# ANNUAL NARRATIVE REPORT
Calendar Year 1986

## IZEMBEK NATIONAL WILDLIFE REFUGE
Cold Bay, Alaska

Pavlof Unit of the Alaska Peninsula NWR
Unimak & Amak Islands of the Alaska Maritime NWR

IZEMBEK NATIONAL WILDLIFE REFUGE
P.O. BOX 127
COLD BAY, ALASKA 99571

Including:
Pavlof Unit of the Alaska Peninsula National Wildlife Refuge, and
Unimak and Amak Islands of the Alaska Maritime National Wildlife Refuge

# ANNUAL NARRATIVE REPORT
CALENDAR YEAR 1986

NATIONAL WILDLIFE REFUGE SYSTEM
Fish and Wildlife Service
U.S. DEPARTMENT OF THE INTERIOR

## PERSONNEL

| | | |
|---|---|---|
| 1. | John Sarvis, Refuge Manager, PFT, GS-485-12 | 6/23/74-Present |
| 2. | Michael D. Blenden, Assistant Refuge Manager, PFT, GS-485-11 | 8/26/84-Present |
| 3. | Christian P. Dau, Wildlife Biologist, PFT, GS-485-11 | 1/30/81-Present |
| 4. | Avery J. Bates, Maintenance Worker, (Retiree) PFT, WG-4749-8 (Retired after 30 years service) | 8/20/81-9/27/86 |
| 5. | Frank Dunn, Maintenance Worker, PFT, WG-4749-8 | 11/21/86-Present |
| 6. | Annette E. Alexander, Refuge Secretary | 1/21/86-Present |
| 7. | David J. Wilson, YCC Enrollee | 6/16/86-8/22/86 |
| 8. | Jeff Backlund, YCC Enrollee | 6/16/86-8/22/86 |

## REVIEW AND APPROVALS

John Sarvis 12/29/87

Submitted By Date

Alaska Regional Office (R-7) Date

Michael Blenden, Assistant Refuge Manager

John Sarvis, Refuge Manager

Christian P. Dau/Wildlife Biologist

Frank Dunn, Maintenance Worker

Annette E. Alexander, Refuge Secretary

Jeff Wilson (left) and Jeff Backlund- YCC crew

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# INTRODUCTION

The Izembek National Wildlife Range was established in 1960 (Public Land Order 2216) with a boundary encompassing 415,300 acres dominated by wet and upland tundra. Within this area are approximately 95,000 acres of tide lands and lagoons owned by the State of Alaska. These areas have been identified as critical habitat by the state and are largely the basis for the identification and establishment of the refuge. Some of the largest eelgrass beds in the world are in these shallow lagoons and this resource, in addition to those in adjacent fresh water and terrestrial habitats, supports the large numbers of migratory waterfowl which characterize the area in fall through spring. Brown bear and barren ground caribou, both impressive resident game species, occur commonly in the area as well.

The Izembek National Wildlife Range became the Izembek National Wildlife Refuge on December 2, 1980, with signing of the Alaska National Interest Lands Conservation Act (ANILCA - P.L. 96-487) by President Carter (Figure 1). Under ANILCA, 16 refuges were either established, redesignated (such as our name change), or enlarged, adding 53,720,000 acres to the NWRs for a total of 76.1 million acres of refuges in Alaska. The purposes for which each of these 16 refuges are to be managed were also changed and/or defined. In addition, 13 refuge Wilderness areas were established, totalling 18,560,000 acres. A Wilderness area of 300,000 acres was designated from Izembek's total of 320,893.

The Izembek NWR lies near the western terminous of the Alaska Peninsula, approximately 650 miles southwest of Anchorage. The refuge headquarters is in Cold Bay, Alaska, a largely federal and state government town of approximately 200 people. The Cold Bay office also has responsibility for the administration of part of the Aleutian Islands Unit of the Alaska Maritime NWR (989,000 acres on Unimak Island) and the 1.5 million acre Pavlof Unit of the Alaska Peninsula NWR. These areas support some of the largest seabird colonies in Alaska with a wide variety of species present. In addition, Unimak Island and the Pavlof Unit support important populations of brown bear, caribou, furbearers and a resident population of tundra swans. Adjacent coastal areas support rich and diversified populations of migratory waterfowl, marine birds and mammals, and fin and shellfish. Several fishery stocks exist in commercial quantities and activities associated with these resources increase on a seasonal basis. This report on Izembek NWR integrates information from the Pavlof Unit and Unimak Island Unit.

The Aleutian Islands National Wildlife Refuge was created from public lands in 1913 by Executive Order 1733. The refuge is administratively divided at Unimak Pass. Unimak Island (989,000 acres) is managed out of the Cold Bay office for logistical and biological reasons. The split conforms to natural boundaries, Unimak Pass forming a distinct and extremely important

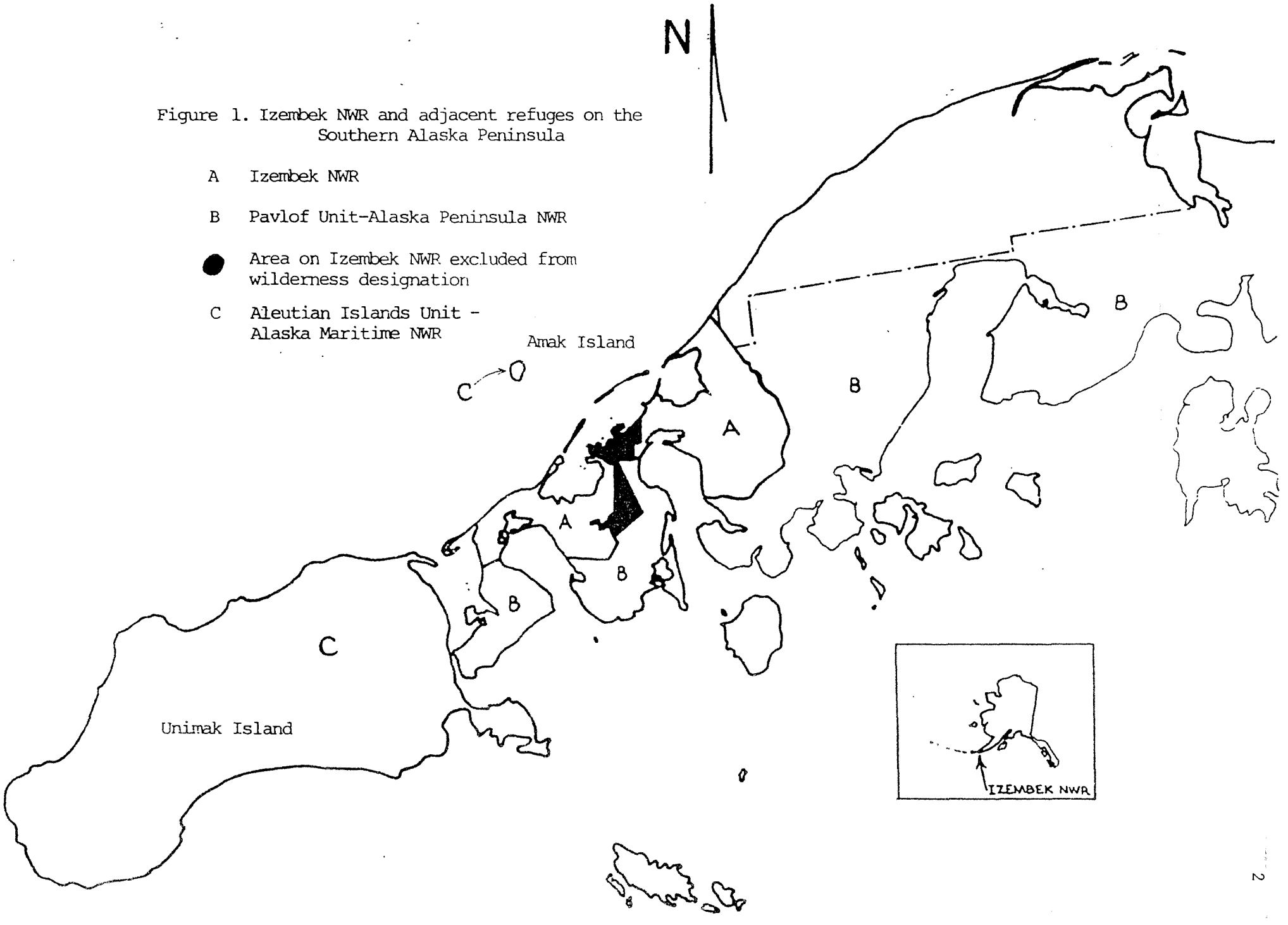


Figure 1. Izembek NWR and adjacent refuges on the Southern Alaska Peninsula

A Izembek NWR

B Pavlof Unit-Alaska Peninsula NWR

● Area on Izembek NWR excluded from wilderness designation

C Aleutian Islands Unit - Alaska Maritime NWR

Mt. Dutton with Delta Point and Cold Bay in the foreground.
(Blenden)

Round Top, Isanotski Peak (or Raggedy Jack) Shishaldin Volcano form the volcanic spine of Unimak Island.
(Blenden)

'biological' divide before the unique Aleutian flora and fauna of the central and western islands. With the passing of ANILCA, came the establishment of the Alaska Maritime NWR with an Aleutian Islands Unit, which included the islands that formerly comprised the Aleutian Islands NWR.

Unimak Island's habitat closely resembles that of the Alaska Peninsula, although it is somewhat impoverished. Cover, such as alder and willow shrubs, are quite restricted in distribution, and there are fairly extensive, bare or nearly bare, ash and lava flows of varying ages. Especially in the western portion, salmon runs are small or non-existent, due partly to steep terrain and bluffs which make upstream negotiation impossible.

Since 1982, management responsibilities for the Pavlof Unit of the APNWR have been assigned to the staff of Izembek NWR. The Cold Bay office is more centrally located and hence, logistically able to adequately perform the required management functions.

The unit encompasses approximately 1.5 million acres of which well over half is native-selected or conveyed. This patchwork of land ownership will cause major problems with management of the refuge, in particular, since the native corporations have selected the coastal areas which are also the most important lands to wildlife.

The Aleutian Range runs the length of the unit and provides some of the most spectacular scenery on the Alaska Peninsula. Pavlof Volcano, the highest peak at 8,261 feet, is an active volcano that has erupted several times in recent years. The northern portion of the unit is characterized by lowland meadows interspersed with numerous ponds and lakes and areas of upland tundra. The southern portion is mountainous with steep-sided valleys drained by alder-lined streams supporting large salmon runs.

Maintenance of refuge habitats in their present pristine condition is the goal of the refuge staff. In view of land status changes resulting from ANILCA and the leasing and subsequent development of offshore petroleum rich basins in the Bering Sea, this chore will be no small one. Research such as the effects of disturbances on black brant and other waterfowl and movements and population dynamics of brown bear and caribou will provide support of our ongoing goal of protecting wildlife and its habitats.

## A. HIGHLIGHTS

1. Ninety locations of 19 radio-collared brown bears were made during the third year of the refuge's Research/Management Study.

2. The second year of a cooperative research project to assess the effects of disturbance on spring and fall staging waterfowl was completed.

3. Eighty-three tundra swans were captured during neck collaring on Izembek and the Pavlof Unit. Resightings of 23 Pavlof birds were reported in Washington, Oregon and California.

4. Cooperative fall productivity survey of the southern Alaska Peninsula caribou herd performed with the Alaska Department of Fish and Game. An aerial census conducted later by the refuge documented a loss of nearly 6,000 animals since 1983. Emergency regulations were put into effect.

5. Sixth annual spring emperor goose survey performed by WA-MBMN and Izembek NWR resulted in a count of 42,228. The population declined 28.2% from 1985; all hunting of species prohibited in 1986.

6. Brant and emperor goose productivity counts conducted for 24th and 20th consecutive years, respectively. Juveniles made up 15.3 and 26.1 percent of the respective populations.

7. A replacement Super Cub (N745) was completed and assigned in December to Izembek NWR.

8. Modification to the refuge headquarters included a bulk storage fuel distribution system and an auxiliary generator building.

9. The second year of a fisheries inventory on the refuge was completed. Progress was made on a refuge Fisheries Management Plan.

## B. CLIMATIC CONDITIONS

The analysis of Cold Bay weather phenomenon could be likened to the experiencing of a continual rapid progression of climatic events. "Cradle of the Storms", "Where the Sea Breaks its Back", "Islands in the Smokey Sea", "The Thousand Mile War", and "Of Fog and Men", are all alluring titles of volumes portraying the saga of man and the harsh environs of the lower Alaska Peninsula and Aleutian Islands. Some characteristics of the dynamic progression of climatic events in 1986 are summarized in relation to 'normal'

in Table 1. Terms such as normal, typical or average erroneously imply an air of moderation. There is nothing normal, typical, average or moderate about weather patterns westerly from 165 W, at least in the residents' views. Statistically, however, we like to compare the harsh events of one year to the harsh events viewed over the long term.

The phenology of activity patterns characteristic to the flora and fauna, including humans, inhabiting the lower Alaska Peninsula is most dramatically affected by climate. However, at times the relationships are not obvious. For example, the spring and summer of 1986 were slightly cooler and dryer than normal, not an uncommon occurrence. But, in 1986 there was essentially a complete berry failure in Empetrum and Vaccinium species. Analysis of average monthly weather patterns does not support that such a drastic response is due strictly to climate. It is highly likely that short duration weather events could have adversely affected critical phases in the life cycles of these species. Such events may not be apparent in monthly averages.

Fall of 1986 was warmer and wetter than normal and subjectively these conditions had some effect on the migration phenology of waterfowl and caribou (Table 2). The fall molt migration of Steller's eiders to Izembek Lagoon, normally completed by 1 September, may have been delayed up to one week. For black brant and Taverner's Canada geese, first fall sightings were on 30 and 25 August, respectively. These arrivals are up to 10 days later than normal. Peak populations of these goose species are usually present by late September. Brant appeared to follow this pattern based on aerial surveys, but Canada goose numbers did not peak until late October. Mild fall climatic conditions are believed to be a primary causative factor in the delayed migration documented in 1986.

The southern Alaska Peninsula caribou herd responded to mild weather in October and November by delaying its appearance in the Cold Bay area by approximately three weeks. Several brown bears present in the Cold Bay area through mid-December were also indicative of the abnormally warm weather. Snow and 'typical' winter conditions did not arrive until 26 December and then were of a temporary nature.

Table 1. Summary of Weather Data, Cold Bay, Alaska, 1986

| Month | Av. Temp. (°F.) | Departure from Av. | Precip. | Departure from Av. | Wind Speed (Av. mph) | Peak/2 (mph) |
|---|---|---|---|---|---|---|
| January | 24.4 | -3.9 | 2.05 | -0.65 | 17.8 | 40 |
| February | 28.4 | 0.9 | 2.23 | -0.04 | 18.1 | 46 |
| March | 27.0 | -1.6 | 0.55 | -1.76 | 14.9 | 58 |
| April | 32.2 | -0.8 | 1.12 | -0.83 | 13.2 | 46 |
| May | 38.0 | -1.5 | 2.02 | -0.45 | 12.9 | 38 |
| June | 44.7 | -0.7 | 1.91 | -0.25 | 16.4 | 43 |
| July | 51.7 | 1.4 | 2.48 | -0.02 | 14.2 | 39 |
| August | 51.2 | 0.0 | 2.63 | -1.07 | 15.7 | 46 |
| September | 49.8 | 2.3 | 7.37 | 3.60 | 19.2 | 52 |
| October | 42.3 | 2.8 | 3.03 | -1.26 | 15.1 | 39 |
| November | 37.0 | 2.7 | 5.08 | 1.04 | 18.2 | 59 |
| December | 34.3 | 4.8 | 4.94 | 2.09 | 18.9 | 52 |
| 1986 AVERAGE | 38.4 | 0.4 | 35.4 (1986 total) | 0.50 | 16.2 | 47 |

/1 Data reported by the National Weather Service, Cold Bay, Alaska

/2 This figure is the fastest mile (i.e. it is the peak sustained wind for a one-minute period). Actual peak gusts (less than one minute duration) are much higher.

Table 2. Fall and Winter Weather Conditions, Cold Bay, Alaska, 1986

| Month | Avg. Temp (°F) | | Precipitation (in.) | | Av. Wind Speed (mph) | |
|---|---|---|---|---|---|---|
| | 1986 | Normal | 1986 | Normal | 1986 | Normal |
| September | 49.8 | 47.5 | 7.37 | 3.77 | 19.2 | 16.3 |
| October | 42.3 | 39.5 | 3.03 | 4.29 | 15.1 | 16.9 |
| November | 37.0 | 34.3 | 5.08 | 4.04 | 18.2 | 17.6 |
| December | 34.3 | 29.5 | 4.94 | 2.85 | 18.9 | 17.2 |
| Overall Average | 40.9 | 37.7 | 20.42 | 14.95 | 17.9 | 17.0 |
| % Change from Normal | +8.5 | | +36.6 | | +5.29 | |

Kayaking, a traditional historical form of Aleut travel, is being practiced by several local residents using 20th Century crafts. (Sarvis)

## C. LAND ACQUISITION

Native conveyed lands (22g-ANSCA) within the Izembek NWR and conveyed and selected lands adjacent to the Pavlof Unit of the Alaska Peninsula NWR are of varying degrees of importance with respect to acquisition. The village corporations of King Cove, False Pass and Pauloff Harbor have suggested they are interested in land exchanges and two (False Pass and Pauloff Harbor) have approached Realty personnel in the Regional Office on this matter. The Realty Division prepared Land Exchange Ascertainment Reports for lands belonging to each of these three Native Corporations. These reports were distributed on 23 December allowing further negotiations to proceed.

The Alaska Peninsula NWR Comprehensive Conservation Plan and the Bristol Bay Cooperative Management Plan suggest the potential for land exchanges involving the Fish and Wildlife Service. Our potential trade lands are those areas of the Pavlof Unit of the APNWR adjacent to the town of Cold Bay.

The possible land exchange in the southern Alaska Peninsula area would add valuable wildlife habitat to the refuge while at the same time provide the private sector with commercially valuable land.

## D. PLANNING

### 1. Master Plan and 2. Management Plan

On 30 May 1985 the Regional Office released the Final Izembek NWR Comprehensive Conservation Plan. Preparation of this plan was mandated by passage of ANILCA in 1980.

In general, the ICCP restated the Fish and Wildlife Service's desire to continue management of Izembek NWR as has been done in the past. The Service selected a management alternative that will continue to manage 300,000 acres (95%) as wilderness. The remaining 15,000 acres (5%) consist of refuge land adjoining the city of Cold Bay and the associated road system. This land was not designated as wilderness in 1980, due to the extensive system of roads and disturbance from military habitation during WW II. Under the Service's preferred management alternative, this land will not be recommended for Wilderness designation, but is designated as a Minimal Management Area in which development and vehicular access would be kept at current levels.

The Final Alaska Peninsula NWR Comprehensive Conservation Plan was released by the Regional Office on 1 August 1985. The Izembek NWR staff manages the Pavlof Unit of the APNWR and hence, was also involved in this planning process.

This plan describes five alternative strategies for the management of about 4.3 million acres. The strategies cover a broad spectrum of management possibilities. The Service's preferred proposal (Alternative B) occupies a conservative, intermediate position within that spectrum. By maintaining the Refuge's natural diversity, the proposal would ensure support of key recreational hunting and fishing. The proposal would also support continued subsistence use of the resources of the Refuge while providing additional opportunities for permanent facilities and motorized access in the enhanced public-use management area near Cold Bay. At the same time, the preferred alternative would consider development of a trans-peninsula transportation corridor in the future, subject to the provisions of Title XI of ANILCA.

The plan also evaluates the suitability of non-wilderness refuge lands for preservation as Wilderness, as required by Section 1317 of ANILCA. As a result, about 53% of the Refuge is proposed for Wilderness designation under the preferred alternative. To date the Record of Decision finalizing the plan has not been signed by the Regional Director.

3. Public Participation

A fundamental part of the CCP process was collection and assessment of public input. Public hearings on the Izembek CCP and Alaska Peninsula CCP were held in Anchorage and local villages to obtain public comments.

All public meetings held were beneficial for us as well as those village members present. Discussions ranged from specific comments on one or both refuge plans to comments on specific refuge management practices and Service policy. In spite of a few critical comments, some of which were well deserved, the general concensus expressed contentment with the status quo and skepticism toward significant development.

Written and oral comments received from the public and other agencies were summarized and considered in the CCP process. Selection of the preferred management alternatives was based, in part, on these comments.

4. Compliance with Environmental Mandates

In accordance with the Alaska Coastal Zone Management Act, the Aleutians East Coastal Resource Service Area was formed. The majority of Izembek NWR, Alaska Peninsula NWR and Unimak Island fall within the boundaries of the Aleutians East CRSA. We submitted comments on the Aleutians East CRSA pre-Public Hearing Draft Coastal Management Plan. This was the first of three opportunities for public comment. At this time, the draft plan serves as an effective back-up and valuable supplement to federal regulations. Several ecologically sensitive areas have been singled out for protection and the plan emphasizes preservation of

natural conditions, wildlife and fisheries. In December 1985, the State of Alaska, Division of Governmental Coordination approved the Aleutians East CRSA policies as part of the Alaska Coastal Policy Council's "District Coastal Management Program".

In addition to fulfilling the CCP requirements of ANILCA and the EIS requirements of NEPA, the Izembek and Alaska Peninsula Master Plans serve also as a Wilderness Review for lands on these two refuges. As of this writing, no additional lands will be recommended for wilderness designation on Izembek (95% already designated by ANILCA in 1980). Considerable acreage will be recommended for wilderness on Alaska Peninsula NWR where none was designated by ANILCA.

5. Research and Investigation

Refuge Personnel

Seasonal Movements and Distribution of Brown Bear on Izembek NWR

This telemetry project, begun in 1977, was greatly accelerated in 1984 and 1985. Fifty brown bears were captured in 1984 and 14 additional captures were made in 1985. Movements of 33 radio-collared bears were recorded using aerial and ground location techniques. See Section G. 8, Game Mammals, Brown Bear.

Seasonal Movements, Distribution and Productivity of Caribou on Izembek NWR

Census efforts, begun in 1979, were continued in 1986, along with continued ground productivity appraisals. See Section G.8., Game Mammals, Caribou.

Caribou Winter Range Survey

Vegetative composition of three general habitat types within the wintering area of the southern Alaska Peninsula caribou herd are being evaluated to provide baseline data on species composition, distribution and abundance. These data will be compared to patterns of caribou distribution and forage consumption.

Population Size and Productivity of Black Brant

This continuing program receives a high degree of emphasis during the fall staging period to ensure accurate assessments for management of the species throughout the Pacific Flyway, per the Pacific Flyway Black Brant Management Plan. This work in 1986 is summarized in Section G.3., Waterfowl, Black Brant.

Population Size and Productivity of Emperor Geese

Emperor geese winter in the Aleutian Islands and the Alaska Peninsula and use the Izembek NWR extensively during the spring

and fall migration. Fall productivity surveys and periodic inventories aid in implementing the Pacific Flyway Emperor Goose Management Plan. The 1986 project results are summarized in Section G 3., Waterfowl, Emperor Goose.

Species Composition and Distribution of Aquatic Vegetation on Izembek NWR

Fertile freshwater lakes with tributaries to the sea are important habitats for fish, aquatic mammals and water birds. Aquatic vegetation is an important component in the biological make-up of these water bodies. This project involves the collection of baseline data on species composition and distribution of aquatic plants. Characteristics such as size and depth of each water body evaluated will also be determined.

Seasonal Movements and Population Dynamics of the Resident Tundra Swan Population

This project continued in 1986. Eighty-six new birds including 15 previously banded birds were captured. Twenty-three different individuals were observed in Washington, Oregon and California. See Section G. 3., Waterfowl, Tundra Swan for complete discussion.

Seasonal Movements and Morphological Characteristics of the Gray-Crowned Rosy Finch, Snow Bunting and McKay's Bunting

This project is a low intensity effort performed primarily at the Cold Bay headquarters of Izembek NWR. Birds are baited to a permanent trap site near the office, captured, banded and released. The age, sex and weight of all birds are noted along with other observations made on physical and plumage characteristics. Banding efforts performed at Cold Bay in 1986 are summarized in Table 3.

Other Personnel

Seasonal Distribution and Abundance of Sea Otters Along the Lower Alaska Peninsula

This project was performed on contract to NOAA as part of the Outer Continental Shelf oil and gas exploration work funded by the Minerals Management Service. Envirosphere Company employees performed aerial surveys periodically throughout 1986 to monitor population size and seasonal movements.

Movement Patterns and Population Status of Western Alaska Peninsula Sea Otters

This project, funded by the Minerals Management Service through the USFWS, involved the capture and radio implanting of 16 otters. The study was performed by Charles Monnett and Lisa Rotterman of the University of Minnesota. Izembek NWR provided logistic support and some of the necessary radio tracking flights.

Table 3. Passerine Banding, Izembek NWR, 1986

| Species | Number Banded | | | | | | Number Recaptured | | |
|---|---|---|---|---|---|---|---|---|---|
| | AHY | | LOCAL | | | Total | AHY | | Total |
| | M | F | M | F | U | | M | F | |
| Tree Swallow | | | | | 4 | 4 | | | |
| Golden-crowned Sparrow | | | | | 14 | 14 | | | |
| Lapland Longspur | 1 | | | | | 1 | | | |
| Snow Bunting | 9 | 2 | | | | 11 | 2 | | 2 |
| Gray-crowned Rosyfinch | 8 | | | | | 8 | 1 | | 1 |

This work conducted by personnel from the King Salmon (FR) field office is summarized in Section G. WILDLIFE, 11. Fisheries Resources.

## E. ADMINISTRATION

### 1. Personnel

One personnel change was made in 1986. Maintenance worker Avery Bates retired after 30 years with the federal government. Frank Dunn, arrived to fill the MW position on November 21, 1986. (Table 4).

Jeffrey Wilson of Cold Bay and Jeffrey Backlund of Rosemount, Minnesota, were enrolled in our YCC program this year. They worked from June 16 to August 22 on a wide variety of refuge projects.

### 2. Funding

Shown in Table 5.

### 3. Safety

RM Sarvis attended OAS pilots' ground school and had his annual flight physical.

Ten caribou were captured this summer using the immobilization drug Carfentanil. This project was completed without mishap. Safety discussions concerning helicopter operations, drug handling and caribou behavior were conducted.

Additional safety meetings were held on many topics throughout the year.

RM Sarvis and ARM Blenden received CPR certification on 25 February while at the annual law enforcement refresher.

On 1 February, Super Cub (N745) flipped landing at Peterson Lagoon, Unimak Island. Thanks to shoulder harnesses and helmets, RM/pilot Sarvis and ARM Blenden were unhurt. Apparently heavy snows during the previous several days had covered a layer of slush over the frozen lagoon. While dragging tracks on the proposed landing surface the plane wheels broke through the snow into the slush layer. The increased resistance provided by the slush rapidly decelerated the plane. It flipped just before coming to a final stop.

After climbing out of the plane and assessing the situation, survival gear was hauled to shore and a camp set up. Upon

TABLE 4 Staffing, Izembek NWR

| | Full Time | Part Time | Temporary | YCC |
|---|---|---|---|---|
| FY 1977 | 3 | 1 | 1 | - |
| FY 1978 | 4 | 1 | 1 | - |
| FY 1979 | 4 | 1 | 1 | - |
| FY 1980[1] | 3 | 3 | 1 | - |
| FY 1981[2] | 3 | 2 | - | - |
| FY 1982 | 5 | - | - | - |
| FY 1983 | 5.0 FTE Permanent | - | - | 2 |
| FY 1984 | 5.0 " " | - | - | 2 |
| FY 1985 | 5.0 " " | - | - | 2 |
| FY 1986 | 5.0 " " | - | - | 2 |
| FY 1987 | 5.0 " " | - | - | 2 |

[1]Includes 1 PFT and 1 PPT ceiling and funding for Cape Sarichef field station, Eastern Aleutian NWR.

[2]One PFT ceiling and 1 PPT ceiling vacated due to closing of Cape Sarichef field station. One PFT ceiling filled at Izembek.

TABLE 5 Funding for Izembek NWR (in thousands of dollars)

| | 1210 | 1220 | 1240 | 1260 | 1360 | 1500 | Total |
|---|---|---|---|---|---|---|---|
| FY 1977 | 93 /1 | 17 | | | | 5 | 115 |
| FY 1978 | 122 /2 | 25 /3 | 20 /4 | | | | 167 |
| FY 1979 | 128 | 35 | 15 | | | | 178 /5 |
| FY 1980 | 169 | 40 | 16 | | | | 225 |
| FY 1981 | 160 | 75 | 13 | | | | 248 |
| FY 1982 | 207 | 96 | 10 | | | | 313 |
| FY 1983 | 208 /6 | 100 /7 | 10 | | | | 318 |
| FY 1984 | | | | 500 | 10 | | 510 /8 |
| FY 1985 | | | | 401 | 15 | | 416 |
| FY 1986 | | | | 385 | | | 385 |
| FY 1987 | 3 | | | 432 | | | 435 |

/1 Includes $3,000 for rehabilitation of Grant Point building.

/2 Includes $9,000 cyclic maintenance.

/3 Includes $10,000 ANCSA.

/4 Includes $15,000 cyclic maintenance.

/5 Includes funding for 3 months' operation and salaries at Cape Sarichef, Unimak Island, Eastern Aleutian NWR.

/6 Includes $15,000 for management of Pavlof Unit of APNWR.

/7 Includes $5,000 for management of Pavlof Unit of APNWR.

/8 Includes $135,000 for ARMM projects, of which $120,000 was for construction of aircraft hangar.

returning to the plane, the Emergency Locator Transmitter (ELT) was checked and found still to be in the "armed" but not "ON" position. It was switched to the "ON" after a futile attempt to establish radio contact.

The weather rapidly deteriorated that afternoon to 20-30 knot winds and moderate to heavy snow showers. However, thanks to a sturdy tent and an amply stocked survival kit, Sarvis and Blenden spent a relatively comfortable night.

Two problems in this emergency were apparent. Despite HF, VHF, FM and ELT radios in the plane, no contact was established with Cold Bay Flight Service or passing aircraft. These radios seemed to be functioning properly. Secondly, the ELT signal was not picked up by the Search and Rescue Satellite (Sarsat) system until 13 hours after it was activated.

### 4. Technical Assistance

Alaska Department of Fish and Game regional Biologist Dick Sellers assisted refuge staff in the capture and radio collaring of 10 caribou from the southern Alaska Peninsula caribou herd. These collared animals will enable us to more easily locate this herd during survey periods.

The Izembek staff assisted Research personnel (AOFWR) with aerial reconnaisance and ground logistics during their evaluation of disturbance factors affecting migratory waterfowl.

### 5. Other Items

#### Special Use Permits

Thirty-five special use permits were issued for Izembek NWR, Pavlof Unit of Alaska Peninsula NWR and Unimak Island, Alaska Maritime NWR. Of the total, 11 were for trapping; 9 were to commercial hunting guides; 3 were for gravel removal; two for groundwater testing and one each to conduct volcanic research, seismic research, surfical geology, operation of a set net site, conduct a gravity survey, sample for hazardous wastes, conduct an outfitting operation, maintain an existing cabin, install a buried power line, and reseed areas left bare during clean up of military debris.

## F. HABITAT MANAGEMENT

### 1. General

Since its establishment in 1960, Izembek National Wildlife Refuge has been managed as a defacto wilderness. Maintenance of the wilderness qualities of the refuge has been and continues to be the primary goal of the refuge staff. With the passage of ANILCA, 300,000 of Izembek's total 320,893 acres were designated as

Wilderness. Refuge lands on Unimak Island, long administered from the Cold Bay office, were also designated as Wilderness with the passage of ANILCA. It sounds good, but ANILCA also abolished long established special regulations which were prime movers in keeping the refuge pristine until Congress could act. And now five years later with mounting pressure from such special interest groups as the petroleum industry, mining, regional and village Native corporations and commercial big game guides, we find ourselves less able to maintain habitat integrity than before ANILCA. In 1982 we initiated the process to re-establish refuge special regulations in force prior to ANILCA. Through 1985 the process was suppressed by the WDC office until the feasibility and need could be evaluated at one refuge, Kenai. Late in 1986 we received the go ahead to try again to return our special regulations to Izembek and Unimak Island since the Kenai "test project" was complete. Our homework had been completed and the necessary paperwork was submitted for RO review. We are hopeful of success this time.

The Izembek NWR boundary encompasses approximately 100,000 acres of lagoon systems which provide habitats essential to the wildlife of the area. These areas are tidelands owned by the State of Alaska. One, Izembek Lagoon, has been afforded protection by the state as a State Wildlife Refuge (114 SLA 1960, Chapter 20, Article 1) (Figure 2). Izembek NWR and the Izembek State Game Refuge received special recognition in 1986 as "Wetlands of International Importance". This designation was in accordance with the 1971 RAMSAR convention of the International Union for the Conservation of Nature. Izembek was one of the first four U.S. sites to be so identified.

The thoughtful planning process leading to the establishment of the Izembek NWR resulted in a refuge characterized by diverse habitats all within the boundary of a single watershed - Izembek Lagoon. Headwaters of the major tributaries on the refuge originate in mountainous areas in the center of the Alaska Peninsula. Drainage from glaciers around 4,800 foot Mt. Dutton and the Aghileen Pinnacles give rise to the Joshua Green River, the largest drainage on the refuge. Frosty Creek and several smaller streams originate from snowpack and glaciers on 6,000-foot Frosty Peak, west of Cold Bay.

The majority of the refuge is below 1,000 feet in elevation. This undulating coastal plain is derived from glacial outwash and deposition, which supports a mixture of low shrub/ericaceous and graminoid tundra. Characteristic species are arctic willow and other Salix spp., crowberry (Empetrum nigrum), mountain cranberry (Vaccinium vitis-idaea), bluejoint grass (Calamagrostis canadensis), white cotton grass (Eriphorum Scheuchzeri), and reindeer moss (Cladonia spp.). Along many watercourses and at intermediate elevations on mountain slopes, dense bands of Sitka alders (Alnus crispa) are found.

(*Saxifraga oppositifolia*) is a common plant of disturbed, windblown uplands.

