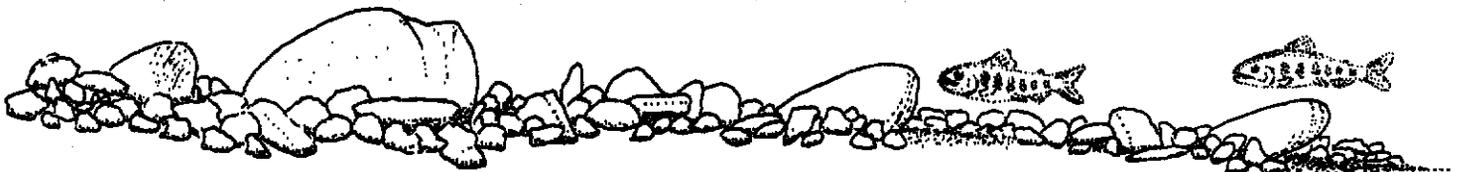
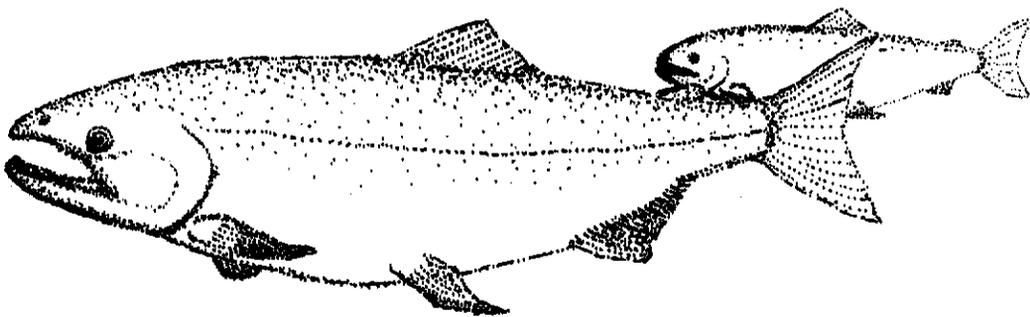




**Fisheries Assistance Office  
Olympia, Washington**

PROGRESS REPORT OF NATIONAL FISH HATCHERY  
PROGRAMMING AND EVALUATION ACTIVITIES,  
PUGET SOUND AND COASTAL WASHINGTON, 1986-87



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## PREFACE

The purpose of this report is to provide an annual update of hatchery programming changes and evaluation activities. Although this report contains some analysis of existing data and recommends changes to programming activities, the intent is to provide periodic updates and not comprehensive analyses of the various programs. Rather, individual reports will be generated that will encompass many years of data concerning individual programs and will provide detailed analysis of the results. Those reports will normally address specific evaluations and will be generated by Fisheries Assistance Office, Olympia, U.S. Fish and Wildlife Service.

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## INTRODUCTION

This report contains information regarding hatchery programming and evaluation activities at Makah and Quilcene National Fish Hatcheries (NFH) for the period, August 1, 1986 - July 31, 1987. This information has been compiled for use by various fishery resource agencies. More detailed information may be obtained from the Olympia Fisheries Assistance Office (FAO).

### QUILCENE NATIONAL FISH HATCHERY

#### FALL CHINOOK

Fall chinook have not been propagated at Quilcene NFH since the mid 1970's when the program was discontinued due to poor adult contribution and return. However, two broods of Nooksack Chinook (84 and 86), brought into Quilcene to supplement the spring chinook program, were suspected of being fall chinook. Electrophoretic analysis of the 1986 Nooksack adult return performed by Washington Department of Fisheries (WDF) personnel indicated that the fish were most likely Nooksack fall chinook (Bill Graeber, WDF, pers. comm.). The resulting fingerlings were released into the Dosewallips River in 1987 (Table 1) to prevent contamination of the Quilcene spring chinook program. The 1984-brood chinook, assumed to be falls because of similar spawn timing as the 1986 brood, had been reared to term and released directly from the hatchery as yearlings in 1986. Scale analysis, run timing, and mark presence were used to distinguish fall-return fish in 1987 resulting from that 1984 release to insure that no contamination occurred with spring-run spawning efforts.

#### SPRING CHINOOK

Restoration of Puget Sound spring chinook continues to be a high priority program of the U.S. Fish and Wildlife Service (Service). Working with state and tribal agencies, our goal is to restore particular stocks in Puget Sound to a level that will sustain direct harvest. Development of a spring chinook brood run at Quilcene NFH is an important part of this restoration effort in Hood Canal.

Releases: The hatchery released 215,584 yearlings on May 8 at 23.0 fish/pound (Table 1). Nearly all fish released were coded wire tagged to meet our commitment to the US/Canada effort as a designated spring chinook indicator stock. Also, tag codes were assigned differentially within the release to accommodate further evaluation of the use of Galomycin (trade name) during rearing to control bacterial kidney disease (BKD). Specific tag information is presented in Table 2.

Terminal Area Returns 1986: The hatchery recorded a return of 192 males and 53 females to the rack during 1986. The entire return was biosampled and resulting age structure and length information is presented in Table 3. Most of the returning males were age three and females age five. Based on the strong return of 3-year-old males, we had predicted a good return of 4-year-old fish in 1987 but that run was less than expected as described below.

