

FEDERAL AID IN SPORT FISH RESTORATION

Elmendorf Hatchery
by
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RESEARCH PROJECT SEGMENT

State: Alaska

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ABSTRACT

During FY 1986 Elmendorf Hatchery was scheduled to produce good-quality chinook and coho salmon smolts for sport fisheries enhancement projects. Brood stocks used at Elmendorf Hatchery may carry detectable levels of disease organisms, while at many hatcheries only disease-free brood stocks are allowed. A total of over 800,000 chinook and coho salmon smolts was produced in FY 1986. Other production included chinook salmon postsmolts for special studies and coho salmon fingerlings. All were produced within the budgetary constraints and without the occurrence of pathogen-related diseases. A clean-up and reconstruction program completed during FY 1986 is expected to result in increased fish production and an improved fish rearing environment. Elmendorf Hatchery also accommodates an estimated 30,000 visitors each year.

INTRODUCTION

Background

Elmendorf State Hatchery is located two miles north of downtown Anchorage, next to the Elmendorf Air Force Base power plant. Through an agreement with the U.S. Air Force, the hatchery uses

the heated-water effluent from the power plant. In exchange, the hatchery maintains the power plant's water supply and routinely stocks the base's lakes to create recreational fishing opportunities. The heated water from the power plant is utilized by the hatchery to maintain a year-round rearing program primarily for accelerated-growth age-0.0 chinook and age-1.0 coho salmon smolts. Elmendorf Hatchery is considered a central incubation facility and rearing facility, since nearly all of the fish produced by its programs are transported to serve other areas. Historically, the brood stocks used for the incubation and rearing programs at Elmendorf Hatchery have had a history of disease, including bacterial kidney disease and furunculosis.

Consequently, appropriate fish cultural practices must be carefully applied to avoid the disease problems and maintain the production programs that provide many hours of recreational angling opportunities.

Physical Plant

Elmendorf Hatchery has nineteen 3 m wide x 21 m long x 0.75 m deep (volume = 63m^3) concrete production raceways. A water reaeration and reuse system has also been added to the facility to increase the production capacity. The system is particularly important during winter, when low stream flows limit carrying capacity, and spring, when the biomass in the hatchery is maximal.

Other physical features include (1) a 58-m^2 water-intake and mixing building, (2) a 74-m^2 operations and incubation building, (3) a 167-m^2 shop, (4) a 77-m^2 water-treatment sump covered with a weather port, (5) a 20-kw standby generator, and (6) a 3- x 4-m walk-in freezer. There are two residences on site, so that the hatchery manager or assistant hatchery manager is able to respond to any emergency during a 24-hour period.

Water Supply

The water supply for the rearing programs at Elmendorf Hatchery is drawn from Ship Creek, which is immediately adjacent to the facility. The volume of water available for rearing fish ranges from 8,340 to 15,120 liters/minute between February and April to 30,300 liters/min during the summer. The volume of heated water (26° C) from the power plant varies from 5,280 liters/minute at night to 18,960 liters/minute during the day. A new well provides 360 liters/minute of clean water that are used to incubate eggs and fill fish transport tanks.

Creek water is mixed with the heated water and pumped through the aeration towers in the water treatment sump to stabilize the dissolved gases. Because the main water source is an open creek, siltation and clogged screens are a frequent problem during high-water periods, particularly in the spring and fall.

GOALS AND OBJECTIVES

The primary objective for Elmendorf Hatchery is to provide good-quality chinook and coho salmon smolts for sport fisheries enhancement projects that need to utilize (as a brood source) stocks of fish that may carry detectable levels of disease organisms.

Production goals for FY 1986 included scheduled releases of chinook salmon smolts into Crooked Creek near Kasilof; Homer Spit and Halibut Cove Lagoons near Homer; Cove Creek in Whittier; and Lowell Creek in Seward (Table 1). Coho salmon smolts were also scheduled for release into Cove Creek and Seward Lagoon. Other production goals included coho salmon fingerlings and presmolts and coho and chinook salmon fingerlings for experimental lake fisheries. One small lot of chinook salmon smolts was scheduled for release into lakes for an experimental fishery in the

Table 1. Fish produced at Elmendorf Hatchery during 1986 to create or enhance sport fisheries.

