Exploring Ocean Frontiers

Ocean Frontiers II: A New England Story for Sustaining the Sea

Grades 7-12 / Secondary Lessons

Acknowledgements

Film

Karen Anspacher-Meyer	Executive Director, Green Fire Productions
Ralf Meyer	Creative Director, Green Fire Productions

Curriculum Authors

Kimberly Williams[1]	B.S. Master of Science in Coastal Oceanography, NYS Certified Science Teacher, Grades 5-12
Jennifer Buffett[2]	B.A., B.Ed, Masters of Science Communications
Sarah Lockman[2]	B.Kin, B.Ed, Masters in Cultural Studies and Critical Theory

Resource Reviewers

Karen Anspacher-Meyer	Executive Director, Green Fire Productions
Eva Barnett	Outreach Manager, Green Fire Productions
Rebecca Clark Uchenna	M.S. Environmental Studies, Conservation Biology, B.S. Wildlife Ecology

Project Developers

Karen Anspacher-Meyer	Executive Director, Green Fire Productions
Eva Barnett	Outreach Manager, Green Fire Productions

Project Manager

Eva Barnett	Outreach Manager, Green Fire Productions

Graphic Design

Monika Sosnowska	MSE Marketing (www.msemarketing.net)

Cover Images	Humpback whale calf - Florian Graner; Offshore wind farm - Public domain; Point Judith Lighthouse - Austin Recio; Fish survey - Green Fire Productions

green fire
PRODUCTIONS

ocean-frontiers.org
greatbearsea.net
greenfireproductions.org

[1] Lessons 1, 2 and 3
[2] Lesson 4

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Introduction

The **Exploring Ocean Frontiers Secondary Educator Resources** are based on the *Ocean Frontiers* film series by Green Fire Productions, and can be used to engage students on an inquiry-based educational journey in ocean stewardship. The inspiring *Ocean Frontiers* films portray how unlikely allies – government, industry, science and conservation – are working together to find solutions that benefit ocean ecosystems and economies.

Students can learn about this new wave of ocean stewardship through these secondary lesson sets that build on real-world science and help make science more relevant. The lessons feature engaging classroom activities that include inspiring film clips, research data, local knowledge, place-based stories, role-playing, background information and more — providing educators curriculum-linked tools to incorporate ocean management and conservation perspectives into a variety of classroom settings. Themes include: collaborative science, ocean planning, stakeholder engagement, ocean data portals, marine biodiversity and ocean stewardship. All secondary lessons are connected to the Next Generation Science Standards and Ocean Literacy Principles.

The films, secondary lesson sets and post-secondary discussion guides are available at no cost: https://ocean-frontiers.org/educator-resources

Ocean Frontiers Film Series

As the blue planet's burgeoning populace faces an uncertain future, never before have the world's oceans been called upon to serve so many, while suffering so much. To address this, people around the world are engaged in collaborative ocean planning. In North America, the U.S. and Canada have created ocean plans to help guide management and conservation of our oceans. State, federal and tribal governments are working together with scientists and a wide array of marine stakeholders including maritime commerce, fishing and recreation, plus the growing industries of offshore wind energy and aquaculture. Green Fire Productions has traveled North America from coast to coast, capturing the inspiring stories of people working together to sustain our seas and our ocean economies. The three *Ocean Frontiers* films focus on ocean planning in the U.S. and *The Great Bear Sea* portrays ocean planning in British Columbia, Canada.

Green Fire Productions, a non-governmental organization, produces documentaries on sustainability and conservation of natural resources. Founded in 1989 by Karen Anspacher-Meyer and Ralf Meyer, Green Fire films are used in classrooms worldwide and screened in community events, for government officials and on public television.

Ocean Planning

Our ocean use is growing rapidly, with massive new ships, soaring demand for offshore sand mining and proposed wind energy development offshore. Our busy waters are also home to endangered whales and sea turtles, and support vital fishing and recreation industries. It's more important than ever that we plan ahead for responsible ocean growth. In the face of both increasing development pressures and increasing interest in the conservation of nature, ocean planning has been identified by scientists, policy makers and stakeholders around the globe as a practical approach to manage both conflicts and compatibilities in the marine environment. It is a comprehensive, ecosystem-based planning process built on sound science to analyze and plan for current and anticipated uses of the ocean. Pioneered in Western Europe, ocean planning is underway in more than 60 countries, including the United States and Canada. For more background information on ocean planning, see Appendix.

Resource Overview

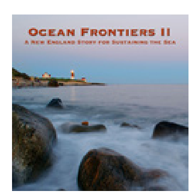
Ocean Frontiers: The Dawn of a New Era in Ocean Stewardship

The first *Ocean Frontiers* film tells four ocean planning success stories from seaports and watersheds across the country — from the busy shipping lanes of Boston Harbor to a small fishing community in the Pacific Northwest; from America's coral reefs in the Florida Keys to the nation's premier seafood nursery in the Mississippi Delta. Lessons include:

- **Uncovering GIS Data: Saving Whales at Stellwagen Bank**
  Map interpretation; using GIS data to reduce ship strikes on whales.
- **Stakeholder Engagement: Playing and Working in the Florida Keys**
  Marine zoning and stewardship roles in coral reef conservation.
- **Rivers Connect: Iowa Farmers & the Gulf of Mexico**
  An inland perspective on reducing human impacts on the ocean.
- **Sustainable Fishing in Port Orford, Oregon: Collaboration in Action**
  Local knowledge, marine protected areas and collaborative research to preserve natural and cultural resources.

View film | Download film | Download Spanish version

Ocean Frontiers II: A New England Story for Sustaining the Sea

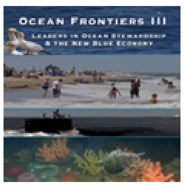


Ocean Frontiers II looks closely at Rhode Island's ocean planning work, the use of science and data to make better decisions and the subsequent siting of an offshore wind farm. The story focuses on how the offshore wind energy company worked with conservationists, fishermen and the Narragansett Indian Tribe to reduce conflicts and potential impacts. Lessons include:

- **Ocean Stakeholders: Every Voice Matters**
  Stakeholder engagement and collaborative decision-making.
- **Keeping Track Of It All: Using Data Portals for Ocean Planning**
  Understanding human activity in the ocean to reduce impacts on marine life.
- **Multi-Species Management: We're All In This Together**
  Food webs; keystone species; systems thinking; writing to Congress.
- **Collaborative Research: Block Island Wind Farm**
  Interpreting data; collaborative research and local knowledge to understand potential wind farm impacts to fishermen.

View film | Download film

Ocean Frontiers III: Leaders in Ocean Stewardship & the New Blue Economy

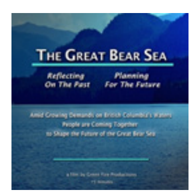


The most recent film in the series, *Ocean Frontiers III*, provides the best overview of U.S. ocean planning in the series. The film focuses on U.S. regional ocean planning efforts and how a broad array of people are using science and data to reduce conflicts and protect marine ecosystems.
Lessons include:

- **What is Ocean Planning: Charting the Ocean's Future**
  Stakeholder role-playing game; working together to resolve conflicts.
- **Ocean Data Portals: The Key to Smart Decisions**
  Exploring interactive mapping tools; scavenger hunt and map making.
- **Marine Biodiversity, Conservation & Healthy Oceans: Deep Sea Corals**
  How human uses of the ocean intersect with marine life; compatible uses; mapping.
- **Get Involved: Student Advocacy & Citizen Science**
  Writing to Congress; engaging in citizen science.

View film | Download film

The Great Bear Sea: Reflecting on the Past—Planning for the Future



The Great Bear Sea portrays marine planning in British Columbia. The film focuses on the collaboration between Indigenous communities and the Province of British Columbia to create marine plans to both protect their home and build sustainable coastal economies. 'Exploring the Great Bear Sea' curriculum resources include elementary, secondary and post-secondary resources that are available for free download online at www.greatbearsea.net. Themes include traditional and local knowledge, collaborative science, marine planning, biodiversity, sustainable resource management and marine stewardship. All resources are connected to the revised British Columbia curriculum.

View film | Download film | Download Spanish version

Tips for Educators

The lesson plans, film clips and resources provide a framework for educators to teach key elements of ocean planning and ocean stewardship. All lessons are inquiry-based and activities can be customized to suit the needs of your environment or learners. Lessons can be taught individually or as units of study with the full four-lesson sets. When utilizing individual lessons, students will benefit from watching the associated full-length film in advance. At points it may be helpful to pre-teach new concepts or learning strategies. These have been noted, where appropriate, with guidance provided.

The resources have been divided into sections to guide the classroom teacher. For each lesson teachers will find essential questions, required materials, learning objectives, step-by-step instructions for suggested activities, extensions and additional resources, as well as learning materials (handouts, worksheets, etc.) to complete the lessons. A background information section is included for each lesson, highlighting additional content for educators. Prior to teaching these lessons, it is highly recommended that educators watch the associated film.

Post-secondary discussion guides are also available for each film and may be adapted by secondary teachers for their learning environment.

Resource Development & Contributors

We believe that teaching students about current marine policy decisions and the science-based, solutions-oriented approach of ocean planning is critical for them to become informed ocean stewards. Green Fire Productions created these resources to inform and motivate the next generation of ocean leaders.

Curriculum Authors

[Lessons 1, 2, 3]
Marine scientist and educator, Kimberly Williams (B.S. Master of Science in Coastal Oceanography, NYS Certified Science Teacher, Grades 5-12) has been consulting in science and education fields in the US for over 30 years and has also taught formally as an adjunct of SUNY Stony Brook's School of Marine and Atmospheric Sciences at Smithtown High School for over 15 years, providing an opportunity for high school students to obtain undergraduate credit for Marine Science course and field work conducted while they are still in high school. Her focus is helping students and adults become better stewards of our coastlines and waterways. She can be reached at williamsocnwld@gmail.com.

[Lesson 4]
Curriculum developers, Jennifer Buffett (B.A., B.Ed, Masters of Science Communications) and Sarah Lockman (B.Kin, B.Ed., Masters in Cultural Studies and Critical Theory) have worked in formal and informal educational settings, including elementary, secondary, post-secondary classrooms and non-profit organizations in British Columbia and Ontario, Canada. They specialize in innovative approaches to hands-on, inquiry and place-based learning, and work with students, teachers and organizations to develop relevant, engaging learning resources and environments. Contact them at: learninginplace@gmail.com.

Contributors

There are materials included in this lesson set that were provided by individuals or organizations for use in this resource. Please note these resources are not available for use or publication outside of the classroom without permission. Thank you to the following contributors for sharing these resources:

Lesson 1: Fish Species, Monthly Temperature and Annual Catch Summary Data Sets from the Block Island Wind Farm Demersal Fish Trawl – INSPIRE Environmental and Deepwater Wind

Next Generation Science Standards & Ocean Literacy Table

Next Generation Science Standards	Lesson 1	Lesson 2	Lesson 3	Lesson 4
Middle School				
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.			✓	✓
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.				✓
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.			✓	
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.		✓	✓	✓
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	✓			
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	✓			
MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.		✓		
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.		✓		
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.		✓		
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		✓		
High School				
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.			✓	
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.		✓		
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.				✓
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.				✓

Next Generation Science Standards	Lesson 1	Lesson 2	Lesson 3	Lesson 4
High School (cont'd)				
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.			✓	✓
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.				✓
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity		✓		
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	✓			
HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	✓		✓	
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	✓			
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.		✓		
Ocean Literacy Principles	**Lesson 1**	**Lesson 2**	**Lesson 3**	**Lesson 4**
Essential Principle #5: The ocean supports a great diversity of life & ecosystems.	✓	✓	✓	✓
Essential Principle #6: The ocean and humans are inextricably linked.	✓	✓	✓	✓
Essential Principle #7: The ocean is largely unexplored.				✓

Ocean Stakeholders:
Every Voice Matters

Essential Questions

- What does it mean to be a stakeholder?
- Why is it important for multiple stakeholders to be consulted before siting a wind farm offshore (or other large development project)?
- Do marine life and marine ecosystems have a “voice”?
- What are some ways that people use the ocean?
- Why might there be conflicts over the use of the ocean?

Materials & Resources

- Computer, projector and screen
- Stakeholder Worksheet
- Stakeholder Worksheet (Teacher Copy)
- *Ocean Frontiers II* film (45 minutes)
  - ¤ Watch on Ocean Frontiers website https://ocean-frontiers.org/of2
  - ¤ Edpuzzle interactive video tool http://bit.ly/OF2Edpuz. Video with embedded questions; free; registration required (see Background Information). Answer Key provided.
- Ocean Frontiers II Guided Viewing Worksheet

Objectives

Students will:

1. Discuss the term ‘stakeholder’ and what it implies, drawing from their own lives.
2. Engage in argument from evidence and brainstorm who the stakeholders might be with regard to a proposed offshore wind farm.
3. Obtain, evaluate and communicate information in order to develop and present the stakeholder point of view to the class.
4. Compile multiple perspectives to create a best practice plan for including stakeholder input in the siting of an offshore wind farm.

Subjects

- Science – Biology, Ecology, Marine
- English Language Arts
- Social Studies

Duration 2 hours, 45 minutes

Note: *Ocean Frontiers II* can be downloaded at http://bit.ly/OF2-DL

Overview

This lesson is designed to help students work collaboratively and understand that there are many user groups ("stakeholders") who have access to shared resources and an active role to play in making decisions that affect them. The activities below aim to help students learn more about collaborative decision-making through role-playing the stakeholders introduced in *Ocean Frontiers II*. Additionally, students will gain an appreciation for the importance of including all perspectives in the decision-making process. They will have an opportunity to practice making sure that every group is heard and will then learn what the actual outcomes were in the film. This lesson can be adapted to focus on any large project under consideration in your own community or region.

> "When we first started the Ocean SAMP process, many people in the community said, "We don't want turbines, and this is going to ruin our lives." The University of Rhode Island has been involved in helping the state make difficult decisions on coastal issues for over 50 years. Our group has been able to build trust within the municipalities, within to some degree the fishing community, marine trades, etc. And so we started by making a list of who do we think needs to be part of this process."
>
> *Jennifer McCann – University of Rhode Island*
> *Coastal Resources Center and Rhode Island Sea Grant*

Activities

Activity 1 – Brainstorming (10 minutes)

1. Provide students with an introduction to the concept of the stakeholder. Ask them how they might be considered a stakeholder in their own lives and what resources they must share with others. Why is it important for every voice to be heard?
   a. *Students may be familiar with being a stakeholder in their family as they help select a location to go for a family vacation, on a sports team as each player has a chance to outline a particular play they want the team to use, or in a class council meeting as each class gets a say in which activities will be selected for Field Day, for example.*
2. Ask students to brainstorm what they think an offshore wind farm is.
   a. *Offshore wind farms are constructed in bodies of water, usually in the ocean on the continental shelf, to harvest wind energy to generate electricity. Quite common in Northern Europe, offshore wind power is new to the U.S., with the first offshore wind farm (depicted in the film) becoming operational in 2016.*
3. Ask students to brainstorm a list of all the groups they think should be considered as stakeholders in the creation of an offshore wind farm. Students can use the entire length of the board to create a long horizontal list.
   a. *Some stakeholders that may come to mind for students (including some which they will be introduced to in the film) include the offshore wind farm developer, transportation industry representatives, coastal residents, whale scientists, fishers, Native Americans,*

military personnel, conservationists, local tourism leaders, restaurant owners and businesses that rely upon the coastal region, etc.

Activity 2 – Group Assignments and Research (45 minutes)

1. Provide each student with a Stakeholder Worksheet and review together as a class.

2. Working in groups of 3 or 4, students should choose one of the different stakeholder groups from Activity 1 to research and represent in a role play about the creation of a new offshore wind farm.

3. Student stakeholders should do a quick internet search that will help them better understand the concerns, issues and values of the group they represent. Simple search parameters might include the name of the stakeholder group and “Offshore Wind”. It's fine for students not to research in great detail at this point, since they will learn more from the film later.
   a. The Keep the Ocean Working website has many stories of stakeholders involved in ocean planning.

4. When their research time is up, each stakeholder group should come to consensus on the top three priorities or concerns of their group about the creation of a new offshore wind farm. Each student should record these top three priorities/concerns for their group in the first box on the Stakeholder Worksheet.

5. Stakeholders will prepare to role-play their group's concerns in a brief (3- 5 minutes depending on class size) presentation to the rest of the class, telling the class what concerns or priorities they chose. Explain to students that this time represents similar time allowances at a public hearing, with the teacher or a student leader as the facilitator.

Activity 3 – The Public Hearing (Presentation of Research Findings) (45 minutes)

1. Each stakeholder group will present their statement to the class. Students should take notes on their Stakeholder Worksheet about the three main concerns of each group.

2. Upon completion of each stakeholder group's presentation, provide an opportunity for students to ask questions for clarification. If visually helpful, have the groups record their top three priorities/concerns on the board.

3. As a class, create a plan for how to incorporate the most important values that each group needs to see incorporated into the Final Action Plan if their group is to support the construction project. Results can be placed into one central location for discussion, for example, on the board. There is also space for students to place this directly on their Stakeholder Worksheet.

4. As a class, discuss why it is important for multiple stakeholders to be consulted before siting an offshore wind farm (or other large development project). Some prompting questions might include:
   a. Were any stakeholders missing from the discussion today? If so, how would they be impacted by the decision?
   b. How are future generations impacted by decisions we make today?

c. Do marine life and marine ecosystems have a "voice" in decision-making?

Activity 4 – Modelling vs. Reality (60 minutes)

1. Provide each student with a copy of the Ocean Frontiers II Guided Viewing Worksheet and review together as a class.

2. *Watch Ocean Frontiers II*. As students watch the film, have them record their answers to the questions on the worksheet. Alternatively, have students watch the film on their own time, via one of these methods:

   a. Ocean Frontiers website - As students watch the film online, have them record their answers to the questions on the Ocean Frontiers II Guided Viewing Worksheet.

   b. Edpuzzle – Have students answer the embedded questions and be prepared to discuss their answers with the class. Before meeting the students for discussion, the teacher should review the Edpuzzle answers as a basis for classroom discussion. See Background Information and Answer Key.

3. After viewing the film, provide a few minutes for the students to complete their answers to the questions. Then, in small groups, have students discuss the questions together.

4. As a class, ask students if they were able to relate to the stakeholder they represented in the classroom activity when they appeared in the video.

   a. How did the class's plan and the outcomes described in the film compare with each other?

   b. Were any groups represented in the film that students did not list in their brainstorm?

5. Provide students time to briefly jot down on their Stakeholder Worksheet how each stakeholder group's needs were met (for those that were addressed in the film).

Activity 5 – Wrap Up/Closure Questions (5 minutes)

1. Ask students how the needs of future generations might affect the decisions being made about our oceans today. Why do they think building trust is so important when deciding on critical issues that affect whole communities and ecosystems?

2. Allow the students time to discuss as a class or journal answers to the Essential Questions to check for student understanding and correct any misconceptions.

Extension

1. Ask students to discuss or journal what they think might have happened with the offshore wind farm (or any large-scale construction project) if there was no substantive stakeholder outreach and involvement.
2. Provide time to conduct additional research regarding the professional or cultural attire of their stakeholder group and role-play their presentation dressed accordingly (ensure students do this with appropriate cultural relevance and respect).
3. Provide students guidance to repeat this activity using an example of a development or large construction project in their region.

Background Information

Stakeholder Engagement

Public participation in environmental policy is critical for us as a society to make smart decisions about our natural environment. Many important decisions being made about the environment include a public component. The more that stakeholders and the public participate in planning and decision-making, the better the chances are that the result will be good for the long-term health of our natural ecosystems and human societies.

The stakeholder process shown in the film was part of the Rhode Island Ocean Special Area Management Plan (SAMP). In 2008, the state of Rhode Island embarked on a comprehensive regulatory planning process for its ocean waters, based on science and including extensive public participation into the question of how (and if) the ocean should be developed. Key pieces critical to the process were understanding how the ocean waters off of Rhode Island are already being used by people and wildlife, developing regulations to minimize conflict between uses, determining where offshore renewable energy should be sited and gaining public approval for the process and its future goals.

Including stakeholders in the process was a key to its success. The main objectives were to identify and prioritize stakeholder issues, design a public process to provide stakeholders with access and influence over decisions, and to collect available information to direct research and policy development. Members of the public were invited to attend meetings and were granted equal footing as stakeholders.

The Rhode Island Ocean SAMP was adopted in 2010, and is a leading national model for how to both develop and implement such a plan. This dynamic and adaptive plan accommodates present uses and responsibly accounts for the emergence of new ones. It helps the state decide, as collaboratively and openly as possible, where it makes the most sense for people to work or play in the ocean realm.

Ocean planning on a larger scale began in 2010 with the creation of the National Ocean Policy, providing federal agencies, states and tribes with a framework to develop regional ocean plans through collaboration and open sharing of scientific information. For more information on U.S. ocean planning, see Appendix.

