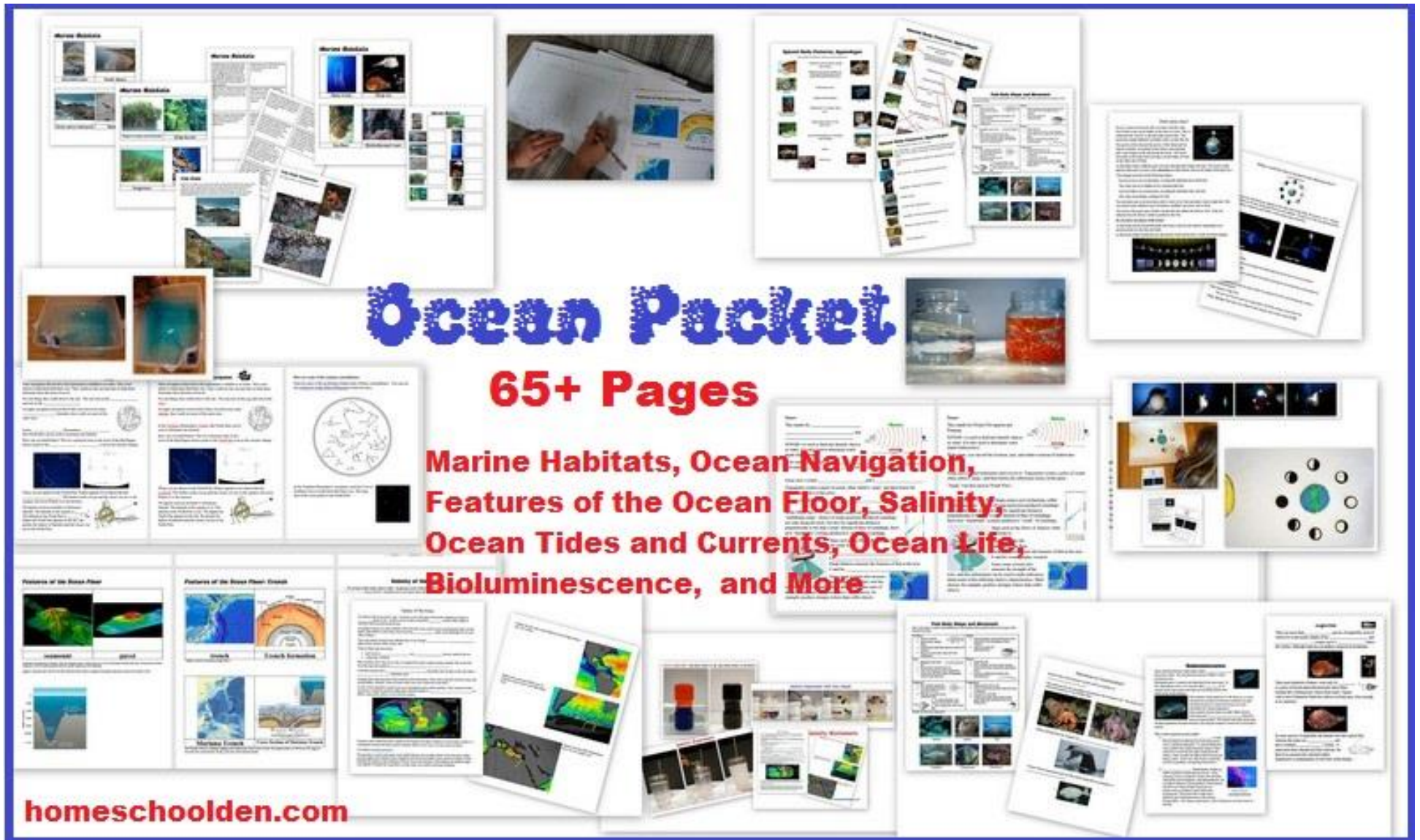


Ocean Packet Quick Preview



Ocean Packet

65+ Pages

**Marine Habitats, Ocean Navigation,
Features of the Ocean Floor, Salinity,
Ocean Tides and Currents, Ocean Life,
Bioluminescence, and More**

