



Refuge Report 01-12

Aleutian Tern Counts from Seabird Colony and Nearshore Marine Bird Surveys in the Kodiak Archipelago, Alaska 1975-2012

Robin M. Corcoran



Aleutian terns at Anchor Cove, Olga Bay, Kodiak Island, Alaska on 27 June 2011. (USWS Robin Corcoran)

Kodiak National Wildlife Refuge
1390 Buskin River Rd., Kodiak, Alaska 99615
December, 2012





The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Suggested Citation:

Corcoran, R.M. 2012. Aleutian tern counts from seabird colony and nearshore marine bird surveys in the Kodiak Archipelago, Alaska 1975-2012 Unpubl. Refuge Report 01-12. U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge, Kodiak, Alaska.

Key words: Alaska, Aleutian tern, Arctic tern, Gulf of Alaska, Kodiak Archipelago, *Onychoprion aleuticus*, population trends, seabird colony, *Sterna paradisaea*.

Disclaimer: The use of trade names of commercial products in this report does not constitute endorsement or recommendation for use by the federal government.



Table of Contents

| | |
|---|----|
| INTRODUCTION..... | 1 |
| Table 1. Source, time series, season, and number of seabird colonies counted 1975-2011..... | 1 |
| METHODS..... | 1 |
| <i>Study Area</i> | 1 |
| Figure 1. Regions surveyed on the Kodiak Archipelago, Alaska | 2 |
| <i>Description of the Data Sources</i> | 2 |
| RESULTS & DISCUSSION..... | 3 |
| Table 2. Aleutian tern counts by date at seabird colonies from 1975-2012..... | 4 |
| Table 3. Mean number of Aleutian terns counted between 1975-2000 and 2001-2011..... | 6 |
| Figure 2. Aleutian tern counts from 1975-2012 | 7 |
| Figure 3. Aleutian tern counts on Afognak and Shuyak Islands 1975-2012..... | 8 |
| Figure 4. Aleutian tern counts in Chiniak Bay from 1975-2010..... | 9 |
| Figure 5. Aleutian tern counts Sitkalidak Straits from 1975-2012..... | 10 |
| LITERATURE CITED..... | 12 |
| Appendix 1. Aleutian Tern counts from 1975-2012 on the Kodiak Archipelago, Alaska..... | 13 |

INTRODUCTION

The Kodiak Archipelago is home to large numbers of breeding seabirds, the majority of which nest on U.S. Fish and Wildlife Service lands administered by Alaska Maritime and Kodiak National Wildlife Refuges. Kodiak and Alaska Maritime Refuges in conjunction with U.S. Fish and Wildlife Service Migratory Bird Management division have periodically surveyed seabirds throughout the Archipelago and sources of seabird colony data include: 1) the North Pacific Seabird Colony Database, 2) Kodiak Refuge Coastal Bird Survey, 3) Kodiak Seabird Colony Survey, and 4) Kodiak Refuge Nearshore Marine Bird Survey (Table 1). Due to significant breeding population declines and disappearance of entire colonies of Arctic and Aleutian terns (*Sterna paradisaea*, *Onychoprion aleuticus*) in Prince William Sound (1999-2000 surveys) these species were among those targeted for monitoring on Kodiak Island during colony surveys in 2001-02 (Stephensen et al. 2002; Stephensen et al. 2003). Designated seabird colony surveys were resumed on Kodiak in 2008-2010 and 86% of the 377 documented colonies in the Archipelago were visited.

Table 1. Source, time series, season, and number of seabird colonies counted in the Kodiak Archipelago, Alaska, 1975-2011.

| Source | Years | Month | No. Colonies |
|---|-----------|---------------|--------------|
| North Pacific Seabird Colony Database | 1975-1994 | May-August | 257 |
| Kodiak Refuge Coastal Bird Survey (Zwiefelhofer) | 1994-2003 | May | 111 |
| Kodiak Refuge Coastal Bird Survey (Zwiefelhofer) | 1994-2007 | August | 111 |
| Kodiak Refuge Coastal Bird Survey (Corcoran) | 2009-2010 | August | 43 |
| Kodiak Seabird Colony Survey (Stephensen et al. 2002; Stephensen et al. 2003) | 2001-2002 | June | 165 |
| Kodiak Seabird Colony Survey (Slater & Ritchie) | 2008 | June | 154 |
| Kodiak Seabird Colony Survey (Corcoran & MacIntosh) | 2009 | June & July | 85 |
| Kodiak Seabird Colony Survey (Corcoran) | 2010 | August | 85 |
| Kodiak Refuge Nearshore Marine Bird Survey (Corcoran) | 2011-2012 | June & August | 39 |

METHODS

Study Area – The Kodiak Archipelago is located in the Gulf of Alaska, 50km east of the Alaska Peninsula and 140km southwest of the Kenai Peninsula. The archipelago is influenced by a maritime climate with an annual mean temperature of about 4°C. Total annual precipitation varies from 250 cm along the eastern coast of the archipelago to 60 cm over the western areas adjacent to Shelikof Strait. Mountains traverse more than half the length of Kodiak Island and dominant vegetation types range from Sitka spruce (*Picea sitchensis*) forest on the northern end of the archipelago to treeless tundra on the southern end. The area is characterized by approximately 4500 km of rocky irregular coastlines with numerous glacially scoured straits, inlets, bays, and fjords with branching arms. Sea bluffs are generally steep and rocky and numerous offshore rocks and islets occur along the coast (USFWS 2008).

For the purposes of surveying seabirds and organizing data the Archipelago is generally divided into three regions: 1) West Kodiak (adjacent to Shelikof Strait); 2) East Kodiak (adjacent to the Gulf of Alaska), and 3) Afognak (north islands including Shuyak Island) (Figure 1). Currently, due to logistics, only one region is surveyed in a season.

