

Limited Entry Policy and the Bristol Bay, Alaska Salmon Fishermen

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KOSLOW, J. A. 1982. Limited entry policy and the Bristol Bay, Alaska salmon fishermen. *Can. J. Fish. Aquat. Sci.* 39: 415-425.

The impact of limited entry was examined upon the diverse groups engaged in the Bristol Bay, Alaska salmon fishery. Whereas limited entry was intended to enhance the state's rural fishing economies, the system has in fact significantly diminished access of the local population to the fishery, the region's primary economic activity. A significant proportion of local fishermen were initially denied entry permits due to entry criteria in which the implicit definition of a legitimate fisherman was based largely upon a nonrural model, development of an application poorly designed for use by the rural Alaskan population, and administration of the program by a bureaucracy that appears insensitive to the needs of the rural communities. The salability of the permits, combined with the poorer fishing earnings of local fishermen and the generally impoverished local economy, led to a further drain of permits from local areas. Unless the system is substantially altered, local fishing communities can be expected to suffer significant further impoverishment because the fishery is now effectively closed to their burgeoning youthful population. However, the present system substantially benefits urban Alaskan fishermen (as well as non-Alaskan fishermen), who are more effective politically than their rural counterparts, so no substantial change in the present system can be expected. Limited entry programs clearly must be based upon a better understanding of the socioeconomic and cultural characteristics of targeted fishing communities if such highly inappropriate consequences are to be avoided.

Key words: limited entry, Bristol Bay, salmon fishery, socioeconomic, *Oncorhynchus nerka*, fishery management

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Nous avons analysé l'impact de l'accès limité sur les divers groupes pratiquant la pêche du saumon dans la baie de Bristol (Alaska). Bien que l'accès limité ait visé à rehausser l'économie de la pêche dans les régions rurales de l'État, le résultat en fut tout autre. En fait, l'accès a été nettement réduit pour la population locale, dont la principale activité économique était la pêche. Une proportion significative des pêcheurs locaux se sont vu refuser des permis par suite de critères définis d'après un modèle non rural; d'un formulaire d'application mal conçu pour utilisation par les populations rurales de l'Alaska; et enfin, de l'administration du programme par une bureaucratie apparemment insensible aux besoins des communautés rurales. La fait que les permis pouvaient être vendus, couplé aux faibles revenus que les pêcheurs locaux retiraient de la pêche et à une économie locale affaiblie, a accéléré cette saignée des permis de pêche des régions locales. À moins que l'on ne modifie le système, on peut s'attendre que les communautés de pêche locales s'appauvriront encore davantage car la pêche est présentement hors de la portée d'une jeunesse montante. Par contre, le présent système profite de façon substantielle aux pêcheurs urbains de l'Alaska (ainsi qu'aux non-résidents), jouissant d'une influence politique supérieure à celle de leurs homologues ruraux. On ne peut donc s'attendre à de grands changements au système actuel. Sûrement, des programmes d'accès limité doivent être fondés sur une meilleure compréhension des caractéristiques socio-économiques et culturelles des communautés de pêche visées, si l'on veut éviter des conséquences aussi désastreuses.

Received April 15, 1981

Accepted November 24, 1981

Reçu le 15 avril 1981

Accepté le 24 novembre 1981

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FISHERIES in western countries have traditionally been open to all who obtained the necessary license and gear. However, resource economists have argued that open access has led to the characteristic economic inefficiency of most fish harvests and low economic status of most fishermen (Gordon 1954; Crutchfield and Pontecorvo 1969). As this argument has taken hold, limited entry programs have been introduced in a number of fisheries. However, despite increasing use of limited entry in fisheries management and growing controversy in regard to its implications (e.g. Crutchfield 1979; Cicin-Sain 1979), the socioeconomic consequences of limited entry have in fact been little studied.

The socioeconomic impact of limited entry upon a fishery will depend upon characteristics of both the fishing community and the particular entry program. The critical elements of a limited entry system are typically the allocation of the entry permits, their ownership, and transferability. What criteria are to be used to ensure the permits are distributed equitably? Are entry permits to remain the property of the state or should they devolve to the recipients? How are succeeding generations to enter the fishery? At this time, little is known of how different groups of fishermen are affected by the particular way these issues are resolved. Indeed it is not clear how fishing communities weigh the fundamental trade-offs among promise of economic gain and loss of flexibility for the entrants and loss of opportunity for those denied access in the changeover from an open access system (Crutchfield 1979; Cicin-Sain 1979).

The Bristol Bay, Alaska salmon fishery appears particularly well-suited to a study of the impact of limited entry. The fishery is conducted by several major groups of North American fishermen: full- and part-time fishermen; fishermen with and without alternative incomes; fishermen with traditional roots in fishing of both European and Native-American descent, as well as more recent entrants. In Bristol Bay, the impact of limited entry upon these diverse groups can be viewed within a single context.

Bristol Bay has also been the focus of considerable debate on limited entry. Crutchfield and Pontecorvo (1969) used the fishery as a classic example of a fishery in need of limited entry on grounds of economic efficiency. Although the fishery is highly valuable (it is based on the world's largest run of sockeye salmon (*Oncorhynchus nerka*)) it has historically been managed largely through gear and vessel restrictions, designed to limit the effectiveness of each fisherman, thereby increasing employment in the fishery.

