Assessment of climate trends and projections and their associated impacts on the Pacific coast of Canada

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Fisheries and Oceans Canada

What is ACCASP?

ACCASP stands for Aquatic Climate Change Adaptation Services Program

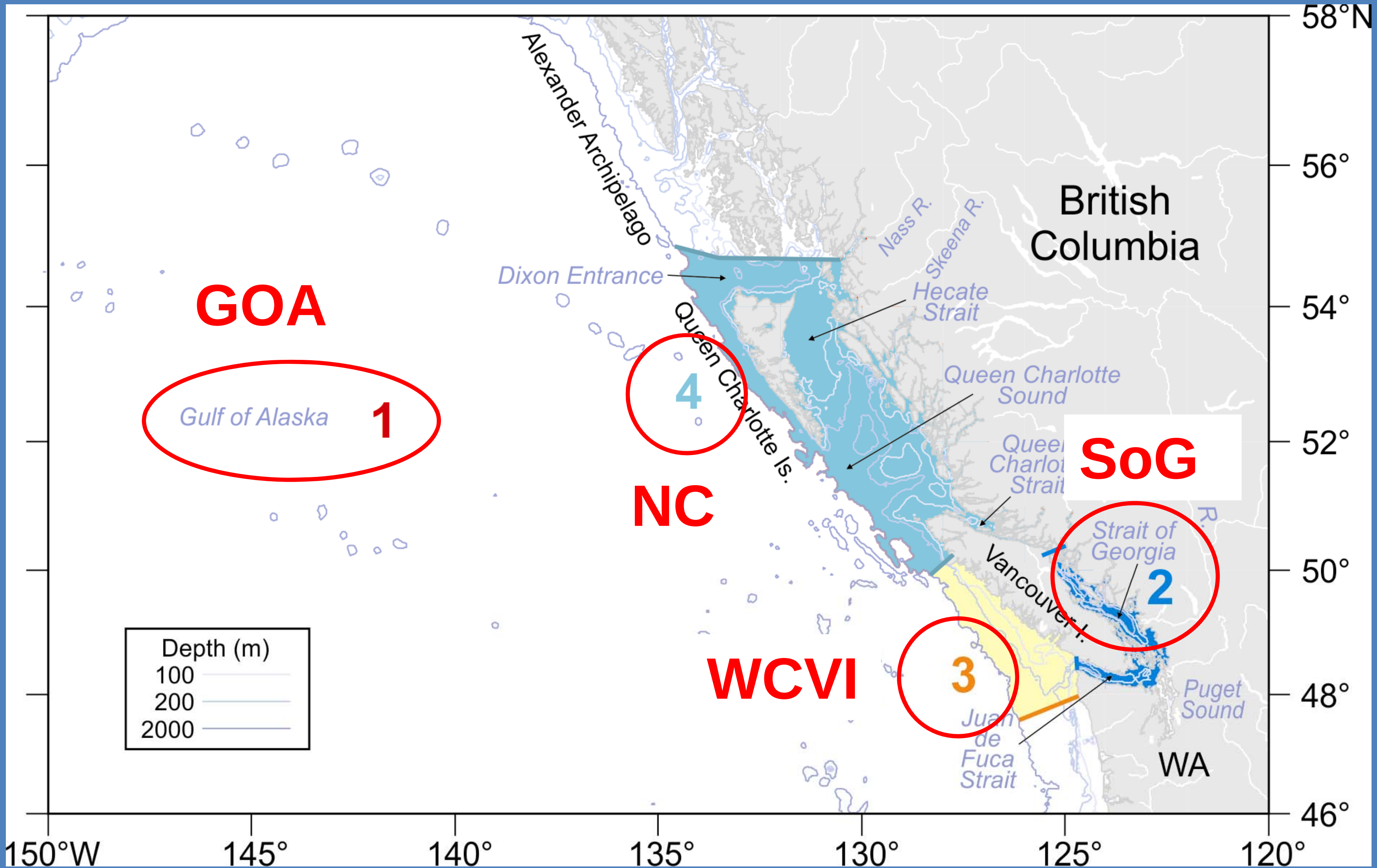
This is the Fisheries and Oceans Canada contribution to a government-wide effort to address climate change adaptation.

This is a Science program developed in close coordination with other 'sectors' (Policy, Fisheries Management, Fisheries Protection Program) of the Department.

Science participants included "Trends and projections" and "Impacts, vulnerabilities and opportunities" teams for each of four Large Aquatic Basins.

ACCASP Large Aquatic Basins

Pacific LAB subdomains



A trend is based on past observations, and the length of the observational records varies.

A projection is estimated from climate model output based on assumptions about future anthropogenic greenhouse gas emissions. We make projections only for the 50 year timescale.

In the North Pacific, climate variability is large relative to anthropogenic trends. Climate model projections have no predictive skill on the 10-year time scale. Trends based on less than 20-30 years of data can not be assumed to represent long-term trends.

What is unique about Pacific LAB?

- no sea ice
- very large interdecadal variability
- very shallow OMZ and ASH
- dominant role for anadromous fish
- adjacent ocean is HNLC

