

**Mass Marking and Mark-Selective Fishery Program  
Actual Releases and Mark-Selective Fisheries for 1999 and Planned Activities  
for 2000**

SFEC (02)-2

Report of the Regional Coordination Sub-Committee of the Selective Fishery Evaluation  
Committee

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## ***Introduction***

This report provides information regarding mass marking, sampling and mark-selective fisheries from the Regional Coordination Sub-Committee of the Selective Fishery Evaluation Committee. The information provided includes actual releases and fisheries for 1999 and planned activities for 2000.

## ***Coho***

### **Coho Marking**

#### *Actual 1997 Brood Coho Releases in 1999*

Mass marking of 1997 brood coho from hatcheries occurred mainly as planned. The majority of coho were released from hatcheries as smolts, with relatively small numbers released as fry in 1998. Fry releases are not mass marked, although some groups may be tagged with or without an adipose clip. Details of 1997 brood smolt releases by agency are shown in Table 1 to 5, as follows:

Canada - A total of 6.8 million adipose clipped coho were released into the Strait of Georgia. An additional 950 thousand were released from the West Coast of Vancouver Island. Details of releases, not including small scale enhancement projects operated by schools and community groups, are shown in Table 1.

Washington - A total of 26.3 million adipose clipped coho were released from Washington Department of Fish and Wildlife hatcheries in Puget Sound, coastal Washington and Columbia River. Details of releases are shown in Table 2. Western Washington Tribal facilities released 1.6 million adipose clipped coho. Details of releases are shown in Table 3. US Fish and Wildlife Service released 621 thousand adipose clipped coho. Details of releases are shown in Table 4.

Oregon – A total of 6.5 million adipose clipped coho were released. Details of releases are shown in Table 5.

#### *Actual 1998 Brood Coho Marking*

Mass marking of 1998 brood coho is occurring as per the planned marking outlined in the 1998 Annual Report (SFEC (99-1)). These fish will be released in the spring of 2000. Actual release numbers will be supplied to the Selective Fishery Evaluation Committee for inclusion in the report for 2000.

#### *Planned 1999 Brood Coho Marking*

##### Canada

Similar numbers and stocks for 1999 brood coho will be marked as were marked in previous mass-marking programs. The same double index indicator stocks and numbers will be marked as in previous years. Table 6 shows the planned marking of Canadian coho stocks.

### Washington/Oregon

Proposed coho mass marking is similar to what has been marked previously. Additional coho will be mass marked at tribal and U.S. Fish and Wildlife Service hatcheries. Tables 7-10 show the planned mass marking of Washington and Oregon coho stocks. The same double index indicator stocks and numbers will be mass marked as in previous years (Table 18).

### **Coho Mark-Selective Fisheries**

#### *Actual 1999 Coho Mark-Selective Fisheries*

### Canada

In June 1998, Fisheries and Oceans Canada announced a long-term rebuilding strategy for coho stocks at risk in British Columbia and a \$400 million adjustment and restructuring program. At that time, it was acknowledged that the rebuilding strategy would be in place for a minimum of six to eight years, and that careful management would be necessary to avoid over-exploitation of stocks at risk. Conservation continues to be the first priority in the management of Pacific salmon. Fishing opportunities occur where abundance permits and where the fishery can be conducted in a manner consistent with achieving conservation objectives.

There were no directed wild coho salmon fisheries during the 1999 commercial season. The commercial fisheries were characterized by mandatory selective fishing techniques, such as revival boxes, brailing, and sorting, with fishing permitted only when stocks of concern were not prevalent. Special management zones (SMZ) were introduced to provide for flexible fishing restrictions to ensure adequate escapement of stocks predicted to return at low abundance. Yellow and red zones remained defined as in 1998.

Barbless hooks were required for all recreational salmon fishing in 1999. Salmon fishing with non-retention of coho was permitted in many areas of B.C. and coho retention was permitted for some local and hatchery stocks, mainly in terminal areas. The north coast had a recreational fishery for coho from late August to the end of the fishing season which was not mark-selective. The south coast had recreational fisheries for coho which were not mark-selective in very confined near-shore areas in Areas 20, 23, 24 and 27. For the most part, these occurred between September 10 and December 31. The limit was one coho per day in both the northern and southern fisheries. Retention of hatchery-marked coho was allowed in Sechelt Inlet, in Big Qualicum and Capilano terminal marine fisheries and in freshwater fisheries in the Lower Fraser tributaries (Chehalis, Harrison, Nicomen, Chilliwack/Vedder, Stave). A pilot mark-selective fishery was conducted in Area 13 (lower Johnstone Strait) during September and October.

### Washington/Oregon

In 1999, mark-selective recreational fisheries for marked hatchery coho salmon (1996 brood) occurred in all four ocean areas from Cape Falcon, Oregon to the U.S./Canada border. The Columbia River (Buoy 10), Willapa Bay, and Grays Harbor estuaries also had recreational mark-selective fisheries. The coastal mark-selective fisheries extended through the Washington side of the Strait of Juan de Fuca into Puget Sound to Port Townsend (Areas 5,6). The most southern portion of Puget Sound (Area 13) was also mark-selective.

Ocean mark-selective fisheries have been held in the Columbia River estuary and adjacent ocean area since 1998. Coho directed recreational angling opened on the central Oregon coast for the first time since 1993, with a mark-selective fishery in July 1999.

Details of the fisheries and sampling activities are found in Attachment 2 to 6.

#### *Planned 2000 Coho Mark-Selective Fisheries*

##### Canada

The preliminary outlook for salmon fisheries in 2000 is very similar to salmon fisheries in 1999, with stocks characterized by poor marine survival and affected by successive El Niño events. As in previous years, Fisheries and Oceans Canada will follow a conservation-based, precautionary approach to all salmon fisheries.

No decision to implement mark-selective fisheries has been made to date, but will be considered during the fishery management planning process. As in previous years, fisheries will likely be restricted to terminal hatchery areas. Some areas, such as Johnstone Strait, may have limited mark-selective coho fisheries.

##### Washington/Oregon

Recreational coho fisheries for 2000 are expected to be similar to those conducted in 1999. Actual fisheries and seasons will be proposed through the Pacific Fishery Management Council pre-season planning process for coastal waters and the North of Falcon Forum for inside waters and agreed upon by the state and tribal co-managers.

Oregon proposes to continue mark-selective fisheries in freshwater where mass-marked hatchery coho are present, including Columbia, Nehalem, Salmon, Coquille, North Umpqua, and Rogue rivers as well as a terminal site in Coos Bay. ODFW may consider options for mark-selective fishing opportunities in the ocean and at Buoy 10. However, opportunity is dependent upon impacts to salmon stocks of concern and will be negotiated through PSC, PFMC, state and state-tribal forums.

## **Coho Sampling**

### *Actual 1999 Coho Sampling*

#### Canada

R9500 tube detectors were only used to sample returns to hatcheries. Nine detectors and support systems were placed in seven major south coast hatchery facilities for the recovery of coded-wire tags from coho salmon. Concerns expressed in 1998 about the reliability of the R9500 counters were well-founded. Early in the season all of the counters had to be returned to the manufacturer for repairs. Moisture associated with the work environment caused the counters to malfunction. The counters were sealed and, as an added precaution, all of the counters were covered with clear plastic covers.

A larger desiccant cartridge was adapted for the R9500 tube detector to facilitate the use of a reusable cartridge and loose desiccant. It is hoped that because of the amount of the desiccant in the cartridge, replacement will not be required as frequently.

During 1999, electronic sampling with wands involved both coho and chinook at a number of major facilities. Carcass recovery programs did not seem to encounter any difficulties while electronically sampling for coho.

There were no directed wild coho salmon fisheries during the 1999 commercial season. Wands were used to sample the few coho that were landed.

All coho intercepted through the recreational creel survey programs were wanded to determine the presence or absence of a coded-wire tag. However, due to continued conservation concerns there were only limited coho opportunities for the sport fishing sector. Creel surveys and encounter rate monitoring were conducted in the Strait of Georgia, Juan de Fuca, West Coast Vancouver Island and in-river fisheries on the Capilano, Stamp, Big Qualicum and Lower Fraser tributaries. A very short opening for coho also took place in the north with a limit of one fish per day, regardless of the fin clip status. The north coast fishery took place after upper Skeena River stocks had already passed above Terrace, B.C. There was no Creel Survey conducted for this fishery.

As a result of continued emphasis on conservation of weak Thompson and Skeena River coho stocks, encounter rate monitoring programs were conducted for the recreational fishery in the Strait of Georgia (Attachment 1).

#### Washington/Oregon

All coho salmon coded-wire tag sampling programs in Washington and Oregon have been converted to use electronic detection equipment. This includes sampling at hatcheries, spawning grounds, and fisheries. New sampling procedures, forms, and data collection have been coordinated with the Data Standards Working Group of the Data Sharing Technical Committee.



Sampling reports are attached for Puget Sound, Washington coastal, Oregon and Buoy 10 fisheries (Attachments 2 to 6).

In Washington, emphasis was placed on obtaining marked to unmarked ratios, encounter rates, and compliance rates. Marked to unmarked ratios for coho were very similar to pre-season estimates for southern Washington coastal waters. The ratio of marked coho salmon decreased compared to pre-season projections for the northern Washington coastal and Puget Sound waters.

The compliance rate (retention of marked coho only and releasing unmarked coho) observed by port samplers in the mark-selective fisheries ranged from 95% to over 99% for the Washington coastal waters. Enforcement activities suggested identical compliance rates to what was observed by samplers on the dock (Attachment 4). Enforcement staff estimated compliance for the four Washington Coastal catch areas. Boats were boarded and searched for catch. The pre-season model projected a rate of 5% retention of all unmarked handled coho; in-season data showed an overall retention rate of 1% of handled unmarked coho.

Monitoring of the central Oregon coastal coho selective fishery was conducted both at-sea and dockside with the following goals:

- Estimate the catch for each two day fishery opening and port within  $\pm 0.05$  of the true value 95% of the time.
- Estimate the proportions of marked and unmarked coho encountered in ocean selective fisheries for each statistical week and ocean catch area such that the estimates are within  $\pm 0.05$  of the true proportion at least 80% of the time.
- Estimate the encounter, drop-off, and retention rates for coho salmon among charter vessels, for each statistical week and catch area such that the estimated rates are  $\pm 0.05$  of the true rates at least 80% of the time.
- Report the rate of angler compliance with finclip retention regulations for the entire fishery within  $\pm 0.05$  of the true proportion at least 80% of the time.
- Estimate non-landed hooking mortality for unclipped fish that are caught and released and for fish that are hooked but drop-off.
- Evaluate the efficacy of using data from dockside sampling to estimate mark and encounter rates by comparing dockside results to those based on at-sea observations.
- Estimate proportions of fishing method and gear type combinations used in the fishery within  $\pm 0.05$  of the true proportion 90% of the time.
- Estimate the proportions of hook wounds that occur at defined locations on the bodies of landed coho within  $\pm 0.05$  of the true proportion 90% of the time.

Estimating these fishery parameters with confidence intervals is a departure from currently used management methodologies. ODFW presented a draft report of monitoring results to the Pacific Fishery Management Council in November, 1999 and received a wide variety of input from researchers around the region. The report is in draft form as ODFW incorporates changes based on the review process. The final report is not ready for general distribution but copies of the draft can be attained by contacting Mike Burner at ODFW (503-872-5252 x 5440).

In summary, anglers retained 5,991 coho, 1,007 chinook on 14,768 trips. Lower than anticipated coho catch rates kept the fishery well below the quota of 15,000. Preseason, the mark rate was anticipated to be around 67%. Postseason evaluation of mark rates based on at-sea observer data matched mark rates measured by dockside interviews at approximately 62%. Compliance with selective fishery regulations in Oregon was nearly 99%, similar to rates found in Washington coastal selective fisheries in 1999. Gear profile and hook wound location data suggests that Oregon ocean salmon fisheries are conducive with selective harvest in that the incidence of critical wounds (gill or gullet) was low (5%).

### *Planned 2000 Coho Sampling*

#### Canada

No directed coho fisheries are expected for south coast commercial fishing fleets in 2000 and fisheries for other species will be subject to strict conservation measures and mark-selective harvest practices to protect south coast (including Thompson River) coho stocks. Any coho encountered by samplers will be electronically sampled for tags. Numbers will be low enough that sampling will occur with wands.

Electronic sampling with wands of both coho and chinook will occur through an expanded creel survey program for recreational fisheries where mass-marked coho are likely to be present. The Voluntary Head Recovery program will continue for northern fisheries and for chinook.

R9500 tube detectors supplemented with wands have been integrated into rack sampling programs at hatcheries participating in mass marking of coho. Wand detectors will also be used during sampling of carcasses on the spawning grounds and at fences on both hatchery and wild indicator streams.

#### Washington/Oregon

Washington and Oregon sampling activities are expected to be similar to those implemented in 1999.

#### Alaska

ADFG will continue traditional (adipose mark) visual CWT sampling for coho salmon. There are no plans to convert to electronic detection sampling.

### ***Chinook***

#### **Chinook Marking**

#### *Canada*

There is no mass marking of chinook stocks within Canada. However, to maintain assessment capability in the event that Washington pursues chinook mark-selective fisheries in areas where Canadian stocks are present, two stocks will be double index tagged (Shuswap and Chilliwack). A third stock, Cowichan, was marked for 1998 brood but will not be marked for 1999 brood due to funding constraints.

#### *Washington/Oregon*

#### Actual 1997 Brood Chinook Marking

WDFW released 1.8 million adipose clipped 1997 brood chinook into the Columbia River in 1999 (Table 11). The majority of these (1.74 million) were also coded-wire tagged. Oregon did not mass mark the 1997 chinook brood.

#### Actual 1998 Brood Chinook Marking

A chinook mass marking and mark-selective fishery implementation plan has been developed between Western Washington tribes and WDFW. This plan defines the terms of agreement for proceeding with mass marking of Puget Sound chinook. Under this agreement, WDFW released 9.5 million adipose clipped 1998 brood chinook into Puget Sound in 1999 (Table 11). An additional 2.8 million chinook were marked and released by the Western Washington Tribes (Table 12). WDFW also marked 2.1 million spring chinook from Lower Columbia River hatcheries (Table 11). Additional 1998 brood chinook were marked and are being held for release as yearling smolts in 2000. Actual release numbers will be supplied for inclusion in the report for 2000.

ODFW marked and released 8.4 million adipose clipped spring chinook from Lower Columbia River and coastal hatcheries. Table 13 shows mass marking of the 1998 brood by calendar year.

Double index tag groups for 1998 brood chinook were tagged as recommended by SFEC in the 1998 report, with the exception of the following:

- The Skykomish summer fingerling group was not done because the decision to mark was made after they were released.
- The White River spring fingerlings were not done due to a WDFW/Tribal decision not to mark.
- ODFW did not double index the Oregon coastal spring chinook stocks as these are small release groups.

A list of index stocks is shown in Table 17.

#### Planned 1999 Brood Chinook Marking

An expansion of mass marking in Puget Sound for the 1999 brood is being proposed due to increased agreement between WDFW and Western Washington tribes. National Marine Fisheries Service (NMFS) is also evaluating mass marking from an ESA perspective. NMFS fully anticipates that many if not most Hatchery and Genetic Management Plans approved by NMFS will require mass marking, and that the mass mark of choice will often, though not always, be the adipose fin clip. By enabling selectivity, mass marking may also provide the means for sustainable fisheries, clearly a very important objective. However, because a number of critical technical issues remain unsolved, NMFS shares the view of its comanagers that decisions made now to mass mark hatchery chinook are separate from decisions to be made later regarding selective fisheries. Even in cases where NMFS has required that a hatchery's production be mass marked because of ESA concerns, this does not imply that a selective fishery subsequently will be endorsed (Attachment 7).

Proposed 1999 brood chinook mass marking for the Lower Columbia River and the Oregon coast is similar to what was marked for 1998 brood by WDFW and ODFW. WDFW has proposed (Table 14) mass marking 25.4 million fall chinook from Puget Sound hatcheries and 2.8 million spring chinook from Lower Columbia River hatcheries. The Lower Columbia chinook and 22.2 million of the Puget Sound chinook will be released as subyearlings in 2000. The balance of the Puget Sound chinook will be released as yearling smolts in 2001. Additionally, Western Washington tribes have proposed marking 9.1 million Puget Sound chinook for release in 2000 (Table 15). The proposed Puget Sound marking will be subject to the mass marking and mark-selective fishery implementation plan between the Western Washington tribes and WDFW. ODFW has proposed mass marking of 9.7 million spring chinook from their Lower Columbia River and coastal hatcheries for release in 2000 (Tables 16 to 18).

