SUMMARY AGENDA AND NOTES OF UPPER AND LOWER COOK INLET STAFF MEETING HELD JANUARY 25-28, 1988 IN SOLDOTNA, ALASKA

EDITED BY

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Regional Information Report[1/] No. 2S88-12

Alaska Department of Fish and Game
Division of Commercial Fisheries, Central Region
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February 1988

1/ Contribution 88-01 from the Upper Cook Inlet Area Data Report Series. The Regional Information Report Series was established in 1988 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accomodate needs for up-to-date information, reports in this series may contain preliminary data.

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ACKNOWLEDGMENTS

I want to thank the following Upper Cook Inlet staff members for contributing to the compilation of this report. They are John Hilsinger, Paul Reusch, Ken Tarbox, Jim Browning, and Bruce King.

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AGENDA
UPPER AND LOWER COOK INLET
STAFF MEETING
SOLDOTNA
25-28 JANUARY 1988
(Revised)

Chairman: Ken Tarbox

I. BUDGET
   A. Preaudit FY 88
   B. Budget request FY 89
   C. Request FY 90

II. REPORTING
   A. Annual Management Report (AMR) format
   8. 1987 AMR/Board reports
   C. Age-Weight-Length (AWL) reports
      1. Salmon
      2. Herring
   D. Other

III. COMPUTER NEEDS

IV. TRAINING

V. LOWER COOK INLET (LCI)
   A. Salmon
      1. Mikfik
      2. Enhancement
      3. Bear Lake
      4. Forecast
      5. Escapement data
      6. Other
   B. Herring
      1. Management Plan
      2. Fishery outlook and forecast
      3. Historical report
      4. Kodiak stock ID report
      5. Meeting with Westward staff
      6. Herring sampling
   C. Groundfish
      1. State waters fish tickets
      2. Federal waters fish tickets

   D. Secretarial needs for LCI

   E. LCI fish tickets

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AGENDA
UPPER AND LOWER COOK INLET
STAFF MEETING
SOLDOTNA
25-28 JANUARY 1988
(Continued)

C. Cook Inlet Aquaculture Association
   1. Status of Trail Lakes hatchery
   2. Eklutna capacity
   3. Paint River
   4. Daniels Lake flow control structure

IX. SPECIAL TOPIC - LCI AERIAL SURVEY

A. Review of current survey
   1. Area covered
   2. Frequency and cost
   3. Use of data

B. Review of Upper Cook Inlet aerial spawning ground surveys
   1. Stream surveys
   2. Area under the curve method

C. New technology
   1. Plotter and plotting routines
   2. Computerized escapement data base

D. Other applications

E. Future direction
   1. Review of escapement goals
   2. Forecasting based on spawner-return method
   3. Where do we want to be 5 years from now?

F. Southeast staff meeting will include topic of aerial survey.

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

II. REPORTING

A. Annual Management Report (AMR) format

1. "Management Review and Recommendations" sections should include such things as why decisions were made at the time, and what you would have done differently.

B. 1987 AMR/Board reports

1. Regional office should receive reports on diskette in WordPerfect format by 15 February.
2. A comment was made about report deadlines and timeliness of receiving final copy of reports. Region promised one month turnaround on reports from final draft submission to distribution from Central Duplicating.
   Chuck will check into costs of Central Duplicating.

C. Age-Weight-Length (AWL) reports

1. Salmon - Upper Cook Inlet (UCI) report will be completed by 30 April. No sampling was conducted for Lower Cook Inlet (LCI) except for herring.
2. Herring - A historical report of the LCI sac roe fishery will be prepared.

D. Other

1. Report process - The Area Data Report (ADR) series is being replaced with the Regional Information Report (RIR) series. Title page numbering format will be replaced with the number-year-letter designation (Appendix A.1).
2. Report submission - Central Region has done a very good job. Statewide 40% of all technical reports were published from Central Region (Appendix A.2.)
3. There will be a shellfish board meeting 26 April.
4. A comment was made that regional staff should get together with local staff more frequently than just once a year.

III. COMPUTER NEEDS

A. UCI staff are ordering one 386/20, one plotter and two 20 megabyte hardcards for remaining 8086 Compaq machines.

B. LCI staff should order a plotter (Henry will follow up on this request).
   Rance's machine is still in the repair shop (mother board replacement). It was mentioned that a tape backup on this machine would be of significant value.

C. Networking was discussed and LCI is networking two machines as a test. Westward Region is doing this now using IBM software called TokenRing (cost could range from $375 to $1,000 per machine)

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

2. Enhancement

Area	EV	stocking level Fry x10^6	stocking level Rec' x10^6	Estimated Return FRED x10^3	Estimated Return Adjusted x10^3	Estimated Return Tom's x10^3
Leisure	21.0	2.0	2.5	185	172-301	250
Chenik	24.0	1.3	1.5	60	91-216	120
Lower Paint	8.3	0.4	0.5	20 ½	15.8	30
Upper Paint	15.3	0.8	1.0	38 ½	29	50
Elusivak	12.1	0.6	0.9	30 ½	23	40
Kirschner	26.2	1.0	1.5	65 ½	49.8	90
Port Dick	18.9	0.8	1.1	47 ½	35.9	100
Hazel	12.9	1.0	1.0	32 ½	49	100
Grewink	-	0.5	(optimum) 1.1 <-|			(15)
Bear	19.8	3.0		49 ½	75.2	200
				(160)	(178.2)	

EV denotes euphotic volume of lake.
Rec' denotes recommended stocking level.
All lakes are approved for stocking in 1988 except for Bear. A total return estimate (FRED Division) of 528,000 to 639,000 fish is expected (includes Bear).

Paint River return is expected to be between 80,000 and 120,000 sockeye.

Euphotic volume estimates can be used to determine potential stocking level in lakes. For example; without fertilizing the potential smolt/EV would equal 23,000 and with fertilizing the potential smolt/EV would equal 45,000.

McNeil River - A stocking level in July of 1.0 to 2.0 million fry may result in a 40,000 to 80,000 fish return. A stocking level in June of 6.0 million fry may result in a 400,000 to 800,000 fish return. Limnological work is limited at the present.

LCI could use an estimated 8.4 million fry for stocking purposes.

Tustumena Lake - At present, the stocking level could possibly be determined in June based on May heating degree days.

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

3. Historical Report
   a. Age class competition.
   b. Sampling in Kamishak was not too effective in early years.
   c. Poor recruitment occurred in 1971-72 possibly due to the hard winters.
   d. Late arriving fish tend to be smaller at age than earlier arriving fish.
   e. Kamishak harvest rates on older age fish are now 20%.
   f. Age and growth information (average weight at age and harvests for the years 1973 through 1987 are reported in Appendix B.2.)
4. Kodiak stock ID report
   a. Samples from Shelikoff Strait resulted in 75% +/-25% classified to Kamishak Bay.
   b. Kodiak staff conducted hydroacoustic surveys on overwintering stocks. No information concerning stock assessment was compiled.
   c. Ken Florey would like Central Region staff to take over the project and funding.
   d. There was some interest expressed on that idea from UCI staff.
5. Meeting with Westward staff - set for Friday 29 January 1988.
6. Herring sampling
   a. Help - possibility of 3 days assistance by Dave Waltemyer around 21-24 April.
   b. Henry Yuen will be providing support during project.
   c. Discussion of a scale ageing/reading session was provided and a training session will be set up prior to the field season.
   d. Chuck, John and Henry will work on per diem arrangement for samplers.

C. Groundfish
   1. State waters fish tickets.
   2. Federal waters fish tickets.
   3. 1987 ex-vessel value was $2.5 million, the region harvested 6.9 million pounds.
   4. Fish tickets should be sent to Juneau.
   5. Summary programs
      a. provide catch summary by stat area
      b. provide catch summary by state waters

D. Secretarial needs for LCI
   1. CT II needed from 15 April to 1 October.
   2. A big screen monitor is needed for computer in Homer office.

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

H. Evaluation
   1. Evaluations need to be turned in on time. Timeliness is important for employee points.

I. Benefits
   1. Vacation/annual leave pay come out of last job code.

J. Addresses of seasonal employees
   1. Very important to get a current mailing address for sending pay etc.

K. Mid-month draw should always be cancelled when people go on LWOP status.

L. Transfers - pay is frozen at step for Soldotna/Homer to reduce differential to Anchorage pay schedule. Realize that if someone transfers and comes back pay will revert back to Anchorage scale.

M. Letter of return to seasonal position
   1. Wayne will revise letter.
   2. 106 letters were sent out 62 positive responses were returned.
   3. Employee has option of not notifying employer of returning status until first day of employment.

N. Administrative changes
   1. Wayne/region will put together information packet "manual" which keeps us aware of these changes.
   2. Wayne will provide check list of hiring/firing procedures.
   3. Ledger sheets and balance sheets sent from region are the bottom line figures we should use. If decrepencies arise check with region.

O. Risk Management
   1. All field camps should be registered with Risk Management office.
   2. Deductible is $1,000 for equipment.
   3. Ken Florey will check on insurability of field sites and equipment.

P. Policy
   1. What is our policy on vehicle rental/lease?

Q. Bunkhouse - is available for use as office space.

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

What are the management options available? Under normal run timing and forecast, would fish the drift fleet regular periods through 15 July. At that time assess run strength and timing of various runs as well as other species and make adjustments as necessary (i.e. use east-side restrictions for set net and/or drift fisheries) for duration of runs.

2. Other species sampling - need for additional manpower, requires 2 additional crews (4 people for 6 weeks) committed to sampling primarily commercial catch where Northern District streams contribute 70%-80% of early run coho, 90% chums and 80% pinks
   a. Coho - basic sampling plan.
   b. Other species - chum primarily would consist of a basic sampling plan.
   c. Definition needed for what is acceptable level of sampling. What are the objectives:
      1)strictly A-W-L information (length/weight relationships)
      2)stock identification uses
      3)gear selectivity

3. Stock Identification
   a. Near term plans - project moving towards research and development as opposed to application. Depending on results of bootstrapping, commercial catch allocations may need to be recalculated.
   b. Bootstrapping (Appendix E)
      1)Over the range of actual to observed proportions Susitna and Kenai were underestimating true proportion and Kasilof was overestimating or compensating for the true proportion.
      2)Variability in classification proportions was shown to exist to varying degree over the range of actual proportions used because of run strength differential or the ratio of Kenai to Susitna to Kasilof.
      3)As classification accuracy of the model decreases, variability increases.
      4)Based on the graphs, bias was thought to cause these relationships. However, Brian Bue found that systematic and random sampling of the knowns for building the model generated two different results. Therefore, the model results could not be used at face value for simple correction or adjustment of stock contributions derived from the classification analysis of an unknown.

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NOTES OF UPPER AND LOWER COOK INLET
STAFF MEETING
(Continued)

7. Offshore Testfish
   a. 1987 report - being prepared, deadline 1 June.
   b. 1988 plans and participants
      1)Dates of operation will be 1 July to 31 July.
      2)Project will be operated similar to 1987 season except rotate crew of two to reduce overtime pay situation and stay on the transect to conduct all fishing opportunities.
      3)Looking to the future to analyze past data collected for the purposes of determining what physical and/or chemical factors may be influencing the catch per unit effort data.
      4)For FY90 may need to increase budget.

8. Fisheries Coalition
   a. Review of proposals
      1)Sport Fish tagging program
      2)Commercial Fisheries sonic tagging program using passive tagging was essentially eliminated as a viable option.
   b. Staff plans to help
   c. Other - evaluation of east-side set net fishery
      1)Important questions are distance nets are from shore and effort in areas?
      2)In-season should fly aerial survey of east-side as many times as possible to quantify effort.
      3)Chart outside boundary of set nets. John will check on the use of F/V Pandalus or possibility of short term charter.
      4)Initiate a survey for releasing king salmon. This past season two sites recorded 16% and 32% release rates.
      5)Contingency plan would be to be prepared to do #2 and #3 in 1988 season

9. Kenai - Skilak smolt enumeration
   a. May redefine this project to include hydroacoustic/presmolt lake work study
   b. Discussion of proposed Kenai River smolt study.
      1)May 1-15 gear-up
      2)May 15 to June 15 monitor program as a pilot study of one or two days a week @ $10,000 initially.
      3)$35,000 in next year for evaluation study
      4)Tarbox to provide POP on hydroacoustic and smolt studies.

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NOTES OF SPECIAL TOPIC

IX. SPECIAL TOPIC - LCI AERIAL SURVEY

A. Review of current survey - Tom Schroeder

1. Area covered - background
   Because of losing biologist's experience and providing a way to document these events, it is important to review this type of work in the Department.
   a. Geographic area
      1)LCI has 180 nautical miles from east to west.
   b. general description and number of streams
      1)70 streams of importance are surveyed at various times. 30 to 35 streams are of major importance in terms of number of fish.
   c. Species surveyed related to area and time.
      1)Odd year Pink is dominate year class, primarily from Nuka Bay outside.
      2)Timing of species - chum salmon arrive first and pink salmon arrive second.
      3)Use ground-truthing to determine species composition and possibly use commercial fishery species composition to verify.
      4)Possibly separate species by spawning areas, coloration of fish or observing new fish movements.
   d. Learn to anticipate where fish will be for setting up charter which also includes considering when to fly and patterns of movement.
   e. Size of schools -
      1)Pink salmon have tighter schools which makes it difficult to distinguish individual fish.
      2)Chum salmon have less tight schools which makes it easier to see individual fish.
      3)Sockeye salmon timing is different which does not create a problem.
   f. Difficult to estimate numbers and species.
2. Frequency and cost
   a. Type of aircraft
      1)Supercub ($185/hr), Beaver ($220/hr), Cessna 185 ($190/hr)
      2)Supercub used prior to 1981; Beaver used to cover Eastern and Kamishak districts for stability, and the 185 used more for distant areas.
   b. cost
      1)$30,000 budget
      2)Spend $36-37,000 in real dollars. Cost can go up due to enhancement projects and necessity of shifts in surveying location of commercial catch areas.
      Also time for training of assistant could increase cost to $47,000 per year.

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NOTES OF SPECIAL TOPIC
(Continued)

2)fastest travel time between survey areas
3)greatest coverage for money

c)helicopter
1)most precise of aerial methods
d)factors affecting selection of survey type
1)access
2)accuracy level necessary

3)cost
a)greatly dependant on type of survey
1)walking: 2-3 persons per survey
average 2 index areas per day for UCI systems.
2)fixed wing: 1 person per survey
charter costs range around $200/hr
average 5-6 index areas per day
3)helicopter: 1 person per survey
charter costs range around $450/hr
average 5-6 index areas per day
4)recording system
a)standard survey form
b)historical stream survey data base (lotus format)
c)report tables summarizing peak count information

c. Uses of data
1)peak live and dead counts
2)spawner distribution
3)run timing to spawning grounds
4)measure of relative health of the stock

d. Factors affecting accuracy
1)specific factors
a)water conditions
b)weather conditions
c)observer experience
d)fish abundance
e)aircraft type
f)pilot performance
g)fatigue factor
h)frequency and timing of surveys
i)stream configuration and streambank vegetation
2)discussion
a)Most of the above factors have been tested for variability, but not necessarily for accuracy.
b)Accuracy generally tested against independent population estimate.

ACE10098016

NOTES OF SPECIAL TOPIC
(Continued)

3)refinements
a)Neilson and Geen found variable streamlife with time and modified the calculations to accommodate.
b)Ames (Puget Sound Chum) fits survey data to normal curve to account for data anomalies.

c. Uses of the data
1)Population estimates in addition to data uses summarized in stream survey section.

C. New technology - Fred Jamsen
1. Plotter and plotting routines are found in (Appendix H).
2. Computerized escapement data base
a. System developed for Prince William Sound (Appendix I).
b. adjusting software for LCI and UCI
1)Recommend summarizing escapement data similar to commercial catch data for UCI.
2)develop aerial survey data programs UCI/LCI
3)develop sector/hour programs for UCI
4)expand commercial catch programs for LCI
5)Region will allocate time for Fred to work on the aerial survey/escapement programs for UCI.
6)Time to incorporate programs for herring and razor clams was mentioned.
c. other - RBase for DOS is newest version out and Fred has a copy. Westward (Kodiak) is using RBase to develop data bases.

D. Other applications
1. Upper Cook Inlet
2. Lower Cook Inlet

E. Future direction
1. Review of escapement goals
2. Forecasting based on spawner-return
3. Where do we want to be 5 years from now
a. A summary outline of projects, recommendations justifications and new programs are provided for UCI in Appendix J.

F. Southeast staff meeting is incorporating a special meeting on aerial surveying.
1. The Chief Fisheries Scientist office is interested in developing this type of project contribution.

ACE10098018

List of Assignments and Questions

Assignments

Ken Florey:

1. will double check the status of our FY89 budget needs concerning Line 500.
2. will check the status of the FTP for late run of chinook for Resurrection Bay.
3. will check on insurability of field sites and equipment.

Chuck Meacham:

1. will check with Al Didier on whether the lake hydroacoustic budget was included in the FY89 budget.
2. will check into the costs for duplicating services.

John Hilsinger:

1. will call Carmine to find out about fish ticket request.
2. will check on the use of the F/V Pandalus or possibility of short term charter to chart outside boundary of east side set nets.
3. will submit PR for computer equipment (386, plotter).
4. will prepare the 1987 Offshore Test Fish report which is due 1 June.

Chuck, John and Henry:

1. will work on per diem arrangement for samplers.

Wayne Prigge:

1. will revise letter to returning seasonal personnel.
2. will put together information packet "manual" which keeps us aware of administration changes.
3. will provide check list of hiring/firing procedures

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List of Assignments and Questions
(Continued)

All staff:

1. compile a list of training opportunities which should include courses taken and courses denied since January 1986 (1985) to the present.

UCI staff:

1. will provide a computer for in-season fish ticket data entry.
2. AMRs - should receive reports by 15 February.
3. Other report deadlines are provided in Appendix J1.

Questions

1. What is our policy on vehicle rental/lease?

ACE10098022

SALMON SPAWNING GROUND SURVEYS

IN

THE BRISTOL BAY AREA, 1986

By
Richard B. Russell
Donald L. Bill
and
Wesley A. Bucher

Regional Information Report 1/ No. 2K88-9

Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

February 1988

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ACE10098024

AREA	TYPE	NUMBER	DATE	AUTHOR	
PWS	D	87- 1	02/87	MCCURDY M	Prince William Sound Pink and Chum Salmon Pre-emergent Fry Dry Weight Condition Factor Study for Brood Years 1978-1982. Michael L. McCurdy. February, 1987.
PWS	D	87- 2	01/87	ROBERSON K	Solomon Gulch Hydroelectric Project Evaluation. Ken Roberson. January, 1987.
PWS	D	87- 3	03/87	DONALDSON W	1987 Central Region Shellfish Staff Meeting. Wayne Donaldson. March, 1987.
PWS	D	87- 4	03/87	MORRISON R	Estimating the Guideline Harvest Range for Sablefish in Inside Waters of Prince William Sound. Rance Morrison. March, 1987.
PWS	D	87- 5	04/87	DONALDSON W	Shellfish Report to the Alaska Board of Fisheries. Wayne Donaldson. April, 1987.
PWS	D	87- 6	06/87	DONALDSON W	Copper River District Dungeness Crab Survey, June 1987. Wayne Donaldson and Charles Trowbridge. June, 1987.
PWS	D	87- 7	10/87	KIMKER A	Summary of 86 Streamer Tag Application and Overview of Tagging Project for Shrimp in Prince William Sound. Al Kimker and Wayne Donaldson. October, 1987. 15 pp.
PWS	D	87- 8	10/87	HILSINGER J	A Review of the Fishery and Management of the Prince William Sound Pot Shrimp Fishery. John Hilsinger. October, 1987. 10 pp.
PWS	D	87- 9	11/87	ROBERSON K	Report to the Alaska Board of Fisheries. Ken Roberson. November, 1987.
PWS	D	87-10	11/87	DONALDSON W	Copper River District Dungeness Crab Re-Surveys, 1987. Wayne Donaldson. November, 1987. 14pp.
PWS	D	87-11	11/87	DONALDSON W	1987 Orca Inlet Dungeness Crab Survey. Wayne Donaldson. November, 1987. 12 pp.
PWS	D	87-12	12/87	THOMPSON F	Commercial Salmon Catch Statistics for the Prince William Sound Management Area, 1987. Frederick M. Thompson. 138 pp.
PWS	D	87-13	12/87	DONALDSON W	Prince William Sound Tanner Crab Tagging and Index Survey. Wayne Donaldson. December, 1987.
PWS	D	87-14	12/87	BRADY J	Distribution, Timing and Relative Biomass Indices for Pacific Herring as Determined by Aerial Surveys in Prince William Sound. James A. Brady. December, 1987.

ACE10098026

AREA	TYPE	NUMBER	DATE	AUTHOR	
LCI	D	87- 1	03/87	HAMMARSTROM	Trawl Shrimp Index Fishing in the Southern District of the Cook Inlet Management Area. Lee Hammarstrom. March, 1987.
LCI	D	87- 2	04/87	KIMKER A	Cook Inlet Shellfish Management Report to the Alaska Board of Fisheries, April, 1987. Al Kimker and Lee Hammarstrom. April, 1987.
LCI	D	87- 3	09/87	MORRISON R	Lower Cook Inlet Sockeye and Chum Salmon Age, Weight and Length Statistics, 1986. Rance Morrison. September, 1987. 19 pp.
LCI	D	87- 4	10/87	HAMMARSTROM	Trawl Shrimp Index Fishing in the Southern District of the Cook Inlet Area, September 28-October 23, 1987 and October 12-13, 1987. Lee Hammarstrom. October, 1987.
LCI	D	87- 5	11/87	KIMKER A	Southern District King & Tanner Crab Survey, July, 1987. Al Kimker. November, 1987. 12 pp.
LCI	D	87- 6	11/87	KIMKER A	Central Region Shellfish First Annual Shellfish/Vessel Meeting. Al Kimker. November, 1987.
LCI	D	87- 7	11/87	KIMKER A	Kamishak District King & Tanner Crab Survey, June, 1987. Al Kimker. November, 1987. 15 pp.
LCI	D	87- 8	11/87	KIMKER A	Kamishak District King and Tanner Crab Survey, August, 1987. Al Kimker. November, 1987. 14 pp.
LCI	D	87- 9	12/87	KIMKER A	A Summary of Male King and Tanner Crab Abundance Information from the December 1987 Test Fishing in the Southern District, Lower Cook Inlet. Al Kimker. December, 1987. 10 pp.

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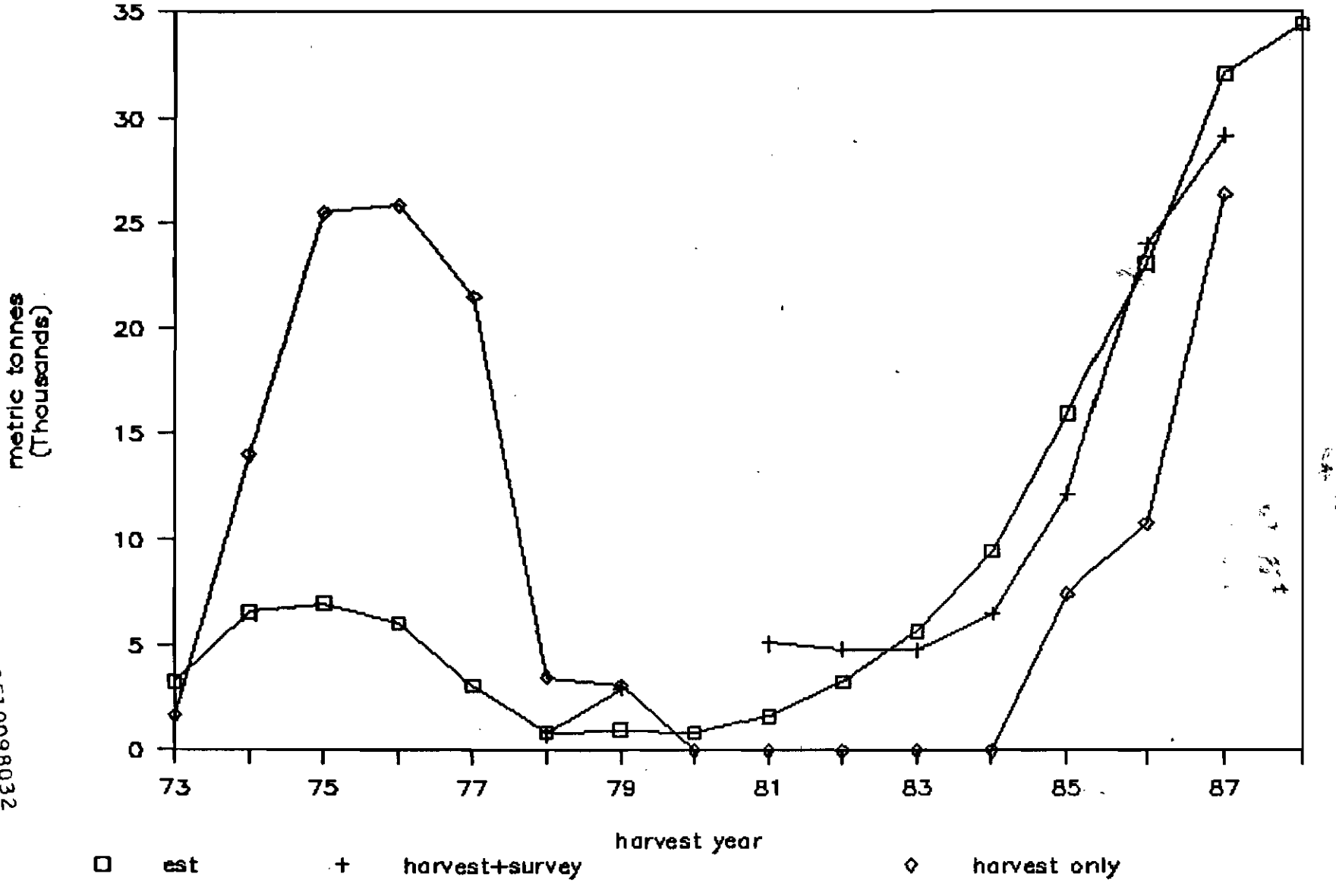
APPENDIX B.1

ACE10098030

cohort analysis



ACE10098032

Table 82. Kamishak district herring average weights in grams by age class and year.

