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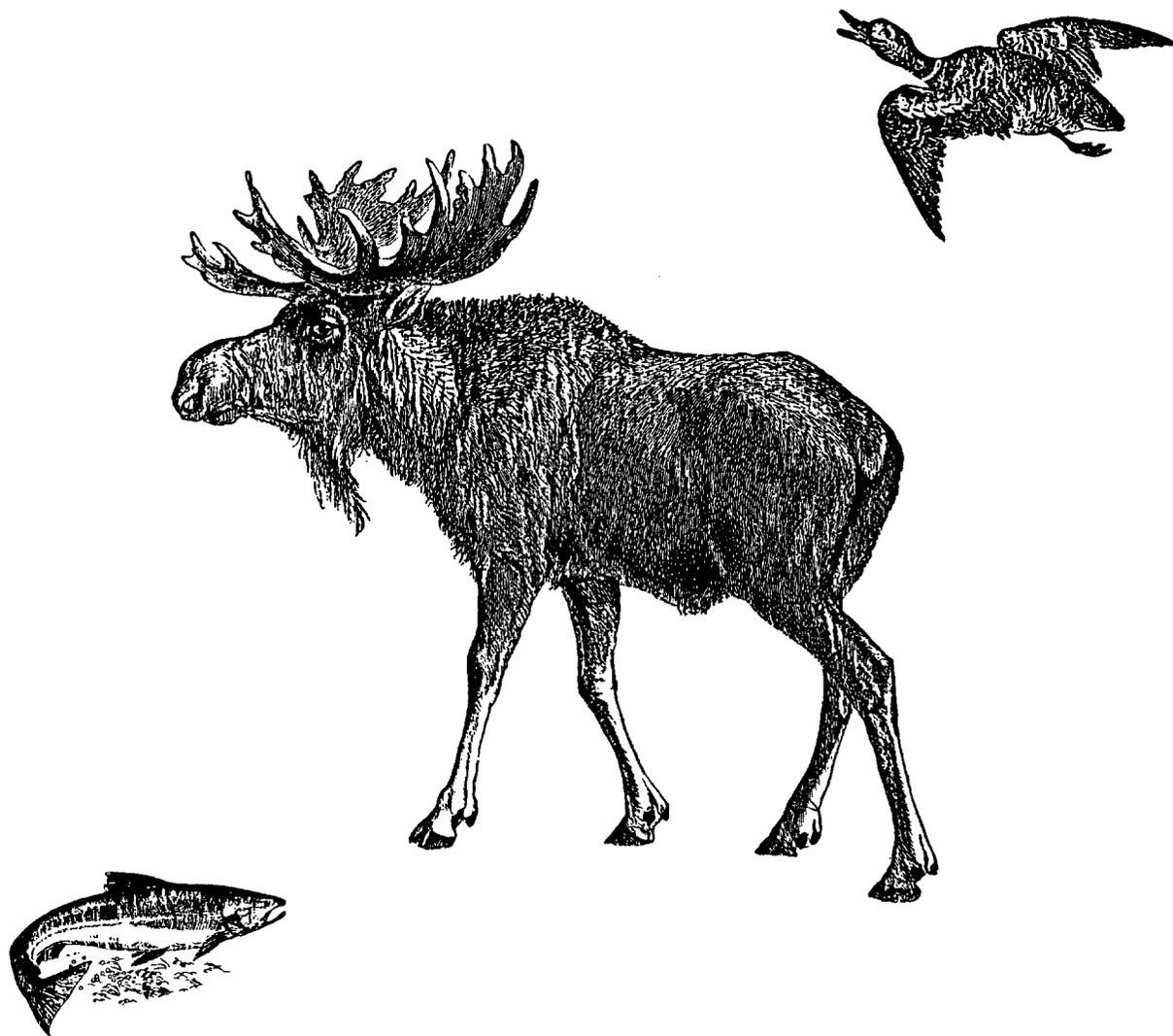
Northeastern Forest  
Experiment Station

Research Paper NE-638



# Subsistence as a Component of the Mixed Economic Base in a Modernizing Community

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## **Abstract**

Although subsistence activities in rural Alaskan communities are often examined in isolation, they are one component of mixed economic systems. Public and private sectors also play primary roles in socioeconomic well-being, and there is considerable interaction among the sectors. In this paper, the mixed economic base of a modernizing rural community is examined with emphasis on the interrelationships between personal use of natural resources and other sectors of the economy.