### **Chinook Mark-Selective Fisheries**

#### *Washington/Oregon*

There were no mark-selective chinook fisheries in 1999 and none are proposed for 2000.

### **Chinook Sampling**

#### *Canada*

Full scale electronic sampling of chinook is only planned for southern B.C. fisheries once mark-selective fisheries have been implemented in areas where Canadian stocks may be impacted. Some West Coast troll fisheries may be wanded before full scale implementation to refine sampling strategies and personnel requirements. Northern fisheries will retain visual sampling of commercial catches and the Voluntary Head Recovery program for recreational fisheries.

Any chinook encountered by surveyors wanding coho during recreational creel survey programs where mass-marked coho are likely to be present will be wanded as part of the interview.

### *Washington/Oregon*

Full scale electronic sampling of chinook is planned to start in 2001 for Oregon and Washington fisheries. Hatchery rack sampling started in 2000, for hatcheries with DIT groups.

### Alaska

ADFG will continue traditional (adipose mark) visual CWT sampling for chinook salmon. There are no plans to convert to electronic detection sampling.

### ***Electronic Detection Studies***

Electronic detection capability has now been integrated into coho sampling programs. Studies are now focussing on the use of electronic detection equipment to sample chinook.

### **1999 Studies**

#### *Canada*

Chinook were electronically sampled at Chilliwack hatchery as part of the ongoing wand evaluation program. Marking of Chilliwack and Shuswap chinook double index-tagged groups began with 1998 brood, so jacks will be returning in 2000.

Problems were encountered sampling with wands in 1999. A total of 157 adipose-clipped chinook were wanded. All heads from clipped fish were removed and sent to the Head Lab. Only 72 of 131 (55%) pins were correctly detected by the wands. Studies in 1998 indicated a 96% accuracy rate for detecting the presence of a tag in the heads of chinook salmon using wand detectors. Further work will be done in 2000 to determine the reason for the high incidence of missed tags.

## Wanding Results from Chilliwack River Chinook Carcass Sampling

<b>Tag Status</b>	<b>Number</b>	<b>Wand Result</b>
No-Pins (26)	22	Correctly Identified
	4	Incorrectly Identified
Full Length CWT (131)	72	Correctly Identified
	59	Not Identified
<b>Total</b>	<b>157</b>	

### *Washington/Oregon*

Previous work by WDFW, USFWS, NWIFC, and CDFO (SFEC (99)-1) showed 91% to 99% accurate tag detection rate in chinook salmon with wands. This work indicated that the undetected tags occurred in larger fish. During 1999, WDFW evaluated a new technique of wanding inside the mouth as opposed to wanding the outside of the head, to determine if the accuracy with wands would be improved. Using the standard technique, 93% of standard length CWTs were detected in adult chinook salmon. With the modified method, 100% were detected. Additional testing needs to occur but the new method may provide a faster and more accurate way to detect CWTs, especially in larger adults. Details of the study are contained in Attachment 8.

### **2000 Studies**

#### *R9500 Tube Detectors*

Plans are to implement a small study program in 2000 at the Chilliwack River Hatchery, Canada to determine the percentage of chinook, based on size (weight and girth), that the R9500 tube detector can accommodate. There is some concern that a fairly high percentage of the chinook returning to the hatchery will not pass through the R9500 tube detector. If the percentage is significant, wanding would be required which could result in additional staffing requirements to process returns.

#### *Wands*

Further studies will be conducted in the fall of 2000 to determine the preferred technique for wanding chinook. Initial results from the new technique tested by WDFW in 1999 of wanding inside the mouth as opposed to wanding the outside of the head suggest that this may result in improved accuracy in detecting CWTs in large fish. A coordinated sampling design was developed between all participating agencies. The study design being used in 2000 is contained in Attachment 9.

### ***Mass-Marking Machine Development***

To address the logistical problem of mass marking increasingly greater numbers of salmonids, Bonneville Power Administration funded the development of an automated mass marking machine. WDFW subcontracted with Norwest Marine Technology (NMT) for the development of an automated marking and tagging system (MATS). MATS achieved production capability early in 2000 and will adipose fin mark and/or coded wire tag about ten million salmonids in Oregon and Washington in 2000. The automated adipose fin marking and coded wire tagging are accomplished without the use of anesthetics or human handling. NMT has built five mobile trailers and plans to build two more by the winter of 2000. Each trailer currently marks and/or tags fish at a rate of approximately 20-30,000 per eight-hour shift. The original five trailers have four lines that independently operate with windows software. The two new trailers will have five lines to increase capacity by 20–25%. The original four line trailers are scheduled to be retrofitted with five lines prior to spring 2001. Each trailer has a built-in sorter capable of sorting fish by length with less than one millimeter accuracy at a rate of two fish per second.

Each line within a trailer can be set to process one of seven different group sizes for fish ranging from 62-142 millimeters. Each line contains a volitional entry system, a grasper, a video system to locate the adipose fin, a fin clipper, a CWT injector, and a quality control device to reject untagged or unmarked fish. All operations are computer controlled with color screens allowing operations such as excision and measuring to be observed in real time.

During the fall of 2000 and the spring of 2001 WDFW and NMT will conduct “side-by-side” experiments to examine the potential differences in adipose fin slip quality, coded wire tag retention, and survival between the traditional and automated marking systems. Preliminary results show no difference in immediate survival or CWT retention. Automated adipose fin clip removal quality has sometimes been slightly less than experienced by hand clipping.

### ***Data Format***

The Data Standards Working Group of the Data Sharing Technical Committee has incorporated most data elements related to mass marking, electronic sampling, and selective fisheries into the PSC data exchange format. Sampling procedures and data forms have been modified to capture the relevant information. One issue which is still outstanding is the need for a descriptive file detailing the locations and time periods where selective mark fisheries were conducted. The Working Group also recommended the addition of a new field in the Release file. This field would record the percentage of poor fin clips (i.e. expected to be unrecognizable in adults) in mass marking groups.

## *Tables*



Table 1. Actual Releases of 1997 Brood Coho Smolts by Canadian Hatcheries  
(not including small scale enhancement projects operated by schools and community groups)

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
St of Georgia	Alouette River	20,120			12,900	33,020
	Bedwell Bay			11,252		11,252
	Big Qualicum R *	37,806	40,367	808,971	739	887,883
	Capilano River	39,679		488,905		528,584
	Chapman Creek			70,000	31,400	101,400
	Chehalis River	34,362		1,042,914		1,077,276
	Chilliwack R *	82,059	93,963	1,789,085	23,069	1,988,176
	Cowichan River				100,862	100,862
	Deadman River				33,850	33,850
	Goldstream R *	29,825	30,203	200	48,089	108,317
	Horseshoe Bay			9,800		9,800
	Inch Creek *	80,257	20,193	381,076	176,685	658,211
	Kanaka Creek				97,700	97,700
	L Campbell R				25,381	25,381
	Little R/GSVI				25,000	25,000
	Malaspina Coll				21,718	21,718
	Mossom Creek				8,000	8,000
	Nanaimo River	30,196			140,795	170,991
	Oyster River	30,261			25,000	55,261
	Powell River				58,887	58,887
	Puntledge R	39,907		540,790	178,199	758,896
	Quinsam River *	62,912	39,955	870,544	629,441	1,602,852
	Reed Pt/Ioco			7,500		7,500
	Richards Creek				200	200
	Sechelt			108,647		108,647
	Serpentine Enh				25,000	25,000
	Seymour R	29,946		303	34,429	64,678
	Sliammon R	21,902				21,902
	Spius Creek *	9,215	40,605	812	27,274	77,906
	Stave Valley				15,000	15,000
Tenderfoot Cr		35,438		202,320	237,758	
Terminal Cr				5,000	5,000	
Thompson R N	28,537		187	38,412	67,136	
	TOTAL	576,984	300,724	6,130,986	1,985,350	8,994,044

\* Double Index Tag (DIT) groups

Table 1. contd.

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
W Coast Van Is	Conuma R	39,676		40,283		79,959
	Marble R				4,990	4,990
	Nitinat R	42,438		258	82,113	124,809
	Robertson Cr *	40,499	40,668	761,505		842,672
	San Juan R	30,200				30,200
	Sooke R				39,628	39,628
	Tahsis R				25,000	25,000
	Thornton Cr				48,340	48,340
	TOTAL	152,813	40,668	802,046	200,071	1,195,598

\* Double Index Tag (DIT) groups

Table 2. Actual Releases of 1997 Brood Coho Smolts by Washington Dept. of F&W Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	George Adams Hatchery *	43,098	44,258	442,297	4,901	534,554
	Issaquah Hatchery			403,274	5,726	409,000
	Kendall Cr Hatchery *	35,208	33,824	236,439	14,529	320,000
	Marblemount Hatchery *	42,296	42,373	163,093	3,471	251,233
	Minter Hatchery			1,438,738	30,862	1,469,600
	Puget Power Spawning			42,262		42,262
	Skookumchuck Ponds			99,261	1,819	101,080
	Solduc Hatchery *	73,132	59,568	420,815	21,985	575,500
	Soos Creek Hatchery *	42,430	42,543	426,750	77,777	589,500
	South Sound Net Pens	44,743	357	1,903,795	34,880	1,983,775
	Voights Cr Hatchery *	45,469	45,078	1,021,841	16,612	1,129,000
	Wallace R Hatchery *	45,303	45,476	200,562	116,571	407,912
	Whatcom Creek			200,000		200,000
	TOTAL	371,679	313,477	6,999,127	329,133	8,013,416
Coast	Aberdeen Net Pens			292,432	5,968	298,400
	Bingham Cr Hatchery *	75,449	74,782	513,433	10,736	674,400
	Forks Creek *	75,963	77,866	481,057	13,643	648,529
	Humptulips Hatchery			1,256,490	73,150	1,329,640
	Lk Aberdeen Hatchery			15,054	546	15,600
	Naselle Hatchery			1,010,214	71,386	1,081,600
	Nemah Hatchery			559,076	14,924	574,000
	Satsop Springs			516,248	9,752	526,000
	Westport Net Pens			192,780	11,220	204,000
	Westport Net Pens			192,780	11,220	204,000
	TOTAL	151,412	152,648	5,029,564	222,545	5,556,169
Columbia	Cowlitz Salmon Hatch	87,250	626	4,116,648	36,136	4,240,660
	Elochoman Hatchery	86,077	1,334	590,650	17,126	695,187
	Fallert Creek	28,175	903	380,216	2,206	411,500
	Kalama Falls Hatchery	29,739	296	880,803	10,175	921,013
	Klickitat Hatchery *	83,708	29,527	3,447,092	54,617	3,614,944
	Lewis River Hatchery *	146,633	148,834	2,729,757	70,887	3,096,111
	North Toutle Hatchery	31,502		646,992	21,385	699,879
	Washougal Hatchery	33,473	261	458,687	17,902	510,323
TOTAL	526,557	181,781	13,250,845	230,434	14,189,617	
TOTAL		1,049,648	647,906	25,279,536	782,112	27,759,202

\* Double Index Tag (DIT) groups

Table 3. Actual Releases of 1997 Brood Coho by Western Washington Tribal Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Lower Elwha *	74,940	76,984		490,038	641,962
	Jim Creek		6,928		1,104	8,032
	Lummi Bay		48,836		945,000	993,836
	Skookum Creek		49,859		1,599,535	1,649,394
	Tulalip		45,135		969,865	1,015,000
	Agate Pass Seapens <sup>1</sup>	41,044		502,690		543,734
	Elliott Bay Pens	44,539		455,147		499,686
	Keta Creek	48,192		585	470,986	519,763
	Upper Puyallup Plants	98,149		101,671		199,820
	Clear Creek	45,165		3,400	468,435	517,000
	Kalama Creek		45,470		175,178	220,648
	Port Gamble Pens <sup>1</sup> *	49,420	52,593	702	175,357	278,072
	Quilcene Bay Pens <sup>2</sup> *	48,875	45,788	394	94,894	189,951
	TOTAL	450,324	371,593	1,064,589	5,390,392	7,276,898
	Coast	Educket Creek <sup>2</sup>			29,992	
Salmon River *		46,363	68,234	8,605	532,000	655,202
Queets Supplementation		19,815				19,815
TOTAL		66,178	68,234	38,597	532,000	705,009
TOTAL		516,502	439,827	1,103,186	5,922,392	7,981,907

<sup>1</sup> Coop with WDFW

<sup>2</sup> Coop with USFWS

\* Double Index Tag (DIT) groups

Table 4. Actual Releases of 1997 Brood Coho by USFWS Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Quilcene *	48,413	47,802	341,007		437,222
Coast	Makah *	39,657	39,869	107,865		187,391
	Quinault *	80,935	78,347	3,090	366,161	528,533
	TOTAL	120,592	118,216	110,955	366,161	715,924
TOTAL		169,005	166,018	451,962	366,161	1,153,146

\* Double Index Tag (DIT) groups

Table 5. Actual Releases of 1997 Brood Coho by Oregon Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Coastal	Butte Falls	56,005	163	69,525	877	126,570
	Cole Rivers *	25,907	25,246	155,135	866	207,154
	Nehalem *	53,112	53,153	107,382	908	214,555
	Noble Creek (STEP)	25,624		98,289	370	124,283
	Rock Creek	56,616	27,191	57,279	255	141,341
	Salmon *	25,694	25,759	92,838	1,750	146,041
	Trask	26,220		161,840	1,170	189,230
	TOTAL	269,178	131,512	742,288	6,196	1,149,174
Columbia R	Big Creek	52,646	182	438,966	33,549	525,343
	Blind Slough Netpens	26,072	184	169,888	945	197,089
	Bonneville	51,050	498	1,249,264	15,619	1,316,431
	Cascade *	133,583	54,428	1,942	1,977,199	2,167,152
	S Fk Klaskanine	19,622	108	406,778	3,144	429,652
	Sandy *	117,498	26,959	531,232	12,770	688,459
	Tongue Point Netpens	26,269	162	176,309	1,403	204,143
	Youngs Bay Netpens *	131,537	26,951	1,934,331	9,654	2,102,473
TOTAL	558,277	109,472	4,908,710	2,054,283	7,630,742	
TOTAL		827,455	240,984	5,650,998	2,060,479	8,779,916

\* Double Index Tag (DIT) groups

Table 6. Planned Mass Marking of 1999 Brood Coho at Canadian Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Str of Georgia	Big Qualicum River *	40,000	40,000	820,000	1,250,000	1,250,000
	Capilano River	40,000		485,000		525,000
	Chapman Creek			75,000		75,000
	Chehalis River	40,000		967,000		1,007,000
	Chilliwack River *	40,000	40,000	1,870,000		1,950,000
	Goldstream *	30,000	30,000		40,000	100,000
	Horseshoe Bay			10,000		10,000
	Inch Creek *	70,000	40,000	520,000		630,000
	Puntledge River	40,000		532,000	800,000	800,000
	Quinsam River *	40,000	40,000	800,000	1,200,000	1,200,000
	Reed Point/Ioco			10,000		10,000
	Sechelt			100,000		100,000
	Spius Creek *	40,000	40,000			80,000
	Trans Mountain			10,000		10,000
	TOTAL		380,000	230,000	6,199,000	3,290,000
W Coast Van Is	Conuma			100,000		100,000
	Nitinat	40,000		210,000		250,000
	Robertson *	40,000	40,000	720,000		800,000
	TOTAL	80,000	40,000	1,030,000		1,150,000
TOTAL		460,000	270,000	7,229,000	3,290,000	8,897,000

\* Double Index Tag (DIT) groups. Goldstream and Spius are DIT groups only and are not proposed for mass marking.

