



Wildlife Resources Agency
DEPARTMENT OF FISH AND GAME

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GRAY DAVIS, Governor



March 14, 2000

REF 90419

Mr. William Hogarth, Director
Southwest Region
National Marine Fisheries Service
501 West Ocean Boulevard, Room 4200
Long Beach, California 90802-4213

Attention Mr. James J. Morgan

Dear Mr. Hogarth:

Enclosed are three copies each of the annual reports for Study 1 (Ocean Salmon Project) and Study 2 (Klamath River Project) of our Salmon and Steelhead Research, Management and Enhancement Project (AFC-16, Award Number, NA76FA0296). The reports cover the period of July 1, 1998 - June 30, 1999.

If you have any questions regarding these reports, please contact Senior Biologist Supervisor (Marine/Fisheries) Neil Manji at (530) 225-2306.

Sincerely,

Donald B. Koch
Regional Manager

Enclosures

cc: Mr. Gene Fleming, Chief
Fisheries Programs Branch
Department of Fish and Game
Sacramento, California

Messrs. Gary Stacey and Neil Manji
Northern California-North Coast Region
Department of Fish and Game
Redding, California

Conserving California's Wildlife Since 1870

REF 90419

FINAL
PERFORMANCE REPORT

STATE: California

AWARD NUMBER: NA76FAO296

PROJECT TYPE: Anadromous Fish - Research

PROJECT TITLE: Salmon and Steelhead Research, Management and
Enhancement Project

PERIOD COVERED: July 1, 1998 - June 30, 1999

Study 1. Ocean Salmon Project

Job 1. Ocean Commercial Salmon Fishery Monitoring and Evaluation

Job 2. Ocean Recreational Salmon Fishery Evaluation

Prepared by: Ocean Salmon Project

Cooperator: California Department of Fish and Game

Address: 1528 Healdsburg Avenue
Healdsburg, California 95448

1998 OCEAN SALMON FISHERIES ANNUAL REPORT

INTRODUCTION

The Ocean Salmon Project (OSP) of the Department of Fish and Game (DFG) is responsible for estimating annual salmon landings and effort in California's commercial and recreational ocean salmon fisheries. In addition, the OSP determines the contribution of coded-wire tagged (CWT) salmon to the commercial and recreational fisheries for use in ocean and inland management efforts. The project also conducts ocean fishery research and provides technical assistance to the Klamath Fishery Management Council (KFMC) as the KFMC continues to work toward the development and refinement of the Klamath Ocean Harvest Model.

A general description of the stratified random sampling model developed by the OSP to estimate ocean salmon landings and fishing effort is presented in a DFG report entitled "Outline of California Department of Fish and Game's Current Program for Estimating Ocean Landings of Coded-Wire Tagged Salmon" (Boydston *et al.*, 1982). A detailed description of these methods can be found in the DFG report entitled "Summary of Methods Used to Estimate the California Ocean Salmon Catch and the Coded-Wire Tag Contribution for 1993."

The California ocean salmon harvest and CWT catch statistics for 1998 were extrapolated from data collected by the OSP's fishery sampling programs combined with information obtained from commercial landing receipts and charter boat logbooks. In California, commercial dealers are required by law to submit landing receipts to the DFG for all salmon purchased. Captains on commercial passenger fishing vessels (CPFVs aka charter boats) are required to submit logs each month that document their fishing activities on a daily basis.

The fishery sampling programs are designed to sample at least 20 percent of all salmon (chinook and coho¹) landed by ocean commercial (troll) and recreational (charter boat and skiff) fisheries in California. Five major port areas are sampled between the Oregon border and Pt. Conception: Crescent City, Eureka, Fort Bragg, San Francisco and Monterey (Figure 1). Each of these port areas consist of several smaller "minor ports" where salmon landings occur (Table 1).

In 1998, commercial fishing for all salmon except coho was allowed statewide in California except for the area between Horse Mountain and the Humboldt south jetty. Sampling of commercial landings occurred in all major port areas during their respective seasons (Table 2).

1. Commercial and recreational landings of coho salmon were prohibited in California during the 1998 season.

Table 1. Sampling activity at major port areas in California and their associated minor ports, 1998.

| Major Port | Minor Port | Commercial Troll | Recreational Skiff | Charter Boat |
|---------------|--------------------------------|------------------|--------------------|--------------|
| Crescent City | | | | |
| | Crescent City launch ramp | - | X | - |
| | Crescent City skiff docks | - | X | X |
| | Crescent City commercial docks | X | - | - |
| Eureka | | | | |
| | Field's Landing | X | X | - |
| | King Salmon | X | X | X |
| | Trinidad launch hoist | X | X | - |
| | Trinidad floating docks | - | X | X |
| Fort Bragg | | | | |
| | Fort Bragg/Noyo | X | X | X |
| | Shelter Cove | X | X | X |
| | Albion | - | X | - |
| San Francisco | | | | |
| | Princeton | X | X | X |
| | San Francisco | X | - | X |
| | Berkeley/Emeryville | - | X | X |
| | Sausalito | X | X | X |
| | Bodega Bay | X | X | X |
| Monterey | | | | |
| | Santa Cruz | X | X | X |
| | Moss Landing | X | X | X |
| | Monterey | X | X | X |
| | Morro Bay | X | X | X |
| | Avila/Port San Luis | X | X | X |

In 1998, recreational fishing for all salmon except coho was allowed statewide in California (Table 2). Minor ports for the recreational skiff fishery were generally launch ramps or hoists within the port area where samplers could interview all sport anglers landing at the site during a sample day. Minor ports for the charter boat fishery were all docks within a port area where recreational salmon fishing trips were made by commercial passenger fishing vessels.

PROCEDURES

Sampling

Sampling was stratified into bimonthly time periods for all fisheries. Commercial landings were sampled generally on an opportunistic basis--the field sampler had to find out when and where local commercial landings of salmon were expected and was responsible for sampling ≥ 20 percent of all commercial landings (by weight) in his/her port area. A sample unit was the total catch of salmon by a commercial troller returning from a single or multiday trip. Data collected included total number and pounds of salmon landed, number of days fished, ocean catch area, gear used, number of shakers (sublegal salmon) released and number of sea lion encounters. In addition, the sampler would measure the fork length (millimeters [mm]) and take the head from any marked salmon (adipose fin-clipped) so that the CWT could be retrieved and decoded at OSP's Healdsburg laboratory.

In addition to bimonthly sampling periods, recreational skiff sampling was stratified into weekday and weekend/holiday periods. Each month, field samplers were given a precise schedule to follow (i.e., sample a specific minor port on a certain day). The schedule was created so that all minor ports within a major port area were randomly sampled for each sampling period. Samplers were instructed to interview all skiff fishermen who landed at their assigned minor port area during a sample day and to keep a tally of nonsalmon boats and any boats missed. In addition, charter boats were sampled on an opportunistic basis such that ≥ 20 percent of all charter boats landing in a minor port were sampled during each sampling period. Data collected from both skiffs and charter boats included the total number of anglers fishing, total number of salmon caught, number of shakers released and number of salmon taken by sea lions. As in commercial sampling, the sampler would measure the fork length (mm) and retain the head from any marked salmon.

Catch Estimations

The total number of salmon landed by the commercial fishery within a time and port stratum was estimated by dividing the total pounds landed (as reported by dealers on Department landing receipts) by an average weight ratio. This weight ratio was calculated by dividing the total pounds of salmon sampled by the total number sampled within the same time and port stratum.

Table 2. Commercial and recreational regulations for California ocean salmon fishing in 1998.

| Fishery Area | Open Season | Minimum Size Limit* | Salmon Species | Quota (# of Salmon) | Special Restrictions |
|-----------------------------|------------------|---------------------|-----------------|---------------------|--|
| Commercial | | | | | |
| Oregon to S. Humboldt Jetty | Sept. 1-30 | 26" TL | All except coho | 6,000 | Maximum 6 lines/boat; barbless hooks; landing limit: 30 salmon/day; all salmon must be landed within area; Klamath Conservation Zone closed. |
| Horse Mt. to Pt. Arena | Sept. 1-30 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| Pt. Arena to Pt. Reyes | July 16-Sept. 30 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| Ft. Ross to Pt. Reyes | July 5-31 | 26" TL | All except coho | 3,000 | Maximum 6 lines/boat; barbless hooks; landing limit: 30 salmon/day; all salmon must be landed within area; open only within 6 nautical miles of shore. |
| Pt. Reyes to Pt. San Pedro | July 1-Sept. 30 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| Pt. San Pedro to Pt. Sur | May 1-31 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| | June 16-Sept. 30 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| Pt. Sur to Mexico Border | May 1-Sept. 30 | 26" TL | All except coho | None | Maximum 6 lines/boat; barbless hooks. |
| Recreational | | | | | |
| Humboldt Mt. (Oregon) to | May 23-June 10 | 20" TL | All except coho | None | Barbless hooks required; 1 salmon/day; no more than 4 salmon/7 days; Klamath Conservation Zone closed. |
| Horse Mt. (Klamath | June 21-July 5 | 20" TL | All except coho | None | |
| Management Zone) | Aug. 11-Sept. 13 | 20" TL | All except coho | None | |
| Horse Mt. to Pt. Arena | Feb. 14-July 5 | 24" TL | All except coho | None | Barbless hooks required**; 2 salmon/day. |
| | Aug. 11-Sept. 13 | 24" TL | All except coho | None | Barbless hooks required**; 2 salmon/day. |
| Pt. Arena to Pigeon Pt. | March 28-Nov. 1 | 24" TL*** | All except coho | None | Barbless hooks required**; 2 salmon/day. |
| Pigeon Pt. to Mexico Border | March 14-Sept. 7 | 24" TL | All except coho | None | Barbless hooks required**; 2 salmon/day. |

* Minimum size limit is in total length (TL).

