ALASKA DEPARTMENT OF FISH AND GAME
JUNEAU, ALASKA

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WOLVERINE STUDIES

by

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Volume IX
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-15-R-2 and 3, Work Plan O

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NOS.: W-15-R-2 & 3 TITLE: Alaska Wildlife Investigations
Big Game Investigations

WORK PLAN: O TITLE: Wolf and Wolverine

JOB NO.: 2 TITLE: Wolverine Studies

PERIOD COVERED: July 1, 1966 to June 30, 1967 (W-15-R-2)
July 1, 1967 to December 31, 1967 (W-15-R-3)

ABSTRACT

Carcasses of 309 female wolverine were examined in an effort to describe the reproductive process in wolverine and to measure productivity.

Most adult female wolverine (91 percent) breed annually and produce about 3.3 kits per litter. Litter sizes ranged from one to six kits. Nidation occurs in January and parturition takes place in late February and March. Exact breeding dates are not known.

Harvests of wolverine have fluctuated periodically for many years. The bounty which was established in 1953 does not appear to have influenced the harvest of wolverine. Since wolverine do not constitute a significant threat to man or fauna, I recommend elimination of the bounty.

RECOMMENDATIONS

1. I recommend removal of the bounty on wolverine. This recommendation has been supported by the Board of Fish and Game.

2. A system for enumerating the annual harvest should be continued after the bounty law is repealed.

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OBJECTIVES

To maintain an annual compilation of the magnitude and sex and age composition of the harvest of wolverine in Alaska. To evaluate the status of the wolverine in Alaska. To describe the life history and some aspects ofthe population dynamics of this bountied carnivore.

TECHNIQUES

A bounty information form is completed whenever a wolverine is presented for bounty. This form provides information on the sex, age, date, and location of kill for each wolverine presented for bounty. In addition the name and address of the trapper or hunter who killed the wolverine is obtained. The foregoing data provides a measure of the magnitude of the annual kill of wolverine and some insight into the characteristics of the kill.

Life history information was obtained by examining the carcasses of wolverine obtained from hunters and trappers. Specimens useful in describing the reproductive processes, morphology, food habits, and aging processes in wolverine were collected. Leg bones (radius and ulna) which are potentially useful in separating young-of-the-year from older wolverine were collected from the pelts presented for bounty (State law requires that the left foreleg be attached to the pelt when it is presented for bounty).

FINDINGS

Introduction

Popular accounts relating the wizardry of wolverines are exceedingly numerous, but quantitative studies designed to describe the ecological role of the wolverine are few. In fact, the life history of this large weasel still is not adequately described. The purpose of this work is to describe the life history of the wolverine and to establish a basis for a more detailed evaluation of the animal's chances of surviving today's exploitation-minded economy that is prevalent in the arctic and subarctic. Current management practices are also evaluated.

Productivity

A preliminary anlysis of the reproductive status of 309 female wolverine collected during the period November 1961 and

April 1967 is presented in Tables 1 and 2. When working with indirect methods of assessing population status the investigator often must rely on various tissues within the animal in order to gain some insight into population characteristics. Most of the reproductive organs and skeletal parts are useful because they may retain scars or layering that are related to the potential production of young and the age of the population represented by the sample being studied. The ovaries and uterii are useful in measuring past and future production of young. When ova are shed the resulting corpus luteum may persist for a number of months if the animal conceives and the scar resulting from the corpus luteum of pregnancy, the corpus albicans, often is pigmented, leaving a long lasting, if not permanent, record of past pregnancies. Unfortunately, the corpora albicans do not persist in the wolverine. At least the techniques employed have failed to reveal them. The corpora lutea, however, are present during the entire pregnancy including the long period of delayed implantation.

The placental scars, dark pigmented areas present on the uterine walls where the placenta was attached, do persist and are readable until nidation occurs during the following pregnancy. Some placental scars may persist for several years confusing placental scar counts. Most scars of the immediate past pregnancy can be segregated from older scars on the basis of pigmentation and size.

Table 1. Indicators of productivity of wolverine, 1965-1967, Alaska.