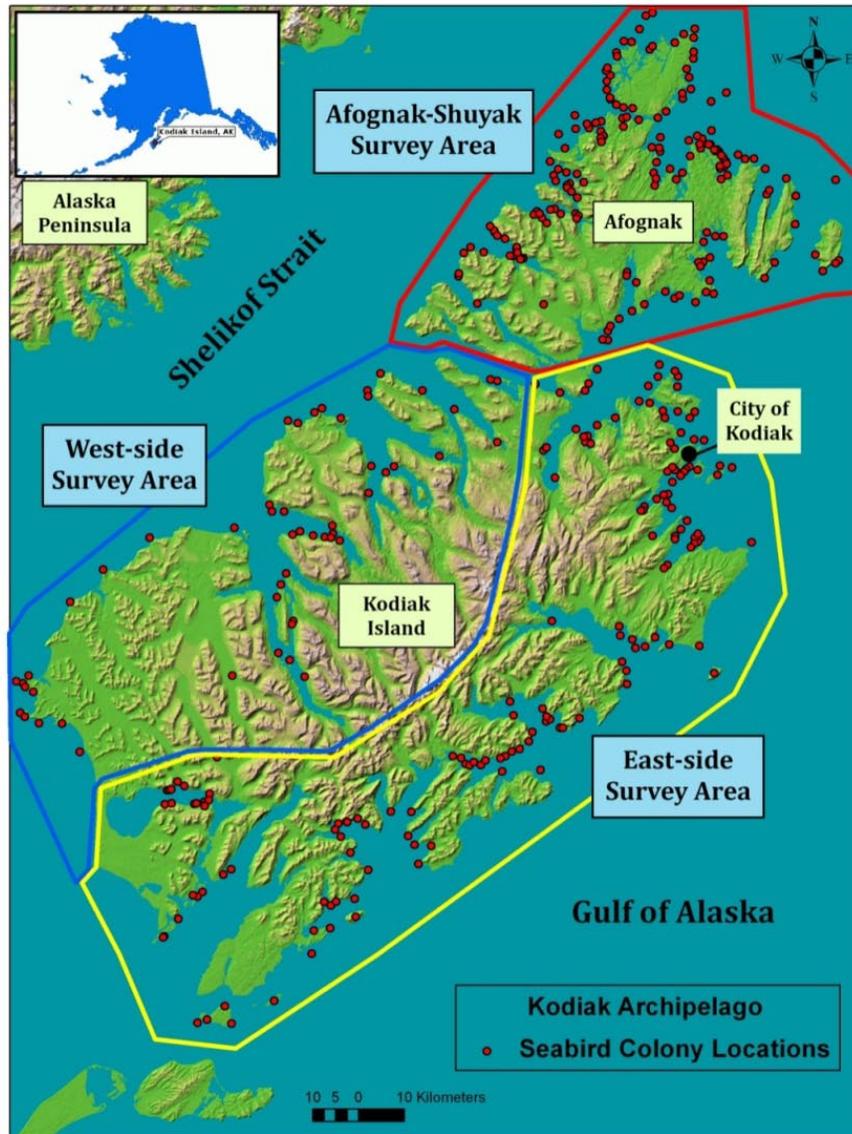


Figure 1. Regions surveyed in one season on the Kodiak Archipelago, Alaska (East-side, West-side, and Afognak-Shuyak Survey Areas). Red circles indicate known seabird colonies (n=377 in 2012).

Description of the Data Sources:

1) North Pacific Seabird Colony Database: The U.S. Fish and Wildlife Service’s Office of Migratory Bird Management maintains a North Pacific Seabird Colony database (<http://alaska.fws.gov/mbp/mbm/northpacificseabirds/colonies/default.htm>) with survey data from southeast Alaska into eastern Russia. The database stores information on the location, breeding population size, and species composition of seabird colonies. This database has seabird counts from colonies in the Kodiak Archipelago from 1975 until 1994. Data from the 1970s were often incomplete with dates by year or month and occasionally noting that a species was present or probable instead of counts of individual birds. Proposed replacements or continuations for this database include the Seabird Information Network: North Pacific Seabird Data Portal (<http://axiom.seabirds.net/maps/north-pacific-seabirds/>) and/or the World Seabird Colony Register (Database).

2) Kodiak Refuge Coastal Bird Survey: Conducted by Refuge biologists Denny Zwiefelhofer and Robin Corcoran on a near-annual basis from 1994-2010. Methods were standard strip transect surveys (Gould and Forsell 1989) recording all individuals of bird and marine mammal species seen within the 200-meter (m) survey zone from shore (100m above and 100m forward of skiff). Observations were made from a 19-foot skiff traveling at slow speeds (approximately 5-9 knots) remaining 100m offshore. Data were recorded using TrueBasic software on a weatherized laptop computer with a Global Positioning System (GPS) to collect wildlife observations simultaneously with specific location information. Only the coastline adjacent to Kodiak NWR was surveyed and coverage included 4 survey areas: 1) West Kodiak (Viekoda Bay west to Uyak Bay), 2) Alitak Bay (including inner bays), 3) Sitkalidak (south Kiluida Bay to Kaguyak Bay), and 4) Afognak (Ban Island north to Blue Fox Bay). From 1994 until 2003 surveys were conducted in May and August; after 2003 surveys were conducted in August only.

3) Kodiak Seabird Colony Survey: During designated colony surveys every effort was made to adhere to the Beringian Seabird Colony Catalog Manual for Censusing Seabird Colonies (USFWS 1999). Most observations were made from a 19-foot skiff traveling at slow speeds (approximately 4 knots) making frequent stops where birds were highly concentrated. Observations were made with standard 10x42 binoculars and/or with image stabilizing 12x36 binoculars. For designated colony surveys each colony in the North Pacific Seabird Colony database plus all other observed colonies were visited. We attempted to identify all birds to species and to count individuals along with fully-formed active nests at these colony locations. A nest was considered active if there was an adult present or if there was fresh vegetation in the nest bowl. We attempted to count individual birds and nests singly at colonies with less than approximately 500 birds. At larger colonies we counted kittiwakes by groups of 10 and at the largest colonies (West Boulder Bay (34008) and Whale Island (34044)) we counted kittiwakes in groups of 100. Data were recorded using TrueBasic software on a weatherized laptop computer with a GPS to collect wildlife observations simultaneously with specific location information. Data from 2001-2002 were summarized in Stephensen et al. 2002 and Stephensen et al. 2003.

4) Kodiak Refuge Nearshore Marine Bird Survey: In 2011 Kodiak Refuge initiated Nearshore Marine Bird Surveys to replace previous Coastal Bird Surveys focusing on harlequin ducks. This survey uses methods currently used in Prince William Sound and at Kenai Fjords and Katmai National Parks to monitor the nearshore marine bird community. The survey modifies protocols developed by the National Park Service Southwest Alaska Network (SWAN) Vital Signs Program to survey the nearshore bird community (tide line to 400m off shore) by incorporating an offshore component (400m to 5km), distance estimation to determine detectability, and multiple with-in season surveys to increase sample size and capture with-in season variability. In 2011, the survey consisted of line transects selected from a systematic sample with a random starting point covering ~ 20% of Kodiak shoreline. Data were recorded using TrueBasic software on a weatherized laptop computer with a GPS to collect wildlife observations simultaneously with specific location information. Detailed descriptions of methods and procedures can be found in the SWAN Marine Bird and Mammal Survey SOP (Bodkin 2011).

RESULTS & DISCUSSION

Aleutian terns were documented at 27 sites on the Kodiak Archipelago from 1975-2012 (Table 2, Appendix 1). The majority of Aleutian terns occurred along the east side of Kodiak from Chiniak to Alitak Bays (Figure 2). During more recent surveys (2001-2012) Aleutian terns were recorded at 19 colonies. Table 3 compares Aleutian tern counts from 1975-2000 with more recent counts from 2001-2011. Since 2001 we have counted only two Aleutian terns on the west-side of Kodiak and 20 on Afognak. During the most recent designated seabird colony surveys from 2008-2010 we visited 86% of known colonies (324 out of 377) and recorded only 326 Aleutian terns at 11 colonies.

