# WINTER OBSERVATIONS OF EMPEROR GEESE IN THE ALEUTIAN ISLANDS, ALASKA, OCTOBER 1988-APRIL 1991

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3. Read coded plastic neck collars on geese and record instances of icing or other problems associated with markers.

4. Record instances and causes of mortality.

This report summarizes findings during the three winters of our study, and ways to improve the value of winter surveys are recommended.

**METHODS**

During the winter of 1988-89, we developed a network of volunteers and used refuge staff to observe emperor geese at Attu, Shemya, Amchitka, Adak, and Unalaska (Byrd 1989). Attu and Unalaska proved to be difficult areas in which to observe emperors closely enough to determine presence of collars or to age geese, thus in subsequent winters, surveys were confined to Shemya, Amchitka, and Adak (Fig. 1).

Surveys were conducted along standardized routes that are accessible by vehicle. At Shemya it was possible to count emperors around nearly the entire periphery of the island, but at Amchikta and Adak only small proportions of the coastlines could be readily viewed. The procedure during each survey was to count geese along the survey route, classify individuals as adult or juvenile (based upon plumage and soft part colors), and record

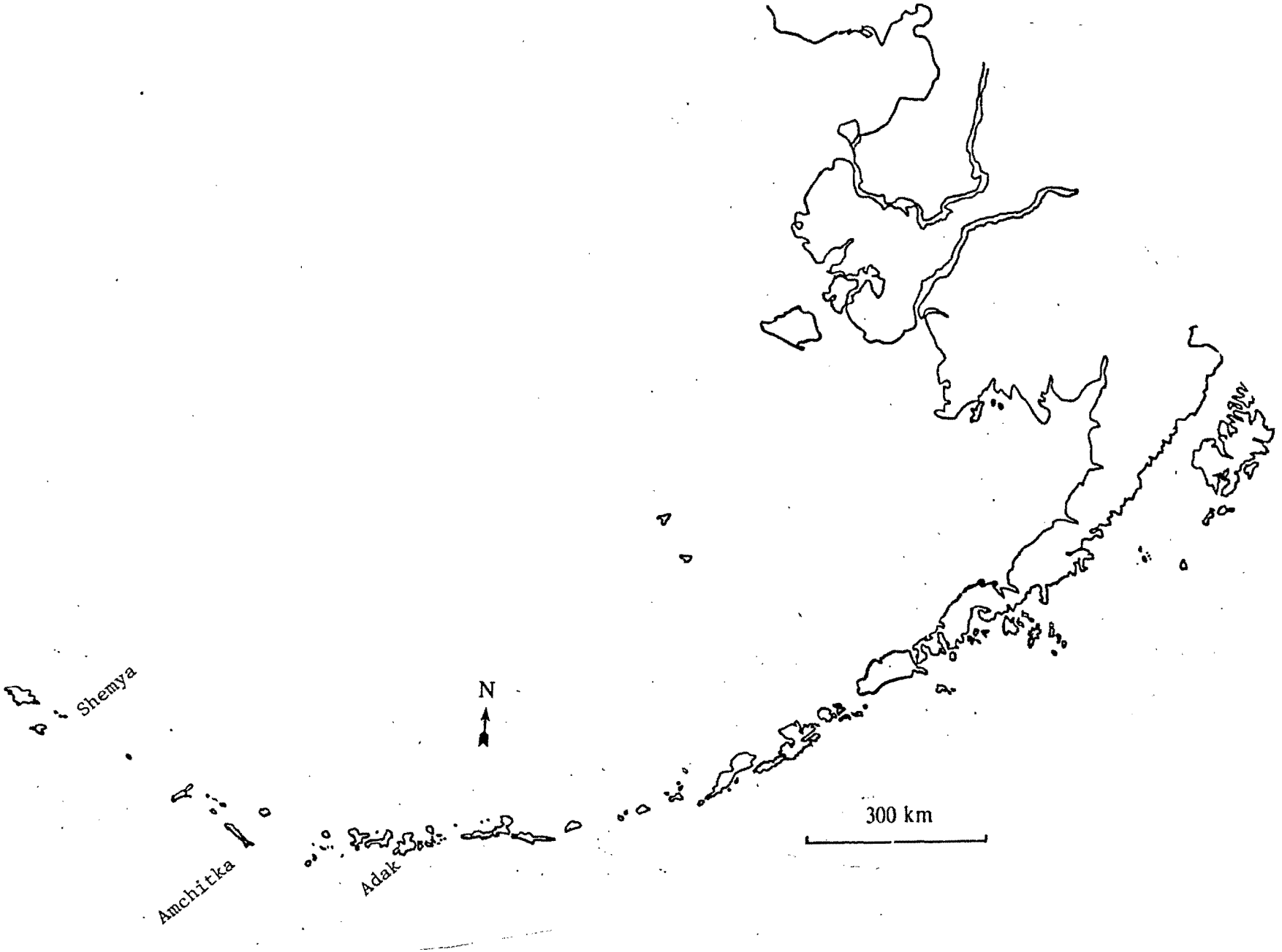


Figure 1. Locations of Emperor Goose study areas in the Aleutian Islands.

codes (if discernable) of collared birds. In addition, collars were observed for indications of ice buildup or any influence on the behavior of the marked birds.

## RESULTS

### Numbers of Geese in Study Areas

Figure 2 illustrates the normal winter pattern of relative abundance for the central and western Aleutians. Although occasional sightings of emperor geese occur earlier in some years, it is usually late October or November before geese arrive in large numbers in the central and western Aleutians (Fig. 2). By December, numbers of emperor geese are near winter peaks, and relatively large numbers remain through mid to late March, although some migration may occur by late March in some years. Most geese depart the Aleutians during April. Interestingly, collared geese at Adak appeared to be among the last emperors to leave. For example, only 9 emperor geese remained in the study area at Adak April 20, 1991; 3 of these were collared (Appendix A).

At Shemya, peak counts exceeded 400 geese only once during our study, and normally there were from 280-400 geese on the survey route December to March (Fig. 2). A similar number of geese was also normally present in the study area at Adak (Fig. 2). Interannual trends in numbers present were not evident. Too few counts were made at Amchitka to define patterns, but in 1991 personnel were able to classify over 400 in a day (Appendix A).

