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Subsistence Uses of Fish and Wildlife and the Exxon Valdez Oil Spill

by

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Alaska Department of Fish and Game

Division of Subsistence



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly-accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g			base of natural logarithm	e
hectare	ha			catch per unit effort	CPUE
kilogram	kg	all commonly-accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
kilometer	km			confidence interval	CI
liter	L	at	@	correlation coefficient (multiple)	R
meter	m	compass directions:		correlation coefficient (simple)	r
milliliter	mL	east	E	covariance	cov
millimeter	mm	north	N	degree (angular)	$^{\circ}$
		south	S	degrees of freedom	df
Weights and measures (English)		west	W	expected value	E
cubic feet per second	ft ³ /s	copyright	©	greater than	>
foot	ft	corporate suffixes:		greater than or equal to	≥
gallon	gal	Company	Co.	harvest per unit effort	HPUE
inch	in	Corporation	Corp.	less than	<
mile	mi	Incorporated	Inc.	less than or equal to	≤
nautical mile	nmi	Limited	Ltd.	logarithm (natural)	ln
ounce	oz	District of Columbia	D.C.	logarithm (base 10)	log
pound	lb	et alii (and others)	et al.	logarithm (specify base)	log ₂ , etc.
quart	qt	et cetera (and so forth)	etc.	minute (angular)	'
yard	yd	exempli gratia (for example)	e.g.	not significant	NS
		Federal Information Code	FIC	null hypothesis	H_0
Time and temperature		id est (that is)	i.e.	percent	%
day	d	latitude or longitude	lat. or long.	probability	P
degrees Celsius	°C	monetary symbols (U.S.)	\$, ¢	probability of a type I error (rejection of the null hypothesis when true)	α
degrees Fahrenheit	°F	months (tables and figures)	first three letters (Jan.,...,Dec)	probability of a type II error (acceptance of the null hypothesis when false)	β
degrees kelvin	K	registered trademark	®	second (angular)	"
hour	h	trademark	™	standard deviation	SD
minute	min	United States (adjective)	U.S.	standard error	SE
second	s	United States of America (noun)	USA	variance	
		U.S.C.	United States Code	population	Var
Physics and chemistry		U.S. state	two-letter abbreviations (e.g., AK, WA)	sample	var
<i>all atomic symbols</i>					
alternating current	AC	Measures (fisheries)			
ampere	A	fork length	FL		
calorie	cal	mideye-to-fork	MEF		
direct current	DC	mideye-to-tail-fork	METF		
hertz	Hz	standard length	SL		
horsepower	hp	total length	TL		
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

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VALDEZ OIL SPILL**

by

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ABSTRACT

The Exxon Valdez oil spill occurred in or near areas used by 18 rural communities for subsistence hunting, fishing, and gathering. Prior to the spill, the Division of Subsistence of the Alaska Department of Fish and Game had conducted baseline studies of subsistence uses in each of these communities. Most of the results of these studies appear in the division's technical paper series. Since the spill, the division has been involved in a four component oil spill response project. The overall goal of the project is to provide communities with reliable information that they can use in their responses to the spill's effects. The four components are: 1) a project which tests subsistence foods for evidence of hydrocarbon contamination; 2) a harvest survey which will update subsistence data for 1989; 3) assistance in designing regulatory changes made necessary by damage to harvest areas; and 4) a public communications program. The paper will describe each of these components and present any preliminary findings which are available.

INTRODUCTION¹

On March 24, 1989, the grounding of the oil tanker Exxon Valdez on Bligh Reef spilled about 11 million gallons of crude oil into Alaska's Prince William Sound. The oil spill has fouled, to varying degrees, the lands and waters used for subsistence hunting, fishing, and gathering by 18 rural communities from Cordova and Tatitlek in the east to Perryville and Ivanof Bay on the Alaska Peninsula to the west (Figure 1). As shown in Table 1, in 1986 these communities had about 15,600 residents (excluding the Kodiak Coast Guard base). In 1980, the majority of the population in 15 of these communities was Alaska Native, mostly Alutiiq. The remaining three (Cordova, Seldovia, and Kodiak city) also had substantial Alaska Native populations. As shown below, subsistence activities have remained central to the economies, traditions, and ways of life of each of these communities.

The Division of Subsistence of the Alaska Department of Fish and Game was created in 1978 to compile and make available to the public, information on "all aspects of the role of subsistence hunting and fishing in the lives of the residents of the state" (AS 16.05.094). The division conducts community-based research using a variety of data gathering methods, including systematic household surveys, key respondent interviews, participant observation, mapping, harvest calendars, and archival research. Most division researchers have training in anthropology and other social sciences.

Since the Exxon Valdez disaster, the division's work in the spill area has been part of the state's oil spill response program, and not part of the "damage assessment" program which is also underway. As noted in this paper, the division's major goal, therefore, has been to provide needed services and useful information to the affected communities, rather than focus research strictly on documenting the spill's

¹ Acknowledgements. Many individuals have contributed to the division's oil spill response program. The first to be mentioned must be Philippa (Pippa) Coiley, the division's "oil spill coordinator" whose efforts have been tireless, extremely effective, and much appreciated by everyone. Bob Wolfe, the division's research director, has made invaluable contributions to all phases of the work. Other division employees who have played (and continue to play) major roles have been Ron Stanek, Lee Stratton, Craig Mishler, Lisa Scarbrough, Janet Cohen, Rachel Mason, Deborah Robinson, Bob Walker, Louis Brown, and Andy Williams. Village technicians Ann Jackson and Mary Kompkoff helped maintain lines of communication with Tatitlek and Chenega Bay. I also thank the many village assistants who served as skiff operators, fishers, and assistant interviewers. Finally, thanks to all the members of the Oil Spill Health Task Force for their contributions to the research design and support of the division's program.

effects for **future analysis** or litigation. But, certainly, the data that result from the division's studies will have applications **beyond** the oil spill response period. The purpose of this paper, then, is to describe the division's oil spill response program, the purposes of each program component, and the kinds of data that will result from the program.

BACKGROUND

Division of Subsistence Research Prior to the Spill

The division has conducted "baseline" subsistence research in each of the rural communities in the oil spill area. Results of this research appear in the division's technical paper series and other publications (Fall and Walker 1989; KANA 1983; Morris 1987; Stanek 1985, 1989; Stratton 1989, 1990; Stratton and Chisum 1986; cf. Walker et al. 1988). For each community, there is comprehensive information for at least one year on harvest quantities, levels of participation in subsistence activities, timing of subsistence harvests, areas used for hunting, fishing, and gathering, distribution of harvests, methods and means of harvests, and techniques of preparing and preserving wild foods, as well as demographic and other economic data.

Patterns of Subsistence Use In the Spill Areas

Table 2 summarizes some information about subsistence harvests in rural communities of Prince William Sound, lower Cook Inlet, the Kodiak Island Borough, and the Alaska Peninsula in the 1980s. With the exception of Seldovia, per capita harvests exceed those of more populated, urbanized areas (Figure 2; cf. Wolfe and Walker 1987), ranging from about 150 pounds for the larger communities of Cordova and Kodiak to 400 pounds or more for some of the villages. These are substantial harvests, considering that the average family in the western United States purchases about 222 pounds of meat, fish, and poultry

each year. This section will briefly describe some findings for four representative communities, one from each area.

Prince William Sound: Tatitlek

Tatitlek, a predominantly Alutliq community with 108 people in 1986, is the oldest continuously inhabited community on Prince William Sound. According to division research, Tatitlek households harvested 340 pounds per capita of wild foods in 1987-88 (Stratton 1990). Every sampled household used, harvested, received, and gave away wild foods (Table 3, Figure 3). Harvests were diverse, with the average household using 22.6 kinds of subsistence foods in the 1987-8 study year (Figure 4). As measured in pounds edible weight (Figure 5), the harvest was composed of 22 percent salmon, 25 percent other fish (halibut, rockfish etc.), 4 percent marine invertebrates, 23 percent game (deer, goats, and black bears), 22 percent marine mammals, 1 percent birds, and 3 percent wild plants. Preliminary data for 1988-9 indicate a higher harvest at 559 pounds per person (Table 2).

Lower Cook Inlet: English Bay

According to state census records, the village of English Bay had about 205 people in 1986, most of whom were Alaska Native. Research conducted in the late 1970s and 1980s (Stanek 1986, 1989; The North Pacific Rim 1981) has demonstrated the continuing significance of subsistence harvests for English Bay families. In 1987, the subsistence harvest was about 303 pounds per person. The harvest was composed of 41 percent salmon, 37 percent other fish, 6 percent marine invertebrates, 3 percent game, 7 percent marine mammals, 1 percent birds, and 5 percent wild plants (Figure 6). All but one surveyed household used wild foods in 1987 (97 percent), and 93.9 percent harvested subsistence resources. On average, English Bay households used 25.1 kinds of wild foods in 1987.

