

STATE OF ALASKA
Bill Sheffield, Governor

Annual Performance Report for
KOTZEBUE AREA CHAR RESEARCH AND MONITORING

by
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ALASKA DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF SPORT FISH
E. Richard Logan, Director

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish
Investigations
of Alaska

Project: F-10-1

Study: T Study Title: TROUT/CHAR/
NON-ANADROMOUS
SALMON

Job: T-6-2 Job Title: Kotzebue Area Char
Research and
Monitoring

Cooperator: Alfred L. DeCicco

Period Covered: 1 July 1985 to 30 June 1986

ABSTRACT

The mean fork lengths of prespawning Dolly Varden char, *Salvelinus malma* (Walbaum), sampled on the Wulik River in 1985 were greater than mean lengths in the 1983 sampling: 631 millimeters for males and 594 millimeters for females. Only one tagged char was recaptured, out of 215 fish sampled.

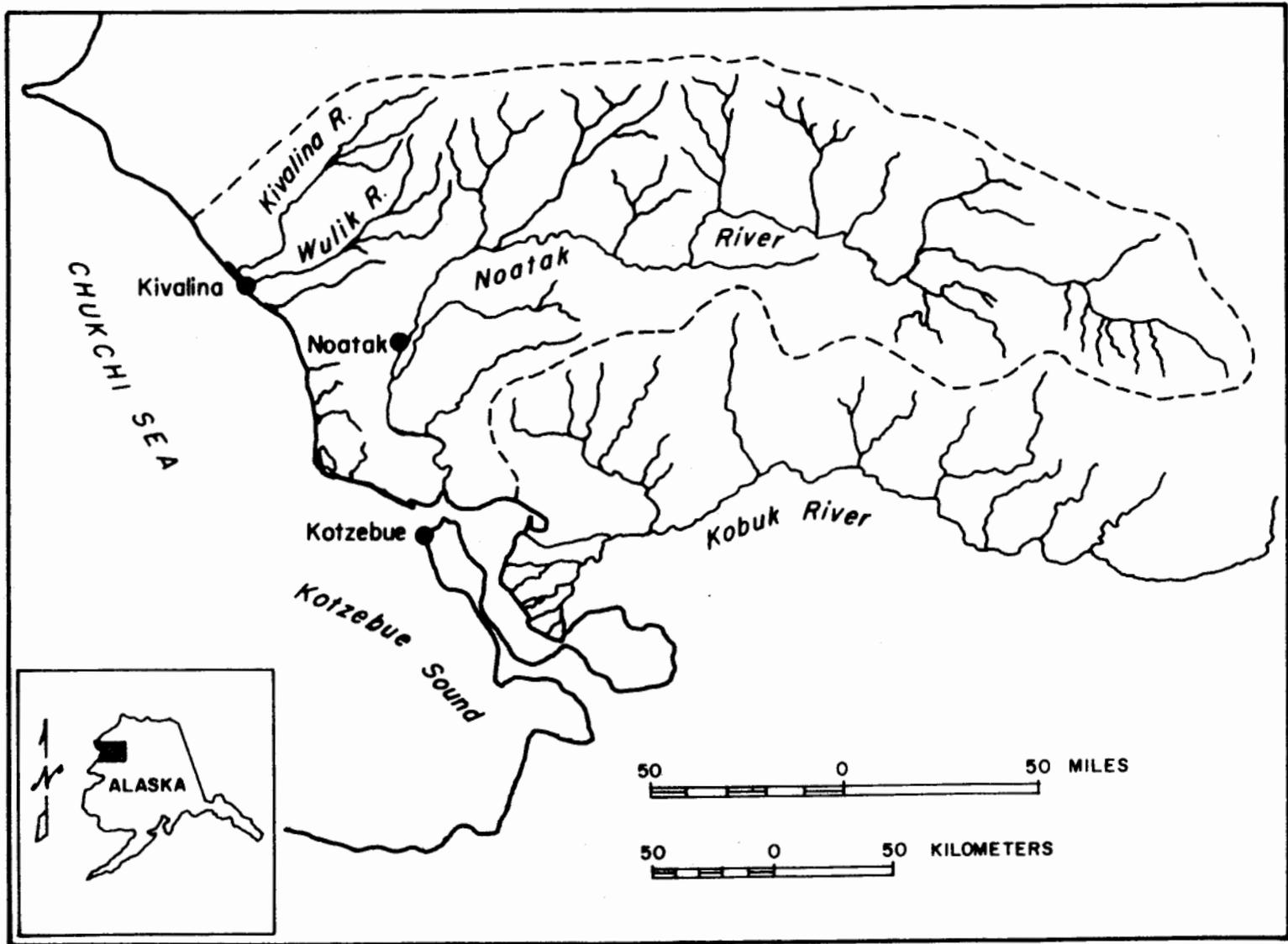
There were 11,701 spawners counted in the Noatak River system: 1,853 in the Wulik River and 1,786 in the Kivalina River. These were the highest counts for the last 5 years. A spawning population of char was discovered in the Anisak River, a Noatak River tributary.

The estimated incidental char harvest in the Kotzebue Sound commercial fishery was 3,627 fish, of which 454 (12.5 percent) were sold. The mean fork lengths were 642 millimeters for males and 598 millimeters for females. The mean coefficient of condition was 1.162 for males and 1.156 for females, higher than in 1984.