	Placental Scars	Corpora Lutea	Fetuses
1965	3.7* (6)**	3.8* (16)**	3.33* (3)**
1966	3.1 (23)	3.4 (33)	3.00 (6)
1967	4.1 (21)	3.5 (35)	3.4 (14)

* Mean number.

** Sample sizes in parentheses.

Table 2. Age composition and pregnancy rates of 309 female wolverine, 1961-1967.

	Non-Preg.		Pregnant		Total
	Imm.	Ad.	(Including Post-Parturient)		Females
1962	33	1	15	(3)	49
1963	18	-	14	(1)	32
1964	24	4	10	-	38
1965	31	-	16	(3)	47
1966	30	2	34	(4)	66
1967	38	4	35	(3)	77
	174	11	124	(14)	309

185-Non-preg.

Immature = 174-56.31% (age determination based on morphology of uterii and ovaries).

Adults = 135-43.68%

Adults = 124 of 135 = 91% of females judged adults were pregnant or had recently given birth.

Finally the uterine contents, blastocysts, embryos, or fetuses can be counted directly to yield a good estimate of the potential rate of kit production.

Estimates of kit production based upon examination of ovaries (corpora lutea) and uterii (placental scars and fetuses) are presented in Table 1. Wolverine apparently breed when about 1 year old and produce a litter on about their second birthday. Litter sizes in this sample ranged from one to six kits with little variation from year to year.

Adult females were separated from sub-adults (young-of-the-year) by examination of the uterii. The cornua of young-of-the-year are tissue thin and small in comparison to the thick walled vacuolar structures of older animals. The ovaries of kits contained no follicles larger than 1 millimeter and were consistently smaller than the ovaries from multiparous and primiparous females.

Implantation and Parturition

Dates of implantation and parturition are presented in Table 3. These dates must be viewed as gross estimates; particularly the dates of parturition. This occurs because no control or experimental animals were available and all estimates are based upon examination of wolverine carcasses obtained from trappers. The exact dates of nidation or parturition cannot be determined. The dates of nidation are reasonably precise.

Table 3. Timing of implantation and parturition in female wolverines, 1962-1967. Each date represents one individual.

	Embryos Implanted	Post Parturient
Date of Death	December 31	February 28
	January 3	March 5
	January 22	March 6
	January 26	March 10
		March 10
		March 10
		March 14
		March 22
		March 28
		March 29
		March 30
		April 14

Finding free blastocysts and their approximate location in the cornua proved feasible. Likewise, locating nidation sites was relatively easy. Determining the exact time the blastocyst implanted was not possible; therefore, the implantation dates, while reasonably accurate, remain an estimate.

Parturition dates are quite another matter. Parturition was based upon the condition of the uterus--uterii that have just discharged their contents are flaccid and engorged with blood, placental scars are large and close examination shows tissue damage associated with normal birth. Lactation was also considered an indication of recent parturition. The precision of the estimates remain unknown because so few wolverine dens have been found and the habits of female wolverine following parturition are not known. I assume they do not travel much for the first few weeks. There is some indication that they are not proportionately represented in the kill of female wolverine during February and March, Table 4. Still, trappers operating close to den sites catch some female wolverine shortly (a week or so?) after they have given birth. While the exactness of the parturition dates is not known, they do provide some insight into the life history of wolverine.

It is clear that wolverine kits are born during mid-winter when food for most predators is scarce. I consider wolverine scavengers and the birth dates of their young tend to support

able 4. Chronology of the Harvest of Pregnant Wolverine 1962-1967.