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In our ocean studies we explored



- . Marine Habitats
- . Water Form Words (bay, estuary, lagoon, fjord, etc.)
- . Features of the Ocean Floor (trench, seamount, guyot, etc.)
- . Ocean Navigation (early navigation with astrolabes & the constellations, modern SONAR)
- . Salinity
- . Ocean Currents (Surface & Deep Sea Currents)
- . Ocean Life:
 - Special Body Features
 - Fish Body Shape and Movement
 - Biological Interactions: Mutualism and Commensalism in the Ocean
 - Deep Sea Life – Bioluminescence, Anglerfish



We also talked about the ocean zones and different layers of the ocean.



Marine Habitats



Notebook Pages Montessori Cards Lapbook Pieces



Marine Habitats

Intertidal zones Sandy shores




Rocky shores-tidal pool Mangroves



Marine Habitats

Mangrove swamps and salt marshes Kelp forests



Seagrasses Coral reefs

Tide Pools

Tide pools

Tide Pools Organisms

Tide pools organisms

Marine Habitats

Open ocean Deep sea


Sea floor Hydrothermal vents

Marine Habitats

Marine habitats grid

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Water Form Words



estuary

An estuary is a partly enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and connection to the open sea.

A lagoon is a shallow body of water separated from a larger body of water by barrier islands or reefs.



lagoon



bay

A bay is a body of water connected to an ocean or lake, formed by an indentation of the shoreline. A large bay may be called a gulf, a sea, a sound, or a bight.

A cove is a smaller circular or oval coastal inlet with a narrow entrance; some coves may be referred to as bays.



cove

Water Form Words

Water Form Words



fjord

A fjord is a particularly steep bay shaped by glacial activity.

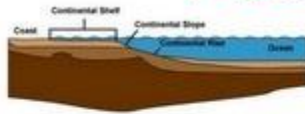


strait

A strait is a narrow body of water that joins two larger bodies of water, such as two oceans, two seas, or an ocean and a sea.

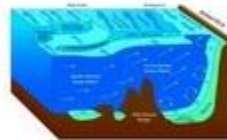
Features of the Ocean Floor

Features of the Ocean Floor



The continental shelf is an underwater landmass which extends from a continent, resulting in an area of relatively shallow water known as a shelf sea. Much of the shelves were exposed during glacial periods and interglacial periods. Continental shelves teem with life, because of the sunlight available in shallow waters.

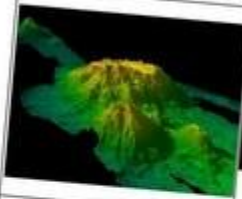
Abyss - the great depths of the ocean floor.



The longest continuous mountain range on Earth is beneath the ocean, mountain ranges from each of the 6 oceans connect forming a gigantic mountain system called the oceanic ridge. There are 40,000 miles of seamounts which span 1/3rd the circumference of the Earth!



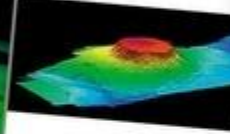
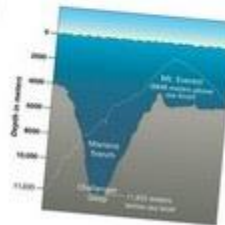
Features of the Ocean Floor



seamount

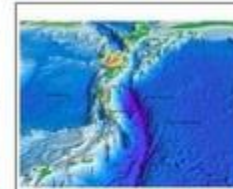
Seamounts are underwater mountains. They are typically extinct volcanoes that rise 1,000 or more meters off the ocean floor. Pictured above, Pinn Point, a 1,000 ft. high seamount with two smaller seamounts in the foreground.

Depth is a seamount with a flat top. The Blue Seamount (shown right) is a peak or flat topped seamount volcano in the Atlantic Ocean.



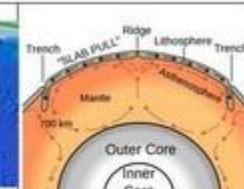
guyot

Features of the Ocean Floor: Trench

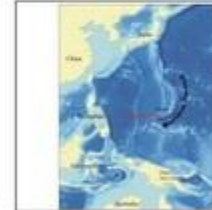


trench

*Atlantic trench is pictured in picture above.