The fall subsistence harvest of char at Kivalina was 10,549 fish. A sample of 1,262 char from this catch was measured and sexed.

KEY WORDS

Char, Dolly Varden, Arctic char, spawning, subsistence, Wulik River, Alaska, Kivalina River, Noatak River, Kotzebue, Chukchi Sea.



BACKGROUND

Although some information on harvest and subsistence use of char in northwestern Alaska had been available (Sarrico and Kessel 1966; Foote and Williamson 1966), Winslow (1969) collected the first biological data on Wulik River char, and Alt (1978) presented the first data on life history and movements of char in the Wulik and Kivalina Rivers. DeCicco (1985) gave a more detailed background and summarized data relating to a 4-year study of char life history on the Wulik, Kivalina, and Noatak Rivers.

The information presented in this report is the product of ongoing char research in northwestern Alaska. Included in this report are sections covering the sampling of the 1985 spawning population on the Wulik River, aerial spawning counts conducted on all drainages, the size and sex composition of the incidental char catch in the commercial salmon fishery in Kotzebue Sound, fall overwintering surveys on the Wulik and Kivalina Rivers and the magnitude and size and sex distribution of the subsistence catch on the Wulik River. Figure 1 is a map of the study area and Table 1 lists fish species present.

RECOMMENDATIONS

Research

1. Aerial counts of spawning char should be continued, and index areas should be identified.
2. Aerial surveys should be flown to locate additional spawning areas.
3. Aerial counts of overwintering char should continue.
4. Size and sex sampling of char occurring in the Kotzebue Sound commercial salmon fishery should continue.
5. The subsistence harvest in Kivalina should be sampled for size and sex composition.
6. Research to determine the survival between spawnings and relationships between summer and fall spawners should be undertaken.
7. The possibility of using a weir to investigate population dynamics in one stream should be investigated.

Management

1. The magnitude of the subsistence harvests in Kivalina and Noatak should be determined.
2. The magnitude of the incidental char harvest in the commercial fishery should be determined.
3. Development of the Red Dog Mine should be monitored.

Table 1. List of common names, scientific names, and abbreviations of fish found in study area.

Common Name	Scientific Name & Author	Abbreviation
Alaska blackfish	<i>Dallia pectoralis</i> Bean	BF
Arctic char	<i>Salvelinus alpinus</i> (Linnaeus)	AC
Arctic flounder	<i>Liopsetta glacialis</i> (Pallas)	AF
Arctic grayling	<i>Thymallus arcticus</i> (Pallas)	GR
Arctic lamprey	<i>Lampetra japonica</i> (Martens)	AL
Bering cisco	<i>Coregonus laurettae</i> Bean	BCI
Broad whitefish	<i>Coregonus nasus</i> (Pallas)	BWF
Burbot	<i>Lota lota</i> (Linnaeus)	BB
Chinook salmon	<i>Oncorhynchus tshawytscha</i> (Walbaum)	KS
Chum salmon	<i>Oncorhynchus keta</i> (Walbaum)	CS
Coho salmon	<i>Oncorhynchus kisutch</i> (Walbaum)	SS
Dolly Varden char	<i>Salvelinus malma</i> (Walbaum)	DV
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i> (Linnaeus)	FSC
Humpback whitefish	<i>Coregonus pidschian</i> (Gmelin)	HWF
Inconnu (sheefish)	<i>Stenodus leucichthys</i> (Guldenstadt)	SF
Lake trout	<i>Salvelinus namaycush</i> (Walbaum)	LT
Least cisco	<i>Coregonus sardinella</i> Valenciennes	LCI
Longnose sucker	<i>Catostomus catostomus</i> Forster	LNS
Ninespine stickleback	<i>Pungitius pungitius</i> (Linnaeus)	NSB
Northern pike	<i>Esox lucius</i> Linnaeus	NP
Pacific herring	<i>Clupea harengus pallasii</i> Valenciennes	PH
Pink salmon	<i>Oncorhynchus gorbuscha</i> (Walbaum)	PS
Rainbow smelt	<i>Osmerus mordax</i> (Mitchill)	RSM
Round whitefish	<i>Prosopium cylindraceum</i> (Pallas)	RWF
Saffron cod	<i>Eleginus gracilis</i> (Tilesius)	SC
Slimy sculpin	<i>Cottus cognatus</i> Richardson	SSC
Sockeye salmon	<i>Oncorhynchus nerka</i> (Walbaum)	RS
Starry flounder	<i>Platichthys stellatus</i> (Pallas)	SFL

OBJECTIVES

1. To estimate the number of char harvested in the fall by residents of Kivalina and Noatak.
2. To estimate the incidental commercial harvest of char in Kotzebue Sound and estimate the proportions of those caught that are sold to buyers in Kotzebue, and kept for personal use.
3. To index abundance of char overwintering in the Wulik and Kivalina Rivers.
4. To index abundance of char spawning in the Wulik, Kivalina, Kelly and Kugururok Rivers.
5. To estimate the size composition and sex ratio of the Wulik River subsistence harvest.
6. To estimate the size composition and sex ratio of char harvested incidentally in the Kotzebue Sound commercial fishery.

TECHNIQUES USED

Using hook and line char were captured on the Wulik River and measured to the nearest millimeter from the tip of the snout to the fork of the tail. They were weighed to the nearest 25 g in a basket net, using a 6-kg Chatillon spring scale. Char were examined for presence of tags or tag wounds. Spawning char were counted from a Piper PA-18 aircraft flying slowly at low altitude over the stream. Polarized sunglasses were used during these surveys and counts were recorded.

