

WILDLIFE SURVEYS AT BOGOSLOF AND FIRE ISLANDS, ALASKA, IN 1999

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Key Words: Black-legged Kittiwake, Bogoslof I., *Callorhinus ursinus*, Common Murre, *Eumetopias jubata*, *Fratercula cirrhata*, National Natural Landmark, Northern Fur Seal, Red-legged Kittiwake, *Rissa brevirostris*, *Rissa tridactyla*, Steller Sea Lion, Thick-billed Murre, Tufted Puffin, *Uria aalge*, *Uria lomvia*.

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EXECUTIVE SUMMARY

Several species of marine mammals and seabirds were surveyed in 1999 at Bogoslof Island, an unusually dynamic volcanic island in the southeastern Bering Sea which is part of the Alaska Maritime National Wildlife Refuge and has been designated as a National Natural Landmark. Although adverse weather conditions precluded completing seabird population surveys on some parts of the island, data were obtained for the following conclusions:

1. Populations of black-legged and red-legged kittiwakes apparently have increased at Bogoslof and nearby Fire islands since 1994. Kittiwake productivity was lower in 1999 than in other years when we have conducted surveys at Bogoslof, but still, approximately 30% of the nests remained active (i.e., chick present or adult sitting tightly) during our visit.
2. Murre populations were lower than previously in the portions of the breeding colonies we surveyed in 1999, but we failed to get a count on the new mountain (which was uplifted in 1992) where thousands of murre are now nesting. Therefore the magnitude of the apparent decline could not be estimated.
3. Tufted puffin populations have increased substantially at Bogoslof since 1973, and increases apparently have occurred even since 1994. A relatively high proportion of the puffin burrows we checked were occupied in 1999 compared to earlier years, and we again found puffins nesting on the lower slopes of the new mountain. From a small sample of nests we concluded that the peak of hatching was occurring during our visit July 31-August 1. We saw adult puffins carrying sand lance and squid in their bills and our prey sampling at burrows confirmed that these species were the most common prey being delivered to puffin chicks.
4. Endangered Steller sea lion counts remain far below historic numbers, but the count in 1999 of non-pups was similar to 1997 indicating the decline may have subsided, at least temporarily.
5. Although detailed counts were not made of Northern fur seals in 1999, the expansion of rookeries into several new areas suggest the increase that has been noted since 1980 may be continuing.

INTRODUCTION

Bogoslof Island, a recently-active volcano in the eastern Bering Sea, was officially recognized as an important breeding area for marine birds and mammals in 1909 when it was designated Bogoslof National Wildlife Refuge (NWR). In 1981 this refuge became part of Alaska Maritime NWR, administered by the U.S. Fish and Wildlife Service (USFWS). The area was also designated as a National Natural Landmark (NNL) in 1967. The National Park Service

(NPS), the agency administering the NNL program, has listed Bogoslof as “damaged” due to declines in populations of Steller’s sea lions (*Eumetopias jubatus*), and sea bird population declines elsewhere in the region.

To try to determine the current status of wildlife populations on Bogoslof, the NWR, NPS (funded ship time), and National Marine Fisheries Service (NMFS) cooperated in a joint survey at Bogoslof Island and nearby Fire Island in 1999. Seabirds were counted in as many areas as weather conditions permitted, but unfortunately, fog and high winds precluded counts of some of the nesting areas. Information was gathered on numbers of cormorants (*Phalacrocorax* spp.), kittiwakes (*Rissa* spp.), and murre (*Uria* spp.) in 9 of 13 breeding areas at Bogoslof, and we were able to estimate productivity for kittiwakes (*R. brevirostris* and *R. tridactyla*). Furthermore, tufted puffin (*Fratercula cirrhata*) burrows were counted in established plots, and prey sampling was conducted for kittiwakes and puffins. NMFS personnel counted sea lions and collected scat for prey studies of northern fur seals (*Callorhinus ursinus*).

This report summarizes the results of the surveys in 1999 and compares them with earlier years. Incidental observations also are included.

STUDY AREA AND METHODS

The birds and marine mammals at Bogoslof and nearby Fire islands have been described previously (Byrd et al. 1980, Byrd and Williams 1994). Bogoslof and Fire islands supported about 50,000 and 35,000 seabirds, respectively in 1973. At that time the island also supported over 3,000 sea lions. Surveys in 1994 (Byrd and Williams 1994) indicated numbers of some species of seabirds were up (kittiwakes and puffins), but others were down (murre). Also Steller sea lions had declined substantially, and northern fur seals (*Callorhinus ursinus*) were increasing. As described earlier (Byrd et al. 1980), substantial habitat changes have occurred over the years at Bogoslof due to volcanic land-building episodes followed by erosion.

