SALISH SEA

MARINE SURVIVAL PROJECT

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PACIFIC SALMON FOUNDATION

LONG LIVE THE KINGS

A fully integrated, multi-disciplinary program to determine the primary factors affecting growth and survival of juvenile salmon in the Salish Sea.

- $20 million – Combined public and private investments
- > 150 participants in projects
- ~ 40 participants and funders
- Centrally coordinated/managed by PSF and LLTK
- 5 years (2014-2018) includes design, 3 yr. program, reporting.
- *3 integrated research categories*:

  Trend Analyses and Modeling, Bottom-up Sampling, Top Down Studies

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… builds on efforts of

- PSF's Strait of Georgia proposal (2009)
- PSC's Fraser Sockeye workshop (June 2010)
- Salish Sea Ecosystem Conference (2011)
- Strait of Georgia Data Centre development (PSF/UBC/Sitka Foundation, 2012)
- Puget Sound marine survival research planning (LLTK report, 2012)
- Salish Sea Marine Survival Workshop (LLTK/PSF, Nov. 2012)
- Creation of a research network to provide capacity (still on-going and growing)

Expected Outcomes

Most comprehensive understanding of the Salish Sea ecosystem, salmon and steelhead components to:

1) Restoration of wild and hatchery salmon and steelhead production: ecosystem-based, identify key interactions, community engagement and empower.
2) Sustainable fisheries and restored community values
3) A foundation for long-term monitoring of Salish Sea and salmon health, and the capacity to sustain this work.

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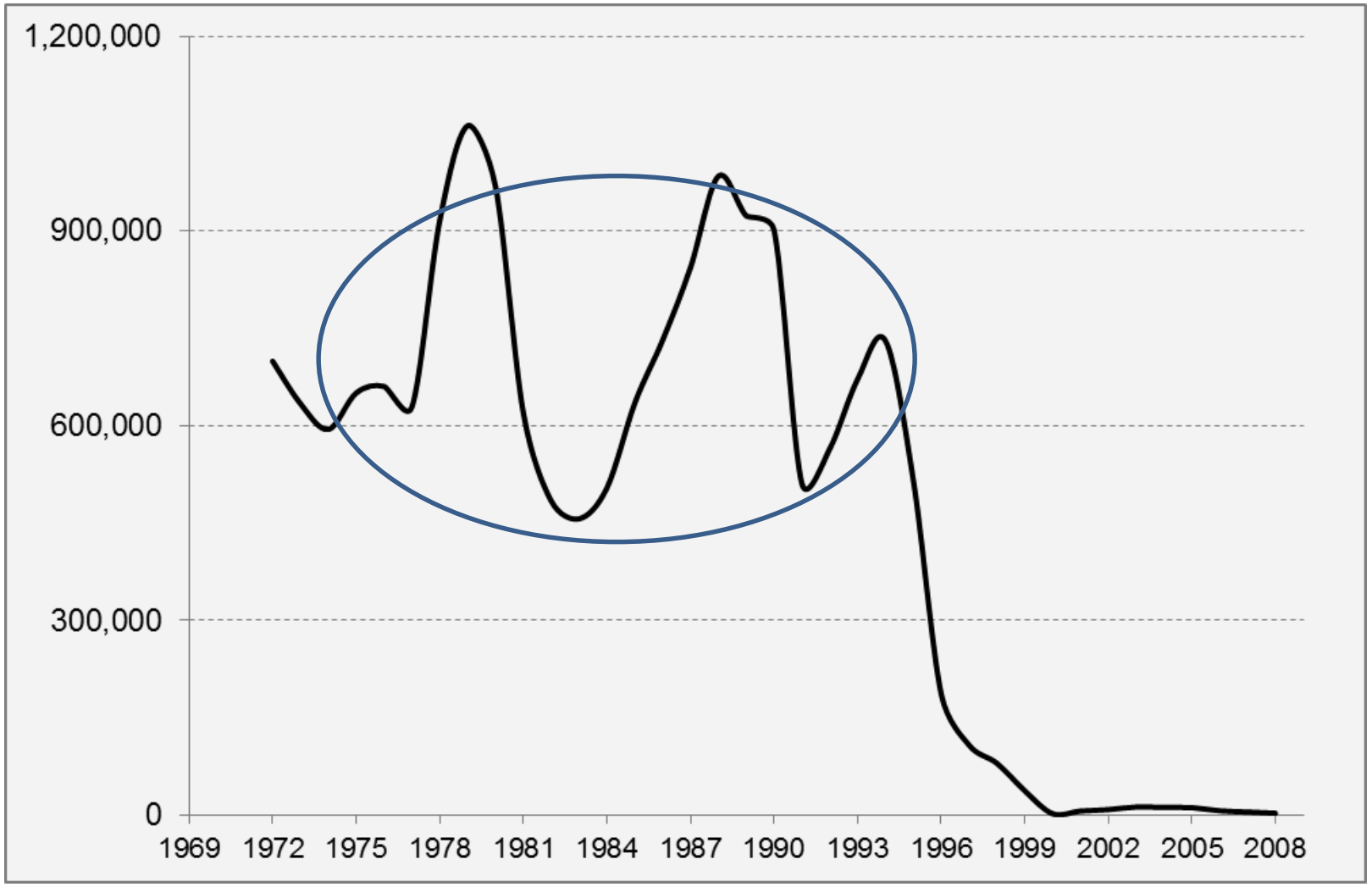
Catch of Coho salmon in the Strait of Georgia (1970 – 2008)



The loss of Coho and Chinook salmon in the Canadian portion of the Salish Sea had significant economic and social effects.

… and changes have not only been observed in Coho, Chinook & steelhead

Fraser sockeye salmon (+/-)

Herring spawning locations

Forage fishes (bait fishes); e.g. Fraser River eulachon

Some marine fishes

Giant kelp and sea grasses

Harbour seals, white-sided dolphin, and harbor porpoise

Fraser pink salmon (odd-year)