Year		1973	1974	1975	1976	1977	1978	1979
Age	3	91	86	63	66	62	62	73
	4	105	115	59	95	97	88	105
	5	122	139	102	127	113	118	130
	6	139	162	137	147	154	166	159
	7	170	178	160	176	173	154	187
	8	190	195	173	195	200	189	222
	9	187	212	200	209	212	205	200
	10	236	271	226	219	222	216	245
	11	-	-	248	238	-	209	-

Year		1983	1985	1986	1987	1987(Test)
Age	3	80	80	89	94	77
	4	118	125	107	136	119
	5	137	155	155	166	148
	6	160	182	188	198	175
	7	180	205	215	217	189
	8	198	219	232	241	205
	9	210	238	248	250	225
	10	218	246	261	266	242
	11	253	259	275	276	269

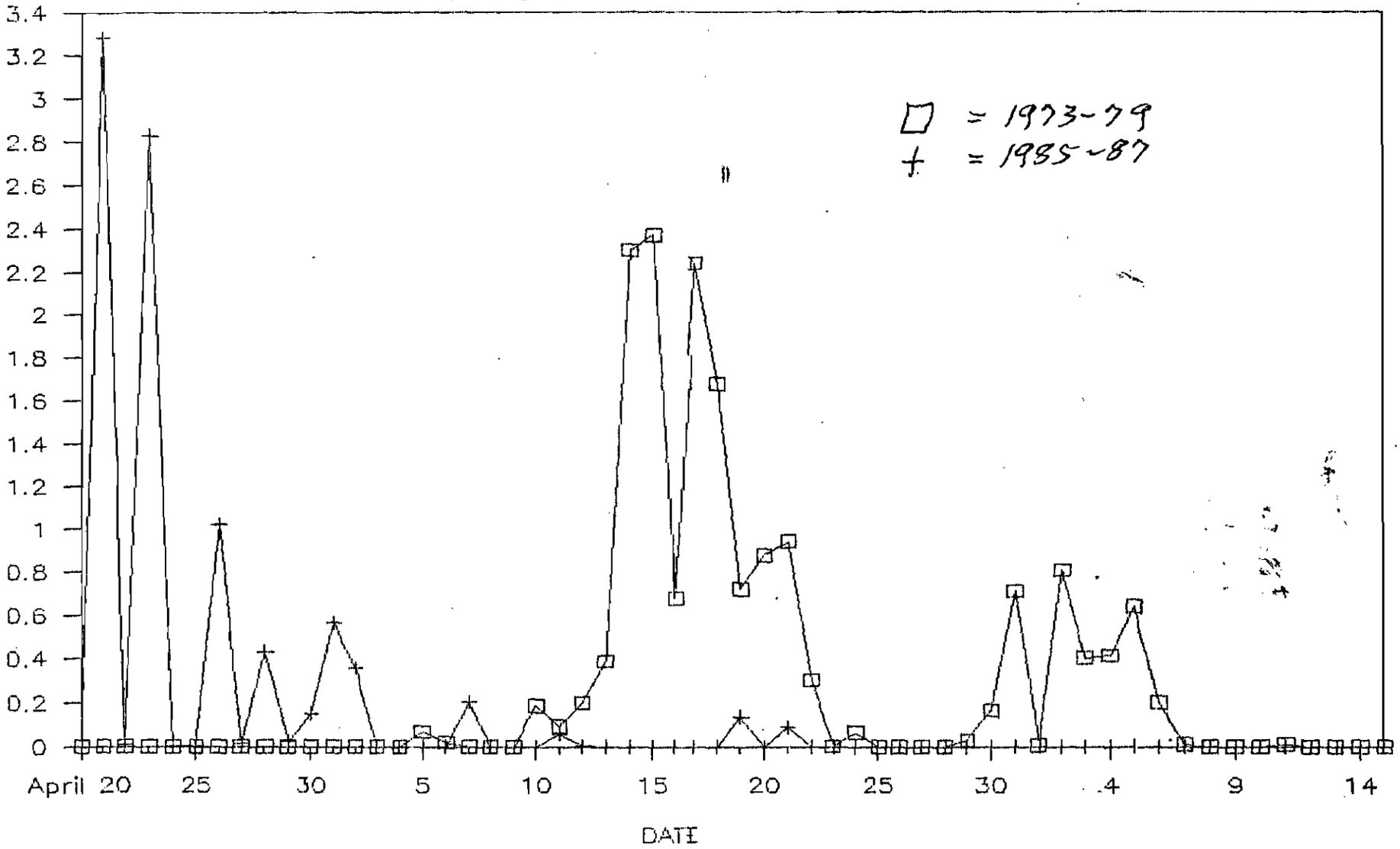
Average weights by age class.

		1973-74	1975-79	1980-87	1973-83	1985-87	1987(Test)
Age	3	88.5	65.2	87.7	72.9	87.7	77
	4	110.0	88.8	122.7	97.8	122.7	119
	5	130.5	118.0	158.7	123.5	158.7	148
	6	150.5	152.6		153.0	189.3	175
	7	174.0	170.0		172.3	212.3	189
	8	192.5	145.8		195.3	230.7	205
	9	199.5	205.2		204.4	245.3	225
	10	257.5	225.6		231.6	257.7	242
	11	—	235.7		237.0	269.7	269

ACE10098034

KAMISHAK DISTRICT HERRING

Comparing Harvests Of 1970's Vs 1980's



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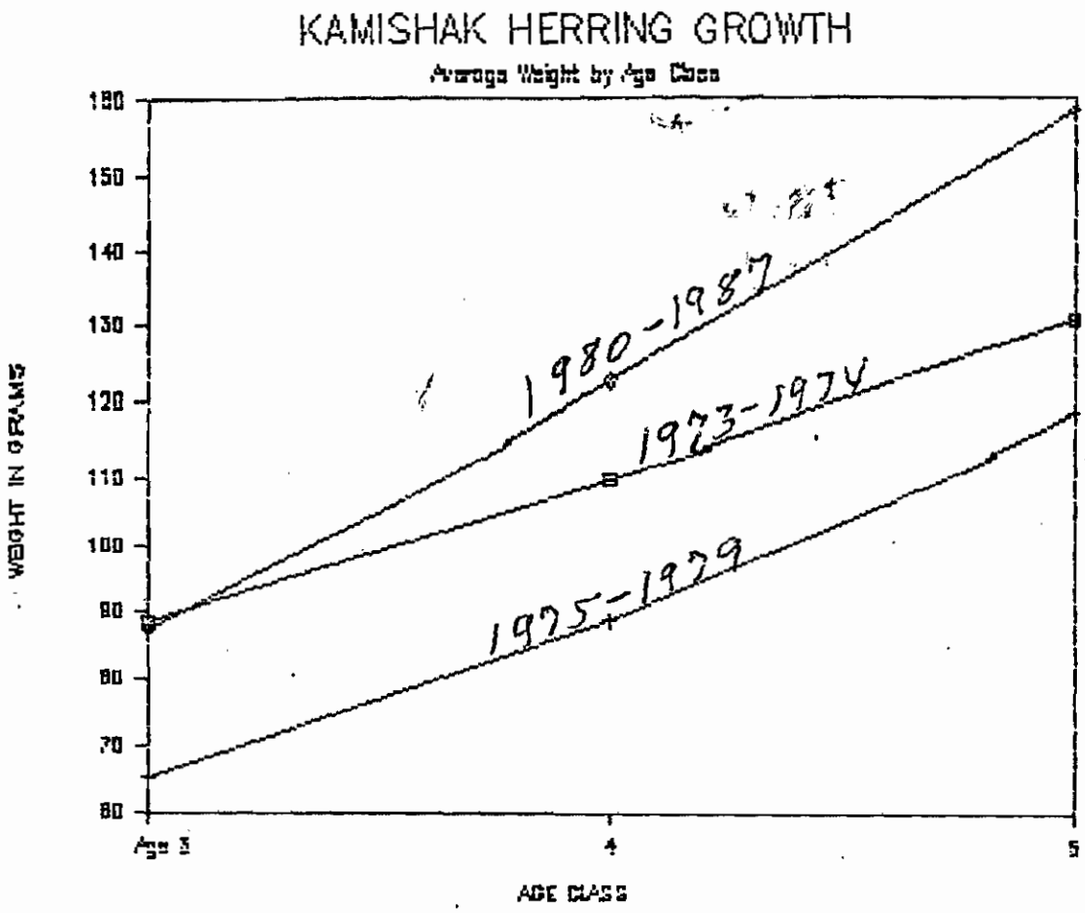

ACE10098038

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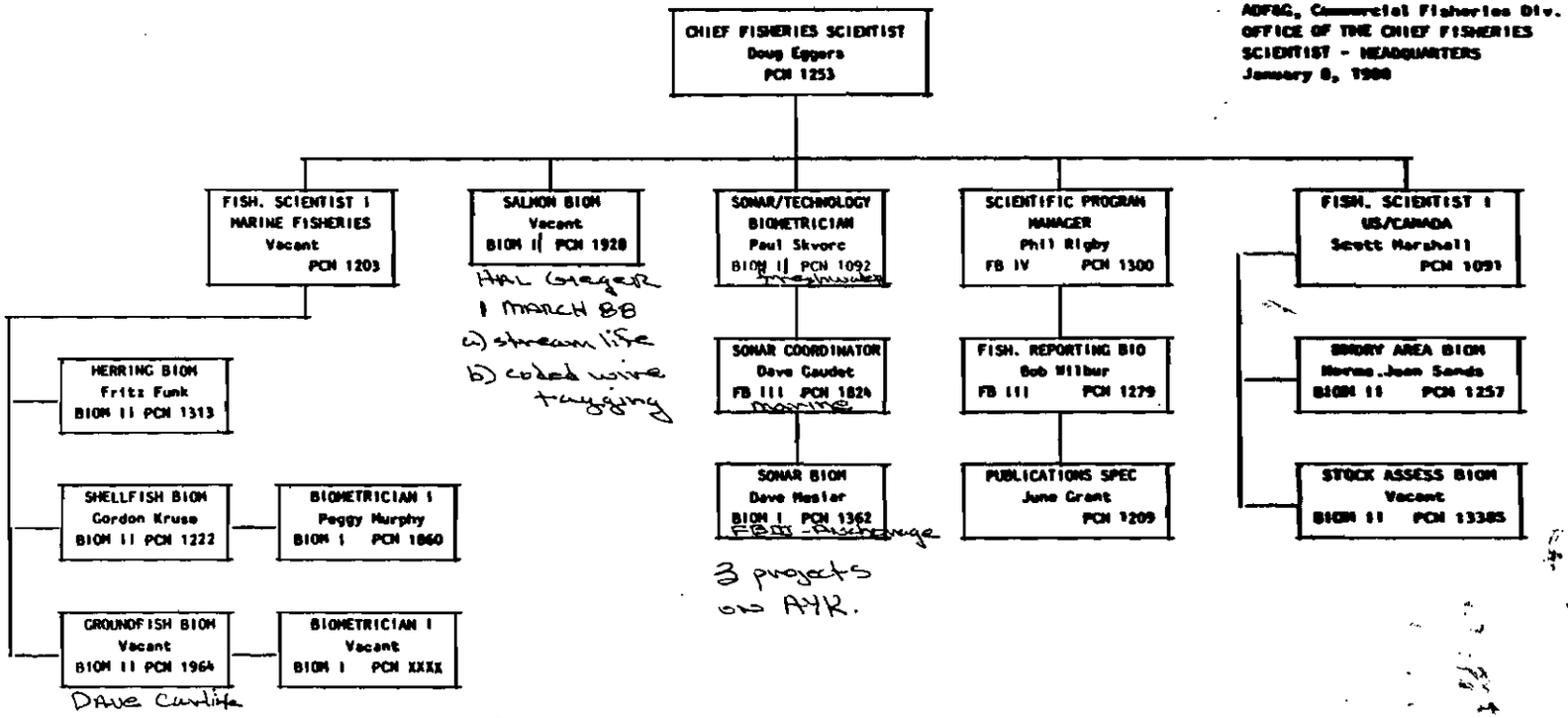
SCIENTIST - HEADQUARTERS
January 8, 1988



ACE10098040

Sockeye salmon stock status, Upper Cook Inlet. All figures are derived from stock allocation analysis except for 1987 figures which were derived from age composition analysis.

TOTAL RETURN

Year	Susitna	Kenai	Kasilof	Crescent	Fish Creek	Big River	McArthur	Chilligan	Grand Total
1979	376,831	597,884	442,893	123,454	117,578				1,658,640
1980	494,340	987,102	805,443	162,497	126,464				2,575,846
1981	764,915	995,247	587,196	62,681	128,011				2,538,050
1982	543,093	2,350,074	1,257,051	204,898	78,973				4,434,089
1983	1,082,955	3,600,435	696,420	394,488	328,662	304,221	44,486	38,272	6,489,939
1984	968,920	942,124	781,758	251,104	286,051	61,593	51,994	68,420	3,411,964
1985	1,266,695	1,931,693	1,388,550	530,111	210,428				5,327,477
1986	845,912	2,912,493	1,920,723	170,836					5,849,964
1987	538,347	8,646,635	1,133,858	655,245	303,805		16,276	80,394	11,374,560

ESCAPEMENT

Year	Susitna	Kenai	Kasilof	Crescent	Fish Creek	Big River	McArthur	Chilligan	Grand Total
1979	157,000	283,880	143,920	81,600	68,722				735,122
1980	190,866	464,038	184,260	90,863	62,628				992,655
1981	340,232	407,639	256,625	41,213	50,479				1,096,188
1982	265,332	619,831	180,239	58,957	28,164				1,152,523
1983	175,936	630,340	210,271	92,343	118,797	138,189	8,534	9,290	1,383,700
1984	279,446	344,571	231,685	118,345	192,352	25,099	26,452	60,631	1,278,581
1985	227,924	502,820	505,049	128,628	68,577				1,432,998
1986	194,887	501,157	275,963	96,000	29,800				1,097,807
1987	101,224	1,596,870	249,246	118,896	91,215		3,000	15,000	2,175,451

ACE10098042

EXPLOITATION RATES

Year	Susitna	Kenai	Kasilof	Crescent	Fish Creek	Big River	McArthur	Chilligan
1979	0.583	0.526	0.676	0.336	0.418			
1980	0.607	0.526	0.769	0.443	0.500			
1981	0.554	0.589	0.565	0.315	0.610			
1982	0.511	0.731	0.849	0.712	0.643			
1983	0.838	0.825	0.698	0.766	0.639	0.546	0.808	0.757
1984	0.712	0.634	0.704	0.529	0.328	0.593	0.491	0.114
1985	0.820	0.740	0.636	0.757	0.674			
1986	0.770	0.828	0.856	0.438				
1987	0.812	0.815	0.780	0.819	0.710		0.816	0.813
MEAN	0.690	0.690	0.726	0.568	0.565	0.569	0.705	0.562
MIN	0.511	0.526	0.565	0.315	0.328	0.546	0.491	0.114
MAX	0.838	0.828	0.856	0.819	0.710	0.593	0.816	0.813

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ACE10098044

Composition of catch by fishery by year Date Prepared: 1/14/88 File Name: CTCHCOMP.

		CATCH								TOTAL RETURN		
		Total		Kenai		Kasilof		Susitna		Kenai	Kasilof	Susitna
Year	Fishery	#'s	%	#'s	%	#'s	%	#'s	%	%	%	%
1980	Drift	777,635	49.1%	272,360	52.1%	265,023	42.7%	191,350	63.1%	27.6%	32.8%	38.7%
	Co/Nin Bch	304,702	19.2%	69,928	13.4%	199,945	32.2%	29,466	9.7%	7.1%	24.7%	6.0%
	Kal Bch	127,236	8.0%	47,386	9.1%	71,692	11.5%	8,082	2.7%	4.8%	8.9%	1.6%
	Sal Bch	125,685	7.9%	75,067	14.4%	50,132	8.1%	0	0.0%	7.6%	6.2%	0.0%
	East totl	557,623	35.2%	192,381	36.8%	321,769	51.8%	37,548	12.4%	19.3%	39.8%	7.6%
	NO west	67,887	4.3%	15,612	3.0%	0	0.0%	49,183	16.2%	1.6%	0.0%	9.9%
	NO east	43,337	2.7%	25,434	4.9%	0	0.0%	9,519	3.1%	2.6%	0.0%	1.9%
	NO total	111,224	7.0%	41,046	7.8%	0	0.0%	58,702	19.3%	4.2%	0.0%	11.9%
	Other	136,723	8.6%	17,277	3.3%	34,391	5.5%	15,874	5.2%	1.8%	4.3%	3.2%
	TOTAL	1,583,205	100.0%	523,064	100.0%	621,183	100.0%	303,474	100.0%	53.0%	76.8%	61.4%
1981	Drift	633,054	43.9%	251,527	42.8%	155,907	47.2%	197,159	46.4%	25.3%	26.6%	25.8%
	Co/Nin Bch	254,907	17.7%	93,302	15.9%	123,420	37.3%	36,357	8.6%	9.4%	21.0%	4.8%
	Kal Bch	96,644	6.7%	52,600	9.0%	29,070	8.8%	13,897	3.3%	5.3%	5.0%	1.8%
	Sal Bch	143,261	9.9%	121,384	20.7%	8,626	2.6%	11,866	2.8%	12.2%	1.5%	1.6%
	East totl	494,812	34.3%	267,286	45.5%	161,116	48.7%	62,120	14.6%	26.9%	27.4%	8.1%
	NO west	150,889	10.5%	37,528	6.4%	0	0.0%	105,062	24.7%	3.8%	0.0%	13.7%
	NO east	98,579	6.8%	19,074	3.2%	0	0.0%	45,952	10.8%	1.9%	0.0%	6.0%
	NO total	249,468	17.3%	56,602	9.6%	0	0.0%	151,014	35.6%	5.7%	0.0%	19.7%
	Other	64,540	4.5%	12,193	2.1%	13,548	4.1%	14,390	3.4%	1.2%	2.3%	1.9%
	TOTAL	1,441,874	100.0%	587,608	100.0%	330,571	100.0%	424,683	100.0%	59.0%	56.3%	55.5%
1982	Drift	2,103,429	64.5%	1,055,287	61.4%	773,140	72.5%	117,665	42.4%	45.1%	62.0%	21.7%
	Co/Nin Bch	319,828	9.8%	129,487	7.5%	186,319	17.5%	0	0.0%	5.5%	14.9%	0.0%
	Kal Bch	256,658	7.9%	150,159	8.7%	83,040	7.8%	23,220	8.4%	6.4%	6.7%	4.3%
	Sal Bch	394,937	12.1%	358,111	20.8%	0	0.0%	35,291	12.7%	15.3%	0.0%	6.5%
	East totl	971,423	29.8%	637,757	37.1%	269,359	25.2%	58,511	21.1%	27.3%	21.6%	10.8%
	NO west	66,940	2.1%	9,389	0.5%	0	0.0%	50,659	18.2%	0.4%	0.0%	9.3%
	NO east	51,120	1.6%	9,677	0.6%	0	0.0%	33,032	11.9%	0.4%	0.0%	6.1%
	NO total	118,060	3.6%	19,066	1.1%	0	0.0%	83,691	30.1%	0.8%	0.0%	15.4%
	Other	66,952	2.1%	6,427	0.4%	24,317	2.3%	17,894	6.4%	0.3%	1.9%	3.3%
	TOTAL	3,259,864	100.0%	1,718,537	100.0%	1,066,816	100.0%	277,761	100.0%	73.5%	85.5%	51.1%

ACE10098046

Composition of catch by fishery by year Date Prepared: 1/14/88 File Name: CTCHCOMP.

		CATCH								TOTAL RETURN		
		Total		Kenai		Kasilof		Susitna		Kenai	Kasilof	Susitna
Year	Fishery	#'s	%	#'s	%	#'s	%	#'s	%	%	%	%
1985	Drift	2,771,563	58.5%	1,427,762	59.7%	1,006,524	62.8%	335,836	51.6%	49.4%	53.6%	39.7%
	Co/Nin Bch	927,182	19.6%	380,166	15.9%	408,454	25.5%	138,563	21.3%	13.1%	21.7%	16.4%
	Kal Bch	492,686	10.4%	286,112	12.0%	168,927	10.5%	37,647	5.8%	9.9%	9.0%	4.5%
	Sal Bch	256,919	5.4%	252,453	10.6%	4,465	0.3%	0	0.0%	8.7%	0.2%	0.0%
	East totl	1,676,787	35.4%	918,731	38.4%	581,846	36.3%	176,210	27.1%	31.8%	31.0%	20.8%
	ND west	92,688	2.0%	0	0.0%	0	0.0%	92,688	14.2%	0.0%	0.0%	11.0%
	ND east	44,384	0.9%	8,554	0.4%	0	0.0%	35,031	5.4%	0.3%	0.0%	4.1%
	ND total	137,072	2.9%	8,554	0.4%	0	0.0%	127,719	19.6%	0.3%	0.0%	15.1%
	Other	154,302	3.3%	35,055	1.5%	14,471	0.9%	11,255	1.7%	1.2%	0.8%	1.3%
	TOTAL	4,739,724	100.0%	2,390,102	100.0%	1,602,841	100.0%	651,020	100.0%	82.7%	85.3%	77.0%

ACE10098048

Restrictions put on drift fishery.

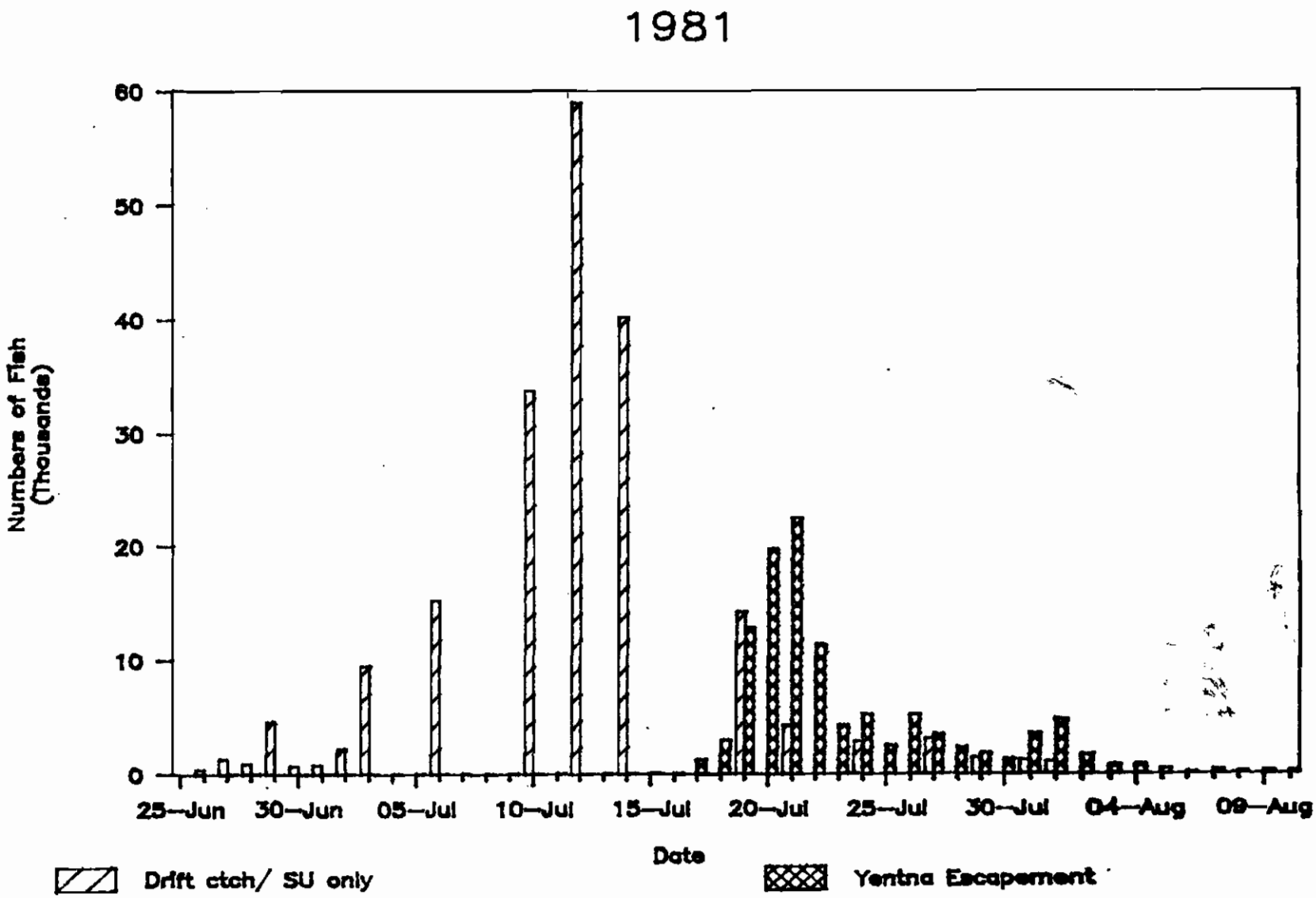
0 all areas
1 all areas except Western Subdistrict
2 all areas except Chinitna Bay
3 all areas except within 2 miles of eastside
4 all areas except Chinitna Bay & within 5 miles of eastside
5 all areas except within 2 miles northern part of Upper Subdistrict
6 all areas except Chinitna Bay & Western Subdistrict

7 north of Anchor Point to Red River
8 north of Anchor Point to Red River except Western Subditrict
9 north of Anchor Point except Western Subdistrict
10 north of Red River except Western Subdistrict

11 south of Kalgin Island
12 south of Cape Kasilof to southern tip Kalgin Island
13 south of Clam Gulch/southern tip Kalgin/Harriet Point
14 south of Clam Gulch to southern tip Kalgin exclude Chinitna Bay
15 south of Clam Gulch tower to southern tip Kalgin Island
16 south of Redoubt Point
17 south of southern tip of Kalgin Island
18 Upper Subdistrict
19 Upper, Lower north of Anchor Point to Red River

20 east of East Foreland to Cape Ninilchik
21 east of East Foreland to Ninilchik
22 Cape Ninilchik to Cape Kasilof within 5 miles
23 east of East Foreland to Cape Ninilchik & south of Kasilof
24 east of East Foreland to Ninilchik & south of Cape Kasilof
25 east of East Foreland to Cape Ninilchik & south of Cape Kasilof
26 east of East Foreland to Ninilchik & north of Kasilof
27 east of East Foreland to Cape Ninilchik north of Clam Gulch
28 south of mid K-Beach within 3 miles
29 closed

ACE10098050



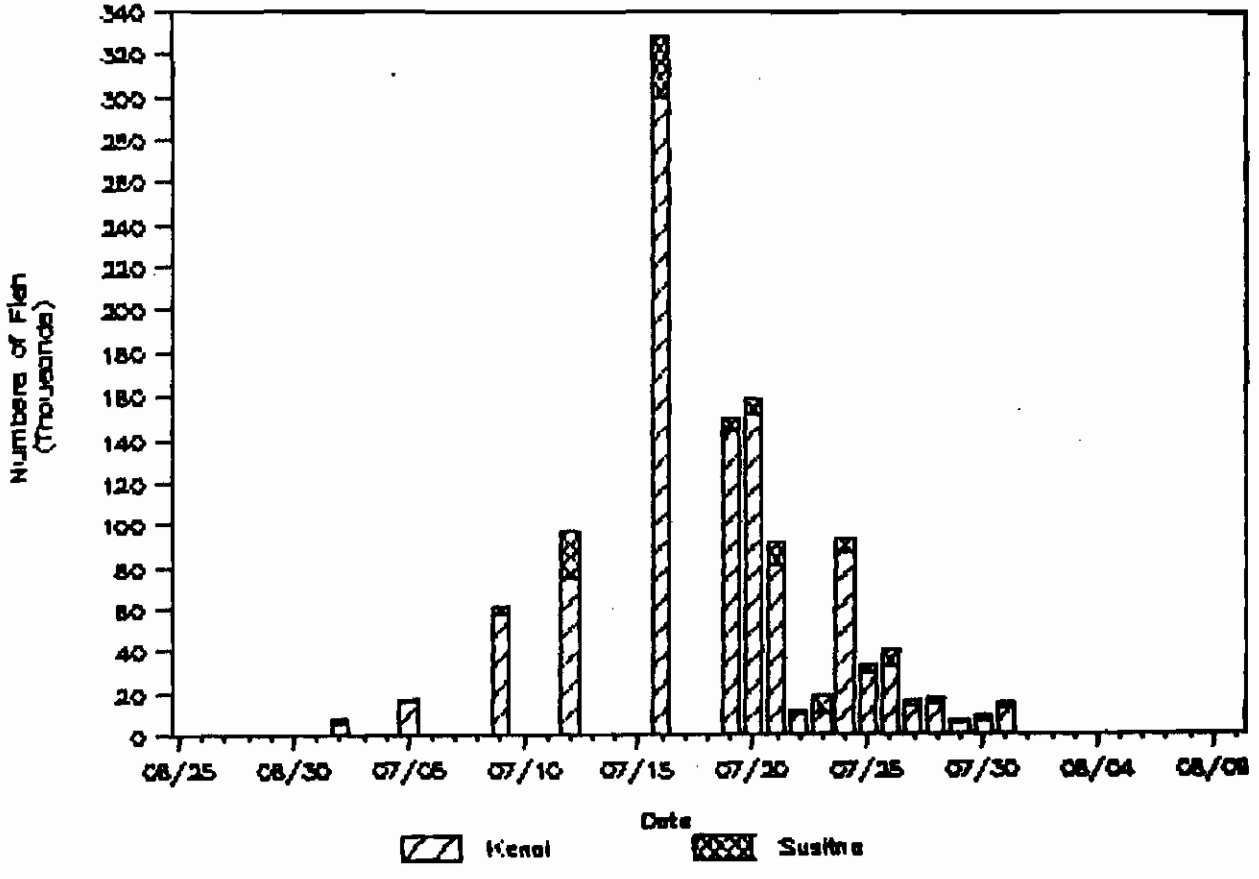
ACE10098052

1982 Drift fishing period summary.

Date	Day	Description
25-Jun	Fri	all areas
26-Jun	Sat	
27-Jun	Sun	
28-Jun	Mon	all areas
29-Jun	Tues	
30-Jun	Wed	
01-Jul	Thur	
02-Jul	Fri	all areas
03-Jul	Sat	
04-Jul	Sun	
05-Jul	Mon	all areas
06-Jul	Tues	
07-Jul	Wed	
08-Jul	Thur	
09-Jul	Fri	all areas
10-Jul	Sat	
11-Jul	Sun	
12-Jul	Mon	all areas
13-Jul	Tues	
14-Jul	Wed	
15-Jul	Thur	
16-Jul	Fri	south of Kalgin Island
17-Jul	Sat	
18-Jul	Sun	
19-Jul	Mon	all areas
20-Jul	Tues	south of Kalgin Island
21-Jul	Wed	north of Anchor Point except Western Subdistrict
22-Jul	Thur	east of East Foreland to Ninilchik
23-Jul	Fri	north of Anchor Point to Red River
24-Jul	Sat	north of Anchor Point to Red River
25-Jul	Sun	Upper, Lower north of Anchor Point to Red River
26-Jul	Mon	Upper, Lower north of Anchor Point to Red River
27-Jul	Tues	east of East Foreland to Ninilchik
28-Jul	Wed	east of East Foreland to Ninilchik
29-Jul	Thur	east of East Foreland to Ninilchik & north of Kasilof
30-Jul	Fri	north of Anchor Point to Red River
31-Jul	Sat	north of Anchor Point to Red River
01-Aug	Sun	east of East Foreland to Ninilchik & north of Kasilof
02-Aug	Mon	north of Anchor Point to Red River
03-Aug	Tues	
04-Aug	Wed	north of Anchor Point to Red River
05-Aug	Thur	
06-Aug	Fri	north of Anchor Point to Red River
07-Aug	Sat	
08-Aug	Sun	
09-Aug	Mon	north of Anchor Point to Red River
10-Aug	Tues	

