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ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF SPORT FISH

A SPECIAL REPORT TO THE

ALASKA BOARD OF FISHERIES

THE KENAI RIVER RECREATIONAL KING SALMON FISHERY

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THE KENAI RIVER RECREATIONAL KING SALMON FISHERY

INTRODUCTION

The Kenai River recreational king salmon fishery is Alaska's largest sport fishery. It is also a relatively new fishery which originated in the early 1970's when anglers developed techniques to harvest fish from this glacial stream. In 1974 the Sport Fish Division began to obtain specific fishery information through a creel census. In that year recreationalists fished 23,610 angler-days to harvest 4,910 king salmon from both the early and late runs. By comparison, in 1986, 126,092 angler-days were expended to harvest 15,647 king salmon. Therefore, participation in the 1986 fishery was more than five times the 1974 total and king salmon harvest has more than tripled (Table 1).

King salmon return to the Kenai River in two distinct runs, early and late. The first run arrives about mid-May, peaks in mid-June, and has passed through the fishery by early July. Late run fish first appear in early July, peak in late July, and are still entering the system in early August. Research suggests most of the early run spawn in two tributaries, the Killey and Funny Rivers. The majority of the late run spawns throughout the mainstem Kenai River from Beaver Creek upstream to Kenai Lake.

King salmon fishing is limited by regulation to the Kenai River downstream from Skilak Lake from January 1 through July 31. The current bag and possession limit is one fish over 16 inches daily and two per season. An angler must stop fishing once he has landed a king salmon.

Historically, the early run of Kenai River king salmon was exploited commercially by both gill nets and traps along the eastern shores of Cook Inlet. However, under current Board of Fisheries policy the early run is allocated to the sport fishery.

Late run fish are currently harvested by both the commercial fishery and the recreational fishery. Both early and late runs pass through the

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popular recreational marine fishery in the vicinity of Whiskey Gulch and Deep Creek where some harvest occurs.

The Kenai River is one of the most productive systems in Cook Inlet. It is also one of the most accessible which contributes to its popularity with recreational fishermen. As a result, the stream has been the focus of public attention for some time. In 1984, the river was added to the State Park System by Legislative Act. A special Advisory Board was created to develop a long-term management plan to address permitting, streamside development, guiding, etc. The Kenai River Comprehensive Management Plan has been completed and adopted by the Department of Natural Resources.

One of the first actions of the Advisory Board was directed at commercial guiding on the river. Prior to the park being established, guides were required only to register with the Department of Fish and Game (ADF&G) and maintain a log book. Since 1985, however, guides have been required to operate under a Department of Natural Resources concessionaire permit, the stipulations being more restrictive than those of ADF&G.

KENAI RIVER KING SALMON STOCK STATUS

Early run Kenai River king salmon are not harvested commercially since they pass through Cook Inlet prior to the commercial season opening. They are harvested by recreational anglers in saltwater fisheries near Whiskey Gulch and off the beaches of Deep Creek beginning in late April or early May. Both marine sport fisheries harvest mixed stocks from Kenai River, Anchor River, Stariski Creek, Deep Creek, Ninilchik River, Crooked Creek and the Susitna River. The largest harvest of early run king salmon occurs in the Kenai River. This fishery begins in mid-May, peaks in early or mid-June and is complete by July 1.

In 1985 the Department initiated a tag and recovery program to estimate the total in-river run of early Kenai River king salmon. King salmon

were tagged near the mouth of the river and fish harvested by sport anglers were examined for tags. Data from this project provided an estimated in-river run of 16,000 fish. The sport fishery harvested 7,970 fish, leaving 8,030 fish for spawning. In 1986 this program estimated a total return to the Kenai River of 27,080 early run fish. From this total, anglers harvested 7,060 (Table 2). The estimated exploitation rates in these two years were 49.8% and 26.1%, respectively. It should be emphasized that these are minimal exploitation rates. In addition to the unknown numbers harvested in the two marine fisheries, there is undoubtedly some low-level mortality associated with the practice of "hook-and-release" which has developed in the Kenai River.

