PTAGIS

PIT-Tag Information Systems

Columbia Basin

Newsletter

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IN THIS ISSUE

CALLING ALL TAGGERS

The PTAGIS project is soliciting experienced PTAGIS users that would like to participate in beta-testing the new PTAGIS web site. If you are interested, please send an e-mail to carters@psmfc.org with your contact information.

The PTAGIS Newsletter is published periodically by Pacific States Marine Fisheries Commission.

We welcome input from the PTAGIS community, so email or write us with your story ideas.

If you have questions regarding the contents of this publication, or about the PTAGIS program, please contact Carter Stein, PTAGIS Program Manager.

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A Fisheries Data Project of the Pacific States Marine Fisheries Commission

NEW ADULT LADDER DETECTORS

at Hiram M. Chittenden Locks

Installation of PIT-tag antennas at selected submerged orifices and overflow weirs at Hiram M. Chittenden Locks adult ladder was completed on June 8, 2004.

Chuck Ebel of the U.S. Army Corps of Engineers, Seattle District (Corps) coordinated the construction and installation of the antennas which was funded jointly by the Corps, Washington Department of Wildlife (WDFW), Seattle Public Utilities, King Conservation District, and the Cedar River Anadromous Fish Committee. The antennas were designed by Biomark with input from fish passage engineers at NOAA Fisheries and WDFW, Corps hydraulic and structural engineers, and fish biologists from the Corps, WDFW, and the Muckleshoot Indian Tribe. Independent technical review was provided by Harbor Consulting Engineers Inc.

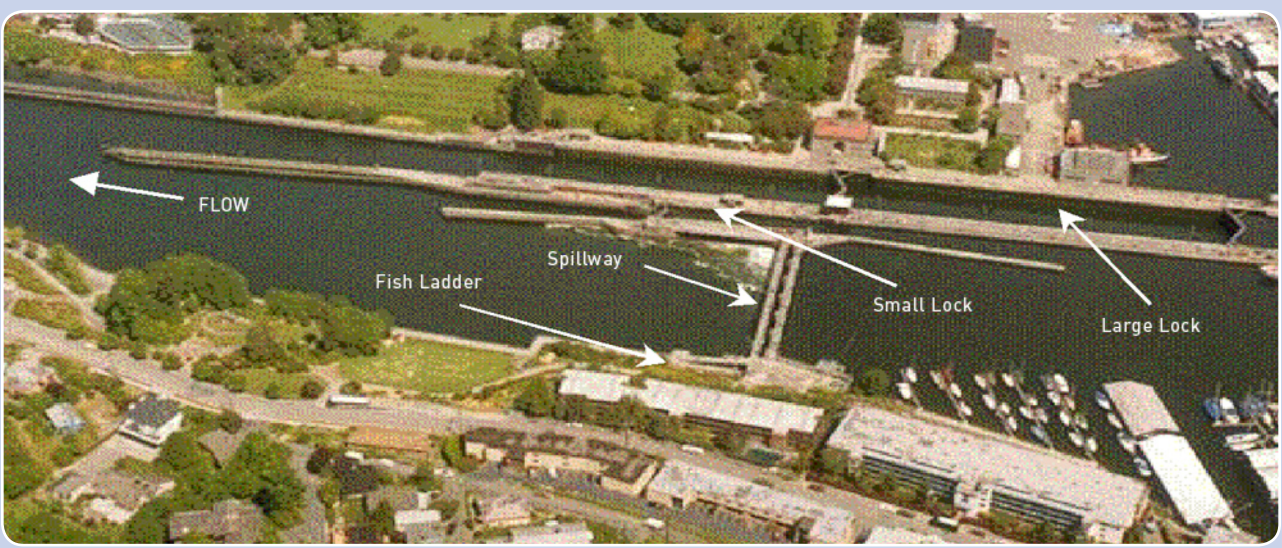
The design of the antennas, constructed by Biomark, had to overcome the challenges of high ambient electrical noise levels and minimal disruption to water flow over the overflow weirs. These challenges were overcome by incorporating internal shields and flow deflectors into the antenna design. Additional challenges included that concrete could not be cut or removed from the weirs as the salt water intrusion can occur on a few extreme tides each year (the Locks separate the saline Puget Sound from Lake Washington) that could result in rebar reinforcement corrosion and structural failure of the ladder. In addition, the bottom portion of the orifice openings are the ladder step floors, they are not suspended off the bottom as in many ladders. The final antenna designs provided a cost effective means to monitor passage of PIT-tagged fish through the submerged orifices as well as the overflow weirs of the ladder.

Detection probability of the antenna array was approximately 100% based on data collected in fall 2004.
Detection probability was determined based on detections of PIT-tagged adult sockeye released into the lower section of the ladder as well as the run-at-large of PIT-tagged fish ascending the ladder.

SMOLT-TO-ADULT RATIOS

Preliminary study results indicate that smolt-to-adult ratios (SARs) appear to be at least on the order of 1% and higher depending on the release group. Preliminary SARs range from 0.5%-3.2% for hatchery and wild Chinook respectively.