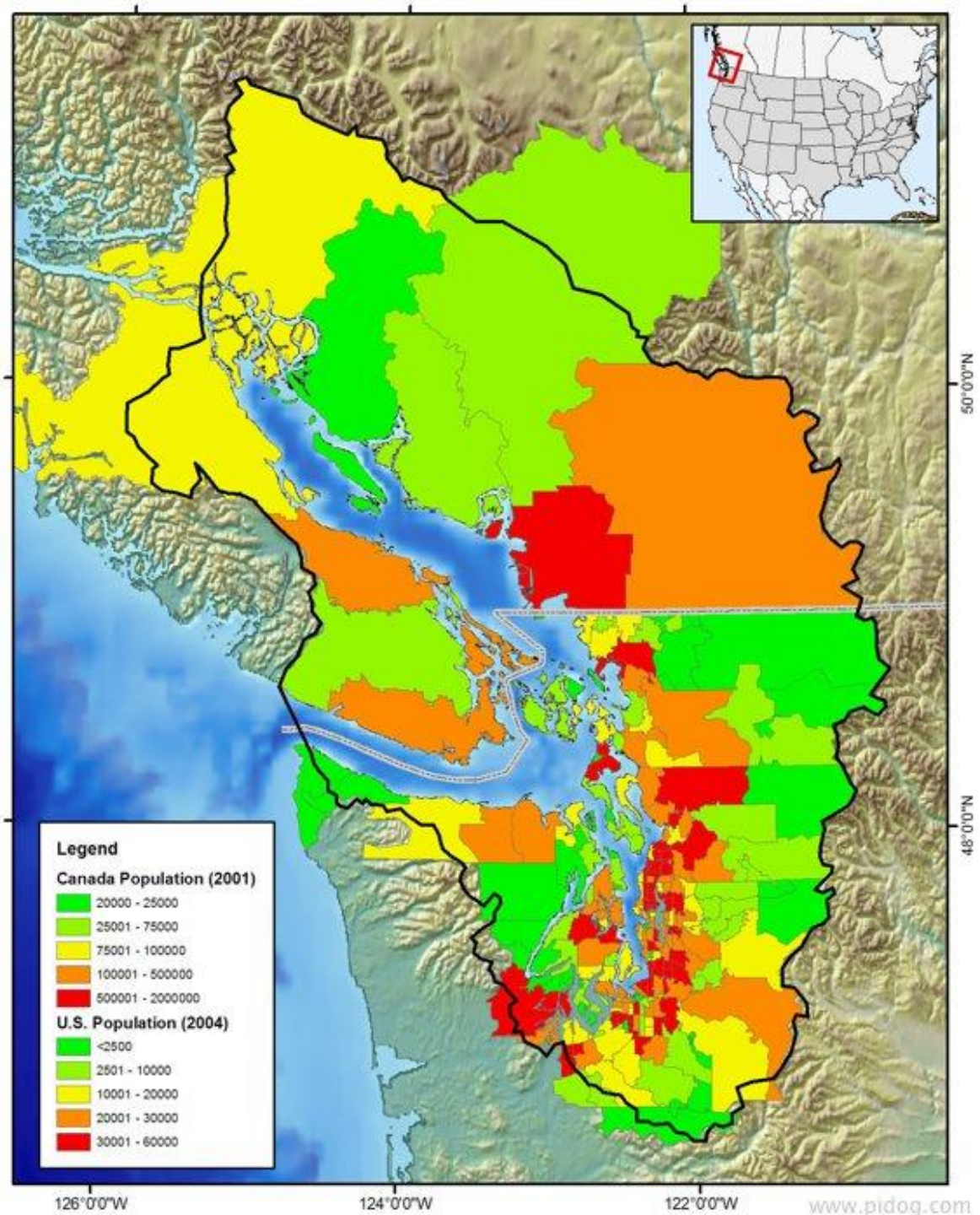
Strait waters, up 1°C over the past 30 years