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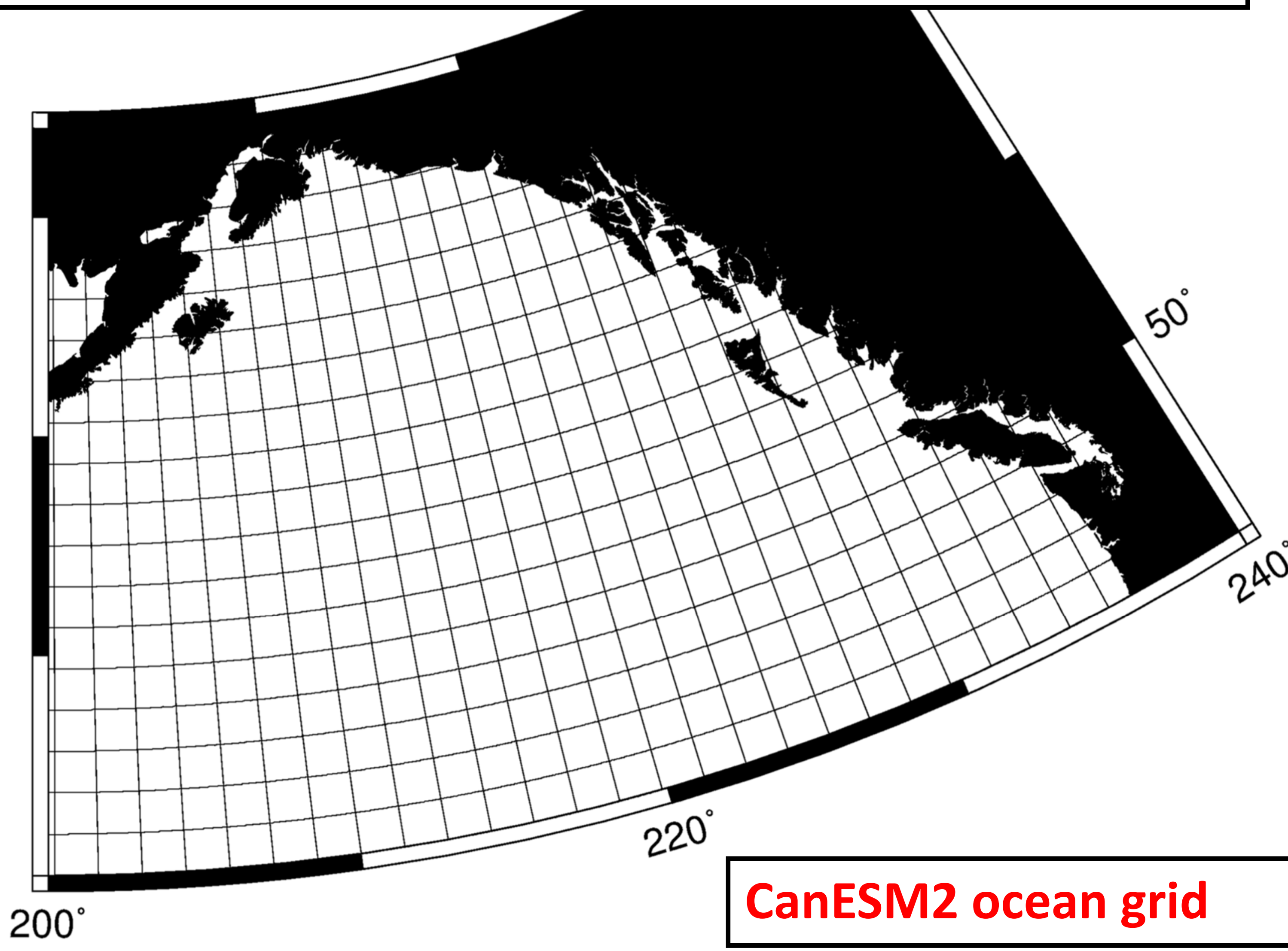
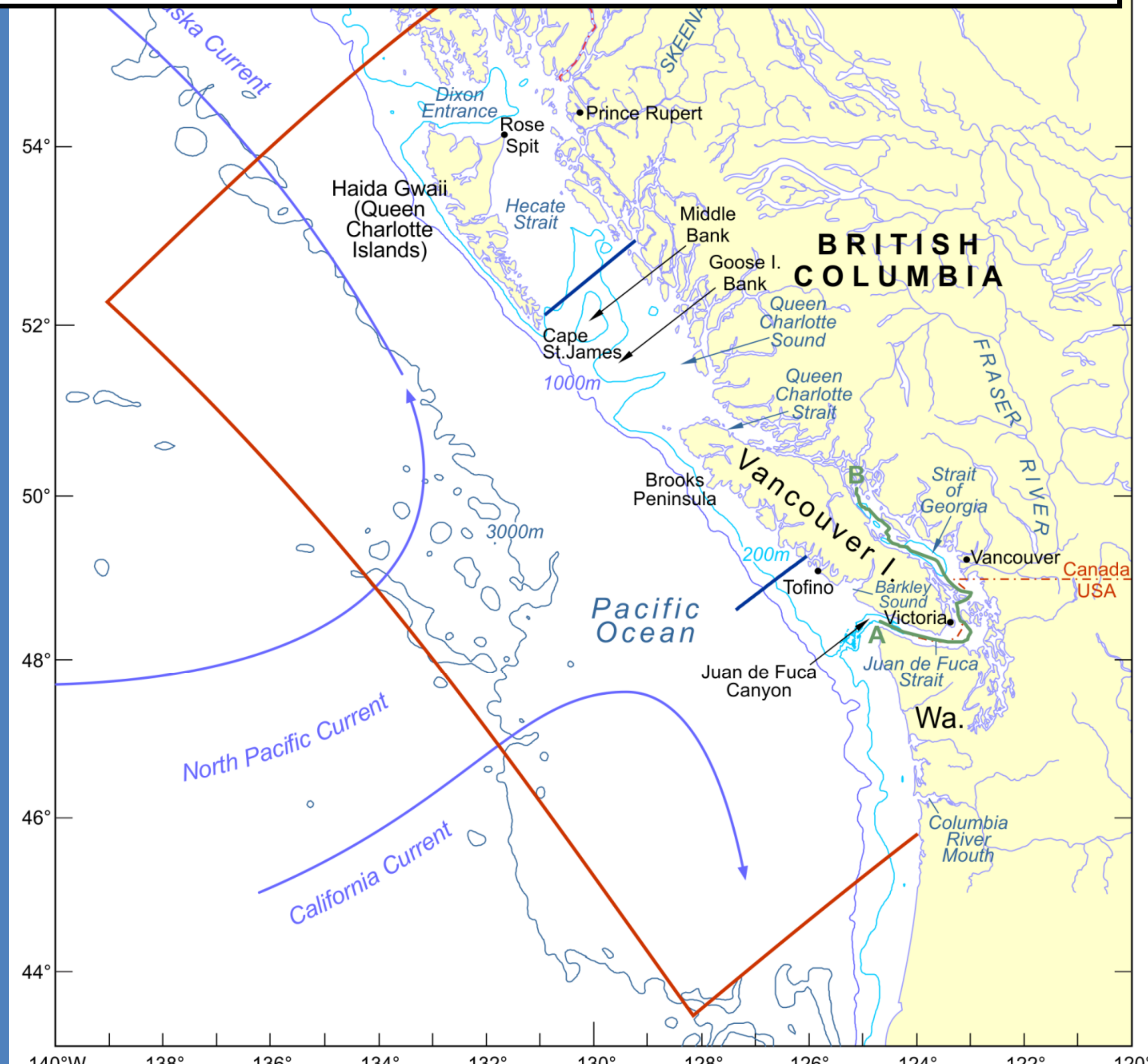
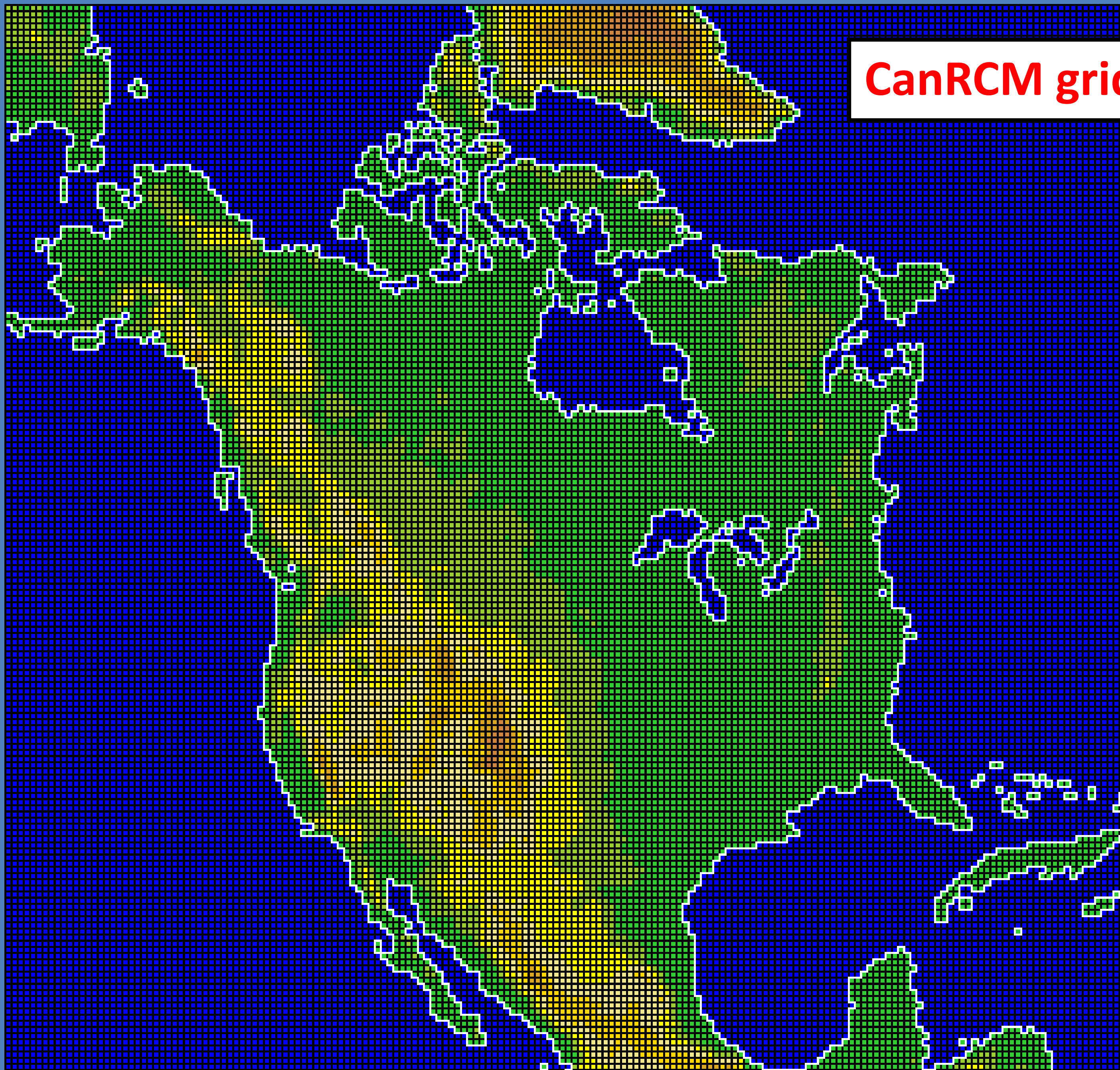
Projections require downscaling for all sub-basins except the open Gulf of Alaska.