** When fishing north of Pt. Conception with bait and by any other means than trolling, barbless circle hooks required.

*** No size limit in effect July 1-Sept. 7 between Pigeon Pt. and Pt. Arena.

The total number of salmon landed by the recreational skiff fishery within each time and port stratum was estimated by dividing the total number of salmon sampled by a sampling ratio. This ratio was derived by dividing the number of minor ports sampled to the total number of minor ports available for sampling within the same time and port stratum. In addition, the ratio of salmon to nonsalmon boats was used to determine the contribution of unknown boats to the fishery.

The contributions of tagged salmon to both the commercial and recreational fisheries were estimated by multiplying the number of CWTs sampled in each fishery by an expansion factor. This expansion factor was derived by dividing the total number of salmon landed by the total number of salmon sampled within a fishery, corrected for any heads observed but not recovered and any CWTs lost during processing. The estimated contribution of CWTs to each fishery (by binary code, port area and time period) were forwarded to the Pacific States Marine Fisheries Commission (PSMFC) who maintains a database of all Pacific coast tag returns.

RESULTS

Observations

An estimated 226,900 chinook salmon were landed commercially during 1998; the majority of these fish were landed in San Francisco and Monterey port areas (Table 3). Project staff sampled 62,315 chinook salmon statewide, approximately 27 percent of the estimated total landings (Table 3). Since it was illegal to commercially land coho salmon in California during 1998, coho were not observed in the fishery.

An experimental commercial fishery was conducted in the Bodega Bay area to determine if fishing inside six miles of shore between Fort Ross and Point Reyes would reduce the number of Klamath salmon landed that the fishery has historically landed fishing outside six miles. If this "inside" fishery had a significantly lower impact on Klamath chinook than what had been historically landed fishing outside six miles, inshore fisheries could be used to increase commercial fishing opportunities in Bodega Bay. Although fishing was relatively slow and the 3,000 fish quota wasn't met, our project collected almost 900 tissue samples for genetic stock identification to be conducted by National Marine Fisheries Service geneticists in Seattle.

Approximately 122,200 chinook salmon were landed by the recreational fishery during 1998; most of the recreational catch and fishing effort occurred in the San Francisco and Monterey port areas (Table 4). In the skiff fishery, samplers interviewed 17,347 anglers who landed 12,450 salmon (Table 5). In the charter boat fishery, samplers interviewed 20,267 anglers and sampled 17,153 salmon (Table 5). Overall, over 24 percent of the total recreational catch in 1998 were sampled (Table 5).

During 1998, OSP samplers collected the heads from 6,103 tagged salmon observed during monitoring. In the commercial fishery, 4,052 CWTs were retrieved (Tables 3, 6) and 2,051 CWTs recovered in the recreational fishery (Tables 5, 6).

ESTIMATIONS/COMPARISONS

Commercial Fishery

In 1998, the California commercial fishery landed over 1.8 million pounds of chinook salmon with an exvessel value of \$3.1 million (Table 3). The average exvessel price paid to the fishermen during the season was \$1.66 per pound. The total number of salmon landed was estimated to be 226,900 and fishing effort (days fished) totaled 12,800 days. This represents a 53 percent reduction in total fish landed compared to 1997 landings. In addition, fishermen spent less time fishing in 1998 than in the previous season; days fished dropped 31 percent from the 18,700 days fished in 1997. The reduction in both catch and effort was due primarily to both a scarcity of salmon and poor fishing conditions in California waters caused by El Niño. In addition, average salmon size (8.0 pounds) was well below the average observed during the last 10 years (10.3 pounds) and was the second lowest average weight recorded during the 22 years (note: the lowest average weight recorded was 7.3 pounds and occurred during the 1983 El Niño).

Recreational Fishery

In 1998, the California recreational fishery landed approximately 122,200 salmon during 151,700 angler days fished (Table 5). Both catch and effort were reduced due to the extremely rough sea conditions and a scarcity of salmon near shore due to El Niño. Anglers on private skiffs fished approximately 84,700 days and landed 62,300 salmon; anglers on charter boats fished 59,900 days and retained 59,900 salmon.

CWTs

Heads from 6,103 tagged salmon were collected by project staff and processed in the Healdsburg laboratory. Almost seven percent of all the salmon observed during project monitoring were tagged. This is more than three times the frequency of tagged fish observed in 1995 (Tables 3, 5) and is due to increasing tagging rates at California hatcheries. Most CWTs were collected from the commercial fishery in San Francisco and Monterey port areas (Table 6). The CWTs were retrieved, decoded and verified by project staff in the Healdsburg laboratory. The final 1998 CWT database was sent to the PSMFC in Oregon.

Table 3. Ocean salmon catch and sampling statistics for 1998 California commercial troll fishery.

| Year(s) | # Chinook Salmon | # Days Fished | Chinook Pounds Landed | Exvessel \$ Value | Sampling Effort | | | |
|-------------------------------|------------------------|------------------|-----------------------------|-------------------------|-----------------|--------------|--------------|-------------|
| | | | | | # Sampled | % Sampled | # CWTs | % CWT |
| 1998 | | | | | | | | |
| Crescent City | 100 | <50 | 1,000 | - | <50 | - | 0 | - |
| Eureka | 2,400 | 200 | 20,000 | - | 1,219 | 50.8% | 38 | 3.1% |
| Fort Bragg | 2,900 | 300 | 35,000 | - | 625 | 21.6% | 20 | 3.2% |
| San Francisco | 126,100 | 6,800 | 1,080,000 | - | 33,782 | 26.8% | 1,913 | 5.7% |
| Monterey | 95,400 | 5,500 | 709,000 | - | 26,689 | 28.0% | 2,081 | 7.8% |
| TOTAL | 226,900 | 12,800 | 1,845,000 | \$3,060,000 | 62,315 | 27.5% | 4,052 | 6.5% |
| 1997 | 487,500 | 18,700 | 5,200,100 | \$ 7,200,000 | 151,325 | 31.0% | 7,393 | 4.9% |
| 1996 | 380,600 | 21,100 | 4,113,000 | \$ 5,984,000 | 91,760 | 24.1% | 3,854 | 4.2% |
| 1995 | 679,300 | 25,800 | 6,633,500 | \$11,693,000 | 181,410 | 26.7% | 3,163 | 1.7% |
| 1994 | 295,600 | 21,200 | 3,103,000 | \$ 6,437,000 | 58,123 | 19.7% | 1,162 | 2.0% |
| 1993 | 279,600 | 25,900 | 2,536,900 | \$ 5,707,000 | 56,289 | 20.1% | 818 | 1.5% |
| 1992 | 163,400 | 20,300 | 1,632,100 | \$ 4,505,000 | 32,032 | 19.6% | 303 | 0.9% |
| 1988-1992 (5-year average) | 545,960 | 46,980 | 5,782,600 | \$16,204,000 | - | - | - | - |

Table 4. California ocean salmon recreation landings in 1998 by port area and month.

| Month | Monterey | | | San Francisco | | | Fort Bragg | | | Eureka | | | Crescent City | | | California Total | | |
|-----------|----------|-----------|------|---------------|-----------|------|------------|-----------|------|----------|-----------|------|---------------|-----------|------|------------------|-----------|------|
| | # Salmon | # Anglers | CPUE | # Salmon | # Anglers | CPUE | # Salmon | # Anglers | CPUE | # Salmon | # Anglers | CPUE | # Salmon | # Anglers | CPUE | # Salmon | # Anglers | CPUE |
| February | closed | closed | - | closed | closed | - | - | - | - | closed | closed | - | closed | closed | - | 0 | 0 | - |
| March | 2,900 | 5,900 | 0.5 | 100 | 200 | 0.5 | <50 | 100 | - | closed | closed | - | closed | closed | - | 3,000 | 6,200 | 0.5 |
| April | 9,400 | 10,700 | 0.9 | 3,700 | 7,000 | 0.5 | - | - | - | closed | closed | - | closed | closed | - | 12,100 | 17,700 | 0.7 |
| May | 10,300 | 11,200 | 0.9 | 4,400 | 5,800 | 0.8 | 600 | 1,000 | 0.6 | 500 | 1,900 | 0.3 | 200 | 700 | - | 16,000 | 20,600 | 0.8 |
| June | 11,000 | 12,200 | 0.9 | 12,300 | 13,600 | 0.9 | 500 | 2,300 | 0.2 | 500 | 1,800 | 0.3 | 700 | 1,500 | 0.5 | 25,000 | 31,400 | 0.8 |
| July | 9,000 | 10,100 | 0.9 | 27,400 | 23,100 | 1.2 | 700 | 500 | 1.4 | 200 | 600 | 0.3 | 100 | 500 | 0.2 | 37,400 | 34,800 | 1.1 |
| August | 900 | 1,900 | 0.5 | 17,600 | 20,800 | 0.8 | 2,200 | 3,300 | 0.7 | 500 | 2,000 | 0.3 | 100 | 600 | 0.2 | 21,300 | 28,600 | 0.7 |
| September | 100 | 300 | 0.3 | 3,700 | 6,900 | 0.5 | 700 | 1,100 | 0.6 | 100 | 500 | 0.2 | <50 | 100 | - | 4,600 | 8,900 | 0.5 |
| October | closed | closed | - | 1,800 | 3,500 | 0.5 | <50 | <50 | - | closed | closed | - | closed | closed | - | 1,800 | 3,500 | 0.5 |
| November | closed | closed | - | closed | closed | - | - | - | - | closed | closed | - | closed | closed | - | 0 | 0 | - |
| TOTAL | 43,600 | 52,300 | 0.8 | 71,000 | 80,900 | 0.9 | 4,700 | 8,300 | 0.6 | 1,800 | 6,800 | 0.3 | 1,100 | 3,400 | 0.3 | 122,200 | 151,700 | 0.9 |