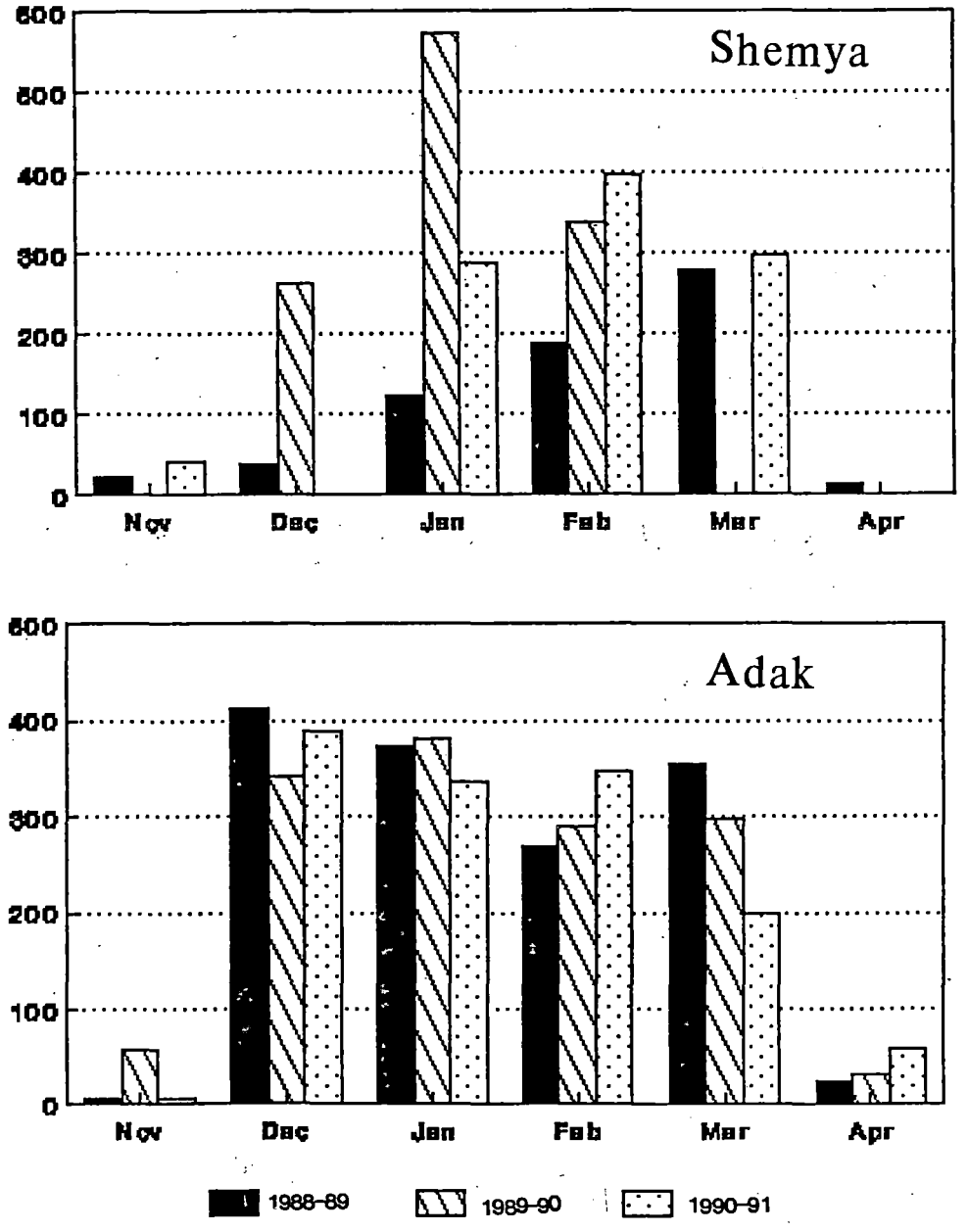


Figure 2. Peak counts of emperor geese in study areas at Shemya and Adak Islands during the winters of 1988-89, 1989-90, and 1990-91 (high counts in very early April before birds started to depart are included in the March sample).

Juvenile Ratios

The primary characteristics of juvenile emperor geese which distinguish them from adults are dark feathers on the head, and relatively dull bills and legs. Although the head feather characteristic becomes less obvious over the course of the winter, some dark edgings are still present through March. It is possible that some juveniles are misclassified as adults, however, known-age collared birds were never misclassified based upon plumage and soft parts.

We estimated the proportions of juvenile emperor geese in sampled flocks in three different ways (Table 1). It appeared that 13% to 17% of the birds observed were juveniles during our surveys. Comparisons of type II counts (Table 1) among years for Shemya and Adak indicated the proportion of juveniles was higher during the winter of 1989-90 than during the other two winters ($Chi^2$'s = 15.2 and 10.6, respectively, both p's < 0.05). Comparisons of proportions of juveniles among sites indicated there was a higher percentage of juveniles at Amchitka than Shemya or Adak during the winter of 1988-89 ($chi^2 = 7.4$, $p = 0.03$) but not in 1990-91 ($chi^2 = 2.8$, $p = 0.24$).

