JOB FINAL REPORT

State: California

Project Number: W-65-R-1 Subproject Title: Nongame Wildlife Investigations

Job Number: IV-6 Job Title: Bobcat Harvest Assessment

Period Covered: July 1, 1983 -June 30, 1984 Job Type: Survey and Inventory

SUMMARY:

An estimated 8,696 bobcats were taken during the 1983 hunting year and the 1983-84 trapping season. Approximately 6,576 bobcats were taken by trappers and 2,077 by hunters. The total take was a decrease of about 1,700 from the 1982-83 year and was the lowest in the last eight years. The majority of the decrease was reflected in the decrease in commercial take and was attributable to the continued decline in fur values. As has become normal, the greatest take continued to occur in counties along California's south coast. Data on the bobcat harvest were gathered through the process of tagging bobcat furs for export, the annual trapping report and hunter survey, and from the U.S. Fish and Wildlife Service depredation control records.

BACKGROUND:

Bobcat harvest has increased in California since the late 1960's. This reflected high fur prices and an abundant population of bobcats. The sale of fur has brought the highest dollar income to trappers of any species of fur harvested and sold in California for the last nine years. In order to determine the magnitude of the bobcat harvest and the resultant effect on bobcat populations throughout the state, a number of studies were initiated. Field studies of local population dynamics have been completed on unharvested populations in Siskiyou, Riverside, and San Diego counties and on a harvested population in San Diego County. Reports on these studies have been made through other jobs. A state-wide harvest monitoring system has been established where the age and sex structures of the harvested population are sampled (see Job IV-7) to determine the effect of the harvest on the various bobcat populations, and to identify the amount of harvest. This latter project is subject of this job report.

OBJECTIVE:

Determine the annual bobcat harvest on a regional basis for the purpose of managing populations through the manipulation of season lengths and chronology, take methods, and take limits.

PROCEDURES:

The commercial take is determined through assessment of mandatory, annual reports of licensed trappers and through a mandatory export tagging program for all bobcat furs. Commercial fur takers report their take at the end of each license year (fiscal year) giving the quantity of take of each species by county. Anyone possessing or wishing to sell or to transport a bobcat fur must

have it tagged. As part of the tagging process, the taker must supply information on the place, date and method of take and provide other biological information for determining the age of the harvested bobcat.

Sport take is determined through the Department's annual hunter survey questionnaire. This survey quiries a 3 to 4% sample of California's licensed hunters about their hunting effort and success for various species. Information on total take, distribution of hunting effort, and percent successful hunters is gathered on bobcat hunting from this survey. Additional information on sport hunting is gathered through the sale of hunting tags and their return. Sport hunters are required to report their kill and provide information on their take.

All depredation take must be reported to the Department. This information is reported directly by the person doing the taking or from the public agencies doing the depredation control work.

RESULTS:

The total estimated take of bobcats during 1983-84 was 8,696 individuals (Table 1). This was about 1,700 less (17%) than were taken during 1982-83, and from 2,500 to 11,502 less than were taken during the previous six years. Trappers continue to take the majority (76%) of bobcats and total hunter take continues to decrease, down 30% from last season and the lowest in the last eight years. The total take of bobcats ranges from none in San Francisco, San Joaquin and Sutter counties to 739 in Kern County (Table 2). The harvest in each of the ten counties having the highest total take was at least 306 (compared to 310 last year). This year only 22 of 58 counties reported a take of more than 100 bobcats; last year more than 100 bobcats were taken from 27 counties.

In what has become the norm, the vast majority of bobcats are harvested from counties in southern California (Table 3). Five of the six counties in the South Coastal area are in the top ten in commercial take. Two counties from the South Sierra area and two from the Southern California area also are in the top ten. Once again, the only county in the northern half of the state reporting a large take is Humboldt County, a perenial on this list.