Late run Kenai River king salmon are harvested by both sport and commercial fishermen. This stock is first harvested in the sport fisheries off Whiskey Gulch in late June and then the larger Deep Creek recreational fishery which peaks about July 4. It is assumed that most king salmon harvested in these two fisheries are of Kenai River origin, but a small percentage is contributed from a smaller late run which enters the Kasilof River.

After passing through the marine sport fisheries, this stock is harvested by the east side beach commercial set net fishery which opens after July 1. These fish then enter the Kenai River and are harvested by an intense recreational fishery. The majority of the late run is in the river when the fishery closes by regulation on July 31.

The Whiskey Gulch sport fishery was monitored on a "one-time" basis in 1986. Creel census estimated a harvest of about 230 fish. The Deep Creek marine fishery has been censused since 1972. Late run harvest in this fishery has ranged from 170 to 2,693, averaging 1,011 through 1985. The 1986 harvest was 676. Data from the east side beach commercial set net fishery are available since 1966. Harvest has ranged from 3,304 (1968) to 20,760 in 1986. Estimates of Kenai River recreational catch are available since 1974. Harvests in this fishery through 1986 ranged from 2,355 to 9,174, averaging 5,310. The 1986 harvest of 8,588 is the second highest recorded.

Total late run exploitation rates in 1984, 1985 and 1986 were therefore 30.7, 55.2 and 32.7%, respectively (Table 3).

As with the early run, it must be emphasized that these are minimal exploitation rates. The small number of fish harvested at Whiskey Gulch prior to 1986 are not included. There is undoubtedly "drop-out" and subsequent unknown mortality in the commercial gill net fishery. It is also reasonable to assume that a small number of fish are lost as a result of "hook-and-release" practices in the Kenai River.

MANAGEMENT CRITERIA

Exploitation rate is not satisfactory as a management criteria because it is a function of total run size. At low run sizes, reductions in harvest may be necessary and low exploitation rates result. With large returns, higher proportions of the run may safely be harvested. At present stock levels it is believed that both early and late runs can sustain a maximum exploitation rate of approximately 50 to 60%

Escapement goals cannot be developed with only three years of total return information. In the absence of escapement goals and in-season estimates of abundance, the Department manages Kenai River king salmon stocks based on indicators of magnitude or strength of the return. During the early run, there are two primary indicators of run strength: (1) Catch-per-unit-effort (CPUE) data in the in-river sport fishery, that is, catch rate; (2) Catch-per-unit-effort from the tagging program. During the late run, data from the east side set net fishery are also utilized.

Data from the marine sport fishery at Deep Creek do not demonstrate any relationship between that harvest and total return. It is therefore not used for in-season management.

Catch rate (CPUE) in the sport fishery is a poor estimator of run strength because sport fishing with hook and line, by its very nature,

is an inefficient harvest method and factors other than fish abundance strongly influence sport harvest rate. For example, water clarity and angler congestion are major factors affecting catch rate.

Catch-per-unit-effort data from the in-river tagging program is probably the best in-season estimator of run strength. Although the project was designed to provide tagged fish for the post-season population estimate, capture techniques are not unlike a test fish project. However, the in-river tagging program is relatively new and has only a 3-year data base (2 years for early run). As the program continues, data will be of increasing value.

Twenty-one years of historical harvest data are available from the east side set net fishery. Although incidental harvest of king salmon in the east side set nets is often viewed as a general indicator of run strength, there are only 3 years of total run estimates (1984 to 1986) upon which to base any conclusions about the relationship of run size and commercial exploitation rate.

COMMERCIAL GUIDING INDUSTRY

In 1981, the Board of Fisheries required individuals who guide sport fishermen on the Kenai River to register with the Department and record their harvest and effort through the use of a log book. This requirement was implemented during the 1982 season. In 1983, anglers were prohibited from fishing from registered guide vessels on Sundays during July. In 1984 and 1985, they were further restricted to fishing between 6:00 a.m. and 6:00 p.m. throughout June and July; in 1986, the July hours were changed to 7:00 a.m. to 7:00 p.m.