However, when limited entry was instituted in Alaskan salmon fisheries in 1974, it was not on the basis of theoretical economic considerations, but in the face of the severe economic crisis in Bristol Bay and other parts of rural Alaska that had followed several years of exceptionally poor salmon returns (Adasiak 1977; Rogers 1979). An explicit effort was made to incorporate both social and economic criteria in determining eligibility for a permit under the Alaskan limited entry system: residence (rural vs. urban) and dependence upon fishing income, as well as experience in the fishery, served as criteria in awarding permits (compare Adasiak (1979) with Campbell (1973) and Fraser (1979) on the Canadian limited entry system for salmon). Although the system has been highly controversial (a statewide referendum unsuccessfully attempted to overturn it in 1976 and ~200 lawsuits have chal-

lenged it in the courts) it has been considered generally successful by its managers (Adasiak 1979).

Bristol Bay thus seemed particularly appropriate for the study of the socioeconomic impact of a limited entry system due to the diversity of groups within the fishery, the apparent need for limited entry regulation, and the manner in which the system was initially framed.

Methods

The study was conducted in June–August, 1979, through a combination of structured and unstructured interviews administered by a survey team consisting of the author, who had fished in Bristol Bay in the 1970 and 1971 seasons, a graduate student of anthropology (M. K. Gilliland, University of California, San Diego), and six volunteers recruited through the Center for Field Research (Earthwatch). Standard questionnaires were administered to captains of fishing vessels, experienced crewmen, and local villagers, and less formal interviews were conducted with cannery superintendents, fishermen's union officials, local community leaders, and numerous fishermen and residents.

Systematic sampling of the fishery population was facilitated by the physical structure of the fishery. Fish processing plants are located primarily in the villages of Naknek and South Naknek, situated on either side of the Naknek River (Fig. 1). The vast majority of Bristol Bay fishermen are not permanent residents of these villages. Because there is no surplus housing in the villages, nonresident fishermen depend upon the canneries for their housing as well as their market. Thus the fishermen could be readily surveyed in their quarters or on their vessels during nonfishing periods.

The captains who were interviewed were selected systematically from the processors' complete lists of captains under contract, which were obtained from five of the eight major canneries. Approximately 20 captains were selected from each cannery. After selecting the first name at random, between every third and every seventh name was selected for the survey, depending upon the number of fishermen on the list. Crewmen associated with the vessels were interviewed if they had fished for 5 yr or more in Bristol Bay.

To survey Bristol Bay residents, interviews were conducted in households in four villages within the Naknek–Kuichak watershed area: Naknek, South Naknek, Nondalton, and Kokhanok (see Fig. 1). These villages represent a gradient in their degree of contact with the outside world. Naknek is the center of the salmon processing industry in Bristol Bay and contains various commercial establishments to service the fishing industry as well as government offices. South Naknek is situated on the other side of the Naknek River. Transport between the villages is by air or boat at high tide. South Naknek is a smaller village, and although it contains several fish processing plants, it has none of the support services; it also has no direct ground link to the airport at King Salmon, which connects the area to the outside world. Nondalton and Kokhanok are situated upriver on the major sockeye salmon spawning grounds (Fig. 1). They are far removed from any large-scale commercial activity, although their residents depend heavily upon the fishery for cash income and upon the upriver salmon for subsistence. Residents of these villages represent the major Native groups in the area. Nondalton is an

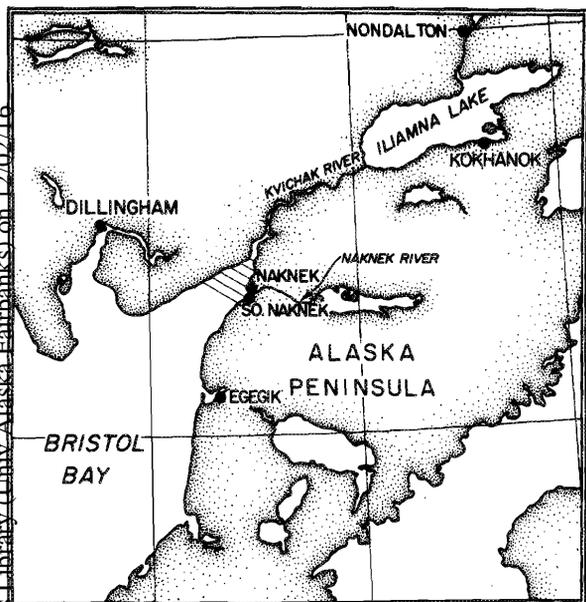


FIG. 1. Bristol Bay and surrounding area showing the location of villages and places mentioned in the text. The Naknek-Kuichak fishery is conducted in the area delimited at the head of Bristol Bay.

habascan Indian village, and Kokhanok is predominantly Eskimo. Kokhanok was also selected because its residents had been acquainted with the author in 1970-71; this was felt to be a considerable advantage due to the short time available for study and the general mistrust of strangers in more remote villages.