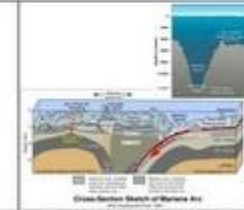


Trench formation



Mariana Trench

The Mariana Trench or Marianas Trench is the deepest part of the world's oceans. The deepest point is 10,994 m or 36,070 ft. It is located in the western Pacific Ocean, to the east of the Mariana Islands.



Cross Section of Mariana Trench

Early Navigation



Early navigators did not have the instruments available to us today. They used nature to help them find their way. They could use the sun and stars to help them determine their direction of travel.

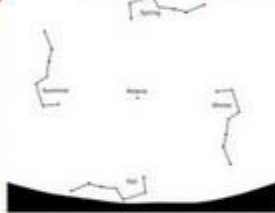
For one thing, they could observe the sun. The sun rises in the _____ and sets in the _____.

At night, navigators noticed that if they traveled at the same _____ (latitude), they could see most of the same stars.



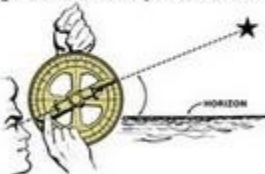
In the _____ Hemisphere, _____ (the North Star) can be used to determine the latitude.

How can you find Polaris? The two outermost stars in the bowl of the Big Dipper always point to the _____, which always points to the _____.



When you are almost at the North Pole, Polaris appears to be almost directly _____ the horizon. The further south you go and the closer you are to the equator, the lower Polaris is to the horizon.

Navigators used an astrolabe to determine latitude. The latitude at the equator is _____°. The latitude at the North Pole is _____°. The higher the North Star appears in the sky, the greater the degree of latitude (and the closer you are to the North Pole).



Early Navigation



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Sonar:

This stands for _____

_____ and _____

SONAR—is used to find and identify objects in water. It is also used to determine water depth (bathymetry).

With sonar, you can tell the _____ and relative _____ of underwater objects.

Sonar uses a sound _____ and a _____

Transmitter creates a pulse of sound, often called a "ping," and then listens for reflections (echo) of the pulse.

"Sonar" was first used in _____

In the 1960s, the U. S. Navy began using a new technology called "multibeam sonar." Arrays of sonar projectors produced soundings not only along the track, but also for significant distances perpendicular to the ship's track. Instead of lines of soundings, these new "multibeam" systems produced a "swath" of soundings.

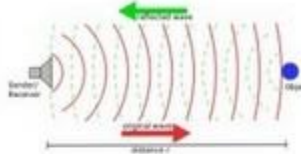
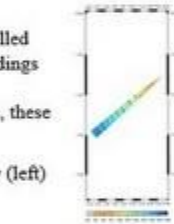


Ships such as the *Henry B. Bigelow* (left) use sonar to

- _____
- _____
- help fisheries measure the biomass of fish in the area
- and for _____

Some sonar systems also measure the strength of the echo, and this

information can be used to make inferences about some of the reflecting object's characteristics. Hard objects, for example, produce stronger echoes than softer objects.



Sonar:

This stands for Sound Navigation and Ranging.

SONAR—is used to find and identify objects in water. It is also used to determine water depth (bathymetry).

With sonar, you can tell the location, size, and relative motion of underwater objects.

Sonar uses a sound transmitter and a receiver. Transmitter creates a pulse of sound, often called a "ping," and then listens for reflections (echo) of the pulse.

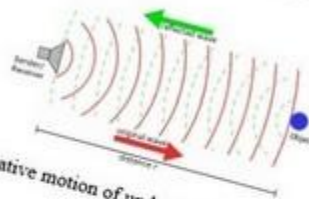
"Sonar" was first used in World War I.

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Ships such as the *Henry B. Bigelow* (left) use sonar to

- survey marine life,
- map the ocean floor,
- help fisheries measure the biomass of fish in the area
- and for oceanographic research.