With the creation of the Kenai River Special Management Area (KRSMA), in essence a State park, came the consideration of operating a business in the park. Department of Natural Resources required guides to obtain a concessionaire's permit. The requirements were more restrictive than those established prior to KRSMA. A fee, insurance minimums, first-aid

training, and proof of Coast Guard recognized competency were among those additional requirements.

The number of businesses and guides registered remained relatively constant through 1984. In 1985, for unknown reasons, the number of guides declined by 20%. In 1986, numbers of guides and businesses registered returned to earlier levels. Table 4 is a summary of the registration program through 1986.

Guided anglers account for a larger percentage of the harvest and effort during the early run fishery than they do during the late run fishery. This is because water conditions (low water) for the inexperienced boat operator are marginal in late May and early June when the early run fishery occurs.

From 1981 through 1985 guided anglers' average harvest was 49.7% of the total early and late run catch (Table 5). Guided anglers, however, accounted for an average of only 21.8% of the total effort. In 1986, the percentage of the harvest taken by guided anglers declined to 43.5%. Guided angler effort was slightly below average at 20.4% of total effort.

During the creel census conducted by the Sport Fish Division, guided anglers are distinguished from non-guided fishermen. The efficiency (relative catch rate) of the average guided angler as opposed to the average non-guided angler is therefore readily obtained by comparing CPUE data for the two groups.

From 1981-1985, guided angler CPUE during the early run fishery has averaged 0.071 king salmon per angler-hour (14 angler-hours to catch one fish). Non-guided anglers have averaged 0.020 fish per hour (50 angler-hours to catch one fish). On the average, guided anglers have been 3.5 times more efficient than non-guided anglers. A similar conclusion may be drawn from examining data from the late run fishery. The average CPUE for the guided angler is 0.066 and for the non-guided angler 0.018.

Guided anglers have been 3.7 times more efficient than non-guided anglers in harvesting late run Kenai River king salmon. In other words, it takes the "average" unguided angler almost four times as long to harvest a king salmon as it does for the "average" guided angler to catch his or her fish. These data were similar for the 1986 season.

HOOK AND RELEASE FISHING

Seasonal bag limits regarding Kenai River king salmon are restrictive, i.e. two per season. King salmon are available from about mid-May through the season's closure on July 31 or about 75 days. All available data suggest that both early and late runs are at or above historic levels. Additionally, the Kenai River is well known for large king salmon and many anglers emphasize "trophy" fishing. In recent years these factors have lead to the development of "hook-and-release" practices among Kenai River king salmon anglers. This practice is somewhat more prevalent among non-guided anglers.

During the early run in 1985, 14,438 king salmon were brought to the boat of which 44.8% or 6,467 fish were released. During the 1986 early run, 11,662 fish were brought to the boat of which 39.5% were released. In 1985 during the late run, 12,697 fish were brought to the boat and 36.6% were released for a harvest of 8,055. During the 1986 late run fishery, 15,903 fish were brought to the boat; 46.0% were released for a harvest of 8,588. In general for both early and late runs in 1985 and 1986, the proportion of fish released ranges from 40 to 44% (Table 6).

In 1986 there were several proposals submitted for the Board's consideration to prohibit hook and release fishing in this fishery. The Board took no action on those proposals. Opponents of the practice contend that: (1) This practice results in physical injury to the fish and higher mortality rates and (2) that anglers are selecting the larger fish which could mean that the genes from these larger fish will be removed from the spawning population and the average size of Kenai River king salmon will decline.

In regards possible injury to the fish, it seems reasonable to assume that unknown limited mortality does occur. However, based on current fisheries research, this mortality is probably minimal and at present stock levels presents no biological problem in the management of the fishery.