ACE10098054

1982 Drift Catch



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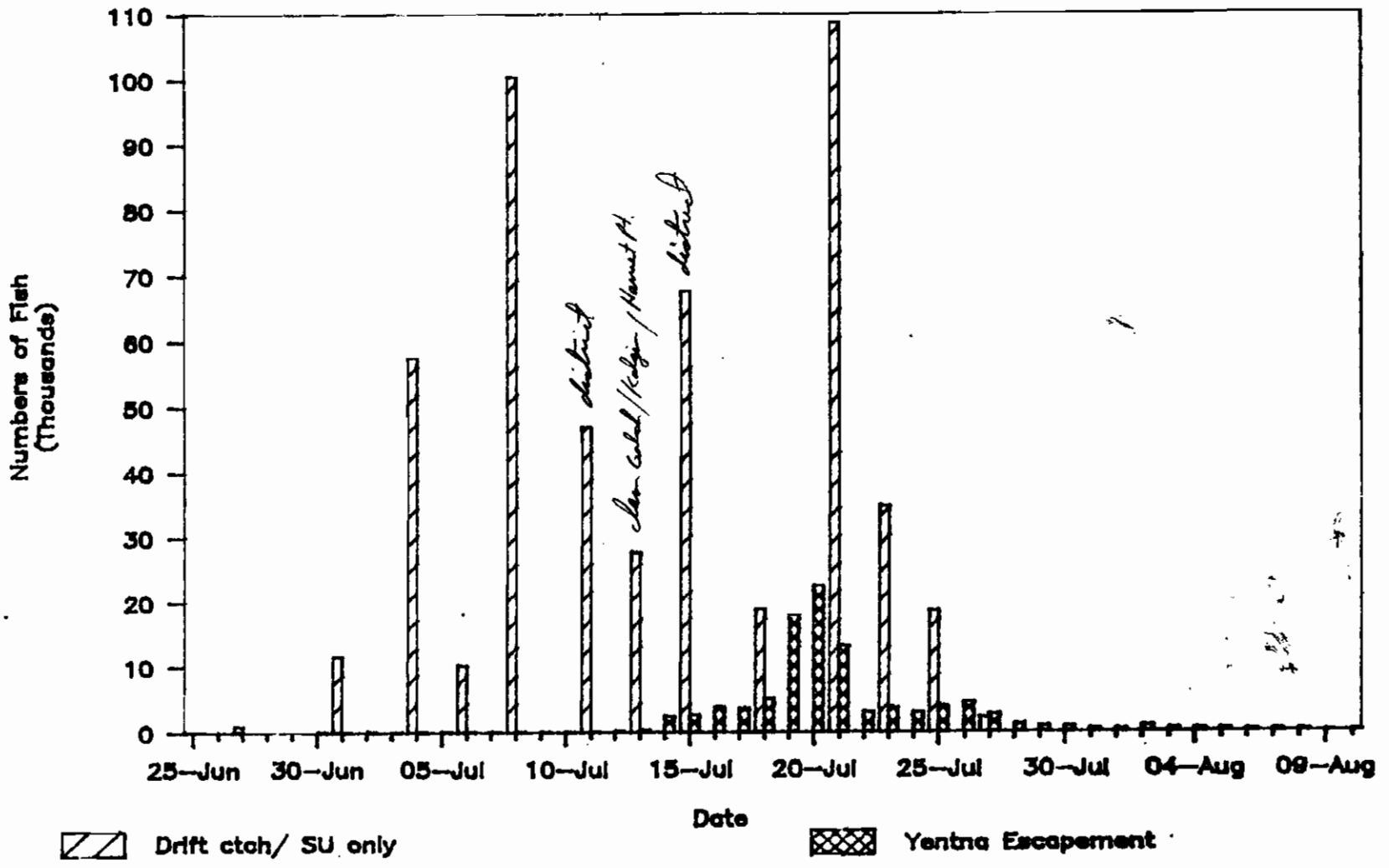
1983

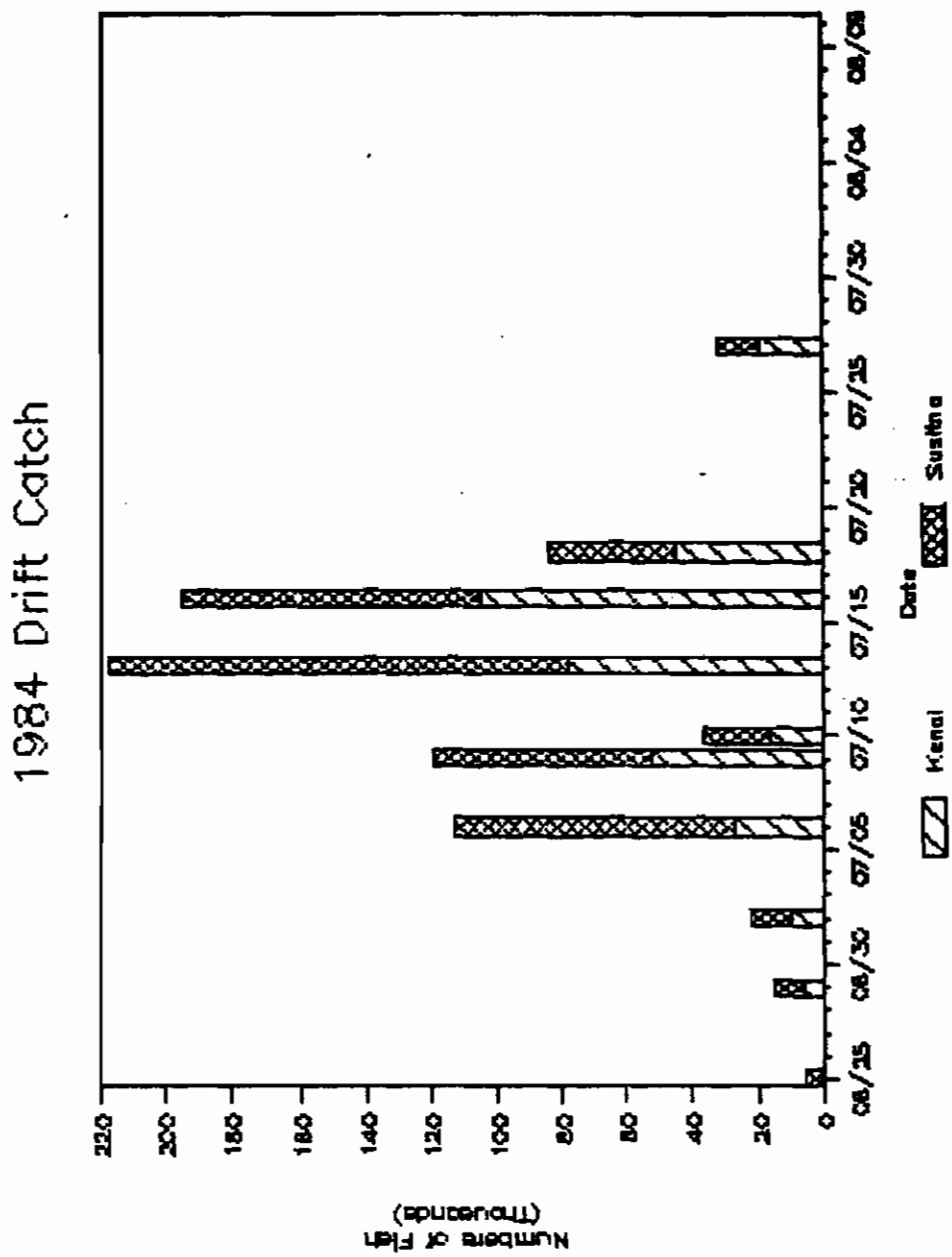


ACE10098058

1984 Drift fishing period summary.

Date	Day	Description
25-Jun	Mon	all areas except within 2 miles of eastside
26-Jun	Tues	
27-Jun	Wed	
28-Jun	Thur	
29-Jun	Fri	all areas except within 2 miles of eastside
30-Jun	Sat	
01-Jul	Sun	
02-Jul	Mon	all areas except within 2 miles northern part of Upper Subdistrict
03-Jul	Tues	
04-Jul	Wed	
05-Jul	Thur	
06-Jul	Fri	all areas except within 2 miles northern part of Upper Subdistrict
07-Jul	Sat	
08-Jul	Sun	
09-Jul	Mon	all areas
10-Jul	Tues	east of East Foreland to Cape Ninilchik & south of Cape Kasilof
11-Jul	Wed	
12-Jul	Thur	
13-Jul	Fri	south of Clam Gulch/southern tip Kalgin/Harriet Point
14-Jul	Sat	
15-Jul	Sun	
16-Jul	Mon	south of Clam Gulch tower to southern tip Kalgin Island
17-Jul	Tues	
18-Jul	Wed	all areas except Chinitna Bay
19-Jul	Thur	
20-Jul	Fri	closed
21-Jul	Sat	
22-Jul	Sun	
23-Jul	Mon	closed
24-Jul	Tues	
25-Jul	Wed	
26-Jul	Thur	
27-Jul	Fri	south of Clam Gulch to southern tip Kalgin exclude Chinitna Bay
28-Jul	Sat	
29-Jul	Sun	
30-Jul	Mon	all areas except Chinitna Bay
31-Jul	Tues	
01-Aug	Wed	
02-Aug	Thur	
03-Aug	Fri	all areas except Chinitna Bay
04-Aug	Sat	
05-Aug	Sun	
06-Aug	Mon	all areas except Chinitna Bay
07-Aug	Tues	
08-Aug	Wed	
09-Aug	Thur	
10-Aug	Fri	all areas except Chinitna Bay

ACE10098060



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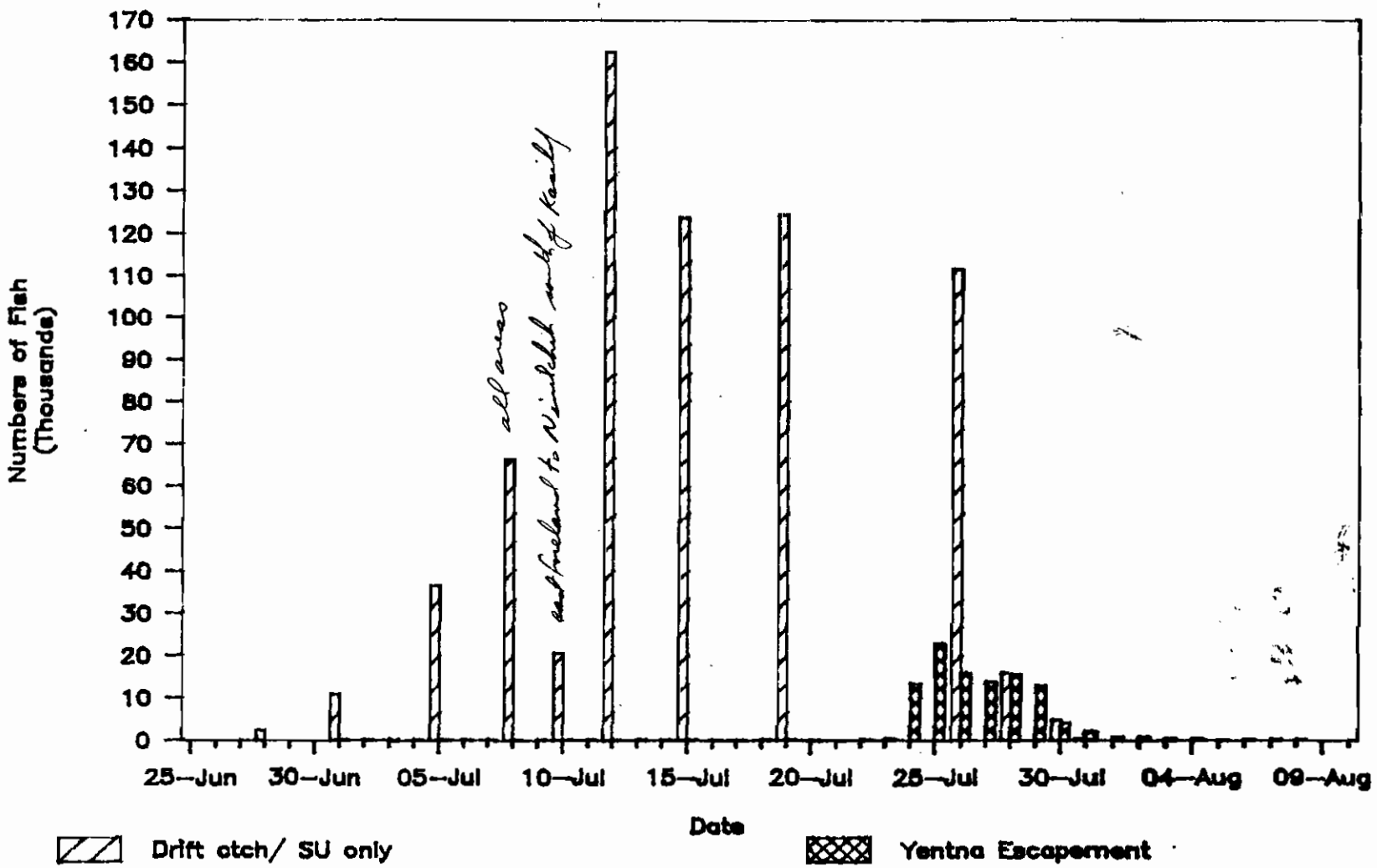
1985



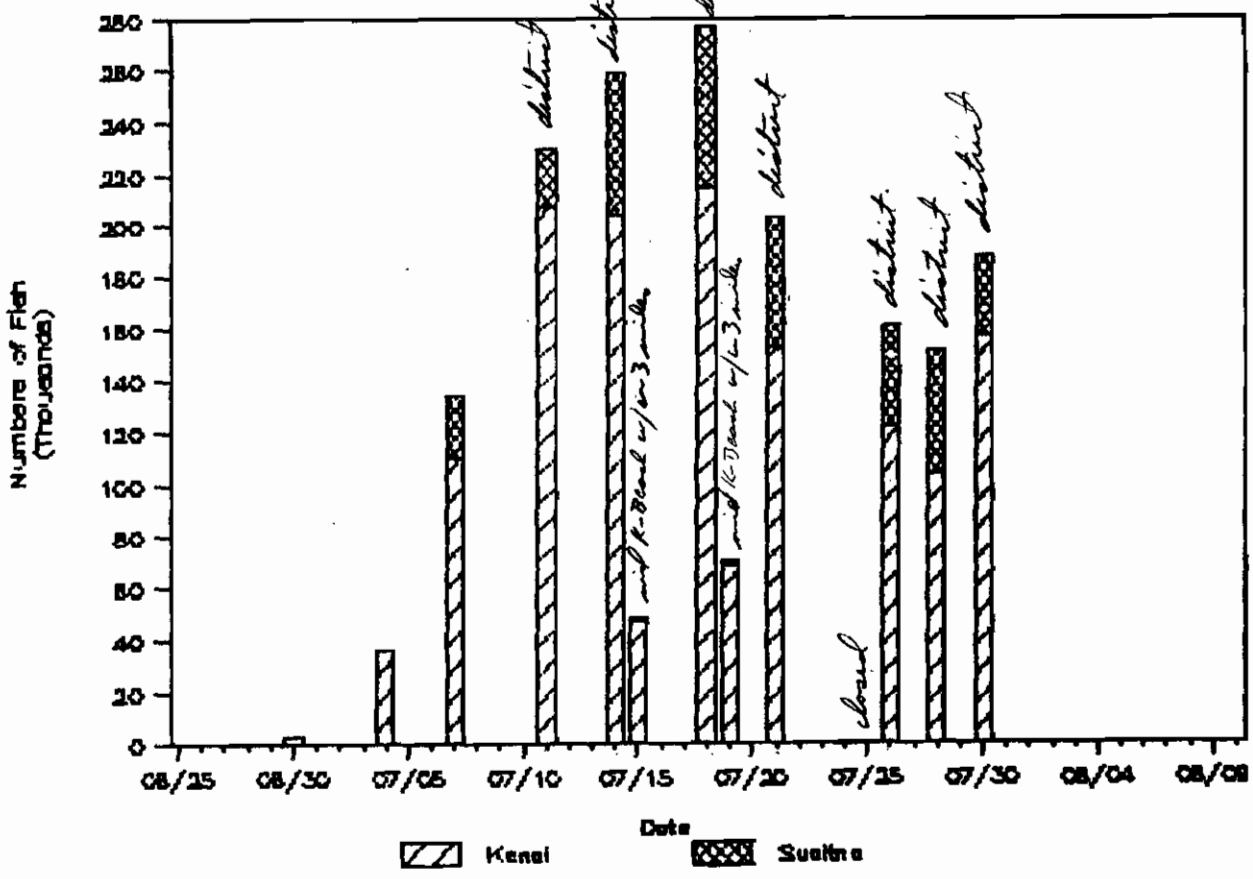
ACE10098064

1986 Drift fishing period summary.

Date	Day	Description
25-Jun	Wed	
26-Jun	Thur	
27-Jun	Fri	all areas
28-Jun	Sat	
29-Jun	Sun	
30-Jun	Mon	all areas
01-Jul	Tues	
02-Jul	Wed	
03-Jul	Thur	
04-Jul	Fri	all areas
05-Jul	Sat	
06-Jul	Sun	
07-Jul	Mon	all areas
08-Jul	Tues	
09-Jul	Wed	
10-Jul	Thur	
11-Jul	Fri	all areas
12-Jul	Sat	
13-Jul	Sun	
14-Jul	Mon	all areas
15-Jul	Tues	south of mid K-Beach within 3 miles
16-Jul	Wed	
17-Jul	Thur	
18-Jul	Fri	all areas except Chinitna Bay
19-Jul	Sat	south of mid K-Beach within 3 miles
20-Jul	Sun	south of mid K-Beach within 3 miles
21-Jul	Mon	all areas except Chinitna Bay
22-Jul	Tues	
23-Jul	Wed	
24-Jul	Thur	
25-Jul	Fri	closed
26-Jul	Sat	all areas except Chinitna Bay & Western Subdistrict
27-Jul	Sun	
28-Jul	Mon	all areas except Chinitna Bay
29-Jul	Tues	
30-Jul	Wed	all areas except Chinitna Bay
31-Jul	Thur	east of East Foreland to Cape Ninilchik
01-Aug	Fri	all areas except Chinitna Bay
02-Aug	Sat	east of East Foreland to Ninilchik
03-Aug	Sun	east of East Foreland to Ninilchik
04-Aug	Mon	all areas except Chinitna Bay
05-Aug	Tues	
06-Aug	Wed	
07-Aug	Thur	
08-Aug	Fri	all areas except Chinitna Bay
09-Aug	Sat	east of East Foreland to Cape Ninilchik
10-Aug	Sun	east of East Foreland to Cape Ninilchik

ACE10098066

1986 Drift Catch



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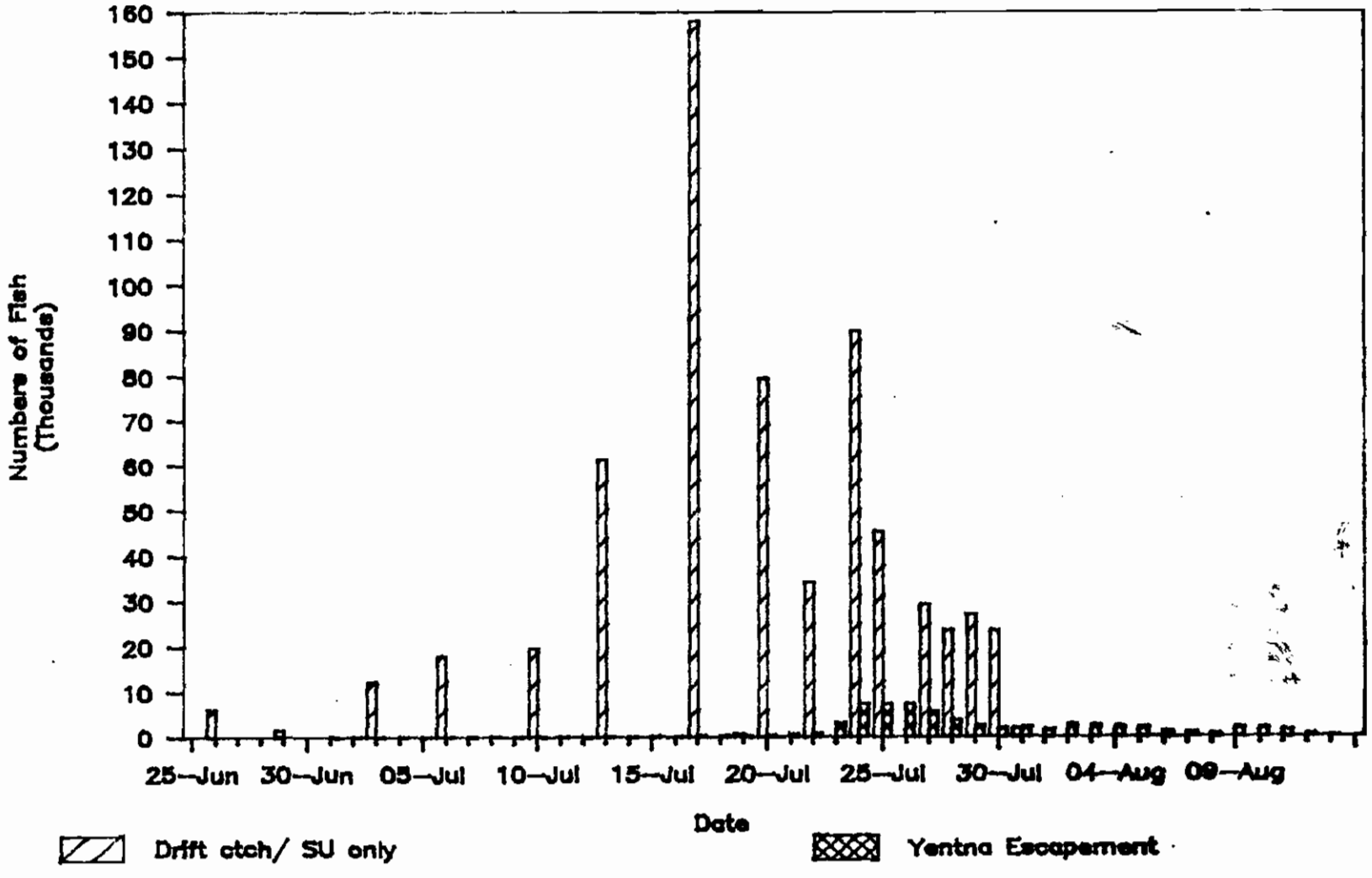
1987



ACE10098070

REGRESSION ANALYSIS

Northern District total on Drift:

Regression Output:		correlation coefficient	drift	ndtot	ndtot^
Constant	0.227784959		0.387	0.119	0.137
Std Err of Y Est	0.03009679		0.258	0.197	0.167
R Squared	0.514924156	0.718	0.217	0.154	0.177
No. of Observations	7		0.468	0.090	0.118
Degrees of Freedom	5		0.499	0.150	0.111
			0.539	0.086	0.101
X Coefficient(s)	-0.2345369		0.397	0.150	0.135
Std Err of Coef.	0.10180274				

Northern District eastside on Drift:

Regression Output:			drift	nde	nde^
Constant	0.074647765		0.387	0.019	0.043
Std Err of Y Est	0.016388519		0.258	0.060	0.053
R Squared	0.307774315	0.555	0.217	0.061	0.057
No. of Observations	7		0.468	0.030	0.036
Degrees of Freedom	5		0.499	0.059	0.033
			0.539	0.025	0.030
X Coefficient(s)	-0.0826525		0.397	0.040	0.042
Std Err of Coef.	0.05543435				

Northern District westside on drift:

Regression Output:			drift	ndw	ndw^
Constant	0.153466110		0.387	0.099	0.094
Std Err of Y Est	0.021840639		0.258	0.137	0.114
R Squared	0.463168062	0.681	0.217	0.093	0.120
No. of Observations	7		0.468	0.060	0.082
Degrees of Freedom	5		0.499	0.091	0.077
			0.539	0.060	0.071
X Coefficient(s)	-0.1534404		0.397	0.110	0.093
Std Err of Coef.	0.07387621				

Eastside total on drift:

Regression Output:		correlation coefficie	drift	estotal	estotal^
Constant	0.055510		0.387	0.076	0.133
Std Err of Y Est	0.081331		0.258	0.081	0.107
R Squared	0.096358	0.310	0.217	0.108	0.099
No. of Observations	7		0.468	0.254	0.150
Degrees of Freedom	5		0.499	0.043	0.156
			0.539	0.174	0.164
X Coefficient(s)	0.200876		0.397	0.208	0.135
Std Err of Coef.	0.275104				

Northern District on drift&eastside:

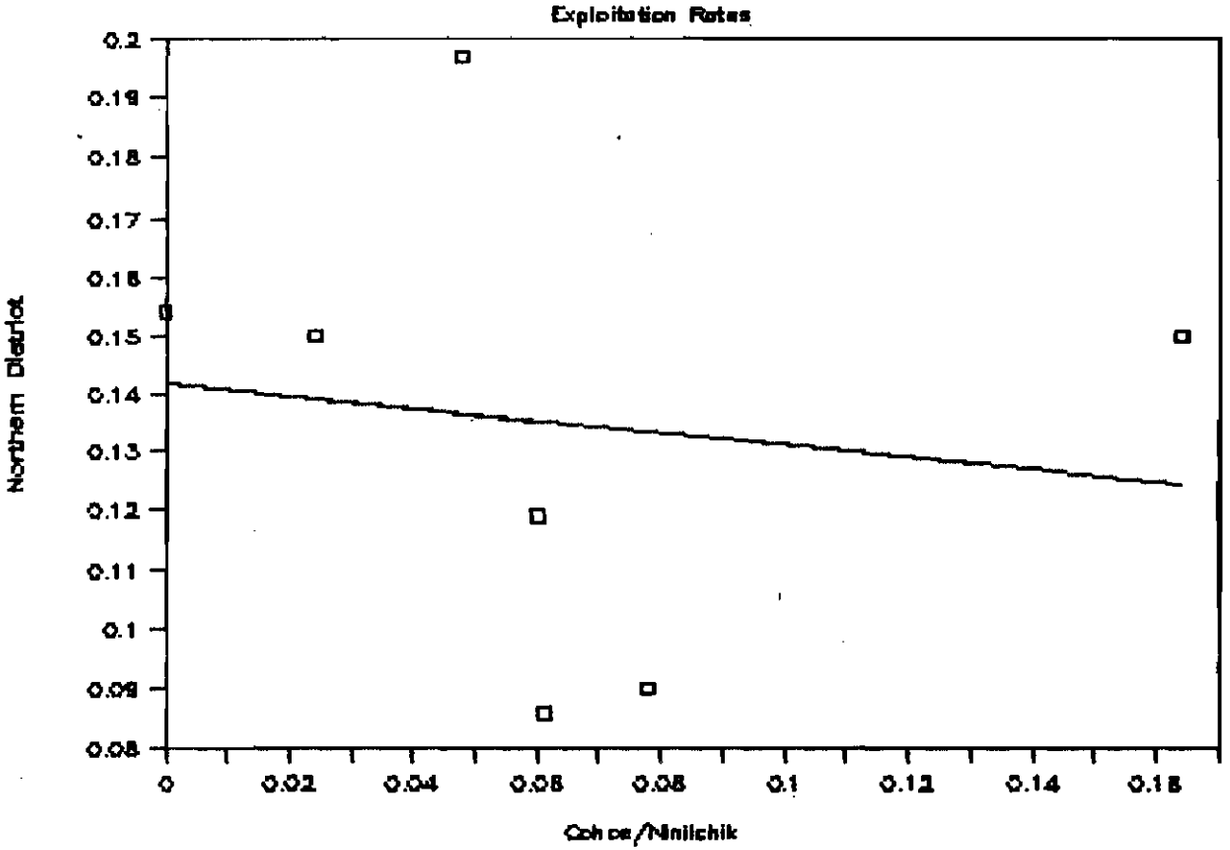
Regression Output:			drift & eastside	ndtot	ndtot^
Constant	0.238262		0.463	0.119	0.148
Std Err of Y Est	0.025730		0.339	0.197	0.172
R Squared	0.645471	0.803	0.325	0.154	0.175
No. of Observations	7		0.722	0.090	0.098
Degrees of Freedom	5		0.542	0.150	0.133
			0.713	0.086	0.100
X Coefficient(s)	-0.19461		0.605	0.150	0.121
Std Err of Coef.	0.064503				