The incidental harvest in the commercial salmon fishery was estimated by interviewing fishermen as they made deliveries of salmon at the buying stations. The catch from fishing period 13 was estimated based on catch/delivery, while the catches from fishing periods 14 and 15 were estimated based on catch/period. Samples from the catches were sexed, measured to the nearest millimeter, and weighed to the nearest 25 g at the buying station. The fall subsistence-catch composition at Kivalina was determined by measuring and sexing fish caught on the Wulik River by one seining crew. Three days were spent fishing with this crew, and as many fish as possible were measured and sexed. The number of fish per tub was also determined at this time. The total catch was calculated after determining the number of tubs of char caught; tubs were then converted to fish, using a factor of 46 char/tub based on a sample of 1,011 char in a catch of 22 tubs.

FINDINGS

Prespawning Dolly Varden char were sampled from the Wulik River from 15 June through 20 June 1985 in an effort to recover tags placed in

Table 2. Summary of aerial surveys of spawning char 1981-1985.

Location	1981	1982	1983	1984	1985
<u>Noatak River System:</u>					
Kelly River Main stem	882	1,079	913	951	1,685
Wrench Creek	1,005	748	1,066	1,182	1,452
No Name Creek	356	158	661	317 ^a	124
Avan River	346	341	254	168	614
Total Kelly	<u>2,589</u>	<u>2,326</u>	<u>2,894</u>	<u>2,618</u>	<u>3,875</u>
Kugururok R. Main stem	1,756	2,499	884	2,818	3,518
Trib Below Trail	-	-	39	30	-
Trail Creek	419	485	-	617	304
Kagvik Creek	792	620	463	726	919
Nunaviksak Creek	317	257	-	430	232
Okatak Creek	-	115	-	130	94
Cairn Creek	-	10	-	-	-
Total Kugururok	<u>3,284</u>	<u>3,986</u>	<u>1,386</u>	<u>4,751</u>	<u>5,067</u>
Poktovik Creek	-	-	-	20	-
Trib below Kelly	193	331	-	232	236
Kaluktavik River	-	549	-	584	455
Nimiuktuk R. Main stem	202	857	-	587	1,460
Tumit Creek	853	783	-	899	513
Kukukpilak Creek	361	56	-	97	14
Seagull Creek	606	474	-	338	144
Total Nimiuktuk	<u>2,022</u>	<u>2,170</u>	-	<u>1,921</u>	<u>2,131</u>
Eli River	-	237	301	214	-
Anisak River	-	-	-	-	173
TOTAL for Noatak:	8,088	9,599	4,581 ^a	10,340	11,937
<u>Kivalina River System:</u>					
Kivalina R. Main stem	73	-	90	119	604
Braided Fork	382	299	412	286	580
Grayling Creek	106	146	183	247	596
Little River	-	7	10	-	6
TOTAL Kivalina River:	561	452	695	652	1,786

(Continued)

Table 2. (Cont'd) Summary of aerial surveys of spawning char 1981-1985.

Location	1981	1982	1983	1984	1985
<u>Wulik River System:</u>					
Wulik R. Main stem	129	184	394	420	712
West Fork	-	133	196	410	252
East Fork	-	73	223	213	356
Sheep Creek	54	28	123	209	159
Tutak Creek	-	-	43	213	136
Ikalukrok Creek	<u>89</u>	<u>-</u>	<u>201</u>	<u>240</u>	<u>238</u>
TOTAL Wulik River:	272	418	1,180	1,705	1,853

incomplete survey

Wulik River spawners in 1983, but only one tagged fish was recovered. The fork lengths of the 215 fish (94 females and 121 males) sampled ranged in from 470 to 764 mm. The mean fork lengths were 631 mm for males and 594 mm for females. In 1983 the mean lengths were less: 618 mm ($p < .1$) for males and 568 mm ($p < .01$) for females. Figure 2 compares the length frequency of samples taken in 1983 and 1985. The one recaptured tagged fish was a 603-mm female that had been tagged as a spawner in the Wulik River on 22 June 1983 at 549 mm; it was recaptured on 16 June 1985 about 1 mi upstream from where it had been tagged.

Because of a late breakup and an exceptionally cold spring, the out-migration of overwintering char was later than usual. Some nonspawners were well upriver when this sampling took place, and the relatively earlier sampling period probably influenced the distribution within the river and sex ratio of fish sampled. Normally, by mid-June nonspawners are moving downstream, and prespawners are distributed well upriver. In 1985 fewer fish than in past years were in prespawning holding areas, and immature nonspawners were found intermixed with prespawners. The proportion of males was much higher in 1985 (56%) than in 1983 (40%); this may indicate that males precede females in the upstream movement of prespawning char.

These observations could have indicated that something was amiss with the health of the spawning population in the Wulik River; however, the 1985 aerial survey count of spawners (1,853) was the highest recorded in the last 5 years. We must therefore conclude that during this dynamic spring period of fish movement, the timing of sampling is critical if catch comparisons between years are to be made.

