FISH 445 Aquatic foods in the global food system Autumn 2021

Understanding where your food comes from and the environmental and social consequences

Course Description:
This course will examine how aquatic foods contribute to the global food system and how they impact the environment and human health and well-being. Aquatic foods are the most internationally traded food product and understanding their role and impacts requires understanding the total food system. Emphasis will be placed on the comparative costs and benefits of aquatic foods to terrestrial foods, and assignments will have students evaluating carbon footprint, water use, labor standards, nutrient content and other impacts across different foods. As an example, the carbon footprint from production of aquatic products varies greatly, from some of the lowest of any food to some of the highest, but can be swamped by the carbon footprint of transport; air transport is the highest, ship transport the lowest. Through assignments, discussions and debates, critical analysis will be emphasized. We will explore many different food systems including pre-contact northwest Indians, current African coastal subsistence, farming, grazing and large-scale industrial aquaculture and capture fisheries. Three themes of the course are

1. All food production has environmental costs, but these differ greatly across both the kind of food, how it is produced, and the processing, transport, retail and preparation.
2. That inequality with respect to ethnicity, race, gender and nationality is found all food systems in terms of food security, income, and working conditions.
3. That the nutritional quality of diets differs greatly around the world in different cultures and income levels.

Learning Objectives:
Upon successful completion of this course you will be able to:
1. Understand the diversity of food systems and how they differentially impact society and the environment.
2. Analyze the differences in environmental and social impact during different steps in the food system; production, processing, transportation, retail and preparation.
3. Critically evaluate the diversity and inequality in the food system, and how ethnicity, race, gender and nationality differ at each part of the food system.
4. Understand the role that food from water (capture fisheries and aquaculture) plays in global food security, employment and nutrition and evaluate the data on the relative importance of the role of food from water.
5. Analyze the impacts of capture fisheries and aquaculture on aquatic environments
6. Evaluate the relative trade-offs of different food production systems, including agriculture, livestock, aquaculture and capture fisheries, in mitigating environmental impacts
7. Evaluate impacts different food production systems on human well-being and equity
8. Critically compare claims made about the costs and benefits of different food production systems

Instructor: Ray Hilborn
Email: hilbornr@gmail.com Phone (206) 543-3587

Meeting times
Class Monday, Wednesday and Friday 12:30-1:30
Lab Thursday 10:30-12:20
Course #. Fish 445 (3 credits) with optional lab (5 credits)
Class hours (lecture 3 meetings per week (50 minutes); lab 1 meeting per week (2 hours)
Office hours: to be determined
Prerequisites: Experience working with data in either R programming language, Microsoft Excel, or equivalent. One of the following course -- BIO 359, BOST 310, ENVIR 250, ENVIR 301, FISH 274, NUTR 202, NUTR 290, QMETH 201, Q SCI 381, SMEA 584, STAT 220, or STAT 311.

Textbook and Readings
There is no textbook for this course. We will read selected articles from journals, books, and other published scientific literature. These will be available as PDFs through the course’s website. Please read the papers prior to class, there will be an online quiz before each class meeting.

Technology
We will use the course web site on Canvas to distribute readings, online lectures, pre-class quizzes and to collect assignments.

Teaching Methodology
Lecture Sessions
Preparation for each of the lecture sessions will include a combination of readings, some short video lectures, a simple online quiz, and student input on key questions. The lecture sessions will be devoted to a mix of lectures on specific topics (1/3 of sessions), group activities such as debates from readings, and breakout sessions discussing how to solve homework.

Homework
Data sets on food production, environmental impacts of various foods, and nutrient content of different foods will be made available and homework problems will involve analyses of these data.