Observations of Collars

Over the three winters of our study, a total of 21 different collars were read (Table 2). It appeared collared birds remained at a particular winter location after they arrived because most collars was seen more than once at Shemya and Adak where

Table 1. Proportions of juvenile emperor geese observed in flocks at three sites in the Aleutian Islands during winter (i.e., December - March).

| Season | Location | Analysis Method[a] Type I | Type II | Type III |
|---|---|---|---|---|
| 1988-89 | Shemya | 0.11(0.02, 3)[b] | 0.11 (508)[c] | 0.12 (546)[c] |
| | Amchitka | 0.18(0.02, 4) | 0.16 (742) | 0.17 (842) |
| | Adak | 0.13(0.05,13) | 0.13(3393) | 0.12(3654) |
| | Average | 0.14 | 0.13 | 0.14 |
| 1989-90 | Shemya | 0.14(0.04,20) | 0.15(5200) | 0.15(5291) |
| | Amchitka | -- | -- | -- |
| | Adak | 0.17(0.02,4) | 0.17 (972) | 0.19(1178) |
| | Average | 0.16 | 0.16 | 0.17 |
| 1990-91 | Shemya | 0.13(0.03,9)[d] | 0.12(2189) | 0.12(2189) |
| | Amchitka | 0.15(0.08,4) | 0.14(1303) | 0.14(1303) |
| | Adak | 0.12(0.03,6) | 0.13 (819) | 0.14(1218) |
| | Average | 0.13 | 0.13 | 0.13 |

