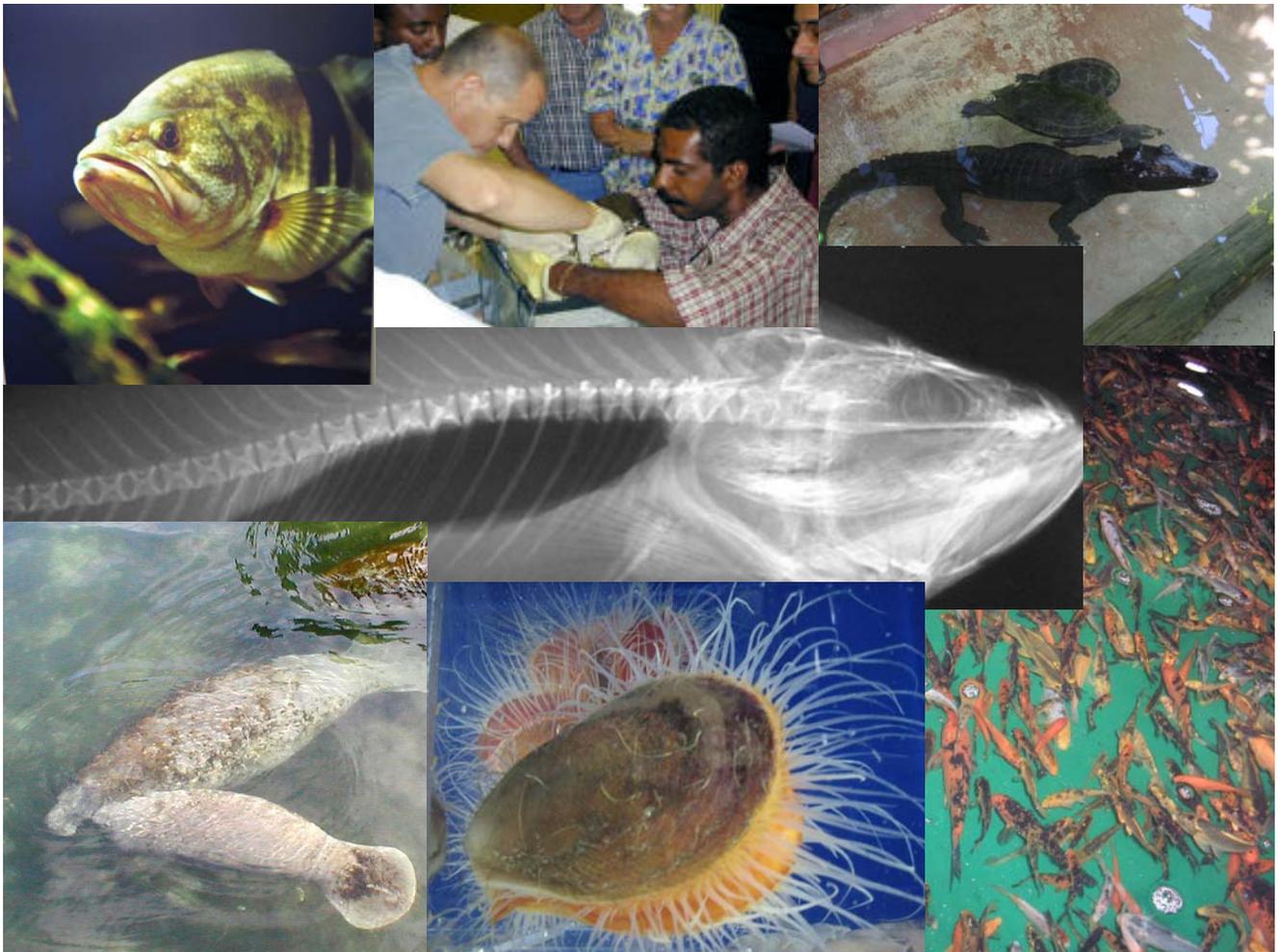


UF | **College of
Veterinary Medicine**
UNIVERSITY of FLORIDA

**University of Florida
College of Veterinary Medicine
Certificate in Aquatic Animal Health**



Up-dated Aug 2011

Certificate in Aquatic Animal Health

The University of Florida has a very active aquatic animal health program that is a collaborative effort between the College of Veterinary Medicine, the Whitney Laboratory for Marine Bioscience, the Program in Fisheries and Aquatic Sciences (School of Forest Resources and Conservation, College of Agriculture and Life Sciences) and the Biology Department (College of Liberal Arts and Sciences). Partnerships with federal and state agencies, and other public and private aquatic institutions throughout the state further enhance the scope of the program, including USDA-APHIS-Veterinary Services, the Florida Fish and Wildlife Research Institute, Disney's Animal Kingdom, SeaWorld, the Florida Aquarium, and commercial aquaculture facilities, just to name a few. Florida's unique and diverse ecosystems, and broad academic programs, create a unique opportunity for veterinary students to receive specialized and directed training within the veterinary curriculum. The purpose of this certificate program is to identify and recognize veterinary students with an interest in aquatic animal health and provide guidance to them during their veterinary studies to help them develop a knowledge base in this specialty.

Aquatic animal medicine is a rapidly expanding specialty of veterinary medicine within the American College of Zoological Medicine (ACZM). Aquatic animal medicine emerged as a veterinary discipline in 1968 when the International Association for Aquatic Animal Medicine had its organizational meeting in Menlo Park, California. Since then the discipline has expanded considerably and today includes aspects of food supply veterinary medicine through aquaculture practice, zoological medicine with aquatic display animals, companion animal and wildlife medicine. Some training in aquatic animal medicine has been available to veterinary students at the University of Florida since the College of Veterinary Medicine accepted its first class in 1976. The program has experienced significant growth since 2000 when programs in marine mammal health, aquaculture and fish health were merged into a comprehensive aquatic animal health program. The certificate program described here is a broad educational program that gives veterinary students a unique opportunity to nurture their interest in this exciting and diverse field. This certificate program is the first of its kind and faculty members are anxious to work with motivated students to help them meet their career goals.

Students who successfully complete this program will receive a certificate that documents their concentrated training in aquatic animal health during their DVM curriculum. This certificate will identify the newly graduated veterinarian as an employment prospect for an entry level position in aquaculture, or a veterinary practitioner able to provide basic medical care to aquatic animals as part of a companion animal practice. Post-DVM training may include continued graduate education working towards a Masters or PhD degree, internships or specialized clinical training in zoological medicine. Guidance from faculty can help veterinary students clarify career goals and pursue appropriate paths to achieve these goals.

