Exxon Valdez Oil Spill
Restoration Project Annual Report

Common Murre Population Monitoring at the Barren Islands, Alaska, 1997

Restoration Project 97144
Annual Report

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Study History: *Exxon Valdez* Oil Spill Trustee Council-sponsored common murre damage assessment studies were initiated at the Barren Islands in 1989 as part of Department of Interior - Fish and Wildlife Service (DOI-FWS) Bird Study No. 3 (Population surveys of seabird nesting colonies in Prince William Sound, the outside coast of the Kenai Peninsula, Barren Islands, and other nearby colonies, with emphasis on changes in numbers and reproduction of murres). During the damage assessment work, three progress reports were written (Nysewander and Dipple 1990, 1991; Dipple and Nysewander 1992), and a final report of 1989-1991 results was completed in 1993 (see Nysewander *et al.* 1993, Effects of the *T/V Exxon Valdez* oil spill on murres: A perspective from observations at breeding colonies). In 1992, murre restoration monitoring work began at the Barren Islands as part of Restoration Project No. 11 (see Dragoo *et al.* 1995, Effects of the *T/V Exxon Valdez* oil spill on murres: A perspective from observations at breeding colonies four years after the spill), and two additional restoration monitoring projects were conducted there in 1993-1994 (Restoration Projects 93049 and 94039, respectively—see Roseneau *et al.* 1995, Common murre restoration monitoring in the Barren Islands, Alaska, 1993; and Roseneau *et al.* 1996a, Common murre restoration monitoring in the Barren Islands, Alaska, 1994). In 1996, Project 96144 was initiated to recensus the Barren Islands murre colonies and reassess the recovery status of this injured species in the spill area (see Roseneau *et al.* 1997a, common murre population monitoring at the Barren Islands, Alaska, 1996). The study continued as Project 97144 in 1997 (see DOI-FWS FY 97 common murre population monitoring detailed project description).

Abstract: Murres were censused at the East Amatuli Island - Light Rock and Nord Island - Northwest Islet Barren Islands colonies using the same basic methods employed by the 1993-1994 restoration and 1996 population monitoring projects. Counts were pooled and averaged with estimates obtained during the 1989-1996 U.S. Fish and Wildlife Service, 1990-1992 University of Washington, and 1991 Dames & Moore postspill studies, and analyzed for trends and differences among years. Although a positive trend was present on one small East Amatuli Island - Light Rock plot set in 1996, no convincing evidence was found that population numbers had increased on the larger sections of the East Amatuli Island - Light Rock and Nord Island - Northwest Islet colonies over the 8-year postspill interval. However, by 1997 the positive trend on the small East Amatuli Island - Light Rock plot set had strengthened, and a significant increase was also apparent at Light Rock. These trends and the fact that counts on six of the seven East Amatuli Island - Light Rock and Nord Island - Northwest Islet plot sets were significantly higher than the averages of previous postspill estimates suggested that murre populations were beginning to increase at the Barren Islands colonies (the high 1997 counts were associated with the presence of large numbers of nonbreeding birds, probably 3- and 4-year-old subadults from the strong 1993-1994 chick cohorts).

Key Words: Barren Islands, common murres, East Amatuli Island, East Amatuli Light Rock, *Exxon Valdez*, Gulf of Alaska, Nord Island, oil spill, population monitoring, Prince William Sound, restoration monitoring, thick-billed murres, *Uria aalge, Uria lomvia.*

Project Data: (To be addressed in the final report).

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EXECUTIVE SUMMARY

Introduction

The Barren Islands, in the northwestern Gulf of Alaska, supported one of the largest breeding concentrations of common murres *(Uria aalge)* in the path of the *Exxon Valdez* oil spill. When winds and currents swept oil through the region during April-May 1989, many of these seabirds were killed: they comprised 74% of 30,000 bird carcasses recovered by 1 August. Based on this information and a computer modeling study, estimates of total bird mortality suggested that 74,000 to 315,000 murres died after contacting floating oil. Because mortality of murres appeared to be high, the U.S. Fish and Wildlife Service (FWS) conducted *Exxon Valdez* Oil Spill Trustee Council-sponsored murre damage assessment and restoration studies at the Barren Islands during 1989-1991 and 1992-1996, respectively. In 1997, murre populations were recensused at the Barren Islands. Evidence was found that murre numbers were beginning to increase at the nesting colonies nine years after the spill. A positive trend, first noted on a small East Amatuli Island - Light Rock plot set in 1994 and still present in 1996, strengthened. A significant increase was also present on the much larger Light Rock section of the East Amatuli Island - Light Rock colony, and with only one exception, the 1997 counts at both colonies were significantly higher than the averages of all previous postspill estimates.

Objectives

The objective was to test the null hypothesis that murre populations have not increased at the Barren Islands colonies since 1989, the year of the spill.

Methods

The East Amatuli Island - Light Rock and Nord Island - Northwest Islet murre colonies were censused completely, and counts were also made on sets of multicount plots (these plot sets provide the best indices for detecting changes in numbers, because they are counted at least five separate times on different days during the census period). Plots were counted from boats using the same methods employed during the 1993-1994 and 1996 restoration studies (i.e., the counts were made by two observers using standard protocols that took into account daily and seasonal attendance patterns of adults). Results were pooled and averaged with count information from 1989-1996 U.S. Fish and Wildlife Service (FWS), 1990-1992 University of Washington (UW), and 1991 Dames & Moore (D&M) postspill studies. Linear regressions were run to test for trends, and differences between 1997 counts and averages of previous postspill estimates were checked with one-sample *t*-tests.

Results

East Amatuli Island - Light Rock: Significant increases were found on two sets of East Amatuli Island - Light Rock plots: multicount plots BMP 3-4, and Light Rock. Trends were not present on three other plot sets: multicount plots BMP 1-8, the UW OSTR plots, and the East Amatuli Island - Light Rock colony. However, the 1997 estimates on four of the five plots sets were significantly higher than the averages of all previous postspill counts on these sets of population monitoring plots (the UW OSTR set was the single exception).

Nord Island - Northwest Islet: Trends were not found in the Nord Island - Northwest Islet whole colony counts, or in the multicount plot estimates. However, in both cases, the 1997 counts on these monitoring plot sets were significantly higher than the averages of all previous postspill estimates.

Discussion

The presence of the two positive trends and the consistently high 1997 counts were associated with the presence of large numbers of nonbreeding birds that were probably 3- and 4-year-old subadults belonging to the strong 1993-1994 chick cohorts (productivity was about 0.50 and 0.70 fledglings per egg at East Amatuli Island - Light Rock and 0.70 and 0.70 fledglings per egg at Nord Island - Northwest Islet in 1993 and 1994, respectively). Recounting the Barren Islands colonies in 1999, when 5- and 6-year-old individuals produced in 1993-1994 will be joined by 3- and 4-year-old birds from the strong 1995-1996 cohorts, may provide the information needed to satisfy recovery goals for common murres in the spill area (productivity was about 0.70 fledglings per egg at East Amatuli Island - Light Rock in 1995 and 1996). Also, recounting these colonies in 1999 will help identify and track any changes that might occur in population numbers that may result from El Niño and La Niña events that have potential to strongly influence environmental conditions in the northern Gulf of Alaska during 1998-1999.

Conclusions

Evidence indicated murre populations were beginning to increase at the Barren Islands nesting colonies. The positive trends and high 1997 counts were associated with the presence of large numbers of nonbreeding birds that were probably subadults belonging to the strong 1993-1994 chick cohorts.

Recommendations

The Barren Islands common murre colonies should be censused again in 1999, because the presence of 3-, 4-, 5-, and 6-year-old individuals belonging to the strong 1993, 1994, 1995, and 1996 cohorts may easily increase population numbers to levels that will fulfill the remaining requirements for declaring this injured species recovered in the spill area (a potential finding appropriate for the 10th anniversary of the spill). Also, counts in 1999 will help identify any changes in population size that might result from El Niño and La Niña events.

INTRODUCTION

The Barren Islands, in the northwestern Gulf of Alaska, supported one of the largest breeding concentrations of common murres *(Uria aalge)* in the path of the T/V *Exxon Valdez* oil spill (e.g., Sowls *et al.* 1978, Piatt *et al.* 1990, FWS 1994). When winds and currents swept oil through the region during April-May 1989, many of these seabirds were killed: they comprised 74% of 30,000 bird carcasses recovered by 1 August (see Piatt *et al.* 1990).[1] Based on this information and a computer modeling study, estimates of total bird mortality suggested that 74,000-315,000 murres died after contacting floating oil (see Piatt *et al.* 1990, ECI 1991).

Because the impact of the spill on common murres appeared to be severe, the U.S. Fish and Wildlife Service (FWS) made murre population counts at the Barren Islands during the 1989-1991 *Exxon Valdez* Oil Spill Trustee Council-sponsored damage assessment studies (e.g., Nysewander and Dipple 1990, 1991; Dipple and Nysewander 1992; Nysewander *et al.* 1993). FWS biologists also counted murres at these islands in 1992, as part of the first Trustee Council restoration project designed to assess the recovery status of this species in the spill area (see Dragoo *et al.* 1995).

Other research groups also made population counts at the Barren Islands murre colonies during the early 1990's. University of Washington (UW) investigators counted birds at East Amatuli Island - Light Rock in 1990-1992, during Exxon- and Minerals Management Service-funded studies (see Boersma *et al.* 1995), and Dames & Moore (D&M) biologists censused this nesting complex and the Nord Island - Northwest Islet colony in 1991 during an Exxon-supported project (see Erikson 1995).

In 1993-1994, we censused the East Amatuli Island - Light Rock and Nord Island - Northwest Islet murre colonies (Restoration Projects 93049 and 94039; see Roseneau *et al.* 1995 and 1996a, respectively). Trends were not apparent in the 1989-1993 FWS counts, or in the combined 1989-1994 FWS, UW, and D&M estimates from Nord Island - Northwest Islet and the larger sections of East Amatuli Island - Light Rock. However, increases were found on two small sets of East Amatuli Island - Light Rock plots counted in 1989-1994 and 1990-1994, respectively.

Murre restoration monitoring work was not funded at the Barren Islands in 1995. However, we counted birds on three sets of East Amatuli Island - Light Rock plots during our Alaska Predator Ecosystem Experiment (APEX) studies (Project 95163J, see Roseneau *et al.* 1996b).

During 1996-1997, we counted the Barren Islands murre colonies again (Projects 96144 and 97144; see Roseneau *et al.* 1997a and this study, respectively). Although a positive trend was still present on one of the small East Amatuli Island - Light Rock plot sets in 1996, no convincing evidence was found that indicated population numbers had increased on the larger sections of the East Amatuli Island - Light Rock and Nord Island - Northwest Islet colonies over the 8-year postspill interval. However, by 1997 the positive trend on the small East Amatuli Island - Light Rock plot set had strengthened, and a significant increase was also present on the Light Rock section of the colony. These trends and the fact that counts on six of the seven East Amatuli Island - Light Rock and Nord Island - Northwest Islet plot sets were significantly higher than the averages of previous postspill estimates suggested that murre populations were beginning to increase at the Barren Islands colonies (the high 1997 counts were associated with the presence of large numbers of nonbreeding birds at the colonies, almost certainly 3- and 4-year-old subadults belonging to the strong 1993-1994 chick cohorts—see Roseneau *et al.* 1995, 1996a, 1996b, 1997a, 1997b).

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[1] Seventy percent of the murre carcasses were common murres (Piatt *et al.* 1990; J.F. Piatt, pers. comm.).

OBJECTIVES

The project was designed to test the null hypothesis that murre populations have not changed at the Barren Islands colonies since 1989, the year of the spill. The specific objective was to count murres at the East Amatuli Island - Light Rock and Nord Island - Northwest Islet colonies and compare the estimates with counts made during the 1989-1995 FWS, 1990-1992 UW, and 1991 D&M studies.

METHODS

The Barren Islands are located at about 58° 55' N, 152° 10' W, between the Kodiak archipelago and the Kenai Peninsula (Fig. 1). The study area consisted of East Amatuli and Nord islands and two nearby islets, East Amatuli Light Rock (Light Rock) and Northwest Islet (Figs. 2 and 3). These sites, which comprise the East Amatuli Island - Light Rock and Nord Island - Northwest Islet colonies, contain all of the murres currently breeding in the island group (see Roseneau *et al.* 1995, 1996a).

We used the M/V *Surfbird*, a 21-m-long FWS research vessel, and the Amatuli Cove camp to support the population counts (Fig. 2). Two people were based on the boat during 19 July - 12 August. The vessel-based census team was intermittently assisted by two APEX seabird studies investigators stationed at Amatuli Cove camp (Project 97163J). APEX team members also counted some East Amatuli Island - Light Rock monitoring plot sets both before and after the vessel-based crew visited the study area.

Population census data were collected and analyzed by the same basic methods used during the 1993-1994 and 1996 restoration monitoring projects (see Roseneau *et al.* 1995, 1996a, 1997a). To compare our counts at the nesting colonies with information from previous studies, we counted two types of monitoring plots. We censused East Amatuli Island, Light Rock, Nord Island, and Northwest Islet completely to obtain whole-colony estimates of birds on major subdivisions of the colonies (e.g., East Amatuli Island, Light Rock). We also counted smaller, previously established plot sets ("multicount plots"—see Roseneau *et al.* 1995, 1996a, 1997a) five or more times to obtain data for statistical analyses of among-year differences and trends in population size. The multicount plot sets, which provide the best indices for detecting changes in numbers, contained about 10-15% of the murres on the cliffs at each nesting complex.

At East Amatuli Island - Light Rock, we counted 64 population census plots (BCP 1-64) and eight multicount plots (BMP 1-8) set up in 1993 (Fig. 3a; also see Roseneau *et al.* 1995, 1996a, 1997a). The multicount set included two plots used during the 1989-1991 and 1992 FWS damage assessment and restoration projects (one at East Amatuli Island and one on Light Rock; see Nysewander *et al.* 1993, Dragoo *et al.* 1995). We also counted some plot subsections separately because they were equivalent to four plots used during the 1990-1992 University of Washington (UW) studies (the OSTR plots: Oval, Swatch, Triangle Rock S, and Triangle Rock NW; see Boersma *et al.* 1995). The multicount plots sampled both central and peripheral nesting areas in general proportion to the number of birds using these habitats (see Roseneau *et al.* 1995, 1996a, 1997a). Plot boundaries were located using photographs in Alaska Maritime National Wildlife Refuge (AMNWR) files.

To census birds at Nord Island - Northwest Islet, we used 28 population census plots (BCP 1-28) and 11 multicount plots (BMP 1-11) set up during the 1993-1994 restoration studies (Fig. 2b; also see Roseneau *et al.* 1995, 1996a, 1997a). Twenty-six of these plots (BCP 1-10 and 12-27) were established during the 1989-1991 FWS damage assessment projects (e.g., Nysewander *et al.* 1993, Dragoo *et al.* 1995; population census plots BCP 1-10 and 24 were equivalent to multicount plots BMP 1-10 and 11, respectively—see Fig. 3b), and two (BCP 11 and 28) were set up in 1993

to cover areas containing small numbers of birds not reported earlier (see Roseneau *et al.* 1995, 1996a, 1997a). AMNWR photographs were used to locate plot boundaries.