CanESM2 ocean grid

Domain of regional downscaling model (Masson, Morrison, Foreman, Callendar, Pena)





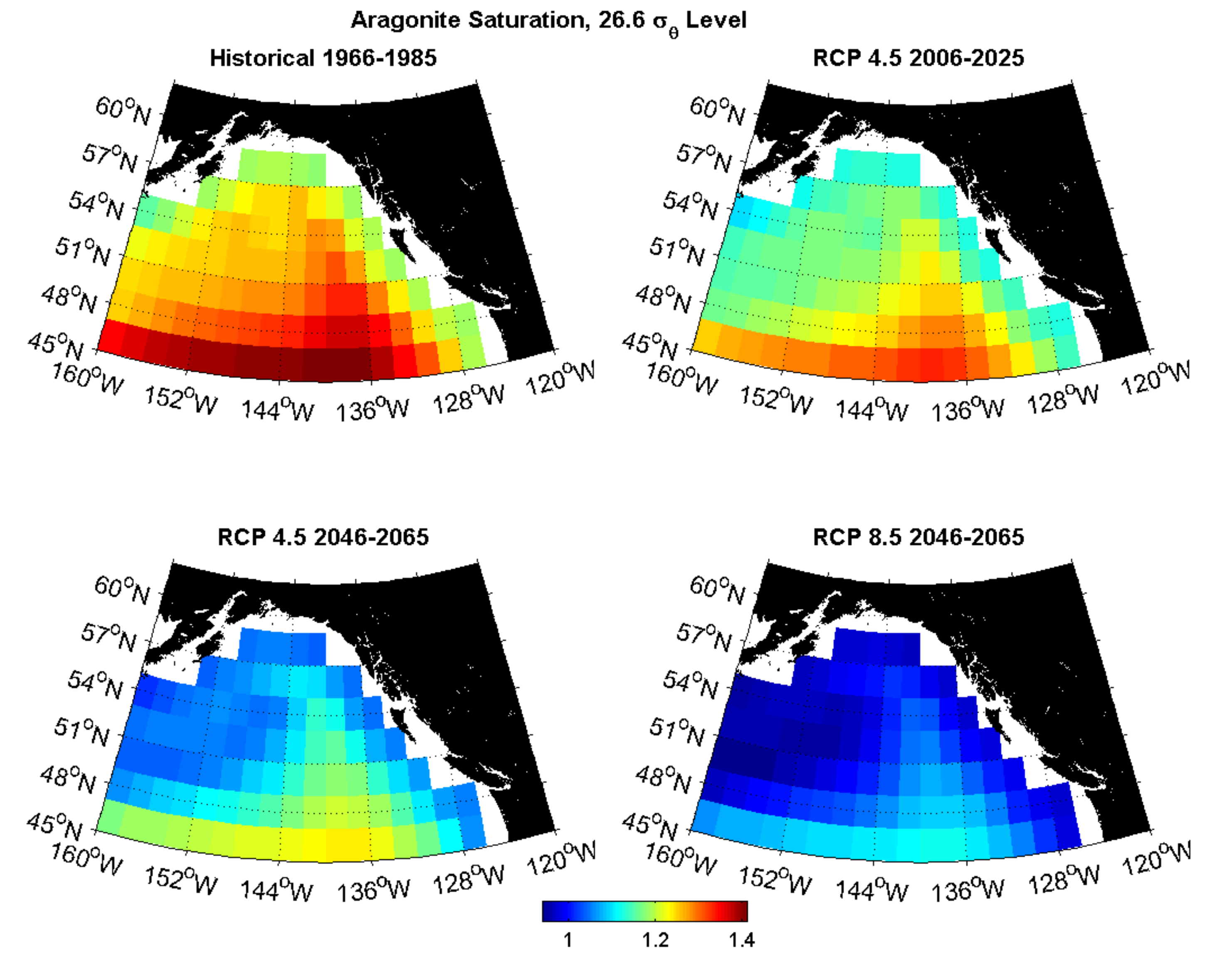
CanRCM grid (45 km)

