Summary of the 2004 POST II Demonstration Phase (Pacific Ocean Shelf Tracking)

Year I Field Results

(With special thanks to the people who got things done:

Dr Jayson Semmens, Melinda Jacobs, Erin Rechisky, Mike Melnychuk, Adrian Ladouceur, Orie McKenzie, Scott Lincez, Jason Stark, Dustin Tierney, Louie Arguin, Dr Sonia Batten, Glenn Crossin, Dr Andrea Osborne, Dr Phillip Pawlik, Dr Igor Bulatov, Ritchie Davis, Sonnie Peterson, James & Brian Waukus, Sun Down Diving, & Cascade Fishing)

Summary of POST
2004 Large-Scale Demonstration

OVERALL GOALS:

– Pioneer the idea of a permanent array

– Create the demand for the "output" (new data)

– Be Successful (No major foul-ups)!

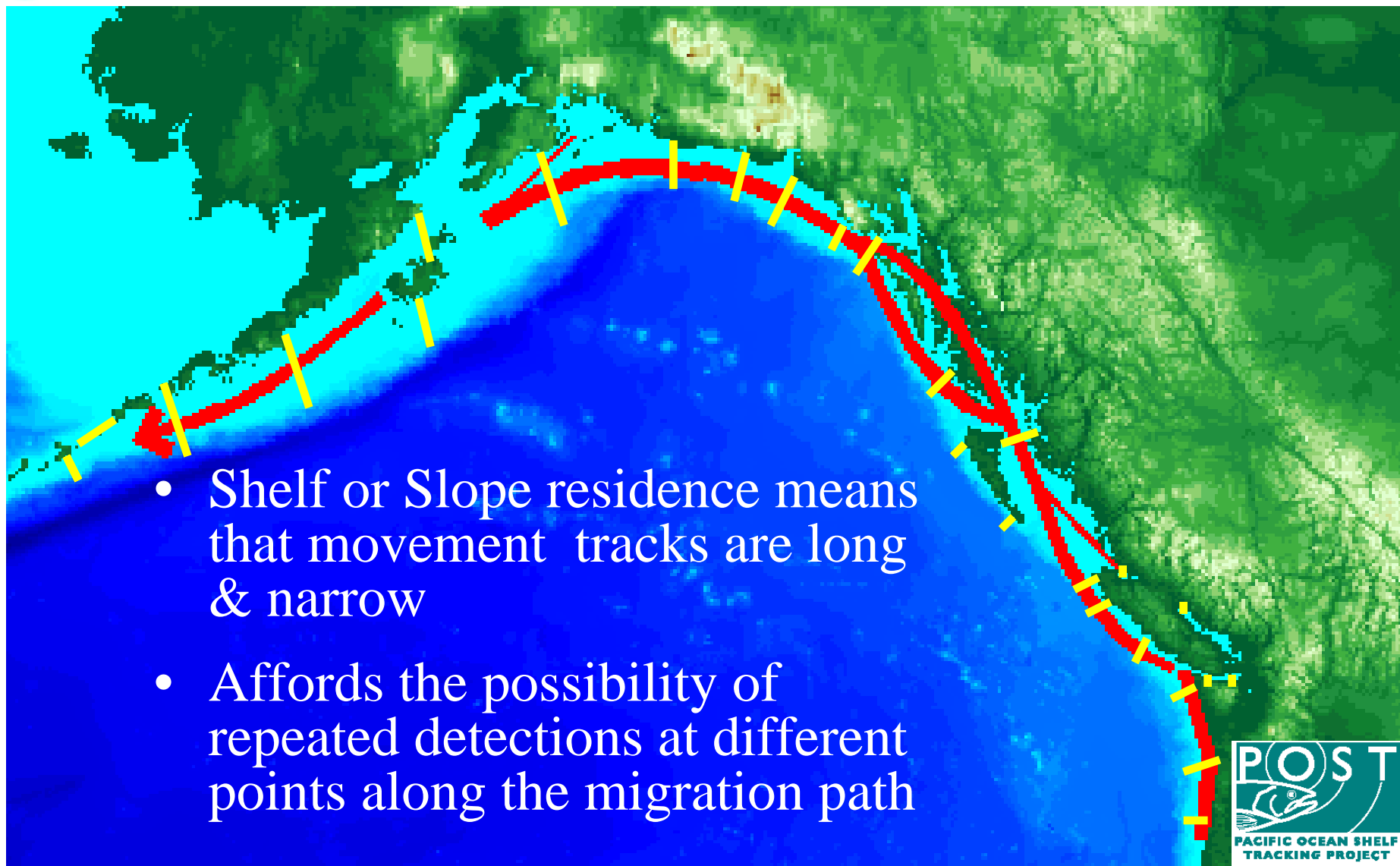– Develop the technology base for a permanent array