All population census team members had previous experience counting murres at the Barren Islands seabird colonies. Two people censused East Amatuli Island - Light Rock several times during 1990-1996, one person helped count this nesting complex in 1995-1996, and the team leader censused both colonies on numerous occasions in 1993-1994 and 1996.

Census team members counted plots from outboard-powered, 4.8-m-long, ridged-hulled inflatable boats and inflatable rafts with the aid of 7 x 42 binoculars and hand-held tally meters (see Roseneau *et al.* 1995, 1996a, 1997a). Boats were tied to bull kelp *(Nereocystis spp.)* 30-90 m in front of the plots or were allowed to drift slowly past them at similar distances. Distances between birds and observers varied, depending on the height and configuration of the cliffs and other factors (e.g., presence of offshore rocks); however, these variables were kept as consistent as possible between counts, including those made during 1993-1995.

Counts were made during the part of the nesting season when attendance was most stable. The census period was defined as the interval between the peak of laying and first sea-going of chicks (e.g., Hatch and Hatch 1989; Byrd 1989; Roseneau *et al.* 1995, 1996a, 1997a). We used a combination of census guidelines, sun-time, and information on attendance patterns from previous Barren Islands studies to determine the best times of day for counting birds (e.g., Boersma *et al.* 1995; Dragoo *et al.*, unpubl. data). All counts were made during 1100-2000 hrs Alaska Daylight Time (ADT).

Plots were counted by two observers. During the counts, one person recorded the scores without revealing his or her own count to the other team member. The recorder compared the scores to see if they were within 15% of each other (i.e., within 7.5% of their average). If they were not and if time allowed, the plot was recounted until the scores fell within this range.

Birds were estimated by 10's; however, observers often counted the last group of individuals on a plot by 1's if the remaining birds consisted of less than 10 individuals (Roseneau *et al.* 1996a, 1997a). The only exceptions were three small East Amatuli Island multicount plots that were always counted by 1's to match UW methods (see Boersma *et al.* 1995), and the top of Light Rock, where birds were sometimes estimated by 50's, because of high densities.

We censused East Amatuli Island - Light Rock once, counted Light Rock four additional times, and censused multicount plots BMP 1-8 (see Fig. 2a) seven times. Nord Island - Northwest Islet was counted completely five times, and the 11 multicount plots (BMP 1-11; see Fig. 2b) were censused on one additional date.

To analyze the data, we calculated one-day totals for East Amatuli Island, Light Rock, East Amatuli Island - Light Rock multicount plots BMP 1-8 and 3-4, Nord Island - Northwest Islet, and Nord Island - Northwest Islet multicount plots BMP 1-11. We also calculated one-day totals for parts of multicount plots BMP 1, 5, and 8 at East Amatuli Island - Light Rock, because sections of these plots were equivalent to the UW OSTR plots. To obtain single values for the UW Light Rock, East Amatuli Island ("Mainland"), and East Amatuli Island - Light Rock ("E. Amatuli Island Total") counts reported by Boersma *et al.* (1995), we averaged numbers listed as ranges in Table 1 of their publication.[1] Results were pooled with corresponding data from previous FWS, UW, and D&M postspill studies (i.e., Nysewander and Dipple 1990, 1991; Dipple and Nysewander 1992; Nysewander *et al.* 1993, Dragoo *et al.* 1995; Roseneau *et al.* 1995, 1996a; Boersma *et al.* 1995; Erikson 1995). UW and D&M estimates were treated as additional counts and averaged with FWS

[1] Numbers listed as ranges in Table 1 of Boersma *et al.* (1995) were the individual scores of two observers making the counts (A.B. Kettle, pers. comm.).

data (e.g., the respective 1992 UW and FWS Light Rock scores of 9,655 and 5,960 birds were averaged to obtain an estimate of 7,808 individuals for that year). Linear regressions were run to test for trends, and differences between 1997 counts and averages of previous postspill estimates were checked with one-sample *t*-tests. The 0.1 significance level was used to increase the power of the tests and reduce Type II error (the 0.9 confidence interval was adequate for our purposes).

RESULTS

East Amatuli Island - Light Rock

At East Amatuli Island - Light Rock, we censused Light Rock (Appendices 1-5), East Amatuli Island (Appendix 6), and the eight multicount plots set up at the colony in 1993 (Appendices 7 and 8). The multicount data also provided information on the small 1989-1992 FWS and 1990-1992 UW plot sets (see Dragoo *et al.* 1995 and Boersma *et al.* 1995, respectively).

Multicount plots BMP 1-8 are the primary set of plots for monitoring post-1992 trends at the East Amatuli Island - Light Rock colony. This plot set, counted four to eight times each year since it was established in 1993, contains more plots, birds, and nesting habitat than the other sets of multicount plots that have longer count histories (e.g., BMP 3-4, UW OSTR plots).

No trend was found on multicount plots BMP 1-8 when 1997 data were included in the analysis (linear regression; see Table 1 and Fig. 4a). However, our 1997 estimate of 7,139 birds was significantly higher than the average of all previous counts on this plot set (1993-1996 mean = 5,570 individuals; one-sample *t*-test, $P = 0.001$, see Table 1).

The increase first detected on the smaller BMP 3-4 plot set in 1994 was still present (linear regression, $P < 0.01$, see Table 2 and Fig. 4b; also see Roseneau *et al.* 1996a), and this trend strengthened when 1997 data were included in the analysis ($P < 0.01$ in 1997 *vs* $P < 0.02$ in 1996; see Roseneau *et al.* 1997a). Also, our 1997 estimate of 1,959 birds was significantly higher than the average of all previous counts on these plots (1989-1996 mean = 1,137 individuals; one-sample *t*-test, $P < 0.001$, see Table 2).

In contrast, the UW OSTR plots did not exhibit a trend when 1997 data were included in the analysis (Regression Analysis; see Table 2 and Fig. 5a). Furthermore, the 1997 estimate of 880 birds did not differ from the average of all previous counts on these plots (1990-1996 mean = 808 individuals; one-sample *t*-test, see Table 2).

A positive trend was present in the Light Rock counts when 1997 data were included in the analysis (linear regression, $P = 0.04$, see Table 3 and Fig. 5b). Also, our 10,377 bird count was significantly higher than the average of all previous estimates on this plot set (1989-1996 mean = 7,809 individuals; one-sample *t*-test, $P = 0.001$, see Table 3). Although an increase was not apparent in the East Amatuli Island - Light Rock whole-colony counts, the 1997 score of 35,209 birds was significantly higher than the average of all previous estimates at this nesting complex (1991-1996 mean = 31,917 individuals; one-sample *t*-test, $P < 0.001$, see Table 3).

Nord Island - Northwest Islet

At Nord Island - Northwest Islet, we censused the whole colony (Appendices 9-13) and the 11 multicount plots that were set up in 1989 (Appendices 8 and 14). Trends were not found in the multicount plot and whole colony estimates over the 9-year postspill period (linear regression; see Table 1 and 3, and Figs. 7a and 7b, respectively). However, our respective 1997 counts of 3,835 and 16,423 birds were significantly higher than the averages of all previous estimates on these plot

sets (1989-1996 means = 3,294 and 12,451 individuals, respectively; one-sample *t*-test, $P = 0.09$ and < 0.001, respectively—see Table 1 and Table 3).

DISCUSSION

We found evidence that murre numbers were beginning to increase at the Barren Islands nesting colonies nine years after the spill. A positive trend, noted on a small East Amatuli Island - Light Rock plot set in 1994, strengthened when 1997 data were included in the analysis (Table 2, Fig. 4b). For the first time since postspill studies began, a significant increase was also evident on the much larger Light Rock section of the East Amatuli Island - Light Rock colony. Furthermore, with only one exception (the small OSTR plot set; Table 2, Fig. 5a), our counts at this nesting complex and the Nord Island - Northwest Islet colony were significantly higher than the averages of all previous postspill estimates on these plot sets (Tables 1-3).

The consistently high 1997 counts were correlated with the presence of large numbers of nonbreeding birds that were probably 3- and 4-year-old subadults belonging to the strong 1993-1994 chick cohorts (productivity was about 0.50 and 0.70 fledglings per egg at East Amatuli Island - Light Rock and 0.70 and 0.70 fledglings per egg at Nord Island - Northwest Islet in 1993 and 1994, respectively; see Roseneau *et al.* 1995, 1996a). These obvious nonbreeders were regularly seen roosting in groups of up to several hundred individuals in areas where birds were either absent or found in only small numbers during the 1993-1996 breeding seasons. They were also observed rafting on the water in front of both colonies in aggregations ranging from a few hundred to a few thousand individuals (e.g., on three occasions in late July - early August two to three groups totaling about 3,000 birds were loafing on the water just east of Nord Island when we counted the colony).

In two previous reports, we suggested censusing East Amatuli Island - Light Rock and Nord Island - Northwest Islet in 1997, because the likely presence of returning 3- and 4-year-old birds would improve the chances of finding positive increases in population numbers. Given the 1997 results, we believe that recounting these colonies in 1999, when 5- and 6-year-old individuals produced in 1993-1994 will be joined by 3- and 4-year-old birds from the strong 1995-1996 cohorts, may provide the information needed to satisfy recovery goals for common murres in the spill area (productivity was about 0.70 fledglings per egg at East Amatuli Island - Light Rock in 1995 and 1996; see Roseneau *et al.* 1996b, 1997b). Furthermore, recounting the Barren Islands murre colonies in 1999 will help identify any changes in population size that might result from El Niño and La Niña events that may strongly influence environmental conditions in the northern Gulf of Alaska in 1998-1999.

CONCLUSIONS

Evidence indicated that murre populations were beginning to increase at the Barren Islands nesting colonies. The presence of two positive trends and the high 1997 counts were associated with the presence of large numbers of nonbreeding birds that were probably 3- and 4-year-old subadults belonging to the strong 1993-1994 chick cohorts.

RECOMMENDATIONS

Based on 1997 results, we recommend censusing the East Amatuli - Light Rock and Nord Island - Northwest Islet common murre colonies again in 1999, when 3-, 4-, 5-, and 6-year-old individuals belonging to the strong 1993, 1994, 1995, and 1996 cohorts will be present. Counting the colonies when these birds join the population may provide the information needed to fulfill the

remaining recovery goals for this injured species in the spill area (a potential finding appropriate for the 10th anniversary of the spill). Also, censusing the colonies in 1999 will help identify any changes in population size that might result from El Niño and La Niña events that may strongly influence environmental conditions in the northern Gulf of Alaska in 1998-1999.

Note: In the case of common murres (and many other alcid species with delayed maturity), subadult birds begin returning to their natal colonies several years before first attempting to breed (e.g., Hudson 1985; also see Birkhead and Hudson 1977). Three-year-old birds begin visiting the nesting cliffs during the early incubation period and 4-year-old's are often present before laying begins. Percentages of returning subadults belonging to these age-classes average about 14% and 19%, respectively, and returns for 5- and 6-year-old birds are in the order of 13% and 16%, respectively (these are almost certainly underestimates, because they were derived from banded birds, and band losses increase with age of individuals). Percentages of 5- and 6-year-old birds that begin breeding at colonies average about 16% and 53%, respectively (see Harris et al. 1994).

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Table 1. Average counts of murres on the primary East Amatuli Island - Light Rock and Nord Island - Northwest Islet multicount plots at the Barren Islands, Alaska nesting colonies during 1989-1997 (numbers of counts are shown in parentheses; ND = no data).

Year	East Amatuli Island - Light Rock (EAILR) Multicount Plots BMP 1-8		Nord Island - Northwest Islet (NINI) Multicount Plots BMP 1-11	
	Numbers of Birds	CV(%)[a]	Numbers of Birds	CV(%)
1989[b]	ND		2,431 (2)	5.1
1990[b]	ND		4,383 (3)	12.9
1991[b]	ND		3,558 (2)	4.0
1992[c]	ND		2,971 (5)	10.6
1993[d]	5,807 (4)	6.9	4,003 (5)	12.9
1994[e]	5,599 (8)	4.9	2,890 (5)	22.1
1995[f]	5,225 (5)	11.2	ND	
1996[g]	5,648 (7)	7.0	2,825 (6)	6.3
1997[h]	7,139 (7)	11.1	3,835 (6)	8.8

Regression Analysis: Count vs. Year (Significance Level = 0.1)

EAILR Multicount Plots BMP 1-8	NINI Multicount Plots BMP 1-11
No significant correlation (n = 5)	No significant correlation (n = 8)

One-sample *t*-test: Average of all Previous Postspill Counts vs. 1997 Count (Significance Level = 0.1)

EAILR Multicount Plots BMP 1-8	NINI Multicount Plots BMP 1-11
$P = 0.001$ (n = 5)	$P = 0.09$ (n = 5)

[a] CV = coefficient of variation (standard deviation divided by the mean and multiplied by 100).
[b] Data are from Nysewander and Dipple (1990, 1991); Dipple and Nysewander (1992); and Nysewander *et al.* (1993). Counts on Nord Island - Northwest Islet plots BMP 1-11 were 2,519 and 2,343 (SD = 124.5) in 1989; 4,991, 3,869, and 4,288 (SD = 567.0) in 1990; and 3,659 and 3,457 (SD = 142.8) in 1991.
[c] Data are from Dragoo *et al.* (1995). Counts on Nord Island - Northwest Islet plots BMP 1-11 were 3,008, 2,637, 2,744, 3,449, and 3,016 (SD = 314.2) in 1992.
[d] Data are from Roseneau *et al.* (1995). Counts were 6,148, 5,835, 6,002, and 5,242 (SD = 397.6) on East Amatuli Island - Light Rock plots BMP 1-8, and 4,589, 4,513, 3,813, 3,479, and 3,623 (SD = 514.4) on Nord Island - Northwest Islet plots BMP 1-11 in 1993.

Table 1 (Continued).

[e] Data are from Roseneau *et al.* (1996a). Counts were 5,423, 5,215, 5,530, 6,145, 5,635, 5,741, 5,674, and 5,430 (SD = 277.0) on East Amatuli Island - Light Rock plots BMP 1-8, and 1,970, 2,685, 3,031, 3,046, and 3,718 (SD = 636.0) on Nord Island - Northwest Islet plots BMP 1-11 in 1994.

[f] Data are from Roseneau *et al.*, unpubl. data. Counts were 4,791, 5,074, 5,937, 4,597, and 5,727 (SD = 584.1) on East Amatuli Island - Light Rock plots BMP 1-8 in 1995.

[g] Data are from Roseneau *et al.* (1997a). Counts were 6,148, 5,504, 5,527, 5,099, 5,419, 6,198, and 5,638 (SD = 396.2) on East Amatuli Island - Light Rock plots BMP 1-8, and 3,035, 2,867, 2,659, 2,656, 2,704, and 3,028 (SD = 177.7) on Nord Island - Northwest Islet plots BMP 1-11 in 1996.

