



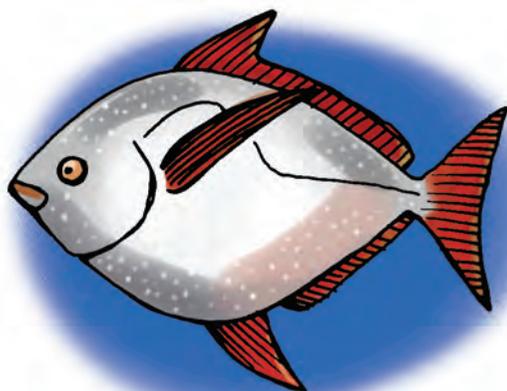
**Sea Otter**  
*Enhydra lutris*



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*Enhydra lutris*

Sea otters live in coastal waters that are 50 to 75 feet (15–23 m) deep. The sea otter is the second smallest marine mammal and is the only marine animal capable of lifting and turning over boulders, which it does to find its prey. It eats sea urchins, snails, clams, fish and abalone that it collects in kelp forests and from the sea floor. It has pouches under each forepaw where it can tuck the food that it collects to bring to the surface. There, sea otters float on their back and eat. They are also known to use rocks as tools to pry abalone from rocks or to break the shells open.

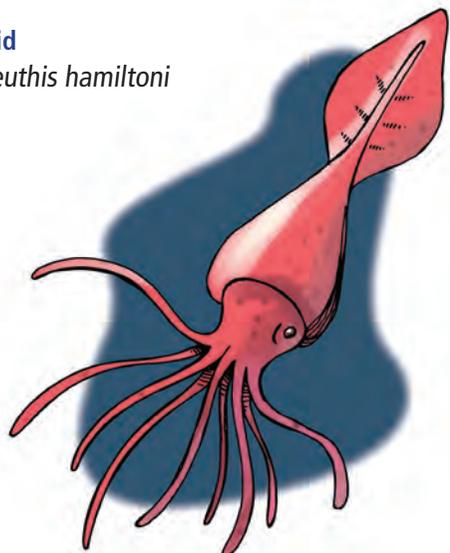
**Opah (Moonfish)**  
*Lampris guttatus*



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Scientists don't know much about opah. They are learning more by using fish tags that transmit information. Opah have bright orange fins and are disk shaped. They are speedy swimmers that feed on almost anything and can grow to between 60 and 200 pounds (27–91 kg). Scientists have recorded opah at depths of 164 to 1,312 feet (approx. 50–400 m).

**Colossal Squid**  
*Mesonychoteuthis hamiltoni*



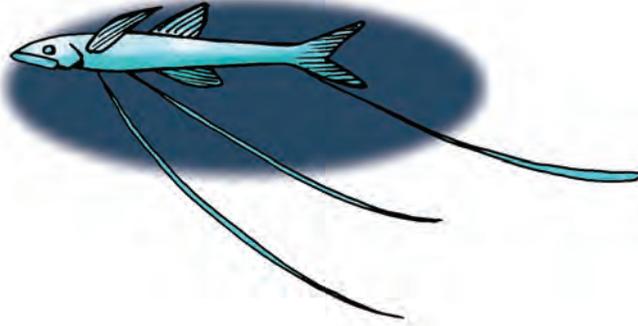
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This huge squid is prey to sperm whales, which are among the deepest-diving whales. Colossal squid can grow to be 39 to 46 feet (12–14 m) long. Each arm is lined with suckers and sharp hooks, some that swivel and others that are three pointed. This squid has the largest eyes documented in the animal kingdom. Scientists believe that colossal squid can be found at depths of 3,300 to more than 7,000 feet (approx. 1,000-1,200 m).





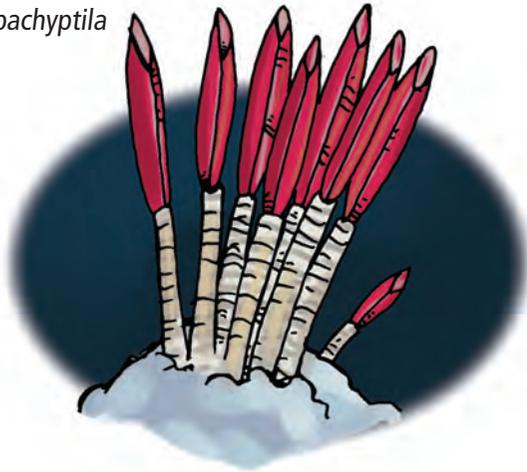
**Tripod Fish**  
*Bathypterois grallator*