FINAL OBJECTIVE:

- A Telecommunications network for the seabed

How do we track acoustically-tagged animals along the continental shelf?

- Shelf or Slope residence means that movement tracks are long & narrow

- Affords the possibility of repeated detections at different points along the migration path

Summary of POST II
2004 Large-Scale Demonstration

2004 Milestones:

- Conduct "industrial scale" demonstration

- Tag 1,000 salmon smolts

- Get system to work

- Develop acoustic-modem "seabed node"

- create the scientific demand for the permanent version
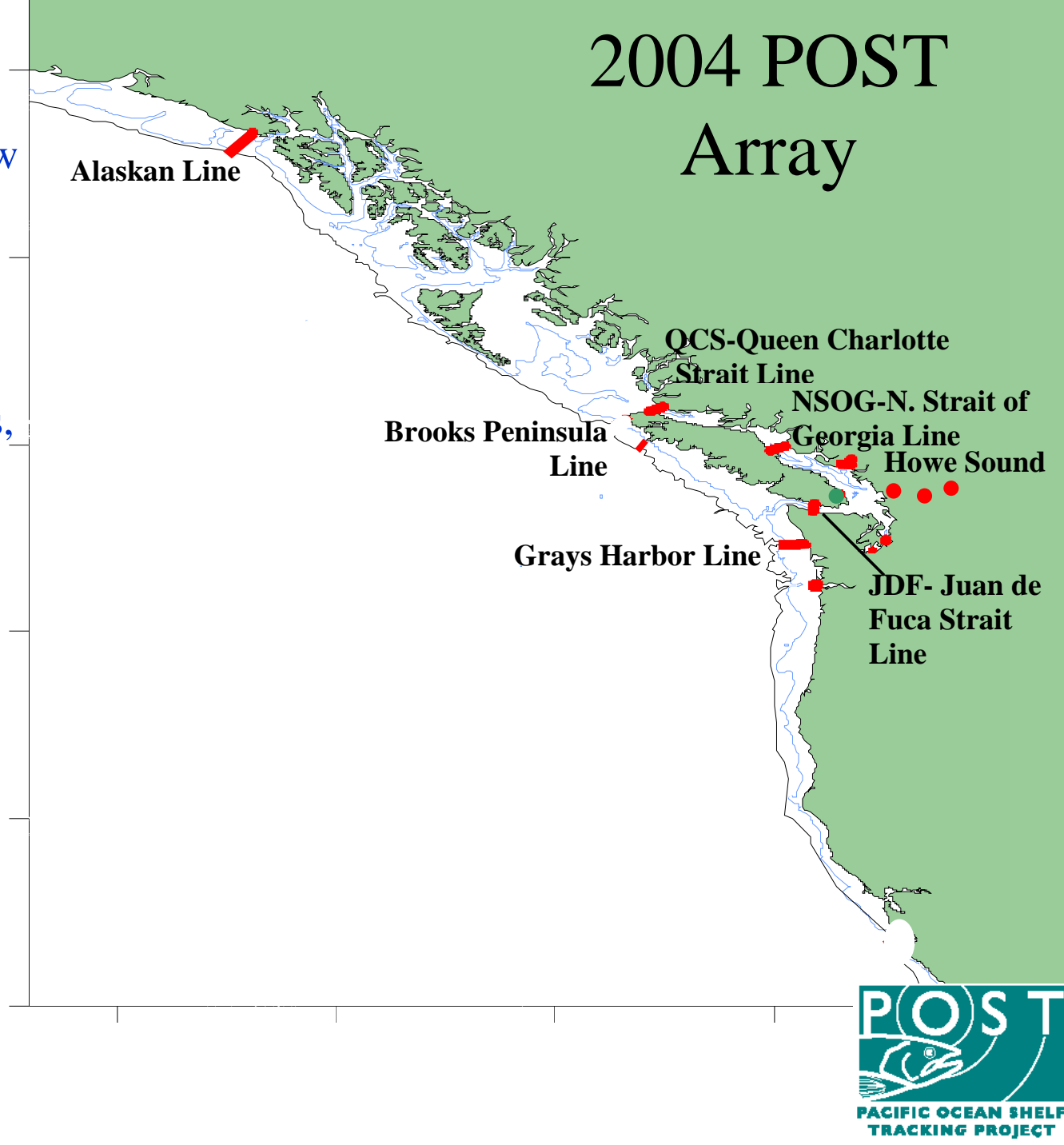
2004 Milestones Met:

- ✓ Deployed large-scale acoustic tracking array (6 lines, ~120 kms)

- ✓ 137 nodes, system run for 4-5 months, downloaded twice

- ✓ Tagged >1,051 smolts

- ✓ Successfully tracked fish, measured movements & ***survival***

- ✓ Developed two versions- One now in field testing, other in prototype testing (Both "working")

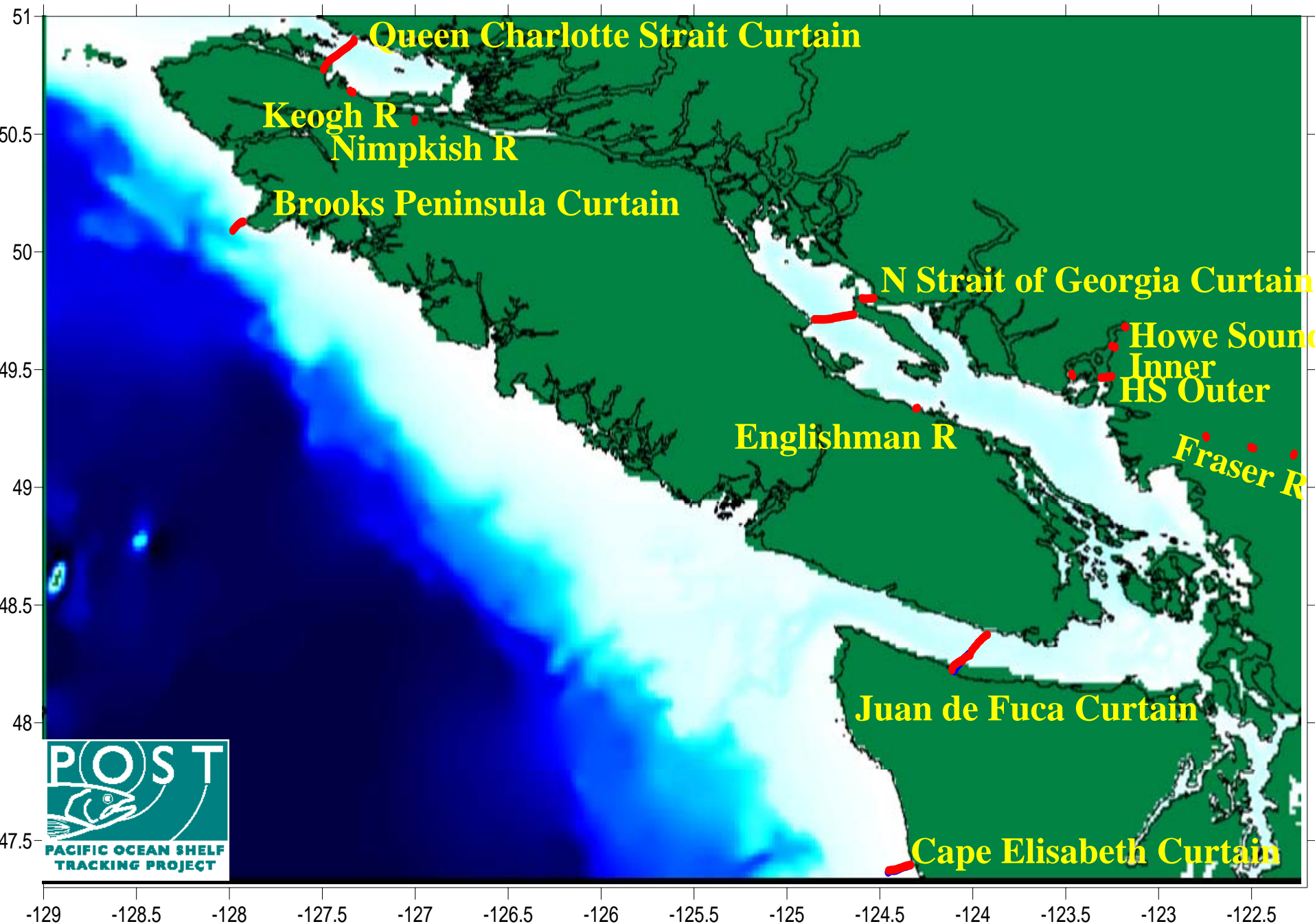- ✓ Ongoing

2004 POST Array

2004 Summary:

- Bought 135 kms of new rope, 38,000 lbs of old boom chain

- Deployed 137 custom-made seabed nodes mainly in 6 major lines, each ~20 kms long

- Tagged 1,051 salmon smolts, with little mortality (3.7%)

- *Counted* with high efficiency smolts leaving rivers, giving separate FW & marine survival components post-tagging

- Alaska line still to be recovered

Alaskan Line

QCS-Queen Charlotte Strait Line

NSOG-N. Strait of Georgia Line

Howe Sound

Brooks Peninsula Line

Grays Harbor Line

JDF- Juan de Fuca Strait Line

POST

PACIFIC OCEAN SHELF
TRACKING PROJECT

Goal #1:

Build 137 acoustic nodes…