Edpuzzle Instructions

The Edpuzzle in this lesson can be used by anyone, but in order for the teacher to collect the students' responses, it's necessary to sign up for an Edpuzzle account. Go to https://edpuzzle.com, click on 'Sign Up' and register as a teacher. Once you have an account, click on Content in the top menu, then select Edpuzzle from the sidebar. In the search bar, enter 'Ocean Frontiers' and perform the search. You'll see both *Ocean Frontiers II: A New England Story for Sustaining the Sea* and *Ocean Frontiers III: Leaders in Ocean Stewardship & the New Blue Economy*. Hover over the video you'd like to use and click on the copy icon to add it to your content.

Click on 'My Content' in the sidebar, select the video by checking its box and then click on 'Assign' at the bottom of the page. Click on 'Add new class' and fill out the form. Click on 'Assign' to finalize. Then click the 'Invite Your Students' button - you will receive a code that students can enter. For further information on using Edpuzzle, watch the tutorials or click on the 'Help Center' button at the bottom right.

Additional Resources

- Rhode Island Ocean Special Area Management Plan
- Rhode Island Ocean Special Area Management Plan Practitioner's Guide
- Keep the Ocean Working - Stories of people from a wide variety of stakeholder groups on why they support and participate in ocean planning.
- Deepwater Wind
- The Narragansett Indian Tribe
- *Ocean Frontiers II* clips playlist

Stakeholder Worksheet

Stakeholder Group:__________________________________ Student Names:______________________________________

In the first box, list your stakeholder group and your group's top three priorities/concerns. After listening to each Stakeholder group express their concerns, values or priorities, briefly describe them in each box below. This will be used to help you make a plan that will take each Stakeholder's most important priorities into account before construction begins. After viewing the film, fill out the "How Addressed" portion of the table with how each Stakeholder group's needs were addressed.

1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:
1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:

Collaborate to make a final plan that could be used by the company making the Offshore Wind Farm. Your final action plan should include as many priorities as possible from every Stakeholder group.

Stakeholder Worksheet - Final Action Plan

The Wind Farm company should:

Answer the following in complete sentences.

1. How well did your plan match what was done in real life (from the film)? What was similar and what was different?

2. How do you think a Stakeholder group would have felt about the plan if their priorities or values were not taken into account?

3. Before you did this activity, did you know that so many groups used the ocean?

4. What is a Stakeholder group you most identify with and would want to be part of if this project was near your home?

Stakeholder Worksheet (Teacher Copy first page only)

Stakeholder Group:______________________________ **Student Names:**___________________________________

In the first box, list your stakeholder group and your group's top three priorities/concerns. After listening to each Stakeholder group express their concerns, values or priorities, briefly describe them in each box below. This will be used to help you make a plan that will take each Stakeholder's most important priorities into account before construction begins. After viewing the film, fill out the "How Addressed" portion of the table.

Military	Wind Farm Company	Conservation Groups	Fishers	Narragansett Indian Tribe
1. 2. 3. How Addressed: *Construction won't happen in training areas*	1. 2. 3. How Addressed: *Collaborating with stakeholders reduced conflicts and saved time and money*	1. 2. 3. How Addressed: *Construction won't happen when whales are present in April*	1. 2. 3. How Addressed: *Surveys assessed how turbines impact fish stocks*	1. 2. 3. How Addressed: *Research of ocean floor begun to avoid disturbing archeological sites*
1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:	1. 2. 3. How Addressed:

Collaborate to make a final plan that could be used by the company making the Offshore Wind Farm. Your final action plan should include as many priorities as possible from every Stakeholder group.

Name:__________________________

Ocean Frontiers II Guided Viewing Worksheet

1. List some of the stakeholders described in the film who may be impacted by offshore development. For one of those stakeholders, describe how they benefit by being engaged in decision-making prior to any development taking place.

2. What is local knowledge and traditional knowledge, and why are they important? Think about the fishers noted in the film, and the knowledge they have about the region, behaviors of species in the region, fishing seasons and locations, etc. Think about Native Americans and the knowledge that has been passed on about the land and sea from generation to generation.

3. What are some of the “no go” areas for wind farm development described in the film? Explain why these areas would not be ideal for development.

4. Describe why it makes sense to work with people from many different geographic areas, as well as many different perspectives (fishers, Native Americans, researchers, industry, etc.) when creating a plan for how humans use the ocean.

5. Are there any voices or viewpoints missing from the offshore development decision-making? Describe who else may benefit from being a part of the discussion and explain why they should be engaged.

Edpuzzle Answer Key - Ocean Frontiers II

1. What does "Sustaining the Sea" mean?

   A: Strengthening or supporting its health

2. Name at least 4 groups mentioned in the video who would benefit from knowing what's under the water before building anything in a particular location offshore.

   A: Native Americans, developers of wind and current energy, investors, federal and state government officials, the fishing industry

3. What is the Navy doing offshore that might be impacted by the construction of a wind farm?

   A: Training exercises

4. At the present time, how many of those exist in the waters of the Gulf of Maine?

   A: Zero

5. According to the CEO of the Wind Energy Company, what combination of factors make the East Coast waters a good place to locate a Wind Farm?

   A: A tremendous quantity of wind and a large number of people who live close to the coast

6. In addition to powering the region's electricity needs, how much would a wind farm in this area be able to cut greenhouse gas emissions by?

   A: 60%

7. When the SAMP (Special Area Management Plan) began, were residents receptive to the idea of Wind Farms in their coastal waters?

   A: No

8. How did the people at the University of Rhode Island work to win over people to the idea of Wind Farms?

   A: By making sure all user groups were invited to have a say in the planning

9. List at least 3 areas that are described as "No Go" areas, where Wind Farms would not be allowed to be located.

   A: Navigation areas, unexploded ordnance areas, sites with severe geological constraints

10. Why do you think the fishers are reluctant to divulge where their fishing grounds are located?

    A: Answers will vary, but students probably understand that fishers work hard to find the best spots and would not want to give the locations away.

11. Did the fishers end up trusting the group enough to work as part of the team?

    A: Yes

12. How many homes can be powered by the 5 Wind Turbines in the Block Island Project?

    A: 17,000 homes

13. How many years ago did the first people live on the continental shelf, an area that is now under water and was under consideration for placing a Wind Farm?

    A: 15,000 - 24,000 years ago

14. Did the Native Americans end up trusting the group enough to work as part of the team?

    A: Yes

15. Why was April a month to avoid building a Wind Farm in the region?

    A: North Atlantic Right Whales are in the area feeding in April and the sound of construction would interfere with their ability to communicate with each other.

16. How are the surveys being used to help better understand what impacts the Wind Farm might have on fisheries in the region?

    A: These fish surveys catch and count fish before, during and after Wind Farm construction to see how it is impacting fish populations in the area.

17. What do you think Dr. Kaufman means when he suggests that we need to "see the world as a system instead of a collection of independent pieces"?

    A: Instead of dealing with management issues one at a time, we need to take into account that they are all interconnected and changes to one species can impact another.

18. Briefly describe why it makes sense to work with people from many different states (instead of just making decisions from your own state's point of view) when creating a plan for how humans use the ocean.

    A: Since most of the species that humans manage do not stay within any one state's borders, states need to come together to make a management plan for the species as they move all along the coastline, across many state lines.

19. What does BOEM stand for?

    A: Bureau of Ocean Energy Management

20. What do Ocean Data Portals allow everyone to do?

    A: See, on one map, all of the user groups in a particular region of the ocean

21. Why would a company planning to construct a Wind Farm use an Ocean Data Portal?

    A: It helps the company find a location to place their Wind Farm where there are the least possible constraints on space, which can save a lot of time and money in the long run.

22. How much of our goods and services are transported across our oceans?

    A: 75%

23. What can happen if not all user groups feel that they have a voice in Ocean Planning?

    A: Tensions and conflicts could result if all the groups are unable to address issues together.

24. What is one indication of climate change impacting lobsters in the Gulf of Maine?

    A. Lobsters are molting four weeks earlier than they normally would.

25. How is the planning described in this film unique?

    A: We, as a society, are for the first time considering ourselves, the environment, AND future generations when making decisions about the ocean.

Keeping Track Of It All:
Using Data Portals for Ocean Planning

Essential Questions

- How do we keep track of the ocean ecosystem and its inhabitants? Why might that be an important thing to do?
- What are some examples of different human activities in the ocean and why should we keep track of them?
- How do human activities intersect with the ocean ecosystem and its inhabitants?
- Why might it be helpful for everyone involved in ocean planning to have the same data and maps?

Materials & Resources

- Computer, projector and screen
- Smart board or overhead projector
- Film clips
  - ¤ *Ocean Frontiers II: Whales and Wind Farms* (3 minutes) http://bit.ly/OF2WhalesWind
  - ¤ *Ocean Frontiers II: Data Portal Layers* (1 minute) http://bit.ly/OF2Portal
- Coastal maps - Northeast, Mid-Atlantic, West Coast (URLs in Resources Appendix)
- Icons Sheet - Cut out, paste to card stock and laminate for multiple uses.
- Adhesive tape
- Regional Ocean Data Portals
  - ¤ Northeast https://northeastoceandata.org
  - ¤ Mid-Atlantic http://portal.midatlanticocean.org
  - ¤ Data Portal Tutorials in Additional Resources

Objectives

Students will:

1. Ask questions and define problems about how planners keep track of all the different uses (human and ecological) of the ocean.
2. Construct explanations for why people need to keep track of ocean use data.
3. Discuss the dynamic nature of data (human and ecological) and how it can be used to inform ocean planning.
4. Understand links between technology, science, the environment and society, and how cross-sector collaboration improves decision-making.

Subjects

- Science – Biology, Ecology, Environmental, Marine
- Technology
- Geography
- English Language Arts
- Social Studies

Duration 60 minutes

Note: *Ocean Frontiers II* can be downloaded at http://bit.ly/OF2-DL

Overview

In this lesson, students will use the regional ocean data portals and clips from *Ocean Frontiers II* to appreciate how complicated it is to plan for development in the ocean, specifically where to install a project that will least interfere with all of the stakeholders in the area, including marine wildlife. They will discuss the importance of having accurate data for making decisions about the ocean and learn that data is dynamic and must regularly be refined and updated to be useful in decision-making. Better maps, and equal access to them by stakeholders, can help us make more informed decisions for ourselves, marine ecosystems and future generations.

> "We have to do it right. The way to do that is to bring everybody who has an opinion about it to the table and to give them a voice, and to ultimately make your decisions based on science, based on data."
>
> *Tricia Jedele – Conservation Law Foundation*

NOTE: Before teaching this lesson, show *Ocean Frontiers II* in class or assign it as homework if students have not yet watched the entire film (as directed in the first lesson in this set: Ocean Stakeholders). For more data portal lessons, download the Ocean Frontiers III lesson set.

Activities

Activity 1 – Assignment of Stakeholders, Research, Creation of a Visual Aid (20 minutes)

1. Show students the *Ocean Frontiers II: Whales and Wind Farms* clip.
2. Display a large map of one of these coastal regions (Northeast, Mid-Atlantic, West Coast) or use your own map.
3. Working in groups of 3 or 4, assign students a stakeholder group from the list below and provide each group with four copies of the corresponding icon from the Icons Sheet. Students will use these icons to represent their activities on the map.
    a. Aquaculture, Fishing, Military, Native Americans, Offshore Wind, Recreation, Shipping, Whales.
4. Provide students a few minutes to research and talk with their group to make an educated guess about where their stakeholder icons would be most appropriately located on the map to represent their use of, or place in, the ocean.
5. Allow students to place their icons on the map in the locations their group has decided upon.

Activity 2 – Group Discussion (15 minutes)

1. Once all the icons are placed on the map, it should look very busy! Ask students if this would be a practical visual aid if they were sitting in a room with all of the stakeholders trying to make a plan for using this area. Of course not!

2. As they are looking at the map, ask students how they think planners would find out where those ocean uses are actually located and how they would depict them on a map.
   a. Remind them what Tricia Jedele says in the film: "We have to do it right. The way to do that is to bring everybody who has an opinion about it to the table and to give them a voice, and to ultimately make your decisions based on science, based on data."
3. Ask students how we would know that the whales are in the area in April. What kind of science or data could be collected to confirm this? Talk about statistics, research surveys, citizen science, etc., and then remind them that even with the knowledge we get from collecting and analyzing data, without a way to share it, it's not very helpful.
4. Ask students what types of data might be static and what types might be dynamic or changing. Discuss how marine life data can change due to changing ocean conditions, location of prey, etc., and how human uses of the ocean can change as societal priorities change. *The regional data portals account for these shifts in marine life and human uses by regularly revising the existing data with new information.*
   a. Why might it be necessary to keep the data up-to-date?
   b. What might happen if a decision about the ocean was based on inaccurate data?
5. Ask students why it is important for us to keep track of what happens in the ocean. Have them include qualitative or quantitative relationships between variables in their explanations.
   a. What are some other human activities in the ocean not represented by the icons?

Activity 3 – Introduction to Ocean Data Portals (20 minutes)

1. Show the *Ocean Frontiers II: Data Portal Layers* clip and point out to students that this is what planners actually use to share data among decision makers and stakeholders. Ask if they remember seeing this as they were watching the film, and if they knew at the time what it was.
2. Using an overhead projector, show students one of the data portals below. Ask students to send up a representative from each user group to find and add their stakeholder data layers to the map so they can see what planners would see. Teachers can guide groups as needed to the appropriate data layers. See Background Information and Additional Resources.
   a. Northeast Ocean Data Portal
   b. Mid-Atlantic Ocean Data Portal
3. Show students other data layers on the portal and allow them time to add and take away layers as they see fit.
   a. Suggest they look for areas where there might be other conflicting uses, beyond whales and wind farms.
   b. Ask students what they think it means when there is no data in a particular location on the map. Why might it be important to fill data gaps?

Activity 4 – Wrap Up/Closure Questions (5 minutes)

1. Allow the students time to discuss as a class or journal answers to the Essential Questions to check for student understanding and correct any misconceptions.
2. Ask students to discuss how planners and scientists could use the data portals for guidance as they determine what would be the best time of year to construct the proposed offshore wind farm. (*Display the data layers showing the presence of whales by season.*)

Extension

1. Provide students time to explore any of the ocean data portals listed in the **Additional Resources** below.
2. Provide students time to access the data portals to see if they can find any other offshore wind farm development zones that may also have conflicts with whales during certain times of the year.
3. Provide students time (or as homework) to watch a data portal tutorial (Northeast or Mid-Atlantic) and propose a user group that is currently not on the portal that they'd like to see included.

Background Information

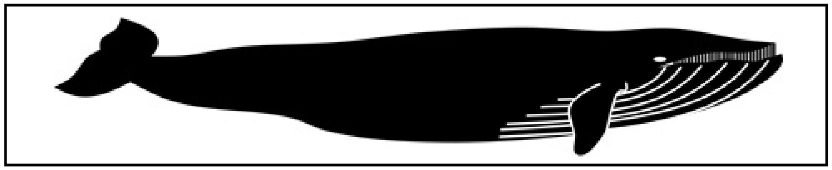
Ocean planning has spurred the creation of centralized sources of ocean data for each region – the ocean data portals. Where in the past data had been siloed in various agencies, universities and industry groups, key data has now been gathered in one place so that planners, stakeholders and the public can see the 'big picture' of what's happening in our oceans. With everyone able to access a common set of data – including ecosystem, marine life and human use layers – it becomes much easier for important decisions about our ocean to be made in a transparent and science-driven process.

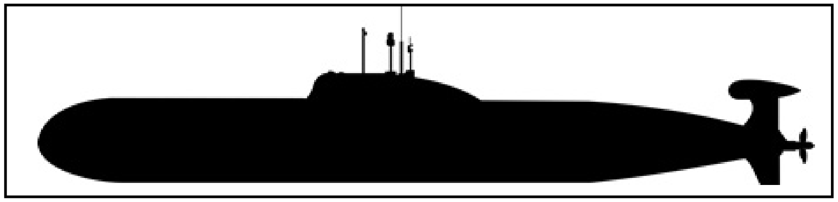
There are several regional ocean data portals in the U.S., with additional portals being developed. The portals are centralized, peer-reviewed sources of data and interactive maps of the ocean ecosystem and ocean-related human activities, showing the richness and diversity of the ecosystem and illustrating the many ways that humans and environmental resources interact.

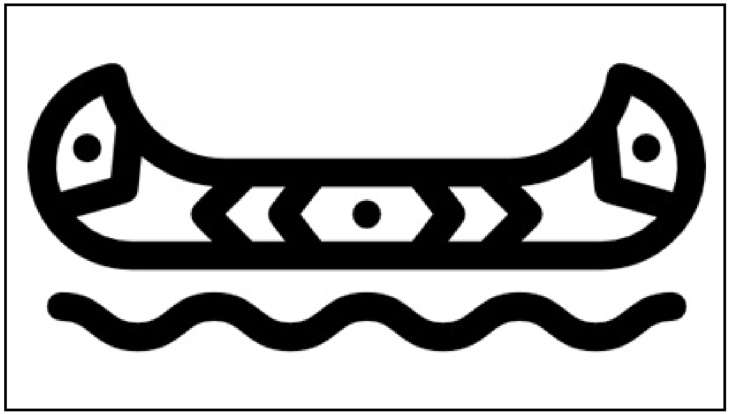
Several of the portals include case studies or story maps as examples of how the portals are used for regional ocean planning, fishery management, marine transportation, offshore wind development, aquaculture siting and many other applications. The portals serve as platforms to engage all stakeholders in ocean planning, putting essential data and state-of-the-art mapping and visualization technology into the hands of government agencies, industry and community leaders to inform and support sound decision-making.

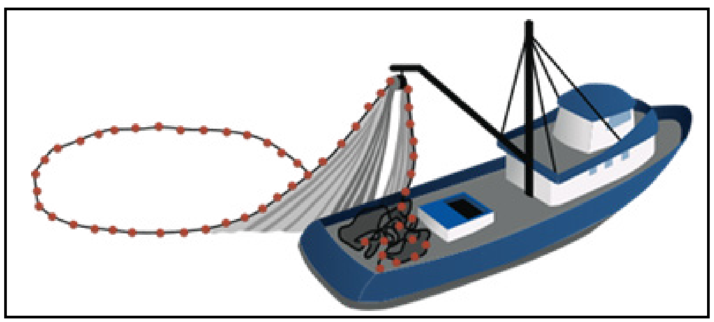
Additional Resources

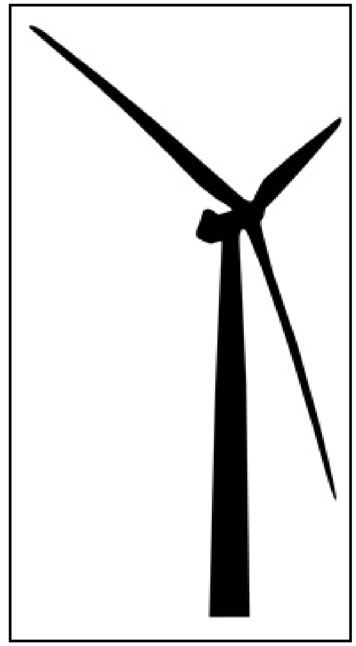
- Northeast Ocean Data Portal
  - Northeast Ocean Data Portal tutorials
- Mid-Atlantic Ocean Data Portal
  - Mid-Atlantic Ocean Data Portal tutorials
- West Coast Ocean Data Portal
- Governors' South Atlantic Alliance Coast & Ocean Portal
- Gulf of Mexico Data Atlas
- Caribbean Regional Ocean Partnership Marine Planner
- Great Lakes Observing System
- Alaska Ocean Observing System Data Explorer

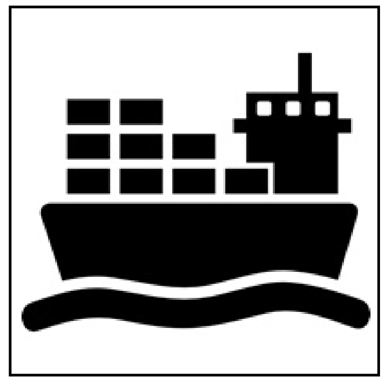


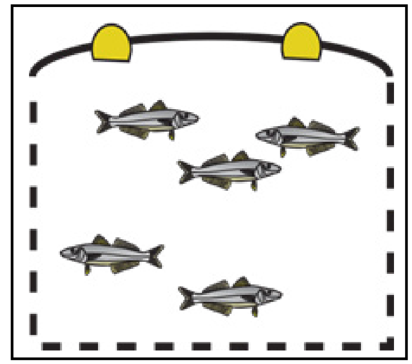












Icon credits:
Whale: https://openclipart.org/download/173515/Whale-by-Rones.svg
Fishing Vessel: http://ian.umces.edu/imagelibrary/displayimage-112-6867.html
Recreational Vessel: https://pixabay.com/en/boat-marine-ocean-sailboat-sea-1297042
Military: https://openclipart.org/detail/254312/submarine-silhouette
Offshore Wind Turbine: https://openclipart.org/detail/3386/wind-turbine
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Aquaculture: http://ian.umces.edu/imagelibrary/displayimage-82-5598.html
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Multi-Species Management: We're All In This Together

Essential Questions

- What is a Food Web?
- What is a Keystone Species?
- What might be the benefits to humans and the ecosystem of seeing "the world as a system instead of as a collection of independent pieces"?
- What do you think the phrase "Multi-Species Management" means?