ISSUES AND QUESTIONS

Since the spill, the division's program in the oil spill area has been directed towards assisting in answering several major questions. This has led the division into some new areas of research. Indeed, the first question that subsistence harvesters raised following the spill is the one that has required the greatest efforts to address. That question is: Are subsistence foods harvested in the oil spill area safe to eat? When people in Tatitlek first raised this issue, the Alaska Department of Environmental Conservation (DEC) responded that the best way to know if foods are free from oil is to smell and taste them. This "organoleptic" test is the primary method used by DEC's laboratory in Palmer for checking the quality of commercial seafoods. A health bulletin issued by the Alaska Department of Health and Social Services (ADHSS 1989a) contained similar advice. Tatitlek residents, and later the residents of other villages, received this advice with skepticism. Indeed, soon after the spill, subsistence harvests virtually ceased in several communities, including Tatitlek, Chenega Bay, English Bay, Port Graham, and Ouzinkle, because of this uncertainty. At the time, there were no plans for chemical analyses of subsistence foods.

This raised a related question: Which organizations are responsible for addressing the issue of subsistence food safety? Who should conduct additional tests? Who should be providing villages with health advice? Who should decide what that advice will be? No single agency could effectively address each of these issues alone.

Yet another set of questions concern the changes in subsistence activities that have occurred following the spill. Changes could occur in harvest quantities, the composition of harvests, levels of participation in harvest and use activities, the degree of sharing of resources, the timing of harvests, and harvest areas. These questions are, of course, ones of damage or impact assessment. But the division, and the affected communities, require such information as part of a response program as well. For example, such data can be used to justify emergency openings of alternative areas for subsistence harvesting activities. Also, these data are basic to the state's ongoing resource management and allocation system. As such, the data must be accessible to resource managers, resource users, and the general public.

Kodiak Island Borough: Old Harbor

Old Harbor is the largest village in the Kodiak Island Borough, with 380 people in 1986. Most of the population is Alaska Native. Subsistence harvests are substantial at Old Harbor. Data for 1983 indicate a per capita harvest of 466 pounds of wild foods (KANA 1983). Every sampled household used and harvested subsistence resources in 1983. Again, the use of subsistence foods was diverse, with an average of 15.4 kinds of resources per household. The harvest was made up of 45 percent salmon, 13 percent other fish, 7 percent marine invertebrates, 15 percent game, 16 percent marine mammals, and 4 percent birds (Figure 7). Harvests measured in 1986 were about the same, 418 pounds per person (Table 2).

Alaska Peninsula: Perryville

Perryville had a population of 127 people in 1986, most of whom were Alutiq. Like Tatitlek, English Bay, and Old Harbor, Perryville had a relatively high level of subsistence production as documented by division research, 391 pounds per person in 1984 (Morris 1987). As with the other villages also, virtually all households in Perryville used (100 percent), harvested (100 percent), and received (100 percent) wild foods. On average, Perryville households used 21.5 kinds of resources in 1984. The harvest in 1984 was made up of 59 percent salmon, 11 percent other fish, 3 percent marine invertebrates, 22 percent game (caribou, moose), 5 percent marine mammals, and 2 percent birds (Figure 8).

In summary, these recent studies illustrate the important dimensions of subsistence uses in the rural coastal communities of the area affected by the Exxon Valdez oil spill (cf. Davis 1979, 1986; TNPR 1981). These studies also establish a baseline by which future changes in subsistence activities can be identified and measured.

Finally, there is the question of how to communicate effectively with the affected communities. Before the spill, subsistence harvesters had made decisions about hunting and fishing activities for thousands of years based upon the accumulated knowledge of their communities. The oil spill added a new and unfamiliar dimension to this decision-making, thereby disempowering the residents of each community. The essential question was, and continues to be: How can useful, trustworthy information be provided to subsistence harvesters so they can regain some control over their lives?

RESPONSES

The division's oil spill response program has consisted of four components which attempt to address the questions listed above. By developing this program, the division has acknowledged its responsibility to be part of the broad response effort. These four components are: 1) subsistence foods collection and testing for hydrocarbon contamination; 2) collection of harvest data and other subsistence use information for the post-spill period; 3) assistance to rural communities in proposing regulatory responses to lost fishing and hunting opportunities; and 4) a public outreach (communications) project. The following section will briefly describe each of these components.

Subsistence Foods Testing

The Pilot Study

As noted above, subsistence harvests stopped around several communities soon after the spill because of the uncertainty about the safety of subsistence foods. After consultation with numerous state and federal agencies and native organizations (e.g. Indian Health Service, the North Pacific Rim, DEC, HSS, and the Food and Drug Administration [FDA]), the division, in collaboration with DEC and the FDA began a "pilot study" designed to supplement the state's organoleptic testing program. The goal was to begin to provide villages with information they needed to make informed decisions about subsistence

harvests. Using maps of harvest areas from previous division research, researchers selected sites near Tatitlek, Chenega Bay, English Bay, and Port Graham for collection of samples of subsistence foods. The site selections were reviewed with village representatives. Accompanied by village assistants, division researchers collected more than 100 samples from over a dozen areas in May 1989. The assistants evaluated each sample in the field for signs of oil contamination. A portion of the samples was sent to DEC for organoleptic testing.

Unfortunately, the FDA was only able to perform chemical tests on tissue from 13 of these samples. The tests were designed primarily to identify the levels of polycyclic aromatic hydrocarbons (PAHs) in the bile and edible tissues. PAHs are among the most toxic components of petroleum and some are known carcinogens. The FDA found (FDA 1989, OSHTF 1989a, ADHSS 1989b,c) that 10 "organoleptically clean" samples had no PAHs or very low levels as measured in parts per billion. Eating foods with these levels did not represent a health risk according to the FDA. But two samples of shellfish taken at Windy Bay and deemed oiled by local assistants in the field had higher PAH values than usually found in areas not contaminated by oil. Insufficient tissue from these samples was available to perform the more detailed tests required for a health risk assessment. The FDA concluded that additional monitoring and testing should be done.

The Oil Spill Health Task Force

At about the time the division was initiating its pilot study, an ad hoc group of state, federal, and native organizations began meeting at the Alaska Native Medical Center in Anchorage as the "Oil Spill Health Task Force" (OSHTF), chaired by the Indian Health Service. The composition of this group is listed in Table 4. The OSHTF has served to coordinate and review research on the question of subsistence foods safety, to develop a consensus on health issues, and to communicate the findings of the studies to the villages.

Exxon-Funded Dames & Moore/NOAA Study

Following the pilot study, the FDA was unable to continue testing samples of subsistence foods collected by the division and the division did not have adequate funding to pay for these tests. Then, biologists with Dames & Moore, a scientific consulting firm under contract to Exxon, requested the division's assistance to design and implement a more comprehensive collection and testing program. After consulting with TNPR and KANA and receiving assurances that full disclosure of findings would occur, the division agreed to assist with the project. Exxon contracted with NOAA's National Marine Fisheries Service laboratory in Seattle to perform the chemical tests of the samples, adding much credibility to the project. Also, division personnel travelled to some of the affected villages, met with village leaders, and endorsed the project.

The Dames & Moore/Exxon/NOAA project included collection of samples of subsistence foods from traditional harvest areas near 11 communities in Prince William Sound, lower Cook Inlet, and Kodiak Island during three phases of collection in July, August, and September 1989 (Varanasi 1989a, 1989b, 1989c, 1990). Whenever possible, division researchers and NOAA personnel accompanied the Dames & Moore biologists and Exxon consultants to each collection site.

The NOAA lab conducted 365 tests to measure the levels of PAHs in the bile and edible tissues of the samples. These tests are highly sensitive, measuring PAH levels down to less than one part per billion. The results of the first round of tests were available by late August, shortly after the results of the division's pilot study. At the request of the state epidemiologist, NOAA then assembled an "expert panel of toxicologists" which met in Seattle on September 14 to review the findings (OSHTF 1989b; ADHSS 1989c,d). The panel concluded that the levels of PAHs found in fish were low and of no health concern. Most shellfish tested were also safe, but some, such as those collected from the contaminated beaches at Windy Bay, had unacceptably high levels of oil contamination and were unsafe to eat. The expert committee concluded that shellfish "should not be collected from obviously oil-contaminated areas."

After receiving the panel's report, a subcommittee of the OSHTF met in Anchorage to review the findings. The division drafted a "script" for a series of village meetings, which was reviewed by the

subcommittee and the full OSHTF as well (OSHTF 1989c). These meetings took place in 10 communities in Prince William Sound, lower Cook Inlet, and the Kodiak Island Borough in September and October. Division personnel assisted with the presentation and answered questions about the program.