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Manuscript received for publication 11 July 1989

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May 1990

## Introduction

The harvesting of natural resources for personal use is a major issue in rural Alaska. Federal and state laws designate subsistence as a priority use in natural resources planning and management. However, those in various disciplines disagree on the proper definition of subsistence and how to differentiate it from recreation.

To gain information on a subsistence community, a cooperative study was conducted with the Alaska Department of Fish and Game in Yakutat, Alaska, which is designated as a subsistence community by the State of Alaska. As a result, local residents have a legal claim for subsistence priority in fish and wildlife allocations even though the level of dependency on natural resource gathering for personal use has been altered by the forces of modernization.

Traditional subsistence communities in Alaska have evolved from a situation where the collection, distribution, and use of natural resources were critical for physical survival to one where mixed economic systems containing private (market), public (government), and subsistence sectors prevail (Glass and Muth 1989). Because there is considerable interaction among these components in rural Alaskan communities, it is necessary to examine the functioning of the whole community rather than to examine each component in isolation. In this paper, the mixed economic base of a modernizing rural community is examined with emphasis on the interrelationships between personal use of natural resources, especially fish and wildlife, and other sectors of the economy. Even if subsistence activities have evolved to a stage where they are more important in satisfying psychological and sociocultural needs rather than assuring material survival, they are an important component of the community's lifestyle and must be considered within the overall context of social well-being for effective resource allocation and other managerial decisions.

## Methods

Information on the use of renewable natural resources by residents of Yakutat was obtained through field interviews with 50 randomly selected households from a total population of 181 households established by preliminary reconnaissance during the 1984-85 winter. The interviews, which required approximately 2 hours each, were conducted by the Subsistence Division of the Alaska Department of Fish and Game through a cooperative agreement with the USDA Forest Service. Data collected were for the 1984 calendar year. Yakutat is one of four communities for which similar data were collected; the results from the other communities will be covered in subsequent reports. Since the Subsistence Division reported the sample characteristics (Mills and Firman 1986), but made no inference to the community population, data analysis drawing inference to the community population for the household sample was completed by the Northeastern Forest Experiment Station in Burlington, Vermont, in

cooperation with the Alaska Region of the USDA Forest Service. Data from the household survey were augmented with information provided by the U.S. Bureau of the Census, Alaska State agencies, public utilities, and other research results.

## Community Setting

Yakutat is an isolated community located on Monti Bay off the Gulf of Alaska, 212 air miles northwest of Juneau. While it does not have road connections to other points in Alaska or Canada, the community has a deep water port and a modern airport with daily jet service to Anchorage, Seattle, and points beyond.

In 1980, the population of Yakutat was 561 of which 62 percent were Native (Source: U.S. Bureau of the Census, 1980 U.S. Census). Of the total population, 449 resided in the city proper with the majority of the remainder living along the 4-mile road connecting the city to the airport.

The Yakutat area provides many opportunities for its residents to harvest fish, wildlife, and other renewable natural resources. Fish, shellfish, marine plants, and mammals are abundant. There are over 20 major salmon supporting drainages in the area; waters which also support both resident and sea-run trout (Environmental Services Limited 1983). Many species of waterfowl and shore birds are available seasonally as the area provides breeding grounds, resting and feeding areas along a major migration route, and overwintering areas for some species of waterfowl. Among the large ungulates, moose are most common. Although deer are a subsistence staple in much of southeastern Alaska, they are limited in the Yakutat area. Mountain goats are found in the higher elevations. Both brown and black bear are common as are furbearers and other small mammals.

As previously mentioned, Yakutat has relatively good transportation service to outside points. Regular freight barge service is available to and from Washington State. Besides the regularly scheduled jet service, charter flights are offered by two companies and there are about 20 privately owned planes in the community. Although there are no road connections to outside points, the Yakutat area has about 48 miles of state maintained roads of which 5 miles are paved. An additional 43.5 miles of road are administered by the USDA Forest Service. A total of 348 cars and trucks were registered in Yakutat in 1984.

Modern communications and public utilities are available in Yakutat. Electricity is provided by the Yakutat Power Company which served 244 residences and 44 commercial customers in 1987. The Sitka Telephone Company provides telephone service in the community to 290 connections, both business and residential. One television channel is available through satellite and a majority of households have television sets (Environmental Services Limited 1983). Although radio reception from outside points is generally poor, there is a local FM station. Mail service and

newspapers from Juneau and Anchorage are available on a daily basis by air. The city proper has centralized water and sewage systems. There is also weekly garbage pick up by a private firm as well as a local landfill area.