In 1999, our field crew was composed of the following: Vernon Byrd and Jeff Williams (Alaska Maritime NWR, Homer and Adak, respectively), Catherine Berg, Karen Boylan, and Rosa Meehan (US Fish and Wildlife Service, Anchorage), Bob Adamcik (USFWS, Washington, D.C.), Bruce Robson (NMFS, Seattle), John Piatt (U.S. Geological Survey, Biological Resources Division, Anchorage), Alexander Kitaysky (Univ. of Washington, Seattle), and Joel Gay (Homer News, Homer). The M/V *Tiglox*, under the command of Kevin Bell, provided support.

We arrived at Bogoslof on July 31, planning to stay through August 2. Unfortunately, we were forced to leave due to high winds on the morning of August 2, thus reducing our field time by about 30%. The following approaches were used to collect data.

Habitat for ledge-nesting seabirds was divided into recognizable geographic segments in 1973 during initial surveys of seabirds at Bogoslof, and these same designations were used for subsequent comparison (Fig. 1). Some of the areas may be viewed from land, but others must be viewed from the water. We used binoculars and tally counters to record the number of cormorants, kittiwakes, and murre on each of the segments that could be viewed from land, but we only had a portion of one day when sea conditions and visibility allowed for counts from small boats. As a result only a portion of the boat count areas were surveyed.

Fire Island

New Mountain (1992)

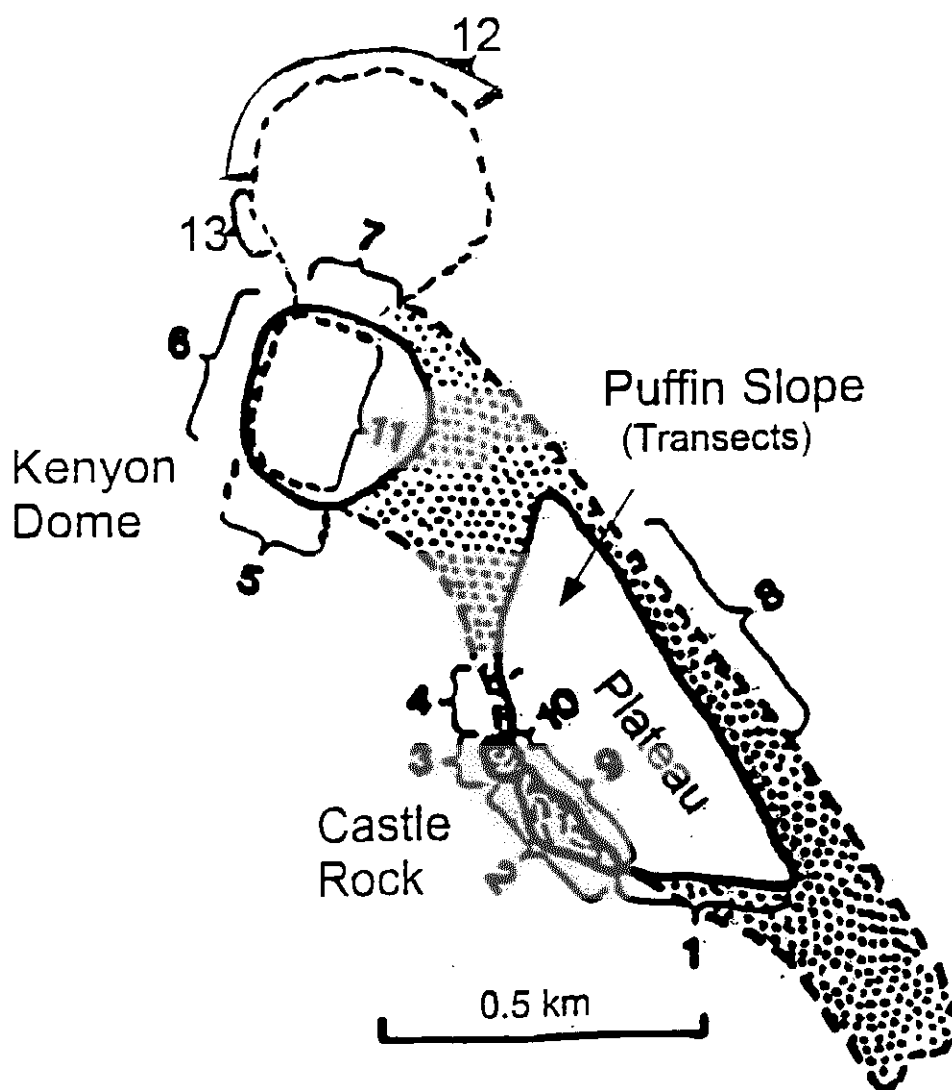


Figure 1. Map of Bogoslof and Fire islands showing place names and segments for counting ledge-nesting seabirds. Stippling indicates beach.