[a] Type I = the sample unit is each count where at least 100 geese are classified by age; Type II = the sample unit is an individual goose, but only the samples including type I estimates are included; Type III = the sample unit is an individual goose and all observations during the period are included regardless of flock size

[b] mean (s.d., n)

[c] Total geese classified

[d] Includes 3 counts in early April

Table 2. Collared emperor geese seen in the Aleutian Islands 1988-1991.

| Location | Season | Collar Code | Total Observations | Comments |
|---|---|---|---|---|
| Shemya | 1988-89 | L79 | 1 | |
| | | N99 | 1 | |
| | 1989-90 | L79 | 6 | |
| | | N99 | 3 | |
| | | 11J | 2 | |
| | | N08 | 4 | |
| | | N42 | 6 | |
| | 1990-91 | L79 | 3 | |
| | | N42 | 4 | |
| | | L75 | 1 | |
| Amchitka | 1988-89 | 8K6 | 1 | |
| | 1989-90 | No observations made | | |
| | 1990-91 | 138 | 2 | |
| | | 169 | 2 | |
| | | 37L | 1 | |
| | | 80X | 1 | |
| Adak | 1988-89 | J13 | 1 | |
| | | L16 | 1 | |
| | | L19 | 5 | |
| | | 6C5 | 3 | Radio transmitting weakly |
| | 1989-90 | None seen | | |
| | 1990-91 | 308 | 6 | Associated with 418 |
| | | 418 | 6 | |
| | | 571 | 5 | Associated with 600 and 603 |
| | | 600 | 8 | |
| | | 603 | 3 | Killed by eagle |
| | | 715 | 2 | |

observations were most frequent. Interestingly, two collared birds seen at Shemya in 1988-89 were seen there again during the next winter, and one of the birds was seen there all three winters of our study. Also a bird first seen at Shemya during the winter of 1989-90 was there again the next winter. These observations suggest at least some emperor geese are faithful to particular wintering areas.

We observed collared birds under a wide range of conditions. In a total of 78 observations (Table 2) that were close enough to read codes, ice was never detected on collars. Geese occasionally appeared to be preening awkwardly around collars, but generally there appeared to be no abnormal behavior associated with these markers.

Instances of Mortality

We recorded only one case of mortality. In December 1990 a juvenile goose with collar 603 was apparently killed by a bald eagle. It had been seen the day before associated with adults wearing collars 715 and 600, and they all appeared to be acting normally. The observers that found the dead goose came upon the eagle soon after the kill, because there were feathers scattered around the carcass, fresh blood was found, and the eagle was just beginning to eat the goose.

## DISCUSSION

Approximately 300-400 emperor geese may be viewed well enough to determine age on any given day December to March at Shemya, Amchitka, and Adak. Samples could be increased by at least 100 birds at Amchitka and Adak by expanding study areas, but there is no opportunity to expand sampling at Shemya.

A comparison of fall juvenile percentages on the Alaska Peninsula, including Izembek Lagoon (C.P. Dau, unpubl. data), with winter surveys in the central and western Aleutians indicates that the proportion of juveniles is lower in the Aleutians. This could be a real decline due to differentially high mortality of juveniles during fall and early winter, but it could also be a result of differences in distribution of family groups. For example, it is possible that wintering populations in the central and western Aleutians contain a smaller proportion of family groups than the fall flocks at Izembek because of differential winter distribution. The possibility that a significant number of junveniles are classified as adults during winter also has to be considered. Nevertheless, it appears this factor is minor.

We recorded only a few examples of obvious response of geese to collars (e.g., excessive preening of neck feathers), and we never saw ice buildup on collars. Nevertheless, our observations may

have been too infrequent to adequately sample for rare events. It is possible that ice could build up on collars at altitudes attained during migration flights.