DeCicco (1985) found that Noatak River char spawned in alternate years; it was therefore generally assumed that char spawning reoccurs in alternate years. However, the low incidence of tag recovery in the Wulik River (one of 215 tags) after 11% of the run had been sampled and a similarly low recovery rate of tagged spawners in the Noatak contradicts this assumption. Accordingly, there are several other possible explanations for these tag-recovery results: (1) Char may not spawn at regular 2-year intervals; (2) there may be a low level of survival between spawnings; (3) there may be many more char spawning each year than the surveys have indicated; or (4) any combination of these factors may exist.

Aerial Counts of Spawning Char

Aerial counts of prespawning char were conducted from 23 July through 27 July 1985. A total of 11,701 spawners was counted in Noatak River tributaries, 1,853 in the Wulik River, and 1,786 in the Kivalina River; these counts are higher than those occurring in any of the past 5 years (Table 2). During this counting period (23-27 July 85), excellent weather and water conditions were encountered, and all major spawning streams, except the Eli River, were surveyed. Parts of the Anisak River were looked at for the first time, and 173 char were observed in its upper reaches. Fish were distributed differently than in past years; more fish were higher up in all river systems. There were also some large groups of char

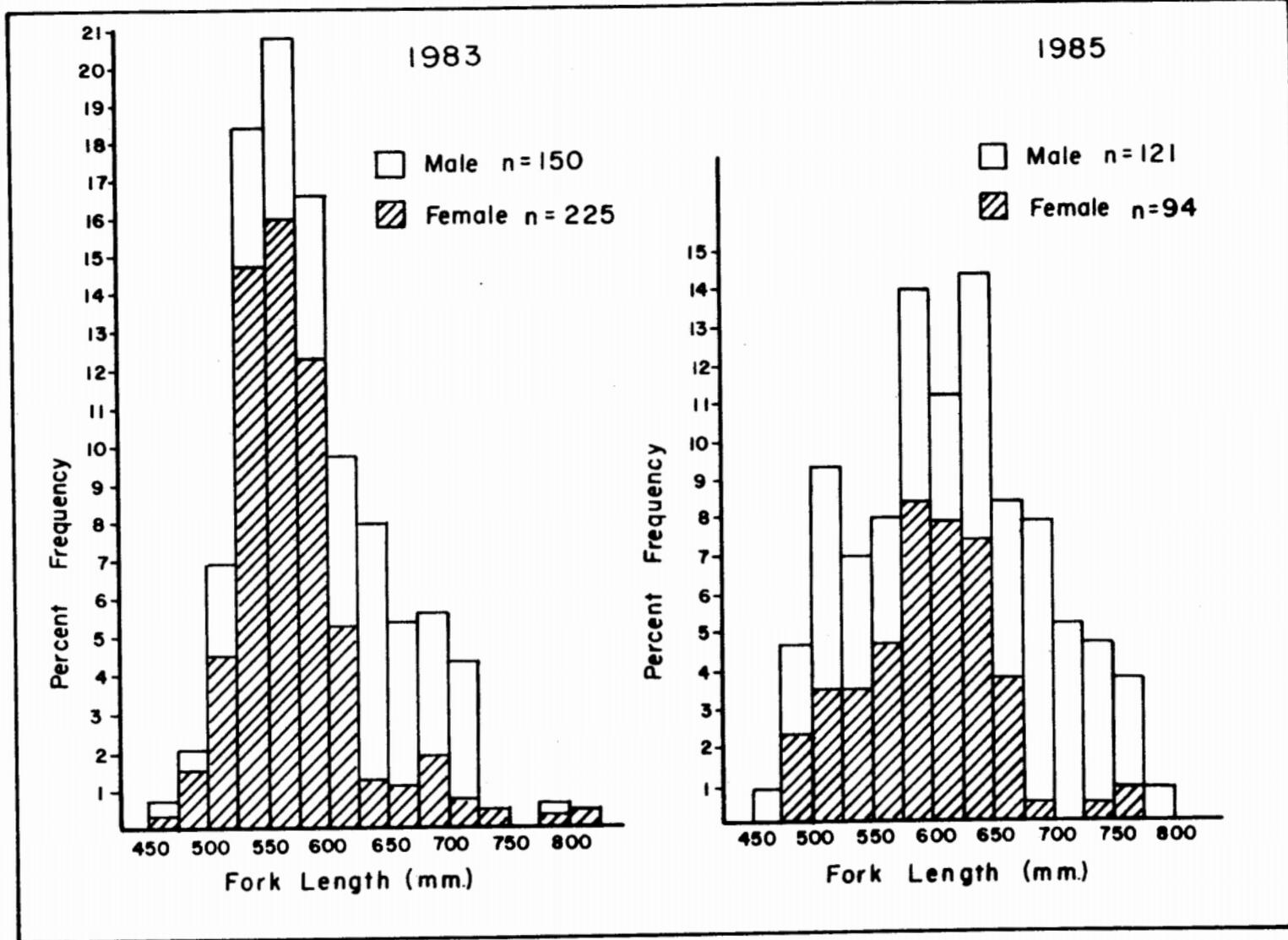


Figure 2. Length frequency of spawning char in the Wulik River, 1983 and 1985.

located below normal spawning areas in some rivers. These latter groups may have overwintered in other systems, and their seaward migration may have been inhibited by the late ocean breakup; this would have prevented their arrival at the spawning grounds by the time of the survey.