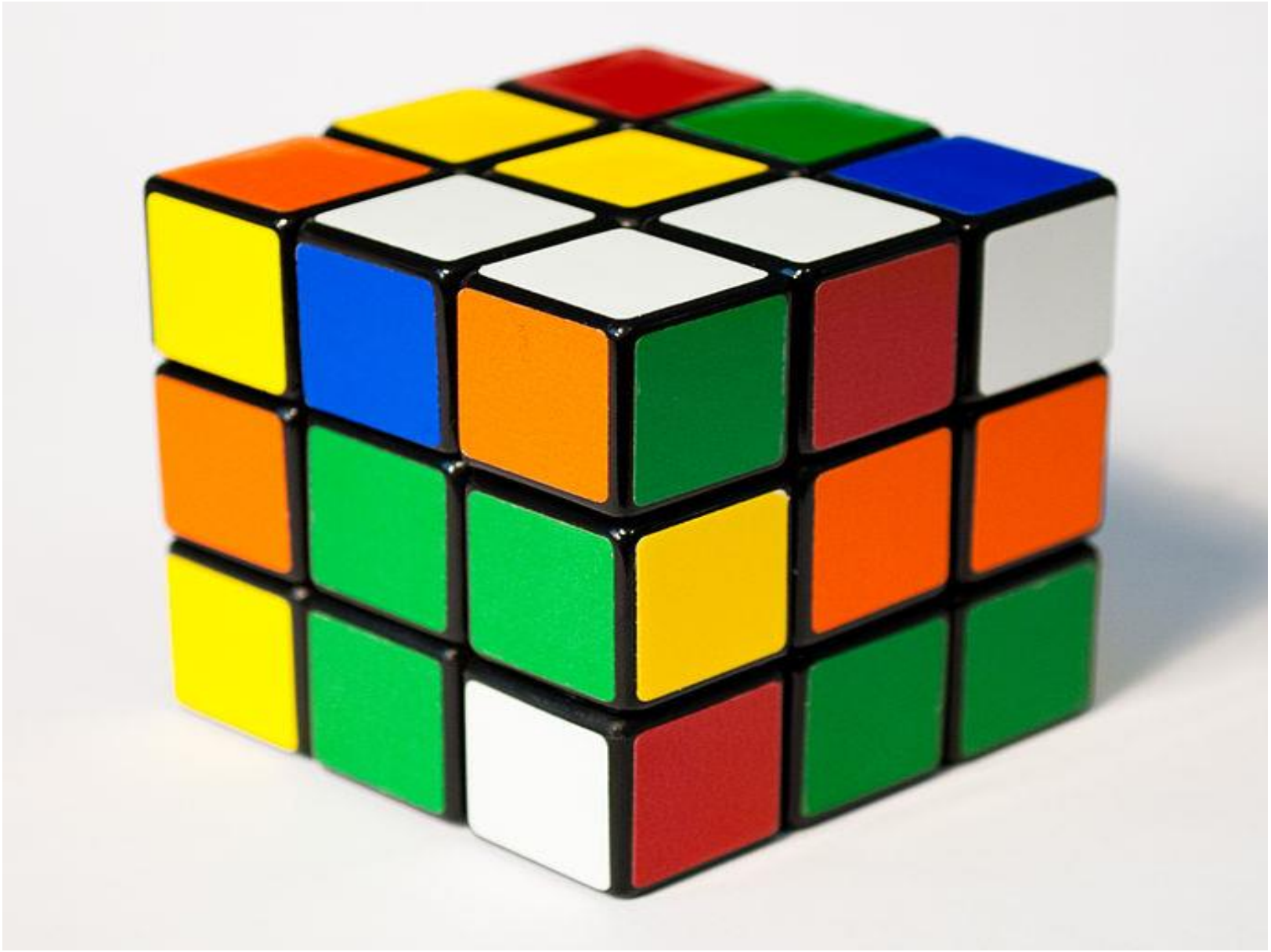
Human population & developments

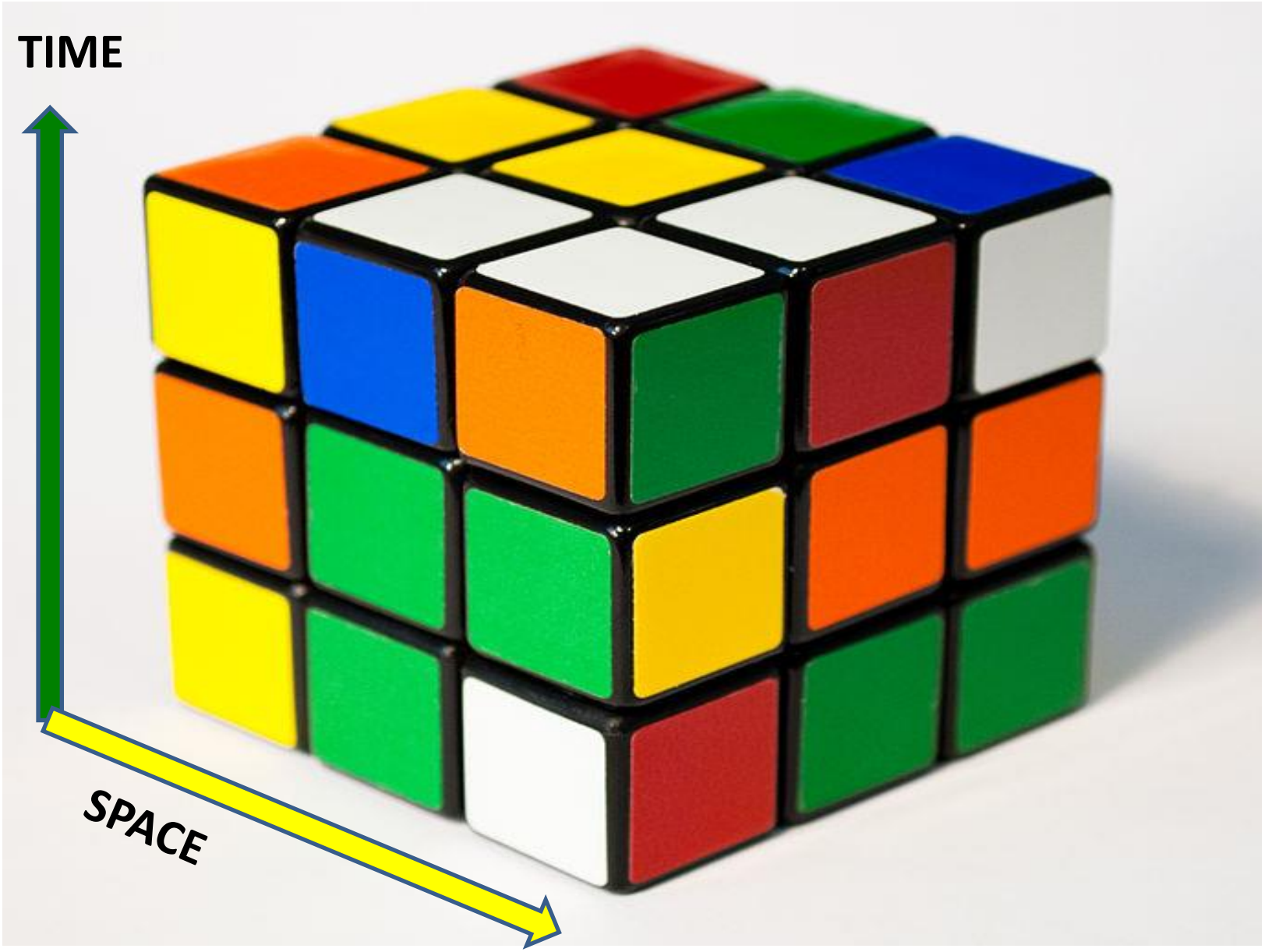
The Salish Sea

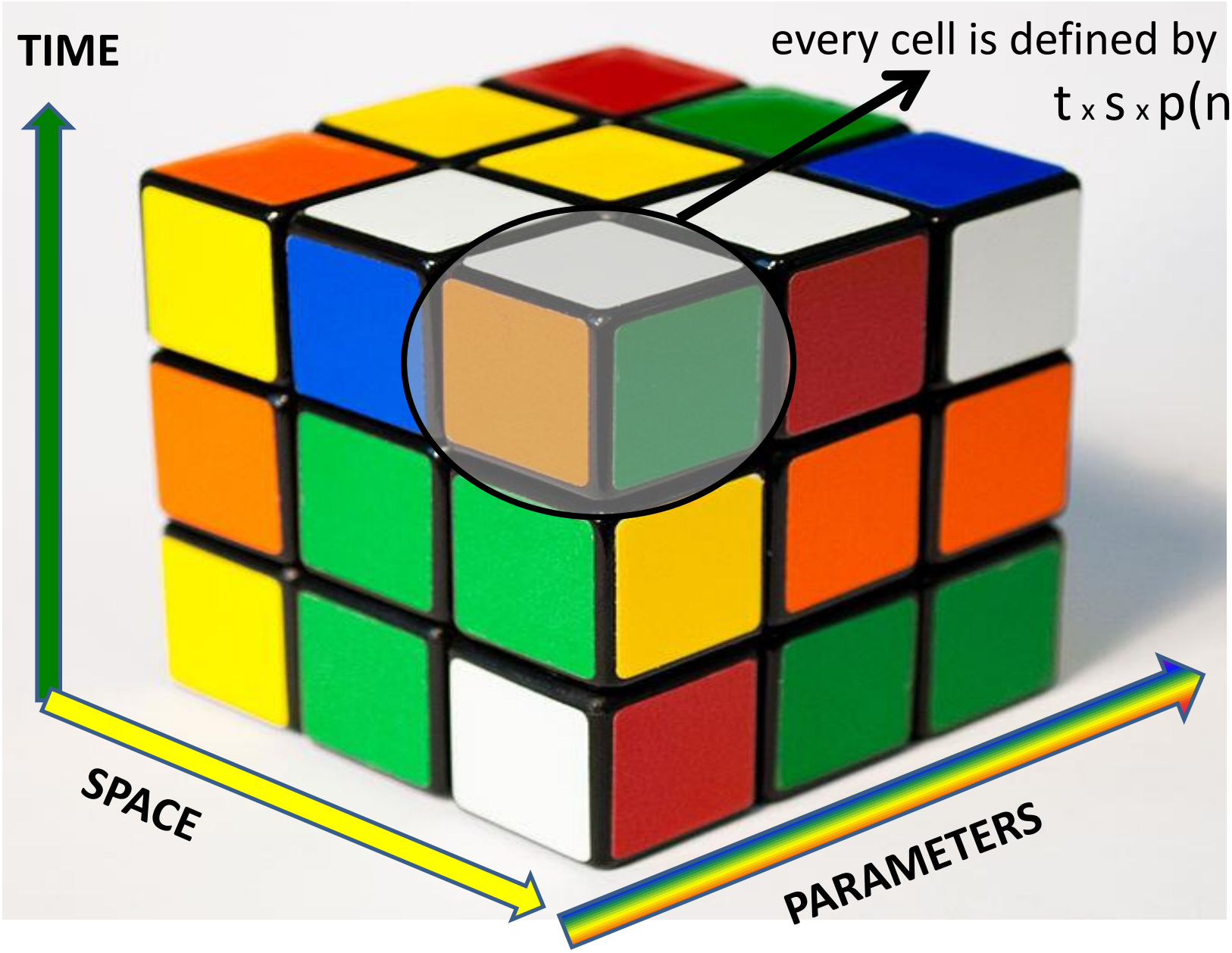
Is a semi-urbanized inland sea, shared waters between U.S. and Canada.

Functionally, a very large estuary.






TIME
SPACE


TIME
every cell is defined by
t x s x p(n)
SPACE
PARAMETERS

Identify the key factors affecting marine survival & growth of juvenile salmon

Top-Down Controls

PATHOGENS / DISEASE

MARINE MAMMALS

SALMON AQUACULTURE

SALMON HATCHERIES

Salmon Habitats & contaminants

SALMON (Growth & Survival)