HIRAM M. CHITTENDEN LOCKS (BALLARD LOCKS)



NEW ADULT LADDER DETECTORS continued

OVERFLOW WEIR ANTENNA

A flow deflector was incorporated into the overflow weir antenna design to reduce disruption of flow.

SUBMERGED ORIFICE ANTENNA

The submerged orifice antennas were bolted to the upstream face of a weir and mated to an aluminum transition/insert which allowed for antenna clearance and change in floor elevation without changing the dimensions of the orifice, thus reducing the possibility of adversely impacting fish passage. The antennas were designed with six inch thick sides to minimize the change in floor elevation.

Development of a **PIT-TAG DETECTION SYSTEM** for the Corner Collector at Bonneville Dam (January 2005 update)

BY SANDRA L. DOWNING (NOAA-Fisheries)

As reported in the November PTAGIS newsletter, the first prototype antenna developed for the corner-collector PIT-tag system did not perform as intended and therefore, it will be necessary to develop a new antenna design for installation into the corner collector.

The goal is to have the corner-collector PIT-tag system developed and installed by spring 2006. This goal was strongly supported by the regional fish managers during different meetings held over the past 2 months (e.g., SCT, FPAC).

Toward achieving the 2006 installation goal, Digital Angel (DA), NOAA Fisheries, PSMFC, BPA, and the Corps met several times in December and January to discuss potential antenna designs, budget issues, and schedules.

The antenna design that the group is moving forward on is a slot design. The Corps will be designing the concrete housing that will hold the slot antenna. DA is proposing a slot antenna that consists of three coils that together will produce the electromagnetic field necessary for detecting tagged fish transiting the exit flume of the corner collector. A conceptual drawing was prepared by PSMFC (*Figure 1*). This design provides an antenna that has the shortest dimensions of all of the designs while still providing a large air gap on all sides of the antenna coils that DA required. The individual coil sections may also be removable (this will depend on structural and mechanical considerations), which would have advantages in terms of operations and maintenance.
In addition, this design makes this installation similar to the PIT-tag systems installed into the fish ladders, where BPA will be responsible for providing the antennas and the Corps will be responsible for designing how to modify the location for installing the provided antennas.

Another significant change from the original plan is that only one site and not two will be outfitted in 2006. Depending on system performance (i.e., will it satisfy the overall detection rate of 60% needed for the corner-collector interrogation system to replace the detections that were being detected at Bonneville Dam before the operation of the corner collector), a decision to move forward with a second antenna will be made.

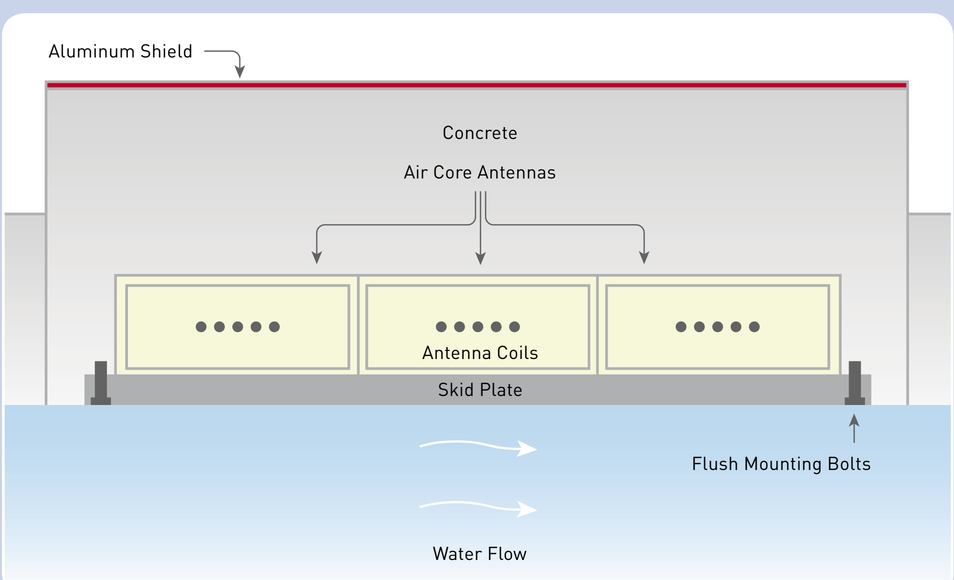


FIGURE 1
Proposed Slot Design. Conceptual drawing of the antenna slot design.

PIT-TAG DETECTION SYSTEM continued

BPA, in coordination with the Corps, has decided to withdraw its request to the Northwest Power and Conservation Council to approve funding for this project out of the capital portion of Fish & Wildlife budget. The Corps will now be responsible for funding the design and construction of the antenna housing from the CRFM budget. BPA will be responsible for funding the design and construction of the antenna through the F&W expense budget.