Five 1 m-wide strip transects, first established in 1973 were surveyed again in 1999 for tufted puffin burrows. Measuring tapes were extended on the ground between stakes at end points of each transect to delineate count areas.

Productivity of kittiwakes was estimated from a sample of nests that could be viewed from land, but due to limited time, we were unable to determine the status of nests where birds were sitting in incubating or brooding positions. As a result, we recorded nests as empty, having 1 or 2 chicks, or “having an adult incubation or brooding”. This type of information provides the “maximum possible productivity”, but precludes precise estimation. For murre, we were unable to estimate productivity, but we made opportunistic observations of eggs and chicks. Furthermore, we checked the status of 8 tufted puffin burrows on the dome created in 1992 to get a rough estimate of the timing of nesting events.

Screens were placed over a sample of puffin burrows to collect prey brought to chicks, and several kittiwakes regurgitated food when they were captured (see below). Moreover, 10 pacific halibut were caught during our stay at Bogoslof and the stomachs were preserved for later analysis of prey. Halibut are opportunistic feeders so reflect prey in the area.

Steller sea lions were counted from a small boat and from an elevated observation point on the central plateau of Bogoslof. Due to the small number of animals left at Bogoslof, the traditional “spook count” for pups was not used. Nevertheless, the elevated observation point provided opportunities for accurate counts.

To facilitate prey studies of northern fur seals, whole scats were scooped into plastic bags for later analysis at the National Marine Mammal Lab. in Seattle. Incidentally, Robson and Meehan were able to remove packing bands from two fur seals that had become entangled.

Kitaysky and Piatt captured a sample of kittiwakes and murre to take blood samples as part of a study, funded by the Univ. of Alaska, Fairbanks, as part of the North Pacific Marine Research Program, to use corticosteroid hormones to estimate stress levels associated with prey shortages.

RESULTS

Ledge-nesting Seabird Populations

We were unable to count birds in areas 1-3, 11, and part of the new mountain at Bogoslof, but the other areas were surveyed (Table 1). Counts for each species were compared with prior years below.

Table 1. Counts of ledge-nesting seabirds at Bogoslof and Fire islands in 1999.

Segment ^a	Date	Time	RFCO	Nests	PECO	Nests	RLKI	Nests	BLKI	Nests	COMU	TBMU	UNMU	Total Murres
1	no count													
2	no count													
3	no count													
4	31-Jul	1400							88	53	66	1185		1251
5 ^b	01-Aug	1300	4	4					678	69			1856	1856
6 ^b	01-Aug	1400							308	58			2169	
7	31-Jul				1		41	12	695	140	40	140		180
7w	900		2	2	2	2	45	15	730	151			669	669
8 cliff	01-Aug	1630							12	6	149	403		552
8 top	31-Jul	1430									800			800
9 rock	31-Jul	1330									130			130
9 plateau	31-Jul	1240									3000			3000
10	31-Jul	1300					84		663		162	301	2155	2618
Plat. Top	31-Jul	1130									320			320
11	31-Jul	1300												
12	no count								1				847	847
13	01-Aug	1800	25	16	2	2			16				490	490
Fire I.	01-Aug	1730					288		1235				7953	7953
	01-Aug	1400												
Totals			31	22	5	4	458		4426					22835

^aFigure 1 delineates the distribution of segments.

^bDue to rough seas, observers in boats were unable to distinguish species of kittiwakes in these segments (listed arbitrarily under BLKI).

Cormorants.--Cormorants are noted for shifting their nesting locations among years, so the reduced counts between 1994 and 1999 on comparable areas may not indicate population declines. It will take a complete count of all areas to make that determination. Nevertheless, it was apparent that both pelagic and red-faced cormorants were still nesting on Bogoslof in 1999 (Table 2). In contrast, we saw no cormorants on Fire Island in 1999.

Table 2. Counts of cormorant nests at Bogoslof and Fire islands, Alaska.

Segment ^a	<u>Pelagic Cormorant</u>			<u>Red-faced Cormorant</u>		
	1973	1994	1999	1973	1994	1999
BOGOSLOF I.						
4	0	0	0	6	0	0
5	0	0	0	10	6	4
6	0	2	0	4	10	0
7	3	12	0	4	4	0
8	0	1	0	6	0	0
13	0	0	2	0	11	16
FIRE I.						
	0	0	0	0	0	0
Totals	3	15	2	30	31	20

^aSee Figure 1 for delineation of segments.