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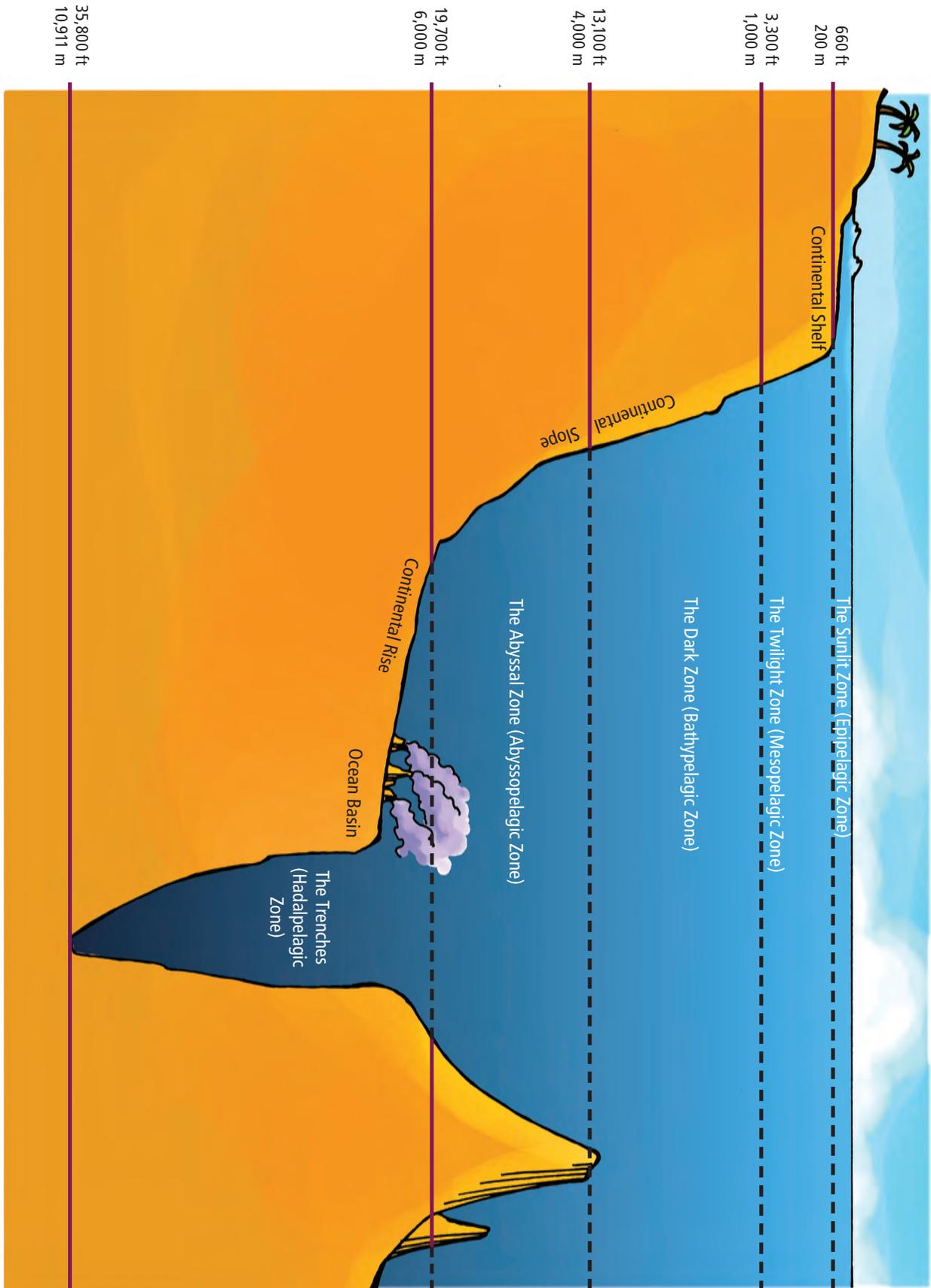
**Giant Tube Worms**  
*Riftia pachyptila*

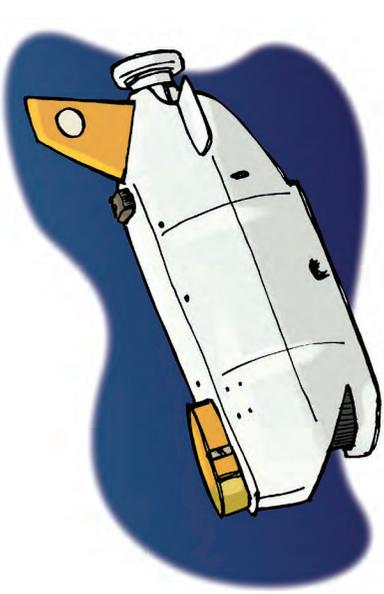


**Giant Tube Worms**  
*Riftia pachyptila*

Giant tube worms can grow to incredible lengths of up to almost 8 feet (2.4 m). These red and white creatures thrive near black smokers and along hydrothermal vents at extreme depths. No predators have yet been discovered, and the worms flourish. Each tubed worm filters nutrients to bacteria that live within its body. Through chemosynthesis, the bacteria turn carbon dioxide, hydrogen sulfide and oxygen into organic molecules that feed the worm.



