Economic losses to the British Columbia salmon aquaculture industry due to harmful algal blooms 2009 - 2012

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PICES 2013, Nanaimo BC, October 11 – 20, 2013

Overview

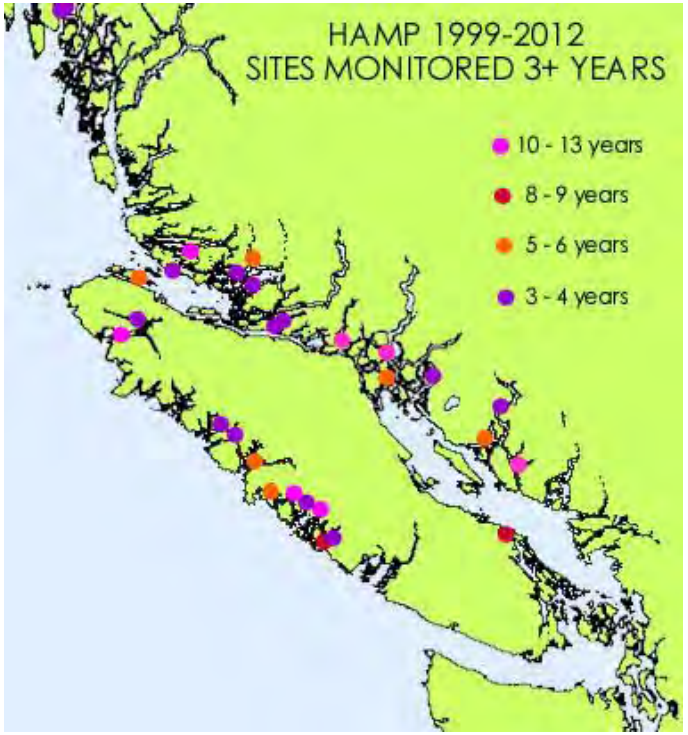
* BC salmon aquaculture industry
* HAMP and our monitoring area
* Local harmful algae species
* Fish-killing HABs 2009 – 2012
* Direct HAB costs 2009 – 2012
* Other costs to aquaculture from HABs
* Future research

Salmon aquaculture in BC

* Largest agricultural export in BC
  * ~75,000 metric tonnes of salmon produced per year
  * ~95% of salmon produced is Atlantic (*Salmo salar*)
* Most strictly regulated agriculture industry in BC
* 130 farm leases; ~75 – 80 usually in operation
* Farms around Vancouver Island and in the Klemtu (Central Coast) area
* Four major salmon aquaculture companies in BC

The Harmful Algae Monitoring Program (HAMP)

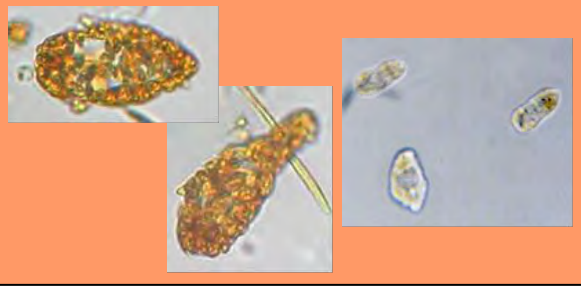
* Work with salmon farmers on HABs
* From 1999 to present
* Monitor 12 – 28 sites around Vancouver Island and Central Coast
* Weekly phytoplankton samples
* Train farmers to ID plankton
* Consult during blooms (all farm sites)
  * Sample analysis
  * Species ID



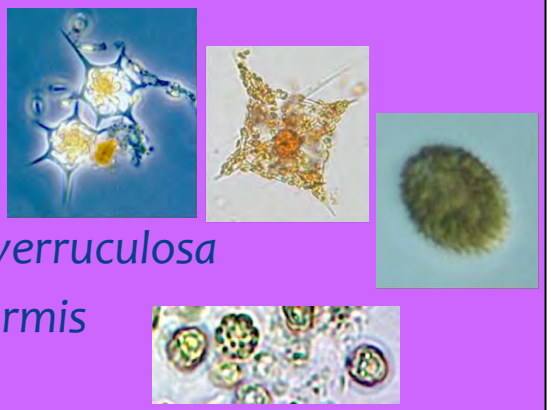
For more information on HAMP:
http://www.verney.ca/assets/SSEC_Presentations/Session%2010/10A_NickyHaigh_Abstract.pdf