The 13.5% decrease in commercial take from last year was the result of a general state-wide trend (Table 4). In the north half of the state, the take was down from 13% to 77% on a regional basis. In the southern part of the state harvest was down 9% to 13% in two areas and up 10% to 16% in two areas, East Sierra and South Sierra. The trend in the Northeast area represents a return to the levels expected by the shorter season instigated in the 1980-81 season.

The market for bobcat fur has become relatively stable in both political and economic terms. There was no national or international regulatory action pending which might have influenced the demand for bobcat furs. Although the preliminary check of the average value for a raw bobcat fur shows a decrease of 3.3% in that value (Table 5), this change is exceedingly small when compared to the decreases in value of coyote and gray fox furs. Since the 1978-79 season the average price per pelt received by a trapper has fallen 62% for coyote furs

and 42% for gray fox furs (Figure 1). This is in contast to the 21% decline in the average price of bobcat over the last six seasons. Since all three species are caught by the trappers making dry-land sets, if the value of the fur of these associated species declines enough to decrease profit margins, fewer trappers will trap and fewer bobcats will be taken. Also, it should be mentioned that the 1983-84 season was the first full season where the dramatically increased fee for a trapping license was in effect and trappers had to pass a test of trapping proficiency and competency to become licensed. As a result the number of licensed trappers decreased from 3,901 in 1982-83 to 1,607 in 1983-84.

Indications from the trends in average take per trapper over the last nine seasons are that it is just as easy to catch a bobcat in 1983-84 than in 1975-76, if not easier (Table 6). This would imply that the trappable population of bobcats is as large now as it has been. If there were a drastic reduction in trappers, as there has been this year, it can be expected that the harvest per trapper should increase due to some decrease in competition among trappers. This occurred showing that the number of trappers trying to take bobcats was pushing a limited resource, either the number of bobcats available or the area available in which to trap them.

It appears that in 1975-76 and 1976-77 demand for bobcats was not great. As demand increased, so did the number of trappers. However, on a state-wide basis the average take per trapper only varied 17% from the lowest value (Table 6). This indicates a very stable situation, considering other variables which may influence harvest. The effect of some of the local variables are seen when comparing the average take per trapper at the county level. Even though these county values vary from year to year and may not vary in accordance with the state-wide average, they generally don't vary dramatically within a county.

The distribution of the method of take reported this year for the commercial take of bobcats remains very similar to the distribution of method of take for the previous three seasons (Table 7). Almost 89% of the bobcats taken were trapped and 0.2% were salvaged. The remaining 10.9% (12.7% in 1982-83) of the commercially taken bobcats were taken by hunting methods; 9.3% were taken through the use of dogs, 0.4% through the use of a predator call, and 1.2% were taken by hunting where the specific method was not given. Once again, hunting with dogs was the most popular form of commercial hunting although not as popular in south coastal and southern California counties as in southern Sierra and northwestern counties. Predator calling only occurs erratically as a commercial hunting method.

The harvest of bobcats by hunters was approximately 2,077 (Table 2). Of these, 1,794 were taken and reported by licensed hunters (Table 8), 1,291 were taken by hunters with hunting licenses only, 503 by hunters with both hunting and trapping licenses, and 283 by hunters with only a trapping license. The estimate of 1,794 bobcats taken by licensed hunters was derived from the Department's annual "Game Take Hunter Survey". A sample of 2.2% of California's 507,344 licensed hunters produced a response of 11,029 questionnaires. This sampling provides an 80% confidence level estimated take of bobcats of between 1,406 and 2,181 individuals. These same hunters spent an

estimated 23,184 days hunting bobcats for an average take of 0.077 bobcats per day (Table 9). This is 1 to 32% below the take per unit effort calculated from licensed hunter information provided over the last six years.

Additional information on the extent and distribution of the sport hunting take of bobcats is gathered through the sport hunting tag program. With these tags and their return to the Department upon taking a bobcat a legal requirement, they should be able to provide considerable information. However, they don't (Table 10). Given a sport hunting public of at least 2,000 to 3,000 (estimated from the annual hunter survey and subtracting all trappers who reported taking bobcats), only a maximum of 19.1% of the sport hunters have bought the required tags over the last four years. Additionally, sport hunters only sent in tags for less than 8.3% of bobcats that they report taking in the annual hunter survey. Actual contact with the Department to provide the required biological specimen for aging the harvested bobcat was 11%.