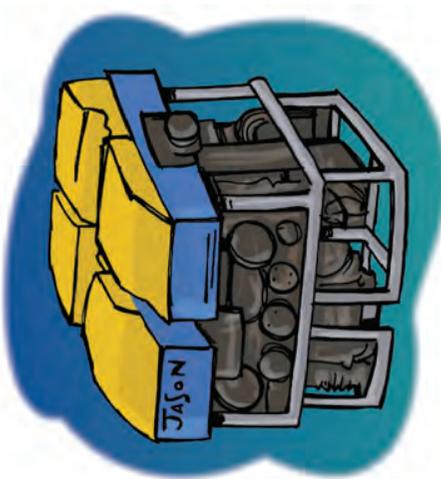




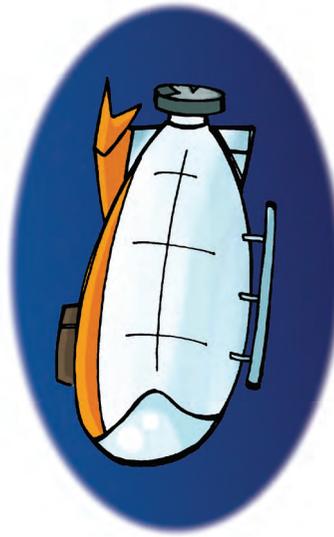
SHINKAI 6500



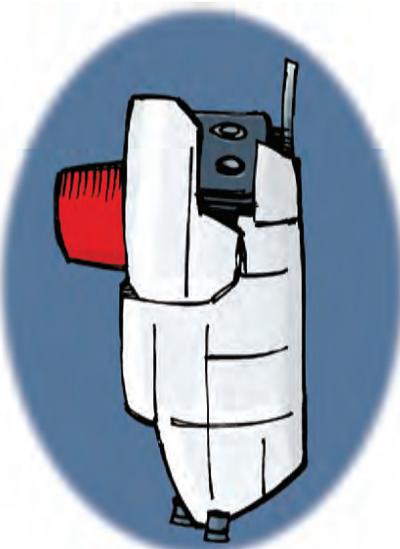
NAUTILUS



JASON



MIR-1 / MIR-2



ALVIN

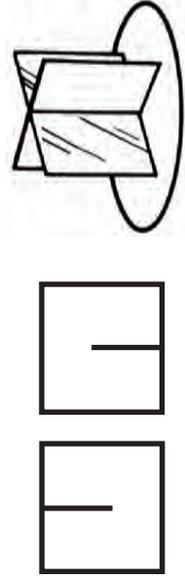


KAIKO 7000II

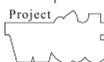
To make deep-sea diving machine (submersible) playing pieces:

1. Cut out two pictures of the machine you have chosen.
2. Paste the pictures on index cards and cut the card to fit the picture.
3. Cut a slit in each picture card as shown below.
4. Fit the two pictures together.
5. Cut out a cardboard circle and glue to the bottom of the picture cards.

6. You are ready for a deep sea adventure!



Note: To learn more about your vessel, you can research it at the library or online.





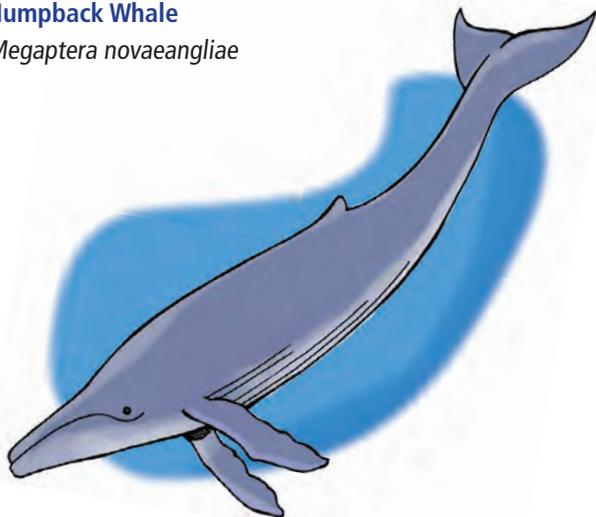
Oceans have been classified by scientists into different zones, each with its own characteristics. Each layer has a different living environment influenced by sunlight, hydrostatic pressure and depth. Marine species pay no attention to these boundaries and often pass between multiple zones, depending on their individual adaptations to survive in varying conditions.

## Sunlit Zone (Epipelagic Zone)

Ocean surface to 660 feet (0–200 m) deep

**Description:** Sunlight penetrates and affects the temperature of the top 660 feet of the ocean. This layer is abundant in marine species and plants that are adapted to sunlight. These species include everything from microscopic plankton to the largest mammal on Earth, the blue whale. Many of the marine species that have been researched the most live in this zone.

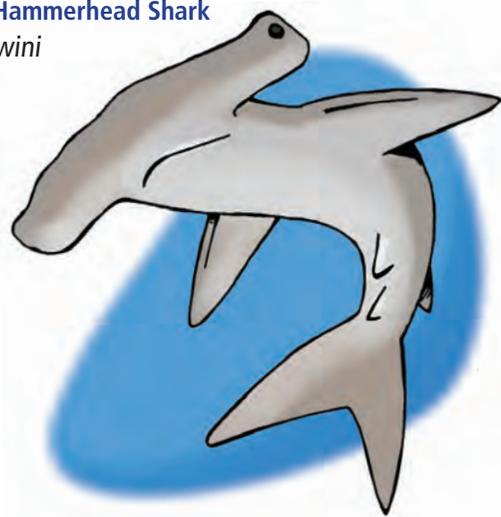
**Humpback Whale**  
*Megaptera novaeangliae*



**Humpback Whale**  
*Megaptera novaeangliae*

Humpback whales grow to be 39 to 52 feet (12–16 m) long and live in all the oceans of the world. They feed on small fish and tiny shrimp-like animals called krill. Every winter, humpback whales migrate to tropical or subtropical waters to mate and give birth. They travel as far as 16,000 miles (25,000 km) each year, giving them the largest range of any mammalian species. Humpbacks can dive to a depth of 500 to 700 feet (approx 150–210 m).

**Scalloped Hammerhead Shark**  
*Sphyrna lewini*



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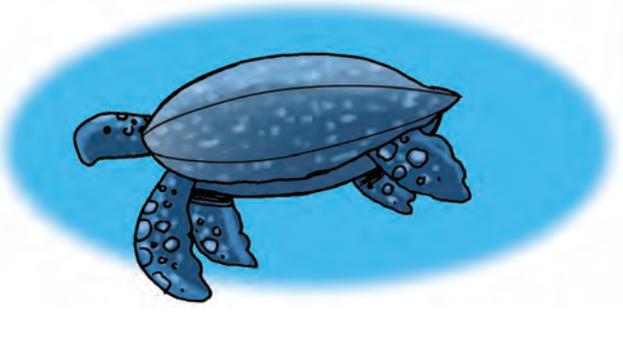
Scalloped hammerhead sharks can grow to lengths of 13 to 20 feet (4–6 meters). The strange shape of the head allows this fish to have a much wider range of vision than other sharks. Unless they are threatened or cornered, scalloped hammerheads are harmless. They can be found as deep as 902 feet (approx 275 m).