Table 5. Ocean salmon catch and sampling statistics for 1998 California recreational fishery.

| Year(s) | Recreational Catch | | Sampling Effort | | | | |
|-------------------------------|--------------------|----------------|------------------|------------|------------------|-------------|-------------------|
| | # Salmon | # Anglers | # Salmon Sampled | % Sampled | # CWTs Collected | % Tagged | # Anglers Sampled |
| 1998 | | | | | | | |
| Private Skiffs | 62,300 | 84,700 | 12,450 | 20% | 860 | 6.9% | 17,347 |
| Charter Boats | <u>59,900</u> | <u>67,000</u> | <u>17,153</u> | 29% | <u>1,182</u> | 6.9% | <u>20,267</u> |
| TOTAL | 122,200 | 151,700 | 29,603 | 24% | 2,042 | 6.9% | 37,614 |
| 1997 | 229,400 | 234,300 | 50,211 | 22% | 3,043 | 6.1% | 49,403 |
| 1996 | 164,100 | 225,500 | 33,107 | 20% | 2,176 | 6.6% | 45,324 |
| 1995 | 397,200 | 378,500 | 88,056 | 22% | 2,360 | 2.7% | 81,524 |
| 1994 | 183,200 | 189,900 | 47,328 | 26% | 872 | 1.8% | 52,415 |
| 1993 | 110,000 | 174,900 | 28,973 | 26% | 786 | 2.7% | 59,210 |
| 1992 | 73,600 | 127,900 | 25,269 | 34% | 261 | 1.0% | 46,790 |
| 1988-1992 (5-year average) | 130,440 | 212,780 | - | - | - | - | - |

Table 6. CWTs recovered by major port and fishery, 1998.

| Fishery | Chinook | | Coho | | Total | |
|----------------------------|--------------|------------|-----------|------------|--------------|------------|
| | CWTs | % Total | CWTs | % Total | CWTs | % Total |
| Crescent City | | | | | | |
| Private Skiff | 13 | | 0 | | 13 | |
| Charter Boat | 0 | | 0 | | 0 | |
| Commercial | <u>0</u> | | <u>0</u> | | <u>0</u> | |
| Port Total: | 13 | 0% | 0 | 0% | 13 | 0% |
| Eureka | | | | | | |
| Private Skiff | 19 | | 1 | | 20 | |
| Charter Boat | 2 | | 0 | | 2 | |
| Commercial | <u>38</u> | | <u>0</u> | | <u>38</u> | |
| Port Total: | 59 | 1% | 1 | 10% | 60 | 2% |
| Fort Bragg | | | | | | |
| Private Skiff | 67 | | 1 | | 68 | |
| Charter Boat | 18 | | 0 | | 18 | |
| Commercial Troll | <u>20</u> | | <u>0</u> | | <u>20</u> | |
| Port Total: | 105 | 2% | 1 | 10% | 106 | 2% |
| San Francisco | | | | | | |
| Private Skiff | 377 | | 6 | | 383 | |
| Charter Boat | 967 | | 0 | | 967 | |
| Commercial Troll | <u>1,913</u> | | <u>0</u> | | <u>1,913</u> | |
| Port Total: | 3,257 | 53% | 6 | 60% | 3,263 | 53% |
| Monterey | | | | | | |
| Private Skiff | 384 | | 1 | | 385 | |
| Charter Boat | 195 | | 0 | | 195 | |
| Commercial Troll | <u>2,080</u> | | <u>1</u> | | <u>2,081</u> | |
| Port Total: | 2,659 | 44% | 2 | 20% | 2,661 | 44% |
| All Ports | | | | | | |
| Private Skiff | 860 | | 9 | | 869 | |
| Charter Boat | <u>1,182</u> | | <u>0</u> | | <u>1,182</u> | |
| Recreational Total: | 2,042 | 34% | 9 | 90% | 2,051 | 34% |
| Commercial Troll | 4,051 | | 1 | | 4,052 | |
| Commercial Total: | 4,051 | 66% | 1 | 10% | 4,052 | 66% |
| TOTAL CWTs: | 6,093 | | 10 | | 6,103 | |

FINAL
PERFORMANCE REPORT

STATE: California

AWARD NUMBER: NA76FAO296

PROJECT TYPE: Anadromous Fish - Research

PROJECT TITLE: Salmon and Steelhead Research, Management and Enhancement Project

PERIOD COVERED: July 1, 1998 - June 30, 1999

Study 2. Klamath River Project

Study Objectives

- 1) To determine the size, composition, distribution and timing of runs of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 2) To determine sport fishery harvest levels of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 3) To determine the relative return rates and contributions to spawning escapements and the fisheries of salmon produced at Iron Gate Hatchery (IGH) and to evaluate experimental management practices aimed at increasing adult returns.

JOB 1. Klamath River Salmon Study Objectives

- 1) To determine the in-river distribution and relative harvest rates of the fall salmon runs in the Klamath River sport fishery from the mouth to the falls at Coon Creek.
- 2) To estimate the sport harvest of fall-run chinook salmon in the Klamath River system upstream of the falls at Coon Creek (excluding the Trinity River basin).
- 3) To determine the length, age and marked fish compositions of fall-run chinook salmon in the run and sport catch.
- 4) To determine the timing and size of the fall-run chinook salmon run in the Klamath River.

(a) Activities:

- i) Procedures: A creel census was conducted to collect information for estimating the sport harvest of anadromous salmonids in the lower Klamath River from its mouth to the falls at Coon Creek (river mile [RM] 34). Shore and boat anglers originating from resorts and landings
-

between the river mouth and Klamath Glen (Blakes Riffle - RM 7) were sampled by project personnel in a stratified selection program designed to sample as close to 100 percent of the landings and effort for the particular unit being sampled as possible. The census period ran from August 6 through October 21 below the Highway 101 bridge (RM 3) and from August 7 through October 21 between the Highway 101 bridge to the falls at Coon Creek (RM 34).

All sea-run fish sampled in the creel census were identified to species, measured to the nearest 1.0 centimeter fork length (FL), and examined for marks and tags. Heads were collected from all adipose (Ad) fin-clipped, presumably coded-wire tagged (CWT), salmon observed. Anglers interviewed were queried as to the species of fish they had caught, their fishing mode (shore or boat) and whether they were through fishing for the day. Census data were recorded on prepared forms for subsequent data entry into project computers throughout the season. CWTs were extracted from salmon heads and decoded by project personnel in the laboratory as they were received.

The Shasta River fish counting facility (SRFCF) was operated this year to determine fall-run chinook salmon spawner escapement for the Shasta River. This facility was installed below the major spawning areas prior to initiation of the fall-run chinook salmon immigration past that site. Immigrating salmonids were enumerated and systematically subsampled for species identification, FL, scales, sex and examined for marks and external tags.

Chinook salmon examined at SRFCF were marked with an operculum punch prior to release to permit the development of an independent estimate of escapement in the Shasta subbasin. Some of these marked salmon were subsequently recovered during Shasta River spawning ground surveys conducted by project staff.

This season, funds made available through the Klamath Restoration Program provided video equipment for time-lapse video recording of fish passage at the SRFCF. A video viewing chamber was installed and video recordings were made for much of the chinook run. Fish counts from video recordings will be compared to weir counts to investigate the possibility of switching to a more automated counting facility.

The Bogus Creek fish counting facility was operated as a marking station for approximately eight hours per day during the 1998 season. For the remainder of the day, the trap was left open allowing fish to pass unobstructed. During hours of operation, anadromous fish trapped were identified to species, enumerated, measured FL, sampled for scales,

sexed and examined for fin-clips and external tags. Prior to release, chinook salmon were given an operculum punch to identify them as fish examined at the weir. An estimate of chinook salmon spawners occupying Bogus Creek above the weir was developed using the ratio of marked to unmarked fish observed during spawning ground surveys.

