

## STUDENT WORKSHEET

Name: \_\_\_\_\_ **ANSWER KEY**

Welcome to the Museum! In the *Unseen Oceans* exhibition, you will explore how scientists study the oceans and the organisms that live there.

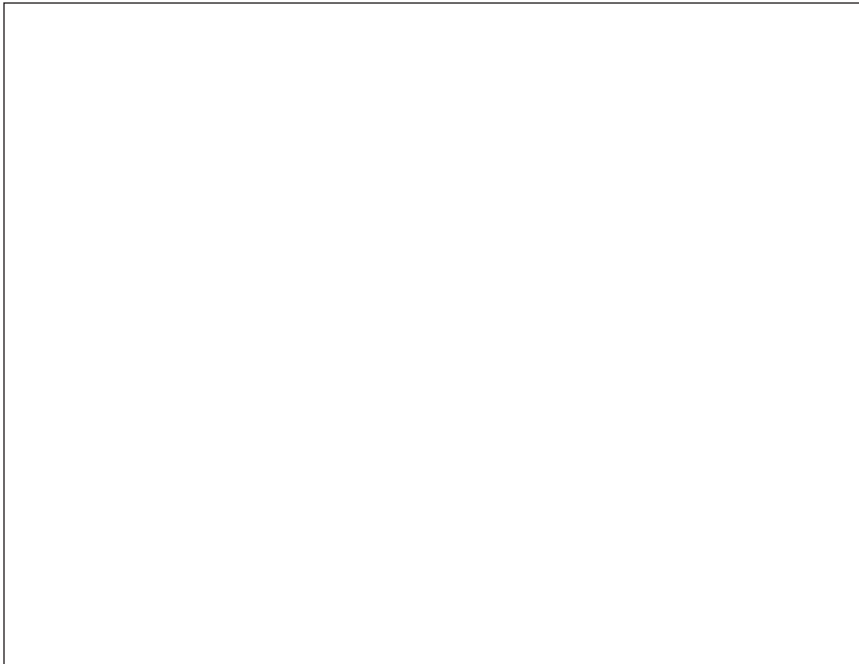
## 1. Mysterious Drifters

In this section, you will investigate **plankton**, free-floating marine organisms that drift with ocean currents.

Why is plankton an important part of the marine ecosystem?

*Answer: Plankton are important because they produce oxygen via photosynthesis and form the base of marine food webs.*

**Draw** and **label** one of the plankton organisms in the exhibition.



Name of organism:

*Answers may vary.*

Notes / Observations / Questions:

*Answers may vary.*

## SCIENTIST AT WORK



**Watch** the Scientist at Work video about Kelly Benoit-Bird.

*"I spend a lot of time aboard ship. There, when things break you have to fix them yourself, and I like the challenge."*

– Kelly Benoit-Bird

**STUDENT WORKSHEET****ANSWER KEY**

How does Kelly study organisms in the ocean?

*Answer: She uses a self-piloting submarine equipped with a sonar called DOR-E. The sonar helps her visualize various organisms using sound waves. This way, she can observe the distribution of predators and prey and the ways in which they interact.*

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What did Kelly do as a child that is now useful to her work as an oceanographer?

*Answer: She used to help her dad, an auto mechanic. This early experience tinkering in his garage still informs how she approaches ocean research. When out in the open ocean she often uses her skills to repair equipment with limited resources and tools.*

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## 2. Secret Lives

Some marine organisms are **biofluorescent**. They have molecules in their bodies that absorb light and then re-emit it.

**Describe** a biofluorescent animal in the exhibition.

*Answers may vary.*

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Why is biofluorescence helpful to marine organisms?

*Answer: Experts think that biofluorescence helps organisms recognize the members of their own species in a very dim environment.*

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### SCIENTIST AT WORK

**Watch** the Scientist at Work video about John Sparks and Dave Gruber, and **experiment** with the camera interactive.

What tools do John Sparks and Dave Gruber use to study fluorescent sharks?

*Answer: They built a camera that can see what sharks can see. By using specialized light and filters, they can detect fluorescence in marine animals.*

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## STUDENT WORKSHEET

## ANSWER KEY

### 3. Encountering Giants

**Whales** are some of the most charismatic marine animals, but we know relatively little about them.

#### SCIENTIST AT WORK

**Watch** the Scientist at Work video about Jeremy Goldbogen and Ari Friedlaender, and **examine** the whale trackers on the table.

*“Curiosity drives a lot of our research. We want to understand how these enigmatic gigantic animals live.”*

– Jeremy Goldbogen



List some of the problems with the design of the first tracker, the “Fickle Beast”	List how scientists have improved upon the first prototype in the Version 3.0 tracker
<p><i>Answers may include:</i></p> <ul style="list-style-type: none"> <li>• weight reducing curves created drag, which sometimes pushed the tag from the whale’s back to its belly</li> <li>• tag’s data recorder was finicky resulting in loss of data</li> <li>• large, soft suction cups were not very effective</li> </ul>	<p><i>Answers may include:</i></p> <ul style="list-style-type: none"> <li>• added styrofoam to the curves to reduce drag</li> <li>• used small, stiff suction cups that affixed better to whale</li> <li>• added right and left facing cameras</li> <li>• added a new VHF transmitter, which improved data transition</li> </ul>

### 4. Going Deep

The **deep ocean** is mostly explored from afar using sound waves, radars, and lasers.

