STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

POND REARING OF KING AND COHO SALMON AND COHO BROOD STOCK DEVELOPMENT

by

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RESEARCH PROJECT SEGMENT

State:	ALASKA	Name:	Sport Fish Investigations of Alaska
Study No.:	AFS 43	Study Title:	MENDENHALL ANADROMOUS FISH REARING PONDS
Job No.:	AFS 43-7	Job Title:	Pond Rearing of King and Coho Salmon and Coho Brood Stock Development

Period Covered: July 1, 1978 to June 30, 1979

;\BSTHJ\CT

In 1978, experiments conducted at the Mendenhall Lakes Salmon Rearing Facility were designed to: (1) continue the evaluation of rearing chinook salmon, *Oncorhynchus tsh(]).J)ytscha* (Walbawn), and coho salmon, *OncoPhynchus kisutch* (Walbawn), previously released from the Mendenhall Lakes Salmon Rearing Facility; (2) compare return rates of pond-reared, estuarine pen-reared, and hatchery-reared coho smolts imprinted at the Mendenhall Facility; and (3) determine the most desirable brood stock of coho for use in improving the Juneau area marine sport fishery.

No salmonids were stocked in Moose Lake in 1978, and no naturally-reared srnolts were marked or enwnerated from the facility. Lake sampling conducted in July, 1978, indicated very low nwnbers of naturally-rearing coho.

In 1978, 10,565 coho smolts were marked and released at the Mendenhall Facility holding pond from fish reared at the Fish Creek Estuarine !earing Facility. Of the 68,034 Crystal Lake Hatchery reared coho smolts released at the Mendenhall Facility in 1978, 10,024 were marked an<l used as a control for the Fish Creek reared release.

In 1978, one age 1.4 king salmon returned to the Mendenhall Facility from 217,436 smolts released in 1974. The total return of all age groups to the facility has been 689 king salmon, with 381 additional strays having been accounted for in the Mendenhall River system.

A<lult returns of coho in 1978 were from three 1977 marked releases at the Mendenhall Facility. These lots included Moose Lake, Crystal Lake llatchery, and Fish Creek Facility reared coho smolts, totaling 39,110 fish. In 1977, jack (precocious male) returns from this group totaled 129 fish. In 1978, only three adults were calculated to have been caught in the sport fishery, 84 in the commercial fishery, and 25 adults returned to the Mendenhall Facility. The mean smolt-to-adult survival was 0.28%. Only the Moose Lake lot appeared in the sport fishery, but

no significant differences appeared between lots. Smolt-to-adult returns have decreased from 9.83% for the 1972 brood year to 0,28% for the 1975 brood year. During this same period, the composition of jacks has increased from 7.12% to 54.39% of the returns.

No eggs were taken from coho returning in 1978, as these stocks were not being continued at Crystal Lake Hatchery in an effort to eliminate bacterial kidney disease (BKD).

Selection of a potential brood stock in 1978 was derived using catch data evaluating coded wire tagged coho from 16 separate wild stocks. As in 1977, Moose Lake reared coho were the most desirable for Mendenhall Facility release, while Auke Lake reared coho contributed heaviest to the sport fishery but had the latest returns. The Speel Lake returns were selected as the most desirable wild stock, based on the very early returns, heaviest contribution to the commercial troll fishery and potential early return to the Juneau Area sport fishery.

BACKGROUND

A declining catch rate of salmon in the Juneau area sport fishery prompted the Sport Fish Division to study the feasibility of providing additional salmon for the fishery by pond-rearing salmon in existing lakes in *the* Mendenhall Valley north of Juneau. The project was first envisioned in 1968. The potential rearing lakes were situated on Forest Service land, so a cooperative agreement between the Department of Fish and Game and the U.S. Forest Service was written and the Mendenhall Salmon Rearing Facility was begun. Both agencies participated in the original planning and engineering of the facility. These plans called for the pond-rearing of chinook and coho fry to the smolt stage in three lakes. The location of the Mendenhall Facility is shown in Figures 1 and 2.

Capital improvement construction began in 1972 and included dredging of one lake, constructing a holding pond, and dredging channels linking the lakes to a common outlet. Several dikes, concrete control structures, and two roads were also constructed. Salmon fry were first planted in Norton, Dredge and Moose lakes in 1973.

During *the* first year of operation, engineering problems were encountered which precluded further use of Dredge and Norton lakes for rearing. The outlet control structure and dikes at Dredge Lake were inadequate and frequent washouts allowed rearing fish to escape. For future use as a rearing lake, the inlet and outlet dikes and control structures would require replacement and the lake would have to be sculptured to facilitate seining. At Norton Lake there was insufficient flow from the outlet to attract salmon smolts and the lake was unsuitable for seining. Further use of Norton Lake would require sculpturing and modification of the outlet channel. The flow from Moose Lake, where *the* original outlet structure was situated, was also inadequate to attract salmon smolts. However, access around the lake was good and the lake could be seined after lowering *the* water level by pumping. It was decided to reduce the