Scales taken from fish at each facility were read by nonproject personnel in the laboratory to determine age. Heads from all Ad fin-clipped fish encountered at both facilities were retained for CWT processing by project personnel in the laboratory.

Spawning stock surveys were conducted in the Salmon and Scott rivers, as well as selected minor Klamath River tributaries upstream of the Trinity River, where fish trapping or counting facilities did not provide an estimate of the chinook salmon spawning escapement. Like last year, project personnel worked cooperatively with US Forest Service personnel, local coordinated resource management plan (CRMP) members, Salmon River Restoration Council, Karuk tribal members, AmeriCorps volunteers and others to complete these surveys.

During each survey, carcasses encountered were identified to species and sex, categorized by size class (adult or grilse) and examined for marks and project-applied tags. All fresh carcasses were tagged with serially numbered washers attached with hog rings and returned to the stream for possible later recovery. Decayed carcasses were enumerated then cut in half before being returned to the stream. Carcasses examined in all areas were systematically subsampled to determine the sex and FL compositions of spawners in the different streams. Mark-recapture estimators (Peterson or Schaefer) were used, when possible, to expand survey data and make spawner escapement estimates. The number of redds encountered during spawning stock surveys were also recorded.

In smaller streams where a low number of spawners were encountered (i.e., Horse Creek, Beaver Creek, Indian Creek, etc.), redd surveys instead of carcass surveys were performed. The total redd count was used to estimate the number of chinook salmon spawning in that tributary.

Again this year, landowners with private property along streams surveyed by project personnel were queried prior to the start of the field season to obtain permission to conduct surveys on stream reaches passing through their land. No surveys were conducted on stream sections situated on private property whose owner had not specifically granted permission for project personnel to survey.

ii) Results:

Angler Harvest

Mouth Upstream to the Falls at Coon Creek

We interviewed 6,133 anglers, 2,352 in the area from the mouth upstream to the Highway 101 bridge (Area 1) and 3,781 fishing between the Highway 101 bridge and the falls at Coon Creek (Area 2). Combined, anglers interviewed in the two areas caught a total of 56 steelhead (40 half-pounders and 16 adults) and 1,240 chinook salmon (211 grilse and 1,029 adults) (Table 1). No coho salmon were observed this year in the creel due to their listing status under the Federal Endangered Species Act.

Anglers interviewed above the Highway 101 bridge caught 87.5 percent of the steelhead and 58.7 percent of the chinook salmon. Boat anglers caught 71.0 percent of the steelhead and 83.8 percent of the chinook salmon. No harvest was allowed this year for cutthroat trout.

Based on expansions of our creel sampling data, anglers completed an estimated 17,606 trips and fished a total of 52,145 hours (3.0 hours/trip, average) in Areas 1 and 2 during the sample period. They caught an estimated 125 steelhead (92 half-pounders and 33 adults) and 3,412 chinook salmon (534 grilse and 2,878 adults) (Table 1).

In Area 1, angler harvest of grilse and adult chinook salmon peaked the week ending September 9. Catch of adult and grilse chinook salmon in Area 2 peaked two weeks later (week ending September 23). Peak harvest of half-pounder and adult steelhead in Area 1 occurred during the week ending September 9. Two more steelhead were landed in Area 1 during the week ending September 30. Peak harvest of half-pounder adult steelhead in Area 2 was bimodal with peaks occurring in weeks ending August 26 and September 23.

For the 1998 season, the allowable sport harvest of adult chinook salmon (chinook salmon ≤ 61 cm TL) in the Klamath Basin was set at 1,800. This year 50.0 percent of the allowable harvest was allocated to the river reach below the falls at Coon Creek. 1998 harvest regulations specified that, in the event 35 percent (630 adults) of the total allowable harvest was landed prior to the Labor Day weekend (which began September 4), restrictions prohibiting the take of additional adult chinook would be implemented. Anglers would then be allowed to harvest adult chinook below Coon Creek Falls beginning Saturday of Labor Day weekend until the allowable sport harvest of 900 fish was reached.

Table 1. Fall 1998 angler effort and harvest estimates, lower Klamath River (mouth to falls at Coon Creek - RM 34) with comparable 1993 through 1997 totals (sample sizes in parentheses).

| Area | Angler Trips | Angler Hours | Steelhead ^{a/} | | Chinook Salmon ^{b/} | | Coho Salmon ^{c/} | |
|---------------------------------|---------------------------|----------------------------|-------------------------|--------------------|------------------------------|--------------------------|---------------------------|------------------|
| | | | Half-Pounders | Adults | Grilse | Adults | Grilse | Adults |
| Mouth-Highway 101 | 9,122 (2,352) | 29,316 (7,842) | 14 (5) | 5 (2) | 124 (34) | 1,603 (478) | 0 (0) | 0 (0) |
| Highway 101-Falls at Coon Creek | 8,484 (3,781) | 22,829 (10,250) | 78 (35) | 28 (14) | 406 (177) | 1,270 (551) | 0 (0) | 0 (0) |
| Totals | 17,606 (6,133) | 52,145 (18,092) | 92 (40) | 33 (16) | 530 (211) | 2,873 (1,029) | 0 (0) | 0 (0) |
| 1997 | 17,730 (7,653) | 67,155 (28,029) | 540 (232) | 582 (249) | 1,275 (546) | 2,694 (1,108) | 0 (0) | 0 (0) |
| 1996 | 27,929 (10,545) | 91,019 (35,547) | 561 (237) | 511 (219) | 1,228 (518) | 7,162 (2,879) | 7 (3) | 153 (52) |
| 1995 | 19,881 (7,523) | 63,369 (28,043) | 317 (127) | 302 (129) | 2,397 (1,073) | 1,582 (1,041) | 4 (2) | 45 (19) |
| 1994 | 15,100 (5,786) | 54,748 (21,665) | 1,002 (432) | 301 (127) | 1,179 (508) | 843 (375) | 2 (1) | 2 (1) |
| 1993 | 16,081 (5,823) | 51,889 (19,417) | 344 (134) | 324 (137) | 1,087 (464) | 1,577 (600) | 7 (3) | 2 (1) |

a. Steelhead half-pounders are ≤ 41 cm FL; adults are >41 cm FL.

b. Chinook salmon grilse are ≤ 50 cm FL; adults are >51 cm FL. Includes fall-run and spring-run chinook.

c. No coho salmon were harvested by sport anglers this year due their listing under the Endangered Species Act.

During 1998, harvest of adult chinook salmon below the falls at Coon Creek was continuous through Sunday of the Labor Day weekend (September 6). This was the third consecutive year anglers were allowed to harvest adult chinook salmon up to Labor Day weekend with being impacted by the 35 percent regulation.

A major reason for this year's uninterrupted adult fishery was the late arrival of fall-run chinook to the Klamath River. Based on the recovery of CWTs from harvested Ad fin-clipped salmon, adult chinook harvested prior to August 20 were considered to be primarily spring-run chinook originating from the Trinity Basin. We estimate that 303 spring-run chinook were harvested by anglers between August 6 and August 19, 1998. This was the first year distinction was made between spring- and fall-run chinook in the lower Klamath River sport fishery for management purposes.

For the remainder of the main stem Klamath above the falls at Coon Creek, anglers were permitted to harvest adult chinook until October 3 (28 days following attainment of the quota below the falls).

Chinook salmon harvested by sport anglers in the lower Klamath River ranged in size from 24 to 100 cm FL. Based on locating the nadir in the length frequency distribution of measured salmon, we determined the grilse-adult separation to be 49 cm; 3 cm less than the 1997 cut-off and 11 cm less than the 61 cm defined as the cut-off in the 1998 regulations. This downward adjustment to the grilse/adult separation resulted in 1,435 chinook originally classified as grilse to be reclassified as adults and were subsequently counted against the quota. The smaller size separation for grilse and adults determined from the creel data was also observed at IGH and in the Salmon, Scott and Shasta rivers. Overall, grilse chinook examined in the angler catch averaged 44.6 cm FL (range 24-49 cm FL) while adults averaged 62.2 cm FL (range 50-100 cm FL). Half-pounder steelhead seen averaged 34.4 cm FL (range 24-41 cm FL) and adult steelhead averaged 53.7 cm FL (range 42-89 cm FL).

Heads were collected from 85 Ad fin-clipped chinook salmon (6 grilse and 79 adult) observed in the creel census. Twenty different tag codes were represented in the CWTs obtained from these heads (Table 2). Since 1993, no Ad fin-clipped coho salmon have been encountered in the creel surveys.

Based on CWTs observed, peak recovery of spring-run chinook in the creel census occurred during the week ending August 19. Recovery of Klamath origin chinook peaked during the week ending September 9 and recovery of Trinity River origin fall chinook peaked during the week ending September 23 (Figure 1).

