

# Marine Biology 11

**District Name:** Mission  
**District Number:** 75

**Developed by:** Z. Bertalan, K. Welton, O. Kraley, S. Hopkins, P. Godbehere  
**School Name:** Hatzic Secondary  
**Principal's Name:** Mike Malfesi

**Board/Authority Approval Date:** January 15, 2004

**Board/Authority Signature:**

**Course Name:** Marine Biology  
**Grade Level of Course:** 11  
**Number of Course Credits:** 4  
**Number of Hours of Instruction:** 120

**Prerequisite(s):** Science 10

**Special Training, Facilities or Equipment Required:**

Special Training	Academic background in Marine Biology or Oceanography
Facilities	Course presentation in regular classroom, with access to a Science Lab. Computer access is also recommended.
Equipment Required	TV/VCR, DVD player, laser disc/video disc player, computers, dissecting equipment, microscopes.

**Course Synopsis:**

Oceans cover approximately 70% of the Earth's surface, and contain about 97% of the water on the Earth. While scientists are finding out more about the oceans and the marine environment, our knowledge is limited. Life on the Earth is dependent on the oceans. We depend on the oceans for our weather, oxygen, food and transportation, hi Marine Biology 11, we will study ocean life, physical oceanography, technology as it relates to the marine environment, careers in marine biology, and issues that relate to the exploitation of resources from the oceans. Optional activities that will be offered through this course will be a field trip to the Bamfield Marine Station (in conjunction with Biology 11), and SCUBA lessons. Marine Biology 11 will be a 4 credit course available to grade 11 or 12 students. Prerequisite: Science 10.

**Rationale:**

With the exception of a unit on marine biology in Biology 11, and an oceanography unit in Earth Science 11, there is no course offered at Hatzic Secondary that adequately covers the topic of marine biology. British Columbia has become a world leader in marine research and technology. The Pacific Oceanographic Institute, Bamfield Marine Station, and several government institutions and university research facilities are located here in British Columbia. Several businesses in the private sector have also established facilities in this province. Businesses such as CanDive, the makers of the NewtSuit, have put British Columbia on the world map as a marine technology centre. It is expected that students will gain a better understanding of the environment around them, and may make environmentally sound decisions that relate to the marine environment and the world around them.

**Organizational Structure:**

Unit	Title	Time
1	Physical Oceanography	35 hours
2	Ocean Life	40 hours
3	Economic Importance of the Oceans	15 hours
4	Technology for Ocean Exploration	15 hours
5	Environmental Issues	15 hours
	Total Hours	120 hours

**Unit/Topic/Module Descriptions:****Unit 1: Physical Oceanography**

Time: 35 hours

Physical oceanography is the exploration and study of the physics and geography of the oceans, ocean currents and water properties. Students will explore the major components involved with oceanography including the dynamics of ocean currents, ocean wave phenomena, the distribution of heat and salt, the momentum exchange involving heat and freshwater, and the interactions between oceans, rivers, estuaries, ice and marginal seas.

**Curriculum Organizer: Physical Factors**

*It is expected that students will:*

- identify the oceans of the world
- describe sea water in the context of salinity, density, temperature, and pressure
- identify physical features of oceans
- analyze the effects of weather, erosion, and the Coriolis effect on the marine environment

**Curriculum Organizer: Biological Factors**

*It is expected that students will:*

- demonstrate the production of ocean currents and give examples
- correlate ocean currents with world climates

**Curriculum Organizer: Environmental and Ethical Issues**

*It is expected that students will:*

- assess the interrelationships between human activities and oceans
- describe the impact of pollution on the oceans of the world
- analyze from different view points the exploitation of the oceans resources

**Curriculum Organizer: Technological Advancements**

*It is expected that students will:*

- describe how space technologies are used to study oceans
- analyze satellite images used to recognize detailed oceanic characteristics

**Unit 2: Ocean Life:**

Time: 40 hours

The oceans harbour a great diversity of organisms, and comprise the largest habitable environment on earth. Students will be introduced to the physical, chemical and biological components of marine biology. The students will interpret the distribution of life in the oceans and other marine environments (salt marshes, sandy beaches, rocky shores, coral reefs, & polar regions) in the context of their adaptations. They will understand that the oceans play a large part in the world economy and they are not infinite resources. The technology used in oceanographic research will also be explored in this unit.

**Curriculum Organizer:** Economic Factors

***It is expected that students will:***

- demonstrate an awareness of the economic debates surrounding ocean based industries

**Curriculum Organizer:** Biological Factors

***It is expected that students will:***

- gain an understanding of the development and structure of the sea floor
- analyze the physical properties of the water masses and currents in the different ocean basins
- understand the marine environments: open ocean, coral reefs and coastal environments as mediums in which to exist
- understand how chemical, physical and geological properties of the marine environment influence the organisms that live there
- describe the structure of the aquatic food chain
- describe the origin, evolution and classification of marine organisms
- analyze the basic characteristics, functions, behaviours, adaptations, and interrelationships between of the ocean's organisms and their habitats

**Curriculum Organizer:** Environmental and Ethical Issues

***It is expected that students will:***

- understand that the world ocean is not an infinite resource
- identify endangered species and explore the causes

**Curriculum Organizer:** Technological Advancements

***It is expected that students will:***

- explore technological methods and equipment used in oceanographic research to contribute to our understanding of the planet earth

**Unit 3: Economic Importance of the Oceans** Time: 15 hours

Students will explore the economic potential of the oceans, and the resulting impact that human activities have on the marine environment. There is an increasing amount of human activity in the areas of fishing, tourism, transportation, weather-related economics (El Nino and La Nina), petroleum exploration (oil and natural gas) and mining. The economic importance, benefits, and stresses that may result from human activity will be explored in this unit.

**Curriculum Organizer:** Economic Factors

***It is expected that students will:***

- identify the resources of the marine environment
- identify some of the substances that can be removed economically from the sea
- discuss the nature and importance of authigenic sediments
- describe the social, political, and economic implications of the E.E.Z. (Exclusive Economic Zone)

**Curriculum Organizer:** Biological Factors

***It is expected that students will:***

- relate human activities to the sustainability of the marine ecosystem
- develop an understanding of the value of the world's oceans and the economic value it possesses

**Curriculum Organizer:** Environmental and Ethical Issues

***It is expected that students will:***

- analyze the balance between exploiting the oceans for economic gain versus the need to preserve the marine environment

**Curriculum Organizer:** Technological Advancements

***It is expected that students will:***

- analyze the uses, benefits, hazards, and limitations of current exploration technologies

**Unit 4: Technology for Ocean Exploration**

Time: 15 hours

Advancements in technology have provided opportunities to examine both living and non-living environments in the oceans by non-intrusive, and systematic methods. Students will become familiar with several ocean exploration projects and the technologies that impact ocean exploration. These include vessels, submersibles, diving technologies and observation tools. Students will be able to distinguish the different sampling techniques, and understand their advantages and limitations. Students will gain an understanding of the economics and environmental issues surrounding use of technologies and be able to discuss the importance of international teamwork in scientific research projects.

**Curriculum Organizer:** Economic Factors

***It is expected that students will:***

- make sense of the relationship between using technologies and economic benefits

**Curriculum Organizer:** Biological Factors

***It is expected that students will:***

- identify the restrictions divers have when exploring the ocean
- give examples of how marine animals and ocean technology interact to relay information

**Curriculum Organizer:** Environmental and Ethical

***It is expected that students will:***

- analyze the relationship between increased knowledge about the oceans and the development of regulations by various countries

**Curriculum Organizer:** Technological Advancements

***It is expected that students will:***

- understand the technological applications and capabilities required for ocean exploration
- understand the importance of design in underwater vehicles
- analyze sea-floor mapping data

**Unit 5: Environmental Issues**

Time: 15 hours

Students will understand that humans serve as a catalyst for change in the oceanographic ecosystem. Change can occur through over-exploitation, pollution, sedimentation, global warming, and oil and mineral exploration. Humans have the capacity to understand that environmental changes concerning the degradation of coral reefs and the melting of the polar ice is multifaceted and complex. Although we may not see the effects of our existence and our direct impact, it is the driving force in the alteration of our ecosystem.

**Curriculum Organizer:** Economic Factors

***It is expected that students will:***

- demonstrate an understanding of how over-exploitation in commercial, industrial, recreational and agricultural activities relate to the ocean and the economic activities of humans

**Curriculum Organizer:** Biological Factors

***It is expected that students will:***

- identify the biological and environmental impacts on coral reefs
- demonstrate an understanding of global warming and its effects on marine ecosystems

**Curriculum Organizer:** Environmental and Ethical Issues

***It is expected that students will:***

- identify harmful marine phytoplankton and its origin in terms of frequency, intensity, and geography
- analyze the various ethical considerations relating to human and marine toxicity

**Curriculum Organizer:** Technological Advancements

***It is expected that students will:***

- identify relevant websites relating to environmental change and oceanographic degradation caused by population growth

**Instructional Components:**

- direct instruction
- interactive instruction
- indirect instruction
- independent instruction
- modeling
- technological instruction
- practical creativity
- brainstorming
- guest speakers
- field trips
- videos
- demonstrations
- group work
- analysis of commercial film and video works
- analysis of own and classmates technological creations
- critical thinking

**Assessment Components:**

- Sixty five percent (65%) of the grade will be based on the evaluation of tests and quizzes throughout the course.
- Fifteen percent (15%) of the grade will be based on the evaluation of Labs and assignments throughout the course.
- Twenty percent (20%) of the grade will be based on a final exam.

<b>Performance Methods</b>	<b>Personal Communication</b>	<b>Other</b>
Quizzes	E-mail	Rating scales and rubrics
Formal Presentation	Critical debate	Criterion referenced assessment
Projects	Guest speaker interaction	Teacher anecdotal notes
Class participation	Peer evaluation	
Assignments	Self-Evaluation Teacher evaluation	

## **Learning Resources:**

### Textbooks:

- Principles of Oceanography, Seventh Edition
- The Blue Planet, Second Edition
- Heath Earth Science
- Physical Geology: Exploring the Earth, Third Edition

### Lab supplies:

- Biological specimens for dissection.

### Videos:

- Understanding Oceans, TLC
- The Unknown World: The Odyssey of Life series
- Incredible Suckers
- The Nature Connection
- The World Between the Tides
- National Geographic: Ocean Drifters
- National Geographic: Jewels of the Caribbean Sea
- Eyewitness series: Ocean
- Eyewitness series: Arctic and Antarctic
- Eyewitness series: Seashore

### Software:

- SimEarth

### Laserdisc/videodisc:

- The Macmillan Geodisc
- Planet Earth: The Blue Planet
- The Water Planet

### Other Suggested Learning Resources:

- Vancouver Aquarium
- Scuba Diving Lessons
- Cartography
- Bamfield Marine Station
- Guest speakers

## **Additional Course Information:**

This course is a revision of a locally developed course originally developed by Mark Bradshaw from School District #75 (Mission), Marine Biology 11, 2000.