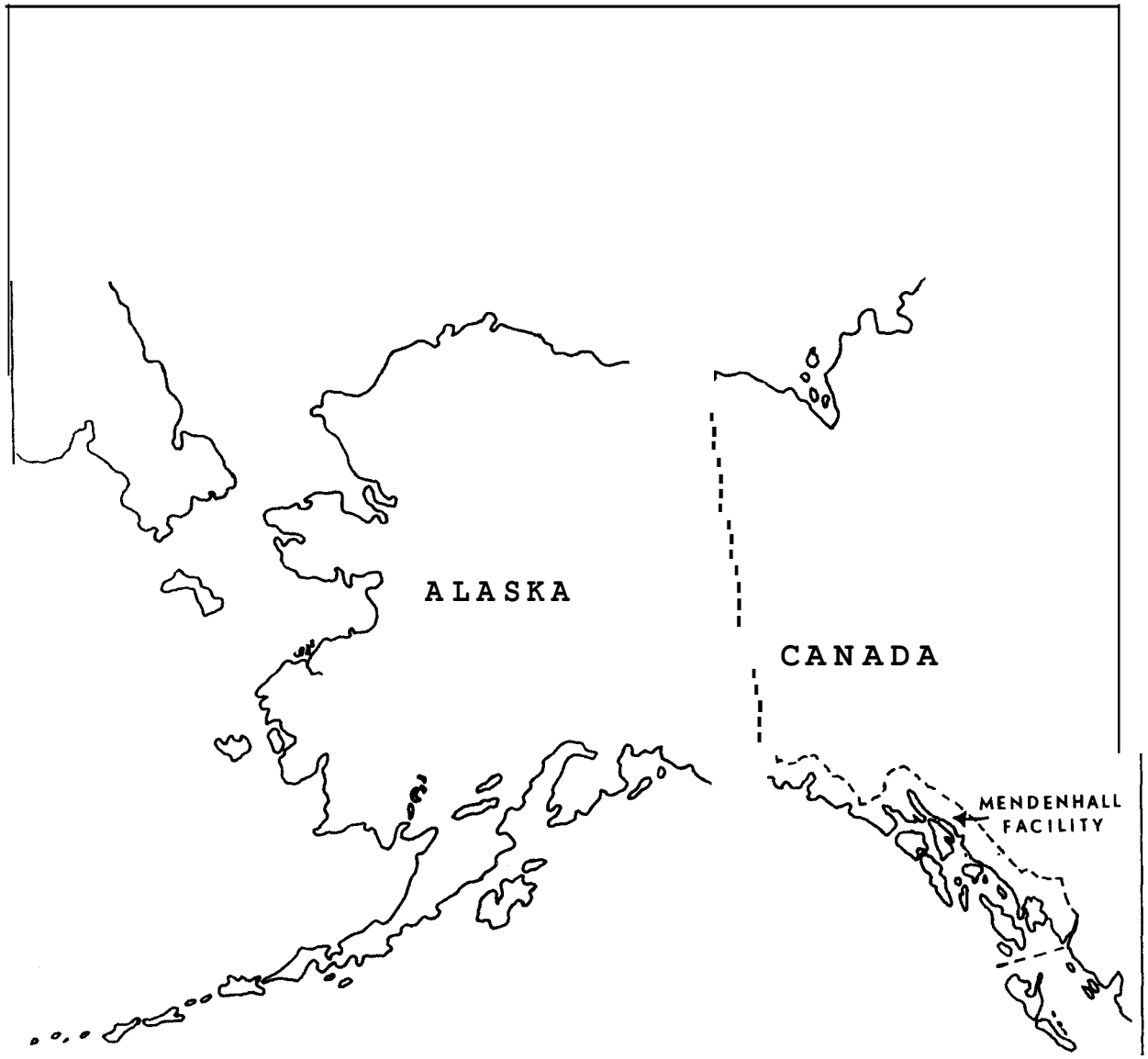
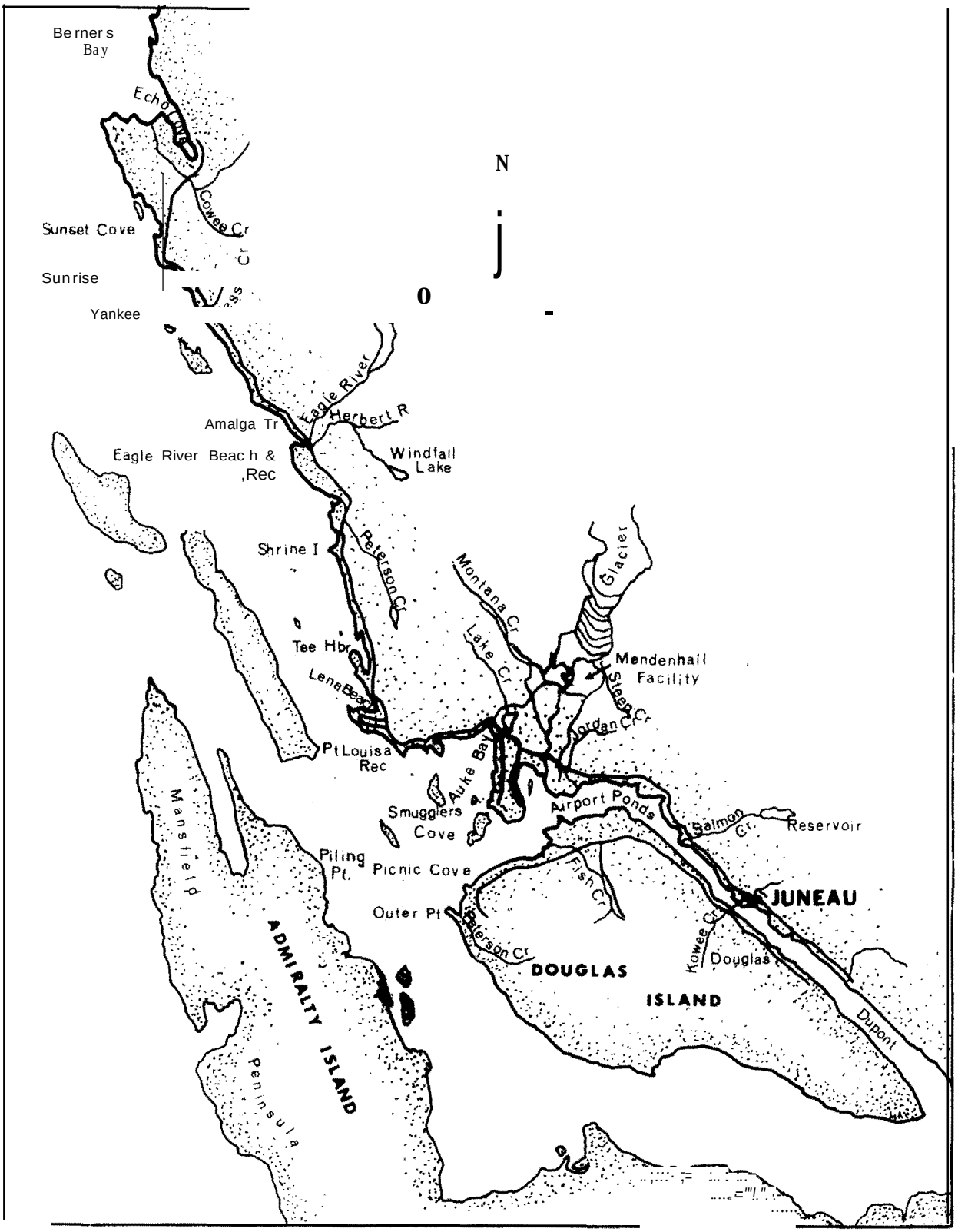


Figure Location of the Study Area.



' **the** Juneau **area roadside** and **marine** :v-P .reati.ona

scope of the rearing facility and to determine its usefulness through the rearing of fish in Moose Lake only. If the project was determined to be viable and monies were available, Norton and Dredge lakes would be put into production.

During the first year of fish rearing operations (1973), effort was directed toward determining the feasibility of producing salmon smolts by pond-rearing methods in Norton, Dredge and Moose lakes (Bethers, 1974). During summer months, rearing fish were fed two or three times daily with commercial dry fish food, and during winter months, the lakes were aerated to maintain dissolved oxygen levels.

ln May of 1974, a total of 81,425 coho smolts were released from Norton and Dredge lakes, and 93,129 chinook salmon smolts were released from Moose Lake. Smolts were produced from 45.5% of the fry planted in Norton Lake and 60.9% of the fry planted in Moose Lake. Dredge Lake could not be evaluated because of unknown fish losses during washouts (Bethers, 1975).