Under Alaska law, Yakutat is a first-class city with a mayor-council form of government. Revenues are raised through a 2-percent sales tax that is imposed only within the city limits. Law enforcement is provided by a village public safety officer as well as a full-time state trooper and a fish and wildlife protection officer, both of whom are assigned to the greater Yakutat area. There is a volunteer fire department. Public schooling is available through the 12th grade and selected college courses are available at night through the University of Alaska and Sheldon Jackson College.

While Yakutat does not have a physician in residence, it does have a staffed community health clinic. Medical and dental care are available periodically through the year by visiting practitioners. In emergency situations, patients are flown to Anchorage, Juneau, or Seattle, the latter in extreme cases.

## The Mixed Economy of Yakutat

The information gathered through the field interviewing indicated that Yakutat is a relatively affluent community (Table 1). Of the households sampled, 50 percent had incomes of \$30,000 or more during 1984. Nearly one-quarter of the respondent households had incomes of \$50,000 or greater. On the other hand, 11 percent of the households had incomes that were less than \$15,000 in 1984. For the sample, mean annual household income for 1984 was \$42,500, while the median was \$40,000. In terms of statistical inference, we can be 95 percent confident that the mean annual household income for the community was between \$37,300 and \$47,700 during 1984.

These income levels are high, but they must be considered within the context of the inflated prices and wages that prevail in Alaska. While comparative figures are not available for Yakutat, it is noteworthy that a moderate budget to support a four-person family in Anchorage was 26 percent more than that required to maintain the same standard in the contiguous states (Leask 1984). Furthermore, costs in Anchorage can be expected to be considerably lower than Yakutat for most imported items due to economies of scale and greater competition. Even so, the Yakutat income figures compare favorably with the estimated U.S. mean household income of \$22,415 and median of \$27,464 for 1984 (Source: U.S. Bureau of the Census).

For the survey sample, the largest single contributor to household income was government employment (32 percent) followed by commercial fishing. Note, however, that the commercial fishing estimates are gross income so they overestimate to the extent that the costs of production are not subtracted. Retail trade, logging, and construction

provided smaller shares of the total of household income for the community.

## Public Sector

As shown by the employment figures cited, the public sector has a major role in the economy of Yakutat. The State of Alaska does not have any broad-based taxes, but residents of the community pay local and federal taxes. They also receive the benefits of government services, social programs, employment opportunities, and other forms of economic stimulation. Although Yakutat may be geographically isolated, its residents have access to the same publicly financed programs as other United States' citizens and Alaskan residents.

Information provided by the Alaska Department of Labor demonstrates the magnitude of government employment as well as its seasonal stability (Table 2). Commercial fishing is not included in these employment figures since it is not covered by Workmens' Compensation. Approximately one-third of average annual employment was through the government sector. Furthermore, government employment is quite stable, ranging from an average monthly employment of 60 in August to 79 in November of 1984. By contrast, employment in the private sector ranged from 95 in February to 205 in June. Commercial fishing is also highly seasonal, so the stabilizing effect of the public sector in providing year-round employment opportunities is an important contribution to the community. For 1984, the average annual wage for government jobs was \$24,535 as compared to \$23,371 in the private sector. During 1985, the data indicate an even greater role for the public sector in providing employment opportunities. During that year, government employment accounted for 37.5 percent of average annual employment and 44.6 percent of total annual wages; again excluding commercial fishing.

Unemployment compensation payments also contribute to the needs of physical survival, thus reducing dependency on direct consumption of natural resources to meet this end. During 1984, the Alaska Department of Labor reported paying 1,178 weeks of unemployment benefits totalling \$133,386. Most benefits were paid from December through April, a period during which not only are job opportunities limited, but also many natural resources are less readily available and harvesting can be impaired by inclement weather.

Besides providing direct employment and transfer payments, the public sector provides opportunities for additional employment and other forms of economic stimulation through capital investments in the community. From 1980 to 1986, the State of Alaska spent over \$15 million on capital improvements in Yakutat (Table 3). Over this 7-year period, the state investment in capital improvements amounted to \$26,755 per person. During the calendar year in which the field survey was undertaken (1984), the state spent a total of almost \$5.5 million on capital improvements in Yakutat, a per capita expenditure of \$9,729.

