PACIFIC MARINE FISHERIES COMMISSION

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FINAL MINUTES OF THE 1987 MARK MEETING

February 19, 1987 - - Portland, Oregon

1. Preliminary Business

Committee members and other meeting participants introduced themselves at the start of the meeting (see list of attendees, Attachment 1). A number of new tag coordinators were welcomed:

Elmo Barney (Metlakatla)	replacing	Dan Romey
Tim Cochnaeur (IDFG)	"	Rodney Duke
Charles Corrarino (ODFW)	"	Lin Roberts
Bryan Ludwig (BCFW)	"	Art Tautz
Charles Morrill (WDW)	"	Jim DeShazo
Ron Olson (NWIFC)	"	Terry Wright
David Zajac (USFWS)	"	John Meyer

In addition, it was announced that Kit Rawson no longer is the tag coordinator for south central Alaska. He resigned from his position with ADFG in the fall of 1986 and is now employed by the Tulalip Tribe in western Washington. Bill Hauser (ADFG, Anchorage) will serve as the tag coordinator until Kit's replacement is hired.

Much appreciation is acknowledged for the hard work and positive contributions of each of the above former tag coordinators.

2. Status of CWT Recovery Data and Project Completion Date

The status of CWT recovery data (as of February, 1987) was reviewed by Ken Johnson (PMFC). Projected dates for submission, processing, and distribution of finalized data are summarized in Attachment 2.

The major recovery agencies met the goal of reporting preliminary recovery data for 1986 within the first three weeks of January 1987. These data were promptly error-checked and loaded onto the on-line system for ready access by all who wished to retrieve the data for planning for the 1987 season.

3. Proposal to End Publication of PMFC Recovery Reports

For many years, PMFC has reported tag recoveries for a given reporting year on the basis of each agency's fisheries and statistical areas within those fisheries. This approach was necessitated by the fact that reporting tag recoveries by tag code (i.e. across all fisheries) would require several large volumes each year because of the large numbers of tag codes now being recovered.

This approach has had several drawbacks. Very few researchers or managers, for example, have a need for recovery data organized by agency, fishery, and statistical area. Rather, the need is typically for a summary of recoveries of a tag code across all fisheries, etc. Other problems include the difficulty in obtaining all agencies' recovery data for a given year within a reasonable time span. Typically, publication of the reports had to be delayed by up to two years in order to include major data sets. Lastly, the printed reports presented major difficulties for revising the data once error corrections were provided.

It was, therefore, proposed that the Mark Center follow CDFO's lead and terminate publication of the expensive and little used recovery reports. This proposal was accepted by the Mark Committee with the understanding that the data would be made available through the newly developed "Tag History Summary Reports" that give all tag recoveries for a given tag code across all agencies, fisheries, areas, and year. The data can be obtained either by direct on-line access or in hard copy reports through requests by mail or telephone.

It was also agreed that recovery reports organized by agency, fishery, and statistical areas would still be available on a request-only basis for those needing the information in that format.

4. Report on Coastwide Stock Indentification Study

Roy Wahle was employed during 1983-1984 to begin development of a coastwide plan to identify important salmon stocks for regional fishery management purposes. His time, however, was largely taken up in an effort to develop a detailed inventory of all chinook and coho stocks from California to Alaska and the Yukon delta, a necessary first step in any regional stock identification plan.

At the request of the Oversight Committee, Johnson (PMFC) continued work on the project during 1985 and 1986. However, progress was intermittent because of limited time and higher priorities for data processing tasks.

Work during 1986 was spent primarily on identifying and describing production/management units for the entire coast, including Canada. This proved to be a major chapter of over 100 pages. Considerble effort also was devoted to developing maps and regional production summary tables to better describe the coastwide status of stocks.

A copy of work accomplished to date was made available for the Mark Committee to review.

Completion of the report was expected in 1987, provided that adequate time could be found to devote to the large project.

5. Update of 1986 High Seas Sampling Program

Frank Thrower (NMFS, AK) reported that a preliminary total of 785 coded wire tags were recovered from the U.S. Observer Program for foreign and joint venture trawl fisheries during 1986 (Attachment 3A). Most of these

(73%) were recovered from chinook taken off Washington, Oregon and California. The substantial number of tags recovered in 1986 (Attachment 3B) is attributed to a pronounced increase in incidental catch of salmon in the groundfish catch from approximately 2,000 in 1985 to 45,000 in 1986.

Attachment 3B also presents a summary of the incidence of CWT marked salmon in landings examined by U.S. observers on board Japanese salmon mother ships within the U.S. EEZ. A total of 12,579 chinook were examined but none were found to be coded wire tagged.

The NMFS will not be carrying out observer sampling in the Gulf of Alaska in 1987 since there will be no foreign fishing. However, the State of Alaska is expected to maintain a low level sampling program in this region.

Quotas for the Bering Sea fisheries are about the same as 1986, with observer coverage by the NMFS at about 95% again. Similarly, sampling coverage of the Washington, Oregon and California groundfish fisheries is projected at 90-95% for 1987.

6. Stress and Depression on the Immune System

Dr. Carl Schreck (ODFW/OSU) presented some of his research on the effects of stress on the immune system of fish and the correlation with the effects of coded wire tagging.

As preface, Dr. Schreck explained that cortisol is the hormone of stress and can cause death in animals if levels are too high. Cortisol levels greater than 100 ng/ml in the plasma are indicative of stress. Field studies have demonstrated that at least 24 hours is required for a stressed fish to return to normal levels of cortisol (Attachment 4A).

Secondary effects of higher levels of cortisol include an impairment of a fish's ability to learn or remember. In addition, resistance to pathogens is greatly reduced.

During experiments done at Warm Springs and Round Butte hatcheries in Oregon, (Attachment 4B) it was found that acute stress associated with tagging caused the immune system to drop rapidly within the first four hours. It then rebounds briefly within 24 hours, followed by an even lower drop that lasts for several days before finally returning to normal levels of antibody-producing cells.

Dr. Schreck offered several suggestions on ways to minimize the stress normally associated with hatchery tagging operations:

(a) Crowding causes stress. Therefore, tagged fish should be returned to lower density pools in order to help reduce the cortisol level.

(b) Fish should be held for at least 24 hours after tagging before being released.

(c) Actual recovery time (i.e. when learning ability regained) should be determined.

(d) When possible, fish should be handled as parrs rather than smolts.

7. Histological Effects of Coded Wire Tags on Tagged Salmon

John Morrison (USFWS) discussed implications of his preliminary studies which documented significant olfactory nerve tissue damage caused by the placement of CWTs in the head region of small salmonids. He noted that up to 50% loss of the olfactory system was observed, with the damage being permanent. In all cases, the damaged nervous tissue was caused by incorrect tag placement. He further found that it was very difficult to get consistent tag placement with very small fish (400-1,200/lb. range). Consequently, the chance of nerve damage increases as the fish size decreases. Consequences of main-stem olfactory damage from coded wire tagging are not known at this time. However, the high incidence of nerve damage in small fish must be of concern since the role of olfaction in salmonid behavior is well documented.

