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 October 31, 2005)

Report Period: January 1 to June 30, 2004

Report Date: July 13, 2004

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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 the North Pacific Marine Science Organization (PICES) and Global Ocean Ecosystem Dynamics (GLOBEC), as well as the electronic tagging research activities of the Pacific Ocean Salmon Tracking (POST) program of the Census of Marine Life.

Progress Summary:

In our last progress report, we reported recoveries of 10 electronic data storage (DST) tags in 2003 and included graphs of data from six of those tags. Subsequently we have received the other four of the reported tags, and graphs of their data are in Figs. 1-3. These include the second DST from a Russian sockeye salmon (Fig 1), a Japanese chum salmon (Fig. 2), and a chum salmon caught in the western Bering Sea off the coast of Kamchatka (Fig. 3). One of the tags, on a Kamchatka pink salmon, was damaged and no data were recoverable.

A new DST recovery from 2003 tagging was reported: an iButton from a chinook salmon tagged as an immature fish in the Gulf of Alaska was caught in a tribal fishery in the Columbia River in Washington. This is the first DST recovery from an overwintering Pacific salmon, although the tag was programmed to finish collecting data in December 2003. It is also one of the few recoveries of tagged Columbia River chinook salmon. This is the only tag recovery from *Kaiyo maru* tagging (27 iButton and temperature-depth tags released) in the Gulf of Alaska in 2003 (4% recovery rate). To date, the fisherman has not returned the reported tag.

A new DST recovery from 2002 tagging was reported and returned: a temperature-depth tag from a chinook salmon tagged as an immature fish in the central Bering Sea in July 2002 and recovered in the Yukon River, Alaska, in June 2004. This tag provides an extraordinary two-year time series of temperature-depth data (Fig. 4).

Additional information on NPAFC's tag recovery and reward program can be found on our web page (http://www.npafc.org/, see "Fish Tag Recovery Program").

Project Administration and Management:

The NPAFC Salmon Tagging project was approved in on June 20, 2002. A Memorandum of Understanding between NPRB and NPAFC was signed on January 29, 2003. Funds for the purchase of tags were transferred to NPAFC in mid-April 2003, but the transfer was too late for the manufacturer to provide tags before the start of the BASIS field season in May 2003. Due to delays in funding significant opportunities to tag and release salmon during BASIS research cruises in 2002 and 2003 were lost. An extension of the project through October 30, 2005 was requested by NPAFC and approved by NPRB on December 19, 2003.

Because of manufacturing problems, no geolocation tags could be delivered for the 2004 tagging season. (Lotek geolocation tags are the only geolocation tags small enough to be carried by a salmon.) Instead, a substitute tag was ordered from Star-Oddi, an Icelandic company with a proven record of providing data storage tags for research on salmon and other species in the Atlantic Ocean. The substitute tags (CTD tags) record conductivity (salinity), temperature, and depth. The costs for the CTD tags are less than for the geolocation tags. Total expenditure for the CTD tags and associated equipment and software for attaching and communicating with the tags was $16,693.

Tags purchased with NPRB funds in 2004:

Tag type	Maker	Model	No.	Date received
Temperature-Depth	Lotek	LTD_1100-500	100	4/8/04
iButton	AlphaMach	iBKrill	100	4/14/04
CTD	StarOddi	DST CTD	20	5/21/04

All tags, including tags remaining from the 2003 field season, have been distributed between two Japanese research vessels (the *Wakatake maru* and the *Kaiyo maru*). Both vessels will be operating in the central North Pacific and Bering Sea. The allocation of tags between the two vessels is as follows:

Data Tag Allocations for 2004:

	Wakatake	*Kaiyo*	Total
CTD	15	5	20
Temperature-Depth	66	50	116
iButton	75	106	181
Total DST	156	161	317

In addition, all 1,000 disk tags purchased with NPRB funds in 2003 have been allocated to the *Wakatake maru*.

