

Pacific Ocean Shelf Tracking (POST)

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1. 2006 ACCOMPLISHMENTS & SCIENTIFIC HIGHLIGHTS

2006 has thus far been a productive year for POST. Because of the nature and necessary timing of the deployment, tagging and recovery work, most of the operational focus to this point has been on the former two activities. Major data recovery efforts will begin in September. By the end of May, all but three of the planned 2006 listening lines had been deployed along the continental shelf of Alaska, British Columbia, Washington and Oregon. This represented 179km of the planned 230km long 2006 acoustic receiver array. The three pending lines were all in place and ready to detect passing fish by the end of July. At the end of June, the planned batch of over 2600 fish had been tagged and released by the POST team and the wait for results began. In addition to the planned lines, a 50km line was deployed in July across the mouth of the Fraser River in a joint project between POST and a group of UBC researchers.

Although the foundation work was well laid out early in the summer, that didn't mean a few months of downtime for POST. With new technology being distributed by our tech supplier (VEMCO), POST began acquiring and testing next generation receiver units. Recently, we have started to replace existing lines with new units that will make up the permanent array. The new receivers bring a major advancement in the ability to retrieve data without having to physically bring the receiver to the surface – data downloads can be done via modem from a vessel cruising in the vicinity of a receiver's location on the ocean floor. Much progress has been made in testing the VR3 receiver units and developing the necessary specifications to fine-tune them for POST's needs before they can be used to replace old receivers along the listening lines. We are happy to report that both the hardware and the data are proving to be effective, efficient and reliable, both in the lab and in the field.

While we are at this point waiting on results to be retrieved from the array this fall, there are a number of preliminary findings that are of interest:

- Cultus Lake sockeye stock in-river survival rates in the Fraser River have rebounded to levels above 2004 survival, after a decimated survival rate in 2005.
- Sackinaw Lake sockeye smolts are being detected in the Fraser River for the third year in a row
- Our Alaskan listening line at Graves Harbour is showing no detection of any of the Snake River Chinook, BC sockeye or BC steelhead – while it is disappointing that the fish are not migrating this far, the “non-result” still fills in a piece of the puzzle.
- Work on the Columbia River is showing that survival of stocks coming out of the river and in early marine ecosystems is high. Based on return results, it is clear that mortalities

must be occurring in the ocean; the next step is to establish exactly where and why the stocks are being killed in the ocean.

- Contrary to popular belief, survival of stocks leaving dammed rivers seems to be comparable to those leaving rivers without dams.
- Based on preliminary findings, POST will be useful for performing a “cost-benefit” analysis of transporting endangered Columbia River smolts by barge to the ocean

2. SOCIETAL BENEFITS, IMPACT & APPLICATIONS

(1) Salmon survival in freshwater

The work already undertaken by POST in both the Columbia and Fraser rivers have provided insights into the freshwater survival of salmon. This work has demonstrated similar survival rates for salmon smolts in both rivers. This evidence suggests that dams may not be the major threat to salmon survival as previously thought. This work has also demonstrated that POST technology is currently the best available for identifying and quantifying freshwater survival and the impact that dams have on salmon smolt survival during their migration to the ocean.

(2) Identifying major regions of ocean residence and mortality for salmon

The POST array will allow ongoing monitoring of ocean habitats used by salmon. By dividing up the West Coast into sections it will be able to measure relative survival in the different geographical regions. POST will also provide the resolution to be able to pinpoint black holes within the North Pacific oceanic environment where salmon experience higher mortality rates. With this continuing time series of oceanic salmon movement and migration, it will be possible to detect changes in migration patterns or habitat usage with climate change.

(3) Critical movement of Halibut in the Aleutian Islands and Gulf of Alaska

Pop-up satellite archival (PAT) tags have been used to track the movement of halibut adults in the Aleutians and Gulf of Alaska, however, the juveniles are too small for this technology and there are critical issues to answer regarding juveniles (<100cm). Researchers using POST data will be able to answer critical issues for halibut regarding the timing, speed and direction of migration, and whether fish migrating in deep water or in shallow water where they are vulnerable to fishing interception. This knowledge is of great interest to fisheries managers.

