Dauphin Island Sea Lab
DISCOVERY HALL PROGRAMS

Building an Oyster Reef: A 3-D Activity

Created by:
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Discovery Hall Programs
Dauphin Island Sea Lab

Building an Oyster Reef: A 3-D Activity

Subject: Life Science

Grade Level: 2-5

Time Required: 60 min

Key Terms: oyster, oyster reef, erosion, salt marsh, habitat

I. Course of Study:

Alabama Course of Study (ALCOS)

2nd Grade, Life Science, Content Standard 8
Identify evidence of erosion.

3rd Grade, Life Science, Content Standard 10
Determine habitat conditions that support plant growth and survival.

3rd Grade, Life Science, Content Standard 13
Describe ways to sustain natural resources, including recycling, reusing, conserving, and protecting the environment.

4th Grade, Life Science, Content Standard 5
Describing behaviors and body structures that help animals survive in particular habitats.

5th Grade, Life Science, Content Standard 9
Describe the relationship of populations within a habitat to various communities and ecosystems.

~~National Science Education Standards:~~

Science as Inquiry E.A.2 *Understanding about scientific inquiry*
Life Science E.C.1 *Characteristics of organisms*
Life Science E.C.3 *Organisms and environments*
Science in Personal and Social Perspectives E.F.3 *Types of resources*
Science in Personal and Social Perspectives E.F.4 *Changes in environments*
History and Nature of Science E.G.1 *Science as a human endeavor*

Ocean literacy standards:

Essential Principle 1: *The Earth has one big ocean with many features.*
Essential Principle 5: *The ocean supports a great diversity of life and ecosystems.*
Essential Principle 6: *The ocean and humans are inextricably interconnected.*

II. Concepts

Eastern oysters, *Crassostrea virginica*, are mollusks that live in marine and estuarine (brackish) waters. They have two shells that are hinged (bivalves) and filter plankton from the water. Oysters and the ecosystem services they provide improve the habitat around them. As they pass water through their bodies to feed and breathe, they also remove pollutants from the water. Oysters grow on top of one another forming large reefs or bars. These reefs provide habitat for many species of crabs, shrimp and fish and many species of birds depend on oyster reefs, eating the oysters and small animals hiding in the spaces between the oysters. Oyster reefs can also help slow or even prevent erosion. As waves pass over oyster reefs, wave energy is reduced and water slows down. This keeps strong waves from crashing onto the salt marshes that line the shore and also allows sediment carried by the waves to be deposited.

Salt marshes occur along low energy shorelines and also provide a number of important ecosystem services. Marshes trap sediment and pollutants as water runs off the land and absorb large volumes of water, preventing flooding. Marshes also provide an important nursery for juvenile animals. Much of the seafood that people like to eat grows up in the safety of salt marshes.

In many places across the United States, oysters are becoming much less common and salt marshes are being lost. Oyster decline may be due to over-harvest, disease, predation, poor water quality or a combination of several environmental or manmade factors. Dredging, filling, damming and other human activities have contributed to the loss of salt marshes. Sea level rise also threatens these habitats.

Scientists and environmental managers are studying oysters and the use of engineered oyster reefs as "living" methods to protect salt marshes from erosion and to provide more oyster habitat. Research scientists at the Dauphin Island Sea Lab are testing the two restoration techniques included in this lesson, concrete domes and steel rebar cages, along with bagged oyster shell. The concrete domes have an exposed rocky surface that provides oysters a hard surface to settle on and the triangular steel rebar cages are filled with oyster shells. All three methods were developed to create oyster habitat, improve water quality and reduce shoreline erosion.

III. Learning Objectives:

Students will:

- learn about oysters, oyster reefs and the ecosystem services they provide
- identify common inhabitants of oyster reefs
- examine sources of coastal erosion, both man-made and natural
- explore different types of engineered oyster reefs
- make their own paper models of engineered oyster reefs

IV. Materials:

Handouts (reef and animal sheets)

Scissors
Tape or glue
Construction paper
Colored pencils or markers
Images of engineered oyster reefs

V. Instructions

Opening

Discuss oyster biology and ecology at grade level. Discuss the ecosystem services provided by oyster reefs. Show examples of natural and engineered oyster reefs and talk about the services they provide. Discuss the animals that can be found living in and amongst oyster reefs. Remind the students that like natural oyster reefs, engineered reefs provide habitat and slow waves as they come ashore. Describe how the slowing of the water allows sediments to settle and makes the environment more suitable for marsh grasses to grow. Show examples of engineered oyster reefs.

Activity

Distribute oyster reef and animal cut outs. Instruct the students on how to color, cut and fold the shapes to create 3 dimensional models. Color and cut out reef animals. Use paper, craft sticks, string or other items to arrange your reefs.

Extension

Create a diorama or other large visual display. One half can show an area without an oyster reef. The other half can show what the environment looks like with an oyster reef (natural or engineered) with plants and animals living amongst it. This can also be done in an empty aquarium with all of the students contributing reefs and animals.

Assessment

1. Have students write a short essay on why they think oyster reefs, salt marshes and/or other coastal habitats are important to the environment and to people. Why do they personally care if these habitats remain?

2. Assign students to research one of the animals commonly found living in or around oyster reefs. In what way does the animal depend on the oyster reef?

VI. Resources and References

Dauphin Island Sea Lab
www.disl.org
Dauphin Island Sea Lab – Discovery Hall Programs
http://dhp.disl.org

The Nature Conservancy
www.nature.org

National Oceanic and Atmospheric Administration- Restoration Center
www.habitat.noaa.gov/restoration

Reef Ball Foundation
www.reefball.com

Reefblk – Coastal Environments, Inc.
www.reefblk.com

This document was developed by the Dauphin Island Sea Lab Discovery Hall Programs. DISL scientists participated in the monitoring of a large-scale oyster reef restoration project and DHP educators provided education and outreach for the project.

"This project was made possible through support provided by the NOAA and The Nature Conservancy, under the terms of ARRA Grant #NA09NMF4630304. The content and opinions expressed herein are those of the author(s) and do not necessarily reflect the position or the policy of the NOAA or The Nature Conservancy, and no official endorsement should be inferred.

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NATURAL & ENGINEERED OYSTER REEFS

IMAGES TO ACCOMPANY
BUILDING AN OYSTER REEF: A 3-D ACTIVITY

OYSTERS & OYSTER REEFS

- Oysters occur in small clusters along intertidal mudflats and can form large subtidal reefs
- Oysters filter pollutants from the water and provide food and habitat for many species of crabs, shrimp and fish
- Artificial oyster reefs are used to increase oyster habitat and prevent shoreline erosion

Oyster Reefs are Important

- Hundreds of species are associated with oyster reefs. They provide habitat for juvenile fish and invertebrates as well as substrate for sessile organisms.
- One adult oyster can filter up to 50 gallons of water per day contributing to the water clarity needed for seagrasses to thrive.
- Oyster reefs stabilize shorelines and reduce erosion.
- Oysters are an economically important species throughout the southeastern United States.
- Oyster reefs serve as feeding grounds for wading birds and fish such as snapper, grouper, and snook.

Image provided by:

Loxahatchee River District

"Preserving Nature by Design" TM

Poster Series, No. 5

www.loxahatcheeriver.org

3 ENGINEERED OYSTER REEFS: An Experiment of the Dauphin Island Sea Lab and the Nature Conservancy

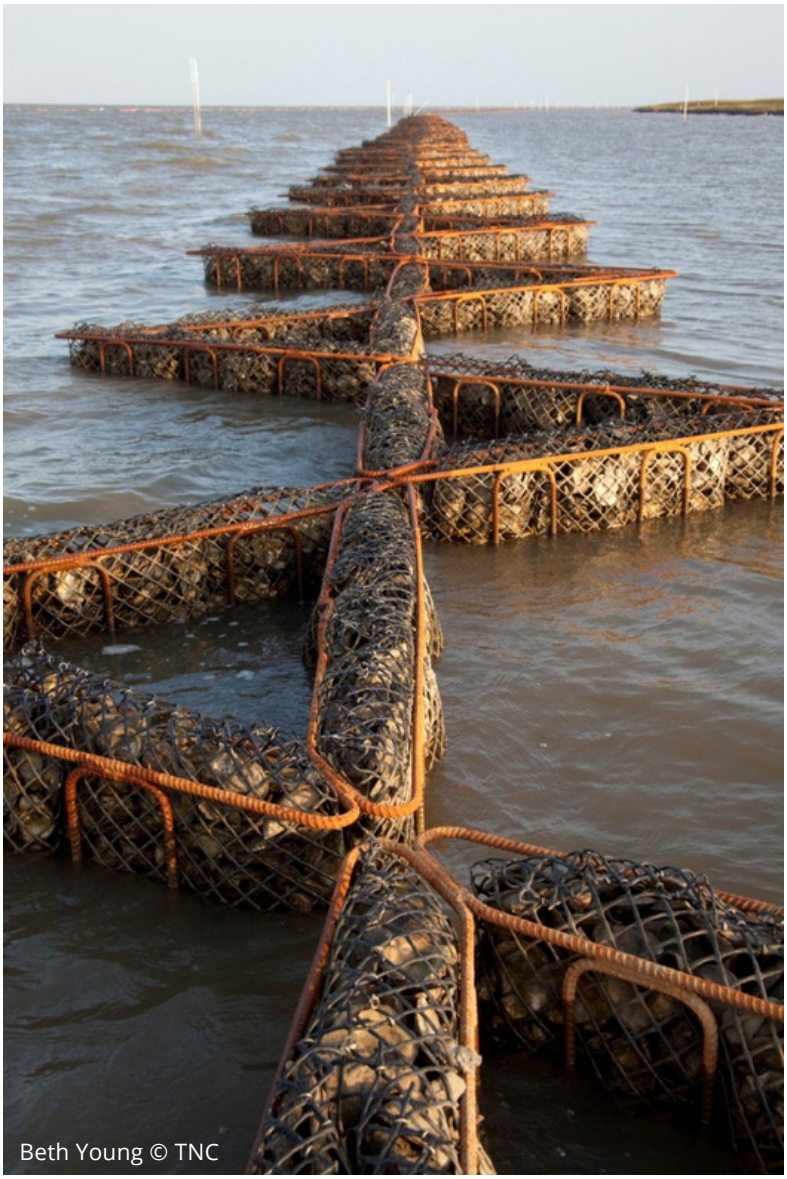
Reefblk℠, Reef Ball™ and bagged shell

REEFBLK℠

(PRONOUNCED REEF BLOCK)

- Steel rebar cages create triangular prisms
- Bags filled with oyster shells collected from shucking houses
- Arranged in an alternating zig-zag pattern

Cages absorb wave energy as water passes through. This can help prevent erosion along the shore and allow sediments to deposit. The oyster shells provide a hard surface for oyster larvae and other filter feeding animals to settle on. The oyster shells also create spaces for animals to hide.



Beth Young © TNC

CLOSE UP OF REEFBLKSM CAGE

REEF BALL™

- Concrete domes with exposed rock surface
- Arranged in nested rows

Wave energy is absorbed as water passes through the holes of the concrete domes. The rocky surface provides a place for oysters and other animals to settle. The holes also provide hiding places for small and juvenile crabs, shrimp and fish.

Beth Young © TNC

Jeff DeQuattro © TNC

BAGGED OYSTER SHELL

Ryan Moody DISL

- Biodegradable plastic mesh bags filled with oyster shell
- Like the cages, oyster shell collected from shucking houses is used in these reefs
- Shell provides a desirable surface for oysters to settle and places for animals to hide

OTHER ENGINEERED OYSTER REEFS...

Oyster shell and fencing material

OYSTER CASTLES®

Before

After

Photos by: Allied Concrete Co.

OYSTER RINGS

CREATED BY:
JOANN MOODY & TINA MILLER-WAY
DISCOVERY HALL PROGRAMS
DAUPHIN ISLAND SEA LAB

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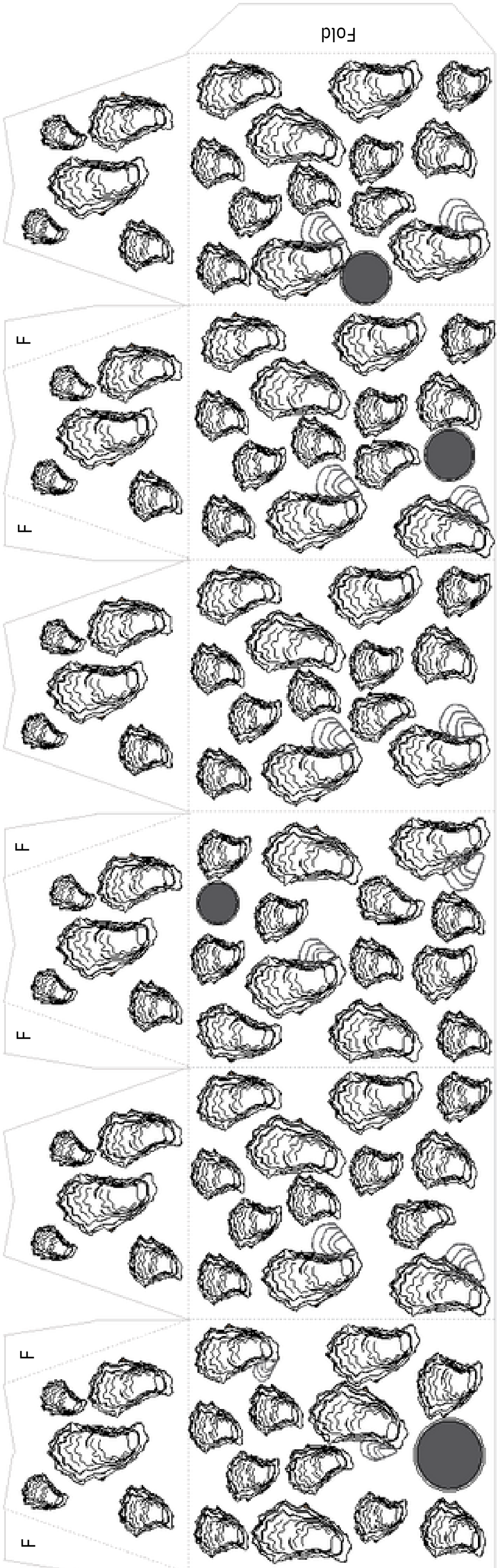
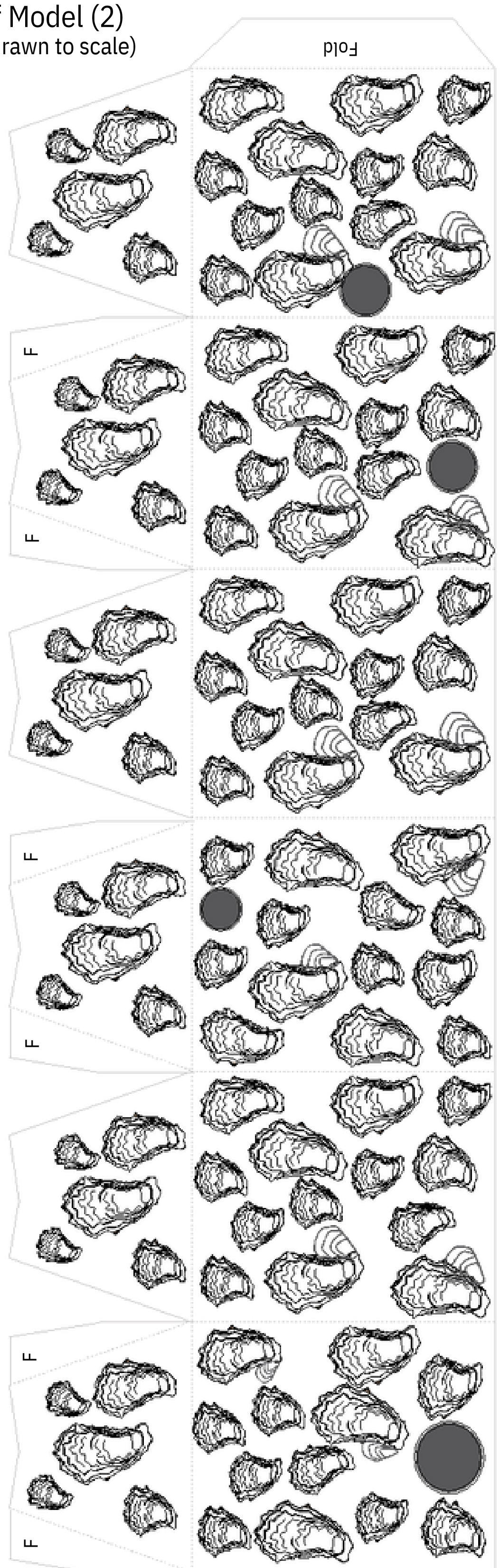
3-D Artificial Oyster Reef Model (2)

(not drawn to scale)

1. Color
2. Cut on solid lines
3. Fold on dotted lines
4. Use tape or glue to secure tabs (final shape should resemble a dome)



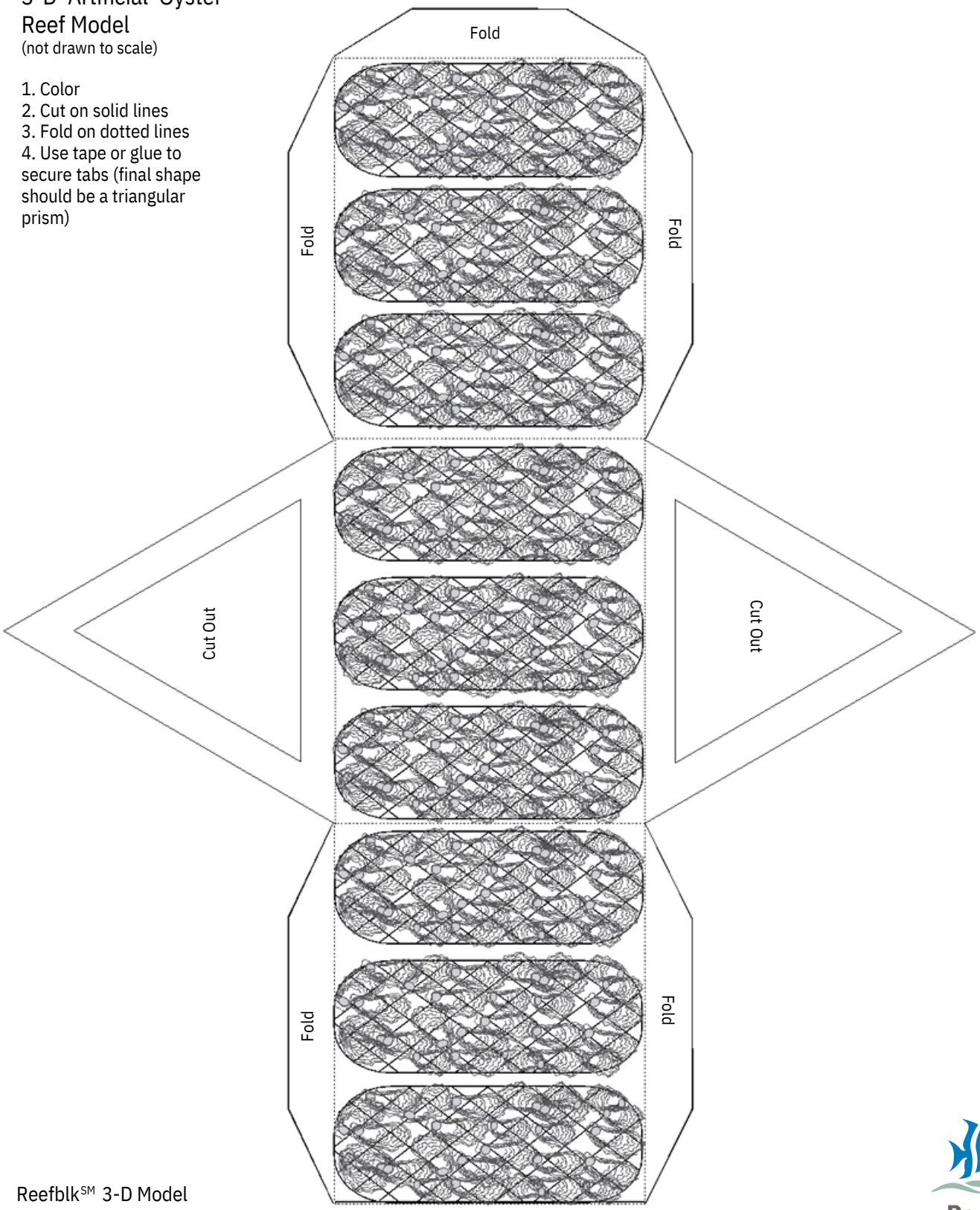


Reef Ball 3-D Model

3-D Artificial Oyster Reef Model

(not drawn to scale)

1. Color
2. Cut on solid lines
3. Fold on dotted lines
4. Use tape or glue to secure tabs (final shape should be a triangular prism)



Reefblk℠ 3-D Model

Dauphin Island Sea Lab

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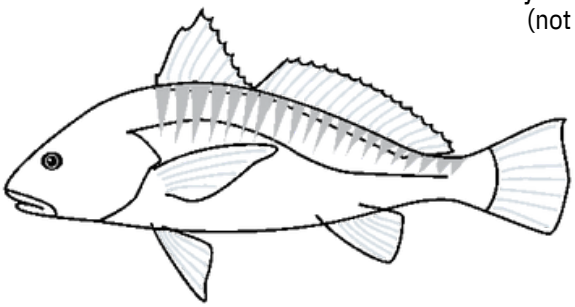
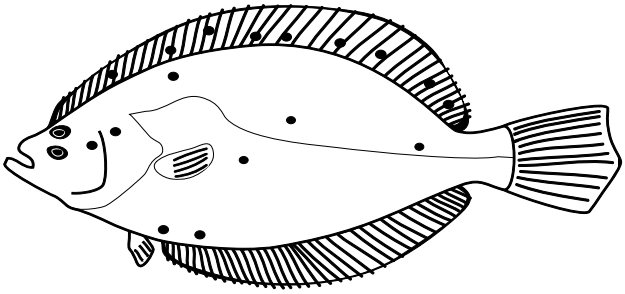
Oyster Reef Animals

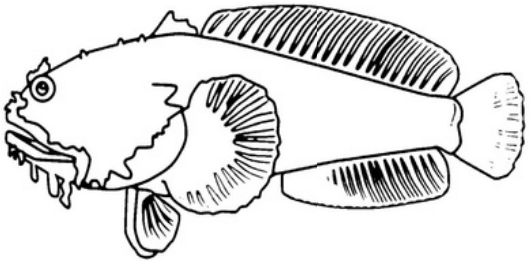
(not drawn to scale)



Croaker

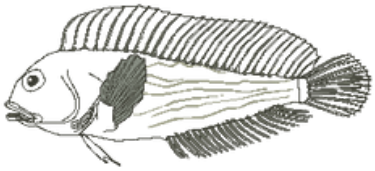


Flounder

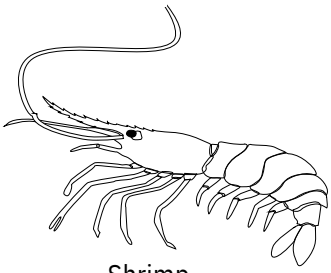


Oyster Toadfish

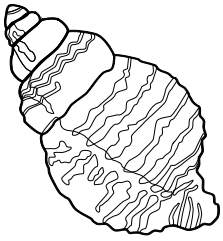
Blue Crab



Blenny



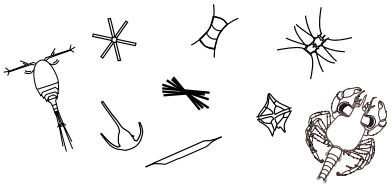
Shrimp



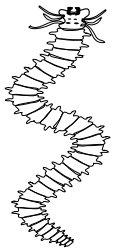
Oyster Drill Snail

Amphipod

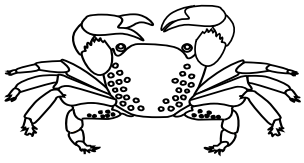
Barnacles



Phytoplankon & Zooplankton



Worm



Mud Crab