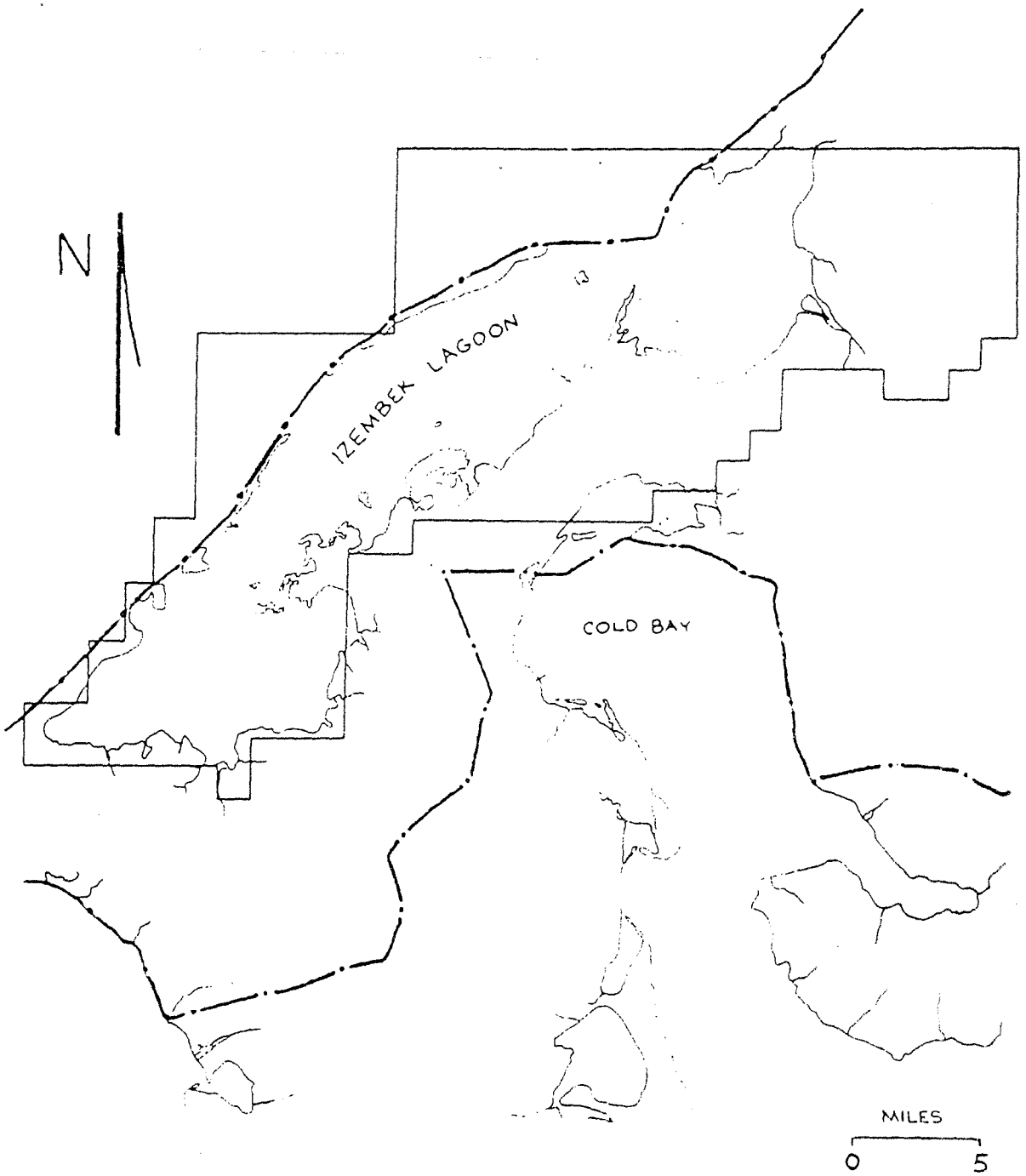


Figure 2. Boundary of Izembek State Game Refuge (----------) in relation to Izembek NWR(-·——·——).

By managing for continuing wilderness qualities of habitat and addressing the biological program toward big game and migratory waterfowl populations and their habitats, the refuge staff felt fisheries resources were adequately protected. This was a subjective and potentially naive view as development and commercial fishing activities may well increase. Hence in 1984, Izembek NWR entered into a two-fold project with the Fisheries Resource field office in King Salmon. Goals of this project were to identify habitats on the refuge important to the maintenance of the fish stocks and to begin development of a Fisheries Management Plan. This work initiated in 1985 and continued in 1986 will be discussed in greater detail in Section G. WILDLIFE, 11. Fisheries Resources.

The conveyance of 17,800 acres of Izembek NWR lands to adjacent village corporations has posed potential management problems as the regulations relating to these 22g (Alaska Native Claims Settlement Act) lands may be more liberal than those presently in force. When ANILCA was first passed, it was assumed by us that refuge rules and regulations would remain in effect, as this was the direction that Native corporations were given in ANSCA, in an effort to discourage them from selecting lands from existing refuges. However, in 1983, it was the solicitor's opinion that those regulations do not apply and that new regulations would have to be promulgated. This was certainly a bad decision and will probably result in further degradation of lands that are supposed to be protected, as well as greatly decrease the potential trade value of these lands. A regional task force has been assigned to develop new regulations.

The intent of the village and regional corporations, with respect to the development of their lands, is unknown at present, but centers on economic return for the shareholders. In this area, such projects as roads, hunting lodges, small boat harbors, gravel mining and thermal and hydroelectric development have been mentioned as potentials. The area promises to be a hub for activities associated with offshore petroleum exploration in the Bering Sea, as well as for an expanding fishing industry. These activities and changing land use patterns will be closely monitored in an attempt to maintain the integrity of the refuge and its wildlife resources. The present status of land conveyance under ANILCA are summarized in Table 6.

2. Wetlands

Approximately 87% of Izembek NWR is characterized as true wetlands. Nearly 200,000 acres of upland tundra (61%), 22,400 acres of wet sedge/grass marsh (7%) and 60,000 acres of pond, lake and riverine areas (19%) make up this total. Most of these areas are covered under Wilderness designation and all are important to the continued stability of fish and wildlife populations on the refuge.

TABLE 6 Native Selection of Land Within the Izembek NWR per the Alaska Native Claims Settlement Act

| Village | Refuge Lands Conveyed (acres) | Refuge Lands Remaining for Conveyance (acres) | Total (acres) | Remarks |
|---|---|---|---|---|
| King Cove | 9,695 | 5,760 | 15,455 | 22g land |
| False Pass | 8,105 | 1,264 | 9,369 | 22g land |
| Pauloff Harbor | - | - | approx. 320 | 22g land |
| Aleut Corp. | - | - | 96,030 | 14 (h) (8)[1] |
| Aleut. Corp. | - | - | 152 | 14 (h) (1) |

[1]In January, 1983, a verbal decision by the Regional Office was made that all 14(h) (8) selections on Izembek are invalid.

The nearly 100,000 acres of state-owned lagoon within Izembek NWR are essential wetland habitat for up to 250,000 migratory waterfowl in the fall. Eelgrass is the most important food item for migratory waterfowl using the lagoon complex and is essential year-round habitat for numerous fish and invertebrate species. Izembek Lagoon covers an area of approximately 84,220 acres (132 sq. mi.). Of this area, 78% (65,692 acres) is tide flat and of that area, 44,671 acres are covered by eelgrass beds (i.e. 53% of the total lagoon area).

Lacustrine habitats on the refuge are of three broad types. Larger upland lakes without stream connections to salt water are common. These clear, deeper lakes tend to be fairly sterile. Adjoining lakes of variable sizes with distributaries leading eventually to salt water are visually and biologically opposite being turbid with rich communities of aquatic vegetation. The key to the richness of these lakes is the large number of red salmon which spawn in them. Nutrients derived from the presence of fish support the submergent vegetation which in turn draws nesting and molting waterfowl. Salmon also draw brown bear and aquatic furbearers to these lakes further increasing the lakes' importance. The need to map and characterize these fertile lakes in a more quantifiable way was a high priority need identified to Fisheries Resources personnel and is also the topic of a refuge study. The third general lake type is that common to low, wet sedge/grass meadows. These lakes are small, shallow and irregular in shape. Although they are fresh-water, some are susceptible to infrequent intrusions of storm surges from adjacent salt water areas. Wet meadows dotted with these types of lakes are important to nesting water birds and to foraging brown bears during spring and summer.

During the summer of 1986 a volunteer, Ms. Peggy Blenden, compiled an aquatic plant species list for eight area lakes - Bluebill, Middle Marker, Lamprey, VOR, Swan, #12, #13 and #14 lakes. These lakes were chosen for study because of their known importance to tundra swans.

The perimeter of each lake was walked and all aquatic plant species encountered were noted. Plants commonly found at some distance from shore (Potamogeton sp. and Ranunculus sp.) were also sampled in this way because wave action caused by frequent high winds in the Cold Bay area break up these submergents and broken plants wash up on shore or float near the edge. Potamogeton was not recorded in Lamprey Lake using this method. To double check, a kayak was then used to survey deeper water. Potamogeton was still not found anywhere in the lake.

One complete survey of each lake was accomplished with the exception of Swan Lake. Plans are to resurvey all lakes in 1987 and at that time include a complete survey of Swan Lake.

Of 14 aquatic plants noted, only 4 occurred in all 8 lakes - Equisetum arvense, Carex Lyngbyaei, Ranunculus trichophyllus and

Sanguishorba stipulata. Aquatic species present in substantial quantities in one or more lakes were Ranunculus trichophyllus, Equisetum fleviatale, Carex Lyngbyai, Arctophila fulva and Hippuris Neelgaris. All quantitative information is subjective.

Also during the summer, Ms. Blenden collected many plant specimens from sea level up to 2,000' in a wide variety of habitats. These plants were then pressed and are presently being made into herbarium specimens. These specimens will add several new species to the Refuge's herbarium.

6. Other Habitats

The Izembek staff, with support from the Regional Office, continued to press the U.S. Air Force and the Corps of Engineers for clean-up and return of the Grant Point radar site to the refuge. This site was abandoned in 1985 when permission to construct a new Minimally Attended Radar facility was granted for another area on the refuge closer to Cold Bay.

Late in the year the Regional Office requested we reinitiate correspondence with the Department of Defense on two matters relating to this situation. We asked if activities involved with construction of the new MAR facility under Special Use Permit IZM-175 had been completed. We requested notification that:

1. Construction of the new MAR facility was in fact completed.

2. As IZM-175 required, planning for the clean-up and return of the Grant Point radar site was underway.

We were advised in January 1987 that the new MAR facility was completed in January 1986. Pertaining to our second inquiry, the Real Estate Division of the Corps of Engineers stated:

"The Air Force has no further need for the Grant Point facility and has investigated the needs of other federal agencies for the site and facilities. This investigation reveals no alternate federal need for the facility. Therefore, the Air Force plans to demolish the facilities and restore the site to a natural condition and request revocation of the existing land withdrawal.

"It has been the Air Force's intent to fund the Grant Point site restoration under the Defense Environmental Restoration Account (DERA). Major federal budget restrictions, however, have caused diversion of all FY 87 funds to other projects. It is expected that FY 88 funds will be available for work on the Grant Point site, which would mean that work could begin as early as October, 1987."

The construction of the MAR facility was found compatible with refuge purposes only because the larger, more environmentally sensitive Grant Point area would be returned to the USFWS. We will continue to insist on compliance with this stipulation.

9. Fire Management

The lower Alaska Peninsula has very little history of range fires. Wet tundra and continually moist air are effective natural fire suppressants. For this reason, we petitioned for and were granted, a Regional Office exemption from preparation of a Refuge Fire Management Plan.

12. Wilderness and Special Areas

After three years of rest, Pavlof Volcano, on the Pavlof Unit of Alaska Peninsula NWR 40 miles northeast of Cold Bay, sparked to life. After several days of increased seismic activity it sent an ash plume 4.5km high on April 16 and one 14.5-16km high on April 18. Northeast winds on the 18th combined with wet snow plastered a layer of ash on the windward side of everything in Cold Bay.

Activity was regularly reported throughout August. Tremors, explosions, ash and tephra emissions were routinely reported by pilots and field crews throughout the summer. An Alaska Fish and Game field camp located 45km east-northeast of the volcano reported almost continuous rumbling at 4-5 second intervals with earthquakes strong enough to shake items off shelves and prevent sleep from 13 to 19 July. While swan banding along the Caribou River, 55km northeast of Pavlof from July 30 to August 3, Izembek staff frequently heard explosions and, when weather permitted, saw ash clouds trailing 30 to 40km east-northeast of the volcano.

The most visible effect of this activity was the dumping of tremendous quantities of ash and tephra, not only in the adjoining mountains, but several cm deep on the coastal plain arching from northwest to northeast of the volcano. Geologists reported snowfields 4km north of the volcano covered with tephra 2.5-7.5cm in diameter and 15cm of new ash 12km to the west-northwest. Refuge staff noticed significant ash deposits intermittently scattered between Moffet Bay and Cathedral River. Most of the streams draining the northeast flanks of Pavlof were heavily laden with silt most of the summer.

The degree to which fish and wildlife populations were affected by this fairly massive habitat alteration remains unknown. One would speculate salmon smolt development may have been hindered in several streams that flooded and carried large amounts of ash. Although the caribou population appears to have declined during the last several years, it seems doubtful this volcanic eruption was a major factor since little or no forage was actually covered and all violent volcanic activity was confined to elevations greater than 1500m, well above areas used by caribou.

On December 2, 1980, 300,000 acres of Izembek were officially designated Wilderness by ANILCA. Preservation of the striking geographic features and conservation of the internationally important fish and wildlife values of the area have always been

Pavlof Volcano, active most of 1986, is shown with Pavlof Sister at 8,261 and 7,028 feet, respectively. (Sarvis)

Northeasterly winds on 18 April blanketed Cold Bay (see left) with ash from erupting Pavlof Volcano (above). (Sarvis)

the primary goals of the refuge so this designation did not greatly alter our program direction.

Volcanos form the backbone of the Wilderness Area of Unimak Island, from Roundtop in the East to Faris-Westdahl in the West. Perpetual snow fields and glaciers surround the five most prominent peaks; Roundtop, Isanotski, Shishaldin, Pogromni and Faris-Westdahl. At 9,372 feet, Shishaldin is the highest peak on the island, and also the most spectacular, being a near-perfect volcanic cone. This mountain is a National Historic Landmark because it has served as a navigational aid for seamen at least since the days of Russian exploration and was undoubtedly used by the Aleuts well before that. Active volcanos include Shishaldin, Pogromni and Faris-Westdahl. Steam and/or smoke rising from the vent of Shishaldin is quite common. A huge lake, Fisher Caldera, lies in west-central Unimak in the crater of a volcano.

Extensive lava flows of varying ages are found below Shishaldin, Isanotski, Roundtop, Faris-Westdahl and Pogromni. Some of those on the north side of Shishaldin have revegetated, although so sparsely that the nature of the substrate is obvious from the air. Several rivers, among them North Creek, Coal Oil Creek and others unnamed, flow partly through wide ash flats. To the southeast of Roundtop, Isanotski and Shishaldin, are areas several thousand acres in size overlaid with virtually bare lava and ash. These are also drained by sizeable streams.

Cliffs ranging from steep bluffs to spectacular wave-cut promonotories and sea stacks occur along the coast, except at Unimak Bight and along the north side of the island from St. Catherine's Cove to Urilia Bay, where more gentle beaches and dunes are found. The more inaccessible bluffs and cliffs support some seabird nests, but are most important for bald eagles. Because of its large size and unique features, Unimak was proposed as a separate unit for Wilderness in 1972. Designation was held up pending resolution of the D-2 lands issue by Congress resulting from passage of the ANSCA. Finally, a Wilderness area of 910,000 acres was established on December 2, 1980, with passage of ANILCA. Management of Unimak will still be the same since it also has been historically managed as a wilderness.

## G. WILDLIFE

### 1. Wildlife Diversity

Approximately 142 species of birds and 23 species of mammals have been reported as residents and/or migrants on Izembek NWR. Four species of Pacific Salmon (chum, pink, red and silver), two varieties of trout (dolly varden and arctic char) and stickelbacks are the primary fish species in fresh-water habitats on the refuge. King salmon may occur in very low numbers in the Moffett Bay area. A minimum of 23 species of saltwater fish have been reported in Izembek Lagoon.

Unimak Island provides a scenic background to the Big Lagoon area north of Morzhovoi Bay. (454) 30 (Sarvis) 3/3/87

RM Sarvis and ARM Blenden enjoy the spectacular scenery of Unimak Island during a swan collar reading trip to Petersen Lagoon. (Sarvis)

2. Endangered Species

The endangered Aleutian Canada goose (Branta canadensis leucopareia) may occur on Izembek NWR during fall migration from their western Aleutian nesting areas, however, this use has not been documented by actual sightings. In addition, the Arctic and American races of the peregrine falcon (Falco peregrinus tundrius and F.p. anatum, respectively) may occur in the area during migration, however, use by this species has not been documented either. The nonendangered or unthreatened Peale's race of the peregine falcon (F.p. pealei) is a fairly common resident of the area.

3. Waterfowl

Tundra Swan

Tundra swans are the key nesting waterfowl species at Izembek, utilize the entire refuge, and remain on refuge lands all year. Therefore, a knowledge of their habitat needs and population parameters is essential to managing and protecting refuge ecological units. In order to fulfill one of our mandates of protecting the essentially wilderness nature of the reufge, knowledge is necessary of species such as tundra swans which require wilderness conditions in order to reproduce. Swans are a key indicator species that show the health of refuge habitats and conditions.

Winter weather in 1986 was more normal (compared to the year before) with below freezing temperatures and snow. Therefore, the swans again concentrated on the open water springs of Petersen Lagoon on Unimak Island. On January 24, 635 swans were present in the area including 59 neck-collared birds (Table 7). The peak winter population has been quite consistent for at least the last 7 years showing a remarkably stable population. The combination of high nest predation, high cygnet mortality and some adult mortality appear to negate any increase in the population.

During observations from the ground on January 24, we were able to observe 42 marked swans and determine the status of markers on many of them (Table 8). They had all been originally marked with a neck collar, matching plastic legband, and a metal legband. We know that none of these markers were permanent, but this was the first opportunity to observe a significant number of birds to see which markers remained. Of the 42 birds, less than half (7) had all three markers present. Five others were missing the plastic legband, one was missing a neck collar, but had both legbands, two had only the metal legband left, and one had only a neck collar, but was missing not only the plastic legband, but the metal one, too!

In addition to the 59 marked swans observed here during the winter of 85/86, four swans migrated to and wintered in the Lower 48 (Table 9). Swan CF was observed twice near Ridgefield NWR, Wash.,

TABLE 7. Winter Tundra Swan Surveys of Unimak Island and Izembek NWR

| Date | Immature | Adult | Total Classified | Total Observed | Marked[1] Swans | Swan[2] Location | Area[2] Covered |
|---|---|---|---|---|---|---|---|
| 01/06/78 | | | | 294 | na | I,P,C,S | I,U |
| 02/08/78 | | | | 309 | na | P,C | U |
| 11/13/78 | | | | 400 | 1 | I,S,P,C | I,U, |
| 11/15/78 | 40(17.6%) | 187 | 227 | 235 | 14 | P | P |
| 11/29/78 | | | | 286 | ? | P | P |
| 12/05/78 | 7(4.7%) | 143 | 150 | 196 | 4 | L,P,C | L,P,C |
| 12/29/78 | 29(8.0%) | 332 | 361 | 361 | 9 | P | P |
| 01/05/79 | | | | 136 | 1 | P | P |
| 01/12/79 | | | | 264 | 1 | I,S,L,C | I,U |
| 01/24/79 | | | | 300+ | 5+ | P | P |
| 02/24/79 | | | | 229 | ? | I,S,P,C | I,U |
| 03/05/79 | | | | 241 | 8 | I,S | I,S |
| 03/07/79 | | | | 236 | 7 | I,S,O,P,C,Z | I,U,Z |
| 11/06/79 | | | | 266 | 9 | I,S,P,C | I,U |
| 12/12/79 | | | | 390 | ? | P | P |
| 12/21/79 | | | | 493 | 6+ | L,P,C | U |
| 01/02/80 | | | | 458 | ? | L,P,C | U |
| 01/07/80 | | | | 494 | 5 | P,C, | L,P,C |
| 01/09/80 | 48(11.9%) | 354 | 402 | 533 | 17 | P,C | L,P,C |
| 02/06/80 | | | | 573 | 11 | L,P,C | U |
| 10/24/80 | 3(4.3%) | 70 | 73 | 92 | 0 | I,P | I,P |
| 10/28/80 | | | | 247 | 9 | I,S,O,L,P | I,U |
| 11/02/80 | | | | 148 | ? | L,P | L,P |
| 01/20/81 | 26(7.5%) | 321 | 347 | 540 | 16+ | S,O.L,P,C | U |
| 01/27/81 | 43(7.6%) | 521 | 564 | 564 | 27 | L,P,C | U |
| 11/16/81 | | | | 285 | ? | L,P | U |
| 12/24/81 | | | | 598 | ? | S,O,L,P | U |
| 01/09/82 | 86(14.7%) | 499 | 585 | 673 | 44 | L,P | S,O,L,P |
| 02/10/82 | | | | 270 | ? | P | P |
| 02/20/82 | | | | 150 | ? | S | S |
| 02/24/82 | 80(13.5%) | 512 | 592 | 592 | 30 | P,Z | I,U,Z |
| 12/08/82 | | | | 654 | ? | P,L | P,L |
| 12/23/82 | | | | 90 | ? | I | I |
| 01/17/83 | 72(12.0%) | 527 | 599 | 672 | 44+ | I,L,P,C | I,U |
| 02/05/83 | | | | 517 | ? | P,L,C | U |
| 03/18/83 | | | | 162 | 17 | I | I |
| 11/15/83 | | | | 120 | 17 | I | I |
| 01/20/84 | | | | 580 | 44 | S,P,O,C | I,U |
| 01/23/84 | | | | 575 | ? | P,O | I,U |
| 02/22/84 | 70(15.8%) | 374 | 444 | 444 | 44 | P,L | I,U |
| 01/07/85 | | | | 114 | ? | I | I(N. ½ only) |
| 01/21/85 | | | | 168 | ? | I | I(S. ½ only) |
| 01/22/85 | | | | 264 | 3+ | I,S,O,L,P,C | I,U |
| 12/30/85 | | | | 104 | ? | I | I(N. ½ only) |
| 01/24/86 | 21(5.2%) | 380 | 401 | 635 | 59 | P,L | I,U |
| 02/01/86 | | | | 272 | ? | L | U |
| 02/02/86 | | | | 241 | 5 | P | P |
| 7-year av. | 10.8%[3] | | | 585[3] | | | |

[1]Includes birds who have lost neck collars, but legband(s) were observed.

[2]I-Izembek NWR, U-Unimak, S-Swanson Lagoon, O-Otter Point, L-Cape Lapin R., P-Peterson Lagoon, C-Christianson Lagoon, Z-Lazaref R.

[3]From peak count each winter (excluding '78 and '85 which were open winters and swans did not congregate enough for reliable total count).

Tundra swan wintering quarters in the Urilia Bay area of Unimak Island with majestic Shishaldin Volcano in the background. (454) 33 (Sarvis) 3/3/87

Tundra swans were captured on the Pavlof Unit in the vicinity of the Caribou and Sapsuk rivers' confluence. (Sarvis)

Table 8. Status of 42 marked Tundra Swans observed at Peterson Lagoon on 1/24/86.

| Neck Collar | Plastic Legband | Metal Legband | No. of Birds |
|---|---|---|---|
| P | ? | ? | 26 |
| P | P | P | 7 (44%) |
| P | M | P | 5 (31%) |
| M | P | P | 1 ( 6%) |
| M | M | P | 2 (13%) |
| P | M | M | 1 ( 6%) |
| P | P | M | 0 |
| M | P | M | 0 |
| M | M | M | ? |

P = present; M = missing; ? = did not see legs.

Table 9. Summary of 40 Tundra Swans resighted in the Lower 48 states.

| Winter | Collar Code | State | No. of Sightings | Year Banded | Location | Age-Sex @ Banding |
|---|---|---|---|---|---|---|
| 80/81 | 11* | OR | 1 | 1978 | IZM | SY-F |
| (3 birds) | 55 | CA | 3 | 1980 | " | ASY-M |
| | 70 | WA | 1 | 1980 | " | SY-F |
| 81/82 | 55 | CA | 1 | 1980 | " | ASY-M |
| (3 birds) | T4 | WA | 1 | 1981 | " | L-F |
| | T5 | BC | 1 | 1981 | " | SY-M |
| 82/83 | | 0 BIRDS SEEN | | | | |
| 83/84 | 9U[1] | WA | 21 | 1983 | IZM | ASY-M |
| (9 birds) | 1F[1] | " | " | " | " | L-M |
| | 2F[1] | " | " | " | " | ASY-F |
| | 4F[1] | " | " | " | " | L-F |
| | 6F[1] | " | " + | " | " | L-F |
| | 8F[1] | " | " | " | " | L-F |
| | 0F[1] | " | " | " | " | L-F |
| | 2J[1] | " | " | " | " | L-F |
| | 7J | " | 1 | " | " | ASY-M |
| 84/85 | A1* | OR | 1 | 1982 | IZM | ASY-F |
| (2 birds) | 6F | WA-11; ID-3 | | 1983 | " | L-F |
| 85/86 | CF | WA-2; OR-1 | | 1985 | Pavlof | ASY-F |
| (4 birds) | CP | WA | 9 | " | " | ASY-M |
| | CT | OR | 2 | " | " | ASY-M |
| | JY | OR | 2 | " | " | ASY-F |
| 86/87 | CF | WA-1; OR- | 1 | 1985 | Pavlof | ASY-F |
| (23 birds) | CY | OR | 1 | " | " | ASY-F |
| | JK | WA | 2 | " | " | ASY-M |
| | JY | WA-1; OR- | 1 | " | " | ASY-F |
| | KF | WA-1; OR- | 1 | " | " | SY-F |
| | MJ | WA | 2 | " | " | ASY-F |
| | YP | WA | 5 | " | " | ASY-F |
| | 9R | WA-1; OR- | 2 | " | " | ASY-M |
| | B3 | OR | 1 | 1986 | IZM | ASY-M |
| | H8 | CA | 1 | " | Pavlof | SY-F |
| | N1 | CA | 1 | " | " | SY-M |
| | N3 | WA | 2 | " | " | ASY-M |
| | N5[2] | " | 1 | " | " | ASY-M |
| | N7[2] | " | 1 | " | " | L-M |
| | NO[2] | " | 1 | " | " | ASY-F |
| | R4[2] | " | 1 | " | " | L-F |
| | R6 | " | 4 | " | " | SY-F |
| | S2 | WA-1; OR- | 2 | " | " | ASY-F |
| | S6 | WA | 1 | " | " | ASY-F |
| | S7 | OR | 1 | " | " | ASY-M |
| | S8 | WA | 1 | " | " | ASY-M |
| | S9 | " | 1 | " | " | ASY-M |
| | 4R | OR | 1 | " | " | SY-F |

SUMMARY: 40 individuals resighted 248 times (WA-220; OR-18; CA-6; ID-3; BC-1).

4 individuals seen more than one winter in L-48 (55, 6F, CF and JY).

*Two swans wintered both at Izembek and in the Lower 48. Swan A1 spent the winters of 82/83 and 85/86 at Izembek and 84/85 in Oregon. Swan 11 spent 78/79 and 79/80 at Izembek and 80/81 in Oregon.

[1]Brood of 2 adults and 6 cygnets.

[2]Brood of 2 adults and 4 cygnets (only 2 observed in L-48).

and once near Sauvie Island, Oregon. Swan CP was observed nine times in the Mt. Vernon/Skagit River, Wash., area. Swans CT and JY were observed twice near Finley NWR in Oregon.

All four of these birds were banded as adults in the summer of 1985 on the Pavlof Unit. As reported last year, we shifted banding efforts to this unit (about 65 miles NE of Cold Bay) in order to determine if these swans were part of the non-migratory Izembek population. No Pavlof Unit swans were observed wintering on Unimak Island, while four were observed in Washington/Oregon. It now appears the Pavlof Unit population is migratory while only those using Izembek are non-migratory. This was further confirmed during the winter of 86/87 when 22 Pavlof Unit swans were sighted in the Lower 48. This will be reported on in more detail in next year's report.

A spring nesting/population survey was again done on the Pavlof Unit following the tundra swan survey protocol developed by Waterfowl Investigations. The four 1:63,000 USGS quadrangle maps surveyed last year were again done and one more map was added (Table 10). All section lines on these maps were flown using Loran equipment for navigation. Maps Port Moller D-5 and D-6 have been surveyed three yeas now with the greatest number of swans (291) and nests (27) found this year. Port Moller maps D-5, D-6, C-5 and C-6 have been surveyed twice with more total swans found in 1985 (486), but over twice as many nests were present in 1986 (44) (Table 11). The increased number of swan nests found in 1986 was probably attributable to the more typical spring weather compared to the very late and cold spring experienced in 1985.

The annual Izembek area nesting survey was accomplished May 20 with 237 swans (24 neck collared) observed on Izembek, Pavlof Unit (SW of Black Hills only) and adjacent areas (Table 12). The total swans and number of nesting pairs were the second highest recorded in the nine years swan surveys have been done here. But these numbers were not that much greater than other years, again indicating an essentially stable population.

A total of 40 nests were found in 1986 (Table 13), one nest above the seven-year average. We are beginning to build an accurate long-term record of swan production on Izembek which should prove valuable in monitoring/predicting future changes. At any rate, 1986 proved to be an average year for number of nests, clutch size, and hatching success, but above average for cygnet survival.

The peak of hatch was the first week of June with 12 of the 21 successful nests hatching by June 7 (Fig. 3). Seven of the remaining nine hatched by June 18 and two were very late (June 27 and 28). This pattern is typical of a normal year with average weather conditions.

Over the last several years, brown bear numbers in the Cold Bay road system have been reduced considerably due primarily to hunting. This situation has provided an opportunity to further

Several tundra swans captured on the Pavlof Unit spent the winter in less remote areas of western Washington. Note neck collared swan in right center of photo. (453) 7 (Sarvis) 1/23/87

Tundra swans wintering in Washington foraged on a variety of croplands. (453) 16 (Sarvis) 1/23/87

Table 10. May 1986 Tundra Swan survey (by each map) of the Pavlof Unit, Alaska Peninsula NWR.

| Date | PML Map | Single | Single w/nest | Pair w/nest | Pair w/brood | Pair w/o nest | Birds in Flocks | Total Swans | Area Covered (sq. mi.) | Density (sq. mi.) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5/21 | D-4 | 11 | 6 | 6 | 0 | 28 | 34 | 119 | 175.8 | .68 |
| 5/16/19 | D-5 | 16 | 6 | 16 | | 40 | 127 | 261 | 177.1 | 1.47 |
| 5/19 | D-6 | 6 | 3 | 2 | | 2 | 13 | 30 | 104.5 | .29 |
| 5/16/19 | C-5 | 10 | 1 | 12 | | 15 | 3 | 68 | 110.7 | .61 |
| 5/19/21 | C-6 | 3 | 2 | 2 | | 7 | 5 | 28 | 110.5 | .25 |
| 1986 TOTAL | | 46 | 18 | 38 | 0 | 92 | 182 | 506 | 678.6 | .75 |

Table 11. Summary of Tundra Swan nesting surveys on the Pavlof Unit, Alaska Peninsula NWR.

| Date | PML Maps | Search Method[1] | Single | Single w/nest | Pair w/nest | Pair w/brood | Pair w/o nest | Birds in Flocks | Total Swans | Area Covered (sq. mi.) | Density (sq. mi.) | Avg. Clutch | Avg. Brood |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/12/84 | D-5&6 | RS | 11 | 5 | 16 | 10 | 39 | 25 | 171 | 281.6 | .61 | 3.7(11/3) | 3.4(34/10) |
| 6/6-10/85 | D-5,6 & C-5,6 | SL | 35 | 5 | 16 | 0 | 124 | 166 | 486 | 502.8 | .97 | 4.4(61/14) | N/A |
| 5/16-21/86 | D-4,5,6 & C-5,6 | SL | 46 | 18 | 38 | 0 | 92 | 182 | 506 | 678.6 | .75 | not done | N/A |

TABLE 12. Spring Nesting Surveys of Tundra Swans

(Area of Coverage: Izembek NWR, Cathedral Lakes, lakes south of Cold Bay to Thin Point and west side of Morzhovoi Bay)

| | No. of Swans Observed (% of Total) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Singles | Swans (nesting pairs) | Swans (other pairs) | In Groups | Total | Area Cov. (sq. mi.) | Density (sq. mi.) | No. of Collared Swans Seen |
| 5/8/78[1] | 6 (8%) | 18 (23%) | 26 (33%) | 28 (36%) | 78 | 315.5 | .25 | NA |
| 4/25,28/79[2] | 10 (5%) | 24 (12%) | 96 (47%) | 75 (36%) | 205 | 413.9 | .50 | 12 |
| 5/14-15/80 | 9 (4%) | 60 (26%) | 84 (36%) | 80 (34%) | 233 | 413.9 | .56 | 1 |
| 5/13,15/81 | 16 (8%) | 58 (29%) | 94 (48%) | 29 (15%) | 197 | 413.9 | .48 | 21 |
| 6/2,6/82[3] | 11 (5%) | 68 (30%) | 92 (41%) | 55 (24%) | 226 | 413.9 | .55 | 23 |
| 5/31-6/1/83[3] | 8 (4%) | 48 (21%) | 94 (41%) | 77 (34%) | 227 | 413.9 | .55 | 37 |
| 6/7-8/84[3] | 5 (2%) | 78 (35%) | 54 (25%) | 85 (38%) | 222 | 413.9 | .54 | 42 |
| 5/28,30,6/1/85 | 20 (7%) | 54 (20%) | 52 (20%) | 140 (53%) | 266 | 413.9 | .64 | 32 |
| 5/20/86 | 11 (5%) | 70 (29%) | 66 (28%) | 90 (38%) | 237 | 413.9 | .57 | 24 |
| Avg. last 8 yrs. | 11(5%) | 58 (25%) | 79 (35%) | 79 (35%) | 227 | 413.9 | .55 | 24 |

[1]Cathedral lakes, lakes south of Mortensen's Lagoon and west side of Morzhovoi Bay areas not covered. Other areas not covered thoroughly.

[2]Survey done too early to include peak of nesting.

[3]Survey a little late for peak of nesting.

Table 13. Tundra Swan production (Izembek NWR, portions of Pavlof Unit of Alaska Peninsula NWR and vicinity).

| Parameter | 1977[1] | 1978[1] | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 7-Yr. Avg. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nests with known clutch | | | | 17 | 23 | 22 | 14 | 30 | 26 | 32 | |
| Number eggs | | | | 82 | 118 | 105 | 75 | 142 | 114 | 154 | |
| Mean clutch | | | | 4.82 | 5.13 | 4.77 | 5.36 | 4.73 | 4.38 | 4.81 | 4.86 |
| Total nests | ? | 14+ | 17+ | 34 | 47 | 44 | 28 | 42 | 35 | 40 | 39 |
| No. hatched (nest hatch success) | 10+ | 9+ | 7+ | 17(50%) | 17(36%) | 22(50%) | 19(68%) | 32(76%) | 16(46%) | 21(53%) | 21 |
| First obs.- # broods (cygnets) | | | | 15(51) | 17(64) | 22(74+)[3] | 19(87+)[3] | 30(118+)[3] | 15(57+)[3] | 19(72+)[3] | N/A |
| Average brood size at hatch | | | | 3.4 | 3.8 | 3.4 | 4.6 | 3.9+ | 3.8+ | 3.8+ | 3.8 |
| Last Obs.-before 9/1 No. broods cygnets) | 10(34) | 9(28) | 7(17) | 10(22) | 13(32) | 9(23) | 17(49) | 22(75) | 10(27) | 16(50) | 14 |
| Average brood size at flight | 3.4 | 3.1 | 2.4 | 2.2 | 2.5 | 2.6 | 2.9 | 3.4[4] | 2.7 | 3.1 | 2.9 |
| Dates of last observation | 7/22 | 7/21,8/8 | 7/18 | Various | Various | 8/22,9/2 | Various | Various | 8/21-26 | Various | N/A |
| Egg hatching success (successful nests only) | | | | 78% | 65% | 85% | 90% | 86%[5] | 89%[5] | 69% | 80% |
| Success-eggs to flight stage) | | | | 32% | 33% | 28% | 46% | 51%[5] | 42%[5] | 44% | 39% |
| Success-hatched to flight stage | | | | 41% | 50% | 33% | 51% | 59%[5] | 47% | 68% | 50% |

[1]Swan surveys not done before 1977 due to no aircraft at station.

