



## FISH 551

### Data-limited Stock Assessments: Principles, Methods, and Applications

Winter Term (Even Years):

Proposed meeting times: Tuesday and Thursdays 10:30am-11:50am.

Location: FISH 213

Instructor: Dr. Jason M. Cope ([jcope@myuw.net](mailto:jcope@myuw.net); [jason.cope@noaa.gov](mailto:jason.cope@noaa.gov))

Prerequisites: FISH 454 or 458; FISH 552

#### Course overview:

The majority of global fish stocks severely lack the data and resources needed to apply traditional stock assessment methods, but this does not excuse the need for science-based analyses to support fishery management decisions. This need has led to a proliferation of data-limited tools. This course is an interactive overview of the principles and methods behind data-limited analysis and fisheries management, demonstrating the latest tools and theory.

#### Learning objectives:

By the end of the course, students should demonstrate the ability to

- Understand the fundamental inputs and principles behind any fisheries stock assessment method.
- Identify the contexts under which we apply stock assessment, and how it connects to data collection and management measures to build harvest strategies
- Learn and apply the diversity of assessment methods, from simple to complex, under a variety of data conditions; how they are related in a web of stock assessment methods.
- Estimate and articulate uncertainty and connect it via control rules and management measures to the risk structure of fishery management systems
- Gain comfort and capacity in interpreting, evaluating and communicating stock assessments results that supports management objectives and robust fisheries management.

- Understand the role of simulation testing as an experimental tool for complex systems.

### **Course structure/schedule**

Each week consisted of 2 classes. The following topics are scheduled for each week, though we will not force the material to fit each week, and will move along at a pace that fits the participants.

**Week 1:** Intro to fisheries management systems; modelling fundamentals; defining uncertainty; data types; life history theory and estimation; the structure and use of Shiny apps; introduction to the stock assessment continuum (a.k.a. SS-DL) tool

**Week 2:** Generalizing stock assessment; interpreting stock assessment outputs; quantifying assessment output uncertainty and applied fisheries science

**Week 3:** Stock assessment types; Status-based methods; Risk analysis; Reference points and life-history based methods; yield-per-recruit; risk analyses; apply the Productivity-Susceptibility Analysis

**Week 4:** Indicator-based methods and applications; Size-based methods application

**Week 5:** Scale-based methods; applying catch-only methods; introduction to the DLM tool

**Week 6:** Integrated frameworks for data-limited methods; applying catch-index and catch-length and other integrated models; data-weighting model efficiency

**Week 7:** Quantifying uncertainty; sensitivity analyses; likelihood profiles; retrospective analysis; ensemble modelling

**Week 8:** Developing and applying decision control rules; management procedure/strategy evaluation

**Week 9:** Decision support tools; an introduction to and application of FishPath

**Week 10:** Science communication and communicating stock assessment results; World Fisheries Congress

**Week 11:** Project reports and discussion

**Course project:** Applying data-limited methods to assessed stocks

- Choose an already completed stock assessment
- Apply suite of data-limited methods as we encounter them in class; explain pros/cons of methods.
- Quantify uncertainty across inputs and methods
- Compare outputs across the multiple methods. How have the derived outputs changed?
- Report how this could assist management decisions using MSE
- Provide discussion on methods and results
- We reserve space for emerging ideas that may lead to publishable papers

### **Grading:**

- Weekly participation and involvement in discussions and applied labs: 15%
  - Both lecture and labs will be highly interactive. Participation is monitored by
    - Coming to class prepared to ask questions (5%)

- Contribute to class discussion and providing feedback on classmates' work (10%)
- Homework assignments: 35%
  - Each student will take on a data set at the beginning of the course and shepherd it through the class, applying data to the different assessment methods as we learn them. These applications (25%) and presentations of the applications (10%) will constitute the homework grade.
- Final project: 40%
  - This project will integrate all of the homework assignments into a term paper that presents the evolving assessment results as different methods are applied. It will also require applying the FishPath decision support tool to help articulate a harvest strategy for the particular stock, and evaluate those recommendations against what is happening in the real fishery management system. Discussions on the weekly assignments will allow students to receive critical feedback that can be included in the final project. The paper (25%) and final presentation (15%) will allow the presenting student to articulate what they have learned throughout the course, while giving the other students opportunities to constructively and critically evaluate the methods, results and conclusions.

***Disability Accommodations:*** *It is crucial that all students in this class have access to the full range of learning experiences. At the University of Washington, it is the policy and practice to create inclusive and accessible learning environments consistent with federal and state law. Full participation in this course requires: 1) the ability to attend two 110 minute lectures/labs per week with up to 20 other students; 2) participate in small group discussions on topics relevant to the course and 3) make short presentations that synthesize personal work and/or results of specific analyses to the class orally. If you anticipate or experience barriers to your learning or full participation in this course based on a physical, learning, or mental health disability, please immediately contact the instructor to discuss possible accommodation(s). A more complete description of the disability policy of the College of the Environment can be found [here](#). If you have, or think you have, a temporary or permanent disability that impacts your participation in any experience barriers to your learning or full participation in this course based on a physical, learning, or mental health disability, please also contact Disability Resources for Students (DRS) at: 206-543-8924 (V), 206-543-8925 (TDD), [uwdss@uw.edu](mailto:uwdss@uw.edu).*

### **Religious Accommodation**

*“Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy \(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form \(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/). ”*

### **Academic Integrity**

*Graduate students are expected to adopt the strict academic integrity standards of professional scientists as well as to adhere to the University Student Conduct Code. This requires that any work reflects your own intellectual efforts. Presenting someone else’s work as your own represents academic misconduct, as does assisting someone else in committing academic misconduct. The Student Conduct Code defines prohibited conduct and describes how the University holds students accountable (WAC 478-121). All suspected cases of academic misconduct will be handled according to University regulations*