(4) International halibut management issues near the Alaskan/Canadian border

There is considerable discussion about extending the halibut fishing season to include winter fishing, with implications for the spawning period for halibut. Currently it is not known if winter spawning aggregations are composed of fish from a single management unit or a mixture of fish from different management units. Should winter fishing commence, it will be imperative to understand whether fish from single or mixed management regions are being targeted in order to apply removals to the correct management unit. By deploying strategic POST lines in these critical fishing regions, important data can be collected on stock movements to answer the question of whether the fishery is targeting a single or mixed cross-border stocks.

(5) Understanding the dynamics of river and ocean movements of green and white sturgeon on the West Coast

There are critical management issues with sturgeon given the high price of their eggs and flesh. Initial results based on POST data reveal that a white sturgeon migrating over 1000 km between two river systems and emphasized that management measures for these species are complex. This discovery is especially relevant given the high conservation value of white sturgeon that is now listed as endangered. By undertaking a targeted tagging program of sturgeons from a number of river systems in the Pacific Northwest, POST data will enable researchers to provide critical management information for these important species and help to obtain baseline information on habitat usage and migration behaviour to help conserve the species. Detailed movement data from the POST network of arrays will help identify spawning regions and provide information on stock structure that is likely to be complex for these fish.

3. WORK PLANNED FOR 2007

Key hypotheses to be assessed in 2007 and beyond are:

Hypothesis 1: Drastic reductions in threatened salmon stocks are due to profoundly greater levels of marine mortality rather than freshwater mortality.

Hypothesis 2: Anthropogenic freshwater impacts (such as dams) are generally not as great an influence on salmon survival as are marine and oceanic processes

Hypothesis 3: Hatchery salmon display different migration behaviour than wild stocks of the same species

Hypothesis 4: Threatened from non-threatened salmon stocks can be differentiated to enable harvest of non-threatened stocks with minimal impacts on threatened stocks

Hypothesis 5: There are identifiable differences in migration behaviour and/or marine residence areas between critically endangered and healthy salmon stocks

(1) Combining genetics and POST data

There are a variety of molecular genetic tools that can now be used to not only identify species but to distinguish between populations or stocks of the same species. There are critical issues in both Canada and California where fisheries can be shut down because there is the risk of exploiting critically endangered stocks even though there might be large numbers available to the fishery from non-threatened stocks. Shutting down a fishery that is targeting a healthy stock because of the risk of catching individuals from an endangered stock has obvious economic implications.

Wild adults can be captured in the ocean in their feeding/resident region prior to their migration back to their natal streams. These individuals can be tagged with POST acoustic tags but at the same time tissue biopsies can be collected for genetic analysis. Undertaking genetic analysis later in the lab will enable any tagged salmon to be allocated to a stock. By monitoring movement in the ocean and arrival times back to natal streams it can be possible to separate the endangered and exploitable stocks (e.g., the migratory behaviour and arrival times at spawning grounds or fishing grounds). By using ongoing monitoring with POST network, researchers and managers could close the fishery during times when endangered individuals may be in the fishing region and open the fishery when it is known that there are only individuals available from healthy stocks.

(2) Combining POST data with fatty acid, stable isotope and organochlorine analyses for identifying orca ecotypes.

Eastern North Pacific orcas are now known to compose three distinct 'ecotypes' ('resident' - with a fish diet, 'transient' – with a mammal diet and 'offshore' which are poorly understood but known to include fish in the diet). Movement patterns of orcas are also poorly known and resident locations particularly in winter are poorly known. New tools including the combination of signature fatty acid (SFA), stable isotope (SIA) and organochlorine contaminant (OC) analyses have been successfully used to identify individuals from these three distinct groups or 'ecotypes'. POST data could help researchers answer critical questions regarding the movement and migration patterns on Pacific Northwest orca ecotypes by combining acoustic POST data with a blubber biopsy analysis of SFA, SIA and OC to correctly identify the population to which the orca belongs to.

(3) Using stable isotopes with POST data to identify prior habitat of tagged animals

Stable isotope analysis can provide information on not only the relative trophic level of the predator (using nitrogen stable isotopes) but also for the past environment that the shark has inhabited (using carbon stable isotopes). For future tracking studies of rays or sharks in large embayment such as Prince William Sound, it will be feasible to take tissue biopsy samples to understand what environment the shark or ray had inhabited *prior* to tracking. By combining the two techniques it will be possible to not only follow the movement and migration of these key predators but also be able to have historical information of where the shark or ray was resident prior to tagging.

