

The Hakai Institute

- The Hakai Institute is a scientific research institution that advances long-term research at remote locations on the coastal margin of British Columbia
- The Hakai Institute is a not for profit organization
- Research focuses of the Hakai Institute are:
 - Oceanographic monitoring (physical, chemical, biological and ocean acidification)
 - Archaeology
 - Marine Ecology
 - Fisheries ecology and oceanography



Figure 1: The Hakai Explorer on its way to sample a station in the Discovery Islands (Photo credit: Grant Callegari)

Hakai Field Program Footprint

- The Hakai Institute has 2 field stations
 - Quadra Island (northern Strait of Georgia)
 - Calvert Island (BC central coast)
- Research focuses on regions that are accessible from those field stations
- Data are sampled year-round at daily to monthly intervals (station dependent)
- Physical data collected are:
 - Temperature, salinity, atmospheric data
- Chemical data collected are:
 - Nutrients, carbon system data, oxygen, pH
- Biological data collected are:
 - Bacteria and viruses, phytoplankton, zooplankton

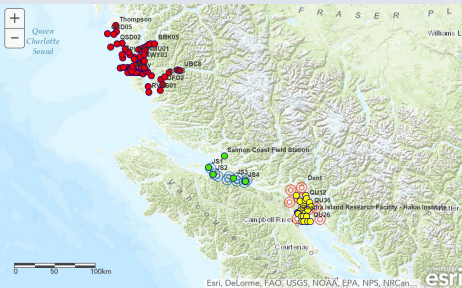


Figure 2: Location of research stations on the British Columbia central coast (red circles), Johnstone Strait (green and open blue circles), and Discovery Islands (yellow and orange open circles).

Central coast core stations

- Five stations on the British Columbia central coast have been designated core stations, where biological, chemical, and physical variables are sampled year-round. All stations are sampled more frequently in summer and about every 6 weeks from October to March
- These stations are:
 - PRUTH - in Kwakwaka'wakw Channel
 - HKP01 - in Hakai Pass, north of Calvert Island
 - QCS01 - NW of Calvert Island in Queen Charlotte Sound
 - FZH01 - in Fitzhugh Sound, east of Calvert Island
 - DFO2 - in Rivers Inlet

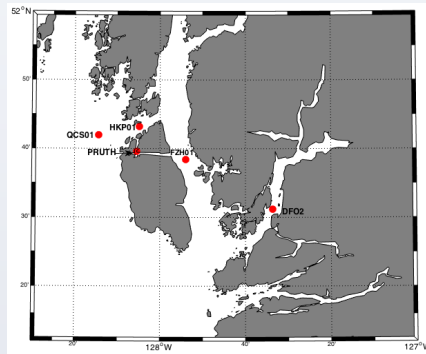


Figure 3: Location of core sampling stations on BC central coast

Results - Observations of the Blob

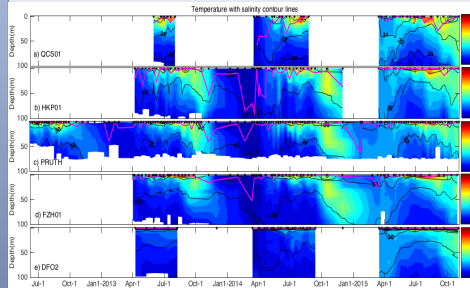


Figure 4: Observed temperature with salinity contour lines at a) QCS01, b) HKP01, c) PRUTH, d) FZH01, and e) DFO2 for June 12, 2012 – November 3, 2015. Magenta lines denote the surface mixed layer depth, defined as the first depth where the density was at least 0.5 kg m^{-3} greater than the surface density. Small black triangles represent when CTD profiles were sampled.

- CTD data reveal warm temperatures to at least 100 m starting in October 2014 at all core stations
- The surface mixed layer was shallower in the winter of 2014-2015
- Surface temperature in the summer of 2015 were warmer than previously recorded in this area
- Warm waters to 100 m were observed until at least November 2015

Results - Nutrients

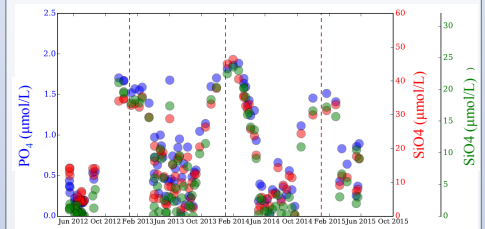


Figure 5: Observed phosphate (blue circles), silicate (red circles) and nitrate plus nitrite (green circles) from June 2012 – June 2015. All samples were collected by Niskin bottles at PRUTH at 5 m depth.

- Nutrient data show lower concentrations in the summer of 2014 than the previous two summers.
 - Nitrate, nitrite and silicate were lowest, suggesting nutrient limitation for phytoplankton in the summer of 2014
- All nutrients were lower in the winter of 2014-2015, suggesting reduced replenishment of nutrients to the surface waters

Results - Biology

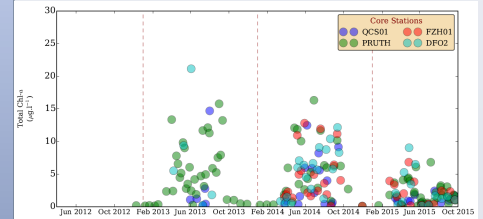


Figure 6: Total chlorophyll-a biomass in the upper 50 m at QCS01, PRUTH, FZH01, and DFO2. All chlorophyll-a samples were collected from Niskin bottles at 0m, 1m, 5m, 10m, 30m, and 50m.

- Chlorophyll concentrations were reduced during the summer of 2015
- Zooplankton biomass was lower during the summer of 2015 than the summer of 2014 (not shown)

Summary

- The Hakai Institute collects biological, physical, and chemical data in remote regions of British Columbia's coastal margin
- The Blob first appeared on British Columbia's central coast during the winter of 2014-2015
- The Blob resulted in increased temperatures to about 100 m and reduced near-surface nutrients, phytoplankton, and zooplankton
- Continuous sampling during the winter of 2015-2016 will offer insight into the impact of the Blob and the El Niño on British Columbia's central coast