**Table 1.—Household income for residents of Yakutat, Alaska, 1984**

Income range	Number of sample households	Percent of all households	Standard error (Percent)	Estimated number of households in community	Cumulative percent of all households
Less than \$5,000	1	2.2	2.2	4	2.2
\$5,000 to 9,999	2	4.3	3.0	8	6.5
\$10,000 to 14,999	2	4.3	3.0	8	10.9
\$15,000 to 19,999	2	4.3	3.0	8	15.2
\$20,000 to 24,999	2	4.3	3.0	8	19.6
\$25,000 to 29,999	4	8.7	4.2	16	28.3
\$30,000 to 34,999	5	10.9	4.6	20	39.1
\$35,000 to 39,999	5	10.9	4.6	20	50.0
\$40,000 to 44,999	8	17.4	5.6	31	67.4
\$45,000 to 49,999	3	6.5	3.6	12	73.9
\$50,000 to 54,999	1	2.2	2.2	4	76.1
\$55,000 to 59,999	1	2.2	2.2	4	78.3
\$60,000 to 64,999	5	10.9	4.6	20	89.1
\$65,000 to 69,999	1	2.2	2.2	4	91.3
\$70,000 to over	4	8.7	4.2	16	100.0

Mean = 42,500

Median = 40,000

Standard error = 3,521

Publicly owned and managed resources, including fish, wildlife, and timber, provide the basis for additional economic opportunities in the Yakutat area. The timing, quantities, and distributional aspects in the allocation of these resources by the public agencies can have a pronounced effect on the local economy. Finally, all Alaskan residents (men, women, and children) were eligible to receive \$1,000 each from the Permanent Fund dividend during 1984.

#### **Private Sector**

The private sector is the source of about two-thirds of the total income reported by Yakutat households, though this is stimulated in part by public investment. Because of the regulations pertaining to disclosure, information on specific categories of employment are not available through the Alaska Department of Labor.

Commercial fishing is the major economic activity within the private sector. However, the available data on numbers of fishermen, harvest, and earnings include both residents of Yakutat and fishers from other areas including some from out of state. There were 164 limited entry permits issued for the Yakutat area in 1984 as reported by the Alaska Commercial Fisheries Entry Commission, 145 of these held by Yakutat residents. A total of 140 permittees actually fished. Regardless of the residency of commercial fishers, the harvest figures provide some interesting insights with respect to the species taken and the kinds of gear used (Table 4). In the Yakutat area, the principal commercial gear types used are set gill nets, handtrolling, and power trolling. Except for king salmon, set gill nets generally take the largest quantity of fish by measure of both numbers and pounds. Power trolling takes the greatest amount of the king salmon and is usually a major source of silver salmon. Although hand trolling produces smaller quantities, it is also effective for both king and silver salmon.

By measures of number of fish and weight, red and silver salmon are the principal species taken. In 1984, these two species together accounted for over 85 percent of the number of salmon and weight of salmon commercially harvested. By both of these measures, silver salmon was the leading species in 1984, but this tends to vary from year to year. For example, red salmon was the leading species harvested in 1983.

According to the Alaska Commercial Fisheries Entry Commission, the total value of the commercial salmon

harvest for the Yakutat area in 1984 was \$3,646,422. Of this, the set gill net harvest was estimated at \$2,305,102; 90 percent of which was taken by resident permit holders.

Although commercial fishing is the leading source of monetary income reported within the market sector, it should be reemphasized that this estimate represents gross income. It is noteworthy that 62 percent of nongovernment income during 1984 was reported as originating from sources other than commercial fishing and represented net income such as wages and salaries. As reported by the sample households, retail trade was the second largest source of income from the private sector. Although retail trade can be expected to remain fairly stable from year to year, other sources of income in the market sector are likely to fluctuate widely, such as logging, which fluctuates with Pacific Rim market conditions, and construction, which fluctuates with the level of public investment.

### Subsistence Sector

Even with the relatively high household incomes, the residents of Yakutat are quite active in harvesting fish, wildlife, and other natural resources for personal use. For the household sample, 37 percent of the members both hunted and fished, 32 percent fished but did not hunt, 1 percent hunted but did not fish, and the remaining 30 percent neither hunted nor fished. From the sample, we can be 95 percent confident that between 331 and 339 of the community residents fished and between 162 and 222 hunted.