**Explore** the topography interactive in the middle of the room, in particular, the section titled “Hidden.”

Describe the Hudson Canyon, how it was made, and its biodiversity today.

*Answer: The Hudson River once carved a valley through what was then dry land, but is now the undersea continental shelf. The river drained water from the miles-thick ice sheet blanketing North America. The canyon supports a complex ecosystem including fish, krill, corals, and sponges.*

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## ANSWER KEY

## SCIENTIST AT WORK

**Watch** the Scientist at Work video about Kaitlyn Becker, and **examine** the robotic gripper on the table.

Why was the robotic gripper developed? How does it help scientists study the creatures of the deep?

*Answer: Creatures of the deep are often fragile and bringing them to the surface damages them permanently. Soft grippers can help scientist study and collect these organisms without damaging them.*



## 5. Taking a Dive

**Observe** the styrofoam cups and plexiglass display.

Traveling to the deep involves major challenges. What are some of those challenges and how did scientists tackled them?

*Answer: The deeper you dive the higher the pressure. Submersibles are built to withstand the pressure.*

*For example, the acrylic sphere in the Triton 3000 is 6.6 inches thick.*

## SCIENTIST AT WORK

**Read** about Dawn Wright next to the plexiglass display.

What is her job? Why is her work important?

*Answer: Dawn Wright maps the ocean floor. Maps of the ocean floor are important for improving maritime navigation, observing underwater volcanoes, tracking deep oil spills, and designing and maintaining marine reserves and sanctuaries.*

## 6. Vital Abundance

From overfishing to altering Earth's climate, **human activity** is changing the ocean and threatening the organisms that live there. Scientists are working to understand how we are affecting the ocean ecosystems and how we can stop their degradation.

**Watch** the Conservation Scientist stories about sustainable fishing, protecting marine habitats, and addressing climate change.

**Choose** one story and **record** the following:

Name of scientist:

*Answer will include one of the following: (1) Nyawira Muthinga: Kenya; (2) Rubaiyat Mansur Mowgli: Bangladesh; (3) Ruth Gates: Hawai'i*

**STUDENT WORKSHEET****ANSWER KEY**

Description of the threat:

*Answer will include one of the following:*

*(1) Nyawira Muthinga: coral reef conservation;*

*(2) Rubaiyat Mansur Mowgli: protecting whales from fishing nets;*

*(3) Ruth Gates: corals are being damaged by climate change*

How is this conservation scientist working to address the threat?

*Answer will include one of the following:*

*(1) Nyawira Muthinga: helping teach local fishermen to use practices that won't damage reefs;*

*(2) Rubaiyat Mansur Mowgli: persuading the government to create a protected region for dolphins;*

*(3) Ruth Gates: learning about the types of corals that are more resistant to climate change*

**SCIENTIST AT WORK**

**Explore** the Scientist at Work display about Jules Jaffe.



*"I love the experience of discovery—when you know you are literally the first person on the planet to observe something."*

*— Jules Jaffe*

How are mini-autonomous underwater explorers (m-AUEs) helpful in studying the ocean?

*Answer: These tracking devices are important for studying plankton (which include the larvae of fish, shellfishes, corals, and other invertebrates) and creating marine sanctuaries to protect them. They can be used to track oil spills and other pollutants. Finally, they can be equipped with microphones and transmit whale sounds.*

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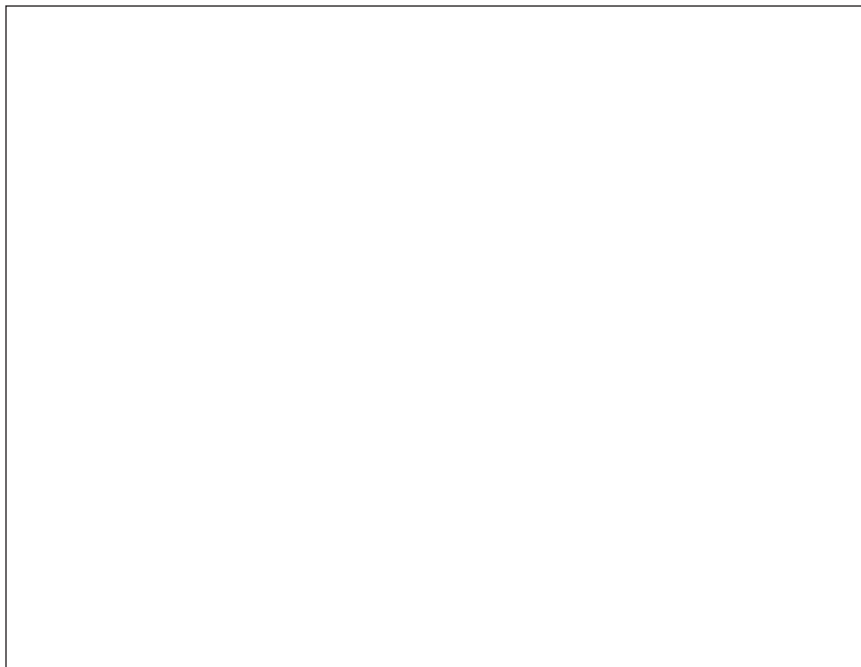
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Notes / Observations / Questions:

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