

IDENTIFICATION AND SYSTEMATICS OF MARINE LARVAL FISHES

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Course date: 14-19 of October 2018 (proposed)
Course location: The Inter-University Institute for Marine Sciences in Eilat
Course hours: Lecture hours= 23 ; Lab hours= 14 ; Field work hours= 11
Course requirements: No prior requisitions

The course will offered for 15 participants and taught in English

COURSE DESCRIPTION

Early life history stages are an important component in many research fields, such as fisheries science and oceanography, species conservation, systematics and morphology. The research on ichthyoplankton has increased considerably in recent years but simultaneously, the ability to identify early life stages of fishes has decreased. However, larval fish identification is the initial and crucial step for all subsequent research. The course is intended to provide students with an understanding of the evolutionary diversity of ichthyoplankton of the Red Sea and the Mediterranean. Students of this course will experience hands-on field experience, using specialized plankton tows. Subsequent sorting of the samples will introduce the students to the major identification keys for larval fishes, become familiar with larval fish anatomy and key characters for their identification.

MEASURABLE STUDENT LEARNING OUTCOMES

Students at the course will study the diversity of the larval stages of the largest group of vertebrates. Larval stage fishes outcompete the diversity of their adult congeners by far. This is reflected in the difficulty to recognize and identify larval stages. Upon completion of this course, students will be able to:

- 1) Identify evolutionary/phylogenetic characters that define larval stage fishes of major teleost groups
- 2) Apply the accumulated knowledge of characters to phylogenetically categorize taxa that were not studied in the course
- 3) Identify ichthyoplankton of major groups to family
- 4) Recognize the key role of larval fish identification for subsequent research fields
- 5) Compare different Early Life History Strategies and understand their importance for the evolution of teleost fishes
- 6) Understand the basics of larval fish curation and data management in a collection or laboratory environment

COURSE CONTENT

Days	TOPIC	LEARNING ACTIVITIES
1	Introduction of the course <ul style="list-style-type: none"> - Course introduction - Introduction: Diversity of ichthyoplankton - Introduction: Fish Anatomy - Introduction: Fish Taxonomy & Systematics - Introduction: What is a larval fish? - Introduction to plankton sampling (bongo, MOCNESS, night traps) - Introduction to plankton sorting and larval fish curation 	MOCNESS net assembly
2	Development and systematics of Elopomorpha: <ul style="list-style-type: none"> - What is a Leptocephalus larva?, Elopiformes, Albuliformes, Notacanthiformes - Anguilliformes 	*Ichthyoplankton collection trip *Sorting and identifying ichthyoplankton in the lab *Snorkeling tour from the IUI
3	Development and systematics of Otomorpha <ul style="list-style-type: none"> - Clupeiformes Development and systematics of the Protacanthopterygii <ul style="list-style-type: none"> - Argentiniformes & Salmoniformes Development and systematics of Neoteleostei <ul style="list-style-type: none"> - Stomiiformes & Aulopiformes 	*Sorting and identifying ichthyoplankton in the lab *Tour of the underwater observatory
4	Development and systematics of Ctenosquamata <ul style="list-style-type: none"> - Myctophiformes & Smegmamorpha II Development and systematics of Acanthomorpha <ul style="list-style-type: none"> - Perciformes I - Guest lecture by Prof. Roi Holzmann 	*Sorting and identifying ichthyoplankton in the lab *Field trip -Surgeon fish spawning (if possible)
5	Development and systematics of Acanthomorpha <ul style="list-style-type: none"> - Perciformes II - Pleuronectiformes & Tetraodontiformes 	*Sorting and identifying ichthyoplankton in the lab
6	- FINAL EXAM	

ASSESSMENT OF STUDENT SUCCESS

On Day 6, the students will be tested to assure the success of the course. The test will be partitioned in a theoretical and practical part. In the theoretical section, the students will be questioned about general morphological features that are important for ichthyoplankton identification, the evolution and systematics fishes based specifically on early stage characters, and about the curation of an ichthyoplankton collection.

In the practical part of the exam, the students must identify five larval fishes. The identification must include a full diagnosis to receive the full points. A wrong diagnosis but correct identification will generate some points, as will a wrong identification but a useful diagnosis. Due to the expectation of a highly diverse student body, we will adjust our questions to their experience; students will have to answer only 10 out of 12 questions in the theoretical part, and 5 out of 7 in the practical identification.

THEORETICAL EXAM	
Questions	Points
Q 1	10
Q 2	10
Q 3	10
Q 4	10
Q 5	10
Q 6	10
Q 7	10
Q 8	10
Q 9	10
Q 10	10
Q 11	10
Q 12	10
TOTAL	100

PRACTICAL EXAM	
Larvae	Points
Myctophidae	20
Synodontidae	20
Labridae	20
Serranidae	20
Acanthuridae	20
Pomacanthidae	20
Tetraodontidae	20
TOTAL	100

RECOMMENDED LITERATURE

- 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, Carson-Ewart BM. 2000. The larvae of Indo-Pacific coastal fishes. An identification guide to marine fish larvae. de Winter AJ, editor. Leiden: Brill. i-xix, 1-850 p.
- 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: University 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 stages of fishes in the 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.
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- 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-ix, 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>