The average fork length for the 4-year-olds was approximately 691 mm or 29.4 inches total length. The maximum length restriction of 30 inches imposed by WDF during spring sport fisheries is designed to protect 80% of 4-year-old fish. This length restriction would not protect the average 4-year-old Quilcene chinook returning in 1986 and in fact only protected 50% of these fish when individual lengths were examined (Hiss and Zajac 1987). The run total fell short of our escapement requirement of 500.

Terminal Area Returns, 1987: During the spring and summer of 1987 we monitored returning adults in the Big Quilcene River by conducting snorkel surveys (Table 4). Our objectives were to estimate abundance, determine timing, document poaching, determine possible broodstock collection sites, and identify an expected return of 3-year-old fall chinook. The first survey conducted on April 29 showed 13 fish in the river and one in the hatchery. Approximately half (60) of the final return had entered the system by mid-May (Figure 1) with some fish showing poaching wounds. The final survey indicated that most of the return had entered the hatchery consequently no broodstock capture efforts were conducted in the river. Some chinook did enter the hatchery later in the season that were identified as fall chinook using scale analysis and absence of a fin clip. They were not used in 1987 spawn efforts.

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags resulting in 35 tags, represented six different codes being recovered. The codes recovered are presented in Table 5 indicating that no group showed a strong return with the best rate being .03 percent. Tag recoveries also occurred in Canadian waters for several tag groups in 1986 (Table 6). Although 1986 recovery information is preliminary in nature, no recoveries were reported by agencies other than Canada. Tag codes 5-14-26, 5-14-52 and 5-14-54 contributed as 3-year-old fish and may be expected to provide more recoveries as 4-year-old fish next year. However, the other recovered code, 5-14-19 contributed poorly (0 to Washington, 10 estimated to Canada) even though the fish were 4 years old when recovered. Release information about these tag groups may be found in FAO (1985) and Kenworthy (1986).

Discussion/Recommendations: Spring chinook continue to be a priority program of the Service at Quilcene. The Service has continued its effort to produce quality smolts by using injections of erythromycin in returning adults to control BKD, individual spawning and incubation to alleviate health risks, and feeding erythromycin to juveniles to control BKD. Also, yearling release size has been reduced from 15/lb to 20/lb in an effort to further alleviate impacts of BKD on the population.

We have attempted to supplement poor adult returns with eggs from WDF hatcheries at Nooksack and Cowlitz. However, eggs received from Nooksack in 1984 and 1986 were suspected to be fall chinook and identification of IHN virus at Cowlitz severely restricts our use of either stock in the near future. We have continued to recommend fishery restrictions (area closures, season dates, and revised maximum catch lengths) and increased enforcement to reduce poaching in the Quilcene River (Hiss and Zajac 1987). However, coded wire tag recovery data presented indicates that neither fishery contribution nor hatchery returns are particularly strong. A more detailed evaluation of current tag recovery data including possible influence of rearing and release strategies will be completed in FY88. In the meantime, we will continue our efforts to improve our adult return through fish health management, input to development of fishery regulations, and maintenance of spring timing by removing returning fall chinook.

#### COHO

Releases: Coho production included 617,231 yearlings released on station (Table 1), 428,600 fingerlings transferred to WDF (Table 7) for seeding underutilized tributaries in the area and 102,000 eyed eggs transferred to Chimacum High School (Table 8).

Terminal Area Returns, 1986: Coho returns provided sufficient spawners to meet program needs for 1986. The hatchery reported an escapement to the rack of 2,506 fish. Of this return 466 adults and 33 jacks were passed upstream to utilize habitat above the hatchery. Coho produced by Quilcene NFH provide fishing opportunities in Canada and United States to both treaty and non-treaty fisherman. No coded wire tagging was implemented for broods resulting in the 1986 return and we therefore cannot provide accurate estimates of contribution or survival. However, based on WDF's post-season run reconstruction estimates and known catch records, 4,659 Quilcene coho were harvested in area 12A net fisheries, 89 in Big Quilcene River net fisheries, and less than 10 in the Big Quilcene River sport fishery (Tim Flint, Dale Ward, WDF; Peter Dygert, PNPTC; pers. comm.) for a total of approximately 4,760 fish.

Discussion/Recommendations: The run reconstruction methods used by WDF employ adult/jack counts recorded at the hatcheries. Historically, inaccuracies in these counts have existed at numerous facilities (Tim Flint, WDF, pers. comm.) and 1985 scale analysis conducted at Quilcene and Makah (Kenworthy 1986) confirmed this at both NFH's. Although we did not biosample the 1986 coho return, we suspect that our visual determination of adults and jacks was not entirely accurate. We have considered using scale analysis on a continuing basis to estimate adult/jack counts more accurately. However, WDF is willing to accept the counts based on fish length from all hatcheries as opposed to establishing coho biosampling programs at the facilities in order to provide slightly better data (Tim Flint, WDF, pers. comm.). We will strive to provide the best counts available based on visual identification.

Current return records indicate that the Quilcene coho program continues to be successful. However, coded wire tagging has not occurred since brood year 1981. Subtle changes in hatchery practices and marine environment have probably caused contribution and distribution differences not accurately represented by the earlier tagging. We suggest that tagging be initiated with progeny from the 1988 return to assess current contribution rates and distribution patterns.