ANALYSIS:

Although the take of bobcats numbered 8,696 during the 1983-84 season, it was the lowest take in the last eight years. High license fees and the low fur value of other species trapped with bobcat definitely affects the take of bobcats. However, the quantity of commercial take has gone up and down in close unison with the average fur value paid for bobcat pelts (Figure 2). This influence of bobcat fur prices on commercial bobcat take seems much stronger than the number of trappers trapping, the fur value of associated species, and even stronger than the influence of weather or the status of the bobcat population, at least at recent harvest levels.

Noting the correlation between trends in bobcat fur value and the quantity of commercial take, and the continued healthy status of most regional bobcat populations (see W-65-R-1 (554), Job No. IV-7), perhaps the current, intensive management of the species could be reduced if the total harvest remained under 10,000 individuals. This level is well under the 14,400 harvest limit previously calculated and certain regional harvest level limits should be established and monitored to conserve all regional populations.

The excessive disparity between the information provided by the annual hunter survey and the sport hunting tag program continues. This occurred despite an increase in compliance of about 90%. However, when compliance is less than 10% to 20%, the large disparity continues. Hopefully, an increase in the limit of sport hunting tags and a revised Department policy for selling the tags will increase compliance.

In the future the bobcat harvest assessment will be covered under Job IV-10, Bobcat Monitoring and Management.

RECOMMENDATIONS:

1. Continue to monitor the take of bobcats by geographical area in order to use the information generated to determine management needed to maintain bobcat populations throughout California.

2. Continue to evaluate the methods used to obtain the harvest of bobcats by hunters and correct them for any inherent biases.

3. Develop and improve methods to evaluate harvest data and to correlate with other population dynamics information.

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Table 1. Estimated Annual Take of Bobcats by Hunting and Trapping in California

Season	Total Commercial Take (IA + IB)	Commercial Trapper Take (IA)	Commercial Hunter Take (IB)	Total Hunter Take (II)	Animal Damage Control Take (III)	Total Annual Take (IA+II+III)
1976-77	5400	5000	400	10500	347	15847
1977-78	5150	4650	500	15300	208	20158
1978-79	8325	6825	1500	5811	56	12692
1979-80	7809	6686	1123	7708	32	14426
1980-81	9595	8702	893	3737	24	12463
1981-82	9337	8162	1175	3037	34	11233
1982-83	8513	7427	1086	2951	48	10426
1983-84	7362	6576	786	2077	43	8696

Bobcats by County 1968-69

County	Licensed Trapper Take	Commercial Hunter Take	Sport Hunter Take	Animal Damage Control Take	Total County Take
Alameda	4				4
Alpine	15				15
Amador	1				1
Butte	27	2			29
Calaveras	7	6	23	2	38
Colusa	74	3			77
Contra Costa			19		19
Del Norte	72	5	24		101
El Dorado	25	26	5		56
Fresno	226	40	15		281
Glenn	45	2			47
Humboldt	192	107	44	3	346
Imperial	25		29		54
Inyo	214		48		262
Kern	571	110	58		739
Kings	59		19		78
Lake	63		10		73
Lassen	79	5	82		166
Los Angeles	400	2	85		487
Madera	133	5		10	148
Marin	14	20			34
Mariposa	67	20		4	91
Mendocino	132	45	44		221
Merced		3			3
Modoc	165	17	5	1	188
Mono	72				72
Monterey	377	94	100		571
Napa	14		10	4	28
Nevada			10		10
Orange	7				7
Placer	3		10	1	14
Plumas	17		10		27
Riverside	187		97		284
Sacramento				1	1
San Benito	125	25	33		183
San Bernardino	602	7	71		680
San Diego	343	22	114		479
San Luis Obispo	429	13	35	6	483
San Mateo		6			6
Santa Barbara	570	14	5	2	591
Santa Clara			10		10
Santa Cruz	2		10		12
Shasta	114	36	15		165
Sierra		2	8		10
Siskiyou	171	26	42		239
Solano	3				3
Sonoma	63	12		9	84
Stanislaus	14				14
Tehama	97	12	85		194
Trinity	17	15	33		65
Tulare	362	63	44		469
Tuolumne	51	21			72
Ventura	306				306
Yolo	19		39		58
Yuba	1				1
Total	6576	786	1291	43	8696