The surveys of Naknek and South Naknek were based upon Borough Tax Assessor's maps and property lists and were conducted during the fishing season. The surveys of Nondalton and Kokhanok were based on a mapping of all residences in the villages, prepared in conjunction with local residents. I surveyed the upriver villages at the end of the fishing season. Village samples were selected systematically after enumerating all residences in the village. Depending upon size, every second to every fourth household was selected for the survey. The head of each household was the only person actually interviewed, but questions concerning all household members were asked.

All questionnaires covered the demographic characteristics of the respondent and his immediate family: their involvement in fisheries, particularly in Bristol Bay; the impact of limited entry policy on the household's fishing income and fishing strategy; and both closed and open-ended questions concerning the respondent's views on limited entry and its effect on various groups of participants in the fishery. The questionnaire administered to fishing captains also contained questions concerning vessel and gear characteristics, and these questions were also asked of those heads of village households who held limited entry permits. The interviews were 1 h in length and were conducted orally; responses to the questions were recorded on survey forms by the interviewer. (Copies of the questionnaire forms may be obtained from the author).

The structured surveys were coded and analyzed first by the

overall frequency of responses and broken down by captains, crewmembers, and local residents. The data from the fishermen were broken down by ethnic grouping and by place of residence (i.e. Bristol Bay area, greater Alaska, or outside Alaska). Data obtained from the villages were separated by village; the total village census was also broken down by age, sex, and ethnic group.

Results

The total resident population of Bristol Bay area is ~4600 (Kresge et al. 1974). 1717 permanent permits have been issued for drift gillnetting. A total of 113 questionnaires were completed. Of the respondents, 42 were captains, 14 were crewmembers, and 57 were heads of households in the villages of Naknek, South Naknek, Nondalton, and Kokhanok. The average household contained 4.1 inhabitants; a total of 235 residents were included in the village survey. Of the 66 households selected to be surveyed, 21 were located in Naknek, 14 in South Naknek, 17 in Nondalton, and 14 in Kokhanok.

Interviews were successfully obtained from 86% (57 of 66) of the village households selected for the survey; 97% of fishing captains contacted were successfully interviewed. However, only 47% of fishing captains selected for the survey were successfully contacted due to fishermen on company lists who either did not show up that year, left early, or chose to fish other Bristol Bay runs (e.g. Egegik or Dillingham; see Fig. 1); also, one cannery list could only be obtained near the end of the season, so few interviews could be completed there (24% of fishermen selected). The canneries were visited repeatedly, and due to a lengthy price dispute during which the fishermen remained ashore, 89% of captains selected from the four major canneries studied and known to be on the fishing ground were contacted. Although 45% of the crewmen aboard vessels that were surveyed had fished 5 yr or longer, only 14 were interviewed. Due to the low numbers of crewmen interviewed, this aspect of the study will not be discussed in detail.

DEMOGRAPHY

The ethnic background and residence of Bristol Bay fishermen are closely linked. The Bristol Bay fishery is dominated by non-Alaskans, primarily Italian-Americans living along the coast of California, as well as Scandinavian-Americans living primarily in the Pacific Northwest (Tables 1-3). These ethnic groups (hereafter referred to as the European ethnic fishermen) were among the first to exploit the Bristol Bay runs commercially (Rogers 1972). Local residents (80% of whom are Native-Americans) comprise 36% of the fishing fleet, and the remainder of the fleet is made up of non-Bristol Bay Alaskan residents, who have no dominant ethnic identity (Langdon 1980). Non-Alaskan fishermen tended to be over-represented in the survey of fishing captains, and Bristol Bay residents were under-represented (Tables 1 and 2) due to the major canners' historic and continued reliance upon non-Alaskan fishermen. Local residents tend to fish for smaller processors and buyers (less reliable markets) that could not be adequately sampled. The survey of local residents compensates for this deficit in the number of local fishing captains in the cannery-based survey.

TABLE 1. Residence of recipients of Bristol Bay drift gillnet permits (August 29, 1979) (from Langdon 1980).

	Residence					
	Bristol Bay		Greater Alaska		Non-Alaska	
	No.	%	No.	%	No.	%
Original permits issued	662	38.6	327	19.0	728	42.4
Changes due to transfers Jan. 1, 1975– Aug. 20, 1979	-43	-6.5	+14	+4.3	+29	+4.0
Residence following transfers	619	36.1	341	19.9	757	44.1

TABLE 2. Ethnic origin of the questionnaire respondents. "Native" refers to Eskimos, Aleuts, and Indians and "European" refers to persons with Italian, Scandinavian, or Croatian ancestry. Percentages are of column totals. (Missing observations: 3.)

Ethnic origin	Questionnaire type							
	Captain		Crew		Village survey		Row totals	
	No.	%	No.	%	No.	%	No.	%
Native	8	17.4	2	22.2	44	80.0	54	49.1
European	23	50.0	5	55.6	1	1.8	29	26.4
Other	15	32.6	2	17.2	10	18.2	27	24.5
Column totals	46	41.8	9	8.2	55	50.0	110	

TABLE 3. Residence of the questionnaire respondents by ethnicity. Percentages are of column totals. (Missing observations: 4.)

