Quarterly Report

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The natural history and ecology of the bearded seal (Erignathus barbatus) and the ringed seal (Phoca hispida)

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I. Task Objectives

1. Summarization and evaluation of existing literature and available unpublished data on reproduction, distribution, abundance, food habits and human dependence on bearded and ringed seals in the Bering, Chukchi and Beaufort Seas.

2. Acquisition of large amounts of specimen material required for an understanding of productivity growth rates and mortality in these two species.

3. Acquisition of baseline data on mortality (including parasitology, diseases, predation and human harvest) of ringed and bearded seals.

4. Determination of population structure of bearded and ringed seals as indicated by composition of harvest taken by Eskimo subsistence hunters.

5. Initial assessment of regional differences in density and distribution of ringed and bearded seals in relation to geographic areas and, to a lesser extent, in relation to major habitat condition.

6. Acquisition of additional information on seasonal migrations.

II. Field and Laboratory Activities

A. Schedule

Date	Location	Activity	Personnel
April-June	Fairbanks	Analyses of seal specimens and data	Eley, Burns
March-April	OSS SURVEYOR (southern Bering Sea)	Collection of seal specimens and seal and ice surveys	Lowry, Frost Burns
March-April	Nome, Kotzebue, Cape Lisburne and Barrow	Collection of seal specimen and seal and ice surveys with aid of helicopter	Eley, Burns
May	OSS DISCOVERER (Bering Sea)	Collection of seal specimens	Lowry
May	Point Hope	Collection of seal specimens from native harvest	Seaman
June	Nome	Collection of seal specimens	Frost
June	Wales	Collection of seal specimens from native harvest	Seaman
June	Point Lay to Barter Island	Aerial survey of ice and seals	Eley, Burns

During this quarter a major field effort was undertaken in the Norton Sound, eastern Chukchi Sea and Beaufort Sea areas. We were successful in acquiring a large sample of ringed seals in Norton Sound

during a period in which our previous sample size was inadequate (March). The entire field program was directly tied in with the acquisition of required material used in other projects, most notably RU#'s 232 and 248.

Laboratory activities consisted mainly of processing female reproductive tracts and determining ages of seals acquired through March 1977. Various parameters of reproduction were determined.

Data management was continued on an ongoing basis, as was the acquisition of information from other related studies, mainly those conducted by Soviet investigators.

B. Scientific Party

Name	Affiliation	Role
John J. Burns	ADF&G	Principal Investigator
Thomas J. Eley	ADF&G	Principal Investigator
Kathryn Frost	ADF&G	Marine Mammals Biologist
Lloyd Lowry	ADF&G	Marine Mammals Biologist
Glenn Seaman	ADF&G	Marine Mammals Technician

C. Analytical Methods

From all specimens we endeavor to obtain weights, standard measurements, lower jaws, foreflipper claws, stomachs, reproductive tracts and intestines. We also obtain blubber, tissue, organ and blood samples as the situation permits.

The ages of seals are determined by examination of claw annuli (for animals generally six years or younger) and dentine or cementum annuli (for animals over six years of age). Growth rates are based on weight and standard measurements correlated with specimen age, sex and date and locality of collection. Species productivity and parasite burden are determined, respectively, through laboratory examinations of reproducive tracts and various organs and correlation of these data with age, sex, and date and locality of collection of each specimen.

Regional differences in seal density and distribution are assessed through aerial surveys following the methods of Burns and Harbo (1972).

Analytical methods are discussed in detail in our Annual Report for 1977.

III-IV. Results and Preliminary Interpretaion

A. Specimens

During March-June 1977 our major efforts were devoted to collection of specimens in the Bering, Chukchi and Beaufort Seas and to the laboratory analyses of these specimens. Little time was given to data analyses.

A total of 13 male, 11 female and 1 sex unknown bearded seals were obtained (Table 1), yielding a 1:1 sex ratio. Sixty-nine ringed seals were obtained and consisted of 42 males and 27 females. Although this is approximately a 2:1 sex ratio, it is probably not indicative of the true sex ratio of the population. During March to May, when most of our samples were obtained, females are involved in lair construction and birth- and pup-related activities and thereby are not readily available for harvest. When specimens collected throughout the year are examined, ringed seals in Alaska and Canadian waters yield a 1:1 sex ratio.