Table 7. Planned Mass Marking of 1999 Brood Coho at Washington Dept. of F&W Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Ballard Salmon Club			30,000		30,000
	Blaine Hi School			10,000		10,000
	Bridgehaven Assoc			25,000		25,000
	Cross Project			50,000		50,000
	Dungeness Hatchery			500,000		500,000
	Fox Island Net Pens			50,000		50,000
	George Adams *	45,000	45,000	410,000		500,000
	Glenwood Springs			100,000		100,000
	Hurd Creek Hatchery			15,000		15,000
	Issaquah Hatchery			450,000		450,000
	Kendall Cr Hatchery *	45,000	45,000	210,000		300,000
	Laebugten Wharf Netp			25,000		25,000
	Lynnwood High Sch			10,000		10,000
	Marblemount Hatchery *	45,000	45,000	160,000		250,000
	Marine Tech Center			10,000		10,000
	Minter Cr Hatchery			1,444,000		1,444,000
	NWSSC - Des Moines			40,000		40,000
	Oak Harbor Net Pens			30,000		30,000
	Orting Coop			50,000		50,000
	Rfeg 2 Skagit			150,000		150,000
	Rfeg 3 Stilly-Snohom			20,000		20,000
	Seattle Aquarium			25,000		25,000
	Solduc Hatchery *	75,000	75,000	450,000		600,000
	Soos Creek Hatchery *	45,000	45,000	510,000		600,000
	South Sound Net Pens			1,200,000		1,200,000
	Vashon Sportsmen			30,000		30,000
	Voights Cr Hatchery *	45,000	45,000	1,090,000		1,180,000
	Wallace River Hatch *	45,000	45,000	210,000		300,000
	Whatcom Cr Hatchery			5,000		5,000
	TOTAL	345,000	345,000	7,309,000		7,999,000

\* Double Index Tag (DIT) groups



Table 7 continued.

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Coast	Aberdeen Net Pens			300,000		300,000
	Bingham Cr Hatchery *	75,000	75,000	450,000		600,000
	Buzzard Creek			25,000		25,000
	Carlisle Lk Project			100,000		100,000
	Deep Creek			100,000		100,000
	Eight Creek Project			100,000		100,000
	Elma Ffa			1,000		1,000
	Elma Game Assoc.			500,000		500,000
	Forks Creek Hatchery			635,000		635,000
	Grays Harbor Comm.			1,500		1,500
	Humptulips Hatchery			1,550,000		1,550,000
	Johnson Project			1,450		1,450
	Lk Aberdeen Hatchery			30,000		30,000
	Naselle Hatchery			1,105,000		1,105,000
	Nemah Hatchery			500,000		500,000
	Oceanshores Net Pen			100,000		100,000
	Rochester Ffa			25,000		25,000
	Skookumchuck			100,000		100,000
	Westport Net Pens			200,000		200,000
		TOTAL	75,000	75,000	5,823,950	

\* Double Index Tag (DIT) groups

Table 7 continued.

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Columbia	Cathlamet FFA			15,000		15,000
	Cowlitz Salmon Hatch			4,000,000		4,000,000
	Deep River Net Pens			400,000		400,000
	Elochoman Hatchery *	75,000	75,000	835,000		985,000
	Fallert Cr Hatchery			525,000		525,000
	Grays River Hatchery			150,000		150,000
	Kalama Falls			700,000		700,000
	Klickitat Hatchery *	45,000	45,000	1,260,000		1,350,000
	Kraus Project			10,000		10,000
	Lewis River Hatchery *	75,000	75,000	1,845,000		1,995,000
	Morgan Creek Pond			25,000		25,000
	North Toutle Hatchery			1,100,000		1,100,000
	Speelyai Hatchery *	75,000	75,000	850,000		1,000,000
	Steamboat Sl Netpens			200,000		200,000
	Washougal Hatchery			3,000,000		3,000,000
	TOTAL	270,000	270,000	14,915,000		15,455,000

\* Double Index Tag (DIT) groups

Table 8. Planned Mass Marking of 1999 Brood Coho at Western Washington Tribal Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Lower Elwha *	175,000	75,000		500,000	750,000
	Skookum Creek	50,000		1,100,000		1,150,000
	Lummi Bay	50,000		950,000		1,000,000
	Jim Creek	0	6,000			6,000
	Tulalip	50,000	0	250,000	700,000	1,000,000
	Elliott Bay Pens	50,000			350,000	400,000
	Keta Creek	50,000			150,000	200,000
	Agate Pass Seapens <sup>1</sup>	50,000		550,000		600,000
	Upper Puyallup Plants	100,000		100,000		200,000
	Kalama Creek <sup>3</sup>					
	Clear Creek <sup>3</sup>					
	Port Gamble Pens <sup>1</sup> *	50,000	50,000	300,000		400,000
	Quilcene Bay Pens <sup>2</sup> *	45,000	45,000		110,000	200,000
	TOTAL	620,000	226,000	3,000,000	2,060,000	5,906,000
	Coast	Educket Creek <sup>2</sup>			50,000	
Salmon River *		75,000	75,000		650,000	800,000
Queets Supplementation		100,000				100,000
TOTAL		175,000	75,000	50,000	650,000	950,000
<b>TOTAL</b>		<b>795,000</b>	<b>301,000</b>	<b>3,050,000</b>	<b>2,710,000</b>	<b>6,856,000</b>

<sup>1</sup> Coop with WDFW

<sup>2</sup> Coop with USFWS

<sup>3</sup> No production projected for this brood year

\* Double Index Tag (DIT) groups

Table 9. Planned Mass Marking of 1999 Brood Coho at USFWS Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Quilcene *	48,000	48,000	354,000		450,000
Coast	Makah *	40,000	40,000	170,000		250,000
	Quinault *	180,000	160,000	320,000		660,000
	TOTAL	220,000	200,000	490,000		910,000
TOTAL		268,000	248,000	844,000		1,360,000

\* Double Index Tag (DIT) groups

Table 10. Planned Mass Marking of 1999 Brood Coho at Oregon Hatcheries

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Coastal	Butte Falls	50,000		72,500		122,500
	Butte Falls	25,000		25,000		50,000
	Cole R *	25,000	25,000	150,000		200,000
	Gardiner	30,000				30,000
	Nehalem	50,000	50,000	100,000		200,000
	Noble Creek	25,000		95,000		120,000
	Rock *	25,000	25,000	20,000		70,000
	Salmon *	25,000	25,000	200,000		250,000
	Trask	25,000		175,000		200,000
	TOTAL	280,000	125,000	837,500		1,242,500
Columbia	Big Creek	50,000		485,000		535,000
	Blind Slough	25,000		175,000		200,000
	Bonneville	50,000		1,125,000		1,175,000
	Cascade *	150,000	50,000		1,550,000	1,750,000
	Eagle *	25,000	25,000	550,000		600,000
	Eagle USFWS *	50,000	25,000		400,000	475,000
	S Fk Klaskanine	25,000		625,000		650,000
	Sandy *	125,000	150,000	550,000		825,000
	Tongue Pt	25,000		175,000		200,000
	Youngs Bay *	125,000	25,000	2,175,000		2,325,000
	TOTAL	650,000	275,000	5,860,000	1,950,000	8,735,000
TOTAL	930,000	400,000	6,697,500	1,950,000	9,977,500	

\* Double Index Tag (DIT) groups

Table 11. Actual Releases in 1999 of Mass Marked Chinook from Washington Dept. of F&W Hatcheries

1997 Brood

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Columbia	Cowlitz Salmon	1,027,147	3,024	50,791		1,080,962
	Lewis R	710,042	7,821	22,722		740,585
<b>TOTAL</b>		<b>1,737,189</b>	<b>10,845</b>	<b>73,513</b>		<b>1,821,547</b>

1998 Brood

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Chambers Crk			297,210	203,522	500,732
	Coulter Crk			1,269,229	24,771	1,294,000
	Garrison			329,771	301,304	631,075
	George Adams *	223,343	225,350	2,010	3,017,618	3,468,321
	Hupp Springs		195,755	6,753		202,508
	Kendall Crk*	167,136	172,014	1,424	1,963,126	2,303,700
	Marblemount	238,912	4,935	2,867		246,714
	McAllister Crk	79,782	873	1,057,507	35,238	1,173,400
	Minter Crk			2,038,625	27,375	2,066,000
	Samish*	196,029	202,256	748	4,260,165	4,659,198
	Soos Crk*	189,430	201,830	48,931	3,091,906	3,532,097
	Tumwater Falls			1,482,080	29,270	1,511,350
	Voights Crk			882,899	911,101	1,794,000
	Wallace R			952,338	30,162	982,500
<b>TOTAL</b>		<b>1,094,632</b>	<b>1,003,013</b>	<b>8,372,392</b>	<b>13,895,558</b>	<b>24,365,595</b>

\* Double Index Tag (DIT) groups

Table 12. Actual Releases in 1999 of Mass Marked Chinook from Western Washington Tribal Hatcheries

1998 brood

Region	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Lummi Bay				1,800,224	1,800,224
	Stillaguamish		176,546		14,108	190,654
	Tulalip	172,267			1,608,647	1,780,914
	Diru Creek	199,505		18,295	231,163	448,963
	Grovers Creek	198,868		60,509	1,087,530	1,346,907
	Keta Creek (outplants)				577,033	577,033
	White River		258,051		32,000	290,051
	Clear Creek *	202,103	192,165	1,946,847	768,219	3,109,334
	Kalama Creek	94,723			945,080	1,098,803
<b>TOTAL</b>		<b>867,466</b>	<b>626,762</b>	<b>2,025,651</b>	<b>7,064,004</b>	<b>10,642,883</b>

\* Double Index Tag (DIT) groups

Table 13. Actual Mass Marking of 1998 Brood Spring Chinook from Oregon Dept. of Fish and Wildlife Hatcheries by Calendar Year.

*Calendar Year 1999*

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Coastal	Nestucca R	26,080		97,339		123,419
	Rogue R *	127,482	49,981	1,077,936		1,255,399
	Trask R	26,506		124,581		151,087
	Umpqua R N Fk	55,880		416,583		472,463
	Wilson R	26,786		79,650		106,436
	TOTAL	262,734	49,981	1,796,089		2,108,804
Columbia	Clackamas R	192,411		458,815		651,226
	McKenzie R	31,874		180,298		212,172
	Molalla R	8,838		26,723		35,561
	Santiam R S Fk	35,986		283,803		319,789
	Willamette R	57,991		320,283		378,275
	Willamette R Pens	28,200		51,700		79,900
	TOTAL	355,300		1,321,622		1,676,923
TOTAL		618,034	49,981	3,117,711		3,785,726

*Calendar Year 2000*

Area	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Columbia	Blind Slough	79,964			125,000	204,964
	Clackamas R *	145,153	54,693	346,123		454,813
	McKenzie R *	127,494	51,045	721,192		899,731
	Molalla R	17,944		54,256		72,200
	Sandy R	27,192		435,000		462,192
	Santiam R N Fk	34,320		537,717		572,037
	Santiam R S Fk	83,966		662,208		746,174
	Tongue Point	53,045			150,000	203,045
	Willamette R	183,639		1,014,231		1,197,869
	Willamette R Pens	31,800		58,300		90,100
	Youngs Bay	79,813			375,000	454,813
	TOTAL		864,330	105,738	3,829,027	650,000

\* Not adjusted for marking error/tagloss. Does not include fish from ODFW hatcheries that are subsequently transferred to hatcheries or release sites in other states, fish released into impoundments or unfed fry releases.

\* Double Index Tag (DIT) groups



Table 14. Planned Mass Marking of 1999 Brood Chinook at Washington Dept. of F&W Hatcheries

*Subyearling: Release in 2000*

Region	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Big Beef Cr UW			200,000		200,000
	Coulter Cr Hatch			1,000,000		1,000,000
	Garrison Springs			850,000		850,000
	George Adams *	225,000	225,000	3,350,000		3,800,000
	Glenwood Springs			500,000		500,000
	Issaquah Hatchery			2,000,000		2,000,000
	Lakewood			200,000		200,000
	Minter Cr Hatch			1,800,000		1,800,000
	Portage Bay Hatch			180,000		180,000
	Rfeg 5 S Puget S			25,000		25,000
	Rfeg 5 Sh Puget S			10,000		10,000
	Rfeg 6 Hood Canal	no numbers				
	Samish-Friday *	200,000	200,000	4,800,000		5,200,000
	Seattle Aquarium			15,000		15,000
	Sherwood Cr Proj			10,000		10,000
	Soos Creek Hatch *	200,000	200,000	2,800,000		3,200,000
	Tumwater – Capitol			3,800,000		3,800,000
<b>TOTAL</b>		<b>625,000</b>	<b>625,000</b>	<b>21,540,000</b>		<b>22,790,000</b>

\* Double Index Tag (DIT) groups

Table 14 continued.

Yearling: Release in 2001

Region	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Chambers Cr			200,000		200,000
	Fox Island Np			250,000		250,000
	Glenwood Springs			200,000		200,000
	Hoodsport			250,000		250,000
	Icy Creek			300,000		300,000
	Longlvkings-Skok			190,000		190,000
	Marblemount			222,000		222,000
	Mcallister Cr			250,000		250,000
	Samish -Friday			100,000		100,000
	South Sound Np			250,000		250,000
	Tumwater - Capitol			250,000		250,000
	Voights Cr			36,220		36,220
	Wallace River *	200,000	200,000	530,000		930,000
	TOTAL	200,000	200,000	3,028,220		3,428,220
Columbia	Cowlitz Salmon			972,000		972,000
	Deep River Pens			150,000		150,000
	Fallert Cr			375,000		375,000
	Friends Of Cowlitz			55,000		55,000
	Gobar Pond			125,000		125,000
	Lewis River *	150,000	150,000	900,000		1,200,000
	North Toutle Hatch			60,000		60,000
TOTAL	150,000	150,000	2,637,000		2,937,000	
TOTAL			5,665,220		6,365,220	

\* Double Index Tag (DIT) groups

Table 15. Planned Mass Marking of 1999 Brood Chinook at Western Washington Tribal Hatcheries

Region	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	
Puget Snd	Lummi Bay	0	0	1,000,000	0	1,000,000
	Stillaguamish	0	185,000	0	0	185,000
	Tulalip	250,000	0	0	1,750,000	2,000,000
	Grovers Creek *	200,000	200,000	125,000	225,000	750,000
	Keta Creek (outplants)	0	0	300,000	0	300,000
	White River	0	350,000	0	200,000	550,000
	Diru Creek	200,000	0	200,000	0	400,000
	Clear Creek *	225,000	225,000	2,500,000	0	2,950,000
	Kalama Creek	100,000	0	900,000	0	1,000,000
<b>TOTAL</b>		<b>975,000</b>	<b>960,000</b>	<b>5,025,000</b>	<b>2,175,000</b>	<b>9,135,000</b>

\* Double Index Tag (DIT) groups

Table 16. Planned Mass Marking of 1999 Brood Chinook at Oregon Hatcheries

Region	Hatchery	Tagged		Untagged		Total
		Ad Clipped	Unclipped	Clipped	Unclipped	
Columbia	Blind Slough	75,000			125,000	200,000
	Tongue Point	50,000			150,000	200,000
	Youngs Bay	75,000			375,000	450,000
	Hood R W Fk	95,000				95,000
	Hood R M Fk	40,000				40,000
	Clackamas R *	350,000	50,000	858,000		1,258,000
	Sandy R	25,000		435,000		460,000
	McKenzie R *	150,000	50,000	795,000		995,000
	Molalla R	25,000		75,000		100,000
	Santiam R N Fk	30,000		637,000		667,000
	Santiam R S Fk	140,000		882,000		1,022,000
	Willamette R	250,000		1,426,000		1,676,000
	Willamette R Pens	60,000		110,000		170,000
	TOTAL	1,365,000	100,000	5,218,000	650,000	7,333,000
	Coastal	Nestucca R	25,000		85,000	
Trask R		25,000		127,000		152,000
Wilson R		25,000		80,000		105,000
Umpqua R N Fk		50,000		362,000		412,000
Rogue R *		120,000	50,000	1,452,000		1,622,000
TOTAL		245,000	50,000	2,106,000		2,401,000
TOTAL		1,610,000	150,000	7,324,000	650,000	9,734,000

\* Double Index Tag (DIT) groups

Table 17. Chinook exploitation rate index stocks identified for double index tagging (DIT)