Some sonar systems also measure the strength of the echo, and this information can be used to make inferences about some of the reflecting object's characteristics. Hard objects, for example, produce stronger echoes than softer



Ocean Unit: Salinity Activities

Salinity Experiment: Red (Salt) Water on top, Blue (Plain) Water on the Bottom



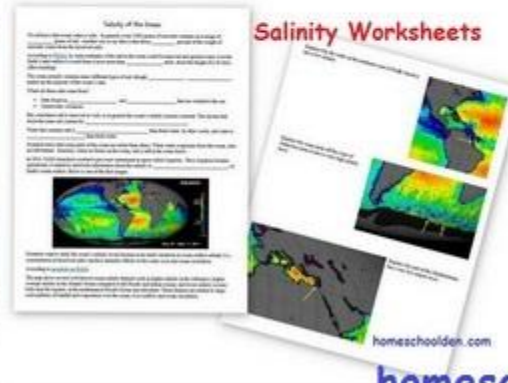
Salinity Experiment with Pony Beads



Salinity Experiment



Salinity Worksheets

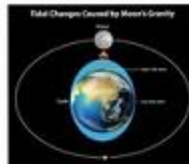


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What causes tides?

If you've been to the beach, then you know that the water level of the ocean can be higher up the shore or lower. This is called the tide. Gravity is one force that causes tides. The moon has a major influence on Earth's tides, as does the sun.

The gravity of the Sun and the gravity of the Moon pull on objects on Earth. In response to the Moon's gravitational pull, water bulges on the side facing the moon. The Moon also pulls on the Earth itself, leaving a second bulge of water on the other side of Earth.



As the Earth rotates, different parts of it pass through these bulges and dips. The result is high and low tides once or twice a day (depending on other factors such as the shape of the land, etc.)

Tide changes proceed via the following stages:

- Sea level rises over several hours, covering the intertidal zone; flood tide.
- The water rises to its highest level, reaching high tide.
- Sea level falls over several hours, revealing the intertidal zone; ebb tide.
- The water stops falling, reaching low tide.

The intertidal zone is the area that is above water at low tide and under water at high tide. This can include many different types of habitats: mudflats, tide pools, and so forth.

The Moon is the main cause of tides, but the Sun also affects the tides as well. Tides are influenced by the Moon's relative position to the Sun.

Do you know the phases of the moon?

As the Moon travels around the Earth, the Moon is thrown into shadow depending on its position relative to the Sun and Earth.

As the moon rotates around the sun, the portion of the Moon that is visible on Earth changes:



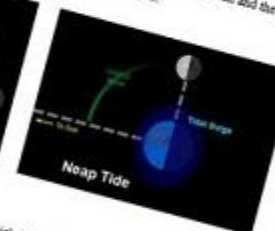
What causes tides?

Spring & Neap Tides and the Phases of the Moon

Where would the Sun be located in the drawing below?



When the Sun and Moon are aligned on the same side of the Earth, the moon is "new." During a new moon, the Sun, Earth and Moon are also aligned. The gravity of the Sun and the gravity of the Moon combine to pull Earth's waters in the same directions.



Spring Tide

When the Sun and Moon are aligned, the highest high tides and lowest low tides are produced.

Neap Tide

When the Sun and Moon are at right angles to the Earth, producing the lowest high tides and the highest low tides.

Spring Tide

When the Sun and Moon are aligned once again, and the Sun augments the Moon's gravitational pull, causing a Spring Tide.

Neap Tide

The Moon and Sun once again are at right angles to the Earth, causing a second Neap Tide.

Note: Spring Tide does not relate to the season, but to the word JUMP.

