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1996 MARK MEETING

FINAL MINUTES

Warwick-Regis Hotel
San Francisco, California

February 15-16, 1996

1. General Business Items

A. Welcome/Introductions

The 1996 Mark Meeting was convened at 9:00 AM, February 15 at the Warwick-Regis Hotel in downtown San Francisco, California. Mark Committee members and other meeting participants were introduced at the start of the meeting (**Attachment 1**). Susan Bates (CDFO), Christine Mallette (ODFW), and Robert Bayley (NMFS-Portland) were welcomed as new tag/mark coordinators, replacing Vic Palermo (CDFO), Dennis Isaac (formerly ODFW, now retired), and Robert Smith (NMFS-Portland), respectively.

Tim Yesaki (BC Environment) was recently appointed to replace Bryan Ludwig. As he was unable to attend, BC Environment was represented by Susan Bates (CDFO) in issues requiring a vote. David Zajac (USFWS) could not attend but forwarded a letter stating USFWS's position on those issues expected to require a vote. Jerry Harmon (NMFS-Columbia River) likewise was not able to attend but the NMFS still had representation by Robert Bayley (Portland) and Ron Heintz (Auke Bay, Alaska).

B. 1997 Meeting Site and Date

After some discussion, it was agreed that the 1997 Mark Meeting will be held in Juneau, Alaska for the first time. However, recognizing that the weather can be a problem for air travel to Juneau during the winter months, the meeting will be delayed from the customary 3rd Thursday in February to the month of April. **The Juneau meeting is scheduled for April 24-25, 1997 (Thursday-Friday).** Depending on the agenda, it is hoped that some time can be scheduled for visits to ADFG's CWT and otolith processing lab in Juneau and NMFS's facilities at nearby Auke Bay.

2. Status of CWT Data Files and Reporting Backlogs

The status of the four primary CWT data files was reviewed (**Tables 1-4;** *Updated 03/20/96*).

A. CWT Release Data

All of the CWT release data through 1994 and nearly all 1995 data (**Table 1**) are available in PSC format and can be accessed on-line at PSMFC. Only a small number of release records are still unreported or have errors that haven't been resolved yet.

B. Unmarked Hatchery Production Releases

Little progress was seen during the past year in reporting unmarked hatchery production releases (**Table 2**). In addition, a sizable portion of the 1995 releases have not been reported. On the positive side, ADFG has been busy during the past year and will be reporting all of its unmarked production releases (up through 1994) in March 1996. ADFG's milestone accomplishment will be a major step forward towards completion of the coastwide data file, with only CDFG (all years) and ODFW (1975-81) data sets unreported yet.

C. CWT Recovery Data

Nearly all historical CWT recovery data are now reported in PSC format (**Table 3**). However, the 1995 recovery data is still incomplete in terms of agency reporting. This has also been the first year that late reporting of release data by one agency (now corrected) significantly delayed the validation of other agencies' recovery data because of missing tagcodes in the release file. Most of the missing 1995 recovery data sets are expected to be reported in the near future.

Noteworthy progress was made by NMFS-Alaska in recently submitting their 1991-1994 recovery data. CDFG 1977, ADFG 1977-79, IDFG 1992-94 and QDNR 1994 historical recovery data sets remain unreported or have unresolved errors.

D. CWT Catch/Sample Data

The CWT catch/sample data sets (**Table 4**) show a similar pattern to that of the recovery data sets. Missing historical data sets include CDFG 1977, WDFW 1973-75, ADFG 1977-79, and QDNR 1994.

NMFS-Alaska submitted its 1991-94 catch/sample data during the 1996 Mark Meeting, and expects to forward its 1980-90 data within the next two months. This represents a second major milestone in reporting for Alaska, in conjunction with ADFG's expected reporting of unmarked hatchery production in March, 1996.

TABLE 1. Status of CWT Release Data

Reporting Agency 03/20/96

Year	CDFG	ODFW	WDFW	IDFG	CDFO	ADFG	FWS	NMFS (AK)	NMFS (CR)	NIFC	QDNR	MIC
Pre-1976	V	V	V		V	V	V	V	V	V	V	
1976	V	V	V	V	V	V	V	V	V	V	V	
1977	V	V	V	V	V	V	V	V	V	V	V	
1978	V	V	V	V	V	V	V	V	V	V	V	
1979	V	V	V	V	V	V	V	V	V	V	V	
1980	V	V	V	V	V	V	V	V	V	V	V	V
1981	V	V	V	V	V	V	V	V	V	V	V	V
1982	V	V	V	V	V	V	V	V	V	V	V	V
1983	V	V	V	V	V	V	V	V	V	V	V	V
1984	V	V	V	V	V	V	V	V	V	V	V	V
1985	V	V	V	V	V	V	V	V	V	V	V	V
1986	V	V	V	V	V	V	V	V	V	V	V	V
1987	V	V	V	V	V	V	V	V	V	V	V	V
1988	V	V	V	V	V	V	V	V	V	V	V	V
1989	V	V	V	V	V	V	V	V	V	V	V	V
1990	V	V	V	V	V	V	V	V	V	V	V	V
1991	V	V	V	V	V	V	V	V	V	V	V	V
1992	V	V	V	V	V	V	V	V	V	V	V	V
1993	V	V	V	V	V	V	V	V	V	V	V	V
1994	V	V	V	V	V	V	V	V	V	V	V	V
1995	V	V	V	E	V	V	V	V	V	V	V	V

(S = Submitted; E = Unresolved Errors; I = Incomplete but Validated Data; V = Validated)

CDFG	=	California Department of Fish and Game
ODFW	=	Oregon Department of Fish and Wildlife
WDFW	=	Washington Department of Fish and Wildlife
IDFG	=	Idaho Department of Fish and Game
CDFO	=	Canada Department of Fisheries and Oceans
ADFG	=	Alaska Department of Fish and Game
FWS	=	U.S. Fish and Wildlife Service
NMFS(AK)	=	National Marine Fisheries Service - Alaska
NMFS(CR)	=	National Marine Fisheries Service - Columbia River
NIFC	=	Northwest Indian Fisheries Commission
QDNR	=	Quinault Department of Natural Resources
MIC	=	Metlakata Indian Community - Alaska

TABLE 2. Status of Unmarked Hatchery Production Releases

Reporting Agency 03/20/96

Year	CDFG	ODFW	WDFW	IDFG	CDFO	ADFG	FWS	NIFC	QDNR	MIC
1965-72			V		V		V			
1973			V		V		V		V	
1974			V		V		V	V	V	
1975	-	-	V		V	-	V	V	V	
1976	-	-	V	V	V	-	V	V	V	
1977	-	-	V	V	V	-	V	V	V	
1978	-	-	V	V	V	-	V	V	V	
1979	-	-	V	V	V	-	V	V	V	
1980	-	-	V	V	V	-	V	V	V	
1981	-	-	V	V	V	-	V	V	V	V
1982	-	V	V	V	V	-	V	V	V	V
1983	-	V	V	V	V	-	V	V	V	V
1984	-	V	V	V	V	-	V	V	V	V
1985	-	V	V	V	V	-	V	V	V	V
1986	-	V	V	V	V	-	V	V	V	V
1987	-	V	V	V	V	-	V	V	V	V
1988	-	V	V	V	V	-	V	V	V	V
1989	-	V	V	V	V	-	V	V	V	V
1990	-	V	V	V	V	-	V	V	V	V
1991	-	V	V	V	V	-	V	V	V	V
1992	-	V	V	V	V	-	V	V	V	V
1993	-	V	V	V	V	-	V	V	V	V
1994	-	V	V	V	V	-	V	V	V	V
1995	-	-	V	E	V	-	V	V	V	V

(I = Incomplete but Valididated Data Sets; V = Validated)
(S = Submitted; E = Unresolved Errors; Dash = Not Yet Reported)

[1]Note: Except for 1989, all of NMFS-AK's hatchery production has been represented by CWT studies.

TABLE 3. Status of CWT Recovery Data

Reporting Agency 03/20/96

Year	CDFG	ODFW	WDFW	IDFG	CDFO	ADFG	FWS	NMFS (AK)	NIFC	QDNR	MIC
1973			V		V						
1974			V		V						
1975			V		V				V		
1976			V		V				V	V	
1977	-	V	V	V	V	-			V	V	
1978	V	V	V	V	V	-			V	V	
1979	V	V	V	V	V	-	V		V	V	
1980	V	V	V	V	V	V	V	V	V	V	
1981	V	V	V	V	V	V	V	V	V	V	I
1982	V	V	V	V	V	V	V	V	V	V	I
1983	V	V	V	V	V	V	V	V	V	V	I
1984	V	V	V	V	V	V	V	V	V	V	I
1985	V	V	V	V	V	V	V	V	V	V	I
1986	V	V	V	V	V	V	V	V	V	V	I
1987	V	V	V	V	V	V	V	V	V	V	I
1988	V	V	V	V	V	V	V	V	V	V	I
1989	V	V	V	V	V	V	V	V	V	V	I
1990	V	V	V	V	V	V	V	V	V	V	I
1991	V	V	V	V	V	V	V	E	V	V	I
1992	V	V	V	-	V	V	V	E	V	V	I
1993	V	V	V	E	V	V	V	E	V	V	I
1994	V	V	I	E	I	V	V	E	V	-	I
1995	I	I	I	-	I	I	-	-	-	-	I

(I = Incomplete but Valid Data Sets; V = Validated)
(S = Submitted; E = Unresolved Errors; Dash = Not Yet Reported)

Incomplete Data Sets:

1) WDFW's steelhead recoveries in Columbia River basin tributaries and Puget Sound are unreported. However, recoveries in the Columbia River mainstem are reported.
2) Metlakatla (MIC) reports recoveries for its fisheries through ADFG. However, hatchery returns are unreported at this time.
3) CDFG's recoveries do not include in-river or escapement data

TABLE 4. Status of CWT Catch/Sample Data

Reporting Agency 03/20/96

Year	CDFG	ODFW	WDFW	CDFO	ADFG	FWS	NMFS (AK)	NIFC	QDNR	MIC
1973			-							
1974			-							
1975			-	V				V		
1976			-	V				V	V	
1977	-	V	-	V	-			V	V	
1978	V	V	V	V	-			V	V	
1979	V	V	V	V	-	V		V	V	
1980	V	V	V	V	V	V		V	V	
1981	V	V	V	V	V	V		V	V	
1982	V	V	V	V	V	V		V	V	I
1983	V	V	V	V	V	V		V	V	I
1984	V	V	V	V	V	V		V	V	I
1985	V	V	V	V	V	V		V	V	I
1986	V	V	V	V	V	V		V	V	I
1987	V	V	V	V	V	V		V	V	I
1988	V	V	V	V	V	V		V	V	I
1989	V	V	V	V	V	V		V	V	I
1990	V	V	V	V	V	V		V	V	I
1991	V	V	V	V	V	V	S	V	V	I
1992	V	V	V	V	V	V	S	V	V	I
1993	V	V	V	V	V	V	S	V	V	I
1994	V	V	V	I	V	V	S	V	-	I
1995	I	I	I	I	I	-	-	-	-	I

(I = Incomplete but Valid Data Sets; V = Validated)
(S = Submitted; E = Unresolved Errors; Dash = Not Yet Reported)

Note: IDFG and NMFS (AK) do not have catch/sample data to report.

E. Comments on Reporting of Mid-Year Release Data

Dick O'Connor (WDFW) noted that the mid-year reporting of release data has not been working well for the past few years because of the increasing complexities of inter-agency cooperative projects. In such cases, there is confusion whether the reporting should be done by the tag coordinator, the reporting agency, or the releasing agency actually doing the tagging. He noted further that the Mark Committee had never addressed the issue for mid-year reporting. He recommended that the tag coordinator would be in the best position to report mid-year data.

Ron Olson (NWIFC) agreed that there was a reporting problem in some cases. However, there was no single reporting guideline because the Mark Committee couldn't find a procedure that worked for all situations. Ken Johnson (PSMFC) concurred and emphasized that the Committee had assigned ultimate responsibility to the tag coordinators to see that shared agency tag codes were reported, regardless of which agency ended up doing the tagging and/or reporting. As an example, he noted that any shared agency 63 codes (WDFW) could be reported by either the respective tribe (through NWIFC) or by WDFW, depending on which agency had the lead role. However, as WDFW's tag coordinator, Lee Blankenship is ultimately responsible to see that the tags are reported, regardless of which agency does it.

Lee Blankenship agreed with the example given and proposed that the general reporting guideline for released tags be extended to mid-year release information. This proposal was supported by the Mark Committee.

Regional Agreement:

The tag coordinator is responsible to coordinate and ensure the reporting of release information for any agency tag codes shared with other agencies, regardless of which agency actually does the tagging and/or reporting. This applies to both mid-year reporting and finalized release data.

Minimum release information required for mid-year reporting includes: Tag Code, Species, Brood Year, Releasing Agency, Hatchery (if not wild), Rearing Type (hatchery, mixed or wild), and Tag Coordinator Code.

3. Status of RMPC Operations

A. Migration to Sun Platform

Jim Longwill (PSMFC) reported that the Mark Center's CWT database was successfully ported last fall from the old Sequent S81 computer to a higher performance Sun Microsystems computer (Server-1000) running the Unix based Solaris operating system. This migration has resulted in several significant benefits:

1) Performance has increased approximately ten fold while maintenance costs are substantially less than for the old system.

2) The Sun platform allows better integration with PSMFC's local area network, thus allowing better system management and network support from PSMFC computer operations staff.

3) It also allows much better sharing of software tools, user applications, and data with other regional projects, including the PIT tag database and StreamNet (formerly Coordinated Information Systems).

Ken Johnson reported that users would soon be provided the choice between obtaining annual recovery data by either the 'standard recovery year' reports (e.g. TS1 report) or by 'run year'. The standard recovery reports gives total recoveries within the calendar year, but masks recoveries from two separate runs. For example, the standard TS1 report can't distinguish a few straggler fish recovered in January or February at the end of one run from those of the next brood year recovered during the main run in the fall and early winter months. The new 'run year' reports, in contrast, combine total recoveries of fish in the main run plus those stragglers returning in the early months of the following year.

Significant progress has also been achieved in mapping all freshwater location codes to the PSC region codes provided in PSC Format 3.1. Some agencies are now providing these data when submitting a new location code file. For those agencies that have not completed the task, the Mark Center has developed an internal mapping file to provide the necessary data. This latter information will be overwritten once the respective agencies submit the region codes in their location files. Once completed, the region coding scheme will greatly enhance on-line data retrievals for any freshwater locations.

B. Data Access via the Internet

Jim Longwill provided an overview of the Internet's phenomenal growth during the last few years and the various text or graphic modes (i.e. "tools") of usage available for accessing data in general as well as the CWT data.

The primary text based modes for fisheries data include e-mail, telnet, and file transfer protocol (FTP). E-mail is routinely used for exchanging messages and small text files. Telnet allows CWT database users to login to PSMFC's Sun computer via their individual accounts for interactive sessions on the Regional Mark Information System (RMIS). Its major disadvantage is that it can not be used to download files. FTP essentially has opposite features. It also allows users to login through individual accounts but it is not interactive. It does have the major advantage of allowing users to either upload or download data with the PSMFC computer.

The graphical mode is represented by the World-Wide Web which has literally exploded in the past two years with the advent of graphical Web browser tools such as Mosaic in 1993 and its superior offspring, Netscape. The Web is currently the only user friendly way to access the Internet. Everything is a document (e.g. page, form, ascii-text) that is HTML coded (hypertext markup language) and literally linked world wide to all other web sites. In addition, access is locally driven by the user's workstation, with no logging in with user accounts required.

Connecting to the Internet can be done by either direct hardware connection, dial-up point to point protocol (PPP), or dial-up bulletin board service (BBS). The latter two optional are the least expensive and provide adequate service for most users.

C. World-Wide Web Site Developments

The Mark Center is actively developing a WWW site for access to PSMFC's CWT database via the RMIS system. Planned developments include CWT query and reporting (HTML-forms based), current data status tables (e.g. **see Tables 1-4 above**) with links to the Data Description file, and CWT query and reporting based on maps. To date, a prototype home page and CWT release data queries (based on HTML) have been completed.

Ron Olson (NWIFC) noted that the University of Washington now has a web page providing CWT release information, organized by hatchery, that is user friendly. Jim Longwill emphasized that PSMFC is working with BPA and other fisheries related agencies in the Columbia Basin to develop a common 'look and feel' for web pages. Ron Olson expressed interest in collaborating with this effort as CRAS may also be upgraded in the future for web access.

Key access information to PSMFC's computer and RMIS is provided below:

Telnet:	telnet.psmfc.org	
FTP:	ftp.psmfc.org	
WWW:	http://www.psmfc.org	
dial-up:	a) (503) 650-5430	(up to 9,600 bps)
	b) (503) 650-5437	(up to 28,800 bps)

D. Proposal to Discontinue Publishing the CWT Release Report in Hard Copy

Ken Johnson pointed out the proposal to eliminate the CWT Release Report in hard copy was intended primarily to determine where costs can be sharply reduced rather than actually eliminate the report. He explained that the Mark Center had taken a $50,000 cut in its PSC (U.S. Section) FY1996 funding because of cuts experienced in the Department of Interior's budget at the Washington, D.C. level. Publications are one area in which costs can be reduced given that all of the CWT release data are available on-line. He also noted that approximately $6,000 was spent last year to print, bind, and mail 250 copies of the CWT release report and 50 copies of the Mark List. However, this year's publications budget has been cut to $2,000, thus necessitating either termination of the reports in hard copy or a sharp reduction in the numbers produced.

The Committee saw an ongoing need for the CWT Release Report in hard copy rather than only available in electronic form. This was also true for the Mark List but to a much lower degree. One problem was that it would be costly to the agencies in both time and money if they had to download the data and produce the reports independently.

Charlie Corrarino (ODFW) recommended that current recipients be sent letters with postcards to be returned if the reports were still required. It was also recommended that the Mark Center coordinate with each tag coordinator to determine the minimum number of required copies as several tag coordinators reported that they could get by with fewer copies. These actions will be taken prior to the publishing of the next CWT Release Report and Mark List.

E. Regional Catch/Effort Database: Let Die or Revive

In February 1994, the PSC Working Group on Catch and Effort Data Exchange finalized a proposed format, coding schemes, and protocols for exchanging catch and effort data from fisheries of interest in the Pacific Salmon Treaty forum. As with CWT data, PSMFC in Gladstone, OR and CDFO's Pacific Biological Station in Nanaimo, B.C. were identified as the formal exchange points for U.S. and Canadian catch and effort data, respectively. The new formats subsequently were sent out for review and comment in April 1994, with a due date of June 1994. Since that time, there has been no PSC movement on either revising the formats or adopting them as recommended by the Working Group.

Ken Johnson noted that the Mark Center has moved forward in the past year and developed a prototype Ingres database for loading and validating catch and effort data with the help of one year's test data provided by Working Group member, Susan Markey (WDFW). However, the Mark Center has been unwilling to proceed further to develop user access tools until the catch and effort formats are adopted and agreements are in place to exchange the data. He stressed that it is time to either revitalize the project or let it die. While it is an issue that needs to be decided in the PSC arena, Mark Committee input was needed as several tag coordinators also sit on the various PSC committees.

Susan Bates (CDFO) responded that Canada remains very supportive of the proposed catch and effort database for U.S. fisheries since it is already available for Canadian fisheries. She also thought there were some problems identified with the data exchange formats by Gary Morishima (Quinault Nation). In addition, the Canada chairperson of the Working Group on Catch and Effort Data Exchange was no longer with CDFO and that the position had not been filled. As such, she had inherited the task but had not been able to work on it because of other duties. She emphasized that it was on her agenda to be addressed in the near future.