Northern District on Cohoe/Ninilchik:

Regression Output:			cohoe/ ninilchik	ndtot	ndtot^
Constant	0.141781		0.060	0.119	0.135
Std Err of Y Est	0.042784		0.048	0.197	0.137
R Squared	0.019738	0.140	0.000	0.154	0.142
No. of Observations	7		0.078	0.090	0.133
Degrees of Freedom	5		0.024	0.150	0.139
			0.061	0.086	0.135
X Coefficient(s)	-0.10682		0.164	0.150	0.124
Std Err of Coef.	0.336678				

ACE10098072

Northern District on Cohoe/Ninilchik



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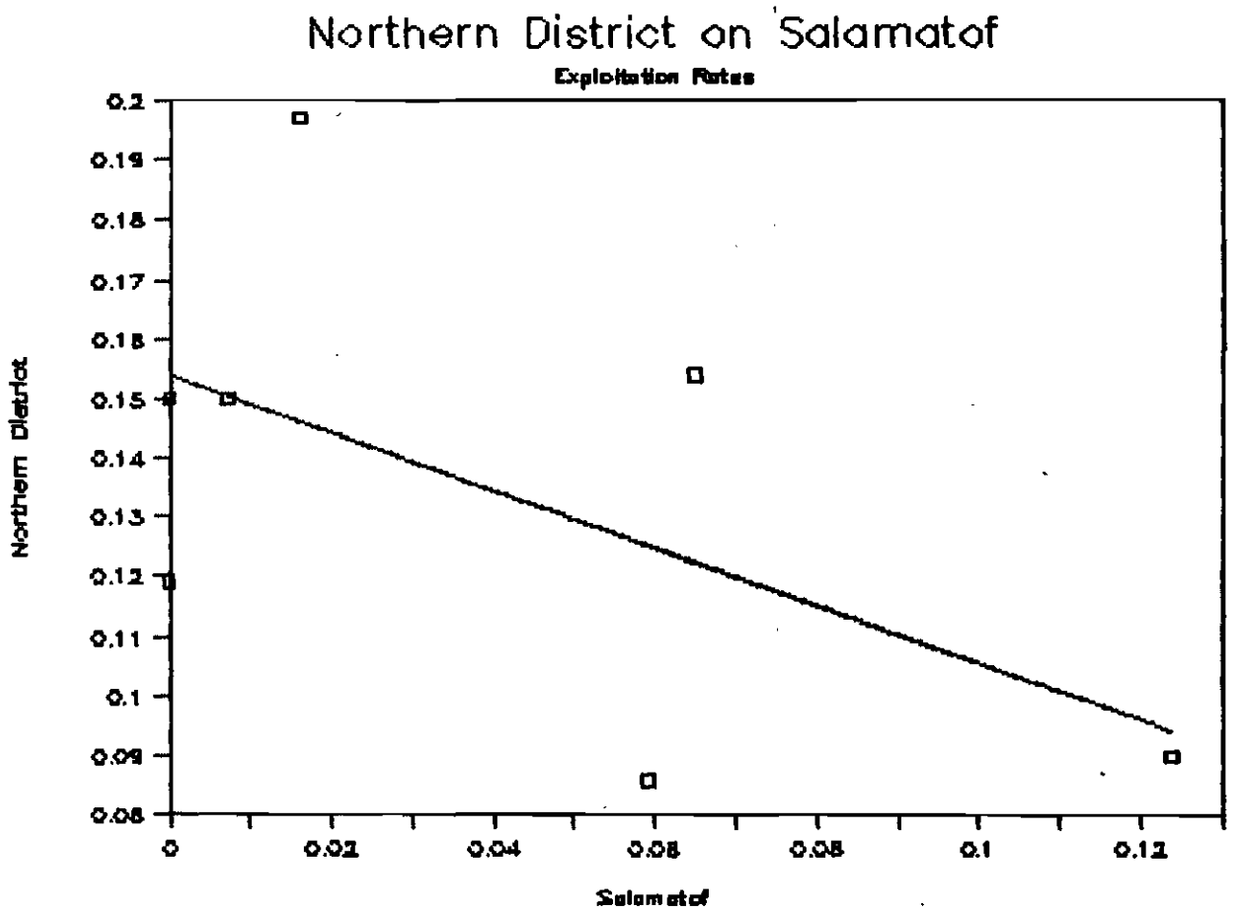

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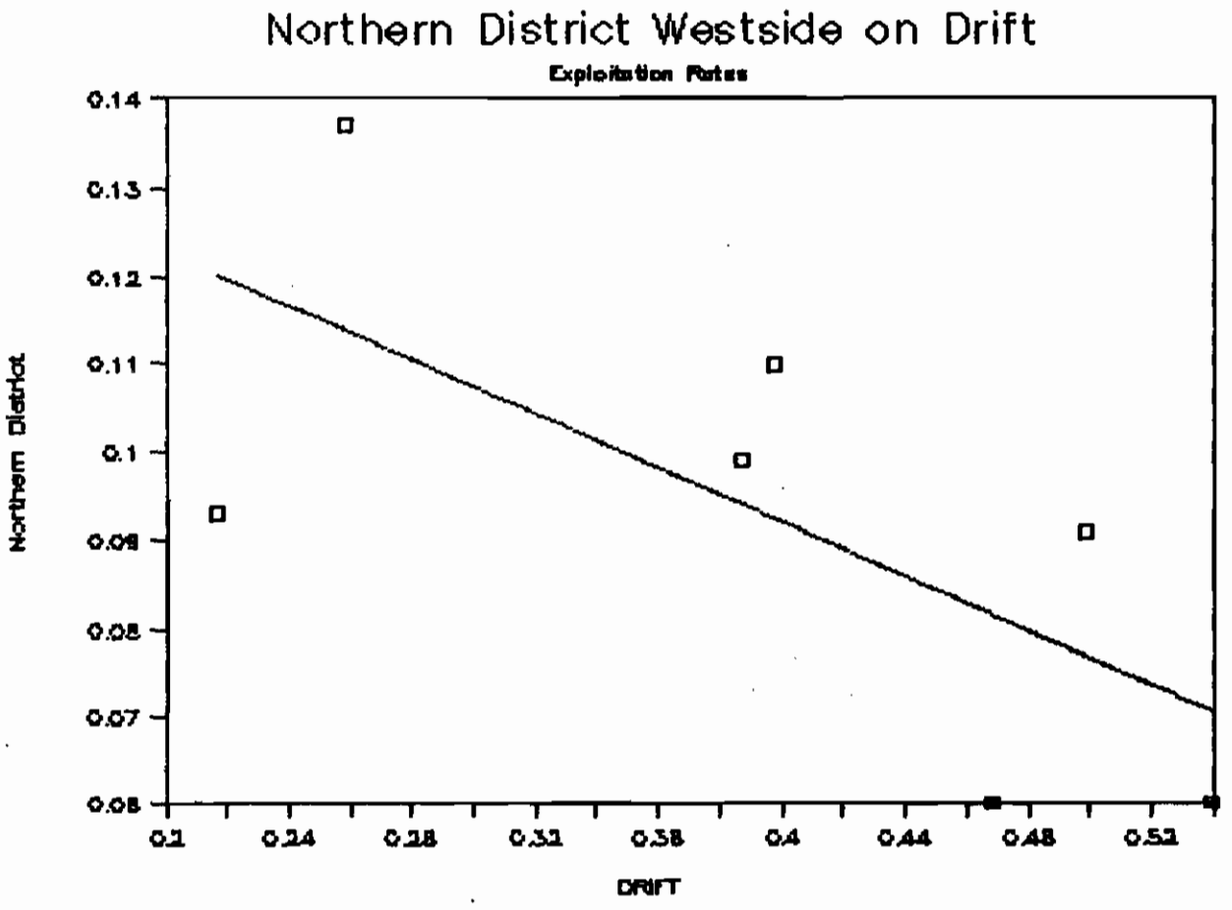

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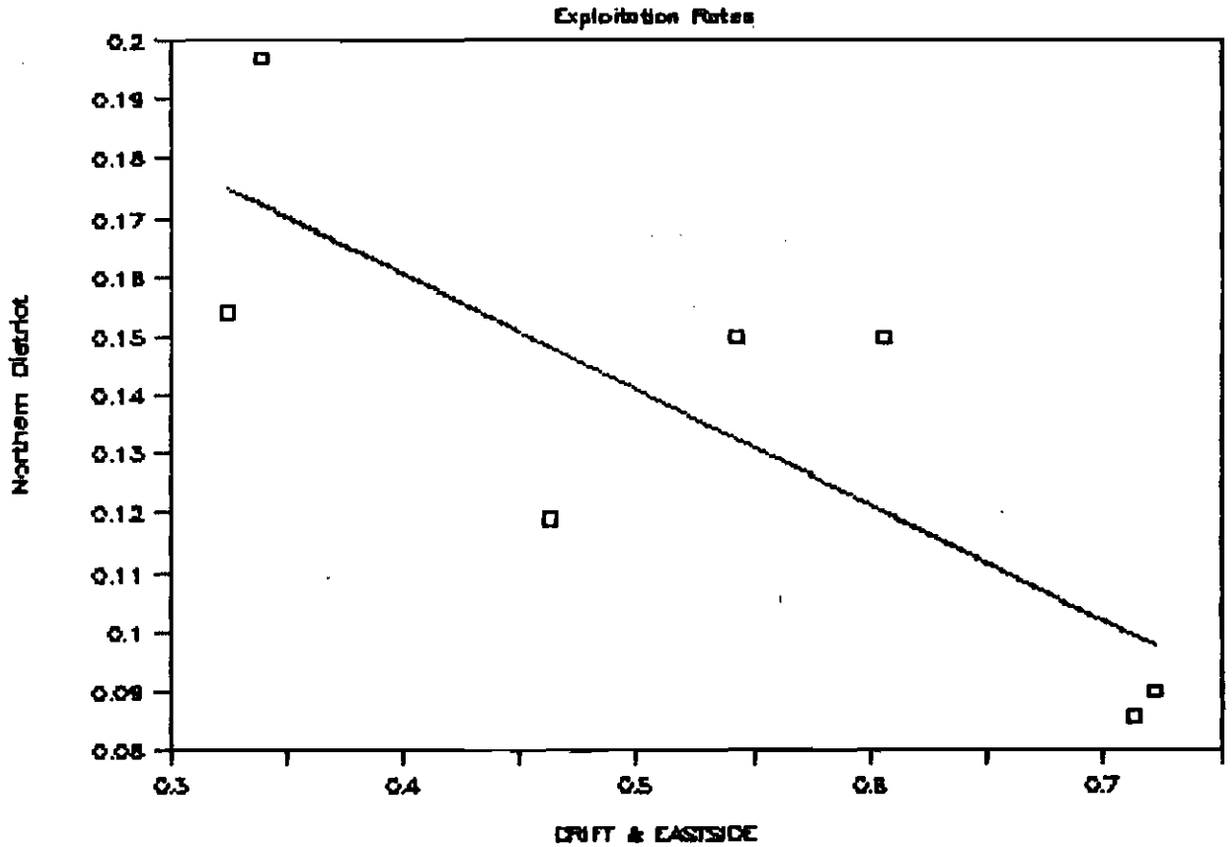
Northern District on Drift&Eastside



ACE10098080

Table . Peak sockeye salmon escapement counts in Susitna River tributary index areas, 1980-1987.

Index Area	Year 1980	1981	1982	1983	1984	1985	1986	1987
Byers Creek					109			
Byers Lake		275				139		
Chelatna Lake	4,120	14,000	23,180	520	575	554		
Eightmile Creek				15,000	4,000			
Clear Creek	320	450	2,060	1,315	421	750		
Fish Creek				15,000	100	1,768		
Fish Lake	2,100	176	280		191			
Hewitt-Whiskey Lakes	3,250	9,850	2,675	3,425	6,593	370		
Larson Lake	1	4,600	2,150	1,200	35,254	37,879	32,322	17,585
Puntilla Lake	550	200						
Red Salmon Lake	1,100	1,212	1,000	150	142			
Red Shirt Lake	650	505	100	6,350	1,640		5,300	
Shell Creek				12,008				
Shell Lake	5,800	6,050	3,150	2,811	8,600	1,102	4,237	
Stephan-Murder Lakes	220	475	452		235			
Upper Susitna River			605	1,060	926	918		
Swan Lake		350	760	340	49			
Trapper Creek				3,000	200			
Talachulitna River	21,125	9,926	14,560	9,590	27,736	22,350		4,900
Trinity-Movie Lakes	200	500	138	260	920	286		
West Fork Yentna River	5,500	9,000	10,340	9,660	6,350	8,200		
Willow Creek					220			
Index Area Total	44,936	57,569	61,450	81,689	94,261	74,316	41,859	22,485
Other minor areas			4		136	148	50	
Grand Total	44,936	57,569	61,454	81,689	94,397	74,464	41,909	22,485

ACE10098082

Table 13. Sockeye salmon return by brood year and age class and return per spawner information for the Susitna River, Upper Cook Inlet.

Brood Year	Spawners	Return by Age Class 1/ 1.2	1.3	2.2	2.3	Total 2/3/	Return per Spawner
1966					43,207		
1967			206,250	6,656	12,717		
1968	61,010	21,005	147,208	10,043	4,997	183,253	3.0
1969	41,346	64,808	92,160	6,678	3,363	167,009	4.0
1970	44,371	75,213	170,546	9,537	2,488	257,784	5.8
1971	114,707	135,948	314,288	6,891	5,594	462,721	4.0
1972	91,927	128,451	502,234	25,950	17,350	673,985	7.3
1973	116,093	128,475	185,407	11,822	6,806	332,510	2.9
1974	71,849	133,795	118,312	26,451	34,547	313,105	4.4
1975	108,000	197,737	206,863	27,441	39,755	471,796	4.4
1976	111,000	214,715	640,532	23,349	68,883	947,479	8.5
1977	232,724	57,533	345,364	16,908	28,767	448,572	1.9
1978	93,029	103,111	527,932	48,362	110,390	789,795	8.5
1979	154,848	408,559	569,758	48,526	60,754	1,087,597	7.0
1980	189,231	197,480	810,049	65,707	75,170	1,148,406	6.1
1981	338,353	259,603	552,309	48,960		860,872	2.5 4/
1982	262,687	150,034					
1983	171,564						
1984	275,581						
1985	225,957						
1986	194,887 5/						
AVG 6/	110,010	143,602	356,204	25,205	35,297	560,309	5.2

- continued -

ACE10098034

Table 14. Sockeye salmon return by brood year and age class and return per spawner information for the Kenai River, Upper Cook Inlet.

Brood Year	Spawners	Return by Age Class 1/ 1.2	1.3	2.2	2.3	Total 2/3/	Return per Spawner
1966					163,441		
1967			318,338	148,526	114,176		
1968	82,180	159,584	628,356	58,057	68,402	914,399	11.1
1969	51,850	26,064	223,052	76,559	74,662	400,337	7.7
1970	72,400	55,509	202,006	132,228	130,287	520,030	7.2
1971	289,270	32,518	455,242	237,802	250,926	976,488	3.4
1972	301,950	443,153	1,496,332	147,373	99,741	2,186,599	7.2
1973	358,070	103,999	2,050,840	81,664	39,706	2,276,209	6.4
1974	144,470	37,255	361,109	75,709	128,564	602,637	4.2
1975	128,500	126,899	484,014	149,819	50,283	811,015	6.3
1976	353,160	226,646	737,456	78,617	118,783	1,161,502	3.3
1977	663,627	132,782	2,086,361	48,529	295,045	2,562,717	3.9
1978	349,928	91,983	3,050,186	49,875	204,663	3,396,707	9.7
1979	245,842	165,312	429,546	110,126	215,571	920,555	3.7
1980	411,918	139,367	1,219,090	232,630	540,527	2,131,614	5.2
1981	369,829	239,603	1,332,690	251,443		1,823,736	4.9 4/
1982	535,862	708,975					
1983	565,941						
1984	311,318						
1985	402,138						
1986	449,957						
AVG 5/	265,628	133,929	1,032,584	113,768	170,551	1,450,831	6.1

- continued -

ACE10098086

Table 15. Sockeye salmon return by brood year and age class and return per spawner information for the Kasilof River, Upper Cook Inlet.

Brood Year	Spawners	Return by Age Class 1/ 1.2	1.3	2.2	2.3	Total 2/3/	Return per Spawner
1966					47,724		
1967			107,418	7,327	3,446		
1968	89,000	104,619	54,201	14,693	3,572	177,085	2.0
1969	46,000	10,677	115,328	7,492	7,709	141,206	3.1
1970	38,000	40,883	11,891	80,516	66,341	199,631	5.3
1971	90,000	28,182	191,159	107,736	58,593	385,670	4.3
1972	113,000	121,115	122,578	122,678	35,036	401,407	3.6
1973	40,000	108,465	299,775	48,922	15,763	472,925	11.8
1974	69,795	183,732	180,601	59,799	67,629	491,761	7.0
1975	47,832	194,165	304,276	80,138	11,643	590,222	12.3
1976	133,537	351,938	354,229	48,702	99,774	854,643	6.4
1977	153,493	185,027	837,384	77,653	40,604	1,140,668	7.4
1978	112,550	239,614	297,041	66,376	88,722	691,753	6.1
1979	151,758	292,399	255,132	132,357	40,043	719,931	4.7
1980	185,672	304,740	391,797	215,935	102,321	1,014,793	5.5
1981	256,137	735,615	909,934	284,336		1,929,885	7.5 4/
1982	178,955	617,806					
1983	207,319						
1984	227,101						
1985	497,967						
1986	275,963 5/						
AVG 6/	97,741	166,581	262,722	81,769	49,058	560,130	6.1

- continued -

ACE10098088

Table 16. Sockeye salmon return by brood year and age class and return per spawner information for the Crescent River, Upper Cook Inlet.

Brood Year	Spawners	Return by Age Class 1/ 1.2	1.3	2.2	2.3	Total 2/3/	Return per Spawner
1966					9,825		
1967			67,120	4,203	4,605		
1968	55,000	17,330	31,840	1,961	1,184	52,315	1.0
1969	51,000	7,948	27,816	1,810	2,906	40,480	0.8
1970	38,000	14,864	49,846	2,729	7,944	75,383	2.0
1971	44,000	10,394	55,063	3,429	12,895	81,781	1.9
1972	62,000	14,048	97,878	5,315	10,782	128,023	2.1
1973	29,000	19,281	93,223	0	216	112,720	3.9
1974	28,000	4,909	90,765	1,137	3,131	99,942	3.6
1975	41,000	35,113	141,777	6,867	28,164	211,921	5.2
1976	51,000	9,035	21,884	5,733	17,352	54,004	1.1
1977	87,000	5,060	170,079	1,020	77,732	253,891	2.9
1978	74,000	15,551	242,787	56,106	133,627	448,071	6.1
1979	87,000	16,213	60,977	49,690	219,831	346,711	4.0
1980	91,000	6,113	231,050	66,653	83,336	387,152	4.3
1981	41,000	11,565	38,930	32,621		83,116	2.0 4/
1982	58,957	12,987					
1983	92,343						
1984	118,345						
1985	128,627						
1986	96,000						
AVG 5/	56,769	13,528	101,153	15,573	46,085	176,338	3.0

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ACE10098090

Table 6. Forecasted returns by age class and river system, 1988.

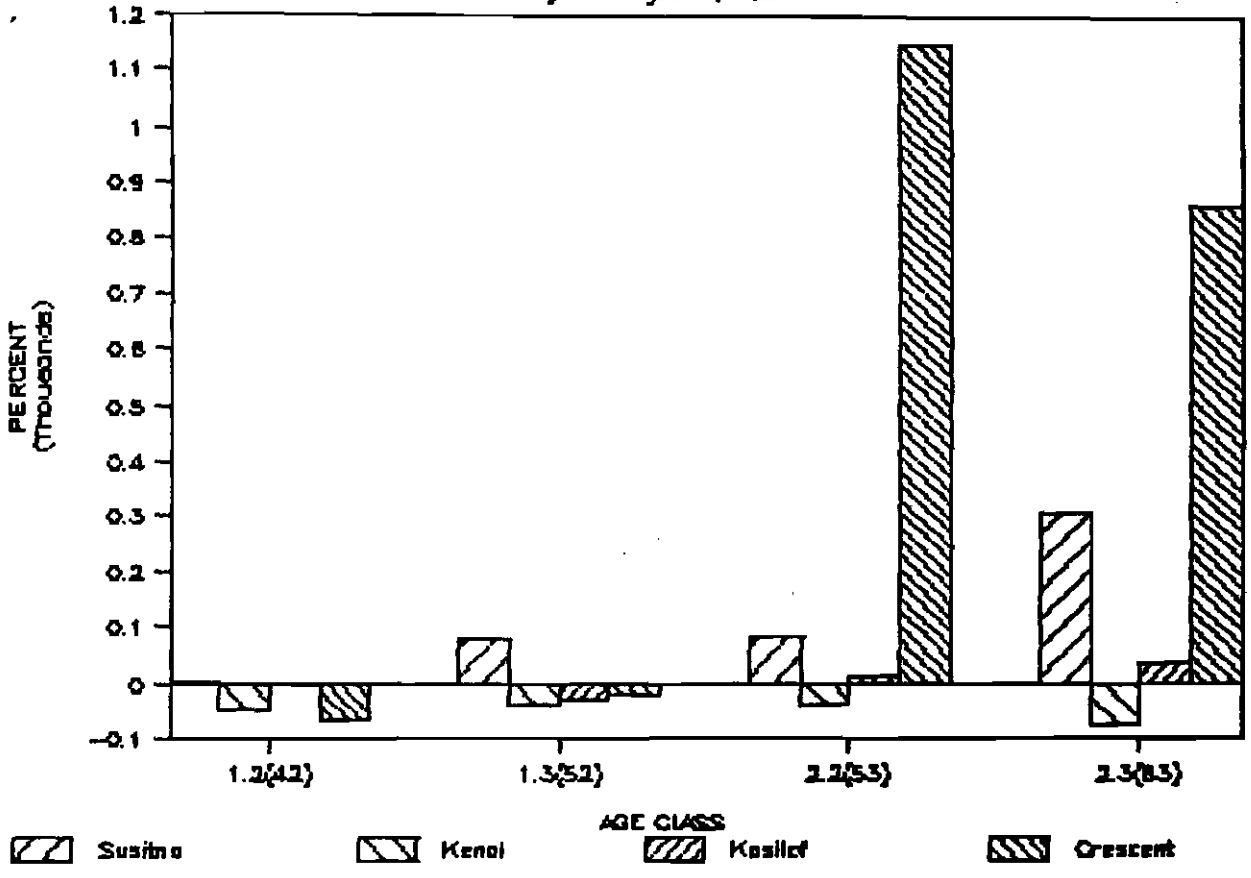
River System		Age Class (in thousands of fish) 1.2(42)	1.3(52)	2.2(53)	2.3(63)	Total
Susitna	#	165	152	29	30	376
	%	43.9	40.4	7.7	8.0	100
Kenai	#	176	4400	101	300	4977
	%	3.5	88.4	2.0	6.0	100
Kasilof	#	479	336	163	90	1068
	%	44.9	31.5	15.3	8.4	100
Crescent	#	5	126	6	66	203
	%	2.5	62.1	3.0	32.5	100
Total	#	825	5014	299	486	6624
	%	12.5	75.7	4.5	7.3	100

01/19/88

ACE10098092

Actual to Forecast Age Composition

by river system, 1984



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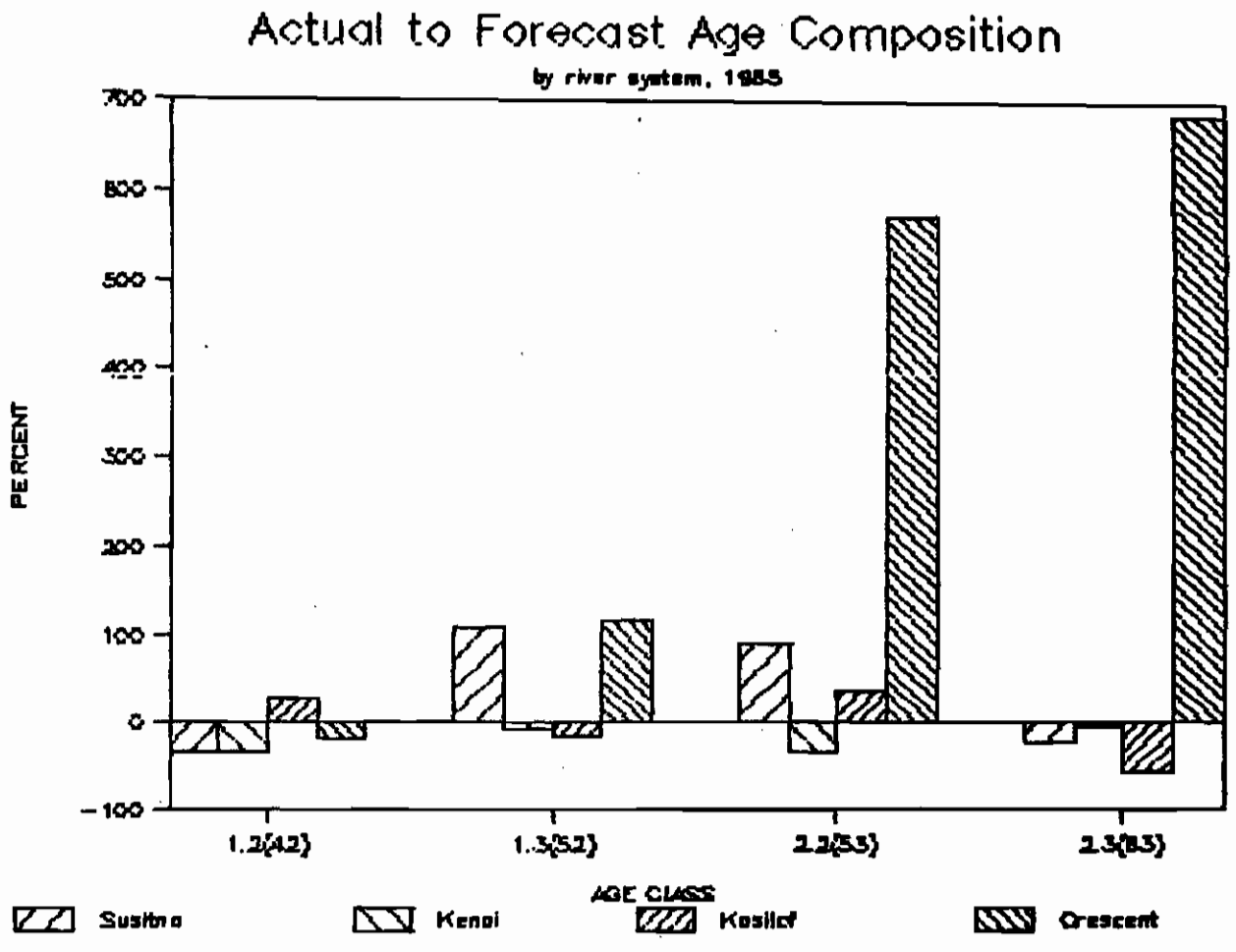