During years when shortfalls occur in the spring chinook program the Hood Canal Management Plan allows us to increase our yearling coho program from 250,000 to 550,000 smolts to more fully utilize our production capacity. However, despite this allowed increase, we still do not use all available rearing space during those years (Russ Ferg, FWS, pers. comm.). During FY88, we will determine our coho capacities depending on various spring chinook production numbers and submit a proposal to the Hood Canal Management Technical Team for consideration of increased coho production at Quilcene NFH. If adopted, we will incorporate the new coho capacities into the programming document. Also, an additional egg transfer of 200,000 to Bangor Naval Station has been approved and will be added to the document in FY 88.

#### CHUM

Releases: The hatchery released a total of 2,503,091 at Quilcene NFH (Table 1) consisting of both Quilcene and Walcott stocks. Releases at Walcott were discontinued in 1985 for harvest management reasons. In addition, 2,499,750 eggs were spawned at Walcott Slough, eyed at Quilcene and transferred to Makah NFH to supplement their program (Table 8).

Terminal Area Returns, 1986: Large numbers of adults returned to both Quilcene NFH and Walcott Slough. Records show a return of 1,012 males and 931 females to Quilcene and 2,153 males and 1,809 females to Walcott Slough. Biosampling was conducted at both sites with 28.9% of the return sampled at Quilcene and 13.7% at Walcott. Scale analysis showed the predominant age class at both locations to be age four (Table 9 and 10). Return rate estimates for the various age classes are presented in Table 11. These estimates show the Walcott Slough return to be slightly more successful for all ages. However, counts of fish remaining in the Big Quilcene River and the Walcott Slough area after spawning operations are completed, are unknown. Therefore, the rates presented are both underestimates and the apparent difference observed between return rates at the two facilities would be influenced if that information was available. In addition to strong returns to the facilities, the Quilcene and Walcott programs contributed well to Hood Canal net fisheries. Run reconstruction estimates indicate 10,453 Walcott chum and 5,128 Quilcene chum were caught in terminal area net fisheries.

Discussion/Recommendations: The transition of the chum program from Walcott Slough to Quilcene NFH and current rearing and release strategies have resulted in a successful program at Quilcene. Although releases are no longer made at Walcott, returns occurred during 1987 and are expected in

1988. These returns should be utilized to supplement Makah NFH and tribal programs as requested. Coded wire tagging has not been done with chum at either facility. However, a reasonable evaluation may be possible using run reconstruction estimates, catch records and escapement data. The feasibility of performing such an evaluation in the near future should be investigated.

## MAKAH NATIONAL FISH HATCHERY

Restoration of coastal stocks of salmon and steelhead are a high priority of the Service. Successful programs are now being realized at Makah NFH with coho and steelhead and the chinook program appears to be improving. Large scale evaluations are currently being performed using coded wire tags and fin marks to assess relative success of the programs and to satisfy our commitment to US/Canada as a major fall chinook production facility.

### FALL CHINOOK

The fall chinook program remains the highest priority effort at Makah NFH. Return numbers have continued to improve with 1986 experiencing the largest return and egg take to date. The Makah tribe continued its support of the program by not allowing a directed fishery upon the run in 1986.

Releases: The hatchery released 700,514 fall chinook on-station as well as 105,190 fall chinook upstream to meet our required mitigation to Makah Steering Committee for trapping and using all returning fish for broodstock (Table 12). All release groups contained coded wire tags to meet our evaluation and US/Canada identification requirements. Specific tag-related information is presented in Tables 13 and 14. The evaluation program is relatively new and no tag recoveries from these programs are expected until 1987.

In addition to our own releases, the hatchery incubated Hoko fall chinook eggs for the Makah Tribe and transferred the resulting 162,740 fingerlings to Hoko pond on April 29 at 111/1b. This group had also been coded wire tagged with assistance from the Service.

Terminal Area Returns: The hatchery return in 1986 was the largest on record. The return totaled 607 fish including 163 age two, 80 age three, 334 age four and 30 age five fish. A small number of adults not needed for broodstock was passed upstream. This group included 27 males, four females and 15 jacks. Table 15 presents chinook length, sex, and age information based on biosampling data collected from 68.8% of the fish. The first fish entered the hatchery on September 24 with 50% of run having entered by mid October (Figure 2).

Discussion/Recommendation: Fall Chinook continue to be the priority program at this facility. Evaluation of the production and mitigation should continue as well as our commitment to US/Canada using coded wire tagging. Directed terminal fisheries should not occur on chinook and incidental catch during coho fisheries should be monitored closely to prevent significant impact on the return.

#### COHO

Releases: Coho production included 250,000 yearlings and 99,619 subyearlings released at the hatchery and 36,466 yearlings released into the Waatch River (Table 12).

Terminal Area Returns, 1986: A total of 6,999 coho returned to the Sooes River during 1986. River net fisheries harvested 445 (Table 16) and 1,499 were passed upstream to use available habitat. The remainder of the return was used as broodstock or excessed to the tribe. Broodstock was taken from fish entering the facility after November 1 to further separate chinook and coho run timing for ease of harvest management. Although the total return was relatively large, not enough broodstock was secured after November 1. Consequently, we had to supplement the program with eggs from Quinault National Fish Hatchery.