Residence	Ethnicity							
	Native		European		Other		Totals	
	No.	%	No.	%	No.	%	No.	%
Bristol Bay	49	90.7	2	6.9	9	34.6	60	55.0
Greater Alaska	2	3.7	3	10.3	7	26.9	12	11.0
California/ Oregon/ Washington	2	3.7	24	82.8	8	30.8	34	31.2
Other	1	1.9	0	0.0	2	7.7	3	2.8
Totals	54	49.5	29	26.6	26	23.9	109	

The Bristol Bay fleet is composed primarily of older fishermen (Table 4); 72% of captains surveyed were more than 35 yr of age, and more than half of these were over 50. Langdon (1980) found the mean age of Bristol Bay drift gillnet captains to be 42.0 yr.

On the other hand, the age distribution of the local communities is skewed considerably toward younger ages. In 1970, the median age of the Bristol Bay Native population was 17.6 yr, and 39% of the heads of village households surveyed were under 36 yr. The birth rate of the Bristol Bay Native population in 1970 (24.8 per 1000 population) was 14% high-

er than that of the non-Native Alaskan population and 36% higher than the national average (Langdon 1979).

CHARACTERISTICS OF FISHERY GROUPS

The major demographic groups that fish Bristol Bay can be further characterized in terms of their self-perception as fishermen, their involvement in fishing activities, their dependence upon Bristol Bay and other fisheries for their livelihood, the types of vessels and gear they use in Bristol Bay, their earnings from the fishery, and their activities when not

TABLE 4. Age distribution of captains and villagers. Percentages are of column totals.

Age	Questionnaire respondents			
	Captains		Villagers	
	No.	%	No.	%
≤24	7	15.2	136	61.8
25-35	6	13.0	26	11.8
36-50	14	30.4	29	13.2
51-65	15	32.6	15	6.8
>65	4	8.7	14	6.4
Totals	46	17.3	220	82.7

fishing in Bristol Bay (i.e. the remaining 10-11 mo of the year).

Both Bristol Bay resident and non-Alaskan fishing captains but not captains from the greater Alaska area) tended to perceive themselves as "fishermen" (Table 5). Social and cultural rather than economic factors seemed the basis for this difference in self-definition by the major fishery groups. Only the non-Alaskans were significantly involved in other fisheries, and less than half (43%) of fishing captains, even in this group, were active in other fisheries. There was no significant difference in the degree to which the different groups depended upon fishing for their livelihood; 44-54% of fishermen in all groups depended upon fishing for more than two-thirds of their income. However, local residents were more dependent upon the Bristol Bay fishery per se (Table 6). Comparison of local vs. nonlocal fishermen obtaining less than two-thirds or more than two-thirds of income from Bristol Bay fishery: $\chi^2 = 4.09$, $df = 1$, $P < 0.025$). However,

both Bristol Bay residents and non-Alaskan fishermen tended to have been brought up in families in which the father fished and to have started fishing while still boys (18 yr of age or younger), whereas those fishing from the greater Alaska area were generally brought up in nonfishing families and first fished as adults (Tables 7 and 8 ($P < 0.01$ and $P < 0.025$, respectively, Fisher exact test)).

Local residents lacked other opportunities to earn money and tended to be more dependent upon the Bristol Bay fishery. The village survey indicated more than half (59%) of all watershed resident men between the ages of 18 and 65 were currently engaged in the Bristol Bay fishery. The modal response of local residents when asked what they did during most of the remainder of the year when not fishing in Bristol Bay was either nothing or some form of rural activity (e.g. subsistence activity, trapping, or guiding) (46%), whereas nonlocal fishermen tended to be engaged in some form of blue-collar work (40%). The seasonal nature of employment in the region can be seen in Fig. 2.

Local residents were not only more dependent upon the Bristol Bay fishery for their income (Table 6), but they earned significantly less from it. In the period 1975-77, Langdon (1979) found the average earnings of Bristol Bay residents were 15% less than the fleet average. This results largely from the considerable disparity between the vessels and gear fished by local and nonlocal fishermen. Whereas virtually all nonlocal fishermen surveyed (98%) fished from the maximum regulation-size 32-foot (9.8-m) gillnetter, 43% of local captains either had no vessel or fished from open skiffs. Skiffs are less seaworthy and, due to prevalent windy and stormy conditions, they are unable to fish as many days as regulation-size gillnetters. The fish-holding capacity of local fishing vessels was also typically less (Table 9), which limits the fishermen's earnings, particularly during a good season and during the

TABLE 5. Response to question, "Do you consider yourself a fisherman?" by place of residence. Percentages are of column totals. (Missing observations: 3.)

Response	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
Yes	13	81.3	4	36.4	25	67.6	42	65.6
No	3	18.8	7	63.6	12	32.4	22	34.4
Totals	16	25.0	11	17.2	37	57.8	64	

TABLE 6. Fraction of captains' annual income derived from the Bristol Bay fishery alone, by place of residence. Percentages are of column totals. (Missing observations: 16.)

Fraction	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
<1/3	2	15.4	2	25.0	12	40.0	16	31.4
1/3-2/3	4	30.8	3	37.5	12	40.0	19	37.3
>2/3	7	53.8	3	37.5	6	20.0	16	31.4
Totals	13	25.5	8	15.7	30	58.3	51	

TABLE 7. Incidence among captains of fathers who had fished, by residence. Percentages are of column totals. (Missing observations: 6.)

