

Mystic Seaport for Educators
Science on the 38th Voyage of the *Charles W. Morgan*
Lesson 5 of 6: The Whale Pump
Teacher Introduction

MSE Lesson 5: The Whale Pump

Grade Level: 5-8 grade

Time Frame: 45 minutes

NGSS Science Standards:

1. MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem
2. MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

Learning Objectives:

- Students are able to visualize and reconstruct the driving processes behind the nitrogen cycle in the ocean
- Students understand how physical or biological changes to the ecosystem can affect the nitrogen cycle
- Students are able to use empirical data to predict and explain seasonal variation in marine mammal populations in the Gulf of Maine
- Students demonstrate an understanding of the connection between photosynthesis, primary consumers, and secondary consumers

Materials/Resources:

- Worksheet
- Video presentation (optional) – computer and projector

Instructional Strategies:

- **Part 1** (20 minutes): To begin the lesson, ensure that every student has a worksheet. Ask students to read the “Introduction” component of the worksheet, either aloud or to themselves.
- **Part 2** (20 minutes): Working in groups or individually, have the students fill out the corresponding questions on the answer sheet.
- **Part 3** (2 minutes): If time allows, ask the students to watch the *Scientific American* video to summarize the lesson (link in “Further Resources”).

Further Resources:

In order to gain a greater understanding of the “Whale Pump,” students can watch the following sixty-second clip from the *Scientific American* website:

<http://www.scientificamerican.com/video/why-whale-waste-matters/>

More advanced students and teachers who are interested in this concept can read the publication that introduces the “Whale Pump” by Joe Roman and James J. McCarthy online:

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0013255#pone-0013255-g003>