Kotzebue Sound Incidental Commercial Char Harvest

The incidental char catch in the Kotzebue Sound commercial chum salmon fishery was estimated at 3,627 fish during the last three commercial periods. Period 13 (22 to 24 August) was the first in which char began to occur in catches. On 22 August very few char were caught; only 40 fish were sold to one buyer. On 23 August, fifteen dockside interviews with fishermen were conducted, resulting in the mean catch per delivery of 1.8 char. On 24 August, 51 fishermen were interviewed, yielding a mean catch of 3.0 char per delivery and a total estimated catch (period 13) of 707 char.

During period 14 (ending on 28 August) Commercial Fisheries Division staff interviewed 23 out of 79 fishermen and estimated the catch at 2,250 char. Because of a decrease in the fishing effort toward the end of this period, this estimate was adjusted downward to 1,823 char. On 31 August an estimated catch of 1,097 char was calculated for the last commercial-fishing period, based on interviews from eight fishermen.

Of the 3,627 char harvested, 454 (12.5%) were sold to commercial buyers. The remainder was kept for personal consumption or subsistence use. The total catch of char in the salmon fishery was greater in 1985 than in the previous two years (Table 3). This is due, in part, to the commercial-fishing season continuing until the end of August in 1985; it was closed early in both 1983 and 1984.

Char occurring in this harvest were sampled for length, weight, and sex. Of 235 char sampled, 107 were male and 128 were female (Table 4). The mean fork length was 642 mm for males and 598 mm for females, and 53% of the total catch was between 600 mm and 670 mm in length. Figure 3 shows the length frequency of char sampled from this catch. The predominance of 600-670 mm fish is probably due to the selectivity of the nets used in the commercial salmon fishery. The mean coefficient of condition for males was higher in 1985 ($\bar{x} = 1.162$ [n=44]) than in 1984 ($\bar{x} = 1.104$ [n=42] $p < .01$). The mean coefficient of condition was also higher for females in 1985 ($\bar{x} = 1.156$) than in 1984 ($\bar{x} = 1.051$ $p < .0005$). Higher coefficient of condition probably indicates better feeding conditions or a longer average time spent feeding in 1985, and it might suggest that a higher portion of the 1985 fall run will mature to spawn as 1986 summer spawners.

Wulik River Subsistence Catch and Catch Composition

Subsistence Harvest:

Four seining crews from Kivalina harvested 10,549 char for subsistence on the Wulik River in 1985 (Table 5). Three of the groups were

Table 3. Incidental commercial catches of char, Kotzebue Sound, 1966-1985¹.

Year	Number of Fish ²	Pounds ³	Avg. Weight
1966	3,325	1	
1967	367	2,606	7.1
1968	3,181 ⁴	21,949	6.9
1969	1,089 ⁵	...	
1970	2,095 ⁵	...	
1971	3,828	23,353	6.1
1972	7,746	56,545	7.3
1973	640	4,608	7.2
1974	2,605 ⁶	20,580	7.9
1975	
1976	
1977	
1978	1,229	9,094	7.4
1979	2,523	12,523	4.9
1980	3,049 ⁷	17,015	5.6
1981	3 ⁷	16	
1982	3,447 ⁸	23,648	6.9
1983	835 ⁹		
1984	1,090 ¹⁰		6.1
1985	3,627 ¹¹		7.0

1 1966-1982 data from Schwarz et al. (1983)

2 Reported 7-10 lb average, all numbers are fish sold except for 1983.

3 Some data extrapolated from average weight reported

4 Includes 269 taken by permit

5 Includes 179 taken by permit

6 Includes 234 taken during commercial inconnu fishery

7 No market for char this year, many more char either used for subsistence or dumped

8 Limited market, many char either utilized at home or dumped

9 Total catch 835, of which 190 were sold

10 Total catch 1,090, of which 347 were sold avg. wt. 6.06 lbs

11 Total catch 3,627, of which 454 were sold avg. wt. 6.99 lbs

Table 4. Sex ratio and size of char caught in the Kotzebue commercial fishery, 1983-1985.

	1983		1984		1985	
	males	females	males	females	males	females
n	49	27	72	67	107	128
FL Range (mm)	445-760	380-628	480-750	427-740	535-790	350-750
Mean	624	554	632	598	642	598
S.D.	59.9	63.1	60.7	59.9	61.0	70.4