Father had fished	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
Yes	14	82.4	1	10.0	28	82.4	43	70.5
No	3	17.6	9	90.0	6	17.6	18	29.5
Totals	17	27.9	10	16.4	34	55.7	61	

TABLE 8. Age at which Bristol Bay captains and crew first fished, by residence. Percentages are of column totals. (Missing observations: 7.)

Age	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
≤ 18	28	73.7	4	40.0	32	84.2	64	74.4
19-29	6	15.8	2	20.0	4	10.5	12	14.0
≥ 30	4	10.5	4	40.0	2	5.3	10	11.6
Totals	38	44.2	10	11.6	38	44.2	86	

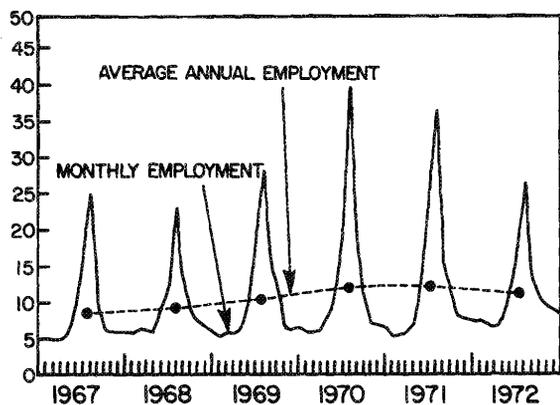


FIG. 2. Employment patterns in Bristol Bay area, 1967-72, showing the seasonal nature of monthly employment and average annual employment. (Source: Kresge et al. 1974.)

(Table 10). Nonlocal fishing captains typically owned more fishing gear as well, 76% owning more than the three shackles (91.4 m) of gill net permitted to be fished at one time, thus maintaining a reserve, whereas only 36% of local fishermen owned more than three shackles of gear.

LIMITED ENTRY AND BRISTOL BAY FISHERMEN

Bristol Bay residents and nonlocal fishermen were sharply divided in their views of Alaskan limited entry policy (Table 11). A majority of both local and nonlocal fishermen felt the present system should be modified, but the two groups proposed fundamentally different modifications. Nonlocal fishermen were predominantly in favor of tightening the existing system (i.e. more enforcement, halting the issuance of additional permits), whereas Bristol Bay residents considered the present system too restrictive and generally believed more permits should be issued to the local population (Table 12). A substantial proportion of nonlocal fishermen (41%) favored retaining the limited entry system in its present form, a view with virtually no support among local residents; a significant

TABLE 9. Capacity of captains' fishing vessels (in number of sockeye the vessel can hold), by the place of residence. Percentages are of column totals. (Missing observations: 13.)

Boat capacity	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
<3000	8	61.5	2	20.0	8	25.8	18	33.3
>3000	5	38.5	8	80.0	23	74.2	36	66.7
Totals	13	24.1	10	18.5	31	57.4	54	

TABLE 10. Captains' estimate of the value of their vessels, in thousands of dollars, by place of residence. Percentages are of column totals. (Missing observations: 22.)

Value	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
≤10	10	83.3	1	12.5	2	8.0	13	28.9
11-20	1	8.3	1	12.5	8	32.0	10	22.2
21-40	1	8.3	2	25.0	11	44.0	14	31.1
>40	0	0.0	4	50.0	4	16.0	8	17.8
Totals	12	26.7	8	17.8	25	55.6	45	

TABLE 11. Opinion of respondents as to whether the limited entry system should be retained, repealed, or modified, by residence. Percentages are of column totals. (Missing observations: 9.)

Opinions	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
Retain in present form	4	7.3	5	41.7	15	40.5	24	23.1
Repeal—return to open entry	11	20.0	2	16.7	1	2.7	14	13.5
Modify present system	32	58.2	5	41.7	21	56.8	58	55.8
No opinion	8	14.5	0	0.0	0	0.0	8	7.7
Totals	55	52.9	12	11.5	37	35.6	104	

TABLE 12. Proposed modifications to limited entry by respondents who stated the system should be modified (Table 11), by residence. Respondents proposed one to three modifications. The question was open-ended. Percentages are of column totals.

Proposed modification	Residence							
	Bristol Bay		Greater Alaska		Non-Alaska		Totals	
	No.	%	No.	%	No.	%	No.	%
More permits for local fishermen	12	34.3	1	5.0	3	10.0	16	21.3
More permits for experienced fishermen	2	5.7	0	0.0	5	16.7	7	9.3
More enforcement	6	17.1	3	15.0	5	16.7	14	18.7
Halt issuance of further permits	1	2.9	2	10.0	4	13.3	7	9.3
End salability of permits	3	8.6	1	5.0	3	10.0	7	9.3
Control price	0	0.0	2	10.0	3	10.0	5	6.7
Other	11	31.4	1	5.0	7	23.3	19	25.3
Totals	35		10		30		75	

number of local residents (20%) but few nonlocal fishermen favored the direct repeal of the system (Table 12). Fishermen from the greater Alaska area and non-Alaskans generally held similar views concerning limited entry.

When asked the open-ended question, what aspects of the

limited entry system they favored, nonlocal fishermen responded overwhelmingly that it limited competition (73%) and the amount of gear in the water (54%) ($n = 48$). Only 31 and 25% of Bristol Bay residents offered these responses, respectively ($n = 59$). Due to the higher fish prices in 1979

and improved harvests, it was generally felt that additional fishermen would enter the fishery if it were not for the permit system.