        precisely place them on the seabed
                … & get them back

Pacific Ocean Shelf Tracking Project map showing tracking curtain locations along the British Columbia and Vancouver Island coast.

Labels on map:
- Queen Charlotte Strait Curtain
- Keogh R
- Nimpkish R
- Brooks Peninsula Curtain
- N Strait of Georgia Curtain
- Howe Sound
- Inner
- HS Outer
- Englishman R
- Fraser R
- Juan de Fuca Curtain
- Cape Elisabeth Curtain

POST
PACIFIC OCEAN SHELF
TRACKING PROJECT

Goal #2:
Surgically implant 1,050 salmon smolts with acoustic tags…
… & keep them alive

POST Tagging Totals (B.C.)

RIVER	CHINOOK H	CHINOOK W	CHINOOK W?	COHO H	COHO W	Dolly Varden Juv	Dolly Varden Ad.	SOCKEYE H	STEELHEAD H	STEELHEAD W	Grand Total
CHEAKAMUS RIVER				100						51	151
COLDWATER	49	2	2	40						31	124
CULTUS LAKE								100			100
ENGLISHMAN										67	67
KEOGH					107	8	30		92	78	315
NIMPKISH				99					1		100
QUALICUM				97							97
SAKINAW LAKE								97			97
Grand Total	49	2	2	336	107	8	30	197	93	227	1051