## RECOMMENDATIONS

Too few collared emperor geese are seen at any of our study areas to adequately evaluate the impact of collars on behavior or survival of geese. I recommend that a sample of geese be captured and collared at Adak and/or Shemya in December and observed thereafter. Activity budgets, survival through the winter, and movement of birds could be evaluated through intensive observations. The proportion of juveniles in flocks should continue to be recorded at Shemya, Amchitka, and Adak throughout the winter.

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Appendix A. Counts of adult and juvenile emperor geese in the central and western Aleutian Islands 1988-1991.

| Winter | Site | Date | Total Adults | Total Juveniles | Percent Juveniles | Neck Collar Codes |
|---|---|---|---|---|---|---|
| 1988-89 | Shemya | 11/10/88 | 16 | 8 | 33 | |
| | | 11/11/88 | 13 | 8 | 38 | |
| | | 12/08/88 | 29 | 9 | 24 | |
| | | 01/19/89 | 109 | 15 | 12 | N99 |
| | | 02/15/89 | 119 | 11 | 9 | |
| | | 03/02/89 | 222 | 32 | 13 | L79 |
| | | 04/13/89 | 11 | 2 | 15 | |
| | Amchitka | 11/02/88 | 77 | 5 | 6 | |
| | | 11/10/88 | 45 | 0 | 0 | |
| | | 11/16/88 | 59 | 2 | 3 | |
| | | 12/06/88 | 42 | 0 | 0 | |
| | | 01/09/89 | 135 | 25 | 16 | |
| | | 01/18/89 | 126 | 32 | 20 | |
| | | 01/31/89 | 236 | 51 | 18 | |
| | | 02/13/89 | 114 | 23 | 17 | |
| | | 02/17/89 | 45 | 13 | 22 | 8K6, 1 unknown |
| | Adak | 11/03/88 | 2 | 0 | 0 | |
| | | 11/11/88 | 6 | 0 | 0 | |
| | | 12/14/88 | 186 | 49 | 21 | L19 |
| | | 12/19/88 | 163 | 29 | 15 | 6C5 |
| | | 12/28/88 | 370 | 42 | 10 | L19 |
| | | 12/31/88 | - | - | - | J13 |
| | | 12/31/88 | - | - | - | L16 |
| | | 01/11/89 | 141 | 29 | 17 | L19 |
| | | 01/13/89 | 338 | 36 | 11 | L19, 6C5 |
| | | 01/17/89 | 72 | 11 | 13 | 6C5 |
| | | 01/20/89 | 201 | 11 | 5 | |
| | | 01/25/89 | 282 | 18 | 6 | |
| | | 02/02/89 | 246 | 22 | 8 | |
| | | 02/03/89 | 11 | 12 | 52 | L19, 6C5 |
| | | 02/07/89 | 212 | 22 | 10 | |
| | | 02/13/89 | 40 | 19 | 32 | |
| | | 02/21/89 | 213 | 36 | 15 | |
| | | 03/02/89 | 321 | 33 | 9 | |
| | | 03/09/89 | 103 | 25 | 20 | |
| | | 03/20/89 | 226 | 39 | 15 | |
| | | 03/30/89 | 79 | 17 | 18 | |
| | | 04/13/89 | 19 | 5 | 21 | |
| 1989-90 | Shemya | 12/05/89 | 163 | 27 | 14 | |
| | | 12/06/89 | 263 | 45 | 15 | 11J, N08, N42, N99 |
| | | 12/07/89 | 223 | 41 | 16 | 11J, N42 |
| | | 12/08/89 | 189 | 34 | 15 | N42, L79 |
| | | 12/12/89 | 144 | 26 | 15 | N08, L79 |
| | | 12/15/89 | 83 | 8 | 9 | |
| | | 12/16/89 | 188 | 45 | 19 | L79 |
| | | 12/24/89 | 210 | 25 | 11 | |
| | | 12/27/89 | 122 | 16 | 12 | L79 |
| | | 12/30/89 | 213 | 51 | 19 | N08, N42, L79 |
| | | 01/01/90 | 322 | 85 | 21 | |
| | | 01/06/90 | 504 | 77 | 13 | N42 |
| | | 01/07/90 | 514 | 60 | 10 | |

