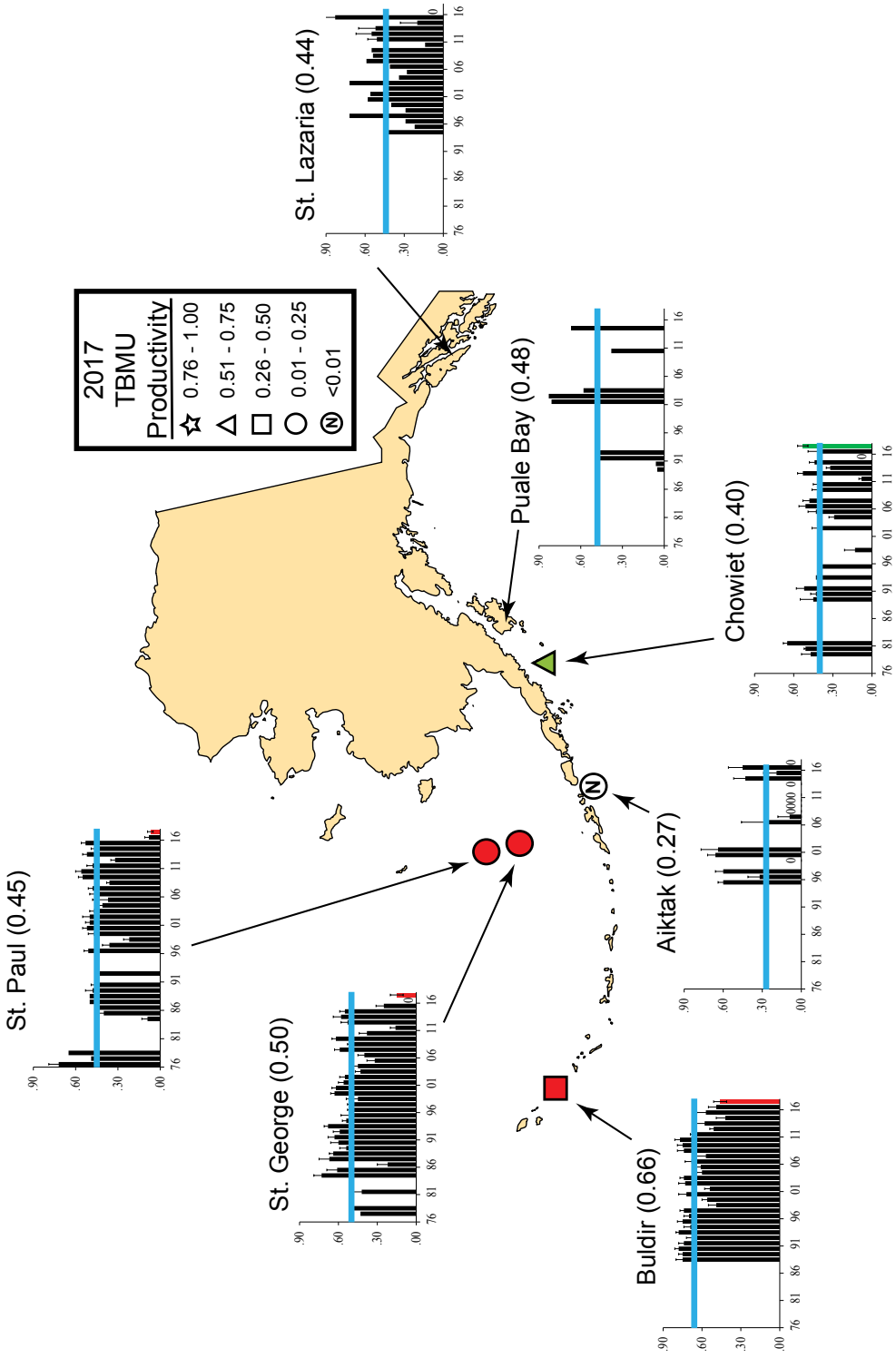


Figure 6. Productivity of thick-billed murres (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

Pigeon guillemot (*Cepphus columba*)

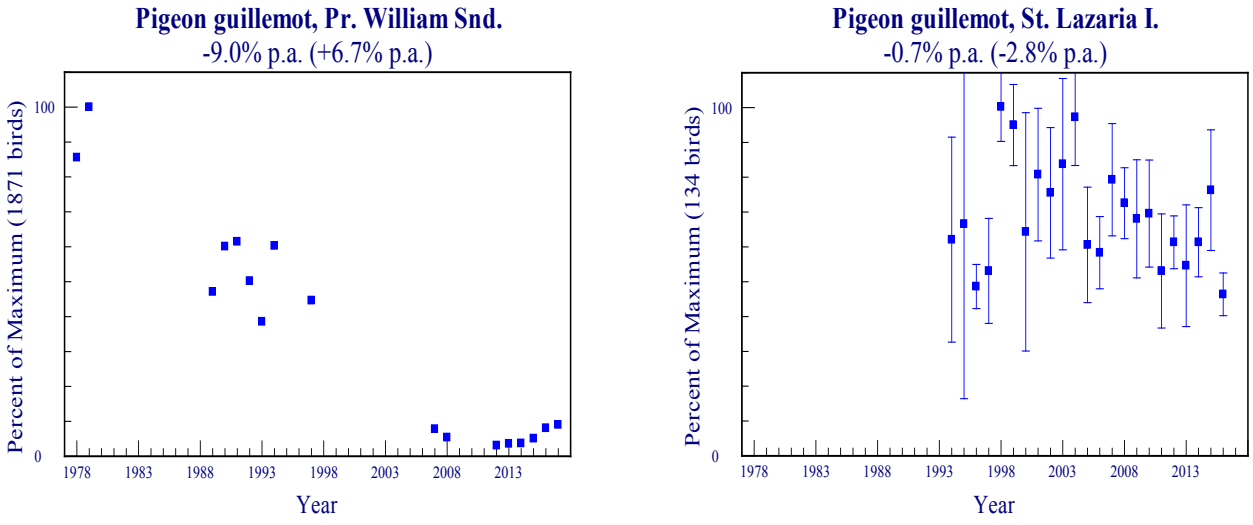


Figure 7. Trends in populations of pigeon guillemots at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

Ancient murrelet (*Synthliboramphus antiquus*)

Table 6. Hatching chronology of ancient murrelets at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Aiktak I.	27 Jun (89)[a]	3 Jul (20)[a]	N. Rojek Unpubl. Data

[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.

Table 7. Reproductive performance of ancient murrelets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/Egg[a]	No. of Plots	Long-term Average	Reference
Aiktak I.	0.87	NA[b] (192)[c]	0.79 (20)[c]	N. Rojek Unpubl. Data

[a]Total chicks fledged/Total eggs.
[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.

Parakeet auklet (*Aethia psittacula*)

Table 8. Hatching chronology of parakeet auklets at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	29 Jun (12)[a]	4 Jul (25)[a]	Pietrzak et al. 2017
Chowiet I.	3 Jul (41)	4 Jul (12)	Evans et al. 2017

[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.

Table 9. Reproductive performance of parakeet auklets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.48	NA[b] (66)[c]	0.53 (25)[c]	Pietrzak et al. 2017
Chowiet I.	0.46	NA (71)	0.40 (12)	Evans et al. 2017

[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.

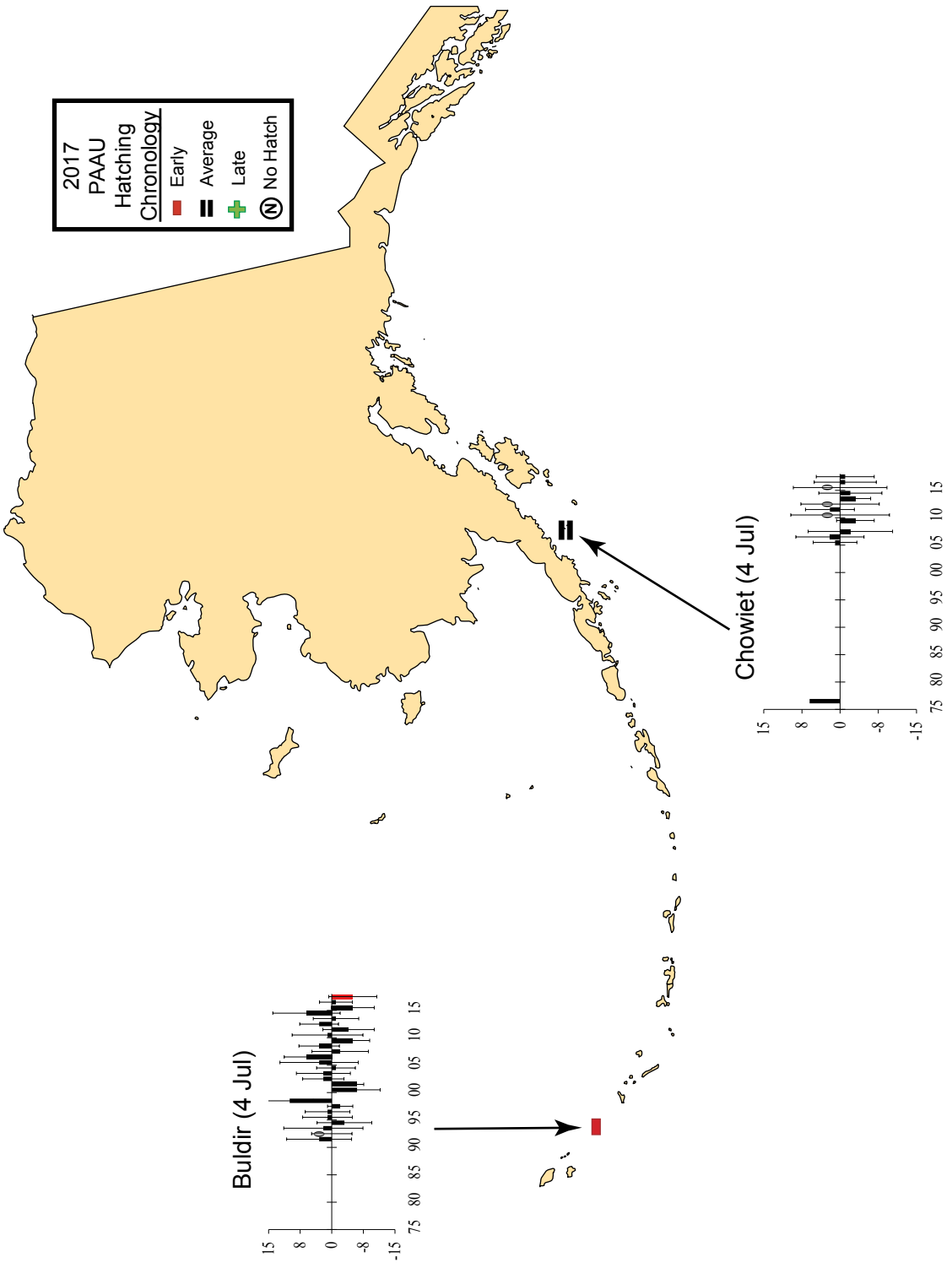


Figure 8. Hatching chronology of parakeet auklets at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

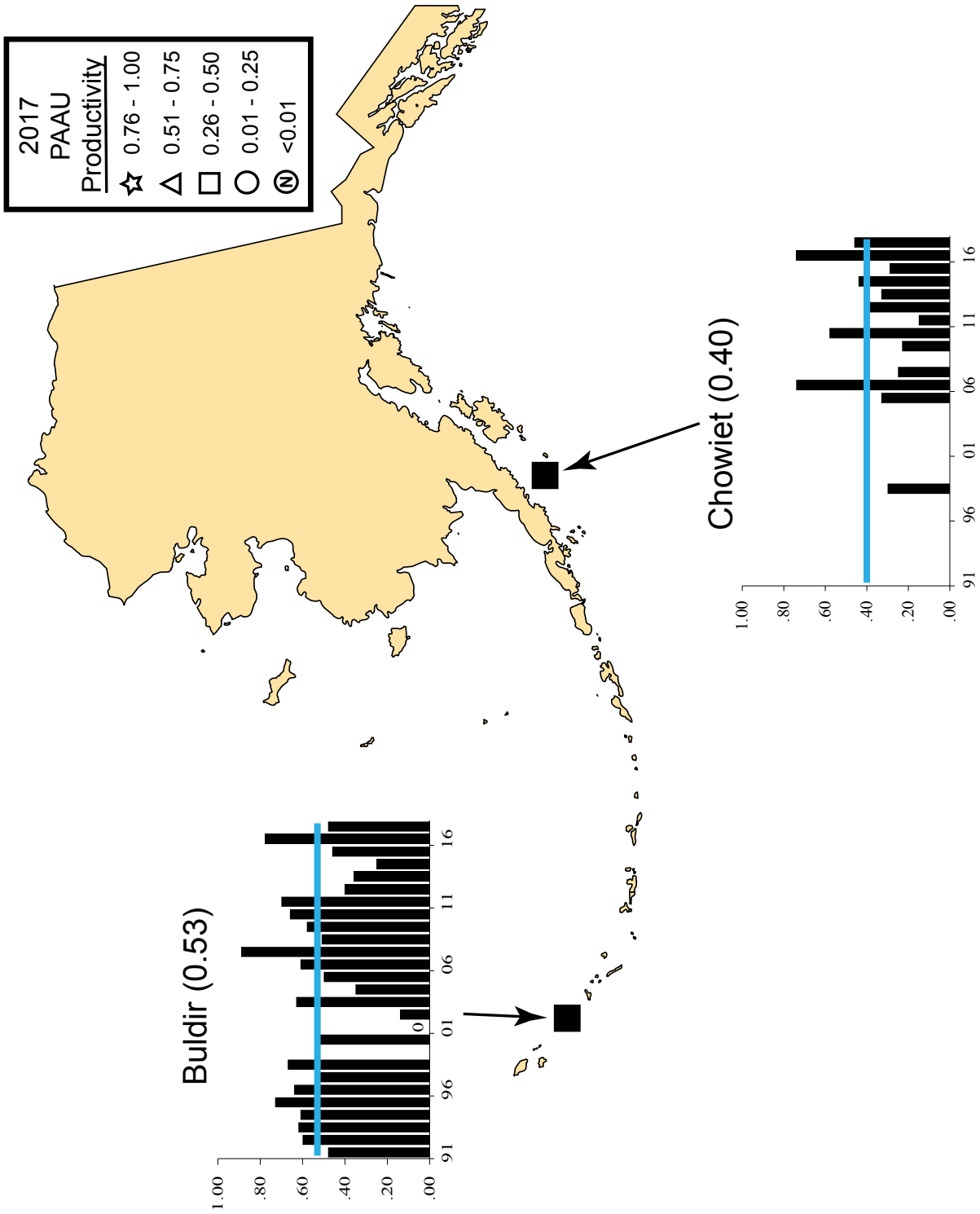


Figure 9. Productivity of parakeet auklets (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

Least auklet (*Aethia pusilla*)

Table 10. Hatching chronology of least auklets at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
St. George I.	29 Jun (43)[a]	13 Jul (9)[a]	Pollom et al. 2018
Buldir I.	23 Jun (19)	27 Jun (27)	Pietrzak et al. 2017

[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.

Table 11. Reproductive performance of least auklets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
St. George I.	0.33	NA[b] (75)[c]	0.61 (9)[c]	Pollom et al. 2018
Buldir I.	0.58	NA (77)	0.58 (28)	Pietrzak et al. 2017s

[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.