Discussion/Recommendations: Although no coded wire tagging has been performed, the recorded river catch and return numbers indicate that the coho program is successful. We are initiating tagging programs with the 1986 brood to identify distribution patterns and contribution rates of the yearling production release. In addition, tagging will be accomplished on the Waatch yearling release. This release had been made directly from Makah NFH to lower Waatch River through 1987. Since no facility was available for the group to imprint on the Waatch system, we have felt that large numbers would return to the Sooes River instead of the Waatch River. However, the Makah Tribe may have an imprint facility available on the Waatch system for the 1988 release. We will be able to evaluate the relative success of the imprint location with the scheduled coded wire tagging. The programming document will reflect the release site change from the Waatch River to the imprint facility. Also, currently programmed reservation tributary fry releases will be reduced to reflect tributary carrying capacities.

As suggested, the coho return has been relatively large and can support some directed harvest. However, the run timing overlaps with fall chinook entry. Since chinook have been identified as the priority species and that run is currently rebuilding, it cannot support a directed harvest and incidental catch during coho fisheries is damaging as well. The broodstock acquisition date of November 1 was established to create run time separation between chinook and coho returns to more effectively harvest excess coho. However, coho broodstock needs have not been met during most returns. The Makah Steering Committee has re-examined chinook timing and concluded that the November 1 date could be moved up to October 15, at least on a trial basis. This new date should allow effective harvest of excess coho as well

as provide sufficient broodstock for hatchery needs. In the meantime, efforts will be made to select for later-returning coho to hopefully shift the run-timing. At any rate, coho fisheries are closely monitored and managed to reduce incidental catch of fall chinook.

## CHUM

The Service, through the Makah Steering Committee, has made a concerted effort to restore chum salmon to the Sooes River using Walcott and Quinault stocks transferred from Quilcene and Quinault NFH's. No apparent success has been realized using these stocks. We are now considering the feasibility of using Nitinat stock from Vancouver B.C. However, it may be difficult to restore chum to the Sooes River since Walcott and Nitinat run timing severely overlap the successful coho and steelhead returns, thus posing significant harvest conflicts (Mark LaRiviere, Makah Tribe, pers. comm.).

Releases: The largest chum fry release since initial operation of the Makah NFH occurred this year. A total of 2,897,927 were released into the Sooes River during April and May (Table 12). Most of this production resulted from eyed egg transfers to Makah from Quilcene NFH in January and February.

Terminal Area Returns, 1986: A total of 47 chum returned to the facility in 1986 (Table 17). Forty two of these fish were 4 years old and the remaining fish were 3 years old. In addition to the hatchery escapement, 42 chum were harvested incidentally during the coho and steelhead fisheries (Table 16).

Discussion/Recommendations: The status of the Makah NFH chum program needs to be discussed by the Makah Steering Committee. To date, attempts to establish a run have not succeeded. If the committee agrees that a chum program is still desirable, perhaps increased effort should be directed towards acquisition of an alternate stock. However, even if another stock is available, it would be necessary and probably extremely difficult to curtail the successful coho and steelhead fisheries to allow the chum run to increase.

## WINTER STEELHEAD

In terms of release numbers the steelhead program is the smallest program at the Makah NFH. However, recent returns have been strong and provide quality fish for both commercial net fisheries and river sport fisheries. In addition to our own program, we incubated eggs for the Makah tribal Hoko pond program and transferred them to Hoko on Feb 18 1987.

Releases: The hatchery released 14,866 yearlings into the Waatch River and 61,051 yearlings into the Sooes River at the hatchery. In addition to the yearling releases, 16,222 fingerlings were released at the hatchery and 74,000 into Sail Creek (Table 12). All yearlings released were fin-clipped

to allow accurate identification of hatchery versus wild returns and to determine relative survival of the Sooes and Waatch releases. The pertinent marking information is presented in Table 18 and 19.

Terminal Area Returns, 1986: Steelhead returning prior to February 1 are considered to be of hatchery origin. The hatchery operates their weir and ladder before February 1 to secure their broodstock. The fish returning after this date are assumed to be wild and allowed to proceed upstream to spawn. A total of 910 steelhead returned to the hatchery during the normal period of operation. Biosampling was performed on the return to determine age structure and wild composition of the run (Table 20). All but one of the fish trapped by the hatchery were of hatchery origin and 69% were age three fish. The Makah tribal fisheries staff estimated upstream escapement to be approximately 752 fish of hatchery origin and 717 fish of wild origin for a total of 1,469. These estimates are based on methods used by Washington Department of Wildlife (WDW) incorporating redd construction before and after March 15 and assuming two adults per redd (Mark LaRiviere Makah Tribal Fisheries, pers. comm.).

A substantial commercial net fishery harvested a total of 6,409 during the 1986-87 winter season (Table 16). The biosampling performed on the catch indicated that 96.9% were of hatchery origin, 3.1% wild and the major age class was 3 for hatchery fish and 4 for wild fish (Table 21).

In addition to the successful net fishery, approximately 174 steelhead were harvested by sports anglers. This estimate was generated from WDW punch card data and Makah Tribal fisheries staff estimates (Mark LaRiviere, Makah Tribe, pers. comm.).