| Winter | Site | Date | Total Adults | Total Juveniles | Percent Juveniles | Neck Collar Codes |
|---|---|---|---|---|---|---|
| 1989-90 | Shemya | 01/17/90 | 281 | 58 | 17 | N08, N42, L79 |
| | | 01/18/90 | 256 | 61 | 19 | |
| | | 01/19/90 | 203 | 40 | 16 | |
| | | 01/20/90 | 244 | 26 | 10 | N99, L79 |
| | | 01/21/90 | 144 | 12 | 8 | N99 |
| | | 01/22/90 | 144 | 17 | 11 | |
| | | 01/23/90 | 110 | 17 | 13 | |
| | Adak | 12/04/89 | 98 | 22 | 18 | |
| | | 12/08/89 | 51 | 38 | 43 | |
| | | 12/14/89 | 171 | 35 | 17 | |
| | | 01/03/90 | 312 | 70 | 18 | |
| | | 01/10/90 | 12 | 2 | 14 | |
| | | 01/12/90 | 15 | 17 | 53 | |
| | | 02/08/90 | 58 | 13 | 18 | |
| | | 02/15/90 | 231 | 33 | 13 | |
| 1990-91 | Shemya | 11/08/90 | 25 | 0 | 0 | |
| | | 11/09/90 | 42 | 0 | 0 | |
| | | 11/10/90 | 32 | 1 | 3 | |
| | | 01/23/91 | 228 | 18 | 7 | L75 |
| | | 01/24/91 | 228 | 47 | 17 | N42, L79 |
| | | 02/19/91 | 115 | 14 | 11 | |
| | | 02/20/91 | 247 | 44 | 15 | N42, L79 |
| | | 02/21/91 | 149 | 24 | 14 | L79 |
| | | 02/22/91 | 123 | 15 | 11 | N42, L79 |
| | | 04/02/91 | 208 | 30 | 13 | N42 |
| | | 04/03/91 | 214 | 33 | 14 | |
| | | 04/04/91 | 173 | 27 | 14 | |
| | Amchitka | 03/02/91 | 322 | 17 | 5 | 138, 169 |
| | | 03/03/91 | 154 | 44 | 22 | |
| | | 03/04/91 | 420 | 63 | 13 | 138, 169, 37L, 80X |
| | | 03/05/91 | 229 | 54 | 19 | |
| | Adak | 11/19/90 | 6 | 0 | 0 | |
| | | 12/11/90 | - | - | - | 715, 600, 603 |
| | | 12/15/90 | - | - | - | 715, 600, 603 |
| | | 12/16/90 | - | - | - | 603 dead |
| | | 12/24/90 | 185 | 15 | 8 | |
| | | 12/28/90 | - | - | - | 418, 308 |
| | | 12/30/90 | - | - | - | 600 |
| | | 01/05/91 | - | - | - | 308, 418 |
| | | 01/14/91 | 173 | 26 | 13 | |
| | | 01/28/91 | 129 | 21 | 14 | 308, 418 600, 571 |
| | | 02/01/91 | 109 | 13 | 11 | |
| | | 02/03/91 | - | - | - | 571, 600 |
| | | 02/09/91 | 60 | 12 | 17 | |
| | | 02/10/91 | 76 | 18 | 19 | 308, 571, 600 |
| | | 02/12/91 | 23 | 2 | 8 | |

| Winter | Site | Date | Total Adults | Total Juveniles | Percent Juveniles | Neck Collar Codes |
|---|---|---|---|---|---|---|
| | | 02/13/91 | 45 | 5 | 10 | |
| | | 02/16/91 | 113 | 14 | 11 | 571, 600 |
| | | 02/28/91 | 76 | 15 | 16 | |
| | | 03/10/91 | 54 | 13 | 19 | 308, 418 |
| | | 04/12/91 | 37 | 21 | 36 | 571, 600 |
| | | 04/14/91 | - | - | - | 308, 418 |
| | | 04/20/91 | 5 | 4 | 44 | 571, 600, 418 |