[2]Total nests deduced in 1978 and 1979 from a combination of nest surveys done too early and later brood surveys.

[3]In 1982, 1983, 1984, 1985 and 1986; 1 brood, 1 brood, 6 broods, 2 broods and 2 broods, respectively were not observed close enough to their hatching dates to be sure of the original number of cygnets. Number of cygnets at hatch is therefore an estimated minimum number. In addition, two nests hatched in 1984 and one in 1985, but the brood was never observed.

[4]Probably high since many broods were last observed in July. Other duties prevented brood checks normally done in August.

[5]1984- did not use nest numbers 6, 9, 12, 30, 31, 36 and 42 in these calculations.

1985- did not use nest numbers 28, 32, 33, 35 in these calculations.

1986- did not use nest numbers 20, 25, 39, in these calculations.

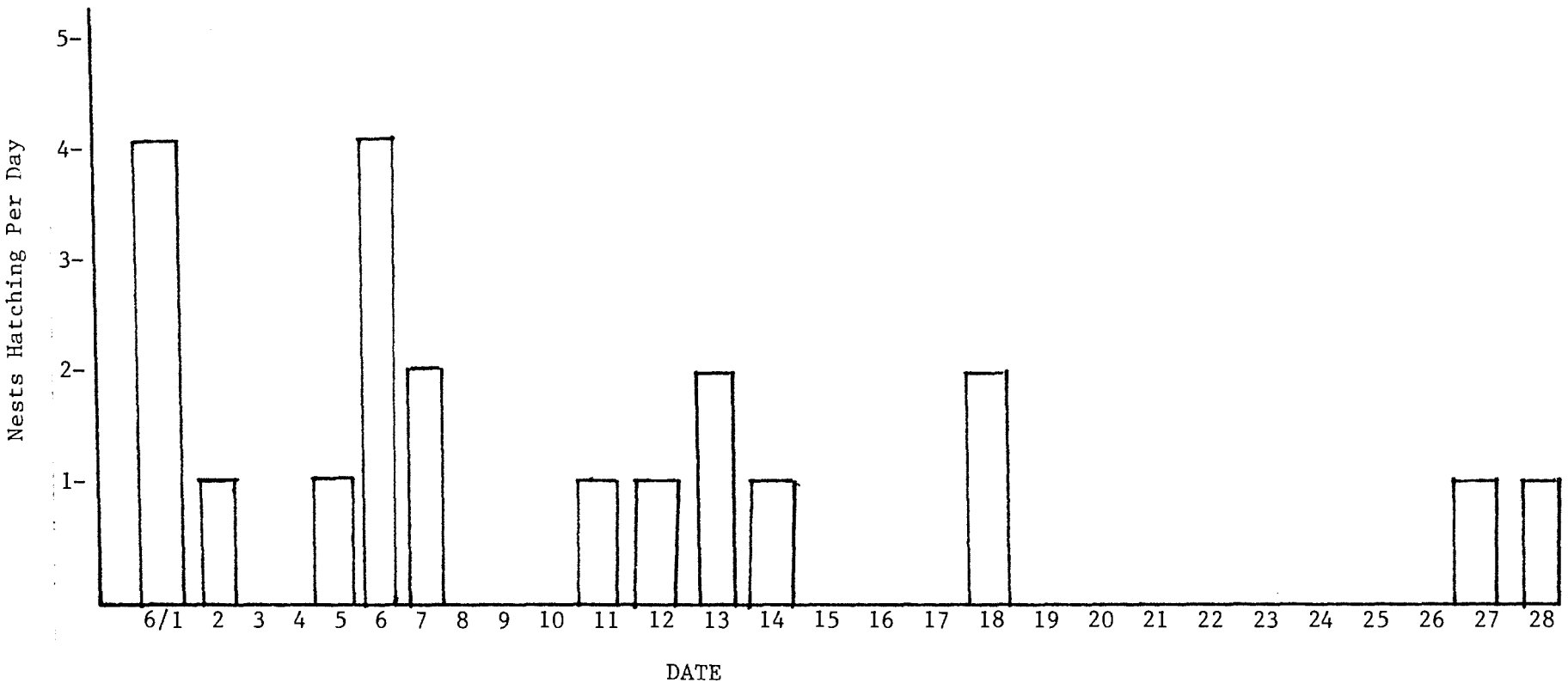


Fig. 3. Hatching dates for 21 successful tundra swan nests in 1986.

test the theory that bears are the primary tundra swan nest predator. Nesting success in the road system area containing low bear numbers has been nearly twice as high as the rest of the refuge. In 1986, 67% of the nests within the road system area hatched, while 50% hatched on the remainder of the refuge (Table 14). Normally, if there was any difference, it would seem nest success in the more disturbed portions of the refuge would be less than the Wilderness portions, since tundra swans prefer undisturbed nesting territories. But in this case, the benefit of low bear predation more than makes up for any additional disturbance that may be occurring in the central area.

The 21 nests that hatched this year had an initial cygnet total of a minimum of 75 (Table 15). There were probably a few more than this initially, since two broods (#11 and #38) were not observed until 13 and 53 days old, respectively.

Of the 21 original broods, 16 broods (76%) containing 50 cygnets reached flight stage, nearly twice as many as 1985 (Table 13). Cygnet survival in 1986 was 68%, the best survival rate recorded so far. As in past years, cygnets perished at a higher rate within the first 10 days of hatching than later with 60% of the cygnet loss occurring then (Figure 4). During the last six years, an average of 50% of the cygnets that died did so when less than 10 days old (Table 16).

We first documented high cygnet loss here during the early years of this study and initially speculated it might be due to diseases or parasites. We had been finding many of the dead cygnets, so decided that predation was not a major factor. We sent some cygnets to the National Wildlife Health Lab for necropsy and received results that indicated no disease or parasite problems. We also had over 100 blood samples analyzed for parasites and none were found. With information only obtainable through a longterm study such as this one it now appears that weather may be the most important factor influencing cygnet survival. During unusual years when the weather has been mild during June and early July, cygnet survival has been better (e.g. 1986) than most years when the weather is normally wet, foggy and windy (e.g. 1985). June and early July in 1986 were unusually dry and slightly warmer than normal and cygnet survival was well above average. In 1985, the temperature was several degrees colder than normal. Compared to 1986, 1985 was colder, wetter and had high average wind speeds. 1986 was the best year for cygnet survival while 1985 was one of the worst.

With several years' data on production by neck-collared swans, we have shown that neck collars have no adverse behavioral impacts on nesting. This year seven marked pairs nested (Table 17). For three pairs, both swans had neck collars, one pair the female only had a neck collar and for three pairs only the male had a neck collar. As usual the hatching success rate (72%) for marked swan pairs was higher than all swan pairs combined (53%). Five of the seven marked pairs had successful nests this year. Their average

Table 14. Comparison of Tundra Swan nest success between the Cold Bay road system and the rest of the refuge.

| Year | Nests in Road System Area[1] | | | Non-Road System Nests | | |
|---|---|---|---|---|---|---|
| | Hatched | Unsuccessful | Total | Hatched | Unsuccessful | Total |
| 1981 | 9 (64%) | 5 | 14 | 8 (24%) | 25 | 33 |
| 1982 | 8 (80%) | 2 | 10 | 14 (41%) | 20 | 34 |
| 1983 | 10 (100%) | 0 | 10 | 9 (50%) | 9[2] | 18 |
| 1984 | 7 (100%) | 0 | 7 | 25 (71%) | 10[2] | 35 |
| 1985 | 3 (75%) | 1 | 4 | 13 (42%) | 18 | 31 |
| 1986 | 4 (67%) | 2 | 6 | 17 (50%) | 17 | 34 |
| Total | 41 (80%) | 10 | 51 | 86 (46%) | 99 | 185 |

[1]The Cold Bay Road System Area is described in the ADF&G brown bear regulations and includes central Izembek NWR and lands south of Cold Bay.

[2]Undoubtedly low since numerous destroyed nests were not located in 1983 and 1984 due to late surveys.

Table 15. Summary of 1986 successful Tundra Swan nests.

| Nest No. | Collar Status[1] | Clutch[2] | Hatching Date | No. Cygnets in Brood (age in days) | | |
|---|---|---|---|---|---|---|
| | | | | First Obs. | Intermed. Obs. | Last Obs. |
| 1 | | 5 | 6/7 | 4(2) | 3(13-31), 2(32) | 2(58) |
| 6 | | 5 | 6/1 | 3(2) | | 3(85) |
| 9 | | 5 | 6/6 | 5(3) | | 5(80) |
| 10 | | 6 | 6/2 | 6(1) | | 6(86) |
| 11 | | 5 | 6/12 | 3+(13) | | 3(55) |
| 14 | | 5 | 6/1 | 4(1) | 3(2) | 0(8) |
| 17 | SCP | 4 | 6/11 | 3(1) | 3(4), 2(12) | 2(113) |
| 19 | | 5 | 6/7 | 5(2) | 4(5-8), 3(13) | 3(81) |
| 20 | | (2) | 6/13 | 2(2) | 2(33), 1(40) | 1(54) |
| 23 | DCP | 6 | 6/13 | 3(2) | | 3(73) |
| 24 | DCP | 8 | 6/1 | 5(2) | | 5(87) |
| 25 | SCP | (6) | 6/6 | 6(3) | 6(35), 5(40) | 5(61) |
| 26 | | 5 | 6/18 | 1(2) | 1(5-36) | 0(47) |
| 29 | | 6 | 6/5 | 2+(1) | 1(4) | 0(7) |
| 31 | SCP | 4 | 6/6 | 2(3) | 2(6-22) | 0(33) |
| 32 | | 6 | 6/1 | 6(2) | 5(8-27), 4(38) | 4(79) |
| 34 | | 6 | 6/6 | 5(3) | 5(6), 4(9), 3(17-47) | 2(74) |
| 36 | | 4 | 6/14 | 2(1) | | 0(9) |
| 37 | | 4 | 6/28 | 3(1) | 2(3-18) | 1(37) |
| 38 | | 2 | 6/27 | 1+(53) | | 1(53) |
| 39 | | (4+) | 6/18 | 4(5) | | 4(49) |
| TOTALS: 21 | | 103+ | | 75+ | | 50 |
| | | 4.90 avg. clutch | 69% of eggs[4] hatched | 44% of eggs[4] to flight | | 68% survived from hatch to flight (excluding nests 29 and 38) |

[1]SCP- Single Collared bird in Pair; DCP- both birds collared

[2]Eggs in ( ) were derived from first brood observation and eggs remaining in nest.

[3]Cygnets first fly at 65-75 days of age.

[4]Excluding nest nos. 20, 25 and 39. Percentage shown is the minimum egg hatching success since more eggs may have hatched, but the cygnets died before the first brood observation.

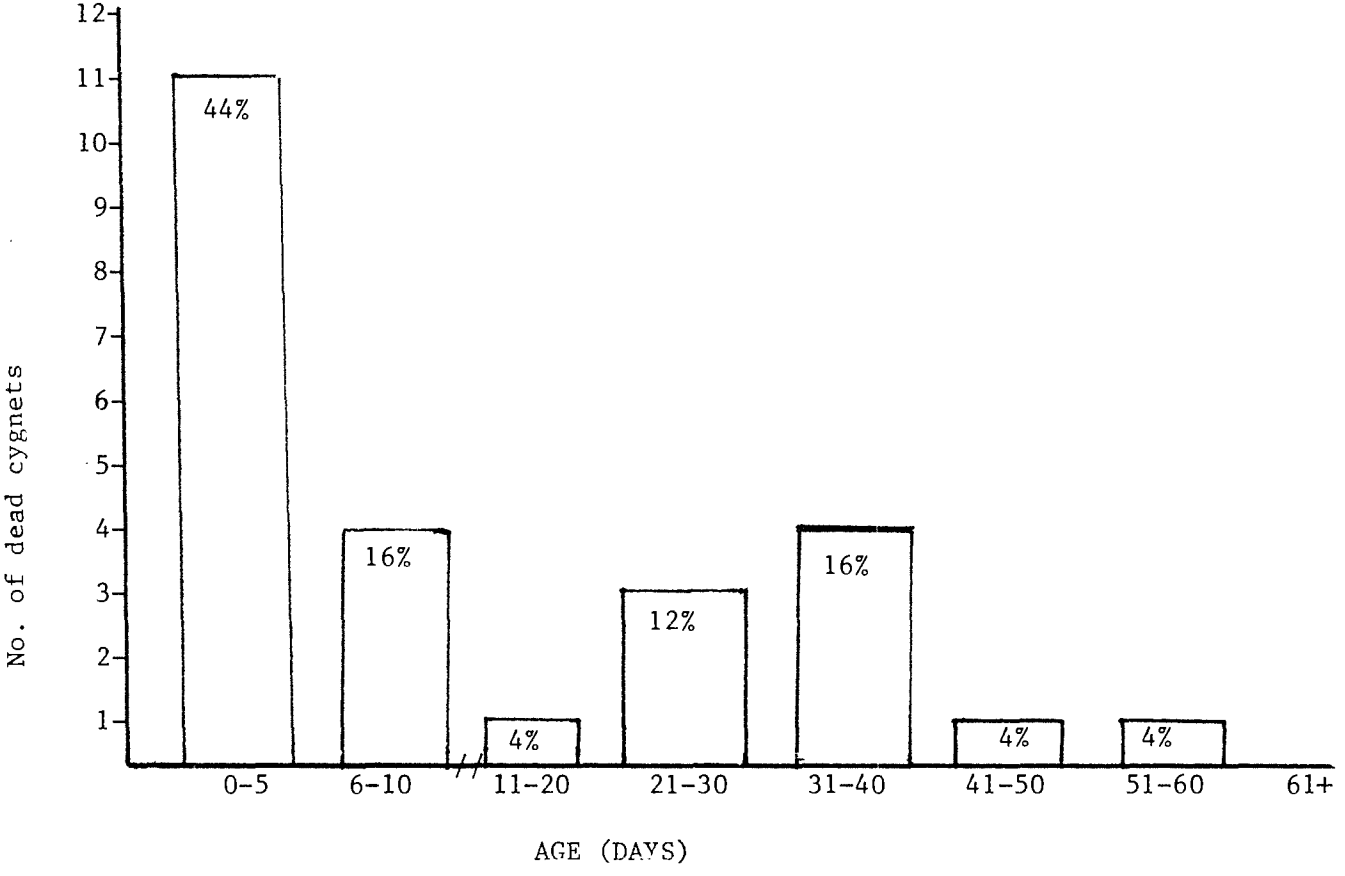


Fig. 4. Chronology of cygnet loss in 1986 (data from Table

TABLE 16. Chronology of Cygnet Deaths by Age Period, 1981 - 1986.

| | Age of Cygnet in Days | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | 0-5 | 6-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61+ | Total Cygnets Lost |
| 1981 | 6 | 14 | 2 | 5 | 1 | | 1 | 3 | 32 |
| 1982 | 12 | 17 | 13 | 3 | 2 | 3 | | 1 | 51 |
| 1983 | 9 | 6 | 9 | 7 | 3 | | 3 | 1 | 38 |
| 1984 | 9 | 8 | 11 | 12 | 2 | 1 | | | 43 |
| 1985 | 6 | 9 | 6 | 3 | 1 | 1 | 3 | 1 | 30 |
| 1986 | 11 | 4 | 1 | 3 | 4 | 1 | 1 | | 25 |
| TOTAL | 53 | 58 | 42 | 33 | 13 | 6 | 8 | 6 | 219 |
| % | 24% | 26% | 19% | 15% | 6% | 3% | 4% | 3% | |

Table 17. Summary of seven nests made by neck-collared swan pairs in 1986.

| Nest | Collar Number | Bird Incubating Nest | | Clutch | Outcome[1] | Number of Cygnets | |
|---|---|---|---|---|---|---|---|
| | (male/female) | Male | Female | | (date) | At Hatch | Flight |
| 17 | 89/Uncoll. | 2(25%) | 6(75%) | 4 | H(6/11) | 3 | 2 |
| 23 | 3F/4J | 3(19%) | 13(81%) | 6 | H(6/13) | 3 | 3 |
| 24 | 61/(74) | 3(21%) | 11(79%) | 8 | H(6/1) | 5 | 5 |
| 25 | 1P/Uncoll. | 1(14%) | 6(86%) | ($6^{+}$) | H(6/6) | 6 | 5 |
| 27 | 9J/4A | 1(50%) | 1(50%) | 3 | DM(6/8) | - | - |
| 31 | Uncoll./A6 | 1(25%) | 3(75%) | 4 | H(6/6) | 2 | 0 |
| 33 | U3/72 | - | - | 4 | DM(6/2) | - | - |
| | | 11(22%) | 40(78%) | 35(avg. 5.0) | | 19 | 15 |

[1]H- Hatched; DM- Destroyed, probably mammalian.

clutch size (5.0) was slightly larger than for all nests combined (4.8).

For the seven marked pair swan nests combined, the male was observed incubating 11 times (22%) and the female 40 times. Although occasionally the male is on the nest more than the female, normally the female does the majority of the incubating. It is interesting to note in contrast, that trumpeter swan males apparently never incubate.

The history of two of the principal and most readily observed swan territories on the refuge is chronicled in Table 18. Bluebill Lake is the most productive swan territory on the refuge and has had a nest there for at least 14 years in a row. Before marking individual birds, one might have assumed the same pair was nesting there each year. But in fact, there appears to be quite a lot of turnover. Two males have each used the territory three years and a female has used it four years with three different mates. One male (#61) has used both territories and had four different mates in five years of nesting!

So far, we have still not had any swans nest that were banded as cygnets. The mortality rate of cygnets is high even after they survive their first year. We have banded 132 cygnets so far, but the vast majority have not survived to breeding age (Table 19). Only seven birds banded as cygnets have been observed at 3 years old or older (Table 20). These few that have reached breeding age have not bred yet. We have a saturated, stable swan population. Apparently a swan must be several years older than its biological breeding age to establish a territory and successfully nest.

To date we have obtained information on breeding age from six swans neck-collared when they were 1-year-old (Table 21). Swans 49 and 50 were collared in 1980 as 1-year-old birds and had an unsuccessful nest in 1981 as 2-year-olds. They nested in a marginal area normally used by few swans. The area had not had a nest before, possibly explaining this pair's ability to have a nest at an early age. Swan 49 nested unsuccessfully again in 1982. The third known age individual that has nested is swan 46, who was banded in 1979 as a yearling. In 1981 when she was recaptured, her cloaca was stetched, possibly indicating a nesting attempt, but it seems unlikely since the area she frequented was near Cold Bay and thoroughly searched. This bird was observed every summer since 1979, but had its first known nest in 1984 as a 6-year-old bird. She nested successfully at Bluebill Lake (a prime nesting territory) with an experienced male (61) who had broods in earlier years with two different females. In 1985, she again had a successful nest with #61 at Bluebill Lake, hatching five young and raising four to flight stage.

Two known age birds paired and nested in 1986. Female swan 72 was banded as a yearling in 1980 and male swan U3 was banded as a yearling in 1981. This year and last year they nested in the southwest part of Izembek NWR, but their nests were destroyed. In

Table 18. History of two principal swan territories near Cold Bay.

| Year | Y Territory (nest location) | Bluebill Lake Territory (nest location) |
|---|---|---|
| 1977 | 23/28 (?) | ? |
| 1978 | 23/28 (?) | 26/27 (?) |
| 1979 | 23/28 (?) | ? (Peninsula?) |
| 1980 | 61/62 (Lake #27) | 73/74 (Island) |
| 1981 | 61/16 (Lake #45) | C9/U8 (Peninsula) |
| 1982 | Unc pair, maybe 9U/2F (Trout Cr. marsh) | C9/74 (Island) |
| 1983 | 9U/2F (nr. Lake #93) | C9/74 (Island) |
| 1984 | 9U/2F (nr. Lake #93) | 61/46 (Island) |
| 1985 | None | 61/46 (Island) |
| 1986 | None | 61/74 (Island) |

Table 19. Resightings of swans banded as cygnets.

| Yr. Banded Age[1] | 0 | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | Total |
|---|---|---|---|---|---|---|---|---|
| 1978 | 6 | 1 | | | 1 | | | 8 |
| 1979 | | | | | | | | 0 |
| 1980 | 5 | 1 | 1 | 1 | | | | 8 |
| 1981 | 14 | | 2 | | | 1 | | 17 |
| 1982 | 6 | 4 | 1 | 2 | | | N/A | 13 |
| 1983 | 31 | 2 | 5 | 1 | | N/A | N/A | 39 |
| 1984 | 4 | 1 | 2 | 1 | N/A | N/A | N/A | 8 |
| 1985 | 15 | 2 | 1 | N/A | N/A | N/A | N/A | 18 |
| 1986 | 14 | 7 | N/A | N/A | N/A | N/A | N/A | 21 |
| Summary | 95 | 18 | 12 | 5 | 1 | 1 | 0 | 132 |
| | 72% | 13% | 9% | 4% | 1% | 1% | | |

[1] 0() to 1 year old-figured from banding date to 4/30 of following year); 1+(1-2 years old, from 5/1 to 4/30 of following year); etc.

Table 20 . Summary of resightings of swans banded as cygnets.

| AGE | POTENTIAL (NO. SWANS) | NO. SWANS ACTUALLY RESIGHTED |
|---|---|---|
| 5+ | 46 | 1 (2%) |
| 4-5 | 85 | 2 (2%) |
| 3-5 | 93 | 7 (8%) |
| 2-5 | 111 | 19 (17%) |
| 1-5 | 132 | 37 (28%) |

Table 21. Ages of breeding and nesting outcome of six known age Tundra Swans.

| Age (yrs.) | Collar Number | | | | | |
|---|---|---|---|---|---|---|
| | Males | | Females | | | |
| | 49[1] | U3[1] | 46 | 50[1] | P8 | 72[1] |
| 2 | D[2] | | | D | | |
| 3 | HF | | ?S | | ?S | |
| 4 | | D | | | | |
| 5 | | D | | | | D |
| 6 | | D | HF | | | D |
| 7 | | | HF | | | D |

[1]49/50 were paired one year; U3/72 paired all three years.

[2]HF-hatched and raised brood to flight; D-nest destroyed; ?S-cloaca stretched indicating egg laying occurred, nest not found.

1984 a double collared pair had a nest in the same location, but we were unable to read the collars before their nest was destroyed and they dispersed. From this and last years' information, it appears highly probable that U3/72 nested for the first time in 1984 at the ages of four and five years, respectively.

The sixth possibly known age nester was female P8. She was captured and collared in 1981 as a yearling. Two years later, she was again captured and at that time, her cloaca was stretched indicating egg laying might have occurred. No nest or brood were ever found associated with this bird.

To summarize, there has been quite a wide variation in age at first nesting here possibly due to the stable nature of the population and "saturated" nesting territories. First nesting has occurred for the six known age swans at two (two swans), three, four, five and six years old (Table 21).

Swan TO continues to hold the record for most consecutive years nesting, having nested for five years in a row ('81 through '85) (Table 22). Swan 61 has also nested a minimum of five years with four different mates in two different territories. Three swans have nested a minimum of four years and 17 swans have nested at least three years (Table 22).

As in previous years, brood movements were monitored to identify the extent of brood rearing habitat with special emphasis on the location of preferred areas. Lakes with outlets large enough to support even a small run of salmon were fertile and had good stands of aquatic vegetation (primarily Potamogeton perfoliatus, P. filiformis and Sparganium hyperboreum). Ponds with similar vegetation stands are present in wet marshes and these, in addition to the somewhat deeper lakes with salmon runs, were used preferentially by swans during the nesting, molting and brood rearing periods. We are collecting data on lake type and use on a seasonal basis and feel this is essential to providing the protection necessary to maintain the tundra swan population and to protect refuge wilderness habitats. Additional limnological information was gathered on these lakes in 1985 and 1986 by the FWS Fisheries Resources crew.

This year we did not have a floatplane for banding operations and as a consequence only caught about half as many swans as last year. We captured 68 new swans plus recaptured 15 individuals originally caught in previous years (Table 23). We concentrated on banding Pavlof Unit swans this year to further delineate the wintering patterns of the population. Of the 68 swans captured, 52 were from the Pavlof Unit giving a sample size of 102 swans in two years from this area. This should be enough to give us a good idea what the wintering pattern is for this population.

After getting used to banding with the aid of a floatplane last year and being able to reach many areas heretofore inaccessible,

Table 22. Nesting longevity of marked tundra swans, Izembek NWR.

| Swan | Mate (yrs.) | 5 Years | 4 Years | 3 Years |
|---|---|---|---|---|
| 61 | 62(81), 16(82) 46(84, 85), 74(86) | 81, 82, 84, 85, 86 | | |
| TO | ? | 81, 82, 83, 84, 85 | | |
| 74 | 73(80), C9(82, 83) 61(86) | | 80, 82, 83, 86 | |
| 3F | 4J | | 83, 84, 85, 86 | |
| 4J | 3F | | 83, 84, 85, 86 | |
| K4 | M5 | | 82, 83, 84, 85 | |
| M5 | K4 | | 82, 83, 84, 85 | |
| 23 | 28 | | | 77, 78, 79 |
| 28 | 23 | | | 77, 78, 79 |
| 45 | 48 | | | 81, 82, 83 |
| 48 | 45 | | | 81, 82, 83 |
| 72 | U3 | | | 84, 85, 86 |
| U3 | 72 | | | 84, 85, 86 |
| A6 | ? | | | 84, 85, 86 |
| A7 | Y7 | | | 82, 83, 84 |
| Y7 | A7 | | | 82, 83, 84 |
| C9 | U8(81), 74 (82, 83) | | | 81, 82, 83 |
| K9 | Y4 | | | 81, 82, 83 |
| Y4 | K9 | | | 81, 82 83 |
| 8C | 3P | | | 83, 84, 85 |
| 3P | 8C | | | 83, 84, 85 |
| 1P | OT(83), ?(84), B2(86) | | | 83, 84, 86 |

Table 23. Summary of Tundra Swans banded and neck-collared in 1986, Izembek NWR and Pavlof Unit.

| Date | Location | ASY M | ASY F | SY M | SY F | L-M | L-F | Neck Collar Codes |
|---|---|---|---|---|---|---|---|---|
| 7/24 | Hatchery Lake | | 1 | | | 1 | 4 | B2, B1, B4, B6, B8, B0 |
| 7/28 | Thin Point Lake | 1 | | 1 | | | | B3, B5 |
| 7/29 | Bluebill Lake area | | | | | 2 | 3 | B7, B9, H2, H4 H6 |
| 7/30 | Shortcut Lake (Sec. 8/9, T50S, R78W) | 5 | 4 | 2 | 2 | | | H1, H3, H5, H7, H8, H9, H0, N1, N2, N3, N4, N6, N8 |
| 7/30 | 35 Swan Lake (Sec. 17, T50S, R78W) | 1 | 2 | | | 3 | 1 | N5, N0, N7, N9, R1, R4, R2 |
| 7/31 | Longhike Lake (Sec. 28, T50S, R78W) | 2 | | | 2 | | | R3, R5, R6, R8 |
| 7/31 | Seal Lake (Sec. 32, T51S, R78W) | 10 | 4 | 1 | 1 | | | R7, R9, R0, S1, S2, S3, S4, S5, S6, S7, S8, S9, S0, V1, V3, V5 |
| 8/2 | Runpeggy Lake (Sec. 33, T50S, R78W) | 3 | 3 | | 1 | | | V7, V9, X1, 8B, 0B, 2R, 4R |
| 8/3 | Potamageton Lake (Sec. 19, T50S, R78W) | 1 | | | | 1 | 3 | X3, X5, X0, Z2 6R |
| 8/5 | Lake 90 | | | | | 1 | 2 | V2, V4, X7 |
| TOTAL-1986 | | 23 | 14 | 4 | 6 | 8 | 13 | 68 |
| Cumulative Total (1978-1986) | | 121 | 133 | 31 | 49 | 62 | 70 | 466 |

[1]In addition, 61, 74(14), 1P, 3F, 4J, 9J, 4A, 9R, GC, GF, KU, TJ, TK, YC, and YU were recaptured in 1986.

it was difficult to go back to the old methods with a wheeled aircraft. But we persevered and were quite successful on most of the Pavlof Unit drives. We landed the wheelplane at a small ADF&G strip on the Sapsuk River and then traveled by inflatable boat about 1-1/2 hours to reach the cabin. The cabin is in the center of the best swan molting habitat. The bulk of the gear and landing crew were brought in by Grumman Goose. The daily routine was for the pilot to travel by inflatable boat to the airplane, fly and spot the swans to be worked that day and direct the banding crew in capturing and keeping track of the birds. On some of the drives after spotting a group of swans, the pilot was able to land back at the strip and join the crew with his boat and help from the ground with the capturing.

We were again pleased that, similar to last year, the swans in this area were easier and more cooperative to capture. They were obviously not as "experienced" with banding drives as Izembek birds. But as is usually the case with wildlife work about the time you draw the conclusion they are easy to capture, you get surprised. One of the last drives we tried involved a brood on a small pond in the Pavlof Unit. What started out seeming like a "piece of cake" turned out to be a failure. We never did capture any of the brood or adults. The next day, we were weather bound in the cabin. By then we were able to laugh about the "disaster". One story led to another and before it was over WB Dau wrote the following poem describing the attempt:

Those Birds

A group of fowl, cygnets, pen and cob
Should be to capture a routine job
In gray matter we had them 100 to 1
A simple plan laid and now the fun:
We'd run them ashore through horsetail tall
Then catch them by hand -run fast, don't fall.
An attainable summit easy to mount
Had we only recalled that swans, too, can count.
Through horsetail and lillies they coursed with great zest,
But, exit that puddle? - Surely you jest!
With flailing of arms and shouting profound
It became clear 'Plan B' must be found.
Ponder and reason, cross radio wave
We had but one ploy, but who was so brave?
A leader must lead, an example to teach
So in jumped John, did you hear that screech?
We were hidden and waitin' for 'Plan B' to unfold
But all we could hear were whoops and "it's cold".
Swans are wilely, they were up on 'Plan B'
And all John got was 'silica knee'.

We regrouped to plan and watch John shiver
When I'll be dipped, one heads for the river.
Frustrated and chilled beyond mere words
We'd met our match with those great, white
birds.

As usual besides placing two-digit blue neck collars on the captured swans, we also put on a matching plastic legband and a FWS metal legband. In addition to placing the markers, we recorded age, sex, plummage characteristics, eye color, size of bill, size of yellow spot on lores, wing and leg measurements. Weight and presence or absence of external parasites were also recorded. Before releasing the swans, photos of facial patterns were taken.

This year's winter observation results from the Pavlof Unit bandings were especially gratifying. A total of 22 different Pavlof Unit birds were observed in the winter of 86/87 in the Lower 48 (Wash., Ore., and Cal.) (Table 9). During the first winter after initial banding in the Pavlof Unit in 1985, only four swans were observed in the Lower 48, but this winter eight from the 1985 bandings were observed as well as 14 more from this summer's banding. More birds were observed two years after banding than the first year after banding, an occurrence we are at a loss to explain. In summary, we have winter observations in the Lower 48 of 22 out of 102 swans banded from the Pavlof Unit with no winter observations of Pavlof Unit birds at Izembek. Therefore, it now appears that only the Izembek and Unimak Island swans are non-migratory. The rest of the swans using the Alaska Peninsula apparently migrate to the Lower 48.

In 1986, 21 (25%) of 83 swans had leeches (Theromyzon rude) in their eyes (Table 24). Over the nine years that we have checked swans for leeches, 116 (20%) out of 569 have had them in their eyes. There were 105 which had leeches (up to four) in one eye and 11 had them in both eyes. They do not appear to be causing significant mortality, but one wonders how much a swan's forward vision is affected by the large bulge a leech causes under the nictitating membrane.

This fall we conducted an extensive caribou survey (see Caribou Section) from October 30 through November 11 and counted all swans seen as well as caribou. Every section line was flown from Herendeen Bay to Cold Bay. A total of 673 tundra swans were counted. The majority (500) were on the Pavlof Unit between Herendeen Bay and the Black Hills, 97 were seen from the Black Hills to the Izembek Unit boundary, and 76 were seen on the north half of Izembek from the boundary to the town of Cold Bay.

So far the winter of 86/87 is turning out to be mild, warm and rainy again. By year's end no swan concentrations had built up at Petersen Lagoon and it appears we will have another difficult time reading swan collars this winter.

Table 24. Occurrence of Leeches in Tundra Swan Eyes, 1978-1986.

| Year | ASY-M | ASY-F | SY-M | SY-F | L-M | L-F | Total Swans W/Leeches | Swans W/O Leeches | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1978 | 1 | 2 | | | 1 | 2 | 6(22%) | 21 | 27 |
| 1979 | | 1 | | | | | 1(6%) | 17 | 18 |
| 1980 | 3 | 3 | | | | | 6(14%) | 38 | 44 |
| 1981 | 7 | 6 | | 4 | 3 | 2 | 22(29%) | 54 | 76 |
| 1982 | 4 | 3 | | | 1 | | 8(12%) | 58 | 66 |
| 1983 | 6 | 4 | 3 | | 4 | 6 | 23(26%) | 67 | 90 |
| 1984 | 4 | | | | 1 | 2 | 7(37%) | 12 | 19 |
| 1985 | 9 | 4 | 2 | 1 | 2 | 4 | 22(15%) | 124 | 146 |
| 1986 | 6 | 3 | | 2 | 2 | 8 | 21(25%) | 62 | 83 |
| TOTALS | 40 | 26 | 5 | 7 | 14 | 24 | 116(20%)[1] | 453 | 569 |

[1] 105 swans had leeches in one eye and 11 had leeches in both eyes.

Black Brant

The status of that portion of the Pacific Flyway population of black brant using Alaskan habitats received increased emphasis in 1986. The Izembek NWR staff continued to fulfill its historical mission of providing a fall estimate of productivity and population size. In addition, various types of support were provided to Research Division personnel during their ongoing analysis of waterfowl disturbance factors, behavior and energetics of fall staging brant. Assistance has also been provided to Waterfowl Investigation personnel in Juneau by monitoring the numbers of brant overwintering in Izembek and adjacent lagoons. These data are important in assessing the distribution and abundance of brant, flyway-wide, as determined from the annual mid-winter survey.

Brant productivity and family group counts conducted at Izembek in 1986 marked the 24th consecutive year such appraisals have been made. Production counts were obtained from 23 September to 23 October with a total of 18,444 individual brant classified to age. Juveniles comprised 2,823 (15.3%) of this total in comparison to the long-term average of 22.9% (Table 25). Productivity of the PF brant population, based on observations from Izembek, has been below average in five of the past six years, however, overall population size, determined from mid-winter surveys, is relatively stable..

Family group size data were collected concurrently with productivity counts. A total of 137 individual families were observed giving an average of 2.6 juveniles/family (Table 26). Productivity was depressed in 1986 and based on our family group counts, so was survival of young (i.e. down 0.1 juveniles/family in comparison to the 21-year average). Average brood size of brant at two locations on the Yukon-Kuskokwim Delta in July was 1.7 and 2.7 young/family which suggest moderate or low mortality of young when compared to observations at Izembek. The fall population of brant at Izembek Lagoon includes birds from Alaska, the western Canadian arctic and Wrangel Island (USSR). It is hypothesized that these birds mix throughout the lagoon and hence our counts are representative of the whole PF population. Radio marking of brant from various breeding areas is planned for 1987 to address this mixing in Izembek Lagoon among other questions. Productivity appraisals of brant conducted this fall were a joint effort of the Research Division and the Izembek NWR staffs. The substantial contributions of Research personnel in 1985 and 1986 are very much appreciated.

The fall arrival of brant at Izembek began on approximately 30 August, nearly 12 days later than average ($\bar{X}$=18 August; n=15 years). No explanation of the late arrival of brant is available, however, mild fall weather conditions in southwestern Alaska may have delayed departure from the Yukon-Kuskokwim Delta or interim

Research Division personnel Paul Flint, Eric Taylor and Mark Wotawa collected beach-strewn fishing floats to use in making goose disturbance study sites within Izembek Lagoon.

Research crew (Wotawa, Flint, Ward and Taylor) observed goose behavior from camouflaged blinds located on islands and around the periphery of Izembek Lagoon.

Table 25. Annual black brant production counts, Izembek NWR

| Year | Adults | Juveniles | Total | % Juveniles |
|---|---|---|---|---|
| 1963 | 3,968 | 1,243 | 5,211 | 23.9 |
| 1964 | 13,324 | 4,577 | 17,901 | 25.6 |
| 1965 | 21,210 | 5,050 | 26,260 | 19.2 |
| 1966 | 9,927 | 7,134 | 17,061 | 41.8 |
| 1967 | 15,219 | 3,081 | 18,300 | 16.8 |
| 1968 | 15,110 | 3,117 | 18,227 | 17.1 |
| 1969 | 12,829 | 3,577 | 16,406 | 21.8 |
| 1970 | 12,104 | 6,256 | 18,360 | 34.1 |
| 1971 | 4,820 | 1.953 | 6,773 | 28.8 |
| 1972 | 6,599 | 3,698 | 10,297 | 35.9 |
| 1973 | 12,025 | 4,999 | 17,024 | 29.4 |
| 1974 | 13,118 | 632 | 13,750 | 4.6 |
| 1975 | 9,396 | 5,452 | 14,848 | 36.7 |
| 1976 | 7,962 | 4,340 | 12,302 | 35.3 |
| 1977 | 8,856 | 4,092 | 12,948 | 31.6 |
| 1978 | 10,696 | 1,842 | 12,538 | 14.7 |
| 1979 | 13,674 | 2,349 | 16,023 | 14.7 |
| 1980 | 9,618 | 3,341 | 12,959 | 25.8 |
| 1981 | 4,109 | 936 | 5,045 | 18.6 |
| 1982 | 11,509 | 1,213 | 12,722 | 9.5 |
| 1983 | 6,149 | 1,947 | 8,096 | 24.1 |
| 1984 | 9,451 | 1,499 | 10,950 | 13.7 |
| 1985 | 12,032 | 1,915 | 13,947 | 13.7 |
| 1986 | 15,621 | 2,823 | 18,444 | 15.3 |
| 24 Yr. $\bar{X}$ | 10,805 | 3,211 | 14,016 | 22.9 |

Table 26. Black brant family group counts at Izembek NWR 1976-1986

| No. of Juveniles | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 21 Yr. $\bar{X}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 36 | 49 | 13 | 22 | 26 | 34 | 18 | 25 | 19 | 125 | 23 | 36 |
| 2 | 59 | 77 | 31 | 64 | 47 | 38 | 22 | 40 | 49 | 223 | 46 | 66 |
| 3 | 78 | 71 | 29 | 37 | 57 | 36 | 25 | 55 | 70 | 173 | 43 | 61 |
| 4 | 40 | 29 | 24 | 17 | 39 | 27 | 20 | 26 | 39 | 73 | 19 | 35 |
| 5 | 19 | 13 | 10 | 5 | 7 | 10 | 4 | 21 | 10 | 24 | 4 | 12 |
| 6 | 4 | 1 | 3 | 0 | 0 | 8 | 0 | 6 | 4 | 6 | 2 | 3 |
| 7 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | <1 |
| Total Families | 237 | 240 | 110 | 146 | 177 | 154 | 89 | 173 | 192 | 624 | 137 | 214 |
| Total Juveniles | 674 | 603 | 326 | 361 | 489 | 431 | 237 | 515 | 564 | 1,538 | 352 | 573 |
| Mean Family Size | 2.84 | 2.51 | 2.96 | 2.47 | 2.76 | 2.80 | 2.66 | 2.98 | 2.94 | 2.46 | 2.57 | 2.72 |

staging areas north of Izembek. Peak fall influxes of brant into the Izembek Lagoon area occur with regularity in late September.

The fall exodus of brant from Izembek Lagoon occurred largely on two dates, 26 October and 9 November with nearly half the population departing on each date. Approximately 2,500 brant were present on Izembek Lagoon on 4 December. The total overwintering population was determined to be 5,745 birds based on a 27 February 1987 survey.

The increasing emphasis of biological investigations on PF brant in Alaska during 1986 came primarily from the Alaska Office of Fish and Wildlife Research which intensified its appraisal of disturbance and behavior of brant at Izembek this fall. A seven-man team including Dirk Derksen, Cal Lensink, Bob Stehn, David Ward, Eric Taylor, Paul Flint and Mark Wotawa spent the bulk of September and October on this important project. Disturbance of brant during aircraft overflights was experimentally tested using a contract Bell 206 helicopter. Additionally, the U.S. Coast Guard provided a Sykorski H-3 helicopter and a four-engined C-130 for individual low-level tests in conjunction with their other duties. We hope to obtain additional support for this project from the Coast Guard in the future during its regular training or periodic search-and-rescue missions in the area.

Six types of fixed-wing aircraft from the C-130 mentioned above to a single-engine Arctic Tern, assigned to the Izembek NWR, were used to perform experimental overflights of Izembek Lagoon during fall 1986. With the exception of the Coast Guard plane, all flights were either charter (n=2) or Service-owned (n=3) aircraft. Overflights were flown this year over a minimum of five permanent observation blinds. Knowing exact aircraft altitude, speed, and course allowed researchers to accurately assess various behavioral responses exhibited by geese at varying distances from the aircraft. Such quantifiable data are essential to determining what the detrimental effects of disturbances are and what might be appropriate means to reduce or eliminate them. In addition to experimental flights, numerous overflights of the Izembek area by private and commercial aircraft were monitored. Quantifiable parameters were determined and field data sheets and portable tape recorders were utilized to address each category for each disturbance.

All forms of waterfowl disturbance encountered by observers were analyzed including boat and foot traffic, various types of auditory stimulus and predator activities (primarily bald eagles). It is apparent that brant can undergo some level of disturbance and not adversely affect their physical capabilities to assimilate nutrient reserves necessary to migrate or breed. Natural forms of disturbance such as activities of predators like bald eagles or gyrfalcons are largely uncontrollable, but must be viewed as a cumulative factor in the overall analysis of disturbance. Identification of an 'acceptable level' of disturbance, and development of means to avoid exceeding that level, is critical to

managing waterfowl and public use on the Izembek NWR and Izembek State Game Refuge..

Behavioral interactions and responses of disturbed and undisturbed brant, engaged in various activities, must be quantified in relation to a number of climatic and phenological factors. To obtain these types of data, Research crews viewed birds for several days from key areas of Izembek Lagoon through the fall. Time budget analyses were performed throughout diurnal periods to provide these baseline data. Such observations also will help to identify increases in migratory restlessness within the population.

The 45- to 60-day fall staging period, during which the bulk of the PF brant population is in residence at Izembek Lagoon, is critical to this population's well-being. Food resources, primarily eelgrass obtained at Izembek, allow for rapid fattening which in turn enables these birds to negotiate their 3,300-mile nonstop flight to Mexican wintering areas. Beyond merely ensuring that brant are physically able to negotiate this dramatic flight, data on other goose species are increasing which suggests that fitness levels of birds entering the winter period may affect breeding output the following summer. If brant exhibit such a characteristic the critical importance of the fall staging period at Izembek would take on a new light. Ongoing research on the Yukon-Kuskokwim Delta and at Izembek will help quantify such factors.

The fall migration phenomenon of brant from Izembek Lagoon to coastal wintering areas in Mexico is one of the most spectacular examples of rapid, long-range bird migrations. The Izembek NWR staff has made observations relating to the birds departure and the associated weather patterns for 28 years. A report on these data is currently in its second draft and the refuge hopes to publish this information in association with enroute and arrival observations collected by other workers. These data may provide additional insight useful in analyzing the annual energetic requirements of brant.

The majority of the brant population departs Izembek Lagoon en mass during early evening hours following the passage of a low pressure system. Northerly winds occur on the back-side of these departure lows providing migrants with substantial tailwinds over more than one-third of their route. Departure to mid-route airspeeds for brant are estimated to average $76\pm11$ mph with an overall average airspeed of $60\pm4$ mph for the entire flight. It is assumed that brant migrate with the most favorable tailwinds which would mean their probable path is not the most direct or the shortest route to Mexico. Estimates of these most favorable paths based on weather system charts from 1959 to 1986 resulted in an average total distance of $3,324\pm146$ miles. The shortest route would be approximately 2,740 miles, however the reduction in ground speed from not utilizing the most favorable tailwind direction would likely result in a longer time enroute.

The spring arrival of brant at Izembek occurred from 18 April to 16 May. The normal arrival usually occurs over about a 10- to 15-day period. Flocks of a few hundred up to a thousand are observed during daylight hours over Cold Bay. As these birds move north over Cold Bay, they gain altitude (to approximately 1500 feet AGL), cross the Alaska Peninsula and descend into Izembek Lagoon. No definite peak arrival date was noted in 1986, but more birds were observed on 11 and 14 May than on other dates. These observations suggest that some of the spring influx occurred during nocturnal hours or else were not detected at Cold Bay. A total of 64,081 brant were counted in the Izembek/Kinzarof Lagoon areas on 6 May. From 4 to 7 May the refuge cooperated in a coastal waterfowl survey of southwestern Alaska with brant numbers totaling 87,206. Spring migration of brant is characterized by short, daily movements over roughly a two-month period. Nevertheless, brant do not normally arrive at Izembek over a month-long period as occurred in 1986.

Numbers and distribution of brant within Izembek and adjacent lagoons are determined each fall by aerial survey. The refuge staff performed two and assisted Wildlife Assistance personnel on a third census in 1986 (Table 27). Additionally, Wildlife Assistance personnel surveyed the area as part of a more comprehensive coverage of southwestern Alaska. The peak count resulting from these various efforts to enumerate the population was used to estimate the composition with reference to age and breeding status (Table 28).

A total of 103,153 black brant were reported during the mid-winter inventory with 86,913 of these in Mexico (Table 29). The peak fall count for southwestern Alaska was 131,594 brant (Rod King, WA-MBMN). Considering that a minimum of 5,745 birds overwintered in Alaska, and the bulk of hunting mortality had occurred, the fall and mid-winter censuses were in quite close agreement.

Canada Goose

Taverner's Canada geese are an important component in the fall waterfowl concentration on the Izembek NWR. The first fall arrivals were a flock of 125, first observed on 19 August. The influx of birds continued slowly through September. Greatest numbers are present in October each year and aerial survey efforts in fall of 1986 placed the peak population at 45,022 birds (Table 27 in brant section). Numbers of Canada geese were approximately 4,000 birds below the average determined from surveys since 1980.

Though this was not true 15 years ago, Canada geese are now the primary species in the hunter's bag at Izembek. Canada geese are of increasing importance due to the harvest restrictions or closures on other species. Taverner's Canada geese made up 78.6% of the goose harvest and 50.9% of the total waterfowl take at Izembek in 1986 (Table 59 in public use section). Adult and

Table 27 . Aerial surveys of goose populations on Izembek and adjacent lagoons, 1986

| Date | Numbers of Birds | | | Observers |
|---|---|---|---|---|
| | Black Brant | Canada Goose | Emperor Goose | |
| 3 October[1] | 93,484 | 18,855 | 2,975 | Bill Butler, Chris Dau |
| 7-8 October | 131,594 | 19,093 | 4,091 | Rod King, Bill Eldridge |
| 20 October | 98,718 | 40,644 | 5,227 | John Sarvis, Chris Dau |
| 29 October | 57,369 | 45,022 | 4,270 | John Sarvis, Chris Dau |

[1]Izembek Lagoon only

Table 28 . Composition of the black brant population, Izembek Lagoon

| | Number of Birds | | | | |
|---|---|---|---|---|---|
| | 1982 | 1983 | 1984 | 1985 | 1986 |
| Peak Count | 146,945 | 147,933 | 123,602 | 135,680 | 131,594 |
| Est. number of hatching - year birds (percent young X total) | 14,004 | 35,652 | 16,933 | 18,588 | 20,134 |
| Est. number of families (number of HY ÷ Avg. family group size) | 5,265 | 11,964 | 5,838 | 7,435 | 7,744 |
| Est. maximum number of breeding adults with young (number of families X 2) | 10,530 | 23,927 | 11,676 | 14,870 | 15,488 |
| Est. total number of sub-adults and non and/or failed breeding adults | 122,411 | 88,354 | 94,993 | 102,222 | 95,972 |
| | (83.3%) | (59.7%) | (76.9%) | (75.3%) | (72.9%) |

Table 29. Black brant mid-winter survey data

| Year[1] | Washington | Oregon | California | Mexico (W. Coast) | TOTAL | 3 Year Running Av. |
|---|---|---|---|---|---|---|
| 1974/5 | 6,163 | 1,507 | 480 | 115,340 | 123,490 | 126,382 |
| 1975/6 | 7,540 | 1,769 | 680 | 112,056 | 122,045 | 125,395 |
| 1976/7 | 14,111 | 2,100 | 0 | 130,756 | 146,967 | 130,834 |
| 1977/8 | 18,100 | 1,110 | 560 | 143,117 | 162,887 | 143,966 |
| 1978/9 | 8,078 | 1,255 | 10 | 120,070 | 129,413 | 146,422 |
| 1979/80 | 7,665 | 1,015 | 135 | 137,550 | 146,365 | 146,222 |
| 1980/1 | 10,107 | 1,790 | 540 | 181,760 | 194,197 | 156,658 |
| 1981/2 | 6,451 | 706 | 485 | 113,402 | 121,044 | 153,869 |
| 1982/3 | 3,113 | 718 | 565 | 104,918 | 109,314 | 141,518 |
| 1983/4 | 7,097 | 930 | 700 | 124,703 | 133,430 | 121,262 |
| 1984/5 | 11,675 | 641 | 801 | 131,568 | 144,685 | 129,143 |
| 1985/6 | 12,026 | 1,113 | 706 | 114,725 | 128,570 | 135,562 |
| 1986/7 | 14,371 | 1,133 | 736 | 86,913 | 103,153 | 125,469 |

[1]Calendar year prior to January mid-winter survey (i.e. 1986 data represents survey done in January 1987).

juvenile Canada geese made up equal components of the fall harvest based on bag check data (Table 30).

In 1986 we received two indirect recoveries of Canada geese banded at Izembek. To date, 53 (12.4%) of the 418 birds banded have been harvested with 16 of these taken on the refuge. Of the remaining recoveries 18 (34.0%) are from the Willamette Valley in Oregon and 11 (20.8%) from southeast Oregon/northeast California (Fig. 5). These recoveries have also been analyzed by year after banding (Table 31) which reveals that over 60% (n=32) were harvested within two years of banding while less than 10% (n=5) were harvested five or more years after banding. Adult recoveries total 14.9% of the adults banded versus 10.7% for juveniles. Both ages appear in the direct harvest (i.e. same year as banding) in nearly equal proportions, however adults appeared in a greater rate in the indirect harvest (Table 32).

The fall departure of Canada geese from the Izembek area occurred largely from 3 to 5 November. Canada geese initiate their migration with weather conditions similar to those used by brant, but Canadas leave during daylight hours. All Canada geese had departed the area by late November.

Emperor Goose

The emperor goose population continued its dramatic decline based on aerial spring surveys in southwestern Alaska (Table 33). The spring 1986 total of 42,228 geese was 28.2% below the 1985 level. The Izembek NWR (WB Dau) and MBM-N (Rod King) cooperated from 4 to 7 May to perform this survey from the Yukon-Kuskokwim Delta to Unimak Island using a single aircraft and crew (Table 34; Fig. 6). The alarming population decline reported precipitated a second survey on 13 and 14 May that substantiated findings of the first survey (Table 35).

This annual spring survey is initiated when essentially the entire population is believed to be staging in bays and lagoons within the survey area. Climatological charts prepared by the National Weather Service (NOAA) and aerial reconnaissance by refuge personnel from the Yukon Delta, Togiak and Alaska Peninsula/Becharof NWRs are the essential indicators used to initiate the survey.

We believe very few emperor geese were outside of the survey area from 4-7 May. Four birds were seen by Research Division personnel at Kokechik Bay on 2 May. Another coastal camp on the Tutakoke River, 35 miles south of Kokechik Bay, had not observed emperor geese as of that date and no subsequent sightings were reported at either camp prior to the start of the survey. These observations and the report of a single emperor goose shot at Scammon Bay (15 miles north of Kokechik Bay) on 18 April suggest that very few birds were north of the survey area on 4 May.

Table 30 . Age ratio of Canada geese in hunters' bags, Izembek NWR

| Year | Canada Geese Harvested | | Total | Adult Immature Ratio in Harvest |
|---|---|---|---|---|
| | Adults (%) | Immatures (%) | | |
| 1976 | 78 (38.6) | 124 (61.4) | 202 | 1.00:1.6 |
| 1977 | 32 (43.2) | 42 (56.8) | 74 | 1.00:1.3 |
| 1978 | 29 (37.7) | 48 (62.3) | 77 | 1.00:1.7 |
| 1979 | 98 (53.3) | 86 (46.7) | 184 | 1.10:1.0 |
| 1980 | 30 (43.5) | 39 (56.5) | 69 | 1.00:1.3 |
| 1981 | 113 (57.1) | 85 (42.9) | 198 | 1.30:1.0 |
| 1982 | 74 (50.7) | 72 (49.3) | 146 | 1.03:1.0 |
| 1983 | 51 (49.1) | 53 (50.9) | 104 | 1.00:1.04 |
| 1984 | 37 (41.6) | 52 (58.4) | 89 | 1.00:1.4 |
| 1985 | 23 (67.6) | 11 (32.4) | 34 | 2.09:1.0 |
| 1986 | 11 (50.0) | 11 (50.0) | 22 | 1.00:1.0 |
| TOTAL | 576 (48.0) | 623 (52.0) | 1,199 | 1.00:1.08 |

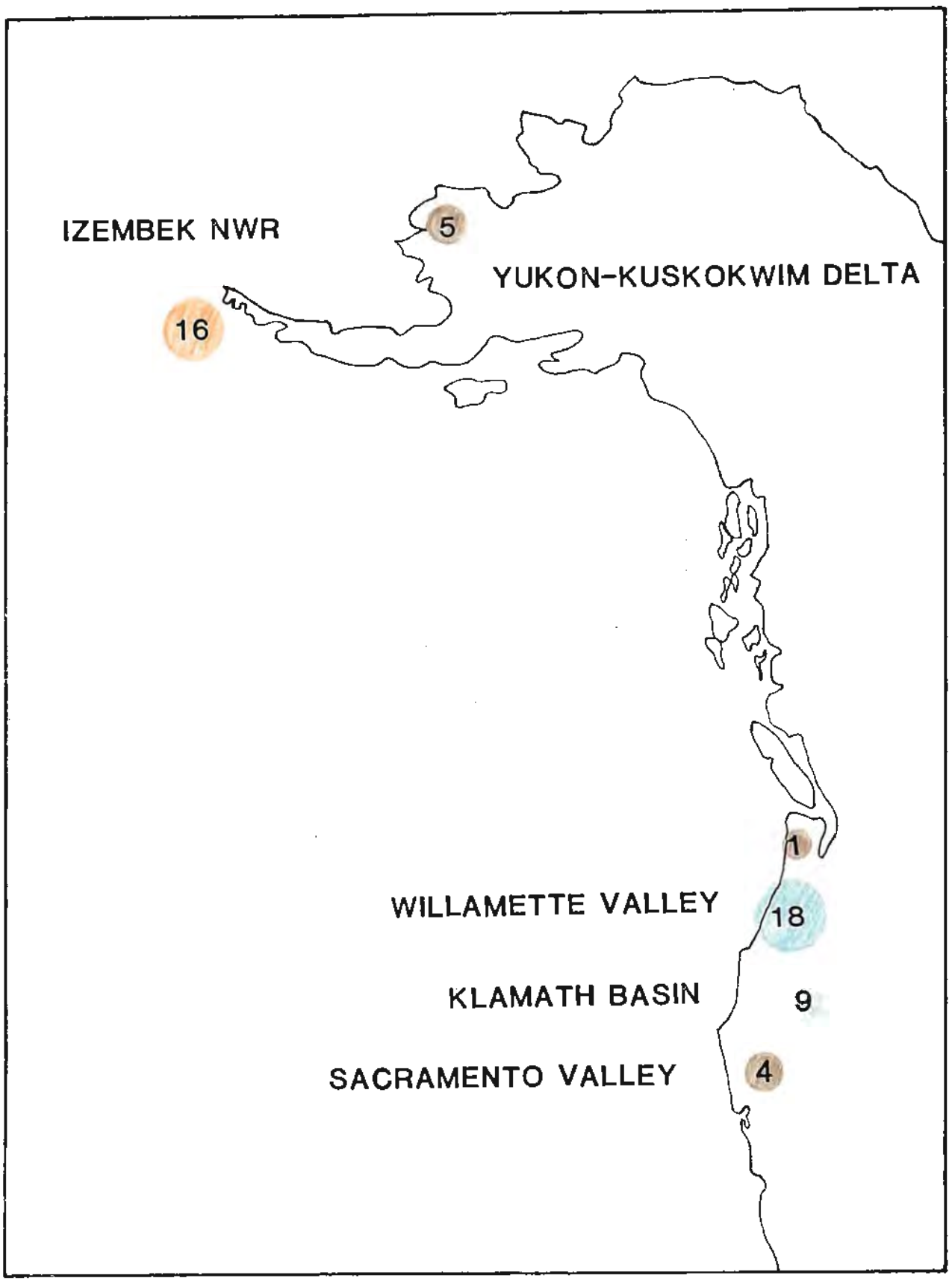


Figure 5 Direct and indirect recoveries of Canada geese banded at Izembek NWR received through 1986

Table 31. Recoveries of Taverner's Canada geese banded on Izembek NWR, 1977 - 1983

| Year | Age/Sex[1] | Number Banded | Recoveries by Year After Banding | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1[2] | 2 | 3 | 4 | 5 | 6 | 7 |
| 1977 | AHY/M | 17 | 2 | | 1 | | | | |
| | AHY/F | 22 | 2 | 2 | | 1 | | | |
| | HY/M | 38 | 2 | | 1 | | 1 | | |
| | HY/F | 31 | 3 | | 1 | 1 | | | |
| | U/F | 1 | | | | 1 | | | |
| 1978 | AHY/M | 25 | 1 | 2 | | 1 | 1 | | 1 |
| | AHY/F | 22 | | 1 | 1 | 1 | | 1 | |
| | HY/M | 43 | 2 | 1 | | 1 | | | |
| | HY/F | 53 | 2 | 2 | 1 | 2 | | | |
| 1980 | AHY/M | 15 | | 2 | | 2 | | | |
| | AHY/F | 18 | 2 | | | | | | |
| | HY/M | 15 | | 2 | | | | | |
| | HY/F | 18 | | 1 | | | | | |
| 1981 | AHY/M | 14 | 1 | | | | | | |
| | AHY/F | 16 | | | | | | 1 | |
| | HY/M | 7 | | | | | | | |
| | HY/F | 8 | | | | | | | |
| 1983 | AHY/M | 10 | | | | | | | |
| | AHY/F | 15 | | | | | | | |
| | HY/M | 24 | 1 | 1 | 1 | | | | |
| | HY/F | 6 | | | | | | | |
| Totals | | 418 | 18 | 14 | 6 | 10 | 2 | 2 | 1 |

[1]AHY = After hatching year; HY=hatching year; U=Unknown; M=Male; F=Female

[2]Recoveries duirng the first hunting season after banding (i.e. direct recoveries

Table 32. Harvest rates of Izembek-banded Taverner's Canada geese by age and sex

| Age/Sex | Number[1] Banded | Direct Recoveries(%) | Indirect Recoveries(%) | Total Recoveries(%) |
|---|---|---|---|---|
| AHY/M | 81 | 4(4.9) | 10(12.4) | 14(17.3) |
| AHY/F | 93 | 4(4.3) | 8(8.6) | 12(12.9) |
| TOTAL ADULTS | 174 | 8(4.6) | 18(10.3) | 26(14.9) |
| HY/M | 127 | 5(3.9) | 8(6.3) | 13(10.2) |
| HY/F | 116 | 5(4.3) | 8(6.9) | 13(11.2) |
| TOTAL JUVENILES | 243 | 10(4.1) | 16(6.6) | 26(10.7) |

[1]One bird captured was not aged.

Table 33. Spring population size and productivity trends in emperor gees

| Year | Spring Population Size (% change from prev. year) | Production[1] (% young in population) | Family Group Size |
|---|---|---|---|
| 1980 | No survey | 24.8 | 2.3 |
| 1981 | 91,267 | 31.7 | 3.2 |
| 1982 | 100,643(+10.3) | 7.8 | 2.7 |
| 1983 | 79,155(-21.4) | 27.1 | 3.2 |
| 1984 | 71,217(-10.0) | 22.3 | 2.8 |
| 1985 | 58,833(-17.3) | 17.4[2] | 2.8 |
| 1986 | 42,228(-28.2) | - | - |

1 Data from Izembek NWR

2 Data from Izembek NWR and other Alaska Peninsula areas

Table 34. Summary of emperor goose sightings by survey area, 4-7 May, 1986

| Date | Location | Number of Emperor Geese Observed |
|---|---|---|
| 4 May | Kolavinarak to Kipnuk | 125 |
| " | Kipnuk to Quinhagak | 0 |
| " | Quinhagak to Jacksmith Bay | 55 |
| " | Jacksmith Bay to Carter Bay | 123 |
| " | Carter Spit to Platinum | 21 |
| " | Platinum to Security Cove(incl. Chagvan Bay) | 787 |
| " | Security Cove to Cape Pierce(incl. Nanvak Bay) | 1395 |
| " | Cape Pierce to Tongue Point | 17 |
| " | Tongue Point to Kulukak Point | 0 |
| " | Kulukak Point to Dillingham | 0 |
| " | Dillingham to Nakeen | 0 |
| " | Nakeen to Naknek | 0 |
| 5 May | Naknek to Cape Chichagof | 0 |
| " | Cape Chichagof to Goose Point(incl. Egegik Bay) | 182 |
| " | Goose Point to Cape Menshikof(incl. Ugashik Bay) | 813 |
| " | Cape Menshikof to Port Heiden(incl. Cinder River estuary and Hook Lagoon) | 4645 |
| " | Port Heiden to base of Strogonof Point(incl. Port Heiden) | 12694 |
| " | Base of Strogonof Point to Ilnik(incl. Seal Islands lagoon) | 5251 |
| " | Ilnik to Port Moller | 0 |
| " | Port Moller to Point Divide | 425 |
| " | Point Divide to Sapsuk River mouth(incl. Herendeen Bay, Nelson Lagoon, Mud Bay, and Kudobin, Deer and unnamed sand islands) | 13710 |
| " | Sapsuk River mouth to Moffet Point | 0 |
| 6 May | Moffet Point to Strawberry Point(incl. Moffet Bay) | 829 |
| " | Strawberry Point to Cape Krenitzin(incl.Izembek Lagoon and Applegate Cove) | 154 |
| " | Cape Krenitzin to Chunak Point(incl. Hook Bay, St. Catherines Cove and Hot Springs Bay) | 0 |
| " | Boiler Point to Littlejohn Lagoon(incl. Little, Middle, Big and Littlejohn Lagoons) | 75 |
| " | Littlejohn Lagoon to Delta Point(incl. Old Man's Mortensen's and Nurse Lagoons) | 0 |
| " | Sanak and Caton Islands | 7 |

Table 34. (continued)

| Date | Location | Number of Emperor Geese Observed |
|---|---|---|
| 7 May | Delta Point to Lenard Harbor(incl. Kinzarof Lagoon) | 62 |
| " | Belkofski Bay | 1 |
| " | Volcano Bay to Arch Point | 0 |
| " | Arch Point to Jackson Lagoon | 0 |
| " | Jackson Lagoon to Canoe Bay | 0 |
| " | Canoe Bay to Dorenoi Bay | 0 |
| " | Dorenoi Bay to Mitrofania | 491 |
| " | Mitrofania to Chignik Lagoon (mouth) | 0 |
| " | Chignik Lagoon to base of Cape Kumliun | 0 |
| " | Base of Cape Kumliun to Cape Kuyuyukak | 85 |
| " | Cape Kuyuyukak to Cape Kilokak | 8 |
| " | Cape Kilokak to Hartman Island | 16 |
| " | Hartman Island to Coal Point | 260 |
| " | Coal Point to Cape Kekurnoi | 0 |
| " | Cape Kekurnoi to Cape Atushagvik | 0 |
| | 4 to 7 May Total | 42,228 |

FIGURE 6. Percentage distribution of emperor geese by survey area, 4-7 May, 1986

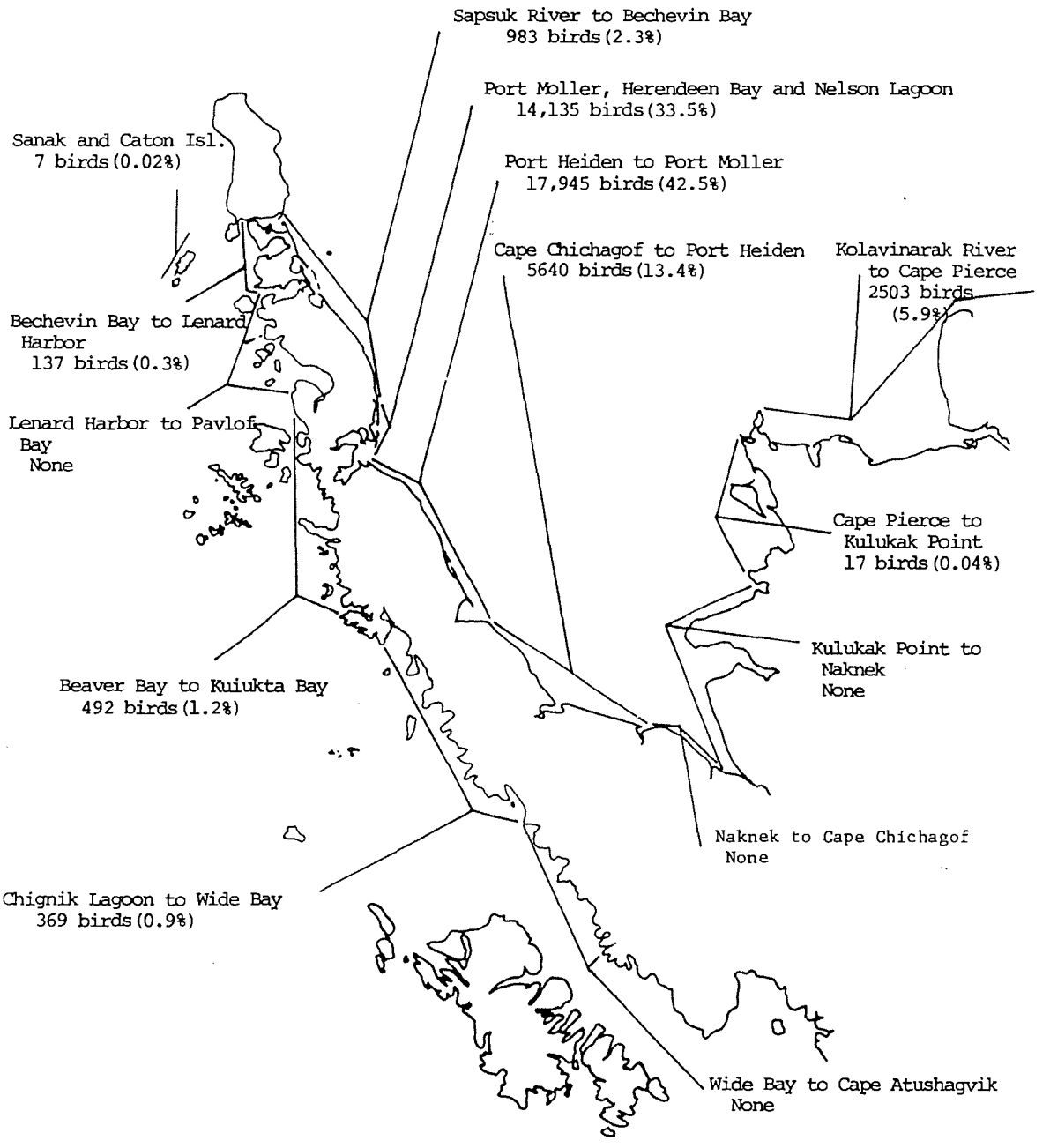

Table 35. Emperor geese observed during the 13-14 May, 1986 follow-up aerial survey of Southwestern Alaska.

| Date | Location | Number of Emperor Geese |
|---|---|---|
| 13 May | Kotlik to Kigigak Island | 771 |
| 14 May | Kigigak Island to Kwigillgok | 1693 |
| 13 May | Kuskokwim River(mouth) to Carter Bay | 521 |
| " | Carter Bay to Chagvan Bay | 505 |
| " | Chagvan Bay to Nanvak Bay | 145 |
| " | Nanvak Bay to Dillingham | 0 |
| " | Naknek to Goose Point(incl. Egegik Bay) | 35 |
| " | Goose Point to Cape Menshikof(incl. Ugashik Bay) | 319 |
| " | Cape Menshikof to Port Heiden(incl. Cinder River) | 755 |
| " | Port Heiden to base of Strogonof Point(incl. Port Heiden) | 15251 |
| " | Base of Strogonof Point to Port Moller(incl. Seal Islands lagoon) | 4589 |
| " | Port Moller to Sapsuk River(incl. Port Moller, Herendeen and Mud Bays, Nelson Lagoon,and Kudobin and unnamed sand islands) | 7951 |
| " | Sapsuk River to Izembek Lagoon(incl. Moffet Bay, Izembek Lagoon and Applegate Cove) | 720 |
| | TOTAL | 33255 |

Dirk Derksen and Dave Ward (Research) performed waterfowl migration watches on Izembek Lagoon beginning on 5 May and ending on 11 May. They reported seeing very few emperor geese during this period. In addition, during the survey, no emperor geese were seen in Bechevin Bay or along the coast of Unimak Island which suggests to us that essentially all of the population had moved east out of the Aleutian Islands. Soviet biologists working in the Commander Islands and along the coast of the Kamchatka Peninsula consider emperor geese very uncommon during spring migration. This confirms that most of the U.S. and Soviet components of the population migrate through southwestern Alaska.