Marianne Johnson (CRITFC) added that, there is still a great deal of interest within PSC in moving towards a more abundance based approach to management. However, there are a lot of obstacles in the way, including the quality and usability of catch/effort data. As such, its not clear if the data can be used for management purposes until it can be looked at.

The Mark Committee opted not to make a recommendation to the Pacific Salmon Commission regarding completion of the catch and effort database because it fell outside the Committee's normal work assignments. It was noted that if the need for the database exists, it will arise through the PSC committees to complete the task.

F. Review of Data Description File, User Access to the Data, and Needed Improvements

Ron Olson (NWIFC) stated that the original intent of the PSC Data Description File was to provide users with the status of an agency's data files (i.e., complete vs incomplete, missing fisheries or datasets, substantial changes in the file from the last data submission, etc). However, a review of the available data description files indicates that not many agencies are using the file for this purpose. Ken Johnson concurred and noted that the data description files were of little use (with some notable exceptions) when updating the Data Status tables discussed earlier in Agenda Item 2.

A second problem, Ron Olson noted, was that the current file description field is awkward to use because narrative paragraphs must be broken out into line by line submissions. Jim Longwill (PSMFC) added that the new file provides a format for agencies to report the file status but it does not specify how or what types of information should be provided. He therefore suggested that perhaps it would be good to go the extra step and specify what types of information are needed.

The Mark Committee recognized that their role was to provide input to the PSC Working Group on Data Standards. A key recommendation, initially proposed by Charlie Corrarino (ODFW) and endorsed by the Mark Committee, was that a standardized list of "questions" or categories be developed as new fields to replace the existing single data description field. This would insure that the major aspects of the dataset are captured and not the individual changes seen at the tagcode level or in the name of a hatchery, etc. Researchers and analysts are typically looking for only major omissions in new data files or significant differences when comparing revised data file submissions.

Susan Markey (WDFW) pointed out that RMIS does not provide on-line user access to the Data Description files at this time. Ken Johnson agreed and noted that it had been a low priority in the software development goals for the Mark Center. However, based on the above discussion, it would now become a high priority task.

Note: User access to the Data Description file on RMIS was made available on March 15, 1996. As it is a relatively new file, users will only be able to retrieve information from 1994 onward. At the present time, reports are only available in PSC data exchange format. More user friendly reports will be added in the near future.

4. Request to Again Mass Mark Snake River Chinook with the Adipose Only Clip

A. Proposal Descriptions:

IDFG, USFWS, and ODFW again requested permission to use the adipose only clip to mark some of their 1995 brood spring and summer chinook hatchery stocks in the Snake River basin. Marking would take place during the spring of 1996, with release in either April, 1997 as smolts (IDFG, USFWS) or in June, 1996 as fry (ODFW).

IDFG's marking proposal (**Attachment 2**) was similar to that carried out in 1993, 1994, and 1995, with two notable exceptions. The first is that the number of fish to be marked

was roughly one third that marked in 1995 because of very low production. A total of 413,400 fish (292,000 summer chinook; 121,400 spring chinook) are to be marked. Of these, 353,400 fish are to receive the adipose only mark, while 60,000 summer chinook from McCall Hatchery are to also receive a CWT. The second exception was that for the first time, there were no plans to also tag a representative group(s) of spring chinook from Clearwater, Rapid River, or Sawtooth Hatchery.

USFWS's 1996 proposal (**Attachment 3**) calls for a maximum of 50,000 spring chinook at Dworshak NFH, and a maximum 15,000 spring chinook at Kooskia NFH to be adipose only marked. Representative release groups will be CWT marked at both hatcheries.

ODFW's proposal (**Attachment 4**) requests marking 35,000 spring chinook fry (Rapid River stock) at Lookingglass Hatchery with the adipose only mark for release in June, 1996. All other release groups will be Ad+CWT marked and released as smolts the following year. The objective is to attempt to rebuild a small, naturally producing run of spring chinook as agreed to by ODFW and the Confederated Tribes of the Umatilla Indian Reservation.

In all three cases, no ocean recoveries are expected, and only a few adipose only recoveries are expected in the lower Columbia River sampling programs.

B. Discussion

It was widely assumed that the three proposals would be quickly approved since similar marking programs had already been approved and carried out in 1993, 1994, and 1995 at substantially higher numbers of adipose only marked fish released. However, the discussion proved very lengthy and at times, very intense. In the interest of brevity, only the key points of the discussion are reported below.

The vexing problem was that this was the first year that IDFG was proposing to release adipose only marked spring chinook without any representative Ad+CWT groups. In addition, only one hatchery (McCall) of the three releasing summer chinook was scheduled to release a small group of Ad+CWT marked fish. A similar concern was also raised about Oregon's proposal as there was no CWT representation for the planned fry release. However, it was noted that all other releases of the Rapid River stock from Lookingglass Hatchery would be marked with an Ad+CWT.

Ron Olson (NWIFC) pointed out that Idaho's proposal represented a subtle but yet significant change from prior years in that the adipose only mark would now be simply a flag for hatchery fish. He argued that this effectively is a desequestering of the adipose clip in the Snake River basin, and thus a serious precedent that does affect the integrity of the entire CWT system. This view was in the minority but supported to varying degrees by several tag coordinators.

An alternative view, argued by others on the Committee and in the audience, was IDFG's proposal needed to be evaluated on its technical merits rather than on the basis of precedent and policy. Prior marking has shown essentially no impact on ocean recovery programs and only limited recoveries in the lower Columbia River. In addition, it was

emphasized that all three proposals were the outcome of NMFS's ESA requirements plus multi-agency planning in the Snake River basin involving IDFG, USFWS, ODFW, WDFW, CRITFC, and NMFS. Therefore, it was argued that there was no technical justification for denying the proposals even if IDFG's proposal did have the appearance of being a desequestering of the adipose mark for the Snake River.

It was asked if some of the Idaho stocks were U.S. indicator stocks for the Pacific Salmon Treaty. Greg Mauser (IDFG) responded that the Rapid River stock was, and that tagging had been considered but decided against. Given the low numbers of fish available, it was highly unlikely that any meaningful CWT information could be obtained for management purposes. As such, it didn't make much sense to invest in the labor and cost of tagging the fish if they weren't going to contribute any information. This view was reinforced by comments from Lee Blankenship (WDFW).

Ron Olson questioned the possibility of marking at least a small representative portion of each hatchery's production to meet the intent of the agreement reached during the policy meeting held in 1993. Gregg Mauser acknowledged that the tagging was a possibility but that he would need to confer with his agency. However, he was not very optimistic because the tagging would subject the fish to additional mortality. Previous experience in Idaho hatcheries has shown an apparent relationship of BKD and tagging. Similarly, there is great reluctance to use other marks such as the ventral fin clip because of the increased mortality. The adipose only mark is seen as the most benign of the available marks.

C. Initial Votes

As the discussion continued, participants began returning to earlier points made, with little visible change in positions. It was therefore agreed to end the discussion and take a formal vote on the proposals. **The proposals initially failed to pass on a first vote, with an 'eight yes' to 'four no' vote (75% yes required to pass). CDFO, BC Environment, CRITFC, and NWIFC cast the 'no' votes.**

The failed vote lead to a second round of serious debate about the proposals. As there continued to be no further change in positions, the issue was tabled until the end of the meeting (second day) to allow time for caucusing and touching base with home offices. At that time, **Ron Olson announced that he was switching NWIFC's vote from 'no' to 'abstain', with the understanding that he needed to consul further with NWIFC and its Tribes during the 30 day grace period before casting his final vote.** Susan Bates (CDFO) also noted that the Canadian agencies would keep their 'no' votes but would likewise confirm this position.

D. Final Outcome:

After further discussions with IDFG, **NWIFC changed its vote to 'yes'**. Ron Olson outlined justifications for NWIFC's switch to a 'yes' vote in a letter to the Mark Committee (**Attachment 5**). Foremost was the consideration that Idaho's proposal would not have a technical impact on CWT data integrity and the issue did not warrant another directors level meeting. In addition, he could understand Idaho's desire to minimize any additional mortality given the low numbers of fish. A follow up letter from Susan Bates

(**Attachment 6**) provides an explanation for the continued 'no' vote for CDFO, plus the commitment to reconsider their position prior to next year's Mark Meeting.

The Snake River proposals therefore passed by a nine 'yes' to three 'no' vote.

USFWS later withdrew the adipose only clip requests involving Dworshak and Kooskia NFH spring chinook (**Attachment 7**) after the Dworshak hatchery evaluation team met again and decided that tagging all fish was more appropriate. David Zajac emphasized in his letter that this withdrawal does not influence any similar proposal that USFWS may submit at next year's Mark Meeting.

5. Requests to Adipose Only Mark Selected Stocks of Pink and Sockeye Salmon

A. USFWS Request for Pink Salmon

The Mark Committee reviewed and approved a USFWS request for a temporary exemption to mark 20,000-40,000 fish of the depressed Dungeness wild pink stock with the adipose only (no CWT) mark. This approval was granted with the stipulation that it is a one year exemption, and that the project would have to be reviewed again at next year's Mark Meeting if additional marking was needed.

Factors influencing the supportive decision include the key fact that there are no CWT programs in Washington involving pink salmon. In addition, there is no coastwide recovery program for Ad+CWT marked pink salmon, although some agencies do sample for the marks on a localized basis. A similar temporary exemption had been given to ADFG in 1981-82 to mark a small number of pinks in Prince William Sound with the adipose only mark.

This proposal was later withdrawn following the Mark Meeting. David Zajac explained in his letter to the Mark Committee (**Attachment 7**) that the pink program lacked adequate funding to conduct the saltwater rearing and to conduct spawning ground surveys at the level needed to recover marked fish.

B. WDFW Request for Sockeye Salmon

The Mark Committee also reviewed and **approved a WDFW request for a temporary exemption to mark 200,000 hatchery produced Wenatchee sockeye with the adipose only mark for release into Lake Wenatchee.** Approval was granted with the same stipulation that it is a one year exemption, and that the project (**Attachment 8**) would have to be reviewed again at next year's Mark Meeting if additional marking was needed.

Factors influencing the supportive decision likewise included the key fact that there are no CWT programs in Washington involving Ad+CWT marked sockeye salmon nor a coastwide recovery program. However, as in the case for pinks, some agencies do sample for the marks on a localized basis. In addition, there have been no ocean recoveries to date for five years of CWT marked releases (200,000 each year).

C. NMFS-Alaska Request for Pink Salmon

NMFS-Alaska introduced a request to mark 70,000 pink salmon (Little Port Walter Hatchery) with an adipose clip (no CWT) and a pelvic clip. **Approval of the Mark Committee was not required,** however, as the regional agreements on marking allow the use of adipose only clips for pink, chum, and sockeye salmon when the mark is used with another fin clip.

6. Status of WDFW/ODFW's Proposals for Mass Marking and Selective Fisheries

Lee Blankenship (WDFW) distributed and briefly reviewed a new report titled "*Intent and Status of Hatchery Coho Mass Marking and Selective Fishery Planning in Oregon and Washington*". (A copy can be obtained from either WDFW or PSMFC). He noted that it had been just completed and was also being presented to the Pacific Salmon Commission that day. Charlie Corrarino (ODFW) also distributed a handout updating the status of Oregon's mass marking project (**Attachment 9**).

He pointed out that weak stock coho management in recent years has taken away the ability to harvest healthy surplus hatchery stocks in the mixed stock fisheries. A second related problem is that the highly valuable recreational fishery in those mixed stock fisheries has also been lost. Mass marking and selective fisheries are seen as just one component in the overall harvest/conservation strategy that addresses the problem of trying to access those healthy hatchery coho stocks while protecting the weaker natural stocks.

In addition, the proposal reflects legislation that was passed by both the Oregon and Washington legislatures. The Oregon legislation specified the intent to implement mass marking, while the Washington legislation (SSSB 5157) is very specific and mandates WDFW to implement mass marking and a selective fishery program.
Fishery agencies met in Kelso, Washington (October 5, 1995) to discuss the ramifications of Oregon and Washington's initial draft proposal on mass marking and selective fisheries. At that time, it was agreed that a system would be set up to identify and evaluate perceived critical flaws so that problems could be resolved through understanding probable outcomes, program modifications, and systematic implementation.

A subsequent meeting in Olympia in November, 1995 resulted in the use of 11 coarse screening criteria to identify areas of concern to any affected agency. The criteria examined included: 1) alternatives to selective fishery option; 2) costs; 3) Treaty Indian rights; 4) management obligations; 5) exploitation rates; 6) management capabilities; 7) CWT program viability; 8) incidental mortality; 9) evaluation; 10) participation; and 11) effectiveness. This assessment resulted in the assignment of 'green light', 'yellow light', or 'red light' for each category. Since that meeting, Oregon and Washington fishery managers have been working to turn the 'red lights' to either 'yellow lights' or 'green lights', and the 'yellow lights' also to 'green lights'. (Note: A 'red light' denoted a concern expressed by any agency that modification was required, while a 'yellow light' implied significant concern that modification might be required. A 'green light' meant that there were no limiting concerns).

The current proposal reflects those changes and improvements in program design, and outlines mass marking of 1995 brood and 1998 selective fisheries for hatchery coho from Oregon coastal, Columbia River, Washington coastal, and Puget Sound facilities. In addition, double index tagging is required for selective fisheries, meaning that one group is released with the Ad+CWT mark, while a second group is released with a CWT only (no mark) to represent wild fish.

There are a few exceptions. Coho stocks in the Columbia River above Bonneville Dam which are being produced for rebuilding purposes are excluded from the mass marking program. In addition, the proposal does not expect the Tribes or federal agencies to participate in marking because of their stated intentions at this time.

The North Puget Sound stocks also are excluded because of their heavy impact in Canada's Georgia Strait recreational fisheries where mass marking would destroy CDFO's voluntary head recovery program. Exclusion avoids a very costly direct sampling program and reduces the impact of the adipose only mass marked U.S. fish on CDFO's Georgia Strait fisheries to an estimated 2%.

Lee Blankenship stressed that there would still be a big impact of adipose only marked fish in Canada's West Coast Vancouver Island (WCVI) fisheries. WDFW is striving to find ways to turn this 'red light' into a 'green light'. In policy level talks, help is being offered to CDFO to purchase the necessary electronic equipment to sample for tagged fish. WDFW also sees this as a Canadian responsibility because so many of the fish taken in the WCVI fisheries are produced by Washington hatcheries. The Washington legislature has stated that they have no intention of supporting hatchery programs if there is no return to the State. Hence, Canada would stand to benefit from assisting in the electronic sampling because continued production by Washington hatcheries would reduce the pressure on their own hatchery and wild stocks.

The first selective fisheries would occur in 1998, with the scope being all recreational fisheries and possibly some limited hook and line (troll) commercial fisheries. The commercial fisheries would be those restricted chinook fisheries where all coho must now be released. Under the new program, marked coho would be retained while all unmarked coho would continue to have to be released. California is being encouraged to adopt a similar selective fisheries because Oregon coho stocks enter into their fisheries as well.

Annual operating costs for tagging and sampling are estimated at $1.1 million for Washington and $400,000 for Oregon for a total of $1.5 million. Start up costs are estimated at approximately $2 million.

Questions and Comments

A question was raised about the significant ongoing cost of mass marking. It was noted that Oregon's legislature, for example, had provided initial funding to mark the 1995 brood coho at all state funded hatcheries (coastal). In turn, mass marking of Columbia River coho (federal hatcheries) depends on presently uncommitted federal Mitchell Act funding through NMFS (**Attachment 9**). However, because of major cuts, the funding level for 1996 is inadequate to even maintain present levels of hatchery operations.

Charlie Corrarino (ODFW) agreed that the situation wasn't promising for Oregon's Columbia Basin coho. He noted that Oregon had several options: 1) find the funding internally; (including possible production cutbacks to fund mass marking); 2) simply not mark the Columbia River stocks at this time; or 3) decide not to mass mark any stocks. A decision is expected within a month.

The prospects for long term funding by the Oregon legislature are believed good but remain an unknown. However, Lee Blankenship emphasized that the Washington legislature has made a long term commitment to support mass marking. As such, WDFW is very confident that the necessary long term support will be available to continue the program for at least 10 years.

Robert Bayley (NMFS) questioned if WDFW planned to go ahead with the proposal even if there were still 'red lights' and 'yellow lights'. Lee Blankenship responded that when these determinations were made, there were no restrictions on how the agencies evaluated a category. WDFW saw its role in then trying to reduce as many of the concerns as possible. Unfortunately, some 'red lights' and 'yellow lights' still exist for some agencies. He stressed that because of the existing state law, a continuing 'red light' or 'yellow light' does not overrule WDFW's requirement to mass mark. Instead, WDFW will go to the legislature and explain what the concerns and risks are and how they have tried to address them.

Lee Blankenship added that there is no question that there will be some information loss with this process. How much depends in part on what Canada does regarding electronic sampling. The only option WDFW has is to give the legislature that information and perhaps the law will be changed. The bottom line is that the Washington legislature has said that either the State gets access to the hatchery production or it will stop funding the production.

Marianne Johnson (CRITFC) noted that the proposal was being developed and presented through the PSC forum. She therefore questioned if PSC would make the final decision on if or how it would be implemented. Lee Blankenship responded that he did not expect PSC to take that role, mainly because it hasn't done so in the past with other similar issues. It will more likely be decided by agency policy makers after working with all affected agencies.

Ron Olson (NWIFC) noted that mass marking and selective fisheries would require a major effort to coordinate marking and sampling, particularly given the short time left for marking the 1995 brood fish. He therefore asked how WDFW viewed this process. Lee Blankenship responded that on the technical level, WDFW and NWIFC have already started the process with the joint Saltonstall-Kennedy funded project to start this summer to install and evaluate electronic sampling gear. A similar joint program is planned with Canada. He stressed that the electronic equipment are known to detect the tags, but that site modifications are required.

Ron Olson agreed that the joint WDFW/NWIFC study would answer a number of pressing questions regarding sampling. However, the short time frame available for tagging and marking 1995 brood coho also raised serious questions about the use of length

and a half wire to insure tag recovery in adults, and whether or not agencies were geared up to do the necessary double index tagging. Lee Blankenship responded that stocks expected to be harvested in selective fisheries should be tagged with length and a half wire as a safeguard to insure recovery. However, a number of recent tests have shown that standard length wire will be recovered at essentially the 100% level.

Ron Olson expressed some uneasiness with electronic sampling as Canada continues to use "old wire" (having a lower magnetic moment) because of concerns about the impact of the magnetism on the fish. As supporting evidence, he noted 10% of the returning coho having "old wire" tags were missed by a wand detector during field tests at Cowlitz Hatchery. Lee Blankenship replied that electronic sampling of Canadian tags wouldn't be a problem as only 1% of the total Canadian harvest is taken in the proposed selective fisheries. He also stressed that good samplers will find 100% of the tags. In addition, three more recent tests (Neah Bay, George Adams, and 1994 Mark Meeting) indicated that the earlier Cowlitz study was an anomaly In the George Adams Hatchery study, approximately 1800 tagged fish came back with 100% recovery by electronic wand. Even so, length and a half wire is recommended as a safeguard.

Susan Bates (CDFO) acknowledged that the wand could work very well to sample the recreational fisheries but she had serious concerns about the feasibility of using tube detectors to sample the West Coast Troll fishery (Vancouver Island). To illustrate the complexity, she noted that coho caught in the troll fishery during July 1995 were offloaded at 50 landing sites. The port of Ucluelet has seven offloading sites alone. The top 19 sites saw 90% of the catch. The daily buy at these top sites exceeded 10,000 coho a number of times. The maximum daily buy was 15,700 coho (plus 4,600 other salmonids).

An estimated 20% of the catch would be adipose clipped, meaning that the wand would not be an option. Furthermore, the typical wharf is a very constrained area, with samplers doing their best to stay out of the way of the fork lifts, graders, and everyone else while handling the fish as fast as possible. Automated sampling would require that the tube detector be somehow installed "upstream" of the sorting tables (a very difficult challenge at the present) plus have some type of gate valve for sorting tagged and untagged fish.

To further complicate matters, the required application engineering is site specific in many cases, thus making it very difficult to meet the sampling requirements. She concluded that the engineering problems for electronic sampling the WCVI commercial fishery were far from trivial and appear to be a long ways from being resolved based on the current generation of tube detectors. CDFO could not handle the task without funding for automated electronic sampling as there was no way that 50,000 adipose only heads could be sent to their tag recovery lab. Lee Blankenship agreed and said that it was also Washington's biggest concern as loss of the information would be a big hit on the integrity of the CWT system.

7. **Potential Conflict with Reused Wire (no Adipose Clip) if Selective Fisheries are Implemented with Electronic Detection for Tagged Fish**

The Regional Agreements have allowed the reuse of surplus CWT wire in salmonids provided that the adipose fin was not removed. This policy has worked well over the years, with only a few cases where natural adipose fin loss resulted in unexpected tag recoveries. However, with the advent of mass marking (adipose only mark), selective fisheries, and electronic sampling, the required double index tagging will result in the release of CWT marked index groups with no adipose clip. As such, reused tags would also be recovered in electronically sampled selective fisheries, and would thus corrupt the existing CWT information.

Lee Blankenship therefore proposed that the Regional Agreements be revised to no longer allow the reuse of surplus wire in salmonids. **This proposal was approved** , with the understanding that it did not apply to the use of blank wire.

Action: The reuse of surplus wire in salmonids is not allowed. Exceptions may be granted only by a special variance request to the Mark Committee. This restriction does not apply to blank wire.

Ron Olson commented that there still remained a lot of unanswered questions on the specifics of electronic sampling, including where, and by who, and standardization of procedures. He therefore recommended that the agencies undertake additional coordination to ensure that the logistics of electronic sampling are fully worked out well in advance of any implementation. This recommendation was seconded by Lee Blankenship. However, the Mark Committee did not establish a formal course of action beyond endorsing the recommendation.

Dick O'Connor (WDFW) also noted that mass marking and selective fisheries will likely require changes in the current PSC formats used for exchanging CWT data. The method of detection will become important as the adipose clip would no longer be the universal flag for CWT marked fish. Washington, for example, is interested in resurrecting its 1994 proposal to the PSC Working Group on Data Standards to include new fields for external identifiers or mark code(s). He cautioned that the process for adding new fields to the PSC formats is fairly slow. Consequently, Data Standards should be alerted as soon as possible if there are additional data elements that will need to be captured with selective fisheries in place. The expanded format will need to be in place by the summer of 1997 to sample returning jacks, or 1998 at the latest to sample returning adults.

8. **Current Status of NMT/Micro Mark Litigation**

Guy Thornburgh (NMT) advised the Mark Committee that a court ordered mediation between NMT and Micro Mark in December 1995 had failed to reach settlement. As a result, NMT has resumed its lawsuit against Micro Mark and is now waiting for a new court date in Washington.

Jan Kallshian (Micro Mark) commented that Micro Mark was trying to do its best to get the dispute with NMT resolved. In the interim, he stressed, Micro Mark is legally in business to make and sell tags, contrary to rumors that have surfaced from time to time.

Update (3/18/96): NMT has also filed a lawsuit in British Columbia courts against Micro Mark for copyright infringements on the CWT format. In the U.S., the two companies will meet again with a court appointed mediator on April 8, 1996.

9. Report on Laser Marked CWTs Marketed in 1995

Ken Johnson prefaced the agenda item by noting that the intent was not to focus attention on those agencies that had purchased laser tags from Micro Mark. Rather, the intent was to provide recovery agencies an idea of the use of laser tags, and approximately when the tags would be seen in the tag recovery labs.

A number of agencies reported purchases of laser marked tags during the previous year. CDFO and IDFG each purchased approximately three million tags. In California, East Bay Municipal Utilities District (EBMUD) purchased 560,000 tags. NMFS-Auke Bay and Douglas Island Pink and Chum (DIPAC) purchased 153,000 and 197,000 tags respectively. In Washington, the Hoh Tribe purchased 15,000 agency only tags for use in steelhead.

With respect to releases, Doug Harriott (CDFO) reported that Inch Creek Hatchery had marked 50,000 coho (1995 brood) with laser tags for release in 1996. In addition, CDFO will tag another 500,000 fish this year for 1997 release. Karen Crandall (ADFG) also reported that DIPAC had marked coho for release this spring, with returns expected in 1997. Tagging plans were not available for the other agencies having laser tags.

10. Review of Coding Scheme Approved for Laser Marked Tags and Discussion of Potential Coordination Problems for Vendors Issuing New Codes

During a June 12, 1995 telephone conference call, the Mark Committee approved both agency assignment of Micro Mark's laser tag codes and a new agency code '50' reserved for the laser tags. The first option allows agencies the flexibility to pre-assign tag codes at the time of ordering so that they can continue the existing coding patterns being used, regardless of which vendor provides the tags. In the second option, the new agency code '50' will be used by those agencies not able to fully ensure the uniqueness of their new codes at the time of ordering. In addition, Data 1 of the new agency code '50' will be matched against the existing agency code now in place for NMT tags. In this situation, Micro Mark will assign the codes on an ascending basis.

Given that several million laser tags have now been purchased, the June 12th decision was revisited to see how it was working. Several tag coordinators commented that the policy was working well for them and that they did not propose any changes.

From a data management viewpoint, Ken Johnson expressed serious concerns about the likelihood of re-issued tag codes corrupting the database when there are two or more tag

suppliers. While the tags can be readily distinguished physically, there is currently no way to separate the two in the tag recovery database if an identical code (other than ones with agency code '50') is issued by both NMT and Micro Mark.

A new field for identifying tag type in the tag recovery record was considered during the June 12th conference call but rejected because tag type typically isn't recorded by the tag recovery labs. In addition, it would have required a new PSC format version to add a field. At a minimum, a new code for laser tags could and should be added to the release file's field 'tag type' to identify laser tag releases versus releases of the various versions of the standard NMT tags.

One suggestion was to establish a single database on-line at PSMFC where either vendor could determine available codes and then "lock" up codes as required. It was recognized, however, that the future course of action hinged on the outcome of NMT's litigation against Micro Mark. Therefore, the issue was tabled until the litigation has been resolved.

11. Coordination Issues Involving Thermal Marking Programs

Karen Crandall (ADFG) noted that the Mark Committee agreed in 1991 to report thermal marks to PSMFC, with the intention that they would be published in the annual Mark List. However, no agency, including ADFG, has done that. The likely reason for this is that the agencies haven't felt the need for this coordination and notification. In addition, the existing fin mark format is inadequate for reporting thermal marking plans and marks (**Attachment 10**).

The situation has changed greatly in the past five years. Up through 1995, Alaskan hatcheries thermally marked approximately 600 million salmon, with 114 unique groups marked. However, in 1996, 700 million salmon were thermally marked, exceeding the total for all previous years combined. The sharp increase was largely due to Prince William Sound Aquaculture Assoc. as they marked 100% of their pink salmon production. CDFO, WDFW, and NWIFC also have expanding thermal marking programs.

The original intent was to use thermal marks to identify stocks within terminal areas, hatcheries, and spawning grounds. However, as use of thermal marking has grown in Alaska, British Columbia and Washington, interest has also grown in expanding their use to some extent in mixed stock fisheries. This requires some level of notification and coordination on a regional level. She emphasized further that this need was recently reinforced when ADFG assigned a thermal mark to a group of chinook, and by chance, happened to learn in time that Canada had already used the identical mark on hatchery chinook of the same brood year. She noted that the thermal mark recovery labs are getting more sophisticated and probably could have separated the two stocks. However, it remains important to know what marks are being used on a regional basis because of the potential for duplication and resultant confusion of recoveries in non-terminal areas.

Karen Crandall recommended that PSMFC maintain records of thermally marked salmon releases with some reference to the thermal mark used. She also recommended that a subcommittee be set up to develop a suitable reporting form for thermal marking plans and releases. One possible report form was provided as an example (**Attachment 10**).

The actual format for codifying thermal marks, however, may need to be somewhat flexible as Washington and Alaska use different approaches. Alaska prefers to use the Region, Band, rings (BRr) method for coding the otolith thermal mark. (A handout was provided on the BRr method and can be obtained from Karen Crandall or the Mark Center). However, this approach is difficult for WDFW staff to use. One solution, she suggested, was to let each agency report codes in their preferred way, with suitable documentation on how the codes are generated. Another solution would be to provide a graphic depiction of the placement of the rings and their spacing.

A third suggestion was to develop a centralized database library of images of the various thermal marks used regionally by all of the agencies. Users could then access the images via the World Wide Web (WWW) Internet service. This latter suggestion was endorsed as a very promising avenue. Ken Johnson noted that such a database could easily fit within PSMFC's future plans for its web site.

Action: A Subcommittee on Thermal Marking will be set up to work out details of reporting thermal marks and releases. Karen Crandall will serve as chairperson. Specialists from WDFW, CDFO, and NMFS-AK will be assigned to assist in the project. PSMFC staff will also participate with regards to an image database for WWW users. A first meeting was suggested during this spring.

12. Agency Reports on Tagging Plans for 1996

Minimal changes were projected by most agencies for tagging levels in 1996 as compared to 1995. There were some exceptions. NMFS-Alaska will be tagging 300,000 pink salmon this year. WDFW's normal tagging level of 10 million fish will be increased in 1996 by an additional one million chinook (and another 900,000 coho for double index tagging if selective fisheries are implemented). CDFO's tagging level will drop from 4.8 million to approximately four million. ODFW expects a decrease in tagging Snake River stocks but a gain of 500,000 tagged coho for double index tagging. Lastly, USFWS's Coleman NFH will be doubling its tagging of chinook to two million smolts.

13. Update on 1995 High Seas Sampling Program

Ron Heintz (NMFS-Alaska) reviewed the status of the high seas sampling program for CWT marked fish. His report is presented below:

"In 1994, observers on U.S. Domestic groundfish vessels recovered 147 CWTs from 61,101 salmon. Of these, 56 chinook and 1 coho were recovered off the coast of Oregon and Washington in the whiting fishery, 81 chinook were recovered in the Gulf of Alaska, and 8 chinook and 1 chum from the Bering Sea Aleutian Islands trawl fisheries.

Among the tags recovered off the coast of Oregon and Washington was a chinook released from the Lyons Ferry Hatchery representing the endangered Snake River fall chinook. The tag, 634160, was recovered west of Willapa Bay in May, 1994. In April 1995, the tag 634661 was recovered off Gray's Harbor.

As reported last year, expansions for CWT recoveries for species other than chinook are no longer available. Expansions for chinook are limited to the Bering Sea and Gulf of Alaska trawl fisheries, while no expansions are available for the whiting fishery off the Oregon/Washington coast. To build expansions, NMFS requires estimates of the catch of each salmon species in each of the three trawl fisheries. The observer program no longer summarizes the catch for salmon other than chinook. Apparently this reduction in information results from budget cuts, coupled with a dramatic increases in the amount of observer data since trawl fisheries became entirely domestic. Expansions for chums in the Bering Sea are provided in the NMFS recovery reports because they predominate the salmon bycatch in that fishery, but the reported values are slight overestimates.

In 1994, Japanese research vessels examined 27,776 salmon and recovered only six CWTs: two coho and four steelhead. In addition, they also observed 81 steelhead with missing adipose fins. In 1995, Japanese research vessels recovered three CWTs from a catch of 12,046 salmon.

NMFS recently summarized the bycatch of all the prohibited species in the Gulf of Alaska and Bering Sea fisheries since 1990. In general terms, 15% of the total catch in these fisheries is bycatch which is discarded for various reasons. Of the remaining catch, 40% of the mass is retained as saleable product and the remaining 60% is discarded as offal. Since 1990, an average of 52.5 thousand salmon have been caught in the Gulf of Alaska trawl fisheries and discarded each year. Of these, approximately 200 are tagged fish from Canada, and 40 each from Oregon, Washington, and Alaska."

14. Differential Survival of Ventral Fin and Adipose Fin Clips in Fall Chinook (WDFW/USFWS)

Lee Blankenship reported on a WDFW/USFWS study designed to determine the effect on survival of removing the adipose and ventral fin on fall chinook (**Attachment 11**). He noted that it was an extension of a similar study on coho that was reported on during last year's Mark Meeting. The study was conducted at Spring Creek NFH on the Columbia River, using the 1992, 1993, and 1994 brood years. Returns were first sampled in 1995.

For each brood year, four groups of chinook were marked and tagged with unique codes. The four groups included: CWT only, Ad+CWT, LV+CWT, and Ad-LV+CWT. The 0-age fish were approximately 70mm FL when tagged. Quality control checks were performed on all groups to evaluate tag loss and fin clip quality. All returning adults in 1995 were sampled electronically with an R-10 tube detector for the presence of a CWT.

Result are very preliminary as the number of total returns is low and only covers one sampling year. Even so, the trend in survival back to the rack is what one would intuitively expect. Fish marked with a CWT only had the highest survival, followed in turn by Ad+CWT, LV+CWT, and lastly Ad-LV+CWT. In addition, the survival of Ad+CWT fish was 2-3 times higher than that seen for LV+CWT marked fish.

Ron Olson recalled the earlier results of the Warm Springs NFH study in which LV marked spring chinook had a similar or higher survival than the Adipose marked fish, and asked for thoughts as to why the results differed. Lee Blankenship responded that results of the current study are very preliminary. However, he also noted that the Warm Springs study was a diet study that afforded some information on survival of different marks. In contrast, the Spring Creek study was specifically designed with quality controls to look at differential survival related to fin marks. In addition, the Warm Springs study used much larger yearling spring chinook while the Spring Creek study used 0-aged fall chinook.

He added that he still didn't have any good explanation for the coho study results reported last year (1995 Mark Meeting minutes) where Ad-LV+CWT marked fish returned at a higher rate than LV+CWT marked fish. The result was contrary to expectation of increased mortality with increased fin clips.

15. Long-Term Retention of Fluorescent Visible Implant Marks in Adipose Eyelids of Chinook and Coho (WDFW)

Lee Blankenship reported that WDFW first began using fluorescent Visible Implant (VI) marks on 1990 brood Lyons Ferry fall chinook as an visual mark to separate them from Umatilla River strays to maintain genetic integrity. All fish were double marked with a CWT to monitor mark retention (**Attachment 12**). Since that time, a number of modifications have been made to the injector system and types of material used. In addition, UV detection was added to evaluate detection in ambient light.

Returning four year olds of the 1990 brood fall chinook had a 54% mark retention in ambient light. This increased to 75% the following year when monitored with UV light, indicating that marks were being missed in ambient light. Following modifications to the elastomer material and injector system, the retention rate in 1995 increased to 92% for returning 1993 brood fish. The minimum size recommended for marking was 100mm for both chinook and coho. Marking rates have increased to 800 fish/hr per marker.

A somewhat comparable test was done at Skagit Hatchery on 1991 brood coho to evaluate differential survival between VI standard elastomer and CWT marked fish. No significant differential survival was observed between the two groups, implying that the fluorescent elastomer material does not cause increased predation.

While there are still problems with the system, Lee Blankenship stressed that it is getting close to being an effective stock identification tool. With continued modifications, tag retention is expected to be above 95%. However, he also emphasized that any handling of the fish during the first week after marking results in VI tag loss. Even pushing the fish back in a pond can cause tag loss. Recent work in New Mexico has also found that fish must be placed carefully in the water following marking to prevent tag loss.

16. Report on CDFO Research on Tag Loss and Differential Mortality Associated with VI Filament and Elastomer Marking of Coho

Richard Bailey (CDFO) was not able to attend the Mark Meeting. However, Susan Bates reported that he had a research paper on this subject slated for publication in the North American Journal of Fisheries Management within the next 4-6 months. Lee Blankenship also mentioned that he had reviewed the paper and recalled that there was no differential mortality associated with the VI marks. In addition, the VI filament tags had a higher tag loss rate than that for elastomer tags. This finding is similar to that seen in WDFW's research.

17. Update on WDFW's Prototype Mass Marking Machine

Lee Blankenship reported that work on the prototype mass marking machine was progressing exceptionally well. The WDFW project has been funded by BPA, and is subcontracted to NMT and Stratos Engineering in Seattle. When the project was started three years ago, the objectives were to develop a mass marking machine for adipose clips that would require no human handling of the fish, no anesthesia, a throughput of 2 fish/sec, and at a maximum cost of $100,000. As work progressed, the design was expanded to include CWT tagging.

The concept, as demonstrated in a video last year, was to build individual prototype components, including a staging area where the fish would voluntarily swim into, a gate area that would regulate throughout at the desired rate, and a tagging and clipping machine where the fish would be seized, clipped, tagged, and then drop out into the water to swim away. Each one of these individual components was successfully developed last year.

To meet the goal of two fish/sec, the system will have four identical lines controlled by a centralized computer designed to work in a wet environment. Each line will process fish at the rate of one fish per two seconds, with a conservative total estimate of 50,000 fish marked per machine in an eight hour day. The machines will accommodate fish in the size range of 60-150mm, with each line being able to be set for a specific size range. Varying ideas, including the use of videos, is being considered for automated size grading. Two staff will be required to operate the system which is designed for a standard sized tagging trailer. Power requirements can be either 110 or 220 volts. The projected machine life is 20 years.

A total of $1.5 million in funding was requested this year to combine the components into a functioning system. BPA provided $900,000 in funds, while WDFW and NMT provided an additional $300,000 and $100,000, respectively. The shortfall of $200,000 is essential to complete the prototype and there is hope that BPA can reprogram some end of year funds to meet the need.

Current funding is adequate to complete integrating all components in a single line, with completion projected for May, 1996. If the additional $200,000 funding is found, the remaining lines is projected for completion by September, 1996. The goal is then to allow for a full year of field testing to work out bugs, followed by unit production in 1998.

Cost of the mass marking machine was originally targeted at $100,000 or less. However, Guy Thornburgh (NMT) noted that there are too many unknown variables at this point to make a reasonable cost estimate of the final product. He pointed out that NMT's guiding concept was that it would have to be less costly than the current tagging system, including labor costs, to justify making the machine.

18. Feasibility of Implanting Blank Wire Tags in the Body of Juvenile Fall Chinook (ODFW)

Shannon Focher (ODFW) gave an overview of the body tagging study done at Irrigon and Umatilla hatcheries (**Attachment 13**). Approximately 2.6 million sub-yearling fall chinook are released annually into the Umatilla River to partially mitigate for fish losses caused by Columbia River mainstem dams. Each year, a varying but large number of Umatilla fall chinook stray into the upper Columbia and Snake Rivers. Because of the need to maintain genetic integrity of the upper Snake River stocks, the NMFS requested that all Umatilla hatchery production be mass marked in order to identify strays in the Snake River system.

ODFW therefore initiated a study in the Umatilla drainage to evaluate six marks as potential mass marks. These marks were: 1) LV; 2) Body Tag+LV; 3) Body Tag; 4) Ad+CWT; 5) Ad-RV+CWT; and 6) Ad+CWT+Body Tag. The body tags were blank CWTs injected into the right shoulder of the fish. The study was initiated in 1991 on fall chinook reared at Irrigon Hatchery and continued in 1992 and 1993 at Umatilla Hatchery.

The three year study demonstrated that body tagging was too costly and time consuming to work as a mass mark for hatchery production. Estimated costs per 1,000 fish for body tags and LV clips was $70 and $17, respectively. Time required to mark 1,000 fish with a body tag was 0.85 hours versus 0.13 hours for the LV clip. Therefore, to mass mark Umatilla Hatchery's production (2.3 million fish) with the body tag would require 81 days versus 12 days for the LV clip.

Problems were also encountered in detecting some body tags with a hand wand in returning live adults because the tags had migrated deep into the body musculature. This problem was resolved in 1995 by switching to a tube detector. As the study is still in an early stage, monitoring of returning adults will continue for several years to evaluate the effects of fin clips, body tags, and CWTs on smolt to adult survival. Additional details are provided in **Attachment 13**.

19. The Effect of Double Length versus Single Length Tags (WDFW)

Lynn Anderson (WDFW) reported on a study began in March, 1994 to determine the effect on survival and possible straying of coho tagged with standard and double length CWTs. The study also evaluated the effectiveness of the hand wand in electronically detecting tags in returning adults.

One group of coho was tagged (code 635658) with standard length 'old' wire (i.e. lowest magnetic moment) to give a worse case scenario for electronic detection. A second group was tagged (code 635660) with double length 'new new' wire that had a magnetic moment 5.2 times greater than the standard length 'old' wire (**Attachment 14**).

The results showed no significant difference in survival to the hatchery rack for single and double length wire marked coho (2.1% vs 2.0%, respectively). Likewise, there was no significant difference in mean fork length between the two groups. In addition, there was no significant difference in detection rates using the Wand detector with the single length and double length wire (99% vs 100%, respectively). However, the high detection rate may have been due in part to the small size (average 47.8 cm) of returning coho to George Adams Hatchery.

No differences in survival between the two experimental groups also implies that the 5.2 times highest magnetic moment of the double length wire did not result in any biological behavioral differences. As such, Guy Thornburgh (NMT) argued that there isn't continued justification for concerns about the higher magnetic moment of the "new new" standard length wire. He also noted that he was surprised to the ability to detect essentially all of the "old" wire tags because of the substantially lower magnetic moment, and strongly discouraged any further use of the "old" wire.

This discussion led into an announcement by Guy Thornburgh that NMT had just introduced new length and a half wire with a new format. The results of this discussion have been moved to Agenda Item 23.j.

20. Effects of Coded Wire Tagging on the Survival of Spring Chinook (WDFW)

Lee Blankenship reported on the 7th year results of a 10 year study funded by BPA to evaluate the combined effects of handling, anesthesia, adipose clipping, and CWT marking on the survival and/or growth of spring chinook. The study was done at Cowlitz, Carson, and South Santiam hatcheries in the Columbia River using three consecutive brood years (1989,1990,1991) (**Attachment 15**). Spring chinook were selected because of their known difficulty to handle in the hatchery.

The entire production of each hatchery was otolith marked with thermal banding patterns so that straying adults from either other facilities or wild fish could be identified. In addition, approximately one third of each group was CWT marked and adipose clipped by standard procedures. Control and untagged juveniles were precisely counted with a wet counter. Approximately 1.5 million juveniles were CWT marked each year (Carson: ~500,000; South Santiam: ~350,000; Cowlitz: ~1,000,000).

Completed returns are now available for the 1989 brood. No significant difference was found in growth between tagged and untagged adult returns. However, there were differences seen in survival between the three hatcheries. At Cowlitz Hatchery, CWT marked and untagged adults returned in the same ratio as they left the hatchery, indicating no difference in survival. Tagged adults at South Santiam Hatchery returned at a 4.5% lower rate than the controls, but this was not statistically significant. A significant difference was seen at Carson NFH where CWT marked adults had a 9.2% lower

survival. This may have been affected by a high level of BKD prior to tagging, and a subsequent outbreak of IHN during tagging.

Lee Blankenship noted that he will be reporting on the study for the next few years as the last two brood years complete their return. At that point, he expects to be able to have sufficient data for pooling and replication that will allow a clear statement on the effects of coded wire tagging spring chinook.

21. Report on WDFW's Field Test using Photonic and VI Jet Marks

A. Photonic Studies

WDFW is currently conducting studies at Cowlitz and Puyallup hatcheries to determine the long term retention and visibility of photonic fluorescent marks in returning adult coho (**Attachment 16**). Photonic marks were applied subcutaneously using a needle-less air injector to penetrate the skin with thousands of fluorescent latex micro beads approximately 3-5 microns in diameter. The anal and caudal fin rays and periocular tissue (adipose eyelid) were used for mark sites. Marking rates averaged 600-800 fish per hour. The injector and photonic solution were purchased from New West Technologies. The fish were also adipose clipped and coded wire tagged to identify the study group in the event that some of the photonic marks don't persist until return to the hatchery.

Short term retention varied between the two hatcheries and also between the body sites selected for marking. After 4 1/2 months, coho at the Cowlitz Salmon Hatchery had a 99.5% photonic mark retention in the anal fin. Of these, 3.7% were considered poor with only a small dot remaining. The Puyallup Salmon Hatchery study group fish were each marked in the anal fin, caudal fin, and left adipose eyelid. After 62 days, a quality control check revealed a photonic mark retention rate of 93.9% for the anal fin, 80.6% for the adipose eyelid, and 63.9% for the caudal fin.

Both study groups were released in the spring of 1995, with adult returns expect in the fall of 1996. At that time, 100% of the returning CWT marked adults will be also checked for the presence and visibility of a photonic mark using a ultra-violet light.

B. Visual Implant Jet Mark Study

Lee Blankenship noted that NMT's VI Jet fluorescent mark differs from the Photonic Tag in that it is visible in ambient light and consists of a different material that becomes cohesive after injection into the fins. However, it is also applied with a needle-less injector. Five colors are available, with blue being the hardest to see in ambient light.

WDFW began a study at Marblemount Hatchery in August 1995 to determine if coho marked in the anal fin with a red VI Jet mark returned at the same rate as unmarked coho, and to determine long term VI Jet loss (**Attachment 17**). The study was done using 1994 brood coho averaging 13 grams. Three groups were given separate marks: 1) 1.5 length CWT (no adipose); 2) 1.5 length CWT + adipose clip; and 3) 1.5 length CWT + adipose clip + anal fin VI Jet mark.

A short term quality control check at 30 days for mark retention found 2% or less CWT loss for the three groups. The VI Jet mark retention was 99.6%. Returning adults to the Marblemount Hatchery in 1997 will then be electronically sampled for the presence of a CWT. If present, then additional information will be taken on the presence or absence of the VI Jet mark in both ambient and ultraviolet light.

More recent work has involved testing short term retention of VI Jet mark in the ventral and pectoral fins. This has proved very successful as well, resulting in optimism that the five colors available now and five fins can provide a series of code combinations.

Recommendations and Discussion

Lee Blankenship emphasized that both the Photonic Tag and the VI Jet mark are still in a developmental stage, and that long term retention remains an unknown until adult returns are evaluated in the above studies. Preliminary results show that both are excellent short term marks. Visibility of the VI Jet mark in ambient light was seen as a strong plus. He noted, however, that New West Technologies just introduced Photonic Tags that can also be seen in ambient light

There are problems in controlling the flow and pressure of the needle-less injector. The basic problem is that the device was actually designed for human inoculations. He felt confident that this is a minor problem that should be relatively easy to resolve.

He also expressed having early concerns about the highly visible red VI Jet mark in the anal fin as it almost looked like a fish lure bobbling along in the current. The effect on predation was tested in another study (not reported on in this meeting) done in Bingham Creek (Chehalis River system) using 70mm chinook. The study used a number of marks, including VI Jet, Photonic Tag, Pittag, CWT, and otolith thermal marks. The marked fish were released in the wild stream 20 km above a weir. The results indicated that there was no effect on any of the mark groups relative to the controls (otolith marked) except for the Pittagged group (30% loss). And in that case, he suggested, it might have been a factor of marking too small of fish for the Pittag. At any rate, there wasn't any increase in predation seen in the highly visible VI Jet marked group.

Susan Bates questioned if there were any health concerns about potential ingestion of either fluorescent material. Stephen Oura (New West) responded that FDA had given its approval of the Photonic Tag material, in part because it was in such minute amounts as to not be a concern. Lee Blankenship added that the fluorescent materials were "biocompatible grade" and already used extensively in the medical profession.

22. Photonic Marking Presentation (Stephen Oura, New West Technologies)

Stephen Oura spoke to the Mark Committee about his company's Biometrix System-1000 Photonic Tagging. He explained that New West had marked a number of Sacramento River winter run chinook over 18 months ago, and that the fish were being kept at the Steinhart Aquarium of the California Academy of Sciences at Golden Gate Park in San Francisco. The fish are doing excellent and the marks are readily seen in ultraviolet light.

An invitation was extended to visit the museum without charge to see the fish and participate in a hands-on demonstration of photonic tagging.

a. Tag Applicability and Tissue Response:

Paul Siri (Univ. Calif., Davis) presented his research on photonic tags (**Attachment 18**). He prefaced his remarks by noting that he had no financial involvement with New West Technologies and that he had volunteered to become involved in the research because of his work with the Sacramento River Winter Run Chinook Captive breeding program. Interest in the 2-6 micron latex spherical photonic tags was stimulated by a need to apply an intelligent tag at low cost with minimal stress to captive chinook at smolt lengths of less than 55mm FL to keep pace with a year-0 smoltification. Pittags were not an option because of the larger size of fish required for pit tagging.

Marking studies conducted on both chinook and steelhead were found to be both efficient and economical. Photonic marks were applied to the anal fin of both species at sizes ranging from 50 to 80mm FL. Histological samples taken at three months revealed that the latex spheres were captured well by the soft tissues, with very little evidence of host reaction. Paul Siri also noted that with respect to earlier questions about FDA approval, no evidence has been found that the beads move into the musculature.

He concluded his presentation by endorsing photonic tags as a very promising method of fish identification. Future comparative studies involve looking at stress proteins in fish to evaluate subtle imnological responses to stress. Stress proteins are ubiquitous in the animal kingdom and are mobilized in response to stress.

b. Future Plans of New West Technologies

Stephen Oura indicated that New West's current focus is to develop improved scanners. At the present time, a cheap UV light is used to detect a marked fish. They are working to develop a small palm sized LED unit with a photodetector system (diode laser) that would give an audible signal if activated in natural light. The targeted price range is under $50.

New West also is pursuing work on a larger auto-scanner ($5,000 price range) that will analyze the spectrum signature and decode the mark, much like a barcode scanner. Approximately 20 thousand unique signatures or codes are available if visible light is divided into units of 10 nanometers and three fluorescent colors are used. One problem noted, however, was that as the fish grow and the membranes thicken over the embedded beads, there will be a gradual shift in the light's wavelength. Stephen Oura agreed but felt that a solution could be developed.

A second problem discussed was that a given solution would be made up of unique amounts of single colored beads having one of the basic standard colors. As such, a 'mixed color' solution would have to be continually mixed during tagging to insure consistency of the color. Stephen Oura acknowledged the problem but felt that the normal movements of the tagger would be sufficient to maintain a uniformly mixed solution.

23. Advances in CWT Technology (Guy Thornburgh, Northwest Marine Technology)

Guy Thornburgh noted that NMT was celebrating its 25th anniversary this year and was very proud of its long commitment to fisheries and fishery scientists. He added that those who know Dr. Keith Jefferts also know of his great love for fishing and dedication to the preservation of the fisheries resources. During these past 25 years, NMT has introduced a large number of quality products, but not all have returned NMT's financial investment in the research and development. In each case, however, the unsuccessful products (e.g. x-ray readable CWTs; fish counters for fry and eggs) were an attempt by NMT to meet the expressed needs of the region's fishery managers. He also stressed that NMT will continue to undertake new research and development as the needs become known because of its commitment to the fisheries resource.

a. Marine Stock Assessment

A major goal for NMT in the next five years is to continue to focus a lot of energy on methods for assessing marine stocks. When looking at the status of the world's fisheries, there are many large populations of fish without reasonable population estimates. Many of the fishery scientists, unfortunately, have not adopted mark/recapture procedures used so effectively in freshwater and for Pacific salmonids.

NMT has begun a project with NMFS and Natural Resources Consultants to mark pollock in the Bering Sea. NMFS had spent $4.5 million assessing biomass in the Bering Sea, but had to find a more cost effective method because of substantial budget cuts. NMT believes it can be done for much less money using mark and recapture. A successful pilot program has been completed where pollock were captured and tagged with a CWT. In about one year, NMT will be undertaking a large scale marking and detection program for pollock. This will require automated electronic sampling as the fish plants handle approximately two million fish per day.

NMT has also worked successfully with New Zealand on a marine population assessment program for snappers using hand held injectors and wands. In addition, NMT is working with the Europeans to develop a similar assessment capability for shrimp populations. It is hoped that this latter effort will be underway in 1-2 years.

b. Archival Tags

NMT's new archival or memory tags, introduced last year, record water temperature, body temperature, light, and depth of dive. The tags have now been implanted successfully in bluefin tuna by the Japanese and they have five recoveries to date. Because of this success, NMT is now in negotiations with the Japanese government for a four year project to produce a large number of the tags. In addition, the proposal calls for a 60% reduction of the current size and increased battery and memory capacity. If NMT is successful in the re-engineering work, the archival tags will be small enough for use in adult salmon during the last months of their life before they enter freshwater. Potential areas of application research include the Bering Sea and the eastern Atlantic Ocean.

c. VI Elastomer Marking

NMT's five year company plan in terms of projects and product development is to continue to work with the visual implant (VI) type of tag and enhancements such as the VI Jet mark. The company believes that it is very important to continue to work with implant tags that do well in fish and meet the needs for increasing batch capacity or marking individual fish.

The front end of the elastomer injector has been re-engineered to overcome concerns that it was too labor intensive (maximum rates were 350-500 fish/day). Now, when the inject button is pushed, it instantaneously injects the exact amount of material into the fish. Production tagging rates are now projected at 800 fish/hour.

A small elastomer injector has been developed that overcomes the problem of delivering the highly viscous elastomer material by hand without the aid of compressed air. The device uses an 'off of the shelf' insulin syringe (28 gauge needle, 1/3 cc capacity). The small needle results in tremendous pressure at the tip of the needle, making it possible for hand injection of elastomer marks.

d. VI Alpha Tags

The little plastic VI alpha tags have been redesigned to improve tag retention and handling ease. The tags are made from an alternative material that is much more pliable and easier to read. A significant improvement is expected in tag retention. Work is now focusing on a system to inject the new tags.

e. VI Jet Marks

NMT is continuing its development of the VI Jet Mark but is not presently marketing the product. Reasons for this include the need to be certain that the mark persists through the lifecycle of the fish. In addition, NMT is not satisfied with its use of 'off of the shelf' inoculaters as they are not designed for marking fish. NMT is therefore designing an injector that will place the material into the fish rather than blast excessive amounts at the fish and into the air where it can enter the lungs of those working in the trailer. Two different types of injectors for a trailer environment are now being worked on.

Like New West Technologies, NMT is also very interested in determining the coding combinations that fishery biologists desire, and to develop automated decoding of the fluorescent marks. Guy Thornburgh also stressed that NMT was willing to work with any agency interested in marking a large number of fish with the VI Jet mark as it would assist in the product development.

NMT has a new and inexpensive product that allows one to see fluorescent marks in ambient light. The product is a pair of yellow tinted glasses that must be used with a blue tinted filter that is placed between the fish and the observer.

f. Multi-Shot Hand Tag Injector

The hand held multi-shot tag injector has been significantly resigned and upgraded this past year by replacing every single part of the original version. While it is typically not needed for most tagging projects, it serves a vital need for very small projects and for testing tag detection equipment installed at a sampling site.

g. Electronic Detection Research

The hand wand has been repackaged to make it waterproof. The beeper signal is much stronger, and the LED is brighter. In addition, the unit now comes in three pieces to reduce costs of repairs in the event that it is damaged (e.g. driven over in the parking lot). In the past, a seriously damaged unit had to be discarded.

NMT now has two new R-8 tube detectors (4"x8") to join the R-10 model (5"x10") built last year. One unit was demonstrated for the Committee. Five more R-8 units are under production. The smaller units are designed for coho and steelhead. They are built of honeycomb aluminum and weigh only 70 lb. Cost is $15,000/unit.

In July, NMT will deliver two stand alone diversion gates to WDFW for the R-8 detectors. One of these will then be forwarded to Canada for testing. The gates attach at the lower end of the tube detector. Tagged fish will be automatically diverted into a separate bin. The units are also wired to accommodate a conveyor belt. It was also noted that based on the application problems encountered in last year's test of the R-10 unit at Ucluelet (see item below), the R-8 unit and gate would fit much better into fish plant processing lines. NMT welcomes any help in developing gates for the tube detectors as that is not its area of expertise.

h. Mass Marking Machine

Guy Thornburgh touched on NMT's progress on developing a mass marking machine with WDFW. He noted that he had first encountered the idea while moderating a meeting on mass marking five years ago, and had left the meeting believing that it was totally impossible. However, progress in the last two years has convinced him that it is possible and that it will revolutionize the way fish are handled in the very near future.

i. CDFO's Field Test of NMT's "R10" Rectangular Tag Detector at Ucluelet

Ken Johnson commented that this topic had been included under NMT's main agenda item because there were misunderstanding circulating about the results of the Ucluelet field test of NMT's R-10 detector. He indicated that he had spoken with Richard Bailey (CDFO) and learned that the R-10 had functioned perfectly with respect to tag detection. The problem was that the unit did not fit into the operating environment of the plant.

Susan Bates (CDFO) confirmed that observation and noted that she had previously addressed the issue at some length during the discussion of Agenda Item 6 (see page 18). It is a complex application engineering problem as docks differed significantly. Common

problems include time constraints to sample the fish, confined space for both samplers and detection equipment, elevation problems for passing the fish through the detector and still have them remain at waist level, and the need for sorting gates to orient and space fish entering the detector and for separating tagged fish on exit. A further complicating fact is that landed fish need to be weighed with the head intact.

Lee Blankenship agreed with Susan's points and again stressed that WDFW was willing to assist Canada with funding and staff assistance to resolve the sampling challenges.

j. New Length and a Half Wire Format Introduced by NMT

Guy Thornburgh noted that there has been increased interest in using 1 1/2 length tags for double index tagging to ensure recovery by electronic detection in selective fisheries. To date, users could generate 1 1/2 length tags by reprogramming the Mark IV tag injectors. However, it also meant that they had to buy 1.5 times more tag wire at a cost 1.5 times greater to tag the same number of fish with single length wire. To resolve this situation, NMT will now market a new 1 1/2 length tag (**Attachment 19**). The tags will be sold for the same price as standard length wire.

The new 1 1/2 length tags have the same format for the Agency, Data 1, and Data 2 fields. However, the new master word is recognizable even if the wire was accidentally cut at standard length during tagging. A comparison of the standard length and new 1 1/2 length master words is provided below:

Format	Blank	Blank	P	32	16	8	4	2		1
Std length			0	0	1	1	1	1	1	1
1 1/2 length	0	0	1	1	0	1	0	1	1	1

Action: During subsequent discussion, it was recommended that a new tag type be added for length and a half wire for reporting releases in PSC format. This proposal was supported by the Mark Committee.