Region	Natural/Unmarked Stock Representation	DIT Stock	Hatchery
Southern B.C.	Lower Fraser	Chilliwack	Chilliwack
	Interior	Lower Shuswap	Shuswap
	Lower Georgia Strait	Cowichan *	Cowichan
Puget Sound	Nooksack River spring	Nooksack spring Fingerlings	WDFW Kendall Creek
	Skagit River springs	Skagit spring yearlings	WDFW Marblemount
	White River springs	(none)	
	North Puget Sound summer/fall	Skykomish summer Fingerlings	WDFW Wallace River
	North Puget Sound fall	Samish fall fingerlings	WDFW Samish
	Mid Puget Sound fall	Green R. & Grovers Cr. fall fingerlings	WDFW Soos Cr. & Suquamish Grovers Cr.
	South Puget Sound fall	Nisqually fall fingerlings	Nisqually Hatchery at Clear Creek
	Hood Canal fall	George Adams fall fingerlings	WDFW George Adams
	Strait of Juan de Fuca	(none)	
Washington Cst		(none)	
Columbia R	Lower Columbia spring	Lewis R. spring yearlings	WDFW Lewis River
	Willamette River spring	Clackamas spring yearlings	ODFW Clackamas River
	Willamette River spring	McKenzie spring yearlings	ODFW McKenzie River
Oregon Coast		(none)	

\* 1998 brood only

Table 18. Coho exploitation rate index stocks identified for double index tagging (DIT)

Region	Natural/Unmarked Stock Representation	DIT Stock	Hatchery
Lower Fraser	East Coast Vancouver Island	Big Qualicum	Big Qualicum
	Lower Fraser	Chilliwack	Chilliwack
	East Coast Vancouver Island	Goldstream River	Goldstream River
	Lower Fraser	Inch Creek	Inch Creek
	North Vancouver Island	Quinsam River	Quinsam River
West Coast Van Is	West Coast Vancouver Island	Robertson Creek	Robertson Creek
Puget Sound	Nooksack	Nooksack	WDFW Kendall Creek
	Skagit	Skagit	WDFW Marblemount
	Stillaguamish/Snohomish	Skykomish	WDFW Wallace River
	Mid Puget Sound	Green River	WDFW Soos Creek
	South Puget Sound	Puyallup	WDFW Voights Creek
	North Hood Canal	Quilcene	USFWS Quilcene Natl
	Quilcene Net Pens (Hood Canal)	Quilcene	Quilcene Net Pens
	South Hood Canal	George Adams	WDFW George Adams
	Strait of Juan de Fuca	Elwha	Lower Elwha Tribal
Washington Coast	North Coast	Solduc	WDFW Solduc
	North Central Coast	Queets	Quinault Salmon R
	Quinault	Quinault	USFWS Quinault R
	Grays Harbour	Satsop	WDFW Bingham Cr
	Willipa Bay	Forks Creek	WDFW Forks Creek
Columbia	Lower Columbia River	Lewis River	WDFW Lewis River
	Lower Columbia River	Tanner Creek	ODFW Youngs Bay
	Lower Columbia River	Sandy	ODFW Sandy
	Umatilla River	Tanner Creek	ODFW Cascade
	Yakima River	Tanner Creek	ODFW Cascade
Oregon Coast	Oregon North Coast	Nehalem River	ODFW Nehalem
	Oregon North Central Coast	Salmon River	ODFW Salmon River
	Oregon South Central Coast	Rock Creek	ODFW Rock Creek
	Oregon South Coast	Rogue River	ODFW Cole River

## *Attachments*

## Attachment 1: 1999 Observer Programs in the Strait of Georgia Recreational Fishery

By Ted Carter, Stock Assessment Division

As a result of continued emphasis by Fisheries and Oceans Canada on conservation of weak Thompson and Skeena River coho stocks, we again conducted encounter rate monitoring programs for the recreational fishery in the Strait of Georgia. Roving observers conducted on-water interviews in the Victoria area (Statistical Areas 19 and 20). Logbook information was collected from recreational fishing guides between Campbell River and Victoria. While contacts were made and commitments given, no data were collected from guides in the Vancouver area. Another observer monitored the selective marked coho fishery near the Big Qualicum River.

Roving observers ventured out daily from the Victoria Coast Guard base and conducted their interviews in areas of highest fishing activity. All interviews were conducted in Statistical Areas 19 and 20. Interviews were kept brief to be the least disruptive to fishing as possible. Again this year one of the observers was a former fishing guide and very familiar with the area. This contributed greatly to complete coverage of the areas by knowing where to encounter fishers in various weather conditions. The roving observer program was conducted between September and October.

Recreational guide boat operators participated in a logbook program between June and October, depending on the area. In spite of further reduced opportunities, guides were very co-operative and willing to record and share their trip information. Logbooks were distributed to guides in Victoria, Sooke, Sidney, Duncan, Nanaimo, and Campbell River on Vancouver Island as well as to three guides in Vancouver. Although several calls and queries were made, no data were received from the Vancouver guides.

A selective marked coho fishery was conducted in the vicinity of the Big Qualicum River between the beginning of October and mid-November. The fishery began in an area north of Big Qualicum River as a mainly shore-based fishery and expanded into the river in mid-October. A single observer patrolled the various access points along the beach daily throughout the fishery and interviewed fishers for catch and effort information. Once the river fishery opened, interview effort was split between the river access at Big Qualicum Hatchery and the beach accesses.

The roving observers were well received by the recreational fishers with only a few interview refusals. Observers completed nearly 400 interviews for a total of over 1000 hours of fishing effort (Table 1). Catches of chinook were generally low averaging 0.04/hour in combined areas. Coho release rates ranged from 0.01 to 0.1/hour in Area 19 and 0 to 0.08/hour in Area 20. Following the first year of the survey, observers delayed their morning start time to acquire more complete trip information from fishers.

Fourteen guide boat operators collected logbook information from five different DFO Statistical Areas (Table 2). Catches and release rates were quite variable between areas. Guide operators



were considerably more successful than the average recreational fishers interviewed by roving observers in their ability to catch chinook with Area 13 having the highest number of chinook landed. The catch rate for chinook in combined areas was 0.2/hour. Coho release rates ranged from 0 in Areas 18 and 19 to 0.56/hour in Area 17.

No on-board observer program was conducted in 1999, however, creel survey data from Area 19 indicate a coho release rate less than 1/3 of the 1998 rate (0.09/trip-1998, 0.03/trip-1999). No direct comparison can be made due to differences in recording of effort, however, the roving observer data in Area 19 indicated the coho release rate in 1999 was 0.06/hour compared to 0.03/trip for the creel survey. A trip length is variable but usually between 4 and 6 hours making the creel survey release rate considerably lower than the encounter rate program results.

Fishing in the Big Qualicum selective marked coho fishery mirrored the 1998 fishery with effort being split between shore-based and boat-based fishing. As the season progressed, the majority of the effort was shore-based and was conducted by local fishers. Through the sampling period our observer conducted over 1000 interviews for a total effort of 3472 hours (Table 3). During this fishery, 762 clipped coho were retained while 1161 clipped and 1260 unclipped coho were released. The catch rate for coho (retained and released combined) was 0.92/hour.

During the shorter, more intensive in-river fishery, our observer conducted over 1400 interviews for a total of 7888 hours fishing effort. Part way through this fishery the retention of clipped coho was permitted and the number of coho retained was 1473 clipped and 432 unclipped. River fishers were not as diligent about noting marks on released coho, consequently many were recorded as unknown. The number of coho released was 296 clipped, 153 unclipped, and 1468 unknown. The catch rate for all coho (retained and released) was 0.48/hour. This is the opposite of 1998 when the catch rate in the river was more than double that of the beach fishery.

Table 1. 1999 Roving Observer Program Summary

Area 19

Date	Hours Fished	Salmon Catch Retained					Chinook Released	Coho Released
		Chin	Coho	Sock	Pink	Chum		
12-18 Sep	105	6	0	0	4	0	2	11
19-25 Sep	72.65	1	0	0	0	0	1	2
26Sep- 2Oct	89.75	10	0	0	3	1	1	3
3-9 Oct	83	6	0	0	1	1	0	1
10-16 Oct	69.25	6	0	0	0	0	0	1
17-23 Oct	89.5	5	0	0	0	0	0	1

Area 20

Date	Hours Fished	Salmon Catch Retained					Chinook Released	Coho Released
		Chin	Coho	Sock	Pink	Chum		
12-18 Sep	135.2	1	0	0	4	0	0	10
19-25 Sep	37.5	0	0	0	1	1	0	4
26Sep-2 Oct	133.25	2	0	0	4	0	0	11
3-9 Oct	90	2	0	0	1	1	0	3
10-16 Oct	39	2	0	0	1	0	0	0
17-23 Oct	65.5	1	0	0	0	1	0	3

Table 2. 1999 Guide Logbook Summary

Stat Area	Hours Fished	No. of Anglers	Catch Retained					Chinook Released	Coho Released
			Chinook	Coho	Sockeye	Pink	Chum		
13	914.2	553	155	4	1	333	18	64	190
17	432	274	132	0	0	0	0	273	240
18	62.75	47	17	0	1	7	0	4	0
19	144.5	99	16	0	0	32	0	10	0
20	420.5	247	78	3	30	166	1	50	61

Table 3. 1999 Big Qualicum River Selective Marked Coho Fishery

Beach Fishery

Date	Hours Fished	Catch Retained						
		Chinook		Coho		Sockeye	Pink	Chum
		Clipped	Unclipped	Clipped	Unclipped			
1-2 Oct	274.5	0	0	27	0	0	3	0
3-9 Oct	636	0	1	88	0	0	0	0
10-16 Oct	709	0	1	129	0	0	0	0
17-23 Oct	810	0	0	229	0	0	0	1
24-30 Oct	562.5	0	0	173	0	0	0	1
31 Oct-6 Nov	425	0	0	116	0	0	0	0
7-13 Nov	55.2	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>3472.2</b>	<b>0</b>	<b>2</b>	<b>762</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

Catch Released							
Chinook			Coho			Pink	Chum
Clipped	Unclipped	Unknown	Clipped	Unclipped	Unknown		
0	2	0	104	67	0	26	0
1	24	6	118	141	0	7	0
0	10	10	265	197	0	0	0
0	5	4	422	439	3	0	14
0	0	4	191	288	5	0	7
0	0	0	61	127	3	0	1
0	0	0	0	1	0	0	0
<b>1</b>	<b>41</b>	<b>24</b>	<b>1161</b>	<b>1260</b>	<b>11</b>	<b>33</b>	<b>22</b>

In-River Fishery

Date	Hours Fished	Catch Retained						
		Chinook		Coho		Sockeye	Pink	Chum
		Clipped	Unclipped	Clipped	Unclipped			
16-Oct	346	5	12	129	46	0	0	0
17-23 Oct	2138	18	61	437	124	0	0	0
24-30 Oct	1837	0	9	417	119	0	0	0
31 Oct-6 Nov	2147	0	3	413	113	0	0	0
7-13 Nov	1272	0	0	74	29	0	0	0
14-Nov	148.5	0	0	3	1	0	0	0
<b>TOTAL</b>	<b>7888.5</b>	<b>23</b>	<b>85</b>	<b>1473</b>	<b>432</b>	<b>0</b>	<b>0</b>	<b>0</b>

Catch Released							
Chinook			Coho			Pink	Chum
Clipped	Unclipped	Unknown	Clipped	Unclipped	Unknown		
0	9	252	140	67	0	8	217
5	13	479	155	83	348	22	1351
0	2	103	0	0	454	0	1351
0	0	39	0	3	447	0	1833
0	0	2	0	0	212	0	1137
0	0	0	1	0	7	0	156
<b>5</b>	<b>24</b>	<b>875</b>	<b>296</b>	<b>153</b>	<b>1468</b>	<b>30</b>	<b>6045</b>

## Attachment 2: 1999 Puget Sound Sampling Activities

Washington Department of Fish and Wildlife  
Angelika Hagen-Breaux

When considering the effects of mass marking and selective fisheries on Puget Sound Sampling, it is important to distinguish between activities caused by mass marking (even in absence of selective fisheries) and activities due to the implementation of selective fisheries.

### **1. Activities and changes due to mass marking of coho salmon**

Before coho were mass marked (removal of the adipose fin of most hatchery coho and some wild coho), a missing adipose fin was the external sign of a coded wire tagged fish. Now, for coho, a missing adipose fin is an indication of a hatchery fish and no longer signifies the presence of a tag. Thus, visual observations to determine tag status are no longer possible. Electronic tag detection equipment (wands and tunnel detectors) are utilized by samplers to detect the presence of a coded wire tag.

Samplers were trained in the proper use of the new equipment and in execution of the new sampling protocols. Sampling protocols were modified to accommodate the four groups of mark/tag combinations. Coho can now be either marked and tagged, marked and untagged, unmarked and tagged, unmarked and untagged. Samplers have to conduct several sorting and counting steps to accurately group and enumerate large quantities of coho.

The new sampling requirements necessitated the following:

- Purchased canopies and tool boxes for trucks to securely store electronic sampling equipment.
- Developed and printed new forms and sampling manuals.
- Trained samplers in use of electronic sampling equipment
- Trained samplers in use of new forms and execution of new sampling protocol.
- Appointed a seasonal electronic sampling coordinator to assure high quality and standardization of sampling.
- Eliminated voluntary coho tag recovery program.
- Electronically inspected each coho in sample.
- Hired additional staff to:
  - (1) Increase sampling effort to replace voluntary tags and make up for time lost due to electronic sampling.
  - (2) Increase sampling effort to 10% of recreational catch per area and month to achieve needed precision in stock specific fisheries evaluation.
  - (3) Create sampling teams of two samplers (prior to mass marking one sampler was sufficient) when sampling large quantities of commercial coho, due to increased sampling complexity (see above).

- Additionally, chinook encountered in South Puget Sound were also electronically sampled to retrieve tags from unmarked White River Spring chinook. Some chinook stocks in South Sound (Green River chinook) were tagged at much higher rates than in previous years, thus requiring more handling time to collect tagged snouts and complete relevant forms.

## **2. Activities and changes due to selective fisheries in Puget Sound**

Puget Sound had recreational, selective coho fisheries in marine areas 5 & 6 from August 1 - September 30, and in marine area 13 from July 1 - October 31.

Selective fisheries are sampled identical to non-selective fisheries.

However, since unmarked coho cannot be landed during a selective fishery, marked to unmarked coho ratios can no longer be determined dock-side by visual catch inspection. Puget Sound Sampling implemented several studies and hired additional staff to determine these parameters.

The following activities were conducted to assess marked to unmarked coho encounter ratios:

- On the water monitoring of recreational hook-ups (Area 5): WDFW staff watched private anglers and recorded the outcome of each observed hook-up (species, mark-status, retained/released).
- Monitoring anglers on board of charters (Area 5): WDFW samplers watched charter boat clients and recorded the outcome of each observed hook-up.
- Voluntary angler trip reports (Area 5 & 13): Anglers record the outcome of each hook-up and submitted data to WDFW.
- Questioning anglers dock-side about the quantities and species of salmon released and the mark status of released coho (all areas).

Forms and data bases were created to accommodate, store, and analyze new information. A considerable amount of time will be spent analyzing, evaluating and summarizing the data from these new studies. Selective fisheries reports will be published in March.

Puget Sound Sampling also participated in public outreach and education activities, producing & distributing de-hookers to release unmarked coho, and educating anglers about species identification and selective fisheries.

Attachment 3: Monitoring Results from the 1999 Ocean Recreational Selective Fisheries from Leadbetter Point to the U.S. Canada Border

Washington Department of Fish and Wildlife

Wendy Beeghley

Doug Milward

Scott Barbour

January, 2000

The Pacific Fishery Management Council (PFMC) adopted selective fisheries for coho in all four ocean areas from Cape Falcon, Oregon to the U.S./Canada border as well as the Buoy 10 fishery in the Columbia River estuary. This paper is a report on the three areas north of Leadbetter Point (Catch Record Card Areas 2, 3 and 4).

When the Council set the 1999 selective fisheries, assumptions were made about coho and chinook abundance, distribution of stocks, coho mark rates, compliance with the new regulations, and incidental mortality. A monitoring plan was developed to test some of these assumptions through dockside catch and effort sampling along with direct on-water observations of the fisheries in progress.