Table 2. Aleutian tern (ALTE) counts by date at seabird colonies on the Kodiak Archipelago, Alaska from 1975-2012. Colonies with over 100 terns on any single count are highlighted.

| Colony No. | Colony Name | Date | No. ALTE | Figure No./Region |
|------------|-----------------------------|-------------------|-------------|-------------------|
| 10008 | New 8 Lagoon Point | 6/22/2001 | 0 | 5/Sitkalidak |
| | | 6/20/2009 | 3 | |
| 10009 | New 9 Sitka Triangle | 6/21/2001 | 0 | 5/Sitkalidak |
| | | 6/23/2009 | 0 | |
| | | 6/18/2011 | 0 | |
| | | 6/19/2011 | 3 | |
| 10010 | New 10 SE of Avnulu Creek | 6/20/2001 | 0 | 5/Sitkalidak |
| | | 6/22/2009 | 0 | |
| | | 6/19/2011 | 0 | |
| | | 6/20/2011 | 1 | |
| 10011 | New 11 West Kaiugnak Bay Pt | 6/20/2001 | 0 | 5/Sitkalidak |
| | | 6/22/2009 | 20 | |
| 32004 | Akhiok Bay | 8/9/1977 | 1000 | 6/Akhiok |
| | | 6/14/2001 | 2 | |
| | | 5/21/2002 | 105 | |
| | | 6/19/2002 | 2 | |
| | | 5/23/2003 | 61 | |
| 32015 | Aiktalik Marsh/Island | 5/27/1977 | 50 | 6/Akhiok |
| | | 6/14/2001 | 120 | |
| 32021 | Island East of Akhiok | 6/13/2002 | 0 | 6/Akhiok |
| | | 6/26/2011 | 4 | |
| | | 6/28/2011 | 0 | |
| 34004 | Sheep Island | ??/??/1977 | 735 | 5/Sitkalidak |
| | | 7/24/1994 | 1 | |
| | | 6/22/2001 | 0 | |
| | | 6/21/2009 | 70 | |
| 34007 | Ladder Island | 6/22/1976 | 10 | 5/Sitkalidak |
| | | 6/5/1994 | 1 | |
| | | 6/23/2001 | 0 | |
| | | 6/20/2009 | 0 | |
| 34053 | Cub Island | 7/24/1994 | 1 | 5/Sitkalidak |
| | | 6/22/2001 | 0 | |
| | | 6/21/2009 | 0 | |
| 34054 | Amee Island | 6/23/1976 | 3000 | 5/Sitkalidak |
| | | ??/??/1977 | 330 | |
| | | 7/24/1994 | 1 | |
| | | 6/22/2001 | 0 | |
| | | 6/21/2009 | 120 | |
| | | 6/18/2011 | 0 | |

Table 2 (continued).

| Colony No. | Colony Name | Date | No. ALTE | Figure No./Region |
|--------------|---------------------------|------------------|------------|-------------------|
| 34069 | Pasagshak Point | ??/??/1976 | 50 | 4/Chiniak |
| | | 6/25/2001 | 0 | |
| | | 6/25/2009 | 0 | |
| 34085 | Mary Island | ??/??/1975 | 50 | 4/Chiniak |
| | | ??/??/1977 | 54 | |
| | | ??/??/1978 | 40 | |
| | | 6/15/2001 | 0 | |
| | | 6/27/2009 | 0 | |
| 34100 | Head Of Middle Bay | 6/??/1977 | 50 | 4/Chiniak |
| | | 6/??/1978 | 60 | |
| | | 6/15/2001 | 0 | |
| 34101 | Head Of Kalsin Bay | 6/??/1977 | 240 | 4/Chiniak |
| | | 6/??/1978 | 320 | |
| | | 6/15/2001 | 22 | |
| 34103 | Rolling Bay Lagoon | 7/1/1976 | 1 | 5/Sitkalidak |
| | | 6/21/2001 | 0 | |
| | | 6/23/2009 | 1 | |
| 34104 | Kodiak Ranch | 7/7/1994 | 1 | 4/Chiniak |
| 34105 | Olds River | 6/1/1978 | 1 | 4/Chiniak |
| 34106 | S Shore Woman's Bay | 7/9/1975 | 20 | 4/Chiniak |
| | | ??/??/1976 | 0 | |
| | | ??/??/1977 | 0 | |
| | | 6/??/1978 | 40 | |
| | | 6/15/2001 | 0 | |
| 35028 | North Anchor Cove | 6/17/1993 | 54 | 6/Akhiok |
| | | 6/11/2002 | 0 | |
| | | 7/13/2009 | 0 | |
| | | 6/27/2011 | 3 | |
| 35029 | South Anchor Cove | 6/17/1993 | 24 | 6/Akhiok |
| | | 6/11/2002 | 0 | |
| | | 6/27/2011 | 4 | |
| 43075 | Too Triangle | 6/17/2008 | 0 | 3/Afognak-Shuyak |
| | | 6/21/2012 | 4 | |
| 43076 | Island 10 | 7/30/1976 | 40 | 3/Afognak-Shuyak |
| | | 6/17/2008 | 0 | |
| | | 6/21/2012 | 0 | |
| 43097 | Grassy Island | 6/20/2008 | 8 | 3/Afognak-Shuyak |
| | | 6/27/2012 | 2 | |
| 43100 | Black Cape Islets | 6/21/2008 | 3 | 3/Afognak-Shuyak |
| 43102 | Foul Bay 2 | 6/21/2008 | 7 | 3/Afognak-Shuyak |
| 43109 | Foul Bay 9 | 6/21/2008 | 2 | 3/Afognak-Shuyak |

Table 3. Mean number of Aleutian terns (ALTE) counted at colonies between 1975-2000 and 2001-2011 on the Kodiak Archipelago, Alaska.

| | Mean Count/Colony 1975-2000 | SE (95% CI) | n | No. Colonies 1975-2000 | Mean Count/Colony 2001-2011 | SE (95% CI) | n | No. Colonies 2001-2011 |
|-------------|-----------------------------------|--------------------------|-----------|------------------------------|-----------------------------------|-----------------|-----------|------------------------------|
| ALTE | 221 | 112 (109,332) | 28 | 17 | 14 | 5 (9,18) | 42 | 19 |

Counts at only five colonies in the Kodiak Archipelago have recorder greater than 100 Aleutian terns: Akhiok Bay (32004), Aiktalik Marsh (32015), Sheep Island (34004), Ameer Island (34054), and the Head of Kalsin Bay (34101) (Table 2, Figures 2-6). Akhiok Bay (Figure 6) had 1000 nesting Aleutian terns in August 1977, but during surveys from 2001-2003 birds initiated nesting in reduced numbers (105 in 2002; 61 in 2003). Numbers at Akhiok Bay in May 2002 were 105 but less than a month later only two Aleutian terns were seen (Stephensen et al. 2003). An aerial survey conducted of Aiktalik Marsh (Figure 6) in June 2001 had 120 nesting terns present. This site has not been resurveyed primarily due to logistical difficulties including poor anchorages for the Refuge research vessel, strong currents and winds, and shallow, heavily vegetated substrates. Sheep Island and Ameer Island are in close proximity in east Sitkalidak Strait (Figure 5). Data from the 1970s indicate that Aleutian terns occurred at these sites in high numbers (330-3000 individuals). These colonies have been intermittently active in recent years at reduced numbers (70-120 individuals). The Head of Kalsin Bay (Figure 4) also supported large numbers of nesting Aleutian terns in the 1970s (240-320) but had reduced numbers in 2002 (only 22 terns) when it was last surveyed by USFWS biologists. Kalsin, Middle (34100), and Womens Bay (34106) colonies are accessible along the road system and have generally been monitored by volunteers from the city of Kodiak (Rich MacIntosh, pers. comm.). These colonies are initiated in most years but are seldom successful due to livestock grazing and four wheeler and hiker activity.