Coastal temperature time series

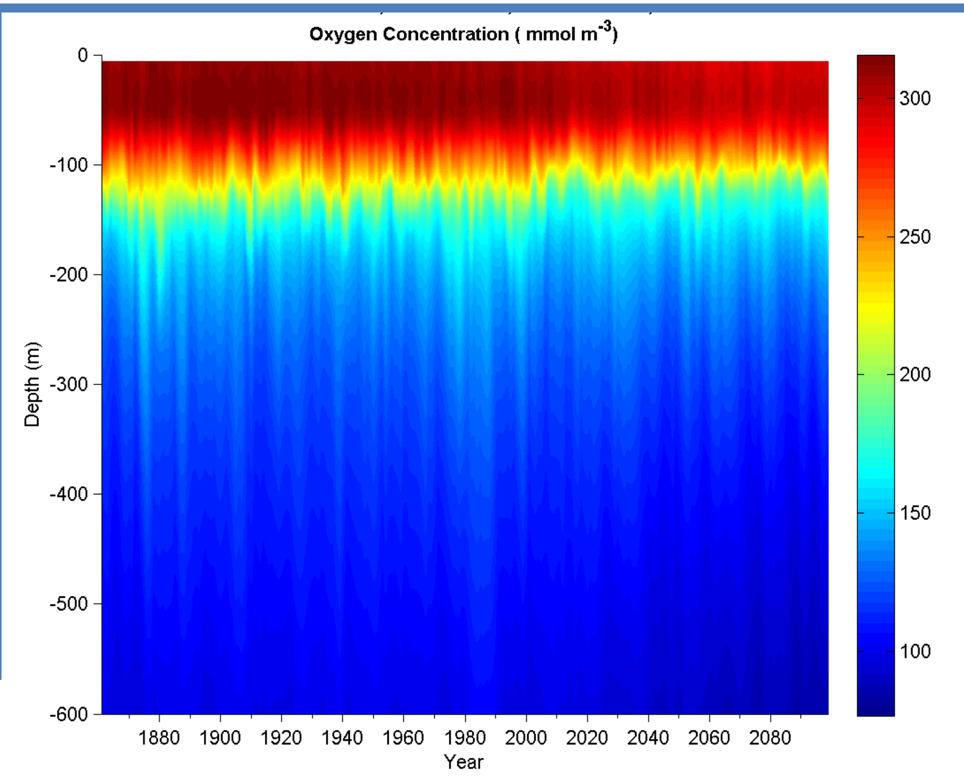
	Duration (years)	Trend (ºC / 100 y)
Amphitrite Point	76	0.77 ± 0.60
Kains Island	76	0.57 ± 0.74
Entrance Island	74	1.48 ± 0.53
Race Rocks	69	1.52 ± 0.57
Pine Island	74	0.86 ± 0.80
Langara Island	71	0.85 ± 0.75
Bonilla Island	51	0.86 ± 1.05
Chrome Island	48	3.60 ± 1.86

Cummins and Masson 2014 Prog Oceanogr 120: 279

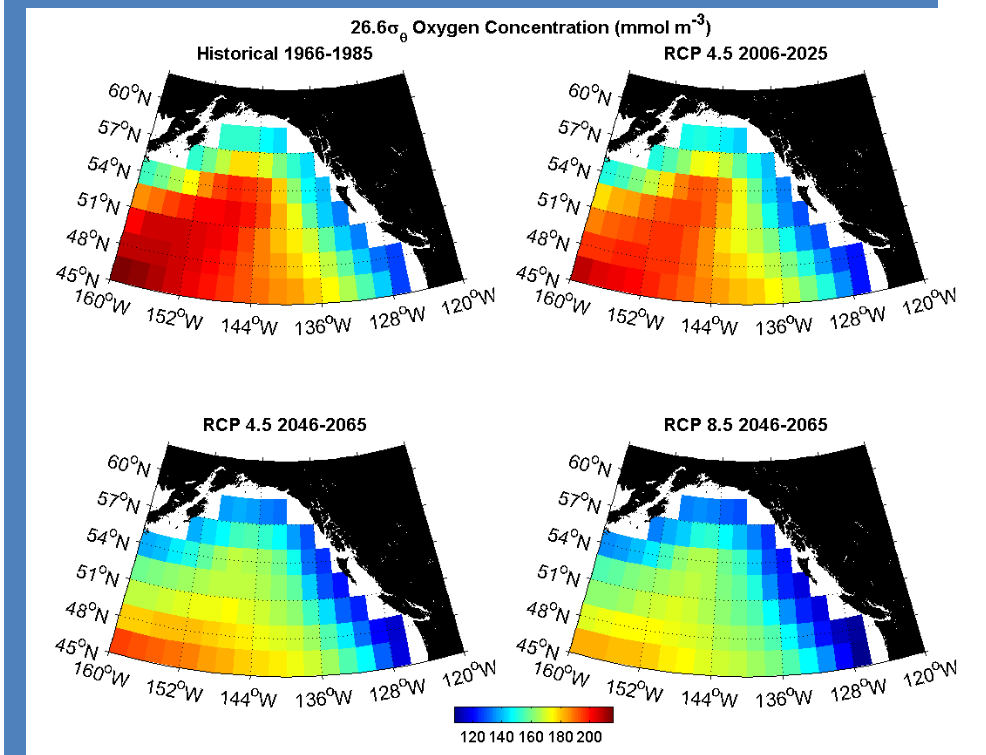
Projections of aragonite saturation (Gulf of Alaska)



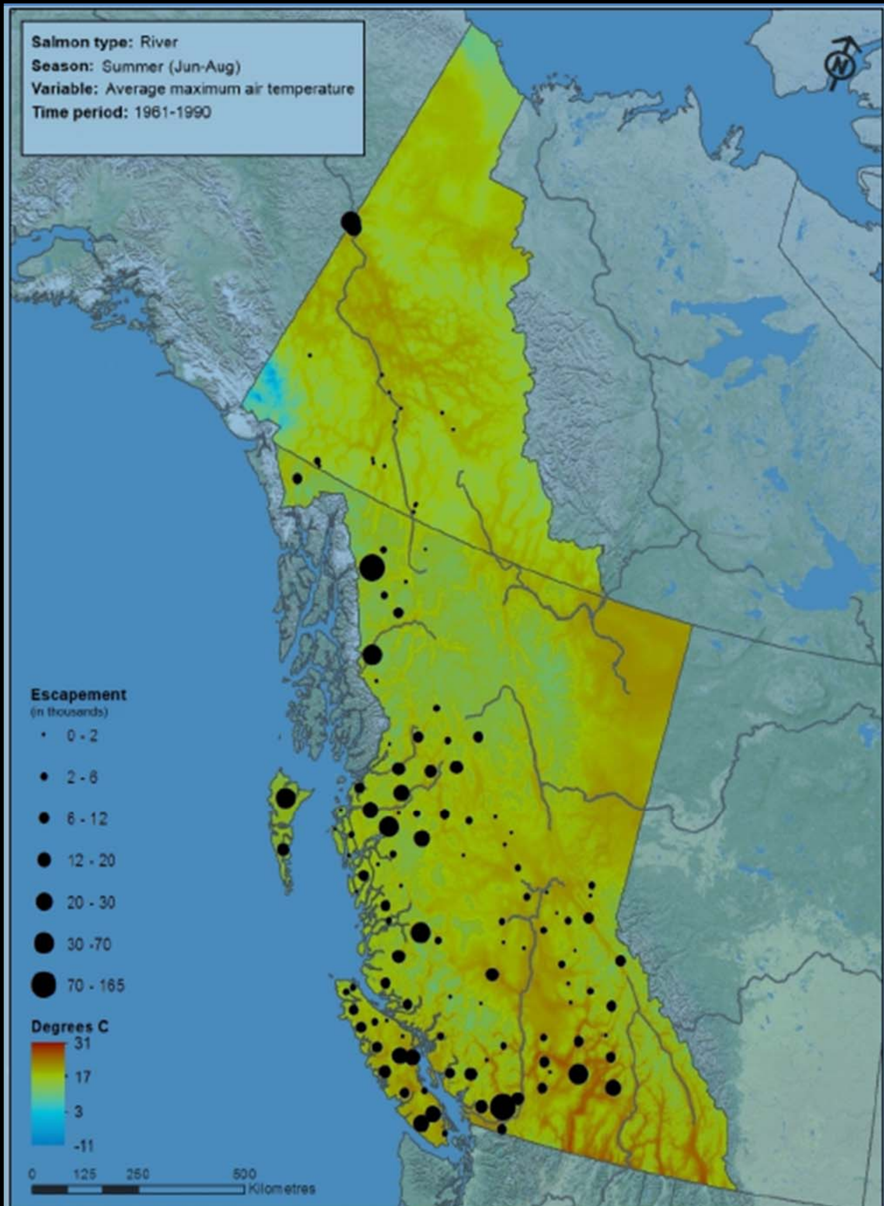
Projections of dissolved oxygen (Gulf of Alaska)