Biological Interactions

Forage fish base

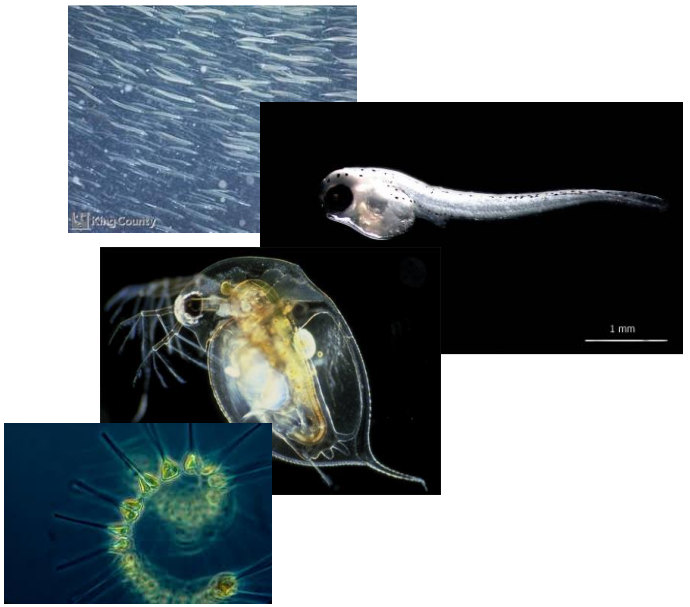
Ichthyoplankton

Zooplankton

Annual weather variation

Phytoplankton

WILD SALMON



Bottom-up Controls

Physical & Chemical Oceanography

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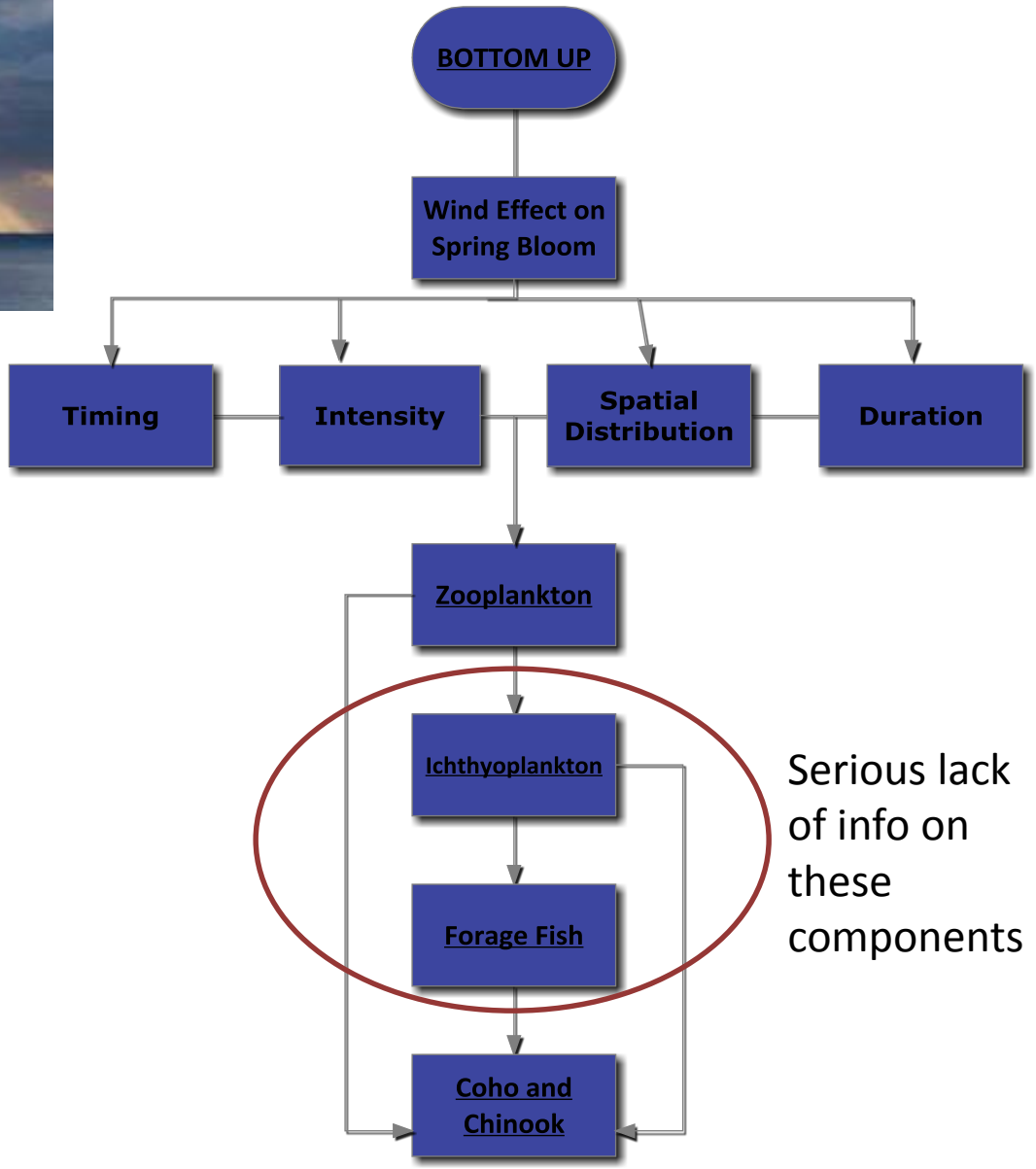
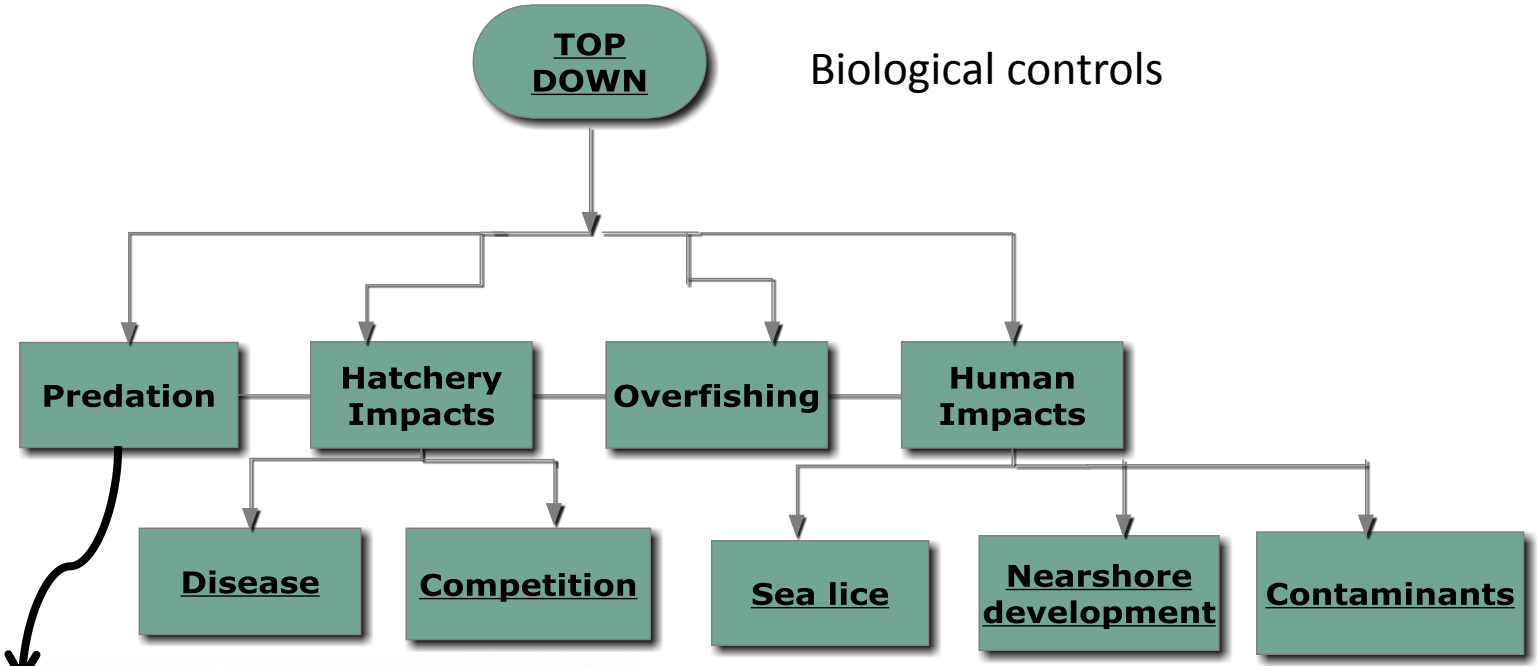
Our primary hypothesis is that:

Environmental factors now control annual production of Chinook and Coho in the Strait of Georgia.