Whereas 41% of nonlocal fishermen felt limited entry had enhanced their income, only 4% of local residents felt the changed management had enhanced their family income; 49% of all village households surveyed responded that the system had actually diminished their income. When asked the open-ended question, what aspects, if any, of limited entry they were critical of, 58% of watershed residents responded that it inhibited the entry of young people into the fishery and, more generally, kept local people out of it. They tended to believe that an insufficient number of permits had been granted local residents initially, that permits were being further drained from the local area due to their sale, and that there was insufficient opportunity for young people to enter the fishery. These aspects of the Alaskan permit system are examined below.

In the survey of local villages, 22% of men over the age of 18 claimed that their application for a permit to fish in Bristol Bay had been denied. Of those denied a permit the median reported number of years fishing in Bristol Bay was 10 seasons (range, 2–33). In their own eyes and those of much of the community, most of these unsuccessful applicants are legitimate Bristol Bay fishermen. Why did they not qualify for permits?

Those watershed residents who were experienced fishermen and yet failed to obtain permits typically had not fished the 2 yr just prior to the imposition of the limited entry system. The primary criterion used by the Alaskan Limited Entry Commission to determine status as a bona fide Bristol Bay fisherman was recent participation in the fishery as a license holder. Of 20 points required to obtain a permit, 3 points were allotted for each of the years 1971 and 1972 in which a license was held, 2 points each for 1969 and 1970, and 1 point for each year a license was held back to 1965. Dependence on the fishery for income was only considered for 1971–72 and 1972 was given greater weight. However, 1971–72 were off years for the fishery, 1972 being notably poor. Average net earnings per boat (before crew share) were \$11 301 in 1970, \$5538 in 1971, and \$302 in 1972 (Langdon 1979 from Rogers and Kreinheder 1979). The expected runs are reasonably well-predicted in advance by Alaska Department of Fish and Game; the nature of the sockeye salmon cycle, which peaks every 5th yr in Bristol Bay (e.g. 1965/70) is also well-known by Bristol Bay fishermen. Bristol Bay residents are notably dependent upon seasonal income (Fig. 2), and some found alternate employment during those years. Some were engaged in training and employment on the Trans-Alaska pipeline project (Langdon 1979). Residents of Nondalton are often called upon to fight forest fires in the Alaskan interior. Although this occupation is highly subject to nature's vicissitudes, some found it worthwhile to wait at home for a fire call rather than fish during those years. Due to the generally cyclic nature of salmon runs (Ricker 1950), economic pluralism became a viable strategy for many local rural residents. However, many who did not fish the poor years were later unable to obtain a permit.

The relationships between fishermen on a vessel tended to differ between local and nonlocal fishermen. Proportionately, almost three times as many local residents fished as full part-

ners rather than in a captain-crew relationship (33% vs. 12%; $\chi^2 = 2.80$, $df = 1$, $P < 0.10$). In these instances, the vessel and gear were jointly owned, and all fishing costs and income were shared equally. In the prelimited entry era, only one man could hold the fishing license, but this was a formality as the license conferred no privilege. However, this predominantly rural fishing relationship was not recognized by the Limited Entry Commission. Points sufficient to obtain a limited entry permit were based upon the years as *license holder*. Thus, only one partner could receive a permit; today, if the partnership dissolves, only the permit holder is assured of being able to continue fishing.

Other aspects of the permit application also appear based upon a nonrural definition of a legitimate fisherman. Points were awarded for fishing more than 3 wk during each of the 1971 and 1972 seasons. However, the Bristol Bay sockeye run is often largely completed in ~10 d, although processors promote "professionalism" among the fishermen to have sufficient fishermen to harvest the tails of the run. Local residents have been noted historically to fish predominantly during the peaks of the runs (Rogers 1972), because they depend upon subsistence activities to support their families. Imported foods are highly expensive in these isolated regions, so considerable numbers of salmon are salted, dried and smoked, and canned for the winter. The activity is labor intensive, so local fishermen may return to their villages from Naknek in less than 3 wk, particularly during years of poor commercial fishing, such as 1971–72. Thus this aspect of the application further discriminated against local residents.

Local residents noted several other factors that may have contributed to their inadequate representation in the fishery. Many reported difficulty in understanding the application form, which was long and complex. The original application contained seven pages (four forms) and was accompanied by 41 pages of instructions. To obtain points for various sections required records of gear and vessel ownership, of past years' fishing activity and earnings, and computation of percentage income derived from the Bristol Bay fishery. In 1970, the median number of years of schooling received by Bristol Bay Natives over 25 yr of age was 3.9 yr; 21% of this population had received no formal education; 79% had not gone beyond the elementary level (grade 8) (Langdon 1979). Many did not maintain adequate records for documentation, and the degree to which affidavits were accepted is unclear. Although assistance was provided in filling out the permit applications, many residents questioned the competence and degree of interest of the counsellors. This allegation is supported by the Alaska Legal Services Corporation, which instituted a lawsuit against the Limited Entry Commission on grounds that application assistance was insufficient (Adasiak 1979).