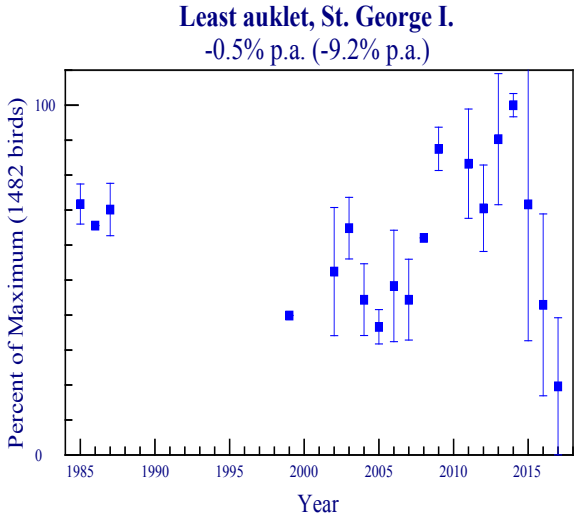


Figure 10. Trends in populations of least auklets at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

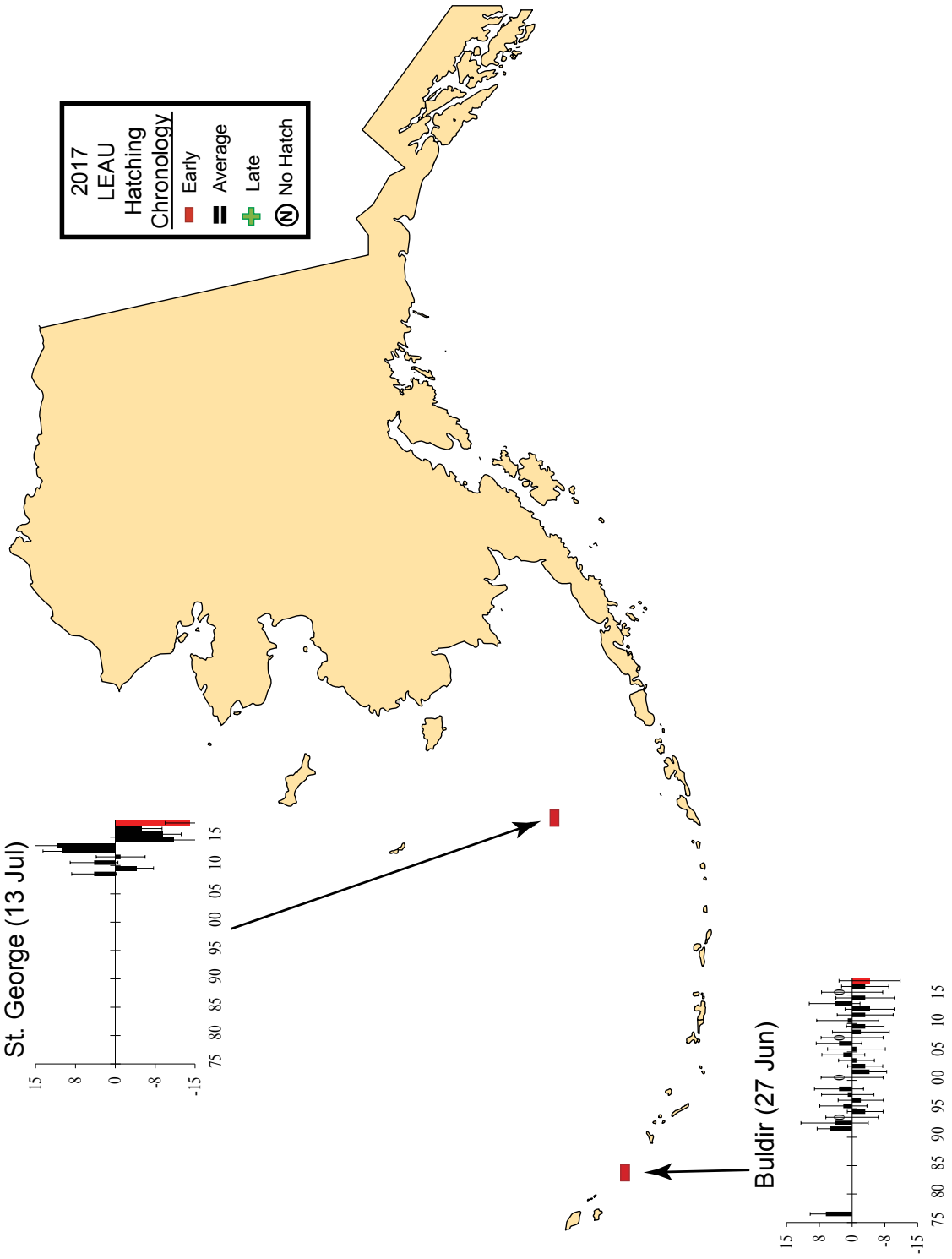


Figure 11. Hatching chronology of least auklets at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

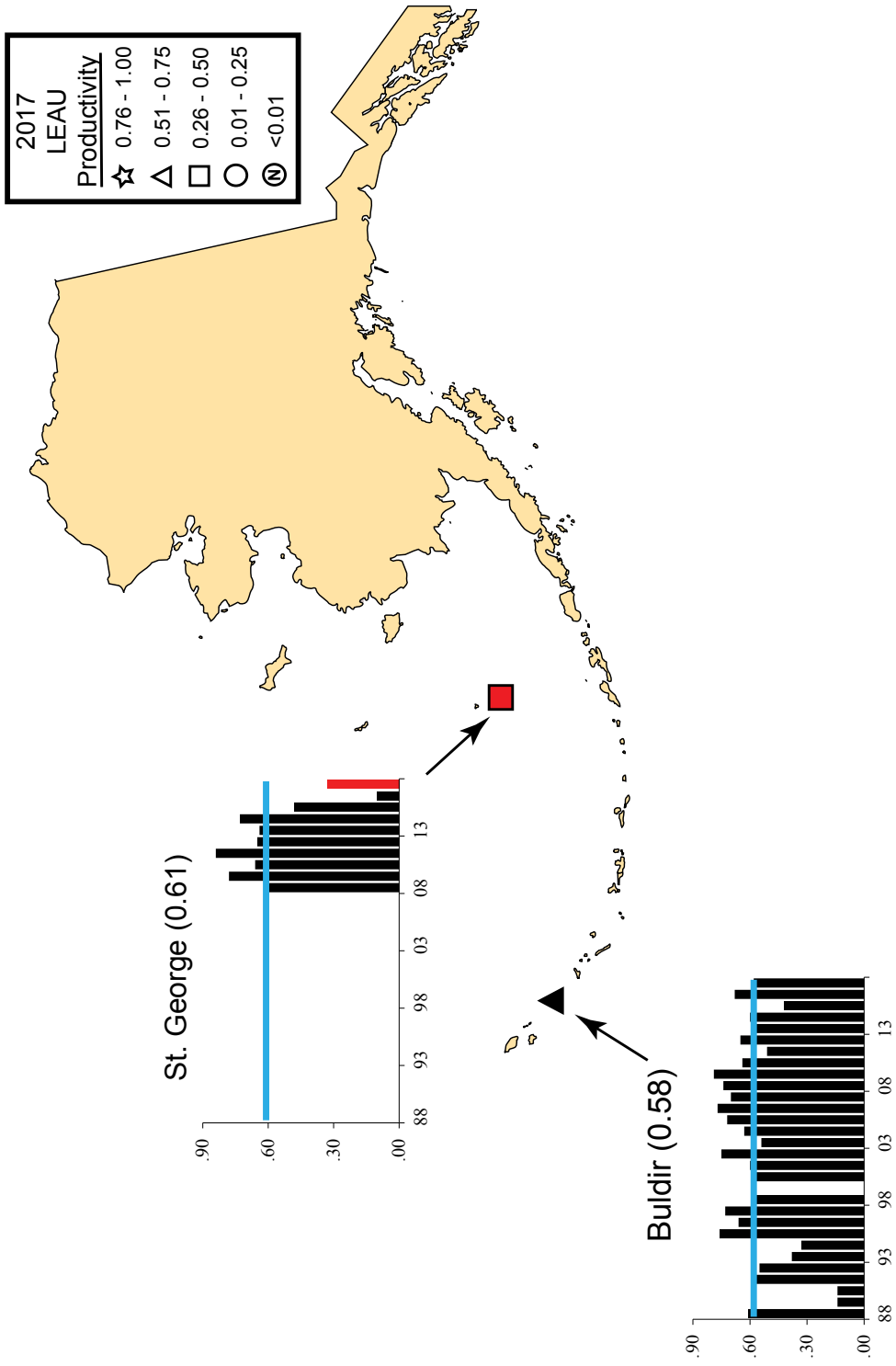


Figure 12. Productivity of least auklets (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

Whiskered auklet (*Aethia pygmaea*)

Table 12. Hatching chronology of whiskered auklets at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	12 Jun (23)[a]	22 Jun (26)[a]	Pietrzak et al. 2017

[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.

Table 13. Reproductive performance of whiskered auklets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.78	NA[b] (74)[c]	0.65 (27)[c]	Pietrzak et al. 2017

[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.

Crested auklet (*Aethia cristatella*)

Table 14. Hatching chronology of crested auklets at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	23 Jun (39)[a]	28 Jun (27)[a]	Pietrzak et al. 2017

[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.

Table 15. Reproductive performance of crested auklets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/ Nest Site[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.67	NA[b] (103)[c]	0.65 (28)[c]	Pietrzak et al. 2017

[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.

Rhinoceros auklet (*Cerorhinca monocerata*)

Table 16. Reproductive performance of rhinoceros auklets at Alaskan sites monitored in 2017.

Site	Chicks Fledged/Egg	No. of Plots	Long-term Average	Reference
Chowiet I.	0.59	NA[a] (46)[b]	0.62 (5)[b]	Evans et al. 2017
Middleton I.	0.52	NA (62)	0.69 (17)	ISRC 2017

[a]Not applicable or not reported.

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

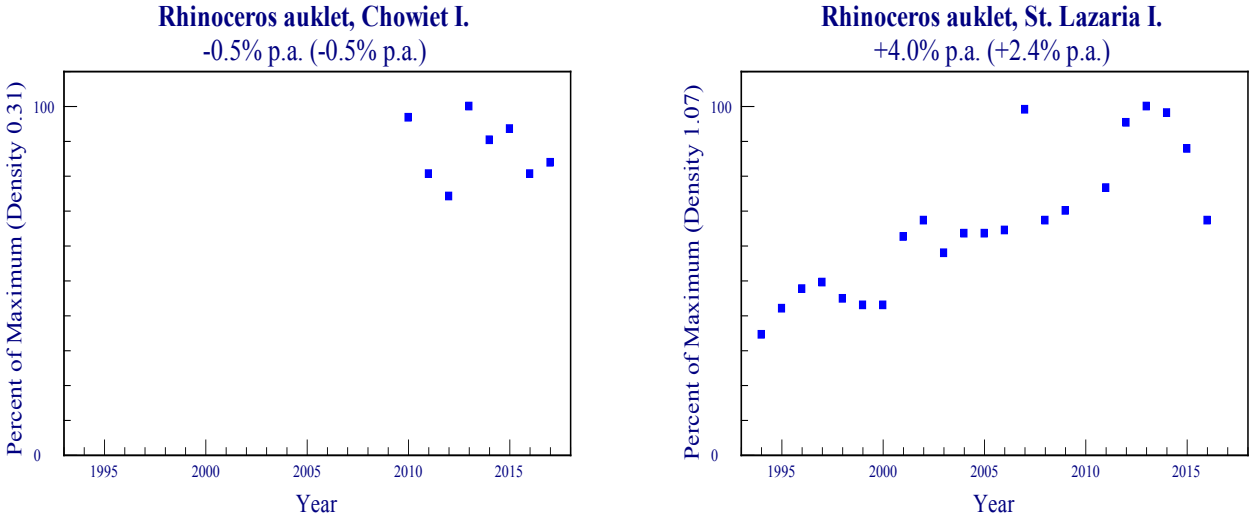


Figure 13. Trends in populations of rhinoceros auklets at Alaskan sites. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

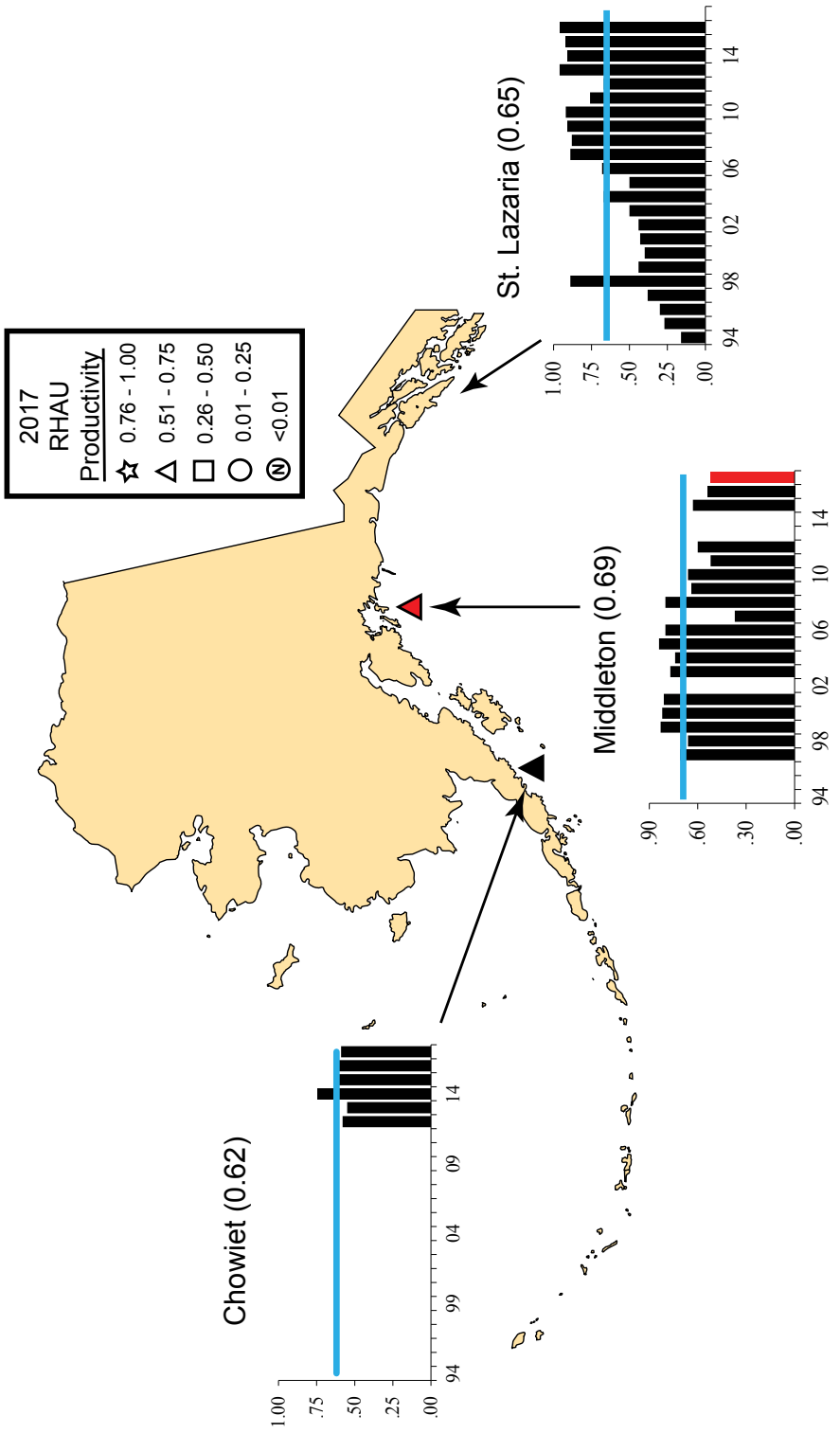


Figure 14. Productivity of rhinoceros auklets (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

Horned puffin (*Fratercula corniculata*)

Table 17. Hatching chronology of horned puffins at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	27 Jul (38)[a]	25 Jul (27)[a]	Pietrzak et al. 2017
Aiktak I.	26 Jul (3)	31 Jul (12)	N. Rojek Unpubl. Data
Chowiet I.	26 Jul (71)	30 Jul (13)	Evans et al. 2017

[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.

Table 18. Reproductive performance of horned puffins at Alaskan sites monitored in 2017.

Site	Chicks Fledged/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.68	NA[a] (44)[b]	0.47 (29)[b]	Pietrzak et al. 2017
Aiktak I.	0.55	NA (11)	0.58 (15)	N. Rojek Unpubl. Data
Chowiet I.	0.06	NA (118)	0.38 (12)	Evans et al. 2017

[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.