Dennis Isaac (ODFW) voiced strong support for Morrison's work and urged a greater awareness of the potential problems associated with tagging small fish, particularly since agencies are now experiencing more and more pressure to tag fish at smaller sizes.

Lee Blankenship (WDF) also suggested that otolith marking techniques could be used as a way to get control groups for testing the effect of tagging on fish.

8. Impact of Army Corps of Engineers Tagging Study

The U.S. Army Corps of Engineers approved funding for a three-year tagging study to evaluate fish survival following passage at Bonneville's second powerhouse. A total of 1.8 million fall chinook (upriver brights) are scheduled to be tagged and released at Bonneville Dam each year for three years, starting with the summer of 1987.

Dr. David Damkaer, (NMFS, Seattle) project manager, reported to the Mark Committee that a 0.5% recovery rate was expected based on returns for earlier tagging studies using upriver bright stock. Total recoveries over the span of the project (1988-1993) were estimated to range between 9,000 and 27,000, with approximately 40% recovered by Canada. He noted, however, that the study did not include any funds to assist in recovery costs.

Chuck Willis (ODFW) presented a second analysis of the estimated recoveries that would result from the Corps/NMFS study. Assuming a total recovery rate of 0.5%, approximately 12,000 tag recoveries were projected in the B.C./Alaska fisheries. Of these, 36% would be recovered by British Columbia, while Alaska would recover 64%. Another 15,000 tags would be taken within the Columbia (in-river hatchery) over the next six recovery years.

Willis's analysis also demonstrated that while 27,000 total recoveries were possible, the yearly impact for Alaska and British Columbia was relatively minor in comparison. For example, the highest number of recoveries for any year was estimated to be 3,500 in 1991. Of these, 1,302 tags would be recovered by British Columbia, while Alaska would recover 2,278. Similarly, if the recovery rate was assumed to be 0.75%, the total recoveries in 1991 would only increase to 1,953 for British Columbia and 3,580 for Alaska (Attachment 5, Table 2).

Margaret Birch (CDFO) also presented results of a Canadian analysis (done by Paul Starr) on the potential impact of the Corps/NMFS study. The projected numbers of estimated recoveries (Attachment 6) is on the same order of magnitude calculated by ODFW. The bulk of the Canadian recoveries are expected at the CDFO's northernmost sampling areas of Prince Rupert and Masset. While the number of observed marks was only projected to increase by 1,000 per year, sampling problems and inadequate staffing levels present a major problem for handling the expanded workload. For example, an additional two technicians will be required to maintain CDFO's present processing operation in the fish plants.

Taking all of the above factors into consideration, CDFO projected that the Corps/NMFS project would cost an additional $8,000/year or $51,850 for the 1988-1993 recovery period.

Neither Canada or Alaska pressed for financial assistance from the Corps/NMFS during the meeting. However, it was made abundantly clear that large initiatives such as this study most definitely impact their respective recovery operations in both cost and logistics. As such, Canada and Alaska are carrying the burden of recovering the bulk of the tags without receiving compensation for this service.

9. CDFO's Concern over Increasing Levels of Tagging

Along a similar vein to Agenda Item 8, Margaret Birch (CDFO) expressed general concern over the continually increasing pressure on their tag sampling and recovery program. Over 40% of the tags now being recovered in the British Columbia are of U.S. origin. This level is expected to increase further with the attention now being given to tagging indicator stocks for harvest management. Additional pressure is expected from ADFG's planned large scale tagging operation to study exploitation and survival rates of SE Alaskan chum stocks, and from the Corps/NMFS project discussed above.

To further complicate matters, the Canadian government has attempted to sharply cut funding for CDFO's entire tag recovery program because of declining revenues. Hence, the entire issue of funding recovery costs for tags of non-recovery agencies is of increasing concern to CDFO.

The Mark Committee was fully supportive of the concerns raised by CDFO and assigned Lee Blankenship (WDF) and Margaret Birch (CDFO) the task of drafting a position statement to further underscore the importance of the issue. The position statement follows:

"Concern over Increasing Levels of Tagging

The Mark Committee members are concerned that major tagging initiatives (i.e. 1.8M tagged releases per year) being proposed by government and private agencies are not considering the resultant recovery costs to other Canadian and U.S. recovery agencies. Recent proposals to reduce budgets toward salmonid recovery activities (i.e. CDFO), as a result of declining revenues, will make new recovery requests for future recovery programs near impossible to fulfill. The Canada Dept. of Fisheries and Oceans, in particular, is at this stage now and the Tag Coordinator cautioned that there are presently no guarantees that specific sampling programs will be maintained. As a result of this discussion, the Committee made the following agreement to be noted in the minutes:

(a) Each recovery agency shall maintain a minimum sampling rate of 20% for all landed commercial salmonid catches which may contain coded-wire tagged/adipose clipped fish;

(b) that the Mark Committee be fully appraised of all major tagging initiatives that are forthcoming from the government and private sectors;

(c) that the recovery costs to intercept salmonid samples and process the returning adult fish be included in the budget proposal. This includes both Canadian and U.S. recoveries."

10. Regional CWT Database for the Pacific Salmon Commission

Bill Johnson (ADFG) reported on the status of the effort to develop an expanded CWT database for the Pacific Salmon Commission. He noted that a Working Group on mark recovery databases was established on February 18, 1986 under the director of the Data Sharing Committee. The initial members of the Working Group included Frank deLibero (WDF), Louis Lapi (CDFO), Bill Johnson (ADFG), and Ken Johnson (PMFC). Dick O'Connor (WDF), Mark Hamer (CDFO), Charlie Corrarino (ODFW), and Mike Messenger (NWIFC) were added to the group later.

Six specific tasks were assigned to the Working Group:

(a) determine the status and information content of available databases;
(b) define information files necessary for use of coded-wire tag data in fisheries management;
(c) describe limitations to data quality, timeliness of data availability;
(d) document data codes and file formats;
(e) describe protocols for use of various systems;
(f) recommend a preferred system to be adopted coastwide; and project time required before the system could be fully operational.

Work through February, 1987 has focused on the data processing aspects. The major recovery agencies each developed tables of what CWT data were available and the associated limitations of those respective data sets. Using this as a guide, the Working Group determined what data are necessary to build the required database.

The Working Group then used the existing PMFC formats for CWT release, recovery, and catch/sample data sets as a departure point for developing the PSC formats. This effort resulted in a number of new data elements being added to each of the three files.

Considerable work still remains before the new PSC data formats can be considered final. In addition, work in 1987 will focus on recommending a preferred system for PSC.

11. Proposal to Add Brands to Comment Field for CWT Release Report

Scott McCutcheon (NMFS, Columbia River) proposed that fish brands be reported to the Mark Center for those Columbia River fish which are both tagged and branded. The brands would be listed as part of the "Comment Field" in both the reporting forms and in the CWT Release Report.

He noted further that this would be very useful to NMFS staff since they use live traps to look at large numbers of fish in the Columbia River. The brands are particularly useful for tracking live animals and allow a cross-check on tagged stocks.

This proposal was approved by the Mark Committee.