TABLE 2. Release information for Ad fin-clipped (Ad + CWT) salmon recovered in the lower Klamath River angler harvest census, 1998.

| CWT Code | Number Recovered | Type ^{a/} | Brood Year | Location |
|--------------------------------------|------------------|--------------------|------------|-------------------|
| <u>Chinook Salmon</u> | | | | |
| <u>Klamath River Drainage Origin</u> | | | | |
| 06-01-02-01-14 | 1 | Ff | 94 | IGH ^{b/} |
| 06-63-29 | 3 | Fy | 94 | IGH |
| 06-57-01 | 1 | Fy | 94 | IGH |
| 06-01-02-02-05 | 1 | Ff | 95 | IGH |
| 06-01-02-02-06 | 10 | Ff | 95 | IGH |
| 06-01-02-02-07 | 10 | Fy | 95 | IGH |
| 06-38-31 | 1 | Fy | 96 | IGH |
| 05-42-42 | 2 | Fy | 96 | CMP ^{c/} |
| <u>Trinity River Drainage Origin</u> | | | | |
| 06-01-04-01-08 | 1 | Ff | 94 | TRH ^{d/} |
| 06-50-22 | 2 | Ff | 94 | TRH |
| 06-52-22 | 1 | Fy | 94 | TRH |
| 06-52-20 | 1 | Sf | 94 | TRH |
| 06-52-21 | 2 | Sy | 94 | TRH |
| 06-52-24 | 1 | Ff | 95 | TRH |
| 06-52-26 | 21 | Fy | 95 | TRH |
| 06-52-23 | 4 | Sf | 95 | TRH |
| 06-52-25 | 14 | Sy | 95 | TRH |
| 06-01-08-02-06 | 1 | Ff | 95 | TRW ^{e/} |
| 06-01-08-02-09 | 1 | Ff | 96 | TRW |
| 06-52-29 | 2 | Sf | 96 | TRH |
| 100000 ^{f/} | 5 | | | |
| TOTAL | 85 | | | |

a. Ff = fall fingerling; Fy = fall yearling; Sf = spring fingerling; Sy = spring yearling.

b. IGH = Iron Gate Hatchery.

c. CMP = Camp Creek ponds.

d. TRH = Trinity River Hatchery.

e. TRW = Trinity River wild.

f. 100000 = No CWT found or tag was lost or unreadable.

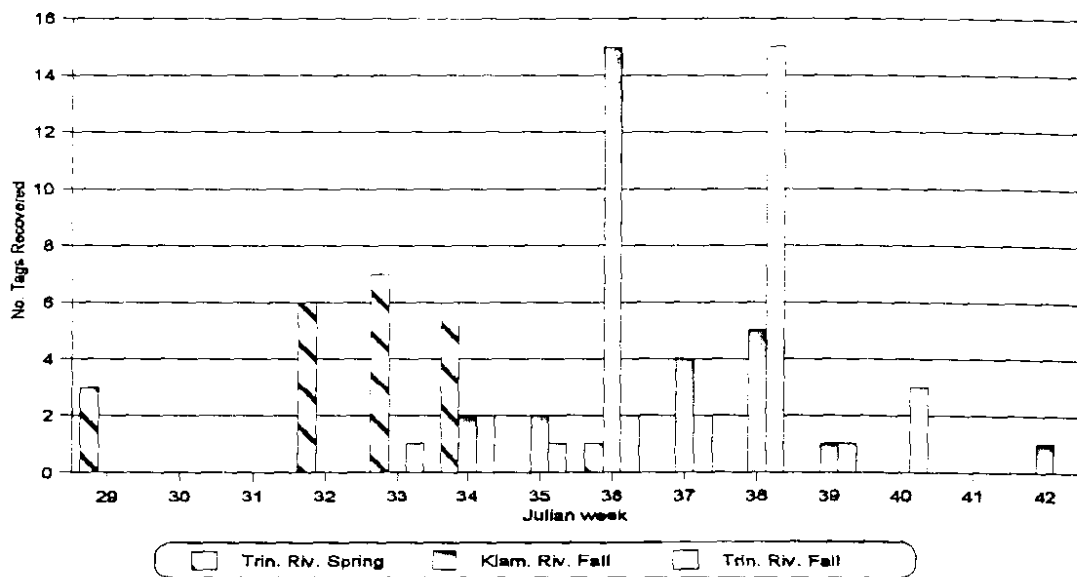


Figure 1. Origin of coded-wire tagged salmon recovered, by Julian week in the lower Klamath River sport fishery, 1998.

Falls at Coon Creek to Iron Gate Dam

Since 1990, angler harvest in the Klamath River upstream of RM 34 (Area 3) has been based on using the average of proportions of total annual Klamath River angler harvest estimated to have occurred in Area 3 during each of the years 1984 and 1986 through 1989 (1985 was not included due to emergency harvest restrictions implemented that year). On average, during the five years, 38 percent (range 20 to 69 percent) of the total angler harvest of chinook salmon in the Klamath River occurred in Area 3 and 62 percent occurred below the falls at Coon Creek (Areas 1 and 2 combined). Based on this proportion, we estimate that, during the 1998 season, anglers harvested 303 grilse and 1,575 adult chinook salmon from the Klamath River between the falls at Coon Creek (RM 34) and IGH (RM 190). Unknown numbers of additional grilse and adult chinook salmon were harvested by sport anglers in the Klamath River between the Interstate 5 Bridge and IGH in a secondary fishery allowed under existing regulations. This secondary fishery was triggered when the 28-day regular season had ended, and IGH reached 8,000 adult chinook spawners.

Fish Counting and Spawning Stock Surveys

Salmon River. In 1998, the Salmon River from its mouth to milepost marker 12 on the North Fork and Cecil Creek on the South Fork was divided into 13 reaches for survey. Wooley Creek, a major tributary to the Salmon River, was also surveyed. Combined, the surveyed areas

account for an estimated 80 percent of the known fall chinook spawning area in the Salmon River. No surveys were conducted in the remaining spawning areas due to budget constraints. Surveys began October 15 and continued, in most reaches, twice weekly until November 16.

During the 1998 season, we examined a total of 638 chinook salmon carcasses. From this total, we flagged and returned to the water 306 fresh carcasses (carcass with at least one clear eye). We subsequently recovered 146 of these. We also saw 120 chinook that were still alive during the last survey of the season. No Ad fin-clipped salmon were observed this year.

This season, we saw and mapped a total of 1,113 chinook salmon redds during our spawner surveys. No steelhead and only two coho salmon were observed this season in the Salmon River.

We measured 534 of the 638 chinook salmon carcasses encountered during the surveys. We constructed a length frequency histogram, smoothed the curve using a running average of three, to determine the grilse/adult cutoff length. The nadir in the length frequency histogram occurred at 53 cm FL, the same as 1997. We assumed this to be the maximum size for grilse chinook in the Salmon River in 1998. Based on this, 6.7 percent of the 1998 fall chinook run in the Salmon River consisted of two-year-old fish. This compares to 3.6 percent, 5.0 percent and 24.4 percent for the 1997, 1996 and 1995 seasons, respectively. The average length of the 36 grilse chinook salmon measured was 48.1 cm FL (range 36-53 cm FL). The average length of the 498 adult chinook measured was 71.6 cm FL (range 54 -110 cm FL).

The adjusted Peterson mark and recapture model produced an estimate of 1,335 (95 percent CI 1,136-1,567) spring-run plus fall-run chinook salmon for the area surveyed. To this number we added the 120 live fish observed during the last survey of the season as well as 100 fall chinook we estimated in Wooley Creek (based on US Forest Service redd surveys). After conducting surveys in August 1998, USFS personnel estimated that 102 spring-run chinook spawned in the reaches of the Salmon River surveyed for fall chinook. Subtracting the spring-run fish, we estimate 1,453 (98 grilse and 1,355 adults) fall-run chinook salmon spawned in the surveyed portions of the Salmon River in 1998 (Table 3).

Scott River. We divided the Scott River from its mouth to Highway 3 near Fort Jones into ten reaches. We also divided approximately 12 miles of the Scott River above Highway 3 into sections and surveyed those known to support spawning salmon.

Scott River surveys were performed twice weekly beginning October 16 and ending November 20, 1998. Survey conditions were generally unimpaired by high river flows or bad weather except in late November when sustained high flows precluded additional survey work.

We examined 1,601 chinook salmon carcasses in the Scott River this season. From this total, we flagged and returned to the stream 668 fresh carcasses. We later recovered 579 of these. In addition to the carcasses observed this season, we saw 304 live chinook during our last survey and a total of 1,141 chinook salmon redds. No steelhead or coho salmon carcasses were seen this year in the Scott River. No Ad fin-clipped salmon were observed this season.

We measured 1,403 of the 1,601 chinook salmon carcasses encountered during the surveys. All were presumed to be fall-run fish. We used a length frequency histogram, smoothed using a running average of three, to determine the grilse/adult cutoff length. The nadir in the length frequency histogram occurred at 50 cm FL. We assumed this to be the maximum size for grilse chinook in the Scott River in 1998. Based on this, the average length of the 156 grilse chinook salmon measured was 45.3 cm FL (range 32-50 cm FL). Grilse chinook salmon comprised approximately 11.1 percent of the 1998 Scott River run. The average length of the 1,247 adult chinook measured was 67.1 cm FL (range 51-102 cm FL).