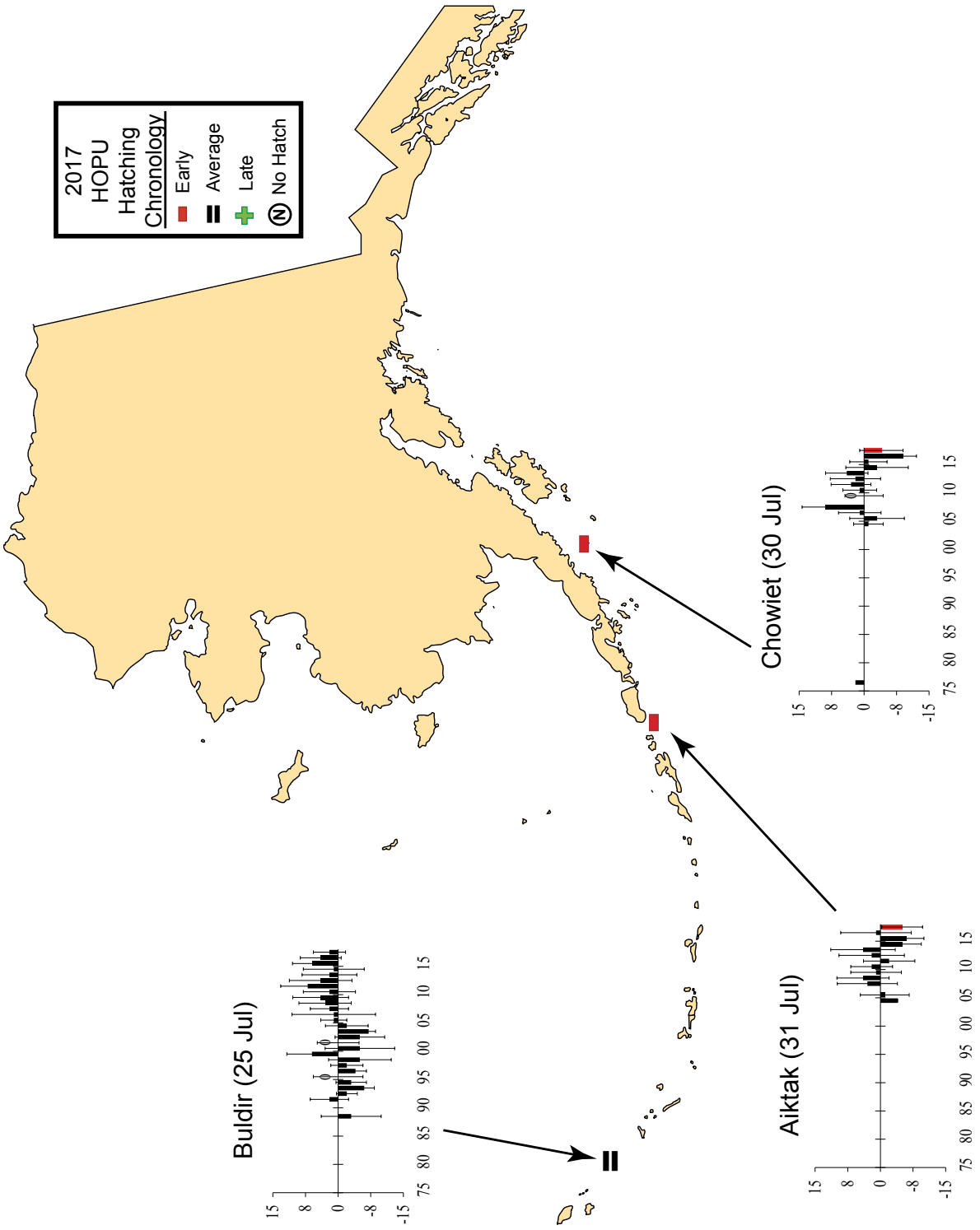


Figure 15. Hatching chronology of horned puffins at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

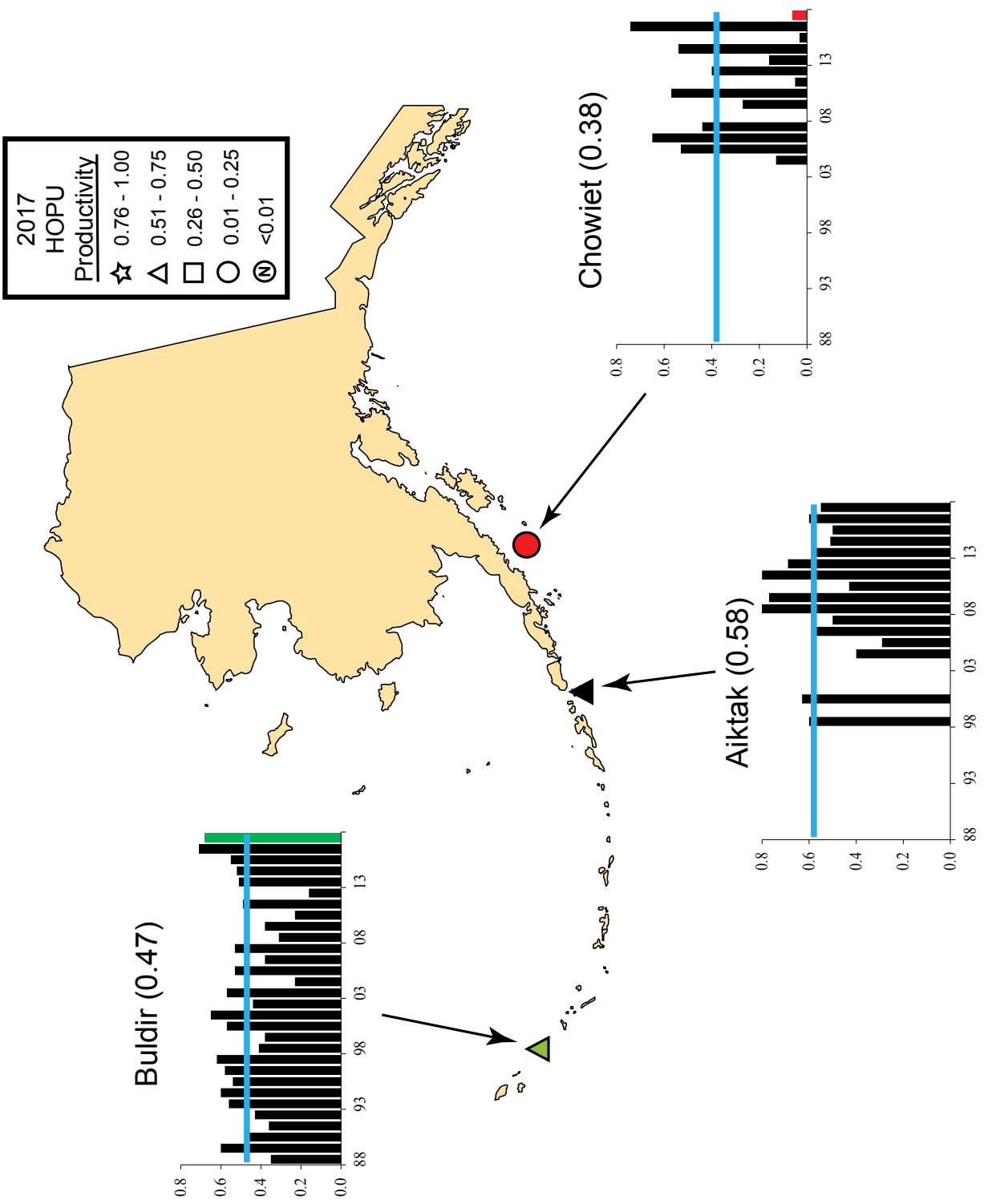


Figure 16. Productivity of horned puffins (chicks fledged/egg) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

Tufted puffin (*Fratercula cirrhata*)

Table 19. Hatching chronology of tufted puffins at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Aiktak I.	30 Jul (4)[a]	31 Jul (20)[a]	N. Rojek Unpubl. Data
Chowiet I.	27 Jul (31)	24 Jul (12)	Evans et al. 2017

[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.

Table 20. Reproductive performance of tufted puffins at Alaskan sites monitored in 2017.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.06	NA[b] (17)[c]	0.40 (29)[c]	Pietrzak et al. 2017
Aiktak I.	0.13	NA (82)	0.56 (21)	N. Rojek Unpubl. Data
Chowiet I.	0.02	NA (63)	0.40 (11)	Evans et al. 2017
Middleton I.	0.17	NA (71)	0.41 (12)	ISRC 2017

[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 burrows used to calculate productivity and the number of years used to calculate the long-term average. Current year not used in long-term average.

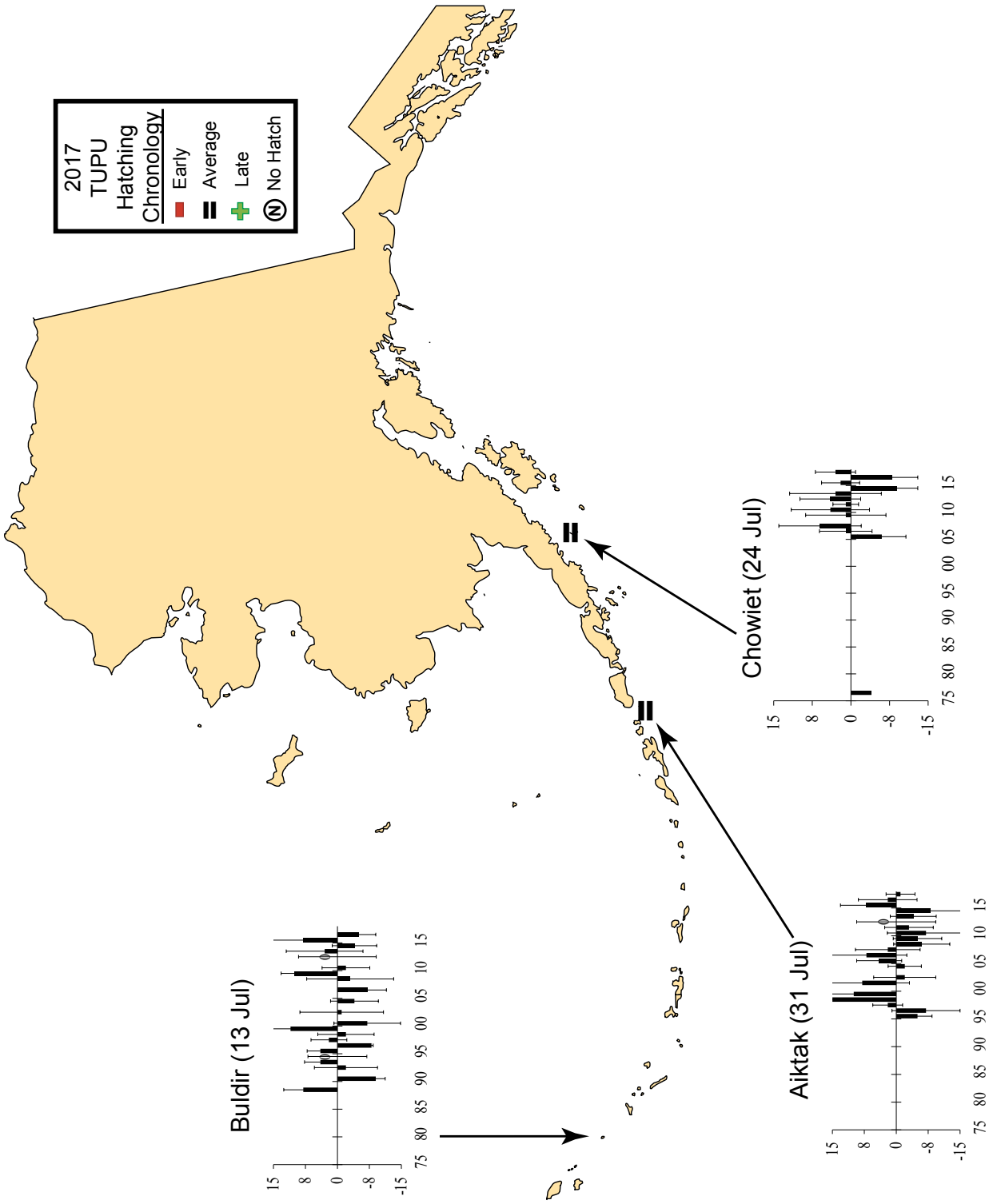


Figure 17. Hatching chronology of tufted puffins at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

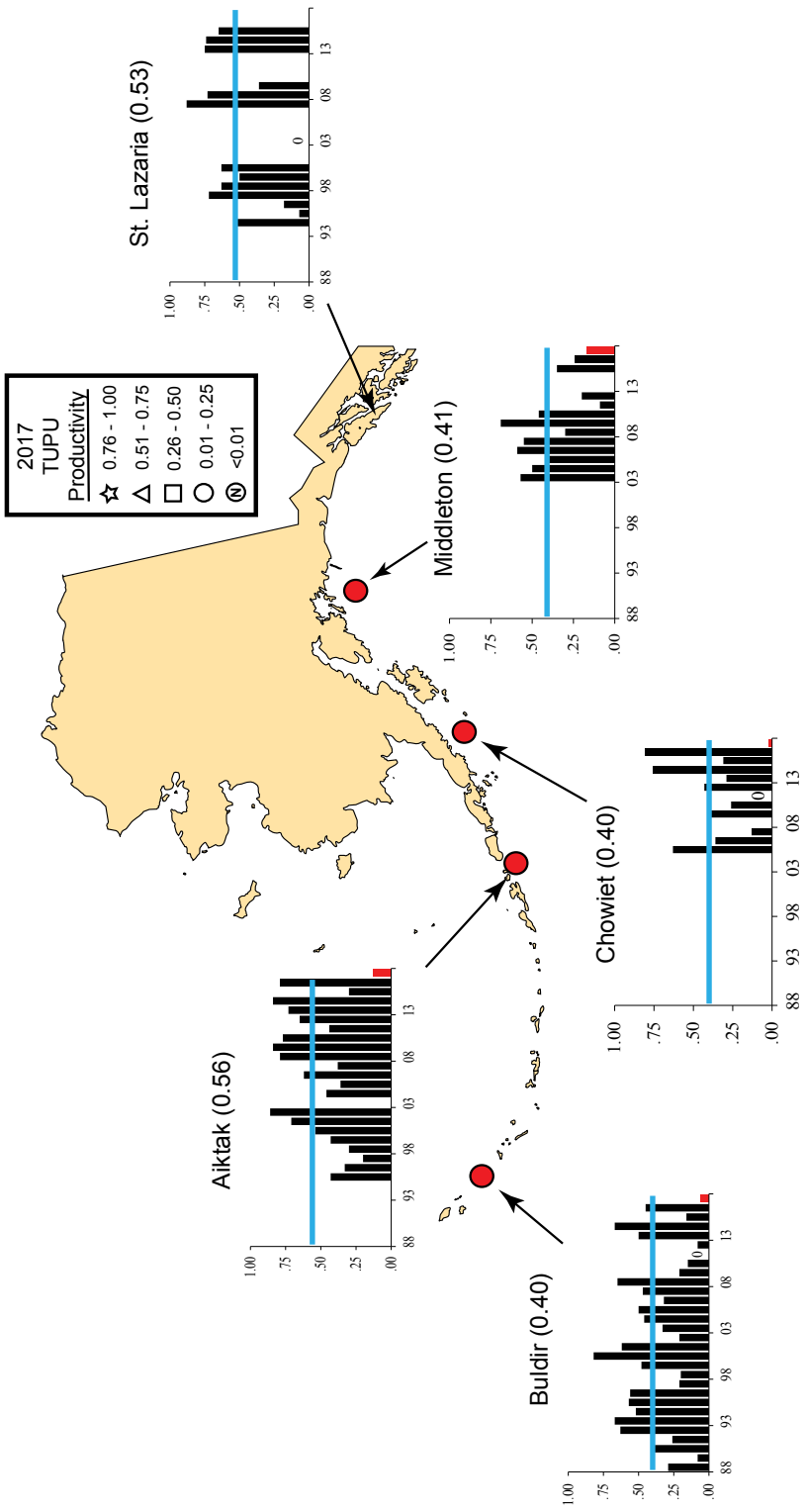


Figure 18. Productivity of tufted puffins (chicks fledged/egg) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

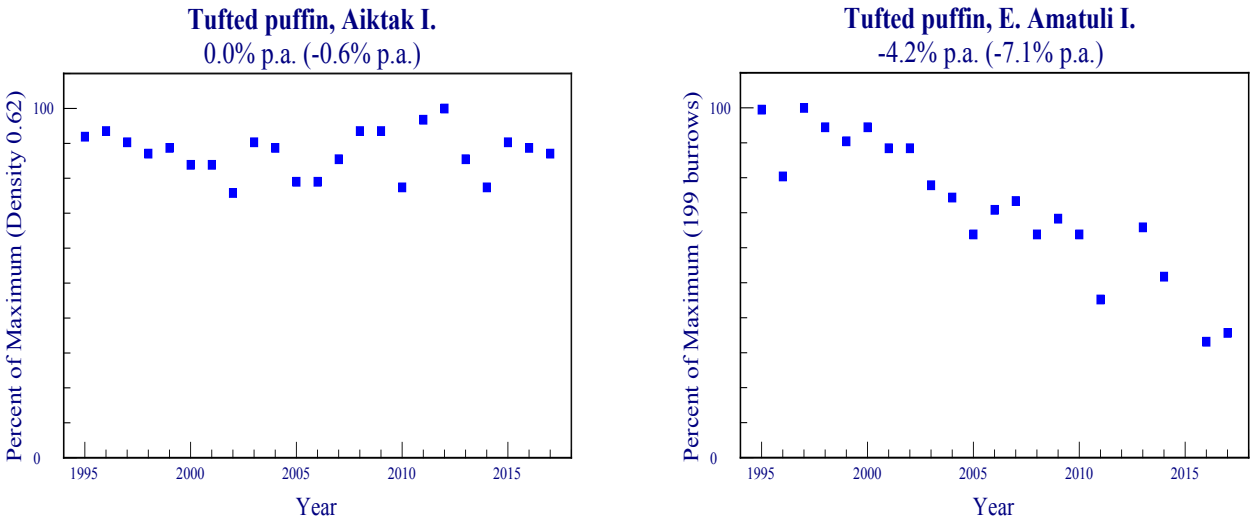


Figure 19. Trends in populations of tufted puffins at Alaskan sites. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

Black-legged kittiwake (*Rissa tridactyla*)

Table 21. Hatching chronology of black-legged kittiwakes at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	20 Jul (14)[a]	7 Jul (29)[a]	Pietrzak et al. 2017
Chowiet I.	16 Jul (101)	17 Jul (20)	Evans et al. 2017
E. Amatuli I.	24 Jul (14)	14 Jul (19)	A. Kettle Unpubl. Data

[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.

Table 22. Reproductive performance of black-legged kittiwakes at Alaskan sites monitored in 2017.

Site	Chicks Fledged[a]/Nest	No. of Plots	Long-term Average	Reference
C. Lisburne	0.79[b]	2 (92)[c]	0.57 (33)[c]	Dragoo et al. 2017
St. Paul I.	0.00	10 (202)	0.27 (37)	Mong and Romano 2017
St. George I.	0.01	7 (198)	0.20 (41)	Pollom et al. 2018
C. Peirce	0.00	6 (147)	0.21 (32)	K. Hilwig Unpubl. Data
Round I.	0.00	2 (29)	0.19 (20)	E. Weiss Unpubl. Data
Buldir I.	0.01	7 (212)	0.16 (29)	Pietrzak et al. 2017
Chowiet I.	0.22	11 (328)	0.19 (21)	Evans et al. 2017
E. Amatuli I.	0.17	4 (96)	0.36 (25)	A. Kettle Unpubl. Data
Pr. Will. Snd.	0.20[b]	NA[d] (19,350)	0.22 (31)	D. Irons Unpubl. Data
Middleton I.	0.22	NA (104)	0.36 (37)	ISRC 2017

[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.