Materials & Resources

- Computer, projector and screen
- Food Web graphic
- Food Chain graphic
- Film clips
  - ¤ *Science Friday: The Whales of New York* (5 minutes) http://bit.ly/SFWhalesNY
  - ¤ *Ocean Frontiers II: Systems View* (2 minutes) http://bit.ly/OF2Systems
- Mid-Atlantic Ocean Data Portal: Ocean Story #2 Handout
- Letter Writing Template

Objectives

Students will:

1. Compare, integrate and evaluate sources of information presented in different media to address a scientific question or solve a problem.
2. Analyze and interpret data available on an Ocean Data Portal.
3. Construct explanations and design solutions that work across multiple food webs.
4. Engage in argument from evidence as they compare system components individually and as integral parts of the whole.

Subjects

- Science – Biology, Ecology, Environmental, Marine, Technology
- English Language Arts
- Geography
- Social Studies

Duration 1 hour, 45 minutes

Note: *Ocean Frontiers II* can be downloaded at http://bit.ly/OF2-DL

Overview

In this lesson, students will have an opportunity to better understand food chains and food webs, and that the ocean has many variables – moving parts that are all interdependent on one another. Students will learn how the interdependent variables are not just the plants and animals, but also the habitats themselves, and that humans are part of the system and dependent upon the health of our oceans. Through research, students will gain an understanding of how to construct a well-thought-out argument for conserving all of the components of a system, rather than selecting individual pieces to protect.

> "Most of the laws and approaches that we have right now for marine resource management deal with the ocean piecemeal. Fisheries deal with fishes one species at a time. We deal with economic sectors one at a time. And we know this is wrong. We do it this way because it's simpler. If you adjust shipping lanes so that they have minimal interference with marine mammals, the whale watch industry, the boating industry, recreational fishing – they all benefit. So, the key to making marine spatial management efficient is to back up and take a systems view."
>
> *Les Kaufman, PhD – Professor of Biology, Boston University*

NOTE: Before teaching this lesson, show *Ocean Frontiers II* in class or assign it as homework, if students have not yet watched the entire film (as directed in the first lesson in this set: Ocean Stakeholders: Every Voice Matters).

Activities

Activity 1 – Food Chains and Food Webs (30 minutes)

1. Draw a simple food chain on the board (such as herring > seal > killer whale) and engage the class in the following discussion:
    a. What is this schematic called? (*Food chain*)
    b. What does it represent? (*Common predator/prey relationships; flow of energy between predator and prey.*)
    c. What do the arrows tell us? (*They represent the flow of energy from one organism to another; the direction the arrow is pointing shows the flow of energy.*)
2. In pairs, have students select any organism and attempt to create a food chain for that organism.
3. As a class, have one of the student pairs share their food chain with the class, drawing it on the board and explaining the relationships. Discuss the following:
    a. Does your chosen organism have any other predator/prey relationships? What are they and how could these be represented on the diagram? Fill them in on the diagram, using the appropriate arrows to show the flow of energy.
    b. Point out that as we add to the food chain diagram, the schematic becomes more of a web.

4. Project the Food Chain and Food Web graphics on the board as visual aids.
    a. Ask students to discuss the differences between a food chain and a food web, describe which is more realistic, and why. See the Background Information section for a short description. (*Predator/prey relationships are rarely linear (like a food chain); there are often multiple relationships at play. Food webs are thus more realistic.*)
    b. How do humans play into the food web? Other than the example on the projected image, can they think of a marine creature that humans consume or use commercially that is also used by other animals and would be part of a shared food web? (*Ex. shrimp, clams, striped bass, as food for humans, fish and whales; or small schooling fish like menhaden that whales eat, but humans also use for bait, pet food and in dietary supplements.*)
    c. What are some of the external forces impacting the food chain/web drawn on the board? (*Habitat destruction, fishing, etc.*)

Activity 2 – Food Webs and Keystone Species (30 minutes)

1. Show students the *Science Friday: The Whales of New York* clip about the resurgence of whales.

2. As a class, construct another food web on the board using some of the animals described in the clip. Keep the food web constructed in Activity 1 visible on the board.

3. After constructing the food web, lead a class discussion to demonstrate the concept and importance of keystone species in ecosystems (see Background Information):
    a. What animals or plants not mentioned in the video might be part of the food web? (*Striped bass, bluefish, weakfish, osprey, eagles*)
    b. What was the key factor that attracted the whales to the waters off New York City, and the region in general? (*The return of the menhaden.*)
    c. What makes some species, such as the menhaden, stand out or seem more important when we look at an entire food web or compare food webs across different species? (*They belong to many food webs.*)
    d. A keystone species is a plant or animal upon which other species largely depend, such that if they were removed, the ecosystem would change drastically. The term "keystone" implies this importance. A keystone is a stone slab in the center of an archway. Without it the whole arch will collapse. The menhaden is considered a keystone species.
    e. Ask students if they can think of other examples of keystone species. (*Sea otters in kelp forests, wolves, etc.*)

4. Read the Mid-Atlantic Ocean Data Portal: Ocean Story #2 Handout about keystone species with students and emphasize the link between the appearance of whales and menhaden.
    a. What are some factors that may have influenced the return of the menhaden?

5. Look back to the food webs constructed in Activities 1 and 2. Do the two webs interconnect at all? What happens when one species is impacted by humans or natural occurrences?
    a. If it hasn't come up already, stress the interconnectedness of all living things on Earth. If one species is in threat, this impacts a series of other species (and so on).

Activity 3 – Taking a Systems View (10 minutes)

1. Show students the *Ocean Frontiers II: Systems View* clip where Dr. Les Kaufman describes how, up until recently, most of our laws regarding ocean resource management have dealt with the ocean only as individual pieces instead of looking at how those pieces interact with each other.
    a. Ask students their thoughts on how realistic this has been.
    b. Considering how different food webs are so intertwined and connect many different animals (and humans), ask students to discuss why decision makers might take a piecemeal approach if it's not realistic. (*Because it's very complicated and can be overwhelming to look at so many moving parts.*)
    c. Reinforce with students that conversations around managing our oceans as whole ecosystems (as discussed in the film) are now taking place among government officials and fisheries managers.
2. In *Ocean Frontiers II*, Dr. Kaufman talks about challenges, and one of them is that 'we need to see the world as a system instead of as a collection of independent pieces'.
    a. Ask students what Dr. Kaufman means by this statement.
    b. Ask students to use their knowledge of food webs and keystone species to demonstrate what Dr. Kaufman means.
3. As a class, ask students to come up with a few ideas about which particular species they would suggest would benefit most from human protection to best ensure survival of the entire system.

Activity 4 – Multi-Species Management (30 minutes)

1. Using the menhaden as an example (or another keystone species from a regional perspective), ask students to brainstorm actions that could be done to help that species survive.
    a. Is there a habitat that species lives in that is being impacted by humans?
    b. How would managing that particular species or its habitat be beneficial to humans and other species?
2. Allow students to place their actions in bulleted format on the board.
3. As individuals, in small groups or as a class, use the actions from the board to draft a letter to an elected official or a management agency explaining the connection between, and importance of, keystone species to the success of the entire system. Use the Letter Writing Template to help draft the letters.

Activity 5 – Wrap Up/Closure Questions (5 minutes)

1. Ask students to think about and then discuss the multitude of species that all rely upon the same groups of animals for food or other products.

2. Allow the students time to discuss as a class or journal answers to the Essential Questions to check for student understanding and correct any misconceptions.

Extension

1. Using the actions students created, allow students to create a Public Service Announcement that persuades viewers to conserve the habitat and/or species they feel is a keystone species in their region.

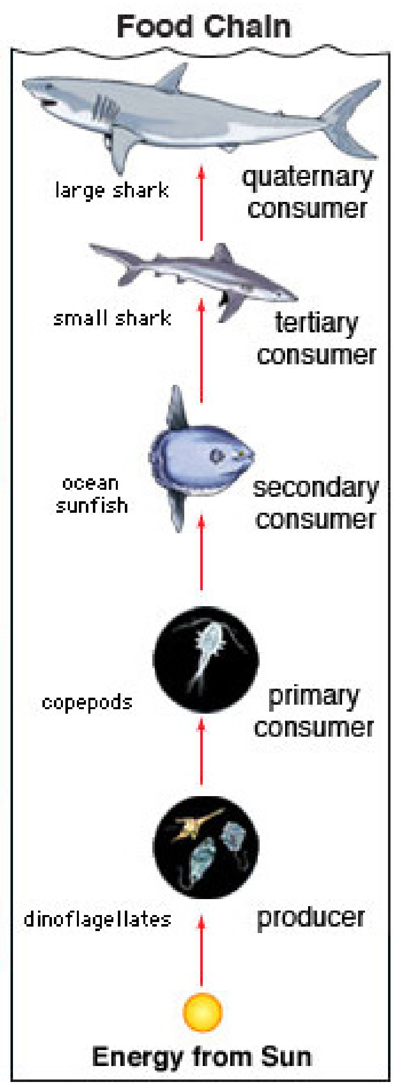
2. Allow time for students to watch each other's PSA's and vote on the most influential one that also contains the most accurate information about the habitat or species they are trying to protect.

Background Information

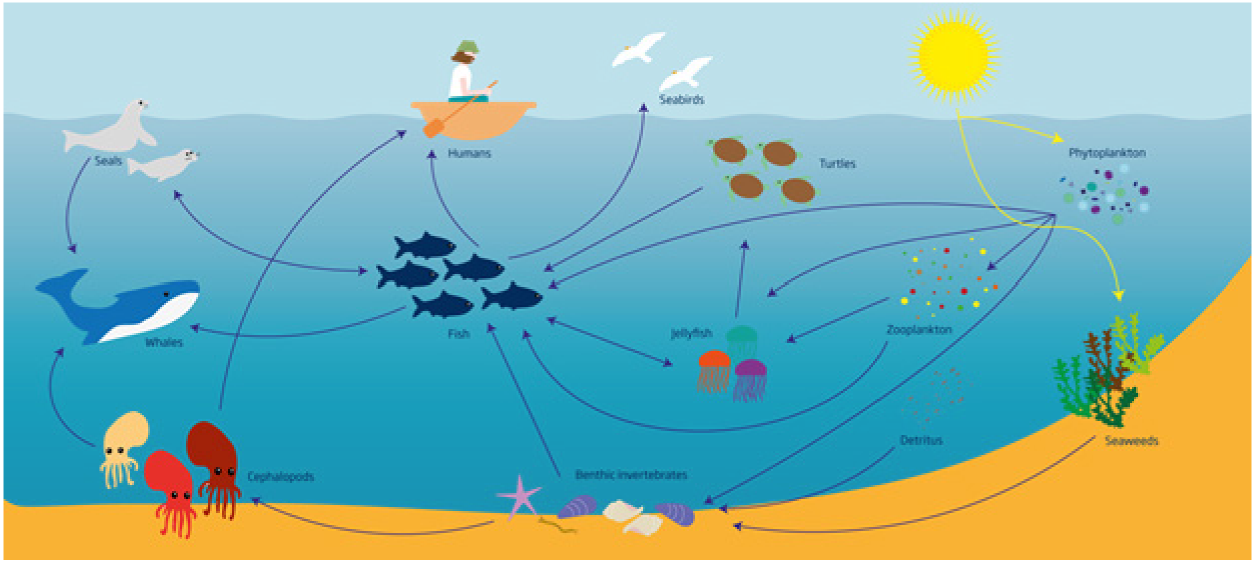
Food Chains and Food Webs

Food chains and food webs are a way of depicting the relationship between predators and their prey. Since most animals eat more than one prey item, food webs are considered more accurate and realistic than food chains. In the ocean, nutrients that come from the decay of plant and animal matter nourish autotrophs such as algae and plant drifters (phytoplankton), which are, in turn, grazed upon by heterotrophic creatures, including drifting marine animals (zooplankton). Zooplankton then provide energy to young fish and other smaller heterotrophs, which then will provide energy for larger heterotrophs. Each level of predator and prey is termed a Trophic Level and it is important for students to understand that energy is not passed up each trophic level completely, but rather energy is lost from one trophic level to the next. Thus, there are usually many more autotrophs than heterotrophs in a typical food web, and the numbers keep decreasing as you approach the top carnivores in the system.

Diagrammatically, food chains and webs are usually drawn showing the energy from the organism that is the prey flowing into the next higher trophic level (the predator) using a series of arrows, as can be as can be seen in this diagram and on the next page.



Source: Encyclopedia Britannica 2006



A simplified marine food web. Source: © JNCC/ Alejandra Bize

Keystone Species & Menhaden

A keystone species is a plant or animal upon which other species largely depend, such that if they were removed, the ecosystem would change drastically. Keystone species are found across many food webs, for example, the reemergence of the menhaden was beneficial for several species. It is not just consumed by one type of whale, or only by whales. It is important to emphasize with students that the demise of a keystone species can lead to the demise of many other creatures.

Marine life is also harvested for uses beyond human consumption, and their removal from the ecosystem can have devastating impacts on the creatures that rely upon them if they are not managed carefully as a shared resource. For example, humans don't eat menhaden, but the fish are harvested for a wide variety of products, including bait, vitamin supplements (fish oil pills), lipstick, fertilizer and animal feed, just to name a few.

Atlantic menhaden (Brevoortia tyrannus) are small forage fish that occupy estuaries and coastal waters from northern Florida to Nova Scotia and form large, near-surface schools. They are an important component of food webs, providing a link between primary production and higher organisms by consuming plankton and providing forage for species such as striped bass, bluefish, weakfish and more. They are also commercially fished. The reappearance of whales in New York Harbor is partially attributed to the rise of menhaden stocks in the area. The fate of the menhaden depends on natural resources and fisheries management decisions.

Writing to Congress

Letters to your Members of Congress are one of the primary forms of constituent contact, and every letter counts. Emailing a letter is the most effective way to send it as it gets filed right away, though letters can also be mailed or faxed. Below are some helpful letter-writing tips:

1. Use clean, white 8½ x 11 paper, with a letterhead if appropriate
2. Include the exact return of address on the letter as well as on the envelope
3. Keep the letter to a page or less
4. Identify your subject clearly
5. State your reason for writing. Explain how the issue affects you and your community.
6. Use your own words. This will strengthen your viewpoint and be much more influential than the words prepared by a group or organization.
7. Be polite and courteous at all times. Do not threaten or demand as this will not strengthen your viewpoint.
8. Consider the timing of your letter.
9. Thank your Senator/Representative, if appropriate.
10. Address the letter and envelope clearly and correctly; follow the format of a business letter and include the date.

Additional Resources

- Aquatic Food Webs (NOAA)
- Science Learning Hub, Marine Food Webs
- 3 Animals That Keep Their Whole Ecosystem Together (Keystone Species)
- Some Animals Are More Equal than Others: Keystone Species and Trophic Cascades
- Menhaden (Virginia Institute of Marine Sciences)
- North Atlantic Right Whale (NOAA Fisheries)

Mid-Atlantic Ocean Data Portal: Ocean Story #2 Handout

The 'Keystone Species'

Menhaden, aka bunker, mossbunker or pogy, are a small forage fish that are often used as bait by Mid-Atlantic anglers. The fish filter feed on plankton and swim in large schools that lure predators like bluefish, striped bass and humpbacks.

Gotham Whale attributes the return of the whales to a spike in menhaden in the New York Harbor area over the past few years. The organization conducts educational outreach on the importance of the species and advocacy work to help ensure its numbers remain strong.

“I call menhaden the keystone species in this area,” Granton said. “It’s bird food. It’s fish food. It’s shark food. It’s whale food. If you liken them to a house of cards, you pull out the menhaden and you potentially look at a biodiversity collapse.”

Again, what changed? Why the sudden surge in menhaden? Gotham Whale points to a handful of possible factors. Among them are catch limits that allowed stocks to rebound and an overall improvement in the New York Harbor area’s water quality, driven by cleaner water entering from the Hudson River and other tributaries.

“What we’re seeing now is 40 years’ fruit of the Clean Air and Clean Water Act and the fact that we still have the Marine Mammal Protection Act being enforced,” Granton said.

Gotham Whale founder Paul Sieswerda has another theory that points to Aug. 27, 2011. Hurricane Irene has been overshadowed by 2012’s Superstorm Sandy in the collective conscious of New York and New Jersey coastal residents. While Irene didn’t carry Sandy’s legendary wind force and tidal surges, those living inland will remember it as a catastrophic rain event that overwhelmed watersheds like the Passaic and Raritan in New Jersey and the Hudson in New York.

At the time, Sieswerda’s fledgling organization was giving what were billed as “whale-dolphin-bird watching adventures, because it was an adventure if we’d see anything.” He recalled the scene during a cruise he led a few days after Irene.

“We were hoping to see whales and the water was brown for miles and miles,” Sieswerda said. “We could not drive the boat far enough to get out of the plume. It was 20 miles down the New Jersey shoreline.”

But given time, Sieswerda believes, the silts and nutrients provided a jolt for plankton in the region’s waters. The menhaden followed, he believes, and so did their predators. In this scenario, a storm that devastated the human environment may have helped bring back marine mammals not seen in such high numbers in the area since whaling age.

“My big question is, how did the whales know and communicate [to others at sea], ‘Hey there’s a lot of good food around here,’” Sieswerda said.

Source: The Mid-Atlantic Ocean Data Portal: Ocean Story #2

Letter Writing Template

How to write a letter to your Members of Congress

Your name:

Your mailing address:

Your email address:

Date:

The Honorable _______________________
Office: (United States Senate or House of Representatives)
Address: (Use Legislator's Washington, D.C. address)

Dear Senator or Representative (choose one) _______________________,

Introduce yourself (include the name of the school you attend) and explain why you are writing to your Member of Congress. What is the problem you are concerned about?

Explain why this issue is important to you and your community.

What do you want your Member of Congress to do?

Thank your Member of Congress for considering your concerns. Allow for follow-up by expressing your interest in hearing back from them.

Sincerely,

Your signature

Your name

Collaborative Research: Block Island Wind Farm

Essential Questions

- What is collaborative research?
- How is collaborative research being used to help inform decision-making in ocean planning?
- How is scientific research helping fish species living in the area of the Block Island Wind Farm?

Materials & Resources

- Computer, projector and screen
- Film clip
    - *Ocean Frontiers: II: Collaborative Research* (5 minutes) http://bit.ly/OF2Research
- Block Island Wind Farm Information Handout
- Research Questions and Notes Worksheet
- Research Questions and Notes Worksheet (Teacher Copy)
- Fish Species Sharing Worksheet
- Species Data Set Handouts[1]
- Monthly Temperature Data Handout[1]
- Annual Catch Summary Handout[1]

[1] Resources provided by INSPIRE Environmental and Deepwater Wind

Objectives

Students will:

1. Explore the Block Island Wind Farm (BIWF) and learn how collaborative research was used in this project.
2. Analyze and interpret data regarding the Block Island Wind Farm research project.

Subjects

- Science – Ecology, Environmental, Marine

Duration

135+ minutes

Note: *Ocean Frontiers II* can be downloaded at http://bit.ly/OF2-DL

Overview

In this lesson, students will explore the Block Island Wind Farm (BIWF) research project and the collaboration between the fishers and researchers to produce sound science to determine any impacts to fisheries associated with the construction and operation of an offshore wind farm. Using data gathered from the project, students will explore the data and research five species of fish that were studied across five years. Students will share their findings with their peers using a jigsaw strategy.

> "Most of the people in the industry feel that it's necessary to see how these proposed wind farms are going to affect the resource. And the best way to do that is to come out here on a regular basis and get samples of what is actually here. I fish in this area quite often, so I know what should be here when we come. I have an idea of what we should catch."
>
> *Rodman Sykes – F/V Virginia Marise, Point Judith, RI*

NOTE: Before teaching this lesson, show *Ocean Frontiers II* in class or assign it as homework if students have not yet watched the entire film (as directed in the first lesson in this set: Ocean Stakeholders: Every Voice Matters).

Activities

Activity 1 – Introduction to Block Island Wind Farm Collaborative Research Project (45 minutes)

1. Share the following quote:

   "They [Deepwater Wind] realized they needed to work with us. We told them right out of the gate we want to work with you and we want to find the right place to put it. The most important part is identifying the right piece of bottom, so you're not ruining the resources, you're not messing up critical habitat. There's a whole host of reasons and nobody knows that ground out there like the fishing industry; we live out there."
   Lanny Dellinger, Captain – Fishing 20+ years

   (Source: Local Knowledge and Strong Science Build Broad Support for the Block Island Wind Farm – INSPIRE Environmental poster)

   a. Discuss the local knowledge that fishers would have of the area and how that knowledge helps researchers collect data.

2. Watch the *Ocean Frontiers II: Collaborative Research* clip.

3. Review the term collaborative research (valuing different types of knowledge in the scientific process). Consider the following discussion points:

   a. What is "sound science" and how does collaborative research connect with "sound science"?

   b. How does valuing different types of knowledge (for example, the local knowledge of fishers, the traditional knowledge of Native Americans, the scientific knowledge of researchers, etc.) contribute to a better scientific approach?

c. Why is a collaborative research approach important for decision makers? Policy makers? Stakeholders? Federal and state agencies?

d. Why is it important to have multiple stakeholders contributing to research projects like the Block Island Wind Farm?