The coordinated spring survey of emperor geese in southwestern Alaska provides the best available index of status of the population. In addition, these efforts are expanding our knowledge of the migratory behavior of this and other species in critically important coastal estuaries. These data are essential for the development of a recovery program for emperor geese.

Negotiations among residents of the Yukon-Kuskokwim Delta (i.e. Waterfowl Conservation Committee of the Association of Village Council Presidents), the states of Alaska and California, sportsmen's groups and the USFWS resulted in the 1985 Yukon Delta Goose Management Plan. According to this plan, if the spring emperor goose population falls below 60,000 birds based on a 3-year moving average all hunting must stop. With the 1986 survey total of 42,228 geese, this average fell to 57,427 (Fig. 7). Spring hunting was already in progress and notification of native villagers of the required closure probably had little effect on the spring 1986 take. Emperor goose hunting was prohibited during the legal fall season by the normal regulatory process. Restricted hunting of emperor geese may be allowed again when the spring population reaches 80,000 geese again based on a 3-year moving average.

An action plan and a draft Pacific Flyway Management Plan for emperor geese identify a population goal of 150,000 birds. This goal is comparable to historic levels and should be maintained. It seems, to the Izembek NWR staff, that the difficulty in reaching and maintaining a population of 150,000 emperor geese is greatly increased by allowing hunting when only 80,000 individuals are present. We would suggest that hunting be prohibited if the population falls to 25% below the identified goal (ie. when 110,000 - 115,000 geese are present).

Emperor geese began their fall influx into the Izembek NWR on 25 August when six birds were seen in Kinzarof Lagoon. Peak numbers were present in October as determined from three aerial surveys (Table 27 in brant section). The aerial survey conducted by Rod King and Bill Eldridge (MBMN/WA-RO) was part of the annual fall survey of emperor geese in southwestern Alaska. The total of 68,051 geese counted from 5-11 October 1986 was used to estimate the composition of the fall population (Table 36).

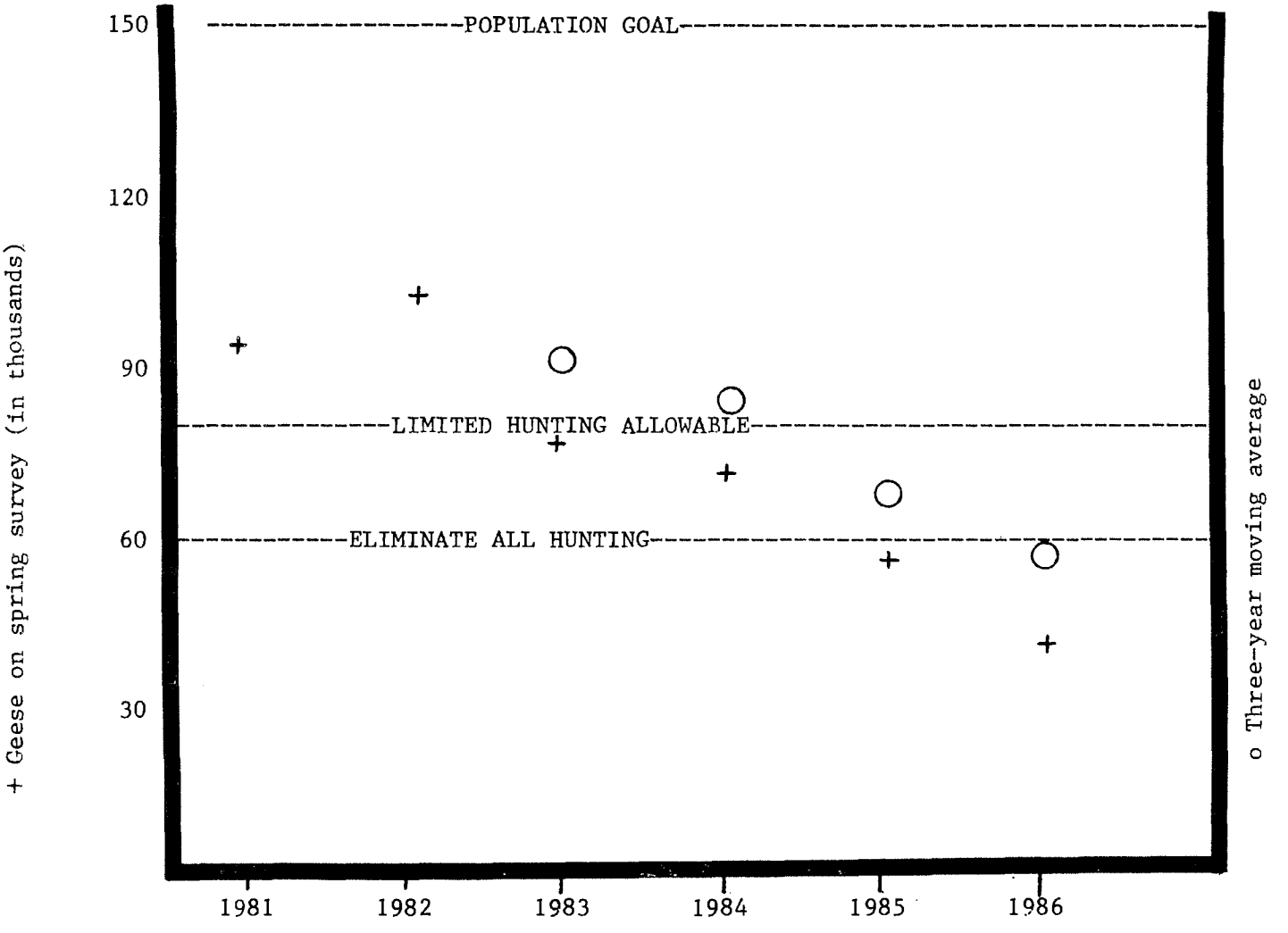


Figure 7. Emperor goose spring population size in relation to management thresholds

Table 36. Composition of the Emperor goose population based on fall surveys in southwestern Alaska

| | Number of Birds | | | | |
|---|---|---|---|---|---|
| | 1982 | 1983 | 1984 | 1985 | 1986 |
| Fall Peak Count | 80,608 | 72,551 | 82,842 | 59,792 | 68,051 |
| Est. number of hatching - year birds (percent young X total) | 6,287 | 21,112 | 18,557 | 10,404 | 17,761 |
| Est. number of families (number HY ÷ Avg. family group size) | 2,239 | 6,598 | 6,628 | 3,716 | 8,881 |
| Est. maximum number of breeding adults with young (number of families X 2) | 4,658 | 13,196 | 13,256 | 7,432 | 17,762 |
| Est. total number of sub-adults non and/or failed breeding adults | 69,663 | 38,243 | 51,029 | 41,956 | 32,528 |
| | (86.4%) | (52.7%) | (61.6%) | (70.2%) | (47.8%) |

Emperor goose productivity counts in 1986 were performed by the Izembek staff and personnel with the Research and Wildlife Assistance divisions in the Regional Office and the Alaska Peninsula/Becharof NWR staff. Observations were made from 7 September to 4 December. Emperor goose productivity as determined from Izembek counts was based on a 2 October aerial photographic survey and by conventional ground counts at other times using spotting scopes. Nineteen flocks totalling an estimated 5,290 emperor geese were photographed in areas from Nelson Lagoon to Bechevin Bay by the Izembek staff. Sampling within these flocks totaled 1,246 geese with a weighted overall mean of 28.3% juveniles present. Ground productivity counts through early November resulted in 4,664 individual emperor geese classified to age with 1,381 (29.6%) of these juveniles. Production of young was well above last year's rate of 17.4% and slightly above the long-term average of 28.7% based on these data (Table 37).

Izembek information was combined with similar counts made at other bays and estuaries along the northside of the Alaska Peninsula from 30 September to 15 October. The proportion of young in the population based on all sampling in 1986 was 26.1%. Emperor geese have experienced below average production in eight of the past nine years.

The estimate of percent young from specific locations and times (Table 38) varied again this year. This corroborates 1985 data that indicated production estimates from aerial photographs taken from one area and time may not be representative. Comparison of the proportion of young present in each area during the first week of the survey (Table 39) suggests there may be a difference in the age composition of emperor geese using each lagoon. These results may indicate that discrete sub-populations use specific lagoons for extended periods during fall migration.

Family group sizes of emperor geese observed in the Izembek area averaged 2.6 young per family (n=266 families) over the period 7 September to 27 October. Average Class I and Class II sizes for emperor geese at one study site on the Yukon-Kuskokwim Delta were 4.23 and 3.74, respectively (Margaret Petersen, Research, Anchorage). These data suggest an attrition rate of 38.5% for young emperor geese from hatch into the fall migration period. This rate of mortality, as evidenced by size of family groups, is 10% in excess of the average for the historical period for which data are available (Table 40).

Neck collaring of emperor geese at research study sites on the Yukon-Kuskokwim Delta continued in 1986. A collared bird was observed in the Grant Point area on 5 October, however the code was not read. On 8 October and again on 1 December, an adult (6J) was seen in the same area. On 6 October, an attempt was made to night light emperor geese from a flock of approximately 200 birds on Nurse Lagoon, east of Cold Bay. This attempt resulted in only two captures, but with further refining of equipment and techniques, promising results are expected.

ARM Blenden and RM Sarvis processing a juvenile emperor goose caught by night-lighting. (Dau)

Table 37. Emperor goose productivity counts, Izembek NWR, 1966-1986

| Year | Adults | Juveniles | Total | % Juveniles | No. of Families | Family Group Size |
|---|---|---|---|---|---|---|
| 1966 | 699 | 265 | 964 | 27.5 | 132 | 2.5 |
| 1967 | 1,457 | 585 | 2,042 | 28.7 | 66 | 3.3 |
| 1968 | 1,195 | 585 | 1,780 | 32.9 | 40 | 2.8 |
| 1969 | 4,149 | 2,980 | 7,129 | 41.8 | 161 | 3.3 |
| 1970 | 9,722 | 4,933 | 14,655 | 33.7 | 383 | 2.9 |
| 1971 | 8,142 | 3,458 | 11,600 | 29.8 | 480 | 2.7 |
| 1972 | 4,680 | 2,270 | 6,950 | 32.7 | 210 | 3.1 |
| 1973 | - | - | - | - | - | - |
| 1974 | 2,025 | 377 | 2,402 | 15.7 | 50 | 2.6 |
| 1975 | 744 | 405 | 1,149 | 35.2 | 51 | 2.9 |
| 1976 | 1,023 | 324 | 2,247 | 14.4 | 207 | 2.7 |
| 1977 | 996 | 683 | 1,679 | 40.7 | 108 | 2.8 |
| 1978 | 1,395 | 495 | 1,890 | 26.2 | 62 | 3.0 |
| 1979 | 841 | 113 | 954 | 11.8 | 53 | 3.3 |
| 1980 | 1,777 | 586 | 2,363 | 24.8 | 40 | 2.3 |
| 1981 | 1,067 | 495 | 1,562 | 31.7 | 181 | 3.2 |
| 1982 | 1,653 | 140 | 1,793 | 7.8 | 32 | 2.7 |
| 1983 | 1,058 | 393 | 1,451 | 27.1 | 192 | 3.2 |
| 1984 | 2,753 | 795 | 3,548 | 22.4 | 79 | 2.8 |
| 1985 | 2,245 | 503 | 2,748 | 18.3 | 125 | 2.8 |
| 1986 | 3,283 | 1,381 | 4,664 | 29.6 | 266 | 2.6 |
| $\frac{20\ Yr.}{X}$ | 2,857 | 1,135 | 4,004 | 26.6 | 146 | 2.9 |

Table 38. Percent Young observed in photographic samples of emperor geese from six locations on the northside of the Alaska Peninsula in fall 1986.

| | Location | | | | | |
|---|---|---|---|---|---|---|
| Date | Eggegik | Ugashik | Cinder River | Port Heiden Seal Islands | Nelson Lagoon | Izembek Lagoon |
| 9/30-10/5 | 17.1(357)[1] | 14.8(128) | 28.6(1575) | 17.5(957) | 33.6(1295) | 30.7(953) |

[1]Number of emperors classified from photographs at each location are in parentheses.

Table 39. Estimates of percent young of the year from aerial photographs taken on the Alaska Peninsula in fall of 1986.

| | Location | | | | | |
|---|---|---|---|---|---|---|
| Date | Eggegik | Ugashik | Cinder River | Port Heiden Seal Islands | Nelson Lagoon | Izembek Lagoon |
| 9/30 | | | 23.5(552)[1] | | | |
| 10/1 | 16.5(254) | 13.4(97) | 28.7(695) | 20.8(231) | 31.9(422) | 46.3(41) |
| 10/2 | | | | | 26.6(525) | 30.8(721) |
| 10/4 | | | | 16.5(726) | 45.9(348) | 27.0(181) |
| 10/5 | 18.5(103) | 19.3(31) | 34.4(328) | | | |
| 10/11 | 40.0 (5) | | | | | |
| 10/13 | | 36.1(130) | 21.1(109) | 14.7(530) | | |
| 10/15 | | | 28.9(235) | | | |

1. The number of emperors classified from photographs at each location are in parentheses.

Table 40. Juvenile mortality of emperor geese during summer and fall, 1969-1980[1]

| | $\bar{X}$ Clutch Size (n) | $\bar{X}$ Class I Brood Size (n) | $\bar{X}$ Class III/F Brood Size (n) | $\bar{X}$ Fall Family Group Size (n) |
|---|---|---|---|---|
| 1969-1980 | 5.0±0.3 (806) | 4.1±0.4 (517) | 3.5±0.6 (497) | 2.9±0.3 (1,805) |
| Estimated mortality from preceeding age classification | | 18% | 15% | 17% |
| Estimated mortality in relation to fall family group size | 42% | 29% | 17% | |

[1]Summer data from Yukon-Kuskokwim Delta study areas; fall data from Izembek NWR

Steller's Eider

Species of U.S. and Soviet importance, such as the Steller's eider, present managing agencies unique opportunities to further international cooperation. Banding studies of such species are not likely to produce the desired quality of data unless the respective scientific communities are kept well-informed. This has been the direction taken by the staff of Izembek NWR. The favorable result in recent years has been an increasing band reporting rate of our birds taken in the Soviet Union.

Fall captures of molting Steller's eiders were not performed in 1985 or 1986 due to higher priority of other biological programs. Through 1984, 6,980 Steller's eiders were captured at Izembek during fall banding operations. Of 146 direct and indirect recoveries received to date, 83 (56.9%) were from breeding locations in the Soviet Union and 58 (39.7%) are from near the Izembek Lagoon banding sites (Fig. 8).

The fall influx of molt migrants to Izembek Lagoon begins in mid-August and by 10 September most all birds appear to be flightless. This migration appeared to be delayed in 1986 based on the sighting of a minimum of 1,000 female plumaged birds (capable of flight) at Moffet Point on 8 July and the southward passage of numerous flocks containing several hundred birds each along the Yukon-Kuskokwim Delta coastline on about the same date (David Ward, Research, Anchorage).

October 20 and 29 aerial surveys over Izembek and adjacent lagoons resulted in Steller's eider counts of 29,001 and 12,560, respectively. The average count obtained from other fall efforts on Izembek Lagoon only is 36,720$\pm$22,794 birds (n=14) with a peak count of 79,931 in 1980. A comparison of our 1986 data with these historical counts suggests a decline or redistribution of the fall population. Another factor, however may be a delayed migration due to relatively mild conditions that persisted in September and October. Aerial surveys of the wintering population may clarify the question of current population status.

4. Marsh and water birds

Common loons and red-necked grebes nest regularly in the area, but in low numbers. Both species appear to use remote areas of the refuge, however, a pair of common loons did successfully fledge two young from Blinn Lake in 1986. These birds move directly to Cold Bay and saltwater during winter.

5. Shorebirds, Gulls, Terns and Allied Species

Rock sandpipers and semipalmated plovers, two of the most common shorebird species nesting on the refuge, were first noted in the area during the third week of May. This arrival is approximately two weeks later than normal. Hatching dates observed for each

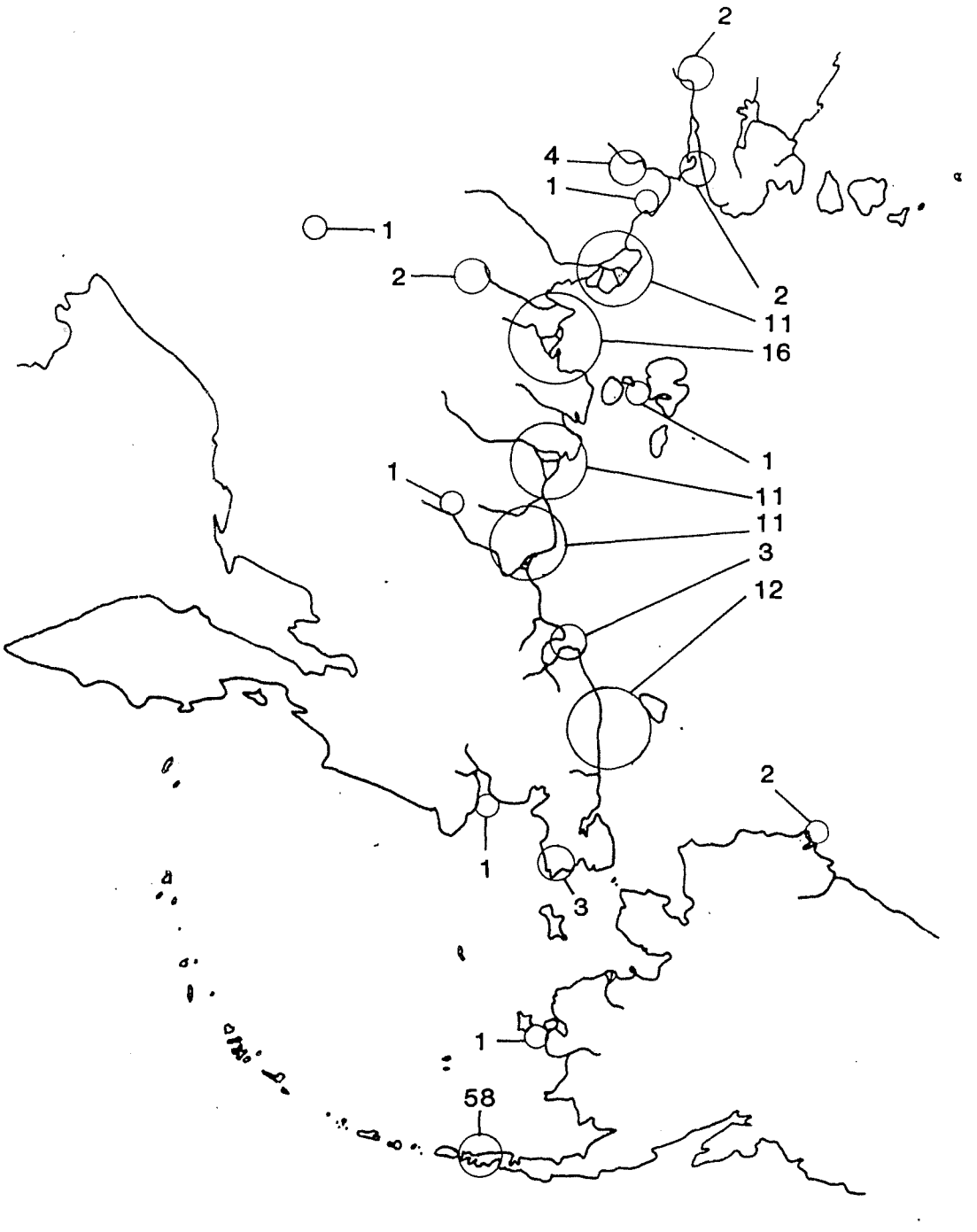


Figure 8. Direct and indirect recoveries of 143 Izembek-banded Steller's eiders in the Soviet Union and Alaska

species suggest that semipalmated plover chicks (at 28 June) were nearly three weeks late while rock sandpipers (from 18-29 June) were not more than one week delayed. Common snipe arrived up to two weeks later than normal with the first sighting on 21 May. Shorebird migration and subsequent nesting data suggest that climatic conditions, or other phenological parameters, important to these species delayed migration and nesting.

Gull migration in 1986 appeared normal with flocks of glaucous-winged gulls moving north continuously from 15 to 18 April. Mew gulls arrived on schedule and hatch dates in the first week of July suggest slight, if any, phenological delays.

Other noteworthy shorebird and gull observations include two whimbrils near Cold Bay on 22 June and the first golden plovers on 21 May. The first documented occurrence of a slaty-backed gull was reported in 1986 when an individual was seen in the company of glaucous-winged gulls near Cold Bay from 17 to 21 September.

Only one observation relating to numbers and species of dead sea birds that had washed ashore was obtained in 1986. On 11 August a four-mile portion of Bering Sea beach contained approximately 100 black-legged kittiwakes and fewer than 10 shearwaters of undetermined species. These densities seem high for kittiwakes and normal for shearwaters.

6. Raptors

A third kestrel sighting was obtained for the area when a single bird was observed near Cold Bay in mid-October. The last records of this species were single birds seen in January of 1966 and December of 1978.

From 27 January to 20 February, six carcasses of bald eagles were recovered by the refuge staff. Electrocution appeared to be the cause of death in five of the birds and the other specimen was forwarded to the National Wildlife Health Laboratory in Madison, Wisconsin, for analysis. The problem has been identified as approximately 30 power poles on the Pavlof Unit of Alaska Peninsula NWR. We hope to construct perches to help remedy the problem.

Rough-legged hawks occupied a previously used nest site on Mt. Simeon (Baldy Peak) in 1986. The nest with three eggs was located on 5 June. On 8 July, two young were in the nest, one being approximately one-third larger than the other. These two young were captured and banded at the nest site on 18 July.

Rough-legged hawks occupied a traditional nest site on Izembek NWR. Two surviving young were banded. (Blenden)

Rock sandpipers nest abundantly on Izembek NWR. (Blenden)

Oldsquaw are common residents in coastal areas adjacent to Izembek NWR.
(454) 20/21 Sarvis (3/1/87)

7. Other Migratory Birds

A chronology of routine and unusual sightings of 'other' migratory birds follows:

Tree Swallow - first sighting at Cold Bay was 10 April, Abnormally late fall sighting on 28 October on Operl Island, Izembek Lagoon

Water Pipit - clutch of six hatched on 29 June

Yellow Warbler - observed nest started and completed on 29 June and 2 July, respectively, first egg laid 3 July with complete clutch of four on 6 July

Rusty Blackbird - first sighting for the Izembek NWR on 16 October at Grant Point

Golden-crowned Sparrow - two nests with four and five eggs fledged on 5 and 13 July, respectively, another nest of five exhibited phenology as follows: nest construction complete 6 June; first egg laid 7 June; 5th egg and incubation began on 11 June; eggs hatch 23 June and young fledge 2 July

Lapland Longspur - first observation on 2 May; nest with five eggs found on 5 June

The Izembek NWR staff banded 55 individuals of five passerine species in 1986. Most birds were captured at a remote controlled bait station/trap located at the refuge office. Other captures were of nestlings in the field. Gray-crowned rosy finch (n=30), golden-crowned sparrows (n=14), snow buntings (n=11), tree swallows (n=4) and a single lapland longspur were the species handled (Table 41). The golden-crowned sparrows were banded by Paul Hedrick (Univ. Washington) during his preliminary investigations of nesting passerines in the Cold Bay area.

The refuge staff conducted the 21st annual Christmas bird count in the Cold Bay/Izembek area 2 January 1987. A total of 2,061 individuals and a record number of 36 species were observed (Table 42).

8. Game Mammals

Brown Bear

The Research/Management Study designed to evaluate the distribution, habitat use and population ecology of brown bears in the Right- and Left-Hand Valley area (Fig. 9) of the Izembek NWR entered its third field season in 1986. This study is designed to provide the refuge with baseline data on an area and brown bear

Table 41 Passerine Banding, Izembek NWR, 1986

| Species | Number Banded | | | | | | Number Recaptured | | |
|---|---|---|---|---|---|---|---|---|---|
| | AHY | | LOCAL | | | Total | AHY | | Total |
| | M | F | M | F | U | | M | F | |
| Tree Swallow | | | | | 4 | 4 | | | |
| Golden-crowned Sparrow | | | | | 14 | 14 | | | |
| Lapland Longspur | 1 | | | | | 1 | | | |
| Snow Bunting | 9 | 2 | | | | 11 | 2 | | 2 |
| Gray-crowned Rosyfinch | 8 | | | | | 8 | 1 | | 1 |

Table 42 Results of Christmas Bird Count, Cold Bay, Alaska, 2 January 1987

| Species[1] | 1986 | Average No. Seen[2] (No. Years Seen) | % Change From Avg. |
|---|---|---|---|
| Common Loon | 4 | 3.5 ( 6) | 14 |
| Red-necked Grebe | 3 | 2.3 ( 8) | 30 |
| Horned Grebe | 21 | 14.4 (10) | 46 |
| Pelagic Cormorant | 6 | 18.6 (19) | -68 |
| Black Brant | 24 | 1,484.4 (14) | -98 |
| Emperor Goose | 378 | 1,211.9 (21) | -69 |
| Mallard | 43 | 38.7 (13) | 11 |
| Pintail | 41 | 28.3 ( 7) | 45 |
| Gadwall | 2 | 3.5 ( 2) | -43 |
| Green-winged Teal | 8 | 6.7 ( 7) | 19 |
| Eurasian Green-winged Teal | 1 | 4.0 ( 4) | -75 |
| Greater Scaup | 1 | 30.2 ( 6) | -97 |
| Common Goldeneye | 38 | 118.5 (20) | -68 |
| Bufflehead | 2 | 9.2 (14) | -78 |
| Oldsquaw | 43 | 252.2 (21) | -83 |
| Harlequin Duck | 81 | 29.5 (20) | 175 |
| Steller's Eider | 898 | 1,163.1 (21) | -23 |
| Common Eider | 18 | 48.1 (17) | -63 |
| White-winged Scoter | 32 | 21.6 (12) | 48 |
| Black Scoter | 69 | 171.8 (18) | -60 |
| Common Merganser | 15 | 10.9 ( 9) | 38 |
| Red-breasted Merganser | 8 | 130.7 (19) | -94 |
| Bald Eagle | 30 | 11.3 (21) | 165 |
| Gyrfalcon | 1 | 1.5 (10) | -33 |
| Willow Ptarmigan | 3 | 7.3 (14) | -59 |
| Rock Ptarmigan | 1 | 2.0 ( 2) | -50 |
| Rock Sandpiper | 44 | 41.9 ( 7) | 5 |
| Sanderling | 1 | 39.6 ( 5) | -97 |
| Glaucous-winged Gull | 43 | 172.5 (21) | -75 |
| Pigeon Guillemot | 1 | 6.9 (12) | -86 |
| Black-billed Magpie | 6 | 2.5 (13) | 140 |
| Common Raven | 126 | 94.4 (21) | 33 |
| Dipper | 1 | 2.3 (12) | -57 |
| Gray-crowned Rosyfinch | 1 | 61.1 (21) | -98 |
| Common Redpoll | 1 | 14.7 ( 6) | -93 |
| Snow Bunting | 66 | 41.6 (21) | 59 |
| Total number of species = 36 | | | |
| Total number of individuals = 2,061 | | | |

Number of observers - 2 (J. Sarvis, C. Dau)
Observation Time - 8 hours (1 hr. on foot; 7 hrs. by car)
Distance Covered - 63 miles (2 on foot; 61 by car)

[1] A total of 58 species have been observed in 21 years

[2] Average 21 years of participation in the Christmas Bird Count

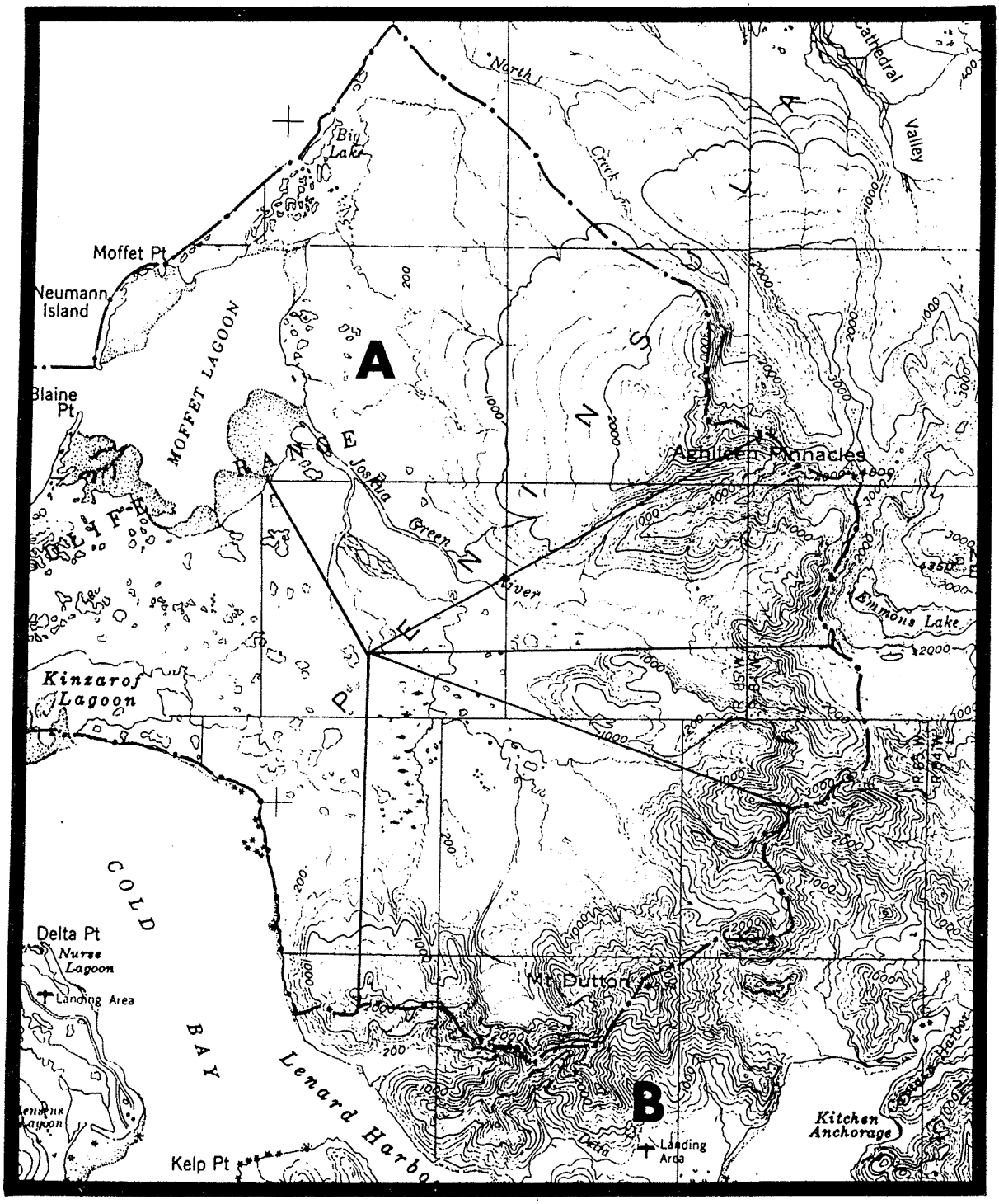


Figure 9. Brown bear study area in the Right- and Left-Hand Valley areas with radio quadrants. A: Izembek NWR (-·-·- boundary), B: Pavlof Unit, Alaska Peninsula NWR

Nurse Creek, which drains into Left-Hand River, is important brown bear habitat on Izembek NWR. (Blenden)

population which we believe is critical to the maintenance of historical distribution and abundance patterns of brown bears throughout the lower Alaska Peninsula. The primary management application of the study relates to identification and hopefully, protection of critical habitats. Data on immigration patterns of bears as related to hunting pressure and the effects of various other forms of disturbance, including fixed-wing aircraft and helicopters on the activity patterns and distribution of bears is also an important goal.

Data on distribution patterns and habitat use were obtained by making 14 flights in 1986 to locate radio-collared brown bears. Twenty-four bears captured and radio-collared in 1984 and 1985 were still available for monitoring in 1986. During the year nine of these bears were lost to the study, five due to probable transmitter failures (Table 43).

Active radio collars were present on 24 brown bears during the winter of 1985/86 and 11 of these were located in their dens. Fifteen animals were available for den site monitoring during the winter of 1986/87 and seven of their dens were located. Clear relatively calm weather is a necessary prerequisite for flights in mountainous denning areas as several physical characteristics of each site are estimated. Denning information obtained allowed us to characterize areas used by various components of the population (Table 44). Of seven bears collared in 1984, whose den sites were found in the winter of 1985/86, six (86%) returned to the same general denning area. Four of these bears' den sites were located during the winter of 1986/87, again in generally the same areas. Three bears captured in 1985 and monitored two successive winters also showed strong fidelity to denning sites (Table 45).

It is apparent from our study that analysis of denning fidelity or den site preferences of bears, when compared on the basis of sex, age or status, can be done only in a general way. Bears are highly individual as evidenced by the high degree of variability within groupings of 'similar' bears. Sows with cubs-of-the-year may den at lower elevations than do maternal females with older cubs, however, they appear to remain longer in areas of higher elevation. We hypothesize that this may be avoidance behavior toward other bears, primarily adult males, which descend to lower elevations soon after den emergence. Our data suggest that males den at lower average elevations than do females of various status and often in areas of low denning concentrations (Table 45). Both sexes and all categories of bears preferred denning areas with slopes greater than $45^{o}$ (i.e. 76% overall). Fifty percent of all dens were northerly facing sites and 44% were in areas of high denning concentrations. We believe our data show that characteristics of ruggedness or inaccessibility are the primary selective factors used by bears. Hence, suitable habitat draws more animals and hence supports higher densities.