No bobcats were reported taken in San Francisco, San Joaquin and Sutter Counties.

Table 3. Ten Counties Reporting Highest Commercial Take of Bobcats 1971-84

Rank	1971-72	1972-73	1973-74	1974-75	1975-76
1	Modoc	Merced	San Diego	San Diego	Humboldt
2	Shasta	Modoc	Modoc	Modoc	San Diego
3	Merced	Shasta	Tehama	Lassen	Modoc
4	Lassen	Siskiyou	Tuolumne	Humboldt	Shasta
5	Siskiyou	Humboldt	Siskiyou	Inyo	Inyo
6	Riverside	Sierra	Humboldt	Siskiyou	Siskiyou
7	San Bernardino	Tehama	Mendocino	Colusa	Riverside
8	San Diego	San Bernardino	Shasta	Riverside	San Bernardino
9	Humboldt	Butte	Lake	Fresno	Solano
10	Plumas	San Diego	Solano	Lake	Lake

Rank	1976-77	1977-78	1978-79	1979-80	1980-81
1	Humboldt	San Bernardino	Humboldt	Santa Barbara	San Bernardino
2	San Bernardino	Humboldt	San Bernardino	Humboldt	Monterey
3	Santa Barbara	Tulare	Shasta	Tulare	Santa Barbara
4	Shasta	Santa Barbara	Kern	Kern	San Luis Obispo
5	San Benito	Kern	Siskiyou	San Bernardino	Humboldt
6	Mendocino	Inyo	Santa Barbara	Siskiyou	Tulare
7	Tulare	Mendocino	Inyo	San Diego	Mendocino
8	Fresno	Modoc	Modoc	Mendocino	Kern
9	San Diego	Shasta	Mendocino	Monterey	San Diego
10	Inyo	Monterey	Tehama	San Luis Obispo	San Benito

Rank	1981-82	1982-83	1983-84
1	San Bernardino	San Bernardino	San Bernardino
2	Kern	Monterey	Kern
3	Monterey	Kern	Santa Barbara
4	Santa Barbara	Santa Barbara	San Luis Obispo
5	Tulare	San Luis Obispo	Los Angeles
6	Humboldt	Tulare	Monterey
7	San Diego	Humboldt	Tulare
8	Ventura	Los Angeles	San Diego
9	Fresno	San Diego	Ventura
10	San Luis Obispo	Ventura	Humboldt

Table 4. Geographical Differences in the Amount of Commercial Take of Bobcats in California from 1980-81 to 1983-84

Geographical Area	1980-81 Take	Change < to >	1981-82 Take	Change < to >	1982-83 Take	Change < to >	1983-84 Take
Northeast	343	16	397	31	522	-37	328
Northwest	1787	-16	1501	-24	1141	-13	997
North Coast	434	29	559	-4	538	-38	332
Central Coast	321	-63	118	6	125	-77	29
North Sierra	75	-39	46	41	65	-46	35
Central Sierra	449	-17	374	-29	267	-16	224
East Sierra	367	-10	332	-22	260	16	301
South Coast	3060	-21	2429	5	2546	-9	2318
South Sierra	1334	48	1971	-28	1428	10	1569
Southern California	1425	-7	1332	7	1419	-13	1230

