# Overview of DFO research related to aquaculture in Pacific Region

January 25th, 2017

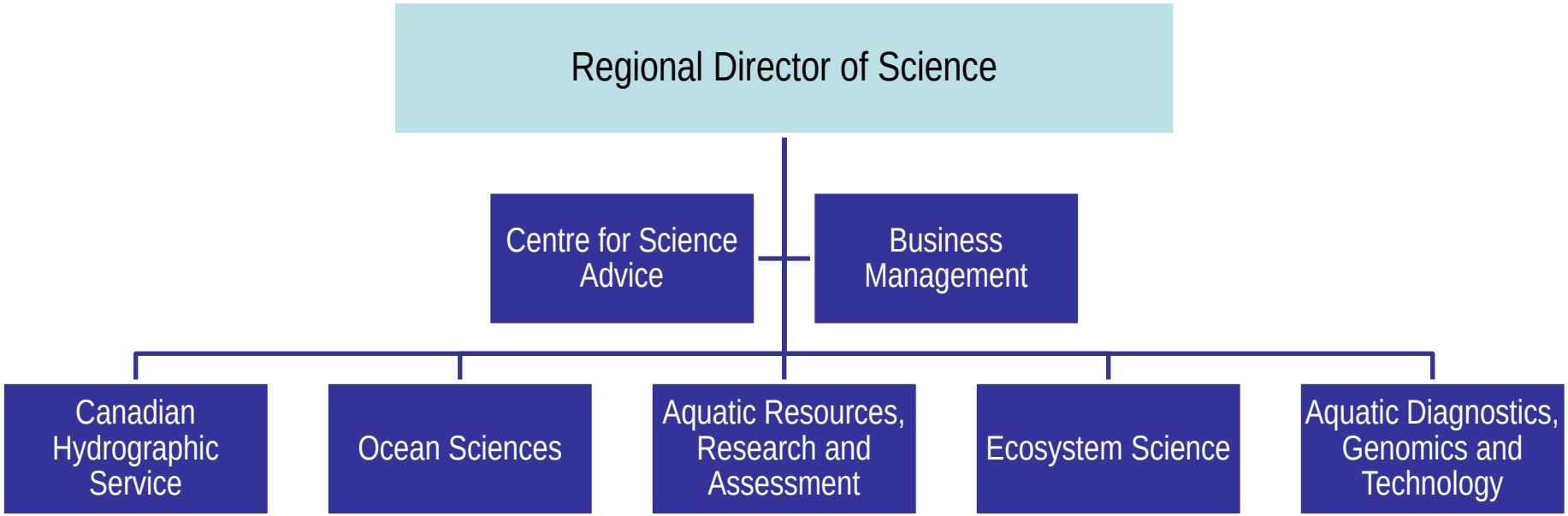
# Outline

- Introduction
- 2016 Reorganization
- Resulting Structure
- Concise summary of research programs related to aquaculture

# Re-organization Objectives

- The main purpose of the re-organization was to restructure to more effectively deliver the science required by the Department
- Divisions were set up roughly by theme area

# Re-organization in Science Branch



# Research Related to Aquaculture Is Distributed Across Three Divisions

- Ecosystem Science Division
  - Near field effects program
  - Far field effects program
  - Ecosystem and long-term research on aquaculture impacts
- Ocean Science Division
  - Oceanographic modeling for particle dispersal
  - Acoustic
- Aquatic Diagnostics Genomics and Technology
  - Molecular Genetics section
  - Aquatic Animal Health program
    - Shellfish Health program
  - Marine Virology/Parasitology

# Ocean Science Division

- Oceanographic studies for particle tracking (Foreman, Chandler)
- Use of hydro-acoustic methods to assess the migration timing and distribution of juvenile salmon in Discovery Islands and Johnstone Strait (Gauthier)