	Nov.	Sample	Dec.	Sample	Jan.	Sample	Feb.	Sample	Mar.	Sample	Apr.	Sample	Unk.	Sample	Total		%
962	1	1	0	6	5	10	2	5	5	14	--------		2	13	15	49	30.61
963	3	5	3	6	3	8	3	5	1	5	1	2	0	1	14	32	43.75
964	0	3	5	12	2	5	0	4	2	4	0	2	1	8	10	38	26.31
965	2	8	2	4	2	10	2	6	4	11	--------		4	8	16	47	34.04
966	3	6	7	15	10	13	1	6	5	10	1	1	7	15	34	66	51.51
967	1	11	11	19	10	19	4	10	4	10	--------		5	8	35	77	45.45
otal	10	34	28	62	32	65	12	36	21	54	2	5	19	53	124	309	40.12
	29.41		45.16		49.23		33.33		38.88		40.00		35.84		40.12		

this observation. Carrion from wolf-kills and big game animals that succumb to the rigors of winter, i.e. malnutrition often complicated by age, disease, and unusual accumulations of snow, is at or near a peak of abundance. In order to test this hypothesis a number of dens will have to be located. So far, I know of only three den sites. One of these, which I found in 1957, was located above timberline in an area where moose carcasses were quite abundant. The moose had succumbed to severe winter conditions complicated by unusual densities of moose and consequent over-utilization of available food supplies. The remains of moose killed by hunters were also common. No wolves were present in the area.

Age Determination Studies

A technique that will reveal the chronological age of wolverine would be most helpful in describing population dynamics regardless of the factors inflicting mortality. The following specimens all potentially useful in determining age have been examined. Correlation with known-age materials has not been made because known-age material is not available. When all potential parameters of age have been checked they will be evaluated.

Potential parameters of age:

1. Ossification of diaphysis of long bone to the epiphysis (radius, ulna, and femur).

2. Ossification of skull (nasals, zygomatic arch)

3. Eye lens weights (dried).

4. Morphology of reproductive organs - (females, ovaries and uterus); (males, testes, os penis).

5. Weight of os penis.

6. Cementum deposits on teeth.

While a number of these techniques may separate young-of-the-year from older animals during all or part of the first year of life, only the deposition of cementum on teeth promises to provide a reasonable estimate of chronological age beyond the first year.

Management Considerations

A review of the available data strongly suggests that wolverine are not serious predators on any of Alaska's species of big game. Individual animals may cause some hardship to trappers by destroying trapped animals and the contents of cabins. Their value as an integral component of wilderness, as furbearers and as big game trophy animals far exceeds any damage they do. The $15 bounty, implemented in 1953, does not appear to have reduced stocks of wolverine. The high harvest of recent years is related to the abundance of the animals, improved trapping and hunting equipment and increased recreational trapping.

The present bounty while not jeopardizing the existence of the animal is not consistent with the principles of wildlife management even if it is viewed as a welfare payment or subsidy to trappers. Removal of the bounty would result in a relatively small annual savings to the State (up to $10,000 annually). In addition it would strengthen the Department's efforts to manage the animal as a valuable furbearer and as a big game trophy animal. Since trapping and hunting pressure has increased in some game management units, a system for enumerating the annual harvest should be substituted for the present bounty information sheet if the bounty is removed. Sealing of each skin, such as is practiced in beaver management, might be the most practical system.

Past Harvests

Records of annual harvests of wolverine prior to the bounty system which was initiated in 1953 were gathered from mandatory fur dealer reports and export permit records. I do not know that the tabulations obtained prior to implementation of the bounty system are strictly comparable to those available after the bounty was authorized. Perhaps the various records indicate general long-term trends even if precision of harvest estimation does vary somewhat.

The records of past harvests shown in Table 5 (adapted from a table prepared by Alan Courtright, 1967) reveal periodic high and low harvests with amplitudes approaching 300 percent.

There are four periods of larger than average harvests. These periods which varied in length and amplitude follow: 1918 (3 years), 1927 (3 years), 1947 (4 years) and 1964 (5 years and continuing).

I have prepared a rather detailed history of the harvest of wolverine in recent years in Table 6. This information was obtained from a form completed whenever a wolverine is presented for bounty. The intent of the form is to provide additional information on the nature of the harvest of wolverine including type of hunter, (professional, incidental, recreational, and unknown), to determine sex composition of harvest, to determine the location of harvest and to determine the method of harvest.