Most colony surveys are completed in June to capture peak nesting activity by the majority of seabird species. The recent nearshore marine bird surveys (2011-2012) were conducted in both June and August at the same sites to get productivity information for species with distinct juvenile plumages. We have not seen any hatch year Aleutian terns during this time. Anecdotally the colony at Too Triangle (Figure 3) on Shuyak Island was active on 16 August 2012 and at least five nestling Arctic terns of varying ages were present. At least five adult Aleutian terns were still in the area and two were seen flying carrying a fish. The mixed tern colony at Grassy Island (Figure 3) with 55 Arctic terns and two Aleutian terns on 27 June 2012 had been abandoned in August, we visited the island on foot on 15 August 2012 and there was evidence of recent brown bear activity at the colony site. We did not see hatch year birds of either tern species during the August 2011 nearshore survey of east Kodiak Island. However, we did not survey Sheep Island (Figure 5) in 2011 but did complete two transects just north and east of the colony. We had 27 Arctic terns (seven carrying fish) and 14 Aleutian terns (one carrying a fish) on 9 August 2011 in close proximity to Sheep Island.

Although historic records from the seabird colony database are incomplete (missing accurate dates) it appears that Aleutian tern numbers have declined on the Kodiak Archipelago since the 1970s. Four of the five largest colonies that supported from 240-3000 individual terns in the 1970s now are used intermittently and at reduced numbers with counts ranging from 22-120 terns. Although the species is difficult to monitor since colonies often shift from year to year, given the few sightings in the region in the past decade it is reasonable to conclude that this species has declined rather than relocated within the Kodiak Archipelago.

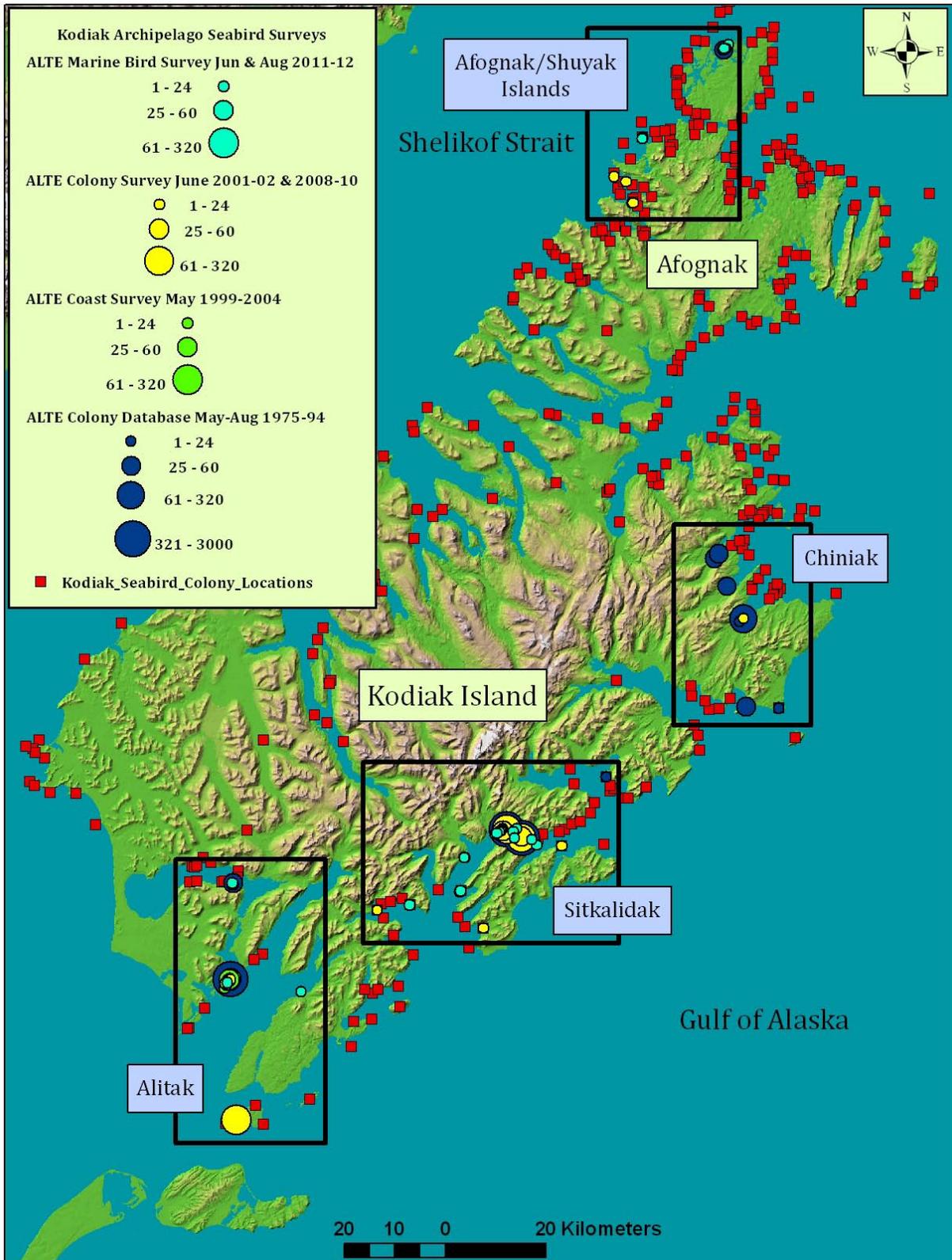


Figure 2. Aleutian tern counts at seabird colonies in the Kodiak Archipelago, Alaska from 1975-2012.

