

Introduction to Fish and Aquatic Invertebrate Histological Interpretation

FAS 6932 (2 credits), Spring, 2011

Course Description

This course teaches basic interpretation of the normal histology (fixed tissue microanatomy and physiology) of fish, bivalves, and corals, and introduces common histopathologic (disease) findings.

Instructor

Course Coordinator: Dr. Roy Yanong
Tropical Aquaculture Laboratory, Program in Fisheries and Aquatic Sciences (FAS),
School of Forest Resources and Conservation, University of Florida, 1408 24th St.
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Office Hours – generally available via e-mail or course mail M-F 8am – 5pm.

Student Learning Outcomes

At the end of this course, each student will be able to:

- Describe and understand proper tissue processing methods for histology of finfish, and select invertebrates (bivalves and corals) and how improper processing leads to tissue artifacts
- Identify from gross and histologic specimens, major organ systems, organs, tissues, and important cell types in normal histologic specimens of finfish and select aquatic invertebrates
- Identify from histologic specimens, common pathologic (disease) findings in representative finfish and select aquatic invertebrates
- Describe how the microanatomy seen in histologic specimens of normal and diseased animals correlates with physiology and pathophysiology (function) in that tissue, organ, and organism
- Interpret tissues from other species of finfish and aquatic invertebrates using a comparative histologic approach
- Understand the relevance of histology for research and diagnostics
- Appreciate and be comfortable with use of virtual slide (Aperio) imaging technology

Course Meeting Times

This is a distance education, online course. Lectures and reading materials will be made available online, and weekly, 2-hour discussions (Wednesdays, 12:50-2:50) will allow for participatory review of lectures and associated materials and digital slide evaluation.

Required Texts/Readings

- 1) USFWS CD Rom (photomicrographs and text), *Fish Histology*, Mumford et al.; also available online for download at:
http://training.fws.gov/EC/Resources/Fish_Histology/histology.html
- 2) *Atlas of Fathead Minnow Normal Histology*, Yonkos, Fisher, Reimschuessel, and Kane; available online at:
<http://aquaticpath.umd.edu/fhm/>
- 3) *Histological Atlas of Florida Surgeonfish*, Tilghman, Floyd, and Klinger; available online at: http://aquacomm.fcla.edu/2059/1/FLSG_TP123.pdf
- 4) *Histological Techniques for Marine Bivalve Molluscs: Update*; NOAA Technical Memorandum NOS NCCOS 27; available online at:
<http://ccma.nos.noaa.gov/publications/histopathtechmemofinal.pdf>
- 5) *Coral Disease and Health Workshop: Coral Histopathology II*, NOAA Technical Memorandum NOS NCCOS56; also available online for download at:
http://www.nwhc.usgs.gov/publications/other/coral_histopathology_ii.pdf
- 6) Digital Pathology: A New Frontier in Education (Soenksen):
<http://www.aperio.com/newsevents/LabMed%20Febo8%20Feature.pdf>
- 7) A Digital Revolution in Pathology (Soenksen):
<http://www.advancedimagingpro.com/publication/article.jsp?pubId=1&id=4826&pageNum=1>
- 8) Course coordinator and individual instructors may provide additional references, and other suggested references are listed below

Class Format, Policies on Attendance and Make-up Exams

The format of the class will focus to a large extent on MediaSite lectures, reading from book chapters or primary scientific literature on the topic for a given class, and scheduled online digital slide laboratories/chats. For each module, students will need to complete a self test quiz. The MediaSite lectures are taped lectures given by individuals from Fisheries and Aquatic Sciences, Veterinary Medicine, the John G. Shedd Aquarium, Disney, USDA-APHIS-

Veterinary Services, and Sea World Orlando. Students will be expected to review the reading material and the MediaSite lectures, then complete the module or lecture quiz and related homework assignments. A final quiz will be available online at the end of the course.

This course is intended to introduce the basic histology of clinically normal fish, bivalves, and corals, and to demonstrate common histopathology of diseased specimens. We include striped bass, pinfish, and common carp as our fish models, but other species may be used or substituted as needed. (Our bivalve models will be determined by Drs. Baker and Sheppard, and coral models will be determined by Drs. Berzins and Yanong.)

A teaching digital slide set will be available with online access and use will be described by way of a tutorial and a scheduled online discussion period. Additional slides and digital images will be made available as per each instructor. Weekly online discussions are scheduled to review lectures and associated materials for that week and to examine digital slides. It is important that students keep up with each module and assignment to optimize the learning experience. **For interactive discussion sessions, Elluminate software will be used and students should have access to a computer with audio input and output (or have a compatible headset with a microphone) for these sessions.**

Upon completion of this course, students are expected to: be familiar with, and describe basic routine histological processing; understand how gross anatomy correlates with microscopic anatomy, explain the relevance of histology for both research and diagnostic work; identify normal microanatomical structures and their functions for a number of different aquatic vertebrate and invertebrate species; understand common physiological and pathophysiological processes and how they alter microanatomy; and learn how to approach the microanatomy of other species based on similarities and differences between those studied in this course.

Assignments

- Students will be expected to review relevant online lectures as scheduled, prior to the week’s 2 hour online discussion.
- Online quizzes will follow each module or lecture
- Homework will be assigned and posted periodically (approximately every two modules)
- A final quiz will be available for completion online during the end of course exam period

Evaluation of Student Learning

95%	Performance & Knowledge of Subject Area	
	Ability to satisfactorily integrate reading material, discussions, and homework assignments as demonstrated	
	60%	Completing self test quizzes

	20%	Homework assignments equally weighted (for every 2 modules)
	15%	Final Exam
5%	Personal Profile	
	5%	Regular access, enthusiasm, and attitude

Grading Scale

Note – Items completed past the due date will automatically be graded -10% as late. Points will continue to be removed over time past the due an additional -10% per day.

