Performance of the POST (Pacific Ocean Shelf Tracking) Array in 2004-05, & Plans for the Future

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Goals of the POST Project

- A permanent continental-scale array
- Directly measure movement, distribution and survival of marine fish in continental shelf waters
- Develop the ability to follow individual fish—or separate stocks—for decades!
- Expand the scientific observations to encompass a wide range of co-located oceanographic observations
- Extend the array to coastal seas around the world (Support the globalization of the science)
POST’s Secretariat

- Administered through the Vancouver Aquarium
- Peggy Tsang is our super industrious Executive Director
- Secretariat organizes the species working groups (Open to all)
- Secretariat manages the data flowing from the POST array, ensuring long term archiving, (eventual) open access, and web-based analysis tools
- Management Board ensures broad representation
- Scientific Steering Committee provides overall direction on Science
POST's Technology - Current & Mid-Term

Acoustic tags for very small fish:
- High survival & tag retention
- 7-9 mm diameter tags
- Unique ID codes
- >4 month battery lifespan
- 10-20+ yr tag lifespans for larger fish (2-5 kg)

Long-lived battery powered receivers (5-10 yr lifespans)

Current technology depends on physically retrieving tracking receivers

Acoustic modems for remote data retrieval
POST’s Objectives

Pacific Ocean Shelf Tracking ‘Baja to Bering’
### POST's 2004 Field Season

- Deployed 120 km of acoustic listening lines (135 seabed nodes)
- Ran the array for 5 months (April-September)
- Both freshwater & marine lines
- 1,051 smolts tagged & released
- Measured population-specific residence time & speed of movement
- Measured fish *survival* directly (never before done on this scale-- and the real reason for all the work)
POST at Work
Deployment of Listening Lines

Deployment of manufactured pop-up moorings with receivers & acoustic releases
A total of 14 (>20) salmon stocks tagged:
- Eight (15+) River Systems
- Five Species
- Mix of Hatchery/Wild comparisons
- POST increased numbers tagged from 1,050 fish in 2004 to 2,700 fish in 2005
- “Buy-in” by the scientific community is starting to happen

91% detection efficiency
Established movement patterns
Demonstrated substantial differences in marine survival between species and stocks of same species
Movements of One Stock—Cultus L Sockeye
Cultus Lake Sockeye (2)
Differences in Sockeye Migration Routes- Howe Sound Sub-Array

Inner Listening Line

Outer Listening Line

Cultus Lake
Sockeye
Sakinaw Lake
Sockeye

Howe Sound inner line

Howe Sound outer line

Sakinaw Sockeye release site

Cultus Sockeye release site
2. Differences in Migration Routes - Queen Charlotte Strait Listening Line

2004 Tag Detections - QCS

Sensor Number

Detections

CULTUS LAKE SOCKEYE
2. Differences in Migration Routes -
Queen Charlotte Strait Listening Line

2004 Tag Detections-QCS

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[Map and chart showing migration routes and detections]
2. Differences in Migration Routes - Queen Charlotte Strait Listening Line

2004 Tag Detections-QCS

CULTUS LAKE SOCKEYE

SAKINAW LAKE SOCKEYE (2005)
Biological Conclusions

1. The ocean migration behaviour of different species of salmon is not the same
2. There are differences in migration pathways (speed, route, distribution) of different stocks of the same species
3. There are differences between hatchery & wild fish from the same stock
4. We predict that the same observations will hold true for virtually all other marine fish species
POST’s Achievements & Future Direction

POST is A Technology Platform, not just a Tagging Study for Fish

- Our goal is a telecommunications infrastructure for the seabed
- An array of 2,000 “Cell phone towers”
- Providing the data communications for a wide range of ocean sensors (T, S, currents,…) ➔ Permanent year-round meteorology for the shelf/slope ecosystem—with fish tracking
Where POST is Going:
Current Testing Phase: Oceans

- Prototype Acoustic Modem-Equipped Tracking Sensor
  - Acoustic modem allows stored data upload & periodic flash upgrades of firmware
  - 7 Yr Projected Bottom Lifespan
  - Ability to provide year-round fish census data
  - * Migration pathways
  - * Timing of migrations
  - * Survival

- Currently have completed 3rd R&D test cycle
Where POST is Going: Final Testing of Modem-Equipped Sub-Array
Where POST is Going:
Current Testing Phase: Rivers

Satellite-Linked Acoustic Sensors

Above water antennae allows tagged smolts to email their departure times (and survival!)

This provides ability to easily measure survival out of large rivers

Two beta-test units are currently deployed in the mouth of the Fraser River
Where POST is Going:
Current Testing Results

VR3-UWM
- Now passes all remote communications tests
- All 14 units retrieved:
  - New deployment/release method tested
  - Sensor response compared with VR-2

VR3-ARGOS (Satellite Linked Units)
- Satellite communications validated
- Will switch satellite platforms
  (ARGOS⇒Iridium/GSM Cell phone)
Summary

I. The POST array provides the basis for making direct observations on fish behaviour/survival in the ocean.

II. It is now possible to consider direct experimental releases into the ocean and measuring the survival response to "treatments" (Hatchery rearing practice; drugs; size at release).

III. POST's large-scale shared array provides a scalable & cost-effective platform for addressing previously intractable scientific questions for all species:

   I. Where do fish stocks go?
   II. Where do they die?
   III. What might we do to address hatchery/wild interactions?
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