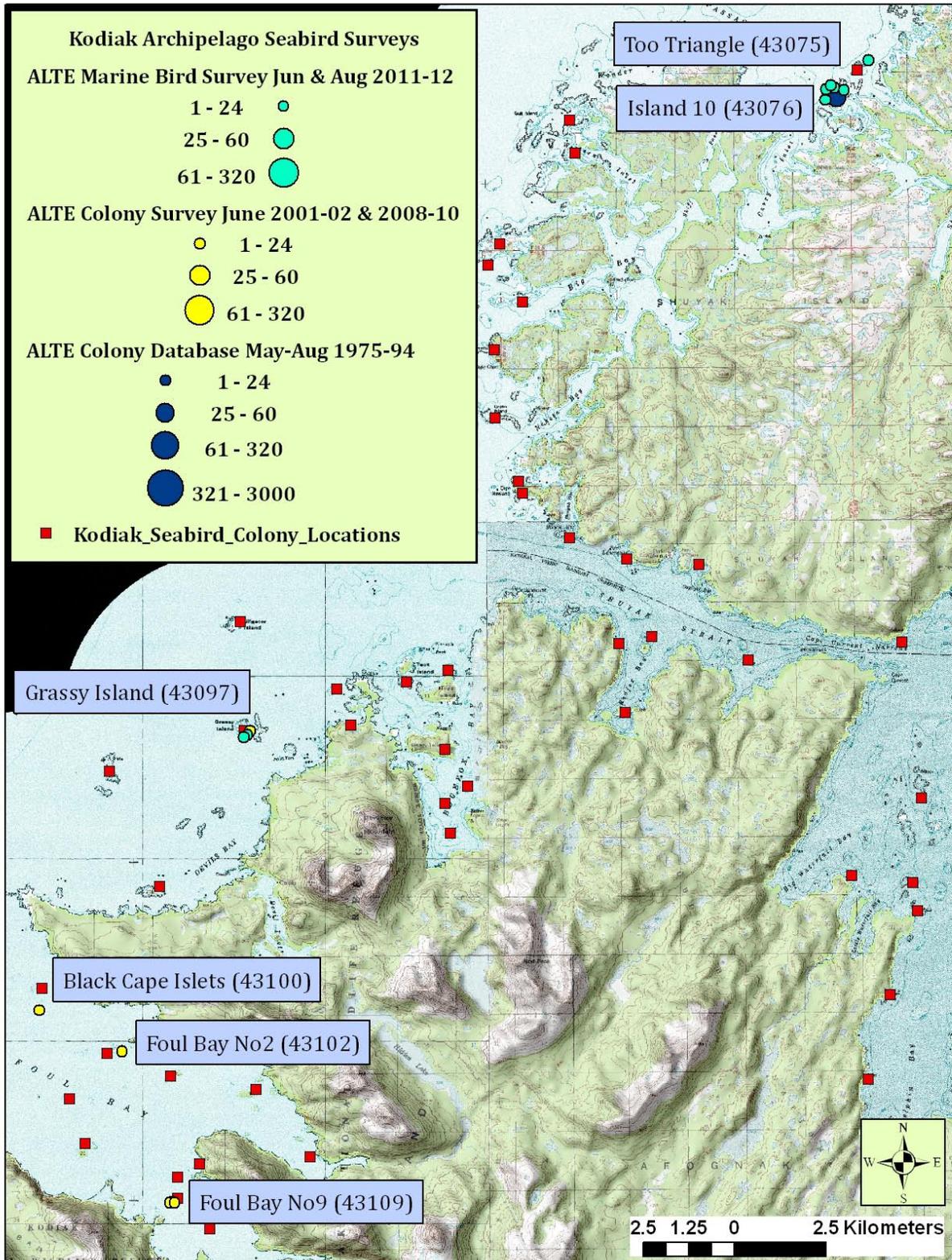


Figure 3. Aleutian tern counts at seabird colonies in the Afognak/Shuyak Islands region of the Kodiak Archipelago, Alaska from 1975-2012.

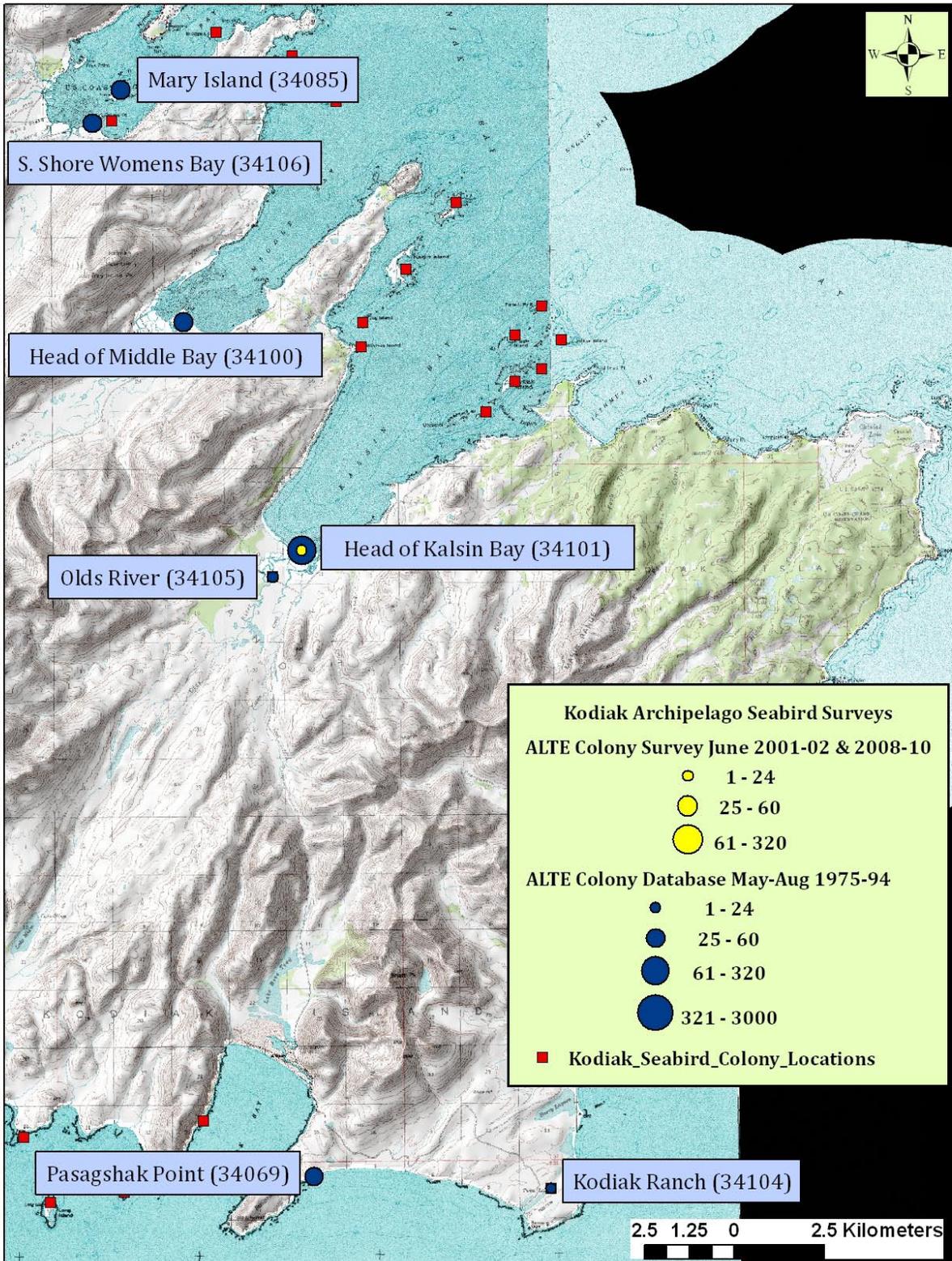


Figure 4. Aleutian tern counts at seabird colonies in the Chiniak Bay region of the Kodiak Archipelago, Alaska from 1975-2010.