Findings from the second and third round of tests performed at the NOAA laboratory on samples collected by Dames & Moore were consistent with those of the first round of tests, according to the conclusions of a second meeting of the expert panel in February 1990 (OSHTF 1990a). (For a full discussion of the findings so far, see Varanasi et al. 1990.)

Despite these efforts, many questions remain unanswered and concerns still exist in the villages. These concerns appeared, for example, during the village meetings in September and October. Villagers asked why more samples had not been tested from more areas. How could they be sure that resources were safe based upon the limited number of samples and sites examined so far? Also, little or no information was available about other important resources, such as deer and marine mammals. Village residents also pointed out that health bulletins and news releases often did not reach most of the families in their communities, leaving people uninformed and, sometimes, afraid. Finally, some community representatives wondered why the subsistence foods testing project was being run by Exxon rather than the state.

1990 Collection and Testing Program

In order to address these continuing issues, in late 1989 the division received funding to continue a subsistence foods collection and testing program in the winter and spring of 1990. If additional funds are obtained, a third cycle of collection and testing will take place in the summer as well. The project was designed with the collaboration of the OSHTF to be consistent with the earlier testing efforts. Sites near each village that had previously been tested were selected to monitor any changes to hydrocarbon levels. Additionally, other sites or resources can be selected as "special assessments" after consultation with the communities. Also, we have added harvest areas of five Alaska Peninsula communities to the testing program. The NOAA lab will again conduct the tests and provide summary reports.

Also, the division assisted NOAA's marine mammal tissue archival project in obtaining village assistance to collect additional marine mammal samples in Prince William Sound and lower Cook Inlet. The division will finance the testing of these samples in the NOAA laboratory. Finally, the division has arranged for the laboratory at Texas A&M University to conduct tests of samples of deer collected by the Department of Fish and Game in Prince William Sound and the Kodiak Island area.

Household Harvest Survey

As noted above, the division has conducted at least one annual harvest survey in each of the rural communities of the oil spill area. It had been the division's intent to update these data periodically in the future. Because of the important questions and data needs arising from the spill, however, the division decided to accelerate our schedule for "harvest updates" in these communities. Fifteen communities are included in the harvest survey, including Tatitlek and Chenega Bay in Prince William Sound; English Bay and Port Graham in lower Cook Inlet; Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions in the Kodiak Island Borough; and Chignik, Chignik Lagoon, Chignik Lake, Ivanof Bay, and Perryville on the Alaska Peninsula.

A survey questionnaire was designed to collect data consistent with earlier division research. Some additional questions were added which asked respondents to assess subsistence activities in 1989 in comparison with other years. Table 5 lists the kinds of data collected with the questionnaire. After approval of the project from each village council or council representative, research began in most of the communities in late January 1990. As of March 1, 1990, 349 interviews had been completed in 13 of the 15 study communities (Table 6).

Preliminary results of this research should be available by June 1990. These will be distributed to each village along with an offer from the division to assist in using the information. A final report will be prepared by the fall of 1990.

Fish and Hunting Regulatory Responses and Other Applications

In 1989, the division worked with communities in the oil spill area to identify alternatives to traditional fishing areas that had been contaminated. In several cases, emergency changes to existing subsistence fishing regulations were necessary. An example is opening Eshamay Lagoon, Jackpot Bay, Sawmill Bay, and Crab Bay to subsistence fishing by Chenega Bay residents (ADF&G 1989). These waters had been protected by booms and had escaped oiling. The remainder of Chenega Bay's traditional fishing area was closed because of "moderate to heavy oil contamination." In addition, during the response period, division staff, in consultation with village representatives, used harvest area maps and technical papers to identify subsistence harvest areas as priorities for protection and clean-up activities.

Public Outreach Program

Finally, the division has received funding to hire an information officer to design and implement a public communications program for the OSHTF. The goal of the program is to provide subsistence users in the oil spill area with information they need about subsistence food safety. The program will include news releases, newsletters, a video tape, and public meetings. The first newsletter was mailed in late February (OSHTF 1990b), with a second now in production. This program will run through June 1990.

THE FUTURE

The division's oil spill response program will continue at least through June 1990. By that time, results from five rounds of subsistence foods testing will be available (one from the pilot study, three from the Exxon study, and one from the division's current project). (Results from the division's spring collection phase [the sixth round of testing] will be distributed in early August.) Data for marine mammals and deer will also be available. Six newsletters and a video tape will have been distributed to assist subsistence users in making decisions about harvesting activities. The preliminary results of the household interviews

will also be completed by June. Additionally, the division will work with communities to identify regulatory actions needed to provide subsistence harvesters with alternatives to harvesting in traditional areas still contaminated by oil. The OSHTF continues to meet to review these efforts and coordinate research.

It is, of course, very unlikely that all the questions about the spill's effects on subsistence resources and subsistence uses will be answered by this June. The division has proposed that at least one more round of foods collection and testing occur this summer. If questions remain, further rounds of collection and testing should take place over the winter and spring of 1991 as well. If subsistence harvest areas remain contaminated, further regulatory actions may be necessary. Analysis of the survey data will occur, and a second round of household interviews, covering the 1990 harvest year, may be appropriate. However, funding for these programs remains, at this time, uncertain.

REFERENCES CITED

Alaska Department of Fish and Game

1989 Subsistence Fishing Emergency Order No.: 2-F-E-13-89. Issued at Cordova, June 6, 1989. Division of Commercial Fisheries.

Alaska Department of Health and Social Services

1989a Oil Spill Public Health Advice. State of Alaska Epidemiology Bulletin No. 6. May 5, 1989. Division of Public Health, Section of Epidemiology. Anchorage.

1989b Oil Spill Public Health Advice - Report No. 2. State of Alaska Epidemiology Bulletin No. 8. July 14, 1989. Division of Public Health, Section of Epidemiology. Anchorage.

1989c Oil Spill Public Health Advice - Report No. 3. State of Alaska Epidemiology Bulletin No. 16. September 22, 1989. Division of Public Health, Section of Epidemiology. Anchorage.

1989d Oil Spill Public Health Advice - Report No. 4. State of Alaska Epidemiology Bulletin No. 17. October 13, 1989. Division of Public Health, Section of Epidemiology. Anchorage.

Alaska Department of Labor

1989 Alaska Population Overview 1986. Administrative Services Division. Juneau.

Davis, Nancy Yaw

1979 Western Gulf of Alaska Petroleum Development Scenarios: Kodiak Native Sociocultural Impacts. Alaska OCS Socioeconomic Studies Program Technical Report No. 41. Springfield, Virginia: National Technical Information Service.

1986 A Sociocultural Description of Small communities in the Kodiak/Shumagin Region. Minerals Management Service Social and Economic Studies Program Technical Report No. 121. Anchorage.

Fall, James A. and Robert J. Walker

1989 Subsistence Harvest Survey Data for Six Kodiak Island Borough Communities, 1986. A Report to the Kodiak Area Native Association. Anchorage. (Draft)

Food and Drug Administration (FDA)

1989 Summary of Analyses of Subsistence Seafood from Pilot Study. Center for Food Safety and Applied Nutrition. Washington.

Kodiak Area Native Association

1983 Kodiak Island Area Local Fish and Game Resource Guide. Prepared with assistance from the Department of Fish and Game Division of Subsistence. Kodiak.

Morris, Judith M.

1987 Fish and Wildlife Uses in Six Alaska Peninsula Communities: Egegik, Chignik, Chignik Lagoon, Chignik Lake, Perryville, and Ivanof Bay. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 151. Juneau.

The North Pacific Rim

1981 Chugach Region Community Subsistence Profiles. Anchorage.

Oil Spill Health Task Force (OSHTF)

1989a "Results of ADF&G Pilot Study of Subsistence Foods Testing Released by FDA."
Report dated 8/25/89. Files, Division of Subsistence, Anchorage.

1989b Subsistence foods and Oil: Results of Subsistence Foods Test. "Script" for village meetings. September 25, 1989. Files, Division of Subsistence, Anchorage.

1989c Interim Findings of Toxicological Expert Committee for Evaluating Data Related to the Consumption of Marine Subsistence Foods (EXXON VALDEZ Oil spill).
Report dated September 14, 1989. Seattle, Washington. Files, Division of Subsistence, Anchorage.

1990a Findings of Toxicological Expert Committee for Evaluating Data Related to the Consumption of Marine Subsistence Foods (EXXON VALDEZ Oil spill).
Report dated February 21-22, 1990. Seattle, Washington. Files, Division of Subsistence, Anchorage.

1990b February 1990 Newsletter. Prepared by Division of Subsistence. ADF&G. Anchorage.

Stanek, Ronald T.

1985 Patterns of Resource Use in English Bay and Port Graham, Alaska. Department of Fish and Game, Division of Subsistence Technical Paper No. 104. Juneau.

1989 English Bay and Port Graham Resource Harvest Update. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 176. Juneau.

