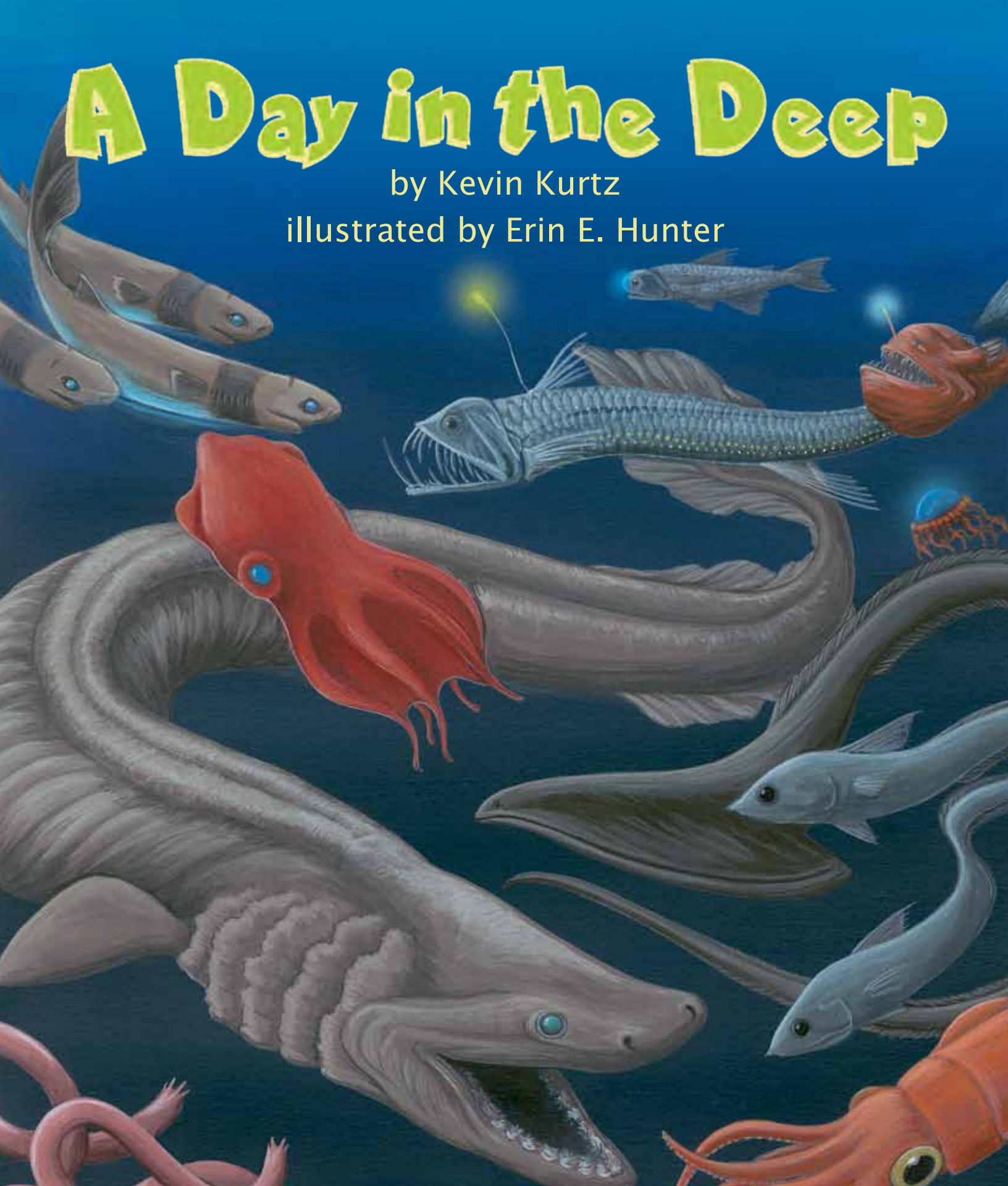


A Day in the Deep

by Kevin Kurtz

illustrated by Erin E. Hunter



A Day in the Deep

Travel deep into the ocean — way below the surface — and you'll encounter some creatures you never knew existed! This book takes you on a journey through the dark depths of the sea towards the ocean floor. Most ecosystems need sunlight, but deep in the ocean where the sun doesn't shine, animals have adapted some very interesting ways to see, protect themselves, and eat. Discover the unique habitats, adaptations, and food chains of these deep-sea creatures.

Animals in the book include: *Sargassum* fish, cookiecutter shark, viperfish, plankton, headlight fish, vampire squid, frilled shark, spookfish, marine snow, pelican eel, *Atolla* jellyfish, and anglerfish

It's so much more than a picture book . . . this book is specifically designed to be both a fun-to-read story and a launch pad for discussions and learning. Whether read at home or in a classroom, we encourage adults to do the activities with the young children in their lives. Free online resources and support at ArbordalePublishing.com include:

- For Creative Minds as seen in the book (in English & Spanish):
 - Deep Ocean Habitats
 - Match the Animal to its Life Zone
 - Glowing in the Dark
 - Living Under Pressure
- Teaching Activities (to do at home or school):
 - Reading Questions
 - Language Arts
 - Coloring Pages
 - Math
 - Science
- Interactive Quizzes: Reading Comprehension, For Creative Minds, and Math Word Problems
- English and Spanish Audiobooks
- Related Websites
- Aligned to State and Core Standards
- Accelerated Reader and Reading Counts! Quizzes
- Lexile and Fountas & Pinnell Reading Levels

eBooks with Auto-Flip, Auto-Read, and selectable English and Spanish text and audio available for purchase online.