Data available do indicate that anglers are selectively retaining larger fish, i.e. those approximately 36 inches and larger. Spawning ground surveys, however, reveal that large numbers of late run king salmon in excess of 36 inches are reaching the spawning grounds. Additionally, late run fish which are not subject to harvest continue to enter the river in August after the fishery closes. On the average, these fish are larger than the fish which enter in July. There is no indication that present conduct of the fishery will affect average fish size.

AFFECT OF COMMERCIAL ON SPORT FISHING

Recreational anglers have contended that during and immediately following a commercial period on the east side beaches, catch and harvest rates in the Kenai River decline precipitously.

Staff examined available catch-per-unit-effort (CPUE) data for the first, second and third day following a commercial opening. Data revealed that on approximately 50% of the first, second and third day following a commercial opening, catch rates remained the same as prior to the commercial opening or improved. During the remaining days (about 50% of the total) CPUE in the river declined. Therefore there is no statistical relationship between the occurrence of a fishing period on the east side beaches and subsequent recreational angler success in the Kenai River for recent runs.

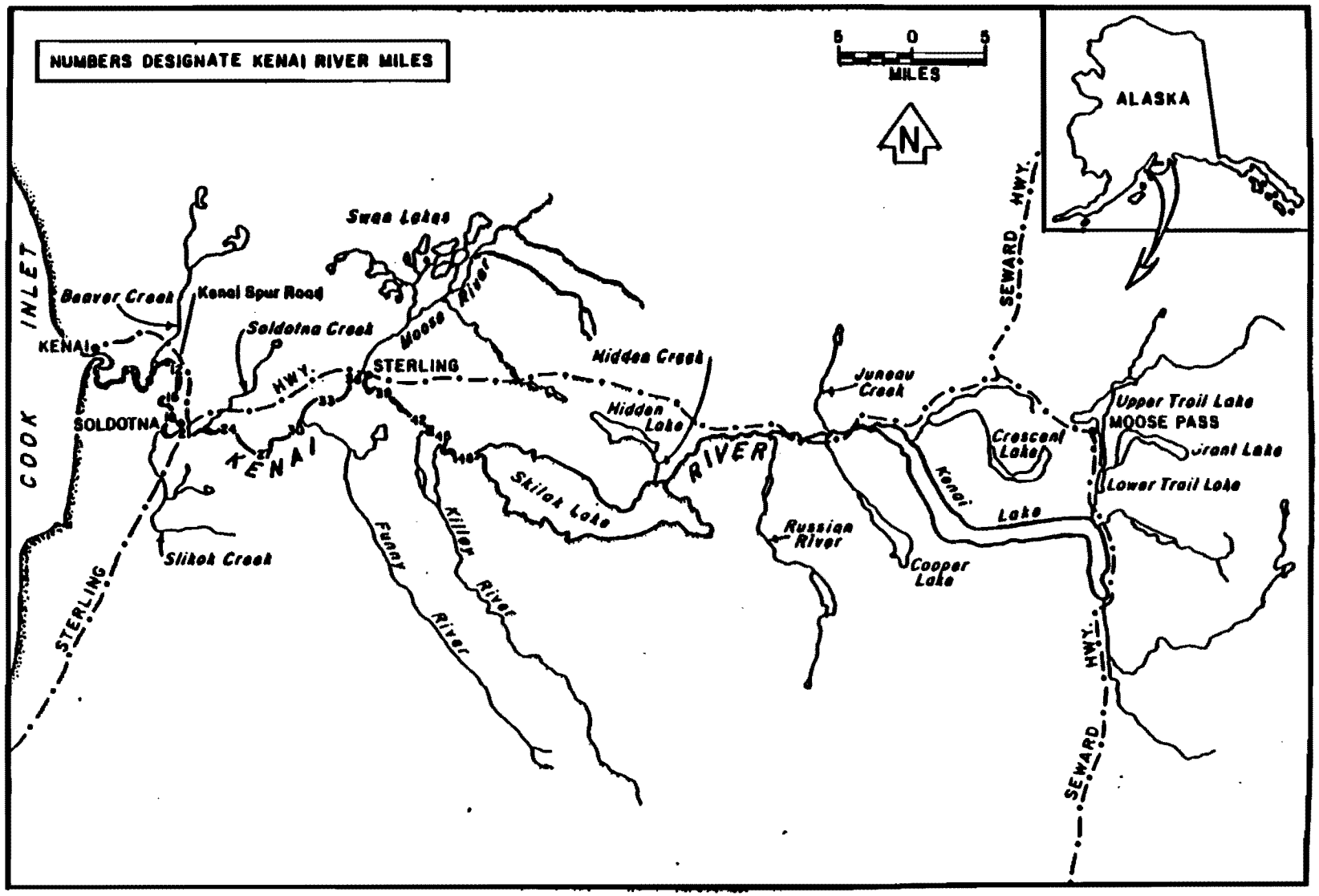

Figure 1. The Kenai River system.

Table 1. Historical summary of the Kenai River recreational fishery for chinook salmon, 1974-1986.

Year	Early Run			Late Run			Total		
	Harvest	Effort[1]	Catch/ Hour	Harvest	Effort[1]	Catch/ Hour	Harvest	Effort[1]	Catch/ Hour