Stratton, Lee

1989 Resource Uses in Cordova, a Coastal Community of Southcentral Alaska. Department of Fish and Game, Division of Subsistence Technical Paper No. 153. Juneau.

1990 Resource Harvests and Use in Tatitlek, Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 181. Juneau. (Draft)

Stratton, Lee and Evelyn B. Chisum

1986 Resource Use Patterns in Chenega, Western Prince William Sound: Chenega in the 1960s and Chenega Bay 1984-1986. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 139. Juneau.

United States Department of Commerce

1980 Census of Population and Housing, 1980 -- Summary Tape File 3A. On file, Division of Subsistence, Anchorage.

1984 American Indian Areas and Alaska Native Villages: 1980. 1980 Census of Population Supplementary Report. Bureau of the Census. Washington: U.S. Government Printing Office.

Varanasi, Usha, Sin-Lam Chan, William D. MacLeod, John E. Stein, Donald W. Brown, Douglas G. Burrows, Karen L. Tilbury, Catherine A. Wlgren, Tom Horn, Susan M. Pierce

1989a Survey of Subsistence Fish and Shellfish for Exposure to Oil Spilled from the EXXON VALDEZ, Interim Report (Cycle I). Environmental Conservation Division, Northwest Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

1989b Survey of Subsistence Fish and Shellfish for Exposure to Oil Spilled from the EXXON VALDEZ, Interim Report (Cycle II). Environmental Conservation Division, Northwest Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

1989c Survey of Subsistence Fish and Shellfish for Exposure to Oil Spilled from the EXXON VALDEZ, Interim Report (Cycle III). Environmental Conservation Division, Northwest Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

1990 Survey of Subsistence Fish and shellfish for Exposure to Oil Spilled from the EXXON VALDEZ, Summary (Cycles I-III). Environmental Conservation Division, Northwest Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

Walker, Robert J., David B. Andersen, and Louis Brown

1988 Community Profile Database Catalog. Alaska Department of Fish and Game, Division of Subsistence. Anchorage.

Wolfe, Robert J. and Robert J. Walker

1987 Subsistence Economies in Alaska: Productivity, Geography, and Development Impacts. Arctic Anthropology 24(2):56-81.

TABLE 1. RURAL COMMUNITIES IN THE EXXON VALDEZ OIL SPILL AREA^a

<u>Community</u>	<u>1986 Population</u>	<u>Percent Alaska Native, 1980</u>
<i>Prince William Sound</i>		
Chenega Bay	60 ^b	77.0% ^b
Cordova	2,053	15.2%
Tatitlek	108	77.9%
<i>Lower Cook Inlet</i>		
English Bay	205	79.0%
Port Graham	195	87.6%
Seldovia	552	24.4%
<i>Kodiak Island Borough</i>		
Akhiok	123	96.2%
Karluk	107	100.0%
Kodiak City	6,619	14.0%
Kodiak Station ^c	1,715	NA
Larsen Bay	169	83.3%
Old Harbor	380	92.6%
Ouzinkie	195	94.2%
Port Lions	296	73.5%
Balance ^d	3,967	NA
<i>Alaska Peninsula</i>		
Chignik Bay	155	53.4%
Chignik Lagoon	88	85.4%
Chignik Lake	146	89.1%
Ivanof Bay	41	92.5%
Perryville	127	92.8%
TOTAL	15,586	

^a Based on classification of the Alaska Joint Board of Fisheries and Game.

^b Based on Division of Subsistence harvest survey (Stratton and Chisum 1986); data are for 1985-6.

^c Coast Guard Base. Population deleted from regional total.

^d Includes Chiniak.

Sources: Alaska Department of Labor 1989; U.S. Department of Commerce 1980, 1984; Stratton and Chisum 1986

TABLE 2. WILD RESOURCE HARVESTS IN COMMUNITIES OF COASTAL SOUTHCENTRAL ALASKA, 1980s.

<u>Community</u>	<u>Year</u>	<u>Per Capita Harvest, Pounds</u>	<u>Percent of Harvest Composed Of:</u>						
			<u>Salmon</u>	<u>Other Fish</u>	<u>Marine Invert.</u>	<u>Game</u>	<u>Marine Mammals</u>	<u>Birds</u>	<u>Plants</u>
<i>Prince William Sound</i>									
Chenega Bay	1984-5	309	21	8	2	18	49	1	1
Chenega Bay	1985-6	361	21	16	1	20	39	1	1
Cordova	1985	152	39	23	6	26	1	2	4
Cordova	1988	b	b	b	b	b	b	b	b
Tatitlek ^a	1987-8	340	22	25	4	23	22	1	3
Tatitlek ^a	1988-9	559	39	19	5	13	20	2	3
<i>Lower Cook Inlet</i>									
English Bay ^a	1987	303	41	37	6	3	7	1	5
Port Graham ^a	1987	251	47	33	6	2	5	1	6
Seldovia	1982	52	35	25	16	15	0	1	8
<i>Kodiak Island Borough</i>									
Akhiok	1983	564	43	6	9	8	28	7	NA
Akhiok	1986	158	66	4	8	20	1	1	1
Chiniak	1983	204	34	25	12	27	2	c	NA
Karluk	1983	832	67	9	2	8	10	4	NA
Karkuk	1986	381	66	11	1	12	7	2	1
Kodiak City	1983	143	28	43	12	15	2	c	NA
Larsen Bay	1983	388	40	17	10	16	14	3	NA
Larsen Bay	1986	205	48	16	12	19	2	1	2
Old Harbor	1983	466	45	13	7	15	16	4	NA
Old Harbor	1986	418	43	9	6	15	25	2	<1
Ouzinkie	1983	358	44	15	14	10	8	9	NA
Ouzinkie	1986	401	46	16	7	17	8	6	1
Port Lions	1983	267	33	34	14	14	3	3	NA
Port Lions	1986	323	47	15	10	23	2	2	1

TABLE 2. (continued) WILD RESOURCE HARVESTS OF COMMUNITIES OF COASTAL SOUTHCENTRAL ALASKA, 1980s.

<u>Community</u>	<u>Year</u>	<u>Per Capita Harvest, Pounds</u>	<u>Percent of Harvest Composed Of:</u>						
			<u>Salmon</u>	<u>Other Fish</u>	<u>Marine Invert.</u>	<u>Game</u>	<u>Marine Mammals</u>	<u>Birds</u>	<u>Plants</u>
<i>Alaska Peninsula</i>									
Chignik Bay	1984	194	74	11	4	7	3	1	NA
Chignik Lagoon	1984	229	55	8	7	26	1	3	NA
Chignik Lake	1984	282	52	5	1	39	1	2	NA
Ivanof Bay	1984	445	62	3	6	22	5	3	NA
Perryville	1984	391	58	11	3	22	5	1	NA

a Preliminary data.

b Data analysis underway; preliminary results not yet available.

c Included with game.

Sources: KANA 1983; Fall and Walker 1989; Morris 1987 ; Reed 1985; Stanek 1985, 1989; Stratton 1989, 1990; Stratton and Chisum 1986; Walker et al 1988.

TABLE 3. CHARACTERISTICS OF WILD RESOURCES USES IN FOUR COMMUNITIES OF COASTAL SOUTHERN ALASKA

<u>Community</u>	<u>Year</u>	Mean Number of Resources <u>Used per HH</u>	<u>Percent of Households that:</u>				
			<u>Used Resources</u>	<u>Attempted a Harvest</u>	<u>Harvested Resources</u>	<u>Received Resources</u>	<u>Gave Away Resources</u>
Tatitlek, Prince William Sound	1987-8	22.6	100.0%	100.0%	100.0%	100.0%	100.0%
English Bay, Lower Cook Inlet	1987	25.1	97.0%	93.9%	93.9%	93.9%	93.9%
Old Harbor, Kodiak Island	1983	15.4	100.0%	NA	100.0%	81.6%	77.6%
Perryville, Alaska Peninsula	1984	21.5	100.0%	100.0%	100.0%	100.0%	100.0%

Sources: KANA 1983; Morris 1987; Stanek 1989; Stratton 1990; Walker et al 1988

TABLE 4. COMPOSITION OF THE OIL SPILL HEALTH TASK FORCE (OSHTF)

THE INDIAN HEALTH SERVICE (IHS)

ALASKA DEPARTMENT OF HEALTH AND SOCIAL SERVICES, EPIDEMIOLOGY SECTION

THE NORTH PACIFIC RIM (TNPR)

KODIAK AREA NATIVE ASSOCIATION (KANA)

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC), DIVISION OF ENVIRONMENTAL HEALTH

ALASKA DEPARTMENT OF FISH AND GAME, DIVISION OF SUBSISTENCE

GOVERNOR'S OFFICE, STATE OF ALASKA, OIL SPILL COORDINATOR'S OFFICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

EXXON

TABLE 5. TOPICAL CONTENT OF DIVISION OF SUBSISTENCE HARVEST SURVEY QUESTIONNAIRE

DEMOGRAPHY. For each household member:

- Birth date
- Birthplace
- Length of residency in community
- Relationship to household head
- Ethnicity
- Level of formal education
- Months resided in village in 1989
- Plus: information on temporary residents of household in 1989

COMMERCIAL FISHING.

