Lesson Links to Next Generation Science Standards

*All of the lessons reinforce the scientific method by asking students to observe, predict, hypothesize, participate in an experiment or activity, sort/classify, and make conclusions.

Kindergarten through 2nd grade

(1) Bioacoustics
   a. K-ESS3-3 – Communicate solutions that will reduce the impact of humans on other living things in the local environment. This lesson introduces students to the Right Whale Listening Network and encourages students to think of ways to minimize their impact on local waters and marine mammal species.
   b. 1-LS1-2 - Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. This lesson encourages the students to explore why marine mammals rely so heavily on sound and how that enables them to communicate a variety of information to other individuals as well as their offspring.
   c. 2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats. This lesson allows the students to observe the various adaptations marine mammals possess that allow them to send and receive sound much more efficiently than many terrestrial mammals. They can also make comparisons between marine mammal species that may be found at different locations in the water column.

(2) Marine Mammal Adaptations and Climate Change
   a. K-LS1-1 - Use observations to describe patterns of what plants and animals (including humans) need to survive. In this lesson students explore the marine habitat and the adaptations required by mammals to survive there.
   b. 2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats. In this lesson students compare and contrast marine and terrestrial habitats and then observe various marine mammals species and compare their adaptations to those found on land.

(3) Marine Mammals in Our Backyard
   a. K-ESS3-1 - Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. This lesson uses google earth to illustrate how the students meet their needs and how local marine mammal species cover a larger geographic area to meet their needs.
   b. 1-LS3-1 - Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. In this lesson students discover how individual North Atlantic right whales can be photo identified by comparing their callosity patterns.
   c. 2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats. In this lesson students compare the species found in their "backyard" (both aquatic and terrestrial).

(4) Food Webs
   a. K-LS1-1 - Use observations to describe patterns of what plants and animals (including humans) need to survive. In this lesson students are asked to compare plant and animal needs and where their energy requirements place them in the food web.
   b. K-ESS3-1 - Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. In this lesson students build both a terrestrial and ocean food web and explore the different feeding strategies employed by marine mammals as their habitat affects the location of "plants".
   c. 2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats. Students compare and contrast what they know of terrestrial plants and animals with plankton and marine mammal samples and relate that to habitat information.

(1) Bioacoustics
    a. 3-LS2-1 - Construct an argument that some animals form groups that help members survive. In this lesson students explore the importance of a whale pod and how bioacoustics is an integral part in pod health.
    b. 4-LS1-2 - Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. In this lesson students discover why sound is so important in the ocean and leads to resultant behavior in marine mammals.
    c. 5-ESS3-1 - Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. Students will discover how sound can be used to monitor local whale species as well as protect them from ship strikes.

(2) Marine Mammal Adaptations and Climate Change
    a. 3-LS4-3 - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. In this lesson students analyze various marine mammals and discover the adaptations that make them best suited for the marine environment.
    b. 4-LS1-1 - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. In this lesson students compare the external and internal anatomy of a human and harbor porpoise and relate it to the animal's habitat.
    c. 4-ESS3-1 - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. In this lesson students learn about fossil fuel consumption and climate change.

(3) Marine Mammals in Our Backyard
    a. 3-LS3-1 - Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. In this lesson students discover how individual North Atlantic right whales can be photo identified by comparing their callosity patterns.
    b. 5-ESS3-1 - Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. In this lesson students participate in North Atlantic right whale photo id and discover how this monitoring is critical to this endangered species' recovery.

(4) Food Webs
    a. 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. In this lesson students make a model, marine food web.
    b. 5-PS3-1 - Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. Students construct a food web and investigate how the suns energy travel's through that web.

(1) Atlantic salmon
  a. 5th and MS - ESS3 - Earth and Human Activity. In this lesson, students will learn how human actions have affected salmon habitat and how individuals and communities have responded to the problem to protect salmon and their habitat. They will design a method for monitoring and minimizing a dam's impact on salmon migration.
  b. 5th and MS - ETS1 – Engineering Design. The students will define the problem caused by dams in the river ways, define criteria for a successful bypass, try out multiple solutions as a group and as a class, and then evaluate the effectiveness of each design.
  c. MS-LS1 – From Molecules to Organisms: Structures and Processes. Use empirical evidence to show how salmon behavior impacts the probability of successful reproduction.
  d. MS- LS2 – Ecosystems: Interactions, Energy and Dynamics. Students will construct an argument supported by empirical evidence that changes to the physical and biological components of the riverine ecosystem have affected Atlantic salmon populations.