The successful student in this program will be required to complete a total of 15 credits, which includes 7 credit hours of a core curriculum in aquatic animal health: Diseases of Warm Water Fish (VEM 5374, 2 credit hours), Sea Vet Clinical Training (VME 5378, 3 credit hours), and an externship (VEM 5892, 2 credit hours) or research project (VEM 5991, 2 credit hours) approved by program faculty. In addition, the student must complete 8 credit hours from a list of elective courses (included below). The student will be assigned a mentor from the aquatic animal health program faculty who will work with the student to select the elective courses most appropriate given the student's interests and career goals. Students who enter the veterinary program with undergraduate or graduate course work relevant to aquatic animal health may petition the faculty for up to 4 credits

towards their certificate from some of their previous work. They may do so by submitting a formal letter to our program education committee, describing in detail the related work, how it pertains to aquatic animal health and why these credits are needed to supplement course credits currently available through the program.

To participate in the aquatic animal health certificate program veterinary students must be in good academic standing and maintain a 3.0 GPA in the veterinary curriculum. If a student is placed on academic probation, his or her ability to participate in this program will be curtailed until the period of academic probation has been completed in a satisfactory manner. Applications for admission to the certificate program will be accepted no earlier than the spring semester of your freshman year in vet school, once fall grades of the previous semester have been released.

The Core Curriculum in Aquatic Animal Health

The core curriculum consists of entry level courses in fish and marine mammal medicine. These are Diseases of Warm Water Fish (VEM 5374, 2 credit hours) offered during the summer A term of even years and Sea Vet Clinical Training (VEM 5378, 3 credit hours) offered summer A each year. Students who enter the College of Veterinary Medicine as freshman in the fall of an odd year will be able to take these courses at the end of their freshman year. Students that enter the program in the fall of even years may take Diseases of Warmwater Fish the summer prior to entering the veterinary curriculum. Additional credit may be granted for similar courses offered at other institutions as substitutes. These include Aquavet (University of Pennsylvania and Cornell University), AQUAMED (Louisiana State University) and others. Program faculty can guide students in identifying course work that will fulfill this core requirement. In addition to this core course work, students will be expected to complete an externship (VEM 5892, 2 credit hours) or research project (VEM 5991, 2 credit hours) approved by the aquatic animal health faculty. An example template for completing course work is provided below.