- Participation in each fishery in 1988 and 1989
- Permit holders and crew members by person id number
- Amount of each resources remove from commercial harvests for home use

SUBSISTENCE USE AND HARVEST. For each resource for 1989:

- Did household use the resource?
- Did household try to harvest the resource?
- Harvest quantiles by gear type.
- Did the household receive the resource from other harvesters?
- Did the household give away the resource to other households
- Communities involved in the exchange of resources
- Areas used for resource harvesting (1989, 1988, and "regularly")
- Plus respondent's assessment of the household's use of each resource category
in comparison with other years

EMPLOYMENT, INCOME, AND HOUSEHOLD EXPENSES.

- For each person over 16 years of age: job title, employer, location of job, months worked, shift, and amount earned
- Other sources of income
- Household expenses in 1989
- An assessment of 1989 expenses compared with other years

OTHER.

- Respondents views on trends in sharing and on treatment of elders in the community
- Household's receipt of resources from "formal sharing programs" organized
in response to the spill in 1989

TABLE 6. SAMPLE ACHIEVEMENT, HARVEST SURVEY IN OIL SPILL AREA COMMUNITIES, 1990 (as of 3/1/90)

<u>Community</u>	<u>Total Households</u>	<u>Target Sample</u>	<u>Households Surveyed</u>	<u>Percent of Target Surveyed</u>
<i>Prince William Sound</i>				
Chenega Bay	19	19	Research begins in early April	
Tatitlek	32	32	Research begins in early April	
<i>Lower Cook Inlet</i>				
English Bay	41	41	29	70.7%
Port Graham	61	61	49	80.3%
<i>Kodiak Island Borough</i>				
Akhiok	13	13	9	69.2%
Karluk	14	14	12	85.6%
Larsen Bay	39	39	34	87.2%
Old Harbor ^a	94	47	47	100.0%
Ouzinkie ^a	68	34	34	100.0%
Port Lions ^a	72	36	36	100.0%
<i>Alaska Peninsula</i>				
Chignik Bay	40	40	30	75.0%
Chignik Lagoon	15	15	15	100.0%
Chignik Lake	27	27	20	74.1%
Ivanof Bay	7	7	7	100.0%
Perryville	31	31	27	87.1%
TOTAL			349	

^a Because of the relatively large size of Old Harbor, Ouzinkie, and Port Lions, 50 percent random samples were selected for interviewing.

Note: these are preliminary totals and are subject to change.