Mark Recoveries: All returning jacks were sampled at the hatchery for adipose marks. A total of 13 jacks had returned of which 9 were marked.

Discussion/Recommendations: Our goal with the steelhead program is to maintain temporal separation between hatchery and wild stocks. This would allow river net fisheries to target on hatchery fish and allow the wild run to maintain itself in the natural environment without competition and genetic dilution occurring from hatchery stock. To achieve this, we have assumed that hatchery fish return before February 1 and have secured our broodstock accordingly. Fish returning after that date are assumed to be wild and are allowed to pass upstream. Efforts should continue to evaluate the effectiveness of using this date for run separation. Mark application of hatchery releases and biosampling of the run both before and after February 1 will facilitate our efforts to further refine the run separation date.

Several changes to the programing document have been discussed for FY 88. These include a shift from direct yearling releases into the Waatch River to release into an Educket Creek (tributary to Waatch) imprint facility and reduction of the fingerling release to reservation creeks from 100,000 to a number more closely aligned with carrying capacity.

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- Hiss, J.M., and D.P. Zajac. 1987. Status of Quilcene spring chinook run. Fisheries Assistance Office, U.S. Fish and Wildlife Service, Olympia, Washington.
- Kenworthy, B. 1986. Progress report of national fish hatchery programming and evaluation activities, Puget Sound and coastal Washington, 1984-85. Fisheries Assistance Office, U.S. Fish and Wildlife Service Olympia, Washington.

Table 1. Record of Quilcene National Fish Hatchery salmon releases made into the open waters of Washington during 1987.

Species	Stock	Brood Year	Release Location	Date	Number	Size (No/lb)	Weight(lbs)
Fall Chinook	Nooksack Hatchery (WDF)	86	Dosewallips R.	3/20/87	54,629	364.2	150
Spring Chinook	Quilcene NFH	85	Big Quilcene R.	5/8/87	215,584	23.0	9373
Coho	Quilcene NFH	85	Big Quilcene R.	5/7,8/87	617,231	23.0	26,836
Chum	Quilcene NFH	86	Big Quilcene R.	4/27/87	634,030	610.0	1,039
				5/4/87	1,540,509	661.0	2,331
	Walcott Slough	86	Big Quilcene R.	5/4/87	328,552	715.0	460

Table 2. Quilcene National Fish Hatchery spring chinook tag groups released in 1987.

	Primary purpose	Secondary purpose
Purpose:	US/CANADA Indicator Group	Use of Galomycin to control BKD
Investigator:	FAO - Olympia, USFWS	Olympia Fish Health Center, USFWS
Project Length:	Ongoing	Four Years
Year of Project:	N/A	First
Brood Year:	1985	1985
Tag Code:	5-8-32 <u>1/</u>	5-14-62 5-17-48 5-17-49 5-17-50 5-18-31 5-18-32 5-18-33
Tag Date:	September, 86	
Stock:	Quilcene NFH	
Size at Tagging:	40.0/1b	
Release Location:	Big Quilcene River	
Release Date:	May 8, 1987	
Size at Release:	23.0/1b	
Number Marked Released:	28,082	29,620 25,391 24,374 24,141 25,875 26,124 26,098
Tag Retention Rate (%):	90.6	93.2 85.9 84.9 77.2 88.7 85.7 87.1
Number Unmarked Released:	5,879	
Percent Marked at Release:	97.3	

1/ Control group for the Galomycin evaluation.

Table 3. Quilcene National Fish Hatchery spring chinook age at return during 1986 (100% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
2	48	292	0	-	48
3	113	473	0	-	113
4	15	691	1	690	16
5	16	774	52	791	68
Totals	192		53		245

Table 4. Actual counts of brood year 1987 spring chinook (all ages) in the Big Quilcene River and hatchery. Counts in the river are based on snorkel observations.

Date	4/29	5/13	5/27	6/12	6/25	7/10	7/27	8/6	8/14	8/19
Hatchery	1	0	8	24	55	84	98	105 <u>1/</u>	125 <u>1/</u>	100
River	13	33	62	59	25	30	25	20 <u>2/</u>	20 <u>2/</u>	12 <u>1/</u>
Totals	14	33	70	83	80	114	123	125 <u>1/</u>	145 <u>1/</u>	112 <u>1/</u>

1/ Count known to include coho

2/ Count known to include coho and was conducted on subsection of Big Quilcene River.

Table 5. Spring chinook coded wire tag recoveries at Quilcene National Fish Hatchery, 1986.

Number Killed	Number Sampled	Sampling Rate(%)	Tag Code	Agency	Number Observed	Number Expanded	Age	Survival to Rack(%)	Origin
245	245	100.0	5-10-33	FWS	9	9	5	.03	Quilcene
			5-14-52	FWS	7	7	3	.03	Quilcene
			5-14-19	FWS	6	6	4	.01	Quilcene
			5-14-53	FWS	7	7	3	.03	Quilcene
			5-14-54	FWS	4	4	3	.008	Quilcene
			5-14-26	FWS	2	2	3	.004	Quilcene

Table 6. Preliminary year 1986 estimated and (observed) recoveries of spring chinook released from Quilcene National Fish Hatchery.