Fishery Descriptions

**AREA 2:** The ocean recreational fishery from Leadbetter Point, Washington to the Queets river (Area 2) opened on July 19 and was scheduled to run through the earlier of September 30 or attainment of the 42,200 coho quota. A harvest guideline of 13,400 chinook also existed. The fishery was open Sunday through Thursday, July 19 through August 29, and then seven days per week August 30 through September 30, for a total of 62 fishing days. A two salmon daily bag limit was in effect, only one of which could be a chinook. Retained coho were required to have a healed adipose fin clip. No more than 6 salmon were allowed per person in 7 calendar days (Sunday through Saturday). The fishery was closed from 0 - 3 miles from shore beginning August 22.

**AREA 3:** The ocean recreational fishery from the Queets river to Cape Alava (Area 3) opened on July 19 and was scheduled to run through the earlier of September 30 or attainment of the 2,600 coho quota. A harvest guideline of 400 chinook was also in effect. The fishery was open seven days per week July 19 through September 30, for a total of 74 fishing days with a two salmon daily bag limit; retained coho were required to have a healed adipose fin clip.

**AREA 4:** The ocean recreational fishery from Cape Alava to the US/Canada border (Area 4) opened on July 19 and was scheduled to run through the earlier of September 30 or attainment of the 10,200 coho quota. The fishery was open seven days per week July 19 through September

30, for a total of 74 fishing days, with a two salmon daily bag limit and no chinook retention; retained coho were required to have a healed adipose fin clip.

## Methods

**AREA 2:** WDFW stationed four dockside samplers and two on-water observers in Westport to monitor the Area 2 selective fishery. The on-water observers concentrated their efforts on the charter fleet operating from Westport. Charter operators volunteered space on their vessels to accommodate the WDFW observers. The observers on charter boats collected information about that specific boat's encounters for the day. Data recorded included species hooked, presence or absence of the adipose fin, size (legal or sublegal), and result of the hookup (fish retained, released, or dropped off) for each hookup that occurred on that vessel.

Dockside port samplers collected catch information through interviews and catch inspections as fishing boats returned to port. Data collected per boat included catch by species, presence or absence of adipose fins on all retained salmon, number of anglers, total number of salmon released by species, and number of adipose-clipped coho released. Landed salmon were sampled for species, fin mark, and coded-wire tag and scale collection. Due to the mass marking of hatchery coho, electronic detection equipment was used to indicate the presence or absence of coded-wire tags in all coho.

Total effort data was collected through counts of vessels leaving the port on their way to the fishing grounds each day. Dockside sampling data was then expanded according to the observed effort profile to estimate total effort and retained and released catch.

**AREA 3:** WDFW stationed one employee in La Push to monitor the selective recreational ocean fishery in Area 3. Because there is little to no charter boat activity in La Push, and because the private sport activity is relatively low and scattered, on-water observation was not feasible. The port sampler in La Push handed out voluntary salmon angler trip reports to as many fishers as possible and collected them upon the anglers' return to port.

Dockside, the port sampler collected catch information through interviews and catch inspections as described above. Total effort data was collected through a count of vessels returning to the port. Dockside sampling data was then expanded according to the observed effort profile to estimate total effort and retained and released catch.

**AREA 4:** WDFW stationed four people dockside and two on-water observers in Neah Bay to monitor the Area 4 selective fishery. The on-water observers worked from a WDFW vessel, observing hookups by the private boat fleet. The observer vessel positioned itself each day near concentrations of private fishing boats. When a hookup occurred, the WDFW vessel moved as close as feasible, and observers recorded species hooked, presence or absence of the adipose fin, size (legal or sublegal), and result of the hookup (fish retained, released, or dropped off) as possible.



In addition, WDFW personnel fished aboard a privately owned boat whenever possible and recorded the above information about each encounter. This method was implemented when it became apparent that due to conditions such as fog, low effort, and the fact that fishers didn't tend to group in one area like in other areas along the coast, it was possible to witness more encounters this way.

On-water observers also rode along on charter boats whenever possible. Charter operators in Neah Bay volunteered space on their vessels to accommodate the WDFW observers. The observers on charter boats collected information identical to that collected in Westport. However, low charter boat salmon effort from Neah Bay resulted in very few ride-along trips.

Finally, voluntary salmon angler trip reports were handed out by WDFW dockside staff as in La Push. The trip reports were collected from anglers as they returned to port.

Dockside, the port samplers collected catch information through interviews and catch inspections as described above. Total effort data was collected through counts of vessels leaving the port on their way to the fishing grounds each day. Dockside sampling data was then expanded according to the observed effort profile to estimate total effort and retained and released catch.

### Catch and Effort

In Area 2, 19,072 anglers caught a total of 12,595 coho or 30% of the 42,200 coho quota, and 6,585 chinook or 49% of the 13,400 chinook guideline.

In Area 3, 2,921 anglers caught a total of 2,577 coho or 56% of the 4,600<sup>1</sup> coho quota, and 984 chinook or 246% of the 400 chinook guideline.

In Area 4, 8,102 anglers caught a total of 5,370 coho or 53% of the 10,200 coho quota.

Table 1 shows estimated total effort and landed salmon catch by month for the catch areas north of Leadbetter Point.

### Selective Fishery Observation

**AREA 2.** WDFW staff observed anglers on board charter boats for each week the fishery was open in Area 2. Data collected include observations of 815 legal-sized coho encountered aboard chartered fishing vessels. Of these encounters, 483 coho were retained, which is 3.8% of the

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<sup>1</sup>The original Area 3 coho quota of 2,600 plus an additional 2,000 made available in-season from coho remaining on the non-treaty troll fishery quota.

12,595 coho retained in the ocean fishery. The mark rate (adipose fin clipped) of the legal-sized coho encountered through the season was 60%. The mark rate by month was 62%, 60% , and 54% for July, August and September respectively (Table 2). Twenty-eight percent of the 1,817 salmon observed hooked in Area 2 dropped off prior to being landed.

**AREA 3.** The voluntary angler trip report system was the only method used to collect encounter rate data from Area 3 since effort is too low and dispersed to accommodate on the water remote platform observations, and there is no charter boat fleet in La Push. Data collected in the fishery include records of 250 individual hook-ups of legal-sized coho from private fishing vessels brought to the boat. Of these encounters, 88 coho were retained, which is 3.4% of the 2,577 coho retained in the fishery. The mark rate (adipose fin clipped) of the legal-sized coho encountered through the season was 40%. The mark rate by month was 39%, 44%, and 36% for July, August and September respectively (Table 2). The trip report data showed that of the 361 salmon hooked, 48 salmon (13%) dropped off prior to being landed.

**AREA 4.** WDFW staff observed catch in the Area 4 fishery from an on-water remote platform, through fishing from a privately owned boat, and from a few charter ride alongs. A total of 395 legal-sized coho were observed as they were brought to the boat. Of these encounters, 87 coho were retained, which is 1.6% of the 5,370 coho retained in the fishery. The mark rate (adipose fin clipped) of the legal-sized coho encountered through the season was 26.%. The mark rate by month was 29%, 24%, and 29% for July, August and September respectively (Table 2). Of the 562 salmon observed hooked, 72 salmon (13%) dropped off prior to being landed.

#### Ocean Troll Fisheries

The 1999 non-Treaty and Treaty troll fisheries were non-selective fisheries. The coho mark rates observed in landings from these fisheries could provide another assessment the actual mark rate in the ocean population of coho

**Non-Treaty Troll Fishery.** The non-Treaty troll fishery was open for coho and chinook in a non-selective plug only fishery beginning July 10 with quotas of 20,000 coho and 7,000 chinook. The fishery is not a very good choice for comparison with the sport fishery because Area 4 was closed within 17 miles of shore for the first part of the fishery and later, all of Area 4 was closed. Furthermore, the fishery was directed towards chinook with plugs the only legal gear, and coho catches were low. Even with a sample rate of 74%, the total catch of 3,815 coho distributed between Areas 2,3 and 4 is not enough coho to do a very good comparison.

Impacts in the fishery were modeled with the FRAM model and the mark rate for coho was predicted to be 49%. If the fishery had gone exactly as planned pre-season, the landed catch should have been 9,760 marked coho and 10,240 unmarked coho. The actual landed catch in the fishery was 3,815 and of the 2,809 sampled coho, 1,043 (37%) were marked.

**Treaty Troll Fishery.** The Treaty troll fishery was open for coho and chinook in a non-selective fishery beginning August 1 with quotas of 38,500 coho and 30,000 chinook. Impacts in the fishery were modeled with the FRAM model and the mark rate was predicted to be 42%. If the fishery had gone exactly as planned pre-season, the landed catch should have been 16,016 marked coho and 22,484 unmarked coho. The actual landed catch in the fishery was 33,441; of the 9,142 sampled coho, 3,034 (33%) were marked. Since no selection was presumed to have taken place in the fishery it should be possible to expand the sample data to the total catch providing another method of estimating the mark rate in the ocean population of coho. Applying the mark rate observed through dockside sampling to the 33,441 landed coho, 11,099 are estimated to have been marked fish and 22,342 unmarked fish. Landings from the Treaty troll fishery were more than 5,000 fish under the quota, but with the mark rate significantly lower than projected pre-season, the number of landed unmarked coho was almost identical to the pre-season prediction.

The 33% mark rate observed in the Treaty troll fishery compares to a rate of 26% in the Area 4 sport fishery. The difference in mark rates may be due to the fact that the Treaty troll fishery occurs mainly outside of the Straits, while a large portion of the sport fishery effort occurs inside the Strait of Juan de Fuca, and the mark rate on coastal and Columbia River coho stocks was higher than that on Puget Sound stocks.

#### Comparison of Pre-season vs. Post-season Estimates of Coho Mark Rates

Pre-season projections of 1999 coho mark rates were estimated using the coho Fishery Regulation Assessment Model (FRAM). The coho FRAM uses inputs of pre-season run size projections and historic coded wire tag recovery data to predict the resulting impacts from a proposed fishery. Fram model run 9931 was the final pre-season assessment of the PFMC's adopted fishery package for the 1999 ocean fisheries. Table 3 compares the coho mark rates projected by the FRAM model with those observed through on-water monitoring in Areas 2, 3, and 4 in 1999.

Observation data showed actual coho mark rates very similar to pre-season projections in Area 2. The total observed coho mark rate for the season in the ocean Area 2 selective fishery was 60% compared to 61% projected pre-season. The observed mark rates in Areas 3 and 4 were lower than projected pre-season. In ocean Area 3, the observed coho mark rate was 40%, compared to the pre-season projection of 54%. The observed coho mark rate in the ocean Area 4 selective fishery 26%, compared to 43% projected pre-season.

#### Comparison of Dockside and Observer Data in Selective Fisheries

Observation data on 1999 selective coho fisheries were collected in part to investigate potential bias in estimates of coho mark rates based on angler recognition of released coho. Relative to estimates of released salmon from fishery observation data, information collected at the dock shows a small bias towards higher numbers of salmon released (Table 4).

The dockside sampling of the ocean Area 2 selective fishery showed a coho release rate of 46%, compared to a rate of 40% observed on the water. In Area 3, dockside sampling data showed a coho release rate of 68%, compared to a rate of 65% reported on voluntary angler catch reports. Dockside sampling data from Area 4 showed a coho release rate of 80%, compared to a rate of 78% observed on the water.

### Compliance

Concerns about compliance with selective regulations existed pre-season because 1999 was the first year for selective ocean fisheries in Areas 2, 3, and 4. Information on compliance was collected through both dockside sampling by the WDFW sampling program and enforcement activities conducted by WDFW Enforcement staff.

Compliance with the selective fishery regulation in the ocean area fishery was high for both private and charter vessels. In Area 2, 37% of the total estimated number of coho landed were sampled dockside by the ocean sampling program. In Area 3, 74% of the total estimated coho landed were sampled, and in Area 4, 34% were sampled dockside. Dockside sampling showed compliance rates for the season of 99.2%, 98.4%, and 96.4% for Area 2, Area 3, and Area 4 respectively (Table 5).

Boat patrols, dockside enforcement, and investigative work conducted by WDFW Enforcement found nearly identical selective fishery compliance rates. In Area 2, the compliance rate was estimated at 99.5%; a 98.1% compliance rate was estimated in Area 3, and a compliance rate of 95.4% was estimated for Area 4 (Attachment 3a).

### Drop Off Rates

On-water observers in all areas recorded information on fish which were hooked but lost before being brought to the boat, commonly referred to as drop offs. For this study, the definition of drop off was that the fish was actually hooked but became free before it could be landed. This definition calls for some judgement on the part of the observers or anglers recording the data, resulting in potential bias.

Current Council methodology for estimating mortality due to drop off uses a rate of 5% of the total number of fish handled (retention plus release). Mortality rates for the season estimated from on-water observation data ranged from 1% in Areas 3 and 4 to 3% in Area 2. Estimates of drop off mortality rates from on-water observation data collected during the ocean selective fisheries are compared with FRAM projections in Table 6.

## Estimated Mortality

Table 7 shows the FRAM pre-season projections of total coho mortality. Estimates of actual coho mortality in the ocean selective fisheries are shown in Table 8. This analysis uses estimates of coho mark rates from on-water sampling to estimate total coho release. Estimates of incidental mortality are calculated using rates adopted by the Council for recreational fisheries (5% drop off mortality and 8% hooking mortality).

Incidental coho mortality in Area 2 is estimated at 1,704 which, when combined with a total coho retention of 12,595, puts the estimate of total coho mortality in the Area 2 selective fishery at 14,299. This compares to a pre-season projected total mortality of 47,936 coho. Had the fishery taken its full quota, the total coho mortality would have been nearly identical to what was modeled pre-season.

In Area 3, incidental mortality is estimated at 602 which, when combined with a total coho retention of 2,577, puts the estimate of total coho mortality in the ocean selective fishery at 3,179. This compares to a pre-season projected total mortality of 3,018 coho.

Incidental coho mortality in Area 4 is estimated at 2,211 which, when combined with a total coho retention of 5,370, puts the estimate of total coho mortality in the ocean selective fishery at 7,581. This compares to a pre-season projected total mortality of 22,127 coho. Had the fishery taken its full quota, the total coho mortality would have been significantly higher than what was modeled pre-season because a much higher percent of the handled fish would have been unmarked since the observed mark rate was lower than projected pre-season.

## Conclusion

The coho mark rate in Area 2 was nearly identical to pre-season projections. The ratio of marked coho decreased compared to pre-season projections moving north where the influence of Puget Sound stocks is higher.

The release data collected through dockside interviews matched what was observed during on-water observations. Angler recollection did not appear to decrease with an increasing number of released fish.

The selective fishing compliance rate ranged from 95% to over 99% on the coast. Enforcement activities suggested identical compliance rates to what was observed by samplers on the dock. The pre-season model projected a rate of 5% retention of all unmarked handled coho; in-season data showed a retention rate of 1% of handled unmarked coho in all three areas.

## Acknowledgments

The Ocean Sampling Program staff would like to thank all of the samplers and observers whose data collection made these analyses possible, and Sargent Mike Cenci and the officers of the Ocean Enforcement Division who supplied their compliance information. Additionally, a special thanks to Mark Cedergreen and Butch Smith as well as the Westport Charter Boat Association and the Ilwaco Charter Boat Association and the charter boat operators who voluntarily gave us access to ride along with the fleet as they fished.

Table 1: Salmon catch and effort by area and month in the 1999 ocean recreational fisheries.

MONTH	Area 2			Area 3			Area 4		
	Angler trips	Coho	Chinook	Angler trips	Coho	Chinook	Angler trips	Coho	Chinook
July	5,329	4,060	2,271	1,022	661	396	2,524	1,456	0
August	9,427	7,264	3,103	1,230	1,318	488	3,950	2,963	0
Sept	4,319	1,271	1,211	669	598	100	1,628	951	0
<b>TOTAL</b>	<b>19,075</b>	<b>12,595</b>	<b>6,585</b>	<b>2,921</b>	<b>2,577</b>	<b>984</b>	<b>8,102</b>	<b>5,370</b>	<b>0</b>

Table 2: 1999 mark rate of legal-sized coho encountered during on-board observation (Areas 2 and 4) and from angler trip reports (Area 3) in the ocean recreational fisheries.

