# SYLLABUS FOR FW 528: DIVERSITY AND IDENTIFICATION OF LARVAL FISHES (ECAMPUS)

**Course Name:** Diversity and Identification of Early Life History Stages of Fishes
**Course Number:** FW 528
**Initial Term Offered:** Spring 2021
**Credits:** Three

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## RECOMMENDED COURSE WORK

A completed 300 level systematics of fishes, ichthyology or comparative anatomy course. Although, this course is a standalone course, students are strongly encouraged to enroll in the on-campus laboratory course 529 for first-hand experience in working with and handling a larval fish collection. Although it is a graduate level course, with instructor approval undergraduates are eligible to enroll.

## COURSE DESCRIPTION

Research on early life history stages of fishes has increased considerably in recent years, due to its importance in many research fields, such as fisheries science and oceanography, species conservation, systematics and morphology. Simultaneously, the ability to identify ichthyoplankton has decreased. This course is intended to provide students with an understanding of the evolutionary diversity of ichthyoplankton of the world. Students of this course will learn how to use the major identification keys for larval fishes, become familiar with larval fish anatomy and key characters for their identification.

## COURSE CREDITS

This course combines ca. 90 hours of instruction, online activities, assignments and a discussion board debate for 3 credits. This is equivalent to a 3-credit lecture course.

## MEASURABLE STUDENT LEARNING OUTCOMES

You will study the diversity of the larval stages of the largest group of vertebrates. The diversity of larval stages outcompetes the diversity of their adult congeners by far. This is reflected in the challenge to recognize and identify larval stages even of common and well known species. Upon completion of this course, students will be able to:

1) Identify morphological characters that define larval stage fishes of major teleost groups

2) Apply your accumulated knowledge of characters to phylogenetically categorize taxa that were not studied in the course

3) Identify ichthyoplankton of major groups to family

4) Compare different early life history strategies and understand their importance for the evolution of teleost fishes

5) Understand the basics of larval fish curation and data management in a collection or laboratory environment

**STUDENT RESPONSIBILITIES AND ASSIGNMENTS**

Lectures

Each week will include several recorded lectures, delivered through Adobe Presenter. The lectures cover the major groups of fishes and will introduce, step by step, important characters necessary to successfully identify larval fishes to family level. The lectures of the first week are a primer to understand larval characters on the background of their morphology and evolutionary affiliation.

Discussions

In each week (except for week 1), an open-ended question or a controversial topic will be posted that you will debate with your classmates. In some weeks, you must gather information and share it with the class. I ask you to make at least **two substantive** posts during each discussion of which the first contribution posted no later than Wednesday at 11:59pm. Each discussion is worth up to 20 points.

Larval Fish Exercises

The first quiz will take place in week 1. The exercises are weekly assessments of our learning outcome, and to help you with learning and manifesting the content of the lectures. In these assignments, you will be presented either with larval fish images that you must identify to family level or characters and you have to identify the larvae. Each quiz is worth up to 20 points. **As a motivation to do a good job in the quizzes, you will be allowed to use your diagnoses in the midterm and final exam.**

Group Assignment

In week 3, you will be assigned to a group with some of your fellow students. In the following eight weeks, you will work on a scientific larval fish description. Many larval fishes are still undescribed and in case you will work with ichthyoplankton in the future, you most likely will discover new larvae. This exercise will introduce you to how to write a scientific description, following standard guidelines: Abstract, introduction, material and methods, results, discussion and literature cited. This is a comprehensive task, you and your fellow students will start with a comprehensive literature search that you submit in week 5 to give me the chance to verify and

approve your literature selection. I will post several publications of larval fish descriptions that are useful and can be used as a framework. The group assignment is worth up to 240 points.

Late Work

Students lose 10% of points each day an assignment is submitted late. Assignments will not be accepted after four days.