Laboratory Sessions
Students registered for 5 credits will have a two hour “laboratory” session each week. The first two sessions will be devoted to several “field” trips visiting the UW farm and food service providers such as UW cafeterias and nearby restaurants to see some of the food system first hand. Then there will be three weeks of exercises in how to prepare a presentation on how individual products work their way through the food system. The major activity for the remaining lab sessions will be presentation of individual project by each student examining a food product and evaluating what is known about the social and environmental impacts of the product as it makes its way from production to processing to transport to retail to end use. The project will consider issues of income, gender, ethnicity in those involved at each stage in the food system, as well as inputs and outputs, where waste occurs, and where and how the product is consumed.

Each in the laboratory session with student presentations, all other students will prepare an evaluation of the strengths and weaknesses of the presentation using an online form supplied by the instructor.

Exams
There will be one final exam (30% of course grade for 3 credit students and 18% of grade for 5 credit students) The final exam will have some short answer questions to evaluate understanding of the
material and then essay questions to evaluate critical thinking and analysis. The exam will cover the assigned reading and material covered in lecture.

**Evaluation and Grading**

<table>
<thead>
<tr>
<th>Topic</th>
<th>% of grade - 3 credit version</th>
<th>% of grade - 5 credit version</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Class Quizzes</td>
<td>10%</td>
<td>6%</td>
<td>Basic understanding of readings and online lectures</td>
</tr>
<tr>
<td>Pre Class Questions</td>
<td>10%</td>
<td>6%</td>
<td>Ability to identify key issues and contradictions</td>
</tr>
<tr>
<td>Debate Performances</td>
<td>15%</td>
<td>9%</td>
<td>Ability to present good arguments</td>
</tr>
<tr>
<td>Debate Questions</td>
<td>15%</td>
<td>9%</td>
<td>Ability to critically evaluate issues</td>
</tr>
<tr>
<td>Homework assignments</td>
<td>20%</td>
<td>12%</td>
<td>During the term there will be 4 homework assignments that involve analyses of specific data sets</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
<td>18%</td>
<td>Knowledge and ability to integrate concepts</td>
</tr>
<tr>
<td>Lab - Initial outline of presentation</td>
<td>n/a</td>
<td>4%</td>
<td>Outline of the project describing a particular food and its impacts in the food system.</td>
</tr>
<tr>
<td>Lab - First draft of presentation</td>
<td>n/a</td>
<td>8%</td>
<td>A draft of the presentation graded on thoroughness of the analysis and quality of the research</td>
</tr>
<tr>
<td>Lab - Presentation on a specific food</td>
<td>n/a</td>
<td>12%</td>
<td>The work presented and the presentation</td>
</tr>
<tr>
<td>Lab - Your critique of other students presentations</td>
<td>n/a</td>
<td>16%</td>
<td>A confidential written evaluation of the other student’s presentations and be graded on how well you identified strengths and weaknesses</td>
</tr>
</tbody>
</table>

**Participation**

Students are expected to attend class and to participate in all graded activities, including labs for those registered for lab sections. Regular participation during paper discussions and laboratories are essential.
for a good performance in this course. A student who is anticipating being absent from class due to a
Religious Accommodation activity needs to complete the Religious Accommodations request process by
the second Friday of the quarter. Students who anticipate missing class due to attendance at academic
conferences or field trips, or participation in university sponsored activities should provide a written
notice to the instructor ahead of the absence. Students are individually responsible for all information
presented in lectures, guest lectures, readings and discussion and laboratory sections. If you are unable
to take an exam a 15 minute oral exam will be given by the instructor. No late assignments will be
accepted unless of medical or personal emergency. If you know you have a conflict with a class session,
please speak with the instructor well ahead of time. Only excused absences will be accepted. Excused
absences include absences associated with religious accommodations, pre-approved professional
activities, injury or illness of student or family member.

**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 three 50 minute lectures per week with 40 other students; 2)
participate in small group discussions on topics relevant to the course, 3) participate in 3h
laboratory/discussion sections and 3) make short presentations that synthesize small group discussions
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.

**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. Accommodations must be requested within the first two weeks of this course using
the Religious Accommodations Request form.”