Thanks to Dr. George I. Matsumoto, Senior Education and Research Specialist at the Monterey Bay Aquarium Research Institute for reviewing the accuracy of the information in this book.

Kevin Kurtz developed his interest in the deep sea while spending eight weeks as the Educator at Sea aboard the marine geology research vessel *JOIDES Resolution*. He holds degrees in English literature and elementary education and started his career by working at a marine biology lab. Since then, he has combined all of these experiences by working as an environmental educator and curriculum writer for organizations such as the South Carolina Aquarium, the Science Factory Children's Museum, and the Center for Birds of Prey. Kevin has authored *A Day in the Deep*, *A Day on the Mountain*, and the award-winning *A Day in the Salt Marsh*. Visit his website at kevinkurtz.homestead.com.

Erin E. Hunter is both a children's book and scientific illustrator. She has illustrated *A Day in the Deep*, *A Day on the Mountain*, *Multiply on the Fly* and *The Great Divide* for Arbordale. In addition, she has taught botanical illustration and field sketching at UC Santa Cruz. Erin's portfolio includes print and online design projects for clients ranging from marketing firms to culinary groups to educational organizations. Erin lives with her husband on California's Monterey Peninsula. When she's not sketching and painting, she tends to flowers, fruit trees, and vegetables in her backyard garden. Visit her website at eehunter.com.