[h] Data are from this study (see Appendices 7 and 14). Counts were 6,427, 6,102, 7,851, 6,836, 7,835, 6,781, and 8,139 (SD = 795) on East Amatuli Island - Light Rock plots BMP 1-8, and 3,267, 3,662, 3,797, 4,072, 4,026, and 4,183 (SD = 357) on Nord Island - Northwest Islet plots BMP 1-11

Table 2. Average counts of murres on multicount plots BMP 3-4 and the four UW OSTR plots at the Barren Islands, Alaska nesting colonies during 1989-1997 (numbers of counts are shown in parentheses; ND = no data).

	East Amatuli Island - Light Rock			
	FWS Multicount Plots BMP 3-4		UW OSTR Plots	
Year	Numbers of Birds	CV(%)[a]	Numbers of Birds	CV(%)
1989	852 (2)[b]	14.8	ND	
1990	575 (2)[b]	32.8	648 (2-5)[c]	
1991	860 (2)[b]	27.2	811 (5-6)[c]	
1992	745 (5)[d]	32.6	818 (6-10)[c]	
1993	1,375 (8)[e]	12.6	1,003 (5)[e]	9.1
1994	1,246 (8)[f]	8.1	866 (8)[f]	5.4
1995	1,130 (5)[g]	14.7	724 (5)[g]	11.3
1996	1,392 (7)[h]	7.8	785 (7)[h]	8.2
1997	1,959 (7)[i]	16.7	880 (7)[i]	21.3

Regression Analysis: Count vs. Year (Significance Level = 0.1)

Multicount Plots BMP 3-4	UW OSTR Plots
$r^2 = 0.73$, H_0: Slope = 0, $P < 0.01$ (n = 9)	No significant correlation (n = 8)

One-sample *t*-test: Average of all Previous Postspill Counts vs. 1997 Count (Significance Level = 0.1)

Multicount Plots BMP 3-4	UW OSTR Plots
$P < 0.001$ (n = 9)	Not significant (n = 8)

[a] CV = coefficient of variation (standard deviation divided by the mean and multiplied by 100).

[b] Data are from Nysewander and Dipple (1990, 1991); Dipple and Nysewander (1992); and Nysewander *et al.* (1993). Counts on BMP 3-4 were 763 and 941 in 1989 (SD = 125.9); 708 and 441 in 1990 (SD = 188.8); and 1,025 and 694 (SD = 234.1) in 1991.

[c] Data are from Boersma *et al.* (1995). Only the averages of the counts were reported for 1990, 1991, and 1992. Numbers of counts were listed as ranges because they apparently varied among the four plots each year (e.g., in 1990, at least one plot was only counted two times and at least one was counted five times).

[d] Data are from Dragoo *et al.* (1995). Counts were 467, 948, 926, 893, and 493 (SD = 243.2) on BMP 3-4 in 1992.

[e] Data are from Roseneau *et al.* (1995). Counts were 1,580, 1,259, 1,540, 1,492, 1,505, 1,254, 1,263, and 1,110 (SD = 173.5) on BMP 3-4, and 1,091, 1,086, 1,022, 889, and 928 (SD = 91.7) on the OSTR plots in 1993.

[f] Data are from Roseneau *et al.* (1996a). Counts were 1,110, 1,153, 1,270, 1,439, 1,258, 1,301, 1,188, and 1,245 (SD = 101.1) on BMP 3-4, and 871, 788, 850, 949, 842, 899, 873, and 855 (SD = 46.4) on the OSTR plots in 1994.

Table 2 (Continued).

[g] Data are from Roseneau *et al.*, unpubl. data. Counts were 1,040, 1,148, 1,323, 900, and 1,238 (SD = 166.0) on BMP 3-4 and 652, 697, 793, 652, and 828 (SD = 81.7) on the OSTR plots in 1995.

[h] Data are from Roseneau *et al.* (1997a). Counts were 1,443, 1,408, 1,421, 1,326, 1,240, 1,580, and 1,329 (SD = 108.4) on BMP 3-4 (see Appendix 8), and 778, 709, 899, 823, 720, 788, and 775 (SD = 64.0) on the OSTR plots in 1996.

[i] Data are from this study. Counts were 1,683, 1,933, 2,295, 1,525, 2,085, 1,768, and 2,423 (SD = 328.1) on BMP 3-4 (see Appendix 8), and 713, 567, 982, 955, 1,073, 823, 1,047 (SD = 187.2) on the OSTR plots in 1996.

Table 3. Average counts of murres at the Barren Islands, Alaska East Amatuli Island - Light Rock and Nord Island - Northwest Islet colonies during 1989-1997 (numbers of counts are shown in parentheses).

	East Amatuli Island - Light Rock						Nord Island - Northwest Islet	
	East Amatuli Light Rock		East Amatuli Island		Entire Colony		Entire Colony	
Year	Number of Birds	CV(%)[a]	Number of Birds	CV(%)	Number of Birds	CV(%)	Number of Birds	CV(%)
1989	6,912 (2)[b]	10.2	ND[c]		ND		11,838 (2)[b]	6.5
1990	5,865 (2)[b]	10.5	ND		ND		12,278 (2)[b]	6.5
1991	9,256 (1)[d]		26,501 (1)[e]		31,660 (4)[f]	17.9	14,419 (3)[g]	13.1
1992	7,808 (2)[h]	33.5	25,129 (1)[i]		34,784 (1)[j]		11,212 (1)[k]	
1993[l]	8,454 (4)	8.4	24,775 (2)	6.5	32,722 (2)	5.7	13,422 (4)	15.5
1994[m]	7,750 (5)	7.5	25,054 (2)	3.2	32,871 (2)	0.7	11,797 (4)	11.0
1996[n]	8,620 (4)	13.0	19,722 (1)		27,550 (1)		11,688 (3)	5.3
1997[o]	10,377 (5)	4.3	25,400 (1)		35,209 (1)		16,423 (5)	6.2

Regression Analysis: Count vs. Year (Significance Level = 0.1)

East Amatuli Light Rock

$r^2 = 0.52$, H_0: Slope = 0, $P = 0.04$ (n = 8)

Nord Island - Northwest Islet

No significant correlation (n = 8)

One-sample *t*-test: Average of all Previous Postspill Counts vs. 1997 Count (Significance Level = 0.1)

East Amatuli Light Rock

$P = 0.001$ (n = 8)

Nord Island - Northwest Islet

$P < 0.001$ (n = 8)

East Amatuli Island - Light Rock

$P < 0.01$ (n = 6)

[a] CV = coefficient of variation [standard deviation (SD) divided by the mean and multiplied by 100].

[b] Data are from Nysewander and Dipple (1990, 1991), Dipple and Nysewander (1992), Nysewander *et al.* (1993). Counts at Light Rock were 7,410 and 6,413 in 1989 (SD = 705.0), and 5,430 and 6,300 in 1990 (SD = 615.2), and counts at Nord Island - Northwest Islet were 12,381 and 11,294 in 1989 (SD = 768.6), and 11,713 and 12,842 (SD = 768.6) in 1990.

[c] ND = no data.

[d] Data are from Boersma *et al.* (1995). The number listed here is the average of the two values reported in Table 1 of their publication (8,918 and 9,594; mean = 9,256); in all cases, numbers that appear to be ranges in their table are the individual scores of two observers. The previously reported single 1991 FWS count of 5,529 murres was not used, because it included 3,429 birds on the cliffs and 2,100 individuals on nearby waters (see Nysewander and Dippel 1991).

Table 3 (Continued).

[e] Data are from Boersma *et al.* (1995). The number listed here is the average of the two values (25,468 and 27,534; mean = 26,501) reported in Table 1 of their publication.

[f] Data are from Boersma *et al.* (1995; Table 1) and Erikson (1995; Table 2). The number listed here was derived by averaging the two values (34,386 and 37,128; mean = 35,757) reported by Boersma *et al.*, and then averaging this number with three counts made by Erikson (28,660, 25,213, and 37,010; mean of four counts = 31,660, SD = 5,656.0).

[g] Data are from Dipple and Nyswander (1992), Nyswander *et al.* (1993), and Erikson (1995). The number listed here is the average of two counts reported by Dipple and Nyswander and Nyswander *et al.* (13,404 and 13,262) and the count made by Erikson (16,592; mean of three counts = 14,419, SD of three counts = 1,882.9).

[h] Data are from Dragoo *et al.* (1995) and Boersma *et al.* (1995; Table 1). The number listed here was derived by averaging the two values (9,573 and 9,736, mean = 9,655) reported by Boersma *et al.*, and then averaging this number with the count made by Dragoo *et al.* (5,960; mean of two counts = 7,808, SD = 2,612.8).

[i] Data are from Boersma *et al.* (1995; Table 1). The number listed here is the average of the two values reported in their publication (24,814 and 25,444; mean = 25,129).

[j] Data are from Boersma *et al.* (1995; Table 1). The number listed here is the average of the two values reported in their publication (34,387 and 35,180; mean = 34,784).

[k] Data are from Dragoo *et al.* (1995).

[l] Data are from Roseneau *et al.* (1995). Counts were 9,414, 8,134, 7,760, and 8,507 (SD = 709.1) at Light Rock; 23,632 and 25,917 (SD = 1,615.7) at East Amatuli Island; 31,392 and 34,051 (SD = 1,880.2) at East Amatuli Island - Light Rock; and 12,474, 16,484, 12,817, and 11,913 (SD = 2,075.1) at Nord Island - Northwest Islet in 1993.

[m] Data are from Roseneau *et al.* (1996a). Counts were 6,749, 7,412, 8,450, 7,916, and 8,223 (SD = 681.5) at Light Rock; 25,615 and 24,492 (SD = 794.1) at East Amatuli Island; 33,027 and 32,715 (SD = 220.6) at East Amatuli Island - Light Rock; and 11,071, 10,461, 12,296, and 13,361 (SD =1,291.9) at Nord Island - Northwest Islet in 1994 (the average East Amatuli Island and East Amatuli Island - Light Rock counts of 25,195 and 33,011 listed in Table 1 of Roseneau *et al.* 1996a were incorrect; the corrected values of 24,054 and 32,871 are reported here).

[n] Data are from Roseneau *et al.* (1997). Counts were 7,828, 8,294, 10,273, and 8,133 (SD = 1,116.3) at Light Rock, and 12,392, 11,199, and 11,474 (SD = 624.7) at Nord Island - Northwest Islet in 1996.

[o] Data are from this study (see Appendices 1-5 and 9-13). Counts were 10,511, 9,809, 10,022, 10,757, and 10,787 (SD = 441.3) at Light Rock, and 15,137, 17,260, 15,506, 16,932, and 17,278 (SD = 1,023.2) at Nord Island - Northwest Islet in 1997.

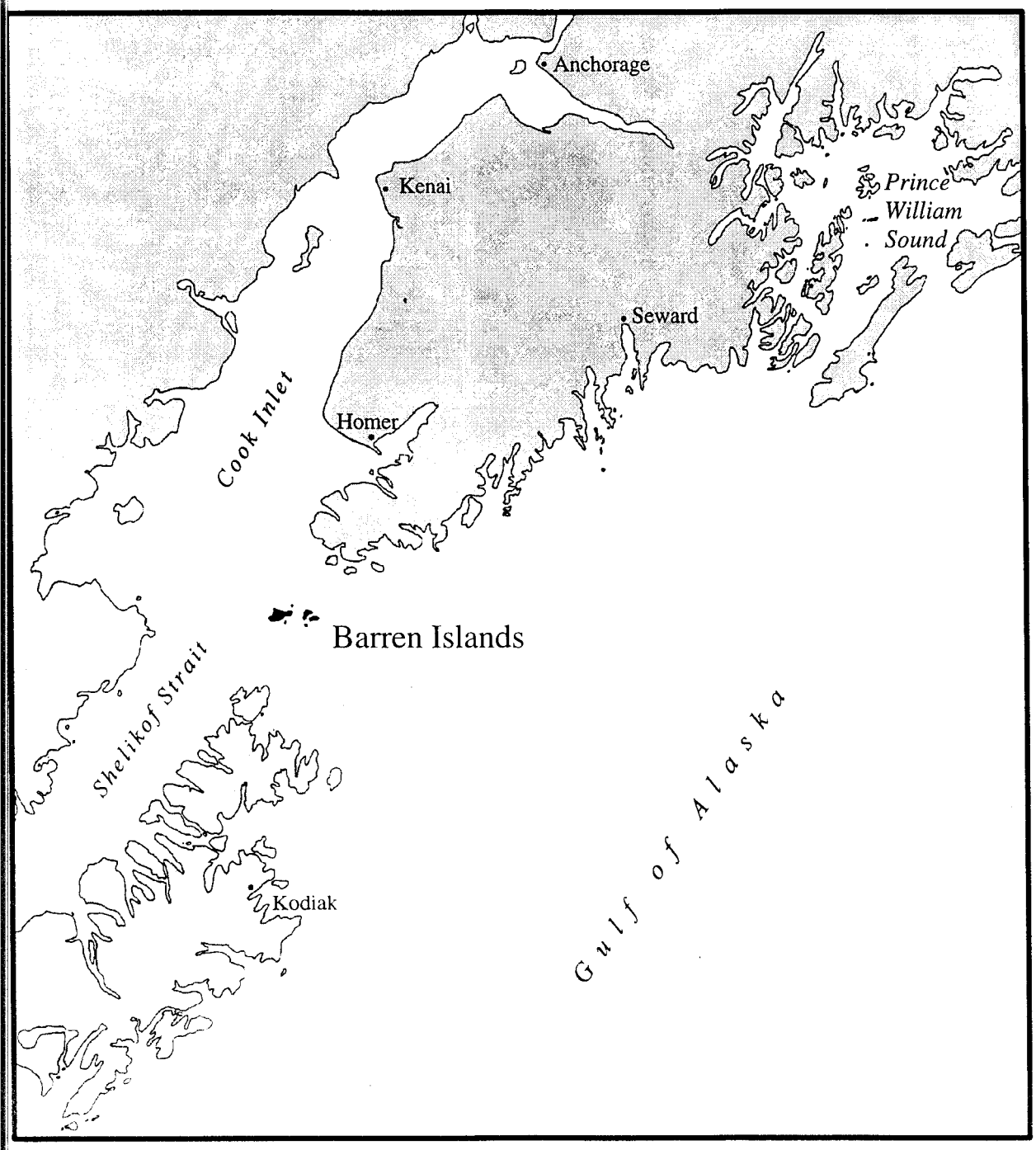

Figure 1. Location of the Barren Islands, Alaska.