**Academic Integrity:**
The University of Washington Student Conduct Code (WAC 478-121) defines prohibited academic and
behavioral conduct and describes how the University holds students accountable. I expect that you will
know and follow university policies regarding all forms of academic and other misconduct.

Acts of academic misconduct include:

- **Cheating:**
  - Unauthorized assistance in person and/or online for assignments, quizzes, tests or examU
• Using another student’s work without permission and instructor authorization
• Allowing anyone to take a course, assignment or exam for you without instructor authorization
• Falsification: intentional use of falsified data, information or records
• Plagiarism: representing the work of others as your own without giving appropriate credit to the original author(s)
• Unauthorized collaboration: working with other students in the course on assignments, quizzes or exams without permission
• Engaging in behavior prohibited by an instructor
• Multiple submissions of the same work in different courses without instructor permission
• Deliberately damaging or destroying student work to gain advantage
• Unauthorized recording, and/or subsequent dissemination of instructional content

If these definitions are not clear to you, please contact me or your TAs so that we can review them with you. It is important that you fully understand what is and is not permissible in this course.

Any suspected cases of academic misconduct will be handled according to university regulations, which include:
• submission of the case material (description of the incident and supporting documents such as an exam, paper, and any communications about the incident) to the College of the Environment Dean’s Office
• suspension of the grade for the quiz, exam, homework, paper or other assignment in question
• an X grade for the class in the case of the academic misconduct procedure continuing past the end of the quarter
• a reduction, down to a zero, for the quiz, exam, homework, paper or other assignment in question should the academic misconduct hearing officer find you responsible

For more information, see the College of the Environment’s Academic Misconduct Policy and the Community Standards and Student Conduct website.

Safety
Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus’s team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.
### Lecture Schedule

Note: many lectures will be preceded by on-line videos to be viewed before class. Pre-class quizzes related to the videos will be posted online.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-Sep-21</td>
<td>Aquatic foods in the food system: production, processing, transport, retail, restaurants, home preparation</td>
<td>Instructor</td>
</tr>
<tr>
<td>1-Oct-21</td>
<td>Where food comes from: role of marine foods compared to freshwater and terrestrial sources</td>
<td>Instructor</td>
</tr>
<tr>
<td>4-Oct-21</td>
<td>History of global food production: the growth of capture fisheries, aquaculture and the green revolution</td>
<td>Instructor</td>
</tr>
<tr>
<td>6-Oct-21</td>
<td>People in the aquatic food systems, how many are employed, incomes, issues re welfare: equity in food systems</td>
<td>Instructor</td>
</tr>
<tr>
<td>8-Oct-21</td>
<td>Gender in food systems: comparison of marine, freshwater and terrestrial</td>
<td>Instructor and guest specialist</td>
</tr>
<tr>
<td>11-Oct-21</td>
<td>Race and ethnicity in food systems: comparison of marine, freshwater and terrestrial</td>
<td>Guest specialist</td>
</tr>
<tr>
<td>13-Oct-21</td>
<td>Nutrient content of different foods</td>
<td>Instructor</td>
</tr>
<tr>
<td>15-Oct-21</td>
<td>An example: Pre-contact West Coast Indian food systems</td>
<td>Representative from a local tribe</td>
</tr>
<tr>
<td>18-Oct-21</td>
<td>An example: Small-scale fishing dependent communities</td>
<td>Small-scale fisher from a developing country</td>
</tr>
<tr>
<td>20-Oct-21</td>
<td>An example: shellfish from Washington State</td>
<td>Local shellfish grower</td>
</tr>
<tr>
<td>22-Oct-21</td>
<td>An example: salmon from Alaska</td>
<td>Native commercial fisher from Alaska</td>
</tr>
<tr>
<td>25-Oct-21</td>
<td>An example: subsistence food systems, aquatic and terrestrial</td>
<td>Instructor</td>
</tr>
<tr>
<td>27-Oct-21</td>
<td>An example: salmon farming</td>
<td>Salmon farm operator and instructor</td>
</tr>
<tr>
<td>29-Oct-21</td>
<td>Midterm Exam</td>
<td>This does not count in grade</td>
</tr>
<tr>
<td>1-Nov-21</td>
<td>Discussion of midterm exam</td>
<td></td>
</tr>
<tr>
<td>3-Nov-21</td>
<td>Genetically modified organisms</td>
<td>Instructor</td>
</tr>
<tr>
<td>5-Nov-21</td>
<td>Case study: marine plants</td>
<td>Marine plant grower</td>
</tr>
<tr>
<td>8-Nov-21</td>
<td>An example: industrial fish meal and fish oil production and its use in aquaculture and livestock</td>
<td>Instructor and aquaculture industry specialist</td>
</tr>
<tr>
<td>Date</td>
<td>First Hour</td>
<td>Second Hour</td>
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</tr>
<tr>
<td>30-Sep-21</td>
<td>Introduction to course</td>
<td>UW Farm tour</td>
</tr>
<tr>
<td>7-Oct-21</td>
<td>Visit Food Service Provider on campus</td>
<td></td>
</tr>
<tr>
<td>14-Oct-21</td>
<td>in class exercise of what goes into a food product such as pizza -</td>
<td>and environmental impacts</td>
</tr>
<tr>
<td>21-Oct-21</td>
<td>Exercise in tracking a product through the food system</td>
<td></td>
</tr>
<tr>
<td>28-Oct-21</td>
<td>In class exercise in critical evaluation of published papers</td>
<td></td>
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<tr>
<td>4-Nov-21</td>
<td>Student presentations</td>
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<td>18-Nov-21</td>
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<td>Student presentations</td>
</tr>
<tr>
<td>2-Dec-21</td>
<td>Student presentations</td>
<td>Student presentations</td>
</tr>
<tr>
<td>9-Dec-21</td>
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**Laboratory Schedule**