Kevin Kurtz

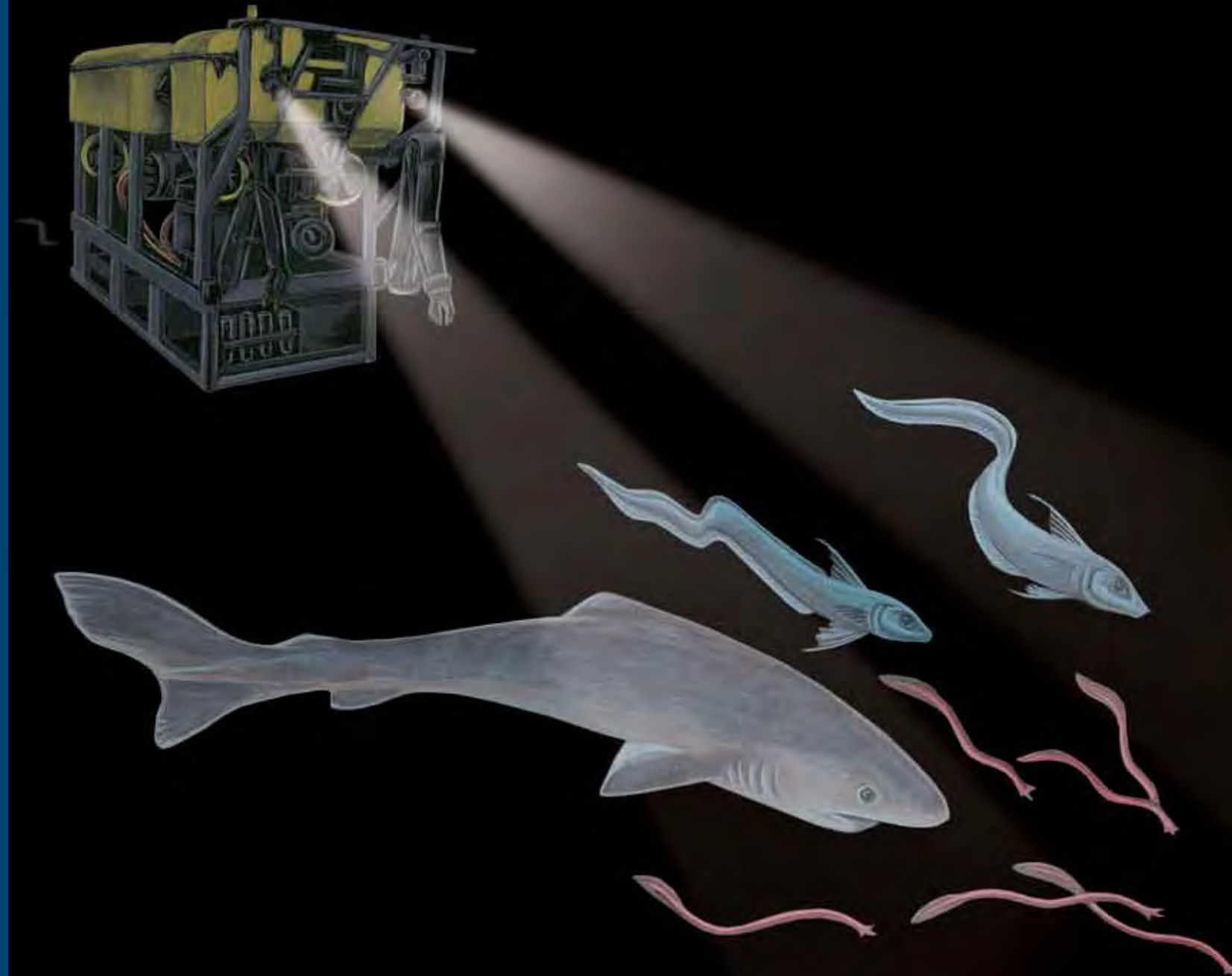


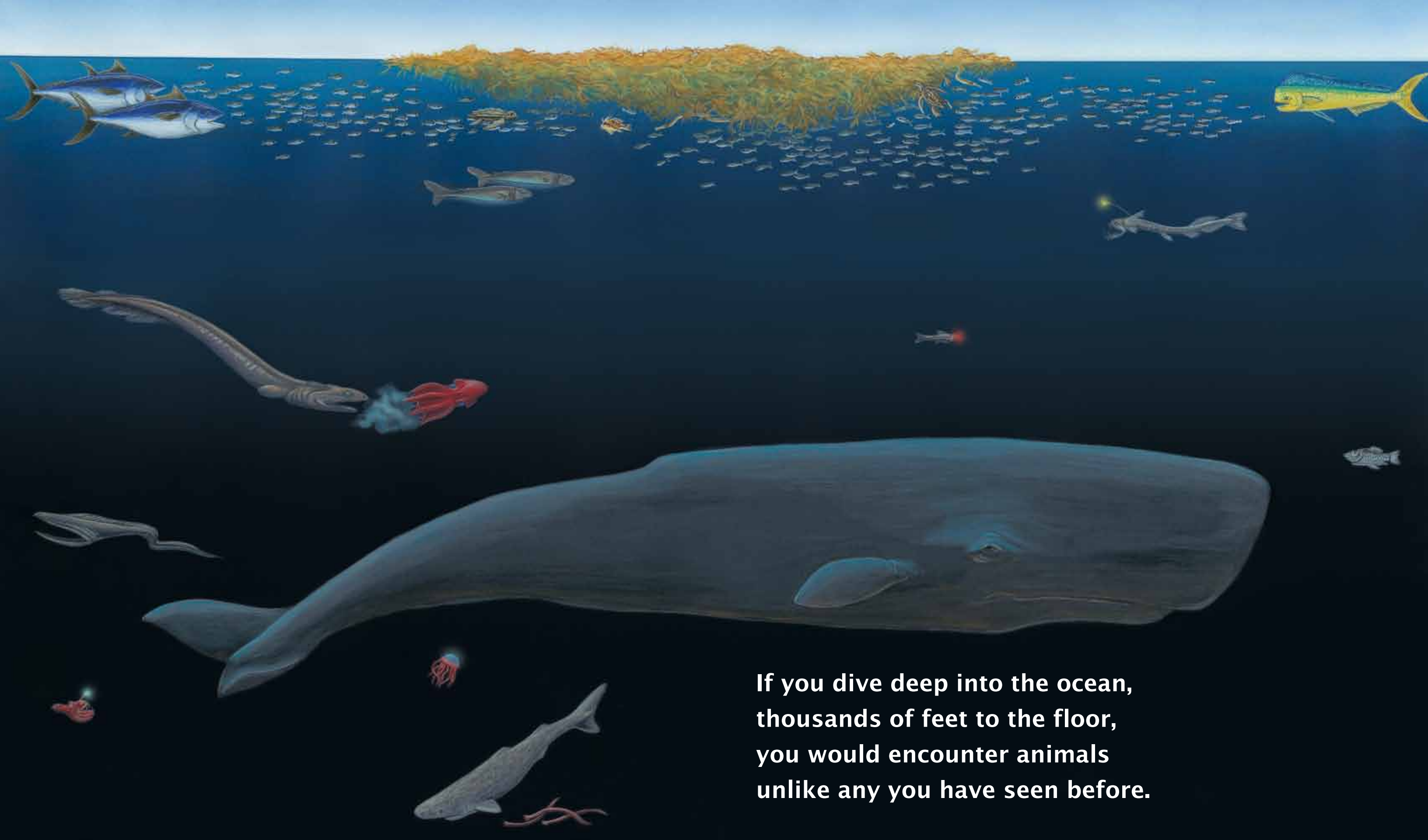
Erin E. Hunter

A Day in the Deep