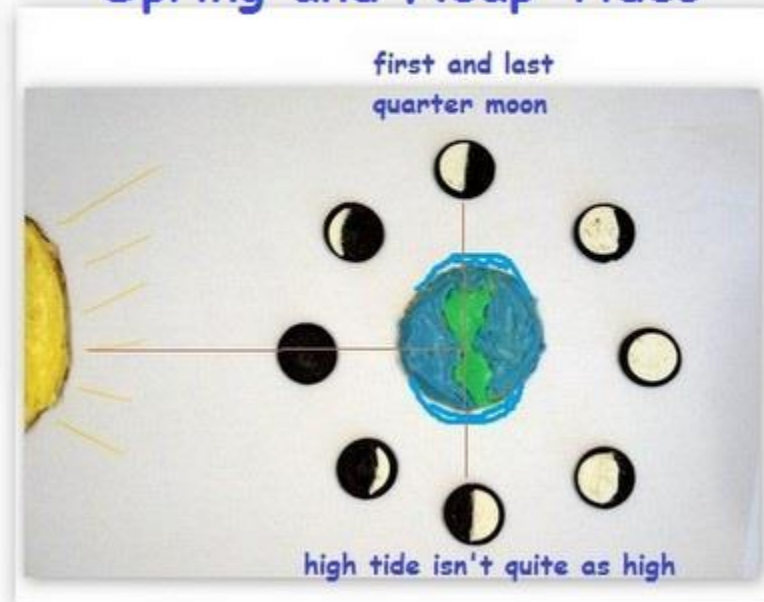
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Spring Tide (above)
Neap Tide (right)

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Activity to Understand Spring and Neap Tides



Fish: Special Body Features

Special Body Features, Appendages

Find examples of each below. Some can be used more than once.
















	venomous dorsal spines along their backs	
	barbel (These look like whiskers, but are feeling and tasting organs near the mouth. They help the fish find food.)	
	bioluminescence	
	strange mouth shapes	
	"fishing lure" to attract their prey	
	sharp spines all over for protection	
	arms and tentacles for catching and holding	
	claws	
	electricity	

barbels,
spines,
bioluminescence,
claws,
etc.

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Special Body Features, Appendages

Find examples of each below. Some can be used more than once.

	venomous dorsal spines along their backs	
	barbel (These look like whiskers, but are feeling and tasting organs near the mouth. They help the fish find food.)	
	bioluminescence	
	strange mouth shapes	
	"fishing lure" to attract their prey	
	sharp spines all over for protection	
	arms and tentacles for catching and holding	
	claws	

Special Body Features, Appendages

Which special feature(s) apply to the animal below?

Ang: electricity -- This is an electric fish found in swamps, lakes and rivers in the Nile, Tanzania, Chad, Niger, Volta, Senegal, and Gabon basin.

Venus flytrap was anemone: tentacles to capture prey or to protect itself.

Red Lion Fish: venomous dorsal spine along their back

Anglerfish: "fishing lure" with bioluminescence

Catfish: barbel

Crystal Jelly: bioluminescence

Stingray: venomous dorsal spine along their back

Stingray: poisonous barb on their tail

Crab: pinching claws

Fish Body Shape and Movement

Fish's body shape is a result of specialization in its environment. There is great diversity in the shapes of fish and their body parts.

Fastest: <ul style="list-style-type: none"> Fastest of all fish Streamlined, torpedo shape Powerful tails help them chase prey and avoid predators Many live in the open ocean and swim continuously 	Sphere: <ul style="list-style-type: none"> When threatened, these fish fill their bodies with water or air, becoming too big to swallow Some have spines for added protection
Flat: <ul style="list-style-type: none"> Elongated, arrow-like fish These hunters ambush their prey They first motionless until a smaller fish swims near, then they lunge with lightning speed to seize their prey 	Elaborate: <ul style="list-style-type: none"> Snake-like fish Slow swimmers, but move easily through cracks and crevices, under rocks and around plants Secretive, hiding from predators and ambushing prey
Depressed: <ul style="list-style-type: none"> Flat, pancake-shaped fish Use camouflage instead of speed for survival Flip fins up and down and swim like a bird To escape predators, they burrow into the sand or mud Many change the color of their skin 	Compressed: <ul style="list-style-type: none"> Flattened from side to side When viewed from the front, these fish seem to disappear Common on coral reefs Compressed bodies allow them to make quick, sharp turns and dart in and out of hiding places

Identify the fish body shape below:



Fish Body Shape
& Movement

Bioluminescence

Many midwater fish have light organs called _____ that produce light. This biological production of light is called bioluminescence.