Tag Code	British Columbia			
	Washington	Southwest Vancouver Island Troll	Central Net	Georgia Straight Sport
5-14-52	(0)	(0)	3(1)	5(1)
5-14-19	(0)	10(2)	(0)	(0)
5-14-54	(0)	10(2)	(0)	5(1)
5-14-26	(0)	3(1)	(0)	(0)

Table 7. Fingerling releases of brood year 1986 Quilcene National Fish Hatchery coho made by Washington Department of Fisheries. (All releases were made on March 30,31 1987 at 624.8/1b.)

Location	Number
East Fork Chimacum Creek	42,200
Naylor Creek	6,400
Chimacum Creek	86,400
Thorndyke Creek	13,700
Tarboo Creek	123,900
Leland Creek	57,300
Little Quilcene River	<u>98,700</u>
Total	428,600

Table 8. Record of egg transfers made by Quilcene National Fish Hatchery, 1987 (all were brood year 1986).

Species	Stock	Location	Date	Number	Development Stage
Coho	Quilcene NFH	Chimacum High School	12/17/86	102,000	Eyed
Chum	Walcott Slough	Makah NFH	1/21/87	960,500	Eyed
			2/4/87	1,539,250	Eyed

Table 9. Chum age at return to Quilcene National Fish Hatchery, during 1986 (28.9% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
3	344	647	283	607	627
4	618	735	635	686	1,253
5	50	759	13	654	63
Totals	1,012		931		1943

Table 10. Chum age at return to Walcott Slough during 1986 (13.7% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
3	535	655	383	616	918
4	1,472	747	1,393	689	2,865
5	146	751	33	710	179
Totals	2,153		1,809		3,962

Table 11. Estimated return rates of chum to Quilcene National Fish Hatchery and Walcott Slough in 1986.

Brood Year	Release Location	Release Number	At at Return	Number Returned	% Return To Rack
1981	Quilcene NFH	1,474,949	5	64	.004
	Walcott Slough	2,210,040	5	180	.01
1982	Quilcene NFH	995,738	4	1,266	.13
	Walcott Slough	1,644,865	4	2,913	.18
1983	Quilcene NFH	1,218,671	3	634	.05
	Walcott Slough	1,315,375	3	938	.07

Table 12. Record of Makah National Fish Hatchery salmon and steelhead releases made into the open waters of Washington during 1987.

<u>Species</u>	<u>Stock</u>	<u>Brood Year</u>	<u>Release Location</u>	<u>Date</u>	<u>Number</u>	<u>Size (No/lb)</u>	<u>Weight(lbs)</u>
Fall Chinook	Makah NFH	86	Sooes R (at hatchery) Sooes R (upstream)	4/28/87 4/18/87	700,514 105,190	82.4 276.8	8,498 380
Coho	Makah NFH	85	Sooes R Waatch R	4/15/87 4/15/87	250,000 36,466	15.8 15.8	15,823 2,308
	Makah NFH and Quinault NFH	86	Sooes R	7/28/87	99,619	59.0	1,688
Chum	Walcott Slough Makah NFH	86 86	Sooes R Sooes R.	4/20,5/4/87 4/20/87	2,840,463 57,464	546.2 419.4	5,200 137
Winter Steelhead	Makah FH	86 87 86 87	Sooes R. Sooes R. Waatch R. Sail Cr.	4/14/87 7/29/87 4/13/87 6/4/87	61,051 16,222 14,866 74,000	5.0 24.6 5.2 126.0	12,210 659 2,859 587

Table 13. Makah National Fish Hatchery fall chinook tag groups released in 1987 directly into the Sooes River

	Primary purpose	Secondary purpose
Purpose:	1) US/Canada indicator group	2) USFWS hatchery evaluation
Investigator:	FAO-Olympia, USFWS	
Project Length:	1) On going	2) Four years
Year of Project:	1) N/A	2) Second
Brood Year:	1986	
Tag Code:	5-19-7 R4	
Tag Date:	April, 1987	
Stock:	Makah NFH	
Size at tagging:	100.0/1b	
Release Location:	Sooes River (at hatchery)	
Release Date:	April 28, May 11, 1987	
Size at Release:	82.4/1b	
Number Marked Released:	137,567	
Tag Retention Rate (%):	92.6	
Number Unmarked Released:	562,947	
Percent Marked at Release:	19.6	

Table 14. Makah National Fish Hatchery fall chinook tag groups released in 1987 for instream mitigation.

Purpose:	Determine total survival of upstream mitigation releases
Investigator:	FA0-Olympia, USFWS
Project Length:	Four years
Year of Project:	Second
Brood Year:	1986
Tag Code:	B5-5-12, B5-5-13, B5-5-14
Tag Date:	March, April, 1987
Stock:	Makah NFH
Size at Tagging:	500.0/1b
Release Location:	Sooes R. Rim's 6.6, 8.0 and 13.4
Release Date:	April 18, 1987
Size at Release:	276.8/1b
Number Marked Released:	35,805, 36,226, 33,159
Tag Retention Rate (%):	84.7, 82.6, 96.1
Number Unmarked Released:	0,0,0.
Percent Marked at Release:	100.0

Table 15. Fall chinook age at return fall chinook to Makah National Fish Hatchery during 1986 (68.8% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
2	163	434	0	-	163
3	75	676	5	765	80
4	195	905	139	894	334
5	10	988	20	954	30
Totals	443		164		607

Table 16. Monthly Indian set net harvest in the Sooes River during the 1986-87 season (data provided by Makah Tribal Fisheries Management).