Moose Lake was restocked with rearing coho on September 16, 1974. These fish were of two different sizes, 109,500 at 83 kg (183 lb) and 99,985 at 36.3 kg (80 lb) and averaged 57.6 kg (127 lb) after two days mixing in the lake. In May, 1975, only 10,167 coho were found surviving in Moose Lake. The low survival could have been due to stress-related disease and/or added predation due in part to the increased stocking densities. No significant overwinter aeration failures occurred.

During 1975, studies were designed to compare growth and survival of coho reared in Moose Lake with coho reared in freshwater pens, and to compare adult returns from pond-reared smolts with returns from hatchery-reared smolts imprinted to the Mendenhall Facility (Bethers, 1976). It was determined that fish growth in Moose Lake was greater than growth of fish reared in pens. However, total survival was greater in pens than in Moose Lake.

The overwintering capability of oose Lake has not been fully determined, but it is believed to be a factor that could prevent the Mendenhall Facility from becoming a "production" facility. By 1976 it was suggested that Moose Lake could best be used for freshwater rearing of coho fry destined for the Fish Creek Saltwater Rearing Facility. By using Moose Lake as a freshwater "prepping" station for fish destined for the saltwater facility, it was hoped that the maximum number of locally reared coho smolts could be released for the fisheries. In 1976, 545,000 coho fry were planted in Moose Lake and in late summer, 99,439 of these were seined and transferred to the Fish Creek Estuarine Rearing Facility for overwinter rearing (Bethers, 1977).

Adult returns of coho and king salmon have been recorded at the Mendenhall Facility, from strays in spawning streams in the Mendenhall River system and from marked fish recovered in the local sport and commercial fishery sampling. Total adult coho salmon returns (excluding jacks) were calculated to be 8,008 in 1975, 4,663 in 1976 and 1,277 in 1977. Contribution of

jacks and adults to the local sport fishery has not been significant due to a combination of late returns, non-biting fish, and glacial conditions in Mendenhall River, which precludes a freshwater fishery. Total adult king salmon returns from the 1974 release of king salmon have been 1,131 fish, which includes 381 strays to other tributaries of Mendenhall River, (but does not include recoveries in the commercial fishery). Contribution to the local sport fishery has not been significant, being a calculated 40 fish in 1976 and 22 fish in 1977.

1t was decided that in 1977 this project should cease artificial rearing of the Mendenhall stock of coho at the facility and should begin an evaluation of several wild stocks of coho that the Department had coded wire tagged. By comparing recovery dates of stocks in the .Juneau area, the one that spent the most time available to the local fisheries would be more suitable for potential use at the rearing facility than the present stock.

ln 1977, this program inspected approximately 62,100 commercially caught coho (55% of the Juneau area troll catch). A total of 71 coho were recovered from one wild stock (Auke Lake) and from Mendenhall Lakes and Fish Creek rearing facilities. Data collected in 1977 indicated that Mendenhall stock coho released from the Mendenhall Facility was the earliest of the three stocks to enter the Juneau area, while the Auke Lake stock was the latest (Bethers, 1978).

Scientific and common names of all species mentioned in this report are listed in Table 1.

RECOMMENDATIONS

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1. Final selection of the most desirable brood stock should be made only after the 1979 returns are evaluated, as several additonal wild stocks have yet to be considered.

2. Brood stock selection should continue to be based on the greatest contribution and the earliest mean capture date in the sport and commercial troll fisheries.

3. The Mendenhall Facility should be used for the rearing of only coho salmon, and this rearing should be confined to Moose Lake. Use of the other lakes for a resident "put-and-take" fishery or for rearing of anadromous runs of Dolly Varden or cutthroat trout should be investigated.

4. All rearing and brood stock maintenance-related activities at the Mendenhall Facility should be conducted by the Division of Fisheries, Rehabilitation, Enhancement and Development.

Table 1. List of Common Names and Scientific Names.

Common Name	Scientific Name and Author
Chinook galmon	*Oncorhynchus tsha;l;)yt scha* (Walbawn)
Coho salmon	*Oncorhynehus kisutch* (Walbaum)
Dolly Varden	*Salvelinus malma* (Walbaum)
Cutthroat trout	*Salmo clarki* Richardson

Research

J. Evaluation of returns of coho salmon previously released from the facility should be continued.

2. A comparison of availability of returning adult coho to the local fisheries should be determined between smolts released into fresh water and smolts released directly into salt water.

3. Studies should be designed to determine techniques of increasing returning adult coho availability and contribution to the local fisheries through selection of brood stock, time of release, and various saltwater rearing strategies.

OBJECTIVES

1. To continue evaluation of rearing king and coho salmon previously released from the Mendenhall Facility.

2. Determine the most desirable brood stock of coho for use in improving the Juneau area marine sport fishery.

3. Determine feasibility of imprinting coho smolts to the Mendenhall Facility that have been reared in saltwater pens.

TECHNIQUES USED

In 1978, no enumeration or marking was conducted for naturally-reared Moose Lake coho smolts. These fish were allowed to out-migrate on their own volition.

In 1978, experiments were conducted in cooperation with the Fish Creek I:stuarinc Rearing Facility operated by the Division of Fisheries, Rehabilitation, Enhancement and Development near the mouth of the Mendenhall River. Coho smolts which had been pond-reared at the Mendenhall Facility in the summer of 1977 were transferred to the estuarine rearing facility for overwintering and release in spring, 1978. One lot of coho smolts that overwintered at the Fish Creek Facility was transferred back to the Mendenhall Facility in May of 1978 for secondary imprinting and release. A similar-sized lot of Crystal Lake Hatchery reared coho wao; released on the same date at the Mendenhall Facility.

All lots of coho releases were adipose clipped and coded wire tagged at Fish Creek Estuarine Rearing Facility or Crystal Lake Hatchery prior to ;elease. Subsequent released lots were treated and handled as much alike as possible. The Mendenhall Facility holding pond was used as a release site for these groups of smolts, with free access to Mendenhall River.