**COURSE CONTENT**

| WEEK | TOPIC | LEARNING ACITIVITIES | DUE DATES |
|---|---|---|---|
| 1 | **Introduction of the course**<br>- Course introduction<br>- Introduction: Fish Anatomy<br>- Introduction: Phylogenetic systematics | Discussion Board 1<br><br>Worksheet I: Fish Anatomy<br>Worksheet II: Phylogenetic Systematics | Discussions are due on Monday at 11:59pm the following week.<br><br>Both worksheets are due on Wednesday the second week. |
| 2 | **Development and systematics of Elopomorpha:**<br>- Diversity and characters of ichthyoplankton<br>- Definition of larva<br>- What is a Leptocephalus larva?, Elopomorpha<br>- How to use larval fish identification keys | Discussion Board 2<br><br>Larval fish quiz 1<br><br>Worksheet 1 | Quizzes begin on Fridays and will close on Wednesdays the following week.<br><br>Worksheets are due on Monday at 11:59pm the following week |
| 3 | **Development and systematics of Otomorpha**<br>- Clupeiformes & Ostariophysi<br><br>**Development and systematics of the Eurypterygii**<br>- Aulopiformes Argentiniformes & Salmoniformes | Discussion Board 3<br><br>Larval fish quiz 2<br><br>Worksheet 2<br><br>Group assignment: Larval fish description | As above<br><br>Sunday at 11:59pm of week 10. |
| 4 | **Development and systematics of Neoteleostei**<br>- Stomiiformes & Ateleopodiformes<br>- Aulopiformes | Discussion Board 4<br><br>Larval fish quiz 3<br><br>Worksheet 3 | As above<br><br>As above |
| 5 | **Development and systematics of Ctenosquamata**<br>- Myctophiformes | Discussion Board 5<br><br>Midterm | As above |
| 6 | **Development and systematics of Acanthomorpha**<br>- Lampridiformes & Polymixiformes<br>- Gadiformes | Discussion Board 6<br><br>Larval fish quiz 4<br><br>Worksheet 4 | As above<br><br>As above |
| 7 | - Stephanoberyciformes | Discussion Board 7 | As above |

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|---|---|---|---|
| | - Zeiformes<br>- Beryciformes<br>- Percomorpha I | Larval fish quiz 5<br><br>Worksheet 5 | As above |
| 8 | - Percomorpha II<br>Pleuronectiformes | Discussion Board 8<br><br>Larval fish quiz 6<br><br>Worksheet 6 | As above<br><br>As above |
| 9 | - Tetraodontiformes | Discussion Board 9<br><br>Larval fish quiz 7<br><br>Worksheet 7 | As above<br><br>As above |
| 10 | | Larval fish quiz 8 | As above |
| 11 | **Final** | | |

**ASSESSMENT**

| FW 528 Requirements | Points |
|---|---|
| Participation/Discussion Board [9x20 points] | 180 |
| Exercises [2x20 points] | 40 |
| Fish quizzes [8x20 points] | 160 |
| Midterm | 100 |
| Group assignment | 240 |
| Final | 220 |
| **TOTAL** | **940** |

Standard OSU grading scale based on percentage

| A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 93-100 | 90-92 | 88-90 | 82-88 | 80-82 | 78-80 | 72-78 | 70-72 | 68-70 | 62-68 | 60-62 | <60 |

**COMMUNICATION**

Please post all course-related questions in the General Discussion Forum so that the whole class may benefit from our conversation. Please email your instructor for matters of a personal nature. I will reply to course-related questions and email within 24-48 hours. I will strive to return your assignments and grades for course activities to you within three days of the due date.

**POLICY ON INCOMPLETES**

An incomplete will only be granted in emergency situations and if the student is passing the course at the time of the request and completes 2/3 of the course requirements before the end of the quarter. The incomplete will be run on a strict 10-week schedule that starts immediately after the end of the quarter, and no further extensions will be granted, so working on your assignments as you can is a very good idea if an incomplete is granted.

**LINK TO STATEMENT OF EXPECTATIONS FOR STUDENT CONDUCT**

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit Student Conduct and Community Standards, or contact the office of Student Conduct and Mediation at 541-737-3656. See: OAR 576-015-0020 (2) Academic or Scholarly Dishonesty.

Specifically, the Student Conduct Code is listed here https://studentlife.oregonstate.edu/sites/studentlife.oregonstate.edu/files/code-of-student-conduct-102218.pdf

1. Academic honesty: Assignments, exams and the research project are expected to be entirely the student's own work. Plagiarism from other students, online sources, or references is not acceptable. Where concepts from literature etc. are used, clearly attribute these to their sources and rewrite these in your own words. Students are expected to collaborate in the group assignment.

2. Expectations for civility and behavior in class: Class members should assist and encourage other students with learning course concepts through discussion board posts on the weekly material (see Evaluation of Student Performance). Students are expected to recognize and value the ideas of others, and to disagree respectfully and civilly on the discussion board without demeaning the personal characteristics of the original poster.

3. Language use: Students should use formal English and spellchecking when composing assignments, essays and debate posts (see Evaluation of Student Performance). Because the discussion board posts are taking the place of informal on-campus class discussion, colloquialisms and less formal writing are allowed, but spelling should still be checked, and the post should be meaningful and related to class material.

**STUDENT ASSISTANCE**

This course will be delivered via Canvas where you will interact with your classmates and with your instructor. Within the course Canvas site, you will access the learning materials, such as the syllabus, class discussions, assignments, projects, and quizzes. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, please visit Ecampus Technical Help.