**Leatherback Sea Turtle**

*Dermochelys coriacea*



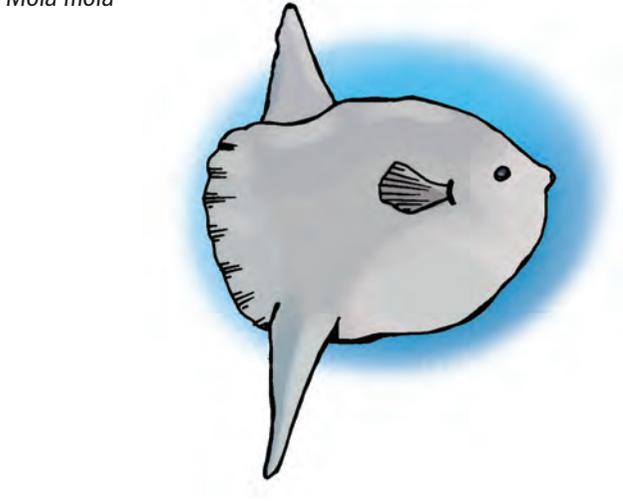
**Leatherback Sea Turtle**

*Dermochelys coriacea*

These endangered animals are the largest of all sea turtles. Adults can weigh up to 2,000 pounds (907 kg). Leatherbacks feed primarily on jellyfish, plankton and salps (a jellyfish-like tubular creature that eats phytoplankton). They can store large amounts of oxygen in their blood and muscle tissue (rather than in their lungs), which allows them to dive for long periods of time. They have been known to hold their breath for as long as 70 minutes. Leatherback sea turtles can dive deeper than 3,900 feet (approx. 1,200 m).

**Roundtailed or Common mola**

*Mola mola*



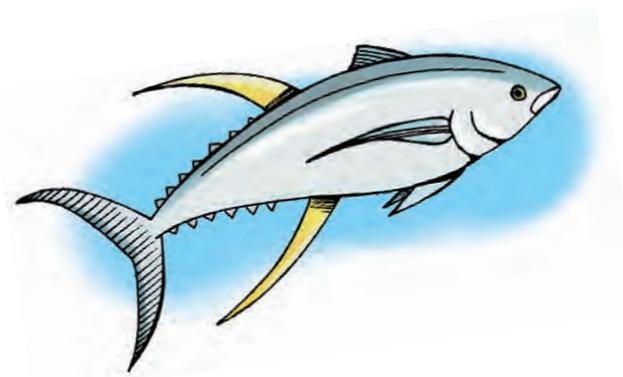
**Roundtailed or Common mola**

*Mola mola*

The mola is often called the “ocean sunfish” because it spends much of its time at the surface of the water on its side, soaking up the warmth of the sun’s rays. It may do this after diving to much colder water at depths of 656 to 1,969 feet (200-600 m). Mola feed on jellyfish, squid, sponges, fish and creatures found along the sea floor. They are usually about 6 to 8 feet (1.8–2.4 m) long but can reach lengths of about 10 feet (3 m).

**Yellowfin Tuna**

*Thunnus albacares*



**Yellowfin Tuna**

*Thunnus albacares*

Yellowfin tuna can grow to more than 300 pounds (136 kg). The tuna’s shape allows it to move quickly through the water and escape toothed whales, sharks and other predators. Yellowfin tuna travel in large schools and are one of the fish most sought after by industrial fishing boats. Although they are capable of diving to great depths (one fish carrying a tracking device dove to 3,805 feet [1,160 m]), they typically stay in the top 330 feet (approx. 100 m) of the oceans.





**Sea Otter**

*Enhydra lutris*



**Sea Otter**

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Sea otters live in coastal waters 50 to 75 feet (15–23 m) deep. The sea otter is the second smallest marine mammal and is the only marine animal capable of lifting and turning over boulders, which it does to find its prey. It eats sea urchins, snails, clams, fish and abalone that it collects in kelp forests and from the sea floor. It has pouches under each forepaw where it can tuck the food that it collects to bring to the surface. There, sea otters float on their back and eat. They are also known to use rocks as tools to pry abalone from rocks or to break the shells open.

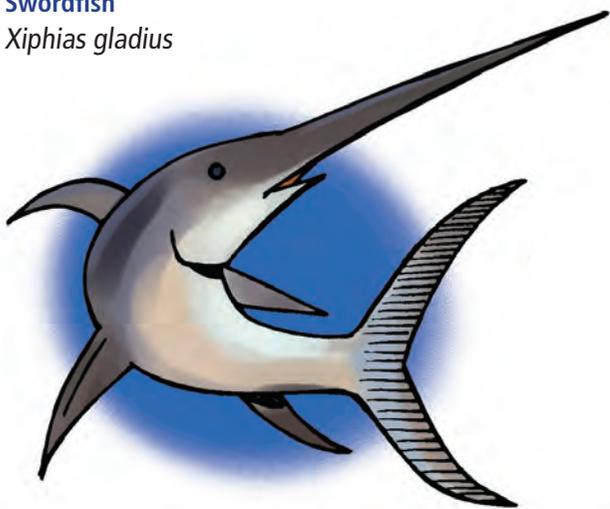
**Twilight Zone (Mesopelagic Zone)**

660 to 3,300 feet (200–1,000 m) deep

**Description:** Because the sunlight that penetrates to this depth of the ocean is very faint, the mesopelagic zone is referred to as the “twilight zone.” Like fireflies on land, some of the creatures that live here use bioluminescence (light produced by a chemical reaction inside the organism) to find prey and perhaps communicate with one another. Most of the creatures that live here have large eyes to help them see in small amounts of light.