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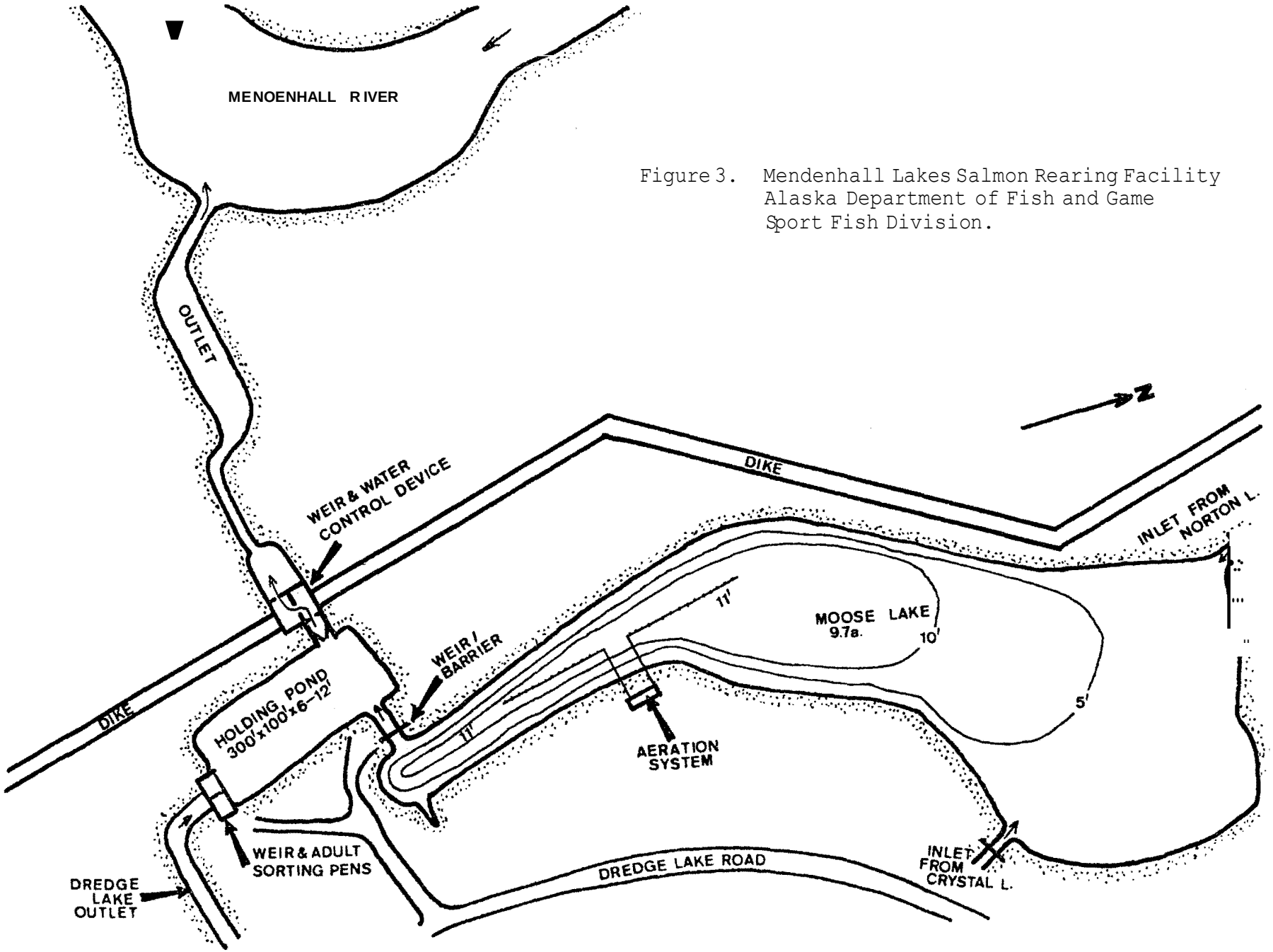

Figure 3. Mendenhall Lakes Salmon Rearing Facility
Alaska Department of Fish and Game
Sport Fish Division.

Contribution of past releases from the Mendenhall Facility to the sport and commercial fisheries was determined from data collected by two other State projects" The Department's Commercial Fisheries tag recovery program was used to recover marked fish from the Southeast Alaska cormnercial troll catch (Davis, 1978). Juneau creel census conducted undcr Sport Fish Harvest Studies was used to recover marked fish from the .Juneau area saltwater sport catch (Robards 1977, 1978).

Beginning July 3, 1978, a supplemental sport fishery creel census was conducted to look for marked salmon which might be missed during regular census operation (Marriott and Jones, 1979). High-use docks were covered during weekends missed by the regular census and during weekend afternoons when the regular census occurred during a morning stratum. Nearly full coverage occurred for fish entered in the Golden North Salmon Derby with, 96.7% of the validated fishermen being checked for fish taken home. Marked fish recoveries during the regular survey were expanded for coverage; whereas, voluntary, supplemental and derby recovered marks were added to the total but not expanded.

1\n iim1igrant trap was maintained in the outlet of the holding pond to capture adult salmon returning to the facility. This trap was checked daily during the period of returns. Adipose marked adults were killed, length measurements and scale samples taken, and the heads returned to the lab for tag removal. Unmarked salmon and jacks were allowed access to the holding pond" The inlet structures to the holding pond were screened off to prevent access to all sizes of salmon into Moose and Dredge lakes. At the end of the spawning migration, the holding pond 111as seined and all marked jacks were kept for tag recovery, and all remaining unmarked salmon and all trout and char were allowed access into Moose and Dredge lakes.

FINll lNGS

LY7G Brood Coho Smolt Releases

On May 3, 1978, smolts from the 1976 brood year Mendenhall stock of coho, which had been reared for one year at the Crystal Lake Hatchery, were released as smolts into the holding pond of the Mendenhall Facility (Fig. 3). A total of 68,034 smolts of mean length 105 mm, mean weight 15.4 kg (34 lb) were released, and of this lot, 10,024 had been marked 1vith CWT 4-18-14. On this same date, 10,565 smolts from the Fish Creek Estuarine Rearing Facility were also released into the holding pond. This group was of 1976 brood year coho hatched at the Crystal Lake Hatchery from Mendenhall eggs. These fish had been transferred to the Fish Creek Facility as fry in 1977, overwintered in the estuarine pens and marked with CWT 4-18-54. This was one of several similar sized groups of coho released from the Fish Creek Facility. The CWT 4-18-14 group (mentioned above) released on this same date was planned as a control group for comparing future survival rates and contributions to various fisheries. The 1978 smolt releases were the fifth consecutive year of coho smolt releases from the Mendenhall Facility (Table 2).

Table 2. Mendenhall Facility coho salmon release and return data from five brood years.

	PLANT SITE	DATE	NUMBER STOCKED	NUMBER RELEASED	NON-SlOLTS	SMOLTS	RELEASE DATE	NUMBER V\RKED	MARK	JACK RETURNS SF	JACK RETURNS CF	JACK RETURNS FAC	ADULT RETURNS SF *	ADULT RETURNS CF **	ADULT RETURNS FAC ***
1972										1974			1975		
Blind Slough	Norton	8/7/73	120,848	80,960	25,970	54,990 J	5/4 to		Ad						
Blind Slough	Dredge	8/7/73	48,896 }		Ad 35,555	9,120	7/3/74 26,435	24,485							
Mendenhall (Moose Lake)	Dredge	8/7/73	90,000						Ad						
			259,744	116,515	35,090	81,425		24,485		0	0	614	333	901	6,774
										1975 Mendenhall Facility Egg Take 1,100,000					
1973										1975			1976		
Blind Slough	Moose	9/17/74	99,985												
Moose Lake	Moose	9/-/74	109,500												
			209,485	10,167	6,263	3,904	5/10/75	1,296	RV	4	****	11	0	****	(44)
Blind Slough	Holding Pond	(Crystal Lake reared)				50,200	5/23 to 6/6/75	15,200	Ad+ 4-2-6	18	0	576	89	1,064	(38)
Blind Slough	Holding Pond	(Crystal Lake reared)				46,479	5/23 to 6/6/75	46,479	Ad+ 1/2 D	9	****	114	0	****	(54)
						100,583		62,975		31	0	701	89	1,073	3,501 *****
										1976 Mendenhall Facility Egg Take 1,008,000					

Table 2. (Cont.) Mendenhall Facility coho salmon release and return data from five brood years.

	PLANT SITE	DATE	NUMBER STOCKED	NUMBER RELEASED	NON-SMOLTS	SMOLTS	RELEASE DATE	NUMBER MARKED	MARK	JACK RETURNS SF	JACK RETURNS CF	JACK RETURNS FAC	ADULT RETURNS SF *	ADULT RETURNS CF **	ADULT RETURNS FAC ***
1974										1976			1977		
Moose Lake	Moose	6/75	134,500			38,694	5/76	14,180	Ad 4-4-2	0	0	253	2	658	575
North Pen	Moose	6/75	10,000			4,233	5/76	4,233	Ad 4-4-4	0	0	3	0	•4	12
South Pen	Moose	6/75	5,000			2,430	4/76	2,430	Ad 4-4-3	0	0	0	0	5	8
Blind Slough	Holding Pond	(Crystal Lake reared)				42,231	6/76	14,695	Ad 4-4-14	0	0	141	0	10	3
						87,588		35,538		0	0	397	2	677	598
										1977 Mendenhall Facility Egg Take 950,000					
1975										1977			1978		
Moose Lake		6/76	545,000	99,439		99,439	(Transferred to Fish Creek ERFJ								
C.L. Hatchery	Holding Pond					22,816	5/77	22,816	Ad 4-16-40	0		40	0	47	3
Fish Creek ERF	Holding Pond					10,097	4/77	10,097	Ad 4-2-7		0	22	0	6	12
\loose Lake	Moose					6,197	4/77	6,197	Ad 4-16-42	1	0	65	3	31	
						39'110		39,110		2		127	3	84	65
										1978 Mendenhall Facility Egg Take I)					

Table 2. (Cont.) Mendenhall Facility coho salmon release and return data from five brood years.

	PLANT SITE	DATE	NUMBER STOCKED	NUMBER RELEASED	NON-SMOLTS	SMOLTS	RELEASE DATE	NUMBER MARKED	MARK	JACK RETURNS SF	JACK RETURNS CF	JACK RETURNS FAC	ADULT RETURNS SF *	ADULT RETURNS CF **	ADULT RETURNS FAC ***
1976										1978					
Moose Lake (Fingerlings overwinter at Fish Creek)	Holding Pond	5/3/78				10,565	5/3/78	10,565	Ad 4-18-54	0	0	0			
Blind Slough		5/3/78				68,034	5/3/78	10,024	Ad 4-18-14	0	0	7			
						78,599		20,589		0	0	62			

* Calculated sport fish catch which includes Golden North Salmon Derby

** Commercial fishing catch expanded for sampling coverage.

*** Rearing facility returns including unmarked fish.

**** These marks not looked for in commercial sampling.

***** Includes 3,365 unmarked adults (differential marking mortality).

On July 14, 1978, Moose Lake was sampled to detennine if smolts released into the holding pond had migrated into Moose Lake and were spending an additional year rearing in fresh water. Fifteen baited minnow traps were set in Moose Lake for 2 1/2 hours. The total combined catch from these traps was only two coho salmon (unmarked fingerlings less than 70 70 mm long) and four Dolly Varden. It was concluded that no significant holdover of coho fingerlings was occurring.

1972 Brood Chinook Returns

In 1978, one chinook salmon returned to the Mendenhall Facility from the 217,438 smolts released in 1974. This fish was an age 1.4 unmarked female (total length 865 mm) and was therefore credited to the unmarked portion of the Moose Lake reared release. No marked chinook salmon were recovered in 1978 in the Juneau area marine recreational fishery. Not including the sizeable number of strays and the unknown contribution to the commercial fishery, the total smolt-to-adult survival for the Moose Lake reared chinook was 0.61%. This is 4.7 times higher than survival from the Crystal Lake Hatchery reared smolts, despite the larger size at release of the latter group (Table 3).

1975 Brood Coho Returns

Adull returns of coho salmon in 1978 were from three marked releases in !977 at *the* Mendenhall Facility. Of the 6,197 Moose Lake reared smolts released, an estimated 3 were recovered in the Juneau area sport fishery, 31 were estimated caught in the commercial fishery, and 10 returned to the Mendenhall Facility. Of the 22,816 Crystal Lake Hatchery reared smolts released at the Mendenhall Facility in 1977, none entered the sport fishery, 47 were estimated caught in the commercially fishery, and 3 returned to the Mendenhall Facility. Of the 10,097 Fish Creek Estuarine F:i ci ity reared smolts released at the Mendenhall Facility, none entered the sport fishery, 6 were estimated caught in the commercial fishery, anJ l2 returned to the facility (Table 4). In addition to these marked fish, 40 unmarked coho appeared at the facility. As all 1977 smolt releases were marked fish, these are thought to be strays from Mendcnhal 1 River spawncrs.

1976 Brood Coho Jack Returns

Returns of 1976 brood year coho appeared as jacks (precocious males) in 1978. Of the 10,565 Moose Lake reared, Fish Creek Facility overwintered smolts released at the Mendenhall Facility on May 3, 1978, no jacks returned in 1978 and none were detected as strays or in the sport or cormnercial fishery. Of the 10,024 marked Crystal Lake Hatchery reared coho (from a total release of 68,034) released on May 3, 1978 at the Mendenhall Facility, 7 returned to the facility and none were detected as strays or in the sport or commercial fishery. The 54 unmarked jacks which returned to the facility in 1978 were assumed to be from the w1markcd portion of this release. One additional adipose marked j:ick with no wire tag also returned to the facility in 1978.

Table 3. Mendenhall Facility chinook salmon release and return data from 1972 brood year chinook released in 1974.