[d]Not applicable or not reported.

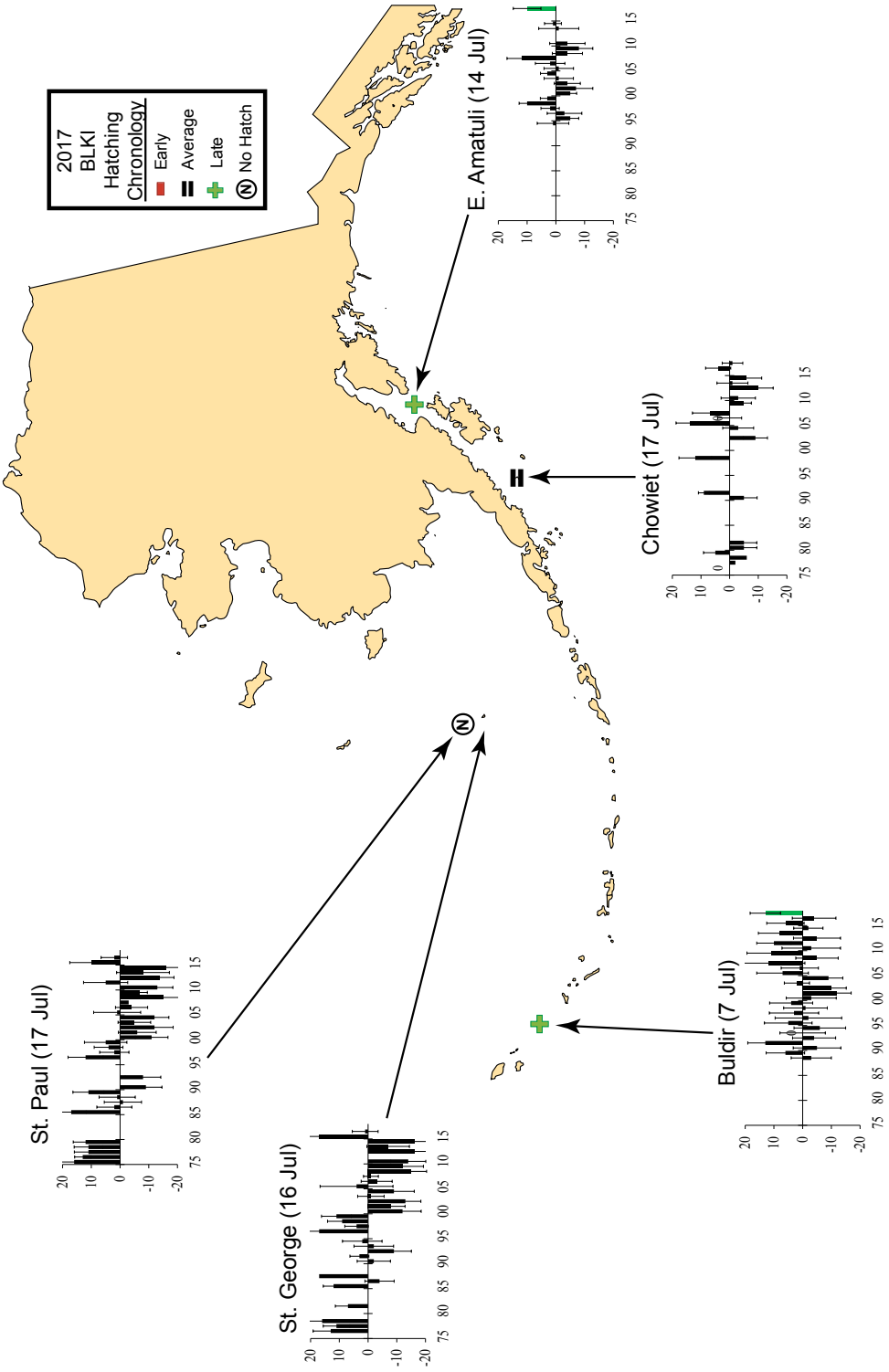


Figure 20. Hatching chronology of black-legged kittiwakes at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

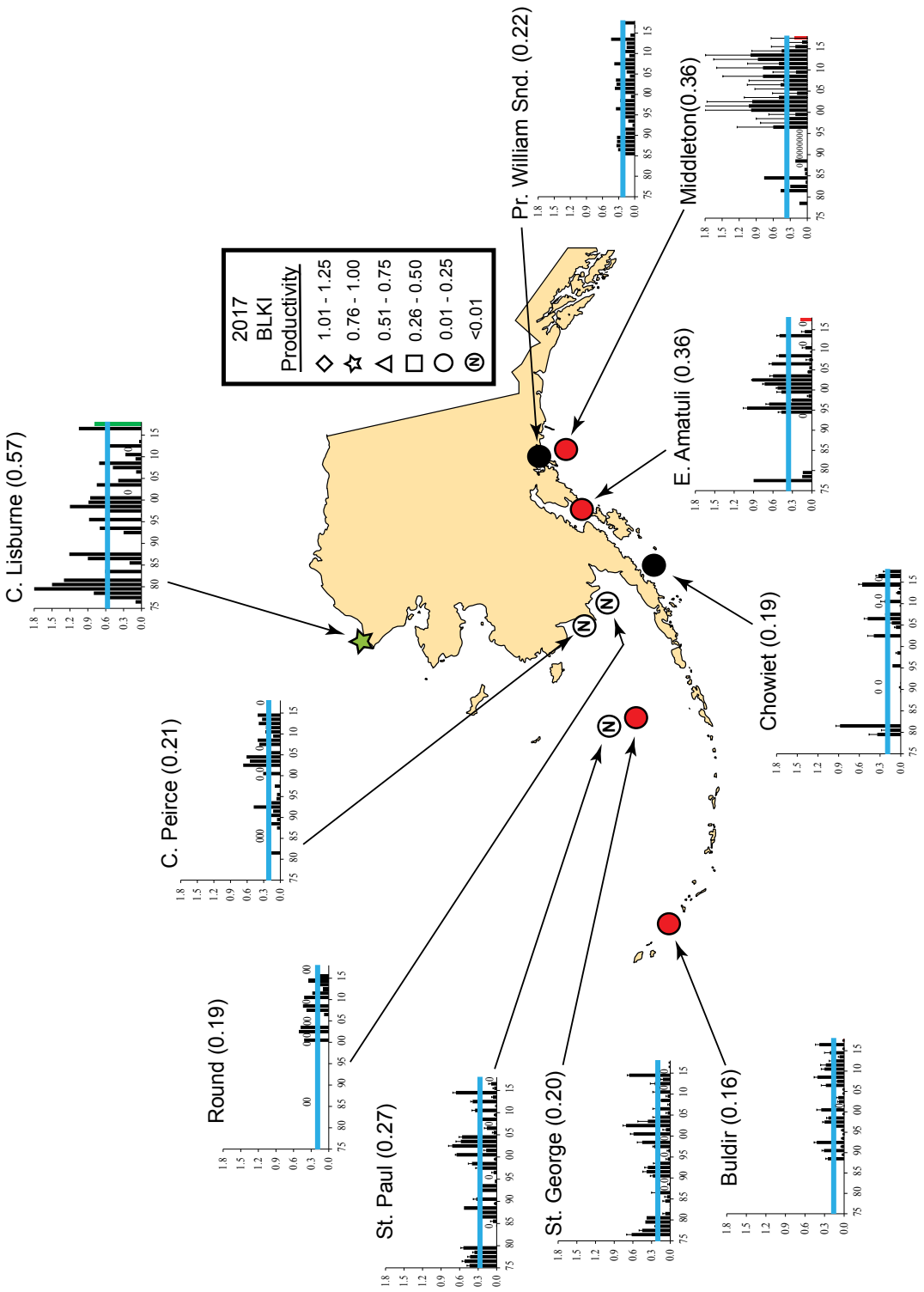


Figure 21. Productivity of black-legged kittiwakes (chicks fledged/nest) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

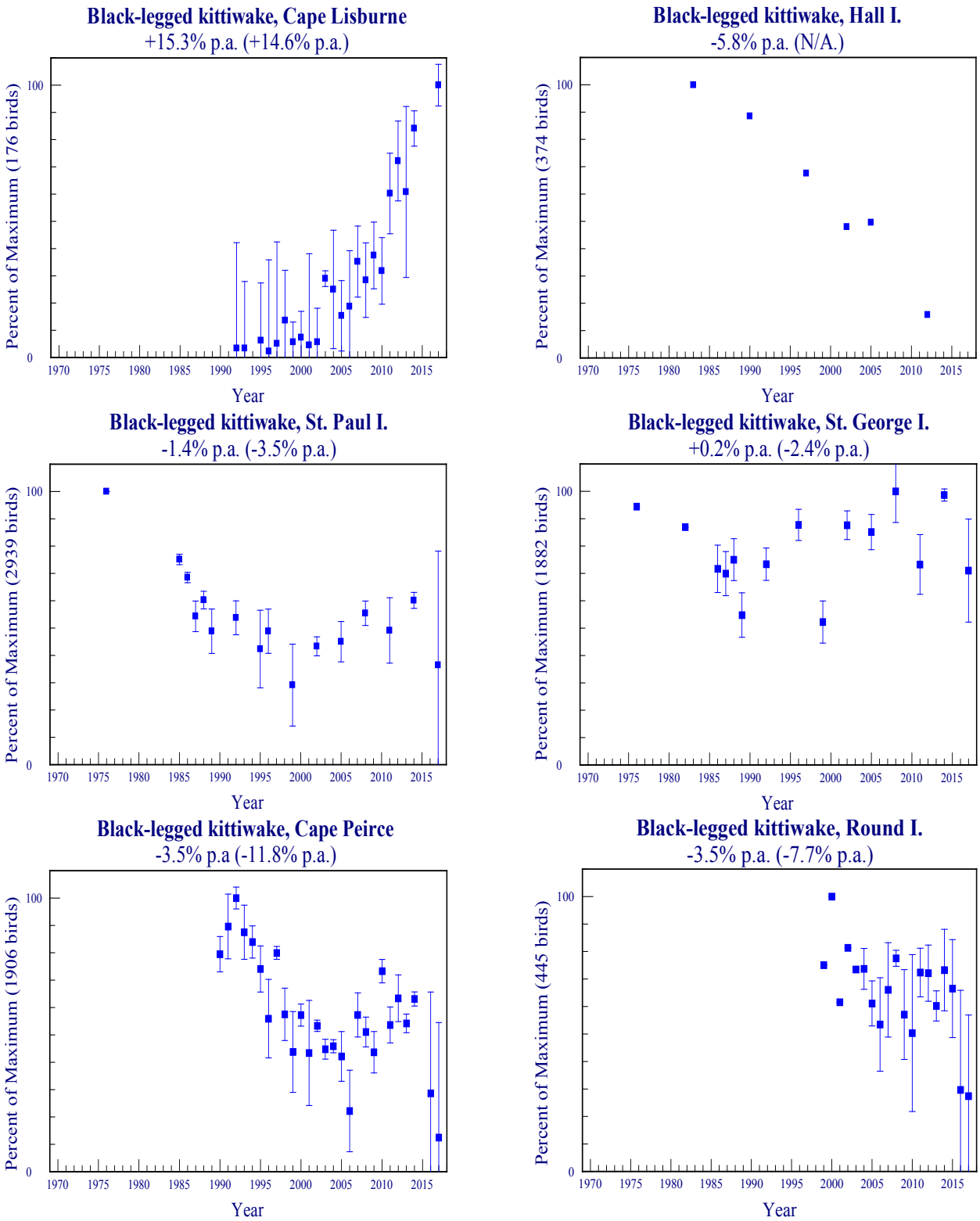


Figure 22. Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). “NA” indicates that insufficient data were available.

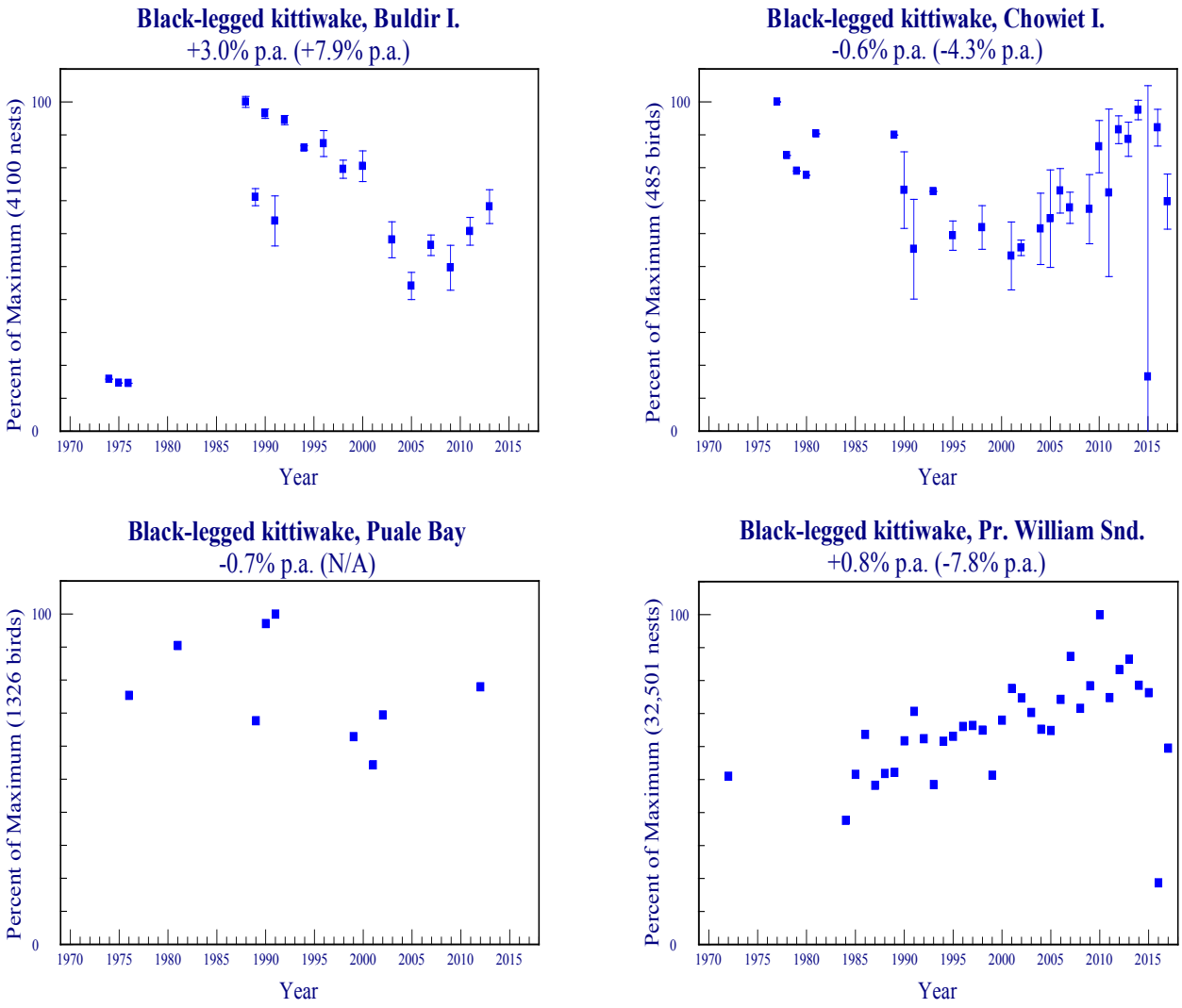


Figure 22 (continued). Trends in populations of black-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). "NA" indicates that insufficient data were available.

Red-legged kittiwake (*Rissa brevirostris*)

Table 23. Reproductive performance of red-legged kittiwakes at Alaskan sites monitored in 2017.

Site	Chicks Fledged[a]/Nest	No. of Plots	Long-term Average	Reference
St. Paul I.	0.00	4 (12)[b]	0.25 (34)[b]	Mong and Romano 2017
St. George I.	0.00	8 (153)	0.24 (41)	Pollom et al. 2018
Buldir I.	0.00	6 (41)	0.19 (29)	Pietrzak et al. 2017

[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.