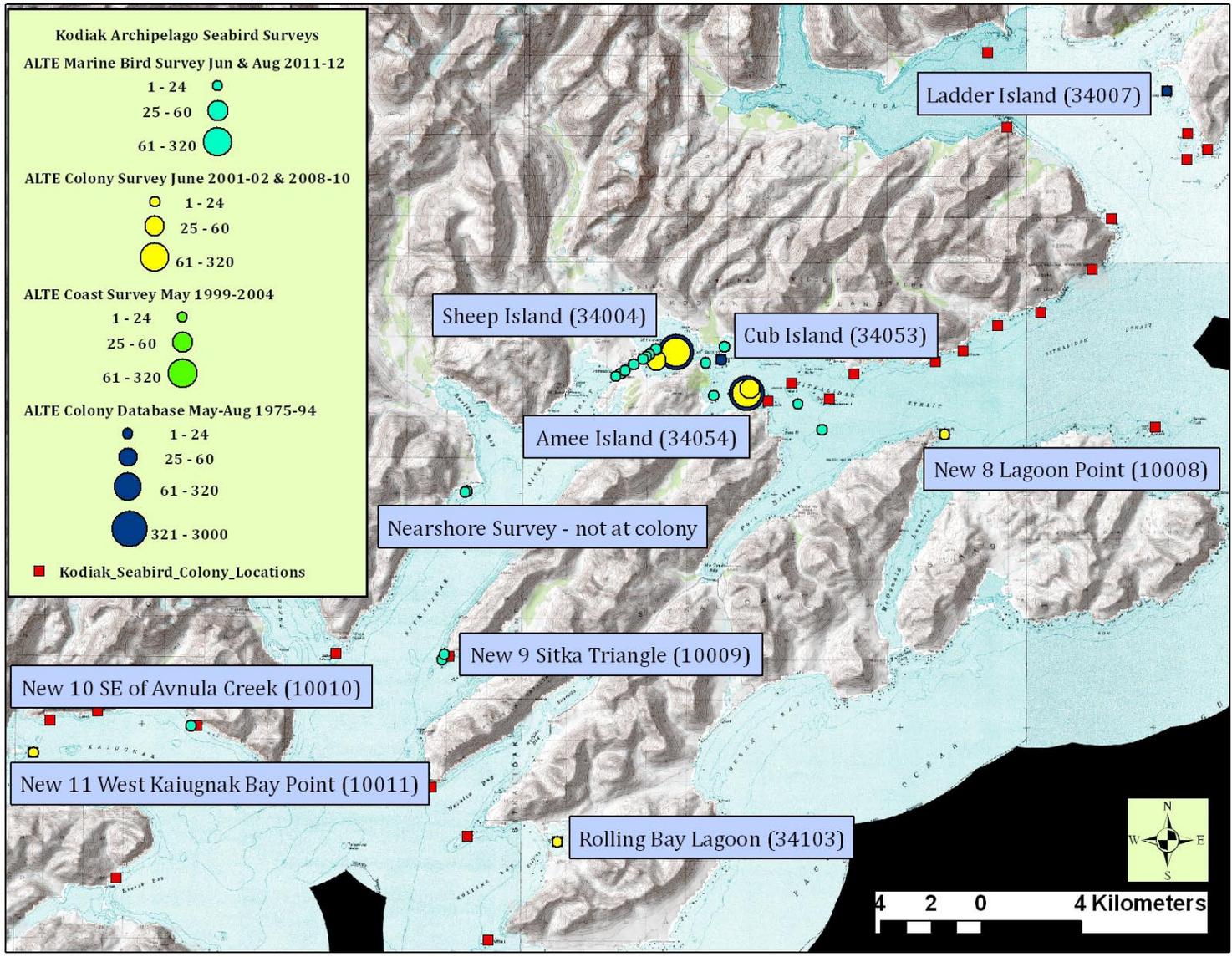


Figure 5. Aleutian tern counts at seabird colonies in the Sitkalidak Straits/Island region of the Kodiak Archipelago, Alaska from 1975-2012.

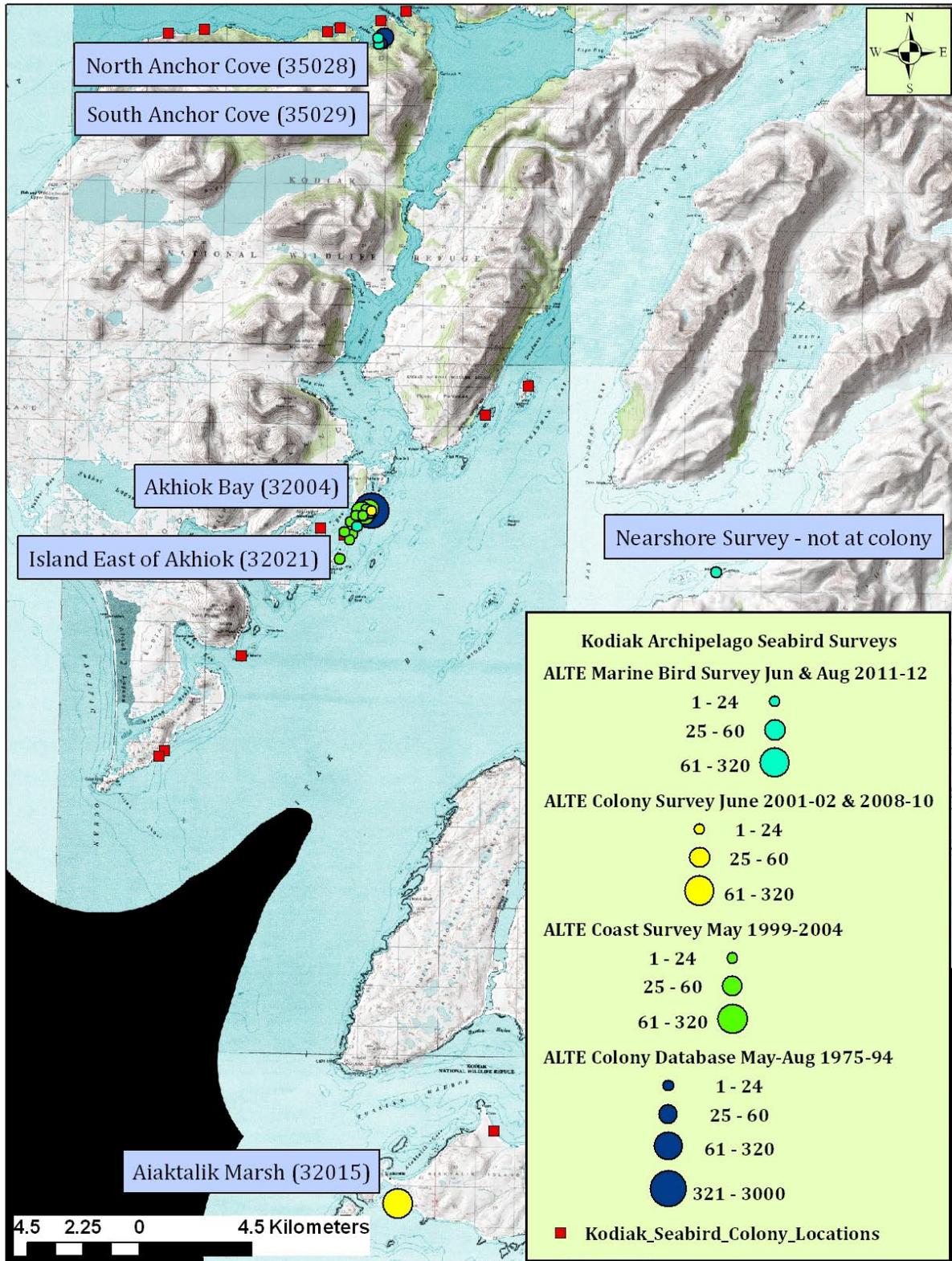


Figure 6. Aleutian tern counts at seabird colonies in the Alitak Bay region of the Kodiak Archipelago, Alaska from 1975-2012.