Descriptions of Core Courses:

Diseases of Warmwater Fish (VEM 5374, 2 credit, letter grade) Diagnosis and management of diseases of warmwater fish. Emphasis on ornamental and display fish production with consideration of food and game fish, and fish health management within public aquaria. The course is intended for students in veterinary medicine and related disciplines as well as graduate veterinarians, aquaculturists, professional biologists and aquarists. It is excellent preparation for the American College of Zoological Medicine Day 1 examination in aquatic animal medicine.

SeaVet Clinical Training (VEM 5378, 3 credit, pass/fail) A training program in marine mammal science and medicine. The curriculum will emphasize species native to Florida such as the manatee and small cetaceans. A segment on sea turtles will also be included. The course is intended to serve as an introduction to aquatic animal medicine, clinical techniques, and captive husbandry. Common health concerns of both free-ranging and captive populations will be discussed with emphasis on management and disease prevention. The course is intended for veterinary students and veterinarians with an interest in marine mammal medicine.

Students must choose ONE of the following to complete the core curriculum:

Individualized Investigation (VEM 5991, 2 credit, letter grade) Students individually prepare an oral and written report on an aquatic animal health related research or clinical topic.

Externships (VEM 5892, 2 credit, Pass/Fail; **max 6 credits**) Students spend two weeks at an approved aquatic animal facility.

Note that completing a research project (VEM 5991), publishing it and presenting it at a scientific meeting is **STRONGLY RECOMMENDED** for those students who may want to pursue a career in the zoo and public aquarium industry.

Certificate Time-Line:

Most of the below listed courses can be taken either before, during or after veterinary school, so there is plenty of flexibility in how the requirements can be fulfilled. For those students interested in completing all of the requirements during a typical 4 year professional veterinary school time line and who would like to receive the certificate by graduation, please see the example charts below. The opportunities to take the Diseases of Warm Water Fish varies depending upon when you start your freshmen year because the course is only offered in even years (2008, 2010 ...). The advanced course, Advanced Fish Medicine, is only offered in odd years (2009, 2011 ...).

Example Time-Line for Students Entering the Veterinary Curriculum in Fall of an Odd Year:

	2007	2008			2009			2010			2011			
	Fr			So			Jr			Sr				
Core Courses	F	Sp	Sm	F	Sp	Sm	F	Sp	Sm	F	Sp	DVM Credits	Certificate Credits	
SeaVet, VEM 5378									•			Elective 3	3	
Diseases of Warmwater Fish, VEM 5374			•									2	2	
Externship, VEM 5892									•			2	2	
Elective Courses														
Marine Mammal Medicine, VEM 5377								•				Elective 1	1	
Individualized Investigation, VEM 5991			•									2	2	
Topics in Aq. An. Hlth							•			•		2	2	
Externship, VEM 5892						•						2	2	
IAAAM conference											•	0	1	
Total Credits												14	15	

Example Time-Line for Students Entering the Veterinary Curriculum in Fall of an Even Year:

	2006			2007			2008			2009			2010			
	Fr			So			Jr			Sr						
Core Courses	F	Sp	Sm	F	Sp	Sm	F	Sp	Sm	F	Sp		DVM Credits	Certificate Credits		
SeaVet, VEM 5378									•				Elective 3	3		
Diseases of Warmwater Fish, VEM 5374						•							2	2		
Externship, VEM 5892									•				2	2		
Elective Courses																
Marine Mammal Medicine, VEM 5377									•				Elective 1	1		
Advanced Fish Medicine VEM 5375											•		2	2		
Individualized Investigation, VEM 5991			•										2	2		
Topics in Aq. An. Hlth								•		•			2	2		
IAAAM conference												•	0	1		
Total Credits													14	15		

*Note – Fr = Freshman, So = Sophomore, Jr = Junior, Sr = Senior, F = Fall, Sp = Spring, and Sm = Summer.

Elective Classes in Aquatic Animal Health

A broad range of elective course work is available from within the College of Veterinary Medicine as well as from other units on campus. The student and his or her mentor should work together to identify elective classes that are consistent with the student’s interests and career goals. A list of potential elective courses is provided below. Approval of aquatic animal health program faculty may be sought for relevant courses not on this list.