Kittiwakes.--Due to rough seas, we were unable to differentiate species of kittiwakes in segments 5 and 6, and we could not accurately count nests on several sections. As a result, we could not make definitive comparisons with 1973 when nests only were counted, and we had few areas that we could use to evaluate changes in black-legged and red-legged kittiwakes separately. Nevertheless, the two species combined have increased at Bogoslof and Fire islands since 1994 by approximately 40% (Table 3). In the areas that allowed for comparisons, black-legged kittiwake numbers were up in segments with substantial numbers of birds, and red-legged numbers increased in the three areas we could compare.

Table 3. Counts of kittiwakes at Bogoslof and Fire islands, Alaska, in 1999 compared to 1994.

Segment ^a	<u>Black-legged Kittiwake</u>		<u>Red-legged Kittiwake</u>		<u>Total</u>	
	1994	1999	1994	1999	1994	1999
BOGOSLOF I.						
4	46	88	0	0	46	88
5	512	-- ^b	55	-- ^b	567	678
6	558	-- ^b	58	-- ^b	616	308
7	480	1425	37	86	517	1511
8	21	12	0	0	21	12
10	345	663	58	84	403	747
13	52	16	0	0	52	16
FIRE I.	1089	1235	201	288	1290	1523
Totals					3512	4883
Difference						(+39%)

^aSee Figure 1 for delineation of segments.

^bDue to rough seas, observers in boats were unable to distinguish species of kittiwakes on these segments.

Murres.--Murre numbers were lower in comparable areas in 1999 than in 1994 and particularly since 1973 (Table 4). Clearly habitat for murres has changed at Bogoslof and Fire islands since 1973. For instance Fire Island is smaller, one peak of Castle Rock has fallen, and the new mountain was uplifted in 1992. We saw hundreds, perhaps several thousands, of murres on the new mountain, but were unable to count the segment carefully. A complete count of that area will be needed to make strong conclusions about the magnitude of the decline.

Table 4. Counts of common and thick-billed murres at Bogoslof and Fire islands, Alaska.

Segment ^a	Number of Murres		
	1973	1994	1999
BOGOSLOF			
4	3009(1) ^b	1561(4)	1251(5)
5	2315(0)	1925(17)	1856(?)
6	895(0)	2176(18)	2169(?)
7	1285(10)	186(3)	180(22)
8	6427(2)	3289(20)	1352(70)
9	5640(98)	4400(100)	3130(100)
10	6900(20)	3207(?)	2618(?)
Sub-total	26,471	16,744	12,556
FIRE			
Sub-total	39,300(13)	10,891(6)	7,953(?)
TOTAL	65,771	27,635	20,509

^aFig. 1 delineates the distribution of segments.

^bPercentage of all murres that were common murres in parentheses.

Kittiwake Productivity

Black-legged Kittiwake.--Only 33% (86 of 257) of black-legged kittiwake nests examined were still active at the beginning of August (Table 5). Our check may have occurred before the peak of hatching; birds were still sitting tightly on 72 nests (28%) as if they were incubating or brooding small chicks, and only 14 nests (6%) obviously had chicks. Two had two-chick broods and 12 had single chicks. We have no way of knowing how many chicks ultimately fledged, but as of early August, the maximum potential was for productivity around 30%, the rate probably was somewhat lower by the end of the season due to chick mortality and uncertainty about the proportion of nests still containing eggs or chicks at the time of our visit..

Apparently kittiwakes were finding concentrations of prey near Bogoslof, because we observed several feeding melees within 0.5 km of Bogoslof and we saw red-legged kittiwakes taking unidentified prey off the surface of the water near Fire Island.

Short visits to Bogoslof, which have been the method of surveying for wildlife there historically, provide only an inexact index to productivity of kittiwakes. Nevertheless, it is possible to compare among years the proportion of nests “still active” in August (Table 6). In 1999 approximately 67% of the black-legged kittiwake nests we sampled were empty. This is similar to 1993, but higher than 1991 or 1994. In contrast to 1993, when we knew that 37% of the nests had chicks, we only knew with certainty that 6% had chicks in 1999. The remaining 28% were considered still active because adults sat tightly on the nests. An unknown proportion of these nests may not have had chicks; therefore, productivity of black-legged kittiwakes in 1999 may have been the lowest we have seen at Bogoslof.

Table 5. Status of black-legged kittiwake nests at Bogoslof Island, Alaska, on July 31 and August 1, 1999.