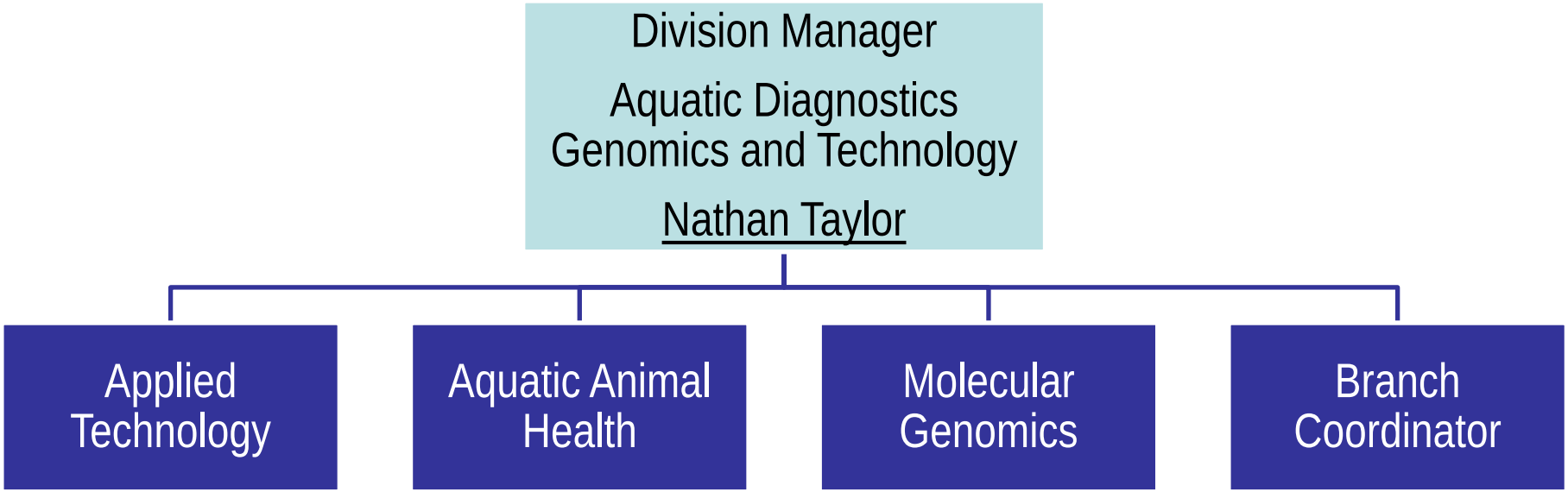
# ESD– Far Field Effects*

- Coastal monitoring programs on both the Atlantic and Pacific coasts that will be used to investigate key environmental parameters and deposition associated with medium and far-field effects of aquaculture sites
- This program is being nationally led by a RES in St. Andrews and will have a strong focus on deposition, i.e. both modeling and monitoring
- In BC, there will be a Biologist and a technician assigned to this position but staffing it is not yet complete

# New program – Ecosystem and long-term research on aquaculture impacts*

- Ecosystem and long-term research on aquaculture impacts on aquatic ecosystems and risk mitigation techniques
- Inform regulatory decision-making and long-term environmental sustainability of the aquaculture sector
- Both a RES and an EG have been staffed into this new program but the operational details (i.e. O&M funding) of the program's delivery have not been worked out

# Division Organization



# Molecular Genomics - Section

- Provides molecular tools and advice required for effective fishery and enhancement management, regulation and policy development within DFO.
- Contributes to the applied research and resource management mandates of other DFO research, regulatory and enforcement staff by provision of tools and analysis for high resolution identification, monitoring and assessment of organisms and their biotic/abiotic environments
  - Salmon stock ID
  - Population genetics
  - Forensic work
- Develops tools to assess the cumulative impacts of stressors on organisms and ecosystems, and to maintain or improve the health and condition of organisms cultured and/or regulated by DFO.