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Course Readings

Aquatic foods in the food system: production, processing, transport, retail, restaurants, home preparation

Where food comes from: role of marine foods compared to freshwater and terrestrial sources

History of global food production: the growth of capture fisheries, aquaculture and the green revolution

People in the aquatic food systems, issues re income, welfare: equity in food systems
To be determined

Gender in food systems: comparison of marine, freshwater and terrestrial

Race and ethnicity in food systems: comparison of marine, freshwater and terrestrial

Nutrient content of different foods
Perhaps Koehn et al. Environmental impacts of nutrient production in the food system

An example: Pre contact West Coast Indian food systems
https://royalbcmuseum.bc.ca/exhibits/bc-archives-time-machine/galler07/frames/main.htm

Small scale fishing dependent communities
To be determined

An example: Shellfish from Washington State
To be determined
An example: salmon from Alaska
To be determined

An example: subsistence food systems, aquatic and terrestrial
To be determined

An example: salmon farming
To be determined

An example: marine plants
To be determined

An example: industrial fish meal and fish oil production and its use in aquaculture and livestock
To be determined

An example: industrial grain production and its use in aquaculture and livestock
To be determined

Environmental impacts of capture fisheries, marine aquaculture, freshwater aquaculture, crops and livestock
To be determined

Carbon resulting from the food system, comparison of capture fisheries, aquaculture, crops, livestock
Hall et al. (2011). Aquaculture production: Biophysical demands and ecological impacts. In Blue Frontiers: Managing the environmental costs of aquaculture, section 2, pp. 16-40

Water requirements for different production systems

Pesticides and antibiotics use and consequences
To be determined

Nutrients release and plastics use and consequences

Human health issues in food system workers

Enslaved labor in the food system

Gallagher, A.T., 2017. What’s wrong with the Global Slavery Index? Anti-Trafficking Review

Biodiversity impacts of aquatic food systems


Biodiversity impacts of crop systems
Biodiversity impacts of livestock
Something from Livestock’s long shadow

Expected Climate change impacts on marine, freshwater and terrestrial food systems
Something from IPCC

The future of global aquatic food production in the food systems context