		Total Encountered	Marked Encountered	Unmarked Encountered	Unknown Encountered	Coho Mark Rate
<b>AREA 2</b>	July	213	132	81	0	62.0%
	August	534	318	216	0	59.6%
	Sept	68	37	31	0	54.4%
	<b>Total</b>	<b>815</b>	<b>487</b>	<b>328</b>	<b>0</b>	<b>59.8%</b>
<b>AREA 3</b>	July	173	67	106	0	38.7%
	August	55	24	31	0	43.6%
	Sept	22	8	14	0	36.4%
	<b>Total</b>	<b>250</b>	<b>99</b>	<b>151</b>	<b>0</b>	<b>39.6%</b>
<b>AREA 4</b>	July	145	42	101	2	29.0%
	August	208	49	158	1	23.6%
	Sept	42	12	30	0	28.6%
	<b>Total</b>	<b>395</b>	<b>103</b>	<b>289</b>	<b>3</b>	<b>26.1%</b>

Table 3: 1999 mark rate of legal-sized coho encountered during on-board observation (Area 2 and 4) and from angler trip reports (Area 3) in the ocean recreational fisheries compared with the FRAM preseason projected mark rates.

		Total Legal Sized Coho Encountered	Observed Coho Mark Rate	Projected Coho Mark Rate
<b>AREA 2</b>	July	213	62.0%	63.9%
	August	534	59.6%	60.1%
	Sept	68	54.4%	60.1%
	<b>Total</b>	<b>815</b>	<b>59.8%</b>	<b>60.5%</b>
<b>AREA 3</b>	July	173	38.7%	60.5%
	August	55	43.6%	50.2%
	Sept	22	36.4%	50.2%
	<b>Total</b>	<b>250</b>	<b>39.6%</b>	<b>53.8%</b>
<b>AREA 4</b>	July	145	29.0%	43.1%
	August	208	23.6%	42.9%
	Sept	42	28.6%	42.9%
	<b>Total</b>	<b>395</b>	<b>26.1%</b>	<b>43.0%</b>

Table 4: Comparison of coho release rates observed on-water and reported through dockside interviews in the 1999 ocean recreational fisheries.

		ON-WATER OBSERVATIONS			DOCKSIDE REPORTS		
		Coho Retained	Coho Released	Release Rate	Coho Retained	Coho Released	Release Rate
<b>AREA 2</b>	July	127	104	45.0%	1119	992	47.0%
	August	318	269	45.8%	3086	2,470	44.5%
	Sept	38	43	53.1%	459	526	53.4%
	<b>Total</b>	<b>483</b>	<b>332</b>	<b>40.7%</b>	<b>4664</b>	<b>3988</b>	<b>46.1%</b>
<b>AREA 3</b>	July	64	109	63.0%	365	834	69.6%
	August	17	38	69.1%	1,179	2,406	67.1%
	Sept	7	15	68.2%	372	797	68.2%
	<b>Total</b>	<b>88</b>	<b>162</b>	<b>64.8%</b>	<b>1,916</b>	<b>4,037</b>	<b>67.8%</b>
<b>AREA 4</b>	July	43	103	70.5%	527	1,769	77.0%
	August	34	188	84.7%	962	3,774	79.7%
	Sept	10	49	83.1%	330	1,723	83.9%
	<b>Total</b>	<b>87</b>	<b>308</b>	<b>78.0%</b>	<b>1,819</b>	<b>7,266</b>	<b>80.0%</b>

Table 5: Compliance with selective fishery regulations observed through dockside port sampling.

		Total	Marked	Unmarked	% Landed
		Coho Landed	Coho Landed	Coho Landed	Coho Marked
<b>AREA 2</b>	July	4,060	4,032	28	99.3%
	August	7,264	7,233	31	99.6%
	Sept	1,271	1,229	42	96.7%
	<b>Total</b>	<b>12,595</b>	<b>12,494</b>	<b>101</b>	<b>99.2%</b>
<b>AREA 3</b>	July	661	649	12	98.2%
	August	1,318	1,292	26	98.0%
	Sept	598	594	4	99.3%
	<b>Total</b>	<b>2,577</b>	<b>2,535</b>	<b>42</b>	<b>98.4%</b>
<b>AREA 4</b>	July	1,456	1,396	60	95.9%
	August	2,963	2,869	94	96.8%
	Sept	951	911	40	95.8%
	<b>Total</b>	<b>5,370</b>	<b>5,176</b>	<b>194</b>	<b>96.4%</b>

Table 6: Estimated drop off mortality in the 1999 ocean recreational fisheries using on-water observation data.

		Total	Estimated	FRAM total	Observed Drop	
		Salmon Handled	Observed Drop Offs	Observed Drop Off Mortality a/	Drop Off Mortality b/	Off Mortality Rate c/
<b>AREA 2</b>	July	363	185	15	18	4.1%
	August	810	273	22	41	2.7%
	Sept	141	45	4	7	2.6%
	<b>Total</b>	<b>1,314</b>	<b>503</b>	<b>40</b>	<b>66</b>	<b>3.1%</b>
<b>AREA 3</b>	July	219	42	3	11	1.5%
	August	68	6	0	3	0.7%
	Sept	26	0	0	1	0.0%
	<b>Total</b>	<b>313</b>	<b>48</b>	<b>4</b>	<b>16</b>	<b>1.2%</b>
<b>AREA 4</b>	July	183	39	3	9	1.7%
	August	245	19	2	12	0.6%
	Sept	62	14	1	3	1.8%
	<b>Total</b>	<b>490</b>	<b>72</b>	<b>6</b>	<b>25</b>	<b>1.2%</b>

a/ Assumes 8% hooking mortality rate on observed drop offs.

b/ Total drop off mortality calculated using FRAM methodology (5% of handled fish).

c/ Estimated drop off mortality/Total salmon handled; 5% used by FRAM pre-season



Attachment 4: 1999 Washington Coastal Selective Salmon Fishery

STATE OF WASHINGTON DEPARTMENT OF FISH AND WILDLIFE ENFORCEMENT PROGRAM

The following report is a synopsis of enforcement activities by Washington Fish and Wildlife Officers, for the coastal selective salmon fishery. Enforcement presence in the four salmon management areas was accomplished by vessel, dock patrols, special investigations, and joint operations with Oregon State Police, National Marine Fisheries Service and the U.S. Coast Guard.

Developing compliance rate estimations for fish and wildlife violation are difficult. When compliance is estimated by comparing the number of contacts to violations discovered by WDFW Officers, the data can be confounded by having a uniformed officer present. Users who are violating fish and wildlife laws change their behavior when an officer is present. Often the contact-to-violation percentage is a reflection of the effectiveness of the officer at discovering a violation.

Washington Fish and Wildlife Officers were heavily engaged in the education process during patrols. There were numerous requests from anglers for information relative to fish identification and how to release fish unharmed. In response to this, Officers distributed hundreds of identification pamphlets and de-hooking devices while in the field and offered hands on instruction when possible. These field "training" sessions enhanced efforts by anglers in correctly applying the information received from media, sports shows, and other sources to the real-life situation. The presence of pink salmon runs in catch area four added to the complexity of fish identification for some anglers. However, many mistakes were deterred by the educational efforts of Officers.

Officers attempted to concentrate on intentional violators. For example, one surveillance in Neah Bay netted two individuals who had made multiple fishing trips in one day. A total of ten coho were caught and all but one were un-clipped. These persons were issued citations for exceeding the daily limit, fail to submit catch for inspection, possessing un-clipped coho and fail to record salmon catch data.

The WDFW Enforcement Division elevated the coastal salmon season to a priority issue. Officers worked in concert with other enforcement entities and assigned WDFW officers from other areas of the state to achieve a visible presence throughout the peak of the season. The results are summarized by catch area on the following pages.

**Area One (Ilwaco, WA):**

**Enforcement Hours:**

Docks -	219
Vessel -	138
Investigative -	127
Interagency -	<u>41</u>
Total -	525 hours

**Contacts:** 1,115 total

**Violations:**

License (no license / fail to record salmon catch) - 2 warnings; 11 citations.

Gear (more than one line / barbed hook) - 1 citation.

Possession (over limit / wild coho retention) - 1 warning; 7 citations.

Season / area (conservation zone closure / closed day / closed season) - 63 warnings; 34 citations.

Boater safety (gear / registrations) - 2 warnings; 1 citations.

Other offenses (shellfish/ bottom fish limits / warrants/ narcotics) - 1 warning; 26 citations.

**Total Warnings: 69**

**Total Citations: 80**

Estimated compliance with salmon rules is 89.4 %.\*

The estimated compliance for possessing unmarked coho was approximately 99.3% .\*\*

Season/ area violations, primarily vessels fishing in the conservation zone, accounted for 81.5%\*\*\* of the total salmon rule violations.

**Area Two (Westport, WA):**

**Enforcement hours:**

Docks -	56
Vessel -	159
Investigative -	17
Interagency -	<u>30</u>
Total -	262

**Contacts:** 569 total

**Violations:**

License (no license / fail to record salmon catch) - 13 warnings; 8 citations.

Gear (more than one line / barbed hook/ fail to submit gear for inspect.) - 14 warnings, 36 citations.

Possession (Over limit / wild coho retention) - 3 citations.

Season / area (conservation zone closure / closed day / closed season) - 16 warnings; 1 citation.

Boater safety (gear / registrations) - 3 citations.

Other offenses (shellfish/ bottomfish limits / warrants/ narcotics) - 4 warning; 20 citations.

**Total Warnings: 47**

**Total Citations: 71**

The estimated compliance rate with salmon rules was 84 %\*.

The estimated compliance rate for possessing unmarked coho was approximately 99.5%.\*\*

Gear violations, primarily anglers fishing with barbed hooks, accounted for 55%\*\*\*\* of total salmon rule violations.

**Area Three (LaPush, WA):**

**Enforcement Hours:**

Docks -	42
Vessel -	28
Interagency -	0
Investigative -	<u>02</u>
Total -	72

**Contacts:**            259 total

**Violations:**

License (no license / fail to record salmon catch) - 4 warnings; 6 citations.

Gear (more than one line / barbed hook/ fail to submit gear for inspect.) - 5 warnings, 4 citations.

Possession (Over limit / wild coho retention) - 5 citations.

Season / area (conservation zone closure / closed day / closed season) - 0.

Boater safety (gear / registrations) - 1 warning.

Other offenses (shellfish/ bottom fish limits / warrants/ narcotics) - 2 warnings; 7 citations.

**Total Warnings: 12**

**Total Citations: 22**

The estimated compliance with salmon rules was 90.8 %.\*

The compliance rate for possessing unmarked coho was approximately 98.1%.

**Area Four (Neah Bay, WA):**

**Enforcement Hours:**

Docks -	106
Vessel -	231
Investigative -	<u>15</u>
Total -	352

**Contacts:** 888 total

**Violations:**

License (no license / fail to record salmon catch) - 39 warnings; 41 citations.

Gear (more than one line / barbed hook/ fail to submit gear for inspect.) - 34 warnings; 19 citations.

Possession (Over limit / wild coho retention) - 7 warnings; 34 citations.

Possession of Canada caught salmon in violation of Port rules - 4 citations.

Season / area (conservation zone closure / closed day / closed season) - 0

Boater safety (gear / registrations) - 4 warnings.

Other offenses (primarily bottomfish limits) - 2 warnings; 18 citations.

**Total Warnings: 86**

**Total Citations: 116**

The estimated compliance with salmon rules was 80 %.\*

The estimated compliance for possessing unmarked coho was 95.4%.\*\*

\* % compliance with salmon regulations = total salmon violations ( license, gear, possession, season and area ) / total contacts

\*\* % compliance for possession of unmarked coho = total possession violations / total contacts

\*\*\* % compliance for gear violation = total gear violations/ total salmon violations

\*\*\*\* % of salmon violations in Conservation Zone = area, season violations / total salmon rule violations

*(In some areas we were unable to separate offenses for possessing over limits of salmon and possession of illegal coho.)*

## Attachment 5: Review of 1999 Tribal CWT Sampling

All western Washington tribal CWT sampling for coho has been converted to use electronic detection equipment. This includes recoveries on spawning grounds, at hatcheries, and in tribal fisheries. New sampling and data collection procedures have been developed in conjunction with the requirements set by the Data Standards Working Group of the Data Sharing Technical Committee.

### Equipment

Wand detectors seem to be the detection tool of choice; especially when sampling small numbers of fish, working in a confined space, or sampling at isolated sites. Problems with overly sensitive wands continued this year, although not to the same extent as in 1998. Some of the wands that were sent back to the manufacture for adjustments continued to be problematic upon return. Replacement wands were difficult to locate at times.

Tube detectors performed well this year, and there were no reports of equipment failures. Quad-counters were used at two sites and also proved reliable.

### Tribal Fisheries

In cooperation with the Washington Department of Fish and Wildlife, a joint tribal/state workshop was held to train samplers using electronic detection. This pre-season workshop covered various sampling methods, proper use of equipment, and new forms and sampling manuals. Individual site-specific training was also offered, to maximize efficiency as well as accuracy of the sampling effort.

Commercial site modifications included installing new tables, lifts, and storage areas for electronic detection equipment. The inability to work samples as expeditiously as in the past caused concern among fishermen and buyers in some locations. The concern involves a potential decrease in the value of the product, due to the inability to store the fish in a cold environment, while waiting to be processed.

The past few years have seen low number of coho returns, especially to Puget Sound. It is unknown what sample rates will be achieved using electronic detection in a high return year.

### Hatcheries and Escapement

Hatcheries as a whole seemed well prepared for this second year of electronic sampling. Pre-season workshops were conducted to provide training on electronic sampling procedures and introduce new data forms. Electronic sampling at hatcheries remains time consuming and physically demanding. Hatcheries reported that more staff time is being allocated to conduct the sampling. Sorting tables, tote lifts, and winches were used at some sites to lessen the physical impacts of electronic sampling.

All stream-surveyed coho underwent electronic detection this year. The process of electronic sampling did not have an impact on sampling levels due to the size of returns on most streams. Impacted most were tribes that did not have enough wands to sample all heads directly in the field. In those instances heads were excised from all fish and brought back to a centralized point for tag detection.

Attachment 6: Summary of Monitoring Results from the 1999 Buoy 10 and Columbia River Area Ocean Selective Fisheries

Oregon Department of Fish and Wildlife  
Washington Department of Fish and Wildlife



March, 2000

## Introduction

This summary is the result of joint monitoring efforts by Oregon Department of Fish and Wildlife (ODFW) and Washington Department of Fish and Wildlife (WDFW) for the 1999 recreational selective coho salmon fisheries in the Columbia River estuary (Buoy 10) and in the adjacent ocean area from Cape Falcon, Oregon to Leadbetter Point, Washington. A full report is underway which will incorporate the methodologies used in a monitoring report on the 1999 selective fishery on the central coast of Oregon ('DRAFT, 1999 Monitoring Program for Selective Ocean Coho Salmon Fisheries Off the Central Oregon Coast from Cape Falcon to Humbug Mountain', ODFW, 1999). The central Oregon coast report was recently reviewed by the Scientific and Statistical Committee of the Pacific Fishery Management Council (PFMC) and is currently being finalized by ODFW.

## Fishery Descriptions

The Columbia River area ocean recreational (ocean) fishery from Cape Falcon, Oregon to Leadbetter Point, Washington opened on July 19<sup>th</sup> and remained open through the scheduled closing date of September 30<sup>th</sup>. The coho quota of 55,000 was not attained. The fishery, originally open Sunday-Thursday, was opened seven days a week beginning September 3<sup>rd</sup> when it became clear that the quota would not be reached. The harvest guideline for chinook was 7,600. The bag limit was two salmon per day but only one chinook and no more than six salmon per calendar week with minimum size limits of 24" for chinook and 16" for coho. Selective fishery regulations required all retained coho to have a healed adipose finclip.

The estuary fishery (Buoy 10) in the Columbia River from the mouth upriver to the Astoria-Megler Bridge opened August 1<sup>st</sup> through December 31<sup>st</sup>. The bag limit was two salmon per day with minimum size limits of 24" chinook and 16" for coho. The Buoy 10 fishery was not quota managed but selective fishery regulations required all retained coho to have a healed adipose



finclip. The Buoy 10 fishery outpaced the preseason expectation for chinook retention by the end of August and was closed to chinook retention August 30<sup>th</sup> to reduce overall impacts and preserve Columbia River chinook sharing agreements.

## Methods

The ODFW and WDFW hired full-time observers for at-sea observation of the ocean and Buoy 10 salmon fisheries. Charter operators from the ports of Ilwaco, Astoria, Warrenton, Hammond, and Garibaldi volunteered space on their vessels to accommodate ODFW and WDFW observers. Additionally, WDFW observed private fishing boats from an adjacent vessel.