Descriptions of Potential Elective Classes:

PROFESSIONAL LEVEL (on campus)

Through the College of Veterinary Medicine we offer: the courses listed below as well as some new ones that are currently under development. Veterinary students would not normally be required to pay additional tuition to participate in these courses.

Advanced Fish Medicine (VEM 5375, 2 credit, pass/fail) An advanced clinical techniques course that teaches advanced medical care of piscine patients. Prerequisites include Diseases of Warm Water Fish or equivalent or permission of instructor. Portions of this course will help prepare students for the aquatic animal section of the ACZM specialty board examination.

Marine Mammal Medicine (VEM 5377, 1 credit, pass/fail) To educate students in the basic science, husbandry, medicine and surgery of marine mammals. To understand the classification of

mammals, special husbandry issues and management of species including medicine surgery and anesthesia. Course coordinator – Dr. Mike Walsh.

Topics in Aquatic Animal Health (VEM 5931, 1 credit, pass/fail; **max 3 credits**)

Presentation/discussion by students of selected articles relating to aquatic animal health, including both vertebrates and invertebrates; plus a monthly one hour seminar. Spring and fall semesters every year, one hour a week.

PROFESSIONAL LEVEL: (off campus)

Externships (VEM 5892, 2 credit, Pass/Fail; **max 6 credits**) Students spend 2-6 weeks at an approved aquatic animal facility. A list of approved externships is available on the College of Veterinary Medicine web site. Approval of aquatic animal health faculty is required for the externship to count towards the certificate, and for students to apply for financial support from the aquatic animal health faculty.

Scientific Conferences (certificate credit only, not for DVM credit) conference must be approved by the Aquatic Animal Health program education committee and include: International Association of Aquatic Animal Medicine (IAAAM), the Society for Marine Mammalogy Biennial Conference on the Biology of Marine Mammals, etc... You may receive 1 certificate credit for attendance to a conference and 2 certificate credits for an oral or poster presentation for no more than two conferences.

ADDITIONAL COURSES:

Students may apply for certificate credit for courses they have taken as an undergraduate or graduate that may be relevant to aquatic animal health.

Examples of undergraduate courses taught outside of the College of Veterinary Medicine which may be considered as electives towards the certificate in aquatic animal health:

Zoology

ZOO 4403C Field Problems in Marine Biology *Credits: 4 to 6; Prereq: BSC 2011 and 2011L with a grade of at least C.* Survey of major marine taxa, systematics of local marine fauna and flora, with familiarization of the marine environment. Laboratory emphasizes field work and independent projects.

Wildlife Ecology and Conservation

WIS 4443C Wetland Wildlife Ecology *Credits: 4; Prereq: WIS 3401.* Ecological principles of conservation and management of wildlife in wetland environments, including a survey of the structure and function of major wetland types.

Soil and Water Science

SOS 2007 The World of Water *Credits: 3.* Course explores the full range of water issues including abundance and quality of water in the environment, water policy, and conflict.

SOS 4307 Ecology of Waterborne Pathogens *Credits: 3; Prereq: MCB 3020 or MCB 4203 or equivalent* Survival strategies, gene regulation and metabolism of waterborne pathogens. Methods for microbe detection and control.

Fisheries and Aquatic Sciences

FAS 2024 Global and Regional Perspectives in Fisheries *Credits: 3.* Fish biology, ecology and habitats relevant to fisheries on both a global and regional (Florida) scale. Follows the fisheries occurring from cold, mountain rivers to the depths of the oceans, with special topics (e.g., artificial reefs, fisheries bycatch and aquaculture). Intended for non-science and science majors. (B)

FAS 4202C Biology of Fishes *Credits: 4; Prereq: BSC 2011 and BSC 2011L.* Course will focus on the general biology of fishes, with emphasis on trends in their evolution, integrative and sensory biology, physiology, feeding ecology, reproduction, growth, and population dynamics as they relate to fisheries.

FAS 4305C Introduction to Fishery Science *Credits: 3; Prereq: refer to the department.* Principles of fish management in freshwater and marine systems. Includes field and laboratory techniques for aquatic habitat and fishery resource assessment, aquaculture practices and consideration of contemporary issues pertinent to sport and commercial uses of renewable fisheries resources.

FAS 4405C Principles of Aquaculture *Credits: 4; Prereq: BSC 2011 and BSC 2011L, or permission of instructor.* Culture methods of fish and shellfish, species selection, biological and environmental principles, case histories and future trends.