Status of Nests	Number of Nests	Percent of Total Nests
Empty	171	67
1 chick	12	5
2 chicks	2	1
Adults still on nests ^a	72	28
Total	257	

^a Adults sitting on nests as if incubating or brooding, but we could not determine the exact status (some could have been empty).

Red-legged Kittiwake.--We were able to view 28 nests: 20 were empty (71%), 2 had single chicks (7%), and birds remained on 6 nests (21%) indicating they may still have been active (having an egg or young chick). Based on this small sample, it appeared productivity, at least to the early chick phase, could not have exceeded 29% in 1999, and it likely was going to be less by season's end.

Like black-legged kittiwake, in 1999 this species probably had the lowest rate of productivity we have recorded at Bogoslof (Table 6).

Table 6. Productivity of kittiwakes at Bogoslof Island, Alaska, based on observations on August 21, 1991, August 9, 1993, August 5, 1994, and August 1, 1999.

Species	Parameter	Year			
		1991	1993	1994	1999
Black-legged Kittiwake	Sample Size	381	333	294	257
	Nests empty	169 (0.44) ^a	210 (0.63)	92 (0.32)	171 (0.67)
	Nests w/1 chick	191 (0.50)	120 (0.36)	198 (0.67)	12 (0.05)
	Nests w/2 chicks	21 (0.06)	3 (0.01)	4 (0.01)	2 (0.01)
	Nests w/ \geq 1 chick	212 (0.56)	123 (0.37)	202 (0.68)	-
	Nests w/sitting adult ^b	-	-	-	72 (0.28)
Red-legged Kittiwake	Sample Size	78	72	50	28
	Nests empty	30 (0.38)	47 (0.65)	23 (0.46)	20 (0.71)
	Nests w/1 chick	48 (0.62)	25 (0.35)	27 (0.54)	2 (0.07)
	Nests w/sitting adult ^b	-	-	-	6 (0.21)

^a Proportion of total in parentheses.

^b Adults sitting on nest as if incubating or brooding, could not determine exact status (some could have been empty).

Tufted Puffin Populations (Burrow Counts)

We counted 262 tufted puffin burrows in the 5 strip transects at Bogoslof in 1999 (Table 7). About 86% of the burrows were occupied, a particularly high percentage.

The number of nesting burrows on Puffin Slope has increased since 1973 (Table 8). Even since 1994, puffins have increased on most of the area. Slight decreases occurred on transects 0 and 4 at the edges of the colony where habitat is being lost due to erosion.

Table 7. Summary of tufted puffin burrow counts at Bogoslof Island on July 31, 1999.

Transect	Occupied ^a	Unoccupied	Total
0	39	3	42
1	32	7	40
2	53	9	62
3	55	7	62
4	47	10	57
Totals	226 (86%)	36	262

^a A burrow was considered occupied if droppings, egg fragments, or feathers were found near the burrow entrance.

Table 8. Comparison of changes in numbers of tufted puffin burrows in strip transects at Bogoslof Island, Alaska, 1973-1999.

Transect	1973	1991	1994	1997	1999
0	23	32	43	42	42
1	32	30	30	40	39
2	19	42	48	56	62
3	34	46	53	60	62
4	11	46	62	51	57
Total	119	196	236	249	262
% Occupied ^b	--	75	61	69	86

^aFig. 1 delineates the location of transects.

^bDroppings, egg fragments, or feathers were found near the burrow entrance.

Tufted Puffin Food

A total of nearly 800 screen-hours (n screens times y hours) of effort yielded 31 prey samples on August 1. Preliminary analysis indicated 1-20 sandlance (*Ammodytes hexapterus*), most 6-8 cm long, were present in 28 of 31 (90%) samples. The next most commonly delivered prey was squid which occurred in 8 samples (26%). Samples will be sent to Univ. of Alaska, Fairbanks to confirm identification of other fish present.

Other Bird Observations

We recorded 21 species of birds on or near Bogoslof in 1999 (Appendix A). We noted that glaucous-winged gull (*Larus glaucescens*), a particularly common component of the avifauna, appeared to produce relatively few chicks in 1999. Also noteworthy was the discovery of bald eagles (*Haliaeetus leucocephalus*) nesting on Bogoslof. This is the first record of this species nesting there since 1973.