Species	Brood-stock	Lifestage	Number	Stocking Location
Chinook	Crooked Creek	Smolt	185,000	Crooked Creek, Kasilof
Chinook	Crooked Creek	Smolt	101,000	Halibut Cove Lagoon, Kachemak Bay
Chinook	Crooked Creek	Smolt	104,000	Homer Spit Lagoon, Homer
Chinook	Crooked Creek	Smolt	85,000	Cove Creek, Whittier
Chinook	Crooked Creek	Smolt	101,000	Lowell Creek, Seward
Chinook	Crooked Creek	Smolt	18,000	Lakes, Matanuska Valley; FY 1987 release
Chinook	Crooked Creek	Postsmolt	25,000	Lakes, Anchorage; FY 1987 release
Coho	Bear Creek	Smolt	53,000	Box Canyon Creek, Seward
Coho	Bear Creek	Smolt	52,000	Seward Lagoon, Seward
Coho	Bear Creek	Smolt	1,000	Institute of Marine Science, Seward
Coho	Bear Creek	Smolt	105,000	Cove Creek, Whittier
Coho	Ship Creek	Presmolt	56,000	Rear to smolt; FY 1987 release
Coho	Bear Creek	Fingerling	207,000	Lakes, Matanuska Valley

Matanuska Valley and another small lot of chinook salmon was scheduled to be held until fall for release as 60-g "postsmolts" into the Anchorage area lakes.

Elmendorf Hatchery produces fish to enlarge or create sport fisheries, but it also supports a unique nonconsumptive use as well. Many visitors are attracted to the facility because of its proximity to Anchorage and the high visibility of salmon runs in Ship Creek. Consequently, the public relations and informational services provided by the staff have become increasingly more important.

PERFORMANCE

Production

In the summer of 1985 (FY 1986-87), the water system at Elmendorf Hatchery was drained so that the raceways and sumps could be thoroughly cleaned and disinfected. Consequently, fish production was limited. As a result of the capital improvement projects (CIP) completed at Elmendorf Hatchery during the past year, the production capacity will be increased to 1.6 million chinook and coho salmon smolts, or approximately 28,000 kg of fish will be released each year. This will include a mixture of 1.3 million 16.0-g and 0.3 million 24.0-g chinook and coho salmon smolts, respectively. Chinook salmon at Elmendorf Hatchery are normally reared at a density of 100,000 smolts/raceway, or $2.8 \text{ kg/m}^3/\text{cm}$, while coho salmon smolts are reared at a density of 50,000 smolts/raceway, or $1.9 \text{ kg/m}^3/\text{cm}$.

Planned fish production goals and actual fish production are compared in Table 2. All programs during FY 1986 were well within the acceptable range of $\pm 10\%$ of the goal.

Table 2. Fish production goals and actual production at Elmendorf Hatchery, 1986.

Production Goal	Hatchery Performance	Deviation(%)
585,000 chinook salmon smolts	594,000 chinook salmon smolts	+1.5
25,000 chinook salmon postsmolts	24,846 chinook salmon postsmolts	-0.6
200,000 coho salmon smolts	211,075 coho salmon smolts	+5.5
200,000 coho salmon fingerlings	207,123 coho salmon fingerlings	+3.6
60,000 coho salmon presmolts	56,000 coho salmon presmolts	-6.7
Non-consumptive use: to provide a wildlife viewing and learning experience for hatchery visitors.	Accommodated approximately 30,000 visitors and students during FY 1986.	

Programs

Chinook Salmon Smolt Program:

Because of construction and clean-up projects scheduled at Elmendorf Hatchery last summer, the chinook salmon eggs were incubated to the eyed-egg stage at Trail Lakes Hatchery before transferring them to Elmendorf Hatchery in late September. As a result, they were moved into raceways 3 weeks later than normal; so in order for them to attain smolt size by June 1986, we had to accelerate their growth.