Veterinary Medicine

VME 4906 Problems in Veterinary Science *Credits: 1 to 3; Prereq: permission of instructor.* Studies and research, investigation of an approved aquatic animal health problem in the field of veterinary medicine. This may count as credits towards the Aquatic Animal Health Certificate if conducted with an appropriate faculty member and on a related topic.

VME 4906 Introduction to Marine Wildlife *Credits: 2; Prereq: permission of instructor.* To be offered Summer C annually, *all on-line, asynchronous.* This course is designed as an introduction to the natural history, anatomy, physiology and behavior of aquatic megavertebrates: whales and dolphins, seals and sea lions, manatees, sea turtles and crocodilians.

VME 4906 Aquatic Animal Conservation Issues *Credits: 2; Prereq: permission of instructor.* To be offered Fall annually, *all on-line, asynchronous.* The course introduces students to some of the controversial issues surrounding the conservation of aquatic animal species ranging from invertebrates to marine mammals, with some emphasis on marine mammals, but including sea turtles, fisheries and marine ecosystems.

Graduate level courses at UF that may be related to Aquatic Animal Health

Fisheries and Aquatic Sciences

FAS 5203C—Biology of Fishes (4) *Prereq: BSC 2011/2011L or consent of instructor.* Emphasis on trends in evolution, integrative and sensory biology, physiology, feeding ecology, reproduction, growth, and population dynamics as they relate to fisheries.

FAS 5255C—Diseases of Warmwater Fish (3) *Prereq: consent of instructor.* Intensive, 2-week course (80 contact hours) in methodology of diagnosis and treatment of parasitic, bacterial, viral, nutritional, and environmental diseases of warmwater food fish and aquarium species. Offered summer term. ****Note**** This is the graduate student course number and name for the **Diseases of Warmwater Fish** VEM 5374 core requirement.

FAS 5265—Reproductive Biology of Fish and Shell Fish (3) *Prereq: courses in ecology and biochemistry, or consent of the instructor.* Ecological, behavioral, and physiological control

mechanisms/ models of reproduction, and how they may be manipulated in fisheries and aquaculture. Offered spring semester.

FAS 5276C—Field Ecology of Aquatic Organisms (4) *Prereq: FAS 4305C or consent of instructor.* Understanding principles of fish and shellfish ecology through field studies. Intensive study in lakes, rivers, and coastal marshes to gain understanding of how fish and shellfish interact with their environment. Extensive field trips required. Offered summer semester.

FAS 5335C—Applied Fisheries Statistics (4) *Prereq: FAS 5276C or consent of instructor.* Population sampling and estimation, statistical assumptions and robustness, mark-recapture, growth, and empirical modeling of populations. Offered fall semester of even-numbered years.

FAS 5901—Aquatic Research and Science (2) General philosophical foundations of science and specific critiques and perspectives found in ecology and aquatic sciences. Offered spring semester of even-numbered years.

FAS 6171—Applied Phycology (3) *Prereq: undergraduate chemistry or biochemistry.* Ecology, management, utilization, and control of freshwater and marine algae and aquatic microorganisms. Overview of associated products, processes, and problems and economic implications. Offered fall semester of even-numbered years.

FAS 6337C—Fish Population Dynamics (4) *Prereq: STA 6166.* Analysis of fish populations for management purposes. Methods for estimating population parameters (e.g., growth, recruitment, and mortality). Use of population parameters and computer models to predict yield and catch composition, and bioenergetics approaches for fisheries management problems. Offered spring semester of odd-numbered years.)

FAS 6355C—Fisheries Management (4) *Prereq: FAS 5276C or consent of instructor.* Integration of scientific, social, political, and legal factors in fisheries management. Offered fall semester of odd numbered years.

Soil and Water Science

CWR 6537—Contaminant Subsurface Hydrology (3) *Prereq: MAP 2302 or 4341 or equivalent; CGS 2420 or equivalent; SOS 4602C or ABE 6252 or CWR 5125 or 5127 or equivalent; or EES 6208 or equivalent.* Physical-chemical-biological concepts and modeling of retention and transport of water and solutes in unsaturated and saturated media. Applications of environmental aspects of soil and groundwater contamination emphasized.

SOS 5242—Wetlands and Water Quality (3) *Prereq: CHM 2040.* Introduction to natural and constructed wetland ecosystems with emphasis on problems associated with eutrophication and water quality. Hydrology, soils, and biogeochemistry. Also offered as distance education course.