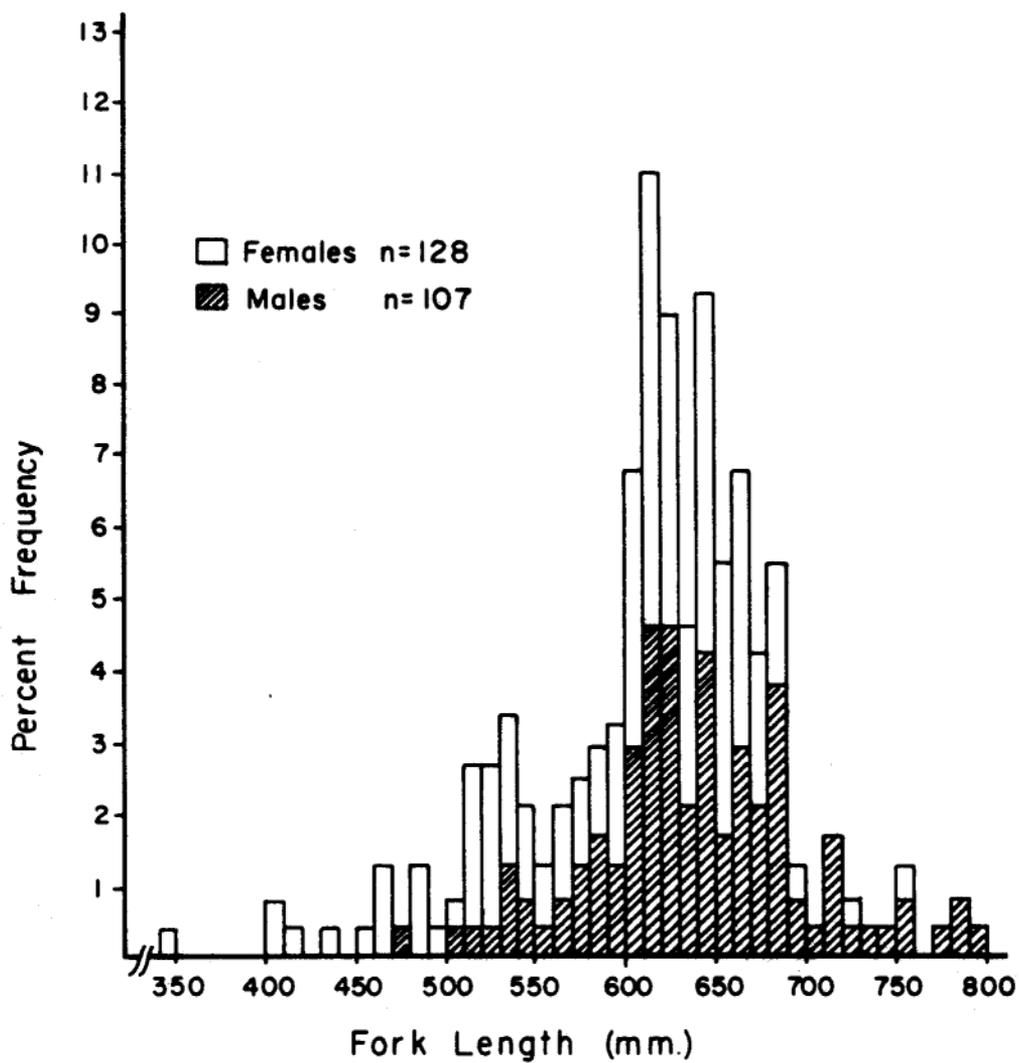


Figure 3. Length frequency of incidental commercial char catch, Kotzebue Sound, 1985.

Table 5. Historical subsistence char harvests at Kivalina.

Year	Season	Weight (lbs)	No. char @2.5 lbs/char	Source
1959	fall	85,600	34,240	Sarrio & Kessel (1966)
1960	fall	124,300	49,720	Sarrio & Kessel (1966)
1964/65 ¹	year	84,611	33,845	Burch (1983a, 1983b, 1983c, 1984a)
1965/66 ¹	year	35,218	14,087	Burch (1983a, 1983b, 1983c, 1984a)
1968	fall	...	49,512	Winslow (1969)
1969	spring	...	8,402	Roguski & Winslow (1970)
1971	fall	...	29,281	Yoshihara (1973)
1972	fall	...	35,733	Yoshihara (1973)
1979	fall	...	14,600 ²	DeCicco (1982)
1981	fall	...	15,000-18,000	DeCicco (1982)
1982	fall	...	18,434	Braund & Burnham (1982)
	winter	4,426	1,771	Burch (1983)
1982/83 ¹	year	72,352	28,900	Burch, (1982a, 1982b, 1983a, b1983)
1983	spring	12,183	4,870	Burch (1983c)
1983	fall	...	16,270	DeCicco (1984)
1984	fall	...	12,000	DeCicco (1985)
1985	fall	...	10,549	DeCicco (present study)

¹ Subsistence year June-May

² Original estimate based on 365 tubs at 89 char/tub (Winslow 1969). This estimate is based on 40 char/tub (DeCicco-1982)

contacted, reporting catches of 51, 54, 70 tubs. The fourth crew was not contacted, but the other crews felt that they were not very successful because of limited seining experience and estimated their catch at 26 tubs. In addition, one crew caught 100 char while seining for whitefish on October 3, and another crew caught 1,203 char on 1 to 3 October. Tubs were converted to fish at 46 char per tub:

51 tubs @ 46 char/tub	2346
54 tubs @ 46 char/tub	2484
70 tubs @ 46 char/tub	3220
est 26 tubs @ 46 char/tub	1196
	1203
	<u>100</u>

Fall Total Subsistence harvest = 10,549

The total fall subsistence catch at Kivalina is a little higher, as some people fish gill nets in the lower river for whitefish and char; these people were not contacted, but their harvest is small, compared to the seine fishery. Two gill nets were observed in sloughs of the lower Wulik on 29 September; both contained only whitefish. There is also ice fishing that occurs throughout the winter and hook-and-line fishing in the spring. Burch (1984a, 1984b, and 1984c) documented yearly subsistence cycles and harvests at Kivalina (Table 6). The combined harvests for September and October most closely approximate the catch of the fall seine fishery. During years for which data exist, approximately 80% of Kivalina's annual char harvest has been taken in this fishery.

Fish per tub calculations:

A seining crew was accompanied by a member of our staff from 1 to 3 October. On 2 October six seine hauls resulted in 15 tubs of large- and medium-sized char and 4 tubs of small-sized char for a total of 868 fish, or 46 fish/tub. On 3 October 2 tubs of large char (35 fish) and 1 tub of small char (108 fish) were captured. A total of 1,011 char were captured, equalling 22 tubs for a mean of 46 char per tub.