**Swordfish**

*Xiphias gladius*



**Swordfish**

*Xiphias gladius*

Swordfish are named for the long, flat bill—resembling a sword—that sticks out from their face and helps them cut through the water. Their impressive leaps, size and beautiful coloring make them famous as sport fish. Scientists believe swordfish are a migratory species that travels long distances each year. Fisherman usually catch them in water between 1,000 and 2,000 feet (approx. 305–610 m) deep, although they can also be seen at the surface.





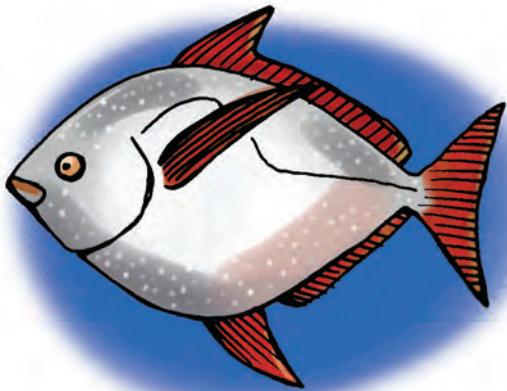
**Cuttlefish**  
*Sepia officinalis*



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*Sepia officinalis*

The cuttlefish is related to the squid, octopus and nautilus. Despite their name, cuttlefish are not fish but are instead a kind of mollusk. They can change colors rapidly to camouflage themselves or to flash a warning if threatened. The cuttlefish has eight arms and three hearts (one for each set of gills and one for the rest of its body). They are found in water that is around 330 to 1,300 feet (approx. 100–400 m) deep.

**Opah ( Moonfish)**  
*Lampris guttatus*



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Scientists don't know much about opah. They are learning more by using fish tags that transmit information. Opah have bright orange fins and are disk shaped. They are speedy swimmers that feed on almost anything and can grow to between 60 and 200 pounds (27–91 kg). Scientists have recorded opah at depths of 164 to 1,312 feet (approx. 50–400 m).

**Large-Scaled Lantern Fish**  
*Neoscopelus macrolepidotus*



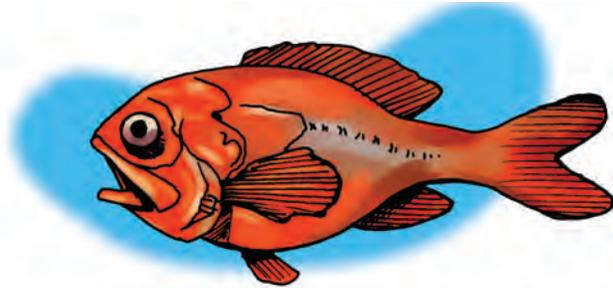
**Large-Scaled Lantern Fish**  
*Neoscopelus macrolepidotus*

Believed to be speedy swimmers, lantern fish are named for the photophores (light-producing organs) that line the underside of their body and tail. Scientists theorize that the fish may use the photophores to attract mates or confuse prey. They are found in water from 980 to 4,900 feet (approx. 300–1,500 m) deep but travel closer to the surface at night to feed or perhaps to avoid being eaten.





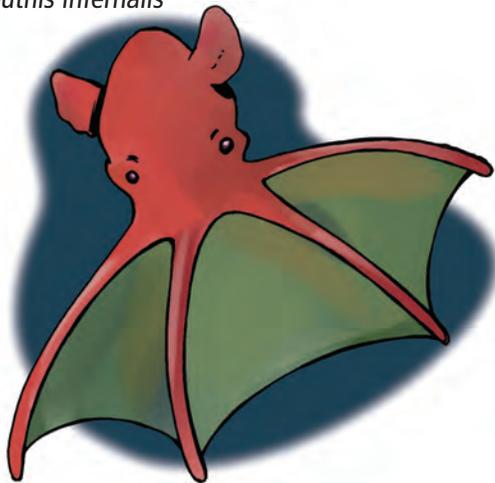
**Orange Roughy**  
*Hoplostethus atlanticus*



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Scientists believe that the orange roughy is a very slow-growing fish that can live to be 150 years old. These ocean ancients gather in dense groups in underwater canyons and near seamounts (mountains on the ocean floor that do not reach the surface), where currents mix and become rich in prey and nutrients. Orange roughy, previously known as “slimeheads,” are commercially fished using bottom-trawling methods. They are found at depths of 2,300 to 3,300 feet (approx. 700–1,000 m).