Denning concentration or density in our analysis is a subjective index based on the number of other radio-collared bears denning

Table 43. Marked bears lost to the study in 1986

| Bear No. | Sex[1] | Age[1] | Radio Frequency | Date | | Cause of Loss/Remarks |
|---|---|---|---|---|---|---|
| | | | | Capture (status) | Lost to study (statua) | |
| IZ29 | F | 15 | 164.675 | 31 July 1984 ( w/3-2½) | Spring 1986 (Unknown) | Probable transmitter failure Radio locations in 1984 (n=6 and 1985 (n=8) |
| IZ37 | F | 7 | 164.615 | 4 August 1984 ( w/2 yrl) | 2 July 1986 (Unknown) | Probable transmitter failure observation/radio locations in 1984 (n=6), 1985 (n=7), 1986 (n=1). |
| IZ41 | M | 21 | 164.655 | 4 August 1984 | 21 May 1986 | Probable transmitter failure observations/radio locations in 1984 (n=3, 1985 (n=7), 1986 (n=1) |
| IZ55 | M | 1 | - | 18 August 1984 ( w/2-2½) | 20 December 1986 | Shot, DLP, Cold Bay |
| IZ63 | F | 8 | 164.560 | 19 August 1984 ( w/2-2½) | 6 August 1986 ( w/2 COY) | Transmitter failure, observa radio locations in 1984 (n=3 1985 (n=11) and 1986 (n=1). |
| IZ68 | M | 4 | 164.685 | 20 August 1984 | Spring 1986 | Probable transmitter failure radio locations in 1984 (n=4 and 1985 (n=11). |
| IZ71 | F | 4 | 164.520 | 14 November 1984 (single) | 27 July 1986 (single) | Shot, DLP, False Pass Observations/radio locations in 1984 (n=13), 1985 (n=10), 1986 (n=3). |
| IZ74 | M | 5 | - | 8 August 1985 | 22 May 1986 | Shot, hunter |
| IZ76 | F | 14 | 164.470 | 8 August 1985 (single) | 27 August 1986 (Unknown) | Dead, natural causes radio locations in 1985 (n=5) and 1986 (n=5). |

[1] at capture

Table 44. Den characteristics of brown bears summarized by sex and status, Izembek NWR, 1984-1986

| Bear Type | No. | Den Elevation | General Aspect[1] | | | | | | | Slope[2] | | | Denning Concentrations[3] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\bar{X}$ (range) | N | NE | SE | S | SW | W | NW | 1 | 2 | 3 | High | Med. | Low |
| Males | 8 | 538(152-976) | 2 | 2 | | | 2 | 1 | 1 | 3 | | 5 | 2 | 1 | 5 |
| Females | | | | | | | | | | | | | | | |
| Singles | 16 | 772(488-1006) | 3 | 1 | 1 | 2 | 2 | 2 | 5 | 1 | 3 | 12 | 8 | 3 | 5 |
| W/COY | 10 | 711(198-1067) | 1 | | 3 | 1 | 4 | | 2 | 2 | | 9 | 6 | 1 | 4 |
| W/YRL | 4 | 968(793-1037) | 1 | | 1 | | | 1 | 1 | | 1 | 3 | 1 | 1 | 2 |
| W/2½ | 3 | 966(884-1037) | | | 1 | | | | 2 | | | 3 | 2 | | 1 |
| TOTALS[4] | 42 | 755±250 (1SD) | 7 (17) | 3 (7) | 6 (15) | 3 (7) | 8 (20) | 4 (10) | 11 (24) | 6 (15) | 4 (10) | 32 (76) | 19 (44) | 6 (15) | 17 (41) |

[1]Categories are 45° spans centered on listed compass headings

[2]Categories are 1= $\angle 30^\circ$, 2= $30^\circ \angle 45^\circ$, 3 $\backslash 45^\circ$

[3]Categories are High= $\backslash 3$, Medium = $\backslash 1 \angle 2$, Low=0, other marked bears denning within a 1km radius of den site

[4]Percentage of sightings in parentheses

Table 45. Characteristics of brown bear dens located during 1984/85, 1985/86 and 1986/87, Izembek NWR

| Bear No. | Sex | Age | Status | Den Characteristics[1] | | | Denning Concentration[3] | | | Distance From Previous Den(km) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Elevation (meters) | Aspect (°TN) | Slope[2] | High | Medium | Low | |
| **Winter 1984/85** | | | | | | | | | | |
| IZ23[4] | F | 16 | W/3 COY | 701 | 225 | 3 | | | * | NA |
| IZ24 | F | 12 | W/3 COY | 915 | 225 | 3 | | * | | NA |
| IZ26 | F | 13 | W/2 YRL | 1037 | 360 | 3 | | | * | NA |
| IZ27 | F | 10 | W/3 YRL | 793 | 335 | 3 | * | | | NA |
| IZ28 | F | 10 | W/3-2½ | 884 | 315 | 3 | * | | | NA |
| IZ29 | F | 15 | W/1 COY | 1067 | 135 | 3 | * | | | NA |
| IZ33 | F | 13 | W/1 YRL | 1037 | 135 | 2 | | | * | NA |
| IZ37 | F | 7 | W/2 YRL | 1006 | 270 | 3 | | * | | NA |
| IZ38 | F | 19 | W/2 COY | 640 | 315 | 3 | * | | | NA |
| IZ39 | F | 13 | W/2 COY | 335 | 135 | 3 | | | * | NA |
| IZ40 | M | 11 | - | 152 | 045 | 1 | | | * | NA |
| IZ41 | M | 21 | - | 976 | 360 | 3 | | * | | NA |
| IZ46 | F | 6 | Single[5] | 976 | 270 | 3 | * | | | NA |
| IZ47 | F | 19 | Single | 1006 | 180 | 3 | | * | | NA |
| IZ48 | F | 13 | Single | 762 | 160 | 3 | * | | | NA |
| IZ49 | F | 14 | Single[5] | 549 | 315 | 3 | | | * | NA |
| IZ50 | M | 4 | - | 579 | 360 | 1 | | | * | NA |
| IZ51 | F | 6 | Single[5] | 854 | 360 | 1 | | | * | NA |
| IZ63 | F | 8 | W/2-2½ | 976 | 135 | 3 | * | | | NA |
| IZ66 | F | 18 | Single | 884 | 270 | 3 | * | | | NA |
| IZ67 | F | 4 | Single | 732 | 225 | 3 | * | | | NA |
| IZ68 | M | 4 | - | 793 | 270 | 3 | * | | | NA |
| IZ69 | M | 5 | - | 549 | 045 | 3 | | | * | NA |
| **Winter 1985/86** | | | | | | | | | | |
| IZ23 | F | 17 | Single | 610 | 225 | 3 | | | * | 0.48 |
| IZ27 | F | 11 | W/3-2½ | 1037 | 315 | 3 | * | | | 1.08 |
| IZ28 | F | 11 | Single | 884 | 315 | 2 | * | | | 0.84 |
| IZ38 | F | 20 | Single | 854 | 360 | 3 | * | | | 0.78 |
| IZ40 | M | 12 | - | 366 | 235 | 1 | | | * | 19.20 |
| IZ49 | F | 15 | Single | 640 | 180 | 3 | | | * | 1.68 |
| IZ67 | F | 5 | Single | 915 | 135 | 3 | | * | | 0.30 |
| IZ71 | F | 4 | Single | 732 | 315 | 2 | * | | | NA |
| IZ73 | F | 4 | Single | 763 | 180 | 3 | | * | | NA |
| IZ77 | M | 18 | - | 458 | 315 | 3 | * | | | NA |
| IZ78 | F | 6 | W/1 COY | 1037 | 225 | 3 | * | | | NA |
| IZ80 | F | 16 | Single | 519 | 045 | 2 | | | * | NA |
| **Winter 1986/87** | | | | | | | | | | |
| IZ24 | F | 15 | W/2 COY | 732 | 225 | 3 | * | | | 0.8 |
| IZ38 | F | 21 | W/2 COY | 854 | 315 | 3 | * | | | 1.3 |
| IZ49 | F | 17 | Single | 488 | 315 | 3 | * | | | 1.6 |
| IZ67 | F | 7 | Unknown | 915 | 135 | 3 | * | | | 0.0 |
| IZ73 | F | 5 | Unknown | 1159 | 180 | 3 | * | | | 0.8 |
| IZ77 | M | 19 | - | 427 | 225 | 3 | | * | | 3.6 |
| IZ80 | F | 17 | W/3 COY | 198 | 135 | 1 | | | * | 3.6 |

[1]Den characteristics are subjective estimates of the general location obtained during aerial tracking flights

[2]Slope evaluations 1=$\leq 30°$, 2=$> 30° \leq 45°$, 3=$> 45°$.

[3]Based on the number of marked bears denning within $\leq$ 1.6 km radius (High=$\geq$3, Medium=1-2, Low=0)

[4]Adopted 1 COY in fall 1984

[5]Produced cubs-of-the-year in 1985

within a 1km radius of each den site. We believe marked bear densites should provide a rough approximation of high, medium or low concentrations of unmarked bears as well. This aspect of the study has been extremely valuable in identifying several key, high density denning areas. This information will aid us in evaluation of various forms of development and public use that are occurring or may be proposed in these areas.

Low aerial overflights were made of denned collared bears in an attempt to determine alertness. Twenty-four bears found in dens the past three winters were fitted with collars with both active and inactive modes (i.e. different pulse rates)(Table 46). When the transmitter is stationary for one hour or more a slower (inactive) pulse rate is initiated. Very little movement on the part of the bear is necessary to switch the transmitter to the faster (active) pulse rate. Eleven bears varied between active and inactive mode on successive den checks and three encountered initially on inactive mode quickly switched to active mode when approached by the aircraft. These data suggest that at least some bears may respond to aircraft disturbance while denned and that these and others appear to normally undergo periods of activity in the den. Of the five bears alerted by the aircraft, one was a large boar, and the remaining four were non-maternal sows.

We have not identified any adverse effects of intra-den alertness in response to aircraft overflights or if such responses differ from normal activity rhythms of individual bears.

After the bears' emergence from their dens in April and May of 1986, we attempted to determine the status of all 15 radio-collared sows. This was done to determine if single sows had produced young during the winter and to determine survival of older cubs. Three sows captured as singles in the fall of 1984 produced cubs during the winter of 1984/85. Along with an appraisal of productivity we obtained an assessment of fall to spring survival from post-denning tracking flights (Table 47). Ideally pre- and post-denning flights would provide visual evaluations of each family group and hence an evaluation of over-winter mortality only. However, we were forced to use 'last sightings' in fall and 'first sightings' in spring so observed mortality could not be precisely timed in each case. Sample sizes for COY(n=4) and yearling (n=4) families were small, but suggested that COY are much more vulnerable than are yearlings. We then compared spring through fall survival of cubs (Table 48). Sample sizes were again small but seemed to indicate good survival of COY (n=7) and an unknown rate for a small sample of 2 1/2-year-old cubs (n=2) from spring through fall.

Radio tracking flights continued through the spring (n=5), summer (n=5), and fall (n=3) periods of 1986. Locations of radioed bears were marked on mylar overlays of 1:120,000 black and white aerial photographs of the study area. When time or weather conditions precluded determining exact locations, general locations were estimated by making omnidirectional aerial scans from a point in

The geography of the Frosty Peak area, as viewed from Middle Lagoon, suggests its volcanic origin. (455) 20 (Sarvis) 3/3/87

ARM Blenden exploring one of the drainages of Frosty Peak.
(P. Blenden)

Table 46 Index of alertness during denning for bears with bi-modal radio collars

| Bear No. | Sex | Age | Status | Number of Times Monitored in Den | Transmitter Mode | | |
|---|---|---|---|---|---|---|---|
| | | | | | Active | Inactive | Audibly Switched Inactive to Act |
| IZ40 | M | 11 | - | 2 | | | 2 |
| IZ41 | M | 21 | - | 2 | 2 | | |
| IZ68 | M | 4 | - | 2 | 2 | | |
| IZ69 | M | 5 | - | 3 | 2 | 1 | |
| IZ23[1] | F | 17 | Single | 2 | | 2 | |
| IZ28[1] | F | 11 | Single | 2 | | 1 | 1 |
| IZ29 | F | 15 | Single | 2 | 1 | 1 | |
| IZ38[3] | F | 20 | Single | 2 | | 2 | |
| IZ48 | F | 13 | Single | 2 | 2 | | |
| IZ66 | F | 18 | Single | 3 | 2 | | 1 |
| IZ67[3] | F | 4 | Single | 5 | 3 | 1 | 1 |
| IZ71 | F | 4 | Single | 2 | 2 | | |
| IZ78 | F | 6 | Single | 2 | | 1 | 1 |
| IZ23[1] | F | 16 | W/COY | 1 | | 1 | |
| IZ24[2] | F | 12 | W/COY | 3 | 1 | 2 | |
| IZ38[1] | F | 19 | W/COY | 2 | 1 | 1 | |
| IZ38[3] | F | 21 | W/COY | 1 | 1 | | |
| IZ39 | F | 13 | W/COY | 3 | 1 | 2 | |
| IZ26 | F | 13 | W/YRL | 1 | | 1 | |
| IZ27[1] | F | 10 | W/YRL | 1 | | 1 | |
| IZ37 | F | 7 | W/YRL | 2 | 1 | 1 | |
| IZ27[1] | F | 11 | W/2½ | 2 | 1 | 1 | |
| IZ28[1] | F | 10 | W/2½ | 2 | 1 | 1 | |
| IZ63 | F | 8 | W/2½ | 2 | 1 | 1 | |

[1]Monitored 1984/85 and 1985/86 [2]Monitored 1984/85, and 1986/87

[3]Monitored 1984/85, 1985/86 and 1986/87

Table 47. Brown bear cub survival, fall 1985 through spring 1986, Izembek NWR

| Family | Age | Fall | Spring | |
|---|---|---|---|---|
| | | No. of Cubs | No. of Cubs | % Cub Survival |
| COY | | | | |
| IZ29 | 16 | 1 | Unknown | - |
| IZ46 | 7 | 2 | Unknown | - |
| IZ78 | 6 | 1 | 1 | 100 |
| YEARLING | | | | |
| IZ39 | 15 | 2 | 2 | 100 |

Table 48. Brown bear cub survival spring through fall 1986, Izembek NWR

| Family Type | Age | Spring | Fall | |
|---|---|---|---|---|
| | | No. of Cubs | No. of Cubs | % Cub Survival |
| COY | | | | |
| IZ23 | 18 | 2 | 2 | 100 |
| IZ24 | 14 | 3 | 2 | 67 |
| IZ38 | 2 | 2 | 2 | 100 |
| IZ63 | 9 | 2 | Unknown[1] | - |
| IZ80 | 17 | 3 | Unknown | - |
| 2½ YR OLD | | | | |
| IZ39 | 15 | 2 | Unknown | - |

[1] Radio failure

the western portion of the study area (Figure 9). Quadrants based on geographic features observable from this scanning point were used to locate general use areas of collared bears. Such observations are of limited value in that only sizeable movements between quadrants could be detected.

Home range polygons were prepared for each radio-collared male bear to portray overall distribution patterns (Figure 10). Exact radio locations are presented for other bears in Figure 11a-e. Data allowing more specific analysis of distributional patterns as related to season, habitat type and food availability were collected and will be analyzed in a final report on the study. Categories used to classify habitat use by brown bears followed a format used in similar studies on the Kodiak NWR. Habitats on the Izembek NWR are not as diverse as those encountered at Kodiak, hence only selected categories were applicable (Table 49). Each observation of a radio-collared bear was coded to habitat type to determine seasonal use patterns. These data were combined by population cohorts in Table 50 to show preliminary patterns. Considerable individual variation and small sample sizes within cohorts suggest that animals particularly in this study, are best dealt with separately to most accurately portray variability in habitat use.

Numerous radio locations obtained during aerial tracking flights do not correspond to actual visual sightings of the bear. Obviously this was the case during the denning period, but it also occurred often when animals were occupying 'day-beds' within the alder (Alnus crispa) zone. Activity patterns of most bears are primarily nocturnal and crepuscular. This fact presents an obvious problem in projects such as ours which rely on data collected primarily from diurnal aerial surveys. Fortunately, the determination of seasonal patterns of habitat use, which is a primary goal of our study, can be determined from such surveys. Daily activity rhythms are nevertheless of considerable importance to us as an index of visibility which can help qualify our annual survey efforts. This topic is also predominant in conversations with campers, photographers and most notably bear hunters and guides.

Two study bears were illegally shot out of season in 1986. One of these was a 6-year-old single female captured in 1984 which for three years used the trash dumps in Cold Bay and False Pass. This animal was not reported to be a nuisance at either location, however, deterrents (i.e. M80s and 12-gauge cracker shells) were used to reinforce her avoidance behavior. This bear was found shot approximately one mile north of False Pass. The other bear was a 3 1/2-year-old male shot in defense of life and property in Cold Bay on 20 December. Refuge personnel were not alerted to the presence of a nuisance so preventative measures were not employed. In this and other DLP situations documented by the refuge staff, attractants were improperly left accessible to bears.

IZ70, a non-maternal female brown bear, died of natural causes and was devoured. Her neck collar was retrieved for later use. (Blenden)

THIS LEGEND APPLIES TO THE FOLLOWING FIGURES:

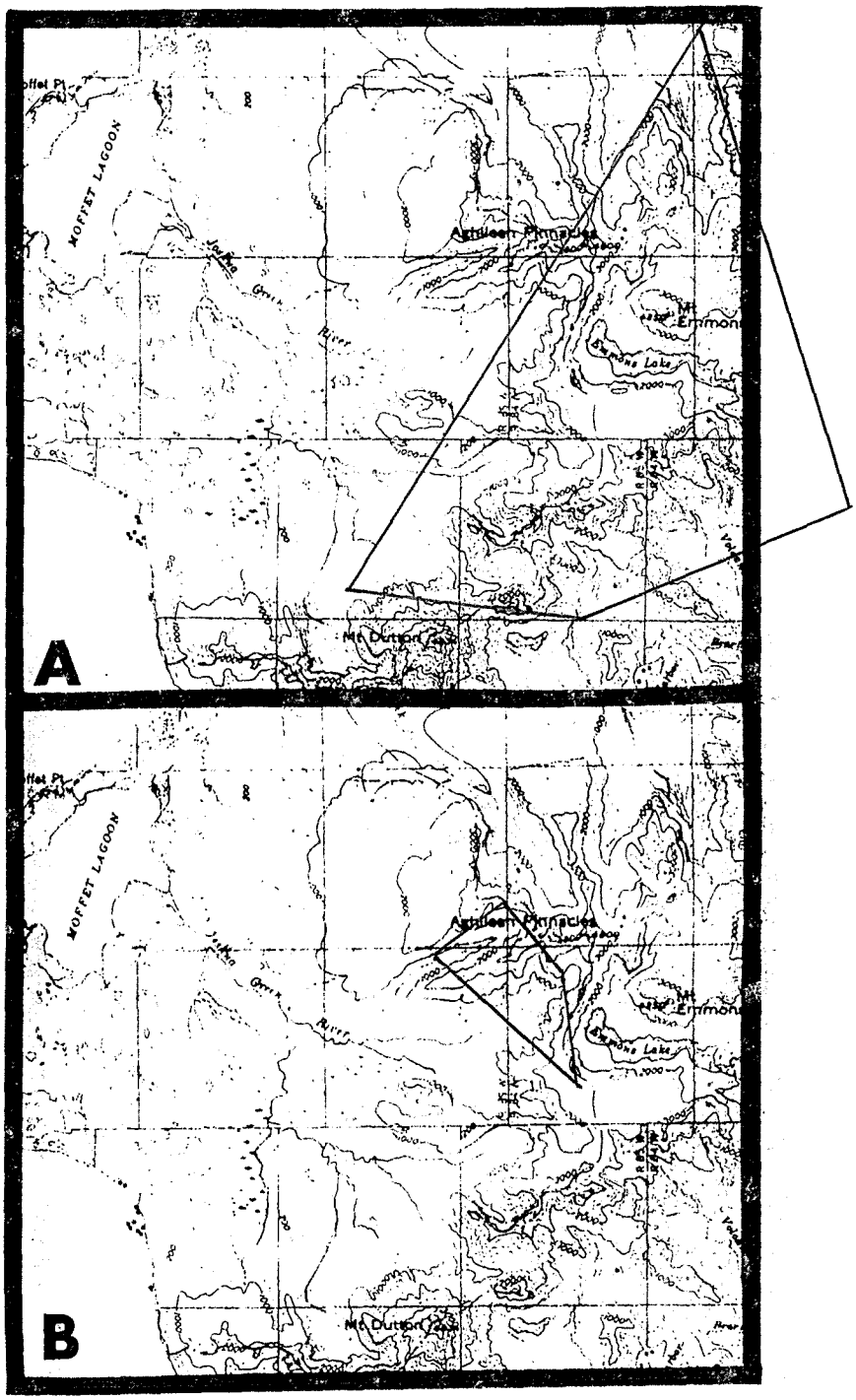


Figure 10. Home range polygons of male brown bears, 1986

A: IZ40 B:IZ77

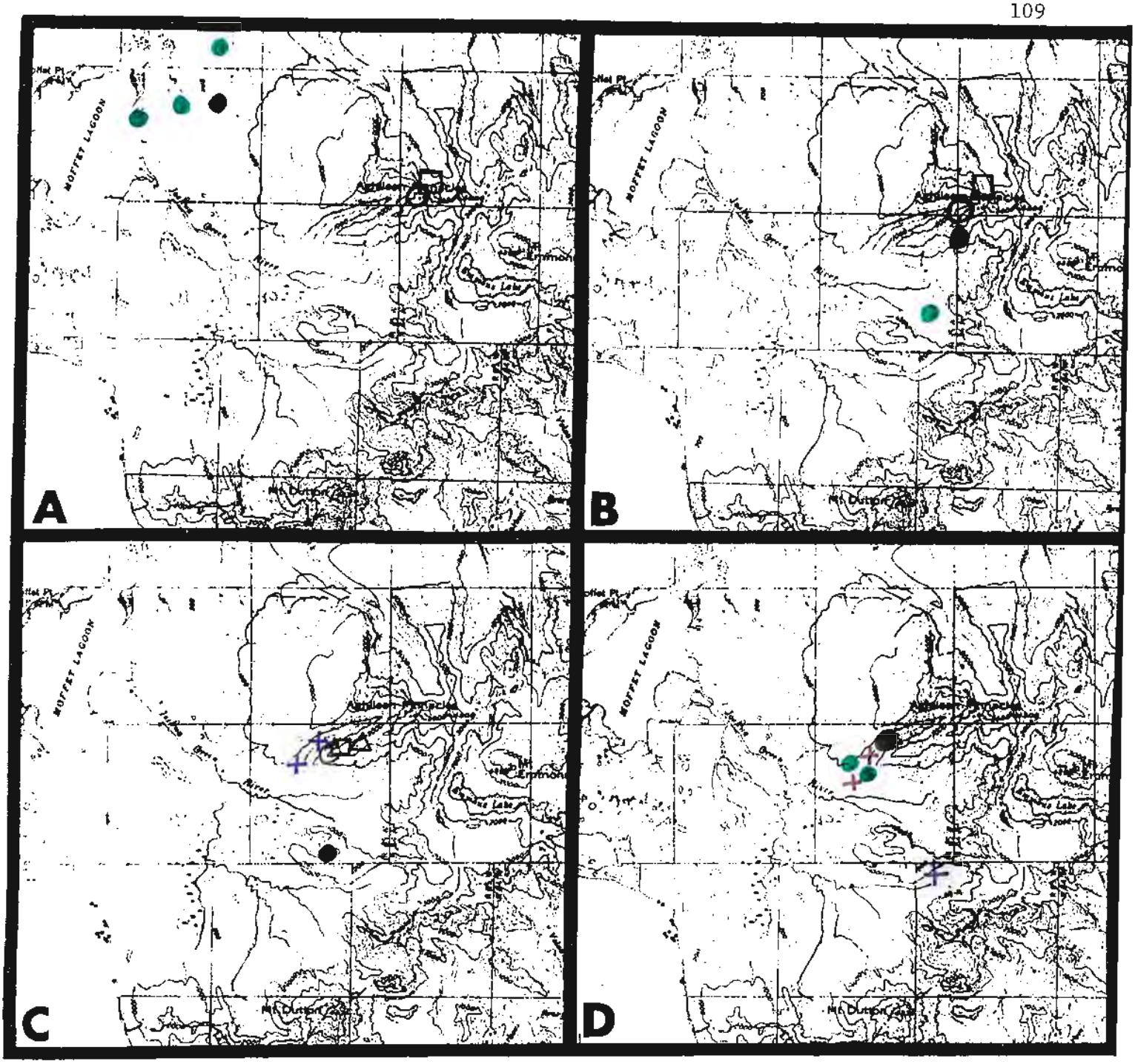


Figure 11a Radio locations of non-maternal female brown bears, 1986

A: IZ27; B:IZ28; C:IZ49; D: IZ76

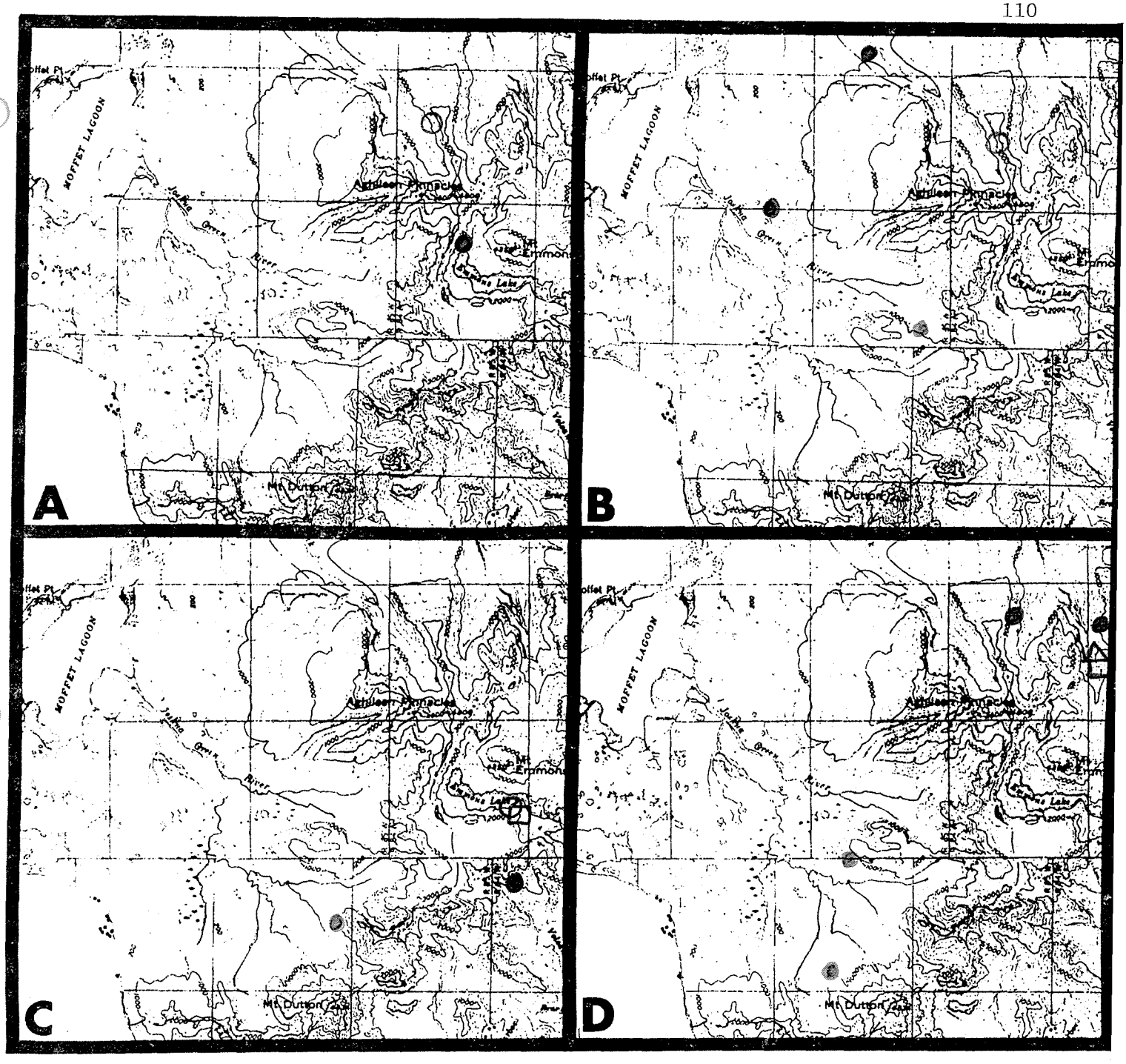


Figure 11b. Radio locations of adult female bears of unknown status, 1986
A: IZ37; B: IZ46; C: IZ51; D: IZ67

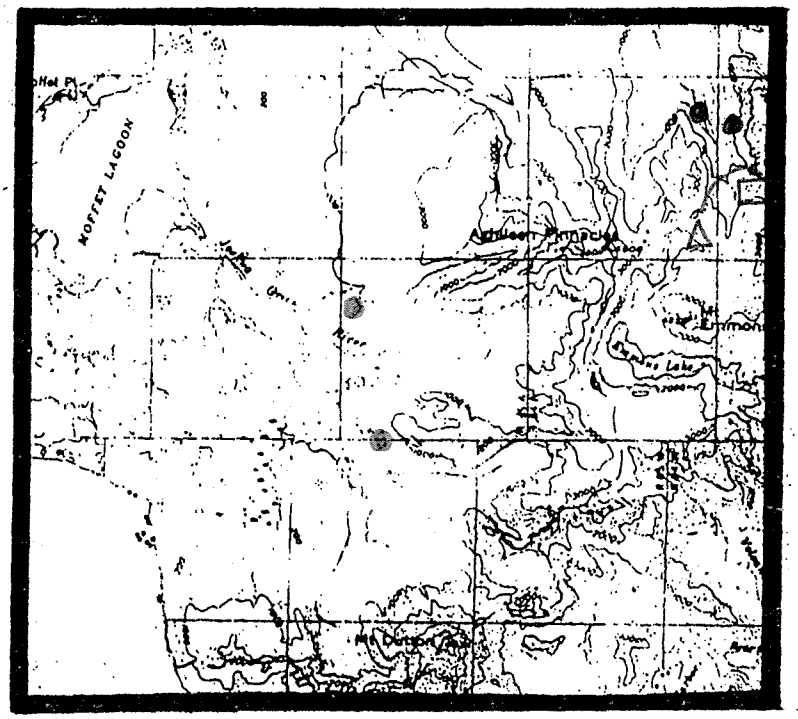


Figure11b(cont'd) IZ73

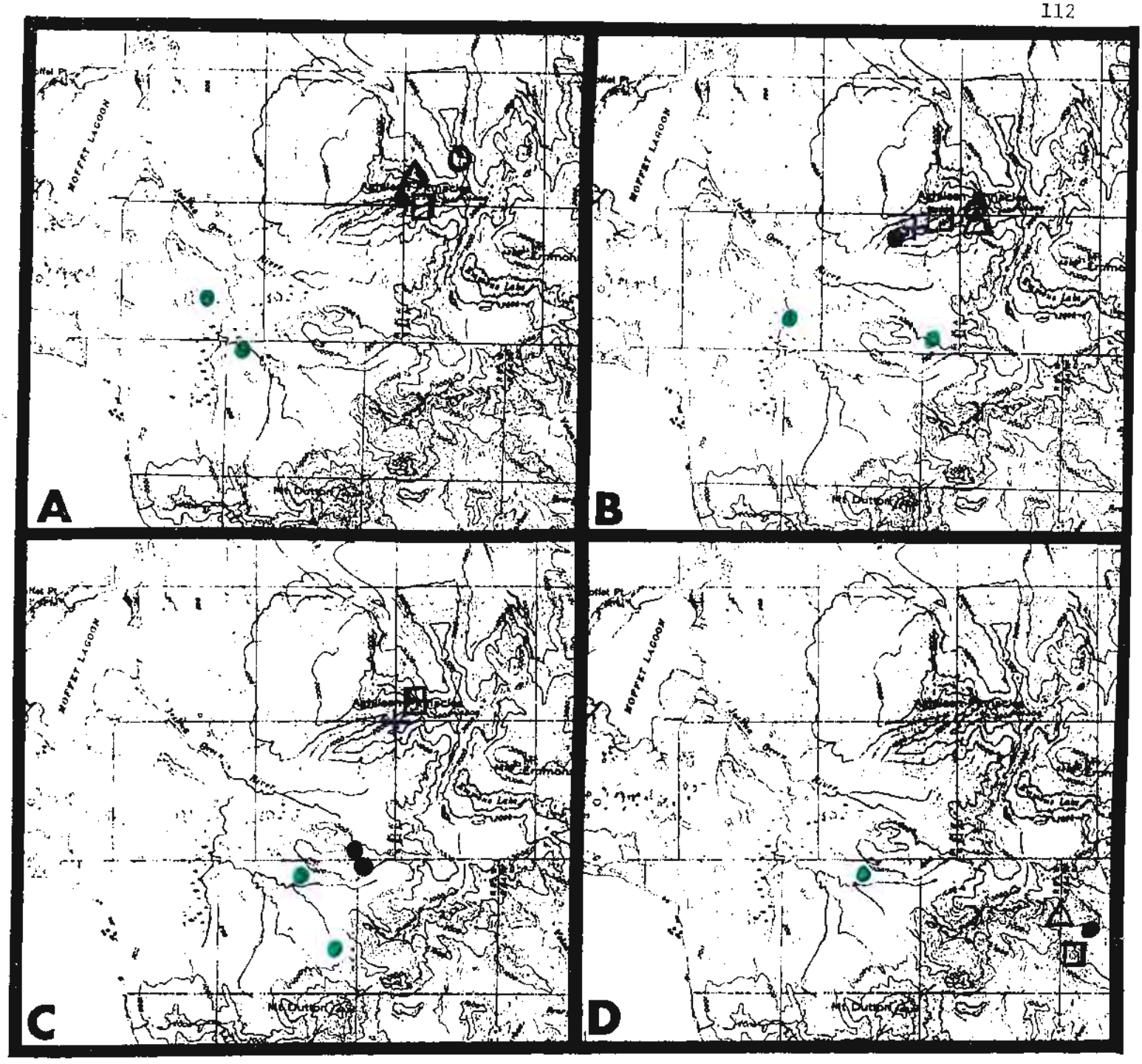


Figure 11c Radio locations of female brown bears with cubs-of-the-year, 1986
A: IZ24; B: IZ38; C: IZ78; D: IZ80

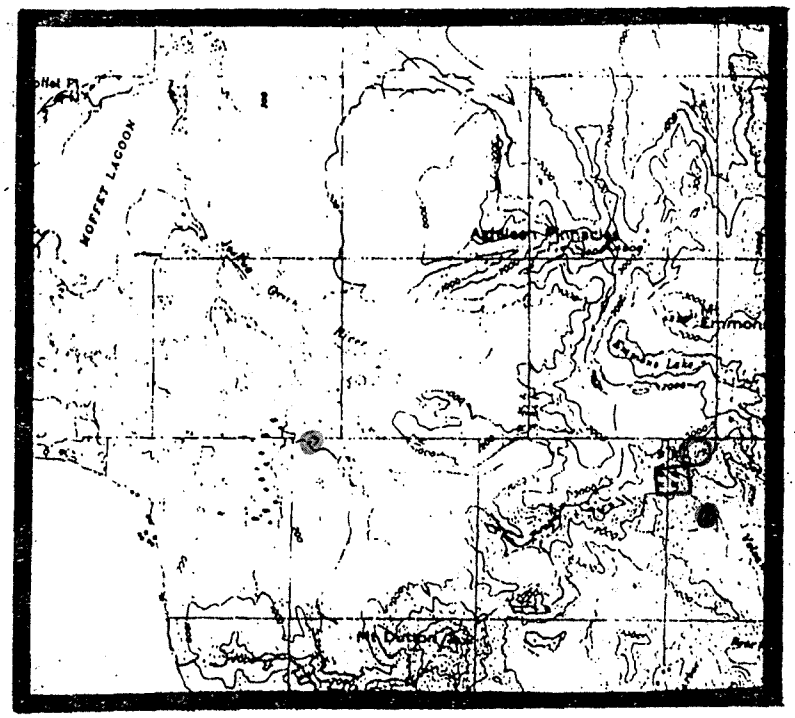


Figure 11d Radio locations of female brown bears with yearlings, 1986
IZ23

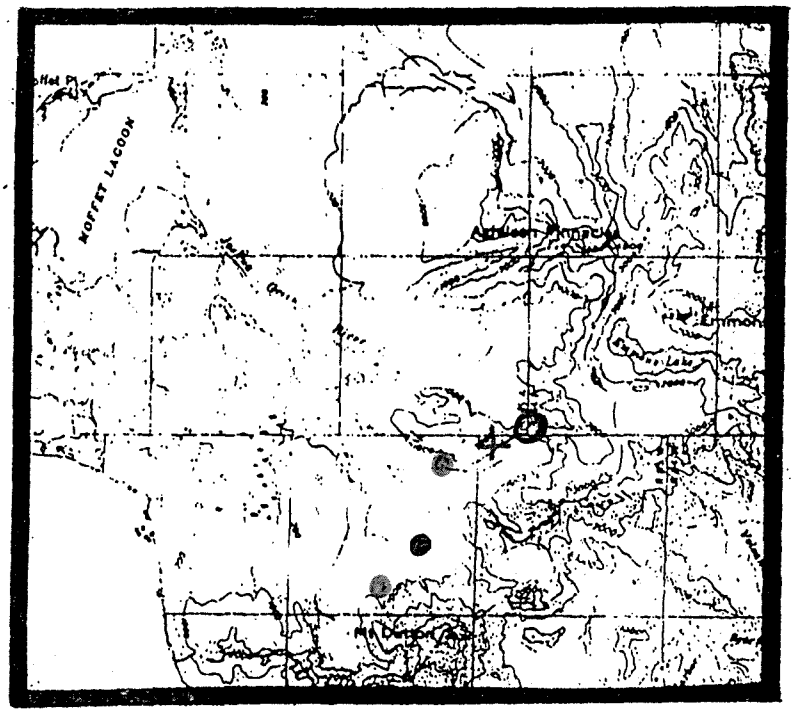


Figure 11e Radio locations of female brown bears with 2-1/2-year-old cubs, 1986 - IZ39

TABLE 49 Habitat categories used to classify habitat use by brown bear, Izembek NWR.[1]

| Code | Habitat Type |
|---|---|
| Lowland | (Sea level to base of foothills) |
| 130 | Tall Shrub ($\geq$1.5 m), closed ($\geq$50% crown cover) |
| 140 | Tall Shrub ($\geq$1.5 m), open (25-75% crown cover) |
| 150 | Low Shrub ($<$1.5 m) - Herbaceous ($\geq$25% shrub cover) |
| 160 | Ericaceous Shrub - Herbaceous (hummocks) |
| 180 | Wet Herbaceous Meadow (marsh, $<$25% shrub cover) |
| 190 | Herbaceous Aquatic Marine (Intertidal areas) |
| Midland | (Base of foothills to upper limit of alder (Alnus crispa) zone) |
| 220 | Barren ($\leq$25% bedrock, scree, bare soil) |
| 230 | Tall Shrub ($\geq$1.5 m), closed ($\geq$75% corwn cover) |
| 250 | Low Shrub ($<$1.5 m) - Herbaceous ($\geq$25% shrub cover) |
| 260 | Ericaceous Shrub - Herbaceous (hummocks) |
| 280 | Wet Herbaceous Meadow (marsh, $<$25% shrub cover) |
| Upland | (Above upper limit of alder zone) |
| 320 | Barren ($\geq$25% bedrock, scree, bare soil) |
| 360 | Ericaceous Shrub - Herbaceous (hummocks) |

[1]Habitat types and codes follow a portion of those used in brown bear studies on the Kodiak NWR (See Barnes, V.G. Jr.(1985) PROGRESS REPORT, Brown Bear Studies - 1984, Research Division, USFWS, unpublished report 38p.)