Table 5. Bobcat Pelt Prices

Season	Average Price	Highest Price
1970-71	$ 10.86	not recorded
1971-72	$ 18.83	$ 30.00
1972-73	$ 29.33	$ 6.00
1973-74	$ 45.00	$ 110.00
1974-75	$ 50.00	$ 110.00
1975-76	$ 133.50	$ 300.00
1976-77	$ 76.00	$ 225.00
1977-78	$ 105.80	$ 185.00
1978-79	$ 120.00	$ 426.00
1979-80	$ 114.20	$ 313.00
1980-81	$ 129.90	$ 325.00
1981-82	$ 114.53	$ 325.00
1982-83	$ 105.85	$ 342.11
1983-84	$ 102.33	$ 380.00

Table 6. Average bobcat harvest per successful trapper per season in California

County	Season								
	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84
Butte	3.8	5.6	2.9	3.1	3.4	2.5			
Fresno		9.1	10.5	10.6	9.2	10.2	9.1	8.5	11.9
Humboldt	9.2	8.8	6.6	6	6.1	5.3	5.7	4.8	7.6
Inyo	10.6	8.3	10.9	10.5	7.3	8.5	5.0	5.3	7.8
Kern	5.3		14.6	26.9	10.6	11.0	10.8	12.2	16.5
Lake	4.5	5.3	5.7	10.0	6.4	4.7	5.9	4.6	5.9
Lassen		5.4	3.5	6.0	4.3	3.8	5.9	6.5	3.6
Los Angeles	6.8	6.6	8.6	7.6	14.8	14.1	8.1	8.8	13.5
Mendocino	4.4	6.7	5.9	8.0	5.9	6.1	4.5	5.4	6.1
Modoc		5.0	5.3	5.6	4.2	3.2	4.6	5.5	7.7
Monterey		8.1	9.1	9.2	11.3	16.3	14.2	11.7	14.7
Plumas	9.8	2.9	3.4	4.5	4.3		5.5	4.5	
Riverside				7.8	9.9	5.8	7.8	9.0	7.4
San Benito		10.9	8.7	9.0	9.8	13.0	9.0	9.8	
San Bernardino		16.9	17.4	19.3	17.5	14.7	9.2	10.0	12.0
San Diego		11.1		12.1	11.5	6.0	9.4	9.8	10.6
San Luis Obispo				9.1	9.0	13.9	8.5	10.6	14.4
Santa Barbara			19.4	16.9	16.8	15.2	13.6	12.2	16.6
Shasta	5.4	5.1	4.3	4.0	3.6	2.9	3.1	3.3	4.1
Siskiyou	6.2	4.3	5.1	6.7	4.4	3.8	5.7	5.1	5.2
Tehama	3.6	4.7	4.8	5.3	3.7	5.1	4.1	3.8	3.7
Trinity	2.5	3.7	4	5.4	4.0	3.3	3.3	4.4	2.5
Tulare		13.1	7.7	11.7	12.2	9.2	9.3	11.2	10.5
Ventura				7.1	10.0	9.4	10.4	11.2	10.4
State-wide	7.78	8.11	8.08	9.04	7.76	8.04	8.78	9.08	11.86
# Trappers harvesting	283	446	550	766	920	1007	909	821	488
# Trappers licensed	931	1692	1889	2378	3221	3201	3686	3901	1607

*County data from counties and years where more than ten trappers per county reported.