If there are problems and you find yourself falling behind, contact me ASAP. Notifying me after the fact will not add points back that have already been removed.

All work conducted should be done independently unless specifically indicated in the assignment directions. Any writing should be your own thoughts or a summary of other reading material. Plagiarism will result in a “o” for the assignment.

A	94 -100
A-	93-90
B+	89-87
B	86-83
B-	82-80
C+	79-77
C	76-73
C-	72-70
D+	69-67
D	66-63
D-	62-60
E	59 -0

Schedule of Class Topics/Modules/Online Discussions

Please note that the schedule below may be amended due to lecturer availability, with appropriate notification to students ahead of time

Module 1, Week 1: Course Introduction:

- a) General Principles and Tissue Types (Roy Yanong, FAS);
- b) Use of Digital Slides and the Aperio System (Roy Yanong, FAS)

Two-hour scheduled online discussion

Module 2, Week 2: Basic Finfish Biology, Necropsy, and Processing:

- a) Comparative Finfish Anatomy and Physiology (Roy Yanong, FAS);
- b) Finfish Necropsy (Deborah Pouder, FAS);

c) Histological Processing (Ilze Berzins, John G. Shedd Aquarium)

Two-hour scheduled online discussion

Module 3, Week 3: Pathology and Immunology:

a) Pathology and Causes of Disease (Roy Yanong/Ilze Berzins);

b) Fish Immunology (Roy Yanong)

Homework Assignment 1 due

Two-hour scheduled online discussion

Module 3, Week 4: Pathology and Immunology (cont'd):

c) Cellular and Tissue Responses to Injury (Roy Yanong);

d) Introduction to Neoplasia (Ilze Berzins)

Two-hour scheduled online discussion

Module 5, Week 5: Skin, Gills, and Pseudobranch (one lecture) (Ruth Francis-Floyd, Vet Med, FAS)

Homework Assignment 2 due

Two-hour scheduled online discussion

Module 6, Week 6: Musculoskeletal System (one lecture) (Kathleen Hartman, USDA-APHIS-VS, FAS)

Two-hour scheduled online discussion

Module 7, Week 7: Finfish Nervous System:

a) Introduction to Fish Neurobiology (Daryl Parkyn, FAS);

b) Histological Features of the Finfish Nervous System (Kathy Heym, Sea World, Orlando)

Homework Assignment 3 due

Two-hour scheduled online discussion

Module 8, Week 8: Hematopoietic, Circulatory, and Excretory Systems:

a) Blood, Lymph, RE System, and CV System (Scott Terrell, Disney's Animal Programs, Vet Med, FAS);

b) Kidney, Spleen, Hematopoiesis (Scott Terrell)

Two-hour scheduled online discussion

Module 8, Week 9: Digestive System and Swim Bladder:

a) Gastrointestinal Tract (Ilze Berzins)

Homework Assignment 4 due

Two-hour scheduled online discussion

Module 8, Week 10: Digestive System and Swim Bladder (cont'd)

b) Liver, Gall Bladder, Pancreas, and Swim Bladder (Ilze Berzins)

Two-hour scheduled online discussion

Module 9, Week 11: Endocrine and Reproductive System (one lecture) (Roy Yanong)

Homework Assignment 5

Two-hour scheduled online discussion

Module 10, Week 12: Shellfish:

a) Normal Shellfish Anatomy and Physiology (Shirley Baker, FAS)

Two-hour scheduled online discussion

Module 10, Week 13: Shellfish (cont'd):

b) Histopathology of Representative Shellfish Diseases (Barbara Sheppard, Vet Med)

Homework Assignment 6 due

Two-hour scheduled online discussion

Module 11, Week 14: Coral Anatomy, Histology, and Representative Diseases (one lecture)
(Ilze Berzins)

Two-hour scheduled online discussion

Module 12, Week 15: Special Topics (TBA)

Homework Assignment 7 due

Two-hour scheduled online discussion

Final Quiz available, online during end-of-course exam period, to be completed by 11:00 pm,

Additional References

Suggested References

1. *Biology of the Hard Clam*, Kraeuter and Castagna
2. *Systemic Pathology of Fish*, Ferguson

Additional References

1. *Wheater's Functional Histology, 4th Edition*, Young and Heath, Churchill/Livingstone, 2000
2. *Color Atlas of Veterinary Histology*, Bacha and Wood, Lea and Febiger, 1990
3. *Histology and Cell Biology: An Introduction to Pathology*, Kierszenbaum;
4. *Fish Medicine*, Stoskopf (Fish Histology chapter)
5. *Fish Disease, Diagnosis and Treatment, 2nd edition*, Noga
6. *Fish Pathology*, Roberts
7. *Molecular Biology of the Cell*, Alberts, et al.
8. *Histological Techniques for Marine Bivalve Mollusks and Crustaceans*, NOAA Technical Memorandum NOS NCCOS 5
9. *Atlas of Tilapia Histology*, Morrison et al, World Aquaculture Society

Other Information

Academic Honesty, Software Use, UF Counseling Services, Services for Students with Disabilities

In 1995 the UF student body enacted an [honor code](#) and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied: "**On my honor, I have neither given nor received unauthorized aid in doing this assignment.**"

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior.

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

(Source: 2010-2011 Undergraduate Catalog)

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/*

Counseling Services

Groups and Workshops

Outreach and Consultation

Self-Help Library

Training Programs

Community Provider Database

- *Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/*

Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/