The survival rate from the eyed-egg stage to emergence (93.9%) was considered normal, and the survival rate from emergence to release (96.7%) was excellent.

Nearly 600,000 chinook salmon smolts were released (Table 2). The average size of the chinook salmon smolts was 13.4 g; this was slightly smaller than the 1986 goal of 15 g; however their response in the saltwater challenge tests indicates they were high-quality smolts. The concentration of sodium in the bloodstream at the time of release was 170 meq/liter (Figure 1), which is the threshold value to indicate physiological tolerance to salt water. Approximately 22,600 adult chinook salmon averaging 9.0 kg/fish are expected to return from these releases over 4 years (assuming a 4% survival rate).

Neither the chinook or the coho salmon smolts had any parasites this year. Typically, parasitism has been a problem each spring; it appears, however, that the clean-up of the cooling pond and sumps and the disinfection of the raceways was effective in curing this problem. Program goals for chinook salmon smolts were met, and we expect good returns of adult fish.

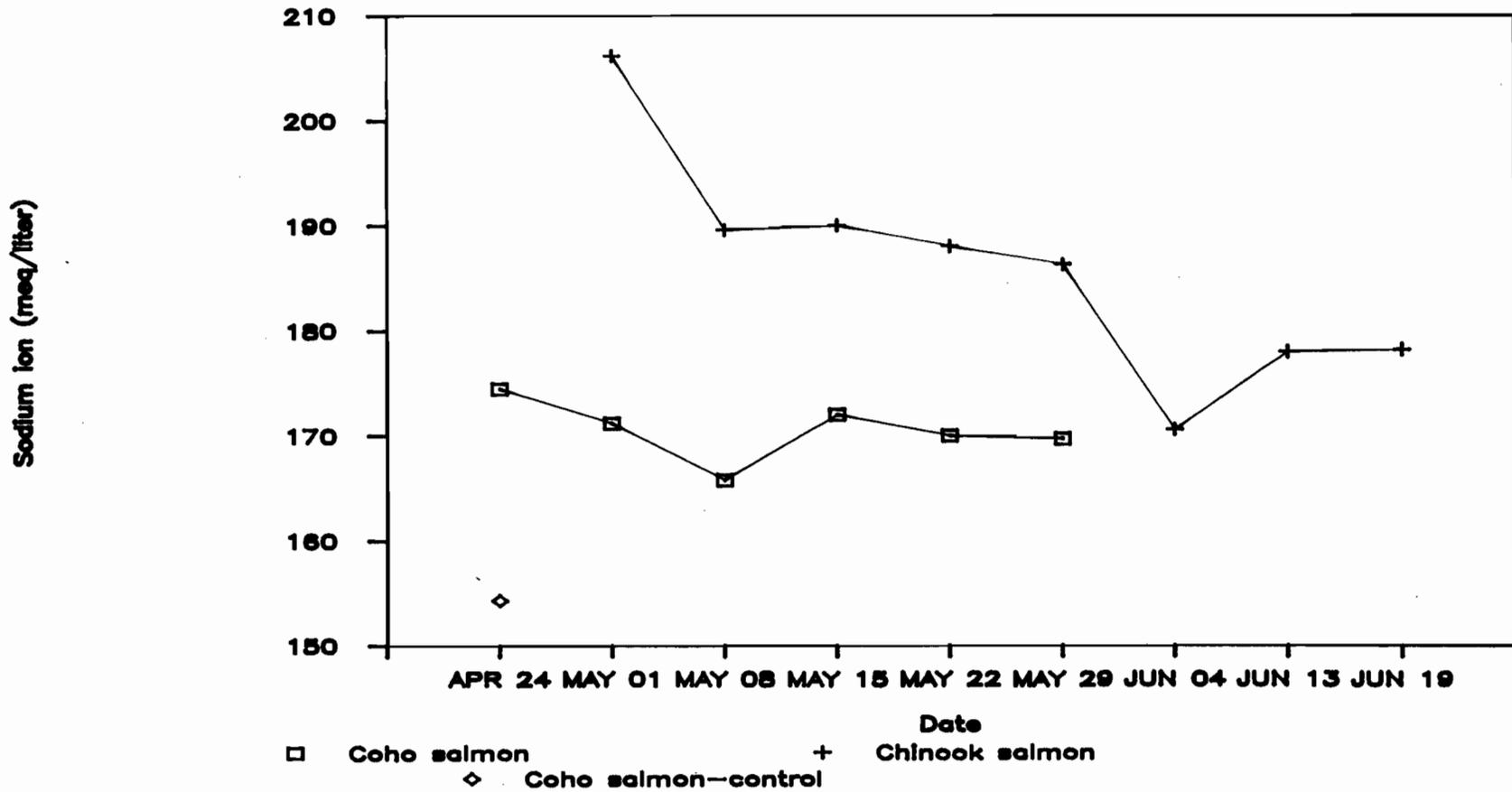


Figure 1. Sodium ion concentrations in the blood serum of chinook and coho salmon smolts from Elmendorf Hatchery, 1986. Coho smolts were released between 27 May and 30 May. Chinook salmon smolts were released between 6 June and 13 June.

Chinook Salmon Postsmolts:

In an experimental program to create new fisheries in urban lakes, 25,000 chinook salmon smolts was held over the summer, reared at 12.2°C, and planted at an average size of 64.1 g. The survival from the smolt stage to release (99.9%) was good; however, some of the males matured and died in August and September, so this may be a potential problem if we elect to hold these fish longer in the hatchery. These fish were released in September for an experimental ice fishery this winter in the Anchorage area lakes.

Coho Salmon Smolts:

In Seward and Whittier, 211,075 coho salmon smolts were released into Seward Lagoon and Cove Creek (Table 2); approximately 8,000 coho salmon are expected to return (based on a survival rate of 4%), and most of these will be available to the sport fishermen. Coho salmon fingerlings were also released into freshwater lakes throughout the Matanuska Valley to provide more road-accessible fishing for sportsmen.

Coho salmon smolts were released at an average size of 21.0 g. The mortality rate from fingerling to smolt stage for this lot of fish was 1.3%. This is an improvement over 1985 when the mortality rate was 13%. Other losses were attributed to birds and counting errors. This lot of fish also performed well in the seawater challenge test (Figure 1).

Coho Salmon Fingerlings:

Coho salmon fingerlings were released into lakes in the Matanuska Valley at an average size of 3.5 g. The survival rates of this lot of fish from the green-egg stage to the eyed-egg stage and eyed-egg to emergence were 85% and 97.2%, respectively; the overall survival rate from green-egg to emergence was 82.6%.

Although these fish were being reared in water treated to reduce supersaturation, they contracted gas bubble disease soon after they were transferred into raceways. Subsequently, some of the fish were transferred into water with dissolved-gas concentrations less than saturation (97.6%) by using forced-draft aeration towers, but the problem still persisted. The lower-than-expected survival rate of 82% from emergence- to fingerling-stage was due to gas bubble disease. A resolution of this situation is already planned for next year.

Visitor Area:

A viewing area for visitors to observe adult salmon was constructed adjacent to the hatchery powerplant/intake dam in 1986. This special cooperative project (U.S. Air Force and FRED Division) allowed the public to readily observe returning hatchery-produced chinook salmon in Ship Creek. An estimated 30,000 visitors used the viewing facility during 1986.

Budget

The official compilation of FY 1986 expenditures has not been completed; however, the Elmendorf Hatchery records indicate that expenditures will be within the budget: \$454,000 expenditure of \$461,000 allocation. A total of 5.8 man-years was spent to operate the hatchery during FY 1986.

PROJECTS AND EVALUATIONS

The chinook salmon enhancement project at Crooked Creek provides a total of over 26,000 recreational fishing days annually. Based on preliminary data, an estimated 12,500 adult chinook salmon returned to Crooked Creek in 1985; of these, an estimated 35% resulted from Elmendorf Hatchery production (Loren Flagg, pers. comm.). Returns to Halibut Cove Lagoon were lower than in recent

years, in part because no smolts were released in 1982. Nevertheless, this year's returning chinook salmon provided approximately 1,000 recreational fishing days. Typically, up to 3,000 angler-days of fishing are provided in Halibut Cove Lagoon by smolts released from Elmendorf Hatchery (Nick Dudiak, pers. comm.).

Chinook salmon returns to Seward and Whittier have been low. An estimated 100 fish returned to Whittier, and 500 returned to Seward this year; however, the chinook salmon returns to Ship Creek are about as expected. Additionally, they are providing excellent viewing opportunities for residents and visitors in the downtown Anchorage area.

Chinook salmon scheduled for the Homer Spit releases were again imprinted with an organic chemical to determine if they can be decoyed to a preferred return location. Adults from those released during the last 2 years returned this summer and created a very popular shore-based, family-oriented fishery. Though these fish returned to their Homer Spit release site successfully, they could not be decoyed to another location by moving the drip station. Details of this project will be presented in another report.

Preliminary data from the experimental releases of chinook and coho salmon in fresh water indicate that the coho salmon are surviving at 50% higher rate than the chinook salmon. The chinook salmon survived poorly in three of the study lakes, but in two of the lakes, they survived nearly as well as the coho salmon. Details of these studies will also be presented in a separate project report.

Adults from the coho salmon smolts released from Elmendorf Hatchery in 1985 contributed an estimated 3,240 fish to the sport fish catch in Seward (Ted McHenry, pers. comm.). Although the data are not yet final, they indicate that the quality and

survival of the smolts produced are greatly improved, compared to previous years. The 1986 Seward smolt release should provide good-quality fishing during the Seward Silver Salmon Derby.

It appears that the Whittier coho salmon fishery has also been improved. Approximately 8,000 returning adults were harvested during 1986 (Kevin Delaney, pers. comm.); the estimated excellent smolt survival rate was 7.4%. The 1986 release should continue this trend.

FACILITY DEVELOPMENT

Nearly all of the Elmendorf Hatchery remedial construction projects were completed during FY 1986: the well, the shop building, alterations to the aeration sump and heated-water delivery system, forced-draft incubation water towers, the cooling pond clean-out, and raceway disinfection. In addition, the second-pass water aeration project has nearly been completed and will soon be ready for testing.

The next step for improving the rearing environment at Elmendorf Hatchery is the completion of the dual water system. This will provide better control of dissolved gases in the water as well as water temperatures.

Unfortunately, the recent addition of the aeration pumps and new well have overloaded our standby power system. Power loads have been adjusted so that pumps and equipment for the most important programs could be given priority. A larger-capacity emergency-power system is being planned, and funding sources are being sought.

SUMMARY

During 1986, with the exception of a small percentage of fish suffering gas bubble disease, Elmendorf Hatchery produced healthy chinook and coho salmon fingerlings, smolts, and presmolts at a rate of within 10% of the goals. The smolts showed strong smoltification characteristics in seawater challenge tests. There was no incidence of pathogen-related disease. This is the third consecutive year without a major pathogen-related disease incidence at Elmendorf Hatchery. Fish resulting from fingerlings produced at the facility provided a freshwater fishery as well as test specimens to compare chinook and coho salmon survivals in fresh water.

The clean-up and reconstruction programs carried out last summer have provided an improved rearing environment for smolts, resulting in fewer parasite problems, an absence of fin fraying, and a negligible mortality. Salmon production at Elmendorf Hatchery will be even greater in FY 1987 than in FY 1986.

The hatchery's appearance and access have been greatly improved for the estimated 30,000 people who visit the facility each year to view the large concentration of hatchery-produced chinook salmon in Ship Creek.