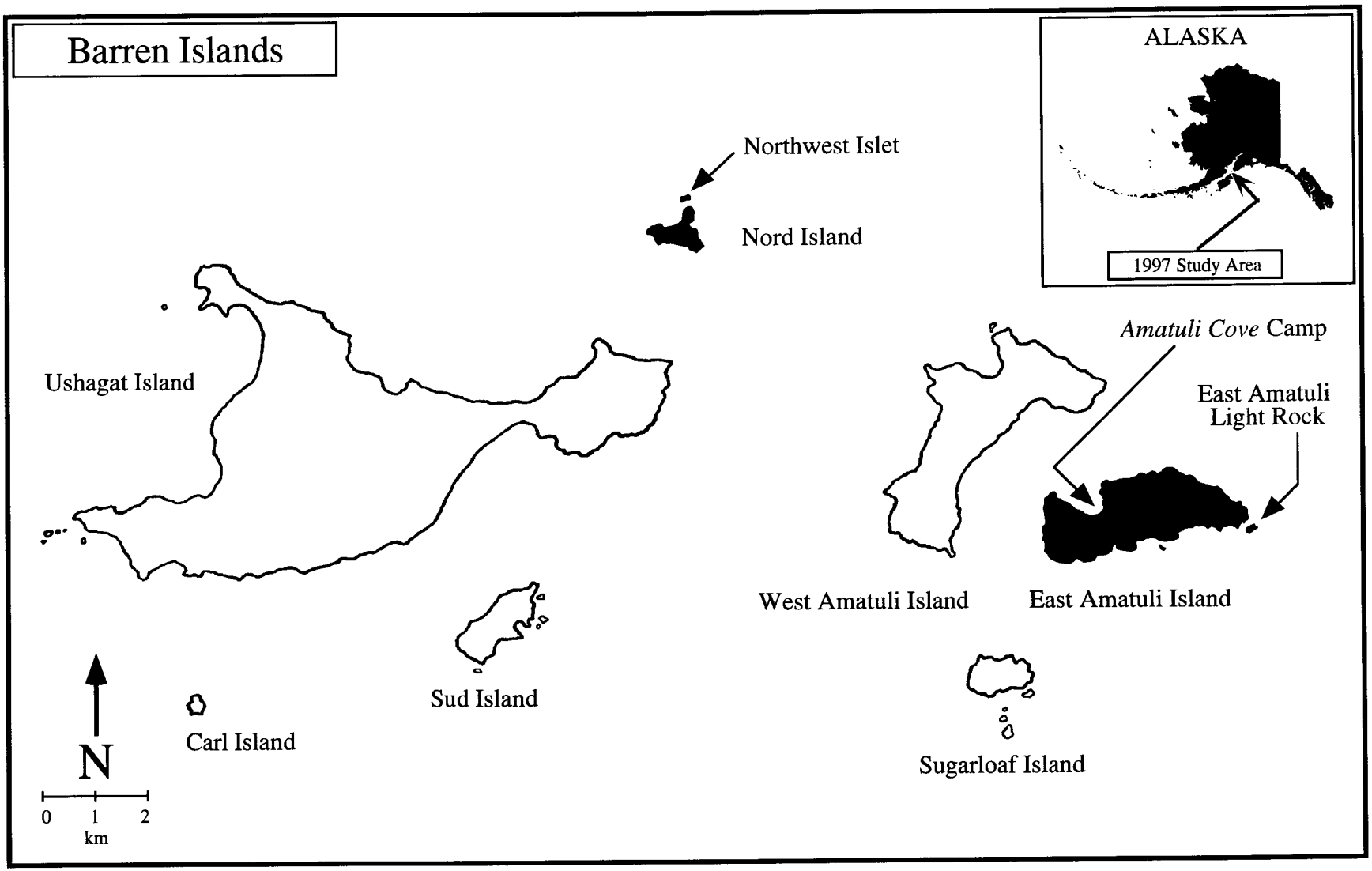

Figure 2. The East Amatuli Island - Light Rock and Nord Island - Northwest Islet study areas (in black), Barren Islands, Alaska (the study areas contain all of the known murre nesting habitat in the island group).

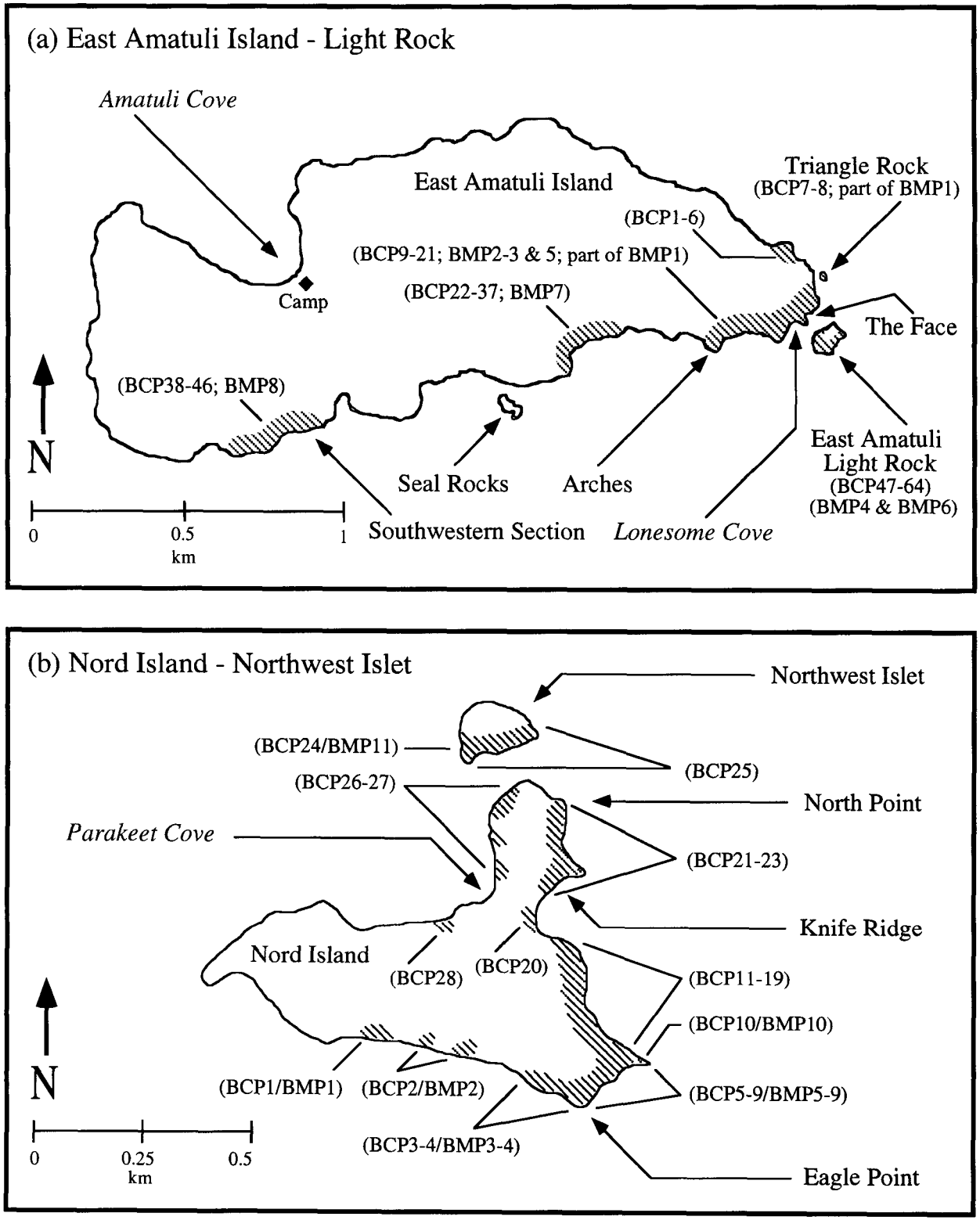

Figure 3. Murre nesting habitat (shaded areas), population census plots (BCP), and multicount plots (BMP) at the (a) East Amatuli Island - Light Rock and (b) Nord Island - Northwest Islet seabird colonies, Barren Islands, Alaska.

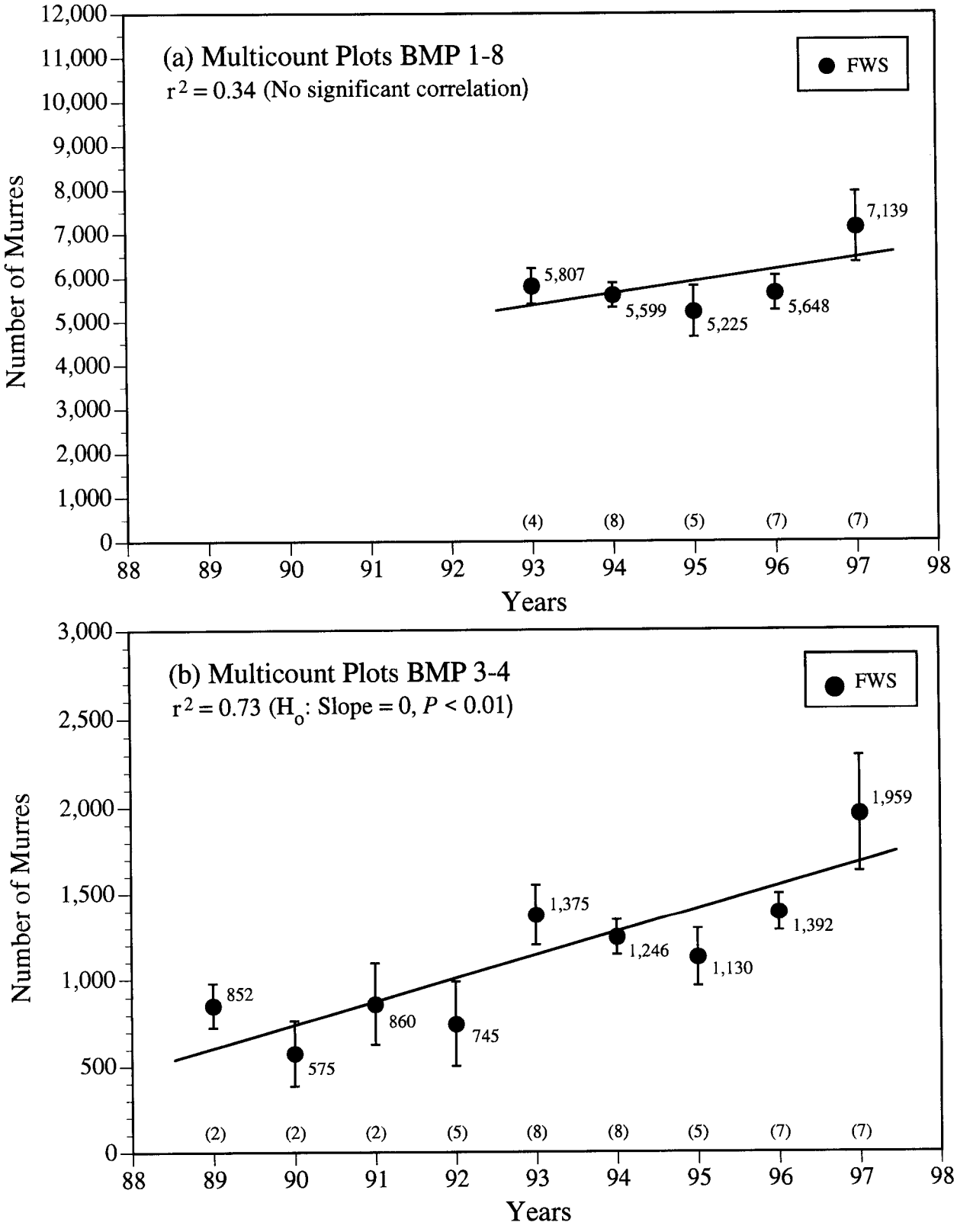

Figure 4. Average counts of murres on (a) East Amatuli Island - Light Rock multicount plots BMP 1-8 and (b) BMP 3-4, Barren Islands, Alaska 1989-1997. Counts were made by the U.S. Fish and Wildlife Service (FWS). Number of counts shown in parentheses; error bars = standard deviation.

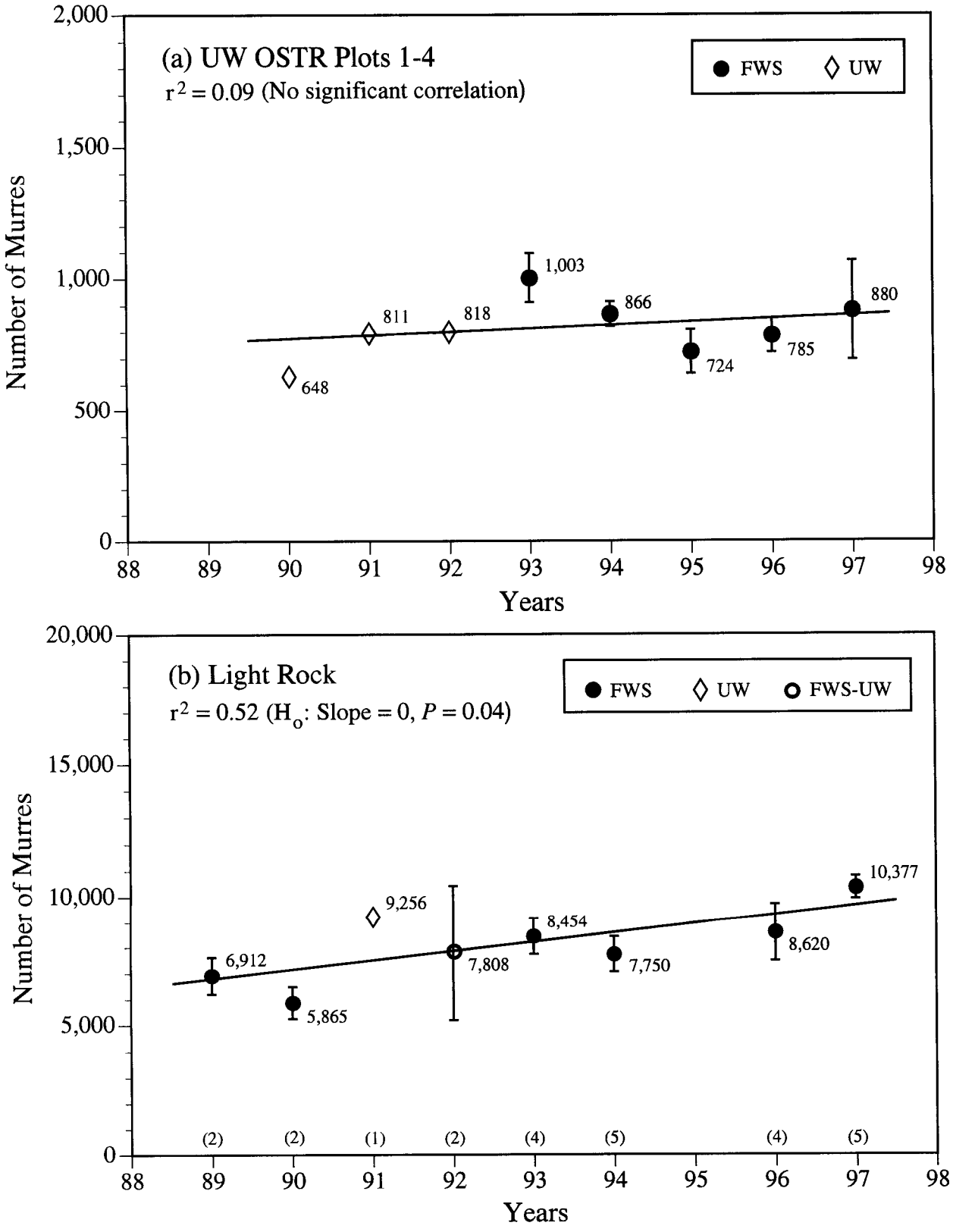

Figure 5. Average counts of murres on (a) the University of Washington (UW) Oval, Swatch, Triangle Rock NW, and Triangle Rock S (OSTR) plots, and (b) Light Rock, Barren Islands, Alaska 1989-1997. Counts were made by UW (see Boersma *et al.* 1995) and the U.S. Fish and Wildlife Service (FWS). Number of counts shown in parentheses; error bars = standard deviation.