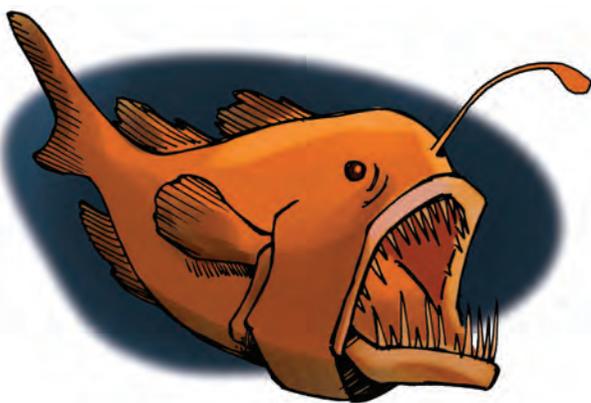
**Vampire Squid**  
*Vampyroteuthis infernalis*



**Vampire Squid**  
*Vampyroteuthis infernalis*

Unlike other types of squid, the vampire squid has a webbing of skin that connects its eight arms. The arms are lined with fleshy spines and have suckers at the ends farthest from the body. Light-producing organs called photophores give off flashes of light to disorient predators. Additionally, the squid uses bioluminescence so that from below, it blends the outline of its silhouette. Flaps that look like ears propel the squid through the water. Vampire squid are found at depths of 300 to 3,500 feet (approx. 90–900 m).

**Humpback Anglerfish (Common Black Devil)**  
*Melanocetus johnsonii*



**Humpback Anglerfish (Common Black Devil)**  
*Melanocetus johnsonii*

The anglerfish uses a lure to catch its prey—hence its name. It typically has a single spine that ends in a lump of glowing flesh; the spine stretches in front of its mouth, and the light lures prey into the trap. Anglerfish are capable of eating prey up to twice their size. They can reach lengths of more than 3 feet (about 1 meter) and can be found at depths of 3,000 feet (914 m).





## Dark Zone (Bathypelagic Zone)

3,300 to 13,100 feet (1,000–4,000 m) deep

**Description:** The only visible light in this range comes from the inhabitants. The hydrostatic pressure at these depths is about 5,580 pounds per square inch.

### Basket Star

*Gorgonocephalus stimpsoni*



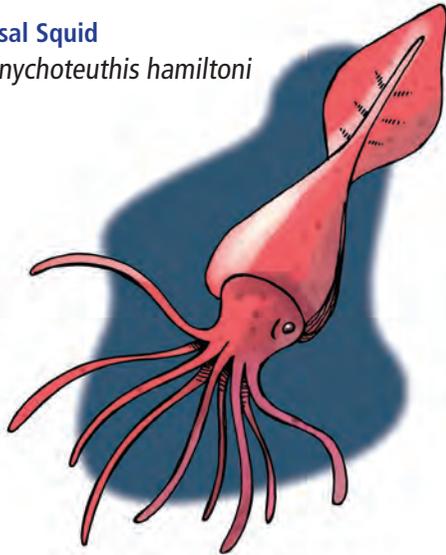
### Basket Star

*Gorgonocephalus stimpsoni*

The basket star is related to a kind of sea star called a brittle star. Basket stars are carnivores, filter feeders and scavengers. Their spidery arms are specially formed to capture plankton from the water. They use the mucous on their tube feet to trap tiny phytoplankton and bacteria food particles on the sea floor. They are found all over the world in water as deep as 6,600 feet (approx. 2,000 m).

### Colossal Squid

*Mesonychoteuthis hamiltoni*



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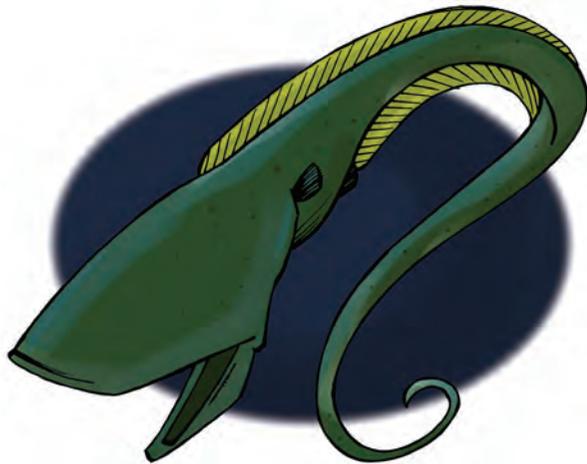
This huge squid is prey to sperm whales, which are among the deepest-diving whales. Colossal squid can grow to be 39 to 46 feet (12–14 m) long. Each arm is lined with suckers and sharp hooks, some that swivel and others that are three pointed. This squid has the largest eyes documented in the animal kingdom. Scientists believe that colossal squid can be found at depths of 3,300 to more than 7,000 feet (approx. 1,000–2,200 m).





**Gulper Eel**

*Eurypharynx pelecyanoides*



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*Eurypharynx pelecyanoides*

The gulper eel is named for its large mouth, which looks much like a pelican's bill. It eats prawns and small fishes, but scientists believe that it may also be able to consume much larger prey because of the size of its mouth. The tip of its tail glows in the dark, and the eel may wave this light in front of its mouth to lure prey. Some gulper eels can live as deep as 10,000 feet (approx. 3,000 m) below the ocean's surface.

**Viper Fish**

*Chauliodus sloani*



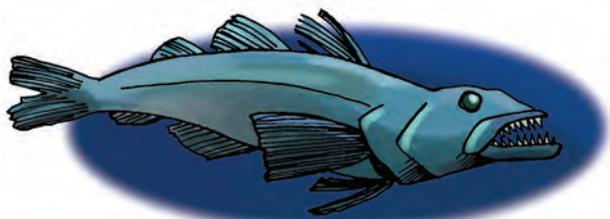
**Viper Fish**

*Chauliodus sloani*

Measuring 6 to 10 inches long, the Viper fish attracts prey with a long dorsal fin that has a glowing tip, called a photophore. It waves this appendage around like a fishing pole to attract prey. In addition, it is scientists believe that another of the Viper fish's tactics for killing prey is to swim at them at high speeds, using its many long, sharp teeth to impale its victims. This is supported by the fact that the first vertebra in the fish's spine acts as a shock absorber. It is found 2,000 feet (approx. 600 m) below sea level when it is feeding and as deep as 5,000 feet (approx. 1,500 m).