Live Boxes for Trawls

In addition to tag purchases, we are developing a live box for attachment to a trawl. The rationale for this is that most BASIS sampling is by trawl, and few fish caught in trawls are healthy enough to be tagged. To increase this number, we are copying a Norwegian design for a live box which fits on top of a trawl and diverts fish into a space where they are protected from damage. An NMFS scientist will study a modification of this trawl which has been successfully used for Atlantic salmon on the US East Coast. Two boxes will be built by fabricators in Dutch Harbor, Alaska, for testing with the trawl used on US BASIS cruises in the Bering Sea. One box will be larger, to capture immature and maturing salmon. The other, about half the size, will be used for juveniles. If successful, the designs will be shared and the live boxes will be available for other BASIS cruises wishing to use it with their trawls. Additional benefits of the live boxes include protecting fish from scale loss, so that collection of better scale samples should be possible, and keeping fish alive for physiological samples. The cost of the live boxes will be

approximately $11,000, and the cost of associated travel will be $2,000. This will be covered by items in the proposal budget for supplies and travel and surpluses from tag purchase funds.

Tag Drawing
All tags returned in 2002, 2003, and 2004 will be eligible for the drawing. The total number of tags reported thus far is approximately 50. We will enter all tags returned in 2004, up to a cut-off date of October 20, just before the NPAFC Annual Meeting in Sapporo. There are 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.

To encourage return of tags released in 2005, we would like to have an additional drawing at the 2005 NPAFC Annual Meeting or in 2006 at the Research Planning meeting. While this was not budgeted in our original proposal, there may be enough surplus funds for a drawing. Until we have completed tag orders and plans for 2005, we cannot specify the exact amount or number of prizes now, but we expect them to be smaller than for the 2004 drawing.

Action planned for 2005:
In 2005 the final delivery of tags from NPRB funding will be used by BASIS research vessels that capture salmon suitable for tagging. There are 100 tags planned for delivery in 2005 (20 geolocation tags and 80 temperature-depth tags). Due to lower-than-anticipated costs of tags, there may be sufficient funds remaining to purchase additional iButton tags in 2005.

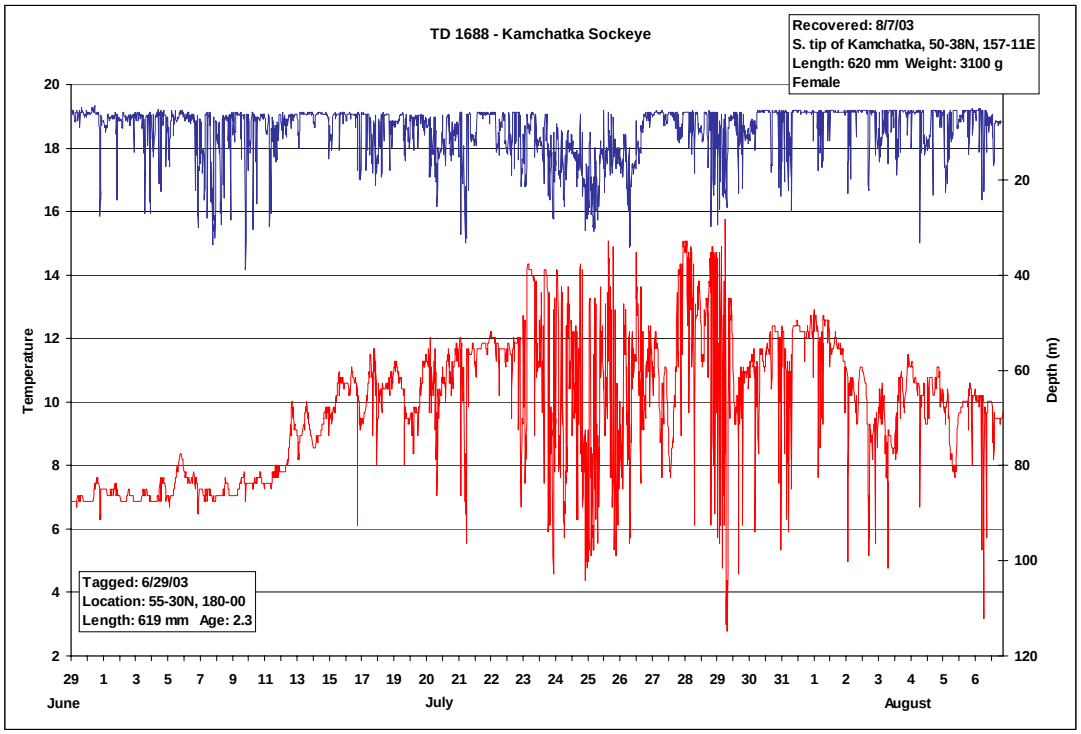

Fig. 1. Sea temperature (°C on left axis, red line) and depth (m on right axis, blue line) data from TD 1688. Sockeye salmon released in the Bering Sea (180°00', 55°30N) on 6/29/03 and recovered off the southern tip of Kamchatka, Russia on 8/7/03.