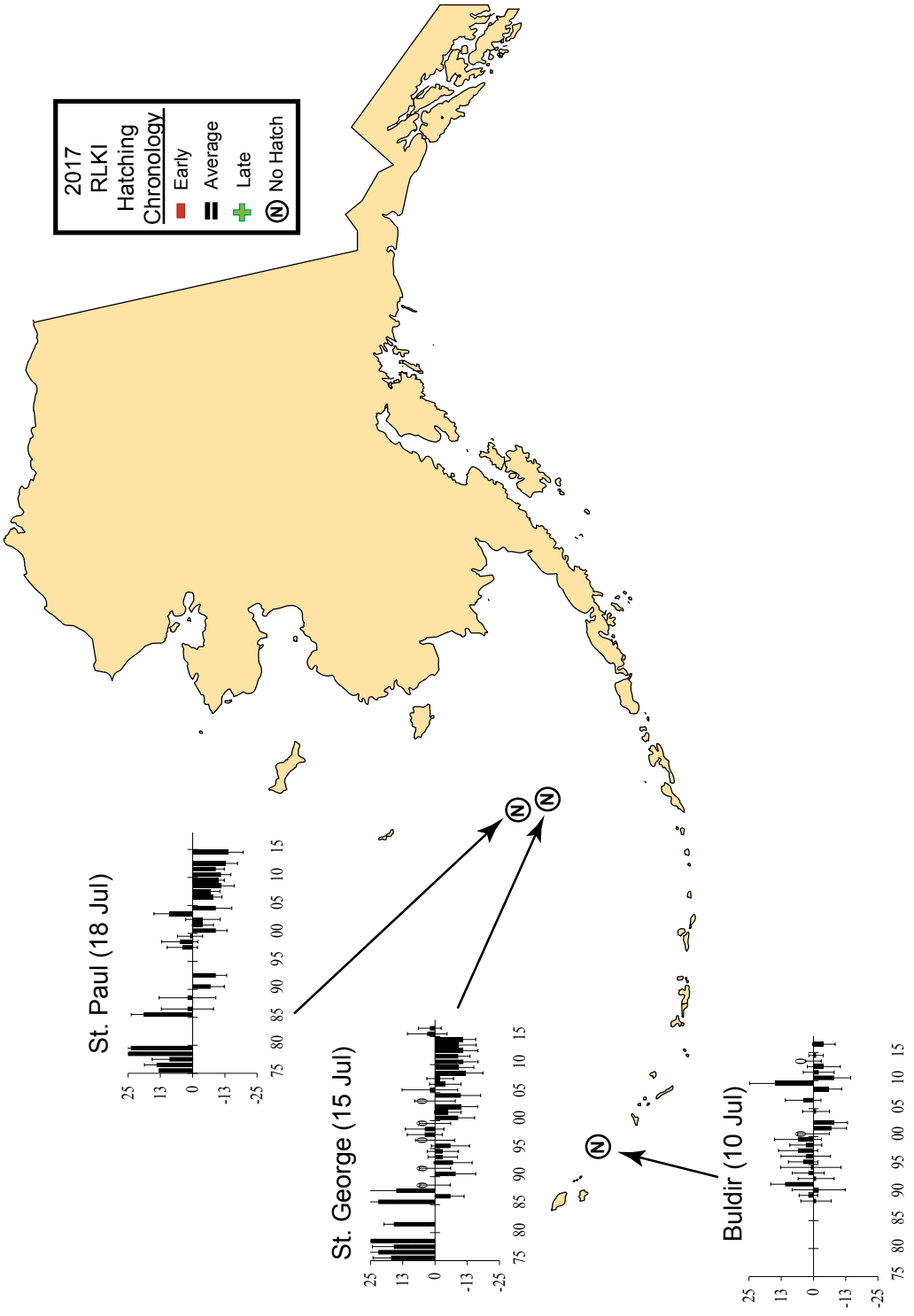


Figure 23. Hatching chronology of red-legged kittiwakes at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

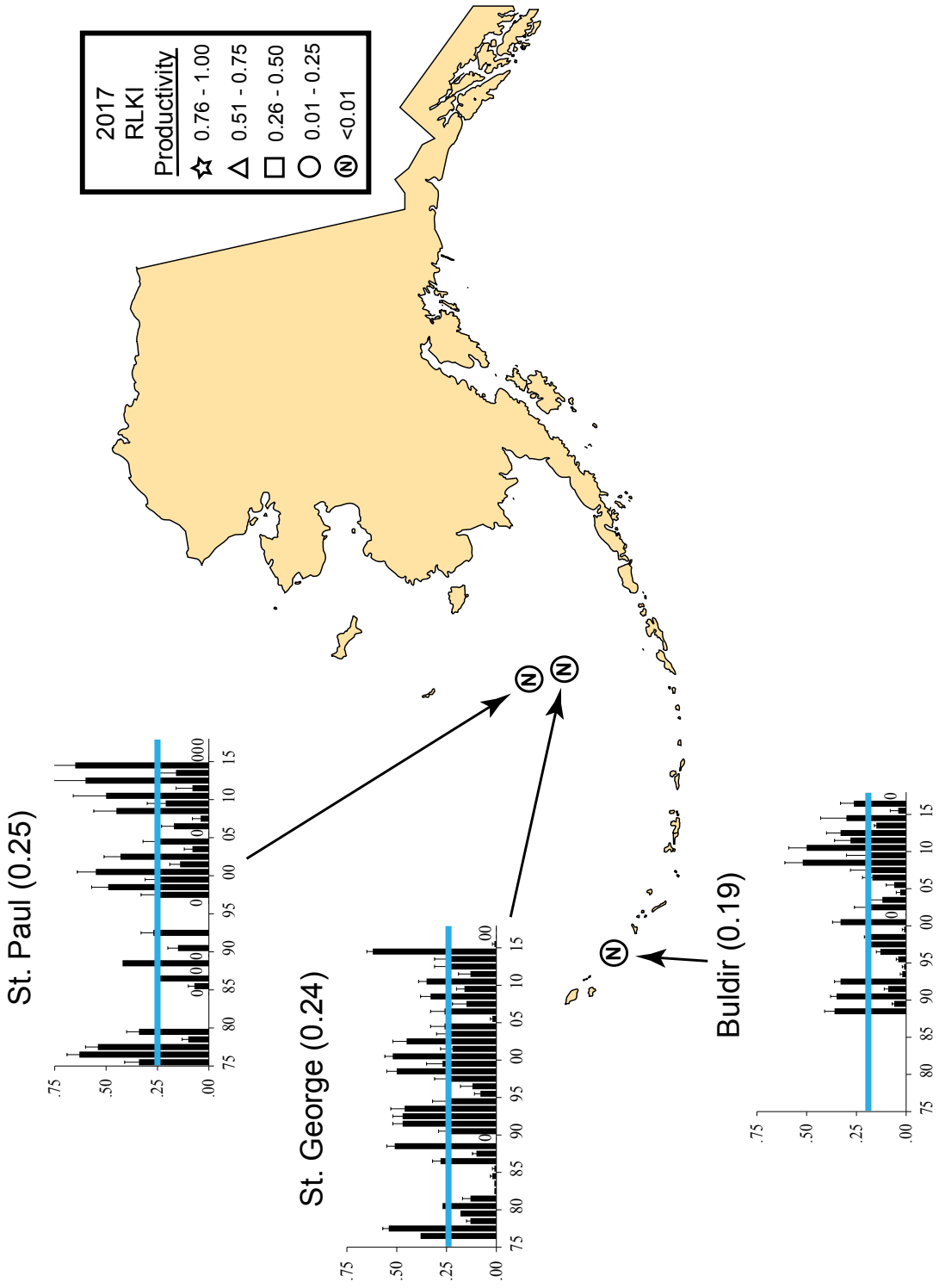


Figure 24. Productivity of red-legged kittiwakes (chicks fledged/nest) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

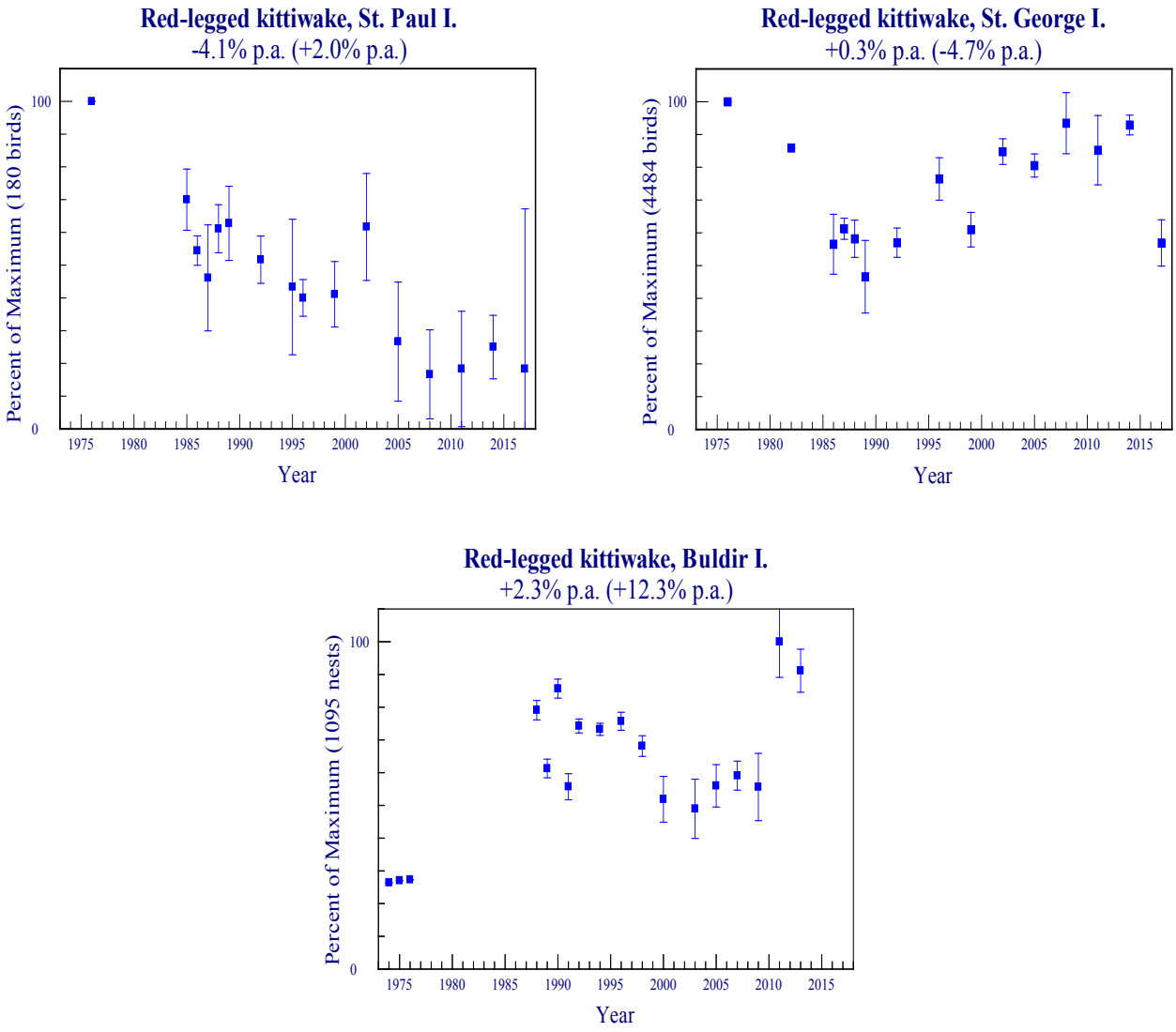


Figure 25. Trends in populations of red-legged kittiwakes at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

Glaucous-winged gull (*Larus glaucescens*)

Table 24. Hatching chronology of glaucous-winged gulls at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	28 Jun (6)[a]	24 Jun (16)[a]	Pietrzak et al. 2017
Aiktak I.	4 Jul (77)	11 Jul (22)	N. Rojek Unpubl. Data
Chowiet I.	2 Jul (32)	2 Jul (11)	Evans et al. 2017

[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.

Table 25. Reproductive performance of glaucous-winged gulls at Alaskan sites monitored in 2017.

Site	Hatching Success[a]	No. of Plots	Long-term Average	Reference
Buldir I.	0.38	NA[b] (45)[c]	0.48 (19)[c]	Pietrzak et al. 2017
Aiktak I.	0.53	4 (278)	0.54 (22)	N. Rojek Unpubl. Data
Chowiet I.	0.81	3 (78)	0.61 (10)	Evans et al. 2017

[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.

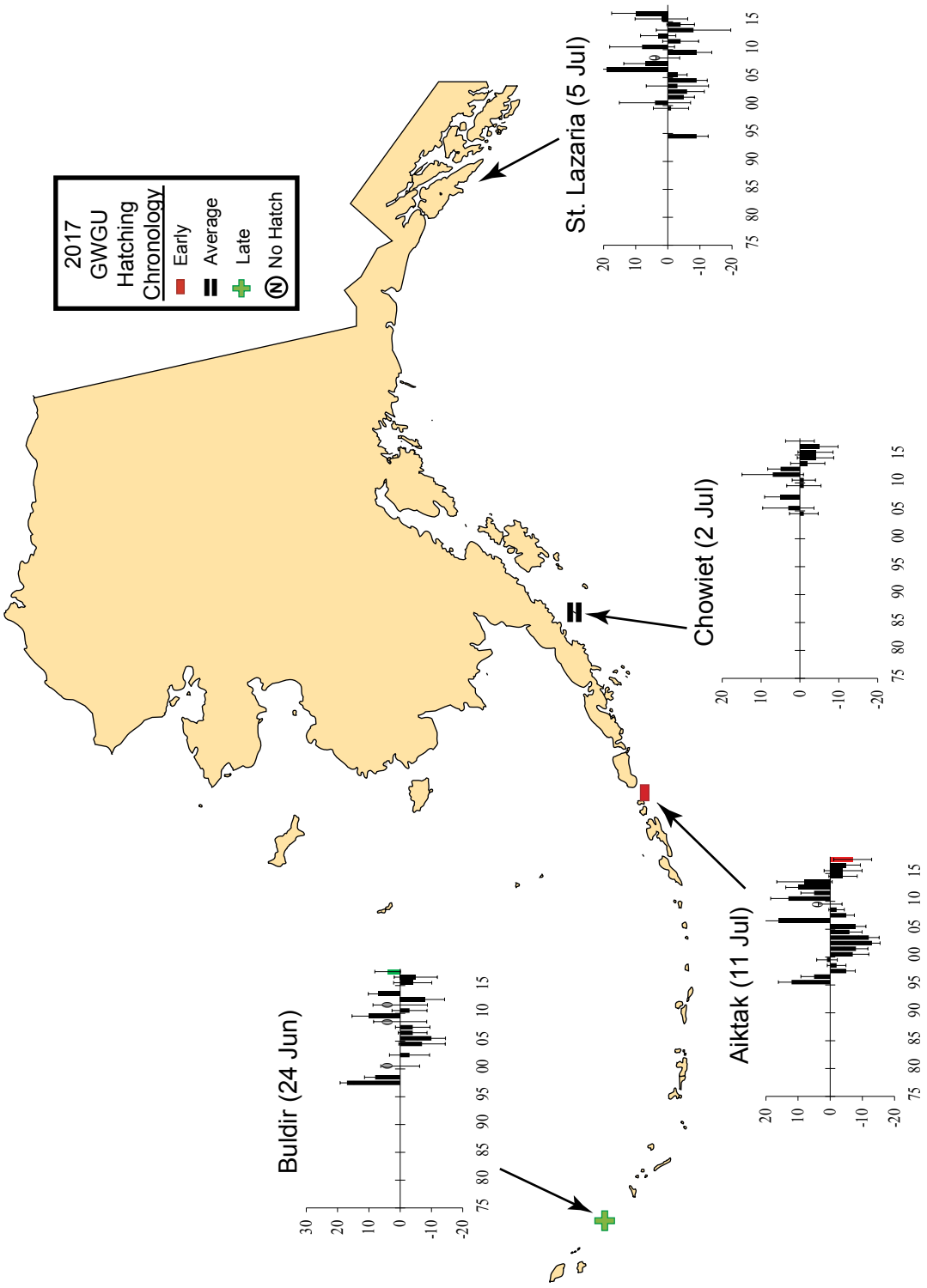


Figure 26. Hatching chronology of glaucous-winged gulls at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