12. Embedded Tag Replication

Northwest Marine Technology's (NMT) newly developed binary tags with embedded code replication were first introduced in 1985 on an experimental basis (agency 42 codes). The coding format was subsequently revised following the review and approval of a new design at the 1986 Mark Meeting. This resulted in a major increase in the number of replicated tag codes released in 1986.

Concerns have persisted, however, on the unknown impact of the new technology on the ability to decode the embedded replicate tags. Therefore, since the first major returns are expected in the 1987 fisheries, NMT staff were given an opportunity to respond to these concerns.

A. Loss of Parity Bit

The loss of the parity bit was foremost among the concerns since many individuals now rely heavily on it to help decode "problem" tags in standard format. NMT recognized the concern but noted that loss of the parity bit was the most practical means of providing embedded replication. They intended to compensate, however, by only issuing tag codes that have a odd number of bits for Data 1 and also for Data 2. This, in effect, will provide a type of "parity check". (Note: the agency 42 prototype tags do not conform to this convention).

B. Replicate Sequencing

Bill Johnson (ADFG) proposed that the Mark Committee authorize use of replicate tags only when such tags are coded with numerically consecutive groups beginning at "Ø1" (Attachment 7). For example, wire with four embedded replicates could only have group codes "Ø1, Ø2, Ø3, and Ø4". It would be invalid to use tags coded "ØØ, Ø1, Ø2, Ø3" or "Ø2, Ø3, Ø4, Ø5", etc. The reason for this is the data processing convention that the last group number also represents the number of replicate groups used in the code.

This proposal was approved by the Mark Committee. NMT also noted that their tag coding machine was "hard wired" to give only consecutive replicates starting with "Ø1" to the requested number of replicates.

C. Potential Problems with Decoding

Some concerns were also raised concerning potential problems when decoding the replicate tags because of the more complicated coding scheme. NMT agreed that the head labs probably would experience slower decoding and a possible increase in error rates. However, it was felt that the benefits of the embedded replicates would far outweigh the disadvantages.

13. New Binary Tag Format - Six Word Wire Tags

Some agencies have or will soon exhaust their available half length tag codes (B series). Therefore, NMT proposed to begin producing in 1987 six word wire with six coded stripes in place of the present four (see Attachment 8). This will prduce two new data fields, "Data 3" and "Data 4". All half length tag codes would be made in the new format as soon as possible while most full-length tags would retain the present 4-word format until such time as needed.

Special features of the new six-word tags include a slightly compressed pitch (distance between marks) to get more repeating data on a tag. Parity checks would be avaialble for Data 1, 2, 3, and 4 for full length tags when half length tags would have the parity limited to Data 1. The capacity of the new half length tags is 15 agencies and 23,000 codes per agency, while that of the full length tags is 63 agencies and 15 million codes per agency.

The Mark Committee expressed some reservations about the new plan since it meant another coding scheme for head labs to contend with in combination with the new embedded replicate tags, In addition, the same basic concerns were raised about decoding accuracy and decrease in head lab production (see Attachments 9 and 10).

It was recognized, however, that the problem of exhaused codes for B-series half length tags can not be solved unless a step such as this is taken. Therefore, it was agreed to give NMT tentative approval to proceed with their proposal. NMT, in turn, agreed to provide all head labs with sample wire for evaluation with 6-8 weeks. If problems and concerns still persisted, the Mark Committee would then re-address the issue by a telephone conference.

14. Update on Passive Integrated Transponder (PIT) Tagging

Scott McCutcheon (NMFS, Columbia River) reported that the PIT tags are now being encapsulated in glass rather than plastic. The switch to glass has eliminated previous problems of tag failure and tissue rejection found with plastic encapsulated tags.

In addition, new detection gear has been developed that has a detection rate of 99.3-99.6%. Other tests demonstrated that 97-98% of live fish swimming through a flume at 7-10 ft./second were decoded correctly.

McCutcheon also noted that the required handling ratio of brands versus PIT tag detection was approximately 413:1. Said another way, it requires far fewer PIT tags to produce the same amount of information on live fish that is now obtained from tracking large numbers of branded fish.

No adverse negative effects have been observed on the behavior of PIT tagged fish over the course of the past three years of evaluation. However, 40 mm length is recommended as the minimum size for tagging.

15. Update on Smith-Root, Inc. Activities

David Smith (SR) noted that his firm had revised their tag detector by making it both lighter and smaller. In addition, the sensitivity has been increased to the point where 100% of full length and 90% of the half length tags are now detected.

Smith-Root has also continued to improve their color-coded tags and offers them at considerable savings over binary tags. While recognizing the restriction on their use with the Adipose clip, David Smith argued that the tags are still a viable cost-effective option for some types of studies.

Lastly, Smith-Root has been actively involved in developing electrical barriers. This proved to be a highly successful product for Smith- Root in 1986.

16. Fin Mark Allocations for 1987

A list of fin mark requests was distributed to the Committee for review. All requested fin marks were approved.

ATTACHMENT 1

1987 Mark Meeting Attendees
(Incomplete Listing)

* Elmo Barney	MIC--Metlakatla, AK
* Margaret Birch	CDFO--Vancouver, B.C.
* Lee Blankenship	WDF--Olympia, WA
* Tim Cochnaeur	IDFG--Lewiston, ID
* Charlie Corrarino	ODFW--Portland, OR
* Karen Crandall	ADFG--Juneau. AK
Patricia Crumley	WDF--Olympia, WA
David Damkaer	NMFS--Seattle, WA
Richard Fralich	NMT--Shaw Island, WA
* Dennis Isaac	ODFW--Clackamas, OR
* Ken Johnson	PMFC--Portland, OR
Bill Johnson	ADFG--Juneau, AK
* JoAnne Karlton	CDFG--Rancho Cordova, CA
Jan Kallshian	NMT--Shaw Island, WA
William Kinney	WDF--Tumwater, WA
* Bryan Ludwig	B.C. Fish. Branch, Victoria, B.C.
Jerry Lukas	ODFW--Portland, OR
Mike Matylewich	CRITFC--Portland, OR
* Scott McCutcheon	NMFS--Pasco, WA
Jeff McGowan	WDF--Olympia, WA
* Charles Morrill	WDW--Olympia, WA
John Morrison	USFWS-Longview, WA
Bill Murray	ODFW--Clackamas, OR
Dick O'Connor	WDF--Tumwater, WA
Steve Olhausen	USFWS--Vancouver, WA
* Ron Olson	NWIFC--Olympia, WA
Carl Schreck	OR Coop. Fish. Res. Unit, OSU, Corvallis, OR
Anita Stohr	WDF--Tumwater, WA
* Frank Thrower	NMFS--Juneau, AK
* Bob Vreeland	NMFS--Portland, OR
Charles Willis	ODFW--Portland, OR
* David Zajac	USFWS--Olympia, WA

* Mark Committee members

ATTACHMENT 2

01/20/87

CWT RECOVERY RECORDS INCLUDED IN PMFC SUMMARY FILES

**** Preliminary Data Sets noted by Asterisks *****

YEAR	STATE/AGENCY								
1975									CDFO
1976									CDFO
1977	CA	OR	WA	AK		QDNR	NMFS-C.R.		CDFO
1978	CA	OR	WA	AK		QDNR	NMFS-C.R.		--
1979	CA	OR	WA	AK	FWS	QDNR	NMFS-C.R.		CDFO
1980	CA	OR	WA	AK	FWS	QDNR	NMFS-C.R.		CDFO
1981	CA	OR	WA	(2/87)	FWS	QDNR	NMFS-C.R.	NMFS-AK	CDFO
1982	CA	OR	WA	AK	FWS	QDNR	NMFS-C.R.	NMFS-AK	CDFO
1983	CA	OR	WA	AK	FWS	QDNR	NMFS-C.R.	NMFS-AK	CDFO
1984	CA	OR	*WA* (5/87)	*AK* (11/87)	FWS	(4/87)		NMFS-AK	*CDFO*
1985	*CA* (4/87)	OR	*WA* (9/87)	*AK* (12/87)	(3/87)	(4/87)		NMFS-AK	(2/87)
1986	*CA* (7/87)	*OR* (6/87)	*WA*	*AK* (6/87)	(6/87)	(4/87)		(4/87)	*CDFO* (6/87)

COMMENTS

I. Preliminary Data Sets

1. British Columbia's data are currently being regenerated on tape because of errors found in the 1978 sports data. Therefore all CDFO recovery data should be considered preliminary for the next few months until verified.

2. Washington's preliminary data for 1984-1986 only includes coastal fisheries. Puget Sound recoveries are not yet available.

II. Missing Data Sets:

1. Alaska (1981) -- These data are now being completely reprocessed by ADFG and should be completed by February, 1987.

2. NMFS-Columbia River (1978-1982) -- These data represent recoveries made in outmigrant juveniles. No sampling occurred in 1984 - 1986.

1986 Coded-Wire Tag Recoveries From The U.S. Observer Program For Foreign and Joint Venture Trawl Fisheries[1]

	FISHING AREA					
	Washington-Oregon California		Gulf of Alaska	Bering Sea		
Origin	Chinook	Coho	Chinook	Chinook	Chum	Total
Alaska			2		1	3
British Columbia	2	2	6	2		12
Washington	259[2]	15	3			277
Oregon	297	20	2			319
California	174[3]					174
TOTAL	732	37	13	2	1	785

(1) Results preliminary; head 94% processed

(2) 55% of the Washington tags were Snake River upriver brights from Lyons Ferry and Priest Rapids.

(3) 40% of the California tags from the Klamath River.

Incidence of coded-wire tagged chinook salmon in landings examined by U.S. observers on board Japanese salmon motherships within the U.S. EEZ and in incidental catches of salmon sampled by U.S. observers on board foreign groundfish vessels within the U.S. EEZ.

	Incidentally Caught in Groundfish Fisheries									Japanese Salmon Mothership Fishery		
	Washington, Oregon, California			Gulf of Alaska			Bering Sea					
Year	Examined	Coded-Wire Tagged	Percent Tagged	Examined	Coded-Wire Tagged	Percent Tagged	Examined	Coded-Wire Tagged	Percent Tagged	Examined	Coded-Wire Tagged	Percent Tagged
1981	2,210	61	2.76	1,389	1	0.07	3,063	0	0.00	3,837	0	0.00
1982	6.336	120	1.89	1,232	5	0.41	2,456	2	0.08	11,818	0	0.00
1983	1,765	29	1.64	2,675	8	0.30	3,077	1	0.14	6,615	0	0.00
1984	2,459	39	1.50	31,095	143	0.46	4,194	6	0.03	5,470	0	0.00
1985	1,193	30	2.51	4,073	41	1.01	4,368	5	0.11	12,588	0	0.00
1986[1]	36,700	775	2.10	--	13	--	--	1	--	12,579	0	0.00

[1] 1986 results are preliminary.