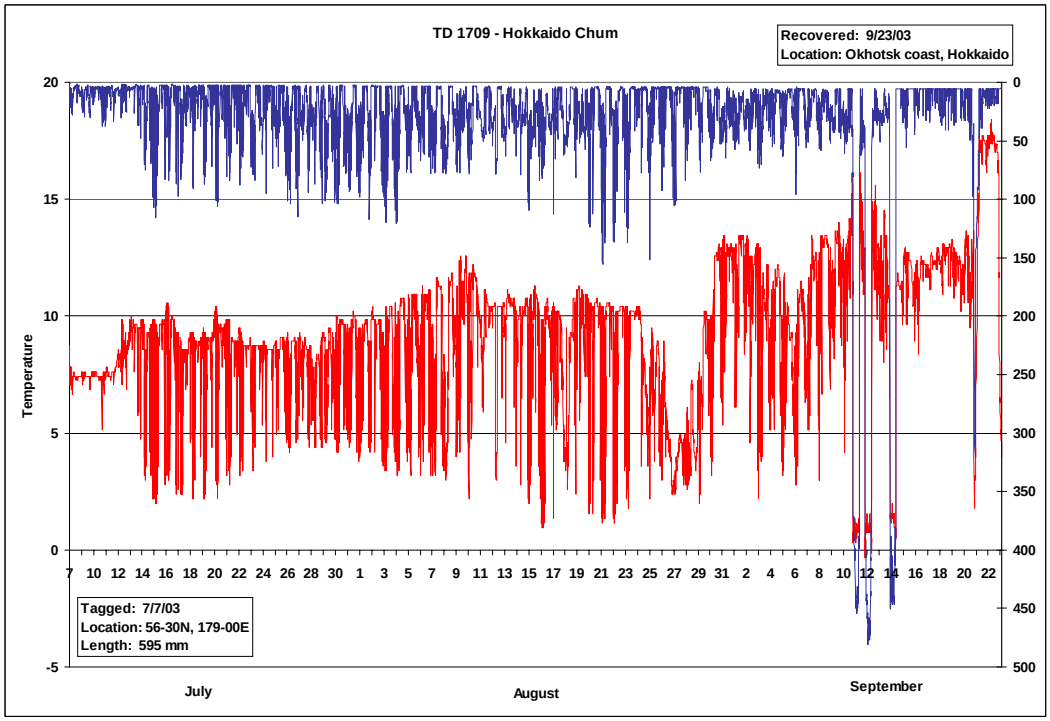

Fig. 2. Sea temperature (°C on left axis, red line) and depth (m on right axis, blue line) data from TD 1709. Chum salmon released in the Bering Sea (179°00'E, 56°30N) on 7/7/03 and recovered on the Okhotsk Coast, Hokkaido, Japan on 9/23/03.