**Patagonian Toothfish**

*Dissostichus eleginoides*



**Patagonian Toothfish**

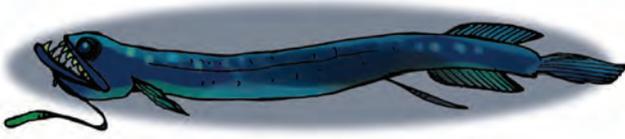
*Dissostichus eleginoides*

The Patagonian toothfish (Chilean sea bass) lives in cold waters near subantarctic islands. It is not a true bass; it was renamed so that it could be sold on the consumer market. These fish can live to be more than 50 years old. It takes 9 years before the toothfish is ready to reproduce. This fact, combined with low reproduction rates, means that heavily fished populations have a hard time recovering. The toothfish is found in very cold waters at depths of 147 to more than 12,631 feet (approx. 45–3850 m).





**Pacific Blackdragon**  
*Iliacanthus antrostomus*



**Pacific Blackdragon**  
*Iliacanthus antrostomus*

The Pacific blackdragon is one of the most abundant species of the deep. These fish feed on just about anything, dead or alive. The female is larger than the male and has a barbel (a whisker-like organ) that dangles from her chin. At night, she travels from hundreds of feet below the ocean's surface up to shallower waters to feed. Males do not have a working stomach and live just long enough to mate. Pacific blackdragon have been found at depths of about 3,200 to 9,800 feet (approx. 1,000–3,000 m).

**Black Swallower**  
*Chiasmodon niger*



**Black Swallower**  
*Chiasmodon niger*

The black swallower has the ability to eat fish larger than itself. It grows to about 10 inches long, and it can swallow fish that are twice its length and 10 times its mass! The black swallower is found all over the world at a depth of 2,300 to 9,000 ft (approx. 700 to 2,745 m).

**Dumbo Octopus**  
*Grimpoteuthis*



**Dumbo Octopus**  
*Grimpoteuthis*

Named for the earlike fins it uses for swimming, this octopus is one of the rarest species in the ocean. It hovers above the sea floor feeding on worms, clams, mussels and crustaceans around hydrothermal vents. These creatures have been typically found from 9,800 to 13,000 feet (approx. 3,000–4,000 m) below sea level, but have also been seen as deep as 23,000 feet (approx. 7,000 m) below sea level.





**Yeti Crab**  
*Kiwa hirsuta*



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The yeti crab was only discovered in 2005. It is about 6 inches (15.2 cm) long and was named after the legendary yeti (or abominable snowman) because of the furry appearance of its legs. Scientists are still learning more about these creatures that live near hydrothermal vents at depths of around 7,200 feet (approx. 2,200 m).



## Abyssal Zone (Abyssopelagic Zone)

13,100 to 19,700 feet (4,000–7,000 m) deep

**Description:** Water temperatures in this zone are near freezing, and there is no light at all. Not many creatures can live here because of the intense hydrostatic pressure. Also called the abyssal plain, half of the Earth’s surface is covered by this zone. This zone is the bottom of the ocean and is typically smooth and flat, broken up by the trenches and canyons of the *Hadalpelagic* Zone. Hydrothermal vents are found here. This zone is one of the least explored places on Earth.

**Fangtooth Fish**  
*Anoplogaster cornuta*



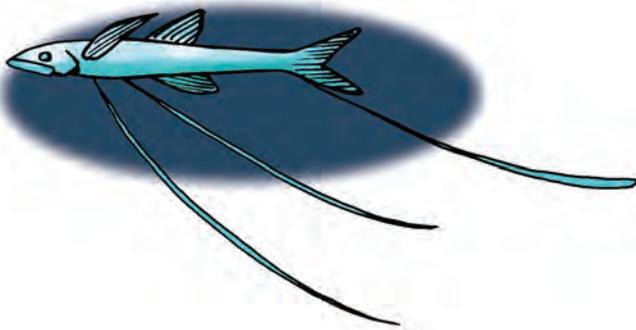
**Fangtooth Fish**  
*Anoplogaster cornuta*

This scary-looking fish grows to be about 4 to 6 inches (11–15 cm) in length, with over-sized teeth that resemble fangs. It is found in tropical and temperate ocean waters as deep as 16,000 feet (4,877 m), where it preys on other fish and small crustaceans. Juvenile fangtooth fish look so different from the adults that they used to be classified as a separate species.





**Tripod Fish**  
*Bathypterois grallator*



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The tripod fish uses its long fins to stand on the sea floor. It waits patiently for prey to bump into its fins. Threads on the fins act as sensors that alert the tripod fish when prey is near. These fish are found at extreme depths of 9,850–19,685 feet (approx. 3,000–6,000 m).

**Sea Pig**  
*Scotoplanes globosa*



**Sea Pig**  
*Scotoplanes globosa*

This relative of the sea cucumber is a curious creature that is found on the bottom of all the world's oceans, in water up to 21,000 feet (6,401 m) deep. Resembling a terrestrial slug, this 6-inch (15 cm) creature moves slowly across the bottom of the ocean, feeding on freshly deposited organic matter. Sea pigs have been filmed in groups totaling several hundred individuals.