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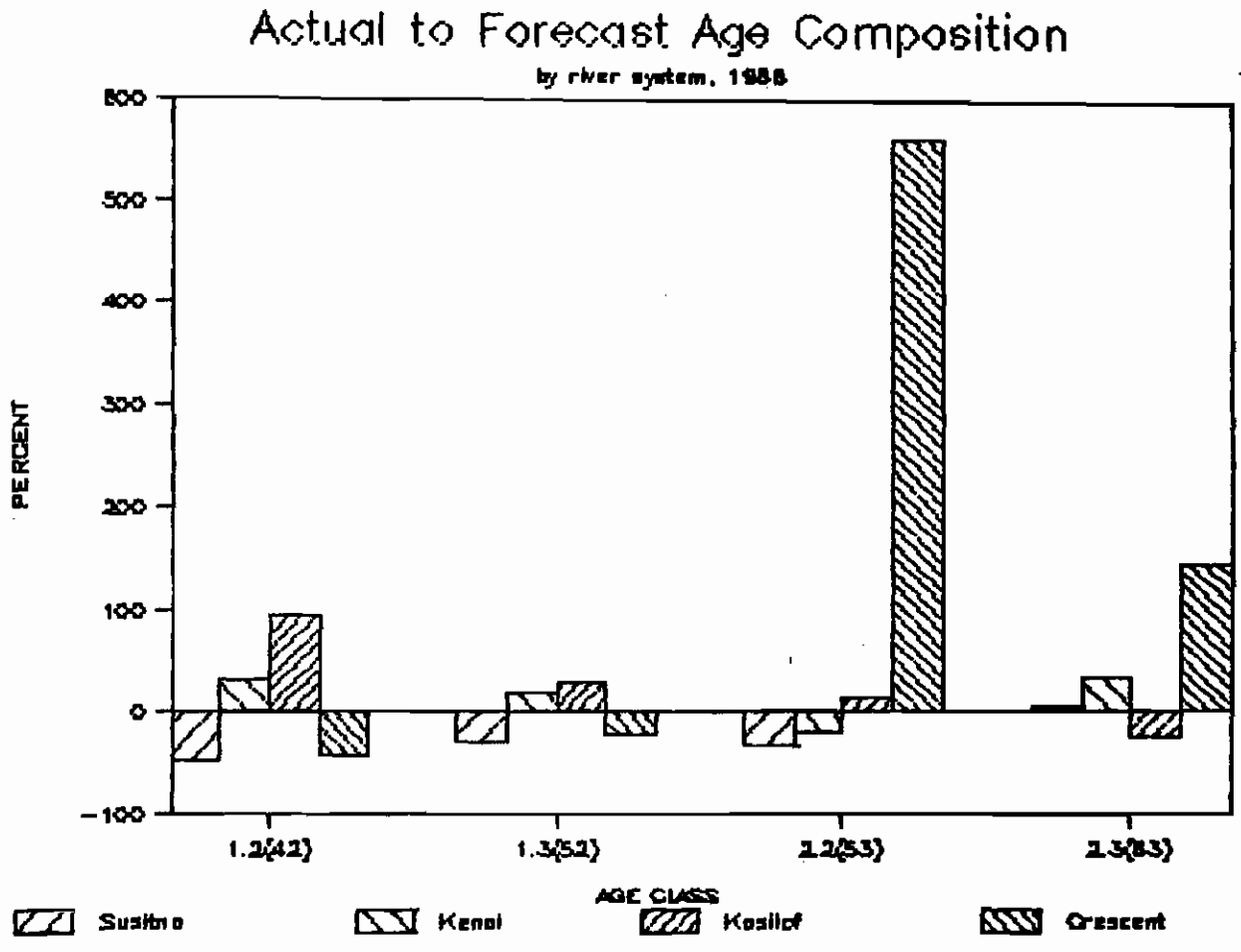

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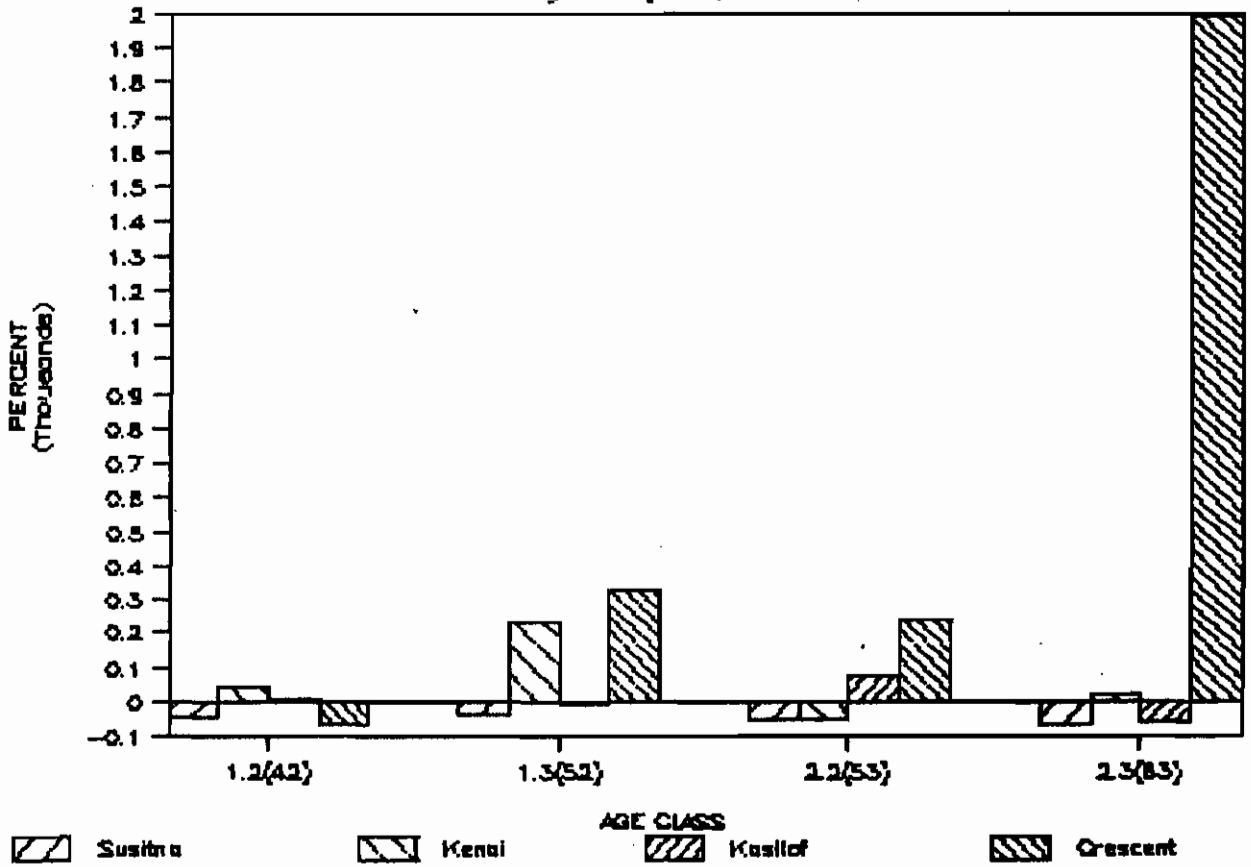
Actual to Forecast Age Composition

by river system, 1987



ACE10098100

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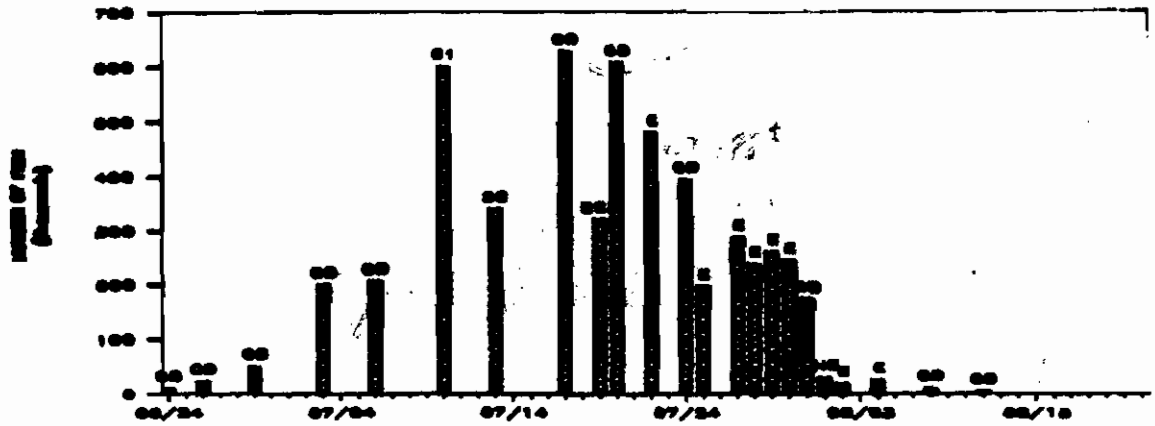
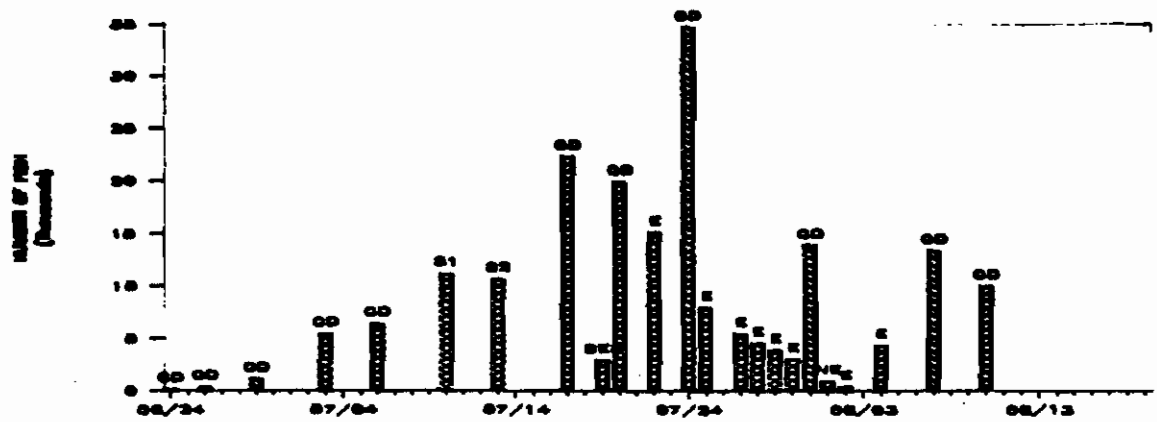
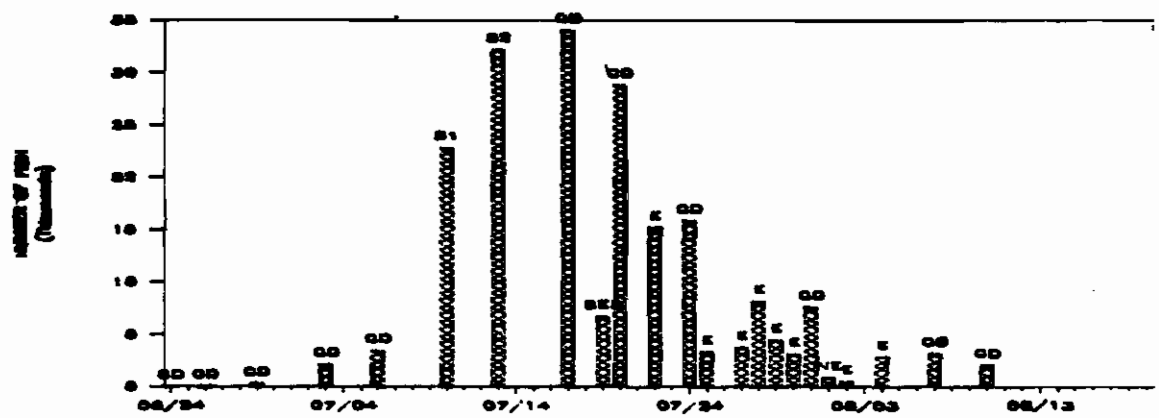
1987 DRIFT SOCKEYE BY PERIOD



1987 DRIFT CHUM CATCH BY PERIOD



1987 DRIFT COHO BY PERIOD



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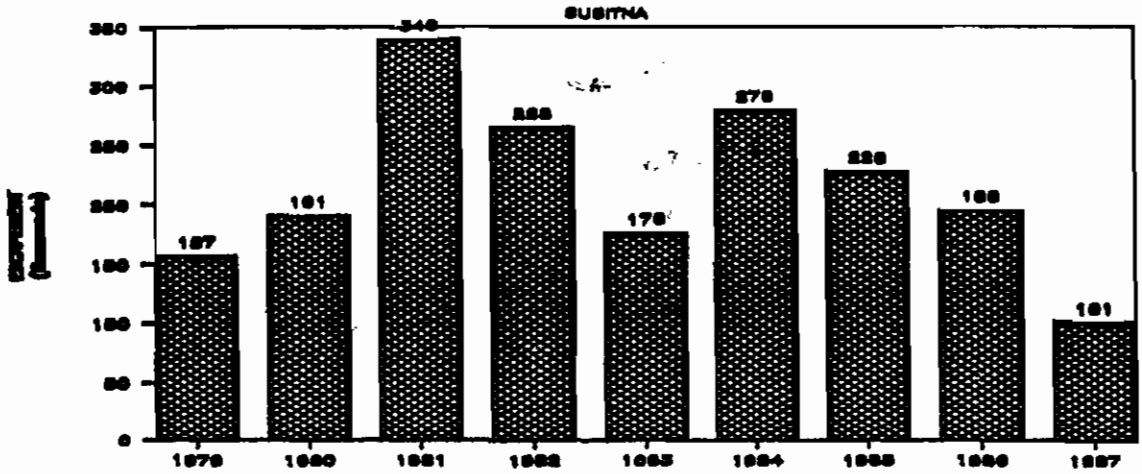
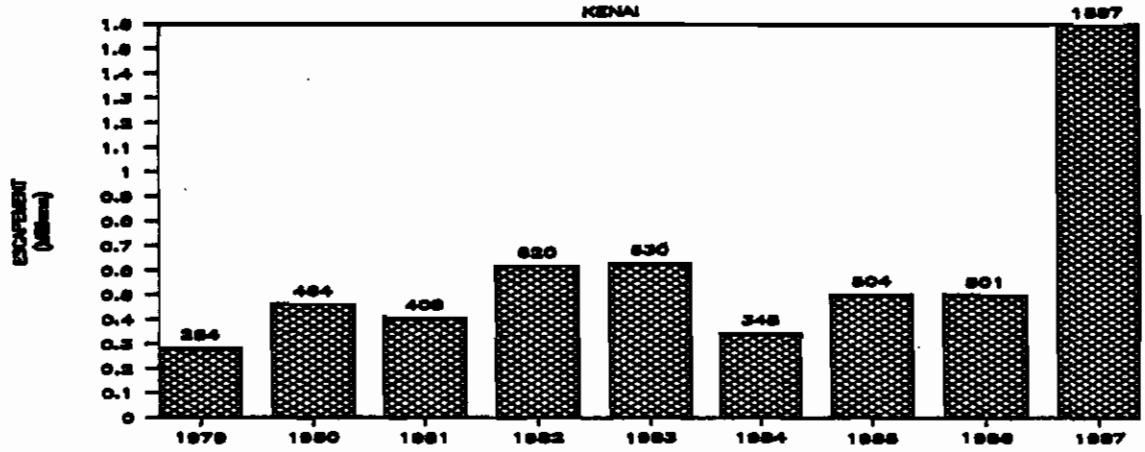
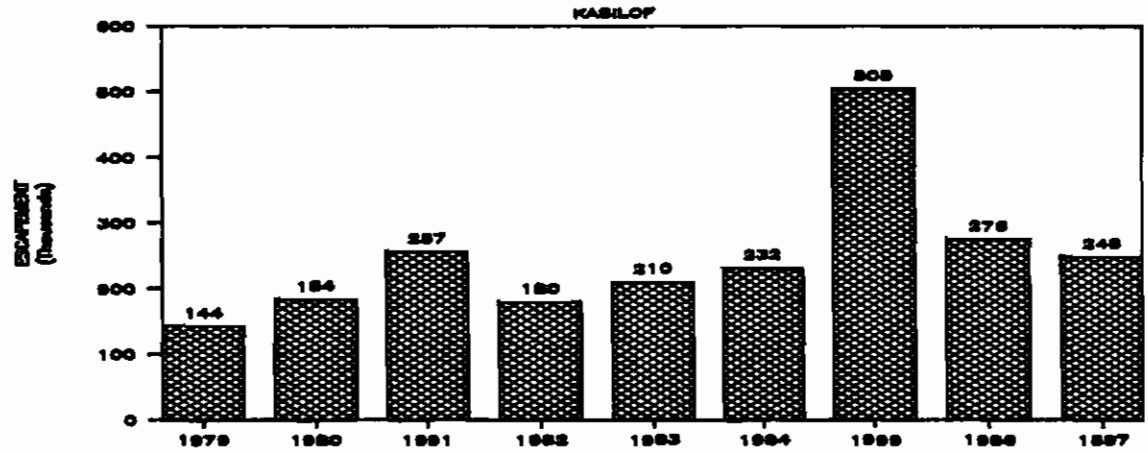
2

HISTORICAL ESCAPEMENT







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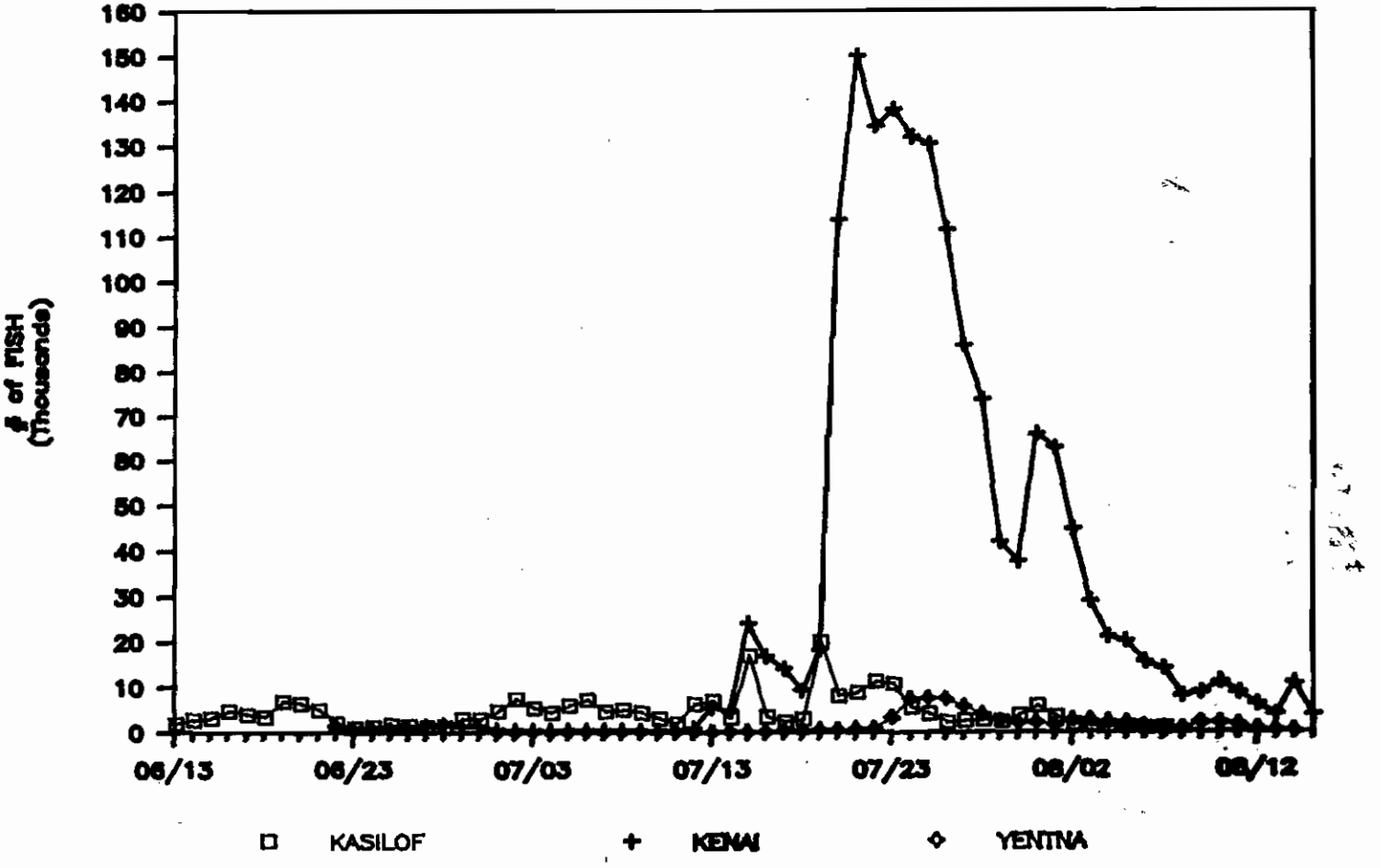
4

1987 SOCKEYE DAILY ESCAPEMENT



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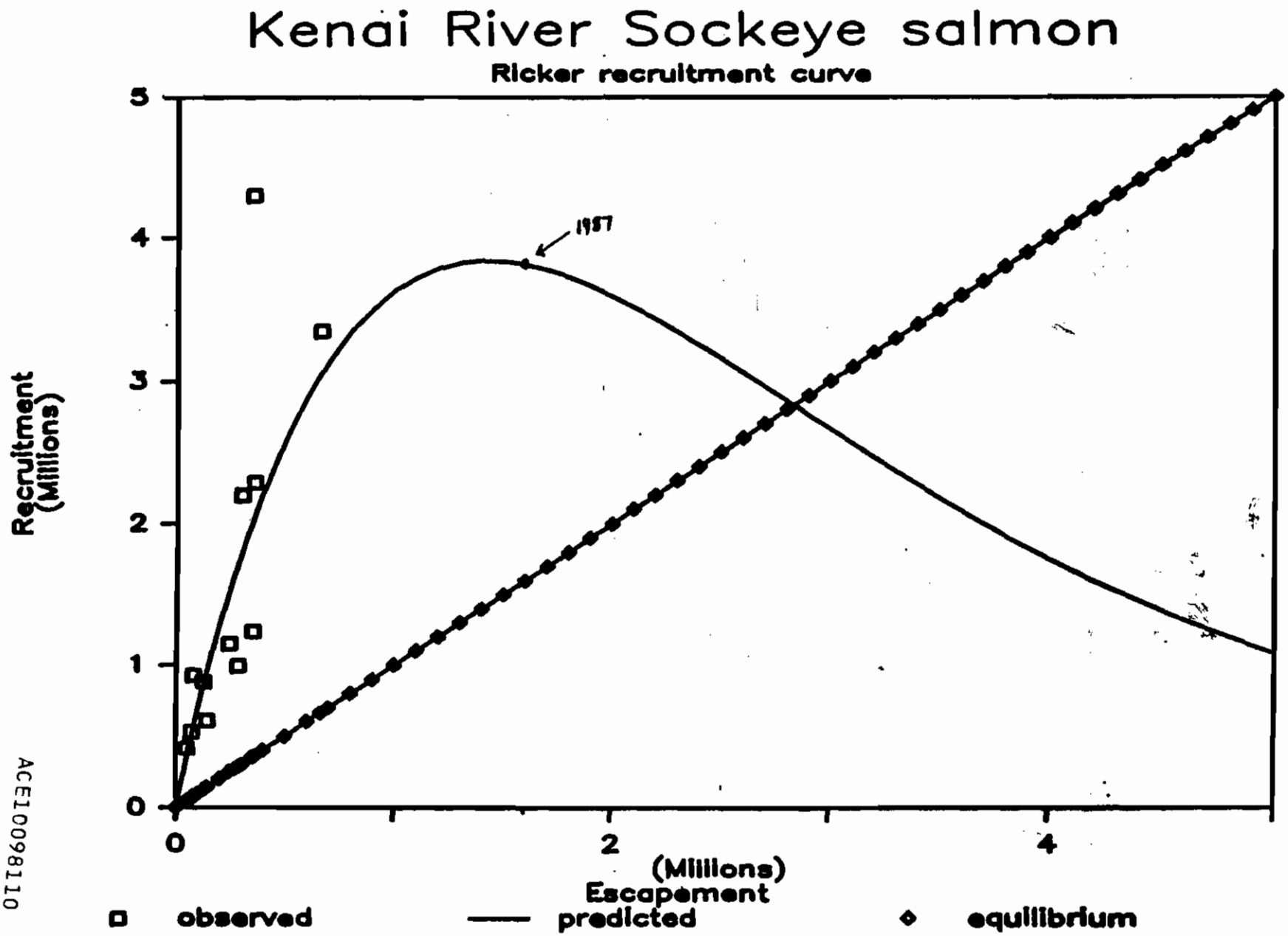
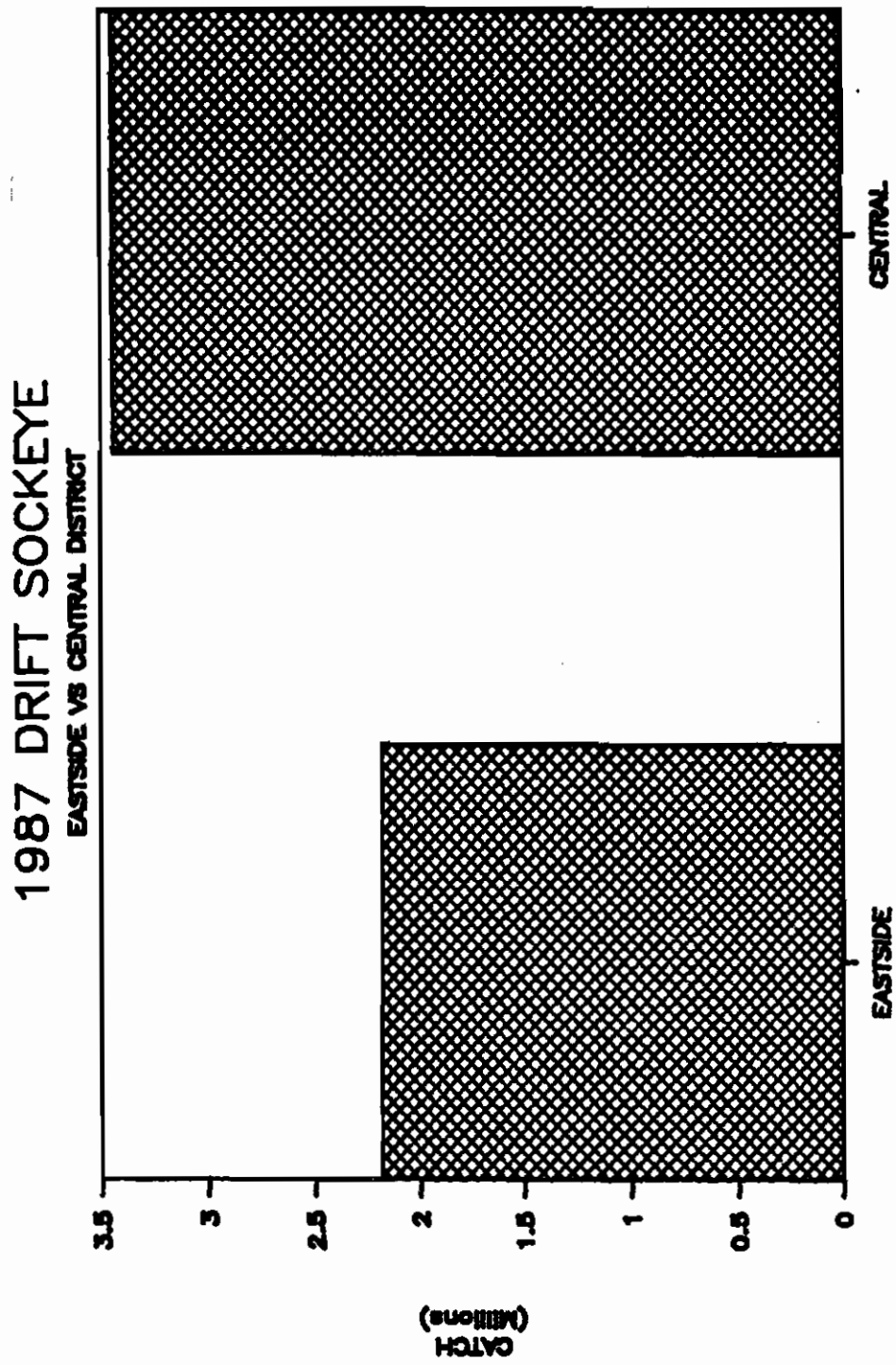


Figure 6. Ricker spawner/recruit curve for sockeye salmon in the Kenai River (brood year 1968-1979).