'able 7. Method of Commercial Take of Bobcats, 1983-84

ty	% Taken by Trap	% Taken by Dogs	% Taken by Calling	% Taken by Misc. Hunt.	% Salvaged Road Kill	% Method Unknown	Sample Size
lameda	100						4
lpine	100						15
mador	100						1
utte	93	7					29
alaveras	54	46					13
olusa	96		3	1			77
el Norte	94	6					77
l Dorado	49	49	2				51
resno	85	15					266
lenn	96	4					47
umboldt	64	36					299
mperial	100						25
nyo	100						214
ern	84	12	1	3			681
ings	100						59
ake	100						57
assen	93	2		4		1	84
os Angeles	100						402
adera	96	4					138
arin	41	59					34
ariposa	77	23					87
endocino	74	21	4				160
erced		100					3
doc	90	5	1	3	1		182
	100						72
onterey	80	19		1			471
apa	100						14
range	100						7
lacer	100						3
lumas	94					6	17
iverside	100						122
an Benito	83	17					150
an Bernardino	99			1			554
an Diego	93			6		1	354
an Luis Obispo	97	2		1			442
an Mateo		100					6
anta Barbara	98	2					584
anta Cruz	100						2
asta	74	19		5		2	150
erra		100					2
iskiyou	87	8	4	1			197
olano	100						3
onoma	84	13		3			31
anislaus	100						14
ehama	89	11					109
rinity	50	47				3	32
ulare	85	15					425
uolumne	71	29					72
entura	100						306
	100						19
uba	100						1
otal							7164

Table 8. Statistical Parameters of the Hunter Take of Bobcats during 1983, Poisson Distribution*

Frequency Distribution: No. of Bobcats Taken	No. of Hunters	Total Bobcats Taken
0	38	0
1	19	19
2	10	20
	$\Sigma f = 67$	$\Sigma yf = 39$

$$\bar{x} = \frac{\text{total bobcats taken}}{\text{total respondents}} = \frac{39}{11029} = .0035361$$

State-wide bobcat bag $\bar{x} = (\bar{x})$ (tot. no. license buyers) = $.0035361 * 507344 = 1794$

Assuming that bobcat take follows a Poisson distribution, confidence limits be assigned by knowing $\bar{x}$ and n (total no. of respondents).

$$\sigma_{\bar{x}} = \sqrt{\frac{\bar{x}}{n}} = \sqrt{\frac{.0035361}{11029}} = .0005662$$

Confidence interval of $\bar{x} = \bar{x} \pm t\sigma$

Confidence Levels	$\bar{x} \pm t\sigma$	Confidence Intervals for $\bar{x}$	Confidence Intervals for State-wide bag**
80%	$.0035361 \pm (1.35)(.0005662)$	$.0035361 \pm .0007644$	1406 to 2182
90%	$.0035361 \pm (1.65)(.0005662)$	$.0035361 \pm .0009342$	1320 to 2268
95%	$.0035361 \pm (1.96)(.0005662)$	$.0035361 \pm .0011098$	1231 to 2357
99%	$.0035361 \pm (2.576)(.0005662)$	$.0035361 \pm .0014585$	1054 to 2534

* After Shimamoto (1976)

** Calculated by multiplying confidence intervals for x by the total number of license buyers (= 507344)

Table 9. Licensed Sport Hunter Take of Bobcats, 1978-83

Year	Est. Licensed Hunter Take	No. Licensed Hunting Bobcats	Percent Successful	Days Hunted	Bobcats Take/Day
1978	5733	7566	45	57603	.100
1979	7462	5960	47	65340	.114
1980	3373	4843	59	32951	.102
1981	2585	4551	45	30192	.086
1982	2574	4408	41	32984	.078
1983	1794	3082	43	23184	.077

Table 10. Sport Hunting Tag Program Compliance, 1980-84

	Season			
	1980-81	1981-82	1982-83	1983-84
No. of Sport Hunting Tag Buyers	262	427	384	495
Estimated No. of Bobcat Hunters	3836	3642	3408	2594
Percent Tag Purchase Compliance	6.8	11.7	11.3	19.1
Take Reported by Sport Hunting Tag Return	70	113	87	107
Estimated Sport Hunting Take	2794	1862	1865	1291
Percent Take Reported Compliance	2.5	6.1	4.7	8.3

*Estimated number of bobcat hunters calculated by subtracting total number of licensed trappers taking bobcats from the total number of hunters estimated by annual Hunter Survey.

*Estimated sport hunting take calculated by subtracting estimated take by persons both licensed to hunt and trap from the reported licensed hunter take.