1974	1,685	11,275	0.041	3,225	12,335	0.037	4,910	23,610	0.038
1975	615	15,047	0.011	2,355	14,943	0.044	2,970	29,990	0.024
1976	1,554	16,430	0.024	4,477	28,030	0.039	6,031	44,460	0.033
1977	2,173	35,479	0.019	5,148	47,539	0.036	7,321	83,018	0.029
1978	1,542	19,569	0.018	5,578	60,636	0.026	7,120	80,205	0.024
1979	3,661	39,665	0.022	4,634	58,895	0.022	8,295	98,560	0.022
1980	1,946	32,365	0.016	3,608	38,260	0.018	5,554	70,625	0.017
1981	4,525	28,335	0.031	5,285	29,906	0.032	9,810	58,241	0.032
1982	5,466	45,723	0.033	4,810	43,366	0.024	10,276	89,089	0.030
1983	6,360	42,716	0.037	9,174	56,295	0.036	15,534	99,011	0.037
1984	4,956	50,455	0.025	7,376	77,462	0.021	12,332	127,917	0.022
1985	7,971	47,394	0.043	8,055	73,615	0.027	16,026	121,009	0.034
Mean	3,538	30,038	0.027	5,310	45,107	0.030	8,848	77,145	0.029
1986	7,059	50,666	0.036	8,588	75,426	0.028	15,647	126,092	0.031

Angler-Days

Table 2. Early run Kenai River king salmon harvest, exploitation rates and spawning escapements, 1974-1986.

Year	Kenai River Harvest	Spawning Escapement	Total Run[1]	Exploitation Rate (%)[1]
1974	1,685			
1975	615			
1976	1,554			
1977	2,173			
1978	1,542			
1979	3,661			
1980	1,946			
1981	4,525			
1982	5,466			
1983	6,360			
1984	4,956			
1985	7,971	8,029	16,000	49.8
Mean	3,538	8,029	16,000	
1986	7,059	20,020	27,079	26.1

[1] Total run and exploitation rate are minimum estimates as a relatively small but unknown harvest of early run Kenai River king salmon occurs in the Whiskey Gulch and Deep Creek marine fisheries.

Table 3. Late run Kenai River king salmon harvests, exploitation rates and spawning escapements, 1966-1986.