If you are unfamiliar with how to submit assignments or how to take online exams on Canvas please see the following link: http://guides.instructure.com/m/4212

For course-related enquiries: If your query is of a general nature, please post in the "General Discussion" forum of the discussion board so that other students can benefit from the answer to your question. If your query is of a private matter, please email the course instructor using the contact information provided. The instructor will reply to queries within 48 hours, otherwise please email again.

**TECHNICAL ASSISTANCE**

If you experience computer difficulties, need help downloading a browser or plug-in, assistance logging into the course, or if you experience any errors or problems while in your online course,

contact the OSU Help Desk for assistance. You can call (541) 737-3474, email osuhelpdesk@oregonstate.edu or visit the OSU Computer Helpdesk online.

**STATEMENT REGARDING STUDENTS WITH DISABILITIES**

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

**OSU STUDENT EVALUATION OF TEACHING**

Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. Results from the 19 multiple choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions via ONID by the Office of Academic Programs, Assessment, and Accreditation. You will log in to "Student Online Services" to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.

**REQUIRED AND USEFUL LITERATURE**

Most of the texts are available as PDF's and will be available through Canvas.


Ahlstrom EH, Moser HG. 1980. Characters useful in identification of pelagic marine fish eggs. Calif Coop Oceanic Fish Invest Rep 21:121-131.

Baldwin CC. 2013. The phylogenetic significance of colour patterns in marine teleost larvae. Zool J Linn Soc 168(3):496-563.

Johnson DG, Keener P. 1984. Aid to identification of American grouper larvae. Bull Mar Sci 34(1):106-134.

Kellermann A. 1990. Catalogue of early life stages of antarctic notothenioid fishes. Ber Polarforsch 67:45-136.

Leis JM. 2014. Taxonomy and systematics of larval Indo-Pacific fishes: a review of progress since 1981. Ichthyol Res 62(1):9-28.

Leis JM, Carlson-Ewart B. 1997. In situ swimming speeds of the late pelagic larvae of some Indo-Pacific coral-reef fishes. Marine Ecology Progress Series 159:165-174.

Leis JM, Olney JE, Okiyama M. 1997. Proceedings of the symposium Fish Larvae and Systematics: Ontogeny and Relationships. The International Larval Fish Conference, June 16-30, 1995 held in Sydney, Australia, at the 19th Annual Meeting of the Early Life History Section of the American Fisheries Society. Bull Mar Sci 60(1):1-5.

Leis JM, Rennis DS. 1983. The larvae of Indo-Pacific coral reef fishes. Sydney: New South Wales University Press. 1-269 p.

Leis JM, Trinski T. 1989. The larvae of Indo-Pacific shorefishes. Honolulu: Univeristy of Hawaii Press.

Matarese AC, Blood DM, Rugen WC. 2010. A taxonomic guide and atlas for the early life history stages of Northeast Pacific fishes. Seattle: Alaska Fisheries Science Center National Marine Fisheries Service, NOAA.

Moser HG, editor. 1996. The early stges of fishes in teh California current region. Lawrence, KS: Allen Press Inc.

Moser HG, Richards WJ, Cohen DM, Fahay MP, Kendall AWJ, Richardson SL, editors. 1984. Ontogeny and systematics of fishes. Based on an international symposium dedicated to the memory of Elbert Halvor Ahlstrom. Lawrence: Allen Press. i-ix, 1-760 p.

Okiyama M, editor. 2014. An atlas of early stage fishes in Japan. 2 ed. Hadano: Tokai University Press.

Richards WJ. 2006a. Early stages of Atlantic fishes: an identification guide for the western central North Atlantic In: Richards WJ, editor. Early stages of Atlantic fishes: an identification guide for the western central North Atlantic Boca Raton: CRC Tyler and Francis. p i-ixx, 1-1335.

Richards WJ. 2006b. Early stages of Atlantic fishes: an identification guide for the western central North Atlantic In: Richards WJ, editor. Early stages of Atlantic fishes: an identification guide for the western central North Atlantic Boca Raton: CRC Tyler and Francis. p i-vi, 1337-2640.

**HELPFUL WEBSITES**

Larval Fish Base
http://www.larvalbase.org/

Ichthyoplankton Information System [IIS}
https://access.afsc.noaa.gov/ichthyo/

Larval Fishes - Australian Museum
https://australianmuseum.net.au/larval-fishes

Smithsonian National Museum of Natural History – Larval Fishes from Carry Bow Cay, Belize
http://vertebrates.si.edu/fishes/larval/index.html

FishBase
http://www.fishbase.org/search.php

California Academy of Science – Catalog of Fishes
http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp