

Project #: R0204

Title: NPAFC Salmon Tagging

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Contract Period and Amount of Funding: July 1, 2002 to October 31, 2003: \$190,800 (extension approved through September 30, 2006)

Report Period: January 1 to June 30, 2006

Report Date: July 14, 2006

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Project Summary: The goal of the NPAFC Salmon Tagging project is to gain a better understanding of the distribution patterns, habitat utilization, and movements of Asian and North American salmon migrating in the Bering Sea and North Pacific Ocean. The research is coordinated by NPAFC as a part of their international cooperative salmon research program, the Bering-Aleutian Salmon International Survey (BASIS). Funding from NPRB is used primarily to purchase tags that are deployed on salmon caught during BASIS research vessel cruises in the Bering Sea and Gulf of Alaska. Several types of tags, ranging from simple numbered plastic discs to complex electronic tags that record sea temperature, depth, salinity, and daily position estimates are used. The BASIS working group of NPAFC coordinates, implements, and reports the results of our salmon tagging research. The proposed work complements ecosystem research and monitoring activities of other organizations in the North Pacific.

Progress Summary:

In January and February, a Japanese vessel, the *Kaiyo maru*, made a rare winter research cruise to obtain information on the distribution and physiological ecology of wintering salmon in the North Pacific Ocean. Adverse weather conditions limited fishing, and subjected fish in the trawl to greater than usual tumbling in the net. Consequently, few healthy fish were available for tagging. No electronic data storage tags (DSTs) were deployed, but 24 salmon were tagged with disk tags (16 chum, 7 pink, 1 sockeye).

In May and June 2006 24 DSTs were released during the research cruise of the same vessel. Tags were released in the central North Pacific Ocean and Bering Sea, between 160°W and 180° longitude and between 50°N and 55°N latitude. Two types of DSTs were used: TD tags (recording temperature and depth) and CTD tags (recording conductivity (salinity), temperature, and depth). These included new tags received in 2006 (15) and reused or remaining tags (9). In addition, 121 disk tags purchased with NPRB funds were used on this cruise.

Data Tags Released in May and June 2006:

	Sockeye	Chum	Chinook	Total
CTD			1	1
Temperature-Depth	15	5	3	23
Total DST	15	5	4	24

In our last progress report, we reported recovery of a 2004 TD tag from Sakhalin, Russia, but not yet returned. We have now received the tag, and it contains good data from June to October 2004 (Fig. 1).

Recoveries of three tags from tagging in 2006 were reported shortly after the end of the reporting period, but preliminary information is provided here (Table 1). One recovery was from a Yukon River chinook salmon carrying a CTD tag (Fig. 2). We believe this is the first recovery of a Yukon chinook tagged on the high seas as a maturing fish, and information from the tag should be useful in understanding the behavior of maturing chinook in and near the eastern Bering Sea shelf. The fish spent most of its time between the surface and about 40 m, but made some excursions to 80-130 m, perhaps at the shelf break. This is also the first recovery from a Pacific salmon of a tag with reliable salinity data. (Of three previous recoveries of CTD tags, reported in 2004, two had faulty salinity data and one tag failed completely.)

One can clearly see the point where the fish moved into an estuarine area of reduced salinity, moved back to higher salinity, then entered the river. The other two tags were from sockeye salmon returning to areas of Bristol Bay and have not yet been received.

Table 1. Recoveries and returns of data storage tags in 2006. Tagging location designated as BS (Bering Sea).

Tag Type	No.	Species	Tagging Location	Tagging		Release Date	Recovery Date	Recovery Area
				Lat.	Long.			
TD	7517	chum	BS	55°00	175°W	6/30/04	10/5/04	Sakhalin Island, Russia
CTD	1899	chinook	BS	54°50	175°W	6/8/06	6/30/06	Yukon River, Alaska
TD	10650	sockeye	BS	54°50	175°W	6/8/06	7/5/06	Nushagak, Alaska
TD	10638	sockeye	BS	54°50	175°W	6/8/06	7/5/06	Egegik, Alaska

Project Administration and Management:

The NPAFC Salmon Tagging project was approved on June 20, 2002. A Memorandum of Understanding between NPRB and NPAFC was signed on January 29, 2003. Extensions of the project were approved by NPRB through October 30, 2005 and subsequently to September 30, 2006.

There were eight temperature-depth tags recovered from salmon in 2004 and 2005 which were available for reuse, one unused CTD tag remaining from 2005, and 279 unused disk tags. Because of favorable changes in the price of tags after our proposed budget was submitted, funds remained in the equipment budget. We used some of these funds to purchase an additional 15 temperature-depth tags, to take advantage of three proposed research cruises in 2006: a winter cruise aboard the Japanese vessel *Kaiyo maru*; a late spring cruise aboard the same vessel; and a late summer cruise aboard a U.S. vessel, the *Oscar Dyson*. All DSTs were used on the *Kaiyo maru* during the spring cruise.

Tags purchased with NPRB funds in 2006:

Tag type	Maker	Model	No.	Date received
Temperature-Depth	Lotek	LTD_1100-500	15	2/7/06

Travel and contract funds were used to support a U.S. scientist on the first leg of the winter *Kaiyo maru* cruise. U.S. scientists also participated and assisted with tagging on the second legs of the winter and spring cruises of the *Kaiyo maru*.

Funds from the equipment category were also used to support completion of the live box for attachment to a trawl, which was first proposed in July 2004. (Most BASIS sampling is by trawl, and few fish caught in trawls are healthy enough to be tagged. To increase this number, we have copied a design for a box which fits on top of a trawl and diverts fish into a space where they are protected from damage.) Construction and design problems had delayed completion of the box. It is scheduled for testing and implementation in August 2006 on a cruise of the U.S. vessel *Oscar Dyson*.

In April 2006 approval was sought and received to transfer funds remaining in several categories of the budget into the contractual/consultants category, for support for preparation of a final report of this project. The University of Washington has been contracted for preparation of the report, and work on it has been initiated.

Action planned for the remainder of the project (until 30 September 2006):

The final cruise for this project will be that of the U.S. vessel *Oscar Dyson* in August and September. This cruise will be used to test the live box and to tag suitable fish with remaining tags. There are 134 disk tags remaining and possibly two TD tags which have been used but can be re-used. The final report for the project will be completed.

Outreach

A list of outreach activities performed for this contract is provided following the figures:

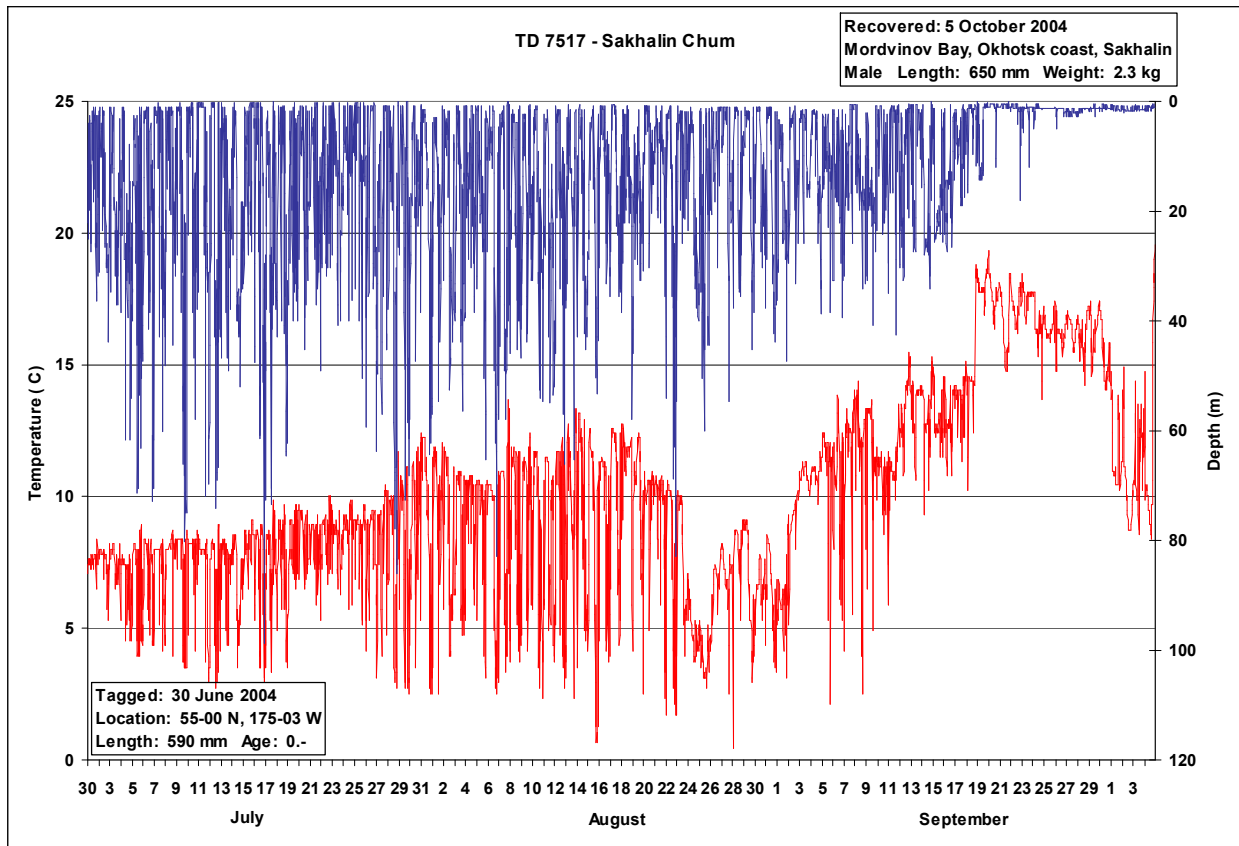


Fig. 1. Sea temperature (°C on left axis, red line) and depth (m on right axis, blue line) data from TD 7517. Chum salmon released in the Bering Sea (175°03'W, 55°00N) on 6/30/04 and recovered on Sakhalin Island, Russia, on 10/5/04.

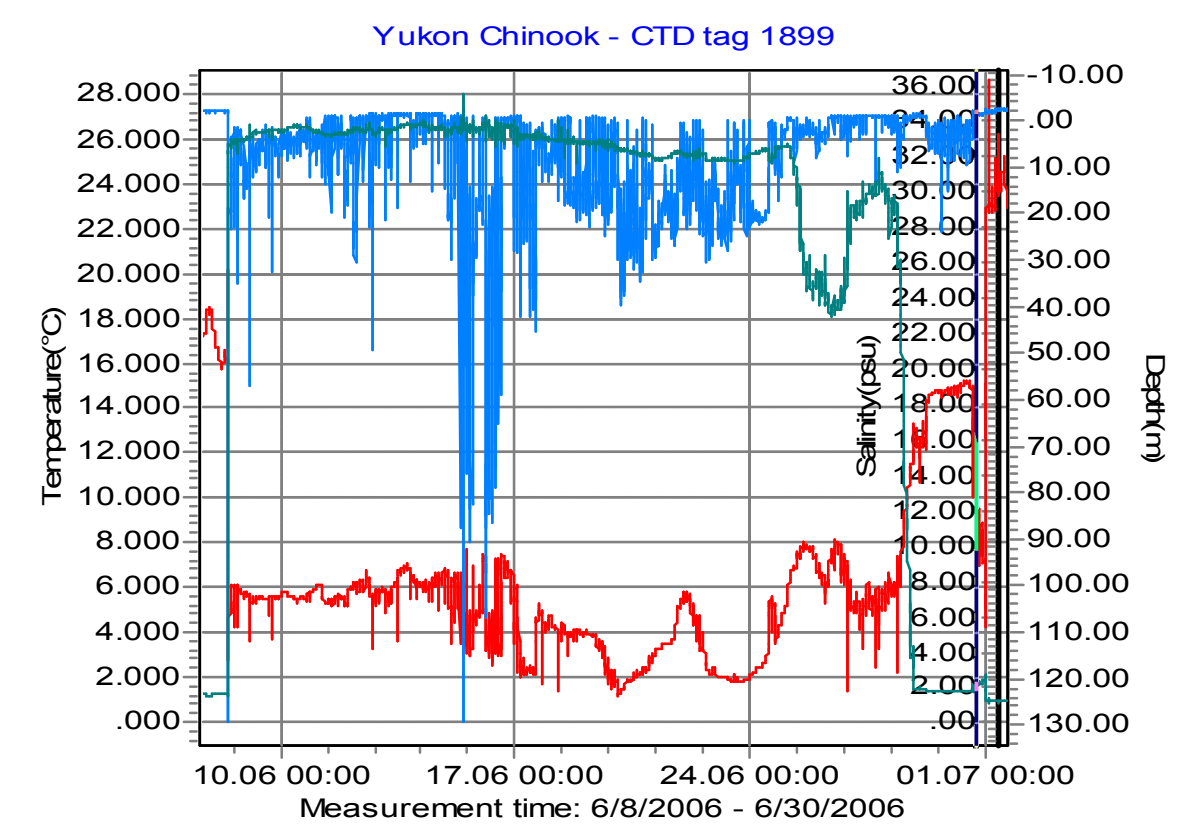


Fig. 1. Sea temperature (°C on left axis, red line), depth (m on right axis, blue line), and salinity (psu, on second right axis, green line) data from CTD 1899. Chinook salmon released in the Bering Sea (175°08'W, 54°50N) on 6/8/06 and recovered in the Yukon River on 6/30/06.

Outreach

Presentations:

R. Walker presented a paper summarizing the results of new information from U.S. and NPRB tagging programs at an NPAFC Workshop, "BASIS-2004: Salmon and Marine Ecosystems in the Bering Sea and Adjacent Waters," held in Sapporo, Hokkaido, Japan, October 30-31, 2004, and an extended abstract of this paper was published in NPAFC Technical Report 6.

(Walker, R.V., N.D. Davis, K.W. Myers, and J.H. Helle. 2005. New information from archival tags from Bering Sea tagging, 1998–2004. NPAFC Tech. Rept. 6:38-40.)