ATTACHMENT 3B

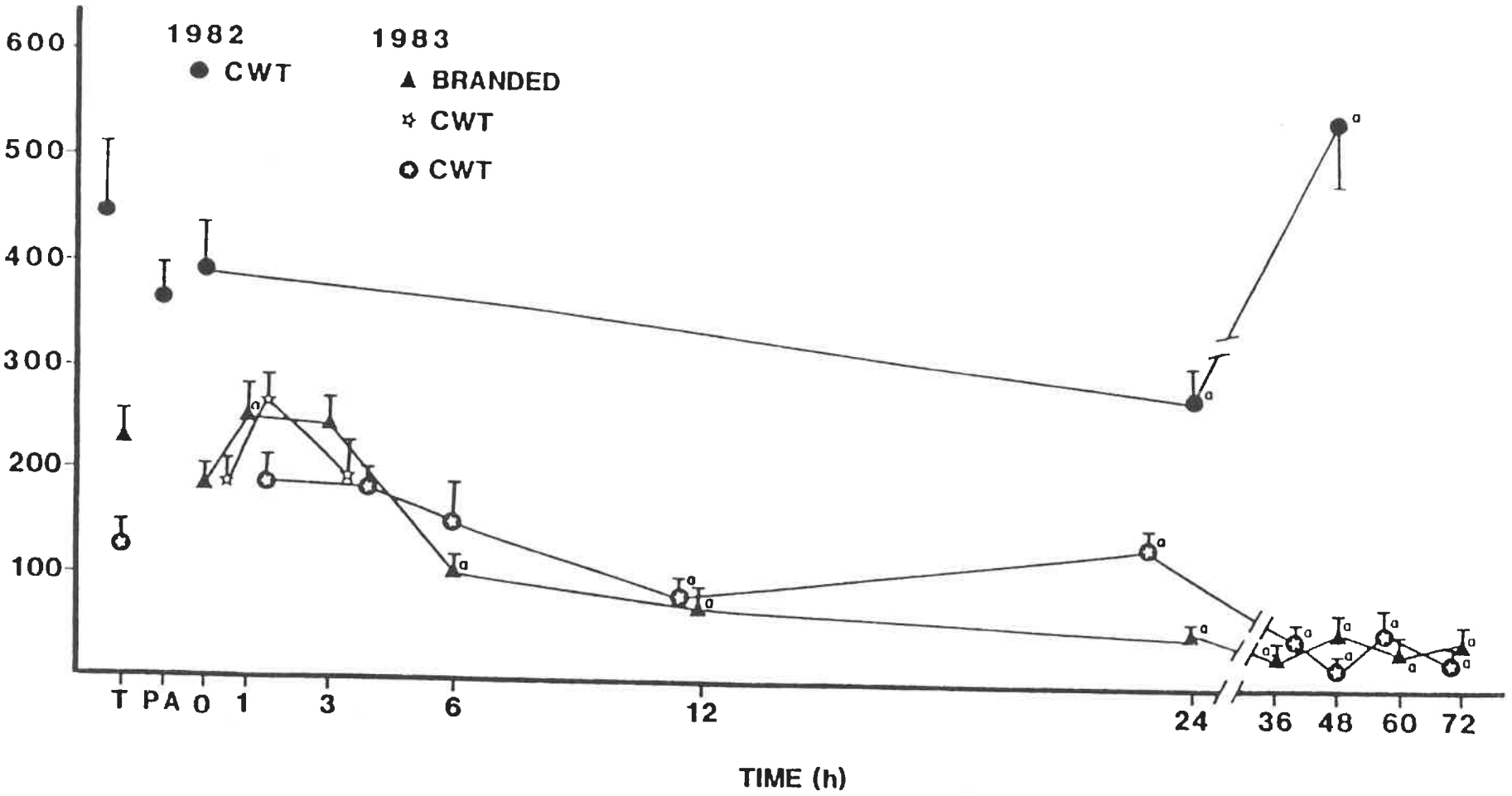

Figure 46. Plasma cortisol levels in juvenile fall chinook salmon collected from the marking facility at McNary Dam during July 14-22, 1982, and July 7-13, 1983. Fish were sampled from the holding tank (T), and after they were anesthetized (PA), and after they were fin-clipped and cold-branded (BRANDED), and after they were branded and had coded wire tags inserted into their snouts (CWT). Branded and CWT fish were also collected, held in large plastic tanks (ca. 100L) with flow-through water, and serially sampled through 72 h. All points are the means + SE of 10 to 12 fish. Points marked (a) are significantly different from T = 0 of same line ($P < .05$, LSD test),

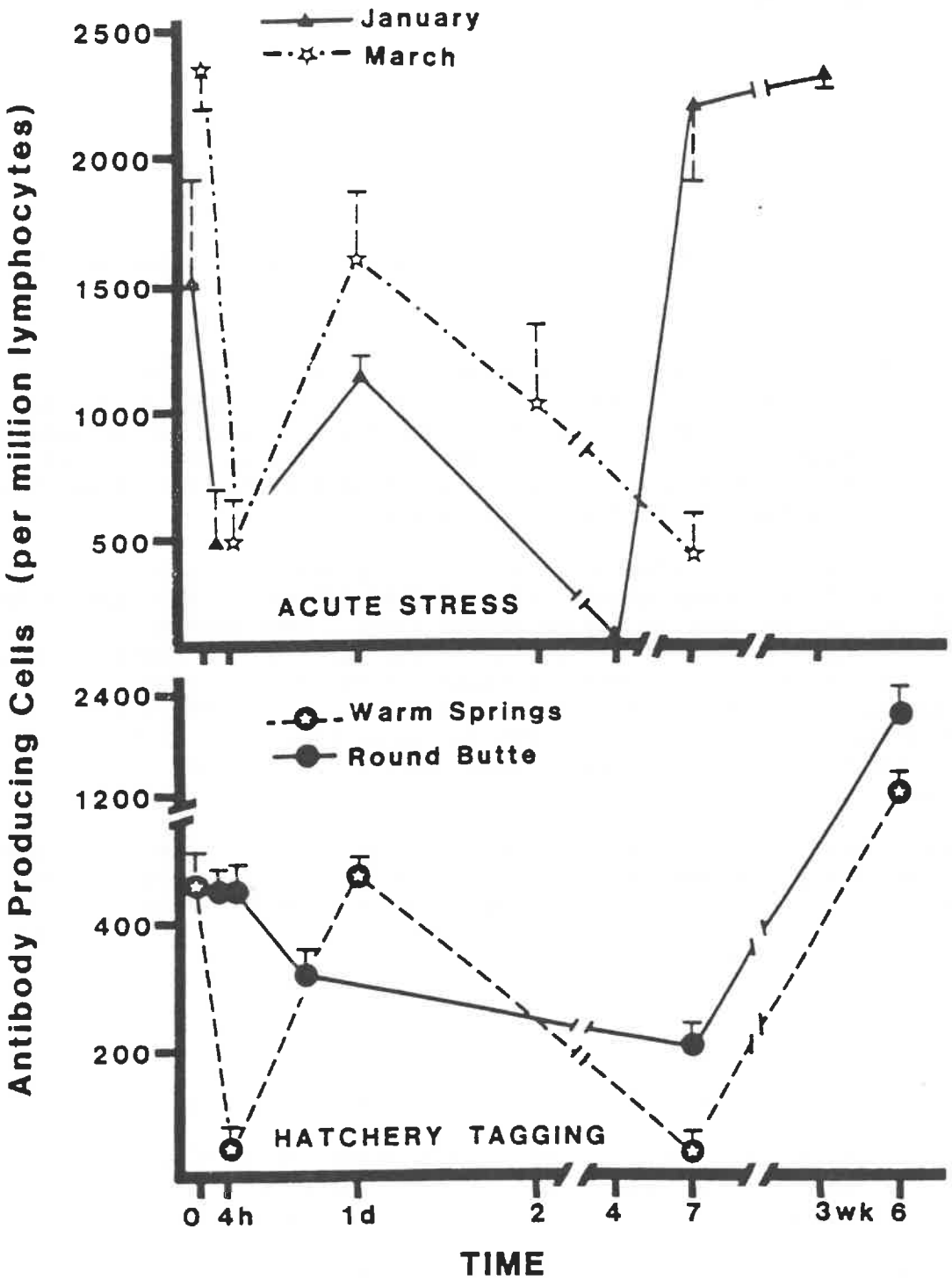

Figure 1. Antibody-producing cells (mean + 1 SE) generated from anterior kidney lymphocytes during 9 d in vitro culture with the antigen trinitrophenol-lipopolysaccharide. Lymphocytes were removed from juvenile spring chinook salmon at various times after an acute, 30 s stress in the laboratory setting (sample sizes: 6 to 10) or after tagging procedures at two fish hatcheries (sample sizes: 30 to 32).

ATTACHMENT 5

DEPARTMENT FISH AND WILDLIFE

MEMORANDUM

INTRA-DEPARTMENT

DATE: February 11, 1987

TO: Lloyd Phinney

FROM: Chuck Willis

SUBJECT: Tag Recovery for Corps Survival Past Bonneville Second Powerhouse Study

Attached are estimations of the number of CWT recoveries which may result each year (1988 through 1993) from marked releases of subyearling upriver bright fall chinook salmon at Bonneville Dam in the Columbia River. Releases of 1.8 million tagged fish annually are scheduled from 1987 through 1989 resulting from a Corps funded study of fish survival following passage at the Second Powerhouse.

These estimates are based upon information provided by Bob Vreeland (NMFS) on three tagged groups released from Bonneville Hatchery in June and July of 1980 and 1981 which showed overall mean recovery rates of 0.50% (total recoveries), 0.23% (all fisheries - mostly ocean), 0.08% (BC), and 0.14% (U.S. - mostly Alaska) for Table 1. I used proportionately increased rates to estimate what recoveries would be for the study design criteria of 0.75% for total recoveries in Table 2. Recovery rates used in Table 2, then, were 0.12% (BC) and 0.22% (Alaska).

Harold Hansen (ODFW) provided information on the mean rates of return for age groups two through six. These age group means were derived from seven to thirteen data points (separate marked groups) from brood years in 1977 through 1980 released from Bonneville Hatchery. The mean age group specific return rates were as follows:

Age Group	2	3	4	5	6	sum
Return Rate (%)	9.2	23.2	52.9	14.3	0.4	100.0

An exemplary calculation for an entry in Table 1 would be:

1.8 million marked fish released x 0.08% recovered in BC fishery x 9.2% recovered as two-year-olds = 132 CWT recoveries in BC fisheries in 1988 from marked fish releases in 1987 (1986 brood).

Please let me know if you have questions regarding these estimates. My phone number is (503)229-4524.

cwc
Attachment

L2-11

Table 1. Estimated annual recoveries of CWT'd upriver bright fall chinook salmon following release at Bonneville Dam, Columbia River assuming an overall total recovery rate of 0.50%.

Brood Year	Number Released	Estimated Recoveries						Location
		1988	1989	1990	1991	1992	1993	
1986	1.8 million	132	334	762	206	6		BC
		232	585	1,333	360	10		Alaska
1987	1.8 million		132	334	762	206	6	BC
			232	585	1,333	360	10	Alaska
1988	1.8 million			132	334	762	206	BC
				232	585	1,333	360	Alaska
TOTALS		132	466	1,228	1,302	974	212	BC
		232	817	2,150	2,278	1,703	370	Alaska
		364	1,283	3,378	3,580	2,677	582	Total

Table 2. Estimated annual recoveries of CWT'd upriver bright fall chinook salmon following release at Bonneville Dam, Columbia River assuming an overall total recovery rate of 0.75%.

Brood Year	Number Released	Estimated Recoveries 1988	1989	1990	1991	1992	1993	Location
1986	1.8 million	199	501	1,143	309	9		BC
		364	919	2,095	566	16		Alaska
1987	1.8 million		199	501	1,143	309	9	BC
			364	919	2,095	566	16	Alaska
1988	1.8 million			199	501	1,143	309	BC
				364	919	2,095	566	Alaska
TOTALS		199	700	1,843	1,953	1,461	318	BC
		364	1,283	3,378	3,580	2,677	582	Alaska
		563	1,983	5,221	5,533	4,138	900	Total

Fisheries and Oceans
Pêches et Océans

ATTACHMENT 6

Fisheries - Pacific Region
1090 West Pender Street
Vancouver B.C.
V6E 2P1

Pêches - Région du Pacifique
1090 rue Pender ouest
Vancouver (C.B.)
V6E 2P1

Your file Votre reference

Our file Notre reference

March 10, 1987

Charles F. Willis
Salmon & Steelhead Enhancement Coordinator
Fish Division, Dep't. of Fish & Wildlife
P.O. Box 59
506 S.W. Mill Street
Portland, Oregon 97207 U.S.A.

Dear Sir:

Re: Tag Recovery for Corps Survival
Past Bonneville Second Powerhouse Study

At your request, we have reviewed the pertinent information on the above proposal and prepared several comments for you to bring to the attention of the US Army Corps of Engineers.

1) Recovery Impacts and Costs

In light of our Salmonid Commercial Sampling and Recovery Program, the bulk of Canadian recoveries from this project will be made at our Prince Rupert and Masset locations, our most northern sampling areas in B.C. In 1986, approximately 1300 marked chinook were recovered at these locations; with this program on line, the number of observed marks is expected to almost double from the present level (ie: 2300 maximum). Even though the mark incidence for this species is minimal, we will have difficulties with some processing plants to permit access for an adequate sampling crew to sample most chinook catches.

This Department does not have any laws in place which allow a sampler the right to remove the heads from any adipose-clipped salmonid that may contain a coded-wire tag. Therefore, only certain processing plants are prepared to comply with our program. As a result, pre-season negotiations are regularly held with such companies to discuss appropriate access to sample their salmonid landings - in particular, large, whole, chinook salmon.

An additional two technicians will be required to maintain our present operation in processing all marked chinook salmon quickly. The plant operators simply do not tolerate large, marked chinook salmon being piled up at our work stations. At times, we can examine 2-3 vessels of salmon catch before returning to process the recovered sample. Therefore, with the potential increase in marked fish being available for processing,the

backlog simply cannot build up any greater than the current level.

Beginning in 1987 and subsequent years, our Kitimat River chinook production will begin to show strongly in northern BC commercial fisheries. This production may mask your program in terms of the proportions of Fall upriver Bright chinook being recovered and/or add to the complexity of our crews readily intercepting most chinook marks at our plants.

Secondly, another large proposal by SSE Alaska to coded-wire tag one million chum salmon over three years (1988-90), with recovery between 1990 - 1992, will have adverse impacts as well on our northern sampling locations. This other recovery request will occur during peak interceptions of the upriver Bright chinook stocks. The demand for sample crews to intercept troll-caught chum in conjunction with chinook recovery activities will be intense. It is definitely uncertain now whether or not all our crews and processing plants will cope with the forthcoming situation. (The estimated recovery costs being requested for the SSE Alaska chum proposal is $86,500 per year, or nearly $0.50 million for a five-year program.)

Given your understanding of the apparent constraints as stated above, the DFO recovery costs required to undertake the Corps proposal are provided below:

1)	Labour - additional technicians for July/August	$5,000
2)	Transportation - sample shipping	1,000
3)	Laboratory dissection and data processing	2,000
		$8,000/year (1987$)

1988 = $8,000 1989 = $8,250 1990 = $9,000
1991 = $9,300 1992 = $9,000 1993 = $8,300

TOTAL for 1988/93: $51,850

2) Analysis of Estimated Recoveries in Canadian and US Fisheries

Attached please find a memo which summarizes an analysis of estimated upriver Bright chinook recoveries using forward cohort analysis and historical data from 1981 and 1975 broods of this particular stock. We budgetted based on the table highlighted by the dark arrow.

...../3

3) Marking Design

We are concerned about the multiple numbers of mark groups (18 replicates of 20,000) being released at five different locations. However, given our telephone conversation last week, I appreciate your design, given the apparent constraints on labour to tag the fish and sufficient holding facilities. We only caution you, however, to consider the following points:

- no particular mark group should be held any longer in the truck when releases are being made; using several trucks and randomizing the order of locations will help to reduce possible bias; and

- small releases as proposed may be easy prey to predators at the time of release.

4) Summary

I trust the above information will be helpful to both your Department and the Corps of Engineers. As outlined above, the proposal will most definitely impact our recovery operations in both cost and logistics at the plants.

I hope that I have given a clear message from this letter that large initiatives such as the two discussed will cost recovery dollars to Canada. Funds directed to assist our program to achieve other agency goals are now becoming essential.