Brood Year	Date Released	Number Marked	Number Released	Year		Sport Catch	Escapement to Facility	Return per Year	Accum. Return	Accurn. Percent Return
1972	6/74	39,560	93,129	1974	1.0	0	4	4	4	0.00
S/23-28/74 = 16.8 g. '108.7 mm				1975	1.1	0	0	0	4	0.00
				1976	1.2	32	126	158	162	0.17
Hatched at Crystal Lake Hatchery, reared to smolt at Moose Lake. Marked with Adipose Clip).				1977	1.3	12	392	404	566	0.60
				1978	1.4	0		1	567	0.61
						44	523	567		
1972	6/74	124'309	124,309	1974	1.0	0	11	11	11	0.00
4/30 - 5/28/74 = 26.8 g.				1975	1.1	0	0	0	11	0.00
Hatched at Crystal Lake Hatchery, reared to smolt at hatchery, released as smolt from Mendenhall Facility. Marked with 1/2 Dorsal Clip).				1976	1.2	8	58	66	77	0.06
				1977	1.3	10	97	107	184	0.13
				1978	1.4	0	0	0	184	0.13
TOTAL		163,869	217,438			18	166	184		

1976 33 "strays" counted in Mendenhall River tributaries not included in table.

1977 348 "strays" estimated in Mendenhall River tributaries and two counted in Auke Creek not included in table.

Tcible ' Sport and commercial recoveries of selected coded wire tagged stocks of coho salmon from the Juneau area, 1978.

		Expanded Sport Catch Mean Data	COMMERCIAL TROLL RECOVERIES EXPANDED FOR SAMPLING COVERAGE — Fishing Sections 157	116	114	113	112	111	Unknown or other	Tagged Escapement	Total Tag Return (% Survival)
MOOSE LAKE (Mendenhall Facility) (4-16-42)	6,197	3	0	0	0	8	5	5	13	10	41
		8/11	Mean date of catch 8/19								(.007)
CRYSTAL LAKE (tendenhall Facility) (4-16-40)	22,816	0		3	11	8	5	19	0	3	50
			Mean date of catch 8/30								(.002)
MOOSE LAKE 1976 !'ish Cr. E.R.F. 1977 (Mendenhall Facility) (4-2-6)	10,097	0	0	0	0	0	0	0	6	12	18
			Mean date of catch 9/7								(.002)
AUKE LAKE (Auke Creek Weir) (4-5-6)	3,038	11	0	0	84	8	5	30	113	112	352
		8/27	Mean date of catch 8/23								(.116)
SPEEL LAKE (Marked as fingerlings in 1976) (4-4-10)	7,535	3	0	3	39	108	23	38	325	99	635
		8/4	Mean date of catch 8/7								(.084)

Brood Stock Evaluation

Parameters heing examined for an improved brood stock for the Juneau area include: (1) early entry and long availability in the Juneau area (section llla of Fig. 4); (2) high smolt-to-adult survival, (3) high contribution to the sport and troll fisheries by remaining in a "biting condition", (4) early return and maturation at the facility, (5) a low incidence of straying, and (6) a low incidence of precocious males.

!'he 1978 evaluation of a potential brood stock was from data collected on coded-wire tagged salmon through the Juneau marine creel census and 11ivision of Commercial Fisheries sampling programs. Stocks evaluated were returns from the 1977 smolt releases of 39,100 coho from the Mendenhall Facility, 75,820 coho from the Fish Creek Estuarine Rearing Facility, and 47,997 fingerlings marked in 1976 in 16 separate wild systems in northern Southeast Alaska (Table 5). These fish were marked primarily to assess the commercial fishery harvest rates in Icy Straits, but 1narkcJ returns passing through the Juneau sport fishery could be examined for contribution to that fishery and mean date of capture. The Mendenhall Facility releases were compared in detail with the Auke Lake and Speel Lake natural runs (Table 4). Of the Mendenhall releases, the Moose Lake reared coho made the only contribution to the sport fishery and had the earliest mean capture date in both the sport and commercial fisheries. J\uke Lake coho produced the best contribution to the sport fishery but had a later capture date than both the Moose Lake and Speel Lake populations. Specl Lake produced the best contribution to the conunercial fishery, ha<l the earliest mean capture date (2-3 weeks earlier than Auke Lake), and fish appeared to remain in section 111 a over the longest period of time. On a percentage basis, Auke Lake contributed nine times as many fish to the sport fishery as Speel Lake; however, Speel Lake is not in the center of the sport fishery, and the fish could be expected to be mi_grating more rapidly through the area. After consideration of all parameters, the Speel Lake system coho were selected as being the most suitable stock for use in Juneau area enhancement. The decision to use this stock was made early enough in 1978 to initiate an egg take at the Speel Lake system. However, fish could not be held at the Speel Lake 1veir site during periods of high water, and fish did not school off the spawning areas in concentrations sufficient to make a seining operation successful" Unless the 1979 sampling favors a different system, attempts will be made again to secure eggs from this stock for incubation at the Department's Snettisham Facility.

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The 1978 return data for both adults and jacks illustrates the declining smolt-to-a<lult survival rates and increasing percent of jack returns (Table 6). Coho smolt-to-adult return ratios observed in most natural systems are normally at least 10%, and this percentage is the accepted standard in coho predictions. The 1972 brood year coho demonstrated a 9.83 survival rate, but this rate has progressively declined to 4.64%, 1.36% and 0.28% in a tangent curve approaching 0% (Fig. 5). At the same time, the percentage of jacks in the return has increased progressively