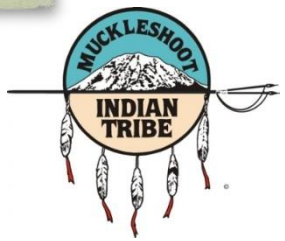


Serious lack of info on these components



Simultaneously … test biological factors for potential impacts and opportunities for intervention (mitigation).

Partners and Funders



Funding Status

- $20 million dollars over 5 years: $10 million U.S / $10 million Canada (plus in-kind contributions).
- Anchored by $5 million/ 5 year grant from the Pacific Salmon Commission, Southern Endowment Fund
- Raised approximately $12 million to date: $3.75 million U.S. (another $500k pending) / $8.25M presently
- NOT Departmental $$ but does involve staff, labs, and ships.

“I’ve been waiting 30 years for this type of effort to occur.”

- Kip Killebrew, Senior Fisheries Biologist,
Stillaguamish Tribe

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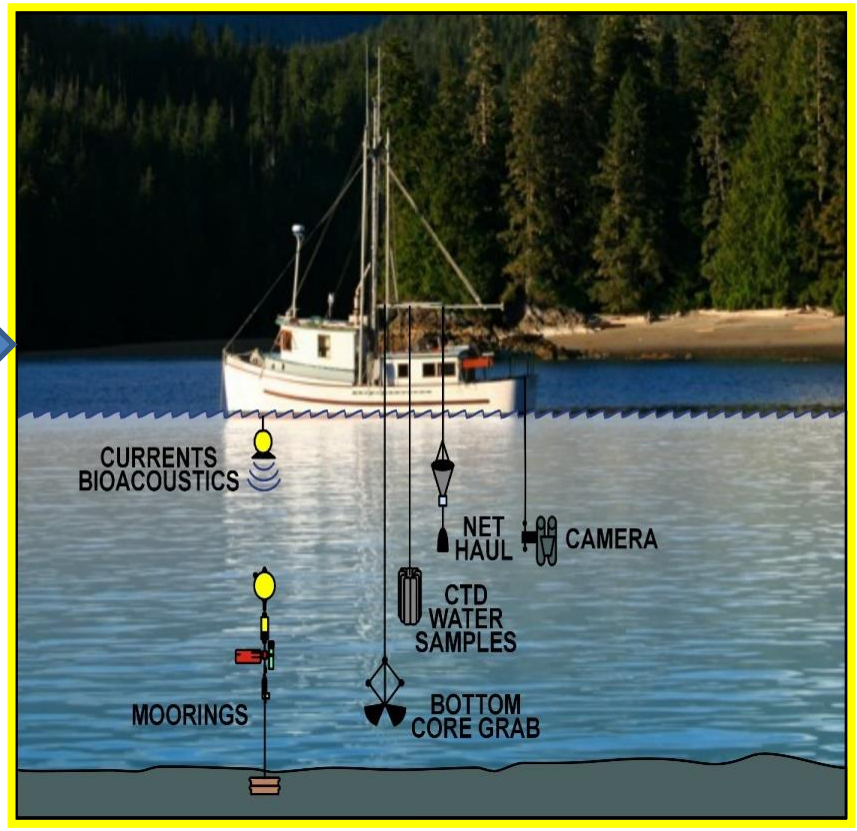
Issues and Pending discussions:

• Pending meetings: DFO Hatchery studies (requested, no reply), Aquaculture x Wild salmon interactions (July 2nd, Cohen response), Fraser River projects (UBC initial discussion, SFU engagement)

• Issues:

i. First Nations engagement (weak), another round of Community meetings
ii. Significant reductions to CWT marking for Indicator populations ... No direct measures of marine survival rates
iii. Limitations on technical staff availability (need to begin recruiting)
iv. Data management and analysis
v. Development of UBC Centre of Excellence for the Strait of Georgia.
vi. An added issue could be the value of the Conservation Stamp
vii. Capacity within PSF
viii. Funding raising challenges

Citizen Science in the Strait of Georgia



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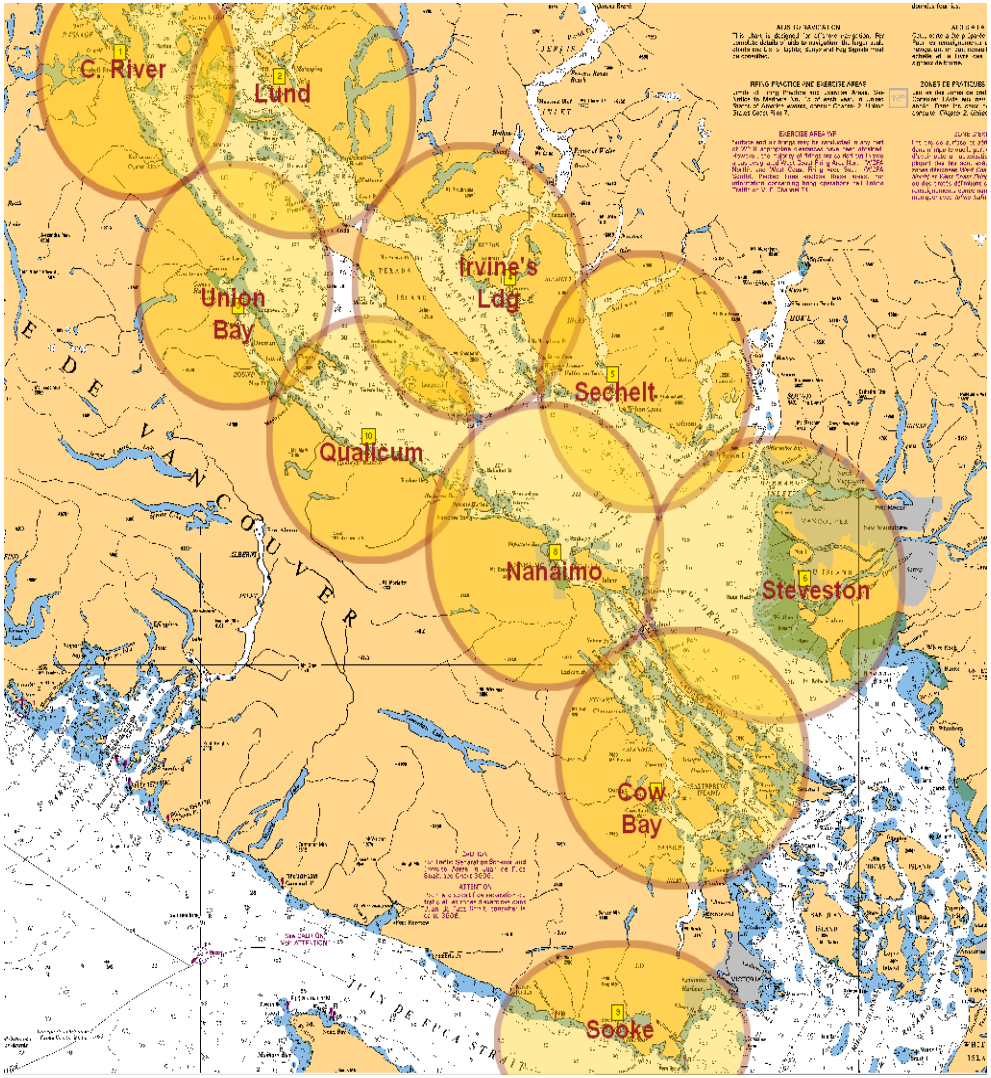
Citizen Science in the Strait of Georgia



- 2014 development: Cowichan Bay, & Campbell River, Victoria, Deep Bay.
- Define time/space scales for sampling
- Involves Ocean Networks Canada, IOS staff, SSMSP technicians

