Marine Science: The Chesapeake Bay Blue Crab
Field portion onboard Buyboat *Mildred Belle*

Course Description: Students will study the biology and ecology of the Blue Crab (*Callinectes sapidus*). Technical labs, field investigations, and a student-directed behavior study will provide hands-on experiences for students. The Blue Crab will be studied as a model organism for understanding Chesapeake Bay diversity and ecology.

Required Texts:
Beautiful Swimmers: Watermen, Crabs, and the Chesapeake Bay by William W. Warner
Life in the Chesapeake Bay, second edition by Alice Jane Lippson and Robert L. Lippson.

➢ *Please note this is a sample syllabus for the field portion of the Blue Crab program. It is largely dependent on weather and ability to secure docking and camping. First 9 days of field portion will be Baltimore to southern Maryland; second 9 days will be southern Maryland to Baltimore.*

Baltimore to Southern Maryland:

Day	Camp location	Dock Location	Possible Programming
Day 1 Monday	Wye Island, NRMA	Same	Introduction to boat, Bay, camping, responsibilities etc.
Day 2 Tuesday	Tilgman Island	Same	Tour Popular Island (being rebuilt with dredge spoils)
Day 3 Wednesday	Taylor's Island	Same	Crab with local waterman; Visit DNR/NOAA's labs on Oxford and meet with Blue Crab researcher
Day 4 Thursday	Jane's Island State Park, Crisfield, MD	Somers Cover Marine, Crisfield, MD	All day onboard programming***
Day 5 Friday	Reedville, VA	Reedville Fisherman's Museum, Reedville, VA	All day onboard programming
Day 6 Saturday	Pt. Lookout State Park, Scotland MD	Same	Morning – tour Reedville Fisherman's museum and town, then programming onboard while underway
Day 7 Sunday	Calvert Cliffs State Park	Solomons Island	On board programming
Day 8	Jefferson	Same	Tour of Calvert

Day	Camp location	Dock Location	Possible Programming
Monday	Patterson Park		Marine Museum, onboard, project presentations
Day 9 Tuesday	Return to Baltimore by van	N/A	Students will help clean the boat and camp equipment for next group then be driven back to Baltimore

*** On board programming is dependent on weather, conditions on Bay and the length of the transit. Program topics will include water quality, navigation, time at the helm, boat checks, plankton studies, and almost daily deployment of the Otter Trawl net, hopefully resulting in catching marine life native to the area of the Bay where the boat is traveling. Other course specifics may include observations of the crab, as well as research time for independent and group projects. Students will also have the opportunity to "chicken neck," a favorite way to catch crabs in Maryland.

Land portion on campus

Day	Time	What: Skill and Learning Goals	How: Activities and Readings
Day 1 Wednesday	Morning	To become acquainted with course expectations and peers To understand the criteria with which students will be evaluated To become familiar with Chesapeake Bay ecology and history To understand the workings of an estuary To learn the biology of a crab including life cycle, reproduction, natural ecology, and introduction to the crabbing industry	**Introduction**: Meet instructors, learn expectations, site review, and play ice breaker games **Introduction:** Syllabus and assignments **Interactive lesson:** Chesapeake Bay background and salt wedge **Interactive lesson:** Crab biology slideshow with handouts
	Afternoon	To examine the external and internal anatomy using proper dissection techniques To learn how to pick crabs	**Lab:** Extended dissections **Fun:** Cooking, picking, and eating crab meat

Day	Time	What: Skill and Learning Goals	How: Activities and Readings
		To become familiar with the Center of Marine Biotechnology (COMB) and its modern marine biotechnological research and aquaculture techniques	**Study Hall:** Articles on COMB, Chesapeake Bay crossword puzzle, L&L readings, 'Beautiful' readings
Day 2 Thursday	Morning	To learn the proper format for a lab write-up and to review the scientific method in research To demonstrate critical thinking skills when investigating the research and policies of COMB	**Group Discussion:** Review the scientific method and lab write-up format **Group Discussion:** Brainstorm questions for COMB staff based on yesterday's articles **Field Trip:** Tour the COMB facility and talk with the COMB staff
	Afternoon	To design a study on crab behavior To learn proper computer lab protocol To utilize proper format in a research proposal To exhibit creativity in creating a fun keepsake To acquire background knowledge on tomorrow's labs	**Group Discussion:** Preparations for the behavior study **Computer Lab:** Internet research on behavior study topic **Individual Work:** Write and submit a formatted proposal for your behavior study **Fun:** Art with a crab carapace **Study Hall:** Read tomorrow's labs, 'Beautiful' readings
Day 3 Friday	Morning	To understand osmoregulation and ammonia excretion To demonstrate proper lab protocol and detailed data recording To correctly use lab tools including a Hach colorimeter, refractometer, and Mettler balance	**Group Discussion:** Review concepts behind osmoregulation and ammonia excretion **Lab:** Conduct the osmoregulation lab and the ammonia excretion lab and record the results
	Afternoon	To demonstrate understanding with a thorough, formatted lab write-up	**Lab:** Finish the labs and analyze the data **Individual Work:** Create and submit a thorough, formatted lab write-up

Day	Time	What: Skill and Learning Goals	How: Activities and Readings
			Study Hall: Correct and finalize your behavior study proposal, L&L readings, 'Beautiful' readings
Day 4 Monday	Morning	To utilize water quality testing equipment to access the health of an ecosystem To identify organisms from a biofilm scrape To investigate the dynamics of bay grass ecology To understand the relationships between local native species and non-native and invasive species	**Field Activity:** Perform water quality tests **Lab:** Examine life from biofilm under microscopes **Group Discussion:** Discuss the importance of bay grasses **Group Discussion:** Identify Chesapeake bay native, non-native, and invasive species **Fun:** Play the Invasive Species game
	Afternoon	To gain appreciation for the diversity of marine life and demonstrate observation skills at the National Aquarium in Baltimore	**Field Trip:** Visit the National Aquarium in Baltimore to investigate local ecosystems and marine ecology **Study Hall:** Complete the Aquarium Quiz
Day 5 Tuesday	Morning	To conduct behavior study using proper lab protocol To record detailed data	**Lab:** Conduct your behavior study lab
	Afternoon	To effectively draw conclusions from research and data To demonstrate understanding with a thorough, formatted lab write-up To create a well thought-out presentation that communicates behavior study results to the group To prepare an educational poster on behavior study to be displayed at graduation	**Lab:** Analyze the data from your behavior study **Individual Work:** Write and submit a thorough, formatted lab write-up **Individual Work:** Prepare the behavior study presentation and poster **Study Hall:** 'Beautiful' readings

Day	**Time**	**What: Skill and Learning Goals**	**How: Activities and Readings**
Day 6 Wednesday	Morning	To learn proper canoeing skills in order to safely explore the aquatic ecosystem at Days Cove Area	**Field Trip:** Canoeing at Gunpowder State Park Days Cove Area
	Afternoon	To identify native and non-native submerged aquatic vegetation To learn proper seine net techniques in order to catch and identify aquatic organisms To assess the health of several aquatic ecosystems through water quality testing	**Interactive Lesson:** Submerged aquatic vegetation identification **Interactive Lesson:** Using the seine net for aquatic organism identification **Interactive Lesson:** Water quality testing in several different ecosystems
Day 7 Thursday	Morning	To present behavior study results to the group, using your poster as a visual aid To understand sustainable development through metaphors found in The Lorax	**Individual Work:** Behavior Study presentations **Group Discussion:** The Lorax by Dr. Seuss: reading and activities
	Afternoon	To critically and creatively role-play a position at a mock meeting on current crabbing industry issues To demonstrate your cumulative knowledge and teamwork through a fun game of Jeopardy	**Group Work:** Mock meeting on current crabbing industry issues **Fun:** Marine Science Jeopardy
Day 8 Friday		Course evaluation Closing ceremony	