ACE10098110



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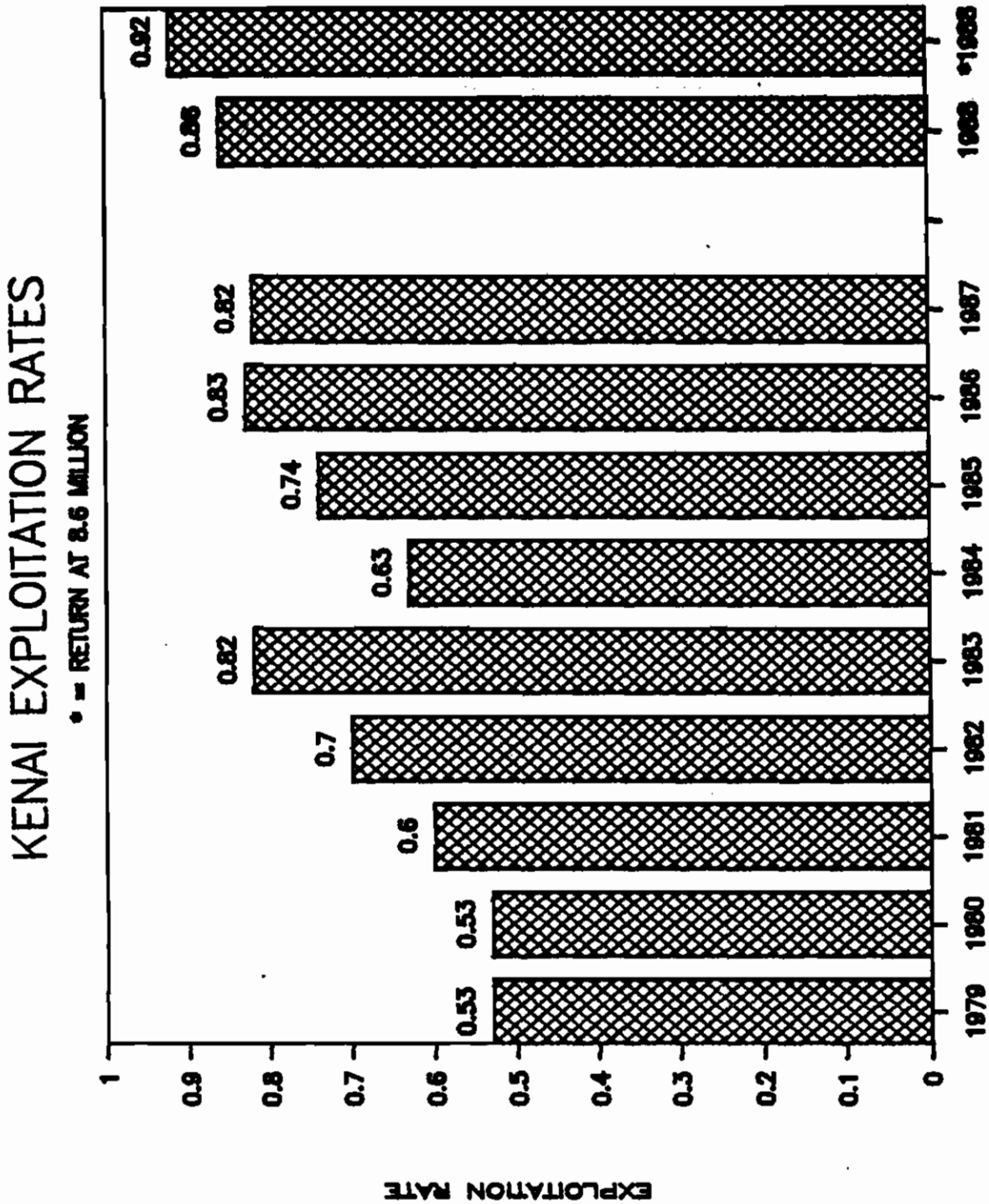

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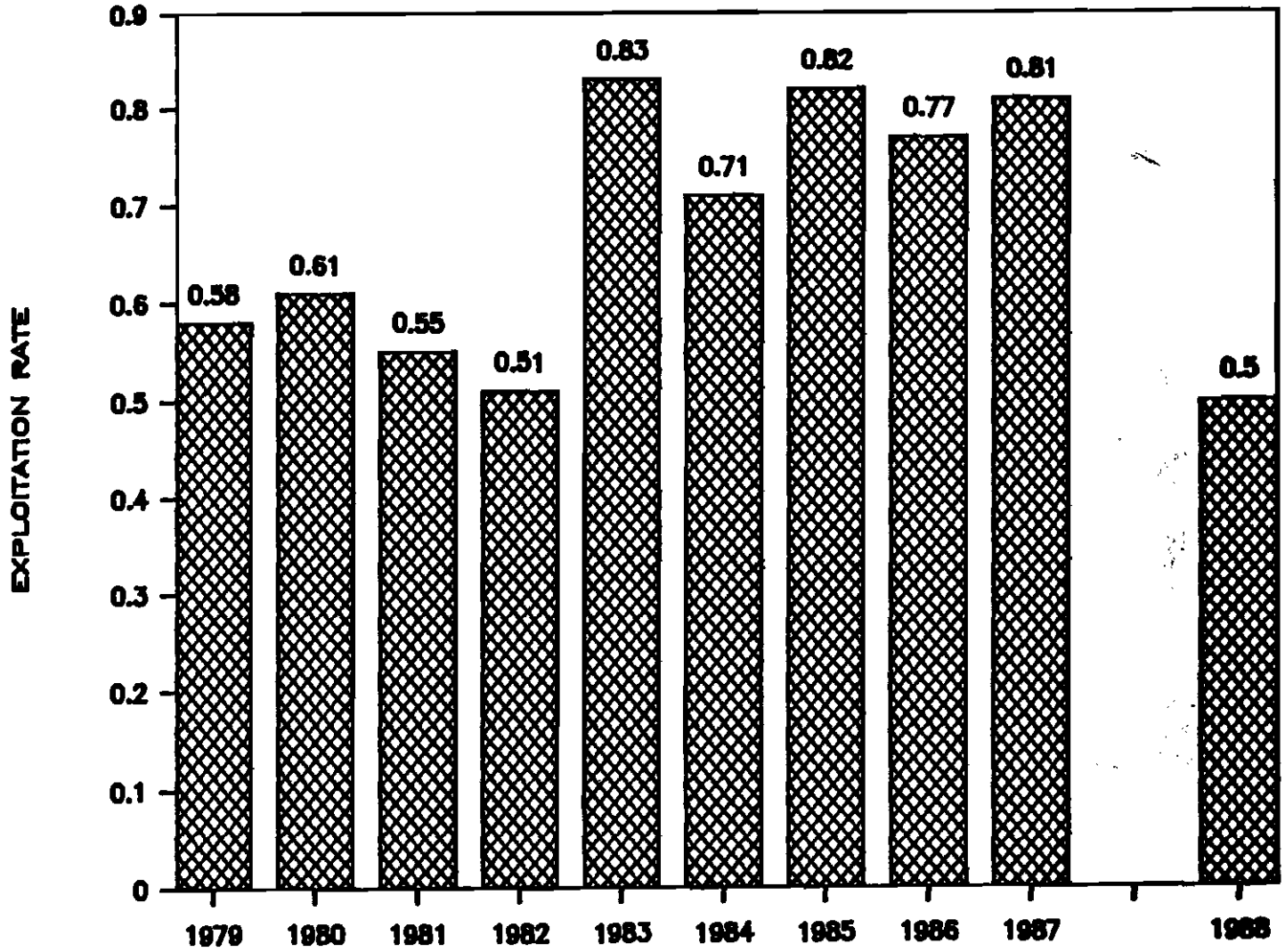
SUSITNA EXPLOITATION RATES



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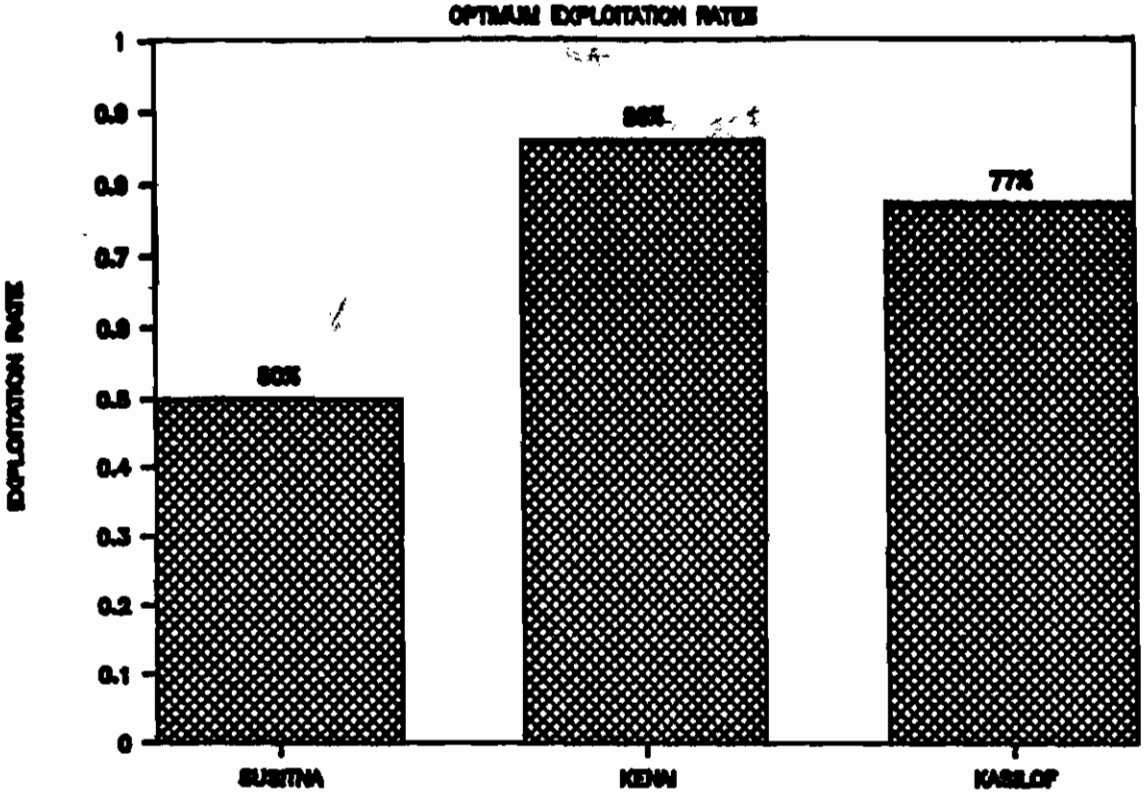
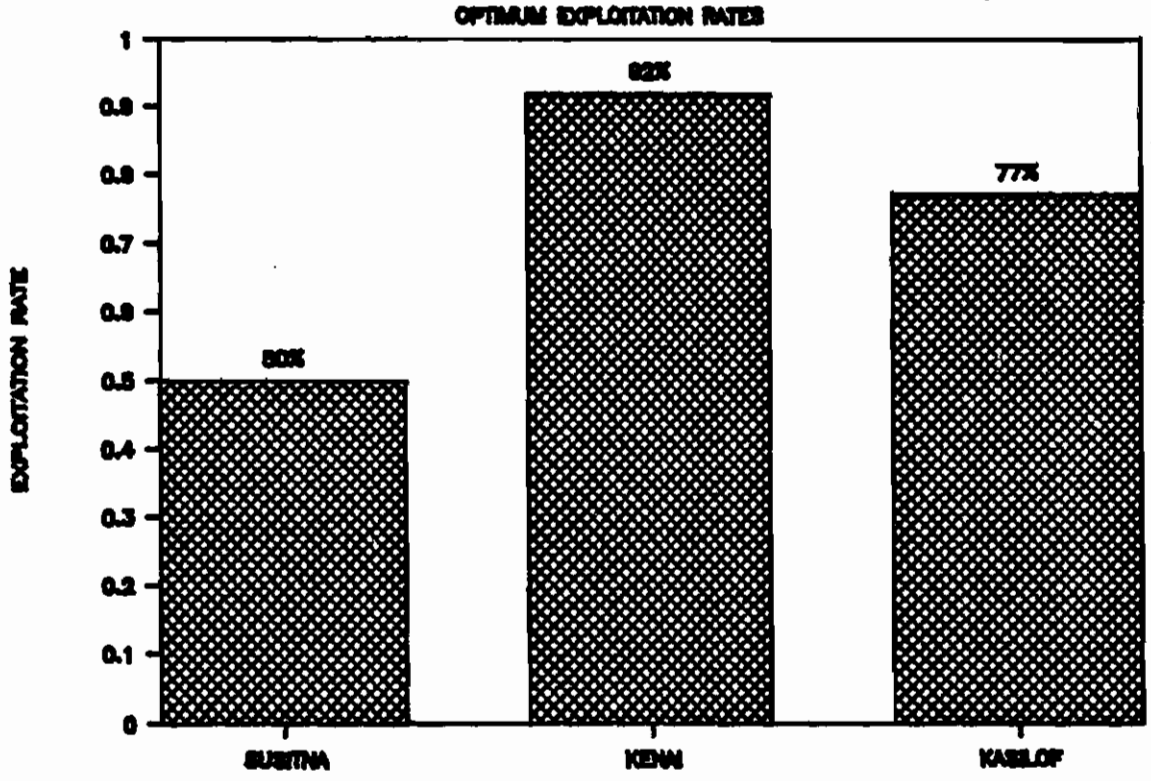
14

1988 RETURN AT FORECAST



1988 RETURN (KENAI = 8.6 MILLION)



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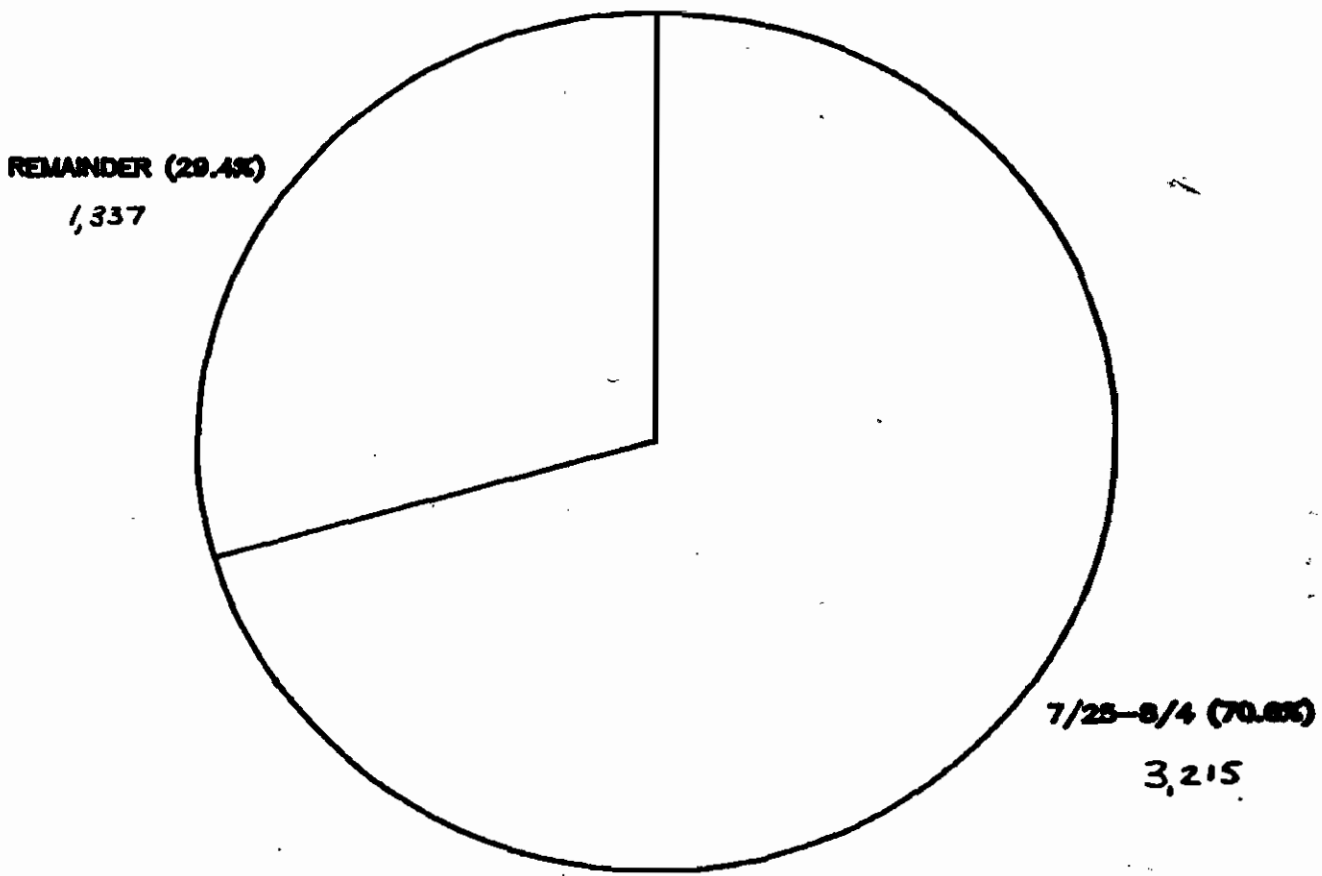
16

DRIFT CHINOOK CATCH

EFFECT OF KENAI RIVER MOUTH FISHING



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APPENDIX E.1

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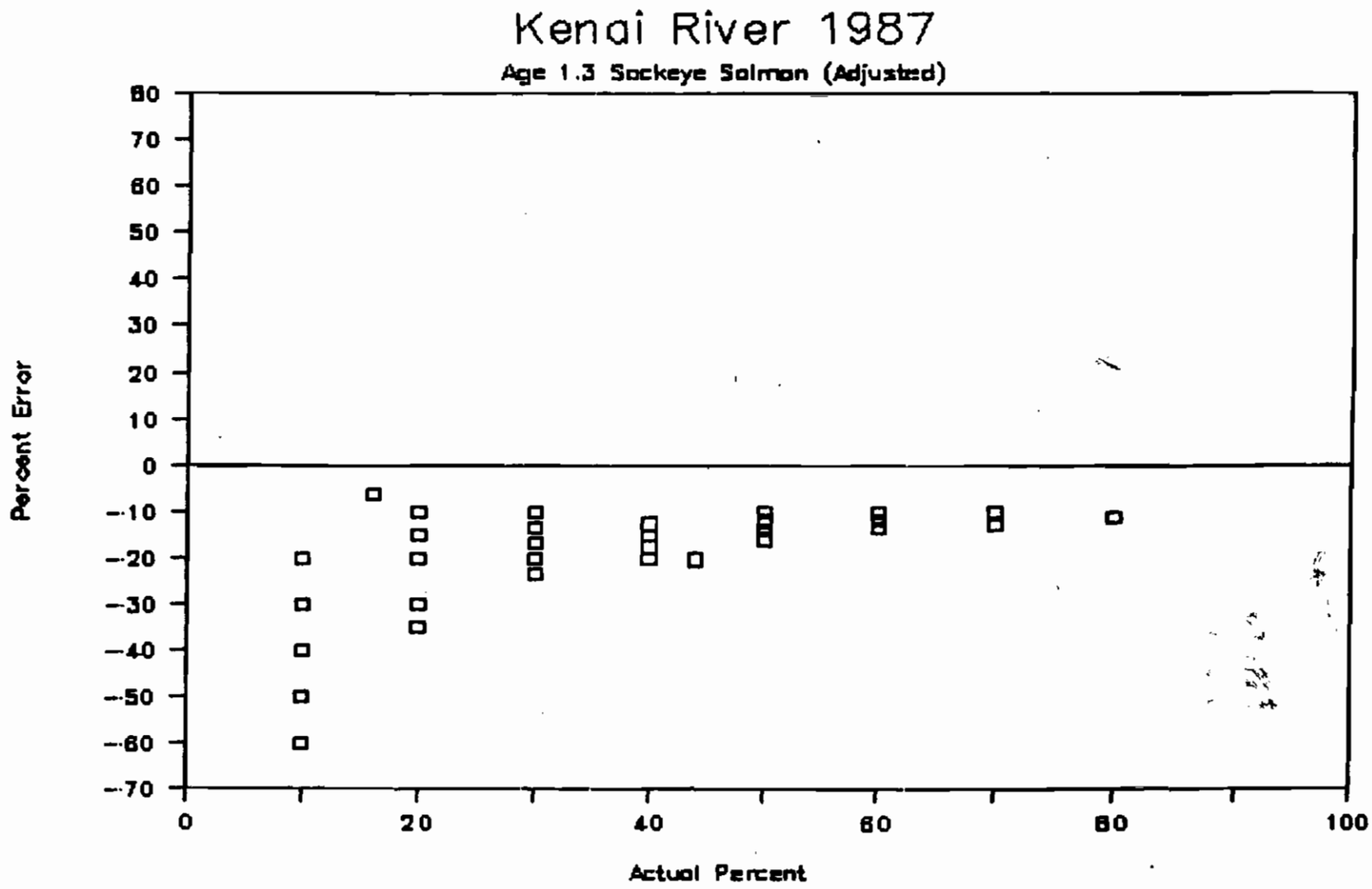


ACE10098124

APPENDIX F.1

ACE10098126

Table 8. Summary of mean lengths and weights of fall rearing juvenile sockeye salmon in Tustumena Lake, 1980-1986.

	Age 0					Age 1.0				
Date	Mean length (mm)	S.D.	Mean weight (g)	S.D.	Sample size	Mean length (mm)	S.D.	Mean weight (mm)	S.D.	Sample size
09/22/80	58.5	6.6	2.3	0.7	222	79.7	3.5	5.7	0.7	20
09/19-23/81	54.6	5.1	1.6	0.4	197	73.2	4.6	3.8	0.7	21
09/27-10/01/82	54.1	5.1	1.8	0.5	194	74.3	3.9	4.6	0.9	17
09/26-10/06/83	59.5	6.1	2.5	0.7	562	79.5	5.0	5.8	1.1	55
09/18-10/04/84	60.7	4.6	2.5	0.6	388	79.0	3.7	5.3	0.8	186
09/18-10/03/85	56.0	5.6	2.1	0.6	173	77.8	5.0	5.6	1.2	52
09/22-25/86	49.7	6.4	1.3	0.5	156	73.4	4.5	4.1	0.7	92
1987	53.1	5.9	1.8	0.6	143	71.3	3.8	4.2	0.6	50

ACE10098128

Table 11. Kasilof River sockeye salmon smolt summary of mean lengths and weights, 1980-1986.

	Age 1.0 smolt					Age 2.0 smolt				
Year	Mean length (mm)	S.D.	Mean weight (g)	S.D.	Sample size	Mean length (mm)	S.D.	Mean weight (g)	S.D.	Sample size
1980	68.3	4.3	2.7	0.5	846	85.9	4.9	4.7	1.5	122
1981	69.9	4.4	2.8	0.5	791	87.7	4.6	5.1	0.8	153
1982	69.0	3.7	2.9	0.6	566	82.0	4.2	4.8	0.7	148
1983	70.0	3.8	2.9	0.5	712	82.9	5.4	5.0	0.9	451
1984	72.7	3.5	3.3	0.6	1,005	84.5	4.4	5.2	0.8	187
1985	69.9	2.8	2.6	0.5	981	83.8	5.4	4.3	0.7	282
1986	69.2	3.9	2.6	0.5	983	84.3	5.1	4.6	0.9	365
1987	64.0	0.1	2.2	0.002	412	76.7	0.02	3.4	0.002	1,223

ACE10098130

Updated Tables

Table 2. Summary of hydroacoustic survey timing, equipment, data collection, Tustumena Lake, 1981-~~1986~~ 87.

Year	Date	Timing	Equipment	Transects completed	Transect speed (m/sec)
1981	06/02-06/05	Day/ Night	Simrad EK-120 9° Transducer	8 x 2[1]	2.5
	06/28-07/01		(same as above)		
	09/21-09/23		(same as above)		
1982	06/28-07/04		(same as above)		
	07/26-07/29		(same as above)		
	09/27-10/01	Day/ Night	425 kHz Biosonics 101 12° Transducer	8 x 2	2.5
1983	07/08-07/11		(same as above)		(up to 6.0)
	08/10-08/16		(same as above)	8 x 1	(up to 6.0)
	09/26-09/29		(same as above)	8 x 2	(up to 6.0)
1984	07/30-08/03	Night	420 kHz Biosonics 101, Dual Beam, 15° and 6° Transducers	8 x 2	2.6
	09/25-09/27		(same as above)		
1985	07/24-08/06		(same as above)		
	09/20-10/03		(same as above)		
1986	07/24-08/03		(same as above)	8 x 2	2.0
	09/22-09/24		(same as above)	8 x 2	2.0
1987	7/27-07/28		(same as above)	6 x 2	
	9/28-10/01		(same as above)	8 x 2	

[1]First number refers to the number of unique transects. Second number refers to the number of replicates per transects.

ACE10098132

Table 4. Fecundity of sockeye salmon in the Tustumena Lake system, Alaska, as determined during the egg takes for the Crooked Creek Hatchery, 1974-1986.

Brood year	Source	Fecundity
1974	Glacier Flats Creek	2,857
1975	Glacier Flats Creek	3,499
1976	Glacier Flats Creek	3,134
	Bear Creek	3,095
	Seepage Creek	3,291
1977	Glacier Flats Creek	3,710
1978	Glacier Flats Creek	3,523
	Bear Creek	3,502
1979	Glacier Flats Creek	3,522
	Bear Creek	3,503
1980	Glacier Flats Creek	N. A.
	Bear Creek	N. A.
1981	Glacier Flats Creek	3,233
	Bear Creek	3,071
1982	Glacier Flats Creek	3,246
	Bear Creek	3,123
1983	Glacier Flats Creek	3,530
	Bear Creek	3,226
1984	Glacier Flats Creek	3,164
	Bear Creek	2,994
1985	Glacier Flats Creek	3,203
	Bear Creek	3,045
1986	Glacier Flats Creek	3,000
	Bear Creek	2,991
1987	Glacier Flats Creek	3,246
	Bear Creek	3,026

ACE10098134

Table 16. Kasilof River sockeye salmon escapement summary, 1968-1986.

Year	Sonar count[1]	Fish used for artificial propagation of Tustumena Lake[2]	Sonar count less egg take[3]
1968	89,000		
1969	46,000		
1970	38,000		
1972	113,000		
1973	40,000		
1974	70,000	205	69,795
1975	48,000	3,365	44,635
1976	139,000	5,463	133,537
1977	155,300	1,794	153,506
1978	116,600	6,681	109,919
1979	152,179	3,024	149,155
1980	187,154	6,030	181,124
1981	256,625	9,700	246,925
1982	180,239	11,571	168,668
1983	210,271	9,903	200,368
1984	231,685	11,141	220,544
1985	505,049	11,280	493,769
1986	275,963	11,952	264,011
1987	250,000	10,485	239,515

[1]Multiple transducer sonar counts rounded to the nearest thousand (1968-1977) from Namtvedt et al. (1979). Side scan sonar counts (1978-1981) from Tarbox et al. (1983).
[2]Source: FRED Division hatchery records.
[3]Considered estimate of natural spawners above sonar site.

ACE10098136

APPENDIX G.1

ACE10098138

1) Calculate value of each full square (no. fish/unit area

□ = 10 fish/~~day~~ square

2) Calculate total number of squares enclosed by curve

181 full squares
33 partial squares totaling 16.5 squares

Total number of squares = 197.5

3) Calculate Total number of fish days

197.5 square * 10 fish/square =

1975 total fish days

4) Divide total fish days by streamlife to arrive at population estimate.