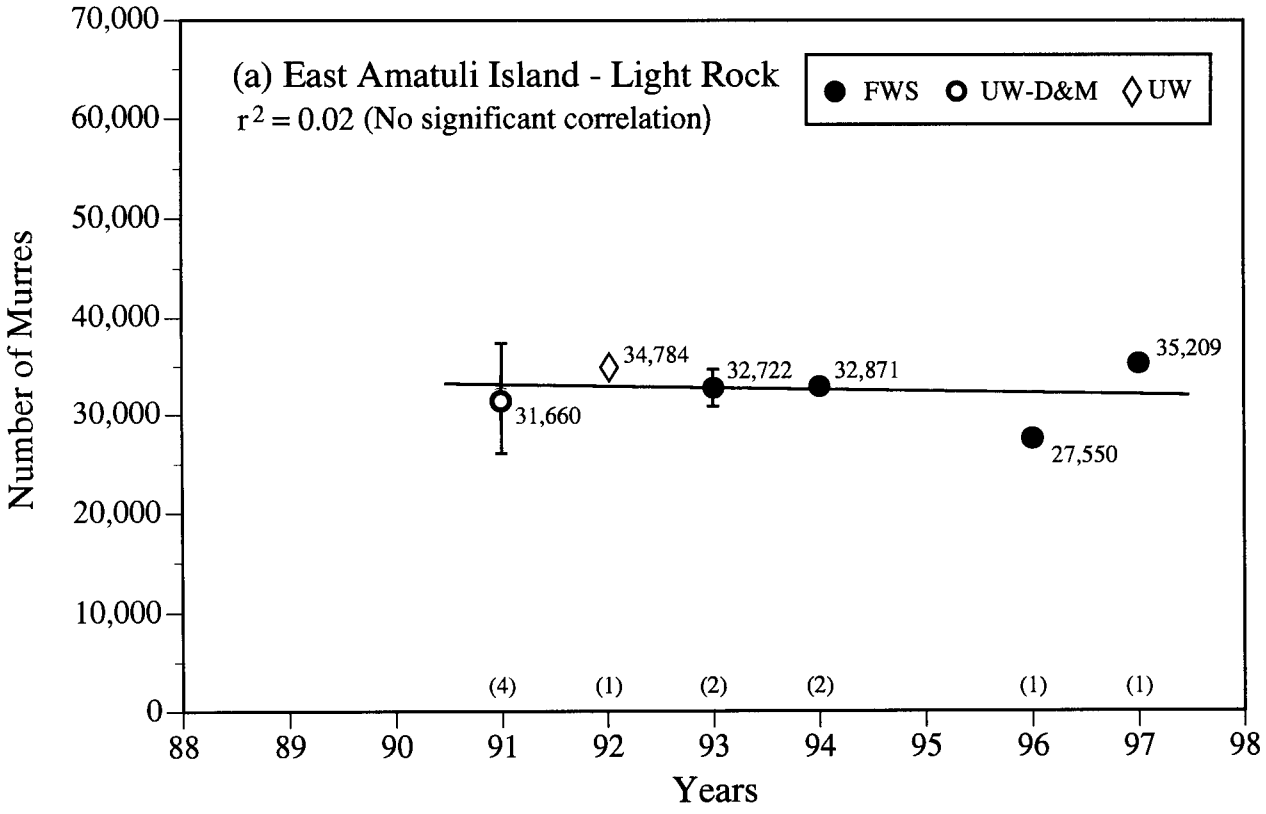

Figure 6. Average counts of murres at East Amatuli Island - Light Rock, Barren Islands, Alaska 1991-1997. Counts were made by the University of Washington (UW; see Boersma *et al.* 1995), Dames & Moore (D&M; see Erikson 1995), and the U.S. Fish and Wildlife Service (FWS). Number of counts shown in parentheses; error bars = standard deviation.

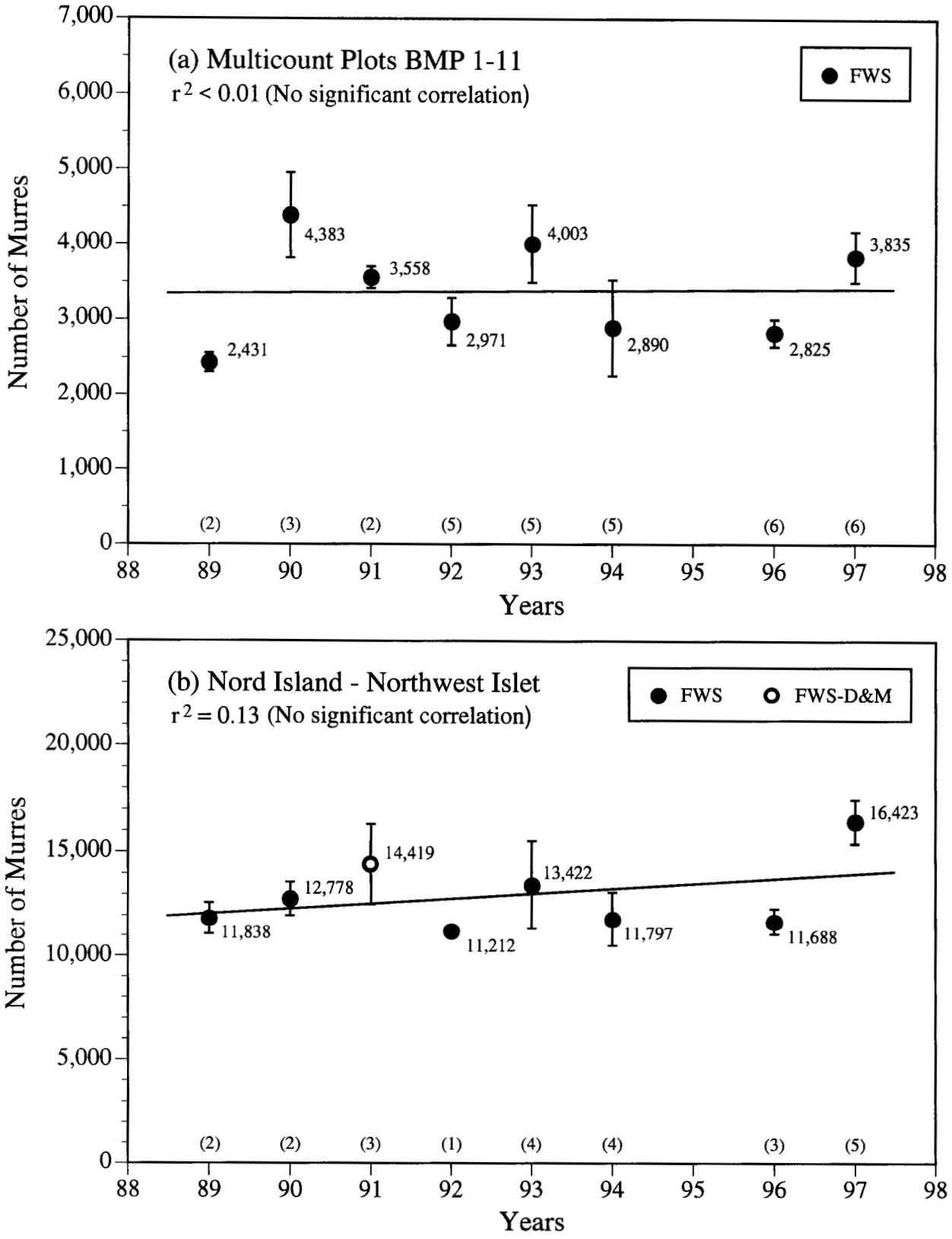

Figure 7. Average counts of murres on (a) Nord Island - Northwest Islet multicount plots BMP 1-11 and (b) Nord Island - Northwest Islet, Barren Islands, Alaska 1989-1997. Counts were made by the U.S. Fish and Wildlife Service (FWS) and Dames & Moore (D&M, see Erikson 1995). Number of counts shown in parentheses; error bars = standard deviation.

Appendix 1. Counts of murres at East Amatuli Light Rock, 25 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

FWS Plot Number	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP47	1623	270	270		270	270			270	270
BCP48	1658	1,050			1,050	1,070			1,070	1,060
BCP49	1630	200	200		200	200			200	200
BCP50	1625	70	70		70	60			60	65
BCP51	1635	1,130			1,130	1,080			1,080	1,105
BCP52	1715	430			430	430			430	430
BCP53	1641	550	530		540	560			560	550
BCP54	1650	1,200			1,200	1,250			1,250	1,225
BCP55	1735	600			600	630			630	615
BCP56	1727	550	540		545	560			560	553
BCP57	[Included in BCP61]									
BCP58	1745	240	230		235	250			250	243
BCP59	1750	480	500		490	540			540	515
BCP60	1741	170			170	160			160	165
BCP61+57	1810	3,290	3,340		3,315	2,720			2,720	3,018
BCP62	1757	160	170		165	150	180		165	165
BCP63	1801	100	100		100	100			100	87
BCP64	1708	240	240		240	250			250	245
TOTAL (Whole Rock)		10,730			10,750	10,280			10,295	10,511

Appendix 2. Counts of murres at East Amatuli Light Rock, 26 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

FWS Plot Number	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP47	1530	275			275	270			270	273
BCP48	1538	790			790	760			760	775
BCP49	1550	210	220		215	210			210	213
BCP50	1547	60	60		60	60			60	60
BCP51	1524	990	1,050		1,020	1,060			1,060	1,040
BCP52	1618	390			390	390			390	390
BCP53	1554	540	560		550	530			530	540
BCP54	1605	1,200	1,130		1,165	1,190			1,190	1,178
BCP55	1613	580			580	580			580	580
BCP56	1713	600	580		590	570			570	580
		Observer 1 (ABK)				Observer 2 (SZ)				
BCP57	[Included in BCP61]									
BCP58	1717	270			270	280			280	275
BCP59	1720	400			400	400			400	400
		Observer 1 (DGR)				Observer 2 (MAB)				
BCP60	1631	240			240	230			230	235
BCP61+57	1643	2,760	3,140		2,950	2,880			2,880	2,915
BCP62	1634	130	130		130	130			130	130
BCP63	1637	90	90		90	90			90	90
BCP64	1448	130	130		130	140			140	135
TOTAL (Whole Rock)		9,655			9,845	9,770			9,770	9,809

Appendix 3. Counts of murres at East Amatuli Light Rock, 27 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

FWS Plot Number	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP47	1320	270			270	250			250	260
BCP48	1254	950	1,000	1,020	990	1,010	950		980	985
BCP49	1315	220	220		220	220			220	220
BCP50	1312	60	60		60	60	60		60	60
BCP51	1338	920	1,010	1,000	977	1,050	1,020		1,035	1,006
BCP52	1353	390			390	370			370	380
BCP53	1358	530	510	560	533	470	450		460	497
BCP54	1413	1,130	1,150		1,140	1,040			1,040	1,090
BCP55	1432	490			490	500			500	495
BCP56	1423	570			570	560			560	565
BCP57	[Included in BCP61]									
BCP58	1509	360	340		350	350			350	350
BCP59	1518	470	520		495	530			530	513
BCP60	1520	200	180	190	190	170	170		170	180
BCP61+57	1446	2,940	3,040		2,990	2,710	2,810		2,760	2,875
BCP62	1944	210	220		215	210			210	213
BCP63	1435	110	110		110	110			110	110
BCP64	1325	220	220		220	240	210		225	223
TOTAL (Whole Rock)		10,040			10,210	9,850			9,830	10,022

Appendix 4. Counts of murres at East Amatuli Light Rock, 29 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

FWS Plot Number	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP47	1717	250			250	235			235	243
BCP48	1703	1,080			1,080	1,040			1,040	1,060
BCP49	1710	230	240		235	250			250	243
BCP50	1707	70	65		68	65			65	66
BCP51	1727	1,000			1,000	1,020			1,020	1,010
BCP52	1745	430			430	440			440	435
BCP53	1730	530			530	540	540		540	535
BCP54	1740	1,180			1,180	1,230			1,230	1,205
BCP55	1800	720			720	710			710	715
BCP56	1750	620	600		610	540	540		540	575
BCP57	[Included in BCP61]									
BCP58	1820	300	320		310	310			310	310
BCP59	1827	600	580	560	580	520	520		520	550
BCP60	1810	250			250	240			240	245
BCP61+57	1851	2,943			2,943	3,105			3,105	3,024
BCP62	1806	200			200	200			200	200
BCP63	1835	120	120		120	125			125	123
BCP64	1720	210	220		215	220			220	218
TOTAL (Whole Rock)		10,733			10,721	10,790			10,790	10,757

Appendix 5. Counts of murres at East Amatuli Light Rock, 7 August 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

FWS Plot Number	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	Average
BCP47	1802	260			260	220			220	240
BCP48	1754	1,160			1,160	1,180			1,180	1,170
BCP49	1750	200	200		200	210			210	205
BCP50	1747	70	70		70	60			60	65
BCP51	1810	1,120			1,120	1,160			1,160	1,140
BCP52	1827	480			480	460			460	470
BCP53	1817	780			780	850			850	815
BCP54	1823	1,250			1,250	1,150			1,150	1,200
BCP55	1842	460			460	460			460	460
BCP56	1832	540			540	470			470	505
BCP57	[Included in BCP61]									
BCP58	1850	290	310		300	280			280	290
BCP59	1855	540	490	530	520	550	550		550	535
BCP60	1846	240			240	210			210	225
BCP61+57	1910	2,968			2,968	3,065			3,065	3,017
BCP62	1838	140	140		140	130			130	135
BCP63	1904	105	105		105	95			95	100
BCP64	1806	210			210	220			220	215
TOTAL (Whole Rock)		10,813			10,803	10,770			10,770	10,787

Appendix 6. Counts of murres at East Amatuli Island, 26 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau; MAB = Margaret A. Blanding; ABK = Arthur B. Kettle; SZ = Stephanie Zuniga.