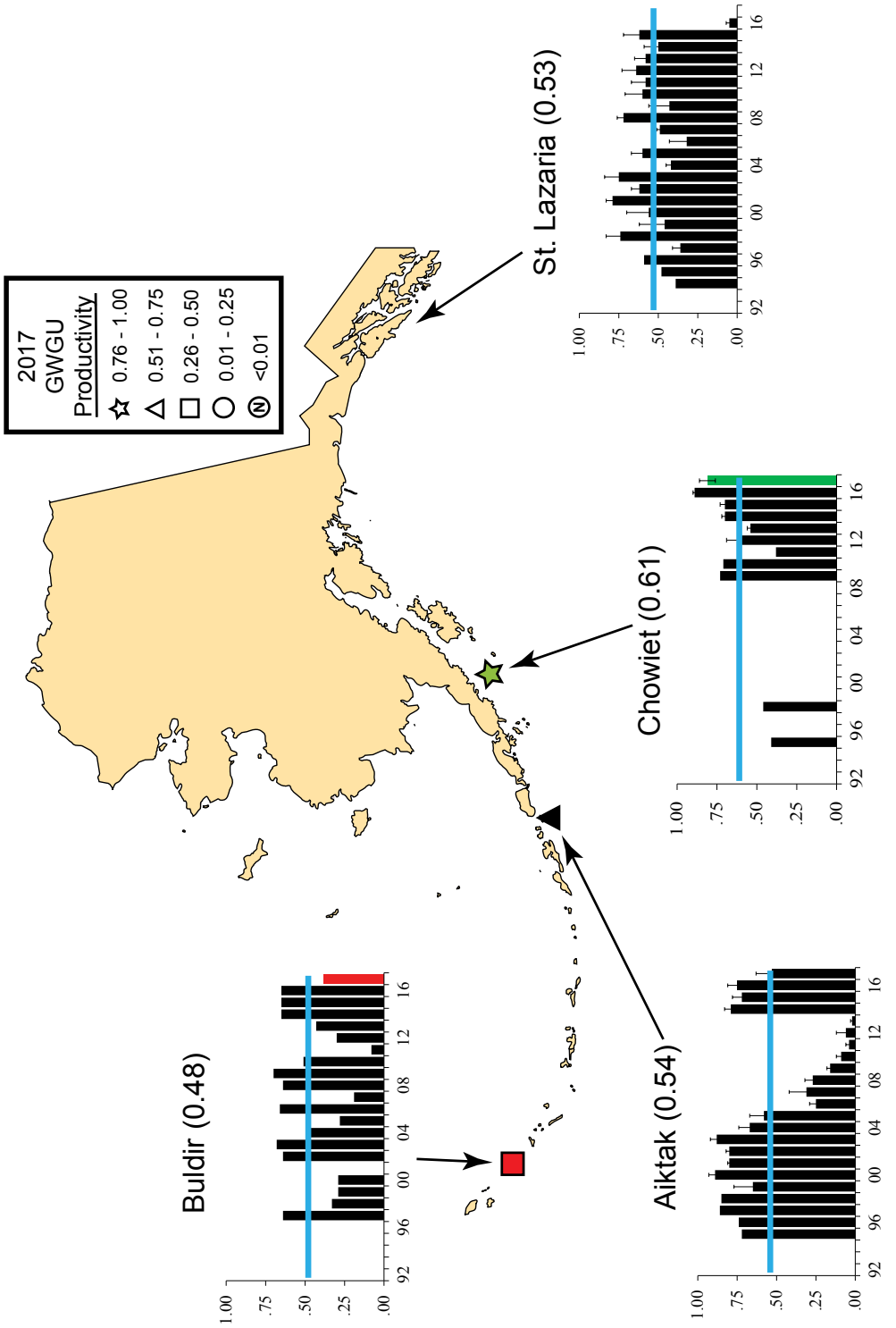


Figure 27. Productivity of glaucous-winged gulls (hatching success) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

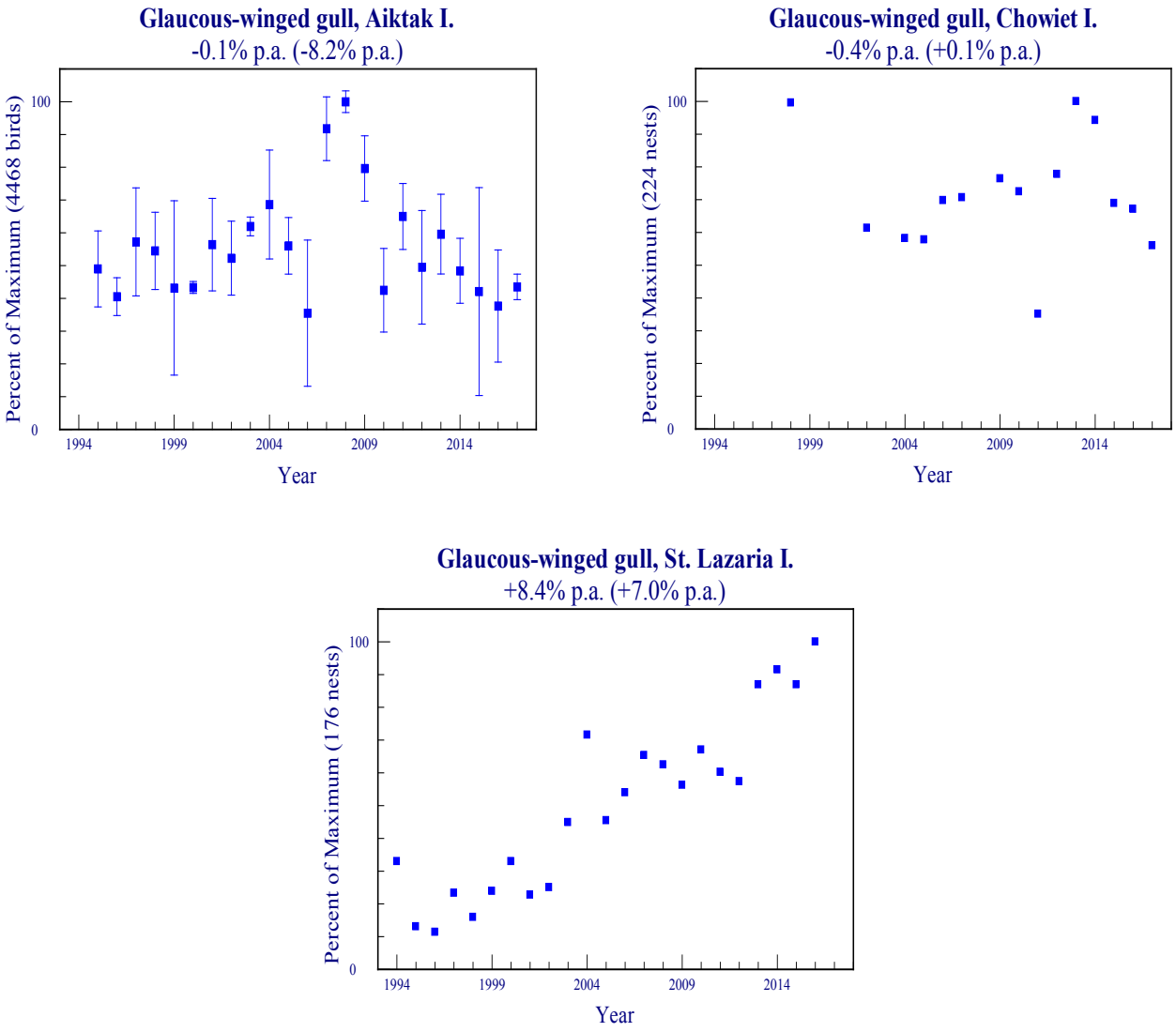


Figure 28. Trends in populations of glaucous-winged gulls at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

Northern fulmar (*Fulmarus glacialis*)

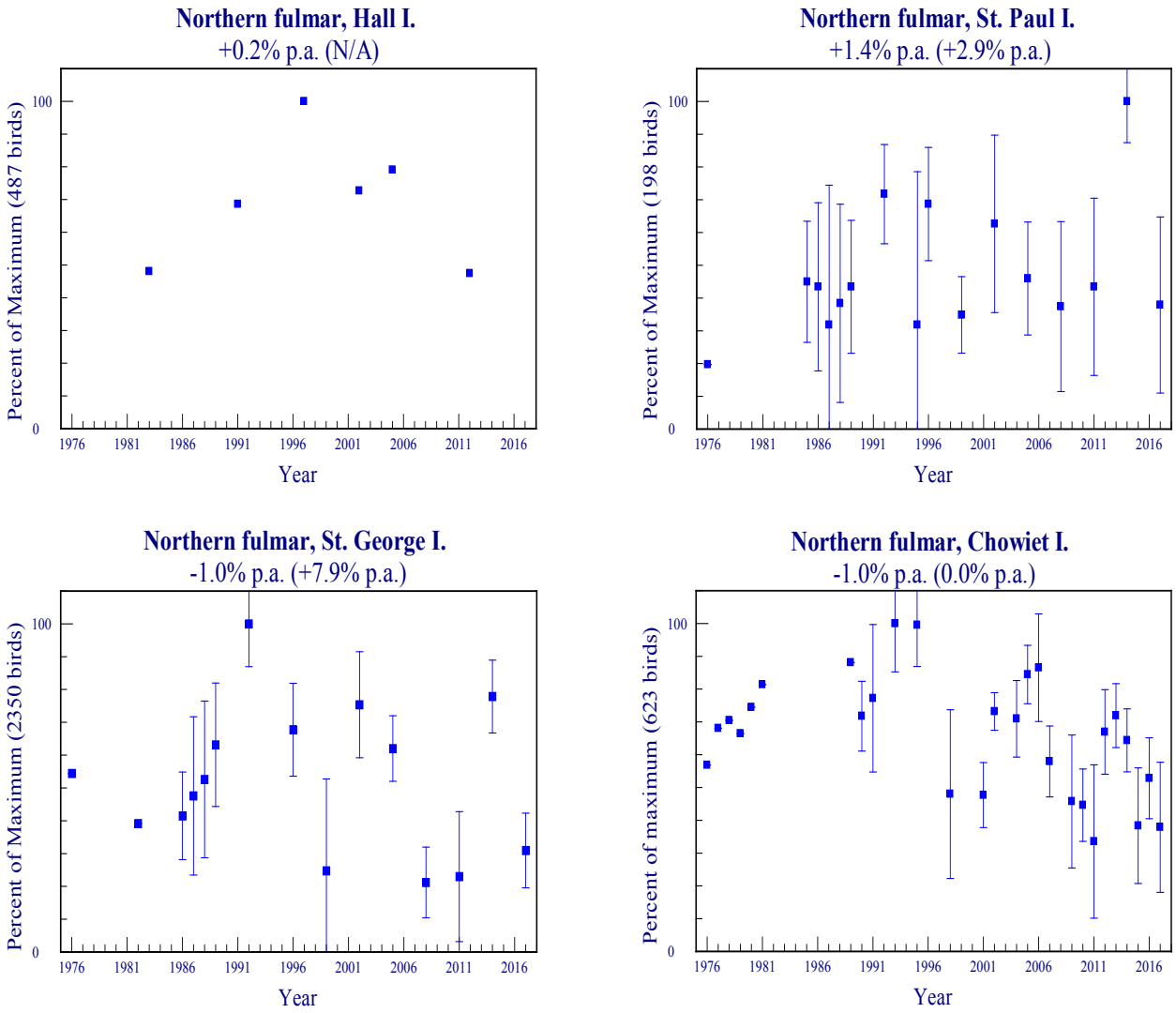


Figure 29. Trends in populations of northern fulmars at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). "N/A" indicates that insufficient data were available.

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

Table 26. Hatching chronology of fork-tailed storm-petrels at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	17 Jul (13)[a]	NA[b]	Pietrzak et al. 2017
Aiktak I.	11 Jul (44)	15 Jul (20)[a]	N. Rojek Unpubl. Data

[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]Not applicable or not reported.

Table 27. Reproductive performance of fork-tailed storm-petrels at Alaskan sites monitored in 2017.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.18	5 (34)[b]	0.73 (30)[b]	Pietrzak et al. 2017
Aiktak I.	0.84	13 (79)	0.80 (17)	N. Rojek Unpubl. Data

[a]Fledged chick defined as being 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.

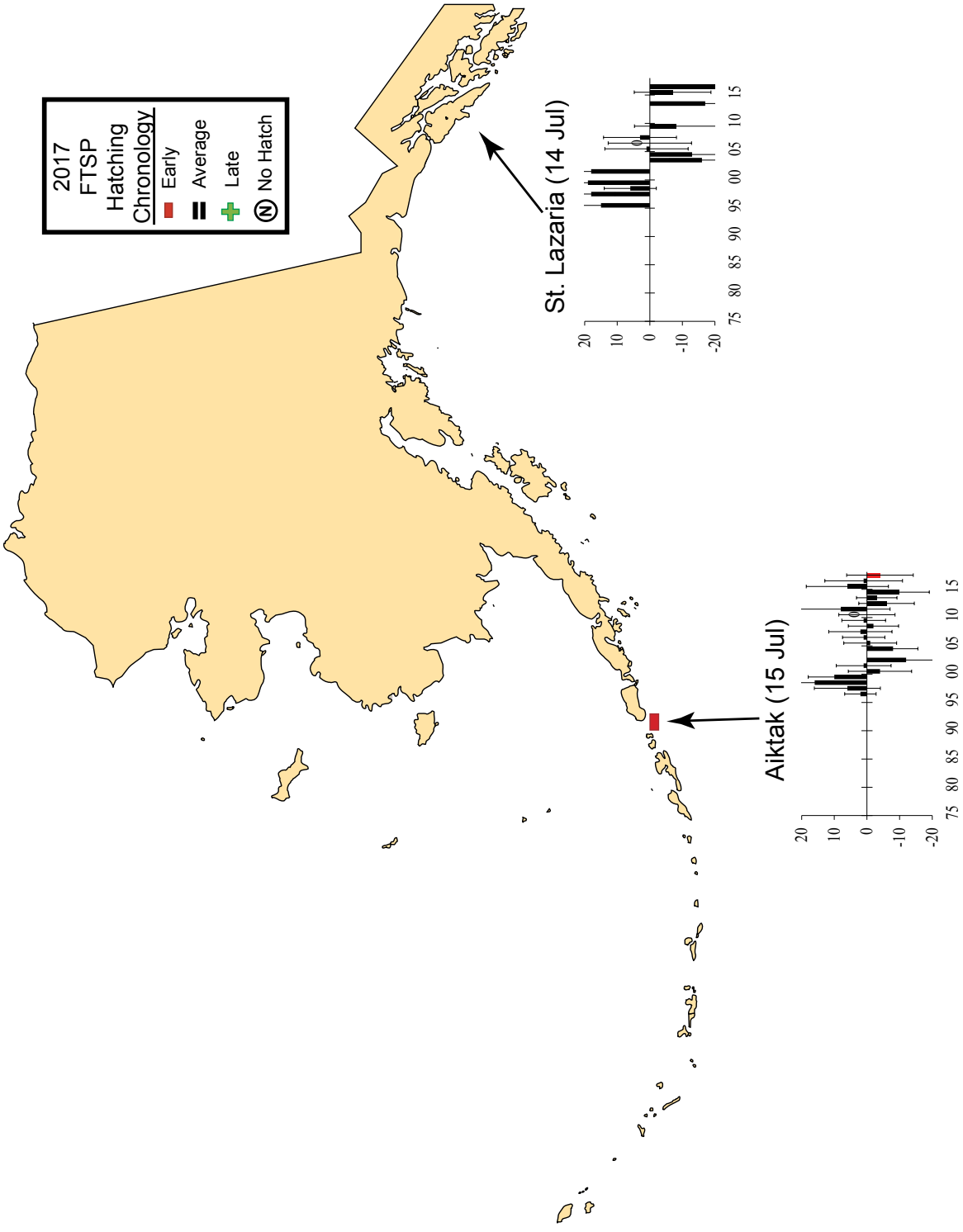


Figure 30. Hatching chronology of fork-tailed storm-petrels at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

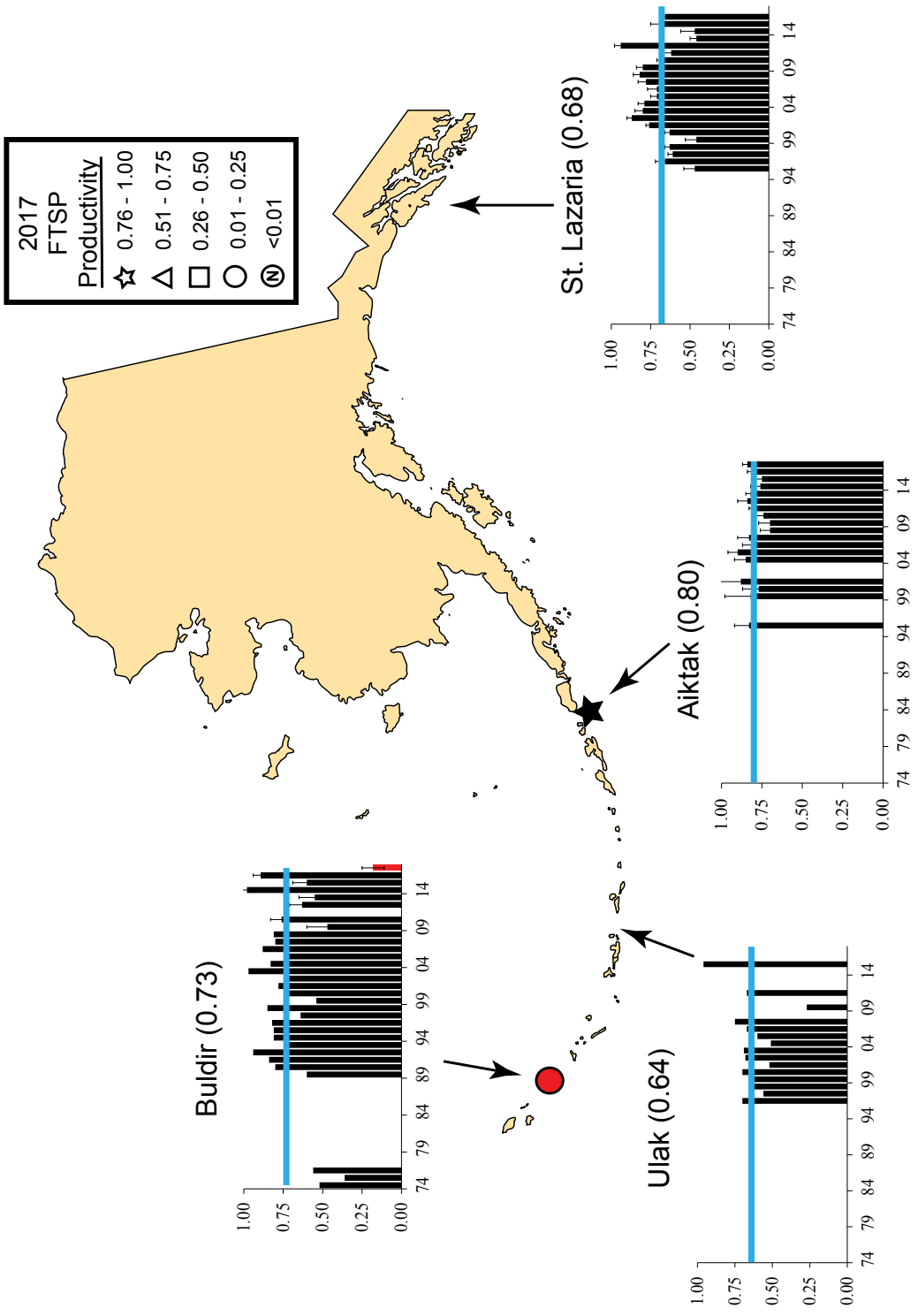


Figure 31. Productivity of fork-tailed storm-petrels (chicks fledged/egg) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