Despite numerous appeals of permit applications, lawsuits (Adasiak 1979), hearings at local and state level, and reports (Koslow 1979; Langdon 1979, 1980) in which these aspects of the Alaskan limited entry program have been raised, the Limited Entry Commission has shown little sign of yielding to pressure from the rural population. Of 30 appeals of permit applications encountered on the village surveys, only 1 had been successful. According to respondents, eight (27%) remained outstanding despite the passing of the fishing season. Although the legitimacy of these claims could not be judged, it may be noted that the single successful appeal followed a

TABLE 13. Probabilities (χ^2 tests, $df = 1$) of family involvement in fishing.

	Native vs. all other	Native + European ethnic vs. all other	Local vs. all nonlocal	Bristol Bay + non-Alaskan vs. greater Alaskan
Crewed with immediate family	NS	NS	0.025	<0.01
Crewed with non- immediate family	<0.25	NS	<0.01	NS
Present crew: A relation	NS	<0.025	NS	<0.05

TABLE 14. Response to question, "Do you want your son(s) to be a fisherman?"
(Missing observations: 7.)

Response	Residence			
	Bristol Bay	Greater Alaska	Non-Alaska	
Yes	7	2	6	
No	0	1	7	
It is up to him	6	2	2	
Want him to fish: not to be a fisherman	0	1	1	
Without sons	1	4	15	
Totals	14	10	33	60

...time-consuming, and aggressive campaign by one of
better educated residents (a health aide).

The free transferability of permits under the Alaska limited
entry system has led to a substantial drain of permits from the
Bristol Bay area. Between 1975 and 1979, permit transfers
resulted in the net loss of 43 permits from local residents to
non-Alaskans and residents of greater Alaska. This represent-
ed 6% of the original permits issued to local residents (Table
13) (Langdon 1980). Residents reported that permits were of-
ten sold in winter in times of need during the poor salmon
years. Furthermore, because local residents earn less from the
fishery than nonlocal fishermen, local fishermen tend to de-
value the permit relative to nonlocal fishermen (Langdon
1980). Due to recent good salmon harvests, the average pur-
chase price of a permit rose from \$1166 in 1975 to \$69 667
in 1979 (Langdon 1980). Given the extremely limited means
of local residents, the drain of permits from the local area
appears to be increasing (Langdon 1980).

Perhaps the most significant impact of limited entry upon
the local villages results from the way it transforms the trans-
mission of the fishery to future generations. Although family
ties are an important component of the social fabric of all
fishery groups, they are particularly pervasive among local
Native-Alaskan and non-Alaskan European ethnic fishermen.
Fishing captains from these groups generally showed a greater
tendency to have crewed themselves with family and relatives
and to have their relations presently serving as crew (Table
13). (The typical Bristol Bay gill-netter is fished by the cap-
tain and a single crewmember.) Seventy-one percent of
Native and European ethnic fishermen had family and rela-
tives presently serving as crew compared with 40% on other
vessels. Entry into the fishery has traditionally followed fami-
ly lines in these groups, young men receiving training as
crewmembers with relatives until they are prepared to acquire

their own vessel. However, under the present limited entry
system, only one member of a family may attain status as an
independent fisherman, and then only upon the permit-
holder's retirement, if the permit is transmitted along family
lines.

Because this change would seem to affect all traditional
fishery groups (in this fishery, local Native fishermen and
non-Alaskan European ethnic fishermen in particular) the
question arises why these two groups viewed the limited entry
system so differently. For one, rural Native-Alaskans have
notably large families, so the pressure for permits is particu-
larly great. In 1970, the modal family size for this population
was 7 and the mean was 5.7, compared with the non-Native-
Alaskan modal family size of 2 and mean of 3.7 (Langdon
1979). The village survey indicated that although two-thirds
of men 18-35 fished in Bristol Bay, 72% in this group had
no permit. The situation is particularly severe among the
younger men: 85% of those surveyed between 18 and 24 yr of
age had no permit. The ability to attain independent status
within the fishery appears effectively closed to a large propor-
tion of the rural fishing population, given the large proportion
of young within this group and the shrinking number of per-
mits held locally. Furthermore, discussions indicated that the
families of many non-Alaskan European ethnic fishermen
appeared to be undergoing acculturation. Many of their chil-
dren were embarked upon nonfishing, often college-based,
careers. Rural Alaskans, on the other hand, generally lack
alternate opportunities due to limitations of regional econo-
mies and lack of education and skills to compete in the urban
environment. Thus locally resident fishing captains who held
a preference as to their son(s)' career were virtually unani-
mous in their desire for them to fish. Nonlocal fishing cap-
tains, regardless of residence or ethnicity, were divided, as
many preferring their sons to take up another career as want-

ing their sons to be fishermen (Table 14).