STATE OF CALIFORNIA

DEPARTMENT OF FISH AND GAME

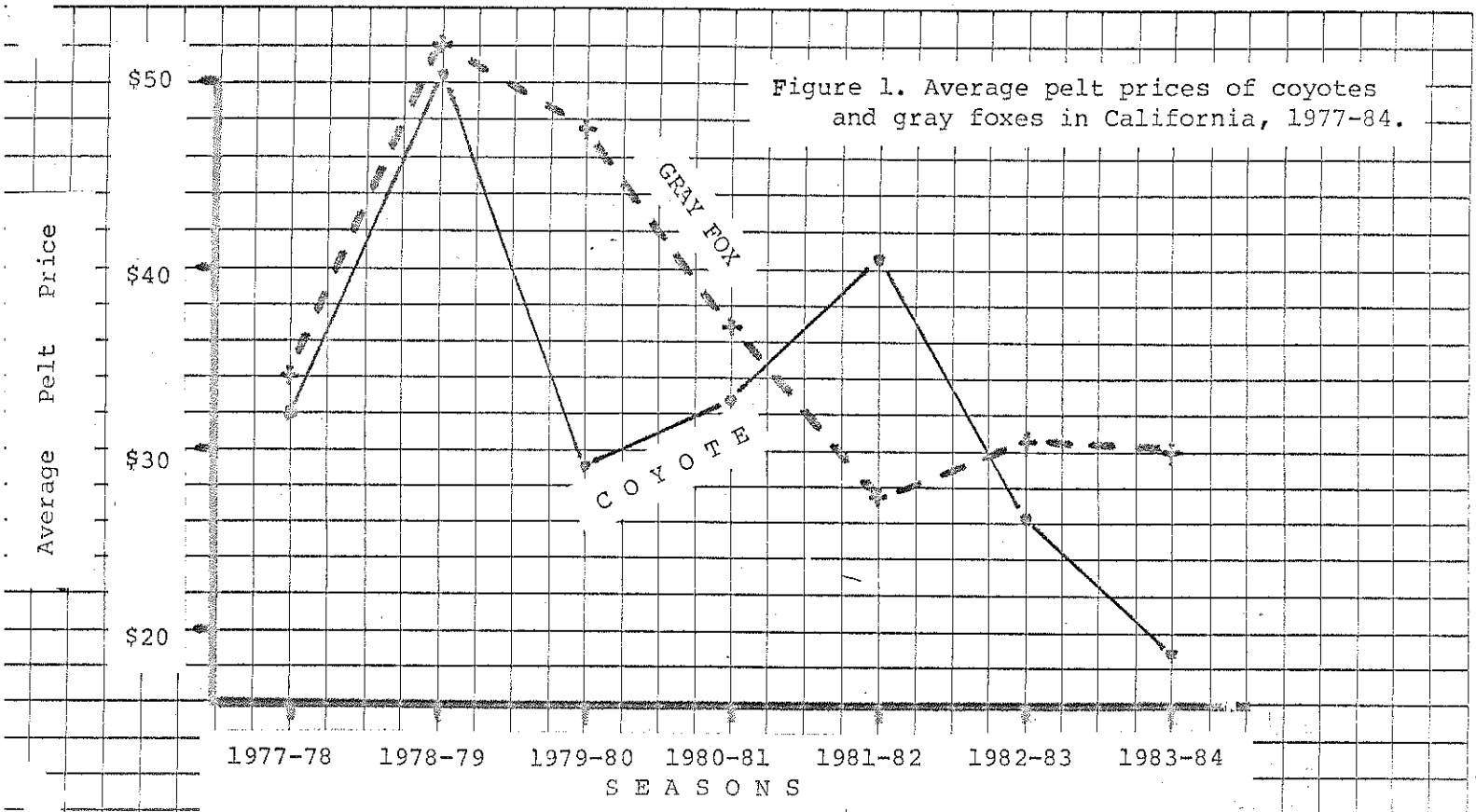

Figure 1. Average pelt prices of coyotes and gray foxes in California, 1977-84.