4. Ask students to think about the scientific method and what methodology is important when setting up an experiment. Use the Block Island Wind Farm Information Handout to review the project. Consider the following discussion questions: (See Background Information)

   a. What is baseline data and why is it important to collect baseline data to observe changes over time? (*Baseline data is an initial collection of data that researchers use to compare with data collected later on in the study.*)

   b. Why is it important to collect long-term data to observe changes over time? (*To observe changes over time, as changes can be presented at different times.*)

   c. Why might you have missing data? What happens when you have a missing month or year? (*Data could be missing due to a problem that surfaces during collection. For example, no trawls were conducted in the Area of Potential Effect (APE) during November 2014 due to the net getting hung up on an unknown structure. Missing data must be taken into consideration when analyzing the results.*)

   d. Why is consistency in data collection important for consistent methodology? (*To ensure that data has been collected fairly and to be able to repeat methodology in the data collection at different collection sites.*)

Activity 2 – Introduction to BIWF Fish and Research (45 minutes plus research)

1. Divide the class into 5 groups and review the Research Questions and Notes Worksheet. Then assign each group a species of fish that was studied during the BIWF project:

   a. Black sea bass

   b. Little skate

   c. Scup

   d. Summer flounder

   e. Winter flounder

2. Explain that each group will become experts on the assigned fish and should research specific species traits. Brainstorm as a class to decide the species traits that will be researched. For example, what it looks like, diet, geographic range, preferred habitat, average size/size range and any other facts their group thinks are important to share.

3. Provide each group with the corresponding set of Species Data Set Handouts for the species of fish, as well as the Monthly Temperature Data Handout. Allow the students to study and make observations about the data and connect their observations to the life history of that species, as well as temperature. Some observations students may make include seasonality and abundance of the species, as well as changes in length and temperature.

4. Using the Research Questions and Notes Worksheet, students should answer the questions and then generate three or four further questions that can be researched after looking at the data.

5. Provide time for each student to prepare for the next activity using the Fish Species Sharing Worksheet.

Activity 3 – Sharing Fish Data (40 minutes)

1. Have students form new groups so that there are representatives from each of the previous groups looking at the five species of fish. Have each student share their learning with others on the various species of fish and continue filling out the Fish Species Sharing Worksheet so each student has their own notes on all fish species.
2. As a class, project the Annual Catch Summary Handout and examine the data and charts for the various species. Discuss observations and reflections.

Activity 4 – Wrap Up/Closure Questions (5 minutes)

1. Ask students how different types of knowledge can contribute to research projects, for example, researchers, fishers, industry, community members, etc.
2. Allow the students time to discuss as a class or journal answers to the Essential Questions to check for student understanding and correct any misconceptions.

Extension

1. Use a dichotomous key to key out the species or make your own dichotomous key to identify the different species used in the research project.
2. Plot monthly data for all 5 years to see abundance in species and analyze with temperature data.

Background Information

Overview of Data Provided

In the Block Island Wind Farm (BIWF) project there was a dialogue with fishers and scientists. By working collaboratively, the collective efforts of people with different backgrounds, experiences and knowledge bases far exceed what would be accomplished by one group of people working alone. The Rhode Island Coastal Resource Management Council Fisheries Advisory Board (FAB), comprised of delegated commercial fishermen and state regulators, expressed the need to better understand fish and crustacean use of the project area pre-construction, during construction and post-construction. The commercial fishing industry and Fisheries Advisory Board provided insight into the BIWF area that helped drive decision-making and biological survey design and methodology. This helped the researchers produce sound science. Collaborative research, like the efforts involved in this project, bring together researchers and involved stakeholders to achieve a common goal. In this way, important research ideas and impact concerns (e.g., cultural, socioeconomic) that may have been missed are included in surveys.

INSPIRE Environmental and Deepwater Wind provided data collected during the demersal fish trawl within and around the Block Island Wind Farm (BIWF). The five years of catch data collected monthly in the vicinity of the BIWF can be used to explore trends in fish abundance as related to seasonality and to examine an environmental correlate (temperature). The data presented allows comparison of trends within a year and among years. Project years are based on October-September (Year 1 covers Oct. 2012 – Sept. 2013...Year 5 covers Oct. 2016 – Sept. 2017). There is data for five species of fish collected in the Area of Potential Effect (APE) – the site with the 5 wind turbine generators, which were installed in summer 2016.

Species Data Sets

Monthly and Summary data sets for five fish species are included in this lesson:

- Black sea bass (migratory species)
- Little skate (year-round resident species)
- Scup (migratory species)
- Summer flounder (migratory species)
- Winter flounder (year-round resident species, with a migratory sub-population)

Each species' Monthly Data Set is four pages long and includes species abundance, average length and temperature data from the two tows taken within the area of potential effect (APE).

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)

The Summary Data Sets include a series of charts to provide an overview of the data. Please note that no trawls were conducted in the APE during November 2014 due to the net getting hung up on an unknown structure.

Monthly Temperature Data

The average Monthly Temperature Data was collected in the Area of Potential Effect with near-bottom measurements. It contains charts to provide a quick preview of the five-year data set.

Project Year	Month	Date	Average Temperature (Celsius)

Annual Catch Summary

The abundance data is shown in the Annual Catch Summary, showing the total abundance for each of the five species during the five project years.

Additional Resources

- NOAA Fact Sheets
- Economic Information on New England Fisheries
- INSPIRE Environmental Poster – Local Knowledge and Strong Science Build Broad Support for the Block Island Wind Farm
- INSPIRE Environmental Poster – Assessing Potential Impacts on Demersal Fish of Block Island Wind Farm Construction and Operation

Block Island Wind Farm Information Handout

Overview of Methodology

- The bottom fish trawl survey was conducted at three sites in the Block Island Wind Farm (BIWF) area to see if fish and invertebrates were affected by the installation and operation of a wind farm.
- There are 5 wind turbine generators (WTGs) are in the Area of Potential Effect (APE), which were installed in summer 2016.
- Fish were collected in APE and the two nearby reference areas (REFE) and (REFS) with similar habitat characteristics before, during and after installation and operation of the WTGs.
- Monthly baseline sampling of two bottom trawl tows at each of the sites.
- Water temperature, dissolved oxygen and salinity were recorded.
- Organisms were identified by species, weighed and length measurements were taken of a selection of the fish collected.
- Dietary habits were assessed by stomach content analysis and fish condition was assessed by a body weight and length ratio.
- Statistical tests were conducted to determine whether fish abundance, diet or condition differed in project area.

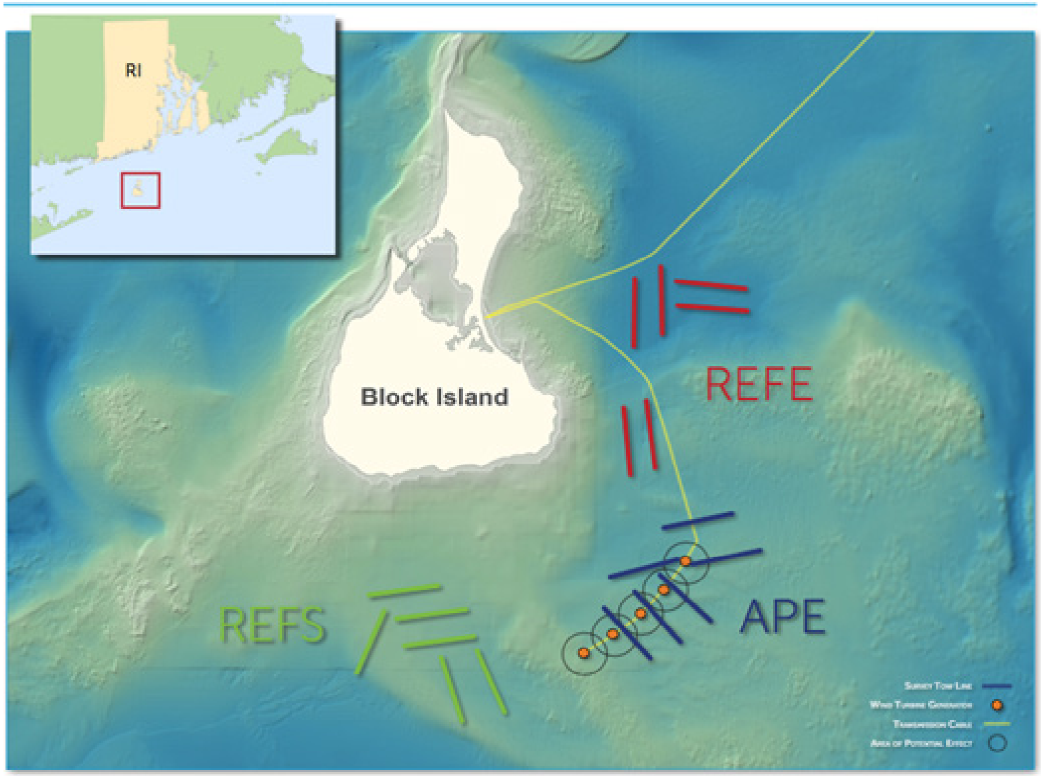


Figure 1. Block Island Wind Farm Demersal Fish Trawl Survey Area.

Acknowledgement: Map from INSPIRE Environmental

Research Questions and Notes Worksheet

Species studied:

Species Traits: (for example, what it looks like, diet, geographic range, preferred habitat, average size/size range, etc.)

Research Questions

1. What is the seasonality of this species?
    a. Year-round? Migratory?
2. Are there trends in abundance for this species?
    a. Compare to all years.
3. Are there changes in length by month?
    a. What can you infer from the changes in average length?
4. How variable is monthly water temperature by year?
    a. Seasonal variability in water temperature - does this appear to have any influence on when the migratory fish species show up and leave the BIWF?

Additional Research Questions:

Notes:

Research Questions and Notes Worksheet (Teacher Copy)

Species studied:

Species Traits:

This will vary from class to class.

Research Questions

1. What is the seasonality of this species?

   Seasonality is best assessed through the 'Mean Abundance by Month Across All 5 Years' plots (for each individual species). Tall bars indicate high abundance of the species. Where these tail off you can see seasonal migrations, and where no bars are we can assume the species is not present, or is present in extremely low abundances such that they were never caught in the net.

   a. Black sea bass — Very high abundance in summer. Migrate into region starting in April and remain until November. They are not found in the region during winter months (Dec-Mar).
   b. Little skate – Little skate is a year-round species and were caught in all 12 months. There may be a small migration with fewer individuals present in Feb/Mar, but they are in fact present year-round
   c. Scup are migratory seasonal residents with very high abundances in fall. Migrate into region in April and leave region by December
   d. Summer flounder are migratory seasonal residents arriving in April and leaving the region in December. Abundance is similar throughout this time period.
   e. Winter flounder is a year-round resident with a migratory sub population. We know some individuals are year-round residents because we can see there is catch in all 12 months. However, there is certainly some migration occurring because abundances are low in summer and high in winter.

2. Are there trends in abundance for this species? Compare to all years.

   This is most easily viewed in the 'Species Abundance by Year' plot and table in the Annual Catch Summary Section. A good way to think about it is to look at the abundance by year plot for your individual species and try to draw a trend line through it. Does this trend line go up, down, or stay flat?

   a. Black sea bass – A steady strong increase in abundance across all 5 years.
   b. Little skate – A steady abundance, there was a dip in years 2 and 3, but years 4 and 5 are extremely similar to year 1.
   c. Scup – A steady increase in abundance in the region. Although year 5 has lower abundance than year 4, the overall trend is for an increased abundance.

d. Summer flounder – Steady abundance. There was a slight increase in year 3, but all other years are extremely similar.
e. Winter flounder – A fairly steady abundance with a difficult to discern trend. Years 4 and 5 similar to year 1. General trend is flat.

3. Are there changes in length by month? What can you infer from the changes in average length?

   This is best viewed in the 'Average length (mm)' plots in the Quick Preview or Species Data Set sheets.
   a. Black sea bass – Slight increase in length during summer months (July, August). This implies summer growth and larger individuals moving into the region during this time.
   b. Little skate – No trend, increases and decreases in mean length occur in any given month. Implies a steady population with no size-dependent migrations.
   c. Scup – No trend/inadequate data. Inadequate amounts of data is an okay concept to touch on. Hard to draw conclusions with all the data gaps.
   d. Summer flounder – Although subtle, each year is an upside down U. This suggests that smaller individuals move into the region first in the spring and remain the latest in the fall. Larger individuals arrive after the small ones and leave before the small ones.
   e. Winter flounder – Same concept as summer flounder, but with larger individuals present in winter months.

4. How variable is monthly water temperature by year? Seasonal variability in water temperature – does this appear to have any influence on when the migratory fish species show up and leave the BIWF?

   The monthly water temperature is not that variable. For example, if you pick each individual month out of the table and look across all 5 years, the mean temperatures are always fairly similar. There are deviations, but in the grand scheme of things, it is not that variable.

   The seasonal variability in the water temperature does have influence on the migratory fish. We can see the migratory species arrive (black sea bass, summer flounder, scup) or depart (winter flounder) as the temperature rises and then depart (black sea bass, summer flounder, scup) or arrive (winter flounder) as the temperature decreases.

Name:________________________

Fish Species Sharing Worksheet

	Fish 1 (your researched fish)	Fish 2	Fish 3	Fish 4	Fish 5
Species					
Seasonality					
2 Observations					
1 Research Question					

Black Sea Bass Data (page 1 of 4)

Monthly Data

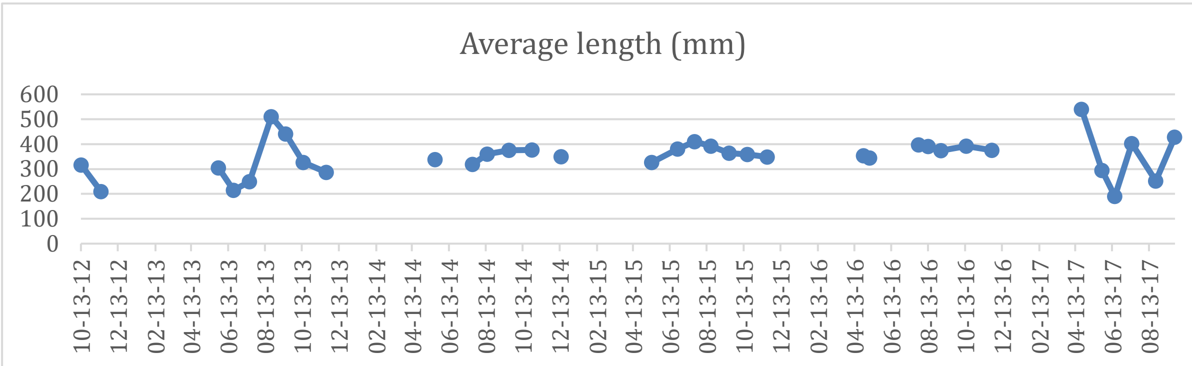
Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
1	Oct	10-13-12	12	316	14.0
1	Nov	11-15-12	6	209	13.0
1	Dec	12-20-12	0		8.8
1	Jan	01-07-13	0		8.9
1	Feb	02-07-13	0		5.5
1	Mar	03-13-13	0		3.7
1	Apr	04-18-13	0		5.4
1	May	05-28-13	4	305	9.2
1	Jun	06-22-13	1	215	12.0
1	Jul	07-18-13	4	249	12.1
1	Aug	08-23-13	1	510	14.6
1	Sep	09-16-13	45	441	15.2
2	Oct	10-15-13	3	327	16.1
2	Nov	11-22-13	12	287	12.3
2	Dec	12-29-13	0		9.5
2	Jan	01-15-14	0		5.4
2	Feb	02-11-14	0		5.5
2	Mar	03-12-14	0		3.6
2	Apr	04-10-14	0		3.1
2	May	05-21-14	9	338	8.2
2	Jun	06-16-14	0		13.0
2	Jul	07-22-14	3	318	14.0
2	Aug	08-15-14	34	360	16.3
2	Sep	09-20-14	33	375	18.7
3	Oct	10-28-14	23	377	16.4
3	Nov	11-29-14			11.0
3	Dec	12-15-14	1	350	8.5
3	Jan	01-23-15	0		3.6
3	Feb	02-17-15	0		2.9
3	Mar	03-03-15	0		2.8
3	Apr	04-13-15	0		3.9
3	May	05-14-15	128	327	5.4
3	Jun	06-26-15	2	380	13.4

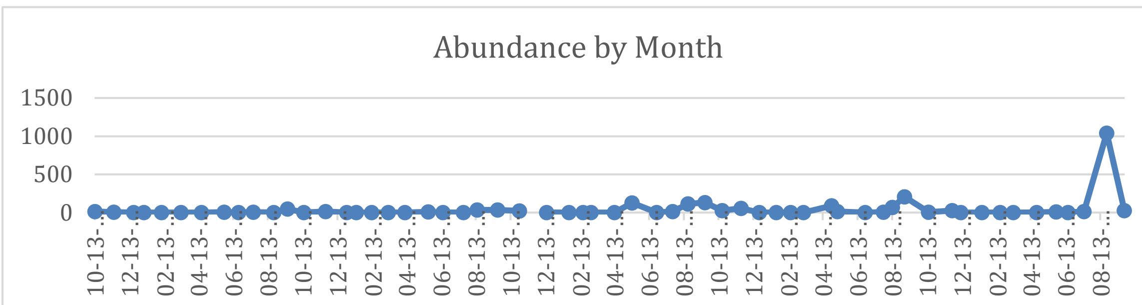
Black Sea Bass Data (page 2 of 4)

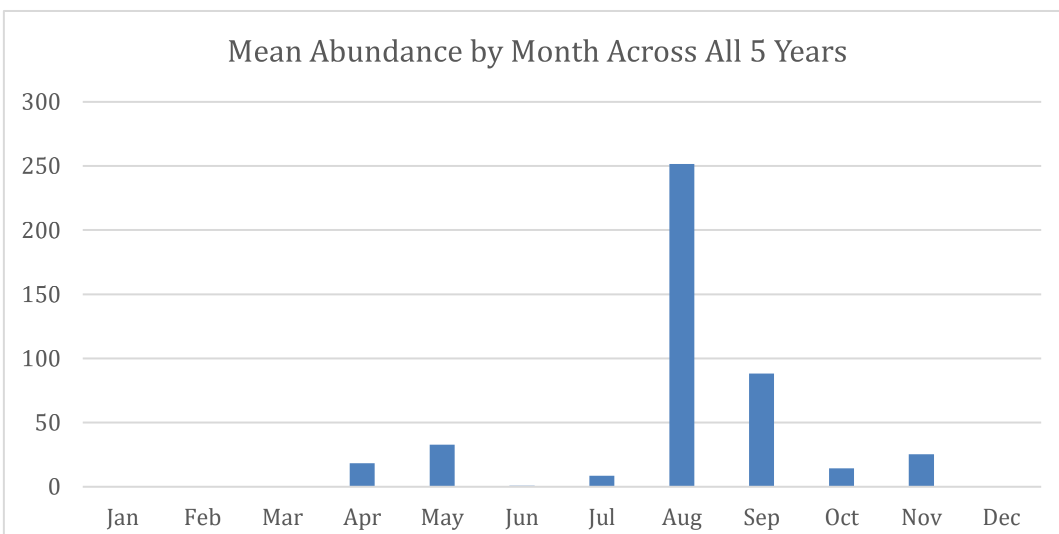
Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
3	Jul	07-24-15	15	410	13.0
3	Aug	08-20-15	115	393	14.6
3	Sep	09-19-15	133	364	15.1
4	Oct	10-19-15	28	359	16.3
4	Nov	11-21-15	56	349	13.8
4	Dec	12-23-15	0		11.4
4	Jan	01-22-16	0		7.8
4	Feb	02-16-16	0		5.2
4	Mar	03-10-16	0		5.8
4	Apr	04-28-16	91	354	7.6
4	May	05-08-16	15	345	8.8
4	Jun	06-26-16	0		11.5
4	Jul	07-28-16	7	397	11.9
4	Aug	08-13-16	67	391	13.3
4	Sep	09-03-16	205	374	17.0
5	Oct	10-15-16	6	393	17.1
5	Nov	11-26-16	27	375	13.1
5	Dec	12-11-16	0		10.6
5	Jan	01-17-17	0		6.2
5	Feb	02-18-17	0		4.1
5	Mar	03-13-17	0		5.2
5	Apr	04-23-17	1	540	4.8
5	May	05-27-17	8	294	11.3
5	Jun	06-17-17	1	190	10.6
5	Jul	07-15-17	14	402	12.5
5	Aug	08-24-17	1041	251	14.1
5	Sep	09-24-17	26	428	17.8

Note: Permission was granted to use the data in the context of this lesson. This data is not available for publication or use outside of the classroom.