Bioluminescence is common and important in the open ocean. In fact, (depending on how you count it) nearly _____ % of animals in the open waters emit light (not including animals that dwell on the ocean bottom).



Most animals on this planet live in the deep sea, so some scientists have pointed out that more creatures use light (bioluminescence) than use sound (including _____). Some animals _____ bioluminescent _____ which house in black pouches. The bacteria emit light all the time, but these organisms can open and closing, allowing the creature to control how much light is emitted.

Why would organisms produce light?

1) _____ to hide. Many predators in midwater have upward pointing eyes to search for silhouettes. To protect themselves, some creatures have light producing organs on their underside to match the dim light coming from the surface. Many can dim the light as they descend into deeper waters. In this way, they become somewhat invisible to predators viewing them from below.

2) _____ Bright flashes of light can startle a predator causing them to hesitate. Some organisms (such as copepods, shrimp, tube-shoulder searid fish, and ctenophores, and siphonophores) will use light to distract or divert predators. Some animals will shoot out clouds of light which acts as a smoke screen so predators cannot follow the escaping prey. The picture above right shows defensive spew bioluminescence in the shrimp, *Parapandalus*. The vampire squid emits a cloud of luminous secretion.



3) _____ Some organisms may emit light as a warning to stay away. Possible warning bioluminescence in the brittle star, *Opiliodon nototopius*. Image courtesy of [NOAA.gov](https://www.noaa.gov)

4) _____ Some organisms use lighted body parts to lure and attract prey. Anglerfish has "fishing lures" that dangle in front of their mouths. Gulper eels have a light at the end of their tail, it is thought they use this light to attract prey to its mouth.

Right: The bioluminescent lure of the barbeled dragonfish, *Eustomia pacifica*. Dragonfish image courtesy of [NOAA.gov](https://www.noaa.gov)



5) _____ Many creatures have specific light patterns, specific to a certain sex. Anglerfish and lantern fish are both thought to produce light to attract a mate.

In the Bathypelagic Zone (Midnight Zone), bioluminescence is as prevalent as in the Mesopelagic Zone (Twilight Zone), however in the complete darkness of this zone, there is no need for counterlighting.

- Bioluminescence can be found in many organisms:
- Dinoflagellates (marine plankton) and radiolarians (protozoa - zooplankton)
 - Various jellyfish
 - Cnidarians (corals, anemone, etc.)
 - Annelids (worms)
 - Mollusks (such as gastropods)
 - Cephalopods - Squid have at least 70 luminous genes
 - Crustaceans
 - Echinoderms (such as brittle stars, sea stars, sea cucumbers)
 - Fish - one family of sharks (lantern shark) and in 43 families of bony fish
 - Anglerfish, Ponyfish, Lantern fish, Hatchet fish, Dragon fish

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Right: The bioluminescent lure of the barbeled dragonfish, *Eustomia pacifica*. Dragonfish image courtesy of [NOAA.gov](https://www.noaa.gov)



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THE LAYERS OF THE OCEAN ACTIVITIES

The Deep Ocean

Coral Reefs: Usually around 150 feet, though some are up to 450 feet deep.

99% of ocean life lives between 0-660 feet.

Giant Squid: These generally dive between 300 and 2,000 feet.

Deepest scuba diver: 1,044 feet.

Sperm Whale: Average dive 4,000 feet. Deepest dive 28,000 feet.

Most jellyfish live in shallow waters, but a few ink waters of 13,600 feet.

Titanic Wreckage: 13,500 feet.

Octopus: The deepest octopus have been spotted at waters - 13,045 feet.

Submersal Robot: The submersible, Alvin, was in a depth of 13,000 feet. The submersible, Alvin, dove to over 25,000 feet. The hydroscapher Trieste dove right into the first manned vehicle to bottom of the Mariana Trench. In 2012, James Cameron did a solo dive to the bottom of the Mariana Trench at 10,912 feet.