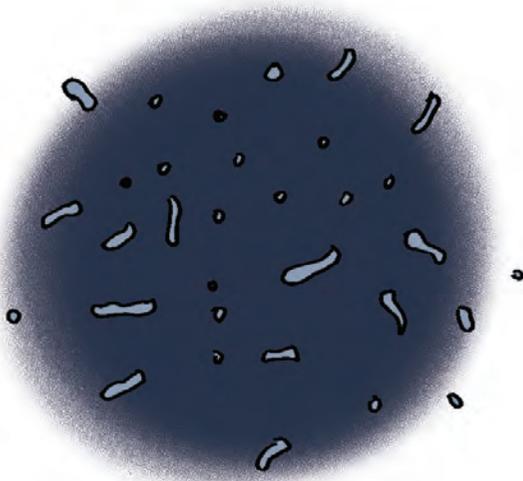


## Trenches (Hadalpelagic Zone)

19,700 to 35,800 feet (6,000–10,911 m) deep—the depth of the bottom of the Mariana Trench off the coast of Japan

**Description:** According to current research, the Mariana Trench is the deepest part of the ocean. The temperature of the water is barely above freezing, and the hydrostatic pressure is extremely high: eight tons per square inch—approximately the weight of 48 Boeing 747 jets! It is very difficult for humans to explore this part of the ocean; in fact, more people have been to the moon than to the bottom of the Mariana Trench. Scientists believe that most trench inhabitants either feed on “marine snow” (debris from decomposing animals and plants above them) or through chemosynthesis (chemical reactions that produce energy from carbon) around hydrothermal vents on the sea floor. These vents form where two continental plates are pulling apart and erupting lava is replacing the sea floor. Creatures that live in this zone are called extremophiles because of the extreme pressure, cold and heat in their environment.

### Bacteria

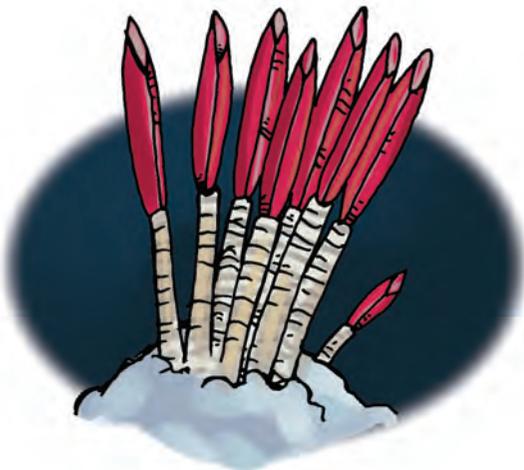


### Bacteria

Bacteria that survive in the extreme conditions around hydrothermal vents are crucial to the existence of all the other inhabitants of the region, providing essential nourishment. These amazing bacteria are able to withstand hotter temperatures than any other living thing on Earth. Scientists know very little about these key building blocks of life but are learning more about them from samples obtained at hydrothermal vents and in thermal pools at Yellowstone National Park in Wyoming.

### Giant Tube Worms

*Riftia pachyptila*



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*Riftia pachyptila*

Giant tube worms can grow to incredible lengths of up to almost 8 feet (2.4 m). These red and white creatures thrive near black smokers and along hydrothermal vents at extreme depths. No predators have yet been discovered, and the worms flourish. Each tubed worm filters nutrients to bacteria that live within its body. Through chemosynthesis, the bacteria turn carbon dioxide, hydrogen sulfide and oxygen into organic molecules that feed the worm.





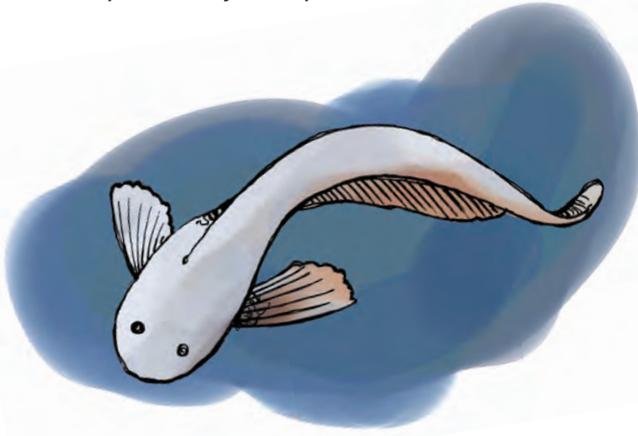
**Hadal Amphipod**  
*Hirondellea gigas*



**Hadal Amphipod**  
*Hirondellea gigas*

These 2-inch (5 cm) shrimp-like creatures live in groups and are found at the deepest points in the Mariana Trench, more than 30,000 feet (9,144 m) below the surface. They are nearly twice the size of related species found in shallower water. With no light and little food, these creatures have adapted to their extreme environment by developing a way to digest wood from vessels that have sunk to the bottom of the ocean.

**Snailfish**  
*Pseudoliparis amblystomopsis*



**Snailfish**  
*Pseudoliparis amblystomopsis*

This white, 9- to 12-inch (23–30 cm) fish has only recently been seen in the wild using deep-sea cameras placed near bait stations. Found in the deepest trenches off the coast of Japan, snailfish have been observed to be attracted first to the bait stations to eat the scavenging arthropods and then the bait itself. Snailfish have been documented at depths of as much as 25,000 feet (7,620 m) below the surface.