A record of wolverine harvests by Game Management Unit for the period 1959-60 through 1966-67 is presented in Table 7. The data is considered complete only for the years 1963-64 through 1966-67 because prior to 1963 the bounty information sheet was not required on a statewide basis.

Discussion

Yield is not always indicative of population abundance and trapping effort and techniques are influenced by a host of variables not necessarily related to the abundance of the species under consideration. For example, trappers in interior Alaska were very active in the middle 1960's when lynx were abundant

and commanding a good price. Wolverine undoubtedly were subjected to additional pressure in Units 11, 12, 13, and 20 during this period. The increasing popularity of hunting wolves from aircraft has also contributed to the harvest of wolverine, although it is illegal to shoot them from an airplane.

Although all records of past harvests suggest that wolverine numbers show periodic fluctuations, these fluctuations apparently were common both before and after the bounty was authorized. Lensink (1958 ADF&G Annual Report) suggested that the bounty was not a sufficient stimulus to induce additional trapping pressure. The more recent data substantiates this view. At present fur auction houses are not actively competing for American wolverine and prices are relatively low ($15 to $50 depending on quality and color). The demand for these skins in the tourist trade and in some arctic coastal villages has forced prices to $50 to $60 at some locations. In several remote areas trappers do not bounty each wolverine, prefering to turn it into cash quickly without the bother of sending the skin to a certifying officer. The extent of this practice is not known, but I have received reports that the practice is not unusual on the lower Yukon and Kuskokwim deltas and on the Seward Peninsula.

Removal of the bounty would save the State several thousand dollars annually (up to $10,000). Its removal would also introduce new management problems revolving around collection

of precise harvest data for specific areas. Snow machines have become a popular and effective means for pursuing and capturing wolverine in some coastal management units. Notably Units 22, 23, and 26. The machines are being substituted for dog teams in other areas. Finally, recreational trapping is becoming popular in the accessible Units, 7, 13, 14, 15, and 20. Most recreational trappers are not motivated by monitary return; hence, the pressure on rare species such as wolverine, may increase considerably. Should the bounty be repealed, implementation of a substitute recording system seems desirable if problems of overharvest are to be avoided. In the foreseeable future only those areas surrounding or readily accessible to major population centers will require more restrictive regulations to insure the welfare of the resource.

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Table 5[2]. Summary of recorded wolverine harvests in Alaska through June 1967 as determined from pelt shipments and bounty records

Year or Period	Number	Year	Number	Year	Number	Year	Number
1798-1821	51[3]	1921	191	1937	369	1953[1]	360
1822-1842	74[3]	1922	296	1938	248	1954	300
1843-1862	1[3]	1923	296	1939	228	1955	350
1863-1867	16[3]	1924	220	1940	326	1956	200[4]
1868-1909	n.d.	1925	360	1941	232	1957	200[4]
1910	110	1926	468	1942	161	1958	350
1911	179	1927	809	1943	92	1959	213[4]
1912	189	1928	831	1944	87	1960	420
1913	242	1929	873	1945	108	1961	441
1914	136	1930	495	1946	157	1962	383
1915	119	1931	406	1947	527	1963	445
1916	297	1932	234	1948	488	1964	551
1917	435	1933	281	1949	490	1965	402[5]
1918	846	1934	279	1950	500	1966	659
1919	516	1935	260	1951	350	1967	694
1920	561	1936	290	1952	400		

[1]Bounty records start here.

[2]Adapted from a harvest report by Alan Courtright, 1967.

[3]Annual mean

[4]These may be export totals rather than number bountied, in which case the figures would be low.

[5]Bounty records not complete.

Table 6. Information on wolverine harvest 1959-1967.