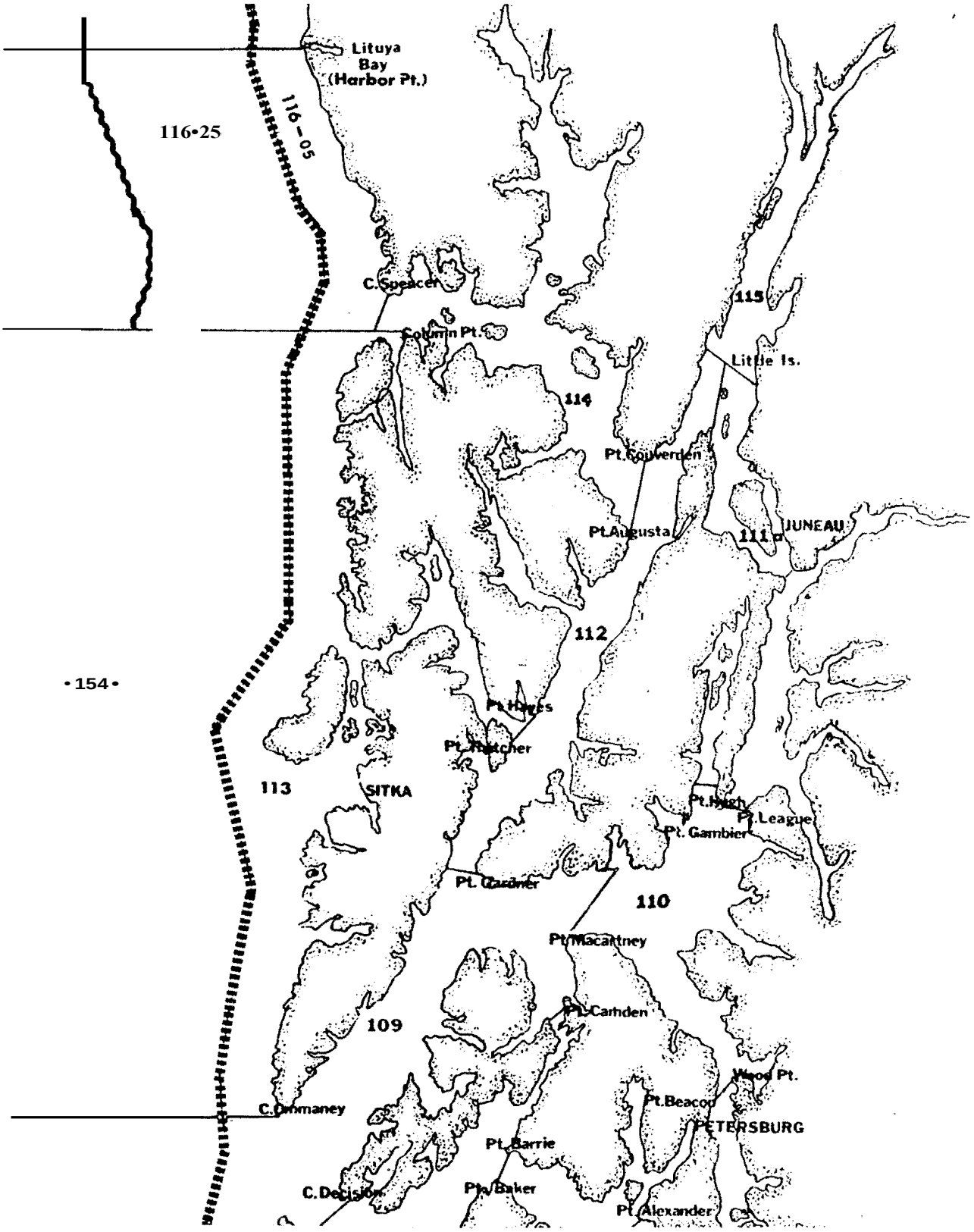

Figure 4. Conunercial fishing sections of northern Southeast Alaska.

Table 5. Summary of marked salmon potentially available to the Juneau area marine recreational fishery in 1978 and marked salon returns detected through creel census sampling and voluntary returns.

Species	Year Released	Release Site	Div.	Mark	Number Marked	Total Release	Marks Sampled	Calculated Contribution to Recreational Fishery **
Sockeye	1974	Auke Lake		Ad RV	20,000		3	39
				Ad LV	40,000		0	0
Chinook	1974	Mendenhall Lakes	(SF)	Ad	39,580	93,129	0	0
				1/2 D	124,309	124,309	0	0
Pink	1977	Auke Creek	(SF)	Ad RV	21,000		0	0
				Ad LV	21,000		0	0
				CWT				
Coho	1977	Mendenhall Lakes	(SF)	4-16-42	6,197	6,197	3	3
		Mendenhall Lakes	(FRED)	4-16-40	22,816	22,816	0	0
				4- 2- 7	10,097	10,097	0	0
		Fish Creek	(FRED)	4-16- 4	10,349	10'713	2	2
				4-16- 5	5,798	6,155	0	0
				4-16- 6	10,350	10,648	2	2
				4-16-17	10,435	10,703	1	1
				4-16-39	8,381	8,432	2	1
				4-16-51	7,486	7,600	1	[illegible]
				4-16-52	17,266	17,642	2	6
				4-16-53	5,755	5,880	2	4
		Auke Lake	(CF)	4- 5- 6	3,038		7	11
		Taku River	(CF)	4-16-43	4,205		4	4
				4-16-44	1,270		0	0
	1976*	Berners River	(CF)	4- 2-15	10,817			
		Yehring Creek	(CF)	4- 3- 1	484		0	0

Table 5. (Cont.) Summary of marked salmon potentially available to the Juneau area marine recreational fishery in 1978 and marked salmon returns detected through creel census sampling and voluntary returns.

Species	Year Released	Release Site	Div.	Mark	Number Marked	Total Release	Marks Sampled	Calculated Contribution to Recreational Fishery **
				CWT				
Coho	1976*	Mosquito Lake	(CF)	4- 3- 2	3,347		0	0
		Sockeye Creek	(CF)	4- 3- 3	3,214		0	0
		Moose Lake	(CF)	4- 3- 4	3,419		1	1
				4- 3- 5	1,251		0	0
		Chilkat River	(CF)	4- 3- 6	1,019		0	0
				4- 3- 7	1,503		0	0
		Berners River	(CF)	4- 3- 8	526		0	0
		Johnson Creek	(CF)	4- 3- 9	1,352		0	0
		Speel Lake	(CF)	4- 4-10	7,535		3	3
		Chilkat Lake	(CF)	4- 5- 2	2,985		0	0
		L. Chilkat River	(CF)	4- 5- 3	3,339		0	0
				4- 5- 4	1,731		0	0

* Tagged as fingerlings, expected to naturally out-migrate in 1977 as 2-check smolts.

Unexpanded recoveries from Golden North Salmon Derby added to recoveries expanded for creel census coverage. Sockeye fishery expanded separately.

Table 6. Marine survival and jack composition of five brood years of coho releases from the Mendenhall Facility.

Brood Year	Smolts Released	TOTAL RETURNS Jacks	TOTAL RETURNS Adults	SMOLT RETURN SURVIVAL Jacks	SMOLT RETURN SURVIVAL Adults	Percent Jacks in Return
1972	81,425	614	8,008	0.75%	9.83%	7.12%
1973	100,583	732	4,663	0.73%	4.64%	13.5?96
1974	93,588	719	1,277	0.77%	1.36%	36.02 6
1975	39'110	130	109	0.33%	0.28%	54,39°0
1976	78,599	62		0.08%		

