
Deep Blue Sea Supplemental Guide



The materials in this kit were funded by a generous grant #11660 from the Chesapeake Bay Trust and from Maryland Department of Natural Resources Wildlife & Heritage Service (<http://www.dnr.maryland.gov/>).

This kit has been designed to supplement Deep Blue Sea, a Growing Up WILD activity. Growing Up WILD is an early childhood education program designed to teach kids aged 3-7 about nature through interdisciplinary, developmentally appropriate activities. Growing Up WILD has been aligned with Common Core (K-2), Head Start Domains, NAEYC standards and Maryland Environmental Literacy Standards.

Growing Up WILD materials are copyrighted by the Council for Environmental Education (CEE). The Growing Up WILD guide with 27 activities can be purchased directly from CEE (www.projectwild.org) or can be obtained for free or at low cost by attending a workshop in Maryland. Check out the Maryland Department of Natural Resources website (www.dnr.maryland.gov/wildlife/Education/ProjectWild/GrowingUpWild.asp) to find out about upcoming workshops or contact Sarah Witcher at 410-260-8566, sarah.witcher1@maryland.gov. Workshops can be set up for free with your organization if a minimum number of participants can be achieved.

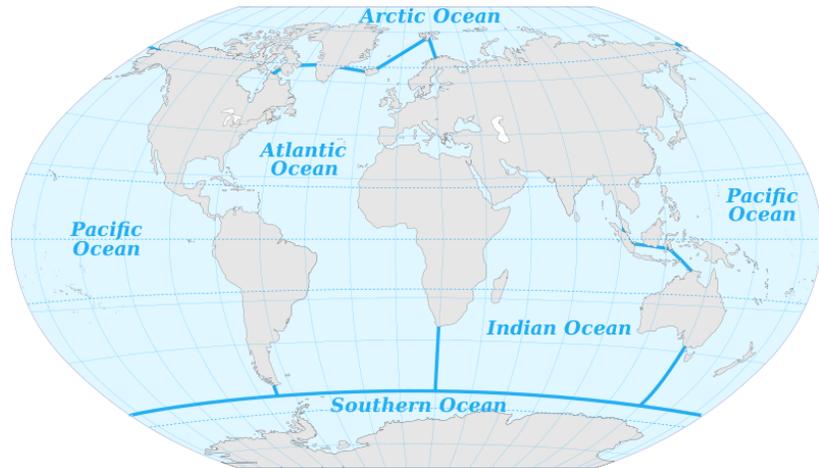
Deep Blue Sea Contents:

1. Sea Otter puppet
2. Inflatable Globe
3. Bike Pump
4. Mix of seashells
5. Alphabet of Ocean Animals Book
6. Animals in the Ocean Book
7. Sea Creatures Book
8. Plastic Fish (6)
9. Laminated ocean animals cards
10. Laminated ocean animal factsheets (6)
11. Laminated activity, resource guide and cd

Please inventory the toolkit upon receipt and before return. Please notify the Wildlife and Heritage Service of any missing or broken items at 410-260-8540. Thank you!

All About Oceans

Oceans cover more than 70% of Earth's surface, and about 97% of Earth's water is contained in oceans and seas. The five oceans – the Pacific, Atlantic, Indian, Southern, and Arctic – are all connected and form an enormous mass of water. Seas are smaller bodies of salty water within the oceans.



The Earth's oceans serve many functions, especially affecting the weather and temperature. One of the most dramatic forms of weather occurs on the oceans: hurricanes, which are known as typhoons in the Pacific Ocean. The oceans moderate the Earth's temperature by absorbing incoming solar radiation (stored as heat energy). The always-moving ocean currents distribute this heat energy around the globe. This heats the land and air during winter and cools it during summer.

Table 1: Size and depth for Earth's oceans, from largest to smallest in area.

Ocean	Area (sq mi)	Average Depth (ft)	Deepest depth (ft)
Pacific Ocean	63,780,000 sq mi	15,215 ft	Mariana Trench, 36,198 feet deep
Atlantic Ocean	41,080,000 sq mi	10,950 ft	Puerto Rico Trench, 28,231 ft deep
Indian Ocean	28,400,000 sq mi	13,002 ft	Java Trench, 25,344 ft deep
Southern Ocean	7,848,000 sq. mi	13,100 - 16,400 ft	Southern end of the South Sandwich Trench, 23,737 ft deep
Arctic Ocean	5,400,000 sq mi	3,953 ft	Eurasia Basin, 17,881 ft deep

Why Are the Oceans Salty?