Steller Sea Lion Counts (Extracted with slight modifications from Robson 1999)

A census of Steller sea lions on Bogoslof Island was conducted on July 31 by Bruce Robson (NMML) and Rosa Meehan (USFWS). Three groups of sea lions were observed on the island; the largest was located on the sandy beach on the east side of the island, and two smaller groups at the southeast tip of the island and on the west side just south of Castle Rock (Table 9). Counts were made from vantage points on land for groups on the east and west side of the island and from a skiff for the group at the southeast point of the island. A total of 144 sea lion pups and 281 non-pups were counted in the three groups. Three juveniles were also observed on a flat rock adjacent to Castle Rock on 2 August. These were not included in the non-pup count for the island, because no sea lions had been observed in this area when the census was conducted on July 31. The non-pup count is slightly lower than the 1998 count of 274 adult sea lions, however the pup count shows a substantial decrease from 220 pups in 1998 which is likely due to the late date of the census in 1999 (i.e., pups were no longer constantly confined to the beach in 1999), not necessarily a real decline.

Table 9. Steller sea lion counts conducted at Bogoslof Island, July 31 1999. Replicate counts are shown for each observer and final counts are rounded up to individual animals for each area.

Location/Counter	Pup Counts	Pup Avg.	Non-Pup Counts	Non-Pup Avg.
<u>West Side</u>				
Robson	36, 35, 35, 35	35.25	54, 54	54
Meehan	34		53	
Final Count		35		54
<u>Southeast Point</u>				
Robson	40, 32	36	74	
Meehan	32		73	
Final Count		40 ^a		74
<u>East Side</u>				
Robson	68, 68, 69	68.33	152, 154	153
Meehan	70		151, 153	152
Final count		69		153
Total Island Count		144		281

^aSea lions on the southeast point were disturbed midway through the census by the sound of the outboard motor. The count of 40 pups by Robson was made before the sea lions reacted to the presence of the skiff and is considered the best count of pups in this area.

Table 10. Summer counts of adult and sub-adult (nonpup) Steller sea lions at Bogoslof Island (NMFS unpubl. data).

Date of Survey	Number of Nonpups ^a
June 29, 1973	3310
June ??, 1976	3308
June 29, 1977	2328
July 15 1979	1468
July 8, 1984	1379
June 11, 1985	1287
June 16, 1989	682
June 17, 1990	713
June 16, 1991	558
June 11-26 1992	540 ^b
June 16-27, 1994	414 ^c
July 5, 1997	245
July 31, 1999	281

^a Data provided by National Marine Mammal Laboratory, Seattle, WA.

^b Mean of counts on 3 different days.

^c Mean of counts on 2 different days.

Northern Fur Seal Studies (Extracted with slight modifications from Robson 1999)

Approximately 40 scat samples were collected from northern fur seal haulout areas on the north end of the island adjacent to Kenyon Dome and behind the rookery between Kenyon Dome and Castle Rock.

Based on descriptions provided by researchers who have visited the island in the past, the distribution of fur seals on Bogoslof Island continues to expand. Three territorial males with females and a minimum of 5 pups were observed in the small cove between Kenyon Dome and the 1992 dome where no pups have been observed previously. The fur seal rookery on the east side of the island south of the 1992 dome appears to extend further south than it did in 1997.

Territorial males with females and pups extended far into the sandy beach area past the end of the

boulders and cobble rock; however, this may also be attributable to increased areas of sand deposited by winter storms. Counts of adult seals were attempted from several vantage points on 1 August; however, poor visibility due to a low-lying fog made counting difficult without disturbing the rookery area. Several additional researchers would have been necessary to conduct these counts and the number of fur seals was probably too large for accurate counts of adult seals.

Data from past counts are provided (Table 11).

Table 11. Counts of northern fur seal pups at Bogoslof Island, Alaska (Ream et al. in press).

Year of Survey	Number of Pups
1980	2
1982	3
1983	13
1984	14
1985	9
1988	80
1989	99
1990	181
1993	890
1994	1472
1995	1272
1997	5096

Other Marine Mammal Observations (Extracted with slight modifications from Robson 1999)

No harbor seals (*Phoca vitulina*) were observed on Bogoslof Island during census activities. The usual haulout on the east side of the island was scanned on the morning of 31 July as the ship approached the island and checked periodically during both days researchers were present on the island.

An underwater survey was made on the afternoon of 1 August by Bruce Robson and Dan Erickson (USFWS) to assess the suitability of Bogoslof Island as an underwater capture site for Steller sea lions. We entered the water on the west side of Kenyon Dome at a depth of about 20 ft. and swam along the bottom to the north side of the island just west of the cove between the two domes. Conditions were overcast with light fog, 2-3 ft. swells, and 15-20 kt. winds. The

dive lasted 20 minutes and the maximum depth reached was 50 ft. Most of the dive was spent in depths of 30-40 ft. among large boulders, many of which had kelp attached. Wave surge was present even at maximum depths reached and it was necessary to hold onto nearby rocks on several occasions. We were accompanied by sub-adult male northern fur seals throughout the dive, although no aggressive behavior was observed. Very little marine fauna was present in the area, and only one small school of fish, possibly juvenile or larval greenlings, was seen. It is difficult to determine whether the site is suitable for sea lion captures. It may be difficult to work among the boulders in rougher weather and it was too early in the season to determine whether sufficient numbers of juvenile sea lions would be present in the area.