Year	Total Animals Bountied	Animals Bounty Information Obtained	Class of Hunter 1. Professional 2. Incidental 3. Recreational 4. Unknown				Method of Take 1. Ground shooting 2. Trapping 3. Snaring 4. Digging out 5. Aerial shooting 6. Unknown					
			1	2	3	4	1	2	3	4	5	6
1959-60	420	(53)	41			12	3	10	4			36
1960-61	441	(136)	116	10	4	6	4	107	5			20
1961-62	383	(142)	114	11	15	2	25	57	57			3
1962-63	445	(287)	216	34	27	10	37	188	52			10
1963-64	551	(474)	320	91	33	30	71	305	64	0	1**	33
1964-65	420*	(402)	235	69	88	10	33	283	33	0	6**	47
1965-66	659	(659)	463	82	105	9	65	492	46	0	0**	56
1966-67	694	(694)	509	35	139	11	78	537	44	1	1**	32

*Bounty records not completed
**Illegal

Table 7. Wolverine harvest by Game Management Unit as obtained from bounty information records--1959-60 through 1966-67**

Game Management Unit	Year	Number Wolverine Reported on Bounty Info. Sheets
1.		
	1962-63	1
	1963-64	2
	1964-65	
	1965-66	1
	1966-67	8
3.	1962-63	1
	1963-64	
	1964-65	
	1965-66	
	1966-67	1
4.		
	1964-65	2
6.	1961-62	14
	1962-63	3
	1963-64	9
	1964-65	12
	1965-66	16
	1966-67	26
7.	1962-63	1
	1963-64	5
	1964-65	16
	1965-66	20
	1966-67	11
9.	1962-63	14
	1963-64	34
	1964-65	39
	1965-66	40
	1966-67	63

Table 7. Continued

Game Management Unit	Year	Number Wolverine Reported on Bounty Info. Sheets
11.	1961-62	1
	1962-63	7
	1963-64	38
	1964-65	12
	1965-66	30
	1966-67	33
12.		
	1962-63	25
	1963-64	17
	1964-65	25
	1965-66	26
	1966-67	30
13.	1959-60	2
	1960-61	
	1961-62	1
	1962-63	37
	1963-64	32
	1964-65	65
	1965-66	102
	1966-67	132
14.		
	1962-63	9
	1963-64	10
	1964-65	15
	1965-66	37
	1966-67	27
15.	1961-62	1
	1962-63	
	1963-64	3
	1964-65	13
	1965-66	15
	1966-67	16
16.		
	1962-63	13
	1963-64	43
	1964-65	34
	1965-66	58
	1966-67	51

Table 7. Continued

Game Management Unit	Year	Number Wolverine Reported on Bounty Info. Sheets
17.		
	1962-63	8
	1963-64	70
	1964-65	7
	1965-66	27
	1966-67	31
18.		
	1961-62	4
	1962-63	5
	1963-64	6
	1964-65	3
	1965-66	5
	1966-67	4
19.	1960-61	7
	1961-62	25
	1962-63	33
	1963-64	21
	1964-65	19
	1965-66	25
20.	1959-60	15
	1960-61	20
	1961-62	26
	1962-63	28
	1963-64	57
	1964-65	60
	1965-66	102
	1966-67	108
21.	1959-60	4
	1960-61	9
	1961-62	23
	1962-63	33
	1963-64	12
	1964-65	15
	1965-66	45
	1966-67	27
22.	1960-61	
	1961-62	4
	1962-63	13
	1963-64	23
	1964-65	11
	1965-66	41

Table 7. Continued

Game Management Unit	Year	Number Wolverine Reported on Bounty Info. Sheets	Game Management Unit	Year	Number Wolverine Reported on Bounty Info. Sheets
19.	1966-67	25	22.	1966-67	31
23.	1959-60	3	25.	1959-60	12
	1960-61	1		1960-61	56
	1961-62	4		1961-62	22
	1962-63	2		1962-63	32
	1963-64	51		1963-64	35
	1964-65	16		1964-65	42
	1965-66	5		1965-66	48
	1966-67	11		1966-67	20
24.	1959-60	4	26.	1959-60	13
	1960-61	4		1960-61	31
	1961-62	9		1961-62	8
	1962-63	11		1962-63	10
	1963-64	10		1963-64	42
	1964-65	16		1964-65	?
	1965-66	5		1965-66	11
	1966-67	11		1966-67	33

**The system was first used in 1959-60 in Interior Alaska, in 1963-64 the system was expanded to include the entire state. The data from 1963-64 to present are nearly complete.