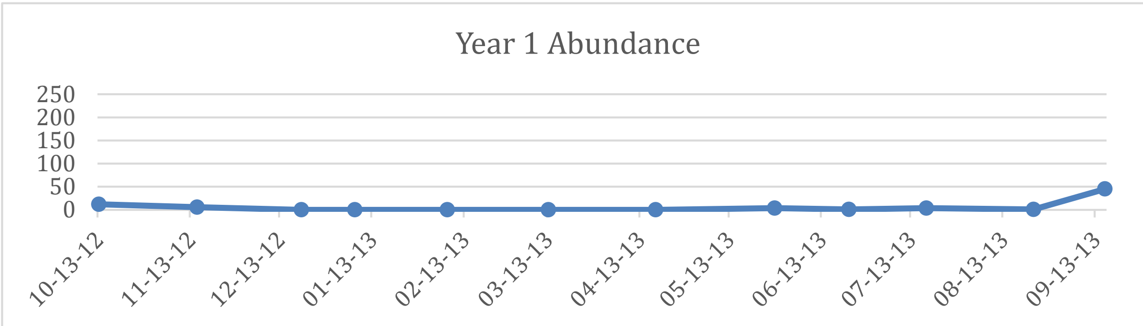
Summary Data

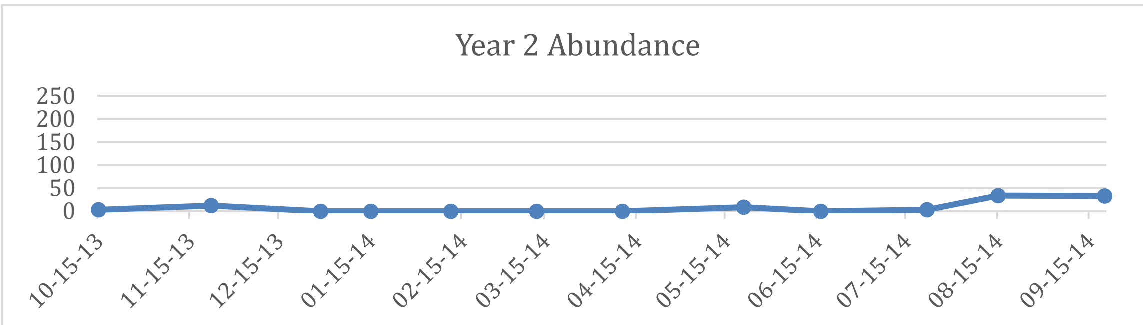


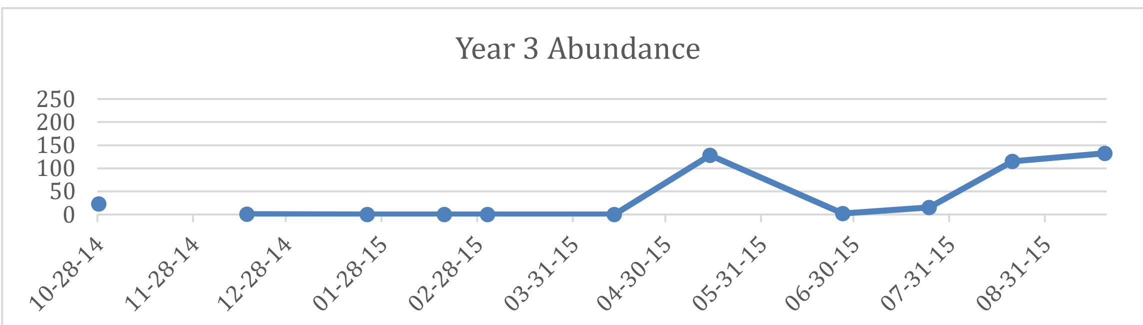


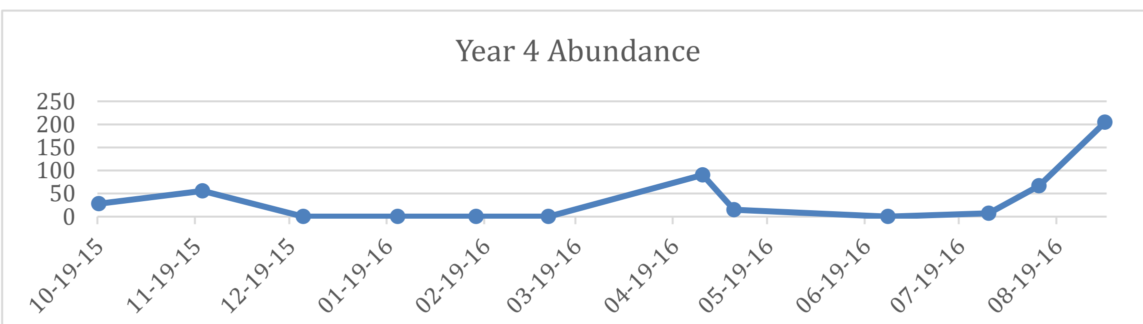


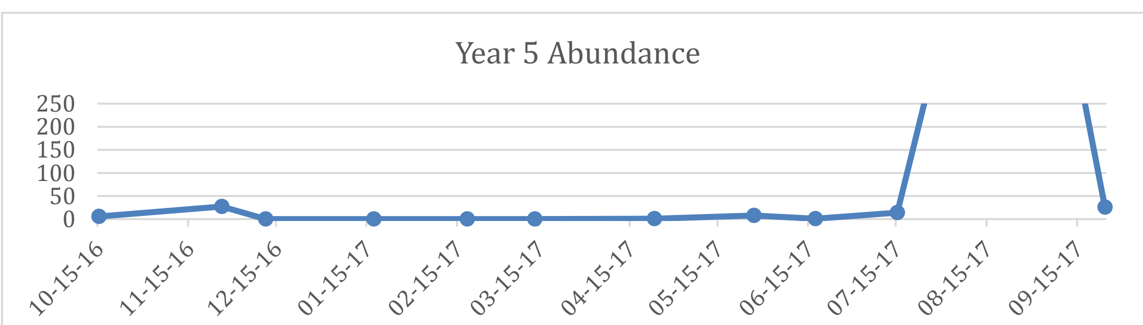
Black Sea Bass Data (page 4 of 4)











Little Skate Data (page 1 of 4)

Monthly Data

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
1	Oct	10-13-12	211	261	14.0
1	Nov	11-15-12	299	264	13.0
1	Dec	12-20-12	213	261	8.8
1	Jan	01-07-13	266	266	8.9
1	Feb	02-07-13	90	275	5.5
1	Mar	03-13-13	78	254	3.7
1	Apr	04-18-13	501	261	5.4
1	May	05-28-13	234	259	9.2
1	Jun	06-22-13	646	265	12.0
1	Jul	07-18-13	322	255	12.1
1	Aug	08-23-13	875	256	14.6
1	Sep	09-16-13	445	263	15.2
2	Oct	10-15-13	234	268	16.1
2	Nov	11-22-13	119	262	12.3
2	Dec	12-29-13	227	270	9.5
2	Jan	01-15-14	57	266	5.4
2	Feb	02-11-14	15	261	5.5
2	Mar	03-12-14	7	256	3.6
2	Apr	04-10-14	56	263	3.1
2	May	05-21-14	232	251	8.2
2	Jun	06-16-14	257	261	13.0
2	Jul	07-22-14	163	270	14.0
2	Aug	08-15-14	178	268	16.3
2	Sep	09-20-14	440	262	18.7
3	Oct	10-28-14	700	257	16.4
3	Nov	11-29-14			11.0
3	Dec	12-15-14	369	264	8.5
3	Jan	01-23-15	152	267	3.6
3	Feb	02-17-15	0		2.9
3	Mar	03-03-15	0		2.8
3	Apr	04-13-15	67	260	3.9
3	May	05-14-15	142	287	5.4
3	Jun	06-26-15	589	262	13.4

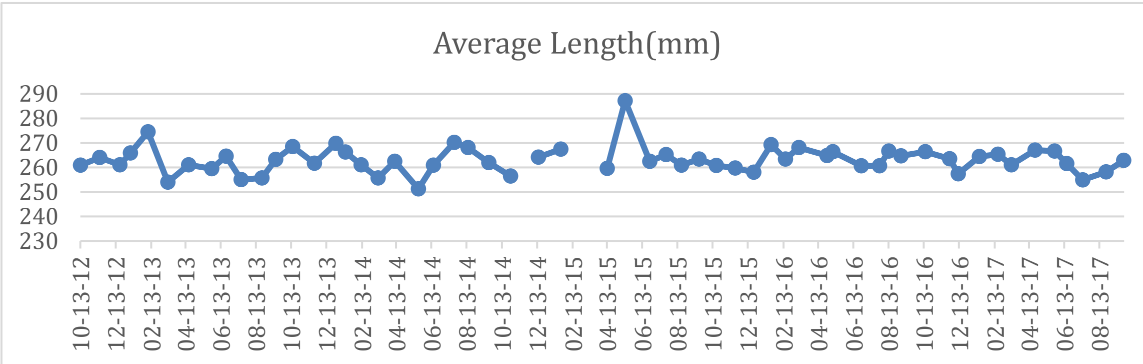
Little Skate Data (page 2 of 4)

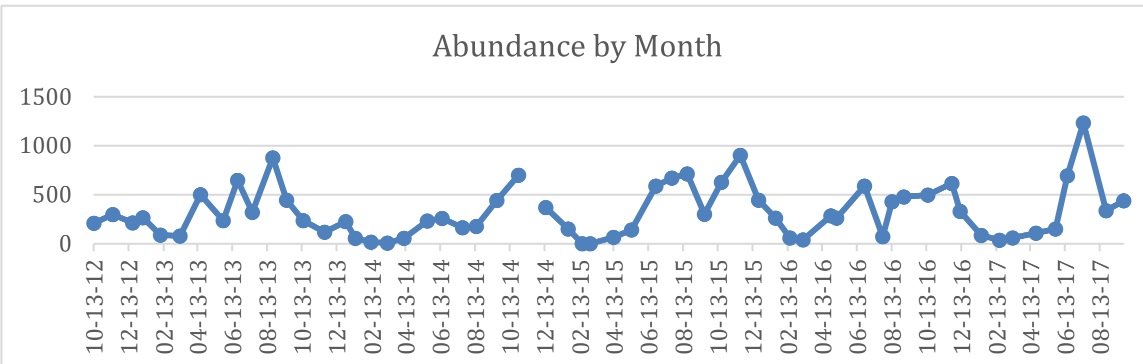
Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
3	Jul	07-24-15	669	265	13.0
3	Aug	08-20-15	712	261	14.6
3	Sep	09-19-15	302	263	15.1
4	Oct	10-19-15	627	261	16.3
4	Nov	11-21-15	903	260	13.8
4	Dec	12-23-15	446	258	11.4
4	Jan	01-22-16	260	269	7.8
4	Feb	02-16-16	58	263	5.2
4	Mar	03-10-16	38	268	5.8
4	Apr	04-28-16	283	265	7.6
4	May	05-08-16	262	266	8.8
4	Jun	06-26-16	590	261	11.5
4	Jul	07-28-16	71	261	11.9
4	Aug	08-13-16	427	267	13.3
4	Sep	09-03-16	476	265	17.0
5	Oct	10-15-16	496	266	17.1
5	Nov	11-26-16	616	263	13.1
5	Dec	12-11-16	330	257	10.6
5	Jan	01-17-17	86	264	6.2
5	Feb	02-18-17	36	265	4.1
5	Mar	03-13-17	59	261	5.2
5	Apr	04-23-17	109	267	4.8
5	May	05-27-17	149	267	11.3
5	Jun	06-17-17	694	262	10.6
5	Jul	07-15-17	1232	255	12.5
5	Aug	08-24-17	338	258	14.1
5	Sep	09-24-17	438	263	17.8

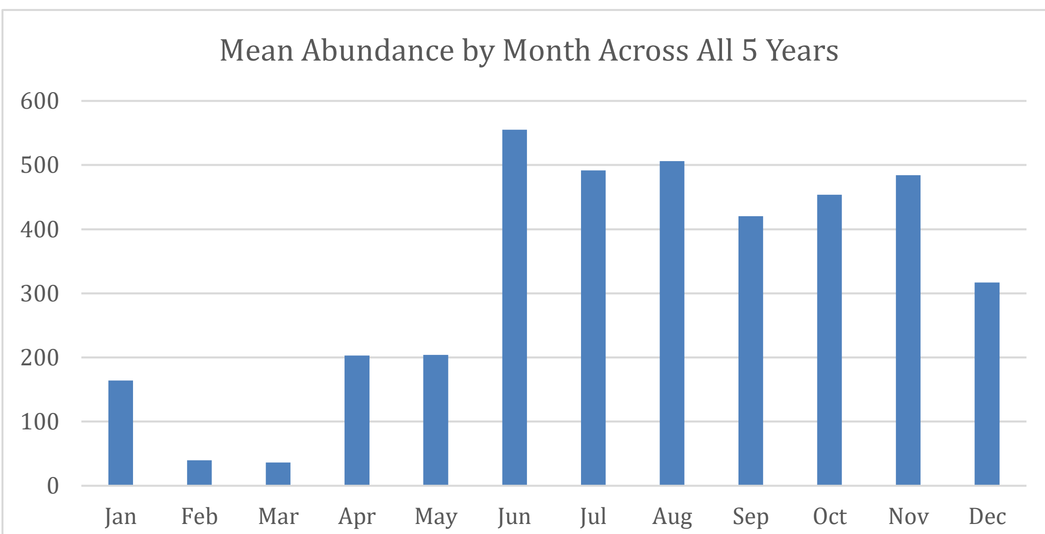
Note: Permission was granted to use the data in the context of this lesson. This data is not available for publication or use outside of the classroom.

Little Skate Data (page 3 of 4)

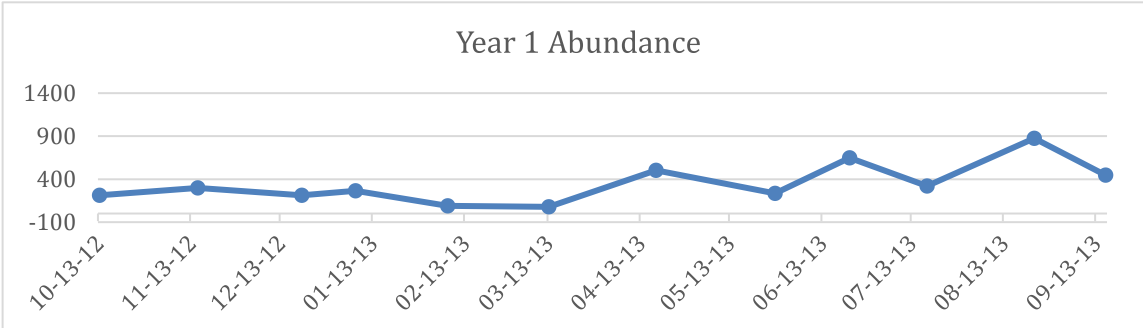
Summary Data

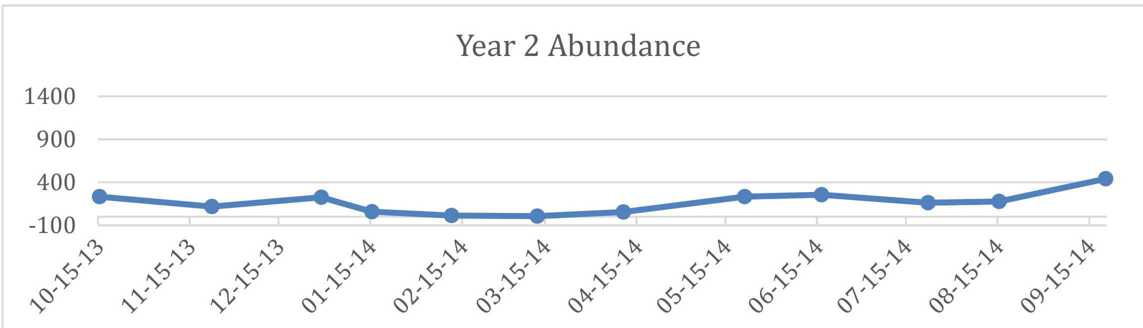


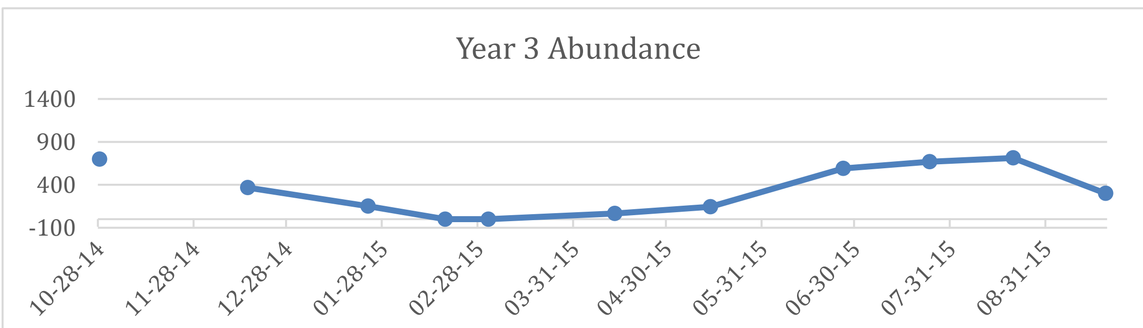


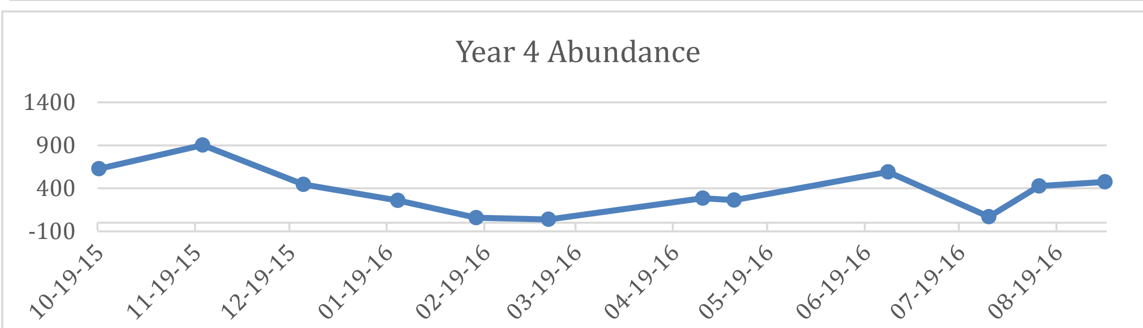


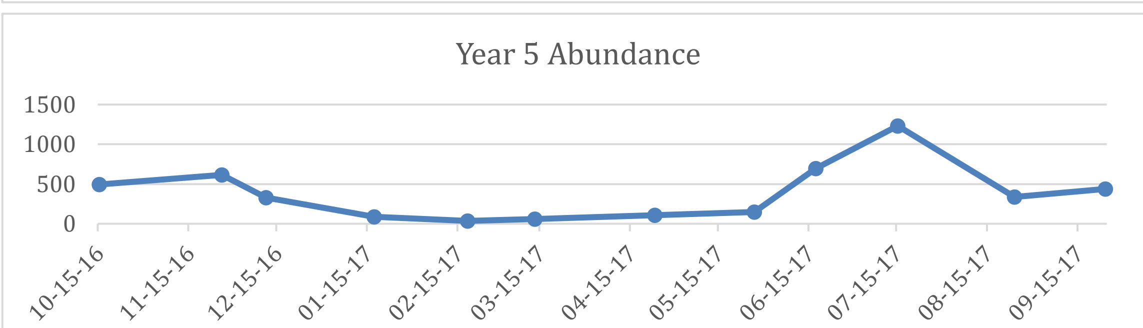
Little Skate Data (page 4 of 4)











Scup Data (page 1 of 4)

Monthly Data

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
1	Oct	10-13-12	133	96	14.0
1	Nov	11-15-12	145	130	13.0
1	Dec	12-20-12	92	98	8.8
1	Jan	01-07-13	0		8.9
1	Feb	02-07-13	0		5.5
1	Mar	03-13-13	0		3.7
1	Apr	04-18-13	0		5.4
1	May	05-28-13	32	128	9.2
1	Jun	06-22-13	3	113	12.0
1	Jul	07-18-13	1	280	12.1
1	Aug	08-23-13	0		14.6
1	Sep	09-16-13	2	98	15.2
2	Oct	10-15-13	1623	91	16.1
2	Nov	11-22-13	11	181	12.3
2	Dec	12-29-13	0		9.5
2	Jan	01-15-14	0		5.4
2	Feb	02-11-14	0		5.5
2	Mar	03-12-14	0		3.6
2	Apr	04-10-14	0		3.1
2	May	05-21-14	113	179	8.2
2	Jun	06-16-14	23	111	13.0
2	Jul	07-22-14	0		14.0
2	Aug	08-15-14	4	299	16.3
2	Sep	09-20-14	51	87	18.7
3	Oct	10-28-14	1542	93	16.4
3	Nov	11-29-14			11.0
3	Dec	12-15-14	2	95	8.5
3	Jan	01-23-15	0		3.6
3	Feb	02-17-15	0		2.9
3	Mar	03-03-15	0		2.8
3	Apr	04-13-15	0		3.9
3	May	05-14-15	3	227	5.4
3	Jun	06-26-15	7	116	13.4

Scup Data (page 2 of 4)