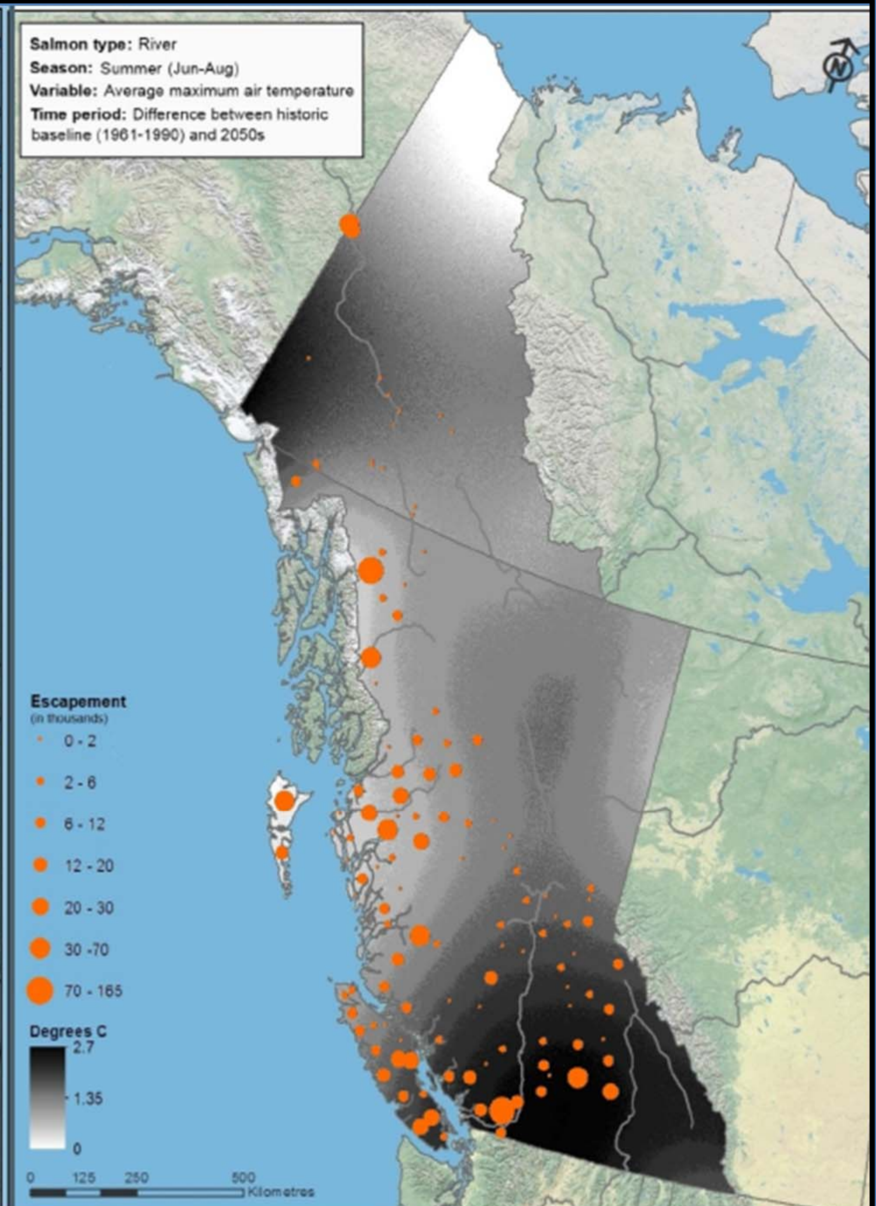


OSP (RCP4.5)