	Harvest							
Year	Whiskey Gulch	Deep Creek	East Side Set Net	Kenai River	Total Known Harvest	Spawning Escapement	Total Run	Exploitation Rate (%)
1966			7,329		7,329			
1967			6,686		6,686			
1968			3,304		3,304			
1969			5,834		5,834			
1970			5,366		5,366			
1971			7,055		7,055			
1972		1,250	8,600		8,600			
1973		491	4,411		4,902			
1974		100	5,570	3,225	8,895			
1975		345	3,678	2,355	6,378			
1976		1,382	8,249	4,477	14,108			
1977		366	9,732	5,148	15,246			
1978		2,693	12,468	5,578	20,739			
1979		1,164	3,671	4,634	14,469			
1980		747	9,643	3,608	13,998			
1981		170	8,359	5,285	13,814			
1982		1,173	13,658	4,810	19,641			
1983		1,707	15,043	9,174	25,924			
1984		835	5,805	7,376	14,016	31,624	45,640	30.7
1985		1,731	16,985	8,055	26,771	21,695	48,466	55.2
Mean		1,011	8,322	5,310	14,643	26,659	47,053	42.9
1986	225	676	20,760	8,588	30,249	62,350	92,599	32.7

Table 4. Historical summary of Kenai River guide registration program, 1982-1986.

	1982	1983	1984	1985[1]	1986[1]
Businesses Registered	125	123	115	84	100
Guides Registered	207	198	214	166	225
Vessels Registered	179	185	199	178[2]	200
Logbooks Issued	222	236	283	274	358

[1] Data provided by Division of Parks and Recreation

[2] 131 powered boats; 47 drift boats

Table 5. Historical summary of harvest, effort and catch per hour by guided vs non-guided anglers, Kenai River king salmon fishery, 1981-1986.

		1981	1982	1983	1984	1985	Mean	1986
					HARVEST			
Guided	Number	4,777	4,861	9,196	5,488	7,825	6,429	6,808
	Percent	48.7	47.3	59.2	44.5	48.8	49.7	43.5
Non-Guided	Number	5,033	5,154	6,338	6,844	8,201	6,314	8,839
	Percent	51.3	52.7	40.8	55.5	51.2	50.3	56.5
					EFFORT			
Guided	Number	13,920	19,332	23,862	22,258	26,483	21,171	26,102
	Percent	23.9	21.7	24.1	17.4	21.9	21.8	20.4
Non-Guided	Number	44,321	69,757	75,149	105,659	94,525	77,882	101,924
	Percent	76.1	78.3	75.9	82.6	78.1	78.2	79.6
					CATCH/HOUR			
Guided		0.070	0.058	0.080	0.058	0.075	0.068	0.067
Non-Guided		0.022	0.025	0.017	0.015	0.022	0.020	0.022

Table 6. Chinook salmon retained and released by recreational anglers on the Kenai River, 1985-1986.

			Number Retained	Percent Retained	Number Released	Percent Released	Total Landed
EARLY RUN							
	Guided	1985	4,780	62.7	2,844	37.3	7,624
		1986	3,590	61.6	2,239	38.4	5,829
	Non-Guided	1985	3,191	46.8	3,623	53.2	6,814
		1986	3,469	59.5	2,364	40.5	5,833
	Total	1985	7,971	55.2	6,467	44.8	14,438
		1986	7,059	60.5	4,603	39.5	11,662
LATE RUN							
	Guided	1985	3,045	67.5	1,466	32.5	4,511
		1986	3,218	64.2	1,797	35.8	5,015
	Non-Guided	1985	5,010	61.2	3,176	38.8	8,186
		1986	5,370	49.3	5,518	50.7	10,888
	Total	1985	8,055	63.4	4,642	36.6	12,697
		1986	8,588	54.0	7,315	46.0	15,903
BOTH RUNS							
	Guided	1985	7,825	64.5	4,310	35.5	12,135
		1986	6,808	62.8	4,036	37.2	10,844
	Non-Guided	1985	8,201	54.7	6,799	45.3	15,000
		1986	8,839	52.9	7,882	47.1	16,721
	Total	1985	16,026	59.1	11,109	40.9	27,135
		1986	15,647	56.8	11,918	43.2	27,565

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