Table 1. Seal specimens obtained during March-June 1977.

Location	Male	Female	Unknown	Total
Nome				
Ringed seal	12	17	-	29
Bearded seal	7	1	1	9
Point Hope				
Ringed seal	23	8	-	31
Barrow				
Ringed seal	5	1	-	6
Bearded seal	3	3	-	6
OSS SURVEYOR				
Ringed seal	-	1	-	1
Bearded seal	3	7	-	10
OSS DISCOVERER				
Ringed seal	2	-	-	2
Total				
Ringed seal	42	27	-	69
Bearded seal	13	11	1	25

B. Ringed Seals

1. Reproductive biology

The reproductive tracts of 19 female ringed seals collected between January and June 1977 were examined during this quarter and the results of these examinations are presented in Table 2. Five of the 19 females (26%) were 7 years of age or younger and all 5 females were nulliparous and not pregnant. Fourteen of the 19 females (74%) were 8 years or older. Of these 14 females, 3 (21%) were nulliparous, 4 (29%) were primaparous, and 7 (50%) were multiparous. Seven of the 14 females older than 8 years (50%) were pregnant when collected and 2 additional females had been pregnant but had aborted the fetuses sometime during mid-pregnancy.

Table 2. Reproductive status of 19 female ringed seals collected from January to June 1977.

Number	Claw age (years)	Month of collection	Pregnant (yes or no)	Reproductive status	Comments
SUVP-1-77	1	April	No	Nulliparous	-
NP-30-77	4	March	No	Nulliparous	-
NP-5-77	5	March	No	Nulliparous	-
NP-10-77	7	March	No	Nulliparous	-
NP-19-77	7	March	No	Nulliparous	-
NP-14-77	8+	March	Yes	Primaparous	-
NP-29-77	8+	March	No	Nulliparous	-
NP-31-77	8+	March	No	Multiparous	-
NP-2-77	9+	March	Yes	Primaparous	-
NP-21-77	9+	March	No	Nulliparous	-
NP-23-77	9+	March	No	Multiparous	had aborted fetus both ovaries cystic
NP-9-77	10+	March	No	Multiparous	-
NP-13-77	10+	March	Yes	Multiparous	-
NP-28-77	11	March	Yes	Multiparous	-
NP-3-77	12	March	Yes	Primaparous	-
NP-18-77	12+	March	No	Nulliparous	-
BP-9-77	12+	April	No	Multiparous	had aborted fetus
NP-1-77	13+	March	Yes	Primaparous	-
NP-15-77	13+	March	Yes	Multiparous	-

In a sample of 33 adult female ringed seals obtained prior to 1973, 30 were or had just been pregnant, yielding a pregnancy rate of 91 percent. The reproductive tracts of 56 adult females collected during 1975 through 1977 have been examined thus far and 33 (59%) were or had just been pregnant. Johnson et al. (1966) found 240 of 280 (86%) adult females (collected near Cape Thompson, Alaska during 1960 and 1961) pregnant. The decline in the pregnancy rates of our samples between 1964-1973 and 1975-1977 corresponds to the decline in the pregnancy rates reported by Stirling et al. (1975). However, the magnitude of the decline in pregnancy rates in Canadian ringed seals is significantly greater; in 1972 a pregnancy rate of 59 percent was found and in 1974 and 1975 a Ø percent and 11 percent pregnancy rate was found, respectively. The reason for the decline of pregnancy rates of female ringed seals in Alaskan waters is unknown and it is presently under investigation.

B. Bearded Seals

During the March cruise of the SURVEYOR, K. Frost and L. Lowry found bearded seals to be comparatively numerous in the ice front. An aerial survey conducted on 28 March, using the ship based helicopter, indicated a density of 0.65 bearded seals per nautical mile^2 in strip transects covering 103.3 nautical miles^2.