Species	November	December	January	Totals
Fall chinook	1	0	0	1
Coho	382	63	0	445
Chum	7	30	5	42
Steelhead	6	4522	1881	6409

Table 17. Chum age at return to Makah National Fish Hatchery during 1986 (80.8% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
3	1	650	4	625	5
4	22	752	20	690	42
Totals	23		24		47

Table 18. Makah National Fish Hatchery winter steelhead mark groups released in 1987 into the Sooes River.

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Purpose:	1) Identify Hatchery Stock	2) Determine survival rate
Investigator:	FAO-Olympia, USFWS	
Project Length:	Three Years	
Year of Project:	Second	
Brood Year:	1986	
Mark Type:	Adipose Clip	
Mark Date:	November, 1986	
Stock:	Makah NFH	
Size at Marking:	10.0/1b	
Release Location:	Sooes River	
Release Date:	April 14, 1987	
Size at Release:	5.0/1b	
Number Marked Released:	58,182	
Number Unmarked Released:	2,869	
Percent Marked at Release:	95.3%	

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Table 19. Makah National Fish Hatchery winter steelhead mark groups released in 1987 into the Waatch River.

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Purpose:	Determine survival rate of Waatch River release	
Investigator:	FAO-Olympia, USFWS	
Project Length:	Three years	
Year of Project:	Second	
Brood Year:	1986	
Mark Type:	Adipose/Left ventral clip	
Mark Date:	November, 1986	
Stock:	Makah NFH	
Size at Marking:	10.0/1b	
Release location:	Waatch River	
Release Date:	April 13, 1987	
Size at Release:	5.2/1b	
Number Marked Released:	13,127	
Number Unmarked Released:	1,739	
Percent Marked at Release:	88.3%	

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Table 20. Winter steelhead age at return to the Makah National Fish Hatchery during 1986 (78.6% sampled).

Age	Male		Female		Total Number In Age Class
	Expanded Number	Mean Fork Length(mm)	Expanded Number	Mean Fork Length(mm)	
2	12	456	0	-	12
3	379	647	246	629	625
4	112	782	157	760	269
5	2	747	2	726	4
Totals	505		405		910

Table 21. Winter steelhead age at harvest during 1986-87 set net fishery in Sooes River (24.4% sampled).

Age	Number of Hatchery Fish	Number of Wild Fish
3	937	4
4	576	27
5	0	16
6	0	2
Totals	1,513	49