**Table 2.—Monthly employment by government and nongovernment sectors, Yakutat, Alaska, 1984**

Month	Total employment <sup>a</sup>	Government		Nongovernment	
		Employment	Percent of total	Employment	Percent of total
January	169	73	43.2	96	56.8
February	169	74	43.8	95	56.2
March	171	69	40.4	102	59.6
April	180	71	39.4	109	60.6
May	265	70	26.4	195	73.6
June	274	69	25.2	205	74.8
July	213	61	28.6	152	71.4
August	221	60	27.1	161	72.4
September	228	71	31.1	157	68.9
October	228	76	33.3	152	66.7
November	238	79	33.2	159	66.8
December	234	77	32.9	157	67.1
Average monthly employment	216	71	32.9	145	67.1

<sup>a</sup>Insured employment as reported by Alaska Department of Labor, Employment Security Division, Juneau, Alaska

It should be emphasized that the traditional subsistence lifestyle involved much more than the harvesting of natural resources for the sake of physical survival alone. Subsistence involves patterns or networks of production, processing, distribution, exchange and consumption that act to help maintain a complex web of institutional relationships involving authority, respect, wealth, obligation, status, power, and other components of social structure (Berger 1985, Dowling 1968, Muth et al. 1987, Spencer 1959). The extent to which current harvesting and related activities maintain the traditional lifestyle was only superficially pursued in the survey. While some information was collected in the household survey regarding the sharing and distribution system—a major component of traditional subsistence—the data are limited because estimates of the quantities of resources that exchanged hands were not collected. Information is available on the extent to which households gave or received specific resources but not the quantities involved.

Almost all of the sample households (98 percent) reported receiving some fish, wildlife, or other resources from other households. There is a 95 percent probability that over 95 percent of the households received resources from other households. Fish and shellfish were received most frequently, with over 70 percent of the sample receiving shrimp and scallops. Among finfish, halibut (58 percent), king salmon (46 percent), and a catchall category of "other fish" that included capelin, hooligan, herring, trout, as well as other saltwater and freshwater species (82 percent), were received most frequently. While several species of

mammals were reported as being received, moose (62 percent) and harbor seal (34 percent) were reported most frequently. Birds and plants also were received by respondent households but not with the frequency of the aforementioned.

For most resource categories, the population of households who gave was smaller than that of those who received. For the respondent households, 86 percent (79 to 93 percent at

**Table 3.—State of Alaska capital appropriations for Yakutat, 1980 to 1987**

Year	State of Alaska capital appropriations	Capital expenditures per capita
1980	\$2,675,000	\$4,768.27
1981	160,000	285.20
1982	400,000	713.01
1983	2,881,000	5,135.47
1984	5,458,000	9,729.06
1985	1,845,000	3,288.77
1986	1,590,400	2,834.94
Total	\$15,009,400	\$26,754.72

Based on 1980 U.S. Census estimate of population for Yakutat at 561. Source: State of Alaska, Office of Management and the Budget, Juneau, AK

**Table 4.—Commercial salmon harvest by gear type and species, Yakutat area, 1983 to 1985**

Year	Gear type	Commercial salmon harvest											
		King		Red		Silver		Pink		Dog		Total	
		No.	lbs.	No.	lbs.	No.	lbs.	No.	lbs.	No.	lbs.	No.	lbs.
1983	Set gill net	976	15,158	152,527	1,000,777	81,541	778,434	25,278	95,920	11,195	95,663	271,517	1,985,952
	Troll	816	10,866	59	335	8,304	60,638	244	779	10	60	9,433	72,678
	Power troll	3,036	41,693	31	186	11,105	79,873	792	2,384	97	701	15,061	124,837
	Other	—	—	249	1,664	1	8	—	—	—	—	250	1,672
	Total	4,828	67,717	152,866	1,002,962	100,951	918,953	26,314	99,083	11,302	96,424	296,261	2,185,139
1984	Set gill net	1,062	20,101	102,545	676,608	182,256	1,827,203	19,870	82,335	32,230	295,011	337,963	2,901,258
	Troll	966	12,653	4	26	21,918	158,616	218	955	6	54	23,112	171,704
	Power troll	7,634	107,809	64	380	56,605	473,446	997	3,861	132	1,073	65,432	586,569
	Other	—	—	33	212	22	211	73	334	9	79	137	836
	Total	9,662	140,563	102,646	677,226	260,801	2,458,876	21,158	87,485	32,377	296,217	426,644	3,660,367
1985	Set gill net	1,231	20,937	234,886	1,507,437	202,814	2,055,563	16,362	72,234	12,466	114,766	467,759	3,770,937
	Troll	1,988	28,440	17	79	33,231	239,433	1,697	5,847	22	159	36,955	273,958
	Power troll	6,975	119,497	222	1,270	165,884	1,260,278	7,554	24,510	696	5,367	181,331	1,410,904
	Other	1	18	66	430	30	308	—	—	2	16	99	772
	Total	10,195	168,874	235,191	1,509,216	401,959	3,555,582	25,613	102,591	13,186	120,308	686,144	5,456,571

Source: Alaska Department of Fish and Game, Commercial Fisheries Division, Juneau, AK

the 95-percent confidence level) reported giving resources as compared to the 98 percent who received. Relatively few households gave shellfish even though they distributed these resources quite widely. As an example, only 12 percent of the sample households reported giving shrimp, though 72 percent of the sample households received this species from other households. The number of households giving resources tended to be higher for species in which harvesting equipment was less specialized or such equipment was available because it was used for other purposes. Thus, finfish were given by larger numbers of households than many species of shellfish. Among the mammals, moose (22 percent) and harbor seal (18 percent) were reported as being given to other households most frequently. Berries were reported as being given to other households by 50 percent of the respondents.

The household survey revealed that Yakutat residents harvested substantial quantities of edible resources. The mean harvest was 1107 pounds, and the median harvest 820 pounds per household. For the community at the 95-percent confidence level, the total harvest was between 141,723 and 259,011 pounds.

Approximately three-fourths of the total harvest by sampled households consisted of fish and marine invertebrates led by the salmon category which included all five species. Fish alone accounted for 57.5 percent of the harvest. Land mammals, with moose being the leading subcategory,

accounted for 14 percent of the reported harvest. Note that some species may be critical to the food supply in specific situations because of their seasonal availability even if they are not major contributors in the total figures. As with most communities utilizing large quantities of fish, wildlife, and other natural resources, harvests among Yakutat residents vary with seasonal availability.

Among the sample households, the leading species of salmon taken for personal consumption was red followed by silver and king, in that order (Table 5). At the 95-percent confidence level, estimated community harvests were between 2,407 and 5,203 for red salmon, 1,774 and 3,583, for silver salmon, and 923 and 1,792 for king salmon. Pink salmon and dog salmon, the latter of which are relatively less abundant than the other species in the Yakutat area, are harvested in smaller quantities for personal consumption.

The interrelationship between commercial and subsistence fishing is further demonstrated by the extent to which salmon caught under commercial licensing are used for personal use. Twenty-seven percent of all fish used for personal consumption were taken from the commercial harvest, the proportion varying considerably by species and gear types. Gillnetting was the predominant means of taking red salmon, over 70 percent of these coming from noncommercial harvests. Gillnetting was responsible for over one-half of the harvest of each species except silver

**Table 5.—Salmon harvest<sup>a</sup> for personal use by species by gear type, Yakutat, Alaska, 1984**

Gear type	Estimated harvest of salmon by species											
	King		Sockeye		Pink		Dog		Silver		All Species	
	Number	Standard error	Number	Standard error	Number	Standard error	Number	Standard error	Number	Standard error	Number	Standard error
Non-commercial gillnetting	452	112	2,601	762	80	47	0	0	590	376	3,738	1,082
Commercial gillnetting	380	132	1,003	364	174	99	163	145	710	223	2,463	789
Non-commercial trolling	54	38	7	7	25	20	0	0	7	7	94	51
Commercial trolling	98	45	0	0	36	36	0	0	177	89	311	130
Rod and reel	372	132	300	147	117	52	40	24	1,231	313	2,069	478
All methods	1,377	271	3,901	890	440	153	203	146	2,787	557	9,008	1,580

<sup>a</sup>Due to missing information, the sum of individual species or gear type may not sum precisely to the total reported in the tables, since totals are based only on cases with valid information for every component available.

salmon—it approached one-half. By contrast to the gillnet harvest, commercially licensed trolling exceeded noncommercial trolling as a source of salmon for personal use. Note that commercial fishermen in Yakutat do not participate in trolling for salmon to the extent that it is practiced in other parts of southeastern Alaska. Lastly, rod and reel fishing is widely practiced and is a major source of both silver and king salmon.

While the survey did not pursue detailed information on inputs and costs of pursuing subsistence activities, it did inquire about the transportation modes used in harvesting fish and wildlife. Mechanized vehicles are purchased through the market sector and require fuel, service, and other marketed goods and services. In fact, 84 percent of the respondents indicated that members of their household used conventional automobiles, trucks (usually pickups), or both in their resource harvesting activities. Skiffs were used by 72 percent of the households and larger vessels by 18 percent. All-terrain vehicles were used by almost one-half of the respondent households and snow machines by 12 percent. Two households reported using airplanes in their fish and wildlife harvesting activities. The use of a particular vehicle does not infer ownership, or if owned by a household member, its primary use may not be for harvesting resources for personal use.

### Interaction Among Sectors

Perhaps the best example of interaction among the components of Yakutat's mixed economy involves the harvesting of salmon whereby a publicly owned and managed resource is taken for both commercial purposes and personal use. Beside allocating a portion of the commercial catch for personal use, the same gear is often used for subsistence fishing. With respect to subsistence fishing, the Alaska Department of Fish and Game concluded: "Set gill nets were placed in the rivers often at

the same locations and by the same individuals who commercially fished" (Mills and Firman 1986).

The interrelationship between commercial fishing and personal use of salmon is further demonstrated by the household survey data. For those who reported income from commercial fishing, the average salmon harvest for personal use per person was 204 pounds as compared to an average harvest of 83 pounds for those who did not have income from commercial fishing. This difference was statistically significant at the .02 level.

While both commercial and personal-use fishing use the same resource base, most of the pressure on the resource is for commercial purposes (Table 6). Except for king salmon for which the personal-use harvest is 12.3 percent (15.2 percent at the upper level at the 95-percent confidence level) of the total harvest, personal use is a minor component of the overall catch even at the higher ranges of the confidence intervals. In addition to the numbers of fish included in the table, there are also salmon caught for sport by nonresidents of Yakutat, but this too is relatively insignificant as compared to the commercial catch.

Monetary income not only provides an alternative means for physical survival, but also provides the basis to invest in equipment that makes subsistence harvesting more efficient. Most of the traditional subsistence gear has been replaced by modern equipment such as metal and fiberglass boats, outboard motors, or even large watercraft, sonar devices, guns, ammunition, steel traps, and the like. Food preservation has largely changed from the use of traditional smoking and drying processes to home canning and freezing. While all of these technological advances have added efficiency in harvesting and preserving, they have made the residents of rural communities more and more intertwined with the other sectors of the economy. The result is that, for many people, cash income affords them

**Table 6.—Comparison of commercial and personal use harvest of salmon by species, Yakutat, Alaska, 1984**

Kind of harvest	Species of salmon									
	King		Red		Silver		Pink		Dog	
	Number harvested	Percent of total	Number harvested	Percent of total	Number harvested	Percent of total	Number harvested	Percent of total	Number harvested	Percent of total
Commercial	9,662	87.5	102,646	96.3	260,801	98.9	21,158	98.0	32,377	99.4
Personal use	1,377	12.5	3,901	3.7	2,787	1.1	440	2.0	203	0.6
Total	11,039	100.0	106,574	100.0	263,588	100.0	21,598	100.0	32,580	100.0

opportunities to supplement their household food budgets through in-kind contributions of fish, wildlife, and other edible resources. For other people, however, cash income allows them to purchase and maintain harvest and processing technologies which serve to enhance their subsistence lifestyles (Muth 1990, Muth and Glass 1989).

However, participation in the subsistence lifestyle has payoffs beyond the physical needs that it satisfies. In addition to serving critical roles in both supplementing income and providing a source of support during periods when monetary income becomes scarce or nonexistent, subsistence activities contribute to overall social well-being through a variety of social, cultural, and psychological functions. Nonetheless, monetary income has become a necessity to purchase the modernized inputs for subsistence production. Because this monetary income originates in the public and market sectors, contemporary rural communities in southeastern Alaska have developed truly integrated three-sector economies.

## Discussion

The forces of modernization have had a pronounced effect in the Yakutat community and have reduced the level of dependency on subsistence activities for physical survival. Much traditional subsistence behavior evolved as a means of coping with the uncertainties of relying on direct consumption of natural resources, but the present situation is one where public programs alleviate much of this uncertainty. While sources of monetary income from both the market sector and public investment are apt to fluctuate over time, social programs now assure a means of survival during the worst of times. Nonetheless, food gathering activities provide additional income, and support the sociocultural configurations of traditional institutional structures.

The complex interrelationships that exist among the three components of the mixed economic systems of rural Alaskan communities make it particularly difficult to assess the impacts of alternative resource allocation and development strategies. For example, development that provides employment opportunities for local residents can have a material effect on the efficiency of food and other resource gathering activities even if the direct monetary benefits are distributed unevenly. If those who receive additional monetary income invest part of it into gear to be used in subsistence activities, the added efficiency can benefit others in the community through the traditional sharing and distribution systems. Furthermore, investment in capital goods that enhance the subsistence harvesting efficiency can be utilized for periods of time beyond that for which monetary income is available if income-producing alternatives are irregular.

While the mixed economic base of a rural community may help insulate its residents from threats to physical survival brought on by resource competition, less clear are the likely

impacts on other aspects of social well-being. The extent to which modernization has affected the traditional subsistence lifestyle is not yet clearly understood. For instance, the intrusion of new people into the community can adversely affect community cohesiveness and weaken social structures. On the other hand, the interaction of people from different cultures can foster better understanding by exposing both groups to new ideas and practices. When viewing declines in fish and wildlife populations brought about by natural or man-made phenomena, the impact on physical survival does not seem to have the relevance that it once did, but the effects on other social values may have become even more important. Even if local fish and wildlife populations were to decline temporarily as the result of an action that also provided additional local income and employment opportunities, community residents would have additional money to purchase substitute foods and to invest in subsistence-related technology that permit greater harvesting efficiency and the ability to travel greater distances to gather resources.

If physical survival is not contingent on subsistence gathering, one must consider the level of resource abundance necessary to induce people to engage in activities in which participation reaps its own rewards. In a sense, increased efficiency may have a negative effect in that resource needs can be satisfied so quickly that the time spent engaged in these self-rewarding activities decreases. Also one must consider how much appeal is lost when participation in subsistence activities is no longer necessary for physical survival. The context in which contemporary subsistence is practiced often makes it extremely difficult to differentiate it from fish and wildlife related recreation.

For Yakutat, the relative importance of salmon as a component of the total subsistence harvest is another factor that insulates the community from the adverse impacts of reduced natural resource availability. Since the subsistence share of the total salmon harvest is small and subsistence is given priority as a resource use, any reduction in salmon stocks is likely to be absorbed by commercial fishers and sport fishers. Furthermore, it is not certain that commercial fishers will suffer losses in revenues in such an event because a widespread salmon scarcity, at least for the preferred species, will likely result in higher prices.

In addition to bringing additional income into rural communities, resource development can create more competition for the available resources. Even where resources are relatively abundant, such as salmon in the Yakutat area, there can be a disruptive influence on traditional subsistence activities brought about by those viewed as intruders.

Examining the economy of Yakutat from a three-sector perspective has provided a more realistic view of contemporary economic interactions. Even though only one community has been examined during one year, it has unveiled some critical areas and suggested where additional avenues of research may be fruitful. In order to

gain better insight into how resource development and allocation changes might impact rural Alaskan communities, the following research, in no particular order of priority, is suggested:

1. *Develop a better understanding of the interaction within and among the three sectors of community economies.* Even within the subsistence sector, little information is available on the quantities involved in the sharing and distribution system. Both long-run and short-run impacts on subsistence efficiency attributable to increased income are also needed.
2. *Ascertain the sensitivity of sociocultural benefits to reductions in availability.* Since other sectors of the economy provide many of the necessities for physical survival, the sensitivity of the subsistence lifestyle to reduced fish and wildlife populations, along with more competition for the available physical supply, needs to be better understood.
3. *Assess the impact of exogeneous factors on the subsistence lifestyle.* Aside from the effects that the intrusion of outsiders may have on fish and wildlife populations, the very existence of more people, different institutions, greater accessibility, and other factors can influence the subsistence lifestyle.
4. *Develop a better understanding of the exchange and distribution system.* More information is needed on the quantities involved in the distribution of subsistence goods and the extent of coverage as rural communities become more diverse. The relevance to institutional constraints on harvesting and its impact on sharing also should be examined.
5. *Quantify the inputs and costs of subsistence harvesting.* Although considerable effort has been placed on quantifying subsistence outputs, little has been done on the inputs and costs associated with alternative harvesting methods. Such information can be especially useful in determining levels of dependency on resource harvesting for personal use.
6. *Determine the income effect of subsistence activities.* Notwithstanding the sociocultural benefits of subsistence, resource harvesting also provides income, not only to those actually engaged in the harvesting of resources, but also to the other recipients. The contribution of subsistence harvesting to community standards of living, even in a material sense, should be an important consideration in resource allocation.

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In this paper, the mixed economic base of a modernizing rural community is examined with emphasis on the interrelationships between personal use of natural resources and other sectors of the economy.

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