The saltiness of oceans (aka **salinity**) varies for each body of water. Oceans get much of their water supply from rivers. As water flows in rivers, it picks up small amounts of mineral salts from the rocks and soil of the river beds. This very-slightly salty water flows into the oceans and seas. The water in the oceans only leaves by evaporating (and the freezing of polar ice), but the salt remains dissolved in the ocean - it does not

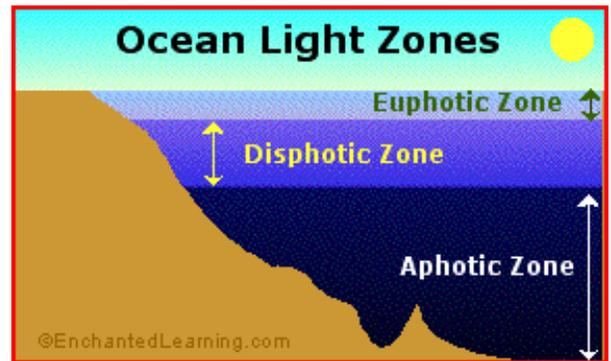
evaporate. So the remaining water gets saltier and saltier as time passes. Typically, the oceans are about 3.5% salt (by weight).

What Causes Tides?

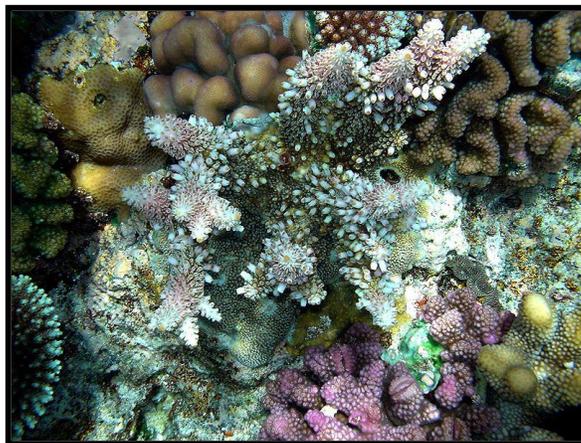
Tides are periodic rises and falls of large bodies of water. Tides are caused by the gravitational interaction between the Earth and the Moon. The gravitational attraction of the moon causes the oceans to bulge out in the direction of the moon. Another bulge occurs on the opposite side, since the Earth is also being pulled toward the moon (and away from the water on the far side). Since the earth is rotating while this is happening, two tides occur each day. Sir Isaac Newton was the first person to explain tides scientifically.

What Are Ocean Light Zones?

Oceans contain different zones which relate to depth and light penetration. Certain ocean zones support specific animal species. In the simplest of terms, the three main ocean zones include the **sunlit** (euphotic) zone, the **twilight** (disphotic) zone and the **midnight** (aphotic) zone.



The **sunlit zone** is the top part of the ocean which receives the most sunlight. This zone goes from the water surface to about 600 feet underwater. Over 90% of marine life can be found in the sunlit zone. Coral reefs can be found in the sunlit zone. In this zone, there is enough light for photosynthesis to take place, so many plants and other photosynthetic organisms live in this zone and food is abundant. Photosynthesis is a process in which sunlight and carbon dioxide gas are converted into food (chemical energy contained in carbohydrates) and oxygen gas. Photosynthesis in the oceans creates approximately 90% of the Earth's gaseous oxygen. Most of the oxygen is produced by phytoplankton. These primary producers (also called **autotrophs**) are the first link in the food chain in the oceans.



Coral reef by Brocken Inaglory, Wikimedia Commons

The **twilight zone** receives considerably less light than the sunlit zone and can be found from 600 feet underwater to about 3,300 feet underwater. In the disphotic zone, there is enough light to see during the day, but not enough light for photosynthesis to take place, so no plants live in this zone. The amount of light decreases with depth. Because of this, food is not abundant. The animals that live in the disphotic zone are adapted to life in near darkness, cold water and high pressure. Many of the animals in this zone have large eyes, helping them see in the nearly dark waters. Most are small, dark and thin (to help camouflage them). Many have large teeth and jaws. Animals such as sperm whales and swordfish often migrate between the sunlit and twilight zones in search of food.