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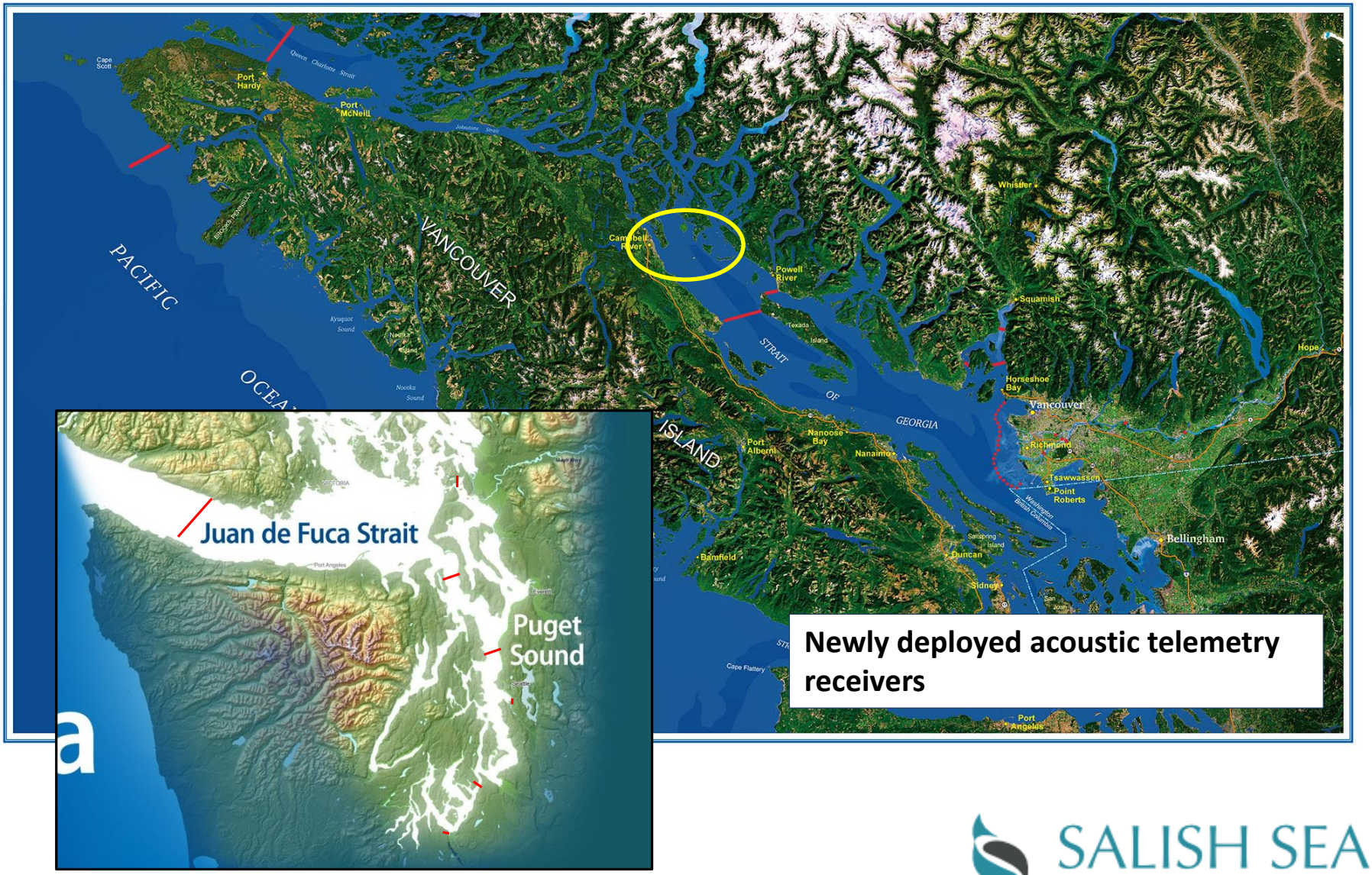
Telemetry Arrays to Track the Fish



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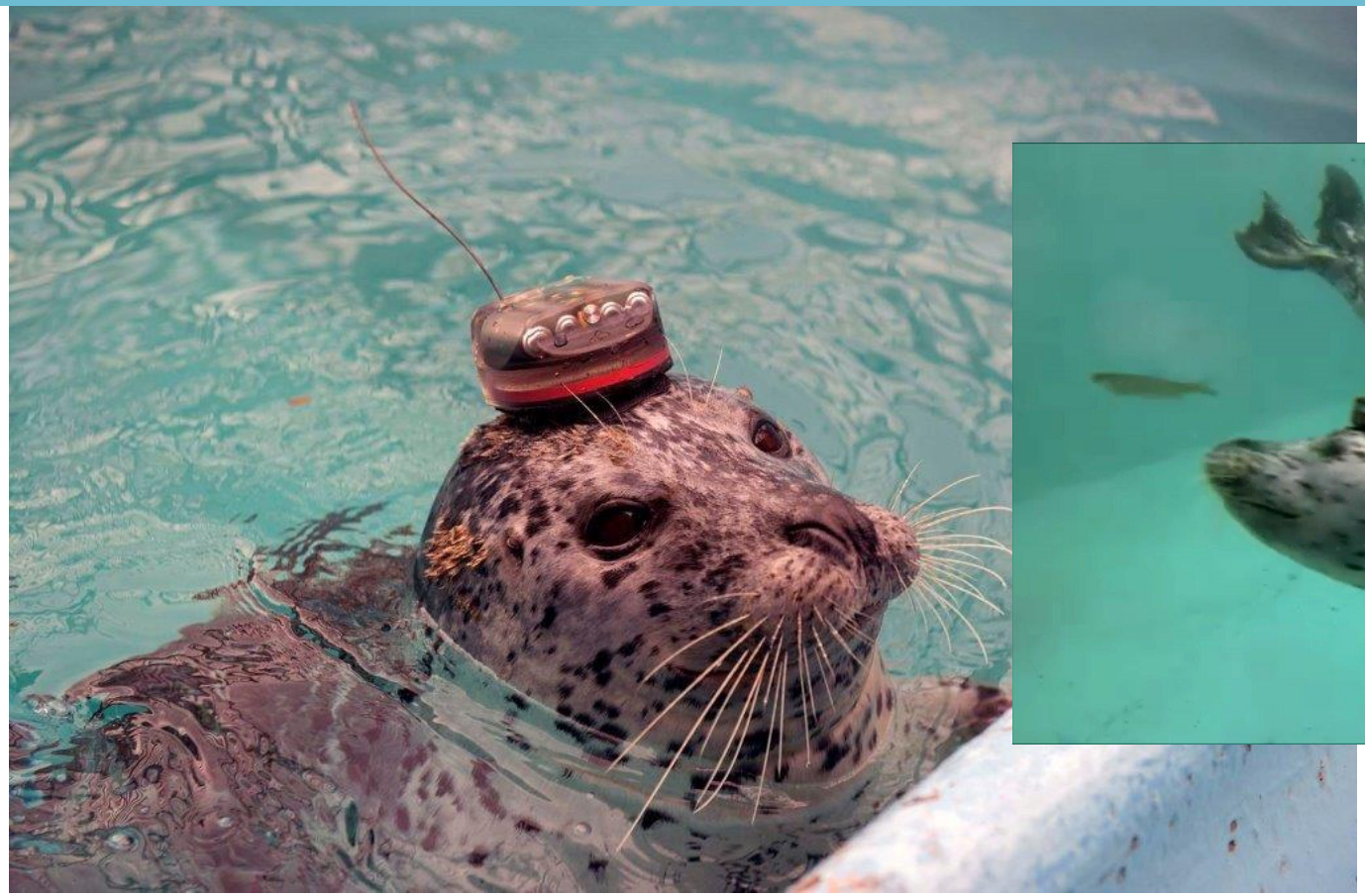
Innovative Research Techniques



Developers: Austin Thomas UBC, Brian Battaile, UBC and Wildlife Computers, Redmond, WA.