4. EDUCATION & OUTREACH

The following activities are underway:

1) Post Project Overview Document

Product: a document providing an overview of POST, describing who we are, what we do, who we do it for, why we're unique, etc. This overview will include fact sheets for easy reference articulating POST array characteristics, related research results, etc.

Activity: the POST Overview will be distributed in person at meetings and conferences; by mail; digitally via email attachment; and as a PDF download from the POST website.

Target Audience: the Overview will be provided to researchers who have been involved with POST, expressed interest in the technology or the tool, or who have been involved in research identified as relevant to POST. The overview will also be distributed to suppliers and customers.

Expected Impact: expanded use of POST array. For instance, researchers will include POST as tool in their grant applications; government decision makers will include use of POST in their budgets; graduate students will use POST in their research, etc.

Objective: improve understanding of the POST mission, goals, activities, organizational structure, etc.

2) Post Project Overview Presentation

Product: a pithy yet informative presentation providing an overview of POST to sell the idea of POST as a tool. The presentation will have a core set of slides, with options for speaking in greater depth on particular topics to certain audiences (branches, so to speak, off the core trunk of slides)

Activity: the POST Overview presentation will be used by POST Board members and staff at conferences and meetings as a means of speaking with a common POST voice to describe the general use of POST as a tool for many different applications, animals, management challenges, etc.

Target Audience: the presentation will be an asset when POST Board members and staff have the opportunity to address top decision makers in government, academia, and business who are busy and may not have a technical background, but will be intelligent, capable of learning quickly and interested in improving their ability to solve problems.

Expected Impact: new audiences will use POST as a tool to answer research questions, address management issues, solve conservation problems, etc. POST will be used to supplement existing tools such as genetics.

Objective: expand the use of POST to more animals and for more applications.

3) Post Publications

Product: a POST manifesto; collaborative peer-reviewed journal and conference papers; fact sheets and updates

Activity: POST scientists will continue to modify and attempt to publish the completed POST manifesto; collaborations will be encouraged and supported to increase the number of publications; POST staff will be supported in efforts to produce informative fact sheets, literature reviews, summary documents, etc.

Target Audience: the scientific community is the primary target audience for the publications

Expected Impact: increased use of the POST array; increased number of citations in the scientific literature; improved credibility as evidenced by increased involvement

Objective: increase scientific profile and articulate and prove applied scientific relevance of POST

4) Memoranda Of Agreement With Collaborators

Product: letters of intent and memoranda of agreement demonstrating commitment to collaborate

Activity: communicate desire and motivation for signing MOUs with collaborators and clearly articulate incentives for involvement with POST

Target Audience: the scientific community, government agencies, academic research laboratories, consulting companies, conservation organizations, etc.

Expected Impact: POST will be used as a tool in a greater variety of applications and by a larger number of researchers and organizations.

Objective: remove barriers to involvement and expand the use of POST

5) Post Email Newsletter

Product: a short and simple yet informative, general, interesting, visually appealing newsletter with updates on POST activities and milestones achieved

Activity: produce regular newsletter to be distributed via email and archived on POST website

Target Audience: a broad audience of politicians, conservationists, journalists, hatchery managers, industry lobbyists, researchers, university administrators, government managers, general public, etc.

Expected Impact: increased awareness of POST progress; increased coverage of POST in media; increased reference to POST in political speeches and discussions; better public awareness of efforts and technical advances; increased inclusion of POST on grant applications and increased use of POST as tool

Objective: remove barriers to involvement, improve general understanding of POST technology, promote results and successes, and expand the use of POST

5. GEOGRAPHIC EXPANSION

The POST Management Board in consultation with potential and current users and funders is currently considering the issue of the extent of geographic expansion. Expansion will be dependent upon our ability to secure funding, which is in turn dependent upon our ability to recruit users within the agencies who have the capacity to provide capital investment.

6. PARTNERSHIPS & COLLABORATION

a. Partnerships

None to report.

b. Links to Other CoML Ocean Realm Projects

None to report.

c. Links to CoML National and Regional Implementation Committees (NRICs)

None to report.

d. Liaisons to CoML Cross-Cutting Groups

None to report.