Assume 6 day streamlife

Pop. estimate 1975/6 = 329 fish

ACE10098140

A L A S K A F I S H E R I E S M I C R O - C O M P U T E R M A P P I N G S Y S T E M

Cook Inlet staff meeting Jan 26, 1988

Page		
	A)	Map and index files
1		1) Names of Alaska map and index files
2		2) Listing of Cook Inlet index file
3		3) Listing of map data for two islands
4-5	B)	Plotting instructions
	C)	Plotting instructions for maps of:
		1) Southern part of Cook Inlet
6-8		a) Kamishak, Southern, Outer and Eastern districts.
9		b) Kamishak district.
10		c) Southern, Outer and Eastern districts.
11-14		2) Prince Wm Sound northern half comparing Pink salmon mean odd year escapement (1979-87) with 1987 escapement. Radius of circle at stream mouth is based on ratio of escapements. Thin circles for 1987 escapement above mean escapement. Thick circles for 1987 escapement below mean escapement.
15-16		3) Cook Inlet Central district with 1986 commercial Sockeye catch.
17-18		4) Homer-Seldovia area with axis labels and location code table.
		5) Other areas
19		a) Kodiak Island
20		b) Alaska Peninsula
21		c) Bristol Bay
22		d) Kuskokwim Delta
23		e) Seward Peninsula
24		f) Southeast
25	E)	Comparison of Hewlett Packard 7475A and Fugitsu ImageGraph 315 plotter

ACE10098142

Cook Inlet map index file

	#points	min. & max. latitude		min. & max. longitude		
Coast						
	3584	61.50861	59.16083	151.98416	147.72556	Port Wells to Trading Bay
	1791	60.91639	57.55361	155.77000	151.70750	Trading Bay to Cape Aklek
Rivers						
	33	60.38361	60.23889	151.31084	151.18750	Kasilof River
	630	62.84195	61.36222	150.57639	146.67528	Susitna River
	27	60.36000	60.22694	152.87670	152.57890	Crescent River
	88	60.53346	60.45568	151.27500	150.51450	Kenai River
Islands						
	10	58.90528	58.88945	152.23306	152.20500	Ushagat I east (Barren I)
	12	58.93278	58.92028	152.01555	151.96916	Amatuli I east (Barren I)
	24	58.95806	58.91917	152.08583	152.01611	Amatuli I west (Barren I)
	54	58.96750	58.90778	152.36028	152.15750	Ushagat I west (Barren I)
	59	59.41222	59.32583	153.55499	153.34473	Augustine I
	28	59.14861	59.10861	151.52444	151.42583	East Chugach I
	24	59.13139	59.10111	151.72778	151.63834	Perl I
	22	59.17389	59.14167	151.87527	151.80194	Elisabeth I
	52	59.46305	59.39778	150.44028	150.28612	Ragged I
	21	59.39000	59.36250	150.43611	150.36333	Rabbit I
	56	59.40639	59.30583	150.77667	150.60973	Nuka I
	12	59.39361	59.37500	153.57777	153.53944	Island W of Augustine I
	37	60.17916	60.09889	152.64833	152.56694	Chisik I
	91	60.51500	60.34389	152.08972	151.85333	Kalgin I
	34	61.17000	61.11861	150.28528	150.15639	Fire I
Lakes						
	35	60.40139	60.35472	153.01334	152.87666	Crescent Lake
	22	61.33805	61.29778	150.48111	150.43140	Figure Eight Lake
	13	61.35361	61.33333	150.52888	150.49167	Lake W of Figure 8 Lake
	50	61.44278	61.38361	151.68388	151.47778	Beluga Lake
	31	61.55222	61.51472	149.97861	149.84917	Big Lake
	21	61.64472	61.60250	150.19749	150.15167	Red Shirt Lake
	33	61.99722	61.93611	151.59027	151.50305	Shell Lake
	99	60.47083	60.38139	150.52417	150.13472	Skilak Lake
	119	62.49944	62.27639	146.71445	146.45027	Susitna Lake
	184	60.29805	60.03667	151.19000	150.63278	Tustumena Lake
	256	61.41099	61.34228	149.15091	148.99199	Eklutna Lake

ACE10098144

Plotting instructions

Record	Variable	Description
1		Map title to be displayed at bottom of plot (90 char max)
2	1	Map title character width (If 0, default value used)
	2	Map title character height (If 0, default value used)
	3	0 = display title, 1 = do not
	4	0 = draw map border, 1 = do not
3		1 = 8½x11 paper, origin at lower-left 2 = 8½x11 paper, origin at upper-left 3 = 11x17 paper, origin at upper-left 4 = 11x17 paper, origin at lower-left (default character width-height = .187cm .285cm)
4		Maximum drawing speed (25 cm/sec used if 0 or greater than 25) 10 cm/sec or less recommended for transparencies
5		Map filename (If blank, no map drawn) (Maximum of 25 characters)
6	1	RECTANGLE Minimum N. latitude
	2	Maximum N. latitude
7	1	RECTANGLE Minimum W. longitude
	2	Maximum W. longitude
8	1	Y-AXIS LABEL Start latitude
	2	Step
	3	Number of ticks between labels
	4	Number of digits after decimal (0-2)
9	1	X-AXIS LABEL Start longitude
	2	Step
	3	Number of ticks between labels
	4	Number of digits after decimal (0-2)

ACE10098146

Plotting instructions for map of Kamishak, Southern, Outer and Eastern districts

A BASIC program OPEN4800.BAS must be run to open a 4800 baud line to the plotter before the mapping program is run.

```
BASICA OPEN4800

4 8 0 0   B A U D   L I N E   T O   P L O T T E R   I S   O P E N E D

 Fujitsu ImageGraph 315 plotter switch settings

 DIP switch 1: default values except #7=1 (Select 12KB input buffer capacity)
                    (For transparency film set #6=1 (Disable paper detection))
 DIP switch 2: default values
 DIP switch 3: default values

                Type SYSTEM ↵ to terminate this program
Ok
SYSTEM
```


The following file = COOK4 contains plotting instructions:

```
Kamishak, Southern, Outer and Eastern Districts
0 0 0 0                  Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                        Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                        Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\COOK.BIN        Map filename (If blank, no map drawn)
58.65 60.2               RECTANGLE  Minimum & maximum latitude
148.7 154.5              RECTANGLE  Minimum & maximum longitude
0 0 0 0                  AXIS-LABEL start latitude, step, #tics, #digits after decimal point
0 0 0 0                  AXIS-LABEL start longitude, step, #tics, #digits after decimal point
3 0                      Number of CITIES (circle drawn for each city) & circle radius (If 0, use default)
Homer
59.64 151.49 2 0 .9 0 .2 .3
Seldovia
59.44 151.71 1 -1 -.9 0 .2 .3
Seward
60.11 149.44 2 0 .9 0 .2 .3
```

Plotting instructions for map of Kamishak, Southern, Outer and Eastern districts (continued)

C_East Chugach I
C_Perl I
C_Elisabeth I
C_Ragged I
C_Rabbit I
C_Nuka I
C_Island W of Augustine I
C_Chisik I
C_Tustumena Lake
S_Port Wells to Trading Bay
C_Trading Bay to Cape Aklek

Lat.	Long.	posit	space right	space above	angle (deg)	width (cm)	ht. (cm)	name
59.640	151.490	Center	.0	.9	0.	.200	.300	Homer
59.440	151.710	Right	-1.0	-.9	0.	.200	.300	Seldovia
60.110	149.440	Center	.0	.9	0.	.200	.300	Seward

Plot 3 circles for cities

ACE10098150

Plotting instructions for map of Southern, Outer and Eastern districts

```
Southern, Outer and Eastern Districts
0 0 0 0                    Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                          Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                          Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\COOK.BIN          Map filename (If blank, no map drawn)
59.0 60.2                  RECTANGLE  Minimum & maximum latitude
148.7 152.2                RECTANGLE  Minimum & maximum longitude
0 0 0 0                    AXIS-LABEL start latitude, step, #tics, #digits after decimal point
0 0 0 0                    AXIS-LABEL start longitude, step, #tics, #digits after decimal point
3 0                        Number of CITIES (circle drawn for each city) & circle radius (If 0, use default)
Seward
60.11 149.44 2 0 1 0 .16 .24
Seldovia
59.44 151.71 1 -2 -1 0 .16 .24
Homer
59.64 151.49 2 0 1.1 0 .16 .24
Kachemak
59.59 151.45 3 0 0 15 .16 .24
Bay
59.63 151.35 1 0 0 40 .16 .24
Chugach IS
59.09 151.65 2 0 0 0 .16 .24
Port Dick
59.24 151.06 1 0 0 -75 .16 .24
Nuka I
59.32 150.71 1 0 0 55 .16 .24
Nuka Bay
59.42 150.50 3 0 0 85 .22 .33
Ragged I
59.40 150.30 1 0 0 0 .16 .24
Two Arm Bay
59.61 150.06 1 0 0 -60 .16 .24
Harris Bay
59.68 149.87 1 0 0 -70 .16 .24
Aialik Bay
59.80 149.74 1 0 0 -70 .16 .24
Resurrection Bay
59.98 149.36 3 0 0 85 .16 .24
Day Harbor
60.00 149.15 3 0 0 80 .16 .24
Tustumena
60.11 150.67 3 0 0 -50 .16 .24
Lake
60.11 150.67 3 0 -.8 -50 .16 .24
```

ACE10098152

Plotting instructions for map of northern half of Prince Wm Sound (continued)

Lat	Long	Subd	Num	Name	Mean Escapement	1987 Escapement
60.930	146.591	221-50	1150	Millard Creek	8465	8770
60.943	146.577	221-50	1160	Duck River	25647	32380
60.962	146.626	221-50	1170	Indian Creek	18747	16920
60.990	146.691	221-50	1200	Donaldson Creek	1737	1210
61.033	146.644	221-50	1210	Levshakoff Creek	11497	5930
61.026	146.614	221-50	1220	No Name Creek	845	190
61.023	146.601	221-50	1230	Gregorieff Creek	8705	4860
61.022	146.570	221-50	1270	Nacmoff River	19112	12760
61.037	146.553	221-50	1290	Vlasoff Creek	10592	10190
61.061	146.730	221-50	1520	Twin Falls Creek	4232	10460
61.053	146.760	221-50	1530	Stellar Creek	26847	10200
61.080	146.493	221-60	1310	Gorge Creek - Port Valdez	2672	1120
61.080	146.430	221-60	1330	Sawmill Creek	4312	2700
61.090	146.227	221-60	1370	Lowe River	2012	2500
61.129	146.286	221-60	1430	Siwash Creek	20200	9170
61.134	146.331	221-60	1450	Crooked Creek	4600	7170
61.138	146.409	221-60	1480	Mineral Flats	2287	1560
60.995	146.964	222-10	2040	Heather Bay	0	0
60.988	147.162	222-10	2080	Granite Cove	0	0
60.952	147.176	222-10	2090	Useless Creek	300	70
60.960	147.190	222-10	2100	Elf Creek	130	210
60.999	147.191	222-10	2130	Bench Mark Creek	472	780
61.017	147.196	222-10	2140	Long Creek	9437	1940
61.005	147.273	222-10	2160	Vanishing Creek	2867	1420
60.997	147.293	222-10	2170	Spring Creek	1310	1000
60.968	147.280	222-10	2180	Billy's Creek	100	0
60.930	147.320	222-10	2210	Eickelberg Creek	2567	250
60.902	147.363	222-20	2240	Backyard Creek	16430	3320
60.922	147.424	222-20	2270	Granite Creek	5637	8270
60.977	147.371	222-20	2290	Cedar Creek	6027	7640
61.005	147.416	222-20	2320	Delta Creek	467	410
61.015	147.431	222-20	2330	Surplus Creek	2243	1880
61.011	147.456	222-20	2340	Wells River	75350	46200
61.026	147.662	222-20	2570	Complex Creek	2040	410
61.020	147.678	222-20	2580	Williams Creek	2973	11040
61.012	147.674	222-20	2590	Jonah Creek	51252	31640
60.975	147.640	222-20	2630	Waterfall Creek	207	170
60.965	147.646	222-20	2640	Siwash River	20305	5240
60.950	147.612	222-20	2650	Unakwik Creek	837	150
60.890	147.653	222-30	2730	Schoppe Creek	1950	70
60.905	147.713	222-30	2760	Black Bear Creek	2720	1180

ACE10098154

Plotting instructions for map of northern half of Prince Wm Sound (continued)

```
PWS Northern half, comparison of 1987 Pink escapement with mean of 79, 81, 83 & 85
0 0 0 0                 Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                       Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                       Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\PWS.BIN        Map filename (If blank, no map drawn)
60.610 61.510           RECTANGLE  Minimum & maximum latitude
145.5 149.0             RECTANGLE  Minimum & maximum longitude
0 0 0 0                 AXIS-LABEL start latitude, step, #tics, #digits after decimal point
0 0 0 0                 AXIS-LABEL start longitude, step, #tics, #digits after decimal point
2 0                     Number of CITIES (circle drawn for each city) & Radius (If 0, use default)
Valdez
61.13 146.35  2 0 1 0 .18 .27
Whittier
60.78 148.68  3 -1 0 0 .18 .27
Port Wells
60.83 148.24 1 0 0 65 .2 .3
Esther I
60.84 148.11 1 0 0 0 .15 .22
Culross I
60.64 148.09 1 -1 0 0 .15 .22
Perry I
60.70 147.82 1 0 0 0 .15 .22
Naked I
60.66 147.30 1 0 0 0 .15 .22
Unakwik Inlet
60.90 147.58 1 0 0 88 .18 .27
Wells Bay
60.87 147.50 1 0 0 88 .15 .22
Glacier I
60.84 147.30 1 0 0 0 .15 .22
Valdez Arm
60.88 146.90 1 0 0 62 .2 .3
Bligh I
60.795 146.78 3 0 0 0 .15 .22
Port Fidalgo
60.78 146.64 1 0 0 15 .18 .27
Port Gravina
60.63 146.50 1 0 0 30 .18 .27
Orca Bay
60.611 147.00 1 28 0 0 .18 .27
```


ACE10098156

```
60.40 152.95 2 0 1 0 .16 .24
Tuxedni Bay
60.195 152.72 1 1 0 0 .16 .24
Chisik I
60.11 152.57 1 1 0 0 .16 .24
Chinitna Bay
59.85 153.18 1 1 0 0 .16 .24
```


ACE10098158

Plotting instructions for map of Homer-Seldovia area showing map accuracy

```
Homer-Seldovia area with location code table and axis labels
0 0 0 1                    Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
1                          Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                          Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\COOK.BIN          Map filename (If blank, no map drawn)
59.32 59.72                RECTANGLE  Minimum & maximum latitude
151.0 152.0                RECTANGLE  Minimum & maximum longitude
0 0 0 0                    AXIS-LABEL start latitude, step, #tics, #digits after decimal point
0 0 0 0                    AXIS-LABEL start longitude, step, #tics, #digits after decimal point
4 200                      Number of CITIES (circle drawn for each city) & circle radius (If 0, use default)
Port Graham
59.348 151.83 2 0 -0.9 0 .16 .24
Seldovia
59.44 151.71 2 0 -0.9 0 .16 .24
Homer
59.64 151.49 2 0 .9 0 .16 .24
Halibut
59.60 151.16 1 1.5 0 0 .16 .24
Cove
59.60 151.16 1 1.5 -1 0 .16 .24
K A C H E M A K
59.59 151.45 3 0 0 15 .32 .48
B A Y
59.63 151.35 1 0 0 40 .32 .48
C
59.565 151.29 1 0 0 0 .16 .24
S
59.51 151.462 1 0 0 0 .16 .24
T
59.45 151.39 1 0 0 0 .16 .24
E
59.35 151.95 1 0 0 0 .16 .24
```


ACE10098160

Plotting instructions for map of Kodiak Island

```
K O D I A K   I S L A N D
0 0 0 0                    Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
4                          Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                          Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\KODIAK.BIN        Map filename (If blank, no map drawn)
56.2 59.3                  RECTANGLE  Minimum & maximum latitude
151.6 155.0                RECTANGLE  Minimum & maximum longitude
```

```
K O D I A K   I S L A N D
0 0 1 1                    Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
4                          Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                          Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\COOK.BIN          Map filename (If blank, no map drawn)
56.2 59.3                  RECTANGLE  Minimum & maximum latitude
151.6 155.0                RECTANGLE  Minimum & maximum longitude
```


ACE10098162

Plotting instructions for map of Bristol Bay

```
B R I S T O L   B A Y
0 0 0 0                 Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                       Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                       Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\BBAY.BIN       Map filename (If blank, no map drawn)
56.8 59.5               RECTANGLE  Minimum & maximum latitude
154.0 162.5             RECTANGLE  Minimum & maximum longitude
```

```
B R I S T O L   B A Y
0 0 1 1                 Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                       Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                       Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\KODIAK.BIN     Map filename (If blank, no map drawn)
56.8 59.5               RECTANGLE  Minimum & maximum latitude
154.0 162.5             RECTANGLE  Minimum & maximum longitude
```

```
B R I S T O L   B A Y
0 0 1 1                 Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
3                       Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                       Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\COOK.BIN       Map filename (If blank, no map drawn)
56.8 59.5               RECTANGLE  Minimum & maximum latitude
154.0 162.5             RECTANGLE  Minimum & maximum longitude
```

-167-
ACE10098164

Plotting instructions for map of Seward Peninsula

```
S E W A R D   P E N I N S U L A
0 0 0 0                  Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
4                        Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                        Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\NW-C.BIN        Map filename (If blank, no map drawn)
64.0 68.5                RECTANGLE  Minimum & maximum latitude
160.0 168.5              RECTANGLE  Minimum & maximum longitude
```

```
S E W A R D   P E N I N S U L A
0 0 1 1                  Title char width(cm) & ht(cm) (0=default), plot title(0=yes), plot border(0=yes)
4                        Paper (1= 8½x11, Lower-Left origin; 2= 8½x11, Upper-L; 3= 11x17, U-L; 4= 11x17 L-L
0                        Maximum drawing speed (cm/sec)  [If 0, use 25 cm/sec]
\MAPDATA\NW-RIL.BIN      Map filename (If blank, no map drawn)
64.0 68.5                RECTANGLE  Minimum & maximum latitude
160.0 168.5              RECTANGLE  Minimum & maximum longitude
```


ACE10098166

Comparison of Hewlett Packard 7475A and Fugitsu ImageGraph 315 plotter

The Fugitsu plotter is fully compatible with the HP7475A.
If you select HP7475A as a plotter with Lotus 1-2-3, either plotter may be connected to the serial port.

The Fugitsu is much better with the mapping programs. It has a 12K buffer compared with only 1K for HP7475A. Plots that require one pass with the Fugitsu need 2 or more passes with the HP7475A (One pass to draw the map and one or more passes to draw the labels). The HP7475A plotter is not recommended for drawing maps!

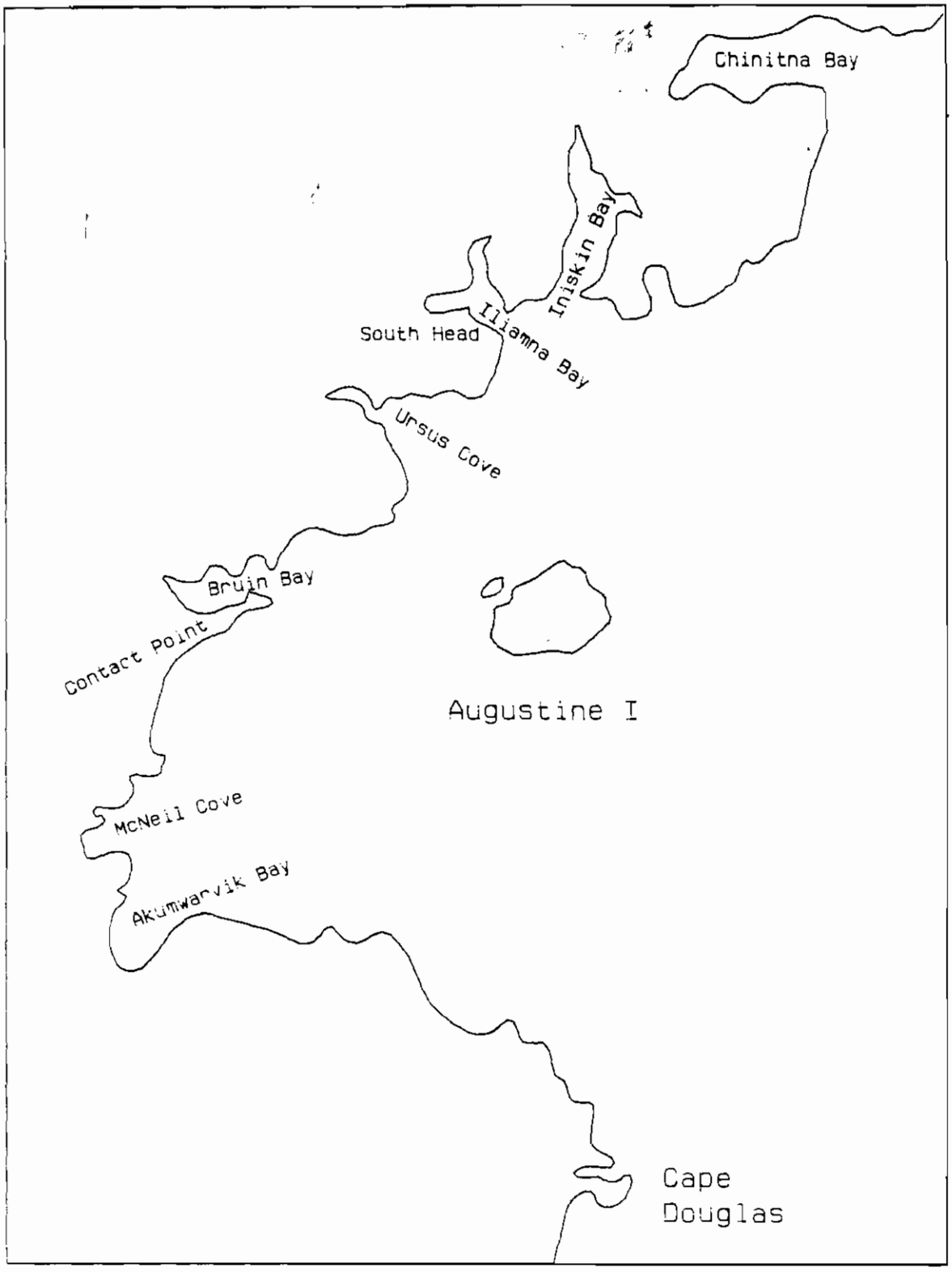
The serial port on a Compaq Deskpro 3/4 or Portable is 25 pin and the Deskpro 286/386 is 9 pin.
If you only have a 25 pin cable for the plotter and are using a Deskpro 286/386, use a standard RS-232 cable from micro to hook up with plotter cable.

	Hewlett Packard		Fugitsu ImageGraph	
Paper	Line width (mm)	Pen type	Line width (mm)	Pen type
standard	0.30	fiber tip	0.25	water-based ball point
	0.70	fiber tip	0.50	water-based fiber tip
coated	0.30	transparency	0.50	oil-based plastic tip
	0.60	transparency		
transparency	0.30	transparency	0.50	oil-based plastic tip
	0.60	transparency		