Deepest recorded fish: 10,912 feet.

Deepest point in the ocean in Mariana's Trench: 10,912 feet (36,070 feet) below sea level. This is 6.8 miles deep!



Cut out the following and glue them onto the following page.

Coral Reefs 	Jellyfish
Sperm Whale 	Giant Squid
Titanic Wreckage 	Octopus
Submersibles 	Scuba Divers
Deepest recorded fish 	
Deepest point in the ocean Mariana's Trench 	

This second activity is available in feet and in meters.

Marine Habitats



Marine Habitats



Intertidal zones

Sandy shores



Rocky shores-tidal pools

Mudflats

Ocean Zones

Sunlight Zone



Twilight Zone



Midnight Zone



Trench Zone



Ocean Zones Cards

Sunlight Zone

Twilight Zone

Midnight Zone

Trench Zone



Blue Marlin



Humpback Whale



Grey Reef Shark



plankton



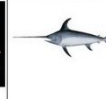
octopus



squid



Cuttlefish



Swordfish



Atlantic Silver Hatchetfish



Anglerfish



Sea Cucumber (Sea Pig)



Snipe Eel



Lanternfish



Lizardfish



Sloane's Viperfish



hydrothermal mussels and coldwater crabs



Anomuran crabs around a hydrothermal vent



Tubeworms and Soft Coral

plankton, sea stars, jellyfish, sea urchins, sea turtles, dolphins, seals, sharks, sting rays, sand dollars, fish

deep diving whales, Swordfish, octopus, squid, Cuttlefish, Hatchetfish, Viperfish

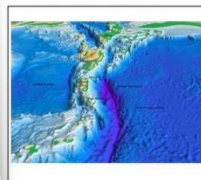
Viperfish, Lanternfish, Anglerfish, Snipe Eel, Lizardfish, Sea Cucumber

mussels, crabs, tube worms, viperfish

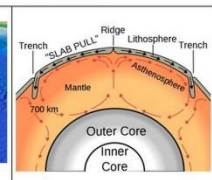
Viperfish only 200 to 5,000 feet during the day and rise at night to feed.

cuttlefish are also known for their vertical migration. During daylight hours most species remain in the twilight zone. Deep-sea squid, however, descend to 1,000 to 1,000 meters (3,300 to 3,300 feet) at night, but are not known to rise from the twilight zone during the day.

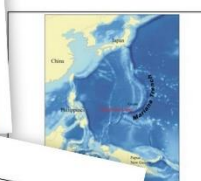
Features of the Ocean Floor: Trench



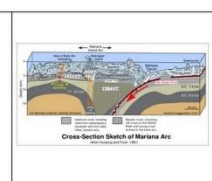
trench



Trench formation

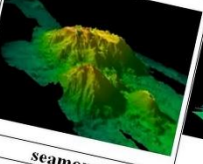


trench

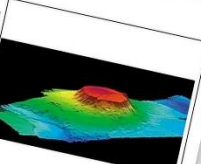


Cross Section of Mariana Trench

Features of the Ocean Floor



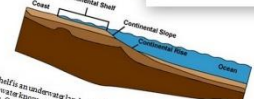
seamount



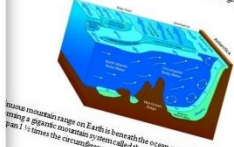
guyot

Seamounts are underwater volcanoes. Pictured above: Piton de la Fournaise, a shield volcano in the French Alps. The Blue Seaamount (above right) is a guyot or flat-topped underwater volcano in the Atlantic Ocean.

Features of the Ocean Floor



A continental shelf is an underwater landmass which extends from a coastline, bounding an area of shallow, shallow water known as a shelf sea. Most of the shelf was exposed during glacial periods and glacial periods. Continental shelves form with life, because of the height available in shallow waters.



A mid-ocean ridge is a large mountain range on Earth's seafloor. The oceanic crust ranges from 100 to 1,000 miles (160 to 1,600 km) in length and 100 to 1,000 miles (160 to 1,600 km) in width. The ridge is the site of the greatest depths of the ocean floor.