Catch Composition:

The catch of a seining crew was sampled on 29 September, and 159 char were measured and sexed. They ranged in fork length from 250 to 800 mm. A sport fish staff member accompanied another seining crew from 1 to 3 October; during that time 1,203 char were harvested. Of this catch, 1,102 were sampled for sex and length (Figure 4).

Successive peaks in length distribution probably relate directly to years at sea, or post-smolt years. The first peak (280-290 mm) reflects the first year at sea, the next peak (370 mm) the second year, and the third peak (470 mm) the third year. Subsequently, as fish reach maturity and as growth and years spent at sea and in fresh water vary in relation to the spawning cycle, this relationship breaks down. Past aging data have shown that char attain 280 mm after 1 year at sea (n=19), 397 mm after 2 years (n=65), and 471 mm after 3 years (n=211) (DeCicco 1985).

Table 6. Yearly char harvest at Kivalina by month¹.

	1964/65	%	1965/66	%	1982/83	%	1983/84	%
June	3,495	11.2	1,023	10.3	1,452	5.6	4,445	16.0
July	0	0	0	0	64	0.2	482	1.7
August	1,760	5.7	328	3.2	323	1.2	174	0.6
September	19,638	63.1	6,462	64.8	21,974	84.2	13,620	49.2
October	5,940	19.1	828	8.3	733	2.8	6,225	22.5
November	0	0	364	3.6	184	0.7	175	0.6
December	40	0.1	762	7.6	74	0.3	80	0.3
January	-	-	64	0.6	225	0.9	84	0.3
February	-	-	4	0.1	170	0.7	1,008	3.6
March	246	0.8	65	0.7	276	1.1	1,311	4.7
April	0	-	12	0.1	138	0.5	66	0.2
May	0	-	65	0.7	478	1.8	40	0.1

¹ Data obtained from Burch (1982-1984) seasonal summaries.
Numbers of char derived from pounds reported at 2.5 pounds/char.

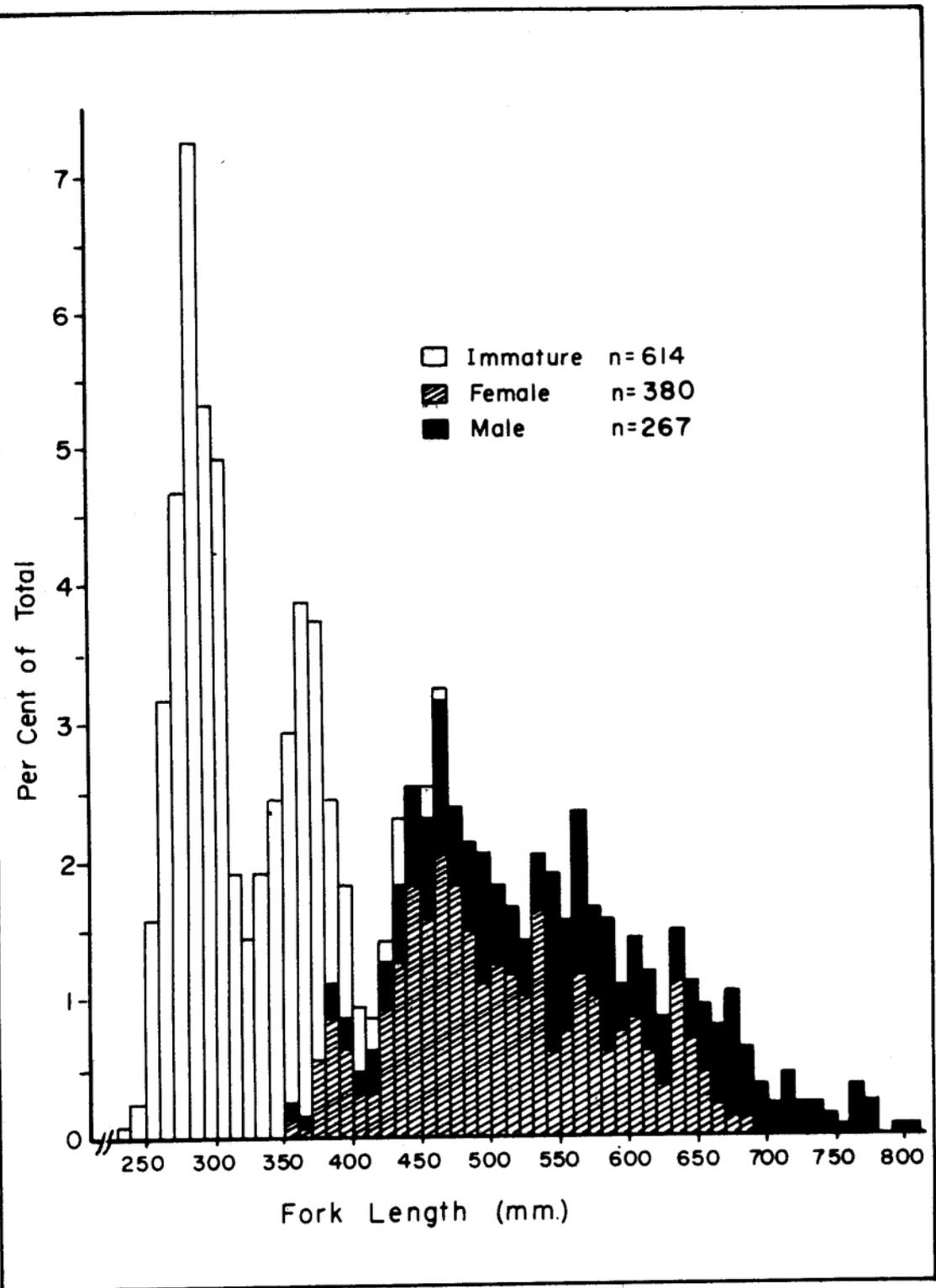


Figure 4. Length and sex frequency of Kivalina subsistence char harvest, 1985.