Discussion

In examining the impact of limited entry policy among the different fishery groups in Bristol Bay, a clear dichotomy was found between local and nonlocal fishermen. Nonlocal fishermen were generally well-equipped and able to realize any increased rent due to limited entry, i.e. a rate of return above that which would accrue to an open entry fishery. On the other hand, local rural communities appeared to suffer under the present system. Initially, some local residents of longstanding experience fishing and who considered themselves legitimate Bristol Bay fishermen were unable to obtain permits. The permit application made apparent allowance for local fishermen by awarding points for rural residence and degree of dependence upon the fishery, although, for the latter, only during 1971-72. However, the application's implicit definition of a legitimate Bristol Bay fisherman was based upon the nonrural fisherman, one who fishes every season, good or bad, and fishes the entire season, both the peak and tails of the run, and who maintains written records of income and has sufficient education to comprehend a complex application process. The application failed to recognize the need of local rural residents to maintain a diversified economy in the face of the drastically fluctuating salmon runs. These conflicting dependencies within the permit application created apparent anomalies: permits were received by some fishermen who had skipped only several seasons prior to the institution of limited entry, while longstanding Bristol Bay fishermen who went elsewhere during those years were denied further access to the fishery.

From 1975 to 1979, 6% of permits issued to Bristol Bay residents has been transferred to nonlocal fishermen (Table 1). The Limited Entry Commission has denied that this has been a problem based upon preliminary findings in south-east Alaska (Adasiak 1979). However, Langdon (1980) analyzed permit transfers in all Alaskan limited entry fisheries over the period 1975-79 and found a net loss of 3.5% of permits from local rural Alaskan fishermen due to transfers. A similar pattern was found earlier when limited entry was instituted in Canadian Pacific salmon fisheries. Ultimately, Canada instituted an alternate nontransferable permit for local native fishermen (Campbell 1973). This pattern seems based upon the poorer earnings of rural fishermen, which causes them to devalue the permit relative to other fishermen, and their more severe short-term exigencies due to greater dependence for cash upon the fluctuating salmon harvest.

However, the most significant impact of the Alaskan limited entry program upon local fishing communities may prove to be the severe limitation it places upon entry into the fishery of the burgeoning youthful rural population. This situation would not be critical if other local opportunities were expanding or if out-migration were a viable alternative. However, based upon the 1970 census, Kresge et al. (1977) found that only 31% of Natives 14 yr of age and older were employed, less than half the proportion of white Alaskans. Eighteen percent of Natives actively seeking employment were unable to find jobs, and of those who were employed, over half worked for 26 wk of the year or less. Mean per capita income of Native Alaskans was one-third that of white Alaskans.

Although increasing numbers of Natives are enrolling in college, the success rate is half that of non-Native students, and overall numbers graduating are very low; in 1969-72, an average of 22 Natives per year received a 4-yr college degree (Kohout and Kleinfeld 1974), although Native groups compose 20% of the Alaskan population.

Certain aspects of the local situation could not be quantified, but are nonetheless important. Five years after the institution of limited entry, the author found a prevailing mood of bitterness and frustration among Bristol Bay residents. Some consider access to the resource an aboriginal right. Many expressed the view that the program had been originally proposed to them as a means to prevent the fishery from being taken over by "outsiders," but that it had resulted in closure of the fishery to themselves. This mood is enhanced by the apparent unresponsiveness of the Commission and state government to their situation despite numerous appeals, lawsuits, hearings, and promises by political leaders. Apparently without recourse through legitimate channels and without opportunity either in the village or the outside world, there appeared to be widespread illegal fishing (i.e. fishing without permits), despite the risk of a high fine. Many fishermen spoke of the need for more enforcement (Table 12). To maintain credibility, the system must be enforced. However, under present circumstances, violation of the system serves as a safety valve to relieve the pressures caused by its inequities.

In response to criticism, the state of Alaska expanded a loan program in 1978 to enable Alaskan residents to buy permits. However, the application is again relatively complex and its requirements for information and collateral may appear prohibitive to rural Alaskans. Preliminary analysis by Langdon (1980) indicated successful loan applicants were primarily from urban Alaska, and there was little impact upon local rural communities. In Bristol Bay, three local residents and eight nonlocal urban Alaskan residents had successfully obtained permit loans 1 yr after initiation of the program.

If the Alaskan limited entry system is to enhance the state's rural economy, some aspect of the program must be directed more clearly to inclusion of that segment of the society. Economic revitalization might begin with issuance of non-transferable permits to rural residents of coastal or watershed regions with greater than, say, 5 yr of fishing experience. A state loan program directed specifically to rural Alaskans for purchase of adequate vessels and gear, as well as permits, would enable rural Alaskans to achieve parity with nonlocal fishermen. Although the change would be politically difficult at this time, the system should be based upon a nontransferable permit, so that as fishermen retired, new fishermen could enter based upon equitable criteria (e.g. experience in the fishery and dependence upon it).

Acknowledgments

This work was supported by the Center for Field Research and a team of EARTHWATCH volunteers, the Alaska Legislature, the National Science Foundation, and an anonymous donation to the Institute of Marine Resources, University of California. I thank F. Bristol, M. K. Gilliland, and R. Higgins for their perseverance through the often arduous field season. I am grateful to F. Bailey and D. Phillips for extensive discussions on methodology. S. Langdon generously permitted use of unpublished materials. M. Huntley, J. Star, and T. White provided technical assistance with data analysis;

- D. Osborn and J. Page assisted with typing; and A. Larson gave many helpful editorial suggestions. I thank the many residents and fishermen of Bristol Bay and members of its fishing industry for their hospitality, time, and cooperation. I am deeply grateful to the late D. Isaacs, who supported and encouraged this work during some of its most critical moments.
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