Key Canadian salmon stocks with major conservation concerns in 2004

Sakinaw Sockeye tags were specially programmed:

1st transmission period: May 15~Sept 1/2004

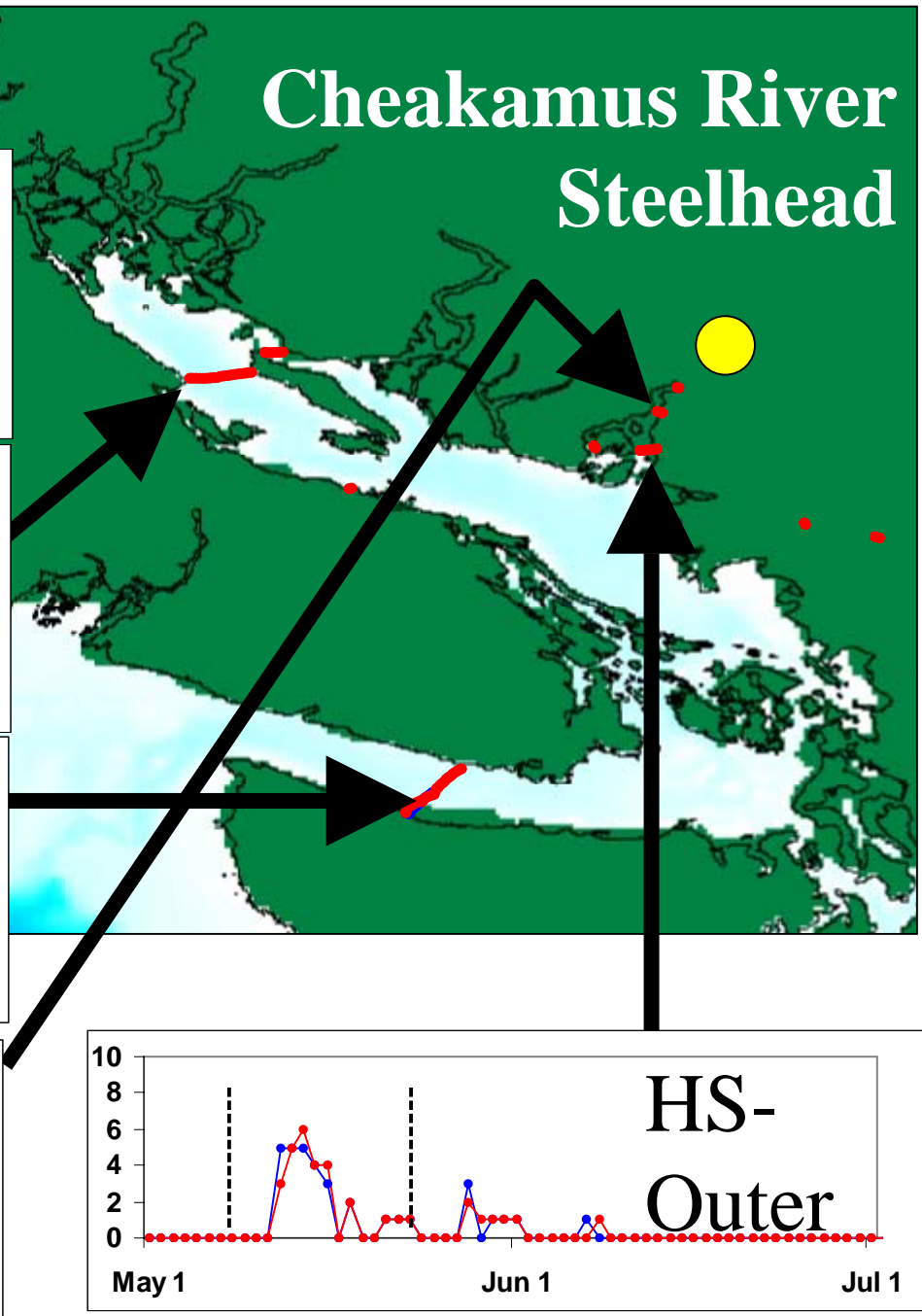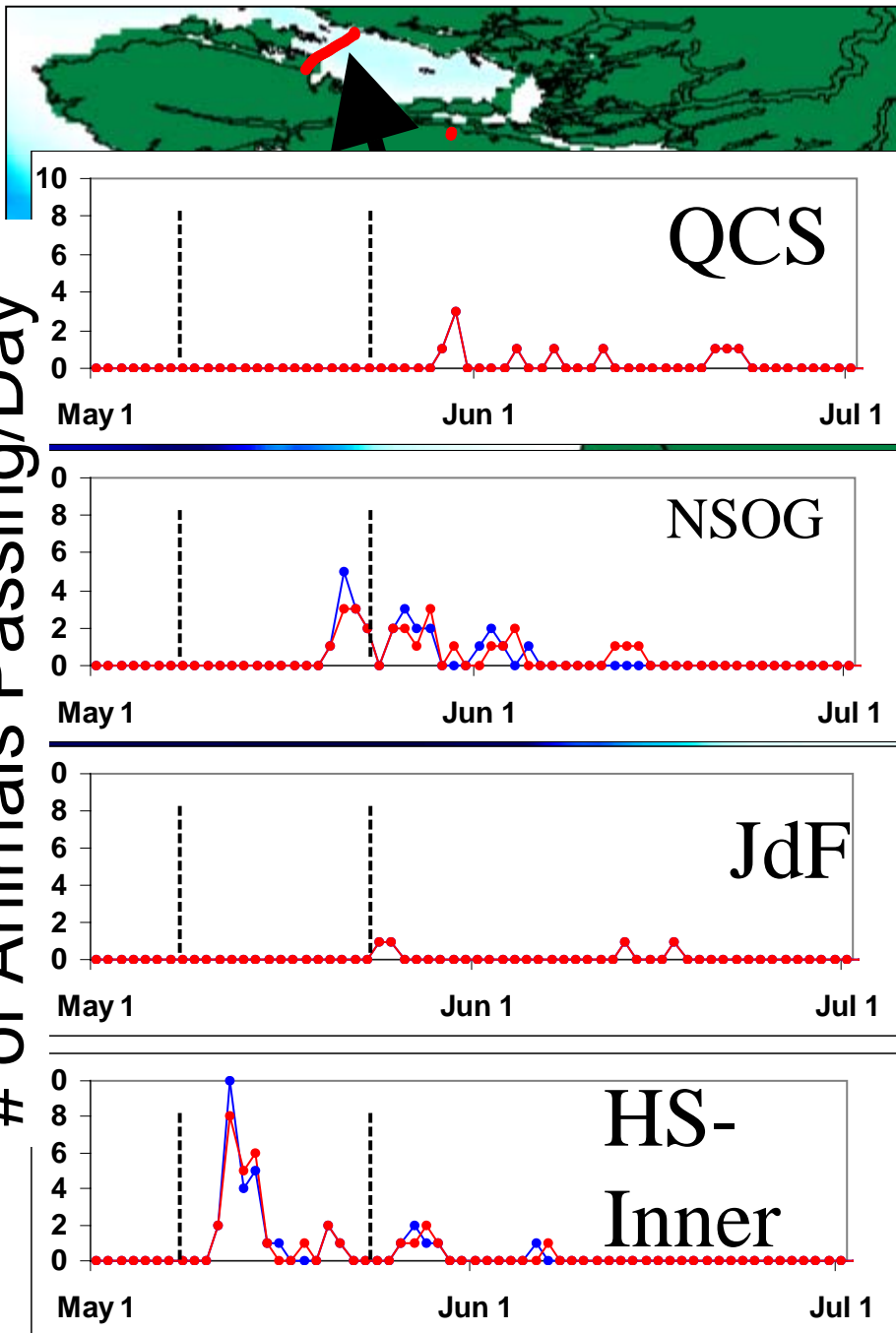**2nd period: June 15/2006 to battery depletion (about 4 mos)**

- Tags surgically implanted in body cavity under full anaesthesia

- Tags are basically a permanent implant that will remain for the life of the fish

- Larger fish can be implanted with larger tags-- many year studies

An Essentially Complete Census of the Fate of Individual Animals was Achieved

Cheakamus River Steelhead

# of Animals Passing/Day

QCS

10
8
6
4
2
0

May 1　　　　Jun 1　　　　Jul 1

NSOG

0
8
6
4
2
0

May 1　　　　Jun 1　　　　Jul 1

JdF

0
8
6
4
2
0

May 1　　　　Jun 1　　　　Jul 1

HS-Inner

0
8
6
4
2
0

May 1　　　　Jun 1　　　　Jul 1

HS-Outer

10
8
6
4
2
0

May 1　　　　Jun 1　　　　Jul 1

POST's 2004 "Acoustic Curtain" Detection Efficiency:

- ➤ *~91% of individuals passing a single acoustic curtain detected*

- ➤ *Therefore, expected detection efficiency over two lines is ≈1 - (0.09)² = 99%*

Steelhead Survival

Species & Stock Steelhead	% surviving fresh water	% surviving to leave Strait of Georgia	% surviving freshwater that also survived to leave SOG[1]
Cheakamus (Squamish River)	75	27	37
Coldwater (Thompson River)	52	19	38
Englishman	79	15	19
Keogh (Wild)	77*	31	40
Keogh (Hatchery)	71*	29	42

Coho Survival

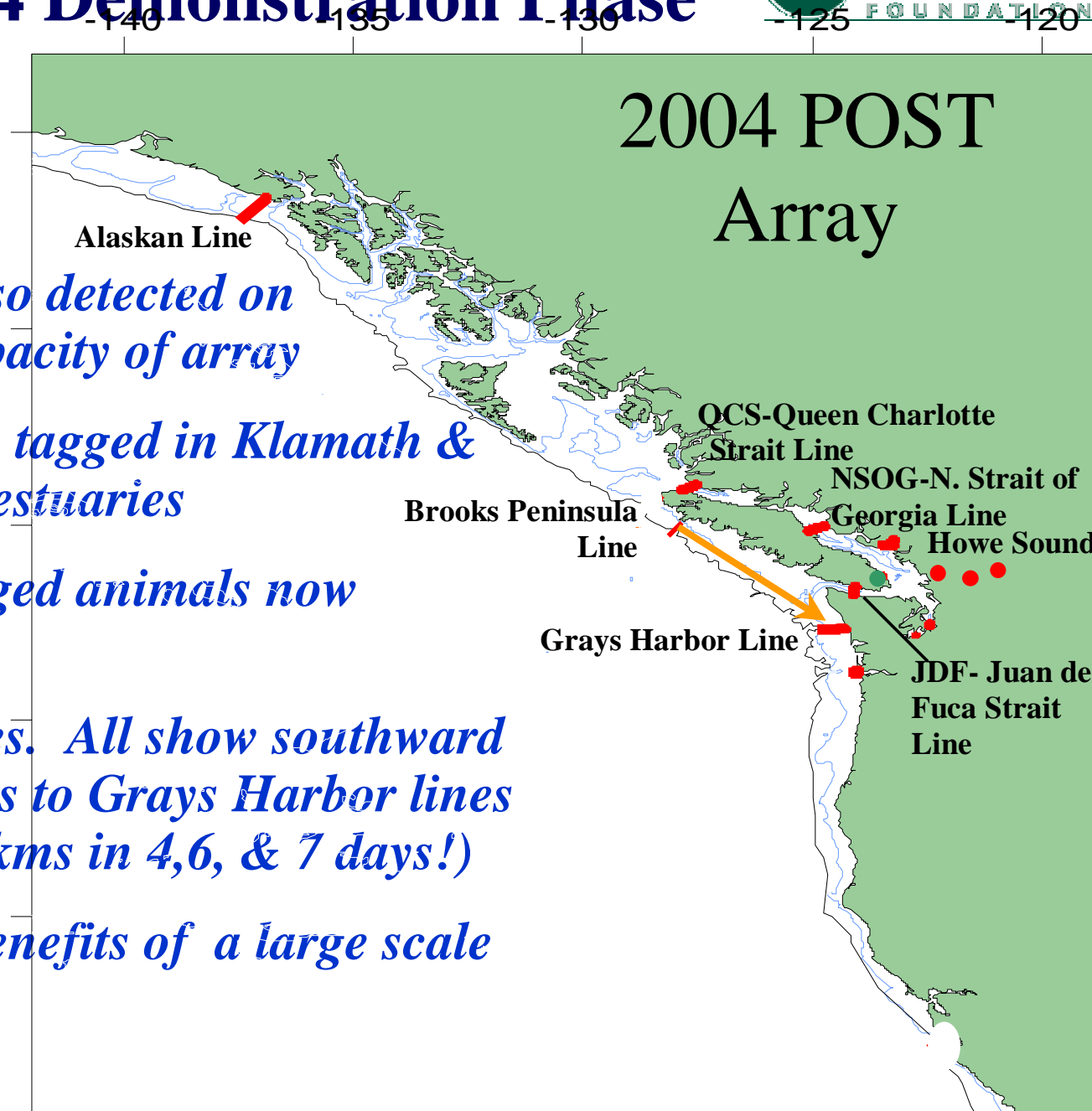| Species & Stock Coho	% surviving fresh water	% surviving to leave Strait of Georgia	% of freshwater survivors that also survived to leave Strait of Georgia
Cheakamus	45	0	0
Keogh	98	36	36
Nimpkish	79	9	12
Qualicum	n/a	0	0
Coldwater (Thompson)	3	0	0

2004 POST Array

Added Results

•*42 Green sturgeon also detected on additional channel capacity of array*

•*All animals originally tagged in Klamath & Rogue Rivers or their estuaries*

•*24% of originally tagged animals now detected.*

•*8 fish on multiple lines. All show southward movement from Brooks to Grays Harbor lines (some as fast as ~480 kms in 4,6, & 7 days!)*

•*Result points to the benefits of a large scale array*

Alaskan Line

QCS-Queen Charlotte Strait Line

NSOG-N. Strait of Georgia Line

Howe Sound

Brooks Peninsula Line

Grays Harbor Line

JDF- Juan de Fuca Strait Line

-140 -135 -130 -125 -120

Fisheries Applications

- *We have demonstrated a precise history of each tagged animal, and therefore of individual stocks & species*

- *Fisheries applications for the array:*
  - *Marine survival estimates "in situ"*
  - *Migration pathways*
  - *Timing of residence ("Habitat use")*

- *Salmon smolts pushed the technology for small animals; POST is even more applicable to larger animals*

POST- Oceanographic Applications

- *Enhanced ocean observation platforms (Coastal GOOS)*

    (& a system to get the data back)

- *Open-architecture platform for hosting many ocean sensors on a 1,000 node grid*

    – *CTD (Gridded Maps of Seabed Temperature & Salinity)*

    – *Bottom Currents (Gridded Maps of Seabed Currents)*

    – *ADCPs (Mid-water currents- Therefore 3-D current structure)*

    – *Nephelometer (Sediment transport)*

    – *...*

POST's Next Phase (2005):

- Deploy ~100 permanent nodes

- Do 2004 all over again…

- Bring in many user groups ("open access")

- Improve the system interface & required engineering components

- Better establish real costs of deploying & running permanent array

- Facilitate added oceanographic sensors

- (Learn the joys of running large scale telemetry systems)