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
3	Jul	07-24-15	0		13.0
3	Aug	08-20-15	0		14.6
3	Sep	09-19-15	704	110	15.1
4	Oct	10-19-15	454	88	16.3
4	Nov	11-21-15	1627	157	13.8
4	Dec	12-23-15	0		11.4
4	Jan	01-22-16	1	130	7.8
4	Feb	02-16-16	0		5.2
4	Mar	03-10-16	0		5.8
4	Apr	04-28-16	31	200	7.6
4	May	05-08-16	1347	135	8.8
4	Jun	06-26-16	0		11.5
4	Jul	07-28-16	0		11.9
4	Aug	08-13-16	40	136	13.3
4	Sep	09-03-16	885	133	17.0
5	Oct	10-15-16	327	104	17.1
5	Nov	11-26-16	352	157	13.1
5	Dec	12-11-16	1	195	10.6
5	Jan	01-17-17	0		6.2
5	Feb	02-18-17	0		4.1
5	Mar	03-13-17	0		5.2
5	Apr	04-23-17	21	232	4.8
5	May	05-27-17	259	126	11.3
5	Jun	06-17-17	2	163	10.6
5	Jul	07-15-17	0		12.5
5	Aug	08-24-17	1548	178	14.1
5	Sep	09-24-17	494	119	17.8

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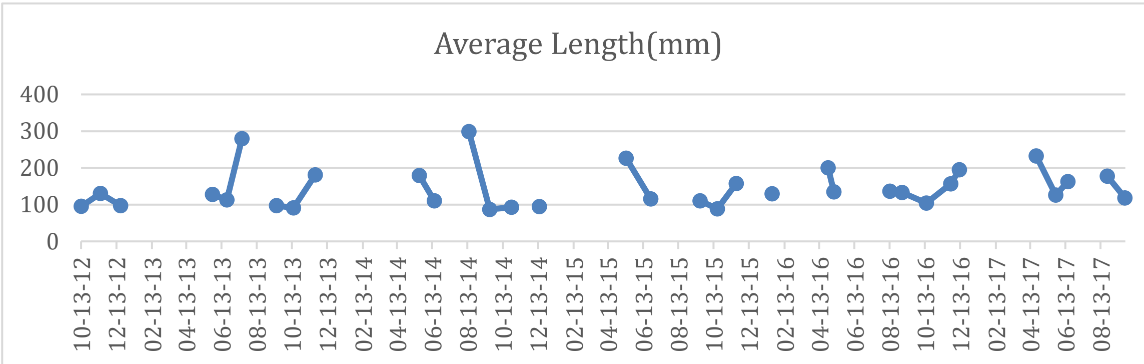
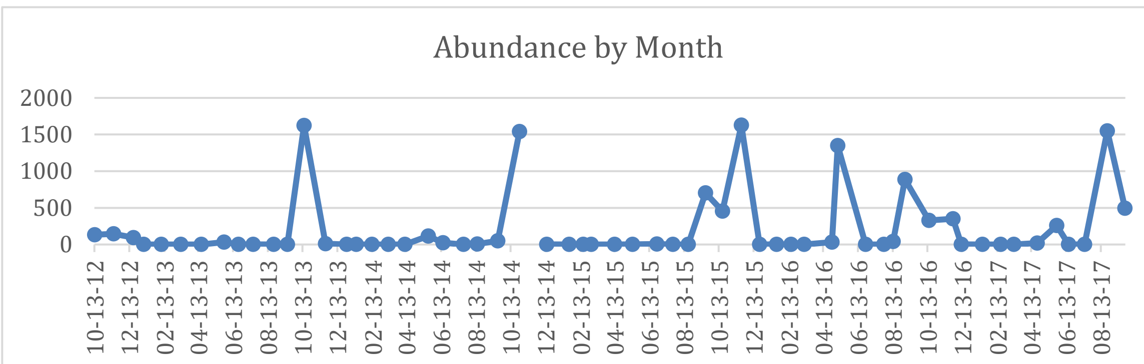
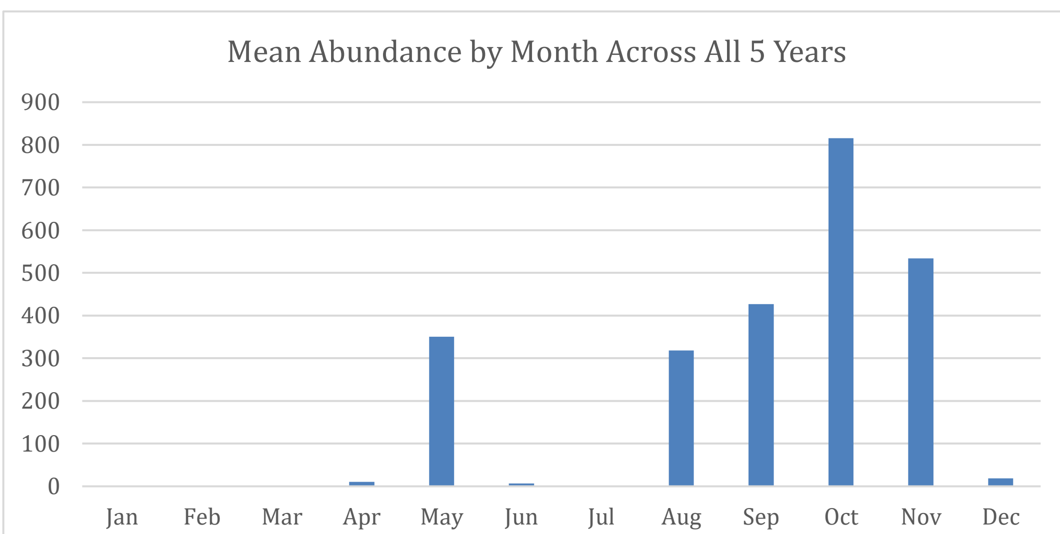
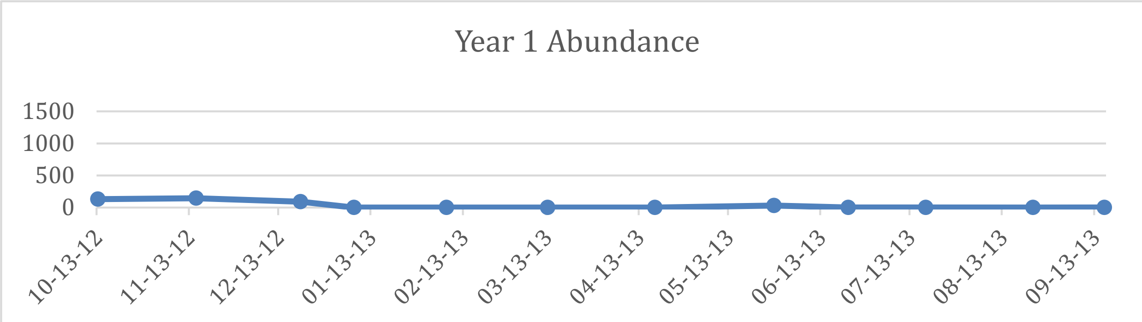
Summary Data

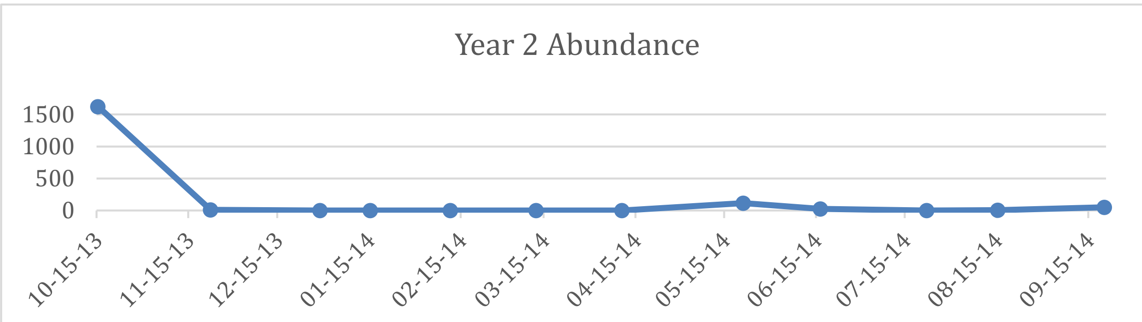


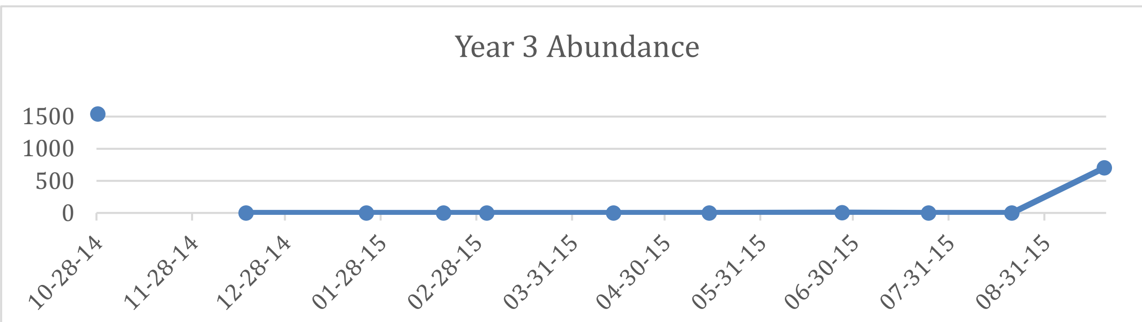


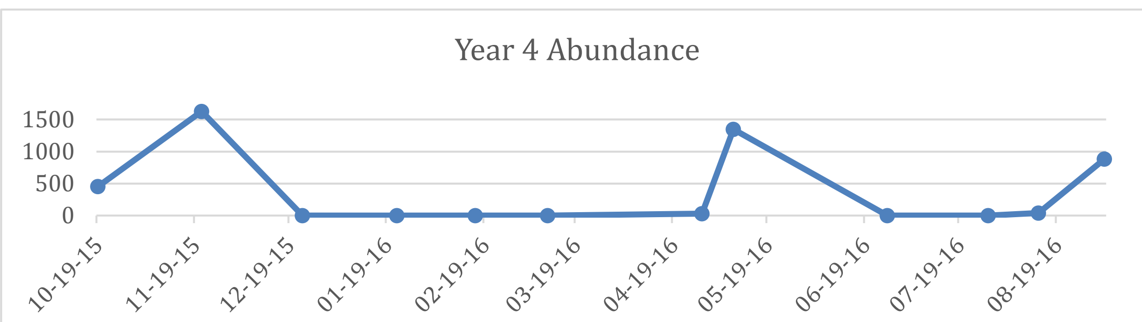


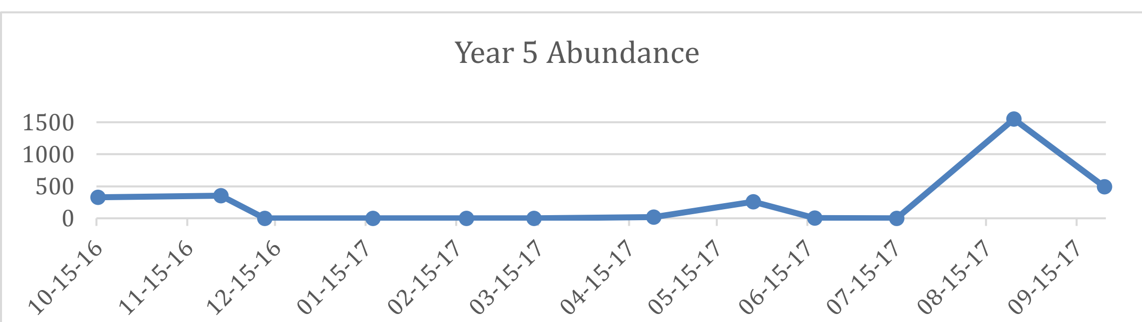
Scup Data (page 4 of 4)











Summer Flounder Data (page 1 of 4)

Monthly Data

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
1	Oct	10-13-12	10	413	14.0
1	Nov	11-15-12	8	425	13.0
1	Dec	12-20-12	4	416	8.8
1	Jan	01-07-13	0		8.9
1	Feb	02-07-13	0		5.5
1	Mar	03-13-13	0		3.7
1	Apr	04-18-13	14	375	5.4
1	May	05-28-13	17	530	9.2
1	Jun	06-22-13	6	506	12.0
1	Jul	07-18-13	2	545	12.1
1	Aug	08-23-13	4	581	14.6
1	Sep	09-16-13	7	437	15.2
2	Oct	10-15-13	2	430	16.1
2	Nov	11-22-13	5	414	12.3
2	Dec	12-29-13	0		9.5
2	Jan	01-15-14	0		5.4
2	Feb	02-11-14	0		5.5
2	Mar	03-12-14	0		3.6
2	Apr	04-10-14	0		3.1
2	May	05-21-14	26	439	8.2
2	Jun	06-16-14	9	487	13.0
2	Jul	07-22-14	4	428	14.0
2	Aug	08-15-14	3	428	16.3
2	Sep	09-20-14	9	437	18.7
3	Oct	10-28-14	15	368	16.4
3	Nov	11-29-14			11.0
3	Dec	12-15-14	0		8.5
3	Jan	01-23-15	0		3.6
3	Feb	02-17-15	0		2.9
3	Mar	03-03-15	0		2.8
3	Apr	04-13-15	1	250	3.9
3	May	05-14-15	19	370	5.4
3	Jun	06-26-15	17	421	13.4

Summer Flounder Data (page 2 of 4)

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
3	Jul	07-24-15	14	428	13.0
3	Aug	08-20-15	12	404	14.6
3	Sep	09-19-15	65	425	15.1
4	Oct	10-19-15	5	405	16.3
4	Nov	11-21-15	2	420	13.8
4	Dec	12-23-15	0		11.4
4	Jan	01-22-16	0		7.8
4	Feb	02-16-16	0		5.2
4	Mar	03-10-16	0		5.8
4	Apr	04-28-16	20	363	7.6
4	May	05-08-16	13	394	8.8
4	Jun	06-26-16	6	404	11.5
4	Jul	07-28-16	1	390	11.9
4	Aug	08-13-16	1	455	13.3
4	Sep	09-03-16	10	428	17.0
5	Oct	10-15-16	6	434	17.1
5	Nov	11-26-16	5	387	13.1
5	Dec	12-11-16	4	389	10.6
5	Jan	01-17-17	0		6.2
5	Feb	02-18-17	0		4.1
5	Mar	03-13-17	0		5.2
5	Apr	04-23-17	3	347	4.8
5	May	05-27-17	4	453	11.3
5	Jun	06-17-17	1	400	10.6
5	Jul	07-15-17	13	433	12.5
5	Aug	08-24-17	12	405	14.1
5	Sep	09-24-17	6	376	17.8

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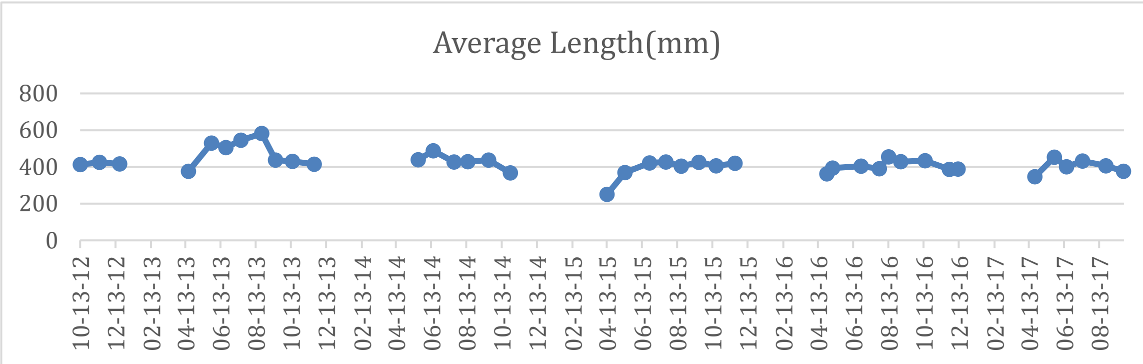
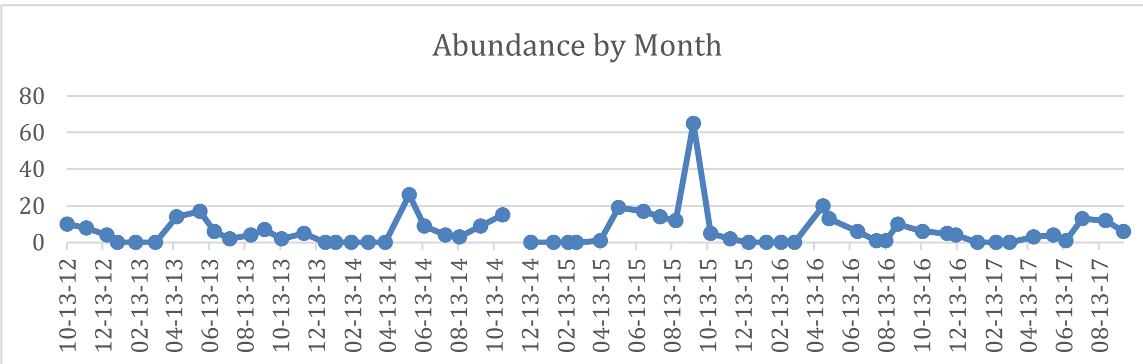
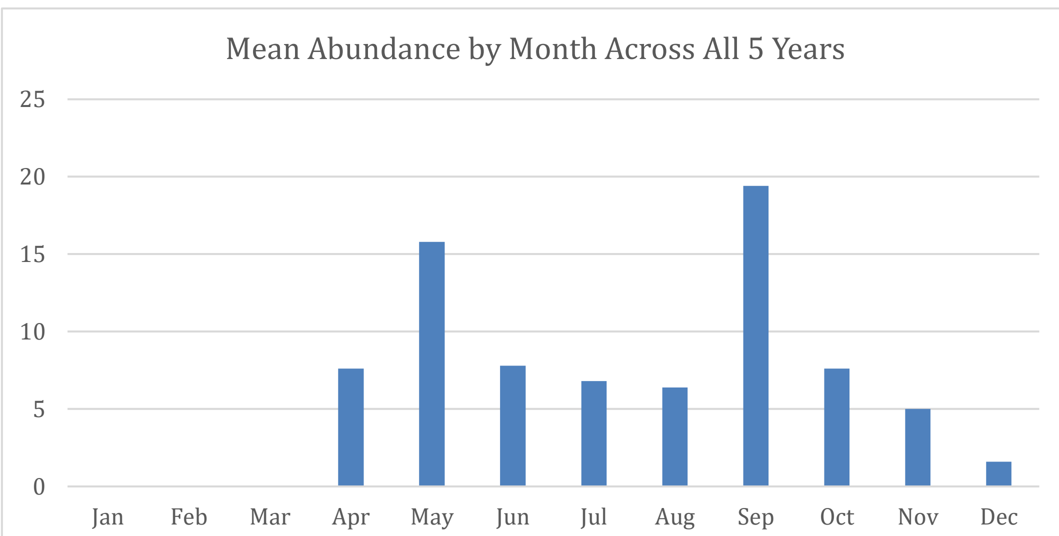
Summer Flounder Data (page 3 of 4)