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www.marinesurvivalproject.com

2014 – 2018

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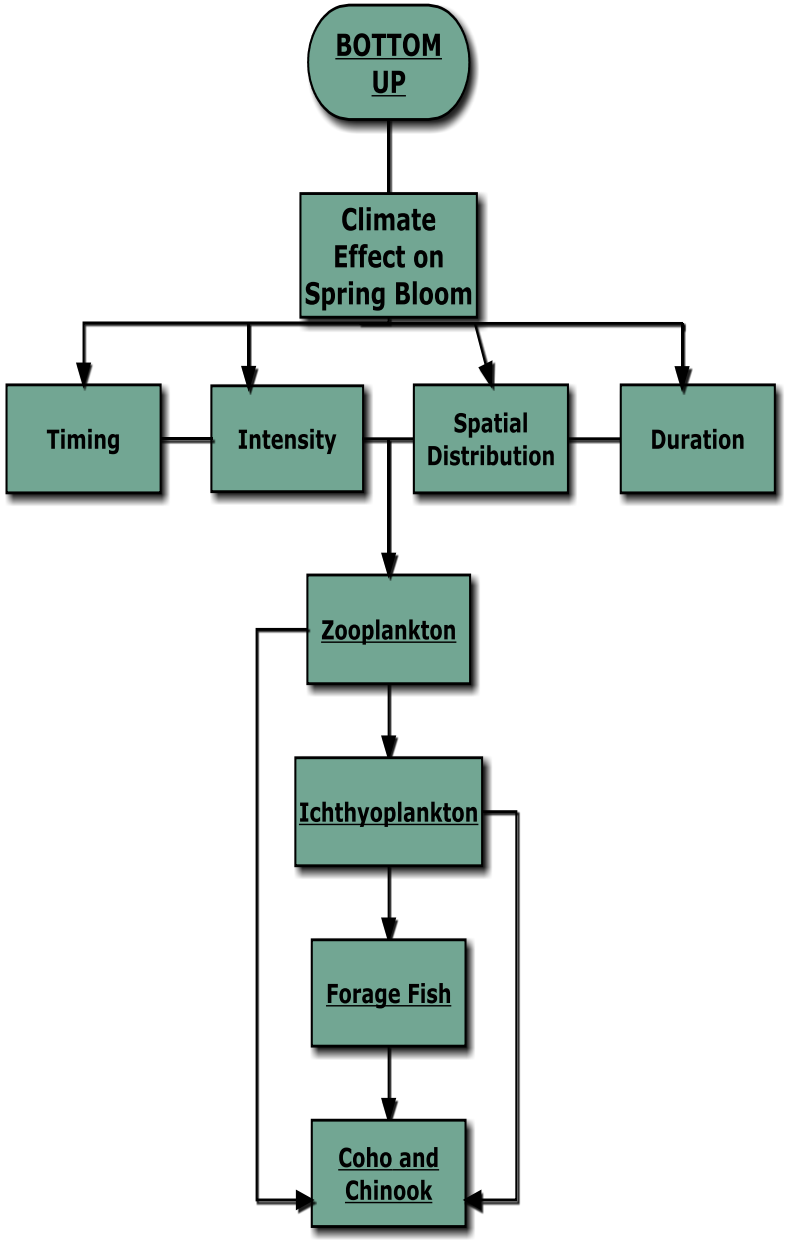


2009 Projects:

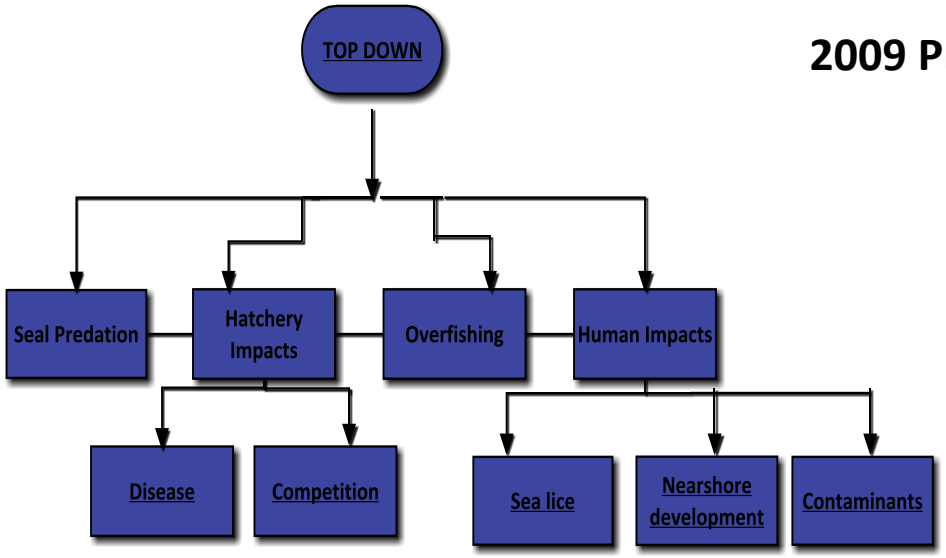
Project 1: Continuous Phytoplankton Monitoring in SoG
Team: A. Pena & D. Masson (DFO/IOS Sidney)
Project 2: Slocum Glider Program
Team: R. Thomson, D. Masson, and T. Curran (DFO/IOS Sidney)
P. LaCroix (Canada Centre for Ocean Gliders, Sidney)
Project 3: Sediment traps and Moored instrument arrays
Team: R. Macdonald, S. Johannessen, R. Thomson (DFO/IOS Sidney)
Project 4: Remote Sensing
Team: G. Borstad (ASL Environmental Services Inc.)

Project 5: Zooplankton & Ichthyoplankton surveys
Team: D.L. Mackas (DFO), J.F. Dower (University of Victoria),
E. Pakhomov (University of British Columbia)

Project 6: Forage fish spawning habitat restoration
Team: R. deGraaf (BMS) & BC Shore Spawners Alliance

Project 7: Juvenile Salmon Surveys
Team: K. Lange and D. Beamish (DFO)
Project 8: Mortality Studies
Team: D. Welch (Kintama Research), T. Farrell (UBC)

2009 Projects:



Project 9: Assessing Impact of Marine Mammals on Salmon in SoG
Team: A. Trites (UBC) & students

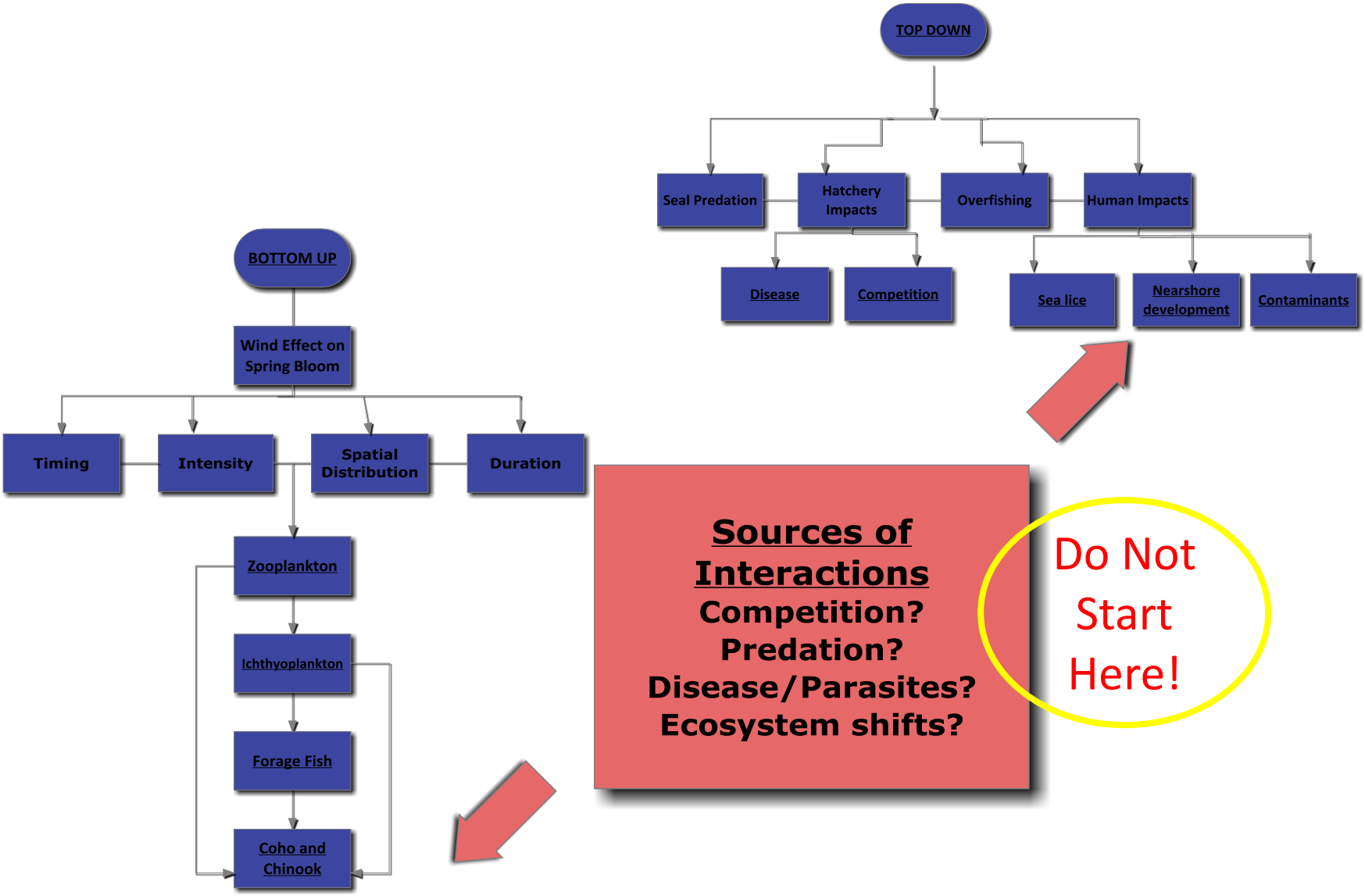
Project 10: Mortality & Disease Profiles of Wild& Hatchery Fish
Team: K. Miller (DFO), T. Farrell (UBC) & B. Devlin (West Van-DFO)

Project 11: Georgia Basin Coho Salmon Hatchery Program
Team: Quinsam Hatchery (D Ewart), Centre for Aquatic Health Sciences (S. Saksida), Marine Harvest Canada, I. Pearsall and B. Riddell.

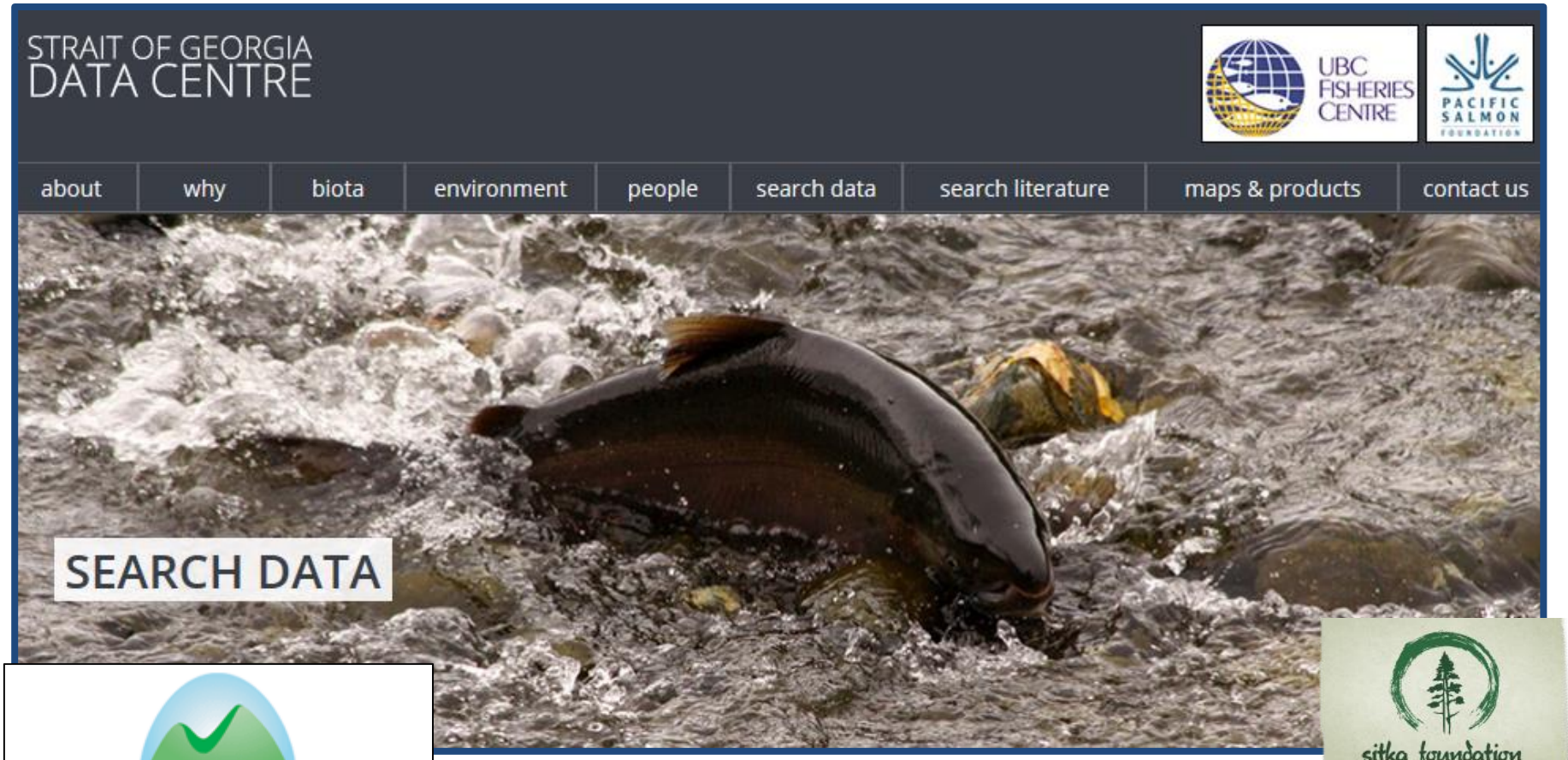
Project 12: Sea Lice Studies
Team: Quinsam Hatchery (D Ewart), Centre for Aquatic Health Sciences (S. Saksida), Marine Harvest Canada, I. Pearsall and B. Riddell.

Project 13: Community-Based Nearshore Restoration
Team: Nikki Wright & others (Seagrass Conservation Working Group)

Project 14: Contaminants
Team: Georgia Strait Alliance


TOP DOWN
Seal Predation
Hatchery Impacts
Overfishing
Human Impacts
Disease
Competition
Sea lice
Nearshore development
Contaminants
BOTTOM UP
Wind Effect on Spring Bloom
Timing
Intensity
Spatial Distribution
Duration
Zooplankton
Ichthyoplankton
Forage Fish
Coho and Chinook
Sources of Interactions
Competition?
Predation?
Disease/Parasites?
Ecosystem shifts?
Do Not Start Here!

Collaboration and Data Sharing



Basecamp™
Project Collaboration

sitka foundation

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