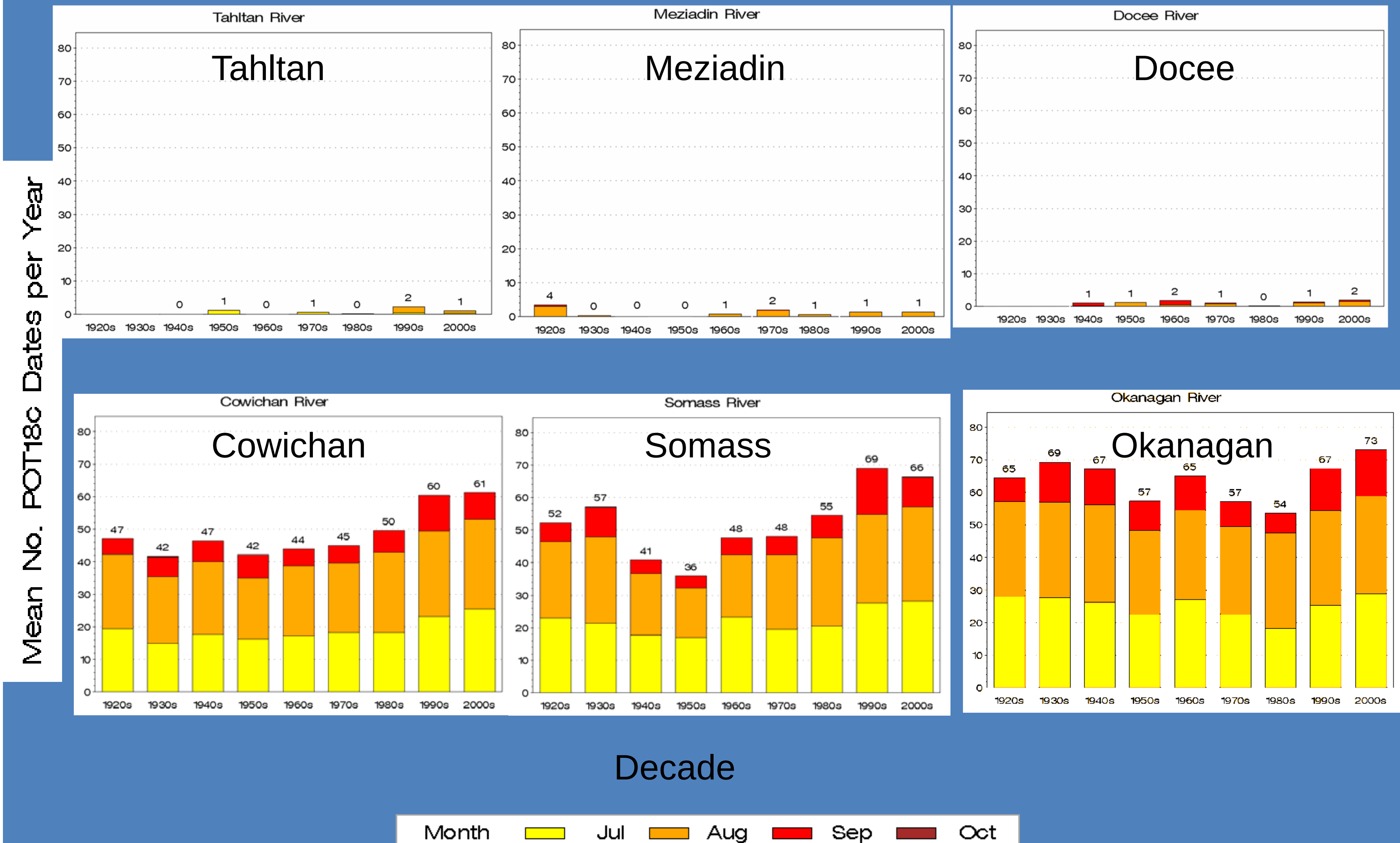


Historic temperatures and projected changes over land

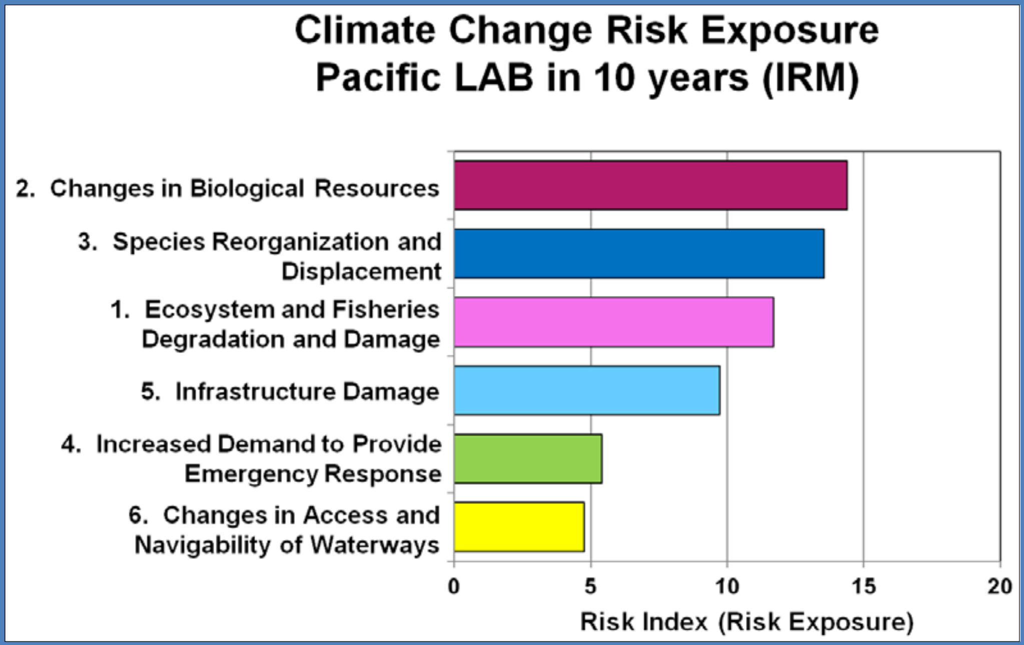


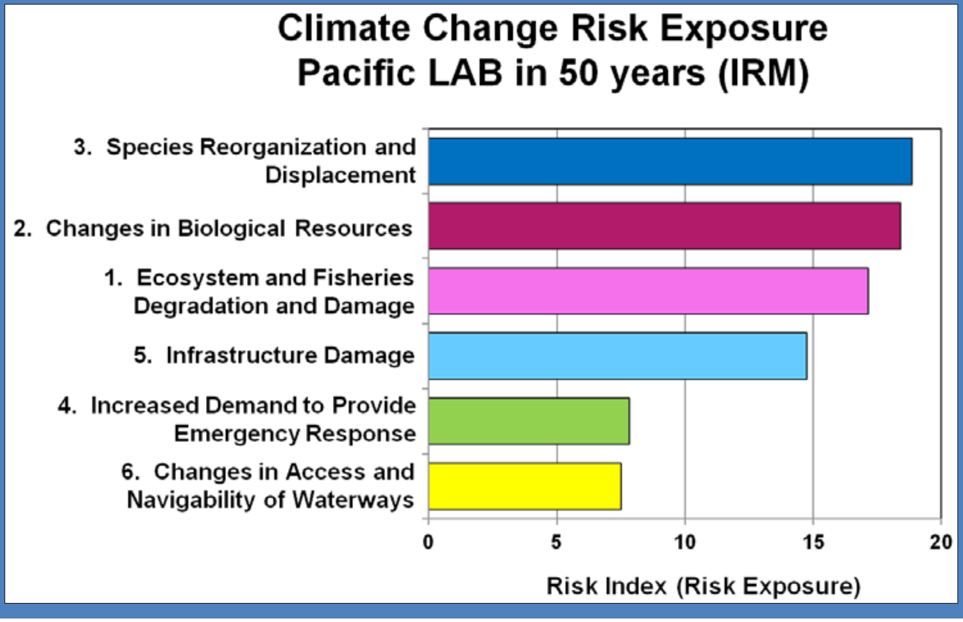


Frequency of occurrence of temperatures >18°C in northern and southern salmon-bearing rivers



