

Treasure Coast Science Scope and Sequence 2012-2013

Course: Marine Science I Honors

Course Code: 2002510

Quarter: 3

Topic(s) of Study: Marine Organisms and Ecosystems

Bodies of Knowledge: Nature of Science and Life Science

Standard(s): 1: The Practice of Science, 2: The Characteristics of Scientific Knowledge, 3: The Roles of Theories, Laws, Hypotheses and Models, 4: Science and Society, 14: Organization and Development of Living Organisms, 15: Diversity and Evolution of Living Organisms, 16: Heredity and Reproduction, 17: Interdependence

Essential Questions: Why are there different ecosystems within the ocean? What are some of the characteristics of the inhabitants of each marine environment? How do scientists design an investigation to answer a scientific question and communicate their findings?

[Concept Map\(s\): Click here](#)

[Resources: Click here](#)

[Syllabus: Click here](#)

[CCSS Literacy Standards: Click here](#)

NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
<p>SC.912.L.14.6 Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. Cognitive Complexity: High</p>	<p>I Classification/Taxonomy</p> <p>A. Prokaryotes</p> <p>B. Marine Algae</p> <p>C. Marine Plants</p> <p>D. Marine Animals</p>	<ul style="list-style-type: none"> • Explain how the biological classification system is used to classify marine organisms. (I) • Explain how the process of natural selection influences the evolution of species. (I) • Compare prokaryotic and eukaryotic cells. (I)
<p>SC.912.L.15.13 Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. Cognitive Complexity: Moderate</p>	<p>II Ocean Zones</p>	<ul style="list-style-type: none"> • Compare prokaryotic and eukaryotic cells. (I)
<p>SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. Cognitive Complexity: High</p>	<p>III Energy Flow Through the Ocean's Biosphere</p>	<ul style="list-style-type: none"> • Explain the classification scheme for marine prokaryotes, protists, fungi, and plants. (I)
<p>SC.912.L.17.1 Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</p>	<p>IV Marine Ecosystems</p> <p>A. Open-Sea</p> <p>B. Coastal</p> <p>C. Polar</p> <p>D. Deep-Sea</p>	<ul style="list-style-type: none"> • Identify the morphological characteristics of marine prokaryotes, protists, fungi, and plants. (I) • Discuss the ecological importance of marine algae and plants. (I) • Explain the classification scheme for marine invertebrates. (I) • Describe the deep ocean floor environment. (II) • Relate the importance of seafloor hydrothermal vents to life cycles on the seafloor. (II) • Diagram and label a profile of the ocean basins illustrating the major zones. (II) • Give examples of how marine species interact with ecosystem components as abiotic and biotic factors and give examples of how they influence one

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<p>Cognitive Complexity: Moderate SC.912.L.17.2 Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. Cognitive Complexity: High</p> <p>SC.912.L.17.3 Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. Cognitive Complexity: Moderate</p> <p>SC.912.L.17.4 Describe changes in ecosystems resulting from seasonal variations, climate change and succession. Cognitive Complexity: Moderate</p> <p>SC.912.L.17.6 Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. Cognitive Complexity: Moderate</p> <p>SC.912.L.17.7 Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems. Cognitive Complexity: Moderate</p> <p>SC.912.L.17.8 Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. Cognitive Complexity: High</p> <p>SC.912.L.17.9 Use a food web to identify and</p>	<p>another. (II, III)</p> <ul style="list-style-type: none"> • Explain why the most productive epipelagic ecosystems are located where they are. (II,IV) • Explain the physical and chemical variations that occur with an increasing depth of water in the marine environment. (II, IV) • Explain the adaptations of marine organisms to increasing water depth. (II, IV) • Give examples of diverse marine ecosystems and their locations on Earth. (II, IV) • Explain the food webs associated with coral reef environments. (III, IV) • Relate food webs to estuarine environments. (III, IV) • Explain why nutrient cycling is critical within the Earth systems. (III, IV) • Trace the flow of energy and nutrients within the marine environment. (III, IV) • Relate food webs to estuarine environments. (III, IV) • Construct a sample marine food web. (IV) • Describe the critical role of phytoplankton in marine food web. (IV) • Describe examples of mutualism, parasitism, and commensalism in the oceans. (IV) • Consider the costs and benefits of diverse reproductive strategies used by species. (IV) • Give examples of adaptations in diverse marine ecosystems. (IV) • Describe adaptations associated with each invertebrate group. (I, IV) • Diagram and explain the anatomy of selected members of invertebrate groups. (I, IV) • Explain the modes of reproduction and reproductive strategies used by marine invertebrates. (I, IV)
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distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Cognitive Complexity: Moderate

SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: Cognitive Complexity: High

1. pose questions about the natural world,
2. conduct systematic observations,
3. examine books and other sources of information to see what is already known,
4. review what is known in light of empirical evidence,
5. plan investigations,
6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
7. pose answers, explanations, or descriptions of events,
8. generate explanations that explicate or describe natural phenomena (inferences),
9. use appropriate evidence and reasoning to justify these explanations to others,
10. communicate results of scientific investigations, and

- Describe the major characteristics and give specific examples of the marine tetrapods. (I, IV)
- Explain the major characteristics of the marine reptiles and birds. (I, IV)
- Describe the major characteristics of the marine mammals. (I, IV)
- List the types of reptiles and birds that are found in the marine environment. (IV)
- Relate the special adaptations that reptiles have for living in the sea. (I, IV)
- Recognize the special adaptations that seabirds have for an oceanic life. (IV)
- Identify the basic characteristics and behaviors of the cetaceans. (I, IV)
- Compare the adaptations of pinnipeds and other marine mammals. (I, IV)
- Identify the unique diving response features of marine mammals. (I, IV)
- Explain the modes of reproduction and reproductive strategies used by other marine vertebrates. (IV)
- Relate the diversity of habitats to the role marine plants in the marine environment. (IV)
- Summarize the major groups of marine fish. (I, IV)
- Explain important morphological features, distributions, and adaptations of marine fish. (I, IV)
- Diagram and explain the anatomy of selected fish (i.e., sharks and bony fish). (I, IV)
- Explain the modes of reproduction and reproductive strategies used by marine fish. (I, IV)
- Describe the process of biological succession, explaining that marine ecosystems undergo natural, gradual changes over time. (IV)
- Explain the adaptations of midwater organisms. (IV)
- Describe the organisms of the

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<p>11. evaluate the merits of the explanations produced by others. Cognitive Complexity: High</p> <p>SC.912.N.2.5 Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. Cognitive Complexity: High</p> <p>SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. Cognitive Complexity: Moderate</p> <p>SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. Cognitive Complexity: Moderate</p> <p>SC.912.N.4.2 Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. Cognitive Complexity: High</p> <p>MA.912.S.1.2 Determine</p>		<p>epipelagic ecosystem. (IV)</p> <ul style="list-style-type: none"> • Identify the adaptations of organisms in the epipelagic ecosystem. (IV) • Explain the epipelagic food webs. (IV) • Discuss the various organisms that build reef environments. (IV) • Explain the conditions necessary for reef growth. (IV) • Explain why the world reef ecosystems are located where they are. (IV) • List each type of coral reef and describe it. (IV) • Explain the formation of atolls. (IV) • Discuss the physical characteristics of the subtidal environment. (IV) • Compare soft-bottom and hard-bottom communities. (IV) • Identify the location of the world's kelp beds. (IV) • Discuss the importance of kelp beds in the marine ecosystem. (IV) • Discuss the origins and classification of estuaries. (IV) • Outline the unique physical and chemical characteristics of estuaries. (IV) • Explain how organisms are adapted to estuarine environments. (IV) • Describe the distribution of life within the four major habitats: open water, mud flats, salt marshes, and mangrove forests. (IV) • Explain the effects of exposure on marine organisms at low tide. (IV) • Explain the distribution of wave energy along the shore and its effects on marine organisms. (II, IV) • Describe vertical zonation. (IV) • Explain oxygen availability, feeding strategies, mobility, and zonation in soft bottom intertidal communities. (IV) • Define a scientific problem or question based on the specific body of
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appropriate and consistent standards of measurement for the data to be collected in a survey or experiment.

Cognitive Complexity: Moderate

MA.912.S.3.2: Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following:

bar graphs, line graphs, stem and leaf plots, circle graphs, histograms, box and whisker plots, scatter plots and cumulative frequency (ogive) graphs. Cognitive Complexity: High

knowledge correlated to the Marine Science I Honors course. (I-X)

- Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals. (I-X)
- Explain why models are used in science to observe processes that happen too slowly, too quickly, or are too small or vast for direct observation. (I-X)
- Describe scientific knowledge's impact on societal decisions. (I-X)