AQUA 503 (3 credits): Fish Health

Instructor: Dr. Barry Milligan

Academic Calendar Entry:

This course provides a review of fish physiology, examines fish diseases (bacterial, viral, and parasitic) and explores biosecurity and fish health management tools of farmed fish. The focus species will be on locally cultured finfish, with some reference to fish cultured internationally.

Course Format

The course will be taught through lectures, guest lectures, and a field trip.
The Canvas learning platform will be used for this course.

Course Overview, Content, and Objectives

The purpose of the course is to provide a review of fish physiology, examine fish diseases (bacterial, viral, and parasitic) and explore biosecurity and fish health management tools of farmed fish. The focus species will be those cultured locally in BC (salmonids), with some reference to fish cultured internationally.

The objective of the course is to give the student an overview of fish diseases which are of economic and biological importance to the aquaculture industry. Students will understand the causative agent of these diseases, learn basic techniques of diagnosis, and learn how to implement biosecurity and other measures to prevent and control disease outbreaks.

Learning Outcomes

- Describe the anatomy and physiology of fish and the mechanisms by which fish defend themselves from disease in their environment
- Compare and contrast the strengths and weaknesses of general disease diagnostic procedures and control methods
- Evaluate how the environment impacts fish and their defense systems with regards to diseases and disorders,
- Explain how bacteria are identified, what causes them to be pathogenic in fish, how they are transmitted, and how the diseases associated with them develop,
- Distinguish how fish respond to bacterial infection and to viral infection
- Explain approaches to fish vaccination
- Describe how viral pathogens of salmonids replicate and transmit from one host to another,
- Evaluate the tools and techniques available for diagnosis and control of viral pathogen,
- Identify fish parasites and explain how they are classified and how to control them,
- Assess the disease transmission pathways into and out of a farm.

Additional Course Requirements

Students will be required to participate in a field trip, taking most of a day. Transportation will be by bus or car pooling. Students will be responsible for packing their own lunch. Students must dress for wet and cold conditions.

Evaluation Criteria and Grading

Students will be evaluated with 4 in-class quizzes (20%), 2 problem sets/assignments (20%), and weekly discussion (10%). There will be a comprehensive open book final exam (50%) that will evaluate critical evaluation and application of the course material.

The course will be graded on a numeric basis.

Required Readings

1. Meyers, T, T Burton, C Bentz, J Ferguson, D Stewart, N Starkey. Diseases of Wild and Cultured Fishes in Alaska. http://www.adfg.alaska.gov/static/species/disease/pdfs/fish_disease_book.pdf. 2019
2. Noga, EJ. Fish Disease: Diagnosis and Treatment. Iowa State Press. 2000.
3. Timmons, Guerdat, and Vinci. Recirculating Aquaculture. 4th Edition. Ithaca Publishing Company LLC. 2018.

Readings will be supplied via Canvas.

Supplementary readings

Supplementary readings (*) will be provided to students via Canvas for some lectures.

Course Schedule

Session	Grading	Topics	Required Reading(s)
1 – Sep 9: 10:00		Fish Health Management 1	3: chapter 16 + Epidemiological Triad handout*
2 – Sep 22: 13:00		Fish Health Work Up	2: chapters 4,5 + Immunology*
3 – Sep 23: 10:00	Quiz 1 - 5%	Water Quality	3: chapter 2
4 – Sep 30: 10:00		Bacterial Diseases	1: BKD, ERM, Furunculosis, Vibriosis
5 – Oct 7: 10:00	Quiz 2 - 5%	Bacterial Diseases	1: Tenacibaculosis, BGD, Aeromonads + SRS*
6 – Oct 14: 10:00		Viral Diseases	1: IHNv, VHSv
7 – Oct 21: 10:00	Quiz 3 - 5%	Viral Diseases	1: PRv + ISAv*
8 – Oct 28: 10:00		Parasitic Diseases	1: Saprolegnia, Kudoa, Ceratomyxa, Myxobolus
9 – Nov 4: All Day		Fish Health Lab Field Trip	Animal Health Centre

10 – TBD	Quiz 4 - 5%	Parasitic Diseases	1: Anisaka, Diphyllobothrium, Gyrodactylus, parasitc copepods, Sea Lice*
11 – Nov 18: 10:00	Assignment 1 – 10%	Harmful Algal Blooms & Gill Health	TBD*
12 – Nov 25: 10:00		Fish Health Management II	TBD*
13 – Dec 2: 10:00	Assignment 2 - 10%	Non-infectious Diseases	1: bloat, dropout, gas bubble + NPLD*

Final Examinations

Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 24-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.
Further information on Academic Concession can be found under Policies and Regulation in the *Academic Calendar* http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,48,0,0

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. All UBC students are expected to behave as honest and responsible members of an academic community. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work.

It is the student's obligation to learn, understand and follow the standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions.

Violations of academic integrity lead to the breakdown of the academic enterprise, and therefore serious actions are taken. Plagiarism or cheating may result in a mark of zero on an assignment, exam, or course. More serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Academic misconduct may result in a one-year suspension from the University and a notation of academic discipline on the student's record.

The UBC library has a useful Academic Integrity website that explains what plagiarism is and how to avoid it. If a student is in any doubt as to the standard of academic honesty in a particular course or assignment, then the student must consult with the instructor as soon as possible. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar. All course work is required to be submitted to Turnitin.com for review.

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community.

Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.
Details of the policies and how to access support are available on **the UBC Senate website.**

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UBC Disability Resource Centre
The Disability Resource Centre ensures educational equity for students with disabilities, injuries or illness. If you are disabled, have an injury or illness and require academic accommodations to meet the course objectives, please contact Access and Diversity https://students.ubc.ca/about-student-services/access-diversity

UBC Ombuds Office
The Ombuds Office offers independent, impartial, and confidential support to students in navigating UBC policies, processes, and resources, as well as guidance in resolving concerns related to fairness.
email: ombuds.office@ubc.ca
Web: http://ombudsoffice.ubc.ca/

UBC Equity and Inclusion Office
UBC is a place where every student, staff and faculty member should be able to study and work in an environment that is free from discrimination and harassment. UBC prohibits discrimination and harassment on the basis of the following grounds: age, ancestry, colour, family status, marital status, physical or mental disability, place of origin, political belief, race, religion, sex, sexual orientation or unrelated criminal conviction. If you require assistance related to an issue of equity, discrimination or harassment, please contact the Equity and Inclusion Office.

Web: http://equity.ubc.ca/

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