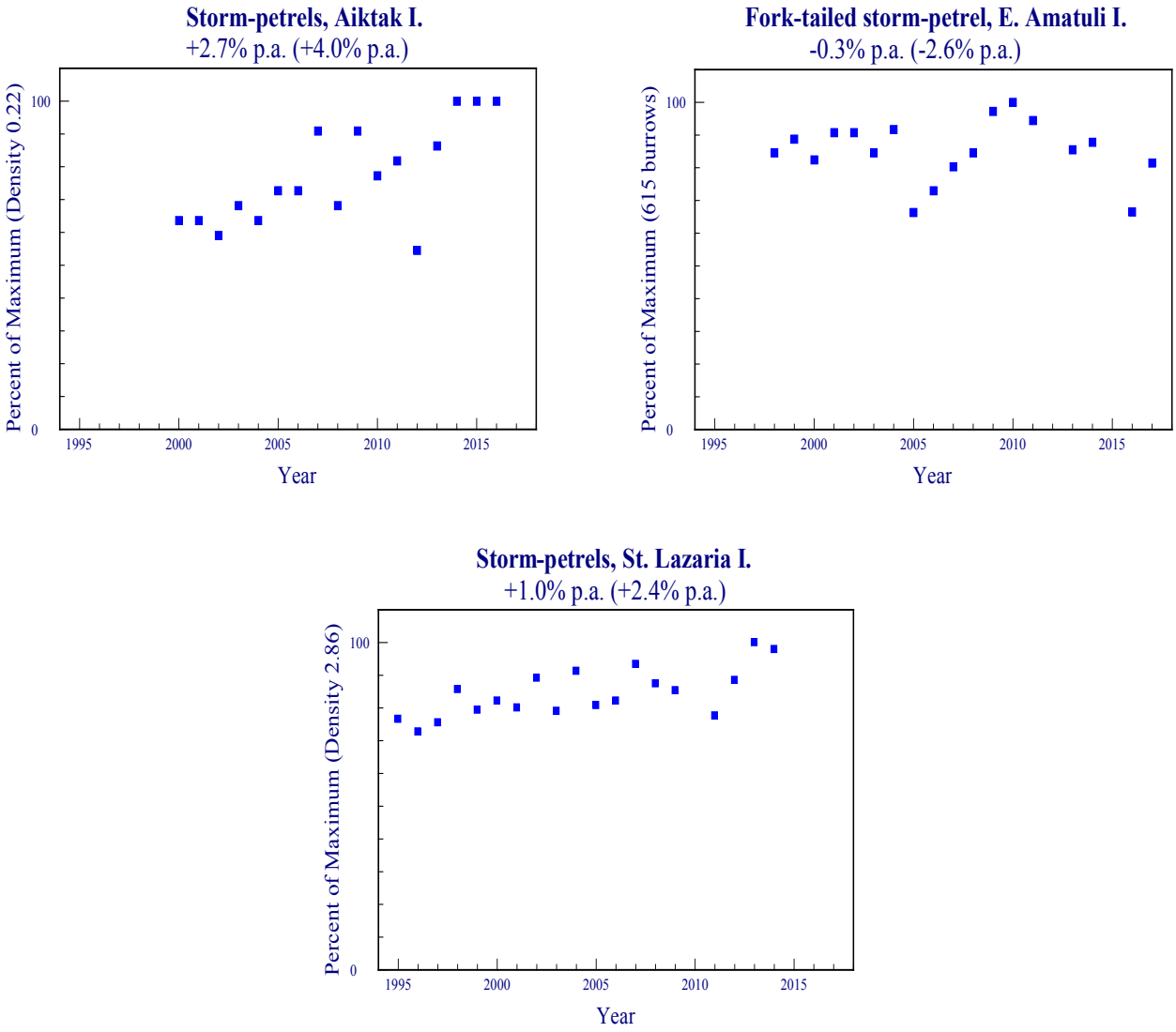


Figure 32. Trends in populations of storm-petrels at Alaskan sites. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

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

Table 28. Hatching chronology of Leach's storm-petrels at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
Buldir I.	29 Jul (20)[a]	NA[b]	Pietrzak et al. 2017
Aiktak I.	30 Jul (49)	30 Jul (20)[a]	N. Rojek Unpubl. Data

[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]Not applicable or not reported.

Table 29. Reproductive performance of Leach's storm-petrels at Alaskan sites monitored in 2017.

Site	Chicks Fledged[a]/Egg	No. of Plots	Long-term Average	Reference
Buldir I.	0.81	5 (32)[b]	0.75 (30)[b]	Pietrzak et al. 2017
Aiktak I.	0.88	12 (117)	0.84 (17)	N. Rojek Unpubl. Data

[a]Fledged chick defined as being 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.

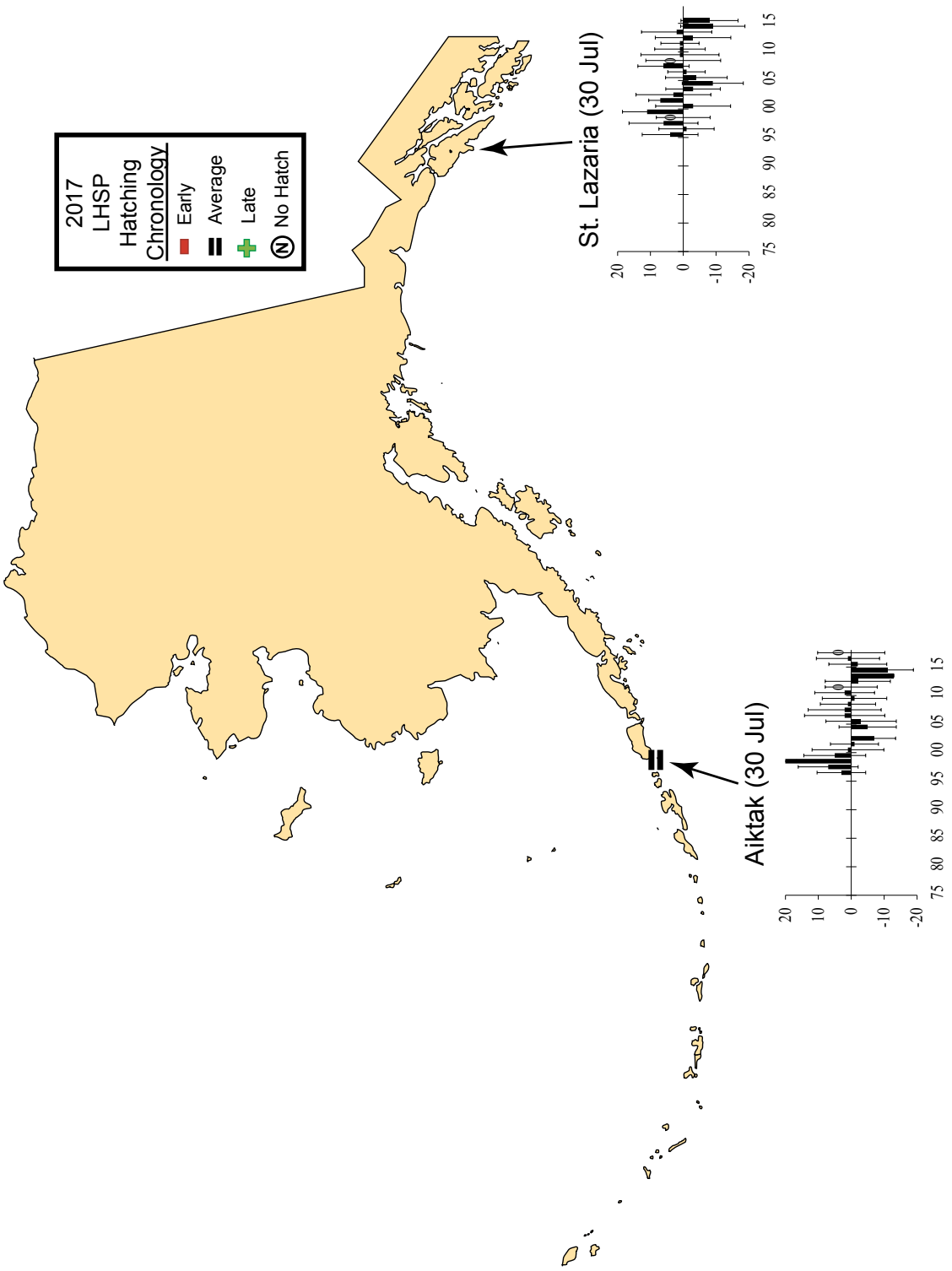


Figure 33. Hatching chronology of Leach's storm-petrels at Alaskan sites. Graphs indicate the departure in days (if any) from the site mean (value in parentheses; current year not included). Lack of bars indicates that no data were gathered in those years. Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >3 days early, black is within 3 days and green is >3 days later than the site mean). Error bars represent ± 1 standard deviation.

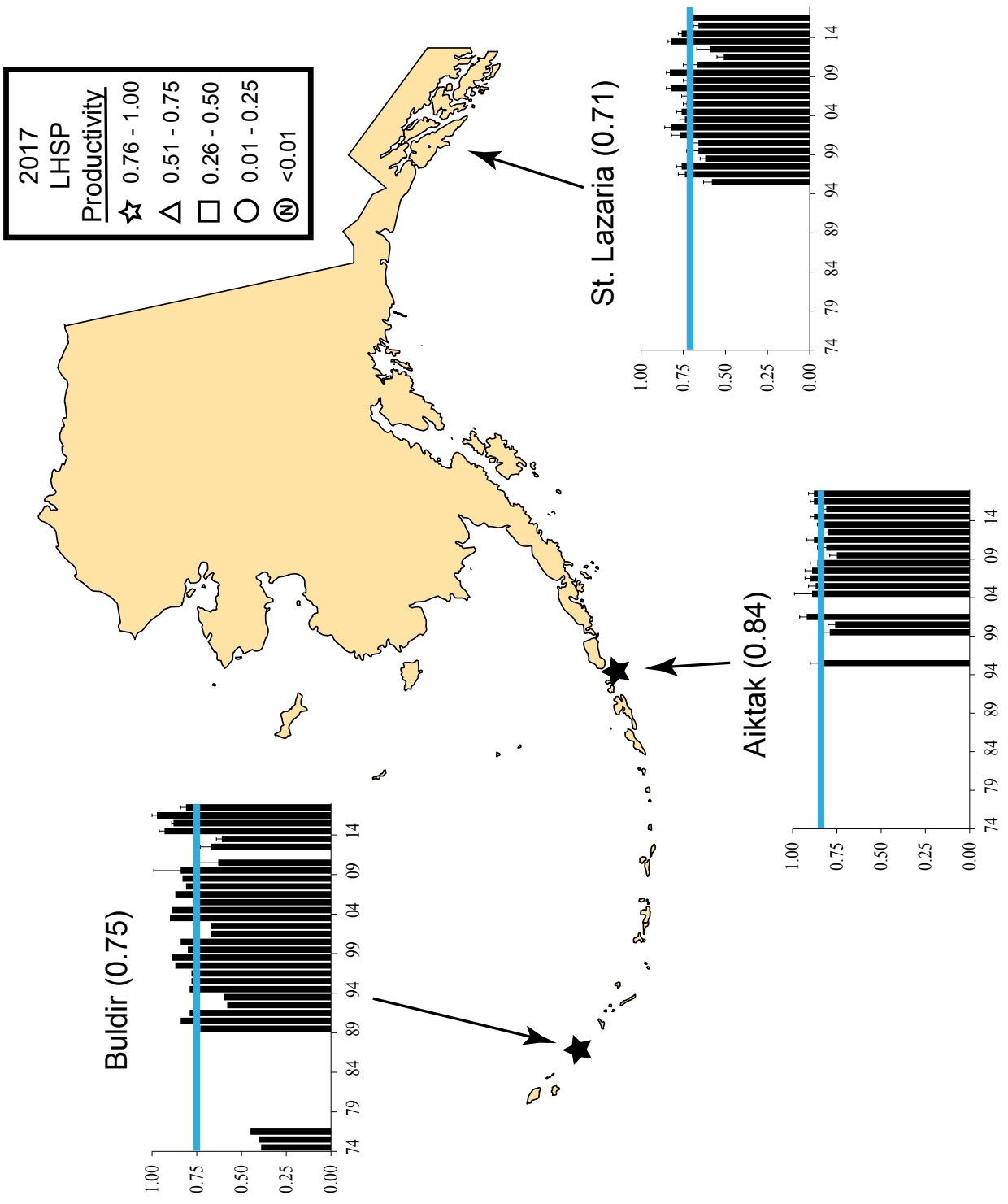


Figure 34. Productivity of Leach's storm-petrels (chicks fledged/egg) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

Red-faced cormorant (*Phalacrocorax urile*)

Table 30. Hatching chronology of red-faced cormorants at Alaskan sites monitored in 2017.

Site	Mean	Long-term Average	Reference
St. Paul I.	22 Jun (55)[a]	29 Jun (27)[a]	Mong and Romano 2017

[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.

Table 31. Reproductive performance of red-faced cormorants at Alaskan sites monitored in 2017.

Site	Chicks Fledged/Nest	No. of Plots	Long-term Average	Reference
St. Paul I.	1.65	4 (89)[a]	1.30 (32)[a]	Mong and Romano 2017
St. George I.	0.96	3 (45)	1.14 (17)	Pollom et al. 2018
Aiktak I.	0.00	NA[b] (174)	0.85 (11)	N. Rojek Unpubl. Data

[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.

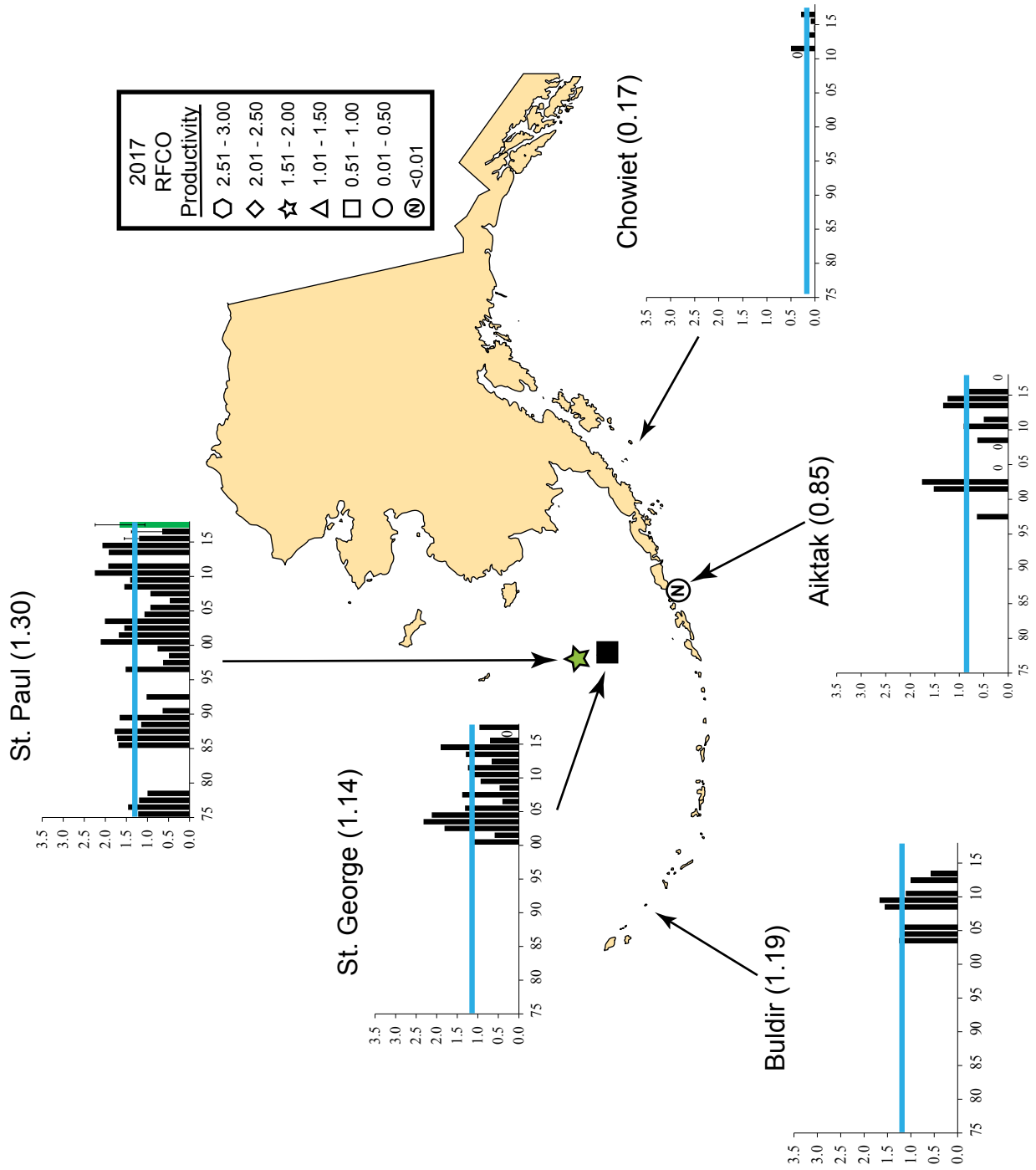


Figure 35. Productivity of red-faced cormorants (chicks fledged/nest) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