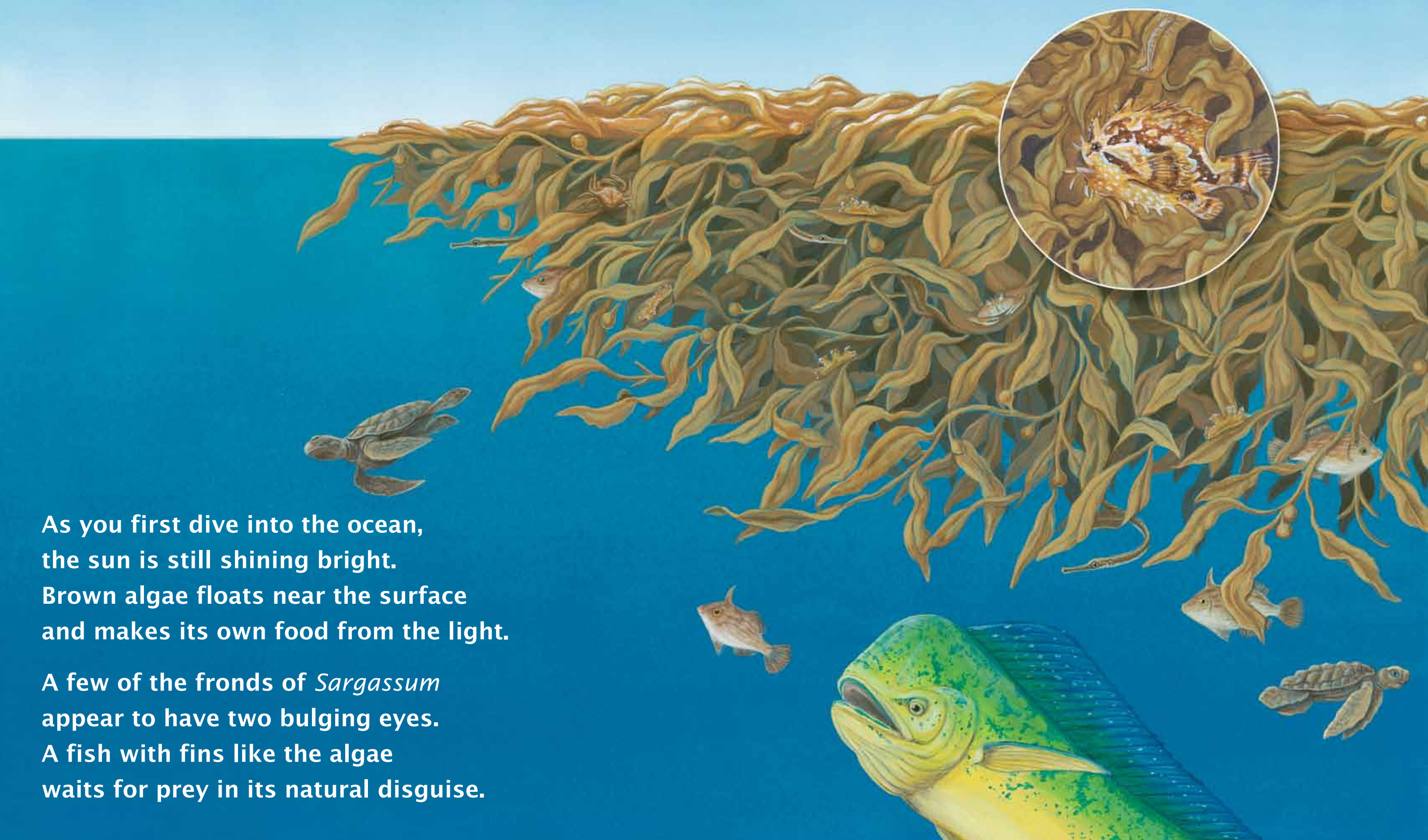
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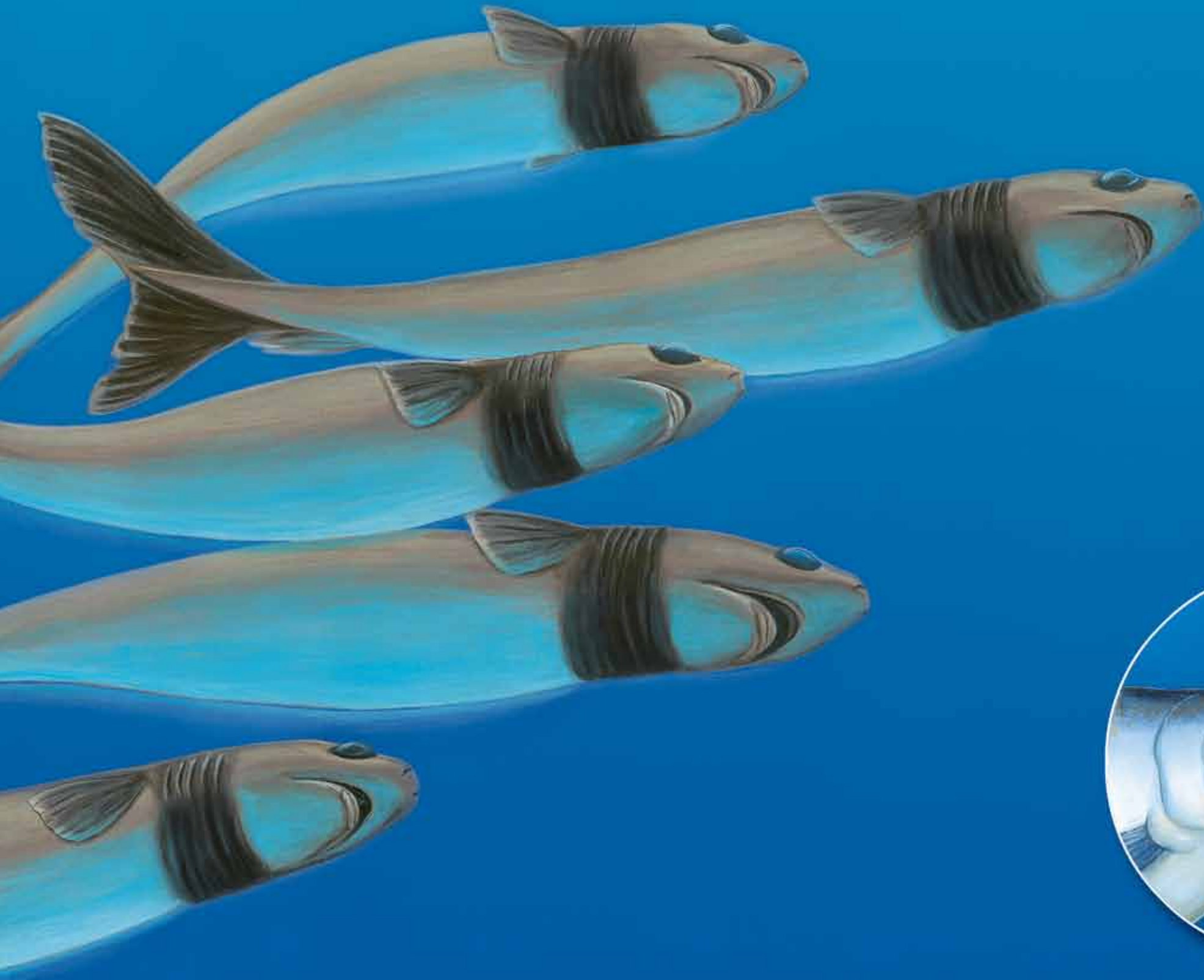