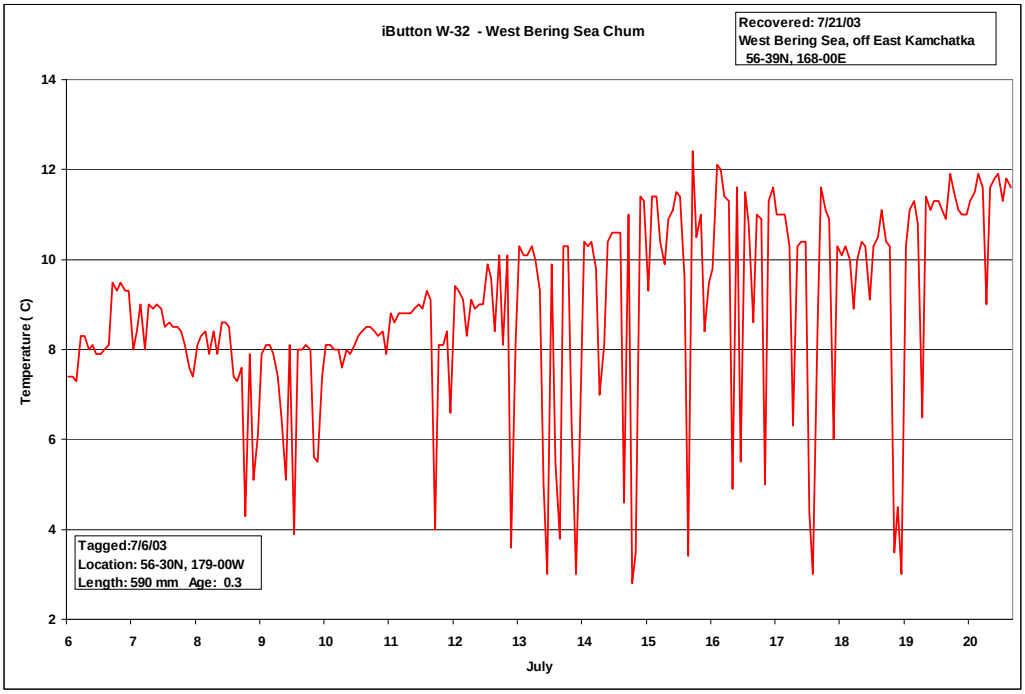

Fig. 3. Sea temperature (°C) data from iButton tag W-32. Chum salmon released in the Bering Sea (56°30N, 178°00W) on 7/06/03 and recovered in the western Bering Sea off the coast of Kamchatka on 7/21/03.

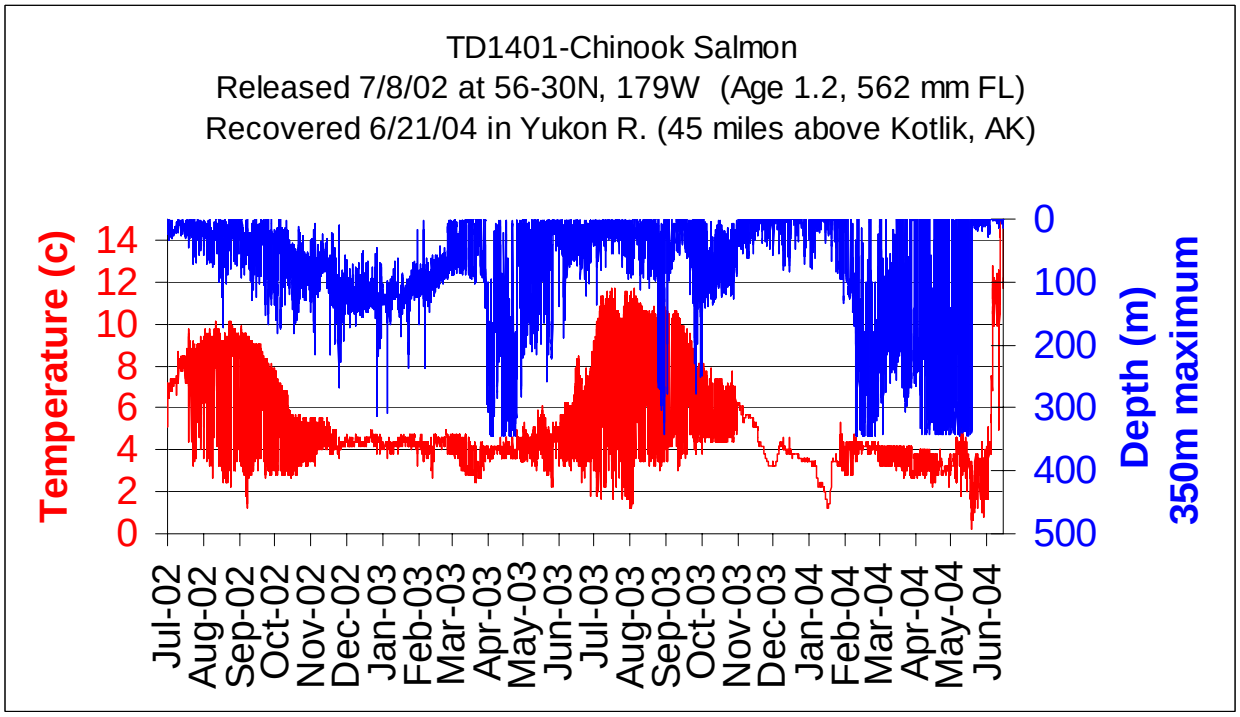

Fig. 4. Sea temperature (°C on left axis, red line) and depth (m on right axis, blue line) data from TD 1401. Chinook salmon released in the Bering Sea (179°00'W, 56°30N) on 7/8/02 and recovered in the Yukon River, Alaska, on 6/21/04. The tag did not record depths that exceeded a maximum of approximately 350 meters.