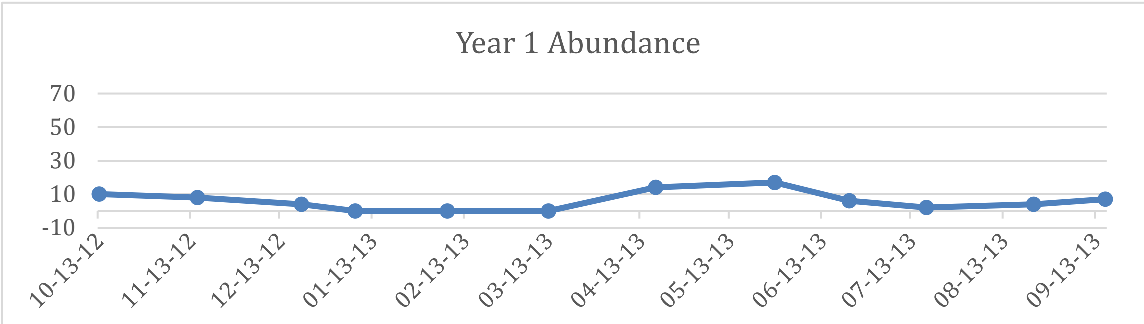
Summary Data

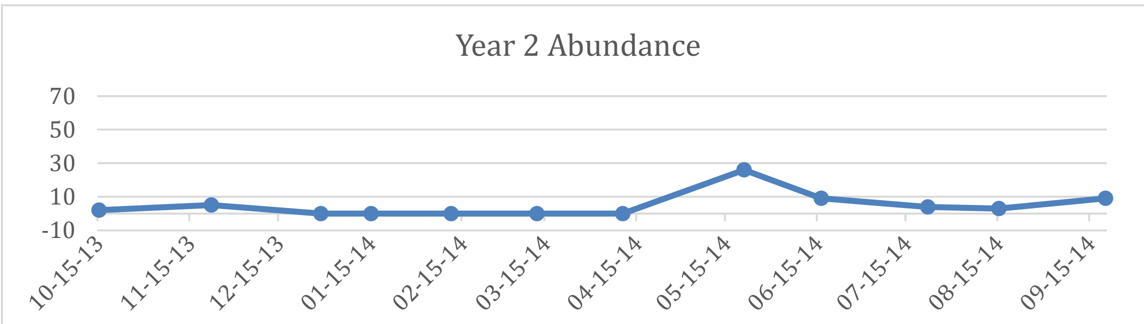


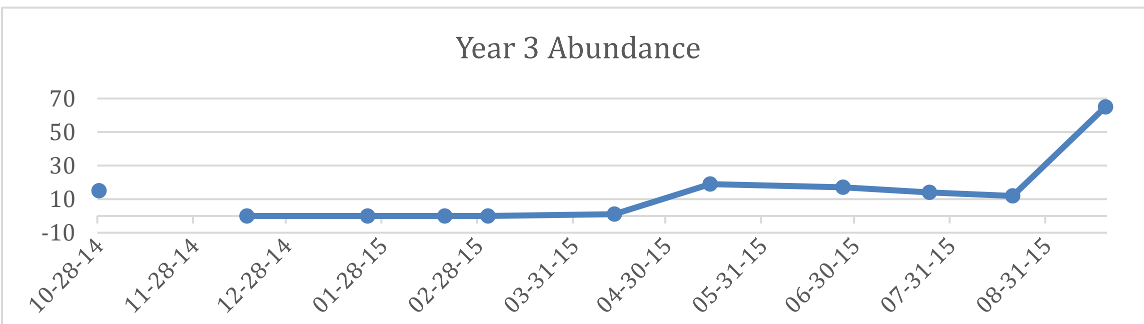


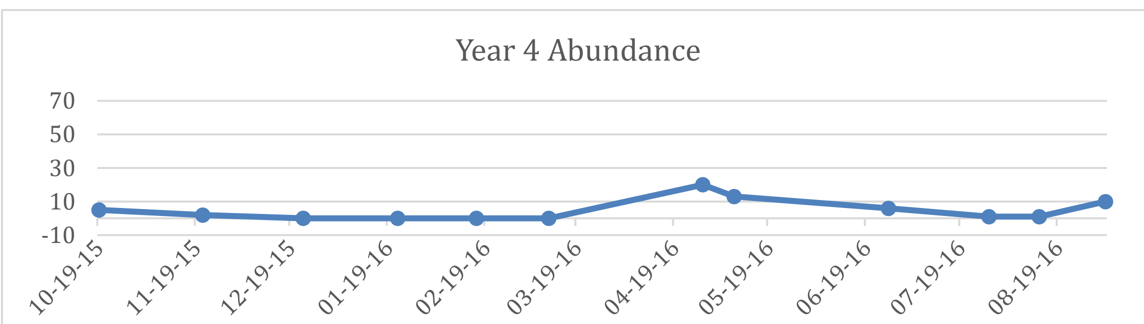


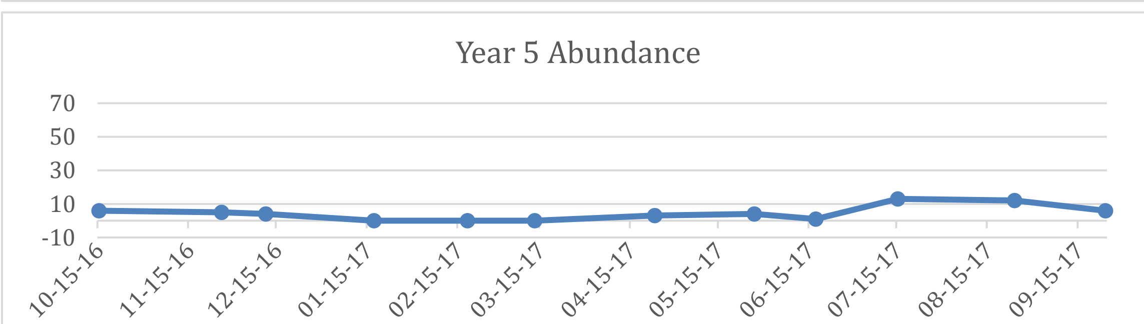
Summer Flounder Data (page 4 of 4)











Winter Flounder Data (page 1 of 4)

Monthly Data

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
1	Oct	10-13-12	2	290	14.0
1	Nov	11-15-12	45	272	13.0
1	Dec	12-20-12	118	358	8.8
1	Jan	01-07-13	116	329	8.9
1	Feb	02-07-13	41	325	5.5
1	Mar	03-13-13	3	344	3.7
1	Apr	04-18-13	87	318	5.4
1	May	05-28-13	40	299	9.2
1	Jun	06-22-13	19	324	12.0
1	Jul	07-18-13	2	233	12.1
1	Aug	08-23-13	0		14.6
1	Sep	09-16-13	2	273	15.2
2	Oct	10-15-13	9	341	16.1
2	Nov	11-22-13	71	354	12.3
2	Dec	12-29-13	57	355	9.5
2	Jan	01-15-14	7	349	5.4
2	Feb	02-11-14	13	345	5.5
2	Mar	03-12-14	3	338	3.6
2	Apr	04-10-14	20	316	3.1
2	May	05-21-14	25	304	8.2
2	Jun	06-16-14	23	326	13.0
2	Jul	07-22-14	6	276	14.0
2	Aug	08-15-14	0		16.3
2	Sep	09-20-14	1	235	18.7
3	Oct	10-28-14	44	312	16.4
3	Nov	11-29-14			11.0
3	Dec	12-15-14	84	333	8.5
3	Jan	01-23-15	15	325	3.6
3	Feb	02-17-15	11	277	2.9
3	Mar	03-03-15	8	378	2.8
3	Apr	04-13-15	22	302	3.9
3	May	05-14-15	36	339	5.4
3	Jun	06-26-15	39	304	13.4

Winter Flounder Data (page 2 of 4)

Project Year	Month	Date	Sum of # of Individuals	Average Length (mm)	Average Temperature (Celsius)
3	Jul	07-24-15	0		13.0
3	Aug	08-20-15	1	195	14.6
3	Sep	09-19-15	8	274	15.1
4	Oct	10-19-15	11	313	16.3
4	Nov	11-21-15	137	323	13.8
4	Dec	12-23-15	116	327	11.4
4	Jan	01-22-16	45	312	7.8
4	Feb	02-16-16	19	293	5.2
4	Mar	03-10-16	43	248	5.8
4	Apr	04-28-16	75	294	7.6
4	May	05-08-16	62	285	8.8
4	Jun	06-26-16	48	280	11.5
4	Jul	07-28-16	5	252	11.9
4	Aug	08-13-16	4	256	13.3
4	Sep	09-03-16	8	295	17.0
5	Oct	10-15-16	9	328	17.1
5	Nov	11-26-16	192	323	13.1
5	Dec	12-11-16	140	310	10.6
5	Jan	01-17-17	33	310	6.2
5	Feb	02-18-17	52	311	4.1
5	Mar	03-13-17	18	308	5.2
5	Apr	04-23-17	41	297	4.8
5	May	05-27-17	24	312	11.3
5	Jun	06-17-17	39	296	10.6
5	Jul	07-15-17	13	282	12.5
5	Aug	08-24-17	16	279	14.1
5	Sep	09-24-17	1	240	17.8

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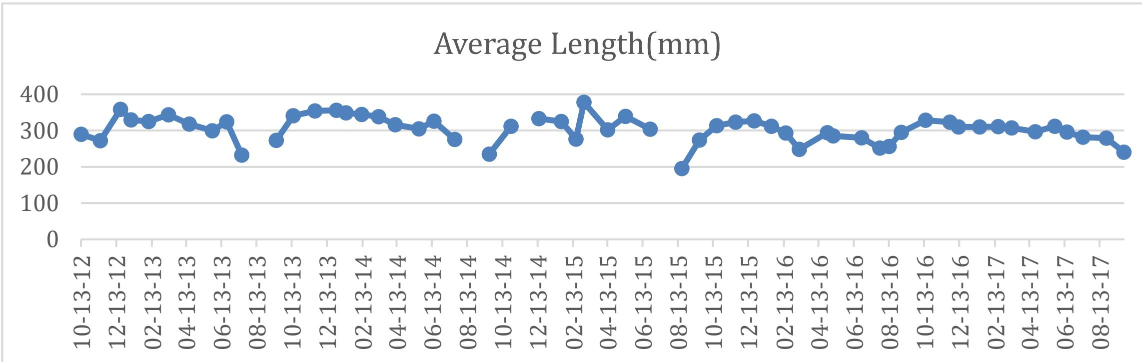
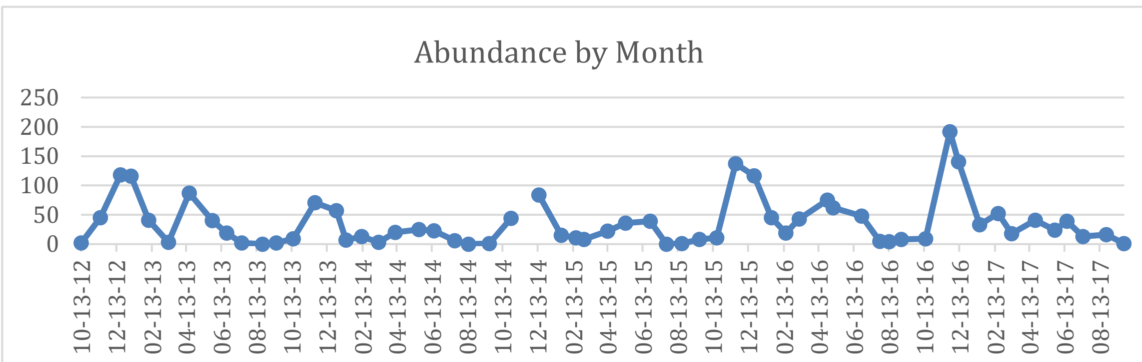
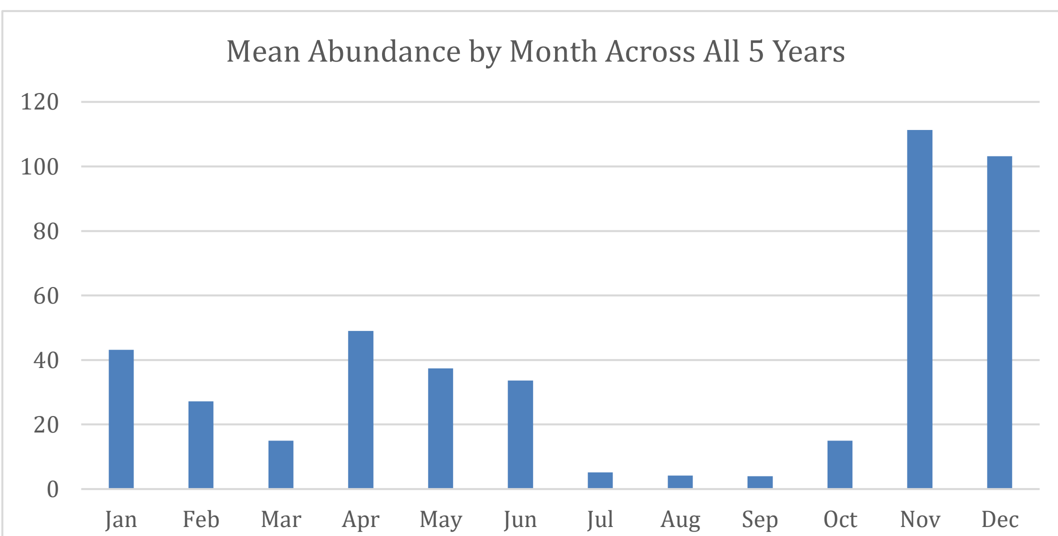
Winter Flounder Data (page 3 of 4)

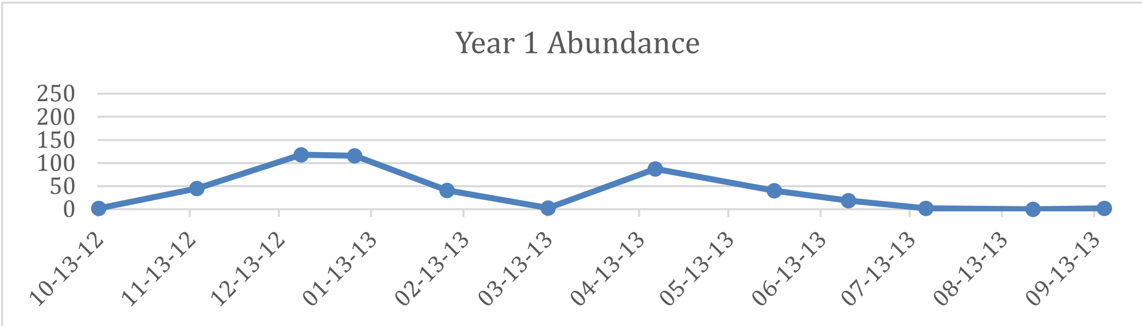
Summary Data

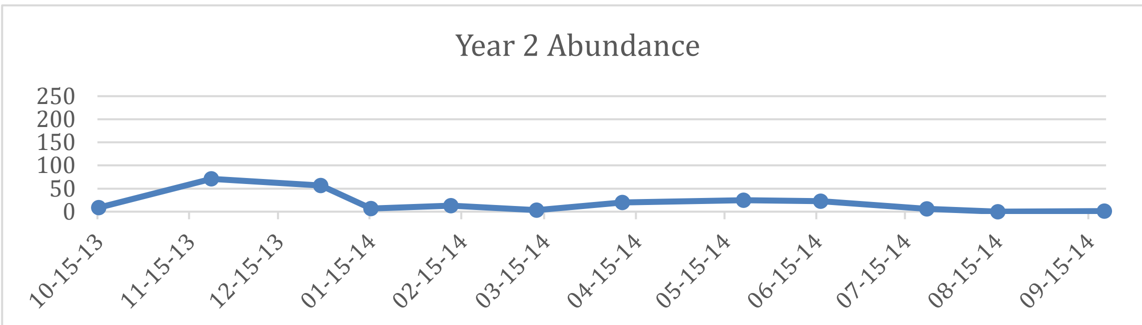


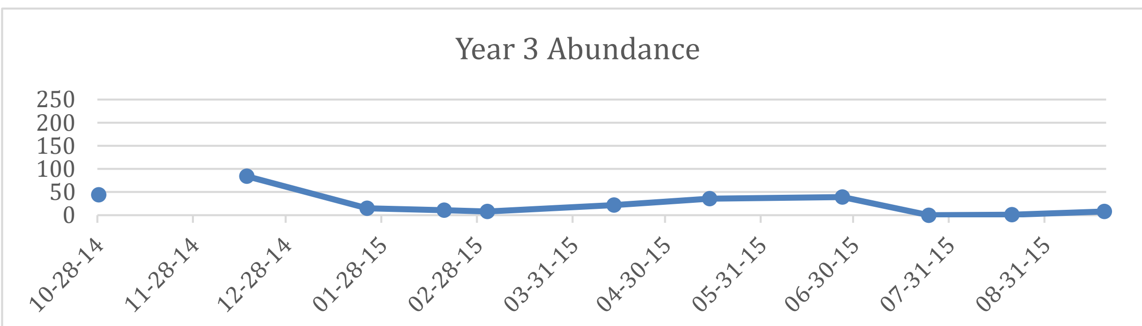


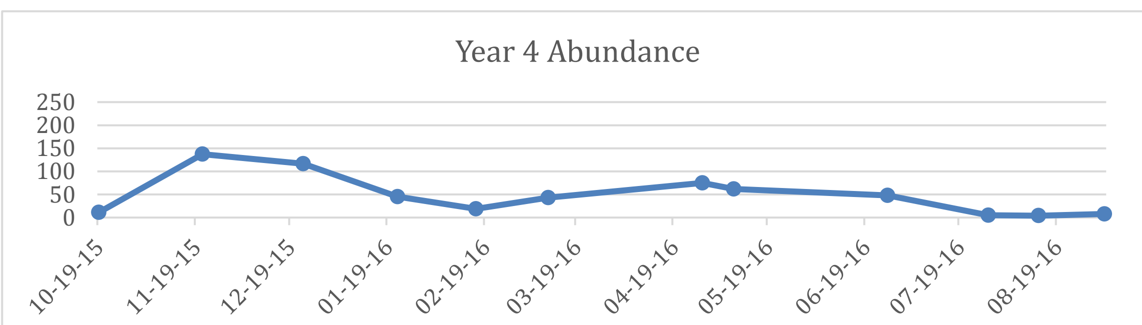


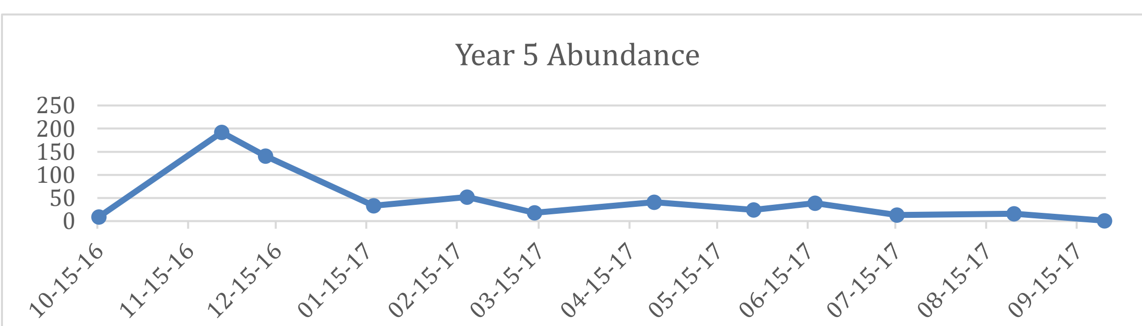
Winter Flounder Data (page 4 of 4)









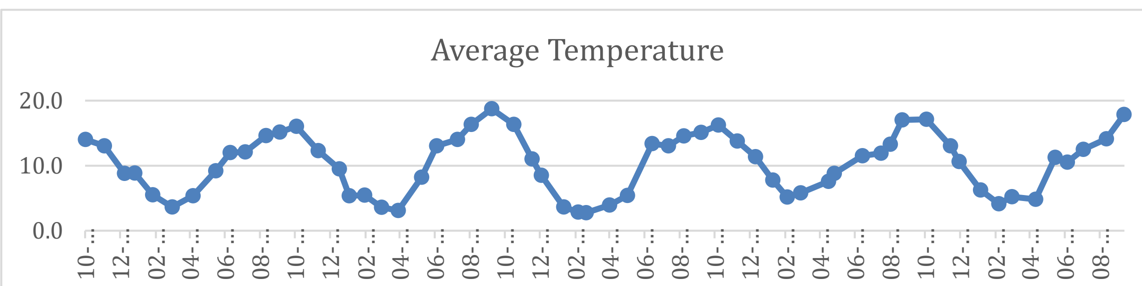


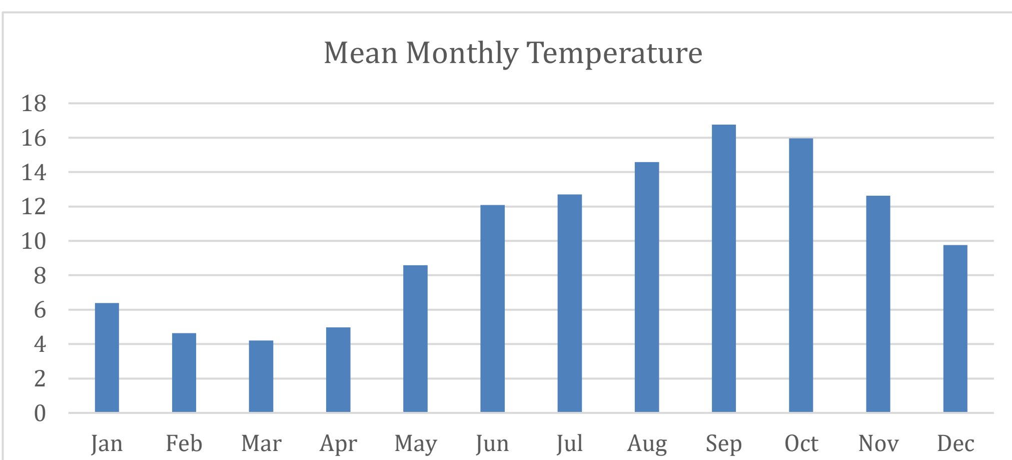
Monthly Temperature Data (page 1 of 2)

Project Year	Month	Date	Average Temperature (Celsius)
1	Oct	10-13-12	14.0
1	Nov	11-15-12	13.0
1	Dec	12-20-12	8.8
1	Jan	01-07-13	8.9
1	Feb	02-07-13	5.5
1	Mar	03-13-13	3.7
1	Apr	04-18-13	5.4
1	May	05-28-13	9.2
1	Jun	06-22-13	12.0
1	Jul	07-18-13	12.1
1	Aug	08-23-13	14.6
1	Sep	09-16-13	15.2
2	Oct	10-15-13	16.1
2	Nov	11-22-13	12.3
2	Dec	12-29-13	9.5
2	Jan	01-15-14	5.4
2	Feb	02-11-14	5.5
2	Mar	03-12-14	3.6
2	Apr	04-10-14	3.1
2	May	05-21-14	8.2
2	Jun	06-16-14	13.0
2	Jul	07-22-14	14.0
2	Aug	08-15-14	16.3
2	Sep	09-20-14	18.7
3	Oct	10-28-14	16.4
3	Nov	11-29-14	11.0
3	Dec	12-15-14	8.5
3	Jan	01-23-15	3.6
3	Feb	02-17-15	2.9
3	Mar	03-03-15	2.8
3	Apr	04-13-15	3.9
3	May	05-14-15	5.4
3	Jun	06-26-15	13.4
3	Jul	07-24-15	13.0
3	Aug	08-20-15	14.6
3	Sep	09-19-15	15.1
4	Oct	10-19-15	16.3
4	Nov	11-21-15	13.8
4	Dec	12-23-15	11.4
4	Jan	01-22-16	7.8
4	Feb	02-16-16	5.2