# Molecular Genetics Salmon Strategic Health Initiative

- Collect samples of wild, hatchery and aquaculture salmonids from BC to examine the presence of various microbes
- Apply BioMark high throughput microbe monitoring platform to identify the epidemiological patterns of microbe distributions in 26,000 wild, enhancement hatchery, and farmed salmon.
- Conduct microbe genome sequencing and phylogenetic analyses to validate novel microbe detections, to support epidemiological analyses for high ranking microbes, and in microbe discovery research.
- Conduct epidemiological studies to describe spatial patterns of microbe distributions, to determine which microbes are compatible with exchange between cultured and wild populations.
- Conduct histopathological analyses on Audit program tissue samples to assess correlations between microbes and lesions in moribund fish and in a subset of wild, hatchery and healthy aquaculture fish to determine which microbes are most likely to associate with cellular damage and disease.
- Conduct physiological assessments at the molecular (gene expression profiling),

# ADGT – Aquatic Animal Health Program

- Pathogen transmission risk assessments (aka farmed/wild disease interactions)
  - Stock releases (Salmonid Enhancement Program)
  - stock transfers (Introductions and Transfers Committee - DFO Science experimental subjects; DFO Science Biosafety Committee)
- Disease investigations (SEP, DFO Science, research animals hosted at a DFO facility, regional resource biologists, public submissions, wild fish kills)
- Disease prevention, management, treatment advise (SEP, DFO Science)
- Regional surveillance program for endemic pathogens of concern (focused on known high risk stocks, reportable diseases as defined by CFIA)
- Maintain fish health database, historic BC pathogen detection records

# ADGT – Marine Virology Program

- Viral diagnostics and characterization - The Virology lab conducts testing for the National Animal Health Program (NAAHP) plus identification of novel virus discoveries and their characterization.
- Research is conducted to investigate viral transmission between wild and farmed fish and potential for virus dispersal from farm sites.
- Utilizing epidemiological analytical approaches to investigate patterns of aquatic pathogens in wild fish populations with extensive datasets detailing the enumeration of fish at various life stages, survival rates, and productivity the Virology program seeks to elucidate factors that influence the occurrence of pathogens and disease.

# ADGT – Marine Parasitology Program

- The structural and genomic characterization of parasites assists in their identification, provides measures of variability within parasite populations and permits predictions concerning parasite interactions with the host.
- Research explores defense responses of the host to better understand resistance to parasite infection.
- Development and application of treatment and immunisation strategies that enhance resistance within a population through the use of novel therapeutic, vaccine or immuno-stimulant formulations is studied.

# Shellfish Health Program

- Disease Surveillance:
- Since 2006, we have conducted histological disease screening on more than 10,000 adult bivalves for 6 different pathogens of concern under the NAAHP.
- I&T typically concerning domestic movement of seed or juveniles
- Mortality and Disease Investigations:
  - Investigate the cause of unusual mortalities or disease conditions among shellfish. These cases are unpredictable and come from a wide variety of clients which are handled on an Ad hoc basis.
- Reference Laboratory:
  - OIE Ref. lab for *Mikrocytos mackini* (Denman Is. Disease)
  - NAAHLS Ref. lab for *M. mackini, Bonamia* spp. and *Marteiliodes chungmuensis*
  - Responsibilities (shared with Dr. Cathryn Abbott):
    - distribution of positive control samples
    - validation of diagnostic test methods
    - training and proficiency testing
    - advice and annual reporting
- Research Projects:
  - Isolation, i*n vitro* culture and biology of the scallop pathogen *Perkinsus qugwadi,* collaboration with Dr. Naoki Itoh (University of Tokyo)
  - Characterization of the bacterium putatively identified as *Francisella halioticida,* cause of disease and mortality among scallops, collaboration with Dr. Stewart Johnson (PBS)
  - Taxonomy and phylogenetic analysis of *Sylon* sp. infections from BC shrimp populations, collaboration with Dr. Scott Gilmore (PBS)
  - Transmission and viability of *Mikrocytos mackini* cause of Denman Island Disease in oysters, collaboration with Dr. Mark Polinski and Dr. Cathryn Abbott (PBS)