FWS Plot Number	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	1129	65			65	66			66	66
BCP2	1120	40			40	35			35	38
BCP3	1135	15			15	15			15	15
BCP4	1135	75	75		75	82			82	79
BCP5	1140	75			75	74			74	75
BCP6	1147	140			140	140			140	140
BCP6.1	1150	20			20	20			20	20
BCP7	1151	185			185	175			175	180
BCP8	1200	120			120	130			130	125
BCP9	1150	310	320		315	318			318	317
BCP10	1206	75			75	70			70	73
BCP11	1307	250	250	250	250	260			260	255
BCP12	1310	450	450		450	450			450	450
BCP13	1319	850			850	860			860	855
BCP14	1218	1,100	1,150		1,125	1,060			1,060	1,093
BCP15	1258	450	480		465	470			470	468
BCP16	1336	2,360			2,360	2,570			2,570	2,465
BCP17	1244	3,020			3,020	2,640			2,640	2,830
BCP18	1720	660			660	680			680	670
BCP19	1724	240	240		240	220			220	230
		Observer 1 (ABK)				Observer 2 (SZ)				
BCP20	1530	1,435			1,435	1,300			1,300	1,368
BCP21		3,495			3,495	3,515			3,515	3,505
BCP22	1448	1,030			1,030	1,120			1,120	1,075
BCP23		1,730			1,730	1,890			1,890	1,810
BCP24	1434	1,050			1,050	910			910	980
BCP25	1417	950			950	940			940	945
BCP26	1420	170			170	180			180	175
BCP27		45			45	50			50	48

Appendix 6 (Continued).

FWS Plot Number	Time	Observer 1 (ABK)				Observer 2 (SZ)				Observer 1 & 2
		Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	Average
BCP28	1405	220			220	205			205	213
BCP29	1402	170			170	178			178	174
BCP30	1358	700			700	780			780	740
BCP31	1353	605			605	540			540	573
BCP32	1340	50			50	57			57	54
BCP33	1306	678			678	651			651	665
BCP34	1317	220			220	200			200	210
BCP35	1322	160			160	180			180	170
BCP36	1331	90			90	90			90	90
BCP37	1251	245			245	262			262	254
BCP38	1241	90			90	99			99	95
BCP39	1235	53			53	55			55	54
BCP40	1233	37			37	43			43	40
BCP41	1229	70			70	73			73	72
BCP42	1221	440			440	428			428	434
BCP43	1219	85			85	90			90	88
BCP44	1155	730	770		750	850	780		815	783
BCP45	1140	225			225	210			210	218
BCP46	1130	115			115	130			130	123
TOTAL (Whole Island)		25,388			25,453	25,361			25,326	25,400

Appendix 7. Counts of murres on multicount plots at East Amatuli Island - Light Rock, 1997.

Note: Counts were made by 1's and 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate that the plots are census plots counted from boats, not land; BMP numbers indicate that the plots are also mulitcount plots that are counted from boats at least five separate times on different days to help track population trends; ABK = Arthur B. Kettle; MAB = Margaret A. Blanding; DGR = David G. Roseneau; SZ = Stephanie Zuniga.

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (ABK)					Observer 2 (SZ)					Observer 1 & 2 Average
				Count 1	Count 2	Count 3	Count 4	Average	Count 1	Count 2	Count 3	Count 4	Average	
BMP1	BCP7-9	6 Jul	1750	505				505	513				513	509
BMP2	BCP11-12	6 Jul	1740	391				391	360				360	376
BMP3	BCP18-19	6 Jul	1730	835				835	800				800	818
BMP4	Part of BCP47-49	6 Jul	1721	830				830	900				900	865
Subtotal	*4 Plots: BMP1-4*			*2,561*				*2,561*	*2,573*				*2,573*	*2,568*
BMP5	Part of BCP20-21	6 Jul	1902	1,145				1,145	1,150				1,150	1,148
Subtotal	*5 Plots: BMP1-5*			*3,706*				*3,706*	*3,723*				*3,723*	*3,716*
BMP6	BCP51	6 Jul	1710	980				980	910				910	945
BMP7	BCP22	6 Jul	1816	975				975	1,090				1,090	1,033
BMP8	BCP38-42	6 Jul	1840	750				750	716				716	733
Subtotal	*7 Plots: BMP1-5 & 7-8*			*5,431*				*5,431*	*5,529*				*5,529*	*5,482*
TOTAL	8 Plots: BMP1-8	6 Jul		6,411				6,411	6,439				6,439	6,427
BMP1	BCP7-9	7 Jul	1540	222				222	222				222	222
BMP2	BCP11-12	7 Jul	1553	540				540	570				570	555
BMP3	BCP18-19	7 Jul	1615	1,005				1,005	1,070				1,070	1,038
BMP4	Part of BCP47-49	7 Jul	1610	950				950	840				840	895
Subtotal	*4 Plots: BMP1-4*			*2,717*				*2,717*	*2,702*				*2,702*	*2,710*
BMP5	Part of BCP20-21	7 Jul	1523	750				750	790				790	770
Subtotal	*5 Plots: BMP1-5*			*3,467*				*3,467*	*3,492*				*3,492*	*3,480*

Appendix 7 (Continued).

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (ABK) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (SZ) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP6	BCP51	7 Jul	1610	1,050				1,050	1,070				1,070	1,060
BMP7	BCP22	7 Jul	1515	890				890	950				950	920
BMP8	BCP38-42	7 Jul	1440	652				652	632				632	642
Subtotal	*7 Plots: BMP1-5 & 7-8*			*5,009*				*5,009*	*5,074*				*5,074*	*5,042*
TOTAL	8 Plots: BMP1-8	7 Jul		6,059				6,059	6,144				6,144	6,102
				Observer 1 (MAB)					Observer 2 (SZ)					
BMP1	BCP7-9	15 Jul	1830	760				760	732				732	746
BMP2	BCP11-12	15 Jul	1804	720				720	730				730	725
BMP3	BCP18-19	15 Jul		1,020				1,020	1,000				1,000	1,010
BMP4	Part of BCP47-49	15 Jul	1743	1,250				1,250	1,320				1,320	1,285
Subtotal	*4 Plots: BMP1-4*			*3,750*				*3,750*	*3,782*				*3,782*	*3,766*
BMP5	Part of BCP20-21	15 Jul	1733	1,050				1,050	1,090				1,090	1,070
Subtotal	*5 Plots: BMP1-5*			*4,800*				*4,800*	*4,872*				*4,872*	*4,836*
BMP6	BCP51	15 Jul	1705	1,050				1,050	1,050				1,050	1,050
BMP7	BCP22	15 Jul	1901	1,150				1,150	1,160				1,160	1,155
BMP8	BCP38-42	15 Jul	1918	794				794	825				825	810
Subtotal	*7 Plots: BMP1-5 & 7-8*			*6,744*				*6,744*	*6,857*				*6,857*	*6,801*
TOTAL	8 Plots: BMP1-8	15 Jul		7,794				7,794	7,907				7,907	7,851
				Observer 1 (DGR)					Observer 2 (MAB)					
BMP1	BCP7-9	23 Jul	1805	790				790	849				849	820

Appendix 7 (Continued).

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP2	BCP11-12	23 Jul	1235	810	830			820	800	790			795	808
BMP3	BCP18-19	23 Jul	1207	690				690	720				720	705
BMP4	Part of BCP47-49	23 Jul	1152	810				810	830				830	820
Subtotal	*4 Plots: BMP1-4*			*3,100*				*3,110*	*3,199*				*3,194*	*3,153*
BMP5	Part of BCP20-21	23 Jul	1359	770				770	770				770	770
Subtotal	*5 Plots: BMP1-5*			*3,870*				*3,880*	*3,969*				*3,964*	*3,923*
BMP6	BCP51	23 Jul	1241	1,080				1,080	1,110				1,110	1,095
BMP7	BCP22	23 Jul	1307	1,100	1,210			1,155	1,170				1,170	1,163
				Observer 1 (ABK)					Observer 2 (SZ)					
BMP8	BCP38-42	23 Jul	1250	644				644	666				666	655
Subtotal	*7 Plots: BMP1-5 & 7-8*			*5,614*				*5,679*	*5,805*				*5,800*	*5,741*
TOTAL	8 Plots: BMP1-8	23 Jul		6,694				6,759	6,915				6,910	6,836
				Observer 1 (DGR)					Observer 2 (MAB)					
BMP1	BCP7-9	25 Jul	1935	775	795			785	810				810	798
BMP2	BCP11-12	25 Jul	1941	890				890	920				920	905
BMP3	BCP18-19	25 Jul	1913	1,060				1,060	1,070				1,070	1,065
BMP4	Part of BCP47-49	25 Jul	1921	1,050				1,050	990				990	1,020
Subtotal	*4 Plots: BMP1-4*			*3,775*				*3,785*	*3,790*				*3,790*	*3,788*
BMP5	Part of BCP20-21	25 Jul	1927	1,000				1,000	970				970	985
Subtotal	*5 Plots: BMP1-5*			*4,775*				*4,785*	*4,760*				*4,760*	*4,773*

Appendix 7 (Continued).

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP6	BCP51	25 Jul	1635	1,130				1,130	1,080				1,080	1,105
BMP7	BCP22	25 Jul	1903	1,140				1,140	1,100				1,100	1,120
BMP8	BCP38-42	25 Jul	1839	837				837	837				837	837
Subtotal	*7 Plots: BMP1-5 & 7-8*			*7,882*				*7,892*	*7,777*				*7,777*	*7,835*
TOTAL	8 Plots: BMP1-8	25 Jul		7,882				7,892	7,777				7,777	7,835
BMP1	BCP7-9	26 Jul	1151	615				615	628				628	622
BMP2	BCP11-12	26 Jul	1307	700	700			700	710				710	705
BMP3	BCP18-19	26 Jul	1720	900				900	900				900	900
BMP4	Part of BCP47-49	26 Jul	1440	880	900			890	820	870			845	868
Subtotal	*4 Plots: BMP1-4*			*3,095*				*3,105*	*3,058*				*3,083*	*3,095*
BMP5	Part of BCP20-21	26 Jul	1604	840				840	820				820	830
Subtotal	*5 Plots: BMP1-5*			*3,935*				*3,945*	*3,878*				*3,903*	*3,925*
BMP6	BCP51	26 Jul	1524	990	1,050			1,020	1,060				1,060	1,040
BMP7	BCP22	26 Jul	1448	1,030				1,030	1,120				1,120	1,075
				Observer 1 (ABK)					Observer 2 (SZ)					
BMP8	BCP38-42	26 Jul	1225	735				735	746				746	741
Subtotal	*7 Plots: BMP1-5 & 7-8*			*5,700*				*5,710*	*5,744*				*5,769*	*5,741*
TOTAL	8 Plots: BMP1-8	26 Jul		6,690				6,730	6,804				6,829	6,781
				Observer 1 (DGR)					Observer 2 (MAB)					
BMP1	BCP7-9	27 Jul	1916	873				873	888				888	881

Appendix 7 (Continued).

New FWS Multicount Plot Number	New FWS Boat Plot Number & Former FWS Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP2	BCP11-12	27 Jul	1717	680				680	690				690	685
BMP3	BCP18-19	27 Jul	1945	1,220				1,220	1250				1,250	1,235
				Observer 1 (ABK)					Observer 2 (SZ)					
BMP4	Part of BCP47-49	27 Jul	1709	1,190	1,140			1,165	1,210				1,210	1,188
Subtotal	*4 Plots: BMP1-4*			*3,090*				*3,065*	*3,150*				*3,150*	*3,108*
BMP5	Part of BCP20-21	27 Jul	1925	1,110				1,110	1,140				1,140	1,125
Subtotal	*5 Plots: BMP1-5*			*4,200*				*4,175*	*4,290*				*4,290*	*4,233*
				Observer 1 (DGR)					Observer 2 (MAB)					
BMP6	BCP51	27 Jul	1338	920	1,010	1,000		977	1,050	1020			1,035	1,006
				Observer 1 (ABK)					Observer 2 (SZ)					
BMP7	BCP22	27 Jul	1918	1,120				1,120	1,230				1,230	1,175
BMP8	BCP38-42	27 Jul	1850	835				835	853				853	844
Subtotal	*7 Plots: BMP1-5 & 7-8*			*6,155*				*6,130*	*6,373*				*6,373*	*6,252*
TOTAL	8 Plots: BMP1-8	27 Jul		7,075				7,107	7,423				7,408	8,139
Mean of 7 counts on 4 plots (BMP1-4)									*Range = 2,568 - 3,989*			*SD = 469*		*3,170*
Mean of 7 counts on 5 plots (BMP1-5)									*Range = 3,480 - 5,114*			*SD = 517*		*4,127*
Mean of 7 counts on 7 plots (BMP1-5 & 7-8)									*Range = 5,042 - 7,133*			*SD = 938*		*6,128*
MEAN OF 7 COUNTS ON 8 PLOTS (BMP1-8)									Range = 6,102 - 8,139			SD = 795		7,139

Appendix 8. Counts of murres on multicount plots at the Nord Island - Northwest Islet and East Amatuli Island - Light Rock colonies, Barren Islands, Alaska, 1989-1996 (1989-1992 data are from Dragoo *et al.* 1995 and Nysewander *et al.* 1993; 1993-1994 data are from Roseneau *et al.* 1996a; 1995 data are from D.G. Roseneau and A.B. Kettle, unpubl. data; 1996 data are from Roseneau *et al.* 1997a).[1]

	Nord Island - Northwest Islet													East Amatuli Island - Light Rock				
Date	BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8	BMP9	BMP10	BMP11	Total	(SD)2	Date	BMP3	BMP4	Total	(SD)
1989														1989				
27 Jul	154	127	7	139	460	531	74	274	375	159	219	2,519		27 Jul	339	424	763	
13 Aug	147	125	10	115	203	480	81	542	250	159	231	2,343		13 Aug	406	535	941	
Mean	151	126	9	127	332	506	78	408	313	159	225	2,431	(124.5)	Mean	373	480	852	(125.9)
1990														1990				
19 Jul	136	436	13	249	1,240	726	110	1,460	252	127	242	4,991		ND [3]	ND	ND	ND	
14 Aug	134	310	13	231	875	468	155	898	380	144	261	3,869		15 Aug	292	416	708	
18 Aug	34	377	14	102	1,016	780	168	978	460	133	226	4,288		19 Aug	233	208	441	
Mean	101	374	13	194	1,044	658	144	1,112	364	135	243	4,383	(567.0)	Mean	263	312	575	(188.8)
1991														1991				
17 Aug	139	291	14	153	833	711	147	595	407	165	204	3,659		19 Aug	529	496	1,025	
22 Aug	140	220	12	126	830	514	103	825	358	129	200	3,457		1 Sep	375	319	694	
Mean	140	256	13	140	832	613	125	710	383	147	202	3,558	(142.8)	Mean	452	408	860	(234.1)
1992														1992				
6 & 9 Aug	95	181	9	143	688	473	71	873	285	84	106	3,008		7 Aug	232	235	467	
10 Aug	63	195	0	65	618	493	76	610	242	117	158	2,637		9 Aug	440	508	948	
18 Aug	85	169	10	178	682	380	114	523	301	168	134	2,744		10 Aug	388	538	926	
24 Aug	70	321	0	163	780	541	150	760	311	165	188	3,449		18 Aug	392	501	893	
26 Aug	42	151	7	113	730	488	101	855	251	142	136	3,016		26 Aug	199	294	493	
Mean	71	203	5	132	700	475	102	724	278	135	144	2,971	(314.2)	Mean	330	415	745	(243.2)

Appendix 8 (Continued).