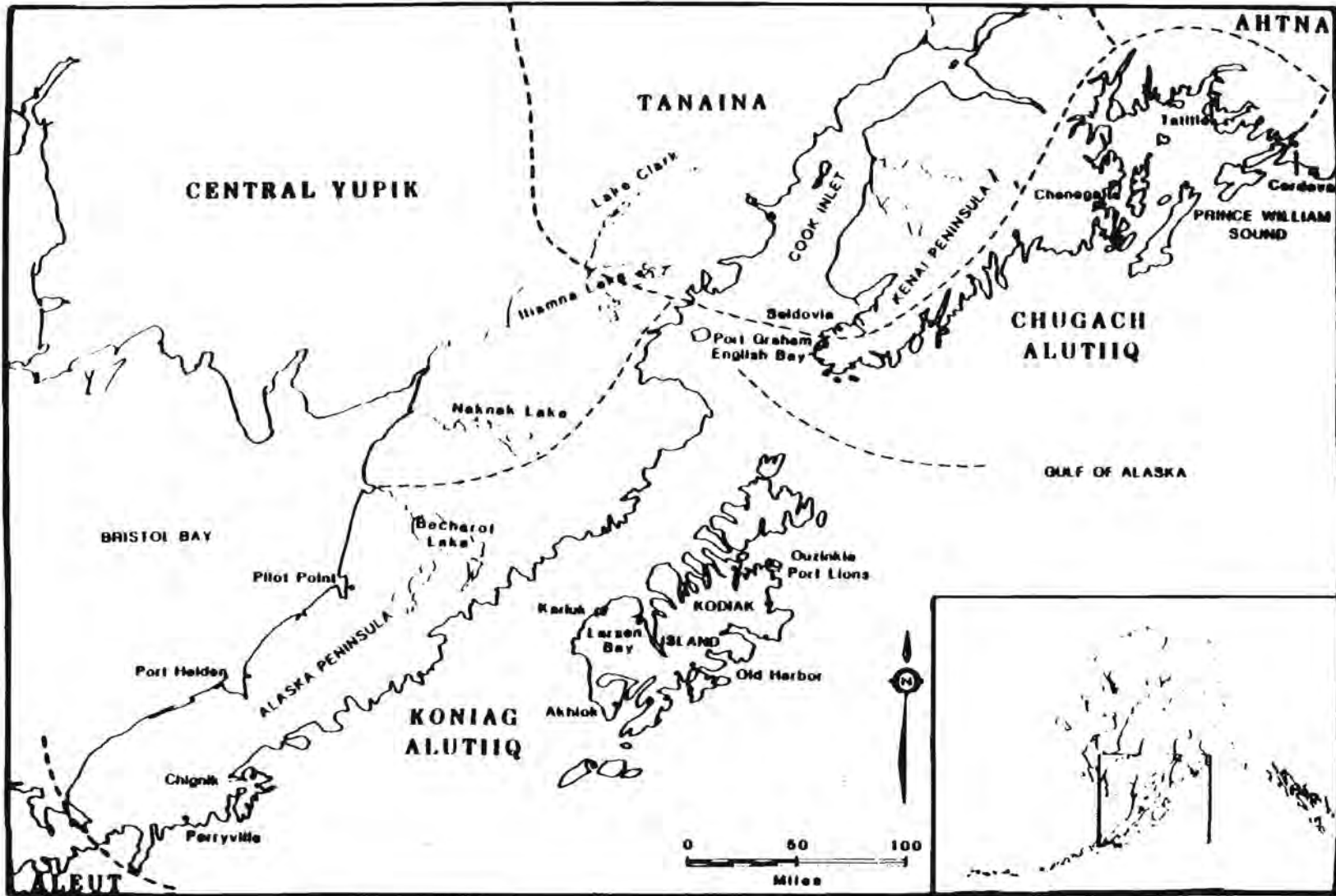


FIGURE 1. STUDY COMMUNITIES

SUBSISTENCE HARVESTS

POUNDS PER PERSON

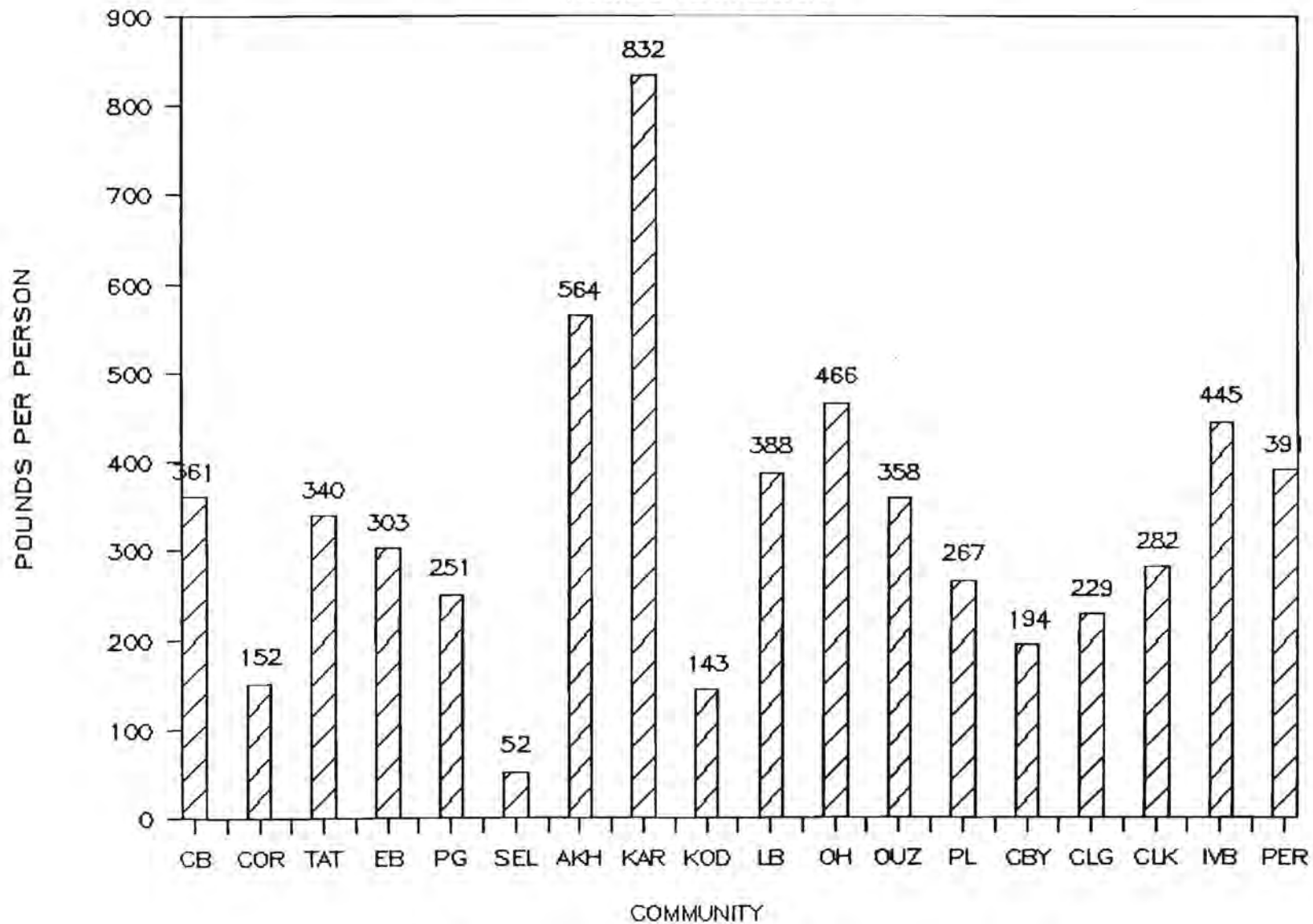


FIGURE 2. SUBSISTENCE HARVESTS, POUNDS PER CAPITA

LEVELS OF SUBSISTENCE PARTICIPATION

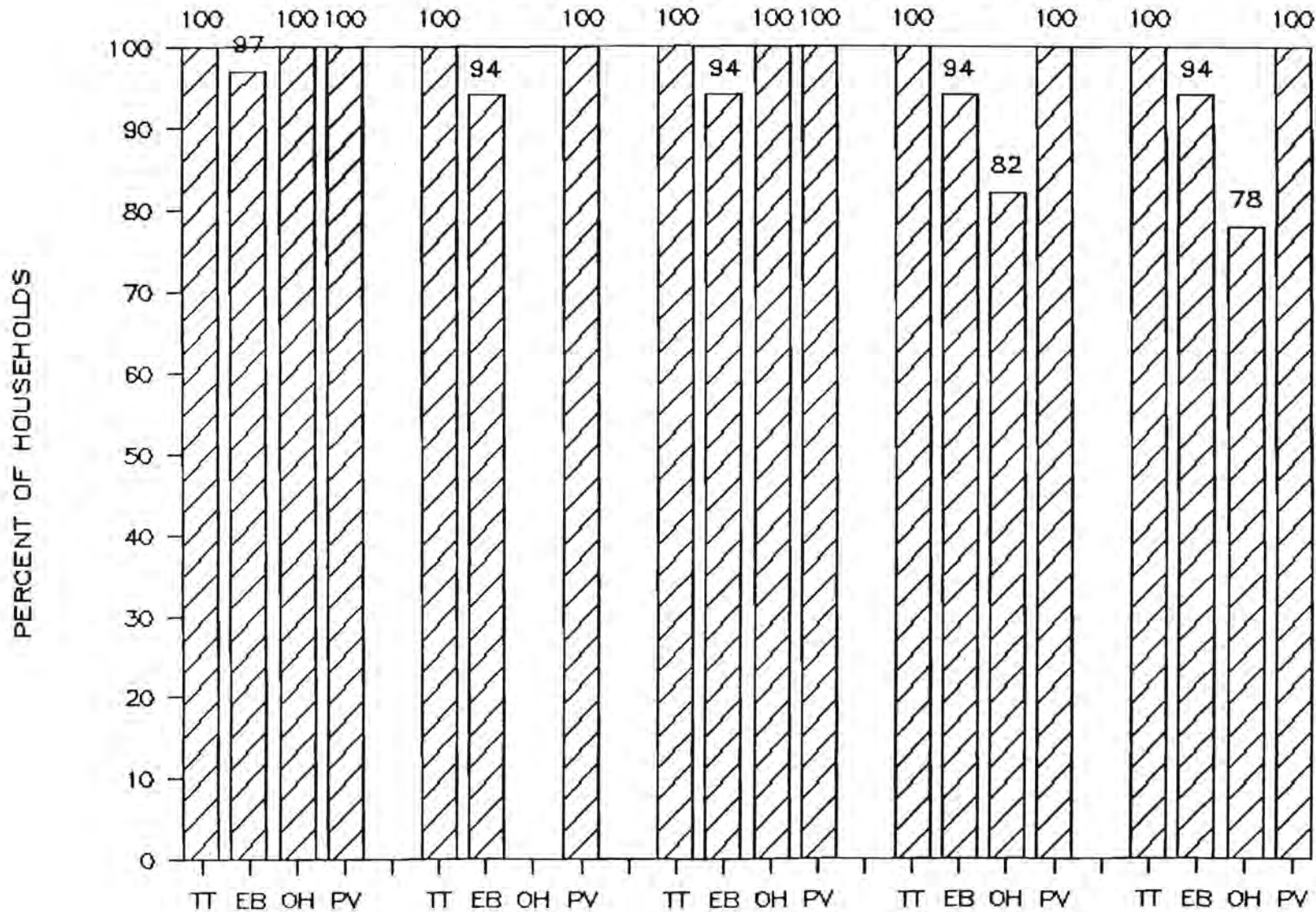
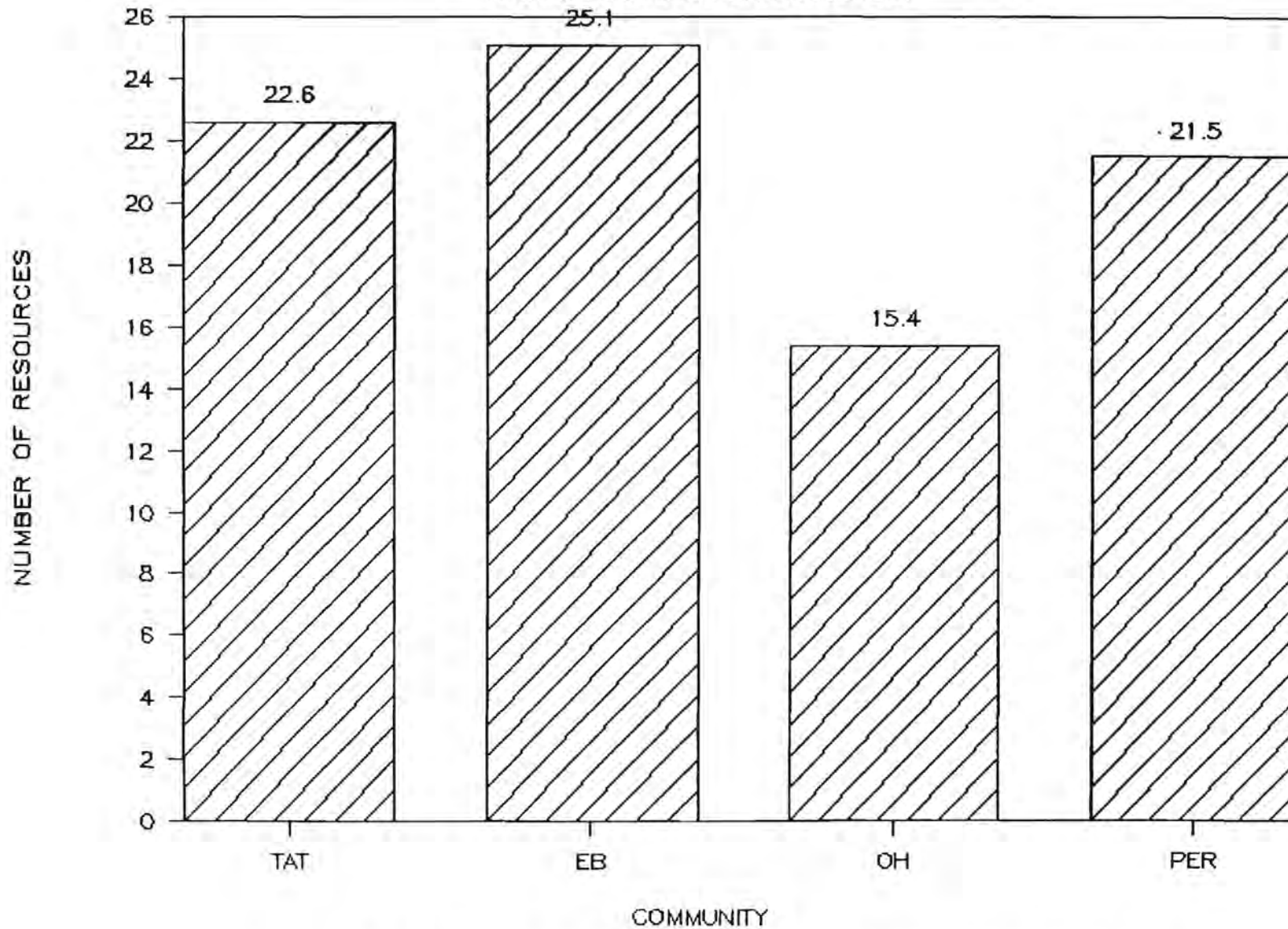