SOS 5245—Water Resource Sustainability (3) Quantitative description of effects of human impacts on hydrologic ecosystems (aquifers, watersheds, coastal zones, lakes and wetlands). Case studies illustrate detrimental effects of unsustainable resource utilization and beneficial management strategies. Also offered as distance education course.

SOS 6448—Biogeochemistry of Wetlands (3) Biogeochemical cycles of carbon, nitrogen, phosphorus, sulfur, and redox cations in wetland soils and sediments, as related to their agronomic, ecological, and environmental significance. Also offered as distance education course.

Veterinary Medicine

VME 6008—Care of Aquatic Megavertebrates (3) *Prereq: permission of instructor.* Care of Florida megavertebrates including dolphins, other cetaceans, manatees, and sea turtles using lectures, tours, and hands-on experience. ****Note**** This is the graduate student course number and name for the **SeaVet** VEM 5378 core requirement.

VME 6938—Topics in Aquatic Animal Health (1; max 3) Presentation/discussion by students of selected articles relating to aquatic animal health, including both vertebrates and invertebrates; plus a monthly one hour seminar. Spring and fall semesters every year, one hour a week.

VME 6934 – Aquatic Animal Conservation Issues (2) - to be offered Fall annually, *all on-line, asynchronous*. The goals of this course are to introduce students to some of the controversial issues surrounding the conservation of aquatic animal species ranging from invertebrates to marine mammals, with some emphasis on marine mammals, but including sea turtles, fisheries and marine ecosystems. Format includes heavy reading, discussion, homework assignments, review of a journal article, and a short grant proposal and review.

VME 6934 – Introduction to Marine Wildlife (2) – to be offered Summer C term annually, *all on-line, asynchronous*. This on-line course will provide an introduction to marine mammals, sea turtles and alligators. It will cover aspects of natural history, behavior, anatomy, physiology, management and research.

Wildlife Ecology and Conservation

WIS 5155C—Natural History of Amphibians and Reptiles (4) *Prereq: WIS 3401 or ZOO 2303C*. Systematics, morphology, biogeography, life history patterns, ecology, and conservation of caecilians, salamanders, frogs, crocodylians, turtles, lizards, and snakes. Weekend field trips required. Offered spring semester of odd-numbered years.

WIS 5323C—Impact of Diseases on Wildlife Population (3) *Prereq: WIS 3401 or equivalent*. Diseases of wildlife, with emphasis on their impact on avian and mammalian populations of North America.

WIS 6444—Advanced Wetlands Ecology (4) *Prereq: WIS 4443, SOS 4242, EES 6308C, or consent of instructor*. Examination of geology, hydrology, chemistry, flora, fauna, and ecology of major wetland systems in North America.

Zoology

PCB 5307C—Limnology (4) *Prereq: PCB 4044C, CHM 2046*. Biological, chemical, and physical dynamics of inland waters.

PCB 6496C—Stream Ecology (4) *Prereq: ENY 3005C, PCB 4044C or 3043C, CHM 2046, PHY 2054*. Physical,

PCB 6815—Hormone Regulation of Invertebrate Behavior (3) Survey and analysis of invertebrate behaviors regulated by hormones. Invertebrates considered include arthropods, coelenterates, helminths, and molluscs.

ZOO 6406—Biology of Sea Turtles (3) All aspects of biology of sea turtles and how their biology affects their conservation.

ZOO 6456C—Ichthyology (4) *Prereq: ZOO 2203C*.

ZOO 6931—Seminar in Marine Turtle Biology (1-2; max: 5) *Prereq: permission of instructor*. Advanced topics in biology and conservation of marine turtles.

Other courses may be appropriate and students are encouraged to discuss their academic background and professional goals with Aquatic Animal Health faculty when selecting electives for this certificate program.

Note For those students that may be unsure if they want to pursue this certificate, the following course is available as an introductory course, however, there is significant overlap with the core requirements and can therefore not be included in the credits that count towards the certificate.

Introduction to Aquatic Animal Health (VEM 5810, 2 credit, Spring, letter grade). Basic medical biology of aquatic animal medicine. Including anesthetizing fish, venipuncture of fish, alligators, sea turtles, sharks, dolphins, and other aquatic species. *Please note that this class is not for students who have completed Diseases of Warm Water Fish and Sea Vet I and as such, cannot be applied toward the aquatic animal health certificate.* It is an excellent elective for those students who want some exposure to this field but do not want to pursue the certificate program.

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