If you dive deep into the ocean, thousands of feet to the floor, you would encounter animals unlike any you have seen before.



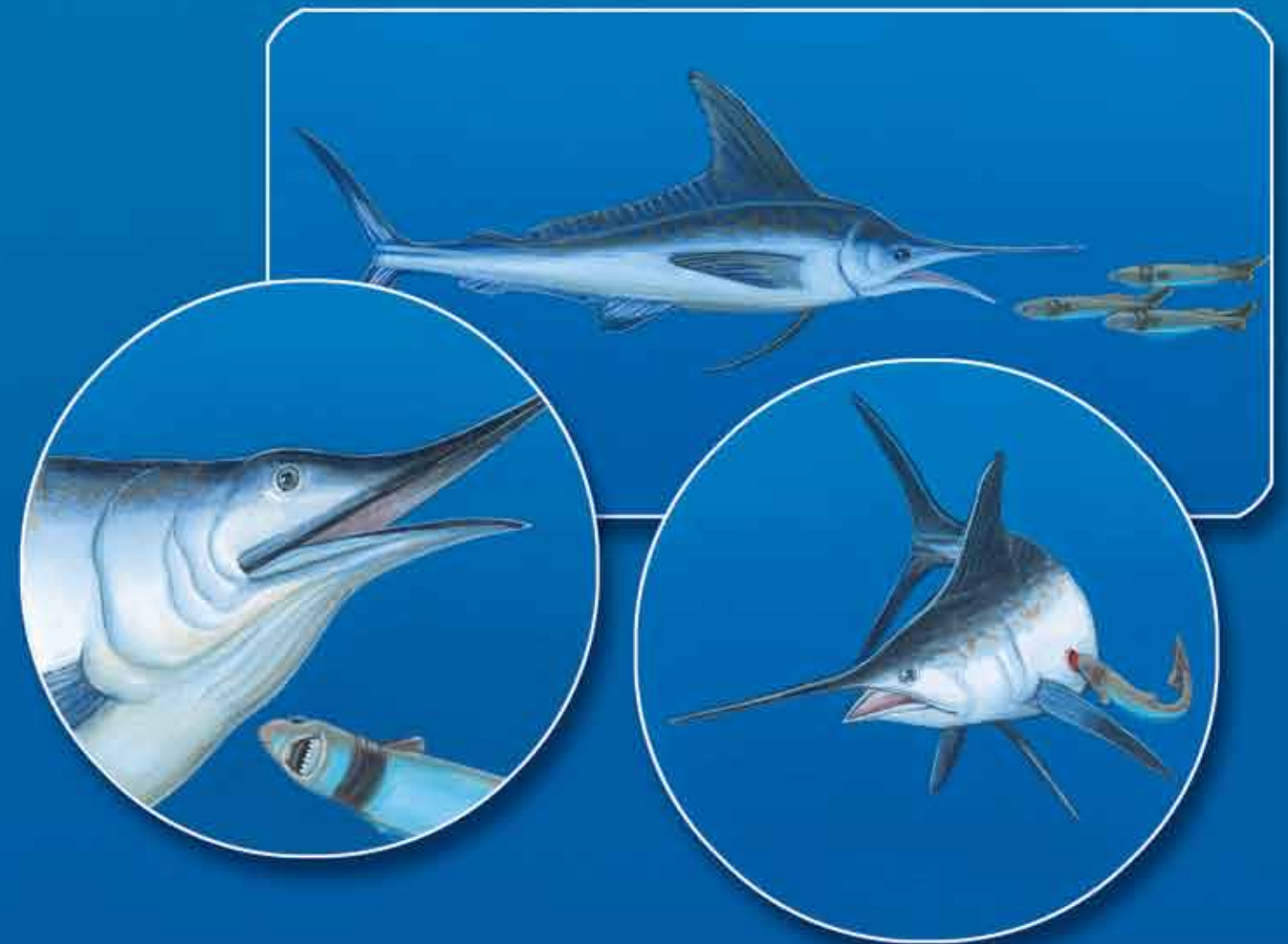
**As you first dive into the ocean,
the sun is still shining bright.
Brown algae floats near the surface
and makes its own food from the light.**

**A few of the fronds of *Sargassum*
appear to have two bulging eyes.
A fish with fins like the algae
waits for prey in its natural disguise.**



Descending five hundred feet deeper, you see sharks with bellies that glow who are schooling in the dimness. They are small and move rather slow.

Suddenly a marlin approaches, but that doesn't cause them fright. One cookiecutter attacks it and twists off a circular bite.



**One thousand feet below sea level,
a fish with protruding jaws
waits patiently in the darkness
with teeth like a raptor's claws.**

**The viperfish flashes a light,
on a spine attached to its back,
to lure in fish and crustaceans.
One approaches, and it attacks!**



For Creative Minds

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Deep Ocean Habitats

Things change the deeper you go in the ocean: light disappears, temperatures grow increasingly colder, and pressure gets much higher. The amount of oxygen in the water decreases with depth but then gets higher again at the bottom! Because these changes affect the types of organisms that can survive there, the ocean is divided into five layers by depth called life zones.

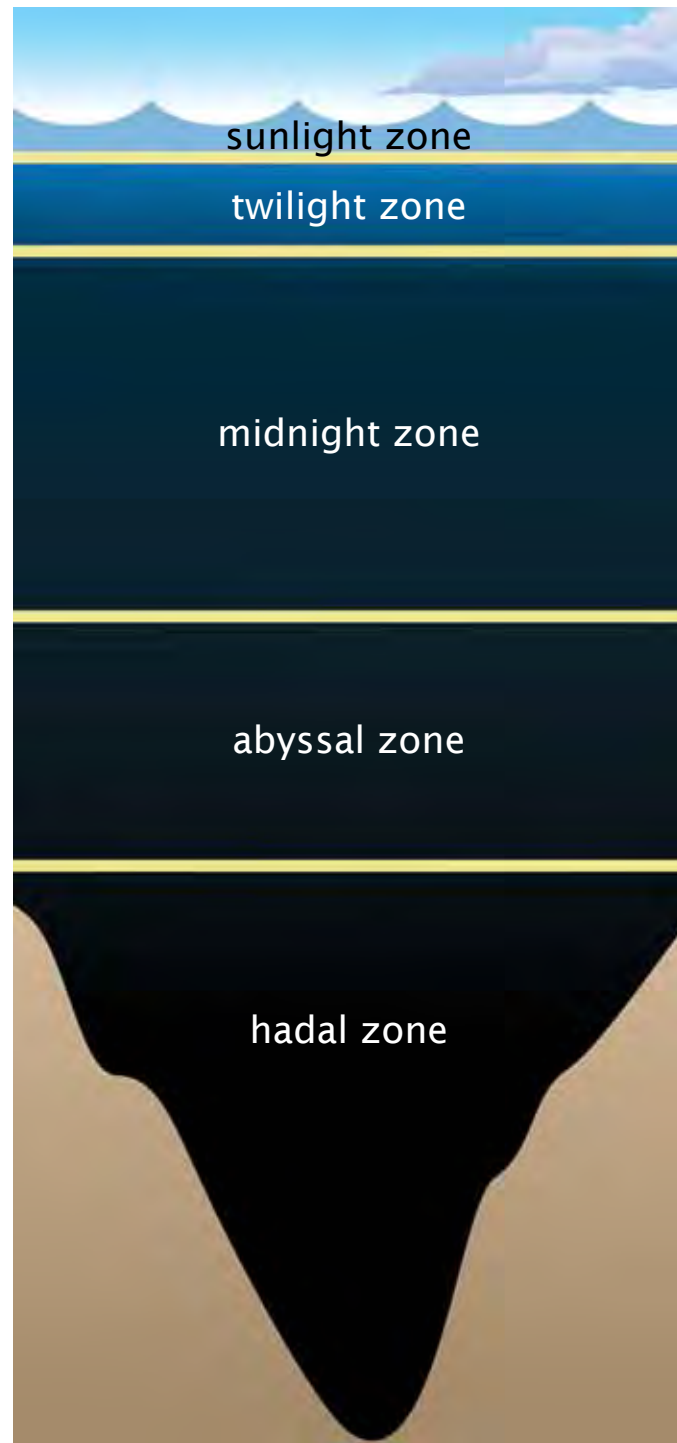
Only the **sunlight zone** receives enough sunlight for algae to convert light into energy (photosynthesis). Because almost all food webs start with plants or algae, this is the zone where the most animals live.

The **twilight zone** still gets some sunlight, but not enough for photosynthesis. The animals that live here either travel to the sunlight zone to feed or depend on food falling from above.

There is no light in the **midnight zone**. Most of the animals that live here produce their own light through bioluminescence.

The **abyssal zone** is pitch black, almost freezing cold, and has little oxygen and incredibly high pressure, yet animals still live here.

In the deep trenches is the **hadal zone**. It is like the abyssal zone, except with even more immense pressure.



Match the Animal to its Life Zone

If you found these living things at each of these depths, which zone would you be in?

0-660 feet (0-200 meters): sunlight zone

660-3300 feet (200-1,000 meters): twilight zone

3300-13,100 feet (1,000-4,000 meters): midnight zone

13,100-19,700 feet (4,000-6,000 meters): abyssal zone

19,700 feet (6,000 meters) and deeper: hadal zone



anglerfish
5000 feet / 1520 meters



frilled shark
2500 feet / 762 meters



vampire squid
2500 feet / 762 meters



spookfish
3000 feet / 914 meters



plankton
1500 feet / 457 meters



marlin
500 feet / 152 meters



pelican eel
4000 feet / 1219 meters



sargassum (brown algae)
surface



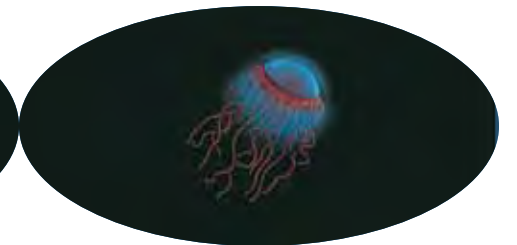
headlight fish
2000 feet / 610 meters



cookie cutter shark
500 feet / 152 meters



viperfish
1000 feet / 305 meters



Atolla jelly
4500 feet / 1372 meters

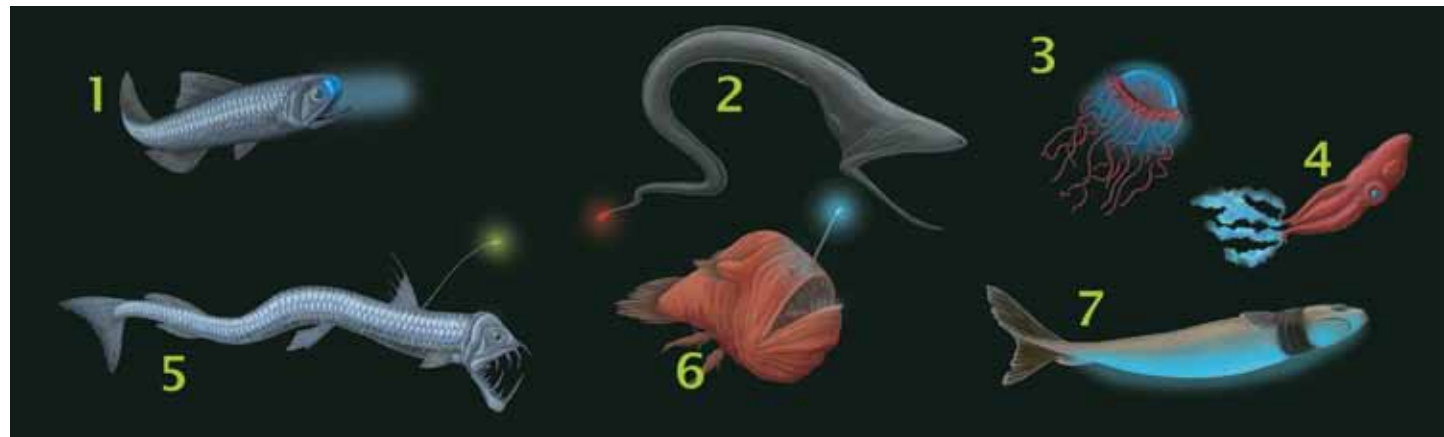
Answers: Sunlight zone: cookiecutter sharks, marlin, Sargassum
Twilight Zone: plankton, frilled shark, headlight fish, spookfish, vampire squid, viperfish
Midnight Zone: anglerfish, Atolla jellies, pelican eels

Glowing in the Dark

Because sunlight cannot reach deep into water, most of the ocean is pitch black. The deep ocean is so black that if you were down there, you could not even see your own hands or feet. Many animals that live in the dark make their own light—similar to how fireflies light up. The parts of the bodies that make the light are called photophores. When living things make light, it is called bioluminescence.