The **midnight zone** receives no sunlight and can be found from around 3,300 feet underwater to the ocean floor. Temperature is nearly freezing and decreases with depth, while pressure is high and increases with depth. Creatures in this area must be able to live in complete darkness and in close to freezing water. Animals in the midnight zone include anglerfish, tubeworms, some squid, viperfish and others.

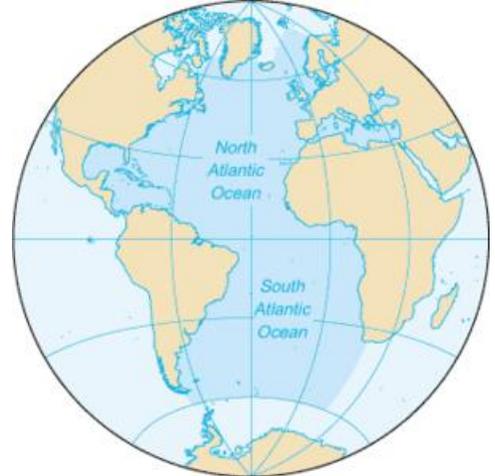


Anglerfish can be found in the midnight zone

Atlantic Ocean

The name, Atlantic, is derived from Greek mythology and means "Sea of Atlas." The Atlantic Ocean appears to be the youngest of the world's oceans. Evidence indicates that it did not exist prior to 100 million years ago, when the continents that formed from the breakup of the ancestral supercontinent, Pangaea, were being rafted apart by the process of seafloor spreading.

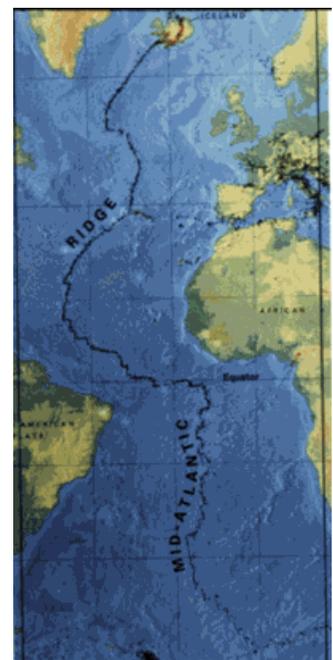
The Atlantic Ocean is the world's second-largest ocean with an area of 41,080,000 square miles. It is located between Africa, Europe, the Southern Ocean and the Western Hemisphere. A small portion of Maryland also borders the Atlantic Ocean. It includes other water bodies such as the Baltic Sea, Black Sea, Caribbean Sea, Gulf of Mexico, Mediterranean Sea and the North Sea. The average depth of the Atlantic Ocean is 10,950 feet and the deepest point is the Puerto Rico Trench at 28,231 feet. The Atlantic Ocean is important to the world's weather (as are all oceans) because strong Atlantic hurricanes are known to develop off the coast of Cape Verde, Africa and move toward the Caribbean Sea from August to November.



Since 1914, ships have been able to travel quickly between the Atlantic and Pacific Oceans using the Panama Canal. The canal cuts through a narrow isthmus that joins North America and South America. This route shortened the sea voyage between New York City and San Francisco by about 7,800 miles. However, the canal is too small for some of today's largest ships to use.

Atlantic Ocean Bottom

The Atlantic Ocean bottom contains a great submarine mountain range called the **Mid-Atlantic Ridge**. It extends from Iceland in the north to approximately 58 degrees south latitude, reaching a maximum width of about 1,000 mi. Several active volcanoes can be found along this ridge. A great rift valley also extends along the ridge over most of its length. The depth of water over the ridge is less than 8,900 ft in most places, and several mountain peaks rise above the water, forming islands. The South Atlantic Ocean has an additional submarine ridge, the **Walvis Ridge**.



Atlantic Ocean Animals

The Atlantic Ocean is home to thousands of different animals and plants. Some notable Atlantic Ocean animals include humpback whales, bottlenose dolphins, sea lions, green sea turtles, starfish, sand dollars, tarpons, shrimp, killer whales, sharks and stingrays.

Species such as Atlantic salmon and American eels also spend part of their lives in the Atlantic. The Atlantic salmon is an **anadromous fish**, typically spending 2-3 years in freshwater, migrating to the ocean where it also spends 2-3 years, and then returning to its natal river to spawn. In contrast, the American eel is **catadromous**. All eels are born in the Sargasso Sea in the Atlantic and later make their way into freshwater or brackish systems to live most of their adult lives. When it is time to breed, the mature eels will return to the Sargasso Sea.