Table 50. Temporal distribution of brown bear sightings by habitat type, Izembek NWR, 1984-1986[1]

| Bear Type (n) | April-June | | | | | | July-September | | | | | | | | | | | October-November | | | | | | December-March[2] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [3]130 | 140 | 180 | 220 | 230 | 320 | 130 | 140 | 150 | 160 | 180 | 190 | 230 | 250 | 260 | 320 | 350 | 130 | 140 | 180 | 220 | 230 | 320 | 130 | 140 | 220 | 230 | 320 |
| Males (6) | 1 | 1 | | 1 | 1 | | 7 | 3 | 1 | | 7 | | 3 | 1 | | | | 1 | | | 1 | | | 1 | 1 | 2 (1) | | 7 (5) |
| Females Single (19) | | 3 | 1 | | | 3 | 7 | 8 | 3 | 2 | 20 | | 9 | 1 | | 4 | 1 | 1 | 1 | | 1 | | | | | | | 19 (15) |
| Females W/COY (11) | | | | | | 4 | 5 | 2 | 2 | 1 | 24 | 2 | 3 | | 1 | 3 | | | | 1 | | | | | | | 1 (1) | 7 (7) |
| Females w/YRL (7) | | 1 | | | | | 1 | 2 | | 7 | 12 | 7 | 6 | | | 3 | | | | 1 | | | 1 | | | | | 6 (4) |
| Females 2-2½-yr.olds (7) | | | | | 3 | 2 | 1 | 2 | 3 | 3 | 11 | 3 | 7 | 1 | | | | | | | | 1 | | | | | | 3 (3) |
| All Bears[1] | 1 | 5 | 1 | 1 | 4 | 9 | 21 (11%) | 17 (9%) | 9 (5%) | 13 (7%) | 74 (39%) | 12 (6%) | 28 (15%) | 3 (2%) | 1 (1%) | 10 (5%) | 1 (1%) | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 42 (89%) |

[1]Some females appeared in different categories due to loss or production of cubs and the changing ages of cubs (i.e. 1984 vs 1985). Total marked individuals was 36 during the period.

[2]Number of dens in Parentheses

[3]See Table for explanation of Habitat Type Codes.

The subject of bear-people conflicts and the biology and management of bears in the Cold Bay area is the subject of a paper prepared for a presentation at an April 1987 symposium. This paper summarizes a history of management strategies ranging from annual hunting seasons with no quota to complete closure of the area. The biology of captured bears, some of which were radio-collared, is also evaluated. The information suggests that harvest has exceeded the reproductive capabilities of bears using the local area. An abstract of this paper follows:

Abstract: The lower Alaska Peninsula supports high brown bear and low human populations. Bears are fewer in number near Cold Bay than in adjacent remote areas. Research involving the capture and marking of 25 brown bears from the Cold Bay area began in 1976. Results indicate that local and transient bears avoid human activity. Also, local bears are more often drawn to garbage or other attractants. In the study, tactile and auditory deterrents and transplanting were used on potential problem bears. Maternal females, their attendant cubs and weaned offspring most commonly used the area. These animals suffered higher mortality than did other population components. Since 1976, 23 (82%) of 28 bears killed near Cold Bay were either matured females (N = 3) or 2- to 3-year-old cubs. Overharvest of maternal females and cubs has depressed local recruitment. Past management plans addressing public use and public safety combined with available biological data will allow for consistent management of Cold Bay brown bears.

Unimak Island - Brown Bear

The process by which brown bear permits for Unimak Island are issued to hunters changed for the fall 1985 season and continued into the spring 1986 season. This hunt changed from a drawing, where applications are made to the ADF&G through the mail to a registration hunt where applicants must appear on a first-come-first served basis at the Izembek NWR office to obtain permits. This change was brought about due to legal actions being considered by the Alaska Board of Game on the general topic of game allocation on the basis of local residence (i.e. "subsistence").

Procedures for hunts across the state were affected, often against the views of the ADF&G and the USFWS. In this process, the brown bear found itself a "subsistence" animal even though there is scanty evidence at best that the meat or hides were historically important to coastal Indians or Aleuts. The meat has not been used by anyone in recent times. Two registration permits were issued, first-come-first-served, for the spring 1986 hunt and 100% hunter success was documented.

We and the Alaska Department of Fish and Game successfully urged the Board of Game to re-adopt the drawing permit process for brown bear hunting on Unimak Island beginning in the fall of 1986. For

this type hunt (trophy/sport) everyone should have an equal chance of obtaining a permit. Return to a drawing hunt eliminated the financial burden placed on local hunters, primarily those who live on Unimak Island, who were required to appear in Cold Bay to qualify for a permit. Also, this reduced administrative requirements for both the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service. Eight drawing permits were issued for this fall 1986 hunt and five participating hunters successfully took three bears (Table 51).

Caribou

The lower Alaska Peninsula caribou herd ranges from Port Moller southwest to the tip of the Alaska Peninsula, occurring seasonally on Izembek NWR (Figure 12). Although intermingling may occur between this herd and one northeast of Port Moller, rugged terrain between Port Moller and the Pacific Ocean is thought to effectively impede interchange between the herds, at least enough to warrant their separate management.

The primary calving ground for the lower Peninsula herd is on the state owned Black Hill area, 40 miles northeast of Cold Bay. Arrival on the calving ground occurs in mid-May. After calving in early June, a large portion of the herd moves toward areas southwest of the Cathedral River during the latter part of July. They typically arrive in the Cold Bay area with the first snows of the year in mid to late October and use the area from two to four months before returning to lowlands adjoining the Black Hill area.

It is here, around Cold Bay that what is thought to be a large portion of the sport/subsistence harvest occurs. During the last several years the popularity of caribou hunting has increased substantially, especially among military and airline employees with travel benefits who can economically travel from Anchorage to Cold Bay for a caribou hunt. Good accessibility afforded by refuge roads and the liberal bag limit of four for resident hunters appeal to many.

Population surveys of this caribou herd have been sporadically conducted since 1949. Refuge staff initiated systematic survey attempts in 1978. Management of the herd has been shared by the Alaska Department of Fish and Game and Izembek NWR. State hunting regulations have been set with consideration given to data and recommendations provided by Izembek NWR staff.

Since 1978, efforts have been directed toward obtaining herd composition and total population estimates. Counts conducted in mid-June through early July primarily provide an estimate of the year's calf crop and in some years an idea of the total population size. Herds are spotted from the air, and after landing near accessible groups, observers hike to suitable observation points to count and classify the animals. Fall composition data have been obtained by ground observation of groups as they cross the Cold Bay road system. Total population estimates have only been

Table 51 Brown Bear Hunter Numbers and Success Unimak Island, 1975-1986

| | Permits Issued | Hunters Active | # Bears Known Taken |
|---|---|---|---|
| CY 1975 | 20 | 9 | 6 |
| CY 1976 | 18 | 10[1] | 4 |
| CY 1977 | 15 | 10[1] | 7 |
| CY 1978 | 15 | 3[1] | 1 |
| CY 1979 | 15 | 8[2] | 7 |
| CY 1980 | 15 | 6 | 3 |
| CY 1981 | 15 | 5 | 3 |
| CY 1982 | 15 | 7[1] | 4 |
| CY 1983 | 15 | 10[1] | 6 |
| CY 1984 | 15 | 4 | 1 |
| Spring 1985 | 7 | 3 | 2 |
| Fall 1985[3] | 6 | 6 | 5 |
| Spring 1986[3] | 2 | 2 | 2 |
| Fall 1986 | 8 | 5 | 3 |

[1]One permittee failed to return questionnaire, unknown if active.

[2]Three permittees failed to return questionnaires, unknown if active. One additional hunter was lost at sea on his return flight to Anchorage, not known if he took a bear.

[3]Changed to a registration hunt with permits issued on a first-come-first-served basis at the refuge office.

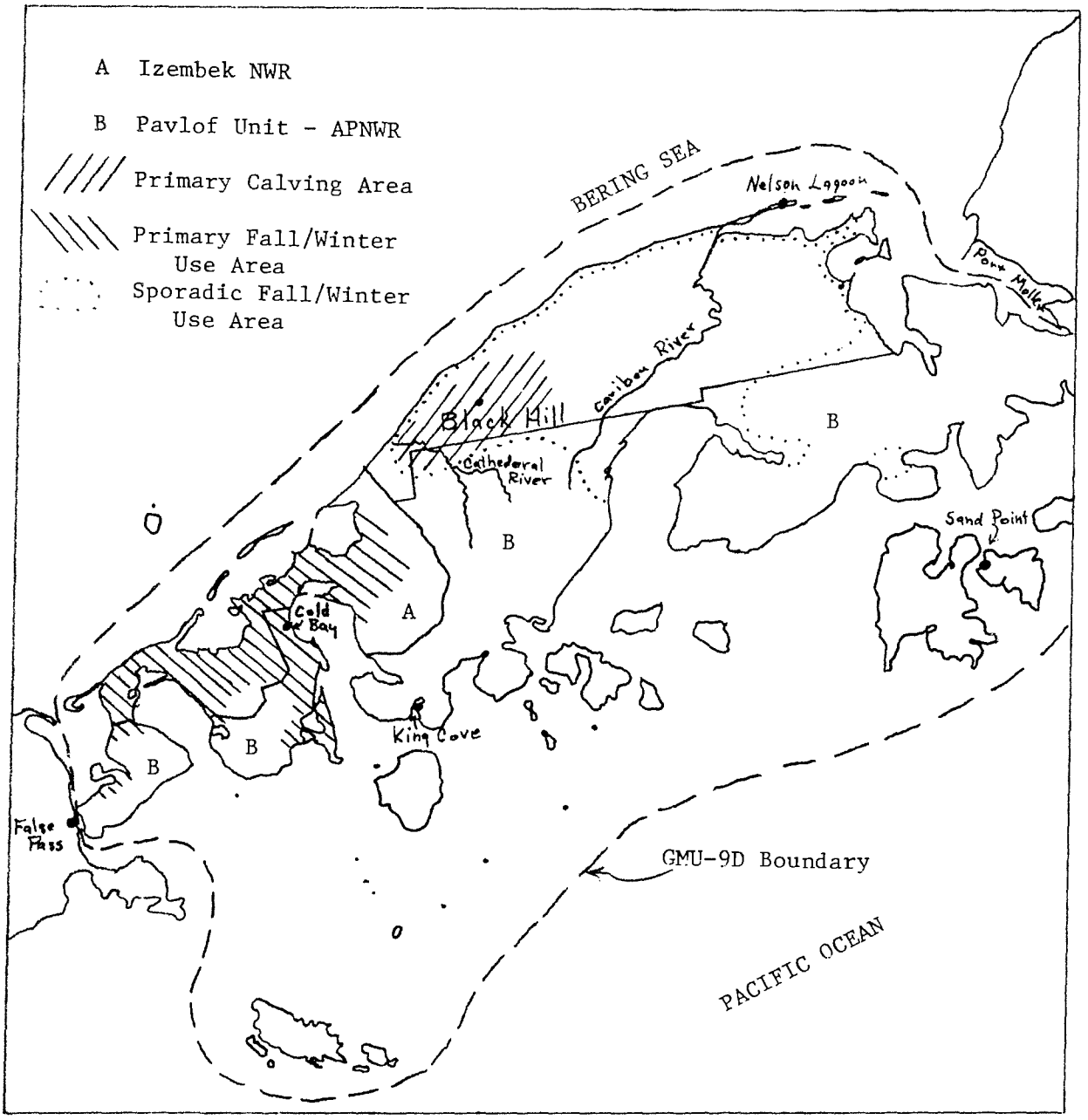


Figure 12. Seasonal distribution of the southern Alaska Peninsula caribou herd, Game Management Unit (GMU)-9D.

accomplished sporadically during past years because of the improbability of simultaneous snow cover and suitable flying conditions throughout all caribou habitat. During successful attempts a combination of caribou counted from 35mm photos and with the unaided eye has proven effective.

In an effort to expedite location of caribou concentrations and provide an index for population size estimates, 10 caribou were fitted with radio collars on April 3 and April 8, 1986. With assistance from Dick Sellers, Area Biologist with Alaska Department of Fish and Game (ADF&G) and Wildlife Biologist Randy Wilk, Alaska Peninsula NWR, nine animals were captured on the first day. Animals were tranquilized with the immobilizing drug Carfentanil. A Bell 206 Jet-Ranger was used for the operation. On April 8 WB Dau, on foot, succeeded in darting one more cow. RM/Pilot Sarvis spotted target groups from the air while the capture crew tranquilized animals and tracked darted animals until they went down. This not only conserved helicopter flight time, but also sped up the entire operation and helped assure against losing tranquilized animals.

Subsequent performance of our telemetry system left much to be desired. During previous telemetry projects we have used Telonics equipment. This year, however, CGS procured transmitters from Advanced Telemetry Systems (ATS). During relocation efforts, signals were received only around one mile from the transmitter - usually at about the same distance the group was first seen. After several discussions with the manufacturer, they loaned a receiver thinking something might be wrong with our Telonics receiver. In field tests performed with two ATS collars retrieved from dead animals and a spare Telonics transmitter, no discernible differences could be detected between any combination of transmitters, receivers and antennas. In fact, they all performed quite well. Hopefully the mystery will be solved before the transmitter batteries are exhausted. To date, we have received little benefit from this expensive project.

In a more positive vein, survey efforts during 1986 were extremely successful thanks partly to modification of procedures used in recent years. Surveys included a productivity survey July 16, a composition survey October 16, and population censuses October 30 and 31, and November 3.

The productivity of a sample group containing 2594 animals was determined July 16. RM/Pilot Sarvis and ARM Blenden landed along a creek northeast of Cathedral River after spotting this group of animals. They were able to inspect every animal in the group as they passed within 300 meters. Of this total 446 (17.2%) were calves. This production figure is comparable with available estimates of past years (Table 52), although still low compared to other populations in Alaska (Dick Sellers personal communication).

A fall composition survey of the southern Alaska Peninsula herd was performed from a helicopter for the first time. This

Table 52 June and July productivity surveys of the southern Alaska Peninsula caribou herd.

| Year | Method | N | % Calves |
|---|---|---|---|
| 1981 | ground | 2971 | 10.4 |
| 1983 | aerial/ground | 2125 | 17.9 |
| 1984 | ground | 2389 | 16.9 |
| 1985* | aerial | 2333 | 5.5 |
| 1986 | ground | 2594 | 17.2 |
| % Calves $\bar{x}$ (±SE) | | | 15.6±6.7 |

*Incomplete survey due to fog, results not used in $\bar{x}$ or SE calculations.

Table 53 Fall composition survey results of the southern Alaska Peninsula caribou herd.

| Date | N | % Calves | % Subadults & Cows | % Cows* | % Bulls | % Large Bulls |
|---|---|---|---|---|---|---|
| 1982 | 1527 | 13.1 | 72.2 | - | - | 14.7 |
| 1983 | 1596 | 15.2 | 80.3 | - | - | 4.5 |
| 1984 | 1567 | 15.3 | 80.9 | - | - | 3.8 |
| 1985 | 1460 | 9.4 | 78.7 | - | - | 11.9 |
| 1986 | 2307 | 13.0 | 84.2 | 65.8 | 21.1 | 2.8 |
| $\bar{x}$'s | | 13.2 | 79.3 | 65.8 | 21.1 | 7.5 |
| SE | | ± 4.1 | ± 7.6 | | | ±11.5 |

*Data unavailable prior to 1986 when helicopter first used.

The Izembek staff cooperated with the Alaska Department of Fish and Game to perform a fall caribou composition count of the southern Alaska Peninsula herd by helicopter. (Blenden)

Ten caribou were immobilized from a helicopter while spotting was performed from the refuge plane. (Sarvis)

technique is used on several herds throughout the state including the northern Alaska Peninsula herd, making data from this survey more comparable. Sellers trained refuge staff in techniques used to sex animals by genital characteristics and other survey procedures he uses on the northern herd. There are several advantages to the helicopter survey, a much larger sample is obtained in less time and with less dependence on location of animals in relation to landing areas. More importantly, however, observers in a helicopter are placed in an optimum position to view genital characteristics and accurately sex a high percentage of animals in view. This is the only feasible way to consistently collect unbiased sex ratio data. We hope to conduct this survey annually. Survey results indicate percentages of cows, sub-adults and calves are similar to those obtained during production and composition surveys of previous years (Table 53). Calves only comprised 13.1% of fall population estimates.

Concern over actual population size of the lower Alaska Peninsula herd compelled refuge staff to perform a census before the bulk of harvest took place during late fall and early winter. Up until this year caribou censuses have been performed during the winter, ideally during periods of complete snow cover, when animals were most concentrated and most visible. The window of favorable weather also had to be long enough to allow group(s) to be located and counted. Since the coincidence of all the necessary variables has occurred very inconsistently, a census procedure was developed to count animals during early fall when the weather is generally more favorable, but there is no snow cover and animals are more dispersed.

Since animals are widely scattered in a heterogeneous pattern at this time of the year we felt a census would not only be much more accurate, but probably require little more effort than random sampling. Therefore, a census was performed October 30 and 31, and November 3, 1986. Transect lines with north-south orientation were flown at one mile intervals, 400-500 feet above ground level over the entire coastal plain and adjoining mountain flanks northeast of Izembek NWR. Beginning and ending points of transect lines were identified in the aircraft's Loran C navigation instrument, freeing the pilot from constant reference to maps. These transect lines were not followed in mountain valleys and on Izembek NWR due to geographical constraints. Flight lines were oriented down the length of valleys and Izembek NWR. The pilot and passenger confined their field of view to a 0.5 mile horizontal distance from the transect line.

Twenty-four hours of flight time were required to complete this survey. RM/Pilot Sarvis, WB Dau and ARM Blenden all participated. Upon completion they all felt this census provided more accurate information than any previously performed since all habitat was covered and animals were as or more visible than in those conducted during periods of snow cover. They also felt this census was more useful since results were probably more accurate

and procedures were less dependent upon weather conditions and more repeatable in the future.

Although we were pleased to develop an improved technique, census results were somewhat disturbing. They demonstrated that the southern Alaska Peninsula caribou population had dropped from over 10,203 animals in 1983 to 4,533 in 1986. Although the 1984 and 1985 data are inconclusive, they do not refute the good quality surveys conducted during November 1983 and October 1986 (Figure 13).

With this information Sarvis, Blenden and Dau met with Greg Bos and Dick Sellers of Alaska Department of Fish and Game at refuge headquarters on November 5 to discuss alternatives that would lead to a decrease in the year's caribou harvest from Game Management Unit 9D. Primary concerns expressed were the apparent magnitude of the population's decline and the herd's continued low productivity. The meeting resulted in a recommendation that caribou bag limits be dropped from four to one in the management unit. An Emergency Regulation to that effect was signed November 14.

On November 12, Blenden conducted a public meeting at Cold Bay on circumstances surrounding the impending change in caribou hunting regulations. Fourteen people attended, a large turnout by Cold Bay standards. Previous survey results, survey techniques, regulation proposals and caribou biology were some of the many topics discussed. The emergency regulation was accepted, but not with enthusiasm.

In our discussions with ADF&G, Izembek staff agreed to monitor caribou harvest on a daily basis on the Cold Bay road system. The objective of the state's emergency regulation was to reduce caribou harvest to approximately 100 animals around Cold Bay. If harvest started to significantly exceed this goal the state was prepared to consider an emergency closure of the season. Izembek staff documented 81 caribou kills in the area during the 1986-1987 and felt that if the harvest limit was exceeded it was not by much.

The 1985-86 harvest statistics for GMU 9D indicate harvest levels similar to those of the past four seasons in all respects (Table 54). Approximately 158 hunters harvested an approximate total of 487 caribou. Harvest information has been derived primarily from ADF&G's mandatory hunter reports, and qualified by a telephone survey and hunter bag checks performed by refuge staff. Although harvest reports are required of all caribou hunters statewide, past comparison of the state's list of reporting hunters with our hunter bag checks and our survey of Cold Bay households has led us to believe the actual reporting rate to be approximately 75 percent.

These data are useful for analysis of year to year harvest trends but may fall short of that required to manage harvest of a wide

Animals were radio-collared to facilitate re-location during spring and fall productivity surveys.

One meter square sample units were selected from the wintering range of the southern Alaska Peninsula caribou herd to determine vegetative species composition. (Blenden)

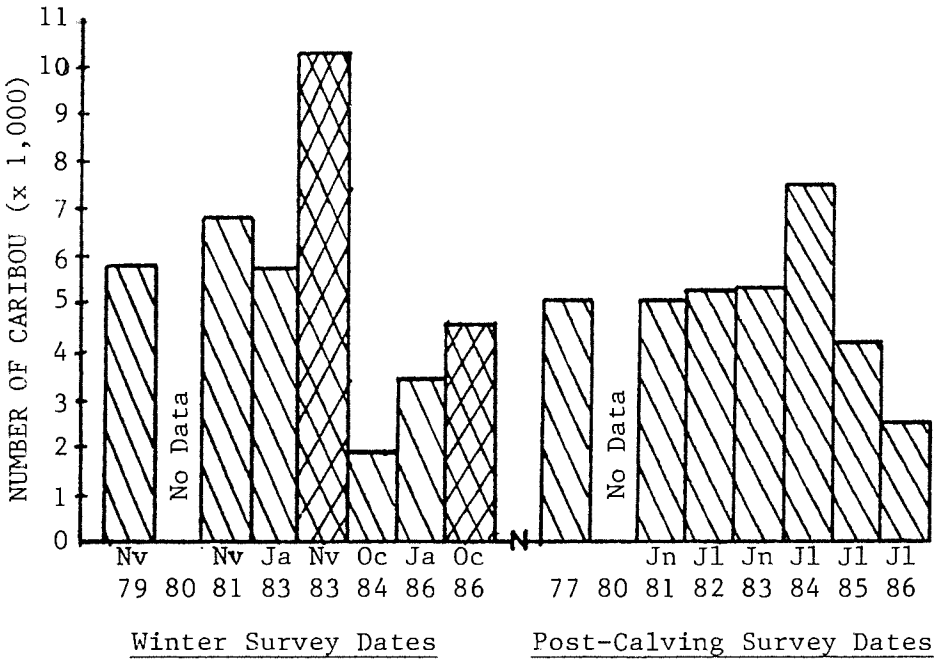


Fig.13 . Highest results of population surveys of the southern Alaska Peninsula caribou herd. Complete coverage of all habitat (XXXX); partial coverage of all habitat (\\\\) i.e. total population ≥ level indicated.

Table 54 Results of ADF&G caribou harvest reports for Game Management Unit 9D.

| Season | No. Successful Hunters | Caribou Harvested | | | | No. Caribou/ Hunter | Total* Harvest |
|---|---|---|---|---|---|---|---|
| | | Male | Female | Unknown | Total | | |
| 1981-82 | 187 | 298 | 130 | 4 | 432 | 2.3 | 575 |
| 1982-83 | 180 | 300 | 110 | 0 | 410 | 2.3 | 545 |
| 1983-84 | 100 | 168 | 81 | 5 | 254 | 2.1 | 338 |
| 1984-85 | 174 | 279 | 109 | 0 | 388 | 2.2 | 516 |
| 1985-86 | 151 | 180 | 162 | 3 | 345 | 2.3 | 459 |
| $\bar{x}$ | 151.4 | 245 | 118.4 | | 365.8 | 2.2 | 486.6 |
| (±SE) | (±35.3) | (±65.5) | (±30.0) | | (±70.3) | (±0.09) | (±93.5) |

*Corrected for 75% reporting rate.

ranging caribou population. The reporting rate and consequently harvest levels for most communities in GMU 9D are unknown. Contribution to the total harvest by members of communities other than Cold Bay has been assumed to be relatively small and constant from year to year. It is possible however, that the majority of the caribou taken are actually harvested by members of these communities, in which case relatively subtle changes in hunting intensity by these individuals could have a large impact on the total number of animals harvested. The effect would go undetected by game managers until the next "good quality" survey was performed.

This is but one of several possible scenarios explaining the decline of this caribou population. Izembek NWR will continue to work with ADF&G to isolate factors responsible for this decline, provide population statistics, and recommend and implement management practices. Hopefully closer analysis of the 1986-87 harvest will be conducted during 1987. If in fact, harvest is significantly greater than assumed, reducing it to tolerable levels in time to benefit the caribou population will be a challenge.

9. Marine Mammals

The investigation of the distribution and abundance of sea otters along the lower Alaska Peninsula received increased emphasis in 1986. This work was carried out as part of research contracts related to assessment of biological resources on or adjacent to leasing areas for offshore petroleum development. Extensive, systematic aerial surveys were conducted throughout the year by personnel with Envirosphere Company. These surveys were initiated from Cold Bay using a NOAA Twin Otter aircraft. Preliminary data analysis placed the sea otter population along the north side of the lower Alaska Peninsula at 2,163 individuals with an additional 2,574 animals residing in the Shumagin Island area south of the Alaska Peninsula. The estimated total population of sea otters for the Alaska Peninsula and Unimak Island is 10,000 animals which suggests a decline or redistribution when compared to the 17,000 animals estimated for the area by the Alaska Department of Fish and Game in 1976.

Distribution and abundance of sea otters in this area is believed to be largely controlled by winter ice conditions. Mild winters have predominated in the area over the past 10 years and this is believed to have allowed for good productivity rates and population expansion.

Sea otter productivity and local movements were investigated in 1986 by Charles Monnett and Lisa Rotterman of the University of Minnesota. This research contract was administered by the U.S. Fish and Wildlife Service with the Izembek NWR providing temporary housing in Cold Bay and aircraft support for radio tracking of marked otters. Of 18 adult sea otters captured as part of this study, 16 (12 females and 4 males) were surgically implanted with

Peggy Blenden assisted on a survey of aquatic vegetation in waterbodies of Izembek NWR. (Blenden)


RM Sarvis prepares to depart with University of Minnesota researcher Chuck Monnett on a sea otter ~~training~~ tracking flight. (Blenden)

radio packages. Radios were inserted into the peritoneal cavity by a veterinarian. Marking operations were performed in nearshore waters of the Izembek NWR and Unimak and Amak islands. Nine aerial tracking flights were performed from August through December. All but one of the adult males were relocated and it is believed that this animal, which was captured near Amak Island, may have left the study area.

Based on this study, males averaged movements of up to 20km which is comparable with other Alaskan studies. Extreme movements of female sea otters averaged 20km, however, two individuals, one with a pup moved up to 50km. Preliminary findings suggest that individual sea otters do move through False Pass from the Pacific to Bering sides of the Alaska Peninsula. Further investigations may show if this is a regular pattern and whether or not it may be in response to climatic factors, primarily ice.

The physical condition of various age and sex classes captured suggested that sea otters inhabiting the lower Alaska Peninsula area are fat and in relatively good condition. It is hypothesized that the observed lack of growth of this population over the past decade may be due to periodic mortalities resulting from icing.

Interesting incidental sightings of marine mammals obtained in 1986 include a moderate sized gray whale well inside Izembek Lagoon on 20 July and a pod of 10 killer whales near Shishkof Pond, Unimak Island on 21 August.

10. OTHER RESIDENT WILDLIFE

Phenologically interesting observations of birds and mammals are collected opportunistically by the refuge staff and filed on an edge-punch sorting system by species. Many valuable observations which outwardly may seem of little significance, take on a new light when viewed with other corresponding pieces of data for a given year or in comparisons with like phenomenon in different years. The edge-punch system allows a rapid analysis of various types of observations on a given species by location and date.

With respect to birds resident to the area, two interesting observations are as follows:

Dipper - a nest with three feathered nestlings was located on 6 June in a bridge framework. These young fledged on 13 July.

Rock Ptarmigan - Downy young observed on Izembek NWR on 13 July.

Interesting sightings of resident mammals obtained in 1986 and not reported in G. WILDLIFE, 8 or 9 include the following:

Arctic ground squirrel - First post-hibernation sighting on 26 March

Approximately 35 miles of improved gravel roadway provide public access to refuge habitats and wildlife.

Salmon shark are uncommon visitors to waters near the refuge. In 1986 one was observed by the refuge staff. This one was caught by a halibut fisherman.

Moose - A single animal thought to be a juvenile female was seen on the Izembek NWR during the fall of 1985 and again on 30 April, 6 May and 26 June 1986. Moose seldom venture south of Port Moller/Herendeen Bay. This mountainous portion of the Alaska Peninsula is thought to be a fairly effective ecological barrier to their movements. Five historical sightings of moose on the Izembek NWR have been recorded prior to 1986.

One red fox was collected by the refuge staff in 1986. This animal was thought to be rabid due to exhibited abnormal behavior. Analysis by the state virologist revealed a negative test for rabies.

11. Fisheries Resources

The Izembek NWR, in cooperation with the King Salmon Fisheries Resources field office, initiated preliminary field investigations in 1985. This work was continued and expanded in 1986. Barbara Mahoney was principal investigator with assistance from Doug Palmer (Seattle National Fishery Research Center) and Dick Marshall (FR-RO). The primary goal of this work was to:

1. Determine adult and juvenile anadromous and resident fish species, distributions and movements associated with Izembek NWR streams.
2. Determine the physical and hydrological characteristics of Izembek NWR streams.
3. Determine age and condition factor of resident and anadromous fish in Izembek NWR.

Izembek NWR is known to have streams containing all five species of Pacific salmon and anadromous rainbow trout (steelhead). However, little is known about the actual biology of the salmonid populations. Refuge streams have had aerial surveys and escapement counts of adult salmon at spawning areas conducted by ADF&G, but only one stream (Russell Creek) has had any type of ground based fishery investigation. Baseline data collected during the 1985 field season will identify juvenile and adult fish distributions, as well as adult salmonid population, age and sex structures. This information will allow refuge management plans to be developed that fully utilize the fishery resources present on Izembek NWR, but still provide for adequate protection of the fishery. Also, the mandates of habitat assessment by ANILCA necessitate a basic inventory of stream fish distributions.

One phase of this initial inventory process involved the mapping of all tributaries on the refuge including those passing through or terminating in shallow lakes or ponds. Red salmon spawn abundantly in lakes with access to the sea and as a result, these waterbodies are rich in nutrients. This factor equates to abundant stands of aquatic vegetation which makes these areas especially attractive to water birds and furbearers.

Doug Palmer, working with Fisheries Resources (King Salmon) tests water chemistry on Izembek NWR.
(B. Mahoney)

ARM Blenden assisted Fisheries Resources personnel in test netting lakes on Izembek NWR. (B. Mahoney-FR)

Doug Palmer (above) and Dick Marshall (below) involved in fisheries research on Izembek NWR. (B. Mahoney)

Salmon runs in various streams on Izembek NWR, and the Pavlof Unit of the Alaska Peninsula NWR are annually monitored by ADF&G biologists of the Commercial Fish Division. Commercial catch and escapement data for these areas are presented in Tables 55 and 56.

ADF&G (FRED Division) constructed the $4 million Russell Creek Hatchery near Cold Bay in 1979. At full capacity, the facility should be able to rear up to 50 million salmon annually. The facility has yet to have reared stock return to the Russell Creek system (Table 57). FRED has been plagued by recent legislative uncertainties with respect to funding which has left the future for personnel and facilities in doubt. With declining state revenues the Russell Creek facility became one of the four scheduled to close in 1987.

14. Scientific Collections

Five bald eagles, found dead on the Pavlof Unit-APNWR, were recovered by the refuge staff in 1986. After a necropsy was performed on each bird, the required plumage was preserved for shipment to the Law Enforcement Division in the Anchorage Regional Office.

Approximately 15 frozen waterfowl specimens were made available to the Wildlife Department of the University of Alaska. These specimens will become part of the student teaching collection which will be administered by Dr. Jim Sedinger. Several study skins were also donated to the University of Alaska. These primarily consisted of a series of short-tailed shearwaters recovered as beached carcasses by Research personnel. The refuge staff conducted a laboratory session to aid researchers in the preparation of scientific specimens.