Ranking the Risks

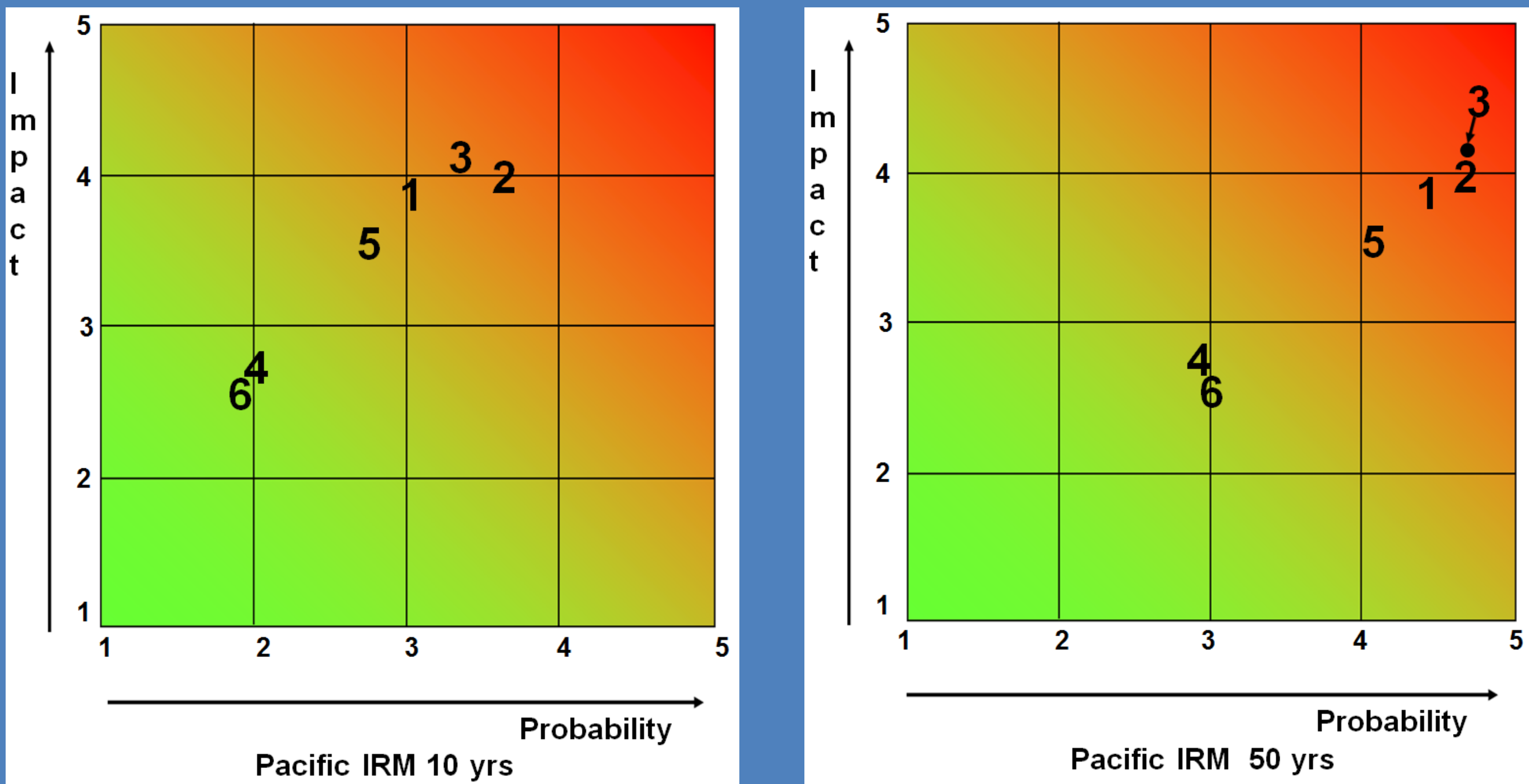




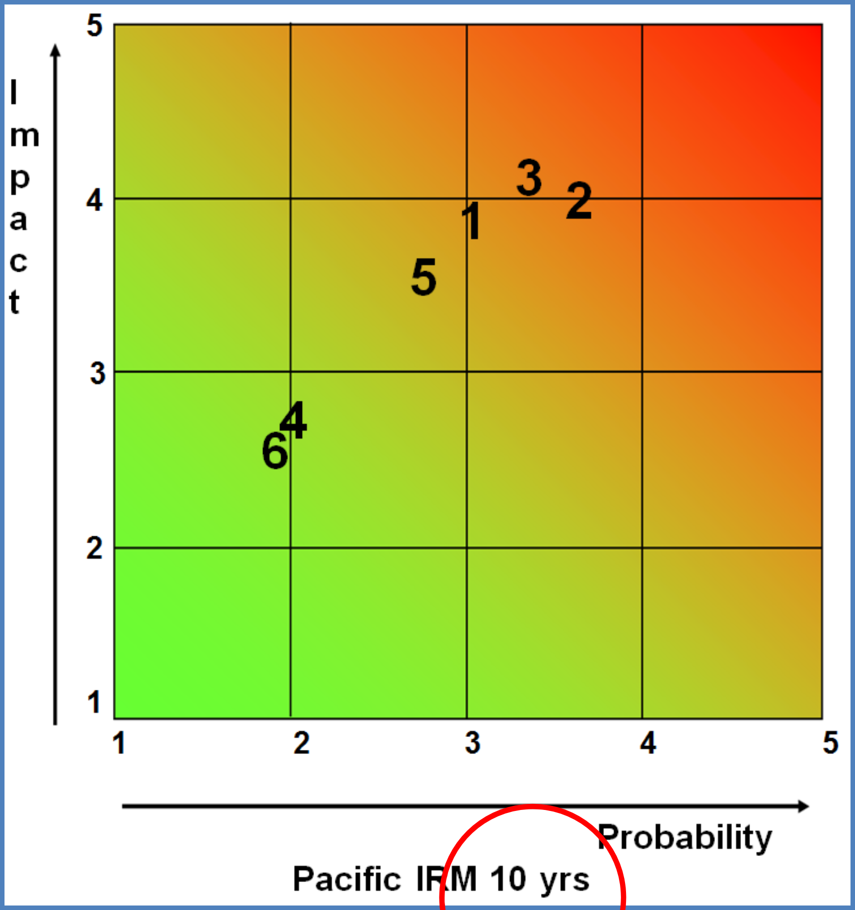
Risk index - all LABs

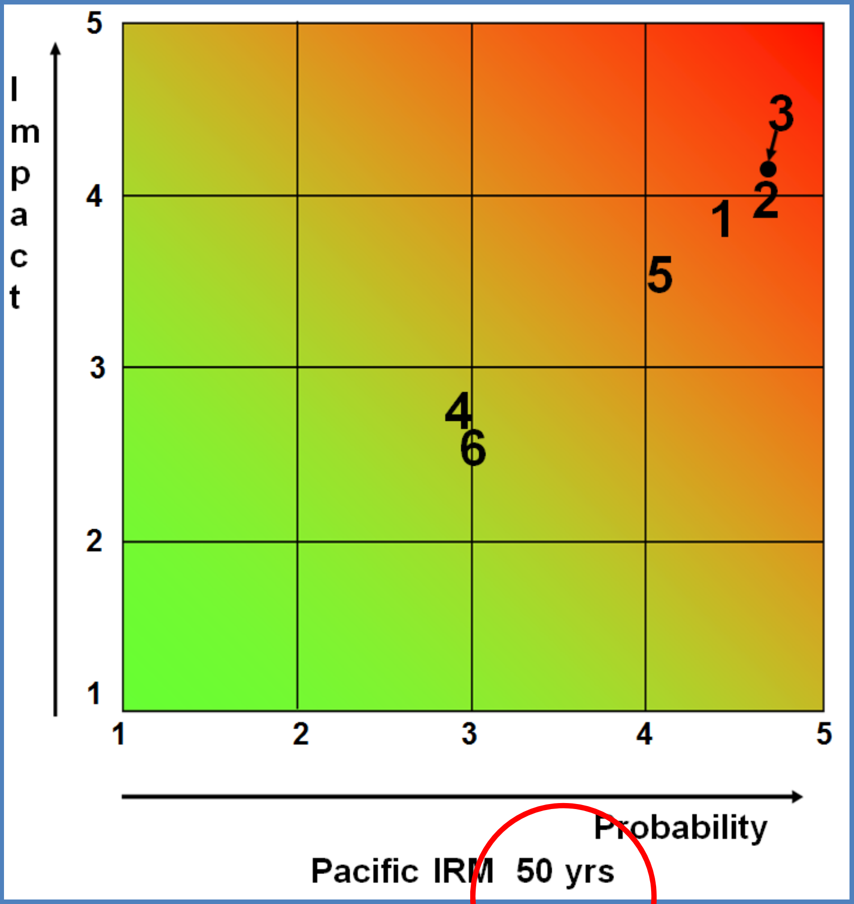
	Arctic LAB	Atlantic LAB	Freshwater LAB	Pacific LAB
1. Ecosystem and Fisheries Degradation and Damage	20.16	13.48	17.1	17.16
2. Changes in Biological Resources	18.24	15.08	13.76	18.4
3. Species Reorganization and Displacement	14.52	13.82	21.12	18.86
4. Increased Demand to Provide Emergency Response	20.16	12.94	11.1	7.83
5. Infrastructure Damage	17.1	18.32	14.96	14.76
6. Changes in Access and Navigability of Waterways	20.16	13.75	14.35	7.5