Yours truly,

Margaret Birch

Margaret Birch
Canadian Tag Co-ordinator
(604) 666-2796

MAB:tai
Encl.

cc: D. Schutz, Head, Biological Services CDFO
B. Riddell, Program Head, Salmon Stock Assessment CDFO
K. Johnson, Regional Mark Co-ordinator PMFC
L. Blankenship, Mark Co-ordinator, Washington DOF
K. Crandall, Mark Co-ordinator, Alaska DOF&G
R. Vreeland, Tag Co-ordinator, NMFS Portland
H. Schaller, Columbia River Inter-Tribal Fish Comm'n.
V. Palermo, Mark Recovery Program Biologist, Salmon Services CDFO

GOVERNMENT OF CANADA

MEMORANDUM

To> Margaret [illegible]
DFO Tag [illegible]ordinator

FROM> Paul [illegible]
[illegible]hinook [illegible] Assessment Biologist
1090 W. [illegible], [illegible]ancouver

March [illegible], 1987

SUBJECT: [illegible] Bright Tag Release of 1.8 Million

At your request, I performed an analysis of the expected recoveries [illegible] Canadian fisheries. At first, [illegible] model, but I decided [illegible] should be sufficient. A model run [illegible] a single brood year at the [illegible] the model will [illegible] the same answer as [illegible].

[illegible] for all Up-River Bright releases from the 19[illegible] brood year to the 1981 brood year. I used the [illegible] the first and last brood years to [illegible] harvest patterns that may affect this stock. The [illegible] that will affect the recoveries of this [illegible] recruitment survival. Since I have seven estimates [illegible], I have bracketed the expected [illegible] the Maximum, the Average, and the Minimum [illegible] survival over the seven observations.

[illegible] the results of the above analysis by [illegible] different [illegible] could [illegible] survival [illegible] level [illegible]

[illegible] as well, I [illegible]

FORWARD COHORT ANALYSIS OF UP-RIVER BRIGHT TAG RELEASE OF 1.8 MILLION

Total Recoveries by Age and Country (1981 BY Template)

	Alaska MIN	Canada MIN	South US MIN	Alaska AVG	Canada AVG	South US AVG	Alaska MAX	Canada MAX	South US MAX
Age 2	0	157	207	0	285	377	0	700	926
Age 3	90	696	2163	165	1268	3940	404	3111	9670
Age 4	983	1044	2955	1790	1902	5383	4393	4669	13210
Age 5	266	147	848	484	267	1545	1188	656	3792
Total	1339	2043	6173	2439	3723	11246	5985	9136	27598

Uses 1981 brood year harvest rates.

Total Recoveries by Age and Country (1975 BY Template)

	Alaska MIN	Canada MIN	South US MIN	Alaska AVG	Canada AVG	South US AVG	Alaska MAX	Canada MAX	South US MAX
Age 2	0	102	440	0	185	801	0	455	1965
Age 3	165	925	760	300	1686	1384	736	4137	3396
Age 4	1176	1163	2047	2142	2119	3730	5257	5200	9153
Age 5	499	500	1558	908	911	2838	2229	2236	6965
Total	1839	2690	4805	3350	4901	8753	8222	12028	21480

Uses 1975 brood year harvest rates

Explanations:

MIN ⇒ uses minimum pre-recruitment survival observed during 1975 - 1981 brood years.

AVG ⇒ uses average pre-recruitment survival observed during 1975 - 1981 brood years

MAX ⇒ uses maximum pre-recruitment survival observed during 1975 - 1981 brood years

Note: These are estimated recoveries. To obtain observed recoveries, they should be divided by 5 (the approx. sampling rate).

ATTACHMENT 7

STATE OF ALASKA

STEVE COWPER, GOVERNOR

DEPARTMENT OF FISH AND GAME

Coded Wire Tag Laboratory

PO Box 3-2000
Juneau, AK 99802
(907) 465-3483

February, 5 1987

Dr. J. Kenneth Johnson
Pacific Marine Fisheries Commission
305 State Office Building
1400 SW Fifth Avenue
Portland, OR 97201

Dear Ken:

In the course of studying CWT data representation for proposed PSC data sharing acitivities, I have developed a concern regarding embedded replicate tags. It may be appropriate for the Mark Committee to discuss this matter and adopt a standard.

Replicate tags in current use are physically capable of supporting replicate groups '00' through '07'. It is likely the upper limit will be extended beyond '07'. It has also been stated that "barring good reason to the contrary" group '00' will not be issued. This is fine as far as it goes. In order to mesh with data processing techniques all agencies appear to be adopting, though, I feel a more detailed protocol should be adopted for use of replicate tags.

Specifically, I propose the Mark Committee authorize use of replicate tags only when such tags are coded with numerically consecutive groups beginning with '01'. For example, wire with four embedded replicates would always have group codes "01, 02, 03 and 04". It would be invalid to use tags coded "00, 01, 02, 03" or "02, 03, 04, 05" or "01, 02, 04, 05".

The technical basis for this is the data processing convention that the last group number also represents the number of replicate groups used in the code. This is used in validating decoded tags. It is also used in apportioning release information, such as Number Tagged, to the individual groups.

If you consider it appropriate, I recommend my suggestion be brought before the Mark Committee.

Sincerely,

Bill Johnson
Division of Fisheries Rehabilitation,
Enhancement and Development

11-KILH

ATTACHMENT 8

Northwest Marine Technology, Inc.

X Shaw Island, Washington 98286 · 206/468-2340 · Telex 287944 NWMT UR
2401 Bristol Court SW, Olympia, Washington 98502 · 206/754-4304

28 October 1986

Dr. Ken Johnson
Pacific Marine Fisheries Commission
305 State Office Bldg.
1400 S.W. Fifth Avenue
Portland, OR 97201

Dear Ken:

Enclosed is a draft describing a new tag format with six encoded rows instead of the present four. Something of the kind is now essential as we are out of half-length codes. We propose to allow for full-length tags in a similar format.

Any comments you may have will be appreciated.

Best regards,

Keith

K. B. Jefferts, Ph.D.

DRAFT

28 October 1986

To: CWT Coordinators & Users

Subject: New Formats - Six Word Wire Tags

To accommodate user needs for more half-length tag codes and for other new features within a unified format, we will begin in 1987 producing six-word wire with six coded stripes in place of the present four. Two new data fields result, and are called Data 3 and Data 4. All half length tags will be made in the new format as soon as possible. Initially, most full-length tags will remain in the present 4-word format, with the six-word format used for special applications.

Examples of the new formats are:

Half-length

		8	4	2	1
Master Word			1	1 1	1
Data 1 /Parity	= 3	1*		1	1
Data 2	= 4		1		
Agency	= 9	1			1
Data 3	= 12	1	1		
Data 4	= 1				1

* = Common parity bit for all fields
Capacity: 15 Agencies 23 Thousand Codes Per Agency

Full-length

		P	32	16	8	4	2	1
Master Word				1	1	1	1 1	1
Data 1	= 42		1		1		1	
Data 2	= 6	1				1	1	
Agency	= 50		1	1			1	
Data 3	= 3	1					1	1
Data 4	= 8	1			1			

Capacity: 63 Agencies 15 Million Codes Per Agency

Replicate Tags

As with four-word wire, an alternate master word signals that a replicate group number is encoded in the parity bit field. The alternate master word is 0 0 1 0 1111 and interpretation of the parity bits is

Word	D3	A	D2	D1			
Parity Bits	0	0	0	1	=	1	
	0	0	1	0	=	2	
	0	1	0	0	=	4	
	1	0	0	0	=	8	etc.