Now that the design and installation goal have been established, the hard work needs to begin. For example, the group is starting to focus on defining what tests need to be conducted in order to determine the following:

1. The maximum antenna height (the antenna width will be around 17') that will still produce an electromagnetic field that could detect tags within the entire antenna (this needs to be reinvestigated because of advancements in the transceiver).
2. The specifics on material for fabricating the housings for the individual antenna coils.
3. The specific slot size necessary to accommodate the three antenna coils.
4. The design of a slot insert that will allow the flume to operate in 2006 even if a PIT-tag antenna is not available.
5. The specifics on the best nonferrous concrete formulation.
6. The specifics for how to wind the coils (e.g., what will be the design for the stand-offs to maintain the air gap around the coil wires).

We would be remiss if we failed to remind the community that this still is a research and development effort; after all, we are attempting to increase the PIT-tag read volume by two orders of magnitude compared to the largest antenna currently installed in the Columbia River Basin. BPA and its contractors will be giving this development their best efforts, but it will take time to conduct the necessary performance testing and that testing could yield unexpected results that might cause a delay in the antenna installation. Regardless of the antenna development, the Corps will be installing the concrete housing in time for the 2006 smolt migration.

Finally, I would like to mention two personnel changes in the multi-agency team working on this project. Scott Bettin has taken over as project manager for BPA and Brad Peterson was hired as the project manager for DA.

Consequently, the current list of team members includes the following:

Affiliation	Name
BPA	Scott Bettin
	Jan Brady
Corps	Don Erickson
	Jeff Hurt
	Dennis Schwartz
	Brandt Bannister
Digital Angel	Zeke Mejia
	Yuri Smirnov
	Brad Peterson
NOAA Fisheries	Sandy Downing
	Earl Prentice
PSMFC	Carter Stein
	Don Warf

Aerial photo of Bonneville Dam taken by the U.S. Army Corps of Engineers. The arrow points to the straight section of the exit flume for the new corner-collector bypass system where the PIT-tag antennas will be installed.

Measurements for **THREE PIT-TAG MODELS** — Possible Consequences

BY SANDRA L. DOWNING

In the November PTAGIS newsletter, Zeke Mejia from Digital Angel announced the development of a new PIT-tag that they had developed to work in the huge 16′ by 16′ antenna needed to detect tags in the exit flume of the corner collector at Bonneville Dam. Unfortunately, there were errors in the values given for the different dimensional measurements.
Below are the corrected values compared to values for earlier tag models.

WEIGHT

Since 2000 when the fisheries community converted to using interrogation systems based on 134.2-kHz FDX-B tags, Digital Angel has manufactured three models of 11–12 mm PIT-tags. Each new tag model has yielded a significant increase in tag-reading distance. However, the consequence of producing that improved tag-reading capability is that the new tags weigh more than their predecessors (*Table 1*). To generate the values presented in the table, 30 to 60 tags were individually weighed on a Mettler AE100 electronic analytical balance that weighs accurately to ±0.0001g.

Tag Model	Number	Mean Weight (g)	Standard Deviation (g)	Increase in Weight from BE tag (%)	Increase in Weight from ST tag (%)
TX1411BE	30	0.0843	0.001		
TX1411ST	30	0.1067	0.001	26.6	
TX1411SGL	60	0.1254	0.001	48.8	17.5

TABLE 1 . Average weights and standard deviations for the three 11-12 mm PIT-tag models manufactured by Digital Angel. The percent increase in weight is also given for each successor tag model.

Since this weight increase with the newer tag models has not been widely broadcasted, we wanted to provide this information so that researchers could plan accordingly when they are tagging small fish The weight of a PIT-tag becomes a concern when tagging small salmonids (e.g., a 55-mm salmonid typically weighs around 2g).

The 400-kHz tags, which were used in the 1980s to establish the minimum tagging fork lengths established within the Columbia River Basin, weighed 0.069–0.072g.
Therefore, even the lightest ISO tag manufactured by Digital Angel, the BE tag, weighs around 20% more than the 400-kHz tag and the current ST tag model weighs around 50% more.

LENGTH AND DIAMETER

To produce the length and diameter values presented in the two tables below, different numbers of tags were individually measured by PSMFC using a Starrett Model 721 digital micrometer that measured accurately to ±0.01 mm (*Tables 2 and 3*). The percent increases (in the 2-13% range) have been significantly less than the weight increases; however, the differences could still be a factor when tagging small salmonids.

Tag model	Number	Mean Length (mm)	Standard Deviation (mm)	Increase in Length from BE tag (%)	Increase in Length from ST tag (%)
TX1411BE	35	11.78	0.22		
TX1411ST	142	12.45	0.11	5.7	
TX1411SGL	86	12.70	0.18	7.8	2.0

TABLE 2. Average lengths and standard deviations for the three 11-12 mm PIT-tag models manufactured by Digital Angel. The percent increase in length is also given for each successor tag model.

Tag model	Number	Mean Diameter (mm)	Standard Deviation (mm)	Increase in Diameter from BE tag (%)	Increase in Diameter from ST tag (%)
TX1411BE	35	1.97	0.01		
TX1411ST	142	2.02	0.01	2.5	
TX1411SGL	86	2.22	0.02	12.7	9.9

TABLE 3. Average diameters and their standard deviations for the three 11-12 mm PIT-tag models manufactured by Digital Angel. The percent increase in diameter is also given for each successor tag model.