Assateague Island

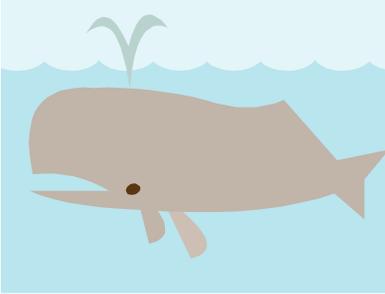
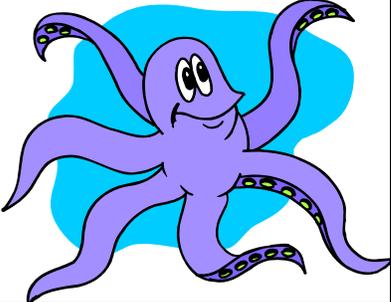
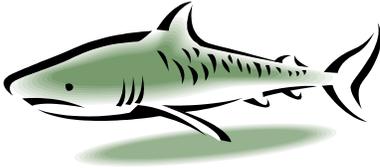
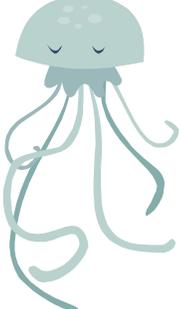
Assateague Island is a **barrier island** bordered by the Atlantic Ocean on the east and the Sinpuxent Bay on the west. Barrier islands are long, relatively narrow strips of land that run parallel to the mainland. Assateague Island is approximately 38 miles long. The entire Island is a wildlife sanctuary, protected from development. The northern portion of Assateague Island is in Maryland, and the southern portion is in Virginia.

Assateague Island supports many different species of wildlife. Over 320 species of birds inhabit the island during some portion of the year, including American Oystercatcher, Great Blue Heron, and Snowy Egret. The Piping Plover is a notable endangered species that nests on Assateague. Horseshoe crabs can be found along beaches and inland bays at Assateague Island. In the spring, the horseshoe crabs mate and lay their eggs. The eggs provide food for sandpipers, gulls, sanderlings, and hundreds of thousands of shorebirds (at least 20 species of shorebirds). Horseshoe crab eggs are also a preferred food for flounder, trout, silversides, crabs, and whelk.

Additional Ocean Activities

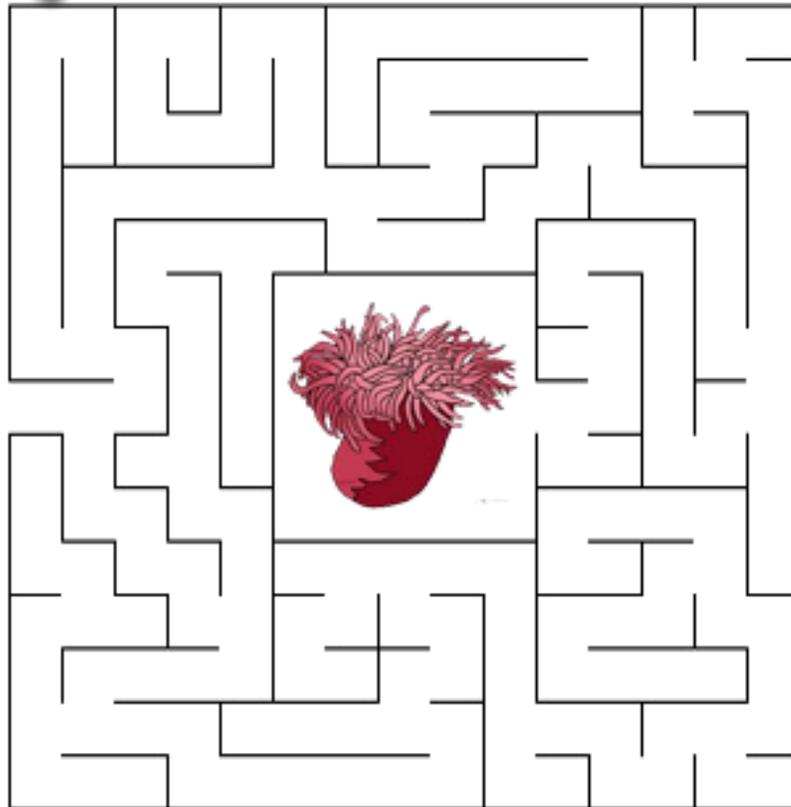
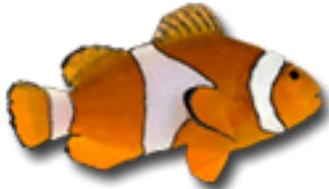
Ocean Animals

Circle the starting sounds of ocean animal names. The words are fish, whale, octopus, crab, lobster, starfish, dolphin, shark, and jellyfish.