FIGURE 3. LEVELS OF PARTICIPATION IN SUBSISTENCE ACTIVITIES: TATITLEK (TT), ENGLISH BAY (EB), OLD HARBOR (OH), AND PERRYVILLE (PV)

SUBSISTENCE RESOURCES USED

AVERAGE NUMBER PER HOUSEHOLD



**FIGURE 4. AVERAGE NUMBER OF RESOURCES USED PER HOUSEHOLD:
TATITLEK (TT), ENGLISH BAY (EB), OLD HARBOR (OH), AND PERRYVILLE (PV)**

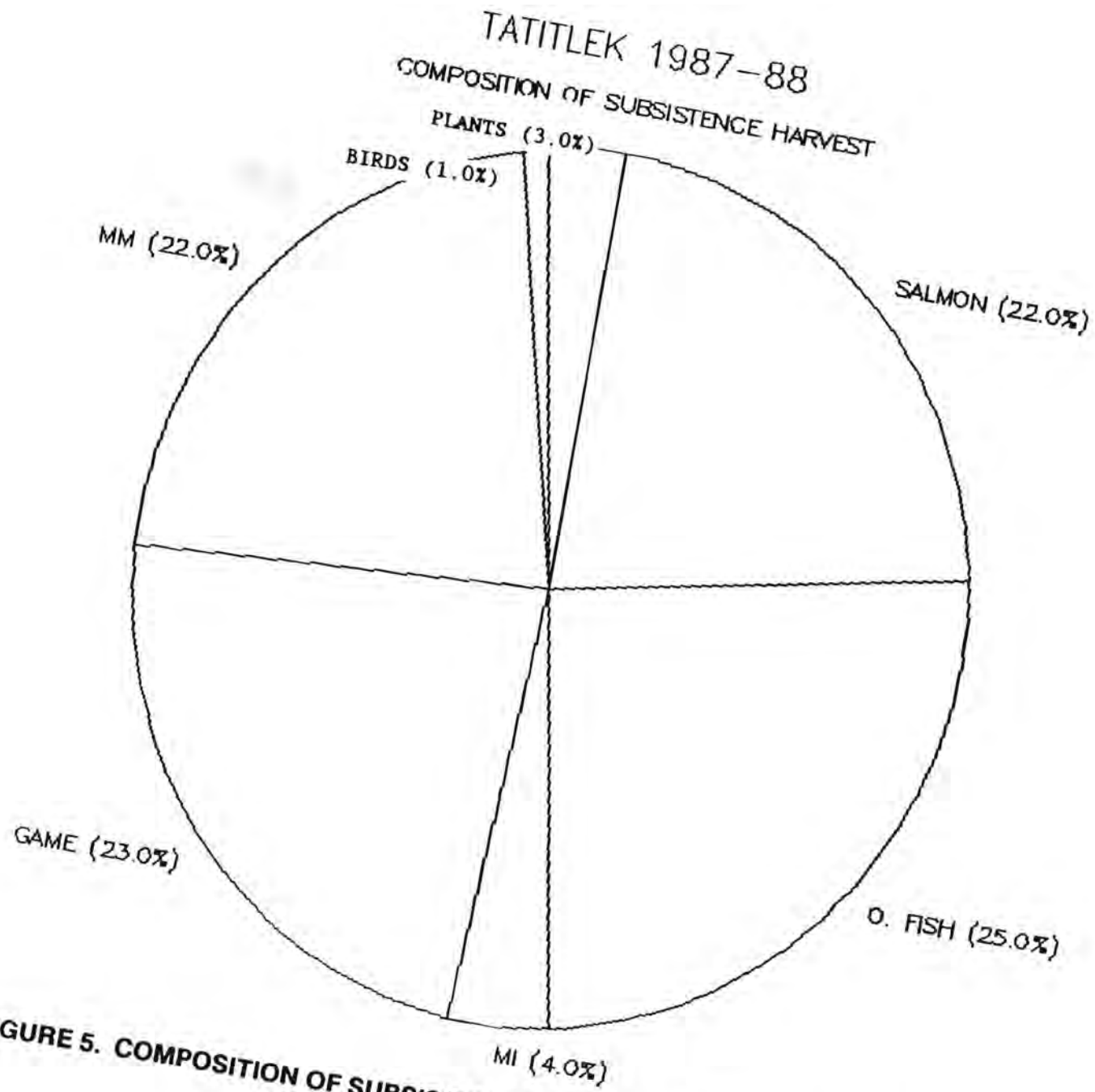


FIGURE 5. COMPOSITION OF SUBSISTENCE HARVEST, TATITLEK, 1987-88

ENGLISH BAY 1987

COMPOSITION OF SUBSISTENCE HARVEST

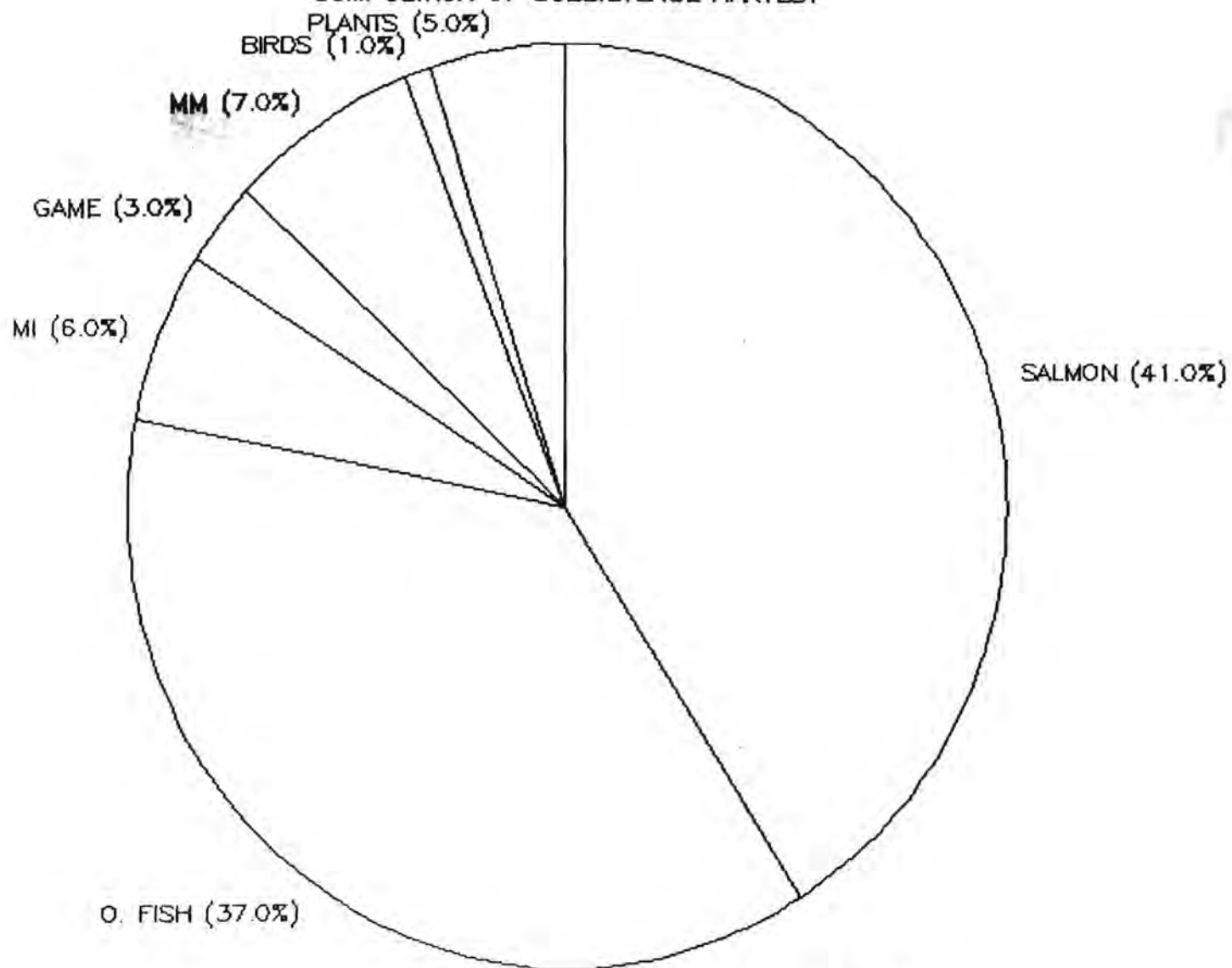


FIGURE 6. COMPOSITION OF SUBSISTENCE HARVEST, ENGLISH BAY, 1987

OLD HARBOR 1983

COMPOSITION OF SUBSISTENCE HARVEST
BIRDS (4.0%)

