Fish and Aquatic Invertebrate Histology

FAS6256 (3 credits), Spring 2015

Course Description

Covers basic interpretation of the 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),
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Office Hours – Mondays 9am-11am, via phone or email

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, bivalves and corals and how improper processing leads to tissue artifacts
- Identify the 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 distance education course includes online lectures and reading materials, and weekly 2-hour discussions (Wednesdays, 12:50 pm-2:50 pm) for participatory review of lectures, associated materials and digital slide evaluation.

Required Texts/Readings

1) USFWS CD Rom (photomicrographs and text), *Fish Histology,* Mumford et al., published by US Fish and Wildlife Service, 2007; 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, published by University of Maryland-Aquatic Pathobiology Center, 2000; available online at: http://aquaticpath.umd.edu/fhm/
3) *Histological Atlas of Florida Surgeonfish,* Tilghman, Floyd, and Klinger, published by Florida SeaGrant, 2003; 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, published by National Oceanographic and Atmospheric Administration, 2006; 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,* published by National Oceanographic and Atmospheric Administration, 2007; also available online for download at: http://www.nwhc.usgs.gov/publications/other/coral_histopathology_ii.pdf
6) A Digital Revolution in Pathology (Soenksen), published by Aperio Technologies, 2011: http://www.advancedimagingpro.com/publication/article.jsp?pubId=1&id=4826&pageNum=1
7) 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 includes - online lectures, readings from book chapters or primary scientific literature on the topic, and scheduled online digital slide laboratories/chats. For each module, students will need to complete a self-test quiz. The lectures are pre-recorded and given by individuals from Fisheries and Aquatic Sciences, the College of Veterinary Medicine, Disney, USDA-APHIS-Veterinary Services, and The Florida Aquarium. Students will be expected to review the reading material and the lectures, then complete the module or lecture quiz and related homework assignments. A final comprehensive exam will be available online at the end of the course.

This course is intended to introduce students to the basic histology of clinically normal fish, bivalves, and corals, and to demonstrate representative, 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. Bivalve models will be determined by Drs. Baker and Sheppard and coral models 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.

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 to three modules). See attached homework assignment for example.
- A final exam will be available for completion online during the end of course exam period

Evaluation of Student Learning

95 points	**Performance & Knowledge of Subject Area**	
	Ability to satisfactorily integrate reading material, discussions, and homework assignments as demonstrated	
	60 points	Online quizzes
	15 points	Homework assignments equally weighted (approx. every 2 to 3 modules)
	20 points	Final Exam
5 points	**Personal Profile/Participation**	
	5 points	Regular access, enthusiasm, and attitude

Grading Scale

Note – Items turned in past the due date will automatically be graded -10% for each day late.

If there are problems and you find yourself falling behind, contact me ASAP.

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 zero points for the assignment.

A	94 -100 points
A-	93-90 points
B+	89-87 points
B	86-83 points
B-	82-80 points
C+	79-77 points
C	76-73 points

C-	72-70 points
D+	69-67 points
D	66-63 points
D-	62-60 points
E	59 -0 points

See https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx for additional information on UF's grading policy.

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)
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 4, Week 5: Skin, Gills, and Pseudobranch (one lecture) (Ruth Francis-Floyd, UF-CVM, FAS)
Homework Assignment 2 due
Two-hour scheduled online discussion

Module 5, Week 6: Musculoskeletal System (one lecture) (Kathleen Hartman, USDA-APHIS-VS, FAS)
Two-hour scheduled online discussion

Module 6, Week 7: Finfish Nervous System:

a) Introduction to Fish Neurobiology (Daryl Parkyn, FAS);
b) Histological Features of the Finfish Nervous System (Kathy Heym, The Florida Aquarium, Tampa)
Homework Assignment 3 due
Two-hour scheduled online discussion

Module 7, Week 8: Hematopoietic, Circulatory, and Excretory Systems:
a) Blood, Lymph, RE System, and CV System (Scott Terrell, Disney's Animal Programs, UF-CVM);
b) Kidney, Spleen, Hematopoiesis (Scott Terrell)
Two-hour scheduled online discussion (Lisa Farina, UF-CVM)

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, UF-CVM)
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 and turned in at date and time indicated by course coordinator.

Additional References

Suggested References

1. *Biology of the Hard Clam*, Kraeuter and Castagna, published by Elsevier Science, 2001
2. *Systemic Pathology of Fish*, 2nd Edition, Ferguson, published by Scotian Press, 2006

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*, 3rd Edition, 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, Campus Helping Resources, Services for Students with Disabilities

Academic Honesty

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.

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."**

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office.

(Source: 2012-2013 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/**

Services for 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/**