24. Refined Laser Ablation System for Stock Identification using Inductively Coupled Plasma Mass Spectrometry (Robert Brown, Elemental Research Inc)

Robert Brown took a few minutes at the offset of his presentation to describe the work and staff of Elemental Research Inc (ERI). The company uses advanced mass spectrometer systems and a wide variety of more routine analytical services to provide inorganic and organic chemical composition analyses for a wide range of clientele. ERI is a small company with 17 employees, the majority having science degrees and four have advanced degrees (Ph.D.) in physics, chemistry, toxicology, and biochemistry. A report on ERI's capabilities was distributed and may be obtained from ERI: Telephone (604) 986-0445.

ERI first became involved in fish identification work in 1988 when CDFO funded research on strontium and rare earth elements as elemental markers in the skeleton and scales. Elemental composition and concentration was determined at levels as low as one

part per billion using Inductive Coupled Plasma (ICP) Mass Spectrometry.. The method used laser ablation to vaporize the central part of a scale. The vapor is then drawn into a mass spectrometer for elemental analysis. Results of this early research were reported during the 1989-1992 Mark Meetings.

A major advancement was achieved in March, 1995 when ERI introduced a new proprietary laser ablation microprobe that was interfaced to a sensitive ICP-Mass Spectrometer. The new system, Robert Brown reported, now provides sensitivity of up to 100 times that in the original research, with spatial resolution of the laser probe down to 5 microns, and multi wavelength operation. It allows analysis of up to 60 elements in 57 seconds. He added that there has been a phenomenal international groundswell of interest in ERI's unique technology since its announcement, including groups from Japan, Australia, Ireland, England, Scotland, Canada, and the U.S.

This sensitivity now allows identification of the natal stream or hatchery of origin of fish as the central portion of a scale contains an "elemental signature" that is unique to the spawning grounds or hatchery waters. Similarly, movement of the fish into marine waters can be analyzed by taking a series of lateral samples extending outward from the center of the scale.

This procedure requires between 10-30 scale samples from returned adults to establish the necessary baseline information on the elemental signature of the respective natal stream or hatchery waters. (A report, entitled "Application of the ERI Laser Ablation/ICPMS System to Salmon Migration Studies" was distributed to the Mark Committee. Copies can be obtained from either ERI or PSMFC).

Accuracies of up to 100% for identification of individual rivers have been attained when annual variations in water composition are excluded, and up to 89% when they are included. Little impact across years is seen in pristine waters. However, polluted waters can obviously cause shifts.

An accuracy of 100% was achieved in identifying steelhead fish originating from the Babine, Zymoetz, Sustut, and Morice rivers (Skeena River system). This was also true across five brood years. Fish samples were obtained from scale cards dating back to 1985. The only two problem data points were associated with cracked and broken scales.

Results in Washington's upper Columbia River did result in some mis-identifications. However, Robert Brown noted that the analyses had been done with only five elements. Most of ERI's work now uses 11-14 elements for the elemental signature, and they are moving towards using the full 60 elements because of the increased accuracy. He also predicted that an expanded analysis of the Columbia River samples also would result in 100% accuracy.

Other advantages of the system include no handling or any impact on the fish during their juvenile period. Likewise, the method is non-invasive and requires only a scale sample. As such, scale samples may be taken from captured live fish before the fish are freed. The method is particularly suited for identifying wild fish stocks. It could be used coastwide once the necessary baseline data are collected for each drainage system.

Analysis of scales has gone through extensive method development, and analysis fees vary widely depending upon the size and scope of the contract. Recent provision of matching funds from the National Research Council of Canada for complete automation of the Laser ICPMS system is expected to lead to significant economics and possible fee reductions in the next 1-2 years.

25. Advancements in Laser Marking Technology (Jan Kallshian, Micro Mark)

Jan Kallshian reported that Micro Mark's goal has been to make improvements to a reliable product that has earned the deserving respect of the fisheries community over the past 25 years. Micro Mark's recent introduction of standard length laser marked tags is viewed as a major advance. He also reported that Micro Mark will be developing a half length tag to meet requests for that product. In addition, 1 1/2 length tags will be offered at the same price as standard length tags without changing the format.

He noted that there has been considerable discussion and concern about how to maintain coordination of tag codes with more than one vendor, and stressed that Micro Mark was willing to support any solution that was developed. One suggestion offered as a possible solution was that agencies specify the tag codes when bid requests are made. Both vendors would indicate on the return bid if the codes were available. This would serve as a double check and it wouldn't matter which vendor filled the order.

In conclusion, Jan Kallshian stressed that the laser marking system is extremely flexible and that Micro Mark can make a wide range of modifications (range, depth, power) to meet user requests. He also added that tags now being shipped are more deeply etched than those initially distributed as samples when Micro Mark announced its new product.

26. Further Consideration of Last Year's Stalled Proposal for a Mark/Tag Workshop

During last year's Mark Meeting, there was strong support for a proposal to organize a CWT workshop on tagging procedures. It was agreed that an ad-hoc committee would be set up to organize the workshop. However, for a variety of reasons, this workshop did not occur.

Discussion of the stalled proposal was again very positive, with an agreement that the workshop was needed and should be held within the next year. The focus of the workshop will be limited to tagging procedures, with the target participants being the tagging trailer supervisors.

A concern was raised that often individuals who need to attend specialized training workshops end up being excluded because of limited travel funds and their place is taken by others higher in management. Lee Blankenship agreed that this often is seen and that the tag coordinators would need to ensure at a minimum that the tagging trailer supervisors are in attendance.

Action: It was agreed that an ad-hoc committee would be established in the spring of 1996 to organize a CWT tagging workshop for tagging trailer

supervisors. David Zajac (USFWS) was nominated to serve as Chairperson. Other suggested members included Gary Shurman (WDFW), Sam Bertoni (ADFG), and Richard Bailey (CDFO). Several other tag coordinators expressed a desire for agency representation but indicated that they would need to consult with staff. **The workshop is targeted for February, 1997.**

27. Review of Procedures for Returning Tags to Appropriate Agencies

Ken Johnson reported that he had received a call from Ken Phillipson (NWIFC) regarding procedures for returning tags. The Quinault Nation operates a tag recovery lab and a question arose as to where to forward tags when the release agency was listed as 'COOP'. For the tags in question, the release records didn't have any additional information on cooperating agencies provided in the 'Comments' field. Ken Phillipson had not found any documentation on the procedures for returning tags. Ron Olson stated that this had led to two basic questions: 1) did all agencies still want to maintain the practice of forwarding and receiving tags; and 2) were all agencies still returning recovered tags to the respective agency tag coordinator, regardless of who might have tagged and released the fish.

The Mark Committee agreed that the procedure of returning tags was desirable and should remain. **Recovered tags are to be returned to the appropriate tag coordinator, regardless of which agency is listed as the releasing agency. The tag coordinator can then forward any tags as necessary to other agencies.**

28. Fin mark Allocations for 1996

Only a partial listing of fin marks was available. Therefore, a complete listing will be forwarded to the Mark Committee for review once the data are received and processed.

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Name	Agency	Mailing Address/Telephone/E-Mail/
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Anderson, Lynn	WDFW	600 N. Capitol Way, Olympia, WA 98501-1091 Tel: (360) 902-2792 E-Mail: anderlma@dfw.wa.gov
* Bates, Susan	CDFO	Pacific Biol. Station, Hammond Bay Road, Nanaimo, B.C. V9R 5K6 Tel: (604) 756-7079 E-Mail: batess@pbs.dfo.ca
Bauer, Jerry	BPA	PO Box 3621, Portland, OR 97208-3621 Tel: (503) 230-7579
* Bayley, Robert	NMFS-NWR	525 NE Oregon, Rm. 500, Portland, OR 97232 Tel: (503) 230-5432 E-Mail: robert_bayley@ssp.nmfs.gov
* Blankenship, Lee	WDFW	600 N. Capitol Way, Olympia, WA 98501-1091 Tel: (360) 902-2748 E-Mail: blankhlb@dfw.wa.gov
Brown, Randy	CDWR	3251 S Street, Sacramento, CA 95816 Tel: (916) 227-7531 rbrown@water.ca.gov
Brown, Robert	ERI	309-267 W Esplanade, No. Vancouver, B.C. V7M 1A5 Tel: (604) 986-0445 E-Mail: eri@mindlink.bc.ca
* Corrarino, Charlie	ODFW	PO Box 59, Portland, OR 97207 Tel: (503) 872-5310 x5407
* Crandall, Karen	ADFG	PO Box 25526, Juneau, AK 99802-5526 Tel: (907) 465-3483 E-Mail: karenc@adfg.st.ak
Crosby, David	Micro Mark	3001 R Avenue, Suite 104, Anacortes, WA 98221 Tel: (360) 299-8100 E-Mail: mmark@sos.net
* Fisher Frank	CDFG	PO Box 578, Red Bluff, CA 96080 Tel: (916) 527-8892
Focher, Shannon	ODFW	Route 2, Box 2541, Hermiston, OR 97838 Tel: (541) 567-1523
* Heintz, Ron	NMFS-AK	11305 Glacier Hwy., Juneau, AK 99801-8626 Tel: (907) 789-6058 E-Mail: rheintz@abl.afsc.noaa.gov
* Johnson,Ken	PSMFC	45 SE 82nd Drive, Gladstone, OR 97027 Tel: (503) 650-5400 E-Mail: johnsonk@psmfc.org
* Johnson, Marianne	CRITFC	729 NE Oregon St. Suite 200, Portland, OR 97232 Tel: (503) 731-1254 E-Mail: marianne@pisces.fish.washington.edu
Kallshian, Jan	Micro Mark	3001 R Avenue, Suite 104, Anacortes, WA 98221 Tel: (360) 299-8100 E-Mail: mmark@sos.net
* Leask, Steven D.	MIC	PO Box 410, Metlakatla, AK 99926 Tel: (907) 886-3150
Lentz, Ken	USBR	2800 Cottage Way, Sacramento, CA 95825-1898 Tel: (916) 979-2472 E-Mail: klentz@rmp700.mp.usbr.gov
Longwill, James	PSMFC	45 SE 82nd Dr., Gladstone, OR 97027-2522 Tel: (503) 650-5400 E-Mail: longwill@psmfc.org
* Mallette, Christine	ODFW	17330 Evelyn St., Clackamas, OR 97015 Tel: (503) 657-2022
Markey, Susan	WDFW	600 N. Capitol Way, Olympia, WA 98501-1091 Tel: (360) 902-2777 E-Mail: markeslm@dfw.wa.gov
* Mauser, Gregg	IDFG	600 S. Walnut, Boise, ID 83707 Tel: (208) 334-3791
O'Connor, Dick	WDFW	600 N. Capitol Way, Olympia, WA 98501-1091 Tel: (360) 902-2778 E-Mail: oconnrjo.dfw.wa.gov
* Olson, Ron	NWIFC	6730 Martin Way E., Olympia, WA 98506 Tel: (360) 438-1180 E-Mail: rolson@nwifc.wa.gov
Oura, Stephen	New West	131 Stony Circle, Suite 500, Santa Rosa, CA 95407-0286 Tel: (707) 578-2345
Thornburgh, Guy	NMT	P.O. Box 427, Ben Nevis Rd, Shaw Island, WA 98286 Tel: (360) 468-3375 E-Mail: guyt@pacificrim.com

* Mark Committee member

#4.

IDFG FISH MARKING SUMMARY - Outmigration Year 1997 Chinook Salmon: Broodyear 1995								
Species	Facility	CWT and Fin Clip			Fin Clip Only			Hatchery Totals
		Adipose			Adipose			
Spring Chinook	Clearwater				21,800			21,800
	Rapid Riv				95,000			95,000
	Sawtooth				4,600			4,600
Summer Chinook	Pahsimeroi				135,000			135,000
	McCall	60,000			97,000			157,000
Mark/Clip Total		60,000			353,400			413,400

ATTACHMENT 2

e:\mauser\mark\96mark

PROPOSAL TO ADIPOSE-CLIP HATCHERY SPRING/SUMMER CHINOOK

==========

AGENCY: Idaho Department of Fish and Game ***DATE:*** January 17, 1996

COORDINATOR: Gregg Mauser

MARK REQUESTED: Adipose clip, including 60,000 CWT group at McCall Hatchery

DETAILS OF MARKING

NUMBER OF FISH: 413,400

SPECIES/RUN: Chinook Salmon, Spring and Summer Run

BROOD YEAR: 1995

STOCKS: Clearwater, Snake, Upper Salmon, South Fork Salmon

HATCHERIES: Clearwater, Rapid River, Sawtooth, Pahsimeroi, McCall

GEOGRAPHIC AREA: Clearwater and Salmon River Drainages

RELEASE DATE: Spring 1997

MANAGEMENT/RESEARCH OBJECTIVES:

Short-term objectives are to maintain runs of spring/summer chinook to Idaho hatcheries. Programs will also produce fry, parr, and smolts for supplementation studies, and participate in captive broodstock programs when enough production is available. Long-term management objectives are to return enough adult fish to provide harvest and fishing opportunity on hatchery produced spring/summer chinook without impacting naturally spawning populations.

IMPACT ON COAST WIDE CWT PROGRAMS:

PREDICTED RECOVERIES:

<u>OCEAN:</u> No recoveries of adipose-clipped spring chinook in ocean fishery samples are anticipated. One(1) adipose-only clipped summer chinook would be sampled in each of the Oregon and Washington troll fisheries.

<u>COLUMBIA RIVER:</u> A total of 17 adipose-clip-only spring chinook and 9 summer chinook would be sampled from the Columbia River fisheries.

CHANGES TO CURRENT SAMPLING PROGRAM:

No changes to the current sampling program are anticipated. Marked fish collected at outplant sites will be examined for CWT's. In-season management of Columbia River spring chinook fisheries is based on GSI sampling, not recovery of CWT'd fish.

EXPECTED BENEFITS:

The expected benefits of this marking program are to maximize hatchery production of spring and summer chinook without impacting naturally produced fish.

ATTACHMENT 3

AGENCY: U.S. Fish and Wildlife Service **DATE:** January 16,1996

COORDINATOR: William H. Miller

MARK REQUESTED: Adipose clip only

DETAILS OF MARKING

NUMBER OF FISH: 50,000 maximum. @ Dworshak NFH
15,000 max. @ Kooskia NFH

SPECIES/RUN: Chinook Salmon, Spring

BROOD YEAR: 1995

STOCK: Dworshak, a Rapid River derivative
Kooskia NFH

HATCHERY: Dworshak NFH ; Kooskia NFH

GEOGRAPHICAL AREA: Clearwater River, Idaho

RELEASE DATE: April 1997

MANAGEMENT AND/OR RESEARCH OBJECTIVES:

Management objectives for upriver chinook are to rebuild wild/natural stocks while providing harvest opportunities on hatchery stocks. Hatchery stocks and wild/natural stocks need to be separated. Therefore the hatchery stocks need to marked so we may identify them. Also, it is important to be able to monitor and evaluate the rebuilding of wild/natural stocks under various proposed rebuilding scenarios. The ESA requires that we know the numbers of fish and impacts associated with the take of any listed wild/natural stock of chinook. Take would include any incidental harvest, hatchery straying or planned wild broodstock production. Interactions between hatchery and wild/natural stocks will be evaluated under any ESA listing. Hatchery related adverse impacts to ESA listed wild/natural stocks need to be identified, quantified, and minimized.

IMPACT ON COAST WIDE CWT PROGRAMS:

PREDICTED RECOVERIES:

Ocean: None.

Columbia River: Based on Dworshak and Kooskia NFH CWT return rates we would expect from 0 to 7 ad clipped only fish to be sampled in the sport and gillnet fisheries.

CHANGES TO CURRENT SAMPLING PROGRAM:

No changes in the present sampling program are expected. We already check all returning fish for tags or marks of any kind.

OTHER: Actual releases are substantially lower than the normal production levels. This situation change somewhat for brood year 1996 since indications are that the adult returns should increase appreciably. There will be a representative CWT release group.

EXPECTED BENEFITS:

1. Downstream migrant benefits

a. Provide timing and numerical estimation of downstream passage success of hatchery and wild stocks separately for both Columbia and Snake River fish.

b. Would permit evaluation of passage success at least down to McNary for both Columbia and Snake River wild stocks.

c. Would permit monitoring of recovery efforts on wild stocks associated with improving downstream passage, i.e., lowering reservoir levels, increased water release.

d. Would provide flexibility in transportation and spill scenarios to benefit primarily wild stocks, i.e., timing spills for those periods when wild stocks are arriving at COE + PUD projects.

Adult Management Benefits

a. Would permit identifying wild stock and hatchery stock at all COE fish counting projects and PUD projects from Bonneville upstream, in both mid Columbia and Snake rivers.

b. Would provide management opportunity to improve harvest management and allow targeting of hatchery stocks. Management agencies could implement selective harvest programs by non-lethal gear above Bonneville, i.e., Zone 6 and sport fisheries.

c. Would permit documentation of straying of hatchery fish to wild/natural production areas.

d. Would permit documentation of any straying of wild fish to hatcheries.

e. It would permit better hatchery genetic management at satellite stations or hatcheries where percentages of runs are used for broodstock. Would allow passing wild adults over weir or rearing wild and hatchery broodstock separate for outplanting or supplementation. This could be quite important when working with any listed ESA species at hatcheries or use for supplementation to wild stocks.

MEMORANDUM

OREGON DEPARTMENT OF FISH AND WILDLIFE

INTRADEPARTMENT

ATTACHMENT 4

DATE: January 30, 1996

TO: Mark Committee

FROM: Charlie Corrarino and Rich Carmichael

SUBJ: ODFW request for temporary exemption from the adipose fin sequestration rule involving Snake River basin spring chinook

AGENCY: Oregon Department of Fish and Wildlife
2501 SW First Ave., P. O. Box 59
Portland, OR 97207
Phone: (503) 229-5400 FAX: (503) 229-5602

COORDINATOR: Charlie Corrarino

MARK REQUESTED: Adipose clip only

DETAILS OF MARKING

NUMBER OF FISH: 35,000

SPECIES/RUN: Spring Chinook

BROOD YEAR: 1995

STOCK: Rapid River

HATCHERY: Lookingglass (ODFW)

GEOGRAPHICAL AREA: Lookingglass Creek,
Grande Ronde River, OR

RELEASE DATE: June 1996

MANAGEMENT AND/OR RESEARCH OBJECTIVES:

These fish will be released as fry, upstream from Lookingglass Hatchery in an attempt to rebuild a small, naturally producing population of spring chinook. The reason for an adipose only request is twofold: the fry are too small for tagging and the desire to maintain maximum survival.

IMPACT ON COAST-WIDE CWT PROGRAMS:

PREDICTED RECOVERIES:

The maximum number of adults (catch and escapement) from the release is 35. Based on current exploitation rates there will be no impact.

CHANGES TO CURRENT SAMPLING PROGRAM

No changes in the present sampling program are expected.

EXPECTED BENEFITS:

1. Permit the identification of hatchery vs. naturally produced spring chinook with a minimal impact on survival.

2. Would help rebuild a naturally produced run of spring chinook as agreed to by ODFW and the Confederated Tribes of the Umatilla Indian Reservation.

ccw

WP

ATTACHMENT 5

Northwest Indian Fisheries Commission

6730 Martin Way E., Olympia, Washington 98516-5540

Phone (360) 438-1180 FAX # 753-8659

March 7, 1996

Ken Johnson
Pacific States Marine Fisheries Commission
45 SE 82nd Drive, Suite 100
Gladstone, Oregon 97027-2522

Dear Ken:

I'm writing in regards to my abstention from the recent Mark Committee vote on agenda item #5 (the adipose-only mark requests for certain hatchery releases of Snake River spring and summer chinook stocks). After further research and consultations I have decided not to oppose another one-year exemption to these proposals (i.e. vote yes). Although I disagree with the principle (multiple uses of the adipose clip), technically this is a unique situation that will not impact the integrity of coded wire tagging data. I also believe that this issue doesn't warrant another directors-level meeting. Our tribal policy people are currently inundated with more important issues, including the current coho mass marking / selective fishery proposal. I would also like to provide the following additional explanation of my position:

Restrictions on Previous Exemptions

As you know, the original 1993 exemption (use of the adipose clip for Snake River hatchery releases of spring and summer chinook stocks) was made after an arduous process that resulted in a non-unanimous policy level resolution. The resolution included several restrictions designed to protect the integrity of the CWT system, while providing a means of meeting the NMFS requirement to mark all of these hatchery fish. Subsequent exemptions for these stocks, with the associated restrictions, were approved by the Mark Committee in 1994 and 1995.

One of the restrictions stated that all marked releases include a representative Ad+CWT group. This year's proposal from IDF&G did not have representative CWT groups for four of the five hatcheries. When questioned about this, Greg Mauser stated that tagging was not being considered for two reasons: 1) because the release numbers were so low, tagging would provide no useful information; and 2) they have fish health concerns (they want to minimize handling of the fish and there are concerns that tagging could exacerbate BKD problems).

Another restriction that accompanied the exemption was that the parties will aggressively pursue a program to develop another external mark. At the mark meeting I suggested that there were alternative marks available for purposes of separating broodstock (e.g. the adipose eyelid

elastomer mark which WDFW had been using). Greg stated that they were not interested in using the ventral clip and considered the adipose eyelid marking experimental technology.

Effects on CWT Integrity

Recoveries and Catch Sampling: Data was previously presented to support the extremely low number of fishery recoveries projected from these releases. As further confirmation of this I analyzed recoveries from the most recent years with recovery data sets (Attachment 1). It was astonishing to see no marine recoveries from 2,816,970 CWT releases. Obviously the amount of marking in this year's proposal will have no significant impact on any sampling program or tag recovery laboratory.

Precedent setting: The issue of precedent setting is more difficult to address. From my perspective the primary concern involves an erosion to the integrity of the CWT system by transforming the adipose clip from a flag for a CWT to a flag for a hatchery fish. Since this change has been proposed for all hatchery fish on the Columbia River by numerous politicians and agencies, and more recently for all hatchery coho and chinook by the Washington and Oregon legislatures, this concern seems valid. However, given the fact that NMFS has required marking, an argument can be made that these stocks represent a unique situation where the adipose mark can serve two purposes without jeopardizing the overall CWT system. IDF&G has stated they will continue to sample all adipose marked fish for CWTs, and it is my understanding that when these hatcheries return to higher release numbers, IDF&G would resume associated coded wire tagging. I can therefore rationalize this year's exemption on the basis that this marking, taken by itself, will not affect CWT data integrity.

PSC Indicator Stock Tagging: At the Mark Meeting it was stated that the Rapid River Stock was a PSC Indicator Stock and IDF&G may actually be tagging this group. According to Jim Scott (Co-chair of PSC Chinook Technical Committee), Rapid River, Sawtooth, and McCall are all on the list of PSC exploitation rate indicator stocks. Recovery data from these stocks has generally not been used by the Committee because of the low number of marine recoveries. However, because of the long tagging history, and the moderate number of in-river recoveries, Jim considered the data from Rapid River and McCall useful for estimating "nonceiling fishery indices" (analyses used by the Chinook Technical Committee in their annual reports) and thought that these stocks would be used for this analysis in the future. I have passed this information onto Greg.

Summary

In summary, although I continue to have concerns with the precedent setting nature of regional exemptions to the adipose clipping policy, I agree that IDF&G's proposal, by itself, should not have a technical impact on CWT data integrity. Given that NMFS has required marking and the fact that these stocks are at such low levels, I can also understand IDF&G's desire to minimize marking and use the adipose-only mark. It appears that the status of these stocks as PSC

indicator stocks, and the necessary tagging levels, needs to be clarified between IDF&G and the PSC Chinook Technical Committee.

Please call me if you have any questions on this matter.

Sincerely,

Ron

Ron Olson
Fisheries Biologist

Attachment 1. Recoveries of BY 87-89 chinook releases from McCall, Sawtooth and Rapid River Hatcheries. Data obtained from PSMFC 2/20/96.

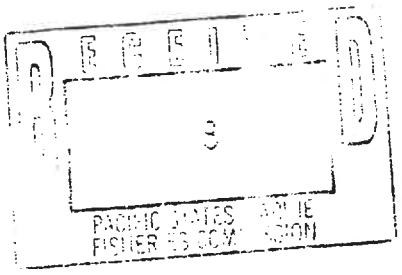
				Recoveries					
				Combined Marine Fisheries		Columbia River Fisheries		Hatchery / Escapement		Total Recoveries	
Hatchery	Brood	Tag Code	Number Released	observed	estimated	observed	estimated	observed	estimated	observed	estimated
McCall	87	103141	46,400					2	2	2	2
	87	103142	46,250					2	2	2	2
	87	103143	46,400					1	1	1	1
	87	103144	44,350							0	0
	87	103145	43,025					1	1	1	1
	87	103146	41,325					3	3	3	3
	87 Totals		267,750					9	9	9	9
	88	103034	251,158			10	18	163	163	173	181
	88	103038	62,378			7	8	44	44	51	52
	88 Totals		313,536			17	26	207	207	224	233
	89	103431	21,502							0	0
	89	103432	21,810							0	0
	89	103433	20,700							0	0
	89	103434	20,807							0	0
	89	103435	21,463							0	0
	89	103436	22,608							0	0
	89	103437	21,620							0	0
	89	103438	21,331			1	2			1	2
	89	103439	21,253							0	0
	89	103440	21,443			1	1			1	1
	89	103441	21,501							0	0
	89	103442	21,406							0	0
	89	103443	21,527			1	1			1	1
	89	103444	21,442							0	0
	89	103445	19,387							0	0
	89 Totals		319,800			3	4	N/A ?		3	4
Sawtooth	87	100000	2,605							0	0
	87	103035	59,529							0	0
	87	103140	48,386					1	1	1	1
	87	103222	45,275							0	0
	87	103223	46,525							0	0
	87	104048	50,635					2	2	2	2
	87	104051	49,805					3	3	3	3
	87 Totals		302,760					6	6	6	6
	88	103211	47,225							0	0
	88	103212	47,425							0	0
	88	103220	47,500			1	2			1	2
	88	103221	50,305							0	0
	88	103224	51,700							0	0
	88	104008	51,125							0	0
	88 Totals		295,280			1	2			1	2

Hatchery	Brood	Tag Code	Number Released	Combined Marine Fisheries observed	Combined Marine Fisheries estimated	Columbia River Fisheries observed	Columbia River Fisheries estimated	Hatchery / Escapement observed	Hatchery / Escapement estimated	Total Recoveries observed	Total Recoveries estimated
Sawtooth	89	103416	21,662							0	0
	89	103417	21,772							0	0
	89	103418	20,710							0	0
	89	103419	21,276							0	0
	89	103420	21,235							0	0
	89	103421	10,586							0	0
	89	103422	17,062							0	0
	89	103423	22,018							0	0
	89	103424	19,928							0	0
	89	103425	22,100							0	0
	89	103426	14,779							0	0
	89	103427	11,597							0	0
	89	103428	21,179							0	0
	89	103429	22,448							0	0
	89	103430	22,103							0	0
	89	104130	14,908							0	0
	89	104131	13,942							0	0
	89	104211	14,311							0	0
	89	104212	14,993							0	0
	89	104217	11,908							0	0
	89	104218	17,500							0	0
	89 Totals		378,017					N/A ?		0	0
Rapid River	87	103147	51,985			9	27	10	10	19	37
	87	103148	51,198			1	2	13	13	14	15
	87	103149	50,843			7	16	15	15	22	22
	87	103150	53,151			1	2	18	18	19	20
	87	103151	53,419					7	7	7	7
	87	103152	52,993			4	8	14	14	18	22
	87 Totals		313,589			22	55	77	77	99	123
	88	103213	55,100			17	32	3	3	20	35
	88	103214	53,850			20	41	2	2	22	43
	88	103215	55,725			9	16	3	3	12	19
	88	103216	55,600			8	16	2	2	10	18
	88	103217	56,025			16	34	3	3	19	37
	88	103218	55,100			11	25	2	2	13	27
	88 Totals		331,400			81	164	15	15	96	179
	89	103401	19,500			1	2			1	2
	89	103402	19,359			2	4			2	4
	89	103403	19,198			2	4			2	4
	89	103404	19,537			4	7			4	7
	89	103405	20,438			2	4			2	4
	89	103406	19,704			6	13			6	13
	89	103407	18,763							0	0
	89	103408	19,141			3	8			3	8
	89	103409	19,856			1	1			1	1
	89	103410	19,556			1	2			1	2
	89	103411	20,026			2	4			2	4
	89	103412	19,757			2	4			2	4
	89	103413	19,600			2	3			2	3
	89	103414	20,525							0	0
	89	103415	19,878							0	0
	89 Totals		294,838			28	56	N/A ?		28	56

Fisheries and Oceans
Pêches et Océans

Pacific Biological Station
Hammond Bay Road
Nanaimo, B.C.
V9R 5K6

ATTACHMENT 6



March 14, 1996

Mr. Ken Johnson
Regional Mark Center
Pacific States Marine Fisheries Commission
45 S.E. 82nd Drive, Suite 100
Gladstone, Oregon 97027-2522

Dear Ken:

Subject: 1996 Mark Meeting Agenda Item 4: 'Request to again mass mark Snake River chinook with the adipose only clip'

Our domestic Mark Users Committee has not had a chance to meet since the Mark Meeting in San Francisco last month. I did, however, consult with members individually to confirm CDFO's position on the above issue. I learned that the CDFO position is contained in a letter May 7, 1993 to Guy Thornburgh of the PSMFC re Policy Resolution by Ad Hoc Policy Committee on Mass Marking Issues by Pat Chamut, Regional Director General. In it he states " In closing I cannot endorse Resolution # 1, nor can I support Idaho, Washington, and Oregon states proposals to adipose-only clip chinook". Therefore, our vote of February 15, 1996 must stand. As promised, though, I will propose to the Committee that we reconsider the issue before the 1997 Mark Meeting.

Thank you for organizing and holding such a well-run meeting last month. Hope things are going well with you.

Sincerely,

Susan Bates

Susan Bates
CDFO Tag Coordinator

Canada

ATTACHMENT 7

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fishery Resource Office
2625 Parkmont Lane Bldg. A
Olympia, Washington 98502

IN REPLY REFER TO:

February 29, 1996

MEMORANDUM

TO: Mark Committee

FROM: Regional Tag Coordinator, U.S. Fish and Wildlife Service

SUBJECT: 1996 USFWS Adipose Fin Mark Requests

I respectfully withdraw the adipose clip requests involving Dworshak and Kooskia spring chinook and Dungeness pink salmon that were proposed at the 1996 mark meeting. I had previously suggested that since the chinook numbers were so low that we would probably coded-wire tag all of them. Since the mark meeting the Dworshak hatchery evaluation team has met again and decided that tagging all of the fish is more appropriate. The pink program suffers from lack of funds to conduct the saltwater rearing and to conduct spawning ground surveys at the level needed to recover marked fish.

I thank the committee for considering these proposals and apologize for any inconvenience created by withdrawing them at this late date. Also, please understand that this withdrawal does not influence any proposals that we may submit at next years meeting.

Thanks.

Dave

Dave Zajac

ATTACHMENT 8

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
ROCK ISLAND HATCHERY EVALUATION
133 SECOND STREET SUITE 7
WENATCHEE, WA 98801

PHONE 509 664-3149 FAX 509 662 6606

February 9, 1996

Lee Blankenship
Washington Department of Fish and Wildlife
600 Capitol Way N. Olympia, WA
98501-1091 MS: 43135

Dear Lee, We would like to use the adipose fin clip as an identifying mark for hatchery produced Wenatchee sockeye salmon without inserting coded wire tags. We collect 300 non-hatchery produced adults at Tumwater Dam each summer and release 200,000 juveniles into Lake Wenatchee each fall. Since 1990, each brood group has been 100% adipose fin clipped and coded wire tagged. We use the adipose clip to identify and pass hatchery fish upstream during broodstock collection. We wanted to use the cwt's to evaluate survival of the groups, but to date we have recovered very few marks on the spawning grounds and none in any fisheries. Susan Markey ran a summary of recoveries for each tagcode we have released (see attachments).

We have a very narrow window in which we can tag these fish (15 July to 15 August). It is difficult to have them at the right size before water temperatures and handling adversely affect fish health. In some years we have treated for *columnaris* after tagging. Tag retention has been poor. The tagging staff spends two weeks each summer on the lake. This time could be better used at Eastbank FH where tagging is taking longer with the need to elastomer tag part of the production. By using an adipose fin clip only we can tag earlier and for a shorter time period (clipping could be organized by hatchery staff).

We propose to evaluate this program by otolith marking specific brood years and release strategy groups (September versus October release). We can then collect adipose fin clipped fish in the lake fishery (if we ever have another) and on the spawning grounds.. The otoliths can be extracted and the groups identified.

Thanks for your help on this Lee, I look forward to hearing from you. Please call if you have any questions.

Rich Eltrich

Rich Eltrich
Fish Biologist

08:49:31 9-feb-1996 SUMMARY OF RECOVERIES OF TAGCODE 634336 PAGE 2
QUERY: rich
RELEASING AGENCY: WDFW
1990 Sockeye TAGGED: 252071 RELEASE TYPE: B
RELEASED: 10/19/91 AD-ONLY: 16375 HATCHERY: WENATCHEE NET PENS
LENGTH: UNMARKED: 2356 SITE: LAKE WENATCHEE (45)
REC STOCK: LAKE WENATCHEE (45)

YEAR FISHERY - <Recovery Agency>	OBS'D	EST'D	MEAS'D	AVG MM
1994 Hatchery - WDFW	1	2	1	530
1994 TOTALS:	1	2	1	530
TOTALS FOR TAGCODE 634336	1	2	1	530

09:05 02/09/96 SUMMARY OF RECOVERIES OF TAGCODE 634336 WDFW-TS1 Rpt
RELEASING AGENCY: WDFW RELEASE TYPE: EXPER.+ PROD.
1990 Sockeye TAGGED: 252071 HATCHERY: WENATCHEE NET PENS
RELEASED (YY/MM): 91/10 AD-ONLY 16375 SITE: LAKE WENATCHEE (45)
FISH/GRAM: 18.90 UNMARKED: 2356 STOCK: LAKE WENATCHEE (45)

YEAR FISHERY - <Recovery Agency>	OBS'D	EST'D	MEAS'D	AVG MM
1994 Spawning Ground - WDFW	11	7		466
1994 TOTALS:	11	7		466
1995 Spawning Ground - WDFW	1	1		530
1995 TOTALS:	1	1		530
TOTALS FOR TAGCODE 634336	12	8		474

Update on ODFW Coho Mass Marking Project

	AD/CWT	Unmarked	Total
Coast	**450,000**	**2,985,000**	**3,435,000**
Columbia	**675,000**	**10,520,000**	**11,195,000**
Total	**1,125,000**	**13,505,000**	**14,630,000**

- Oregon state legislature appropriated funds to mass mark 1995 brood coho at all state-funded hatcheries (coastal).
- Mass marking of Columbia River coho production is contingent upon Mitchell Act (federal) funding through NMFS.
- NMFS continues to raise concerns about mass marking and subsequent selective fisheries.
- Coho intended to rebuild naturally reproducing populations will not be mass marked.
- We are proceeding with purchase of equipment to mark all fish.
- We plan to initiate mass marking in May and go through October.

Thermal Mark Coordination, Notification and Reporting

Problem:

To date Alaskan hatcheries have thermally marked over 600 million salmon. 114 unique groups have been marked. This year Prince William Sound Aquaculture Association marked 100% of pink salmon production at their hatcheries. This year's thermal marking will exceed the total of date. Recovery plans for these fish have been limited to near terminal fisheries or fisheries where recovery of similarly marked fish would be highly unlikely. Salmon of all species are now being marked at different facilities in the state. Hatchery operators thermally mark their salmon knowing that the department has no plans to recover these marks in highly mixed stock fisheries at any time in the near future. Inseason thermal mark recovery and use of these data to help manage transboundary sockeye fisheries in Southeast Alaska has been very successful. Interest in using this stock identification tool is high.

Both Canada and Alaska have marked coho and chinook salmon. Program coordination beyond the local level would not be required if recovery of these marks were confined, as planned, to sampling in near-terminal fisheries, at hatchery racks, at spawning grounds or in near-shore juvenile nursery areas. However, it is hard to control the interest of coastwide researchers and managers in these marked fish as potentially valuable stock identification tools. Recently we heard that NMFS's Ocean Carrying Capacity Project hopes to look at sampled juvenile salmon of the coast of Alaska for thermal marks. This sounds like a reasonable idea but once marked fish are recovered will they know who released the fish? To date there is no repository for these data nor are their any requirements to coordinate assignment of marks.

At a minimum PSMFC needs to maintain records of salmon that have been thermally marked with some reference to the thermal mark code applied. Mark coordinators should be given the opportunity to review the thermal marking plans of other agencies prior to the time marks are induced. This would help to avoid duplication of thermal marks if possible and desired. Recently Alaska assigned a particular thermal mark to a group of chinook but after consultation with an individual in Canada we found that the identical mark had just been used on Canadian hatchery chinook with the same brood year. Thermal mark recovery labs are becoming more sophisticated and probably could distinguish fish from these two releases; but it would be useful and possibly important to know that two similar marks might be recovered in a mixed stock fishery.

In 1991 the Mark Committee adopted procedures requiring that agencies submit thermal marking plans. Washington, Canada and Alaska agreed to meet annually to discuss these plans. According to Ken Johnson no agency, including Alaska, has ever submitted their plans or release information.

Why haven't agencies complied with established procedures?

- Agencies, including Alaska, probably have not seen the need for this coordination or notification
- The format for reporting thermal marking plans or releases was not well defined
- Format for reporting the thermal mark code induced is not satisfactory
- Thermal marking plans need to be reviewed at a different time of year than fin marking plans

What is the solution?

- Determine what time of year is most appropriate to submit thermal marking plans to PSMFC
- Decide who needs to review plans
- Provide an appropriate report format for submitting thermal mark plans and releases
- Possibly require inclusion of thermal mark code designation in comments section of release data
- Determine acceptable thermal mark code identification schemes
- Possibly provide access to stored images of representative voucher specimens for each thermal mark
- Assign problem resolution to a sub-committee of Mark Committee

Thermal Mark Plan or Release Report

Check one: Thermal Mark Plan _____ or Thermal Mark Release Information_____

Date Submitted: _____ **By:** _____
(Name) (Agency)

DRAFT FORM FOR REVIEW

Species	Mark	Recovery Area*	Brood Year	Run	Hatchery	Planned and/or Actual Release: Location (site)	Date(s)	Number	Stage	% of group Marked	Stock	Other Marks fin clips, chemical CWT (Codes)	Planned or Applied Thermal Mark
Example of Thermal Mark Release:													
Coho	*TM*	*M-I-S*	*93*		*Gastineau*	*Gastineau Ch 111-40*	*6/12-6/13/95*	*1,033,843*	*smolt*	*yes*	*Gastineau*	*Ad+CWT (044433-36, 044443)*	*RBR 1:1.5 (5X)48H:48C*
Example of Planned Thermal Marking:													
Sockeye	*TM*	*M-I-S*	*95*		*Snettisham*	*Chilkat Lk 115-32*	*Jun-95*	*2.3 million*	*fry*	*yes*	*Chilkat Lk*	*none*	*RBR 1:1.5,2.3 (5X)48H:48C,(1X)96H:24C,(2X)24H:24C*

TRANSCRIPTIONS OF THERMAL MARK CODING/SCHEDULE (Hypothetical data)

WDF proposal to PSMFC 4/91	ADF&G - CWT & OTOLITH PROCESSING LAB						
	TM ID	B.Y.	SPECIES	RBr	DELTA T	BASEMARK SCHEDULE	GRAPHIC DEPICTION
Pr,370-425,C,48+,48-,4	Tuya	95	-Sockeye	1:1.4	*	(4X)48H:48C	IIII
Pr,380-450,C,48+,48-,6	Tahltan	95	-Sockeye	1:1.6	*	(6X)48H:48C	IIIIII
Po, 560-620,V,48+,48-,5	Tatsamenie	95	-Sockeye	2:1.5	*	(5X)48H:48C	IIIII
Pr,360-450,C,48+,48-,3,96+,48-,1,48+,48-,3	Port Snett	95	-Sockeye	1:1.3,2.4	*	(3X)48H:48C,(1X)96H:48C,(3X)48H:48C	III IIII
Pr,330-420,C,36-,36+,5,36-,72+,1,36-,36+,2	Beaver Falls	95	-Sockeye	1:1.6,2.3	*	(5X)36C:36H,(1X)36C:72H,(2X)36C:36H	IIIIII III
Po,550-610,V,48+,48-,3,96+,24-,1,24+,24-,2	Speel	95	-Sockeye	2:1.3,2.3	*	(3X)48H:48C,(1X)96H:24C,(2X)24H:24C	III III
Pr,375-430,C,48+,48-,5,96+,24-,1,24+,24-,2	Chilkat	95	-Sockeye	1:1.5,2.3	*	(5X)48H:48C,(1X)96H:24C,(2X)24H:24C	IIIII III

* Delta t is important to overall mark quality. A general range easily accomplished in Alaskan production marking applications is 3.5-4degC. The target delta t, along with the duration of the thermal cycle, is ideally determined just prior to marking and takes ambient temperature into account (high ambient temperatures prompt thermal cycles of shorter duration).

NOTES - The structuring of thermal marks which WDF and associated agencies use is different than that used in Alaska. They utilize literally a "bar code symbology", where ADF&G "closely, and equidistantly spaces" thermal rings, and groups of thermal rings to accomplish discrete marks. The latter is in part necessitated by the volume of stock to be marked and the significant fuel cost inherent in accomplishing the temperature differential in Alaskan marking situations. A means for "universal transcription" must take these two, and possibly other approaches into account.

* Planned Recovery Area: M-marine recovery program; I-intermediate recovery in river or estuary; S- spawning area recovery

Differential Survival of Ventral Fin and Adipose Fin Clips in fall chinook salmon (Oncorhynchus tschawytscha)

H. Lee Blankenship, Steve Olhausen, and Daniel A. Thompson

The Washington Department of Fish and Wildlife (WDFW) and the United States Fish and Wildlife Service (FWS) began conducting a study in March 1993 to determine the effect on survival of removing the adipose and ventral fin on fall chinook salmon (Oncorhynchus tschawytscha). The study was conducted at Spring Creek National Fish hatchery on the Columbia River for three consecutive brood years beginning with 1992 brood.

For each brood year four groups of chinook were marked and coded wire tagged (CWT) with distinct codes. The four groups included CWT only, CWT/adipose clip, CWT/left ventral clip, and CWT/adipose clip/left ventral clip. The chinook ranged in size from 4.0 g per fish (72mm FL) for 1992 brood to 2.9 g per fish (65mm FL) for 1993 and 1994 broods. The fish were reared in the same raceways until their release as 0 age chinook in April of each year.

Quality Control Checks

Quality control checks were performed for each group and brood year to determine CWT loss and poor fin marks. The quality control checks were performed between 18 and 33 days post tagging for the groups and the number of viable CWT's released were adjusted accordingly.

Adult Sampling

During the fall of 1995 all chinook returning to the Spring Creek hatchery were electronically sampled for the presence of a CWT using a Northwest Marine Technology R-10 CWT detector. If a coded wire tag was detected the chinook was examined to determine which fin(s) were removed and fin clip quality. Each fish was given an individual head label with the fin clip quality and forklength recorded. The snout was then removed to retrieve the CWT's. Once the CWT's were decoded the fish were assigned to the proper treatment. The results presented in Table 1. shows the number of returns, clip quality and average fork-lengths for each treatment.

Fin clip quality was defined as "Good" (none to 1/4 of the fin present), "Marginal" (more than 1/4 to 1/2 of the fin present), "Bad" (more than 1/2 of the fin present), and "No Mark" (no apparent fin mark).

Results

The results presented in Table 1 show the number of returning adults by clip type and clip quality for 1992 and 1993 brood years returning in 1995.

Table 1. Numbers of chinook returning to the Spring Creek hatchery in 1995 by fin clip and fin clip quality. Fin clip quality was defined as "Good" (none to 1/4 fin present), "Marginal" (more than 1/4 to 1/2 fin present), "Bad" (greater than 1/2 fin present) and "No Mark" (no apparent fin mark).

1992 Brood Recoveries

Fin Clip	# Recoveries	Survival to Rack	Average fork-length	Standard Deviation
Coded Wire Tag Only	71	0.035%	80.7 cm	5.8 cm
Adipose	55	0.028%	80.5 cm	4.9 cm
Left Ventral	23	0.011%	80.1 cm	5.6 cm
Adipose/ Left Ventral	16	0.008%	76.2 cm	6.2 cm

Difference in Survival

Coded Wire Tag Only vs Adipose clip	= 20.0%
Adipose clip vs Left Ventral clip	= 60.8%
Adipose clip vs Left Ventral/Adipose clip	= 71.5%

Clip Quality

Adipose Clip		Left Ventral		Adipose/Left Ventral			
Good	= 96.4% (53)	Good	= 39.1% (9)	Good	= 81.3% (13)	Good	= 18.8% (3)
Marginal	= 1.8% (1)	Marginal	= 30.4% (7)	Marginal	= 12.5% (2)	Marginal	= 18.8% (3)
Bad	= 1.8% (1)	Bad	= 26.1% (6)	Bad	= 0.0%	Bad	= 43.8% (7)
No Mark	= 0.0%	No Mark	= 4.4% (1)	No Mark	= 6.2% (1)	No Mark	= 18.8% (3)

1993 Brood Recoveries

Fin Clip	# Recoveries	Survival to Rack	Average fork-length	Standard Deviation
Coded Wire Tag Only	27	0.015%	60.0 cm	3.7 cm
Adipose	28	0.015%	59.1 cm	5.0 cm
Left Ventral	16	0.008%	58.7 cm	3.5 cm
Adipose/ Left Ventral	15	0.007%	59.6 cm	3.6 cm

Difference in Survival

Coded Wire Tag Only vs Adipose clip	= 0.0%
Adipose clip vs Left Ventral clip	= 46.7%
Adipose clip vs Left Ventral/Adipose clip	= 53.4%

Clip Quality

Adipose Clip		Left Ventral		Adipose/Left Ventral			
Good	= 92.9% (26)	Good	= 50.0% (8)	Good	= 100%(15)	Good	= 60.0% (9)
Marginal	= 0.0%	Marginal	= 37.5% (6)	Marginal	= 0.0%	Marginal	= 20.0% (3)
Bad	= 7.1% (2)	Bad	= 12.5% (2)	Bad	= 0.0%	Bad	= 13.3% (2)
No Mark	= 0.0%	No Mark	= 0.0%	No Mark	= 0.0%	No Mark	= 6.7% (1)

ATTACHMENT 12

Long-Term Retention of Fluorescent Visible Implant Marks in Adipose Eyelids of Chinook and Coho Salmon

H. Lee Blankenship, Glenn Mendel, and Daniel A. Thompson

The Washington Department of Fisheries began using fluorescent Visible Implant (VI) marks to visually identify and maintain genetic integrity of Lyon's Ferry fall chinook salmon with the 1990 brood year. Differential survival between VI marked and unmarked coho salmon was tested at Skagit hatchery. The marks were injected with a semi-automated delivery system that used a modified hypodermic needle. All fish were double marked with a coded wire tag to monitor mark retention. In cooperation with Northwest Marine Technology (NMT) three different types of material, have been tested in an attempt to enhance retention and visibility. Testing of different material and applicator modifications has also occurred in an attempt to increase the speed of application and reduce the minimum size of fish that could be successfully marked. Prior to 1995 returns, returning adults were viewed in ambient light for marks. In 1995 NMT developed a UV lighting system which significantly enhanced the ability to see the marks. The retention rates or visibility observed for these groups under ambient and UV light are listed in Table 1.

The first VI marks were applied to 1990 brood using a modified Mark IV CWT injector and the tags were a red fluorescent monofilament like material. These marks were observed in only 54% of four year old adults in ambient light but the following year 75% were observed with the aid of UV light. To improve retention a multi-component elastomer was injected in a liquid form which polymerized into a rubbery implant with the 1991 brood. Retention as three and four year old's was similar (85%) with or without UV light. A different elastomer material was used with the 1992 brood year. A less viscous material was used in an attempt to increase application speed. The speed was increased, but long-term retention and visibility was reduced. Two colors were used with the 1992 brood, red and yellow. In ambient light yellow marks were observed in only 25% of returning two year old's but with UV light there was 86% retention in three year old returns. We used the same standard material for the 1993 brood as we had previously used with 1991 brood. Machine modifications however enabled better marks to be applied and retention of the 1993 brood in 1995 was 92%.

Differential survival between VI standard elastomer marked and coded wire tagged fish was tested at Skagit hatchery with 1991 brood coho. No significant differential survival was observed between the two groups. Retention as adults for these coho marked at an average of 109 mm FL was 73% in ambient light and 86% under UV light.

Table 1. Observed retention of fluorescent Visible Implant tags in Lyon's Ferry chinook and Skagit coho salmon from 1990 -1993 brood years.

Group	Average Size at Marking (mm fl)	Observed 1994 Retention Ambient Light (*N*)	Observed 1995 Retention UV Light (*N*)
1990 Brood Chinook Red Filament	105	54% (141)	75% (28)
1991 Brood Chinook Standard Red Elastomer	98	86% (124)	85% (150)
1992 Brood Chinook Less Viscous Red Elastomer	95	74% (126)	77% (124)
1992 Brood Chinook Less Viscous Yellow Elastomer	95	25% (251)	84% (128)
1993 Brood Chinook Standard Red Elastomer	100	NA	92% (1,778)
1991 Brood Coho Standard Red Elastomer	109	73% (2,087)	86% (2087) (Observed 1994)

"Feasibility of Implanting Blank-wire Tags in the Body of Juvenile Fall Chinook Salmon."

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ABSTRACT

Fall chinook salmon are released annually into the Umatilla River to partially mitigate for fish losses attributable to mainstem Columbia River Dams. Upper River Bright stock fall chinook salmon from early releases (1983-1990) were reared at Bonneville Hatchery only. Fall chinook salmon from recent years were reared at Irrigon Hatchery (1991), Umatilla Hatchery (1992-present) and Bonneville Hatchery (present). Each year varying numbers of Umatilla fall chinook salmon strayed into the Snake River. Concomitant with the endangered species listing of Snake River stock fall chinook salmon there was a need to separate lower river strays from Snake River stock at mainstem dams. Thus, we initiated a study to examine the utility of potential mass marking techniques. This presentation overviews the evaluation of body tagging as a mass marking tool and compares body tagging to other mass marking options.

Body tags are blank-wire tags injected into the body of a fish. For this evaluation, we implanted body tags into the right shoulder of juvenile fall chinook salmon. To separate the effects of individual marks, we compared body tagging with numerous marking combinations utilizing fin clips, body tags, and coded-wire tags (Table 1). The body tagging study was initiated in 1991 on fall chinook salmon reared at Irrigon Hatchery and continued in 1992 and 1993 at Umatilla Hatchery.

After the first three years of body tagging juvenile fall chinook salmon it was evident that implanting body tags was too costly and time consuming to make them effective as a mass marking tool. Estimated costs per 1,000 fish for body tags + left ventral fin clip, body tags only, and left ventral fin clip only were $87, $70, and $17 respectively. Time required for marking 1,000 fish was estimated at 1.2 h

Table 1. Numbers of fall chinook salmon fin clipped and recognizably adipose and coded-wire tagged at Irrigon and Umatilla Hatcheries to study the effects of tagging.

Mark	Irrigon Hatchery 1991	Umatilla Hatchery 1992	Umatilla Hatchery 1993
Left ventral	-	69,816 74,408	61,801[a] 66,204[a]
Body tag & left ventral	-	65,749 67,144	68,644 70,442
Body tag	147,586	70,435 65,184	69,225 69,518
Adipose & coded-wire tag	104,258	-	-
Adipose & coded-wire tag & right ventral	103,980	31,982 32,287	29,594 29,360
Adipose & coded-wire tag & body tag	145,048	-	-

[a] *Adjusted for fin clip quality.*

for fish marked body tag + left ventral fin clip, 0.85 h for fish marked body tag only, and 0.13 h for fish marked left ventral only. For Umatilla Hatchery production, mass marking 2.3 million fall chinook salmon would require 115 days for fish marked body tag + left ventral clip, 81.4 days for fish marked body tag only and 12.4 days for fish marked left ventral clip only. Tag retention for body tagged fish was similar to that found in coded-wire tagged fish.

In 1993 we began examining adults returning to the Umatilla River for wire tags and fin clips. We have encountered some problems detecting body tags in live adults because of variability in the accuracy of the hand-held tag detector. In 1994 National Marine Fisheries Service requested that all fall chinook salmon from Umatilla Hatchery be given a blank or coded-wire nose tag and a right ventral fin clip. Consequently, the tagging study has been discontinued. In 1995 we tested a tube-type tag detector for adult fish which has improved the detection of body tags. Because we are in the early stages of this study, few adults have been recovered and the effects of marking on smolt to adult survival is inconclusive. We will continue to monitor adult returns in future years to study the effects of fin clips, body tags, and coded-wire tags on smolt to adult survival.

Comparison of Survival of Coho Salmon Coded Wire Tagged With Standard and Double Length Coded Wire Tags and Adult Electronic Detection

H. Lee Blankenship, Daniel A. Thompson, and Lynn M. Anderson

The Washington Department of Fish and Wildlife (WDFW) began conducting a study in March 1994 to determine the effect on survival and possible straying of coho salmon (Oncorhynchus kistuch) tagged with standard and double length coded wire tags (CWT). A second aspect of the study was to test the effectiveness of electronic detection using wand CWT detectors on returning adult coho. The study was conducted at the WDFW George Adams hatchery on 1992 brood coho averaging 16 g per fish (115 mm fl).

635658 → Two groups of coho were tagged simultaneously to ensure random specimens for each group. The first group (N= 45,084) were CWT with old tag wire at the standard (1 mm) length. The second group (N= 44,666) 635660 were CWT with the newest tag wire at a double length (2 mm). The newer tag wire at double length increased the magnetic moment 5.2 times over the old single length wire. Each group was given a distinct tag code. The fish were reared in the same raceway until their release in July 1994 at an average size of 50 g per fish (171 mm fl).

Also 634963 (N=44,284)

Quality Control Checks

At 18 d post tagging quality control checks were performed on 1,700 fish from each group to determine coded wire tag loss and poor adipose clips. The single length CWT group had 0.77% CWT loss and 0.71% poor adipose clips. The double length CWT group had 0.48% CWT loss and 0.83% poor adipose clips.

Adult Sampling

During the fall of 1995 all adipose clipped returning coho to the George Adams hatchery were electronically sampled for the presence of a CWT using a Northwest Marine Technology Wand CWT detector. If a CWT was detected the fish was identified with an individual head label indicating a CWT was detected. If a CWT was not detected the fish was identified with an individual head label indicating a CWT was not detected. For both groups the fish were measured to the nearest centimeter and the snout removed to retrieve the CWT. When a CWT was not detected the fish was subsequently passed through a Northwest Marine Technology 6 inch omni-directional CWT detector. If a CWT was not detected the fish was considered a No Tag. If a CWT was detected it was noted on the individual head label.

One hundred and thirteen coho heads were X-rayed prior to dissection to determine CWT placement. Each head was assigned a number and then a lateral and vertical X-ray was taken to give a three dimensional view. The number was then printed on the X-ray to correspond with each head. The results presented in Table 2 shows tag placement for each group.

Results

The results presented in Table 1 show no significant difference in survival to the hatchery rack for single length and double length CWT groups which was 2.1% and 2.0% respectively. There was no significant difference in the mean forklength between the single length (47.8cm) and double length (47.8cm) CWT groups. There was no significant difference in detection rates using a Wand CWT detector with the single length and double length CWT's with detection rates of 99.9% and 100% respectively. This may have been due to the relatively small average size of coho returning to the George Adams Hatchery and the experience of the samplers.

Upon completion of data entry of all Washington, Oregon, and Canadian coho hatchery rack recoveries, a search of the data base will be conducted to determine if coho with either tag code strayed to another facility.

Table 1. Numbers of adult coho hatchery rac[illegible]ecoveries of standard length and double length coded wire tags.

Standard Length	Double Length
937 Recoveries = 2.1% Survival to Rack	898 Recoveries = 2.0% Survival to Rack
Average length = 47.8 cm SD = 4.6 cm	Average length = 47.8 cm SD = 4.9 cm
45,084 Released	44,666 Released
4.8% Difference in Returns	

Table 2. Tag placement of standard length and double length coded wire tags from X-Rays. Tag placement was defined as Good if the coded wire tag was within the target area, Marginal if the tag was located on the edge of the target area, and Bad if the coded wire tag was outside the target area.

Single Length		Double Length	
# X-Rayed	= 63	# X-Rayed	= 50
Good	= 77.8%	Good	= 84.0%
Marginal	= 14.3%	Marginal	= 10.0%
Bad	= 7.9%	Bad	= 6.0%

Effects of Coded-Wire Tagging on the Survival of Spring Chinook Salmon

H. Lee Blankenship, Eric Volk, and Daniel A. Thompson

The Washington Department of Fish and Wildlife began conducting a study in 1989 with Bonneville Power Administration funds to determine if there was a combined effect on survival and/or growth from handling, anesthesia, adipose clipping and coded-wire tagging salmonids. Three hatcheries (Cowlitz, Carson and South Santiam) on the Columbia River were chosen as test sites. Three consecutive brood years (1989, 1990, and 1991) of spring chinook were chosen as the test species.

The entire production at each hatchery each year was otolith marked with thermal banding patterns. The otolith marks were applied so that straying adults from non-facility or wild fish could be separated from returning control adults. Approximately 33% of each group was coded-wire tagged and adipose marked using normal procedures. Control or untagged juveniles were put through a wet counter for precise enumeration.