Other Observations

Notes were made on sea water temperatures, vegetation, and geology (Appendix B), and a photograph showing the profile of Bogoslof in 1999 was included for reference (Appendix C).

CONCLUSIONS

In spite of adverse weather that precluded completing ledge-nesting seabird population surveys, we were able to gain a sense of the status of the common breeding species of wildlife at Bogoslof in 1999.

Populations of black-legged and red-legged kittiwakes apparently have increased at Bogoslof and nearby Fire islands since 1994. Kittiwake productivity was lower in 1999 than in other years when we have conducted surveys at Bogoslof, and the majority of kittiwake nests had failed, apparently considerably earlier than our visit, since only remnants of nests remained in many cases. We were unable to determine the status of most remaining "active" nests since adults sat tightly on many of them. The presence of so many adults exhibiting this behavior (i.e., as if they were incubating eggs or brooding young chicks) suggested the timing of hatching was relatively late in 1999 (see Byrd et al. 1999). Reproductive success could have been as high as 25% to 30% if most of the sitting birds still had eggs or young chicks and if adequate food resources persisted throughout the chick-rearing period.

Murre populations were lower than numbers recorded previously in the portions of the breeding colonies we surveyed in 1999, but we failed to get a count on the new mountain (which was uplifted in 1992) where hundreds or thousands of murrelets are now nesting. Therefore the magnitude of the apparent decline could not be estimated.

Tufted puffin populations have increased substantially at Bogoslof since 1973, and increases apparently have occurred even since 1994. A relatively high proportion of the puffin burrows we checked were occupied in 1999 compared to earlier years, and we again found puffins nesting on the lower slopes of the new mountain. From a small sample of nests, we concluded that the peak of hatching was occurring during our visit July 31-August 1. We saw adult puffins carrying sand lance and squid in their bills and our prey sampling at burrows confirmed that these species were the most common prey being delivered to puffin chicks.

Endangered Steller sea lion counts remain far below historic numbers, but the count in 1999 of non-pups was similar to 1997, indicating the decline may have subsided, at least

temporarily. Detailed counts were not made of Northern fur seals in 1999, but the expansion of rookeries into new areas suggests the increase that has been noted since 1980 may be continuing.

LITERATURE CITED

- Byrd, G.V., G.J. Divoky, and E.P. Bailey. 1980. Changes in marine bird and mammal populations on an active volcano in Alaska. *The Murrelet* 61:50-62.
- Byrd, G.V., D.E. Dragoo, and D.B. Irons. 1999. Breeding status and population trends of seabirds in Alaska in 1998. U.S. Fish and Wildl. Serv. Rep. AMNWR 99/02. Homer.
- Byrd, G.V. and J.C. Williams. 1994. Status and trends of seabirds and marine mammals at Bogoslof Island, Alaska, a National Natural Landmark. U.S. Fish and Wildl. Serv. Rep. to Nat. Park Serv. under Interagency Agreement No. 9700-4-9025. AMNWR 94/10.
- Ream, R.R., J.D. Baker, and R.G. Towell. In Press. Bogoslof Island studies, 1997. In Sinclair, E.H. and B.W. Robson (eds.) *Fur Seal Investigations, 1997*. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-AFSC-541.
- Robson, B.W. 1999. Bogoslof trip report. Memorandum to files, NMFS, Alaska Fisheries Science Center, National Marine Mammal Laboratory, Seattle.

Appendix A. Annotated List of Birds Observed at Bogoslof Island, Alaska, July 31-August 2, 1999.

Black-footed Albatross (*Diomedea nigripes*).--At least two individuals were seen within 15 km of Bogoslof from the M/V *Tiglax* as she traveled west from the island on August 2.

Laysan Albatross (*Diomedea immutabilis*).--At least one bird was seen within 15 km west of Bogoslof from M/V *Tiglax* on August 2.

Northern Fulmar (*Fulmarus glacialis*).--Up to 10 individuals were seen regularly near Bogoslof during our stay, most dark-phased individuals. There was no evidence of nesting at Bogoslof.

Short-tailed Shearwater (*Puffinus tenuirostris*).--Several individuals were seen within 10 km of Bogoslof from M/V *Tiglax* on August 2.