Observers aboard charter boats collected information about fish encounters, areas fished and types of gear used. Data recorded included species hooked, presence or absence of the adipose fin, size (legal or sublegal), and result of fish contacting the gear (fish retained, released, or dropped off) for every hookup the observer witnessed.

Observers aboard the adjacent vessel witnessed hookups by the private boat fleet. The observer vessel was positioned near a concentration of private fishing boats. When a hookup was observed on a private boat, the observer vessel provided a vantage point to record as much of the above information as could be witnessed.

Dockside port samplers collected catch information through interviews and catch inspections as fishing boats returned to the docks. Data collected per boat included catch by species, presence or absence of adipose fins on all retained salmon, number of anglers, and total number of salmon released by species. Landed salmon were sampled for species, fork length, scale collection, fin mark, and coded-wire tag. Due to the mass marking of hatchery coho, electronic detection equipment was used to indicate the presence or absence of coded-wire tags in all coho.

The ODFW dockside and onboard observers collected gear profile data including method (trolling or mooching), number of hooks, bait or lure, use of flasher, and type of weight.

Total effort data was collected through either exit or entrance counts of vessels passing through the entrance of the ports. Dockside sampling data was then expanded according to the observed effort profile to estimate total retained and released catch.

## Catch and Effort

Retained salmon catch and angler effort in the Columbia River area ocean selective fishery are shown in Table 1. Anglers retained 27,132 coho and 3,253 chinook on 28,100 angler trips. Although catch rates in the ocean fishery were approximately one salmon per angler trip, less than half of the 55,000 coho quota and the 7,600 chinook guideline was attained.

Retained salmon catch and angler effort in the Buoy 10 selective fishery are shown in Table 2. Anglers retained 8,960 coho and 9,850 chinook on 49,576 angler trips. Coho catch rates were less than anticipated partly due to a lower than forecast return of Columbia River hatchery coho and a shift of angler effort to chinook targeted fishery.

#### Coho Handle

The WDFW and ODFW staff observed anglers onboard charter and private boats throughout the ocean selective fishery season. They observed 1,404 (5.2%) of the 27,132 coho retained in the ocean fishery (Table 3). Observers recorded 402 unmarked coho handled for an overall mark rate of 78%.

Observation of the Buoy 10 selective fishery was conducted primarily by WDFW and was concentrated in the August and September timeframe when angler effort and coho catch are the greatest. Observers recorded 232 (2.6%) of the 8,960 coho retained in the Buoy 10 fishery (Table 4). Observers recorded 61 unmarked coho handled for an overall mark rate of 79%.

#### Preseason vs. Postseason Estimates of Coho Mark Rates

Table 5 compares preseason and postseason estimates of mark rate for the Buoy 10 and ocean selective fisheries. Preseason projections of 1999 coho mark rates were estimated using the coho Fishery Regulation and Assessment Model (FRAM). Postseason estimates were calculated from coho encounter data collected during onboard observations. Postseason estimates of mark rates in both fisheries were consistently greater than preseason estimates.

#### Dockside vs. Observer Data in Selective Fisheries

Observation data on 1999 selective coho fisheries were collected in part to investigate potential bias in estimates of coho mark rates based on angler recognition of released coho. Mark rates calculated from data collected at the dock were generally consistent with those calculated from observer data (Tables 6 and 7).

The dockside sampling of the ocean area selective fishery showed a coho mark rate of 72% compared with 78% estimated from observation data. The dockside sampling of the Buoy 10 selective fishery showed a similarly lower coho mark rate of 76% compared to the 79% estimated from observation data. Although both fisheries exhibited a lower mark rate based on dockside sampling versus onboard observation, further analyses are necessary to determine if these differences are statistically significant.

#### Compliance

Using combined information from dockside sampling and boat patrols conducted by Oregon State Police (OSP) and WDFW's Enforcement Program, estimates of compliance with selective

regulations were assessed as a percentage of the retained coho catch with a healed adipose finclip (Tables 6 and 7). Oregon and Washington enforcement personnel contacted over 1,700 anglers in the Buoy 10 and the ocean fisheries combined. Compliance rates in these two selective fisheries were considerably less than the 2.5% rate assumed preseason.

Compliance with the selective fishery regulations in the ocean area fishery was very high for both private and charter vessels. Approximately 35% of the total retained coho in the ocean selective fishery were sampled at the dock and an estimated 1% did not have an adipose clip. This compliance rate of 99% was confirmed by random state enforcement boat patrols.

Compliance with the selective fishery regulation in the Buoy 10 fishery was also high. Approximately one-third of the total retained coho in the Buoy 10 selective fishery were sampled at the dock and an estimated 2% did not have an adipose finclip.

### Estimated Mortality

Estimates of total coho mortality in the Buoy 10 and ocean selective fisheries are shown in Table 8. This analysis uses observed coho mark rates from ODFW and WDFW at-sea sampling to estimate total coho retention and release. Estimates of incidental mortality are calculated using rates adopted by the PFMC for 1999 recreational fisheries (5% drop off mortality and 8% hooking mortality).

Incidental coho mortality in the ocean selective fishery is estimated at 2,301. When combined with the 27,132 retained coho, estimated total coho mortality in the ocean selective fishery is 29,433.

Incidental mortality in the Buoy 10 selective fishery is estimated at 762 coho. When combined with the 8,960 retained coho, estimated total coho mortality in the Buoy 10 selective fishery is 9,722.

### Drop Off Rates

Observers from ODFW and WDFW recorded information on fish which were hooked but lost before being brought to the boat, commonly referred to as drop offs. Current PFMC methodology for estimating mortality due to drop off uses a rate of 5% of the total number of fish handled (retention plus release). Estimates of drop off mortality rates from observation data collected during the ocean selective fisheries are displayed in Table 9. Rates for both chinook and coho were never estimated to be greater than 3%. Based on this analysis, the methodology for assessing drop off mortality adopted by the PFMC is conservatively high.

### Gear Profile

Preliminary results from the gear profile work in the Columbia River area ocean selective fishery suggests that 99% of the anglers are trolling rather than mooching. Additionally, 85% of anglers are using bait versus artificial lures and of the bait anglers over 80% used a tandem hook setup.

### Conclusion

Preliminary postseason results from the 1999 monitoring of the Buoy 10 and ocean selective fisheries indicate that preseason assumptions concerning mark rate, compliance, and drop off used in the modeling of these fisheries are adequately conservative when assessing these fisheries.

### Acknowledgments

The selective fishery monitoring of these fisheries is a joint effort of WDFW and ODFW and their respective enforcement divisions. The ODFW and WDFW would like to thank the charter operators who voluntarily provided space on their boats for observers. Special recognition is due all samplers and observers who spent a great deal of time collecting the data presented in this summary.

Attachment 7: Letter Expressing Views and Policies of the National Marine Fisheries Service (NMFS) on Mass Marking and Selective Fisheries

Dr. Jeffery P. Koenings, Director  
Washington Department of Fish and Wildlife  
600 Capitol Way N.  
Olympia, WA 98501-1091

Dear Dr. Koenings:

In light of the discussions at the Pacific Salmon Commission (PSC) annual meeting in Vancouver last month, I believe it would be constructive to review recent events and the current situation as it involves mass marking and selective fisheries. I would like also to clarify the views and policies of the National Marine Fisheries Service (NMFS) on these matters, and thereby avoid any misunderstandings or surprises that may exist or arise regarding our approach to this issue. While recognizing that not all issues have been resolved even for coho salmon, NMFS' focus is primarily on chinook salmon, due to the fact that many populations of chinook are now listed under to the Endangered Species Act (ESA) and their life history is so much more complex.

For background, recall that the 1985 Pacific Salmon Treaty was accompanied by a Memorandum of Understanding. Among other things, that MOU obligated the parties to maintain a coded wire tag (CWT) and recapture program designed to provide statistically reliable data for stock assessments and fishery evaluations. With the advent of new mass marking technologies in recent years, and in recognition of the potential of mass marking and selective mark fisheries to affect the viability of the CWT program, the PSC adopted a new policy in February of 1998 to address this issue. A process was agreed upon whereby agency proposals would be submitted annually to a newly formed PSC committee known as the Selective Fishery Evaluation Committee (SFEC). Although the PSC lacks authority to prohibit mass marking or selective fisheries, the clear intent of the bilateral policy is to provide advice to the PSC and the cooperating agencies regarding their mass marking and selective fishery programs, all with a view toward ensuring the continued viability of the coastwide CWT program. The SFEC already has contributed substantially to these ends by developing standard analytical techniques, procedures for use of double index tagging methodology, modifications of sampling programs using electronic tag detection technology, and facilitating inter-agency coordination. Thanks largely to the work of the SFEC, most of the issues involving mass marking and selective fisheries for coho salmon seem to have been adequately addressed. Several U.S. jurisdictions and Canada are now actively engaged in coho mass marking and selective fisheries.

In both 1998 and 1999, the states of Washington and Oregon submitted mass marking plans in accordance with the agreed PSC process. In addition to coho, those plans included mass marking of large numbers of hatchery chinook salmon. Although no selective fisheries

specifically have been proposed yet for chinook salmon in marine waters, there understandably exists the expectation that selective fisheries proposals will be forthcoming, as that clearly is the motivation underlying the substantial public investment in the development and application of the new mass marking technology.

Unfortunately, despite the agreed schedule outlined in the PSC's policy and the good faith intentions of all parties, the SFEC was unable to conclude its review of the states' current mass marking proposals for chinook salmon prior to the PSC's annual meeting in February 2000, due largely to competing time demands and insufficient committee resources. Thus, the SFEC was unable to provide a committee recommendation to the PSC or the management agencies regarding those proposals. Although some members of the SFEC have expressed their individual views and concerns, there is no consensus within the entire SFEC on several key issues.

In light of this situation, the PSC neither endorsed nor objected to the proposals submitted by Washington and Oregon. Instead, representatives of the various U.S. and Canadian management agencies engaged in a candid exchange of views in executive session. The PSC then issued a bilateral statement reiterating the need to maintain the integrity and reliability of the CWT program, noting especially its importance to implementation of the newly agreed abundance-based chinook management regime. Although a range of unreconciled scientific opinions still exists regarding certain technical matters, the PSC's bilateral statement represents a firm policy commitment by all parties to maintain the basic viability of the CWT program. Given the timing of the PSC's meetings and domestic management processes, it now falls mostly to the relevant domestic management agencies to grapple with and address the technical problems in a manner that comports with their international and domestic commitments.

During the PSC discussion, Washington/Oregon's PSC Commissioner, Curt Smitch, made a particularly constructive observation. In response to concerns expressed by Canada that its scientific experts are already over-committed to work on other priorities, Mr. Smitch opined that the jurisdictions most strongly pursuing selective fisheries should take lead responsibility for providing the resources to solve the technical problems so that their programs can be successful and the CWT program kept viable. NMFS applauds this suggestion and, recognizing that Washington already has provided equipment and other assistance to bring this technology to fruition, encourages the state to dedicate additional resources to address the remaining analytical issues. NMFS stands ready to offer whatever assistance we can in this regard.

As noted above, NMFS seeks to avoid surprises or misunderstandings on this topic. To that end, allow me to take this opportunity to restate and clarify our policy stance on a number of the relevant issues.

Mass marking. From an ESA perspective, several obvious and significant benefits derive from applying a visual mark to hatchery chinook, most notably the ability to easily monitor and manage hatchery stray rates, and to differentiate hatchery fish from natural fish for broodstock management and stock assessment purposes. Our inability to distinguish the relative proportions

of hatchery and natural recruits in escapement data bases introduces significant uncertainty in NMFS' ongoing assessments of extinction risks for many natural stocks; mass marking will go a long way toward addressing this problem. Using the new mechanized technology for mass marking, these benefits can now be achieved on a massive scale in a very cost-effective and efficient manner.

By enabling selectivity, mass marking may also provide the means for sustainable fisheries, clearly a very important objective. However, because a number of critical technical issues remain unsolved, as noted above, NMFS shares the view of its comanagers that decisions made now to mass mark hatchery chinook are separate from decisions to be made later regarding selective fisheries. Even in cases where NMFS has required that a hatchery's production be mass marked because of ESA concerns, this does not imply that a selective fishery subsequently will be endorsed.

Please note that it is not NMFS policy that all hatchery production must be mass marked. Rather, NMFS policy is that mass marking must be decided on a case-by-case basis, taking into account, among other things, the specific objectives of the hatchery production, the intended purposes of the mark (e.g, study objectives; selective fisheries, etc.), and the effects of the hatchery production on fish listed under the Endangered Species Act (ESA). Because hatchery straying is ubiquitous, the need to monitor and/or control straying will be an issue common to hatchery programs operated for harvest augmentation. In most cases, the only available choices are to discontinue (or reduce) the hatchery production, or to mark the fish. The most practical means to mark the hatchery production will be with the new mass marking technology. Thus, NMFS anticipates that the application of its ESA policies frequently — but not always — will result in mass marking using the adipose fin clip. For these reasons, NMFS fully anticipates that many if not most Hatchery and Genetic Management Plans approved by NMFS will require mass marking, and that the mass mark of choice will often, though not always, be the adipose fin clip.

In some cases it will be counterproductive to visually mark hatchery fish with the adipose fin clip. For example, an adipose fin clip may be inappropriate when the hatchery fish are produced for conservation purposes. In such cases, the goal may be to pass the (unmarked) fish through mark-selective mixed stock fisheries. A similar strategy may apply when the production is intended specifically to contribute to treaty Indian fisheries in terminal areas.

Selective fisheries. The coastwide CWT program plays an essential and currently irreplaceable role in resource assessment programs and fishery management for chinook salmon. As noted in the PSC's statement, the CWT program provides information essential to implementation of the new abundance-based fishery regimes embodied in the 1999 Pacific Salmon Treaty agreement. The data it provides forms the informational background for much of the recovery effort for ESA-listed species.

As noted above, the management agencies have not yet reached a consensus as to whether risks to the viability of the chinook salmon CWT program can be managed within acceptable limits,

thereby unlocking the potential benefits of mark-selective fisheries. The problem is compounded by the fact that there is not a commonly shared understanding of what it specifically means to maintain the viability of the CWT program. While all parties are hopeful that further technical analysis will clarify the degree of risk, it is quite possible that insufficient time is available to solve the technical problems before decisions must be made regarding selective chinook fisheries. The potential for policy conflict is very real.

In case this happens, I want NMFS' position to have been understood well in advance. NMFS will, of course, consider all relevant information and the views of all the comanagers involved, especially including Canada, as the issues and analysis unfold. That said, NMFS will not support mark-selective fisheries in any area where the CWT program is unduly compromised. Given NMFS' particular interest in maintaining its ability to assess the incidental impacts of fisheries on listed species, our national obligation under the PST to maintain the viability of the coastwide CWT program, and the essential role of the program in implementing the new PST chinook salmon regime, it would make no sense for NMFS to take any other position.

I hope that this letter helps to clarify our position on these most important matters. Upon your request, my staff and I stand ready to discuss these issues fully and address any remaining ambiguities. More importantly, we are willing and anxious to discuss means by which NMFS can assist further in addressing the outstanding issues.

Sincerely,

William L. Robinson  
Assistant Regional Administrator for  
Sustainable Fisheries

cc: Patrick S. Chamut, Canada DFO

Original Ltr. also sent to:

Jim Greer, ODFW  
Bill Frank, NWIFC  
Donald Sampson, CRITFC  
Frank Rue, ADFG  
Jerry Mallet, IFG



## Attachment 8: Detection of Coded Wire Tags with the Hand-Held Wand Detector: An Examination of an Alternative Technique

Geraldine Vander Haegen and Lee Blankenship  
WA Dept. of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501-1091  
February, 2000

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### **Introduction**

Using the standard technique suggested by Northwest Marine Technology (NMT), previous tests of the hand-held wand detector showed that it can reliably detect over 90% of tags in chinook (Blankenship et al. 1999; Olson et al. 1999). However, those studies also suggested a bias toward lower detection rates in larger fish, particularly when the wand was used improperly. The failure to detect a tag is surmised to result from the depth of the embedded tag surpassing the range of the wand. While working within the present range limits of the wand, we hypothesized that sampling inside the mouth of the fish with the wand would improve its ability to detect tags because the distance between a deeply embedded tag and the wand would be shorter. Here, we report on some initial tests of this method and our recommendations for its use and further study.