R. Walker presented a paper summarizing the results of new information from U.S. and NPRB tagging programs at the Annual Meeting of the American Fisheries Society held in Anchorage September 11-15, 2005. The paper was part of a special symposium on Bering Sea research under the BASIS program of NPAFC, "Science Bridging Five Nations: The Bering-Aleutian Salmon International Survey."

(Walker, R.V., N.D. Davis, K.W. Myers, and J.H. Helle. New information on vertical distribution and thermal habitats of salmon in the Bering Sea from archival tags.)

R. Walker presented a paper and submitted a manuscript on depth distribution of salmon, which relied heavily on data collected from NPRB tagging, for inclusion in the proceedings of the joint NPAFC-PICES symposium "The Status of Pacific Salmon and their Role in North Pacific Marine Ecosystems", held on Jeju Island, Korea, October 30-November 1, 2005.

(Walker, R.V., V.V. Sviridov, S. Urawa, and T. Azumaya. Spatio-temporal variation in vertical distributions of Pacific salmon.)

Tag Drawing:

To encourage return of NPRB-purchased data tags, all high seas salmon tags returned in 2002, 2003, and 2004 were entered into a drawing for four prizes: a 1st prize of \$5,000, a 2nd prize of \$3,000, a 3rd prize of \$1,500, and a 4th prize of \$500. A total 64 eligible tags (44 from Japan, 9 from Russia, and 11 from the United States) were entered (eligible tags were those returned by non-agency personnel). The drawing was held during a plenary session at the NPAFC Annual Meeting in Sapporo, Japan, on October 29, 2004. All four prizes were won by Japanese fishermen, reflecting the fact that most tagging took place on research vessels operating at times and places likely to coincide with Japanese chum salmon migrations.

<http://www.npafc.org/new/publications/Newsletter/NL17.pdf> (p. 6)

Newsletters:

NPAFC has reported research progress on the tagging program and the NPRB tag drawing in its biannual newsletter:

[http://www.npafc.org/new/publications/Newsletter/Vol7\(2\).PDF](http://www.npafc.org/new/publications/Newsletter/Vol7(2).PDF) (p. 6)

<http://www.npafc.org/new/publications/Newsletter/NL16.pdf> (p. 5)

<http://www.npafc.org/new/publications/Newsletter/NL17.pdf> (p. 6)

<http://www.npafc.org/new/publications/Newsletter/NL18.pdf> (p. 7)

NPAFC Documents:

Five NPAFC documents have been submitted detailing the releases and recoveries of tags purchased with NPRB funds:

Fukuwaka, M., S. Urawa, S. Yoshimitsu, N.D. Davis, and R.V. Walker. 2005. Recoveries of high-seas tags in Japan in 2004, and tag releases and recoveries of fin-clipped salmon from Japanese research vessel surveys in the North Pacific Ocean in summer of 2005. (NPAFC Doc. 889.) Hokkaido National Fisheries Research Institute, Fisheries Research Agency of Japan, Kushiro. 12 p.

- Nagasawa, T., M. Fukuwaka, S. Urawa, K. Hirasawa, N. Davis, and R.V. Walker. 2004. Recoveries of high-seas tags in Japan in 2003, and tag releases and recoveries of fin-clipped salmon from Japanese research vessel surveys in the North Pacific Ocean in fall of 2003 and summer of 2004. (NPAFC Doc. 786.) Hokkaido National Fisheries Research Institute, Fisheries Research Agency, 116 Katsurakoi, Kushiro 085-0802. 13 p.
- Walker, R.V., N.D. Davis, K.W. Myers, and M. Fukuwaka. 2003. Releases and recoveries of U.S. salmonid data storage tags, and recoveries of high seas tags in North America, 2003. (NPAFC Doc. 722.) SAFS-UW-0308. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. 14 p.
- Walker, R.V., N.D. Davis, K.W. Myers, S. Urawa, and K. Hirasawa. 2004. Releases and recoveries of U.S. and NPRB salmonid data storage tags, and recoveries of high seas tags in North America, 2004. (NPAFC Doc. 806.) SAFS-UW-0406. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. 23 p.
- Walker, R.V., N.D. Davis, K.W. Myers, J.H. Helle, M. Fukuwaka, S. Urawa, V.I. Karpenko, A.B. Dekshstein, and S. Zolotukhin. 2005. Releases and recoveries of U.S. and NPRB salmonid data storage tags, and recoveries of high seas tags in North America and Russia, 2005. (NPAFC Doc. 904.) SAFS-UW-0504. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. 20 p.

Websites:

NPAFC and the University of Washington have maintained websites to provide information and encourage return of tags:

NPAFC's tag recovery and reward program web page: http://www.npafc.org/new/science_fishtag.html

UW's tag recovery program web page: <http://www.fish.washington.edu/research/highseas/tagging.html>