Nord Island - Northwest Islet														East Amatuli Island - Light Rock				
Date	BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8	BMP9	BMP10	BMP11	Total	(SD)	Date	BMP3	BMP4	Total	(SD)
1993														1993				
19 Jul	90	210	10	140	1,130	960	120	1,360	240	120	209	4,589		22 Jul	813	767	1,580	
3 Aug	60	175	10	141	1,090	903	90	1,208	480	103	253	4,513		26 Jul	570	689	1,259	
4 Aug	55	153	9	85	1,100	585	95	965	415	143	208	3,813		31 Jul	815	725	1,540	
9 Aug	48	150	1	113	910	443	101	1,108	370	85	150	3,479		2 Aug	735	757	1,492	
17 Aug	123	254	0	115	710	530	140	1,000	380	136	235	3,623		11 Aug	733	772	1,505	
														16 Aug	594	660	1,254	
Mean	75	188	6	119	988	684	109	1,128	377	117	211	4,003	(514.4)	17 Aug	566	697	1,263	
														2 Sep	500	610	1,110	
														Mean	666	710	1,375	(173.5)
1994														1994				
27 Jul	39	153	0	57	490	435	75	135	260	87	239	1,970		27 Jul	550	560	1,110	
28 Jul	54	111	9	50	513	513	120	579	418	96	222	2,685		28 Jul	588	565	1,153	
14 Aug	40	155	9	90	648	630	103	605	393	90	268	3,031		30 Jul	545	725	1,270	
15 Aug	69	205	11	105	685	565	138	568	405	102	193	3,046		31 Jul	584	855	1,439	
16 Aug	78	280	9	130	797	655	124	895	439	92	219	3,718		5 Aug	528	730	1,258	
														6 Aug	546	755	1,301	
Mean	56	181	8	86	627	560	112	556	383	93	228	2,890	(636.0)	14 Aug	548	640	1,188	
														15 Aug	495	750	1,245	
														Mean	548	698	1246	(101.1)
1995														1995				
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		27 Jul	425	615	1,040	
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		31 Jul	508	640	1,148	
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		6 Aug	533	790	1,323	
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		8 Aug	375	525	900	
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		21 Aug	480	758	1,238	
Mean	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		Mean	464	666	1,130	(166.0)

Appendix 8 (Continued).

Nord Island - Northwest Islet														East Amatuli Island - Light Rock				
Date	BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8	BMP9	BMP10	BMP11	Total	(SD)	Date	BMP3	BMP4	Total	(SD)
1996														1996				
22 Jul	88	252	5	64	603	548	94	735	305	105	236	3,035		19 Jul	618	825	1,443	
24 Jul	74	244	5	81	505	520	118	633	355	87	245	2,867		20 Jul	560	848	1,408	
25 Jul	64	233	10	89	463	533	112	568	293	93	201	2,659		21 Jul	578	843	1,421	
26 Jul	65	175	6	80	500	545	85	563	293	85	259	2,656		22 Jul	586	740	1,326	
27 Jul	73	291	5	87	448	465	93	264	693	85	200	2,704		12 Aug	480	760	1,240	
9 Aug	79	242	4	81	588	618	112	660	315	100	229	3,028		13 Aug	585	995	1,580	
														14 Aug	464	865	1,329	
Mean	74	240	6	80	518	538	102	571	376	93	228	2,825	(177.7)					
														Mean	553	839	1,392	(108.4)
1997														1997				
28 Jul	68	110	6	99	745	600	140	640	365	115	379	3,267		6 Jul	818	865	1,683	
30 Jul	90	285	4	107	625	753	125	814	420	135	304	3,662		7 Jul	1,038	895	1,933	
1 Aug	86	210	3	93	780	698	115	1,020	358	103	331	3,797		15 Jul	1,010	1,285	2,295	
2 Aug	100	313	0	118	695	685	205	1,030	490	138	298	4,072		23 Jul	705	820	1,525	
3 Aug	115	348	3	123	790	725	176	842	425	170	309	4,026		25 Jul	1,065	1,020	2,085	
4 Aug	100	345	4	120	750	925	175	825	495	145	299	4,183		26 Jul	900	868	1,768	
														27 Jul	1,235	1,188	2,423	
Mean	93	269	3	110	731	731	156	862	426	134	320	3,835	(337.0)					
														Mean	967	992	1,959	(328.1)

[1] This table contains some values that are slightly different from previously published figures (e.g., Dragoo *et al.* 1995). These revisons were made after reviewing the 1989-1992 field notes. In 1989, count dates were 27 July and 13 August, not 26 July and 12 August. Also, mean plot values have been recalculated in several cases (e.g., Nord Island 1990), and the number 318 reported for plot BMP4 at East Amatuli Light Rock on 1 September 1991 was changed to 319. Correct dates for East Amatuli Island and Light Rock counts are also reported here. Nord Island plots BMP1-11 are equivalent to previously reported plots A1, A2, B, C, D, E, G, H1, H2, I, and NW Islet, respectively. East Amatuli Island and Light Rock plots BMP3 and BMP4 are equivalent to the "Mainland" and "Lt. Rock" plots, respectively. The 13 August 1989 total for plot BMP10 is an estimated value (Dragoo *et al.* 1995).

[2] SD = standard deviation.

[3] ND = no data.

Appendix 9. Counts of murres at Nord Island - Northwest Islet, 28 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
			Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	A1	1403	75	65		70	65			65	68
BCP2	A2	1413	105	115		110	110			110	110
BCP3	B	1239	6			6	6			6	6
BCP4	C	1242	99			99	98			98	99
BCP5	D	1258	740	800	770	770	720			720	745
BCP6	E	1316	620	600		610	590			590	600
BCP7	G	1244	140	140		140	140			140	140
BCP8	H1	1332	630			630	650			650	640
BCP9	H2	1339	360			360	370			370	365
BCP10	I	1350	110	120		115	115			115	115
BCP11	(None)[1]	1421	5			5	5			5	5
BCP12	J	1422	1			1	1			1	1
BCP13	P	1428	210	215		213	220			220	217
BCP14	Q + R[2]	1436	1,833			1,833	1,850			1,850	1,842
BCP15	S [also "S-1" or "R-S"][3]	1448	780	760		770	760			760	765
BCP16	W [also "S-2"][4]	1530	428			428	453			453	441
BCP17	T (right)	1550	370	380		375	370			370	373
BCP18	T (left)	1544	450	470		460	480			480	470
BCP19	U	1555	175	180		178	170			170	174
BCP20	V ["V-1"+V-X"][5]	1556	87			87	90			90	89
BCP21	X	1557	2,740			2,740	2,530			2,530	2,635
BCP22	Y	1635	1320			1,320	1,295			1,295	1,308
BCP23	Z	1639	1,120			1,120	1,050			1,050	1,085
BCP24	NW Islet Plot	1215	373			373	385			385	379
BCP25	Remainder NW Islet[6]	1657	1,600			1,600	1,530			1,530	1,565
BCP26	("Smaller NW Islet") [Subislet-2][7]	1651	429			429	434			434	432
BCP27	Parakeet Cove	1720	470			470	450			450	460

Appendix 9 (Continued).

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP28	(None) [West Parakeet][8]	1725	8			8	7			7	8
TOTAL (Whole Island)			15,284			15,319	14,944			14,944	15,137

[1] Consists of the area between BCP10 and BCP12 that was apparently not counted in previous years (i.e., 1989-1992).

[2] Plots Q and R were combined to form BCP14 because of a boundary problem that occurred during the 19 July and 3 August 1993 counts.

[3] Plot S (BCP15) is equivalent to Plot "S-1" and it is also equivalent to Plot "R-S".

[4] Plot W (BCP16) is equivalent to Plot "S-2".

[5] Plot V was counted as "V-1" (1556 hrs: DGR = 32 birds, MAB = 35 birds) + "V-X" (1626 hrs: DGR = 55 birds, MAB = 55 birds).

[6] Includes a small islet immediately adjacent to Northwest Islet that was counted as part of "Remainder NW Islet" in 1992. In 1993, this small islet was designated "Subislet-1" and the 28 July 1997 counts were: (1700 hrs) DGR = 110 birds; MAB = 110 birds.

[7] Consists of a small islet immediately adjacent to Nord Island that was designated "Smaller NW Islet" in 1992 and redesignated "Subislet-2" in 1993.

[8] Consists of a small group of birds found on a high cliff west of Parakeet Cove that was apparently not counted prior to 1993.

Appendix 10. Counts of murres at Nord Island - Northwest Islet, 30 July 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
			Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	A1	1500	90	90	90	90	89			89	90
BCP2	A2	1512	290	300		295	270	280		275	285
BCP3	B	1516	4			4	4			4	4
BCP4	C	1520	107			107	107			107	107
BCP5	D	1536	630			630	620			620	625
BCP6	E	1526	760			760	750	740		745	753
BCP7	G	1541	130	130	135	132	115	120		118	125
BCP8	H1	1549	793			793	835			835	814
BCP9	H2	1605	420			420	420			420	420
BCP10	I	1610	130	130		130	140			140	135
BCP11	(None)[1]	1611	3			3	3			3	3
BCP12	J	1612	2			2	2			2	2
BCP13	P	1615	180	190		185	170			170	178
BCP14	Q + R[2]	1618	1,775			1,775	1,860			1,860	1,818
BCP15	S [also "S-1" or "R-S"][3]	1632	680	640		660	640	630		635	648
BCP16	W [also "S-2"][4]	1704	341			341	342			342	342
BCP17	T (right)	1714	370	390		380	400			400	390
BCP18	T (left)	1718	460	480		470	470			470	470
BCP19	U	1719	180	200		190	190			190	190
BCP20	V ["V-1"+V-X"][5]	1722	90			90	90			90	90
BCP21	X	1727	3,250			3,250	3,520			3,520	3,385
BCP22	Y	1758	1863			1,863	2023			2,023	1,943
BCP23	Z	1808	1,220			1,220	1290			1,290	1,255
BCP24	NW Islet Plot	1439	314			314	294			294	304
BCP25	*Remainder NW Islet*[6]	1822	1,715			1,715	1,655			1,655	1,685
BCP26	("Smaller NW Islet") [Subislet-2][7]	1813	530	540		535	570			570	553
BCP27	Parakeet Cove	1841	615			615	650			650	633

Appendix 10 (Continued).

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP28	(None) [West Parakeet][8]	1853	13			13	13			13	13
TOTAL (Whole Island)			16,955			16,982	17,532			17,530	17,260

[1] Consists of the area between BCP10 and BCP12 that was apparently not counted in previous years (i.e., 1989-1992).

[2] Plots Q and R were combined to form BCP14 because of a boundary problem that occurred during the 19 July and 3 August 1993 counts.

[3] Plot S (BCP15) is equivalent to Plot "S-1" and it is also equivalent to Plot "R-S".

[4] Plot W (BCP16) is equivalent to Plot "S-2".

[5] Plot V was counted as "V-1" (1722 hrs: DGR = 40 birds, MAB = 40 birds) + "V-X" (1725 hrs: DGR = 50 birds, MAB = 50 birds).

[6] Includes a small islet immediately adjacent to Northwest Islet that was counted as part of "Remainder NW Islet" in 1992. In 1993, this small islet was designated "Subislet-1" and the 30 July 1997 counts were: (1830 hrs) DGR = 145 birds; MAB = 135 birds.

[7] Consists of a small islet immediately adjacent to Nord Island that was designated "Smaller NW Islet" in 1992 and redesignated "Subislet-2" in 1993.

[8] Consists of a small group of birds found on a high cliff west of Parakeet Cove that was apparently not counted prior to 1993.

Appendix 11. Counts of murres at Nord Island - Northwest Islet, 1 August 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
			Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	A1	1327	110	100	100	103	68			68	86
BCP2	A2	1337	210			210	210			210	210
BCP3	B	1344	3			3	3			3	3
BCP4	C	1342	90			90	95			95	93
BCP5	D	1513	770			770	790			790	780
BCP6	E	1521	700			700	670	720		695	698
BCP7	G	1529	120	120		120	110			110	115
BCP8	H1	1537	1,000			1,000	1,040			1,040	1,020
BCP9	H2	1540	370			370	345			345	358
BCP10	I	1547	100	110		105	100			100	103
BCP11	(None)[1]	1548	1			1	1			1	1
BCP12	J	1549	1			1	1			1	1
BCP13	P	1553	220	220		220	230			230	225
BCP14	Q + R[2]	1556	1,910			1,910	1,740			1,740	1,825
BCP15	S [also "S-1" or "R-S"][3]	1605	590	620		605	590			590	598
BCP16	W [also "S-2"][4]	1630	418			418	428			428	423
BCP17	T (right)	1426	340	350		345	330	370		350	348
BCP18	T (left)	1358	330	330		330	340			340	335
BCP19	U	1430	150	150		150	150			150	150
BCP20	V ["V-1"+V-X"][5]	1400	90			90	85			85	88
BCP21	X	1405	2,710			2,710	2,720			2,720	2,715
BCP22	Y	1453	1,321			1,321	1341			1,341	1,331
BCP23	Z	1504	1,000			1,000	1040			1,040	1,020
BCP24	NW Islet Plot	1716	331	331		331	331			331	331
BCP25	Remainder NW Islet[6]	1638	1,660			1,660	1,715			1,715	1,688
BCP26	("Smaller NW Islet") [Subislet-2][7]	1634	430	450		440	420			420	430
BCP27	Parakeet Cove	1655	525			525	520			520	523

Appendix 11 (Continued).

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP28	(None) [West Parakeet] [8]	1706	8			8	8			8	8
TOTAL (Whole Island)			15,508			15,536	15,421			15,466	15,506

[1] Consists of the area between BCP10 and BCP12 that was apparently not counted in previous years (i.e., 1989-1992).

[2] Plots Q and R were combined to form BCP14 because of a boundary problem that occurred during the 19 July and 3 August 1993 counts.

[3] Plot S (BCP15) is equivalent to Plot "S-1" and it is also equivalent to Plot "R-S".

[4] Plot W (BCP16) is equivalent to Plot "S-2".

[5] Plot V was counted as "V-1" (1400 hrs: DGR = 50 birds, MAB = 50 birds) + "V-X" (1403 hrs: DGR = 40 birds, MAB = 35 birds).

[6] Includes a small islet immediately adjacent to Northwest Islet that was counted as part of "Remainder NW Islet" in 1992. In 1993, this small islet was designated "Subislet-1" and the 1 August 1997 counts were: (1646 hrs) DGR = 210 birds; MAB = 215 birds.

[7] Consists of a small islet immediately adjacent to Nord Island that was designated "Smaller NW Islet" in 1992 and redesignated "Subislet-2" in 1993.

[8] Consists of a small group of birds found on a high cliff west of Parakeet Cove that was apparently not counted prior to 1993.

Appendix 12. Counts of murres at Nord Island - Northwest Islet, 3 August 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
			Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	A1	1834	120			120	110			110	115
BCP2	A2	1841	350	380		365	330			330	348
BCP3	B	1530	3			3	3			3	3
BCP4	C	1534	125			125	120			120	123
BCP5	D	1545	780	800		790	790			790	790
BCP6	E	1541	710			710	740			740	725
BCP7	G	1438	183			183	169			169	176
BCP8	H1	1653	841			841	842			842	842
BCP9	H2	1654	420			420	430			430	425
BCP10	I	1435	170	170		170	170			170	170
BCP11	(None)[1]	1440	3			3	3			3	3
BCP12	J	1441	1			1	1			1	1
BCP13	P	1445	200	200		200	210			210	205
BCP14	Q + R[2]	1448	2,077			2,077	2,065			2,065	2,071
BCP15	S [also "S-1" or "R-S"][3]	1502	710	680		695	700			700	698
BCP16	W [also "S-2"][4]	1556	355			355	383			383	369
BCP17	T (right)	1600	450			450	480			480	465
BCP18	T (left)	1609	520	510		515	530			530	523
BCP19	U	1612	190	190		190	190			190	190
BCP20	V ["V-1"+V-X"][5]	1611	130			130	135			135	133
BCP21	X	1643	3,160			3,160	3,070			3,070	3,115
BCP22	Y	1710	1240			1,240	1280			1,280	1,260
BCP23	Z	1705	1,065	1,125		1,095	1100			1,100	1,098
BCP24	NW Islet Plot	1413	306			306	311			311	309
BCP25	Remainder NW Islet[6]	1732	1,570			1,570	1,620			1,620	1,595
BCP26	("Smaller NW Islet") [Subislet-2][7]	1725	505			505	523			523	514
BCP27	Parakeet Cove	1752	645			645	660			660	653

Appendix 12 (Continued).

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP28	(None) [West Parakeet][8]	1800	13			13	13			13	13
TOTAL (Whole Island)			16,842			16,877	16,978			16,978	16,932

[1] Consists of the area between BCP10 and BCP12 that was apparently not counted in previous years (i.e., 1989-1992).

[2] Plots Q and R were combined to form BCP14 because of a boundary problem that occurred during the 19 July and 3 August 1993 counts.

[3] Plot S (BCP15) is equivalent to Plot "S-1" and it is also equivalent to Plot "R-S".

[4] Plot W (BCP16) is equivalent to Plot "S-2".

[5] Plot V was counted as "V-1" (1611 hrs: DGR = 75 birds, MAB = 80 birds) + "V-X" (1615 hrs: DGR = 55 birds, MAB = 55 birds).

[6] Includes a small islet immediately adjacent to Northwest Islet that was counted as part of "Remainder NW Islet" in 1992. In 1993, this small islet was designated "Subislet-1" and the 3 August 1997 counts were: (1745 hrs) DGR = 175 birds; MAB = 180 birds.

[7] Consists of a small islet immediately adjacent to Nord Island that was designated "Smaller NW Islet" in 1992 and redesignated "Subislet-2" in 1993.

[8] Consists of a small group of birds found on a high cliff west of Parakeet Cove that was apparently not counted prior to 1993.

Appendix 13. Counts of murres at Nord Island - Northwest Islet, 4 August 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish & Wildlife Service; BCP numbers indicate the plots are census plots counted from boats, not land; DGR = David G. Roseneau and MAB = Margaret A. Blanding.

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR)				Observer 2 (MAB)				Observer 1 & 2 Average
			Count 1	Count 2	Count 3	Average	Count 1	Count 2	Count 3	Average	
BCP1	A1	1416	100	100		100	100			100	100
BCP2	A2	1830	350	370		360	330			330	345
BCP3	B	1420	4			4	4			4	4
BCP4	C	1422	120			120	120			120	120
BCP5	D	1618	740			740	760			760	750
BCP6	E	1610	880			880	970			970	925
BCP7	G	1426	170			170	180			180	175
BCP8	H1	1626	850			850	800			800	825
BCP9	H2	1640	490			490	500			500	495
BCP10	I	1430	150	150		150	140			140	145
BCP11	(None)[1]	1431	2			2	2			2	2
BCP12	J	1431	3			3	3			3	3
BCP13	P	1441	300			300	290			290	295
BCP14	Q + R[2]	1440	2,045			2,045	2,030			2,030	2,038
BCP15	S [also "S-1" or "R-S"][3]	1649	870			870	880			880	875
BCP16	W [also "S-2"][4]	1455	308			308	288			288	298
BCP17	T (right)	1500	390	370		380	360			360	370
BCP18	T (left)	1507	500			500	510			510	505
BCP19	U	1712	210			210	190			190	200
BCP20	V ["V-1"+V-X"][5]	1512	104			104	110			110	107
BCP21	X	1541	2,850			2,850	2,930			2,930	2,890
BCP22	Y	1724	1,290			1,290	1370			1,370	1,330
BCP23	Z	1820	1,397	1,437		1,417	1337			1,337	1,377
BCP24	NW Islet Plot	1402	310			310	287			287	299
BCP25	Remainder NW Islet[6]	1732	1,610			1,610	1,675			1,675	1,643
BCP26	("Smaller NW Islet") [Subislet-2][7]	1727	540			540	520			520	530
BCP27	Parakeet Cove	1758	625			625	625			625	625

Appendix 13 (Continued).

New FWS Plot Number	Previous FWS Plot Numbers & Names	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Average	Observer 1 & 2 Average
BCP28	(None) [West Parakeet][8]	1807	7			7	7			7	7
TOTAL (Whole Island)			17,215			17,235	17,318			17,318	17,278

[1] Consists of the area between BCP10 and BCP12 that was apparently not counted in previous years (i.e., 1989-1992).

[2] Plots Q and R were combined to form BCP14 because of a boundary problem that occurred during the 19 July and 3 August 1993 counts.

[3] Plot S (BCP15) is equivalent to Plot "S-1" and it is also equivalent to Plot "R-S".

[4] Plot W (BCP16) is equivalent to Plot "S-2".

[5] Plot V was counted as "V-1" (1714 hrs: DGR = 50 birds, MAB = 54 birds) + "V-X" (1512 hrs: DGR = 54 birds, MAB = 56 birds).

[6] Includes a small islet immediately adjacent to Northwest Islet that was counted as part of "Remainder NW Islet" in 1992. In 1993, this small islet was designated "Subislet-1" and the 4 August 1997 counts were: (1741 hrs) DGR = 180 birds; MAB = 165 birds.

[7] Consists of a small islet immediately adjacent to Nord Island that was designated "Smaller NW Islet" in 1992 and redesignated "Subislet-2" in 1993.

[8] Consists of a small group of birds found on a high cliff west of Parakeet Cove that was apparently not counted prior to 1993.

Appendix 14. Counts of murres on multicount plots at Nord Island - Northwest Islet, 1997.

Note: All counts were made by 10's from small boats; times are Alaska Daylight Time; FWS = U.S. Fish and Wildlife Service; BCP numbers indicate that the plots are census plots counted from boats, not land; BMP numbers indicate the plots are also multicount plots that are counted from boats at least 5 separate times on different days to help track population trends; DGR = David G. Roseneau, MAB = Margaret A. Blanding.

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR)					Observer 2 (MAB)					Observer 1 & 2 Average
				Count 1	Count 2	Count 3	Count 4	Average	Count 1	Count 2	Count 3	Count 4	Average	
BMP1	BCP1 (A1)	28 Jul	1403	75	65			70	65				65	68
BMP2	BCP2 (A2)	28 Jul	1413	105	115			110	110				110	110
BMP3	BCP3 (B)	28 Jul	1239	6				6	6				6	6
BMP4	BCP4 (C)	28 Jul	1242	99				99	98				98	99
BMP5	BCP5 (D)	28 Jul	1258	740	800	770		770	720				720	745
BMP6	BCP6 (E)	28 Jul	1316	620	600			610	590				590	600
BMP7	BCP7 (G)	28 Jul	1244	140	140			140	140				140	140
BMP8	BCP8 (H1)	28 Jul	1332	630				630	650				650	640
BMP9	BCP9 (H2)	28 Jul	1339	360				360	370				370	365
BMP10	BCP10 (I)	28 Jul	1350	110	120			115	115				115	115
BMP11	BCP11 (NW Islet Plot)	28 Jul	1215	373				373	385				385	379
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*768*				*773*	*779*				*779*	*777*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*2,128*				*2,153*	*2,089*				*2,089*	*2,122*
TOTAL	11 Plots: BMP1-11			3,258				3,283	3,249				3,249	3,267
BMP1	BCP1 (A1)	30 Jul	1500	90	90	90		90	89				89	90
BMP2	BCP2 (A2)	30 Jul	1512	290	300			295	270	280			275	285
BMP3	BCP3 (B)	30 Jul	1516	4				4	4				4	4
BMP4	BCP4 (C)	30 Jul	1520	107				107	107				107	107
BMP5	BCP5 (D)	30 Jul	1536	630				630	620				620	625
BMP6	BCP6 (E)	30 Jul	1526	760				760	750	740			745	753
BMP7	BCP7 (G)	30 Jul	1541	130	130	135		132	115	120			118	125
BMP8	BCP8 (H1)	30 Jul	1549	793				793	835				835	814
BMP9	BCP9 (H2)	30 Jul	1605	420				420	420				420	420
BMP10	BCP10 (I)	30 Jul	1610	130	130			130	140				140	135

Appendix 14 (Continued)

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP11	BCP11 (NW Islet Plot)	30 Jul	1439	314				314	294				294	304
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*935*				*940*	*904*				*909*	*925*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*2,325*				*2,330*	*2,274*				*2,274*	*2,303*
TOTAL	11 Plots: BMP1-11			3,668				3,675	3,644				3,647	3,662
BMP1	BCP1 (A1)	1 Aug	1327	110	100	100		103	68				68	86
BMP2	BCP2 (A2)	1 Aug	1337	210				210	210				210	210
BMP3	BCP3 (B)	1 Aug	1344	3				3	3				3	3
BMP4	BCP4 (C)	1 Aug	1342	90				90	95				95	93
BMP5	BCP5 (D)	1 Aug	1513	770				770	790				790	780
BMP6	BCP6 (E)	1 Aug	1521	700				700	670	720			695	698
BMP7	BCP7 (G)	1 Aug	1529	120	120			120	110				110	115
BMP8	BCP8 (H1)	1 Aug	1537	1,000				1,000	1,040				1,040	1,020
BMP9	BCP9 (H2)	1 Aug	1540	370				370	345				345	358
BMP10	BCP10 (I)	1 Aug	1547	100	110			105	100				100	103
BMP11	BCP11 (NW Islet Plot)	1 Aug	1716	331	331			331	331				331	331
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*844*				*842*	*807*				*807*	*826*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*2,314*				*2,312*	*2,267*				*2,292*	*2,304*
TOTAL	11 Plots: BMP1-11			3,804				3,802	3,762				3,787	3,797
BMP1	BCP1 (A1)	2 Aug	1701	105	105			105	95				95	100
BMP2	BCP2 (A2)	2 Aug	1715	290	300			295	330				330	313
BMP3	BCP3 (B)	2 Aug	1625	0				0	0				0	0
BMP4	BCP4 (C)	2 Aug	1626	115	115			115	120				120	118
BMP5	BCP5 (D)	2 Aug	1643	690	710			700	690				690	695

Appendix 14 (Continued)

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP6	BCP6 (E)	2 Aug	1638	680				680	690				690	685
BMP7	BCP7 (G)	2 Aug	1804	200				200	210				210	205
BMP8	BCP8 (H1)	2 Aug	1814	950	990			970	1,090				1,090	1,030
BMP9	BCP9 (H2)	2 Aug	1817	490				490	490				490	490
BMP10	BCP10 (I)	2 Aug	1722	140				140	135				135	138
BMP11	BCP11 (NW Islet Plot)	2 Aug	1513	307				307	288				288	298
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*957*				*962*	*968*				*968*	*967*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*1,647*				*1,662*	*1,658*				*1,658*	*1,662*
TOTAL	11 Plots: BMP1-11			3,967				4,002	4,138				4,138	4,072
BMP1	BCP1 (A1)	3 Aug	1834	120				120	110				110	115
BMP2	BCP2 (A2)	3 Aug	1841	350	380			365	330				330	348
BMP3	BCP3 (B)	3 Aug	1530	3				3	3				3	3
BMP4	BCP4 (C)	3 Aug	1534	125				125	120				120	123
BMP5	BCP5 (D)	3 Aug	1545	780	800			790	790				790	790
BMP6	BCP6 (E)	3 Aug	1541	710				710	740				740	725
BMP7	BCP7 (G)	3 Aug	1438	183				183	169				169	176
BMP8	BCP8 (H1)	3 Aug	1653	841				841	842				842	842
BMP9	BCP9 (H2)	3 Aug	1654	420				420	430				430	425
BMP10	BCP10 (I)	3 Aug	1435	170	170			170	170				170	170
BMP11	BCP11 (NW Islet Plot)	3 Aug	1413	306				306	311				311	309
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*1,074*				*1,089*	*1,044*				*1,044*	*1,068*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*2,564*				*2,589*	*2,574*				*2,574*	*2,583*
TOTAL	11 Plots: BMP1-11			4,008				4,033	4,015				4,015	4,026

Appendix 14 (Continued)

New FWS Multicount Plot Number	New FWS Boat Plot Number & Previous Plot Number/Name	Date	Time	Observer 1 (DGR) Count 1	Count 2	Count 3	Count 4	Average	Observer 2 (MAB) Count 1	Count 2	Count 3	Count 4	Average	Observer 1 & 2 Average
BMP1	BCP1 (A1)	4 Aug	1416	100	100			100	100				100	100
BMP2	BCP2 (A2)	4 Aug	1830	350	370			360	330				330	345
BMP3	BCP3 (B)	4 Aug	1420	4				4	4				4	4
BMP4	BCP4 (C)	4 Aug	1422	120				120	120				120	120
BMP5	BCP5 (D)	4 Aug	1618	740				740	760				760	750
BMP6	BCP6 (E)	4 Aug	1610	880				880	970				970	925
BMP7	BCP7 (G)	4 Aug	1426	170				170	180				180	175
BMP8	BCP8 (H1)	4 Aug	1626	850				850	800				800	825
BMP9	BCP9 (H2)	4 Aug	1640	490				490	500				500	495
BMP10	BCP10 (I)	4 Aug	1430	150	150			150	140				140	145
BMP11	BCP11 (NW Islet Plot)	4 Aug	1402	310				310	287				287	299
Subtotal	*6 Plots: BMP1-4, BMP10, BMP11*			*1,034*				*1,044*	*981*				*981*	*1,013*
Subtotal	*8 Plots: BMP1-6, BMP10, BMP11*			*2,654*				*2,664*	*2,711*				*2,711*	*2,688*
TOTAL	11 Plots: BMP1-11			4,164				4,174	4,191				4,191	4,183
Mean of 6 counts on 6 plots (BMP1-4, BMP10, AND BMP11)									*Range = 777 - 1,068*			*SD =*	111	*929*
Mean of 6 counts on 8 plots (BMP1-6, BMP10, AND BMP11)									*Range = 2,122 - 2,688*			*SD =*	365	*2,277*
MEAN OF 6 COUNTS ON 11 PLOTS (BMP1-11)									Range = 3,267 - 4,183			SD =	337	3,835