Complete returns have been analyzed for the 1989 brood. No significant differences in growth was found between tagged and untagged adult returns. Adults at Cowlitz hatchery returned at exactly the same ratio as they left the hatchery as juveniles (Table 1). The tagged adults at South Santiam hatchery returned at a 4.5% lower rate than the un-handled controls but this was not significant (Table 2). A significant difference was observed at Carson hatchery where there was a 9.2% lower survival for coded-wire tagged fish (Table 3). At Carson, records show that the juveniles had a high level of *Renibacterium salmoninarum* (BKD) prior to tagging and infectious hematopoietic necrosis (IHN) broke out during the time of tagging.

When the study is completed and results from the remaining two brood years are available for pooling and replication we will be able to add power to the statement of significance or non-significance.

Table 1. Numbers of coded wire tagged and non-coded wire tagged 1989 brood spring chinook returning to the Cowlitz hatchery.

		Age at Return			
1989 Brood Totals		2 Year	3 Year	4 Year	5 Year
Tagged	= 3,081	1,370	317	1,154	240
Un-tagged	= 5,896	2,633	717	2,682	424
Total Sampled	= 8,977	4,003	1034	3,836	664

Coded wire tag return = 32.3%
Coded wire tag release = 32.3%

Coded wire tagged fish survived equal to non-coded wire tagged.

1991 Returns			1993 Returns		
Length tagged	= 27.5 cm	SD = 2.1 cm	Length tagged	= 69.7 cm	SD = 6.2 cm
Length un-tagged	= 27.7 cm	SD = 0.9 cm	Length un-tagged	= 71.3 cm	SD = 5.8 cm
1992 Returns			1994 Returns		
Length tagged	= 50.6 cm	SD = 3.9 cm	Length tagged	= 80.3 cm	SD = 7.0 cm
Length un-tagged	= 50.0 cm	SD = 3.6 cm	Length un-tagged	= 82.8 cm	SD = 6.3 cm

Table 2. Numbers of coded wire tagged and non-coded wire tagged 1989 brood spring chinook returning to the South Santiam hatchery.

		Age at Return	
1989 Brood Totals		4 Year	5 Year
Tagged	= 622	394	228
Un-tagged	= 1,350	861	489
Total Sampled	= 1,972	1,255	717

Coded wire tag return = 31.5%
Coded wire tag release = 33.0%

Coded wire tagged fish survived 4.5% lower than non-coded wire tagged.

1993 Returns		
Length tagged	= 76.4 cm	SD = 5.7 cm
Length un-tagged	= 77.8 cm	SD = 6.4 cm
1994 Returns		
x-length tagged	= 85.8 cm	SD = 5.7 cm
x-length un-tagged	= 87.7 cm	SD = 6.3 cm

Table 3. Numbers of coded wire tagged and non-coded wire tagged 1989 brood spring chinook returning to the Carson hatchery and Wind river sport fishery.

		Age at Return	
1989 Brood Totals		4 Year	5 Year
Tagged	= 499	424	75
Un-Tagged	= 1,713	1,449	264
Total Sampled	= 2,212	1,873	339

Coded wire tag return = 22.6%
Coded wire tag release = 24.9%

Coded wire tagged fish survived 9.2% lower than non-coded wire tagged.

1993 Returns		
Length tagged	= 76.2 cm	SD = 4.8 cm
Length non-tagged	= 77.4 cm	SD = 8.4 cm
1994 Returns		
Length tagged	= 89.4 cm	SD = 6.2 cm
Length non-tagged	= 90.9 cm	SD = 6.1 cm

LONG TERM RETENTION OF A FLUORESCENT PHOTONIC FISH MARKING TECHNIQUE INJECTED INTO THE FINS AND PERIOCULAR TISSUE OF COHO SALMON

H. Lee Blankenship and Daniel A. Thompson

The Washington Department of Fish and Wildlife (WDF&W) is currently conducting two studies to determine the long term retention and visibility of Photonic fluorescent marks (Figure 1.) in returning adult coho salmon (Oncorhynchus kisutch). The Photonic fish marking uses a needle-less injector (air pressure) to blast in an aqueous solution containing thousands of microspheres 3 to 5 microns in diameter. WDFW studies injected the Photonic material into the fin rays and periocular tissue (adipose eyelid). The Photonic marks appear clear to the naked eye but fluoresces under ultra-violet light. The Photonic solution ($.50 / mark) and injector ($1,500.00) was purchased from NEWWEST Technologies of Santa Rosa, California.

Cowlitz Salmon Hatchery

Photonic marks were applied on 15 December, 1994 to the anal fin (N=10,080) of 1993 brood coho averaging 27 g per fish (130 mm forklength). The marking rates for the Photonic mark averaged 600 to 800 fish per hour. The group was also adipose clipped and coded wire tagged with a unique code. The group was released in the spring of 1995 with adult returns expected in 1996. On 27 April, 1995 a quality control check was conducted on the Cowlitz coho 133 d post marking to determine intermediate Photonic mark retention. The coho were checked for mark loss using a black light box to avoid direct sunlight. There were 500 fish checked from each of the four rearing tanks and the Photonic mark retention averaged 99.5%. An additional 3.7% of the Photonic marks were considered poor with only a small dot remaining.

Puyallup Salmon Hatchery

Photonic marks were applied on 7 February, 1995 to 1,106 coho of the 1993 brood. The mark was injected into the caudal fin, anal fin, and the left adipose eyelid on each fish. The average size of coho marked was 10 g per fish (96 mm forklength). This group was also adipose clipped and coded wire tagged with a unique code. On 14 April, 1995 quality control checks were performed on the Photonic marks 62 d post tagging. The photonic mark retention was 93.9% for the anal fin, 80.6% for the adipose eyelid, and 63.9% for the Caudal fin. The fish were released during the spring of 1995 with adult returns expected in 1996.

Adult Sampling

During the fall of 1996 100% of the returning coded wire tagged coho adults at Cowlitz and Puyallup hatcheries will be checked for the presence of Photonic marks using an ultra-violet light to determine mark retention and visibility.

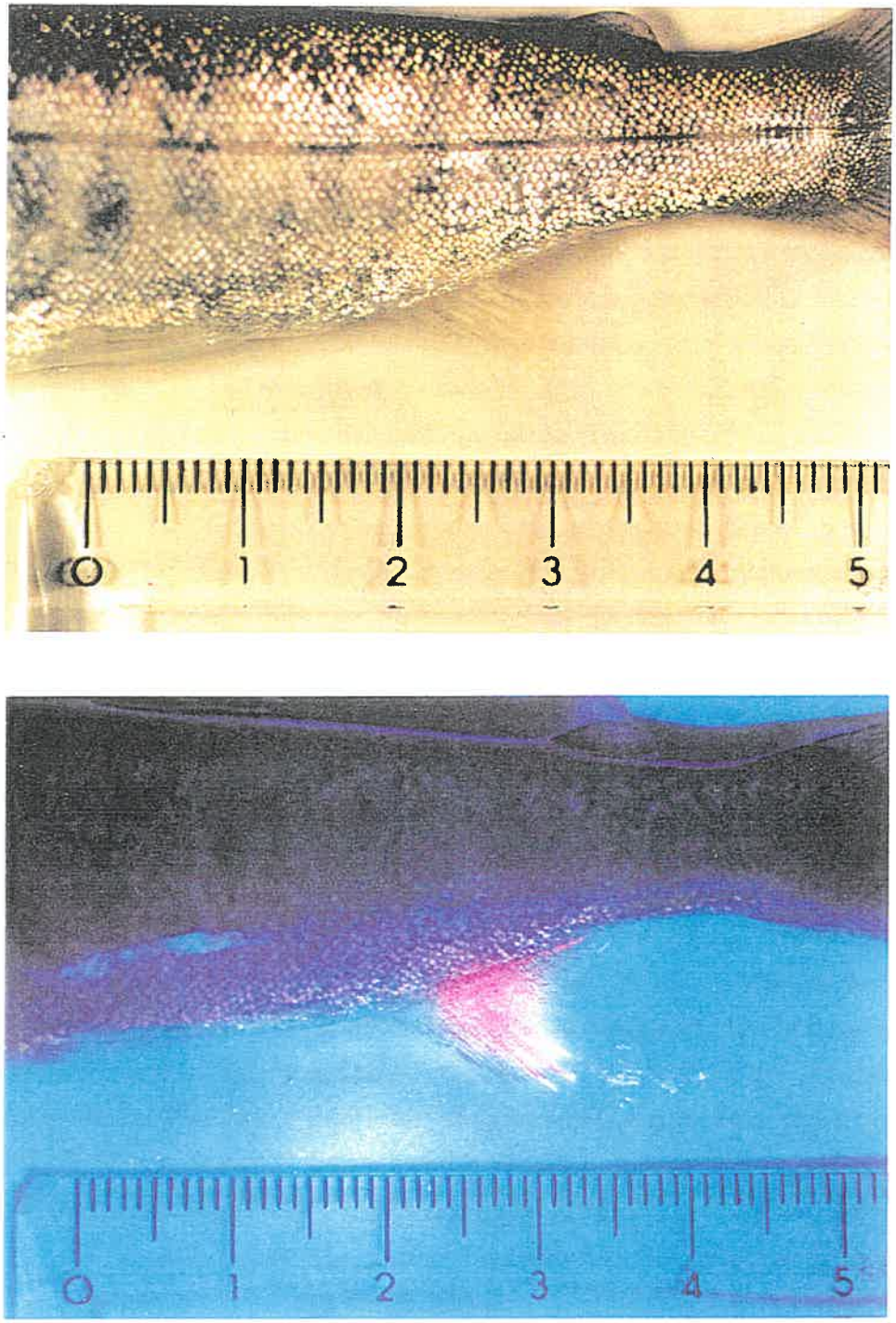

Figure 1. Top photo shows Photonic marks in anal fin of pre-smolt coho salmon under ambient light. Lower photo shows the same mark under 75 W black light. Background scale in millimeters.

Long-Term Retention and Differential Survival of a Fluorescent Red Visible Implant in the Anal Fin of Coho Salmon

Daniel A. Thompson and H. Lee Blankenship

The Washington Department of Fish and Wildlife (WDFW) began conducting a study in August 1995 to determine whether coho salmon *Oncorhynchus kisutch* that had been marked with a fluorescent red Visible Implant Jet (VI Jet, Figure 1) in the anal fin returned in the same proportions as coho not marked and to determine long term VI Jet loss. The study was conducted at the WDFW Marblemount hatchery on 1994 brood coho salmon averaging 13 g per fish (104 mm FL).

Three groups of coho were tagged simultaneously in a WDFW mobile tagging unit to ensure random specimens for each group. The first group consisted of coho (N=47,390) with a 1.5 length coded wire tag (CWT) only (no adipose fin clip). The second group consisted of coho (N=105,274) with a 1.5 length CWT and adipose fin clip. The third group consisted of coho (N=105,087) with a 1.5 length CWT and adipose fin clip and anal fin VI Jet. Each group was given a distinct tag code.

The fluorescent red VI Jet was provided by Northwest Marine Technology and injected using a needle-less injector between the anal fin rays. Tagging rates for the VI Jet marking averaged 600 to 800 fish per hour. The material when injected becomes cohesive in the fin.

Quality control checks

At 30 d post tagging quality control checks were performed to assess CWT loss, poor adipose fin clips and VI Jet mark loss. For the CWT only group CWT loss was 0.5%. For the second group of CWT and adipose fin clip, CWT loss was 2.1% and bad adipose clips were 0.0%. For the third group of CWT, adipose fin clip and VI Jet mark, CWT loss was 2.1%, bad adipose clips were 0.0% and VI Jet mark loss was 0.4%.

Adult Sampling

During the fall of 1997 all adult coho returning to the Marblemount hatchery will be electronically interrogated for the presence of a CWT using a Northwest Marine Technology R-10 CWT detector. If a CWT is detected the fish will then be visually interrogated for the presence of a VI Jet mark initially in ambient light and if no mark is detected it will be interrogated under fluorescence. For each fish we will record the absence or presence of the adipose fin, absence or presence of the VI Jet mark, measure the fish to the nearest centimeter and remove the snout to retrieve the CWT. Once the CWTs have been decoded and assigned to the proper treatments difference in survival and fork length (if any) between the three groups will be determined.

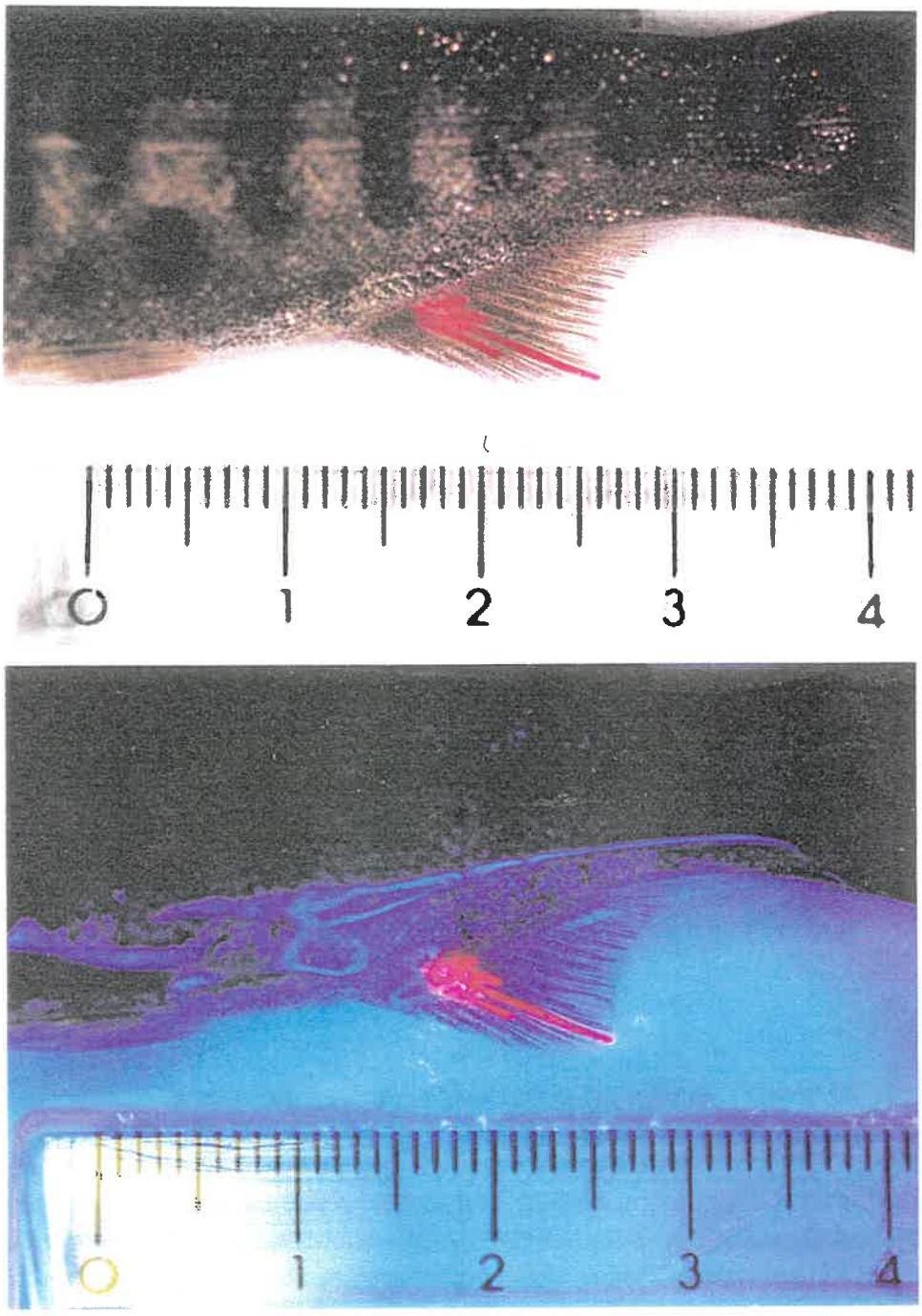

Figure 1. Top photo shows fluorescent red Visible Implant Jet in anal fin of pre-smolt coho salmon under ambient light. Lower photo shows the same mark under 50 w ultra violet light. Background scale in centimeters.

PRELIMINARY OBSERVATIONS OF PHOTONIC TAG APPLICABILITY AND TISSUE RESPONSE

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The Photonic Tag produced by New West Technologies is a latex micro bead, one to six microns in diameter, containing light reactive dyes that flouresce under ultraviolet or laser light. The Sacramento River Winter Run Chinook Captive breeding program began application trials of this technology two years ago in non winter run salmonids. Interest in this tagging option was stimulated by the need to apply an intelligent tag to rare broodstock families at smolt lengths of less than 55 mm FL to keep pace with a year 0 smoltification. Application of 14 mm PIT tags requires a delay in early spring smoltification if spawning occurs late in the summer. Since it is injected into fin tissue, the photonic tag may provide an alternative means of identification if application and retention is feasible in fish smaller than 75 mm (the nominal size constraint imposed by PIT tagging in these studies). In trials using *Oncorynchus tshawytscha (O. tshawytscha)* and *O. mykiss,* tag application proved both efficient and economical. Photonic tags were applied to anal fins of both species ranging from 50 to 80 mm FL. Tagged fish have been reared for 16 months, reaching lengths of up to 500 mm FL, with good tag retention and readability. Fin samples taken from sacrificed fish were examined histologically and showed a limited host reaction. Host response was characterized a mild granulomatous response to the beads. From these preliminary tests, the photonic tag appears promising method of identification. Plans are underway to begin detailed a comparative studies of this novel technique and other tagging methods.

9 February, 1996

New 1 1/2 Length Tag Format
Notrhwest Marine Technology, Inc

At present, users of 1 1/2 length tags must obtain 1 1/2 times as much tag wire as would be needed to tag the same number of fish with single length tags. If this is ordinary tag wire, then they must pay 1 1/2 times as much.

A distinctive format which is not useful when cut into single-length tags would alleviate that problem: we could charge by the number of usable 1 1/2 length tags rather than by the number of equivalent single length tags. However we must make sure that no confusion results if such wire is miscut as single length tags.

We have designed a new format to satisfy these requirements. The Agency, D1 and D2 fields are identical to the standard CWT format, but there are two differences:
1) Two blank spaces appear between the repeating code patterns on the wire. This means that the tag is not always readable if cut to single length.
2) The master word is different and is recognizable even if miscut to single length in all possible ways.

The new master word is shown below along with other master words which we make or have made.

Format	blank	blank	P	32	16	8	4	2	1
Old Half 4A						0	1	1	1
Old Half 4B						0	1	1	1
Half Length 6						0	1	1	1
Standard 4 or 6			0	0	1	1	1	1	1
Replicate 4			0	0	1	0	1	1	1
Sequential 6			0	1	1	1	1	1	1
1 1/2 Length	0	0	1	1	0	1	0	1	1	1

Below we show the new master word repeated as it would be on tag wire, along with nine possible eight-mark reading windows.

```
1 XXXXXXXXXXXXXXX            6 XXXXXXXXXXXXXXXX
  2 XXXXXXXXXXXXXXX            7 XXXXXXXXXXXXXXXX
0 0 1 1 0 1 0 111 0 0 1 1 0 1 0 111 0 0 1 1 0 1 0 111 0 0
    3 XXXXXXXXXXXXXXX            8 XXXXXXXXXXXXXXXX
      4 XXXXXXXXXXXXXXX            9 XXXXXXXXXXXXXXXX
        5 XXXXXXXXXXXXXXX
```

In every window except 1 and 7, blank positions are visible on both sides of the triple index mark, unlike all other formats. In windows 1 and 7 the visible pattern is also clearly distinctive. Even when mis-cut, the new master word will not cause confusion.