Figure 5 compares the length frequency of the 1985 subsistence catch with that obtained in 1968 (Winslow 1969). The only major difference in these two catches is the large peak between 300 and 400 mm in the 1968 catch. This might be interpreted as a strong returning-year class entering the fishery, a larger-sized seine allowing the 200-300 mm fish to escape, or the smaller sample size not representing the overall catch. I feel that we do not know enough about char population dynamics to do more than speculate on the meaning of this apparent difference in length distribution of catch.

Aerial Surveys of Overwintering Char

Surveys of overwintering char on the Wulik and Kivalina Rivers were not conducted because of unsuitable weather conditions during late September and early October.

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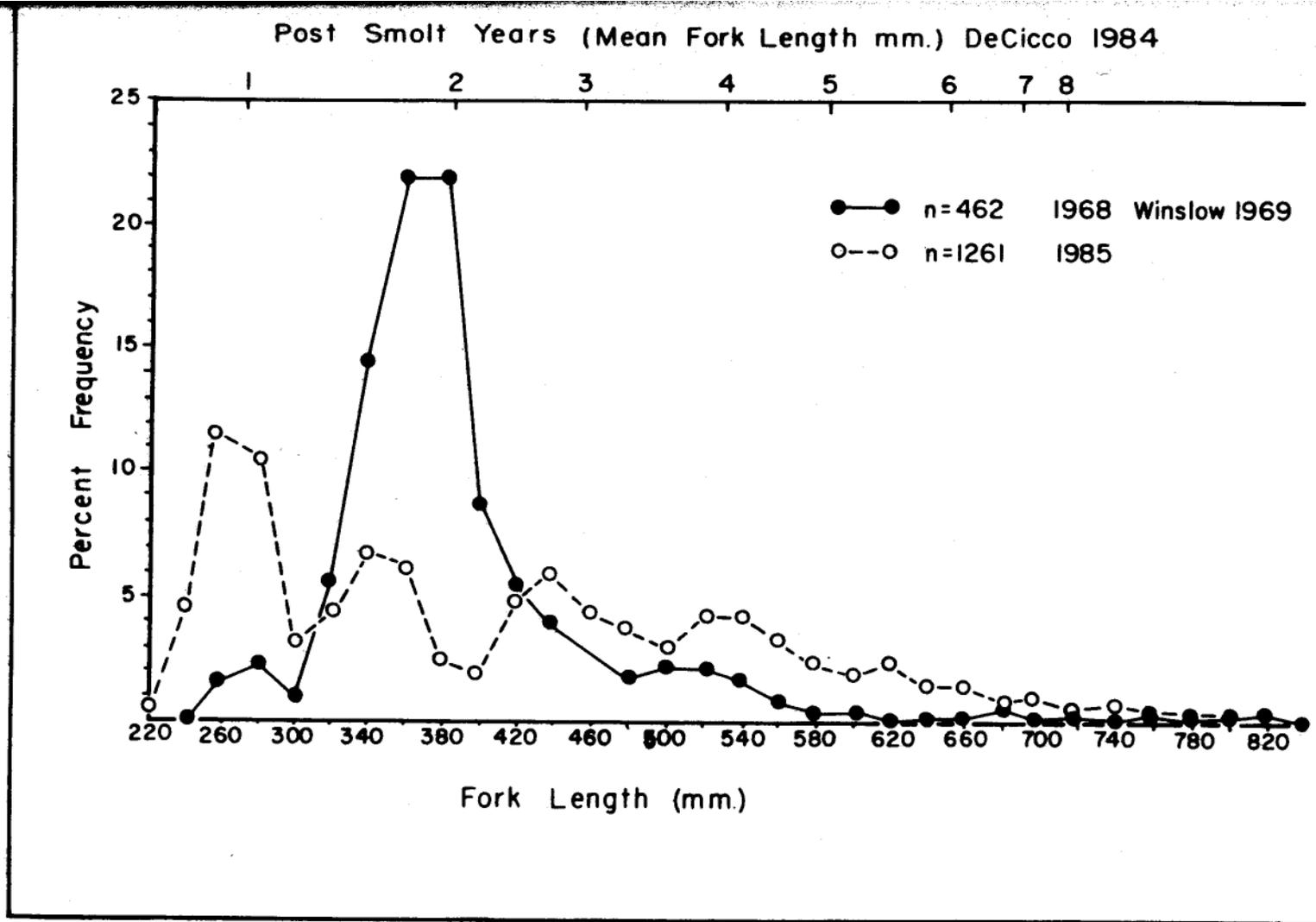


Figure 5. Length frequency comparison of Kivalina subsistence char harvests, 1968 and 1985.

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