We used the adjusted Peterson mark and recapture method to develop an initial estimate of chinook salmon escapement in the Scott River in 1998. To this initial estimate of 3,023 (95 percent CI 2,725-3,353) we added the 304 live fish observed on the last survey of the season. Our final Scott River chinook salmon estimate for 1998 is 3,327 (370 grilse and 2,957 adults) (Table 3).

Shasta River. The Shasta River Fish Counting Facility (SRFCF), located about 0.25 RM above the river's mouth, operated seven days/week, 24 hours/day from September 17 through November 4, 1998. For the 1998 season, our fish counters observed a total of 2,558 fish. Based on systematic sampling of approximately 15 percent of the run, 2,542 of these were estimated to be chinook salmon and 16 were steelhead. We did not observe any coho salmon or Ad fin-clipped chinook in the Shasta River in 1998 (Table 4).

Based on the nadir in their FL distribution of measured chinook salmon, fish less than or equal to 50 cm were considered grilse while those greater than 50 cm were considered adult. Our final estimate for fall chinook in the Shasta River for the 1998 season is 2,542 (138 grilse and 2,404 adults) (Table 3).

Table 3. Fall-run chinook salmon spawner escapement estimates for areas of the Klamath River basin upstream of the Trinity River basin, 1998.

| | Method | 1998 | | | Total 1997 |
|--------------------------------|------------------------|--------------|---------------|---------------|---------------|
| | | Grilse | Adults | Total | |
| Salmon River | Carcass mark/recapture | 98 | 1,355 | 1,453 | 6,000 |
| Scott River | Carcass mark/recapture | 370 | 2,957 | 3,327 | 8,561 |
| Shasta River | Weir count | 138 | 2,404 | 2,542 | 2,001 |
| Bogus Creek | Mark/recapture | 205 | 6,630 | 6,835 | 10,030 |
| Main stem Klamath ¹ | Redd count | 190 | 2,832 | 3,022 | 3,576 |
| Beaver Creek | Redd count | 21 | 306 | 327 | 405 |
| Horse Creek | Redd count | 5 | 71 | 76 | 83 |
| Grider Creek | Redd count | 9 | 132 | 141 | 322 |
| Thompson Creek | Redd count | Not surveyed | | | 68 |
| Indian Creek | Redd count | Not surveyed | | | 688 |
| Elk Creek | Redd count | 15 | 219 | 234 | 480 |
| Camp Creek | Redd count | 7 | 98 | 105 | 910 |
| Red Cap Creek | Redd count | 9 | 138 | 147 | 709 |
| Bluff Creek | Redd count | 1 | 22 | 23 | 296 |
| Clear Creek | Redd count | 13 | 190 | 203 | 291 |
| Aikens Creek | Redd count | 0 | 0 | 0 | 0 |
| Boise Creek | Redd count | 0 | 0 | 0 | 52 |
| Dillon Creek | Redd count | 4 | 53 | 57 | 172 |
| Independence Creek | Redd count | 0 | 2 | 2 | 23 |
| Slate Creek | Redd count | 0 | 0 | 0 | 4 |
| China Creek | Redd count | Not surveyed | | | 4 |
| Perch Creek | Redd count | Not surveyed | | | 10 |
| TOTALS | | 1,085 | 17,409 | 18,494 | 34,685 |

1. Estimate based on redd data from US Fish and Wildlife Service, CCFWO, Arcata.

TABLE 4. Summary of anadromous fish counts, Shasta River and Bogus Creek, 1998 Season (1997 counts in parentheses).

| Facility | <u>Chinook Salmon</u> | | <u>Coho Salmon</u> | | <u>Steelhead</u> | |
|---------------------------|-----------------------|---------|--------------------|--------|------------------|--------|
| | Grilse | Adults | Grilse | Adults | Half-Pounders | Adults |
| Shasta River | 138 | 2,404 | 0 | 0 | 0 | 16 |
| | (334) | (1,677) | (1) | (5) | (0) | (0) |
| Bogus Creek ^{1/} | 12 | 619 | 0 | 8 | 0 | 0 |
| | (14) | (612) | (0) | (3) | (0) | (0) |

1. As in 1997, the Bogus Creek facility was operated as a fish marking station for 8 hours/day instead of a counting station. The numbers reported represent the number of fish handled during weir operation. During the remainder of the time, the facility is open and fish are permitted to pass unobstructed.

This year, video equipment was placed at the SRFCF to record fish passage. Postseason review of the time-lapse recordings produced a total chinook salmon count of 2,115. The discrepancy between our observations and camera counts is based on minor technical problems which caused the camera system to be inoperative at times. Our review of captured video is continuing. This work was funded through a grant from the Klamath River Basin Restoration Program.

Since 1991, chinook salmon examined at the SRFCF have been given an operculum punch prior to their release. Attempts were made in 1998 to recover marked fish during subsequent spawning ground surveys. We initially performed this experiment to evaluate the improvements made to the weir during the summer of 1991. We continued this process during the 1998 season to provide a backup escapement estimation procedure in the event weir counts failed (i.e., due to flooding). Based on the recovery of marked fish during limited spawning ground surveys and using the adjusted Peterson estimator, 1,997 (95 percent CI, 1,448 - 2,728) chinook entered the Shasta River in 1998. Due to the low number of recoveries (36) and our inability to access spawning grounds in the upper portion of the Shasta for recovery purposes, we believe our count to be more accurate.

Bogus Creek. The Bogus Creek Weir, located approximately 0.5 RM from the creek mouth, operated from September 24 through November 11, 1998. It was staffed approximately eight hours/day, seven days/week to mark fish as they passed. We counted 631 chinook salmon (12 grilse and 619 adults), 8 adult coho salmon and 0 steelhead (Table 3). All chinook examined at the weir were marked with an opercle punch prior to release.

Spawning ground surveys occurred above the weir between October 16 and November 20 using similar procedures described for the Salmon and Scott rivers. Based on the recovery of marked fish, we estimate 6,218 (95 percent CI 5,374 - 7,052) chinook occupied Bogus Creek above the weir for spawning.

An additional 617 chinook salmon were counted during spawner surveys of the 0.5-mile section of the creek between its mouth and the weir. This brought the total number of chinook salmon spawning in Bogus Creek in 1998 to 6,835 (205 grilse and 6,630 adults) (Table 4).

A length frequency histogram was constructed with measured lengths of chinook salmon observed at the Bogus Creek Weir and during spawning ground surveys. The nadir in the length frequency histogram occurred at 49 cm FL. We assumed this to be the maximum size for grilse chinook in Bogus Creek in 1998. The average length of the grilse chinook salmon measured was 43.8 cm FL (range, 32-49 cm FL). The average length of the adult chinook measured was 68.8 cm FL (range 50-102 cm FL).

Heads from 55 Ad fin-clipped salmon observed this season in Bogus Creek were recovered. Forty-eight of these fish were chinook salmon originating from IGH (brood years 1993 through 1995) and no tags were recovered, or tags were unreadable, from the remaining seven chinook.

Miscellaneous Spawning Tributaries. Klamath River Project and US Forest Service personnel and numerous volunteers conducted coordinated carcass surveys and redd counts on 14 smaller spawning tributaries to the Klamath River above the mouth of the Trinity River. These surveys yielded a combined chinook salmon spawning escapement estimate of 1,315 (83 grilse and 1,232 adults) (Table 3).

No Ad fin-clipped chinook salmon were observed during surveys of these smaller tributaries in 1998.

Main Stem Klamath River. Project personnel did not survey the main stem Klamath upstream of its junction with the Trinity River this season. However, US Fish and Wildlife Service (USFWS) personnel based in Arcata (CCFWO) conducted weekly redd surveys in the main stem from IGH to the confluence of Indian Creek (RM 107) in October and November. Based on their redd count and using the average grilse rate from the Salmon and Scott rivers, we estimate 3,022 chinook salmon (190 grilse and 2,832 adult) spawned in the main stem Klamath River during 1998 (Table 3).

- (b) Target date for achievement: June 30, 1999
- (c) Date for accomplishment: In progress
- (d) Significant deviations: None

- (e) Remarks: Field activities programmed under Job 1 were carried out as scheduled. Data tabulation, analysis and report preparation activities are continuing.

In August 1996, the project leader was named the California Department of Fish and Game's representative to the technical work group (TWG) of the Klamath Basin Fisheries Task Force (Task Force). This group, made up of representatives of several State, Federal and tribal management and conservation agencies, serves as technical advisor to the Task Force. The TWG meets regularly to discuss issues related to Klamath Basin strategic planning, flow studies, restoration activities and other assignments as directed by the Task Force. For this reporting period, TWG assignments occupied approximately 15 percent of the project leader's time.

- (f) Recommendations: Job 1 activities should be continued in FY 1999-00. An alternative method for estimating sport harvest in Area 3 using data collected each year is needed. Implementation of a roving creel census or mandatory punch card system between the falls at Coon Creek and IGH may be appropriate but would require additional funding.

The SRFCF should be rebuilt to improve fish passage efficiency and to incorporate a viewing window to facilitate video recording of fish passage.

Prepared by: Mark Pisano, Associate Fisheries Biologist Date: September 30, 1999
Sara Borok, Fisheries Biologist
William Chesney, Fisheries Biologist

FINAL
PERFORMANCE REPORT

STATE: California

AWARD NUMBER: NA76FAO296

PROJECT TYPE: Anadromous Fish - Research

PROJECT TITLE: Salmon and Steelhead Research, Management and Enhancement Project

PERIOD COVERED: July 1, 1998 - June 30, 1999

Study 2. Klamath River Project

Study Objectives:

- 1) To determine the size, composition, distribution and timing of runs of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 2) To determine sport fishery harvest levels of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 3) To determine the relative return rates and contributions to spawning escapements and the fisheries of salmon produced at Iron Gate Hatchery (IGH) and to evaluate experimental management practices aimed at increasing adult returns.

JOB 2. Iron Gate Hatchery Juvenile Salmon Tagging

Objective:

- 1) To determine the relative return rates and contributions to spawning escapements and the fisheries made by salmon produced at IGH and evaluate experimental hatchery management practices aimed at increasing adult returns.

(a) Activities:

- i) Groups of fingerling (total approximately 200,000) fall-run chinook salmon of the 1998 brood year (BY) reared at IGH will be marked (adipose [Ad] fin-clip) and tagged (magnetic binary-coded wire) during State FY 1998-99. Marked groups will be released into the Klamath River directly below the hatchery in June of 1999.
-

Data on total numbers of fish released, their size and condition at release, in-hatchery growth and survival and time and release location will be collected for each group released. These data will subsequently be used in analyzing survival, contributions to the fisheries and returns as adults of the fish stocked.

ii) Results:

During this reporting period, a total of 205,841 fall-run chinook salmon, BY 1998, was marked (Ad + CWT [coded-wire tagged]) at IGH. These fish were released into the Klamath River at the hatchery as fingerlings between June 21 and June 22, 1999, along with 4,761,548 unmarked fingerling chinook salmon. No BY 1998 fall chinook salmon were tagged under this contract for the yearling release program (Table 1).

- (b) Target date for achievement: June 30, 1999
- (c) Date for accomplishment: In Progress
- (d) Significant deviations: None
- (e) Remarks: Field activities programmed under Job 2 were carried out essentially as scheduled. Data tabulation, analysis and report preparation activities are continuing.
- (f) Recommendations: Job 2 activities should be continued in FY 1999-00. Long-term funding to restore CWT of fall chinook for monitoring IGH's yearling production program should be obtained.

Prepared by: Mark Pisano, Associate Fisheries Biologist Date: _____
William Chesney, Fisheries Biologist
Klamath River Project

Table 1. Groups of fall-run chinook salmon marked (Ad fin-clipped), tagged (CWT) and/or released from IGH between July 1, 1998, and June 30, 1999.

| Brood Year | Tag Code | Release Size (Fish/Pound) | Number Marked | Number Effectively Released ^{1/} | Release Dates |
|---------------|----------------|---------------------------|----------------|---|---------------|
| 1998 | 06-01-02-03-01 | 84 | 56,661 | 51,641 | 6/21-22/99 |
| 1998 | 06-01-02-03-02 | 84 | 59,659 | 54,373 | 6/21-22/99 |
| 1998 | 06-01-02-03-03 | 84 | 53,675 | 48,919 | 6/21-22/99 |
| 1998 | 06-01-02-03-04 | 84 | 35,846 | 32,670 | 6/21-22/99 |
| Totals | | 205,841 | 187,603 | | |

1. Number marked less tags shed and mortality prior to release.

FINAL
PERFORMANCE REPORT

STATE: California

AWARD NUMBER: NA76FAO296

PROJECT TYPE: Anadromous Fish - Research

PROJECT TITLE: Salmon and Steelhead Research, Management and Enhancement Project

PERIOD COVERED: July 1, 1998 - June 30, 1999

Study 2. Klamath River Project

Study Objectives:

- 1) To determine the size, composition, distribution and timing of runs of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 2) To determine sport fishery harvest levels of fall-run chinook salmon in the Klamath River basin (excluding the Trinity River basin).
- 3) To determine the relative return rates and contributions to spawning escapements and the fisheries of salmon produced at Iron Gate Hatchery (IGH) and to evaluate experimental management practices aimed at increasing adult returns.

JOB 3. Recovery of Coded-Wire Tags (CWT) from Salmon Returning to IGH

Objective:

- 1) To determine rates at which salmon produced at IGH return to the Klamath River system and contribute to the spawning escapements and the fisheries.

(a) Activities:

- i) Procedures: All salmon entering IGH were examined for fin clips. CWT were recovered from salmon lacking adipose fins (Ad-marked) and decoded. Returning fish were systematically sampled for fork length (FL) and scale samples collected. Additional heads from Ad-marked salmon seen during spawner surveys, weir operations and encountered during creel census activities in the lower Klamath River (Job 1) were also collected and tags removed and decoded by project personnel.

ii) Results:

Heads from 1,141 chinook (1,126 adults and 15 grilse) and 9 adult coho salmon were recovered at IGH. We also recovered heads from 55 Ad-marked chinook adults collected during the spawner surveys and weir operations (Table 1). A total of 85 Ad-marked chinook salmon (79 adult and 6 grilse) were seen in the lower Klamath River creel census (Table 2). No coho salmon were observed this year in the creel.

Expanded estimates for the in-river fisheries and spawning escapements, based on sampling by project personnel, were generated for each CWT code (Tables 1 and 2).

Lengths (cm FL) of fish recovered for each CWT code are provided in Table 3.

- (b) Target date for achievement: June 30, 1999
- (c) Date for accomplishment: In progress
- (d) Significant deviations: None
- (e) Remarks: Field activities programmed under Job 3 were carried out essentially as scheduled. Data tabulation, analysis and report preparation activities are continuing.
- (f) Recommendations: Job 3 activities should be continued in FY 1999-00.

Prepared by: Mark Pisano, Associate Fisheries Biologist Date: September 30, 1999
Klamath River Project

Table 1. Spawning escapement observations and estimates of CWT chinook and coho salmon in the Klamath River basin (excluding the Trinity River basin), 1998.

| CWT Bi-Code | Release Location | Brood Year | Release Type ^a | Natural Spawners | | Hatchery | | Totals | |
|-----------------------|----------------------|------------|---------------------------|------------------|------------|--------------|--------------|--------------|--------------|
| | | | | Obs | Exp | Obs | Exp | Obs | Exp |
| Chinook Salmon | | | | | | | | | |
| 10 00 00 ^b | | | | 7 | 22 | 94 | 94 | 101 | 116 |
| 601110308 | Iron Gate Hatchery | 93 | Ff | 1 | 3 | 0 | 0 | 1 | 3 |
| 601110310 | Iron Gate Hatchery | 93 | Ff | 0 | 0 | 1 | 1 | 1 | 1 |
| 66319 | Iron Gate Hatchery | 93 | Fy | 0 | 0 | 1 | 1 | 1 | 1 |
| 66336 | Iron Gate Hatchery | 93 | Fy | 0 | 0 | 3 | 3 | 3 | 3 |
| 601020201 | Iron Gate Hatchery | 94 | Ff | 0 | 0 | 11 | 11 | 11 | 11 |
| 601020113 | Iron Gate Hatchery | 94 | Ff | 2 | 6 | 8 | 8 | 10 | 14 |
| 601020114 | Iron Gate Hatchery | 94 | Ff | 2 | 6 | 9 | 9 | 11 | 15 |
| 601020115 | Iron Gate Hatchery | 94 | Ff | 0 | 0 | 11 | 11 | 11 | 11 |
| 66321 | Iron Gate Hatchery | 94 | Fy | 2 | 4 | 82 | 82 | 84 | 86 |
| 66329 | Iron Gate Hatchery | 94 | Fy | 3 | 9 | 87 | 87 | 90 | 96 |
| 65701 | Iron Gate Hatchery | 94 | Fy | 1 | 3 | 113 | 113 | 114 | 116 |
| 601020202 | Iron Gate Hatchery | 95 | Ff | 1 | 3 | 4 | 4 | 5 | 7 |
| 601020203 | Iron Gate Hatchery | 95 | Ff | 2 | 2 | 18 | 18 | 20 | 20 |
| 601020204 | Iron Gate Hatchery | 95 | Ff | 4 | 10 | 17 | 17 | 21 | 27 |
| 601020205 | Iron Gate Hatchery | 95 | Ff | 3 | 7 | 32 | 32 | 35 | 39 |
| 601020206 | Iron Gate Hatchery | 95 | Ff | 17 | 48 | 317 | 317 | 334 | 365 |
| 601020207 | Iron Gate Hatchery | 95 | Fy | 10 | 29 | 318 | 318 | 328 | 347 |
| 601020208 | Iron Gate Hatchery | 96 | Ff | 0 | 0 | 4 | 4 | 4 | 4 |
| 601020209 | Iron Gate Hatchery | 96 | Ff | 0 | 0 | 3 | 3 | 3 | 3 |
| 063830 | Iron Gate Hatchery | 96 | Fy | 0 | 0 | 5 | 5 | 5 | 5 |
| 063831 | Iron Gate Hatchery | 96 | Fy | 0 | 0 | 3 | 3 | 3 | 3 |
| Totals | | | | 55 | 153 | 1,141 | 1,141 | 1,196 | 1,294 |
| Coho Salmon | | | | | | | | | |
| 100000 | | | | 0 | 0 | 7 | 7 | 7 | 7 |
| 71,044 | Coles River Hatchery | 95 | f | 0 | 0 | 2 | 2 | 2 | 7 |

a. Fy = fall-run, yearling release; Ff = fall-run, fingerling release; Sf = spring-run, fingerling; Sy = spring-run, yearling.

b. This code represents heads for which no tag data was obtained (head lacked tag; tag lost or unreadable).

Table 2. Sport catch observations and estimates of CWT chinook salmon harvested in the Klamath River basin (excluding the Trinity River basin), 1998.

| CWT Code | Release Location | Brood Year | Release Type ^a | Census Area ^b | | Noncensus Area ^b | | NRR ^c | Total | |
|-----------------------|------------------------|------------|---------------------------|--------------------------|------------|-----------------------------|-----------|------------------|-----------|------------|
| | | | | Obs | Exp | Obs | Exp | | Obs | Exp |
| Chinook Salmon | | | | | | | | | | |
| 10 00 00 ^c | | | | 4 | 11 | 0 | 2 | 1 | 5 | 14 |
| 0601020114 | Iron Gate Hatchery | 94 | Ff | 1 | 3 | 0 | 0 | 0 | 1 | 3 |
| 0601040108 | Trinity River Hatchery | 94 | Ff | 1 | 3 | 0 | 0 | 0 | 1 | 3 |
| 065022 | Trinity River Hatchery | 94 | Ff | 1 | 3 | 0 | 0 | 1 | 2 | 3 |
| 065220 | Trinity River Hatchery | 94 | Sf | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 065222 | Trinity River Hatchery | 94 | Fy | 1 | 3 | 0 | 0 | 0 | 1 | 3 |
| 066321 | Iron Gate Hatchery | 94 | Fy | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 066329 | Iron Gate Hatchery | 94 | Fy | 1 | 3 | 0 | 2 | 2 | 3 | 5 |
| 065701 | Iron Gate Hatchery | 94 | Fy | 0 | 0 | 0 | 3 | 1 | 1 | 3 |
| 065221 | Trinity River Hatchery | 94 | Sy | 1 | 3 | 0 | 0 | 1 | 2 | 3 |
| 0601020204 | Iron Gate Hatchery | 95 | Ff | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0601020205 | Iron Gate Hatchery | 95 | Ff | 1 | 3 | 0 | 1 | 0 | 1 | 4 |
| 0601020206 | Iron Gate Hatchery | 95 | Ff | 7 | 20 | 0 | 9 | 3 | 10 | 28 |
| 0601080206 | Trinity River Wild | 95 | Ff | 1 | 3 | 0 | 0 | 0 | 1 | 3 |
| 0601020207 | Iron Gate Hatchery | 95 | Fy | 6 | 17 | 0 | 8 | 4 | 10 | 25 |
| 065223 | Trinity River Hatchery | 95 | Sf | 0 | 0 | 0 | 0 | 4 | 4 | 0 |
| 065224 | Trinity River Hatchery | 95 | Ff | 1 | 3 | 0 | 0 | 0 | 1 | 3 |
| 065226 | Trinity River Hatchery | 95 | Fy | 19 | 54 | 0 | 0 | 2 | 21 | 54 |
| 065225 | Trinity River Hatchery | 95 | Sy | 7 | 20 | 0 | 0 | 7 | 14 | 20 |
| 054242 | Camp Creek Ponds | 96 | Fy | 2 | 6 | 0 | 0 | 0 | 2 | 6 |
| 0601020208 | Iron Gate Hatchery | 96 | Ff | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 0601020209 | Iron Gate Hatchery | 96 | Ff | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0601080209 | Trinity River Wild | 96 | Ff | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 063830 | Iron Gate Hatchery | 96 | Fy | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 063831 | Iron Gate Hatchery | 96 | Fy | 1 | 3 | 0 | 1 | 0 | 1 | 5 |
| 065229 | Trinity River Hatchery | 96 | Sf | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| Totals | | | | 55 | 156 | 0 | 34 | 30 | 85 | 191 |

a. Fy = fall-run, yearling release; Ff = fall-run, fingerling release; Sf = spring-run, fingerling; Sy = spring-run, yearling.

b. Creel census zone extended from the mouth of the Klamath River to the falls at Coon Creek (river mile [RM] 34); the upper river zone extended from the falls (RM 34) to Iron Gate Dam (RM 190).

c. NRR = nonrandom return by angler. Not used for expansion calculations.

d. This code represents heads for which no tag data were obtained (head lacked tag; tag lost or unreadable).

Table 3. Fork lengths of CWT chinook and coho salmon collected from the Klamath River basin (excluding the Trinity River basin), 1998.

| CWT Code | Release Location | Brood Year | Release Type ^a | Total Recovered | Fork Length (cm) | |
|-----------------------|------------------------|------------|---------------------------|-----------------|------------------|---------|
| | | | | | Mean | Range |
| Chinook Salmon | | | | | | |
| 0601110308 | Iron Gate Hatchery | 93 | Ff | 1 | 70 | |
| 601110310 | Iron Gate Hatchery | 93 | Ff | 1 | 76 | |
| 066319 | Iron Gate Hatchery | 93 | Fy | 1 | 80 | |
| 066336 | Iron Gate Hatchery | 93 | Fy | 3 | 82 | 74 - 93 |
| 0601020201 | Iron Gate Hatchery | 94 | Ff | 11 | 74 | 55 - 87 |
| 0601020113 | Iron Gate Hatchery | 94 | Ff | 10 | 74 | 67 - 91 |
| 0601020114 | Iron Gate Hatchery | 94 | Ff | 12 | 72 | 59 - 83 |
| 0601020115 | Iron Gate Hatchery | 94 | Ff | 11 | 79 | 62 - 89 |
| 0601040108 | Trinity River Hatchery | 94 | Ff | 1 | Not recorded | |
| 065022 | Trinity River Hatchery | 94 | Ff | 2 | Not recorded | |
| 065220 | Trinity River Hatchery | 94 | Sf | 1 | 81 | |
| 065222 | Trinity River Hatchery | 94 | Fy | 1 | Not recorded | |
| 066321 | Iron Gate Hatchery | 94 | Fy | 84 | 71 | 50 - 98 |
| 066329 | Iron Gate Hatchery | 94 | Fy | 93 | 72 | 58 - 92 |
| 065701 | Iron Gate Hatchery | 94 | Fy | 115 | 73 | 59 - 93 |
| 065221 | Trinity River Hatchery | 94 | Sy | 2 | 69 | 66 - 72 |
| 0601020202 | Iron Gate Hatchery | 95 | Ff | 5 | 60 | 55 - 65 |
| 0601020203 | Iron Gate Hatchery | 95 | Ff | 20 | 63 | 55 - 77 |
| 0601020204 | Iron Gate Hatchery | 95 | Ff | 21 | 60 | 51 - 69 |
| 0601020205 | Iron Gate Hatchery | 95 | Ff | 36 | 61 | 50 - 74 |
| 0601020206 | Iron Gate Hatchery | 95 | Ff | 344 | 58 | 41 - 73 |
| 0601080206 | Trinity River Wild | 95 | Ff | 1 | Not recorded | |
| 0601020207 | Iron Gate Hatchery | 95 | Fy | 338 | 58 | 48 - 73 |
| 065223 | Trinity River Hatchery | 95 | Sf | 4 | Not recorded | |
| 065224 | Trinity River Hatchery | 95 | Ff | 1 | 55 | |
| 065226 | Trinity River Hatchery | 95 | Fy | 21 | 52 | 43 - 60 |
| 065225 | Trinity River Hatchery | 95 | Sy | 14 | 55 | 47 - 60 |
| 0601020208 | Iron Gate Hatchery | 96 | Ff | 4 | 49 | 45 - 51 |
| 0601020209 | Iron Gate Hatchery | 96 | Ff | 3 | 44 | 42 - 48 |
| 0601080209 | Trinity River Wild | 96 | Ff | 1 | Not recorded | |
| 063830 | Iron Gate Hatchery | 96 | Fy | 5 | 41 | 39 - 44 |
| 063831 | Iron Gate Hatchery | 96 | Fy | 4 | 44 | 39 - 47 |
| 065229 | Trinity River Hatchery | 96 | Sf | 2 | Not recorded | |
| 054242 | Camp Creek Ponds | 96 | Fy | 2 | 56 | 54 - 57 |
| Coho Salmon | | | | | | |
| 071044 | Coles River Hatchery | 95 | f | 2 | Not recorded | |

a. Fy = fall-run, yearling release; Ff = fall-run, fingerling release; Sy = spring-run, yearling release; Sf = spring-run, fingerling release.