LITERATURE CITED

- Anderson, P.J., J.E. Blackburn, and B.A. Johnson. 1997. Declines of forage species in the Gulf of Alaska, 1972-95, as indicator of regime shift. *In*: Baxter BS (ed) Proceedings of the International Symposium on the Role of Forage Fishes in Marine Ecosystems November 13-16, 1996, Anchorage, Alaska. University of Alaska Sea Grant Rep 97-01, p 531-543.
- Anderson, P.J., and J.F. Piatt. 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. *Marine Ecology Progress Series* 189:117-123.
- Bodkin, J. L. 2011. Standard Operating Procedures (SOP) for conducting marine bird and mammal surveys - Version 4.1: Southwest Alaska Inventory and Monitoring Network. Natural Resource Report NPS/SWAN/NRR—2011/392. National Park Service, Fort Collins, Colorado.
- Gould, P. J., and D. J. Forsell. 1989. Techniques for shipboard surveys of marine birds. Technical Report 25, U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.
- Merrick, R.L., K. Chumbley, and G.V. Byrd. 1997. Diet diversity of Steller sea lions (*Eumetopias jubatus*) and their population decline in Alaska: a potential relationship. *Canadian Journal of Fisheries and Aquatic Sciences* 54:1342-1348.
- Piatt, J.F., and P.J. Anderson. 1996. Response of common murrelets to the *Exxon Valdez* oil spill and long-term changes in the Gulf of Alaska marine ecosystem. *In*: S.D. Rice, R.B. Spies, D.A. Wolfe, and B.A. Wright (eds) *Exxon Valdez* oil spill symposium proceedings. American Fisheries Society Symposium 18, Bethesda, MD, p 720-737.
- Stephensen, S.W., D.C. Zwiefelhofer, and R.J. Howard. 2002. Seabird colony survey of south and east Kodiak Island, Alaska, June 2001. U.S. Fish and Wildlife Service Report. Migratory Bird Management, Anchorage, AK. 23pp.
- Stephensen, S.W., D.C. Zwiefelhofer, and L. Slater. 2003. Seabird colony survey of north and west Kodiak Island, Alaska, June 2002. U.S. Fish and Wildlife Service Report. Migratory Bird Management, Anchorage, AK. 34pp.
- U.S. Fish and Wildlife Service (USFWS). 1999. Manual for censusing seabird colonies. Beringian Seabird Colony Catalog. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 24pp.
- U.S. Fish and Wildlife Service (USFWS). 2008. Kodiak National Wildlife Refuge Revised Comprehensive Conservation Plan. U.S. Fish and Wildlife Service, Anchorage, AK.

Appendix 1. Aleutian Tern counts at colonies from 1975-2012 on the Kodiak Archipelago, Alaska.

| COLNO | COLONY NAME | LAT | LONG | DATE | D_QUAL | Count | NO_NESTS | AGE | SOURCE | REGION |
|-------|---------------------------|-----------|-------------|------------|--------|-------|----------|-----|------------------------|--------|
| 10008 | New 8 Lagoon Point | 57.187667 | -153.056500 | 6/20/2009 | Good | 3 | 0 | | Corcoran & MacIntosh | East |
| 10009 | New 9 Sitka Triangle | 57.106300 | -153.388200 | 6/19/2011 | Good | 3 | 0 | AD | Corcoran NMBS | East |
| 10010 | New 10 SE of Avnulu Creek | 57.082000 | -153.553200 | 6/20/2011 | Good | 1 | 0 | AD | Corcoran NMBS | East |
| 10011 | New 11 W. Kaiugnak Bay Pt | 57.071833 | -153.657167 | 6/22/2009 | Good | 20 | 0 | | Corcoran & MacIntosh | East |
| 32004 | Akhiok Bay | 56.945790 | -154.132190 | 8/9/1977 | | 1000 | | | NPS Colony Database | East |
| 32004 | Akhiok Bay | 56.946300 | -154.133500 | 5/21/2002 | | 40 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.945700 | -154.133700 | 5/21/2002 | | 7 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.944200 | -154.136000 | 5/21/2002 | | 51 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.944000 | -154.137700 | 5/21/2002 | | 2 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.937200 | -154.144500 | 5/21/2002 | | 2 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.935200 | -154.146200 | 5/21/2002 | | 1 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.928200 | -154.152700 | 5/21/2002 | | 2 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.945790 | -154.132190 | 6/19/2002 | | 2 | 0 | | Stephensen et al.2003 | East |
| 32004 | Akhiok Bay | 56.937800 | -154.149700 | 5/23/2003 | | 1 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.941700 | -154.146000 | 5/23/2003 | | 11 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.943800 | -154.142300 | 5/23/2003 | | 5 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.945300 | -154.138500 | 5/23/2003 | | 29 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.946300 | -154.135800 | 5/23/2003 | | 7 | N/A | | Zwiefelhofer CoastSurv | East |
| 32004 | Akhiok Bay | 56.944800 | -154.133200 | 5/23/2003 | | 8 | N/A | | Zwiefelhofer CoastSurv | East |
| 32015 | Aiaktalik Marsh | 56.695790 | -154.107490 | 5/27/1977 | Fair | 50 | | | NPS Colony Database | East |
| 32015 | Aiaktalik Marsh | 56.695790 | -154.107490 | 6/14/2001 | | 120 | | | Stephensen et al.2002 | East |
| 32021 | Island East of Akhiok | 56.940000 | -154.141700 | 6/26/2011 | Good | 4 | 0 | AD | Corcoran NMBS | East |
| 34004 | Sheep Island | 57.217190 | -153.234710 | ??/??/1977 | | 735 | | | NPS Colony Database | East |
| 34004 | Sheep Island | 57.217190 | -153.234710 | 7/24/1994 | Poor | 1 | | | NPS Colony Database | East |
| 34004 | Sheep Island | 57.216300 | -153.251500 | 5/13/1999 | | 1 | N/A | | Zwiefelhofer CoastSurv | East |
| 34004 | Sheep Island | 57.217190 | -153.234710 | 6/21/2009 | Good | 70 | 0 | | Corcoran & MacIntosh | East |
| 34004 | Sheep Island | 57.214000 | -153.247500 | 7/15/2009 | Good | 32 | 0 | | Corcoran | East |
| 34007 | Ladder Island | 57.310800 | -152.909410 | 6/5/1994 | Poor | 1 | | | NPS Colony Database | East |
| 34053 | Cub Island | 57.214320 | -153.204750 | 7/24/1994 | Poor | 1 | | | NPS Colony Database | East |

Appendix 1 (continued).