Monthly Temperature Data (page 2 of 2)

Project Year	Month	Date	Average Temperature (Celsius)
4	Mar	03-10-16	5.8
4	Apr	04-28-16	7.6
4	May	05-08-16	8.8
4	Jun	06-26-16	11.5
4	Jul	07-28-16	11.9
4	Aug	08-13-16	13.3
4	Sep	09-03-16	17.0
5	Oct	10-15-16	17.1
5	Nov	11-26-16	13.1
5	Dec	12-11-16	10.6
5	Jan	01-17-17	6.2
5	Feb	02-18-17	4.1
5	Mar	03-13-17	5.2
5	Apr	04-23-17	4.8
5	May	05-27-17	11.3
5	Jun	06-17-17	10.6
5	Jul	07-15-17	12.5
5	Aug	08-24-17	14.1
5	Sep	09-24-17	17.8

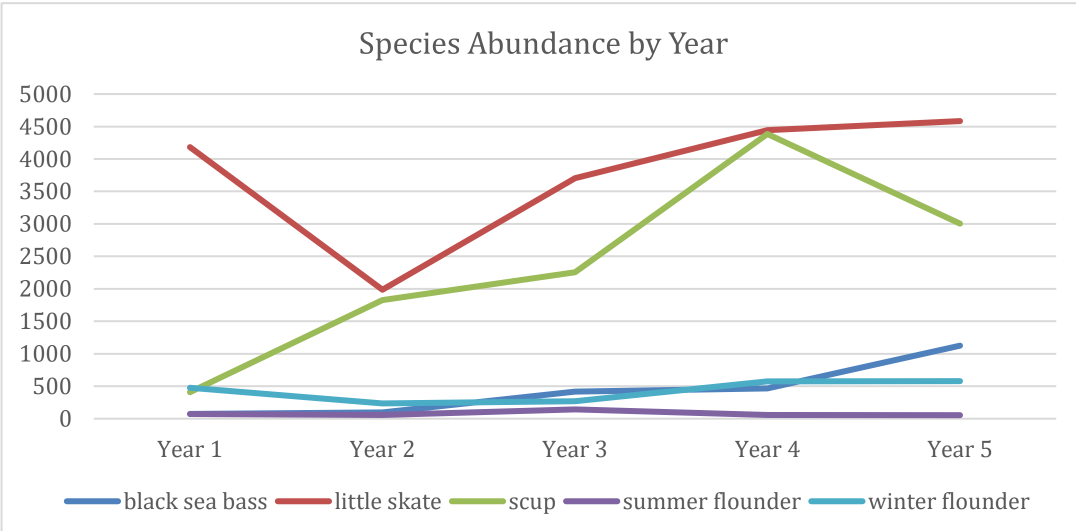


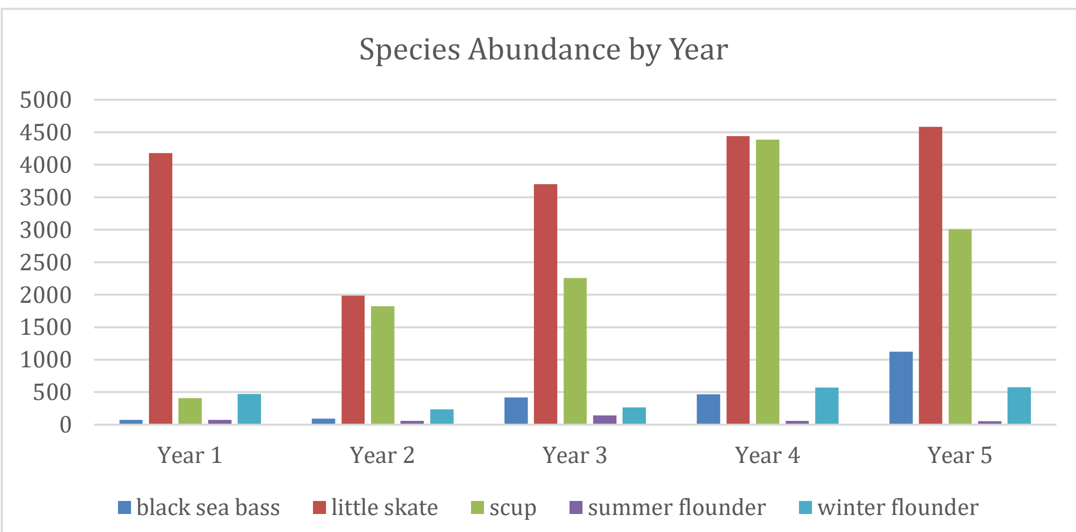


Note: Permission was granted to use the data in the context of this lesson. This data is not available for publication or use outside of the classroom.

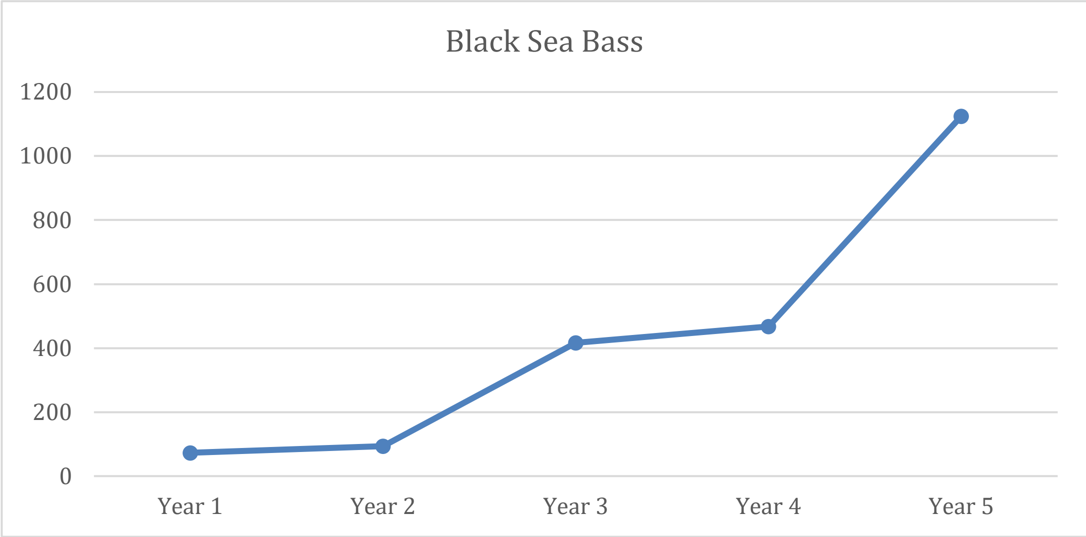
Annual Catch Summary (page 1 of 3)

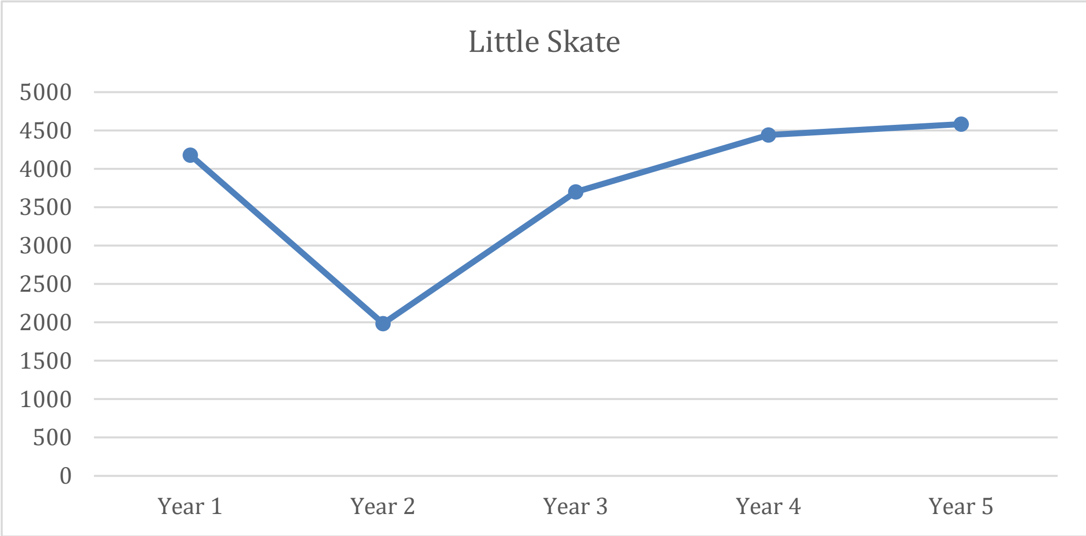
Taxonomic ID	Year 1	Year 2	Year 3	Year 4	Year 5	Total Sum of Individuals
black sea bass	73	94	417	468	1124	2176
little skate	4180	1986	3702	4442	4583	18893
scup	408	1825	2257	4385	3005	11880
summer flounder	72	58	143	58	54	385
winter flounder	475	235	268	574	578	2130

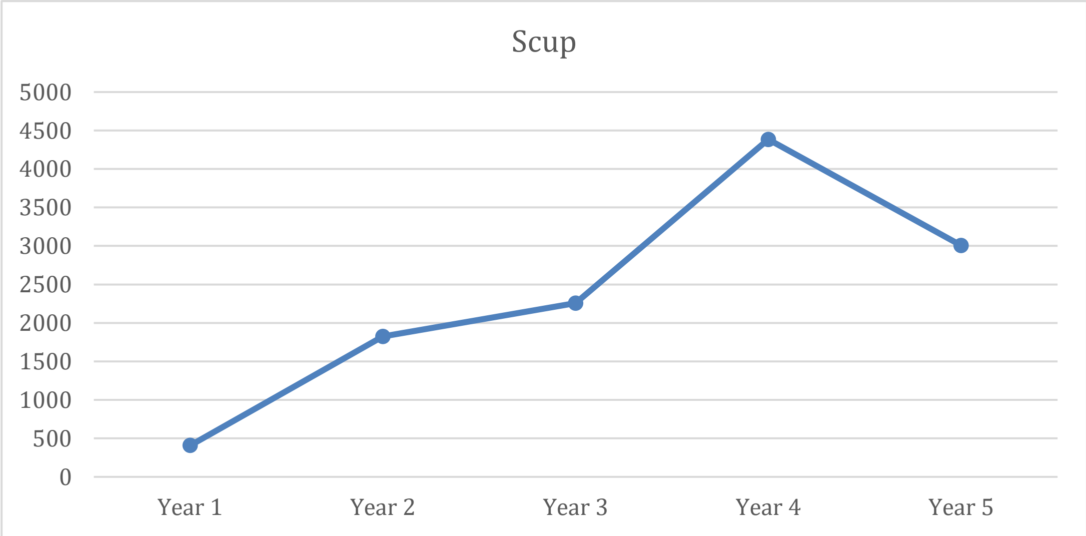




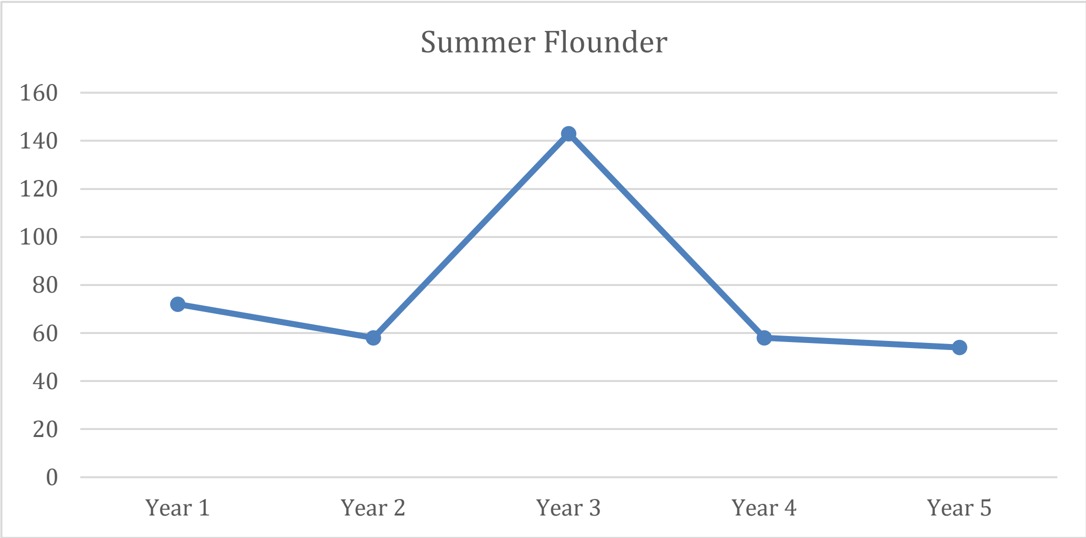
Annual Catch Summary (page 2 of 3)

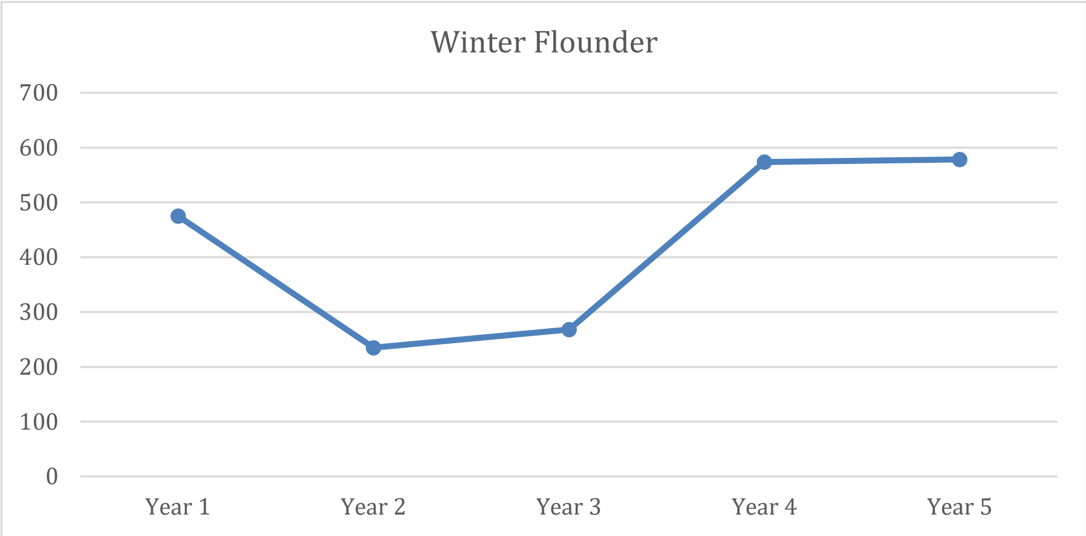






Annual Catch Summary (page 3 of 3)





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Ocean Planning Appendix: Background Information

Ocean planning has been identified by scientists, policy makers and stakeholders around the globe as a practical approach to manage both conflicts and compatibilities in the marine environment in the face of both increasing development pressures and increasing interest and understanding of human interdependence on healthy ecosystems. It is a comprehensive, ecosystem-based planning process, built on sound science to analyze and plan for current and anticipated uses of the ocean. Pioneered in Western Europe, ocean planning is underway in more than 60 countries.

In the early 2000s two bi-partisan ocean commissions, the Pew Ocean Commission and the U.S. Commission on Ocean Policy, articulated a vision for comprehensive ocean governance in the United States, seeing a growing need to support stewardship, multiple use management and science-based decision making. Initial U.S. ocean planning efforts were local and state-based, with Massachusetts, Rhode Island, Oregon, Washington, New York and Connecticut creating state ocean plans for their coastal waters. Ocean planning has been used to reduce ship strikes on endangered whales outside of Boston Harbor by more than 80%, and the Florida Keys National Marine Sanctuary developed ocean plans to reduce conflicts among ocean stakeholders and to protect their coral reefs.

Ocean planning on a regional scale began as a result of the National Ocean Policy, established in 2010 by President Obama. This policy was the result of more than 10 years of work by scientists, policy makers and stakeholders, including ocean industries, coastal residents and conservationists. To implement ocean planning, nine ocean planning areas were designated in the U.S., mostly along large marine ecosystems. In 2016 the Northeast and Mid-Atlantic completed regional ocean plans and began implementing them in 2017. Other regions now have ocean plans in development.

In 2018 the White House revoked the National Ocean Policy, replacing it with one that emphasizes security and commerce over conservation and stewardship. The new policy shifts leadership of regional ocean planning to the states and allows for federal participation and data sharing to continue. With state leadership, ocean planning continues to move the U.S. away from an overly-simplistic issue-by-issue management approach toward comprehensive, informed and strategic ocean management.

Resources Appendix: List of URLs by Lesson

Ocean Stakeholders: Every Voice Matters

- Watch *Ocean Frontiers II* - https://ocean-frontiers.org/of2
- *Ocean Frontiers II* Edpuzzle - http://bit.ly/OF2Edpuz
- Rhode Island Ocean Special Area Management Plan - http://seagrant.gso.uri.edu/oceansamp
- Rhode Island Ocean Special Area Management Plan Practitioner's Guide - http://seagrant.gso.uri.edu/oceansamp/pdf/Practitioner_Guide.pdf
- Keep the Ocean Working - http://keeptheoceanworking.com
- Deepwater Wind - http://dwwind.com
- The Narragansett Indian Tribe - http://narragansettindiannation.org
- *Ocean Frontiers II* clips playlist - http://bit.ly/OF2playlist

Keeping Track Of It All: Using Data Portals for Ocean Planning

- *Ocean Frontiers II: Whales and Wind Farms* - http://bit.ly/OF2WhalesWind
- *Ocean Frontiers II: Data Portal Layers* - http://bit.ly/OF2Portal
- Northeast Data Portal Blank Map - http://bit.ly/NEPortalBlank
- Mid-Atlantic Data Portal Blank Map - http://bit.ly/MAPortalBlank
- West Coast Data Portal Blank Map - http://bit.ly/WCPortalBlank
- Northeast Ocean Data Portal - https://www.northeastoceandata.org
  - Northeast Ocean Data Portal tutorials - https://www.northeastoceandata.org/about/tutorials
- Mid-Atlantic Ocean Data Portal - http://portal.midatlanticocean.org
  - Mid-Atlantic Ocean Data Portal tutorials - http://portal.midatlanticocean.org/how-use-portal
- West Coast Ocean Data Portal - http://portal.westcoastoceans.org
- Governors' South Atlantic Alliance Coast & Ocean Portal - http://gsaaportal.org
- Gulf of Mexico Data Atlas - https://www.ncddc.noaa.gov/website/DataAtlas/atlas.htm
- Caribbean Regional Ocean Partnership Marine Planner - http://planner.caribbean-mp.org
- Great Lakes Observing System - https://portal.glos.us
- Alaska Ocean Observing System Data Explorer - https://portal.aoos.org

Multi-Species Management: We're All In This Together

- *Science Friday: The Whales of New York* - http://bit.ly/SFWhalesNY
- *Ocean Frontiers II: Systems View* - http://bit.ly/OF2Systems
- Marine Food Chain (Encyclopedia Britannica 2006) - http://bit.ly/FoodChainEB
- Marine Food Web (JNCC/Alejandra Bize) - http://bit.ly/FoodWebJNCC
- Mid-Atlantic Ocean Data Portal: Ocean Story #2 - http://portal.midatlanticocean.org/ocean-stories/gotham-whale-new-york-humpbacks
- Aquatic Food Webs (NOAA) - http://www.noaa.gov/resource-collections/aquatic-food-webs
- Science Learning Hub, Marine Food Webs - https://www.sciencelearn.org.nz/resources/143-marine-food-webs
- 3 Animals That Keep Their Whole Ecosystem Together (Keystone Species) - https://youtu.

be/JGcIp4YEKrc

- Some Animals Are More Equal than Others: Keystone Species and Trophic Cascades - https://youtu.be/hRGg5it5FMI
- Menhaden (Virginia Institute of Marine Sciences) - http://www.vims.edu/research/units/projects/menhaden/about
- North Atlantic Right Whale - https://www.fisheries.noaa.gov/species/north-atlantic-right-whale

Collaborative Research: Block Island Wind Farm

- *Ocean Frontiers II: Collaborative Research* - http://bit.ly/OF2Research
- Research NOAA Fact Sheets - https://www.nefsc.noaa.gov
- Economic Information on New England Fisheries - https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/index
- INSPIRE Environmental Poster - Local Knowledge and Strong Science Build Broad Support for the Block Island Wind Farm - https://ocean-frontiers.org/wp-content/uploads/2018/06/AWEA_2017_LocalKnowledge_09262017.pdf
- INSPIRE Environmental Poster - Assessing Potential Impacts on Demersal Fish of Block Island Wind Farm Construction and Operation - https://ocean-frontiers.org/wp-content/uploads/2018/06/AWEA_2016_DemersalTrawl_REVISED.pdf
- INSPIRE Environmental - http://www.inspireenvironmental.com
- Deepwater Wind - http://dwwind.com