BC fish-killing HAB species

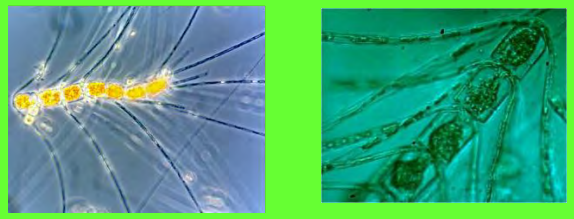
* Raphidophytes
  * *Heterosigma akashiwo*
  * *Chattonella* cf. *marina*



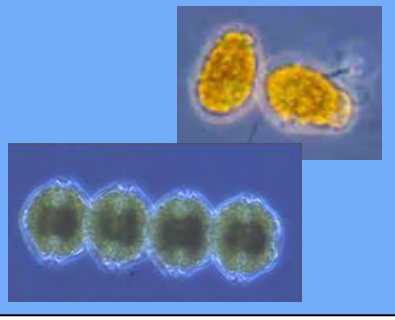
* Dictyochophytes
  * *Dictyocha speculum*
  * *Dictyocha fibula*
  * *Pseudochattonella* cf. *verruculosa*
  * *Pseudopedinella pyriformis*



* Diatoms
  * *Chaetoceros concavicornis*
  * *Chaetoceros convolutus*

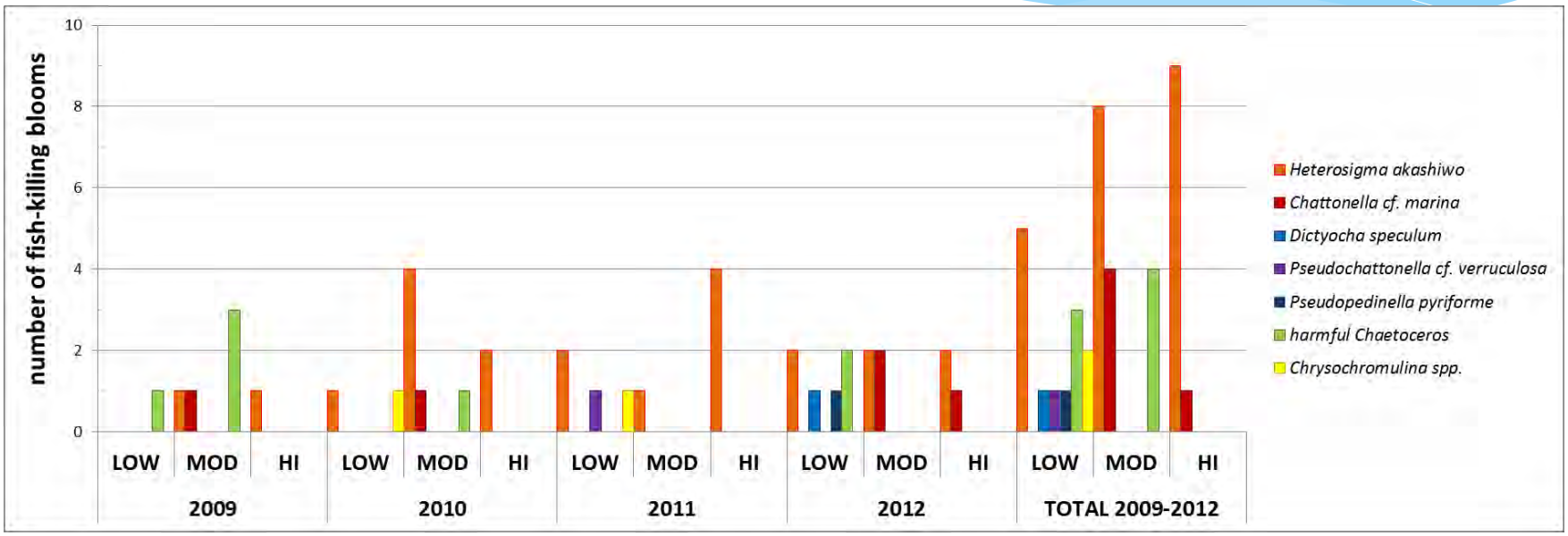


* Dinoflagellates
  * *Cochlodinium fulvescens*
  * *Alexandrium catenella*



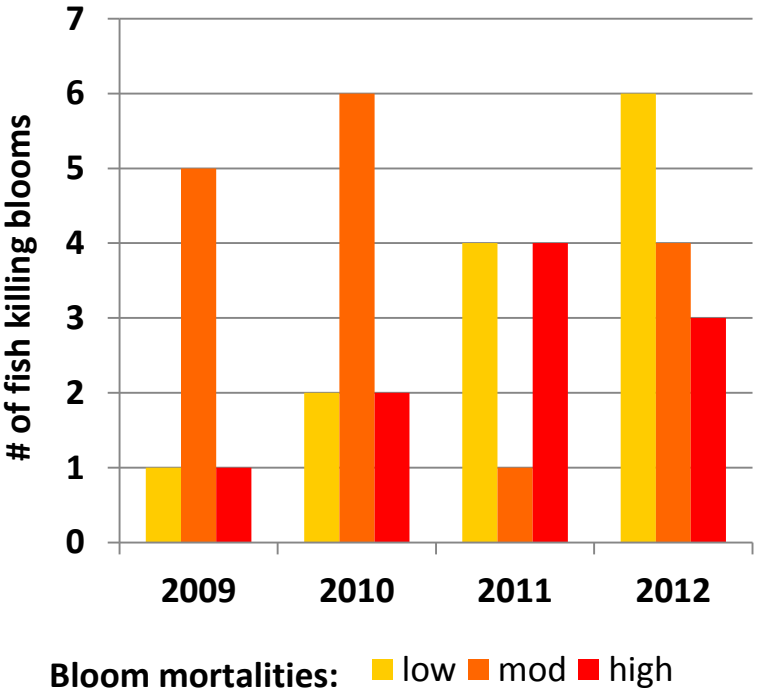
* Haptophytes
  * *Chrysochromulina* spp.

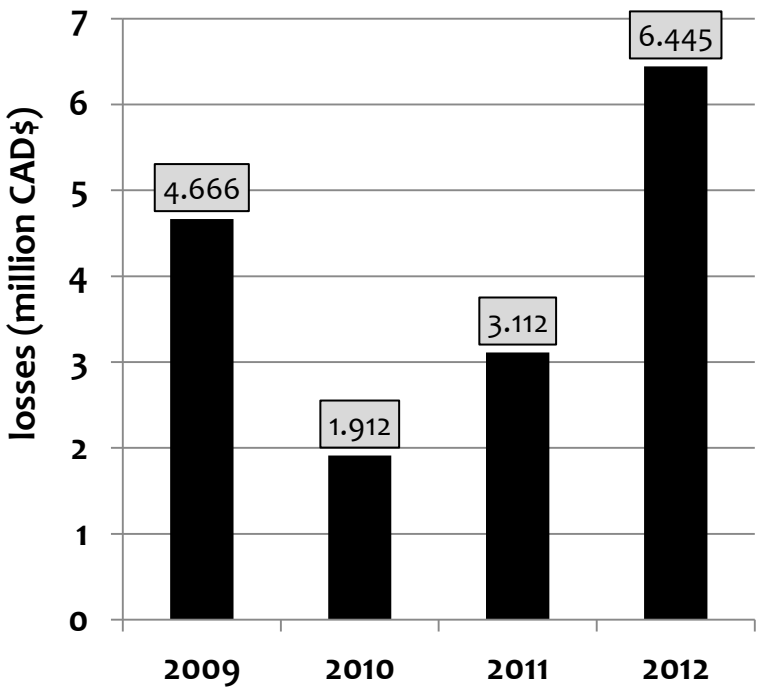
Fish-killing HABs 2009 - 2012



LOW: 10's of fish killed
MOD: 100's of fish killed
HI: tonnes of fish killed

HAB mortalities and costs (fish losses)





Other HAB costs to BC salmon aquaculture

* Lost production
  * withholding feed during blooms results in less growth
* Mitigation
  * Barrier curtains and upwelling or bubbling equipment
  * compressors
  * fuel
  * Costs: ~CAD$1 – 2 million annually per company

Summary

* In 2009 – 2012 direct losses to BC salmon aquaculture from HABs were ~CAD$16 million
* Species primarily responsible for fish losses in 2009 – 2012 were *Heterosigma akashiwo*, *Chaetoceros concavicornis*, *C. convolutus*, and *Chattonella* cf. *marina*
* Other costs to aquaculture from HA are lost production, and mitigation equipment (~$1-2 million annually per company)

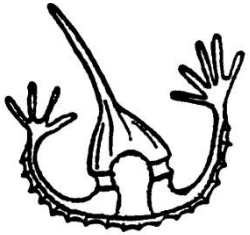
Future research needs

* Definitive identification of HAB species in BC
* Elucidation of species toxins and toxicity
* Effects of environmental factors on HAB species prevalence
* Effects of climate change (warming, ocean acidification) on different HAB species
* Better monitoring methods, especially for:
  * small species such as *Chrysochromulina*
  * species harmful at low levels i.e. *Chattonella* cf. *marina*

Thanks to:

* HAMP participants:
  * Marine Harvest Canada
  * Mainstream Canada
  * Grieg Seafood BC Ltd
  * Creative Salmon
* HAMPsters past and present

And thank you for your attention!



HAMP

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