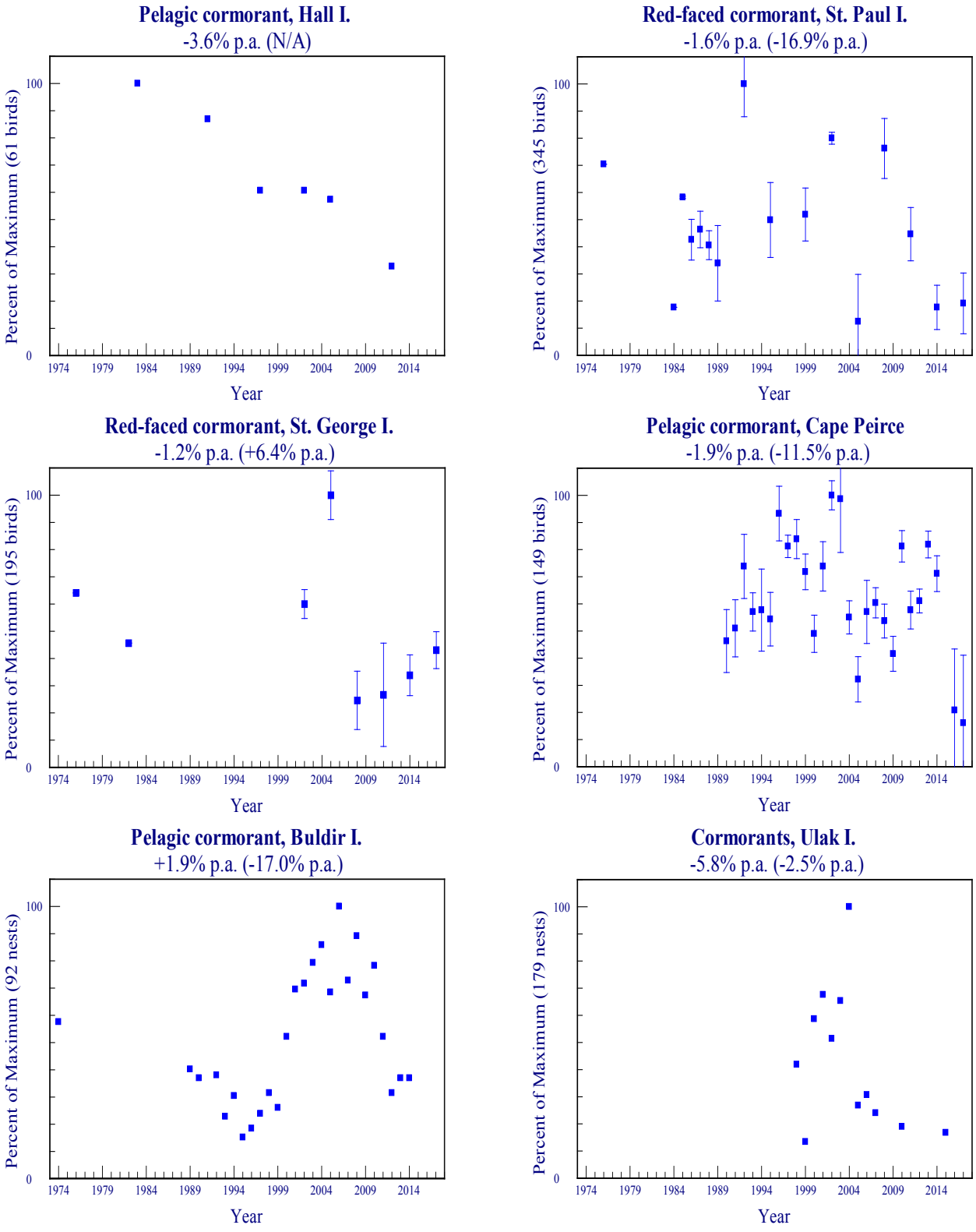
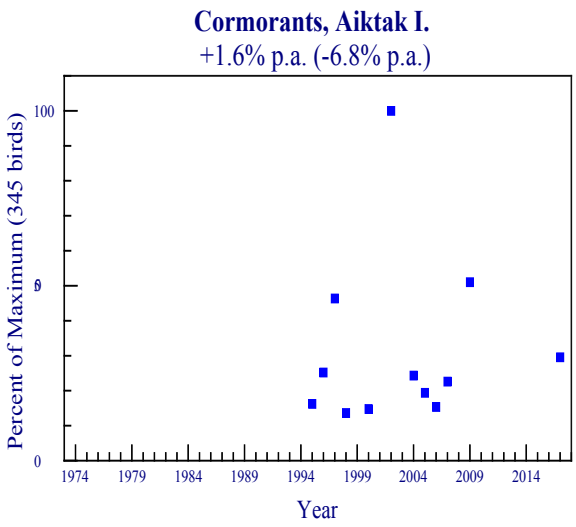


Figure 36. Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses). "NA" indicates that insufficient data were available.



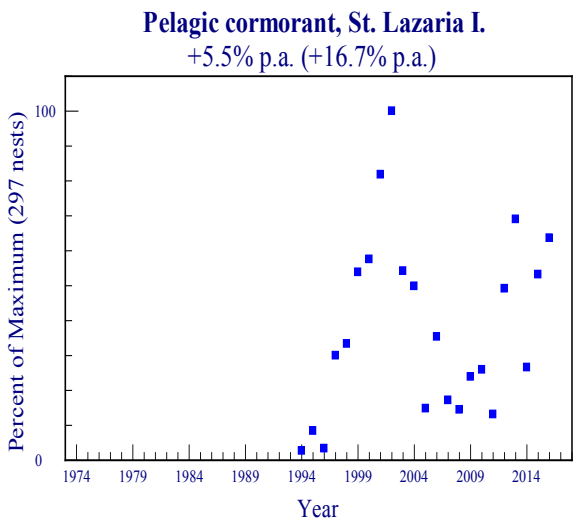


Figure 36 (continued). Trends in populations of cormorants at Alaskan sites. Error bars (90% confidence intervals) are shown for years with multiple counts. Percent per annum (p.a.) changes are indicated for all years and for just the last decade (2008-2017, in parentheses).

Pelagic cormorant (*Phalacrocorax pelagicus*)

Table 32. Reproductive performance of pelagic cormorants at Alaskan sites monitored in 2017.

Site	Chicks Fledged/Nest	No. of Plots	Long-term Average	Reference
C. Peirce	0.00	1 (6)[a]	1.16 (29)[a]	K. Hilwig Unpubl. Data
Round I.	0.16	3 (31)	1.21 (17)	E. Weiss Unpubl. Data
Aiktak I.	0.00	NA[b] (51)	1.00 (14)	N. Rojek Unpubl. Data
Middleton I.	1.60	NA (69)	0.84 (34)	ISRC 2017

[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.

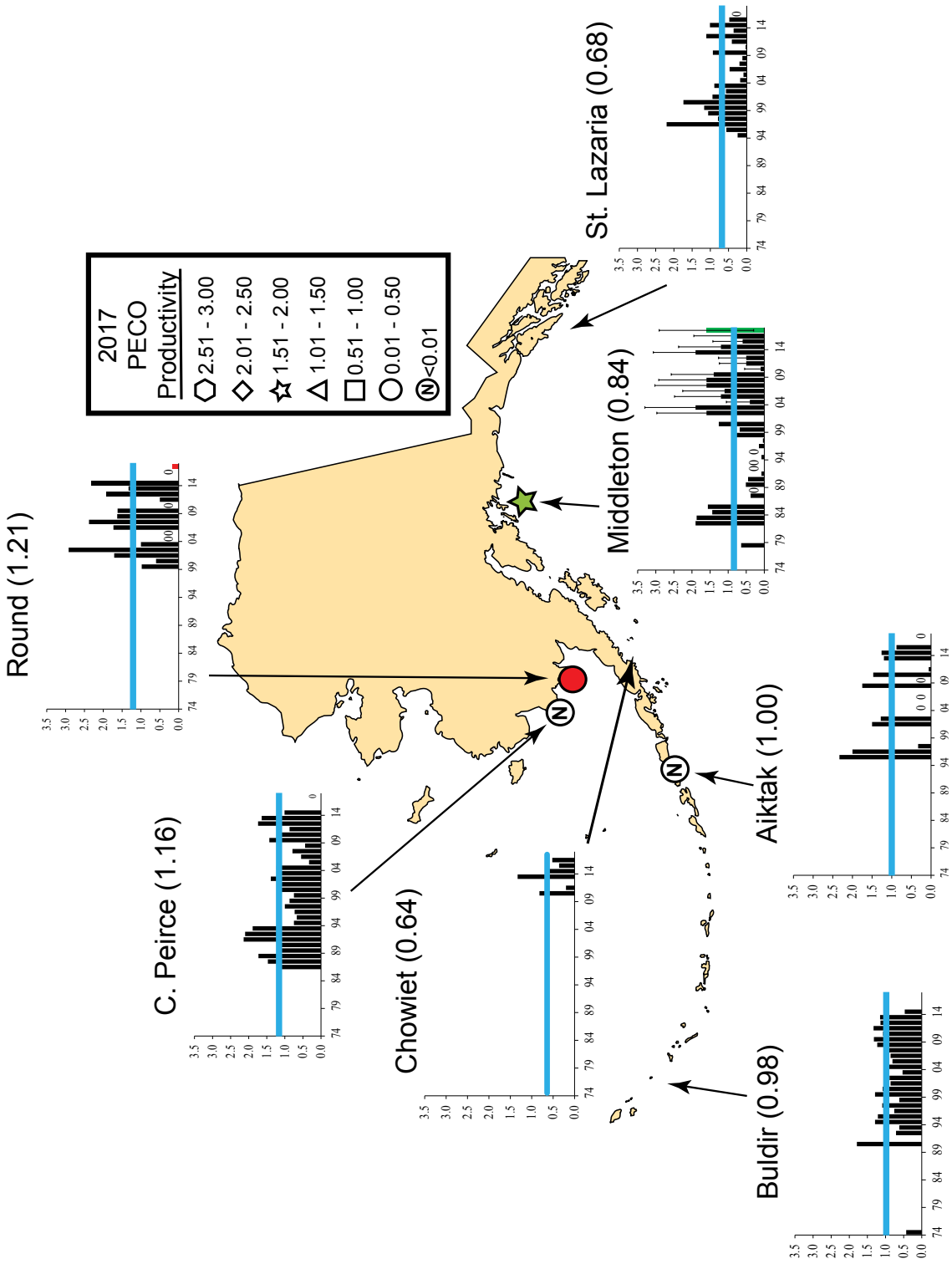


Figure 37. Productivity of pelagic cormorants (chicks fledged/nest) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean).

Table 33. Seabird relative breeding chronology[a] compared to averages for past years. Only sites for which there were data from 2017 are included.

Region	Site	COMU[b]	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	HOPU	TUPU	BLKI	GWGU	FTSP	LHSP	RFCO
SE Bering	St. Paul I.	L	L												E
	St. George I.	L	L			E									
	Aiktak I.			E					E	A		E	E	A	
SW Bering	Buldir I.		L		E	E	E	E	A		L	L			
N Gulf of AK	Chowiet I.	A	L		A				E	A	A	A			
	E. Amatuli I.										L				

[a]Codes:
"E" and red cell color indicate hatching chronology was > 3 days earlier than the average for sites in this region.
"A" and yellow cell color indicate hatching chronology was within 3 days of average.
"L" and green cell color indicate hatching chronology was > 3 days later than the average for sites in this region.

[b]COMU=common murre, TBMU=thick-billed murre, ANMU=ancient murrelet, PAAU=parakeet auklet, LEAU=least auklet, WHAU=whiskered auklet, CRAU=crested auklet, HOPU=horned puffin, TUPU=tufted puffin, BLKI=black-legged kittiwake, GWGU=glaucous-winged gull, FTSP=fork-tailed storm-petrel, LHSP=Leach's storm-petrel, RFCO=red-faced cormorant.

Table 34. Seabird relative productivity levels[a] compared to averages for past years. Only sites for which there were data from 2017 are included.

Region	Site	COMU[b]	TBMU	ANMU	PAAU	LEAU	WHAU	CRAU	RHAU	HOPU	TUPU	BLKI	RLKI	GWGU	FTSP	LHSP	RFCO	PECO
N. Ber./Chukchi	C. Lisburne											H						
SE Bering	St. Paul I.	L	L									L	L				H	
	St. George I.	L	L			L						L	L				A	
	C. Peirce											L						L
	Round I.	L										L						L
	Aiktak I.	L	L	A						A	L			A	A	A	L	L
SW Bering	Buldir I.		L		A	A	A	A		H	L	L	L	L	L	A		
N. Gulf of Alaska	Chowiet I.	H	H		A				A	L	L	A		H				
	E. Amatuli I.											L						
	Pr. Will. Snd.											A						
	Middleton I.								L		L	L						H

[a]Codes:
"L" and red cell color indicate productivity was > 20% below the average for the region.
"A" and yellow cell color indicate productivity was within 20% of average.
"H" and green cell color indicate productivity was > 20% above the average for the region.

[b]COMU=common murre, TBMU=thick-billed murre, ANMU=ancient murrelet, PAAU=parakeet auklet, LEAU=least auklet, WHAU=whiskered auklet, CRAU=crested auklet, RHAU=rhinoceros auklet, HOPU=horned puffin, TUPU=tufted puffin, BLKI=black-legged kittiwake, RLKI=red-legged kittiwake, GWGU=glaucous-winged gull, FTSP=fork-tailed storm-petrel, LHSP=Leach's storm-petrel, RFCO=red-faced cormorant, PECO=pelagic cormorant.

Table 35. Seabird population trends[a] for all available years ("A" columns), and the past decade (2008-2017, "D" columns).

		COMU[b]		TBMU		UNMU		PIGU		LEAU		RHAU		TUPU		BLKI		RLKI		GWGU		NOFU		FTSP		STPE		RFCO		PECO		UNCO	
Region	Site	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
N Bering/ Chukchi	C. Lisburne					↑	↑									↑	↑																
	Hall I.	↔	N/A	↔	N/A											↓	N/A					↔	N/A							↓	N/A		
SE Bering	St. Paul I.	↓	↓	↔	↔											↔	↓	↓	↔			↔	↔					↔	↓				
	St. George I.	↔	↓	↔	↔					↔	↓					↔	↔	↔	↓			↔	↑					↔	↑				
	C. Peirce	↓	↓													↓	↓													↔	↓		
	Round I.	↓	↓													↓	↓																
	Aiktak I.					↓	↓							↔	↔					↔	↓					↔	↑					↔	↓
SW Bering	Buldir I.					↑	↑									↑	↑	↔	↑											↔	↓		
	Ulak I.					↔	↓																									↓	↔
N Gulf of Alaska	Chowiet I.					↔	↓					↔	↔			↔	↓			↔	↔	↔	↔										
	Puale Bay					↔	↓									↔	N/A																
	E. Amatuli I.													↓	↓									↔	↔								
	P. William Snd.							↓	↑							↔	↓																
Southeast	St. Lazaria I.					↔	↔	↔	↔			↑	↔							↑	↑					↔	↔			↑	↑		

[a]Codes:

↓ and red cell color indicate a negative population trend of ≥3% per annum for this site or region.

↔ and yellow cell color indicate that per annum change was within 3% of the site average.

↑ and green cell color indicate a positive population trend of ≥3% per annum for this site or region.

"N/A" indicates that there were insufficient data to determine a trend.

[b]COMU=common murre, TBMU=thick-billed murre, UNMU=unspecified murre, PIGU=pigeon guillemot, LEAU=least auklet, RHAU=rhinoceros auklet, TUPU=tufted puffin, BLKI=black-legged kittiwake, RLKI=red-legged kittiwake, GWGU=glaucous-winged gull, NOFU=northern fulmar, FTSP=fork-tailed storm-petrel, STPE=unspecified storm-petrel, RFCO=red-faced cormorant, PECO=pelagic cormorant, UNCO=unspecified cormorant.

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 thank Melissa Cady (Alaska Peninsula/ Becharof NWR), Kara Hilwig (Togiak NWR), David Irons (USFWS Migr. Birds, Ret.), Arthur Kettle (Alaska Maritime NWR), Nora Rojek (Alaska Maritime NWR), and Ed Weiss (Alaska Dept. Fish and Game) for the unpublished data they kindly provided. 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; all used with permission. Cover art by Susan Steinacher.

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