Fork-tailed Storm-Petrel (*Oceanodroma furcata*).--At least 6 fork-tailed storm-petrels were seen flying low over the water within 1 km of Bogoslof on August 2. This species was found nesting at Bogoslof in 1973.

Leach's Storm-Petrel (*Oceanodroma leucorhoa*).--Williams pulled an adult from a burrow with an egg on Puffin Slope on July 31. This species was seen near Fire Island in 1993, but has not been previously confirmed as nesting on Bogoslof. Piatt and Kataysky heard a number of these birds calling near the *Tiglax* anchored 500 m from the east side of Bogoslof after dark on August 1.

Pelagic Cormorant (*Phalacrocorax pelagicus*).--In an incomplete survey we noted 5 birds and 4 nests on Bogoslof.

Red-faced Cormorant (*Phalacrocorax urile*).--In an incomplete survey we saw 31 birds and 22 nests on Bogoslof.

Bald Eagle (*Haliaeetus leucocephalus*).--A pair of birds nested on a broad ledge on the steep scarp forming the west side of the Plateau on Bogoslof. We could not see the nest to determine whether they had young, but the pair remained in the area while we were nearby. Although a pair was found nesting in 1973, eagles have not been found nesting at Bogoslof in subsequent visits until 1999.

Phalarope (*Phalaropus spp.*).--Karen Boylan saw a flock of 8 unidentified phalaropes near the south point of Bogoslof.

Glaucous-winged Gulls (*Larus glaucescens*).--We were unable to get a count of gulls on Bogoslof, but we encountered hundreds of birds on the island. It appeared gulls did not have a very productive breeding season in 1999. By the end of July no eggs remained in nests, but we found two nests with two young chicks in each and we encountered about 5 other mobile chicks incidental to our other work. With as many gulls as there are at Bogoslof we should have seen dozens of chicks in a year when productivity was high.

Black-legged Kittiwake (*Rissa tridactyla*) and Red-legged Kittiwake (*Rissa brevirostris*).--As summarized in the results section, we counted kittiwakes in most of the segments on Bogoslof and on Fire Island. More kittiwakes were found in 1999 than in prior years on the segments we surveyed. Nevertheless, productivity was probably lower in 1999 than in other years we have done surveys. It appeared less than 30% of the nests would produce young in 1999. Those nests still active appeared to be later than normal, if birds we saw sitting were on eggs or recently-hatched chicks.

Common Murre (*Uria aalge*) and Thick-billed Murre (*Uria lomvia*).--As with kittiwakes, we counted murre on as many segments at Bogoslof as we could and we counted them on Fire Island. Fewer murre were present in 1999 than in prior years, but we were unable to count birds on the new mountain which did not exist prior to 1992, so the magnitude of the decline can not be assessed. We could not estimate productivity from our short visit, but we noticed that common murre on the plateau were still mostly on eggs and at least one thick-billed on a ledge had a just-hatched chick.

Parakeet Auklet (*Cyclorhynchus psittacula*).--Approximately 20 were seen off the west side of the mountain that came up in 1992.

Cassin's Auklet (*Ptychoramphus aleuticus*).--Piatt and Kitaysky found carcasses of two birds on Bogoslof.

Tufted Puffin (*Fratercula cirrhata*).--We counted burrows on the transects on Puffin Slope and found a few more burrows than in 1997. A particularly high proportion of the burrows were occupied in 1999. We checked the status of 8 burrows on the new mountain that came up in 1992 and found 4 with eggs, 1 with a pipped egg, and 3 with chicks. If this small sample is representative, we were probably present at about the peak of hatching.

Horned Puffin (*Fratercula corniculata*).--We saw at least 6 horned puffins on Kenyon Dome where they probably were nesting.

Common Raven (*Corvus corax*).--We saw ravens 3 times on July 31, possibly including the same birds; 2 flying over the plateau, 1 flying over the new dome, and 2 on the beach.

Song Sparrow (*Melospiza melodia*).--We saw at least 10, most of them fledglings, on July 31.

Appendix B. Notes on Habitats at Bogoslof Island, Alaska, July 31-August 2, 1999.

Water Temperatures.--The sea surface was about 8 C on July 31.

Vegetation.--On the new mountain that came up in 1992, the primary vegetation was *Puccinellia sp.* which covered perhaps 30% of the lower 1/3 of the slopes. There were scattered clumps of *Elymus* and *Senecio* also. The plateau is now nearly completely covered with a lush *Elymus/Umbel* community.

Geology.--A substantial portion of the southern slopes of the new mountain has eroded away since 1997 leaving a solid core peak (see photograph in Appendix C).

Appendix C. Panoramic shot of Bogoslof Island in late July, 1999