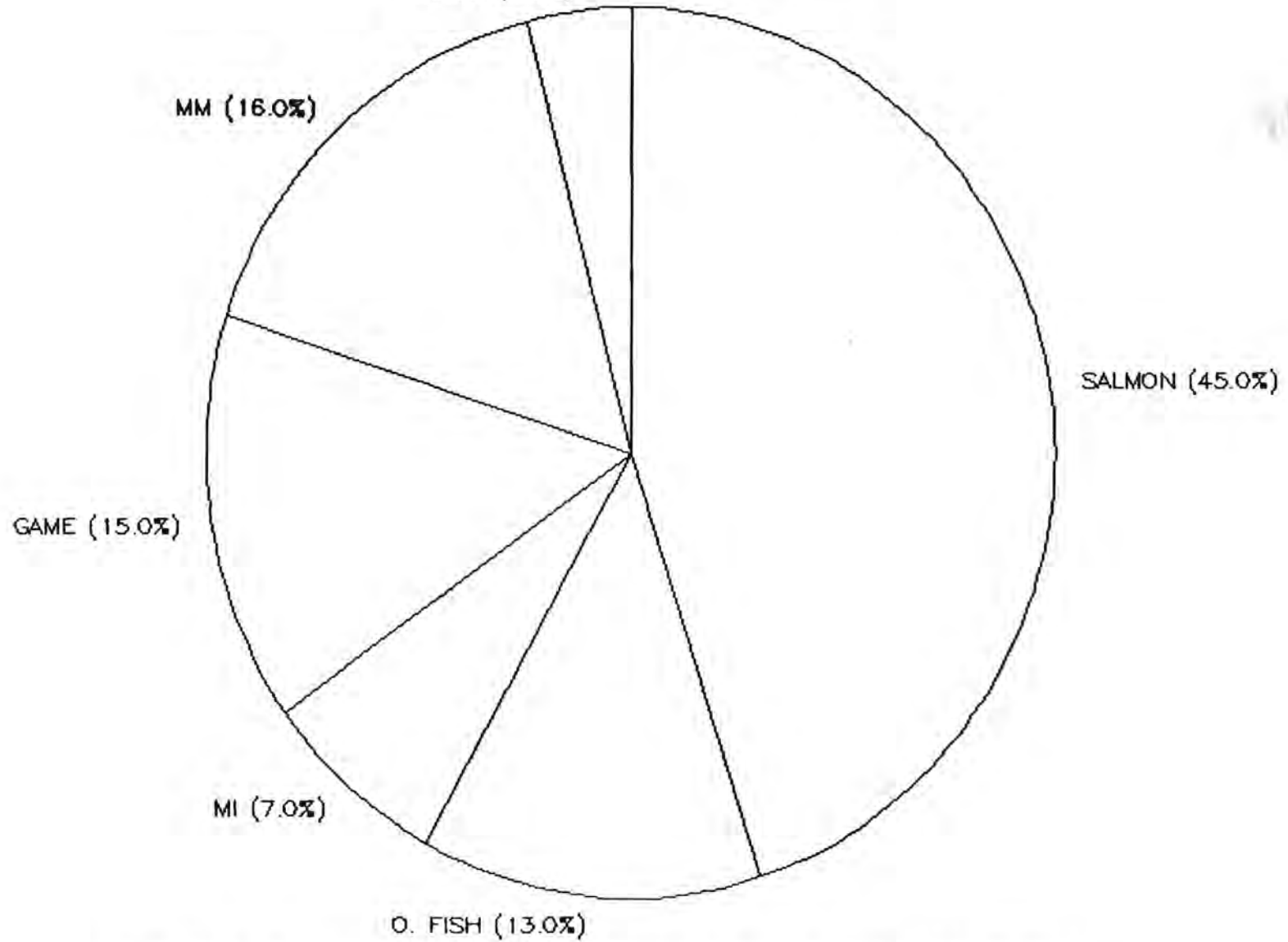


FIGURE 7. COMPOSITION OF SUBSISTENCE HARVEST, OLD HARBOR, 1983

PERRYVILLE 1984

COMPOSITION OF SUBSISTENCE HARVEST

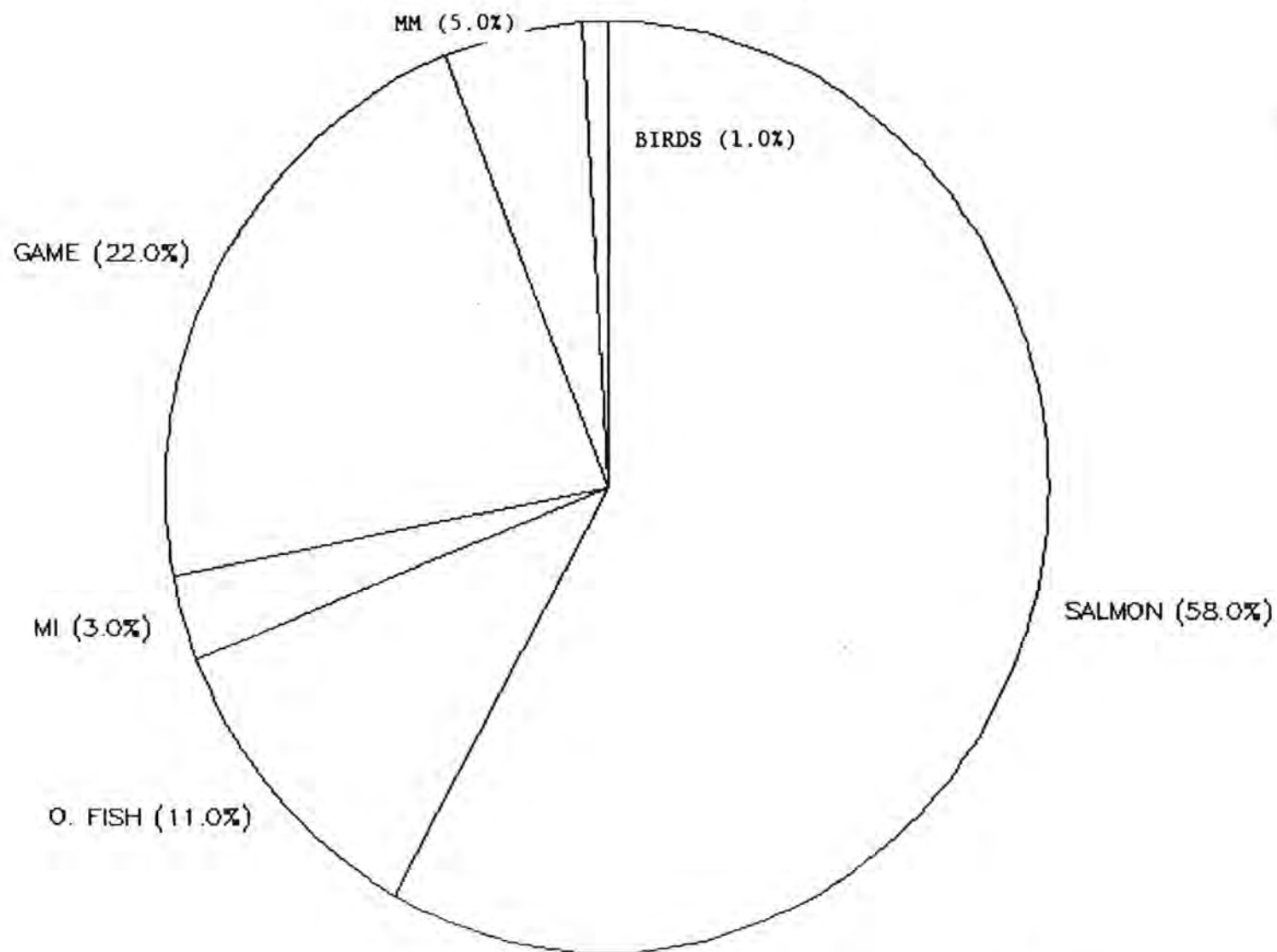


FIGURE 8. COMPOSITION OF SUBSISTENCE HARVEST, PERRYVILLE, 1984