Deep-sea animals use bioluminescence to lure prey and to find mates. They also can use it to attract, startle and hide from predators. Because the deep ocean is pitch black, you would not see the animal's body there, but just the lights they make.

Match the deep-sea animals to the descriptions. Answers are upside down, below.



Cookiecutter sharks attract large predators with dark patches on their glowing bellies. The larger animals think they are getting a meal but the cookiecutter sharks bite them instead. Cookiecutters get enough food out of the bites, but the bites don't kill the other animals.

Many animals are attracted to flashing lights. **Viperfish** flash lights along their bellies and at the end of the first long spines just behind their heads. When other animals come to check it out, the viperfish catch their prey.

Vampire squid escape predators by shooting glowing mucus. The predators will see the mucus but not the animal as it swims away.

Just as drivers use car headlights to see at night, **headlight fish** turn on their "headlights" to find prey.

Atolla jellyfish light up with blue lights to attract prey. They also light up when threatened by predators, attracting other predators to chase the first ones away.

If you've ever gone fishing, you've probably used a lure to attract the fish. **Anglerfish** do the same thing using light-filled "lures" on top of their heads.

Pelican eels use lures too. Their lures are at the end of their tails and flash pink and red. They pull their tails around close to their mouths so they can grab the animals checking out the lights.

Answers: 1. headlight fish, 2. vampire squid, 3. Atolla jellyfish, 4. viperfish, 5. vampire squid, 6. headlight fish, 7. cookiecutter shark.

Living Under Pressure

Squeeze your left arm with your right hand. The force you feel from your hand is called pressure. Whenever one thing pushes against another, it creates pressure. As air is pulled towards the earth by gravity, it creates pressure too! At sea level, air creates 14.7 pounds of pressure per square inch. Scientists call these 14.7 pounds per square inch an "atmosphere." That's like having a fat cat standing on each square inch of your body!

Water causes even more pressure than air. The deeper you dive into the ocean, the more pressure there is. The pressure you feel increases by one atmosphere every 33 feet farther down you go. The deepest part of the ocean has a pressure of more than 8 tons per square inch. That is too much pressure for humans! But there are still animals that live there, even at that pressure! There are animals living at every depth in the ocean.

One
Square
Inch

What does pressure feel like in the deep ocean?

Depth below sea level:		PSI (Pounds per Square Inch)	Imagine that this is standing on <i>every</i> square inch of your body!
feet	meters		
at sea level	at sea level	14.7 psi	fat cat
500	152.4	223 psi	professional football player
1000	304.8	445 psi	lion
1500	457.2	668 psi	motorcycle
2000	609.6	890 psi	polar bear
2500	762.0	1,114 psi	manatee
3000	914.4	1,335 psi	tiger shark
3500	1066.8	1,558 psi	Holstein cow
4000	1219.2	1,780 psi	smart car and its driver
4500	1371.6	2,003 psi	bison



To my grandparents, thanks for everything—KK

In memory of my uncle Marc, who gave me my first camera; and my uncle Keith, who gave me my first microscope—EEH

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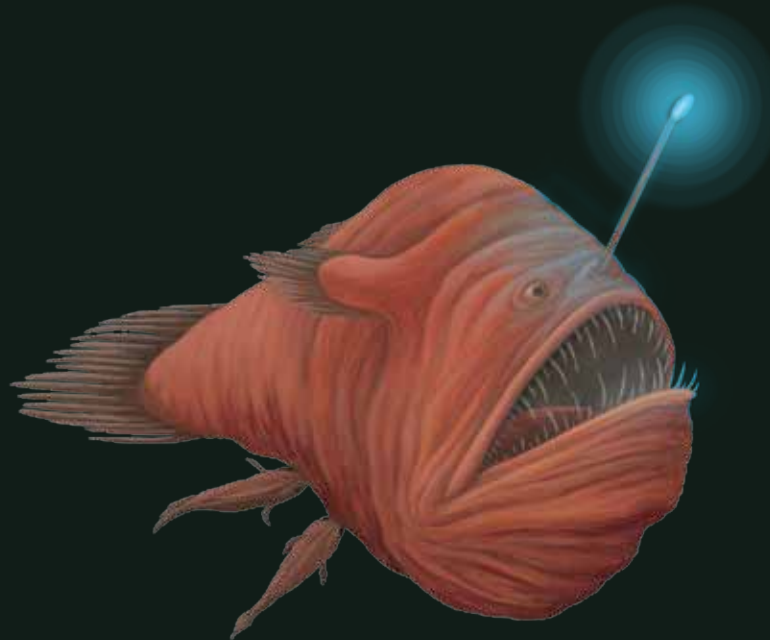
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ocean/marine habitat, repeated lines, rhythm or rhyme



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