It appeared, however, that by the last third of April, active northward migration of bearded seals was well underway and densities of these seals in the southern margin of pack ice were low. The results of aerial surveys conducted by helicopter from the SURVEYOR during late April are indicated below:

Date	General location	No. miles surveyed (NM^2)	Density of bearded seals
21-IV-77	57°40'N 164°55'W	40.6	0.22
23-IV-77	58°30'N 169°50'W	114.5	0.01
23-IV-77	58°30'N 169°50'W	85.3	0.07
24-IV-77	58°45'N 169°30'W	15.0	0.07
24-IV-77	58°45'N 169°30'W	30.6	0
25-IV-77	58°45'N 169°00'W	43.9	0.07
27-IV-77	59°40'N 174°10'W	31.2	0
27-IV-77	59°45'N 174°30'W	24.7	0

Ovarian analysis of 76 female bearded seals collected during 1975 and 1976 was completed during this quarter. General results indicate no long-term changes in productivity since about 1959.

Of the 76 females examined, preliminary results indicate that 54 (71%) were sexually mature and 22 (29%) were sexually immature. The incidence of pregnancy in sexually mature animals, as indicated by the presence of an active corpus luteum, was 96 percent. However, many of these females were taken during the period between mating and fetal implantation (early May to mid-July).

The presence of an active corpus luteum during this period, although indicative of ovulation and probably conception, overestimates the incidence of successful implantation.

Our examination of uteri from female bearded seals taken after 15 July is not yet complete. Partial results, based on specimens collected at Wainwright, during July and August showed that 10 of 12 sexually mature females (83%) were supporting implanted fetuses. Johnson et al. (1966) found that in adult females collected at Point Hope during January through April in 1960 and 1961, 83 percent supported fetuses. Burns (1967) reported a pregnancy rate of 83.5 percent based on a sample of 133 sexually mature females collected between 1962 and 1966.

It appears that the incidence of pregnancy in bearded seals of the Bering and Chukchi Seas has remained high and stable over a long period of time. This is in marked contrast to an apparent sharp decline in pregnancy rates of ringed seals from the same areas.

D. Ringed Seal Surveys

During June 1977 an area of 987 square statute miles was surveyed between Point Lay and Barter Island to assess changes in ringed seal densities from our previous surveys (1970, 1975 and 1976). The results of this 1977 survey are presented in Table 3. A total of 1708 ringed seals were observed, for a mean density of 1.73 seals per square mile. However, when examined according to geographic area the densities ranged from 0.50 seals per square mile (Lonely to Oliktok) to 3.33 seals per square mile (Point Lay to Wainwright).

Table 3. Geographical variation in ringed seal densities, June 1977.

General Location	Area surveyed (statute miles^2)	# ringed seals observed	density (seals/mile^2)
Point Lay - Wainwright	204	679	3.33
Wainwright - Barrow	202	517	2.56
Barrow - Lonely	285	272	0.95
Lonely - Oliktok	87	44	0.50
Oliktok - Flaxman Island	96	66	0.69
Flaxman Island - Barter Island	113	130	1.15

The combined data from the 1970, 1975, 1976 and 1977 surveys are presented in Table 4. A detailed "population" analysis will be presented in our September 1977 Quarterly Report. However, several trends are apparent at this time. The densities of seals have decreased from 1970 to the present. The reason for this decline is unknown and it is being investigated at this time. In addition, we do not know whether there has been a concomittant increase in ringed seals in other areas or whether this is a major decrease in ringed seal numbers in Alaskan waters.

Table 4. Ringed seal densities (seals per square statute mile) for June surveys conducted during 1970, 1975, 1976 and 1977.

Location	1977	1976	1975	1970
Point Lay - Wainwright	3.3	1.9	2.9	5.4
Wainwright - Barrow	2.6	3.8	6.2	3.7
Barrow - Lonely	1.0	1.4	2.8	2.3
Lonely - Oliktok	0.5	1.1	1.4	1.0
Oliktok - Flaxman Island	0.7	1.4	1.0	1.4
Flaxman Island - Barter Island	1.2	0.4	1.8	2.4

V. Problems Encountered/Recommended Changes

None, with the exception of the anticipated difficulty of obtaining seal specimens from the Beaufort Sea during winter and early spring. Our only change will be to direct more effort toward work in this area.

VI. Estimates of Funds Expended

As of May 30 we have expended the following approximate amounts during FY 77.

Salaries and benefits	-	$83,045
Travel and per diem	-	5,300
Contractual services	-	5,266
Commodities	-	4,587
Equipment	-	518
Total expenditures	-	$98,716

VII. Literature Cited

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