This is like the previous case of four-word wire, in that the successive bits of the replicate field appear in the same order when the tag is rotated. The D4 parity bit encodes the overall parity of all fields.

We continue to avoid replicate number 0=0000, so there is a maximum of fifteen replicate codes.

For tags upon which two replicate codes can be read, i.e. tags where the replicate codes are at the ends of the tags, the reading rule is that with the tag in its normal orientation, i.e. least significant digits to the right, the rightmost legible replicate code be recorded. A rule such as this is needed to insure consistency in reading and to avoid statistical biases, and this one is adopted unchanged from the rule used in reading four-word replicate wire.

Fisheries and Oceans | Pêches et Océans

ATTACHMENT 9

Fisheries - Pacific Region
1090 West Pender Street
Vancouver, B.C.
V6E 2P1

Pêches - Région du Pacifique
1090 rue Pender ouest
Vancouver (C.-B.)
V6E 2P1

Your file Votre référence

Our file Notre référence

February 9, 1987

J. Kenneth Johnson
Regional Mark Processing Center
Pacific Marine Fisheries Commission
305 State Office Building
1400 S.W. 5th Avenue
Portland, Oregon 97201, USA

Dear Ken:

Re: Comments on Preliminary Agenda Item for 1987 Mark Meeting - Embedded Tag Replication and New Tag Format

My contract laboratory technicians have considered the potential impacts to tag decoding quality and scheduling related to changes proposed for CWT formats. Their comments regarding replicate and six bit tags are attached for your consideration. Clearly, their concern focusses on maintaining schedules and decoding accuracy.

In addition, I am concerned over how this issue relates primarily to the problem of eroding tag quality. It is now apparent that numerous tags that are dissected are damaged to the extent where a prompt and accurate decoding is either jeopardized or not possible. This system is largely due to poorly maintained tagging machines by various agencies, including ourselves. Therefore, the inclusion of yet more complicated ("noisy") tags into this environment may result in a reduction of laboratory quality.

I have provided you, and as many agencies, with examples of new scratched replicate type tags we have processed. I believe our laboratory possesses the ability to adapt and incorporate these changes successfully. However, a confident launch of these new formats will depend on an ability to instantly recognize the various individual formats and a process reliant on good tag quality.

Yours truly,

Margaret C. Birch

Margaret Birch
Tag Co-ordinator

MAB:tai
Attach.
Distribution: Tag Co-ordinators
cc: D. Zajac, US Fish & Wildlife Service
B. Ludwig, BC Fisheries Branch

Canada

APPENDIX "A"

I. SIX WORD CODED-WIRE HALF TAGS

a) The new proposal of using six word half-tags (involving an added DATA 3 and DATA 4) could be avoided if new "agency" codes were provided to those groups requiring more combinations. Otherwise, it would appear realistic to assume that the decoding of these half-tags will be slower and more complex in procedure. It should also be noted that the "cut-off" point of the half-tag already interferes with the binary etches on the pin.

b) Any "damaged" coded-wire tags may create added problems in decoding and recognizing the new format. Scratched and bevelled tags resulting in decoding problems are currently commonplace. (There are already two different half-tag series, H and B respectively.)

c) There will be an increase in errors and a decrease in production will be highly likely. As hundreds of CWT's are decoded in the lab every day, the lab can ill afford problems creating delays -- especially during "peak" season.

II. REPLICATE TAGS - PROBLEMS IN DECODING

Replicate tags will always present a quality control problem at the decoding stage. There will be doubts about the quality of interpretation in a much higher proportion of replicate tags than in currently used six bit tags and half tags. These doubtful interpretations will arise, primarily in damaged tags, because replicate tags can display either an odd or even number of marks in a given line or word. Thus replicate tags do not have a built-in check to enable the interpreter to ascertain that she has noted and read each mark in a given word.

Currently, six bit tags provide a means of checking that one has read each mark in their "odd number of marks on each line" format and ½ tags do the same via the rule that the total number of marks is usually odd. Replicates provide no such system of double checking whether or not one has read each mark in every line. When tags are damaged, these checks become critical to determining correct codes, enabling the reader to infer or deduce marks which damage has obliterated. As approximately 9% of the tags we retrieve are scratched, gouged, shaved or otherwise damaged, the rates of incorrect or doubtful readings will rise as will the number of indecipherable tags.

The proliferation of replicate codes will increase the possibilities of erroneous interpretations. The determination of the R# (encoded on replicate tags where formerly the parity check appeared) on damaged replicates will often be open to speculation. In addition, the determination that a given tag is a replicate tag may also be difficult as both types of replicate tags in current use can be mistaken for other tags, i.e. the six bit replicate may be mistaken for a traditional six bit tag and the five bit replicate resembles a ½ tag cut to normal tag size (this anomaly sometimes occurs in the tagging operation).

Although useful in determining subsample data, replicate tags may prove difficult in the long run. Due to faulty tagging equipment or laboratory techniques, scratching of the CWT's occurs, thus making it very difficult to decipher. This is how mistakes are made in reading. The parody check may be obliterated and interpreted as missing, thus the CWT will be missed as a replicate CWT or misread completely. Presently, the system of odd-numbered notches is the check used to determine the correct code for a CWT. If the parody were used as a factor to determine replicate tags, there would be no sure way in determining that the decoded CWT code was correct.

NOTE: We appreciate the need to expand the repertoire or tag codes. However, in addition to the problems of interpretation already discussed, we foresee great difficulties in teaching new staff (a) to recognize the type of tag they are presented with, and (b) to interpret each tag. This instructional problem will be especially serious during the transitional years when both old and new formats of tags will be passing through the laboratory.

For example -
- instruction on decoding the varying series of CWT's could take days;
- technicians not familiar with all binary forms will most certainly encounter confusion;
- the supervisor has no way of controlling the type of tag the new staff member encounters at any given moment; and
- a back-up of decoding would definitely ensue.

ATTACHMENT 10

Northwest Indian Fisheries Commission

6730 Martin Way E., Olympia, WA 98506 Phone (206) 438-1180

February 18, 1987

Mr. J. Kenneth Johnson
Pacific Marine Fisheries Commission
305 State Office Building
1400 S.W. 5th Avenue
Portland, Oregon 97201

Dear Ken:

In regards to comments on the agenda item - New Tag Format.

We have reviewed the proposal by NMT, comments of Margaret Birch and discussed the proposal internally. With the information that has been provided to date, I think we should reject any change in full size tags, that would require significant additional time or cost, to read and process. In addition, I think that the format for 1/2 tags should not be changed until after a thorough review, by data base experts of the feasibility of reusing codes after a delay of a set number of years.

The budget crunches that we all face are only going to increase as new demands for the CWT data are forthcoming. Already, the Pacific Salmon Commission is requesting that all chinook tags be processed including preliminary expansions by February 15, of the year following recovery. This will put a monumental strain on programs which just two years ago routinely produced data two and three years after recovery. We cannot afford to integrate a technology that will cause delays and additional costs, unless it proves to be the only viable option.

Sincerely,

Terry E. Wright

TERRY E. WRIGHT
Fishery Management Biologist

TW:sm

twpmfs21887