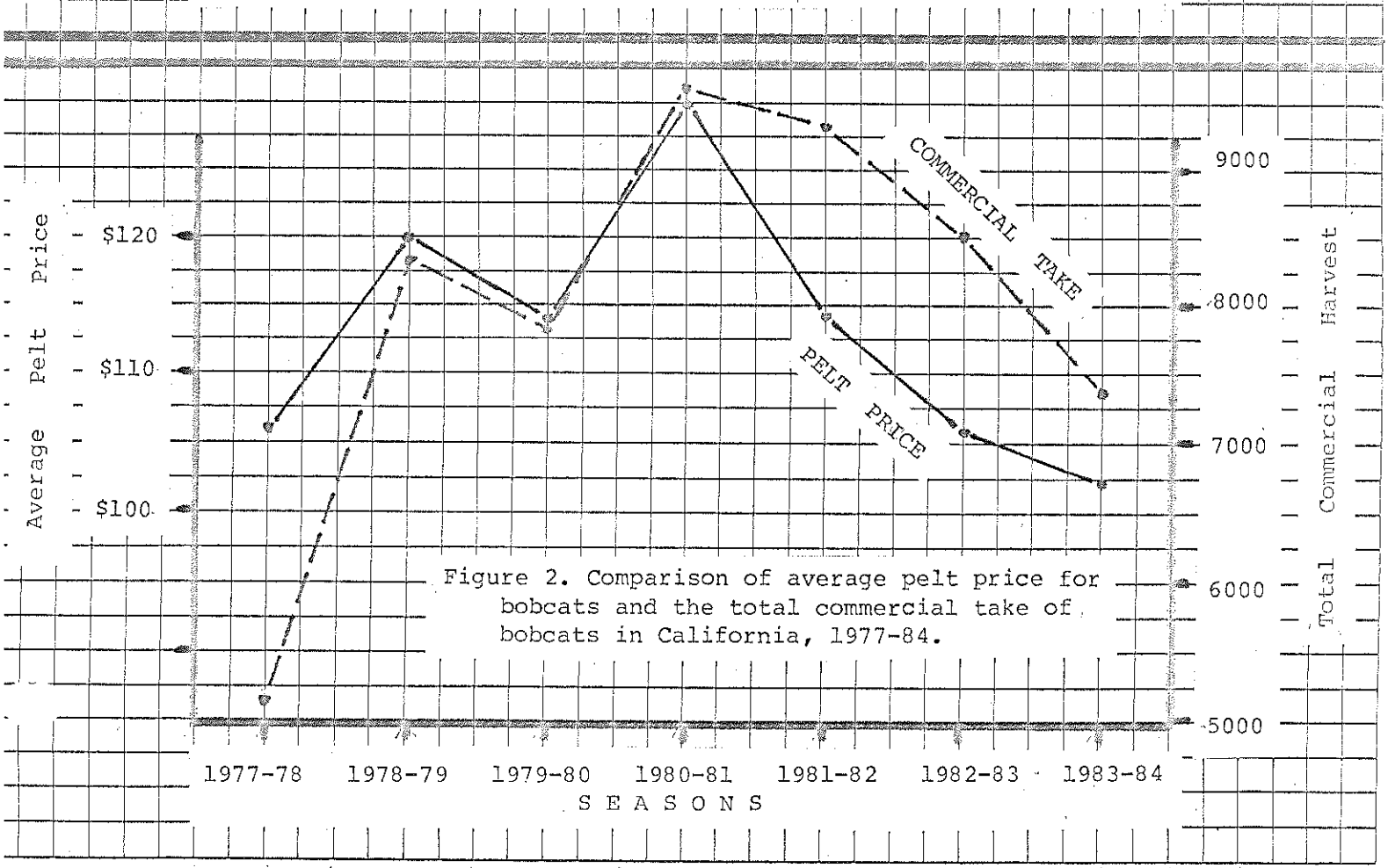

Figure 2. Comparison of average pelt price for bobcats and the total commercial take of bobcats in California, 1977-84.

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