ACE10098168

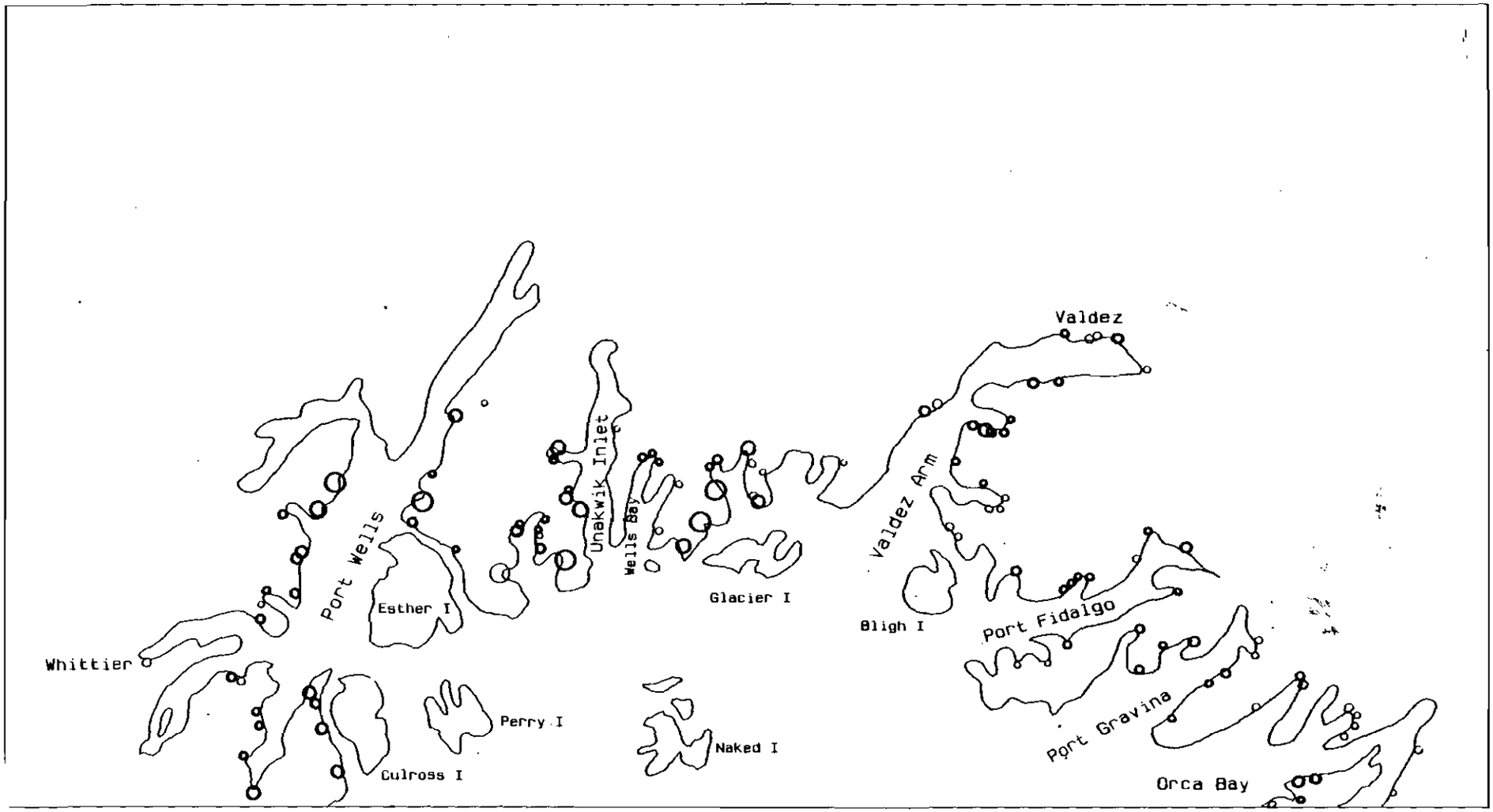
APPENDIX H.2

ACE10098169



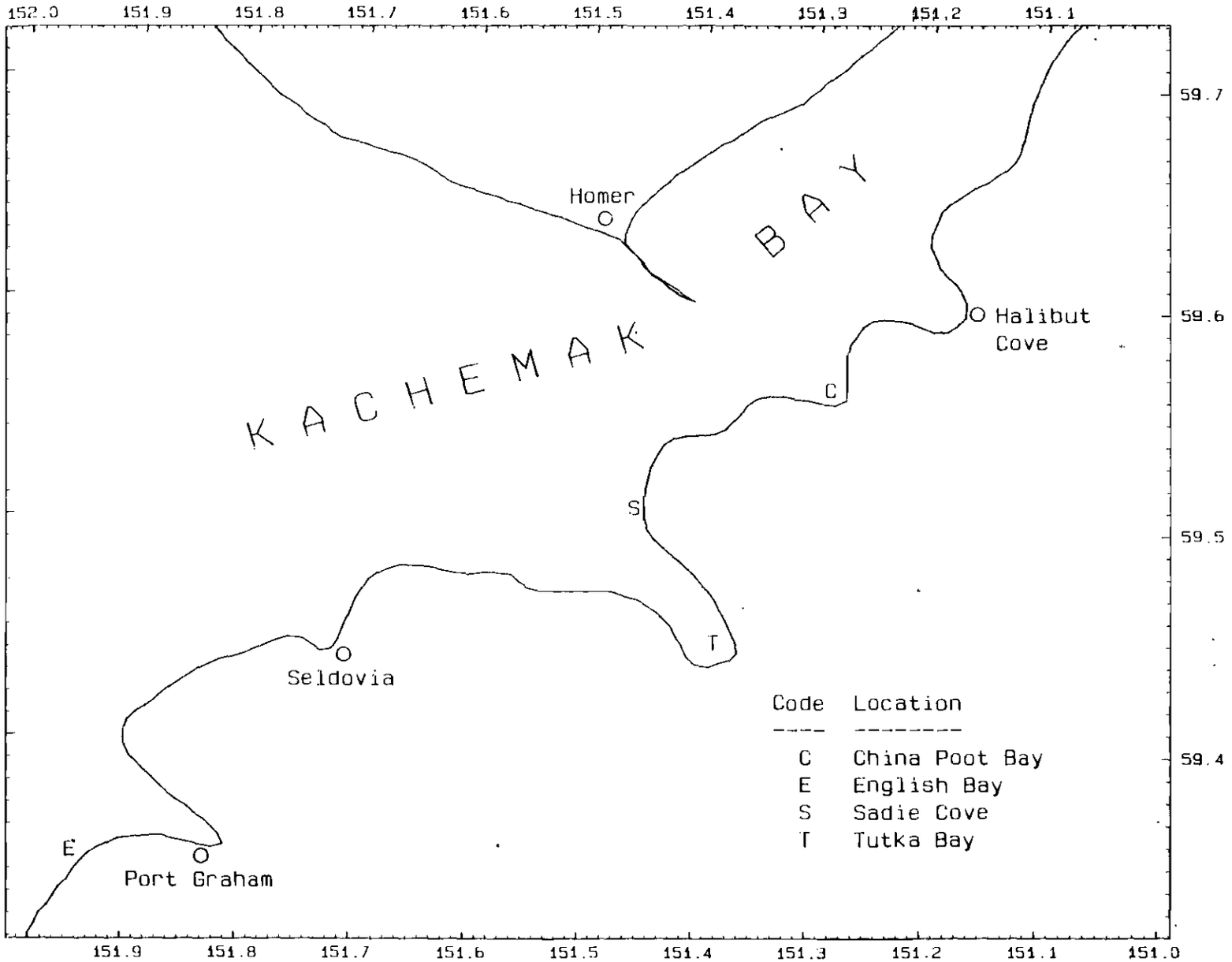
Kamishak District

ACE10098171



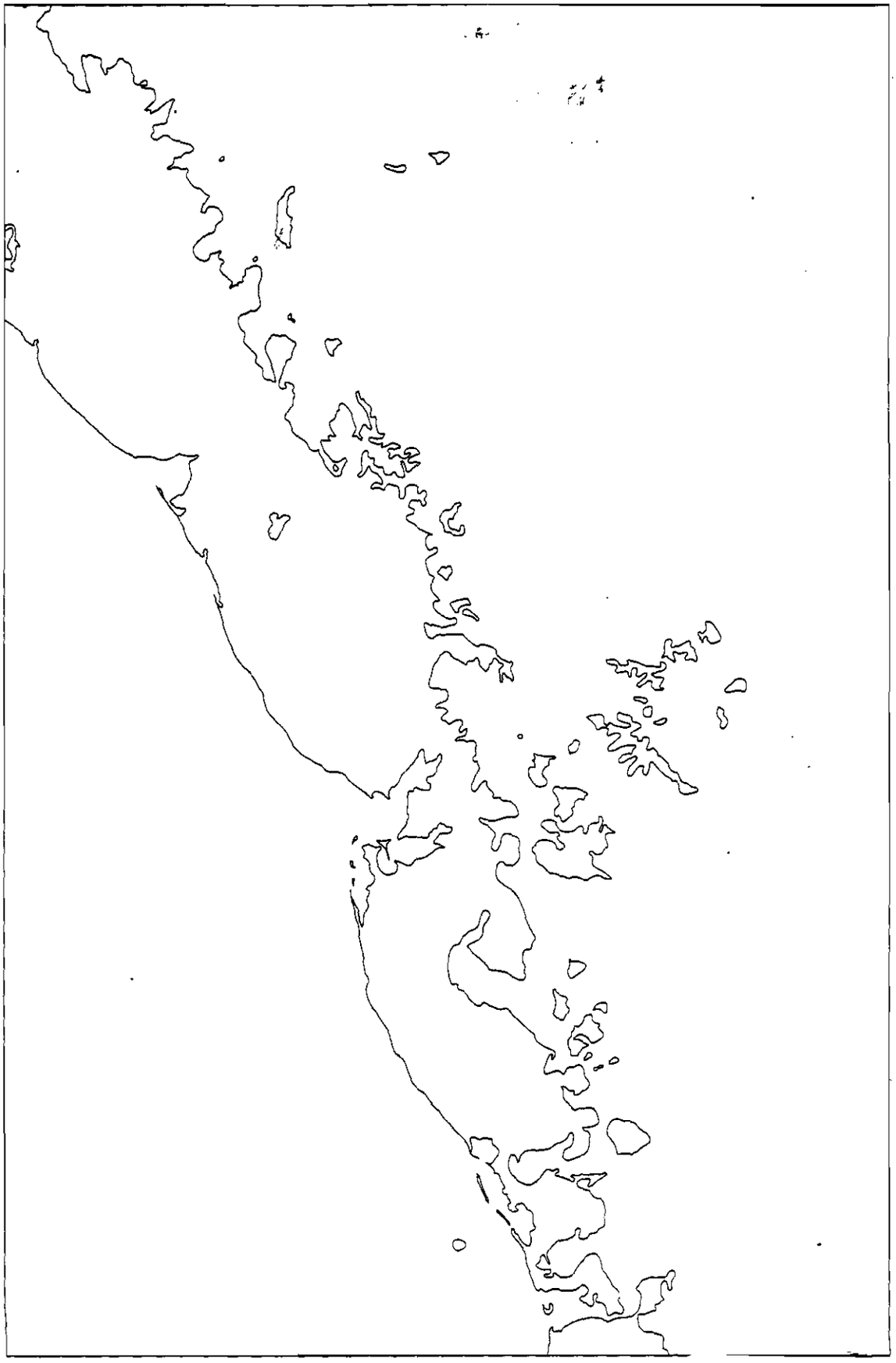
PWS Northern half, comparison of 1987 Pink escapement with mean of 79, 81, 83 & 85

ACE10093173



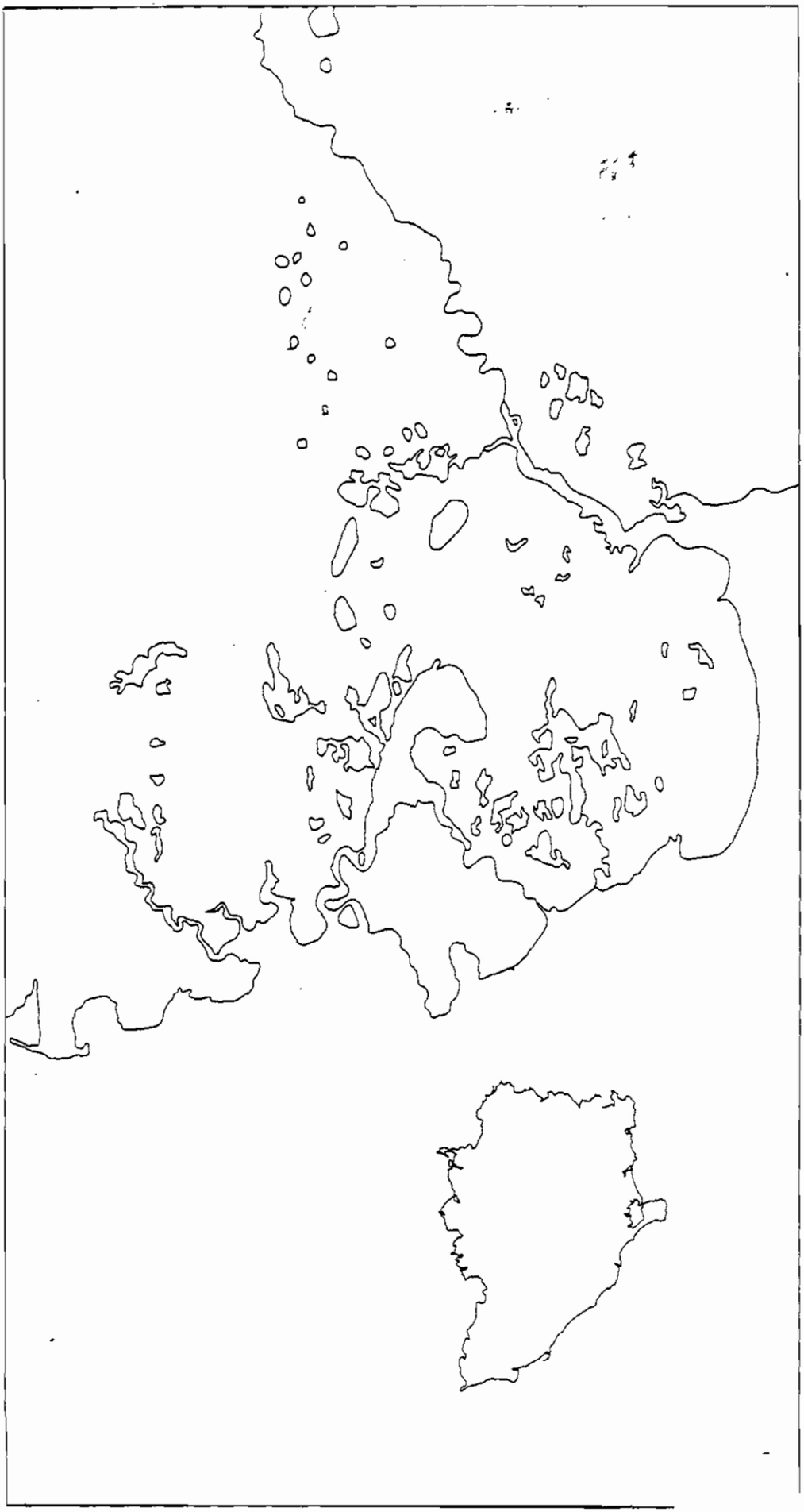
Homer-Seldovia area with location code table and axis labels

ACE10098175



ALASKA PENINSULA

ACE10098177



ACE10098179

SOUTHEAST

ACE10098181

DELIVERY ORDER

R ADFG-Supply, P.O. Box 3-2000
M Juneau AK 99802-2000

D.O. 931410

SHIP TO: ALASKA DEPARTMENT OF FISH & GAME
Division of Commercial Fisheries
333 Raspberry Road
Anchorage, AK 99518-1599
Fred Jamsen 267-2134

DATE DELIVERY REQUIRED AT DESTINATION: 30 days ARO/Less
DATE OF ORDER: October 21, 1987
F.O.B. POINT: Final Destination
AGENCY REQUISITION NO./STOCK REQUEST: 11-165-88
ORDER ISSUED IN ACCORDANCE WITH QUOTES: BID
Exp. Date
Dated 10/20/87

CONTRACTOR
COMPANY CONTACT NAME: Bruce
TELEPHONE NUMBER: 456-2281
GSS Vendor Code
Eric Fr-cables
THE COMPUTER CENTER, INC.
1603 College Road
Fairbanks, AK 99709
Anch 279-5558 Scott

Order is Based On: ☐ Air Parcel Post ☐ Surface Parcel Post ☐ Other - See Te
Shipment Via: ☑ Air Freight ☐ Surface Freight ☐ Vendor's Choi

SHIPPING INSTRUCTIONS
D.O. [illegible]
SHIP PREPAID BEST WAY

Note: This order constitutes a binding commitment between the state and the contractor listed hereon. Unauthorized modification without the expressed prior approval of the purchasing authority will result in a financial obligation on the contractor and/or unauthorized state personnel making the change.

ITEM NO.	COMMODITY CODE	QUANTITY ORDERED	UNIT OF MEASURE	DESCRIPTION (Note: Include C.A. item number if appropriate)	UNIT PRICE	EXTENDED PRICE
1.		1	ea	FUJITSU IMAGEGRAPH PLOTTER: Model B, (11"x17"), FPG-315-101. 6-pen		1,139.0
2.		1	pkg	FUJITSU PENS: Multi-color, ball point, FPG-300-701-10.		9.0
3.		1	ea	CABLE: 9', male 9 pin to female, RS-232-C Connector. ~~for IBM-AT~~		47.0
4.		1	ea	CABLE: 9', male 25 pin to female, RS-232-C Connector ~~for IBM~~-PC		47.0

RETURN THIS COPY DIRECTLY TO SUPPLY

DATE REC'D 14Dec87 TYPE OF ITEM PLOTTER
MAKE FUJITSU MODEL FPG-315-101
SIZE B (11X17) COLOR BEIGE
SERIAL NUMBER 00400
PROPERTY DIVISION
INVENTORY CODE 11 LOCATION OF PROPERTY ANCHORAGE
PERSON PROPERTY ASSIGNED TO FRED JAMSEN

~~CONFIRMING TELECON ORDER-Do not duplicate~~

SEND INVOICE IN DUPLICATE TO: ~~ADFG-Supply, P.O. Box~~ 3-2000
Juneau AK 99802-2000

PAGE 1 OF PAGES
TOTAL OF ALL PAGES $ 1,242.0

REF	TYPE	NUMBER	AMOUNT	DATE	COMMENTS
1	PVN				
2	DO	931410			
3	en	1181118			
4					

FIN	AMOUNT	SY	CC	PGM	LC	ACCT	FY	NAR OBJ	NAR UG
1	1242.00	88	11000021	41710	11006001	75797			
2									
3									
4									

PURCHASING AUTHORITY NAME: Gerlad L. White
TITLE: Supply Officer
PURCHASING AUTHORITY'S SIGNATURE
TELEPHONE NUMBER: (907) 465-4130

IMPORTANT:

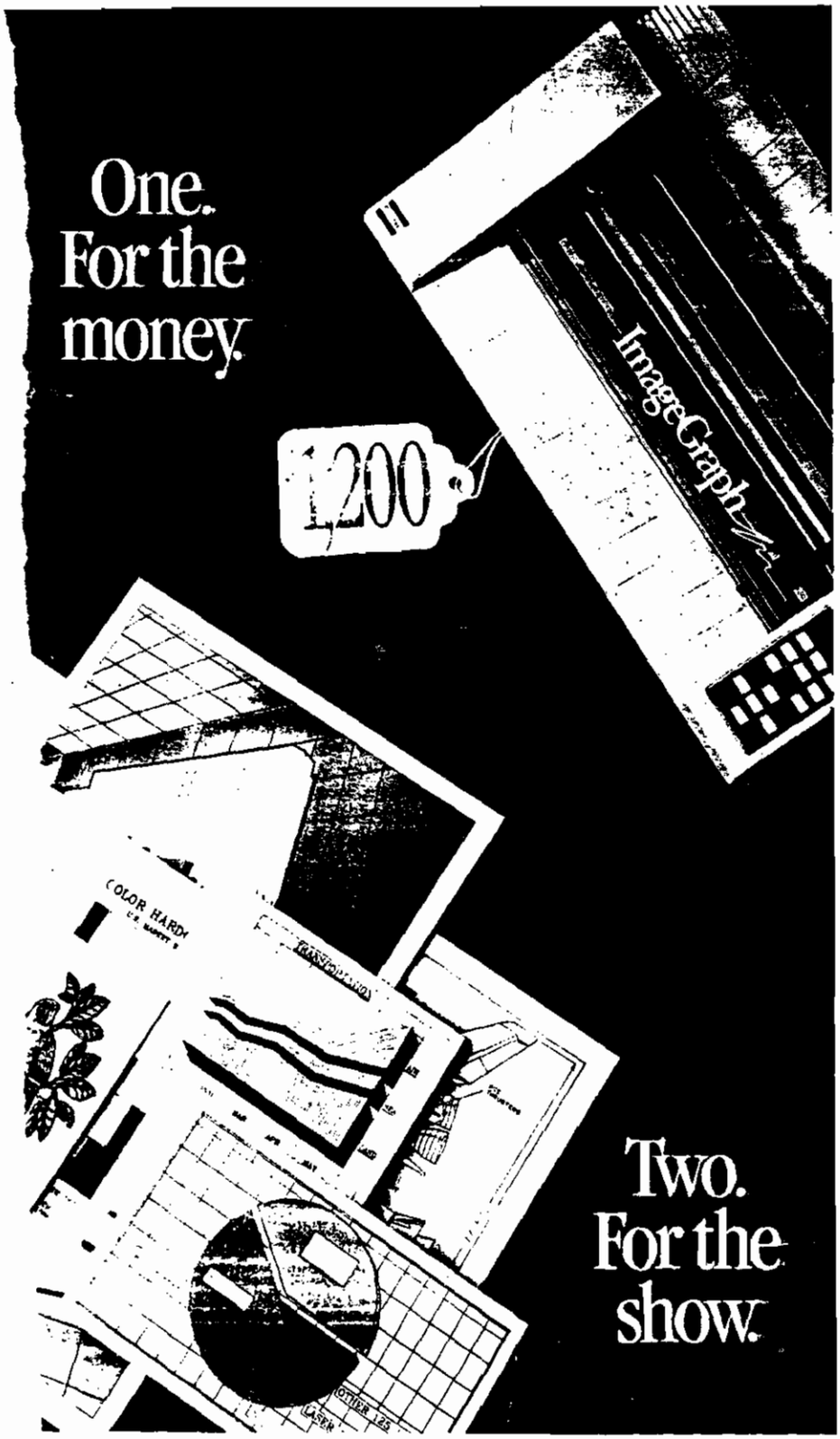
1. D.O. number and receiving agency name must appear on all invoices and documents relating to this order.
2. Do not overship or substitute.
3. Receipted freight bills must accompany all claims for freight charges.
4. The state is registered for tax free transactions under Chapter 32, IRS code. Registration number 92-601185. Items are for the exclusive use of the state and not for resale.

02-601 (Rev. 6-85)

CONTRACTOR

ACE10098183

Two good reasons to buy Fujitsu's pen plotter.



Now there's a pen plotter that can improve your company's image and bottom line. The new ImageGraph™ pen plotter from Fujitsu.

It's 100% compatible with the HP-7475,™ but with some big differences. Like a price that's 35% less, and performance unmatched by any other pen plotter in its class.

In fact, to get the colors, resolution and versatility of ImageGraph in any competitive system, you'd probably have to spend an extra $1000.

Reports, proposals, transparencies. Just about any kind of presentation will be more effective with ImageGraph. Its six pens and 0.025mm resolution will make your company's ideas look brilliant. On a variety of paper types. And in sizes from postcards to 11½ by 32 inches. Not bad for a machine that's quieter and takes up half the desk space of the HP-7475.

ImageGraph works with all popular software packages, including spreadsheets, business graphics and CAE/CAD programs. And it runs these programs faster and easier than any comparable plotter.

So take a closer look at what ImageGraph can do for your company's image, and budget. For a free brochure and location of your nearest distributor, call us today. You'll find it doesn't have to cost a lot of money to put on a really great show.

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Inside California call
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Circle 67 on Reader Card

ACE10098185

APPENDIX I.1

ACE10098187

Copper River Escapement Stream Numbering List
05/07/86

Stream No.	Stream Name	M/R/S
0000	Mountain Slough to Miles Lake Inlet	
0100	Mountain Slough	
0200	Eyak River	M
0220	Eyak Lake	MRS
0250	Hatchery Creek	S
0260	Power Creek	MS
0270	Ibek Creek	S
0300	Little Glacier Slough	
0320	Scott Glacier Stream	
0330	Scott Lake	
0340	Bear Lake	
0400	Big Glacier Slough	
0420	Sheridan Glacier Stream	
0440	Teidemans Slough	
0450	19 Mile Creek	
0500	Alaganik Slough	
0520	McKinley Creek	M
0530	McKinley Lake	RS
0540	Salmon Creek	S
0560	26/27 Mile Creek	S
0600	Pete Dahl Slough	
0620	Walhalla	
0640	Gus Stevens	
0660	King Salmon	
0700	Castle Island Slough	
0800	Storey Slough	
0900	Flag Point to Goodwin Glacier	
0950	Goodwin Glacier to Miles Lake Inlet	M
0990	Miles Lake west side	
1000	Miles Lake Inlet to/including Tonsina R.	M
1100	Miles Lake Inlet to Tasnuna River	M
1180	Whiting Falls Creek	S
1200	Tasnuna River	MS
1300	Tasnuna River to Tiekel River	M
1390	Tiekel Lake	S
1400	Tiekel River	
1410	Tiekel River to Tsina Fork	
1420	Tiekel River above Tsina Fork	
1450	Tsina River	
1470	Ptarmigan Creek	
1490	Stuart Creek	
1500	Tiekel River to Wood Canyon	M
1530	Uranatina River	S
1560	Haley Creek Tagging Site	
1580	Haley Creek	
1600	Wood Canyon to Chitina Bridge	M
1620	Pink Box Recovery Site	
1640	O'Brien Creek	
1660	O'Brien Creek to Salmon Point	M
1670	Chitina Creek, Town Lake	
1680	Salmon Point to Chitina Bridge	M
1700	Chitina Bridge To Chitina Airport 5 Mile	M
1750	Chitina Airport 5 Mile to Tonsina River	M
1790	Lower Tonsina Creek	S

ACE10098189

27	1973	06/25	4	0	4	0	0	0	0	0	0	0	0	0	0	
28		[illegible]2	200	0	200	0	0	[illegible]	0	0	0	0	0	0	0	
29		[illegible]8	225	0	225	0	0	0	0	0	0	0	0	0	0	
30		08/06	225	0	225	0	0	0	0	0	0	0	0	0	0	
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Name: Eyak Lake

Ref No	Obsr	Agncy	Meth	Conditions S	W	R	Time	Comments
1	PF	ADFG	A	0	5	0	0	Milky
2	PF	ADFG	A	0	5	0	0	Milky
3	PF	ADFG	A	0	5	0	0	Milky
4	PF	ADFG	A	0	5	0	0	Milky
5	PF	ADFG	A	0	0	0	0	
6	PF	ADFG	A	0	0	0	0	
7	PF	ADFG	A	0	0	0	0	
8	PF	ADFG	A	0	0	0	0	
9	PF	ADFG	A	0	0	0	0	
10		ADFG	A	0	0	0	0	All surveys made by Cordova office. (unless noted otherwise)
11		ADFG	A	0	0	0	0	
12		ADFG	A	0	0	0	0	Low counts, murky water and gusty winds.
13		ADFG	G	0	0	0	0	On beaches.
14		ADFG	A	0	0	0	0	
15		ADFG	A	0	0	0	0	
16		ADFG	A	0	0	0	0	
17		ADFG	A	0	0	0	0	
18		ADFG	A	0	0	0	0	
19		ADFG	A	0	0	0	0	Turbid.
20		ADFG	A	0	0	0	0	Overcast, bad glare.
21		ADFG	A	0	0	0	0	
22		ADFG	G	0	0	0	0	(Ellison)
23		ADFG	A	0	0	0	0	
24		ADFG	A	0	0	0	0	
25		ADFG	A	0	0	0	0	Milky colored.
26		ADFG	A	0	0	0	0	Muddy.
27		ADFG	A	0	0	0	0	
28		ADFG	A	0	0	0	0	Murky.
29		ADFG	A	0	0	0	0	murky.
30		ADFG	A	0	0	0	0	
31		ADFG	G	0	0	0	0	Low count.

ACE10098191

APPENDIX J.1

ACE10098193

INTRODUCTION

The future of Upper Cook Inlet research programs can take many directions as the geographical size of the area and biological complexity combine to create unlimited opportunities. However, the resources available for investigation are limited and priorities for research must be made. In addition, the long term direction of research in Upper Cook Inlet has never been defined. Short term objectives have in some instances reallocated funds and personnel to projects whose merits have been suspect. This has resulted in the potential loss of useful data. Therefore the Upper Cook Inlet staff has prepared the following five year research plan to aid managers and the public in planning the allocation of personnel and budgets. The plan is presented in two phases. First, the staff realized that recent budget reductions have established a defacto priority and therefore the continuation of these projects is recognized. However, within these projects technical improvements are necessary and recommendations on how to proceed are made. In addition, a number of new projects are suggested which will provide a long term data base which will hopefully result in new commercial fishery management options and direction.

Acc 10098194-B

5. The ultimate objective of this research effort is to improve the estimate of the number of adult salmon entering the various river systems. In this context a number of assumptions about fish behavior have been made. For example, the existing Bendix counting operation must assume that all targets are moving upstream and that no downstream movement of counted targets has taken place. However, examination of this assumption in the mainstem Susitna River (BioSonics) indicated that downstream movement may be significant. In addition, the Bendix equipment requires a measurement of fish swimming speed and is presently limited to a counting range of 18 meters from the transducer. Therefore, it is recommended that the migratory behavior of adult sockeye salmon in the vicinity of the counting operations be assessed relative to upstream/downstream movement, horizontal distribution by species, and swimming speed.

ACE10098195

OBJECTIVE: to improve the precision and accuracy of the estimate of the sockeye salmon production by river system in the commercial harvest in Upper Cook Inlet.

RECOMMENDATION AND JUSTIFICATION:

1. the existing stock separation models require representative samples from the river systems of interest. In this context a number of issues have been identified which questions the validity of the models. **It is therefore recommended that a reevaluation of model selection, representative value, and overall accuracy of the procedure be undertaken and modification of that procedure be implemented if warranted.**

2. the findings of item 1 above may require that the historical data base be adjusted or recalculated. If the results indicate a significant deviation from published data the historical data base should be readjusted.

3. the geographical distance of the Susitna River from the primary fishery ~~has~~ combined with delayed run timing of sockeye salmon migrating to that system to limit the "inseason" usefulness of the stock separation program. Therefore **it is recommended that this issue be examined relative to historical models and the use of recently developed bootstrap techniques.**

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that a minor system sampling program be identified and implemented.

OBJECTIVE: to develop and implement an adult and juvenile sockeye salmon production model for the Susitna River drainage.

RECOMMENDATION AND JUSTIFICATION:

1. the Susitna River system is probably the most complex river system in Upper Cook Inlet. The number of sockeye salmon rearing lakes are known to number at least 15 with significant differences between them in terms of physical and chemical characteristics. The overall sockeye salmon production is the net results of both environmental and biological limitations within these systems. To date no data have been collected on the Susitna River subsystems relative to sockeye salmon production. **Therefore it is recommended that a subsystem evaluation program consisting of counting of adult salmon and estimating freshwater juvenile salmon production by subsystem be developed.** The form of this program is envisioned to consist of weir, tower, or hydroacoustic counting of adults, hydroacoustic enumeration of juveniles within the rearing lakes, and collection of associated limnological data.

2. the total production of adult sockeye salmon from the Susitna drainage has been estimated from combining escapement estimates from mainstem sonar with estimates of harvest from the stock separation program. In this context the escapement estimates have not been verified by any technique and in some years mainstem counting operations have been terminated because of the physical limitations of the Susitna River environs. Alternate counting techniques to sonar have been proposed and implemented in some years (e.g. fish wheel and mark/recapture estimates) by other investigators (Susitna Hydroelectric Studies). However, a full evaluation of these methods has not been made. Preliminary evaluation of collected data has indicated technical difficulties with meeting assumptions associated with the population estimate technique. Therefore **it is recommended that a full evaluation of historical data be completed relative to the usefulness of fish wheel/mark-recapture techniques. In addition,** it is recommended that mainstem sonar techniques be further evaluated for long term escapement monitoring.

ACE10098199

NEW PROGRAMS

1. Computer Data Base for Escapement Information. Presently within Upper Cook Inlet the harvest data is compiled in User Friendly computer format for use by the staff and public. This feature has allowed various offices to generate and meet public and scientific needs in a time efficient manner and without duplication of effort involving Area staff. Therefore it is the opinion of the Research staff that a similar program be developed for all Upper Cook Inlet escapement data. It is estimated that this task would not require more than 1-2 man months of effort.

2. Analysis of Commercial Harvest Data.
The historical harvest data have only been partially examined for run timing analysis and interaction between fisheries. Therefore it is recommended that substatistical area analysis and relationships be evaluated for potential use in developing management options and research program development.

3. Climatic and Hydrological Data Base Development. The production of sockeye salmon and other salmon species in Upper Cook Inlet is without question influenced by the climatic and hydrological regimes of the area. Therefore it is recommended that these data are stored and accessed through User Friendly programs similar to the harvest data. Recent evaluation of sockeye salmon production in Tustumena Lake has reenforced the importance of collecting and analysis of these data Inlet wide.

4. Evaluation of Eastside Set Net Fishery. The continuing expansion of the eastside set gill net fishery and allocation conflict between user groups requires precise information on the operation of that fishery. The relationship of harvest data to effort and interaction between species has not been defined. Therefore it is recommended that a program to define the specific operational characteristics of the eastside set gill net fishery be defined.

5. Marine Environment-Oceanographic Studies and Salmon Migratory Behavior Within Upper Cook Inlet the development of sonar counting techniques in the Kenai and Kasilof Rivers was a major technical achievement which furthered the ability of the Department to meet management objectives. While salmon counting within the various river systems is still developing with more accurate and precise techniques it is unlikely that these refinements will significantly alter management options. In order words a technical plateau has been reached. It is the opinion of the research staff that the next major advancement in management options will achieved in the understanding of the marine environment the migratory behavior of salmon to that environment. Therefore this program recommendation is to continue to develop programs which help to understand the physical and chemical

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