| COLNO | COLONY NAME | LAT | LONG | DATE | D_QUAL | Count | NO_NESTS | AGE | SOURCE | REGION |
|-------|---------------------|-----------|-------------|------------|--------|-------|----------|-----|-----------------------|---------|
| 34054 | Amee Island | 57.202190 | -153.187800 | 6/23/1976 | | 3000 | | | NPS Colony Database | East |
| 34054 | Amee Island | 57.202190 | -153.187800 | ??/??/1977 | | 330 | | | NPS Colony Database | East |
| 34054 | Amee Island | 57.202190 | -153.187800 | 7/24/1994 | Fair | 1 | | | NPS Colony Database | East |
| 34054 | Amee Island | 57.202190 | -153.187800 | 6/21/2009 | Good | 120 | 0 | | Corcoran & MacIntosh | East |
| 34054 | Amee Island | 57.203833 | -153.186000 | 7/15/2009 | Good | 60 | 0 | | Corcoran | East |
| 34069 | Pasagshak Point | 57.435420 | -152.449110 | ??/??/1976 | | 50 | | | NPS Colony Database | East |
| 34085 | Mary Island | 57.706890 | -152.535310 | ??/??/1975 | | 50 | | | NPS Colony Database | East |
| 34085 | Mary Island | 57.706890 | -152.535310 | ??/??/1977 | | 54 | | | NPS Colony Database | East |
| 34085 | Mary Island | 57.706890 | -152.535310 | ??/??/1978 | | 40 | | | NPS Colony Database | East |
| 34100 | Head Of Middle Bay | 57.649000 | -152.506550 | 6/1/1978 | Fair | 60 | | | NPS Colony Database | East |
| 34101 | Head Of Kalsin Bay | 57.591700 | -152.452510 | 6/1/1978 | Fair | 320 | | | NPS Colony Database | East |
| 34101 | Head Of Kalsin Bay | 57.591700 | -152.452510 | 6/15/2001 | | 22 | 0 | | Stephensen et al.2002 | East |
| 34103 | Rolling Bay Lagoon | 57.041100 | -153.311400 | 7/1/1976 | Poor | 1 | | | NPS Colony Database | East |
| 34103 | Rolling Bay Lagoon | 57.041100 | -153.311400 | 6/23/2009 | Good | 1 | 0 | | Corcoran & MacIntosh | East |
| 34104 | Kodiak Ranch | 57.432060 | -152.339420 | 7/7/1994 | Fair | 1 | | | NPS Colony Database | East |
| 34105 | Olds River | 57.585290 | -152.466100 | 6/1/1978 | Fair | 1 | | | NPS Colony Database | East |
| 34106 | S Shore Woman's Bay | 57.698590 | -152.548610 | 7/9/1975 | | 20 | | | NPS Colony Database | East |
| 34106 | S Shore Woman's Bay | 57.698590 | -152.548610 | ??/??/1976 | | 0 | | | NPS Colony Database | East |
| 34106 | S Shore Woman's Bay | 57.698590 | -152.548610 | ??/??/1977 | | 0 | | | NPS Colony Database | East |
| 34106 | S Shore Woman's Bay | 57.698590 | -152.548610 | 6/??/1978 | Fair | 40 | | | NPS Colony Database | East |
| 35028 | North Anchor Cove | 57.116830 | -154.129000 | 6/17/1993 | Good | 54 | | | NPS Colony Database | East |
| 35028 | North Anchor Cove | 57.116500 | -154.133200 | 6/27/2011 | Good | 3 | 0 | AD | Corcoran NMBS | East |
| 35029 | South Anchor Cove | 57.114650 | -154.129670 | 6/17/1993 | Good | 24 | | | NPS Colony Database | East |
| 35029 | South Anchor Cove | 57.114300 | -154.132500 | 6/27/2011 | Good | 4 | 0 | AD | Corcoran NMBS | East |
| 43075 | Too Triangle | 58.612545 | -152.488125 | 6/21/2012 | Good | 2 | N/A | AD | Corcoran NMBS | Afognak |
| 43075 | Too Triangle | 58.605440 | -152.507967 | 6/21/2012 | Good | 2 | N/A | AD | Corcoran NMBS | Afognak |
| 43075 | Too Triangle | 58.602718 | -152.508400 | 6/22/2012 | Good | 1 | N/A | AD | Corcoran NMBS | Afognak |
| 43075 | Too Triangle | 58.606333 | -152.505790 | 8/16/2012 | | 1 | N/A | AD | Corcoran NMBS | Afognak |
| 43075 | Too Triangle | 58.605903 | -152.504027 | 8/16/2012 | | 2 | N/A | AD | Corcoran NMBS | Afognak |
| 43075 | Too Triangle | 58.605192 | -152.499690 | 8/16/2012 | | 2 | N/A | AD | Corcoran NMBS | Afognak |
| 43076 | Island 10 | 58.603290 | -152.503310 | 7/30/1976 | Fair | 40 | | | NPS Colony Database | Afognak |

Appendix 1 (continued).

| COLNO | COLONY NAME | LAT | LONG | DATE | D_QUAL | Count | NO_NESTS | AGE | SOURCE | REGION |
|-------|-------------------|-----------|-------------|-----------|--------|-------|----------|-----|------------------|---------|
| 43097 | Grassy Island | 58.448333 | -152.780833 | 6/20/2008 | | 8 | 0 | | Slater & Ritchie | Afognak |
| 43097 | Grassy Island | 58.447352 | -152.781832 | 6/27/2012 | Good | 1 | N/A | AD | Corcoran NMBS | Afognak |
| 43097 | Grassy Island | 58.446643 | -152.783745 | 6/27/2012 | Good | 1 | N/A | AD | Corcoran NMBS | Afognak |
| 43100 | Black Cape Islets | 58.379500 | -152.880000 | 6/21/2008 | | 3 | 0 | | Slater & Ritchie | Afognak |
| 43102 | Foul Bay 2 | 58.369500 | -152.841000 | 6/21/2008 | | 7 | 0 | | Slater & Ritchie | Afognak |
| 43109 | Foul Bay 9 | 58.332333 | -152.817500 | 6/21/2008 | | 1 | 0 | | Slater & Ritchie | Afognak |
| 43109 | Foul Bay 9 | 58.332167 | -152.818833 | 6/21/2008 | | 1 | 0 | | Slater & Ritchie | Afognak |
| 43109 | Foul Bay 9 | 58.332167 | -152.816667 | 6/21/2008 | | 0 | 1 | | Slater & Ritchie | Afognak |
| N/A | N/A | 57.219000 | -153.202500 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.218167 | -153.247667 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.217833 | -153.248000 | 8/9/2011 | Good | 2 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.216500 | -153.251500 | 8/9/2011 | Good | 5 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.216333 | -153.252000 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.215500 | -153.254000 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.214500 | -153.256500 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.209333 | -153.271333 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.208333 | -153.274333 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.213167 | -153.214667 | 8/9/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.189500 | -153.137833 | 8/10/2011 | Good | 3 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.198500 | -153.153833 | 8/10/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.212500 | -153.262500 | 8/10/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.210500 | -153.268333 | 8/10/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.201333 | -153.209833 | 8/10/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.166500 | -153.373333 | 8/12/2011 | Good | 1 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.166667 | -153.372333 | 8/12/2011 | Good | 3 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 57.166667 | -153.371833 | 8/12/2011 | Good | 2 | N/A | AD | Corcoran NMBS | East |
| N/A | N/A | 56.925500 | -153.903667 | 8/19/2011 | Good | 2 | N/A | AD | Corcoran NMBS | East |