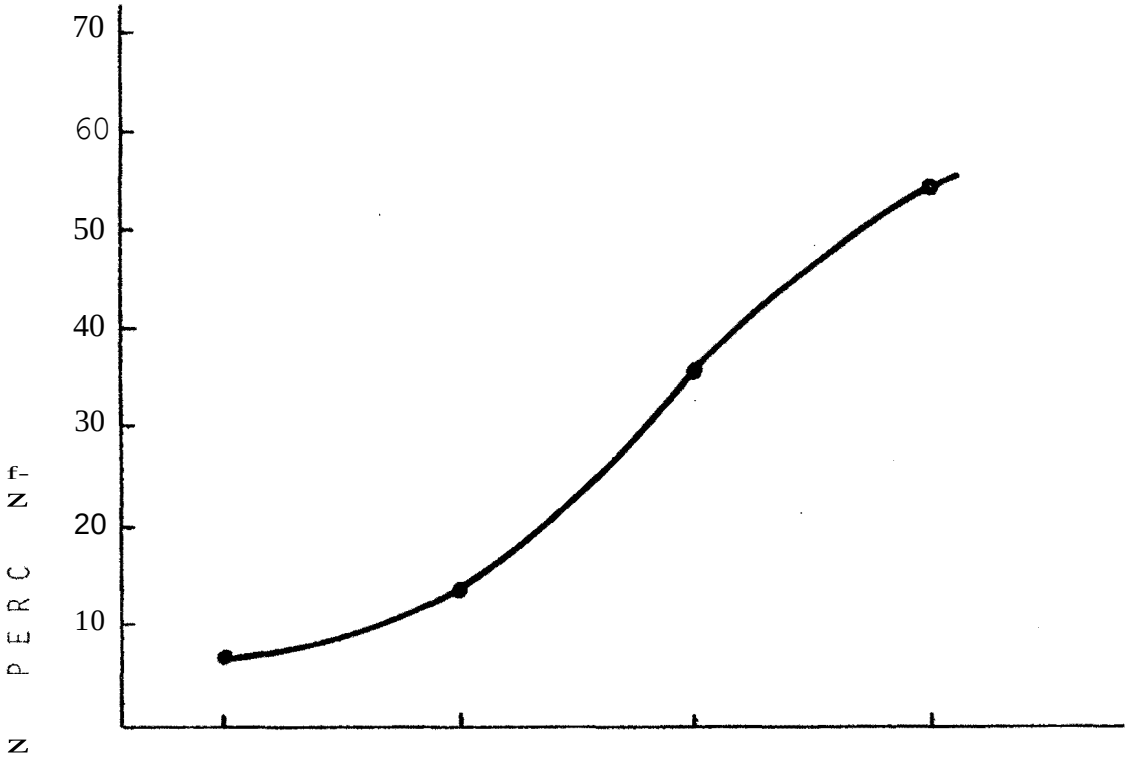

Figure s. Percentage of jacks in Mendenhall Fadlity coho returns.

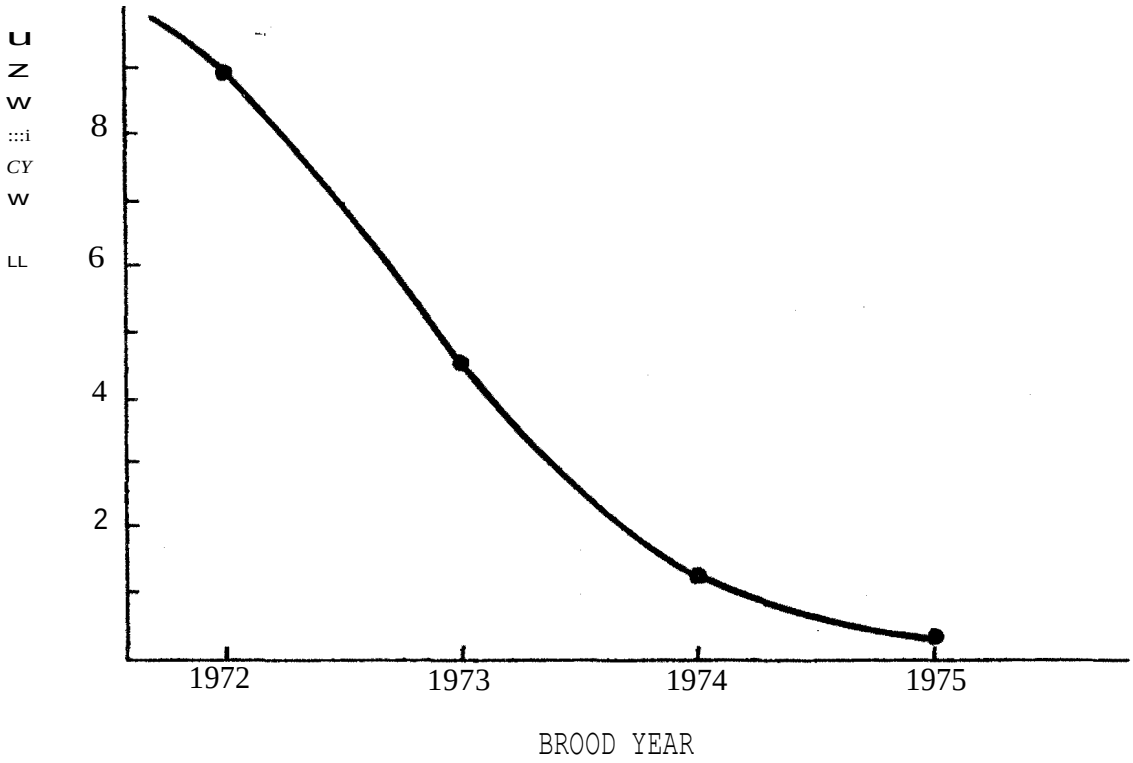

Figure b. Smolt:adult survival rates for 4 brood years of coho returning to the Mendenhall Facility.

from 7.12% to 54.39%, also in the fonn of a tangent curve (Fig. 6). This alanning trend has also been observed at the Department's Fish Creek Estuarine Rearing Facility, Starrigavan Estuarine Rearing Facility an<l the Blind Slough run at the Crystal Lake Hatchery.

The cause of this trend cannot be traced to increased harvest rates, as these are included in the return data. With the percentage of jacks also increasing, mortality rate increases are not occurring entirely in the early life stages but appear to be spread out through the entire rnari.ne residency of the fish. Bacterial Kidney Disease (BKD) has appeared in tissue samples of smolts from all brood years when eggs were incubated at the Crystal Lake Hatchery, and the one factor in common with all of these facilities is the incubation of eggs at this hatchery, followed by high-density rearing. It appears that this chronic infection began in the closed recirculating system of this hatchery and has produced stress-related mortalities throughout the lifa of each brood class that has been exposed.

The Fish Creek Facility and Starrigavan Facility are being phased out and the Crystal Lake Hatchery was temporarily closed down in early 1978 and discontinued further work with the Blind Slough stock of coho. The Mendenhall Facility has ceased rearing coho and taking eggs and is being continued at a maintenance level to complete evaluation of the 1976 brood year coho. At this time it appears that development of a better brood stock and less crowding (in both the hatchery and rearing areas) will increase smolt-to-adult survival; however, there is some doubt that these changes will lead to the production of a viable method of increasing sport catches of salmon in the Juneau area.

If the Mendenhall Facility was located on a clear water system and experienced returns similar to the 8,000+ adult coho that returned in 1975, a freshwater sport fishery could be developed within the migration route to the facility. Even under these conditions, the returning fish would normally enter the river during periods of heavy rain and flooding conditions, and it is doubtful that more than 1,000 could be legally harvested before they would become too mature to be attractive sport fish. One approach being considered by the FRED Division is the selection of an early returning stock, hatchery incubation to fry stage, and low-density stocking into scattered non-anadromous lakes for rearing under natural conditions. This method will probably create improved smolt-to-adult survival; however, the effects of mixing genetic stocks, effects on natural runs below the lakes, and the general economic viability of this approach have yet to be demonstrated.

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