The Integrated Risk Management Heat Map



The Integrated Risk Management Heat Map





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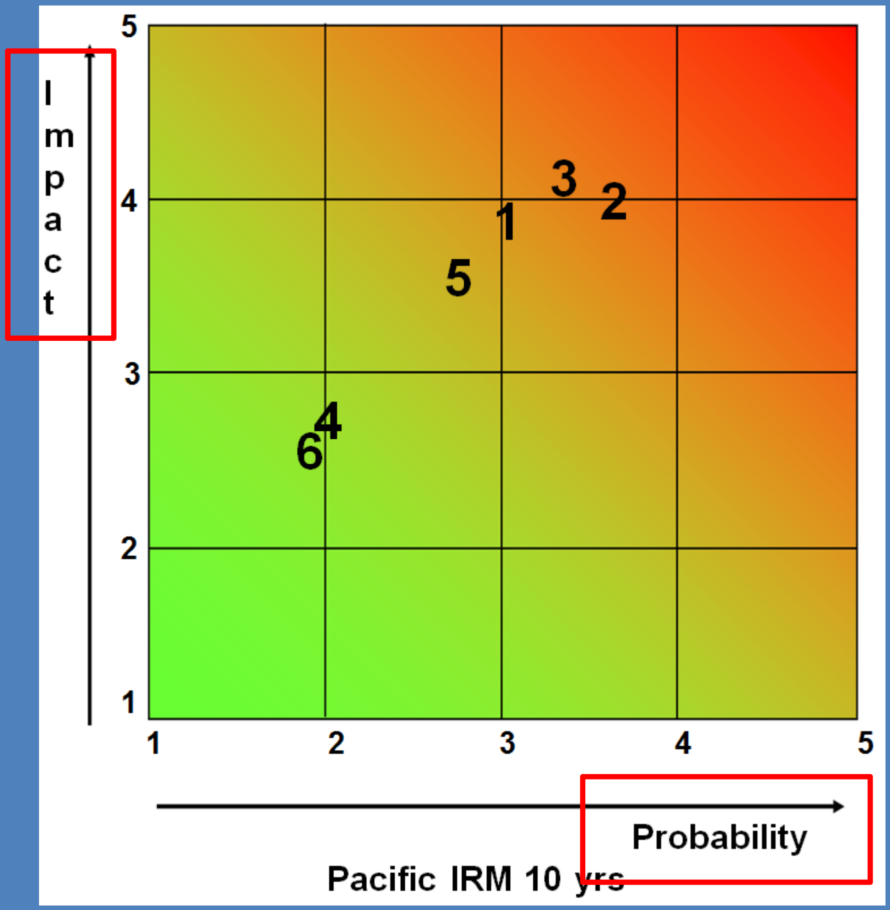
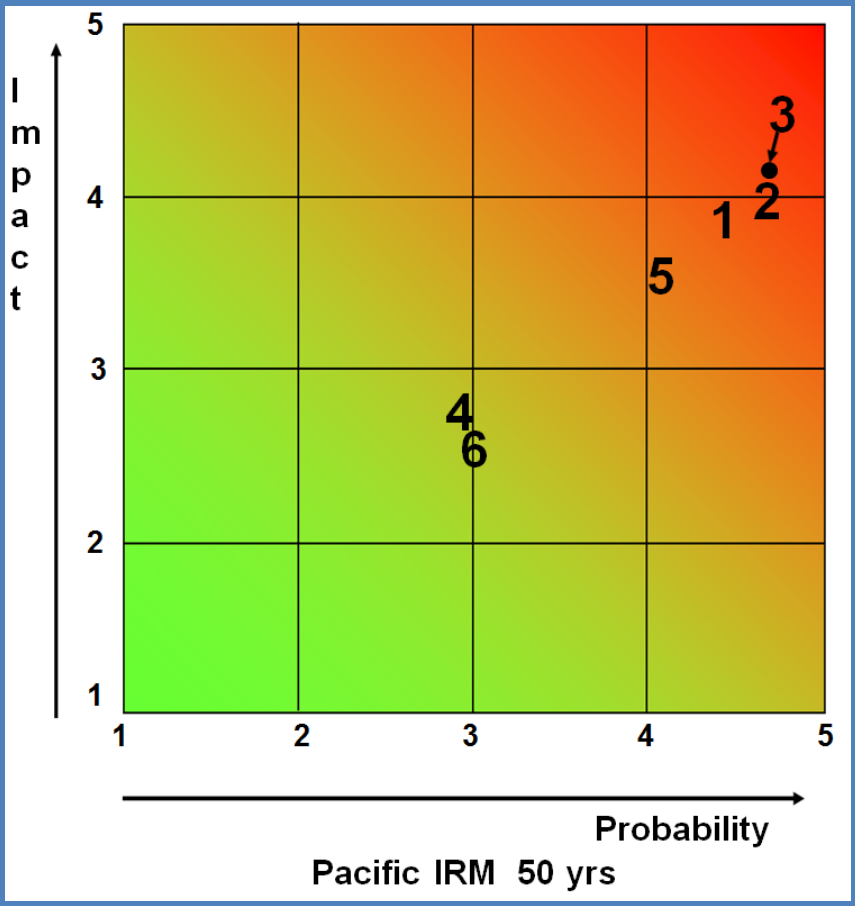
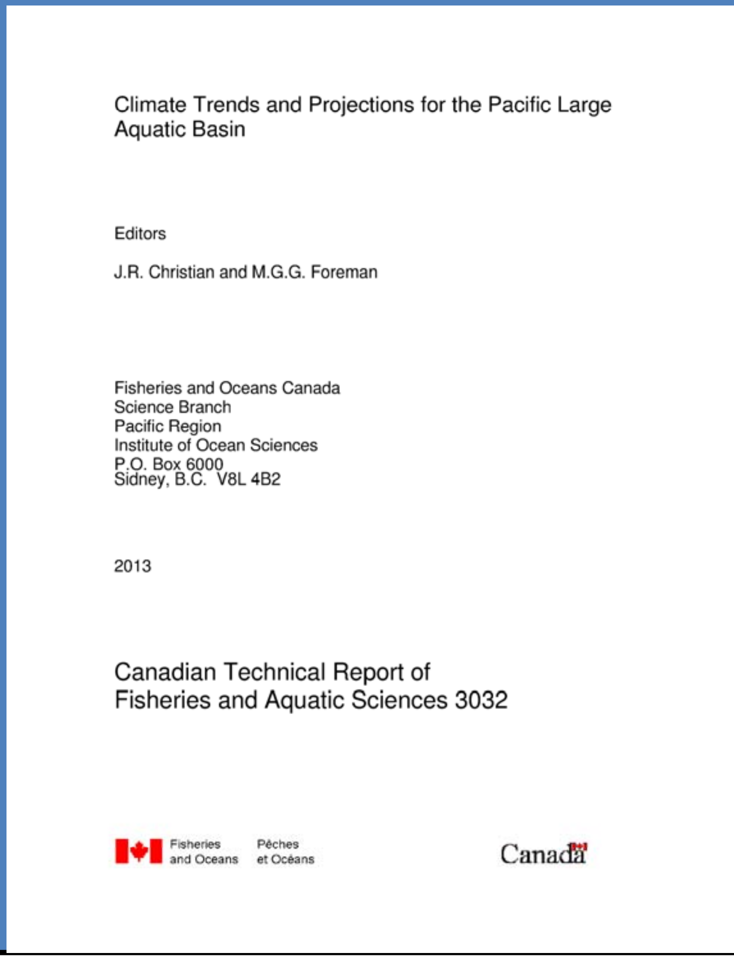




Parting thoughts

- steep learning curve regarding climate variability and climate projections
- differences among LABs in how relative risks are perceived
- heat-map methodology needs work
- O_2, OA and river T risks need more thorough evaluation

Follow links:



Climate Trends and Projections for the Pacific Large Aquatic Basin

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http://www.tandfonline.com/doi/full/10.1080/07055900.2013.873014#.VEbpF_kq9-k