A sample of black brant harvested during the hunting season was made available to the Research division to aid in certain aspects of its work on disturbance, behavior and energetics of the birds on Izembek Lagoon. These specimens will be analyzed in conjunction with extensive systematic collections of eelgrass, which is the primary component in the diet of brant. Eventually, it is hoped that these evaluations will provide a quantifiable index to seasonal fitness. The management implication of such an index would be that various forms of disturbance, that may adversely affect the birds' capabilities to obtain and store necessary nutrients for migration and breeding, can be properly regulated. (See: G. WILDLIFE, 3. Waterfowl, Black Brant).

16. Marking and Banding

Mammals

See Section G. WILDLIFE 8. Game Mammals, Caribou for a discussion of marking activities in 1986.

TABLE 55 Commercial salmon catch and escapement, vicinity of Izembek NWR, 1969-1986

(Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak)

Pink (Humpy) salmon (in thousands)

| | Cold Bay & Morzhovoi* | | Izembek & Moffett | |
|---|---|---|---|---|
| Year | Catch | Escape | Catch | Escape |
| 1969 | 0.2 | 20.3 | 0 | 2.3 |
| 1970 | 1.5 | 43.9 | 0 | 0 |
| 1971 | 3.6 | 4.5 | 0 | 0.1 |
| 1972 | 0 | 5.7 | 0 | 0 |
| 1973 | 0 | 4.6 | 0 | 0 |
| 1974 | 0 | 9.9 | 0 | 0 |
| 1975 | 0 | 8.3 | 0 | 0.1 |
| 1976 | 0.8 | 55.8 | 0.1 | 0 |
| 1977 | 0 | 21.7 | 0 | 0.2 |
| 1978 | 6.0 | 157.7 | 2.2 | 0 |
| 1979 | 0.03 | 19.2 | 0.01 | 0 |
| 1980 | 126.1 | 127.1 | 0 | 0 |
| 1981 | 8.5 | 17.5 | 0 | 0 |
| 1982[1] | 136.9 | 319.7 | 0 | 0.2 |
| 1983 | 13.8 | 31.2 | 0 | 0 |
| 1984 | 139.7 | 236.7 | 0.1 | 0 |
| 1985 | 5.3 | 15.6 | 0 | 0 |
| 1986 | 48.2 | 84.4 | 0 | 0 |

Chum (Dog) salmon (in thousands)

| | Cold Bay & Morzhovoi* | | Izembek & Moffett | |
|---|---|---|---|---|
| Year | Catch | Escape | Catch | Escape |
| 1969 | 0 | 24.6 | 4.5 | 94.4 |
| 1970 | 1.8 | 43.5 | 10.0 | 53.4 |
| 1971 | 0.5 | 54.3 | 36.3 | 54.8 |
| 1972 | 0 | 51.0 | 57.9 | 72.7 |
| 1973 | 0.7 | 30.4 | 96.6 | 70.3 |
| 1974 | 0 | 30.9 | 11.2 | 70.6 |
| 1975 | 0 | 17.7 | 3.4 | 77.6 |
| 1976 | 2.9 | 38.7 | 40.8 | 123.3 |
| 1977 | 0 | 139.1 | 20.3 | 368.3 |
| 1978 | 5.9 | 102.2 | 81.4 | 119.0 |
| 1979 | 4.6 | 27.4 | 17.8 | 178.0 |
| 1980 | 43.3 | 64.4 | 282.6 | 365.2 |
| 1981 | 27.0 | 48.5 | 296.4 | 235.0 |
| 1982[1] | 103.6 | 103.6 | 57.5 | 166.4 |
| 1983 | 58.9 | 62.5 | 154.8 | 173.3 |
| 1984 | 145.5 | 123.4 | 102.7 | 427.5 |
| 1985 | 87.4 | 94.4 | 126.6 | 194.7 |
| 1986 | 134.5 | 157.9 | 69.1 | 142.4 |

*Much of the Cold Bay/Morzhovoi runs occur off refuge

[1]Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Morzhovoi Bay-Isanotski Strait

TABLE 55 Commercial salmon catch and escapement, vicinity of Izembek NWR, 1969- 1986 (Cont'd)

(Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak)

Red (Sockeye) salmon (in thousands)

| Year | Cold Bay & Morzhovoi* Catch | Cold Bay & Morzhovoi* Escape | Izembek & Moffett Catch | Izembek & Moffett Escape |
|---|---|---|---|---|
| 1969 | 2.2 | 7.5 | 6.1 | 14.0 |
| 1970 | 1.0 | 3.3 | 3.1 | 7.5 |
| 1971 | 1.1 | 2.3 | 6.9 | 3.5 |
| 1972 | 0 | 2.5 | 0.8 | 4.8 |
| 1973 | 0.2 | 3.3 | 1.2 | 2.0 |
| 1974 | 0 | 27.3 | 4.7 | 3.7 |
| 1975 | 0.5 | 15.6 | 1.5 | 13.6 |
| 1976 | 1.4 | 27.3 | 20.4 | 15.3 |
| 1977 | 12.5 | 28.7 | 3.1 | 26.1 |
| 1978 | 1.0 | 24.7 | 15.5 | 23.0 |
| 1979 | 0 | 8.5 | 10.8 | 8.4 |
| 1980 | 15.7 | 6.1 | 34.2 | 11.2 |
| 1981 | 8.9 | 7.0 | 30.9 | 12.0 |
| 1982[1] | 19.8 | 17.0 | 24.5 | 21.2 |
| 1983 | 13.8 | 18.2 | 15.2 | 18.5 |
| 1984 | 59.3 | 14.1 | 4.7 | 19.1 |
| 1985 | 30.8 | 7.1 | 6.2 | 17.2 |
| 1986 | 42.5 | 19.7 | 19.1 | 15.7 |

King (Chinook) salmon (in thousands)

| Year | Cold Bay & Morzhovoi* Catch | Cold Bay & Morzhovoi* Escape | Izembek & Moffett Catch | Izembek & Moffett Escape |
|---|---|---|---|---|
| 1969 | 0 | 0 | 0 | 6.9 |
| 1970 | 0 | 0 | 0 | 2.1 |
| 1971 | 0 | 0 | 0 | 0.2 |
| 1972 | 0 | 0 | 0 | 0.2 |
| 1973 | 0 | 0 | 0 | 0.7 |
| 1974 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 |
| 1979 | 0.002 | 0 | 0 | 0 |
| 1980 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 0 | 0 |

[1]Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon

TABLE 55 Commercial salmon catch and escapement, vicinity of Izembek NWR, 1969-1986 (cont'd)

Coho (Silver) salmon (in thousands)**

| Year | Cold Bay & Morzhorvoi* Catch | Izembek & Moffett Catch |
|---|---|---|
| 1969 | 0 | 0 |
| 1970 | 0 | 0 |
| 1971 | 0 | 0 |
| 1972 | 0 | 0 |
| 1973 | 0 | 0.2 |
| 1974 | 0 | 0 |
| 1975 | 0 | 0 |
| 1976 | 0 | 0 |
| 1977 | 0 | 0 |
| 1978 | 1.3 | 0 |
| 1979 | 7.0 | 0 |
| 1980 | 16.4 | 0 |
| 1981 | 13.1 | 0 |
| 1982[1] | 1.4 | 0 |
| 1983 | 0.7 | 0 |
| 1984 | 0.6 | 0 |
| 1985 | 1.9 | 0 |
| 1986 | 2.5 | 0 |

*Much of the Cold Bay-Morzhovoi runs occur off refuge

**Coho escapement data is incomplete. Some surveys are done, but they are rarely peak counts. Fishing effort is usually very light on Alaska Peninsula coho (per comm. Arnold R. Shaul, ADF&G, Comm. Fish Div., Kodiak).

[1] Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Thin Point Cove

TABLE 56 Catch and escapement data for salmon in the Hoodoo (Sapsuk) Lake/Caribou River Drainage.

(Data supplied by Arnold Shaul, Commercial Fisheries Division, Alaska Department of Fish and Game Kodiak, Alaska).

| Year | | Species | | | | | |
|---|---|---|---|---|---|---|---|
| | | Red | Silver | Chum | King | Pink | Total |
| 1982 | Catch | 229,100 | 170,700 | 21,300 | 13,500 | 100 | 434,700 |
| | Escapement | 180,000 | - | 29,000 | 7,000 | - | 216,000 |
| 1983 | Catch | 192,900 | 64,000 | 14,000 | 12,100 | 0 | 283,000 |
| | Escapement | 128,800 | 13,000[1] | 14,000 | 12,500 | 0 | 168,300 |
| 1984 | Catch | 118,800 | 113,300 | 78,400 | 7,800 | 100 | 318,400 |
| | Escapement | 251,000 | 41,000[1] | 49,000 | 6,300 | - | 338,300 |
| 1985 | Catch | 706,300 | 88,200 | 6,600 | 10,900 | 0 | 812,000 |
| | Escapement | 318,500 | 18,100 | 13,000 | 3,200 | 0 | 352,800 |
| 1986 | Catch | 178,400 | 99,300 | 3,600 | 4,800 | 100 | 286,200 |
| | Escapement | 117,900 | 23,000 | 1,800 | 1,800 | 0 | 144,500 |

[1]Sapsuk River only

Table 57. Management Data, Russell Creek Hatchery, 1983-1986 (data supplied by Arnold Shaul, fisheries biologist, Commercial Fisheries Division, ADF&G, Kodiak, AK)

| | SPECIES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Chum Salmon | | | | Pink Salmon | | | |
| | 1983 | 1984 | 1985 | 1986 | 1983 | 1984 | 1985 | 1986 |
| No. adults taken for egging | 7,200 | 9,700 | - | - | - | - | - | - |
| Aerial assessment of stream pop. (i.e. escapement) | 17,200[1] | 55,000 | 64,800 | 94,100 | Trace[2] | 94,000 | Trace | 18,900 |
| Estimated commercial harvest | 1,700 | 25,655 | 42,600 | 26,500 | 100 | 20,144 | 4,000 | 4,900 |
| No. fish fin clipped | - | - | - | - | - | - | - | - |
| Total run (approx.) | 18,900 | - | NA | 121,000 | 100+ | - | NA | 25,000 |

[1] Included hatchery take

[2] No fish seen, however, stream condition was "murky"

Birds

Birds banded under the Refuge Master Banding Permit 20826 are summarized in Table 41. Refer to the appropriate sections in G. WILDLIFE, 3. Waterfowl, Tundra Swans and Emperor Goose for specific discussion of marking involved in these projects.

## H. PUBLIC USE

### 1. General

The majority of public use for the refuge comes from residents of Cold Bay and visiting waterfowl and caribou hunters. Although residents of King Cove (20 miles southeast) and False Pass (35 miles west) villages do use the refuge, it is typically limited to a small amount of caribou and waterfowl hunting.

The population of Cold Bay, although largely transient, remains at the 1985 level of approximately 200. We expect the population stabilization seen in 1985 and 1986 to be temporary. The potential for development of petroleum basins north and south of the Alaska Peninsula could change overnight as a result of the world economy. On a local basis, this would mean people, aircraft and development in Cold Bay. A local population increase of 15% occurred during the 1984 testing of the St. George Basin northwest of Cold Bay.

The population status and structure of Cold Bay in 1987 and the near future may change drastically. Not only do we anticipate more and permanent offshore oil related supported facilities, but the U.S. Coast Guard is also planning to build a 65- to 70-person search and rescue base adjacent to the airfield. This latter facility would be a helicopter base with C-130 support and daily training flights. It would be staffed by personnel unaccompanied by families. Hence, the next few years show great potential for increases in aircraft activities, specifically large helicopters which will accelerate our concern over disturbance of spring and fall staging waterfowl. In addition, a potentially more drastic problem could be the near doubling of the adult population which will affect the intensity of various forms of public use of the refuge. This change will greatly alter the lifestyle of the present residents of the area.

In general, the refuge staff feels that consumptive and non-consumptive public use activities were lower in 1986 as compared to previous years. Caribou and waterfowl hunting seasons are the refuge's most intensive periods of public use. However, harvest limitations eliminated much of the non-local use. In alternate regulatory years, the Alaska Peninsula is open to brown bear hunting, so Izembek had a spring 1986 hunt only. A spring and fall permit bear hunt occurred on Unimak. Bear hunting significantly increases the number of visitors to the area and

Sea kayaking is developing as a new public use on Izembek NWR. (435) 36 (Sarvis) 3/1/87

typically these users engage in other forms of outdoor, consumptive activities as well.

The refuge has taken a low key approach to its interpretive program. Due to Cold Bay's small population, and the predictable patterns of refuge users, refuge staff are able to make personal contact with a very high percentage of users and visitors. In addition to the small visitor display at refuge headquarters, information is presented to the public in several locations around town and plans are being prepared to expand these displays in 1987. An open house with the public invited was held during the fall to expand awareness of refuge programs. This avenue for public involvement will be used more in the future.

6. Interpretive Exhibits/Demonstrations

The visitor displays in the lobby of refuge headquarters exhibit mounted specimens of several species of migratory waterfowl found on the refuge. Also displayed is information aiding public use and the results of ongoing waterfowl surveys on the refuge. The blackboard installed in the lobby in 1983, displays current information on production and population surveys being conducted by refuge staff on black brant, Canada geese, emperor geese and tundra swans.

In 1986 we expanded the office interpretive displays with exhibits of a wolf and red fox, two prominent furbearers on the refuge. In addition, we hope to install a large relief map of the area from Port Moller to Unimak Pass displaying the three refuge areas we administer (i.e. Izembek NWR, Unimak Island-Alaska Maritime NWR and the Pavlof Unit-Alaska Peninsula NWR).

We hope our expanded visitor contact efforts will lead to greater public awareness of the refuge areas of the lower Alaska Peninsula for local residents as well as other visitors.

8. Hunting

Migratory waterfowl of numerous species occur at Izembek NWR each fall and winter. These alluring resources draw many consumptive as well as non-consumptive users to the refuge. Consumptive use of waterfowl in the Izembek area has in recent years been primarily by local residents. Declining populations of arctic nesting geese have resulted in harvest restrictions and in the case of one species, the emperor goose, a closed season. Such restrictions on harvest and rising air fares to Cold Bay have resulted in a large decrease in numbers of non-local hunters. This was the second year in a row during which organized groups of waterfowl hunters did not come to Cold Bay. Historically, such groups made up a large percentage of non-local hunters and a sizeable percentage of the harvest.

The refuge staff maintains high visibility during the waterfowl hunting season for law enforcement and bag checking. Data

This nimrod (Bill Palmisano-Research Division) assured refuge personnel he got all these birds "about 9 a.m. this morning"! (DAU)

Approximately 15 people turned out for our open house at refuge headquarters. New wildlife displays were unveiled and films were shown. Other events are planned. (Dau)

collected from these activities are summarized in Tables 58 and 59.

The Alaska Peninsula was open to brown bear hunting in the spring of 1986 (10-25 May) and closed during the fall season (1-21 October). Izembek NWR is in state Game Management Unit 9D which is open to brown bear hunting every other regulatory year, hence the next open season will be during the fall of 1987. The refuge staff sealed 17 brown bears during the spring 1986 season in cooperation with the Alaska Department of Fish and Game. We sealed all bears harvested on Izembek NWR and only a portion of those taken in adjoining areas. Approximately 200 brown bears are annually harvested on the Alaska Peninsula.

Unimak Island, in state Game Management Unit 10, is normally open to brown bear hunting annually by drawing permit. Until 1986, 15 permits were issued per year for spring (N=7 permits) and fall (N=8 permits) seasons. Litigation over the allocation of game within the State of Alaska for subsistence and other uses resulted in last minute alterations of seasons and bag limits for many species statewide. Brown bear hunting on Unimak Island was changed from a drawing hunt, where applicants applied for permits through the mail, to a registration hunt where permits were issued on a first-come-first-served basis. In addition, two rather than the usual seven permits were available for the spring 1986 hunt. Two King Cove residents obtained the permits and both successfully took bears.

The area biologist for ADF&G and Izembek NWR staff were opposed to altering the Unimak Island brown bear hunt. A joint proposal was presented to the Alaska Board of Game to return this hunt to the registration system with an annual quota of 15 permits issued. This proposal was accepted and eight registration permits were issued for the fall 1986 hunt and three bears were taken (Table 51).

Due to the drastic decline in the southern Alaska Peninsula caribou herd documented by the refuge staff, the ADF&G implemented an emergency harvest reduction midway into the fall season. The normal bag limit of four was reduced to one and a harvest quota of 100 animals was established for the remainder of the season (10 August to 31 March). The refuge staff monitored the harvest and a minimum of 487 caribou were taken through 31 March. A proposal to maintain the limit at one caribou per hunter, proposed to the Alaska Board of Game by the ADF&G with the support of the Service, was approved with a modification of the bag limit to two for local residents only. We will expand our monitoring of this herd to try to identify causative factors for the decline as discussed in G. WILDLIFE, 8. Game Mammals, Caribou.

9. Fishing

Sport fishing is very popular during the summer and early fall. Primary species sought are silver, chum and pink salmon; and Dolly

Table 58. Law Enforcement cases, Izembek NWR, 1986.

| Violation | Date | State Court | Federal Court | Residency | | Source | Disposition |
|---|---|---|---|---|---|---|---|
| | | | | Local | Non-Local | | |
| Violation of state reg/ shooting from road | 1/25 | | x | | x | patrol | not guilty |
| Violation of state reg/ taking game out of season | 5/24 | | x | | x | phone call tip | $125 fine |
| Violation of state reg/ taking game out of season | 5/24 | | x | | x | phone call tip | $125 fine |
| Violation of state reg/ taking game out of season | 5/24 | | x | | x | phone call tip | $125 fine |
| Burglary | 9/26 | x | | x | | investigation | ? |
| Burglary | 9/26 | x | | x | | investigation | ? |
| Violation of state reg/ hunting waterfowl w/o state duck stamp | 10/5 | | x | x | | patrol-foot | $100 fine |
| Violation of state reg/ hunting waterfowl w/o state duck stamp | 10/5 | | x | | x | patrol-foot | $100 fine |

Table 59. Summary of waterfowl bag check data, Izembek NWR, 1986

| Species | (Harvest by Age/Sex) | | | | | | | | Total[1] | % of Harves |
|---|---|---|---|---|---|---|---|---|---|---|
| | Adult | | | Immature | | | Unknown | Crippled | | |
| | M | F | U | M | F | U | U | | | |
| Emperor Goose[2] | - | - | - | - | - | - | - | - | - | - |
| Black Brant | 2 | 6 | 4 | 3 | - | 1 | 5 | 3 | 21 | 21.4 |
| Tav. Canada | 9 | 2 | 1 | 11 | 1 | 4 | 49 | 11 | 77 | 78.6 |
| Goose Total | | | | | | | | 14 | 98 | |
| Pintail | 1 | 1 | - | 1 | 3 | - | 8 | - | 14 | 25.5 |
| Mallard | 1 | 3 | - | - | 2 | - | 1 | 1 | 7 | 12.7 |
| G-W Teal | 5 | - | - | 2 | 1 | - | 16 | 4 | 24 | 43.6 |
| Shoveler | - | - | - | - | 1 | - | - | - | 1 | 1.8 |
| G. Scaup | 1 | - | - | - | - | - | - | 1 | 1 | 1.8 |
| C. Goldeneye | 1 | - | - | - | 1 | - | 5 | - | 7 | 12.7 |
| C. Merganser | 1 | - | - | - | - | - | - | - | 1 | 1.8 |
| Duck Total | | | | | | | | 6 | 55 | |
| TOTAL BIRDS | 21 | 12 | 4 | 17 | 8 | 1 | 84 | 20 | 153 | |

| No. Hunter Contacts (Hours afield/hunter) | No. Ducks Taken (Av./Hunter) | No. Canada Geese Taken (Av./Hunter) | No. Brant Taken (Av./Hunter) |
|---|---|---|---|
| 55 (2.8/hunter) | 55 (1) | 77 (1.4) | 21 (0.4) |

| Species | Est. Bag[3] | Est. Cripples (%)[4] | Est. Ttl Hrvst |
|---|---|---|---|
| Ducks | 55/.1=550 | 60 (10.9) | 610 |
| Canada Goose | 77/.1=770 | 110 (14.3) | 880 |
| Black Brant | 21/.1=210 | 30 (14.3) | 240 |

[1]Excluding Cripples

[2]No open season on emperor geese in 1986

[3]Estimate 10% of hunters contacted

[4]Percent crippling rate per goose species and ducks as a group

Varden trout. Saltwater fishing is also popular with Pacific cod, starry flounder and halibut making up the majority of the harvest.

10. Trapping

Trapping is permitted under state regulations and a trapping permit is also issued by the refuge. Izembek and Unimak Island (Alaska Maritime NWR) were refuge lands specifically mentioned in ANILCA for which trapping permits are required. Ten trappers received permits in the 1986-87 season, seven on Izembek and three on Unimak Island. Several other local residents trapped in areas of the adjacent Pavlof Unit of the Alaska Peninsula NWR where trapping permits are not required. This year's harvest data (for '86/'87 season) and the reported catches for the last four seasons are shown in Table 60.

11. Wildlife Observation

Most wildlife observation on the refuge is incidental to other activities. There are rare days when the weather is good and most of the town turns out to drive refuge roads and view wildlife.

17. Law Enforcement

The 1986 law enforcement effort consisted of highly visible patrols during peak hunting periods, investigation of public complaints, and surveillance and bag checks of hunters in the field. Six violation notices were written for taking migratory birds in violation of state law and sport hunting in violation of state law. As a result, fines were paid in five cases (Table 58).

Refuge officers, Alaska Fish and Wildlife Protection Officer Bob Mumford and (Alaska DOT) Airport Safety Officer Ken Kreitzer worked jointly in the investigation and arrest of two local men who broke into a refuge storage quonset and vandalized some of the contents. After pushing the personnel door in with a pick-up truck, both men slashed four refuge-owned inflatable boats and four boat trailer tires owned by National Oceanic and Atmospheric Administration. Footprints, tire tracks and a scraped pick-up fender led officers to the suspects fairly quickly. Interviews and Officer Mumford's execution of a state search warrant on 24 October resulted in incriminating evidence and one confession. Later that day, RM Sarvis and ARM Blenden assisted Officer Mumford in the arrest of both men. After waiving their rights to a speedy trial they were in jail awaiting a court date. The final outcome was six months in jail for both individuals.

RM Sarvis and ARM Blenden testified on 5 June in U.S. District Court against a hunter they cited after witnessing him shoot a caribou while on the road. Although refuge officers provided an accurate account of the event they plainly witnessed, the U.S. Magistrate ruled in favor of the defendant. Apparently the testimony offered by the defendant's partners cast enough doubt in the magistrate's mind.

Table 60 Results of permit trapping program, Izembek NWR

| | 1982/83 (21) | 1983/84 (17) | 1984/85 (16) | 1985/86 (11) | 1986/87 (7) |
|---|---|---|---|---|---|
| Red Fox | 74 | 82 | 51 | 29 | 16 |
| Land Otter | 18 | 25 | 3 | 5 | 7 |
| Mink | 6 | 32 | 34 | 15 | 12 |
| Wolverine | 1 | 1 | 0 | 0 | 0 |
| Wolf | 0 | 0 | 0 | 3 | 1 |

Number of trappers in parentheses

State Fish and Wildlife Protection Officer Bob Mumford discusses the caribou situation with WR Dau. We maintain close cooperation with FWP and ADF&C. (Blenden)

Two vandals who broke into our Grant Point storage building and slashed three inflatable boats were later apprehended, prosecuted and spent six months in jail for the offense. (Sarvis)

A snowmachine illegally driven off the Izembek road system was abandoned on a frozen lake. The refuge staff retrieved the submerged remains during the summer. (Blenden)

On a more positive note, refuge staff and Alaska Department of Fish and Game jointly developed a public information poster for caribou hunters in the Cold Bay area. The poster has been displayed in several public spots around Cold Bay and reminds hunters of common violations (including shooting from or across a road) and ways to avoid crippling animals.

Izembek NWR extends its appreciation to Bob Mumford, Alaska Fish adn Wildlife Protection Officer for his assistance in the burglary case and his interest and efforts in wildlife law enforcement in the Cold Bay area. Officer Mumford is currently stationed in Sand Point, about 100 miles to the east, but traveled here several times during the year to work during caribou and waterfowl hunting seasons.

18. Youth Programs

Izembek NWR continued its YCC program at the level established in 1983. Two enrollees, Jeff Backlund of Rosemount, Minnesota and Jeff Wilson of Cold Bay were on staff from 15 June through 22 August assisting on numerous maintenance and biological projects.

## I. EQUIPMENT AND FACILITIES

1. New Construction

Construction of a small building to house the refuge stand-by generator was started this summer. Once the project is completed, the electrical distribution system at refuge headquarters will be simplified and streamlined. The project neared completion at the time MW Bates retired. Rerouting buried lines and final wiring of the building remain to be completed.

Construction of the headquarters fuel distribution system also nears completion. This project involves installation of two 5,000 gallon buried storage tanks, a small pumphouse and buried distribution lines to smaller storage tanks buried next to each building. Placing siding material on the pumphouse and installation of a heavier door are all that remain to complete this project.

2. Rehabilitation

With assistance from Alaska Department of Transportation, the Third Bridge on Frosty Road was replaced in August. The state supplied two workers and a large front-end loader, making the job much easier than anticipated.

4. Equipment Utilization and Replacement

The accident involving refuge Super Cub N745 described in Section E. 3. Safety, pointed out an unfortunate and unbelievable flaw in the Office of Aircraft Service's salvage procedures. On 10

Transporting this mounted specimen to the refuge headquarters probably caused several double-takes from local residents. YCC enrollees Wilson (left) and Backlund assisted MW Bates on this mission. (Sarvis)

MW Bates and YCC crew laying the foundation of our new electrical switching and emergency generator building. (Blenden)

The refuge's emergency generator building took shape in 1986. Final wiring will occu in 1987. (Blenden

February, nine days after the accident, the decision of how to retrieve the plane was made. By 28 February, no salvage attempt had been made. In the interim, high winds and thawing conditions had rolled the plane on one side, breaking off one wing and allowing partial submersion of the engine and all the radios. On 17 March refuge personnel retrieved the engine and moved the fuselage to the shore of Peterson Lagoon. The plane was submerged in three feet of water with an eight-inch ice cover. Engine and radios were submerged and both wings torn from the fuselage. On 5 April two OAS mechanics bundled the remains and ferried them into Cold Bay with a helicopter here on a caribou marking project. The plane was "rebuilt" in Anchorage and back in service at Izembek NWR during early December.

We were appalled at OAS's unresponsiveness to the whole situation. No amount of telephone calls could hasten the process. RM Sarvis was continually reminded that this was an OAS plane and consequently OAS's responsibility. This of course is the case, but, thousands of dollars of equipment were ruined through OAS's inability to salvage this aircraft in a timely manner. Not only did this impact the taxpayer, but tarnished the image of Izembek NWR since most local people are not aware that the refuge was not responsible for retrieving the plane. If we had been allowed, we could have salvaged the plane within a few days of the accident, avoiding the needless destruction of engine, radios, fuselage and wings due to winds and submersion.

Several lessons in the realm of safety and aircraft operation were learned or reinforced by this experience and are discussed under appropriate sections of this report. In the context of Equipment Utilization and Replacement, this experience reminded us of the need to trust our own judgement and let the regulatory chips fall where they may. In retrospect we should have at least arranged for the immediate removal of the engine and radio equipment, and possibly the wings and fuselage. Later reprimands could have been endured with the knowledge that $30,000 to $40,000 taxpayer dollars were saved.

During April and May, Yukon Delta NWR was good enough to loan us Super Cub N724 which was desperately needed during a caribou marking project, to locate radio-collared bears and to monitor swan nesting. The refuge staff's generosity was appreciated.

After returning N724 at the end of May, we acquired a nearly new (50 hrs.) Arctic Tern 68AT which was used until N745 was "rebuilt" and returned to service at Izembek NWR during December. The Arctic Tern got mixed reviews from pilot and passengers. Visibility from the passenger and pilot seats seems better than from a Super Cub and there is more passenger room. On the other hand, the rear storage bay is fairly small and cabin storage is extremely limited making transportation of bulky items like inflatable boats and outboard motors impossible.

Two concerns have been voiced to OAS. The left tank main and reserve fuel lines have been reversed so the fuel selector valve has to be operated opposite the valve labeling (i.e. operate on LEFT main and there is a 15-minute reserve; operate on RESERVE and there in no reserve left). Secondly, on a 25 June flight from Alaska Peninsula NWR's Lawrence Creek field cmap, the fiberglass engine cowling rattled loose and slid against the propeller in flight. By changing the plane's flight altitude, pilot/RM Sarvis was able to keep damage to a minimum, however a significant amount of fiberglass was abraided from the front of the cowling. Apparently, the thin fiberglass construction allowed enough vibration of the cowling to enlarge the screw holes securing it to the fuselage. It then slid forward against the propeller. An OAS mechanic repaired the damage using several additional layers of fiberglass and aluminum and the Tern was returned to service 28 June. The manufacturer should have used thicker fiberglass or aluminum on the whole cowling. Also a fuel leak at the left tank fuel gauge was repaired on 27 June.

We were pleased to see N745 returned to service during December.

## J. OTHER ITEMS

### 1. Cooperative Programs

Alaska Department of Fish and Game

Caribou: Area biologist Dick Sellers (King Salmon) assisted the refuge in the April capture and radio collaring of 10 caribou from the southern Alaska Peninsula herd. In mid-October, further assistance was obtained in the completion of a productivity survey. The Izembek NWR and ADF&G cooperated a third time in November when emergency regulatory changes were made to limit harvest based on data from refuge surveys.

Izembek State Game Refuge:
A Memorandum of Understanding between the USFWS and ADF&G was signed calling for the cooperative management of the State Game Refuge and the adjacent Izembek NWR.

U.S. Fish and Wildlife Service

Fisheries Resources (King Salmon):
Housing, ground and aerial logistic support, etc., were supplied by Izembek NWR staff toward the completion of a fisheries inventory and management plan for the area.

Research (AOFWR):
Housing, general and aerial support, etc., were supplied by Izembek NWR staff in this cooperative work to quantify disturbance factors, behavior and energetics of spring and fall staging geese, primarily black brant.


The SuperCub is an ideal aircraft for most of the surveys done on Izembek. The plane is on floats in summer and wheel/skis in winter. (455) 25 (Sarvis) 3/3/87


N745, the refuge SuperCub, re-built after extensive damage early in the year. (Blenden)

Wildlife Management-MBMN:
The Izembek NWR provided personnel and funding toward an ongoing effort to census emperor geese in southwestern Alaska during spring.

Wildlife Management-Marine Mammals:
Via an MMS contract through the USFWS, two researchers from the University of Minnesota worked on sea otters in the Izembek area in 1986. Temporary housing, logistic support and aerial radio tracking and survey flights were cooperatively provided by Izembek NWR.

University of Washington
Paul Hendricks, a doctoral candidate, was provided housing and logistic support as part of an investigation of gray-crowned rosy finches and other passerines in the Izembek NWR area.

National Audubon Society
A Christmas bird count has been conducted by the refuge staff since 1963.

With a small staff in a rural area such as Izembek, it is essential to maintain a highly cooperative rapport with various types of agencies and groups. This is an important goal of the refuge staff which to date has resulted in comparatively high biological output in relation to manpower and funding.

4. Credits

John Sarvis wrote Section G.3., Tundra Swan and reviewed and edited the remainder of the report.

Mike Blenden wrote Sections E, G.8, Caribou, and I.

Chris Dau wrote the remainder of the report.

Annette Alexander handled word processing and editing.

## K. FEEDBACK

The Izembek NWR staff continued to monitor the level of additional paperwork responsibilities placed upon us from within as well as outside the Fish and Wildlife Service (Table 61). We began this annual analysis in 1983 by maintaining a reporting deadlines list on which all incoming requirements are logged in and out. The reporting requirements summarized are additional to identified responsibilities in the AWP, and those in other routine areas such as payroll, energy, activities and outputs. Additional reporting requirements in 1986 increased from the 1985 level [i.e. 1985 n=64, 1986 n=73 (+14%)].

Table 61. Non-Annual Work Plan reporting responsibilities assigned to Izembek NWR during 1986.[1]

| Requesting Office | No. Received (%) | X Reporting Period (Days ± 1SD) | X Izembek NWR Turnover Time (Days ± 1SD) | X Days Ahead of Deadline | Type of Report | |
|---|---|---|---|---|---|---|
| | | | | | Resource (%) | Non-Resource (%) |
| Refuges (RO) | 13 (18) | 29.4 ± 17.3 | 18.5 ± 24.3 | 9.8 ± 14.9 | 23 (32) | 50 (68) |
| Regional Office (other) | 53 (73) | | | | | |
| Central Office | 1 ( 1) | | | | | |
| Other Agency | 6 ( 8) | | | | | |
| TOTAL | 73 | | | | | |

[1]Reporting with a deadline; many written and verbal requests are also received by the refuge staff with an estimated 75% of these also being non-resource oriented.

During their recent site visit to the refuge, we took advantage of the presence of Refuge Supervisor South Paul Schmidt and Regional Director Region 7 Walt Stieglitz to expound on the problem of low-paid, low-grade, but high expectation jobs like the GS-5 Secretary Series. It's the same sad commentary that so many people apparently have voiced. The federal government expects those in secretarial positions to continually increase their skills in troubleshooting computer systems, but refuses to compensate these people adequately.

At smaller refuges such as Izembek, the lone secretarial staff must be more competent than staff at larger refuges due to the isolation from immediate help, training and variety of duties. In the field we have no one else to turn to for immediate answers to computer problems. We have to rely on troubleshooting from previous experience and with the expertise of IRM people over the telephone. Secretarial staff are called upon to know, troubleshoot and be office systems managers for at least the AOS/VS system on the DG 10SP; for telephone systems, for CEO, FFTS, and in some offices with a second computer system for MS/DOS, DB3+, WordPerfect and other programs. In exchange for this mixed bag of talents they are paid the same rate as a store clerk who only needs to know how to punch a register.

It's too bad that this lament isn't enough to change the minds of the Office of Personnel Management. We see the same problem outlined in the Annual Narrative reports from all over the U.S. If OPM doesn't see the need for merit pay, and higher grade levels for higher skill levels, then it will find itself with a shortage of qualified secretaries as hospitals have found with the shortage of qualified nurses for basically the same reasons - lack of job satisfaction and additionally complicated, more sophisticated duties without commensurate compensation for these added duties.

The third area of concern which we have had a great deal experience with this last year has to do with computer acquisitions. In the Government Computer News publication (a newspaper type magazine) the problems between CGS and IRM have been well defined on the national level. It is all too true on the regional level as well. We researched the computer market for the software and hardware which, as a package, would meet our needs and still be mainstream enough to interface with almost anything currently in use by the Service.

We were told that we can only request components by specifications, not by brand names. This is understandable to a point. The acquisition became a nightmare in terms of 20 refuges ordering computers, components, software, and printers. These items went out to bid piecemeal and they are still arriving piecemeal - a printer here, a modem there. Who is supposed to configure the stuff? Surprise, surprise, the GS-5 "SYSTEMS MANAGER".