### **Methods**

#### Chinook - Soos Creek Hatchery

Coded-wire tagged chinook returning to Soos Creek Hatchery in 1999 were recognizable by the absence of the adipose fin. These fish were visually separated from unmarked fish by the hatchery crew during normal spawning and sorting activities. Knowing these fish were likely to have CWTs, we attempted to electronically detect the tags using the standard wand technique described by NMT (wanding only outside the snout). If no tag was detected, we then tried detecting the tag by sampling inside the mouth. In this method, the fish is held by the gills so that the mouth gapes open. The wand is inserted vertically into the fish's mouth with the long axis of the wand parallel to the spine. The most sensitive side of the wand (the side with the arrows) is placed against the roof of the mouth and moved up and down several times over the entire surface of the roof of the mouth. The fish were thus sorted into three groups: fish with tags that could be detected using the standard technique only, fish with tags which could only be detected by sampling in the mouth, and fish with undetectable tags. The fork length of each fish was measured, and all snouts were collected along with an indication of which wanding method was used.

#### Coho - Solduc Hatchery

Coho returning to Solduc Hatchery in 1999 could not be distinguished by visual means; all of the hatchery fish in this brood year were mass marked. As the fish were removed from the adult pond for spawning, the hatchery crew used the standard wanding technique to detect tags. All

tagged fish were set aside, then the fish in which no tag was detected were re-sampled by wanding in the mouth.

## Results

We sampled 304 marked chinook for CWTs (figure 1) at Soos Creek Hatchery. Tagged fish ranged from 46 cm to 107 cm (FL), with either 1.0 mm or 1.5 mm CWTs. CWTs were detected in 272 fish using the normal wanding technique. All 1.5 mm CWTs were detected using the normal wanding technique. Using the normal wanding technique, we missed 21 CWTs (7.2%), all of which were detected by wanding in the mouth, and all of which were 1.0 mm CWTs. Fish with tags that were detected only by wanding in the mouth did not show a particular bias towards larger fish, rather they spanned range of lengths seen. Eleven marked fish in which no tag could be detected by either method were later shown by dissection to have no tag; we did not miss any CWTs using the combined methods.

Some fish with CWTs detected using the standard method were also wanded in the mouth. In every case, we could still detect the CWT. If the signal was weak with the standard wanding procedure, wanding in the mouth produced a strong signal from the wand. The number and lengths of these fish were not recorded, and will be the subject of future studies.

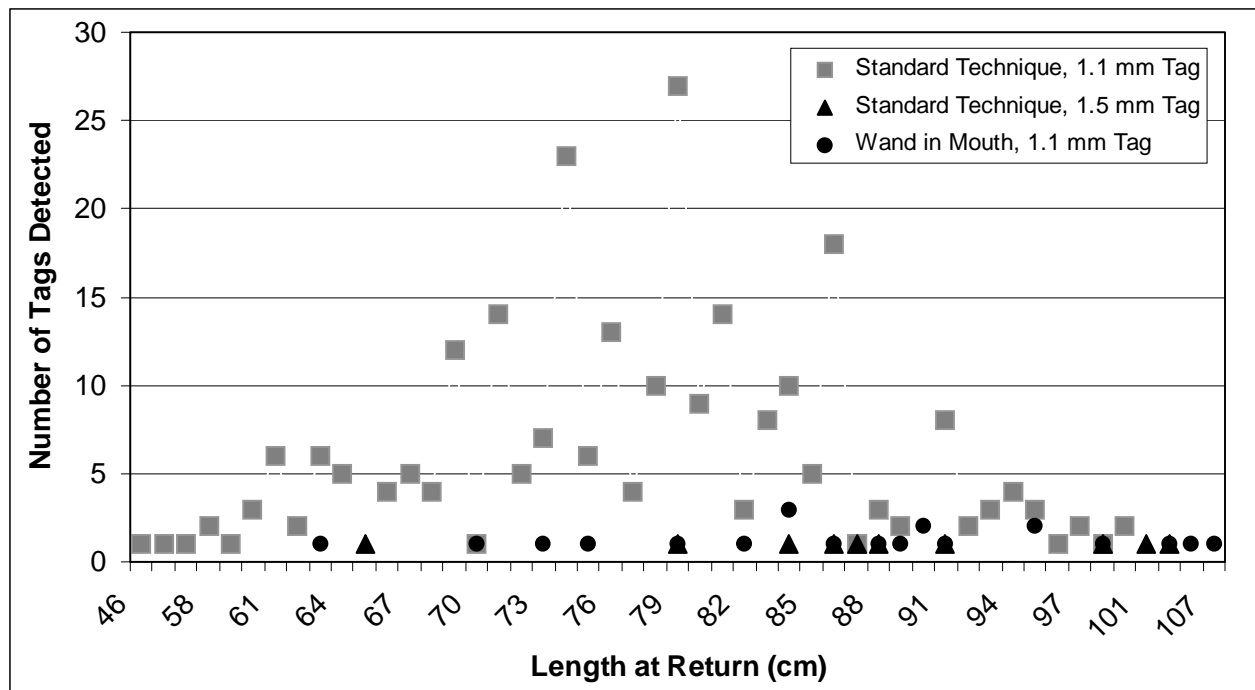


Figure 1: Frequency of tags detected in Soos Creek fall chinook by fork length using the standard wanding technique only (“Standard Technique”) or the standard wanding technique followed by wanding in mouth (“Wand in Mouth”)

At Solduc Hatchery, we re-sampled 400 coho salmon by wanding in the mouth, but did not recover any more tags. All CWTs recovered were 1.5 mm.

## **Discussion**

We demonstrated that 7% more tags could be detected by sampling chinook in the mouth. We had expected that sampling in the mouth would improve detection only in the larger chinook, but our results showed otherwise. Because trained samplers were used, and because those samplers already had the expectation of finding a tag, we can not attribute the missed tags in the smaller fish to poor wanding technique, rather, more effort than usual was used to find tags by the standard method. All of the missed tags were 1.1 mm tags, and in several cases, a 1.5 mm tag in a fish of the same length was detected with the standard wanding technique.

No 1.5 mm tags were missed in coho at Solduc Hatchery using the standard wanding technique. This result is expected given that coho are generally smaller than chinook. However, the coho at Solduc are on the high end of the size range of adults returning to Washington State; the largest fish we sampled was 1 m long.

Based on these results, we are not proposing to change the wanding technique for coho, but feel that further examination on fish returning with 1.1 mm tags is necessary. We support the continued use of 1.5 mm tags given that coho are usually tagged at a reasonably large size, that the survival is not reduced compared to 1.1 mm tags (Vander Haegen and Blankenship 1999) and that the wands can reliably detect 1.5 mm tags even in large coho.

In this and previous studies, we have shown the wand can detect more than 99% of 1.5 mm tags in chinook, and therefore continue to support the use of 1.5 mm tags. However, the present study suggests that the rate of detections of 1.1 mm tags can be as high if chinook in which no tag was detected using the standard wanding method are then wanded in the mouth. This is a compelling reason to consider requiring samplers to wand chinook in the mouth if they have not detected a tag by the standard wanding method, or if they are not positive that the wand beeps indicate a tag is present. Ideally, we would like to require only a single sampling method to increase the speed with which fish could be sampled for CWTs. Some cursory examinations suggest that we may be able to detect all tags by sampling only in the mouth, but we will not adopt this method until further studies are completed in fall, 2000. Obviously, fish with mouths too small to accommodate the wand at all would be sampled outside the snout, but in such small fish, all tags would be well within the detection range of the wand. Sampling in the mouth is approximately as fast as the standard sampling technique, and we feel that it would leave less room for sampling error. A second advantage of wanding in the mouth is that it may decrease the number of false positive detections that result from dirt on the skin of the fish - the inside of the mouth is generally clear of debris.

In conclusion, we presently recommend wanding chinook in the mouth if no tag was detected using the standard wanding method. In fall 2000, we will conduct further studies to determine if

this should be the only technique used for chinook, and what its use may be for coho with 1.1 mm tags.

### **References**

Olson, R., K. Phillipson, and D. Zajac. 1999. Detection of coded wire tags in chinook salmon with the “wand” detector. Pp. 54-58 in Selective Fishery Evaluation Committee, 1998 Annual Report. Pacific Salmon Commission SFEC (99)-1.

Blankenship, H.L., D. Thompson, and G. Vander Haegen. 1999. Returns of chinook salmon coded wire tagged with 1.1 mm and 1.5 mm coded wire tags and adult electronic detection. Pp 59-63 in Selective Fishery Evaluation Committee, 1998 Annual Report. Pacific Salmon Commission SFEC (99)-1.

Attachment 9: Detecting Coded Wire Tags with the Hand-held Wand Detector: Proposal for Evaluating an Alternate Technique

Geraldine Vander Haegen and Lee Blankenship  
WA Dept. of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501-1091  
July, 2000

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## **Introduction**

Using the standard technique suggested by Northwest Marine Technology (NMT), previous tests of the hand-held wand detector showed that it can reliably detect over 90% of tags in chinook (Blankenship et al. 1999; Olson et al. 1999). However, those studies also suggested a bias toward lower detection rates in larger fish. The failure to detect a tag results from the depth of the embedded tag surpassing the range of the wand. While working within the present range limits of the wand, we hypothesized that sampling inside the fish's mouth with the wand would improve its ability to detect tags because the distance between a deeply embedded tag and the wand would be shorter. Initial tests of this method showed wand inside the mouth increased the rate of detections (Vander Haegen and Blankenship, 2000). While encouraging, we did not evaluate whether all of the tags could be detected by wand inside the mouth only, and a larger sample size is needed to fully evaluate the method.

The objective for sampling experiments in 2000 is to compare tag detection rates by wand inside the mouth to the standard wand procedure for coho and chinook. We will be answering the questions:

- Can we detect all of the CWT's in chinook and coho by wand inside the mouth only, or do we need a combination of this and the standard wand technique?
- If neither method can detect all of the tags, which is better?
- Is the same method best for both species, or should different methods be used depending on species? For consistency and simple training, one method is preferable for all sampling.

## **Assumptions**

The tunnel detector (either R8000 or R9500) can detect all tags.

The samplers in the experiment are trained to, and do use the best possible technique. We are evaluating the detection capability of the wand under field conditions, not the training of individual samplers. It is therefore necessary to sample only once with each technique.

## Definitions

*Wanding inside the mouth:* In this method, the fish is held by the gills so that the mouth gapes open. The wand is inserted vertically into the fish's mouth with the long axis of the wand parallel to the spine. The most sensitive side of the wand (the side with the arrows) is placed against the roof of the mouth and moved up and down several times over the entire surface of the roof of the mouth. If a fish is too small to fit the wand inside the mouth, it is wanded using the standard wanding technique.

*Standard wanding technique:* This is the standard method recommended by Northwest Marine Technology and demonstrated on their video tapes.

## Methods

The study design is a 2-way ANOVA with replicates for each species. The factors in the ANOVA are tag length (1.0 vs 1.5) and wanding method (Standard vs Wand in Mouth). The goal is to sample as many coded-wire tagged fish as possible of each species, and of each tag length (standard and length and a half). At least four replicates of 250 tagged fish per replicate in each category is desirable. We will concentrate our effort at hatcheries where tagged groups are expected to return, so that we can maximize the number of tags encountered per unit of sampling effort.

At each site, each fish will be sampled three times - twice with a wand detector, and once with an R-series detector (see summary of steps below). First, each fish will be sampled using the standard wanding procedure. Next, the fish will be sampled by wanding in the mouth, and finally the fish will be sampled with the R-series detector to verify that a tag was not missed by both wanding methods. To eliminate bias in the results, the samplers must not know the results from a previous sampler as they search for a tag, and they must not have a prior expectation that a tag should be present. Several measures will be taken to address these requirements:

1. Before any fish are sampled, every fish in the sample will be tagged with a uniquely numbered, nonmagnetic tag. This way, the results from each sample can be tracked to an individual fish.
2. For chinook, because the presence or absence of the adipose fin indicates the presence or absence of a CWT, then the mark, or lack thereof, must be obscured before any CWT sampling begins. Before this is done, the original mark must be recorded with the label number for later transfer to the head cards. The mark can be obscured in many ways - we plan to use a sharp knife to cut a slight notch in all of the fish to be sampled at the site of the adipose fin. The samplers using the electronic detection equipment must not be present while this is done. Samplers will be given a mix of fish so that there is no expectation of all the fish having CWT.

3. Different, equally well-trained samplers must be used for each wand sampling technique to eliminate the possibility of remembering a sample result. Because it is likely that the samplers will be working close to each other, a temporal separation between samples is necessary to eliminate a bias. If there are a lot of fish to sample, the first sampler should accumulate a number of sampled fish before the next sampler begins. If there are a few fish to sample, one sampler should leave the immediate area, and the first sampler should sample all of the fish before the next one returns.
4. If necessary, the same samplers that used the wand can sample using the R-series detector, but the wand sampling must first be complete.
5. **Data Recording**
  1. If a separate person will be recording the results for all of the samplers, (this is preferable) one master sheet can be used (for example, Form A). The samplers must call out the result for every fish sampled, whether or not a CWT was detected.
  2. If the samplers will record their own results, they must use separate data sheets (Form B). The result for every fish sampled must be recorded, whether or not a CWT was detected.

Once the wand sampling is complete for any given fish, it will be put through an R-series detector to verify the result. After the fish are separated using the R-series detector, a final check should be made to ensure that every fish in which a CWT could be detected using a wand was also detected using the R-series detector. Any fish that had a positive detection using a wand, but not using the R-series detector should be re-sampled to verify the result.

The snouts from all fish with CWT must be collected, and the fish label number noted on the head card. The head must be tracked through the laboratory so that the tag length can be related back to the detection result.

The final data must include:

- Sampling location
- Sampling date
- Samplers name for each detection type
- Species
- Sex
- Fork length
- Tag length
- Result for each detection type

## References

Olson, R., K. Phillipson, and D. Zajac. 1999. Detection of coded wire tags in chinook salmon with the “wand” detector. Pp. 54-58 in Selective Fishery Evaluation Committee, 1998 Annual Report. Pacific Salmon Commission SFEC (99)-1.

Blankenship, H.L., D. Thompson, and G. Vander Haegen. 1999. Returns of chinook salmon coded wire tagged with 1.1 mm and 1.5 mm coded wire tags and adult electronic detection. Pp 59-63 in Selective Fishery Evaluation Committee, 1998 Annual Report. Pacific Salmon Commission SFEC (99)-1.

Vander Haegen, G.E. & H.L. Blankenship. 2000. Detection of coded-wire tags with the hand-held wand detector: an examination of an alternate technique. Selective Fishery Evaluation Committee 1999 Annual Report. Pacific Salmon Commission.



- Step 1.** Label fish
- Step 2.** Note presence or absence of adipose fin on master tracking sheet
- Chinook: go to **step 3**, then continue
- Coho: go to **step 4**, then continue
- Step 3.** Because the absence of an adipose fin signifies a CWT is present, this mark must be obscured such that the sampler can not distinguish a fish that was originally marked from one which was not. This could be done by removing a slight notch of tissue from the area of the adipose fin. The sampler must be given a mix of CWT and untagged fish so that they will not expect all CWT fish.
- Step 4.** Sampler 1 - Search for tags using standard wandng technique and note the result on master tracking sheet.
- Step 5.** Sampler 2 - Search for tags by wandng in mouth and note the result on master tracking sheet.
- Step 6.** Put fish through R8000 or R9500 tunnel detector and note the result on master tracking sheet.
- Step 6a** If no tag was detected by the tunnel detector and no tag was detected by wandng, remove the label and dispose of the fish.
- Step 6b** If no tag was detected by the tunnel detector, but a tag was detected by wandng, verify result then dispose of the fish or collect the snout accordingly. **write the fish's label number on the head tag.**
- Step 6c** If a tag was detected by the tunnel detector, collect the snout and **write the fish's label number on the head tag.**
- Step 7.** Track CWT recoveries though lab to relate the tag type to detection results.

Form A - Separate data recorder

Date:

Location:

Sampler name:

Standard wandling procedure:

Wanding in mouth:

R-series detector:

Species:

Label Number	Ad clip (Y or N)	Detection result (Y or N)		
		Standard	Wand in mouth	R-detector