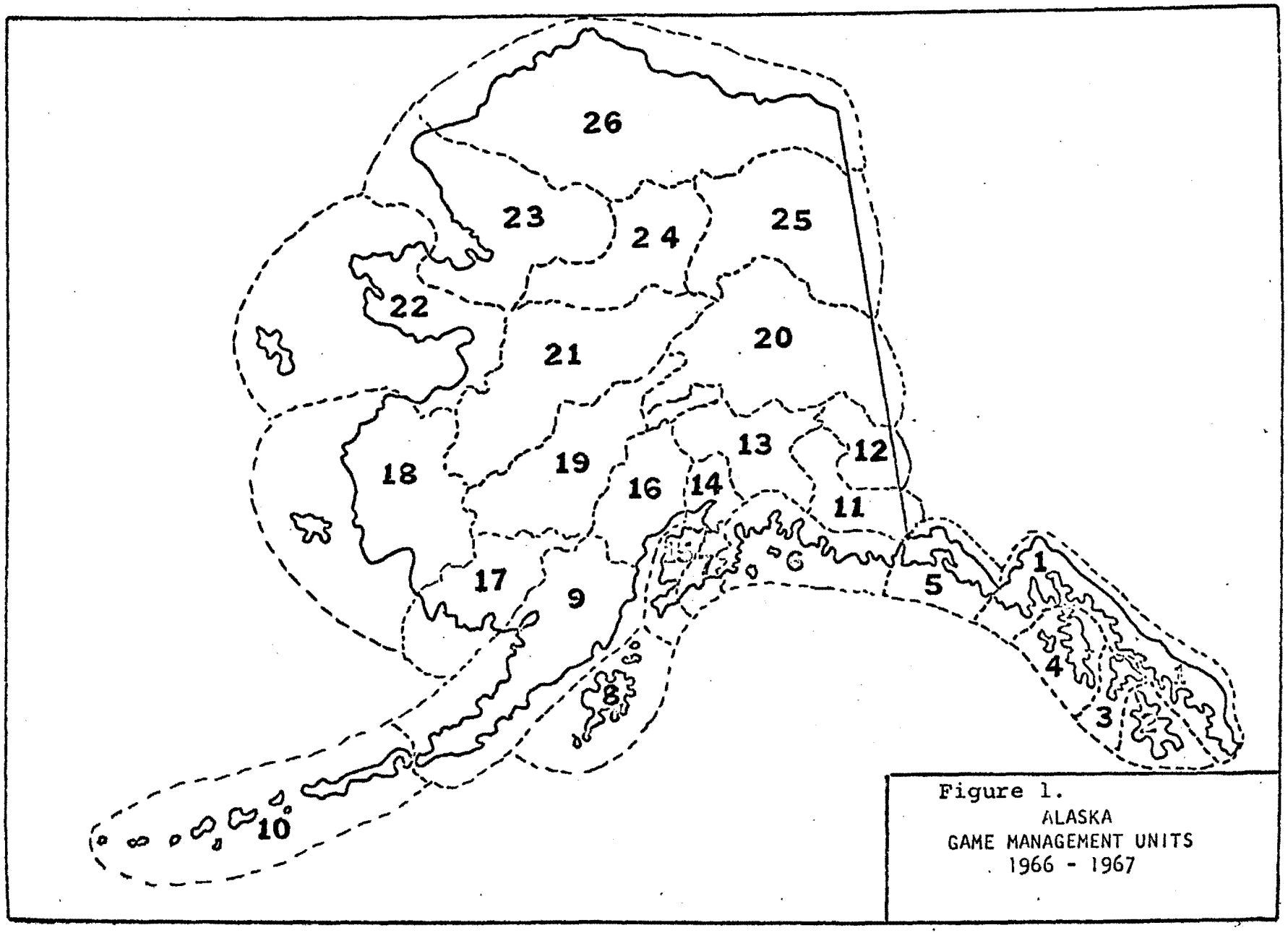

Figure 1.
ALASKA
GAME MANAGEMENT UNITS
1966 - 1967