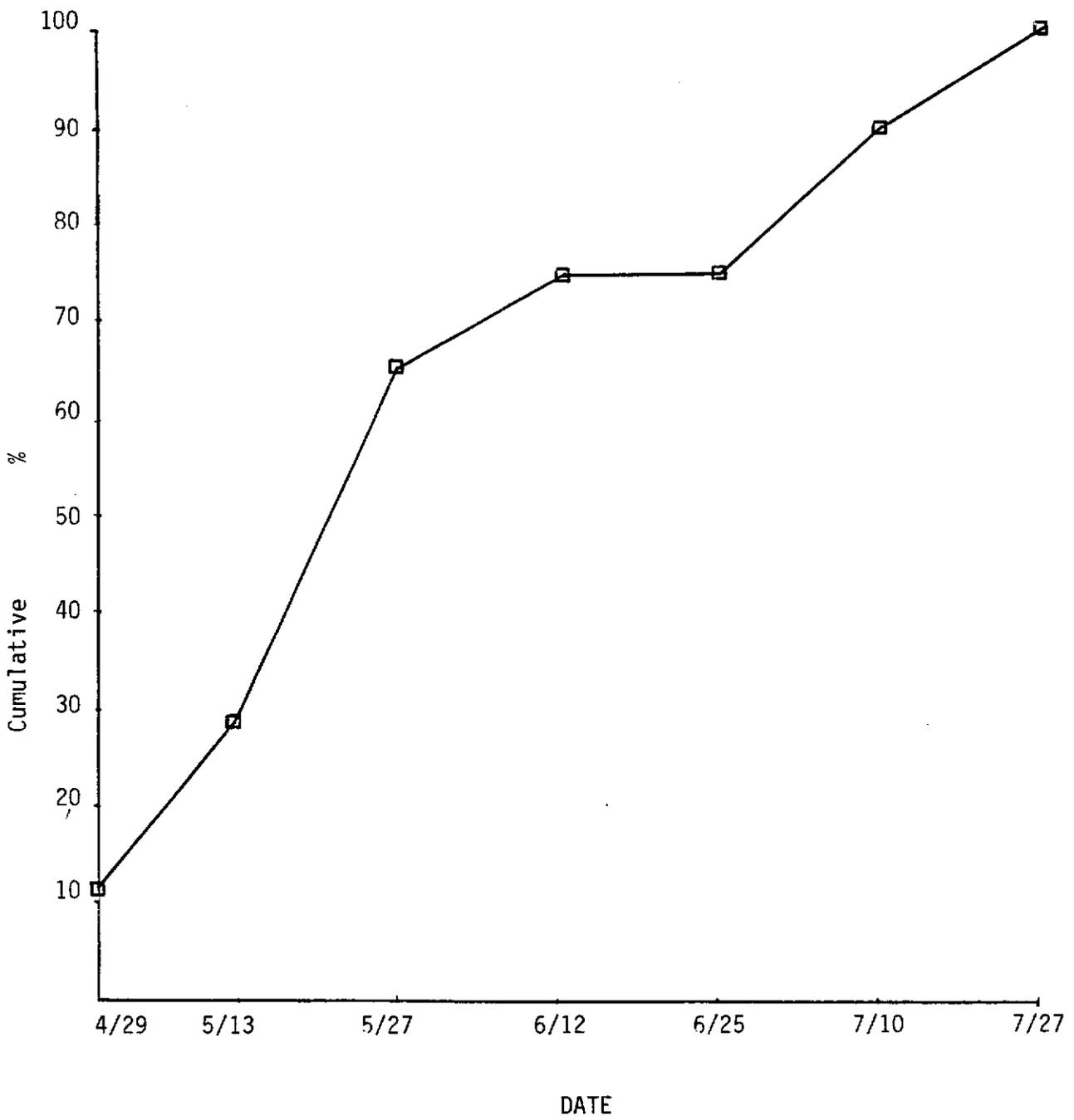


Figure 1. Timing of the 1987 spring chinook return to the Big Quilcene River.

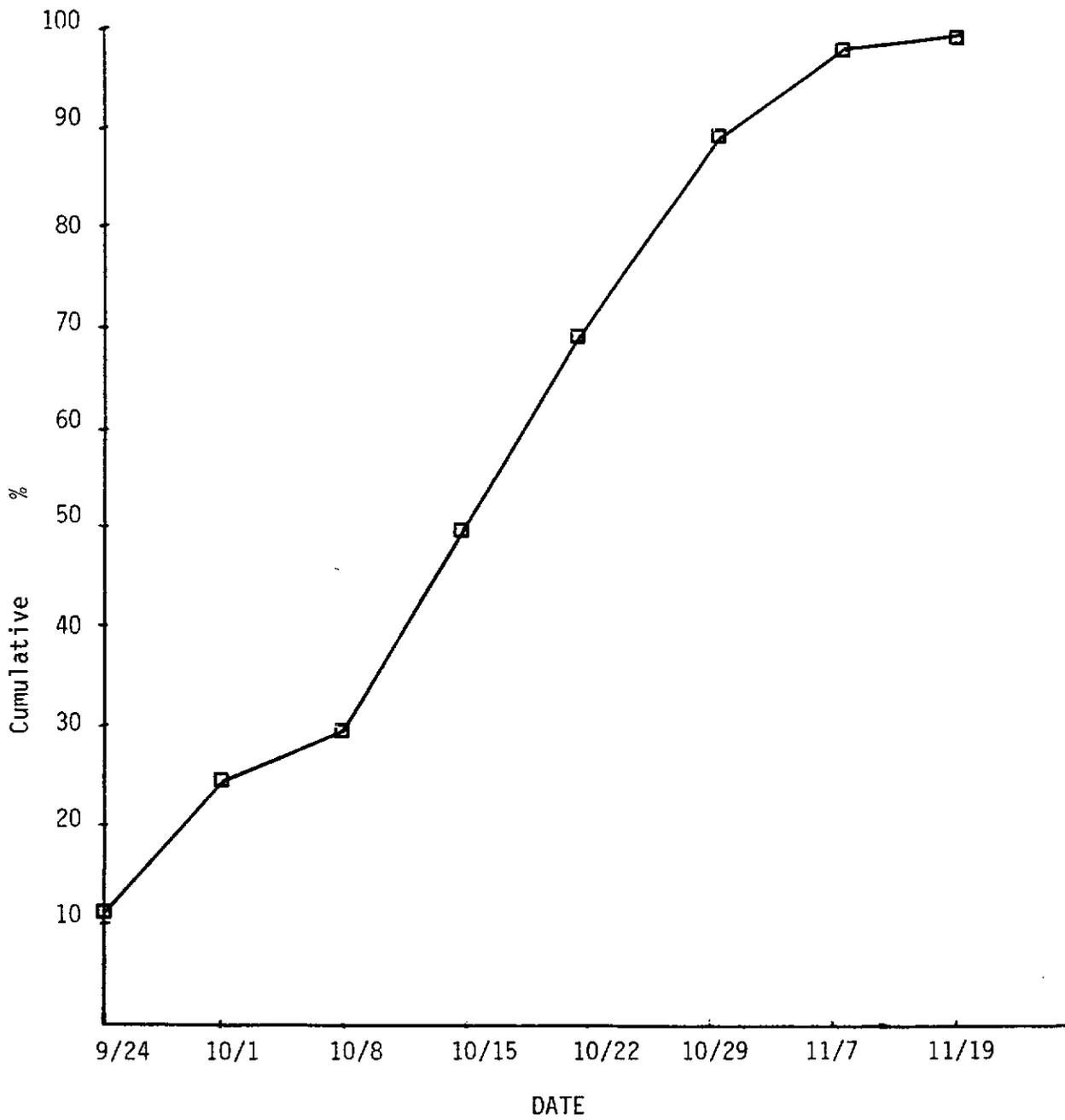


Figure 2. Timing of the 1986 fall chinook return to the Makah National Fish Hatchery.