		
A F P	W Y E	O M T
		
C V W	A L N	B N S
		
O D L	S R I	U J Y

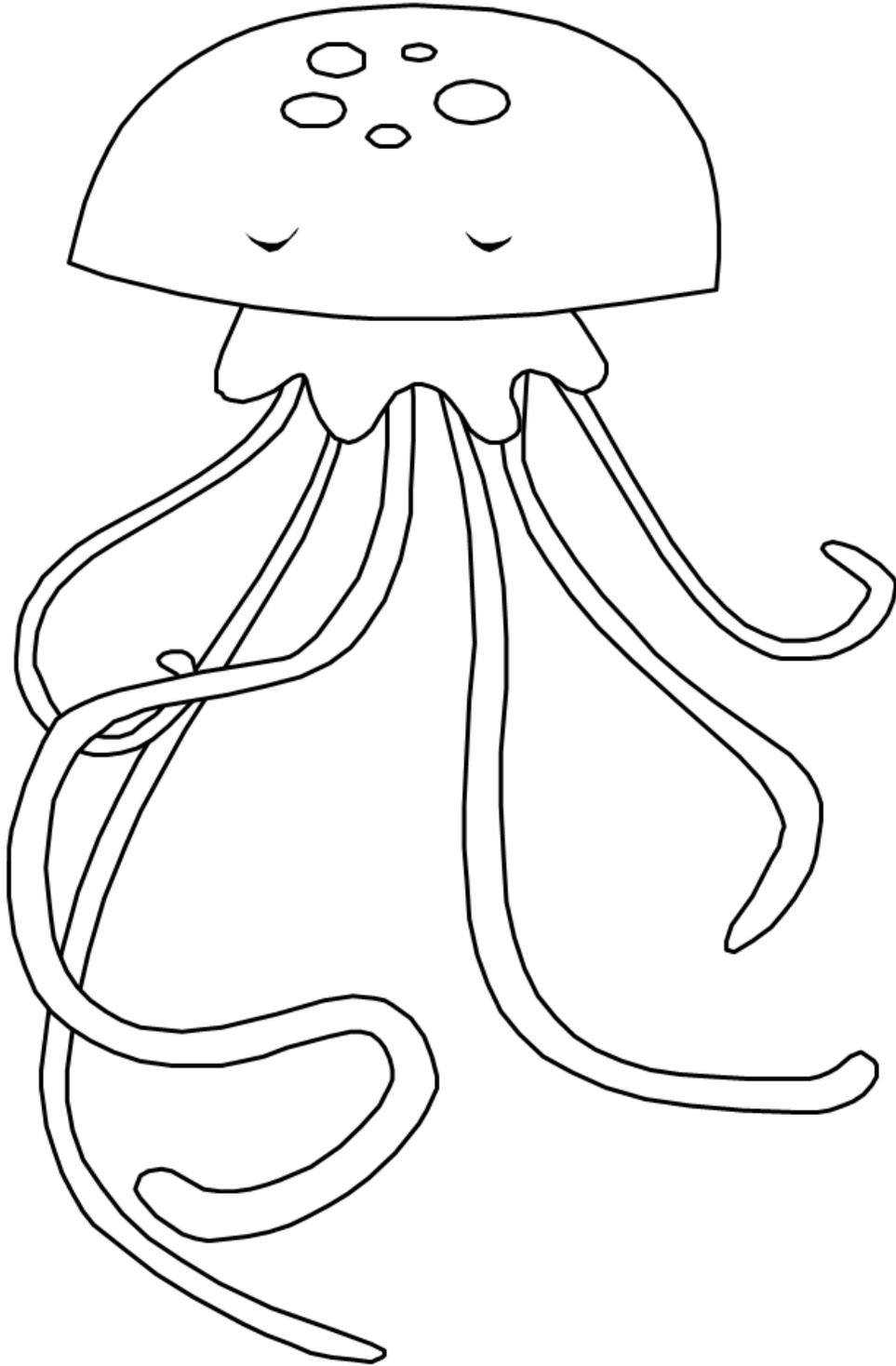
Ocean Maze

Sea anemones protect clownfish from predators. Help the clownfish find the sea anemone.



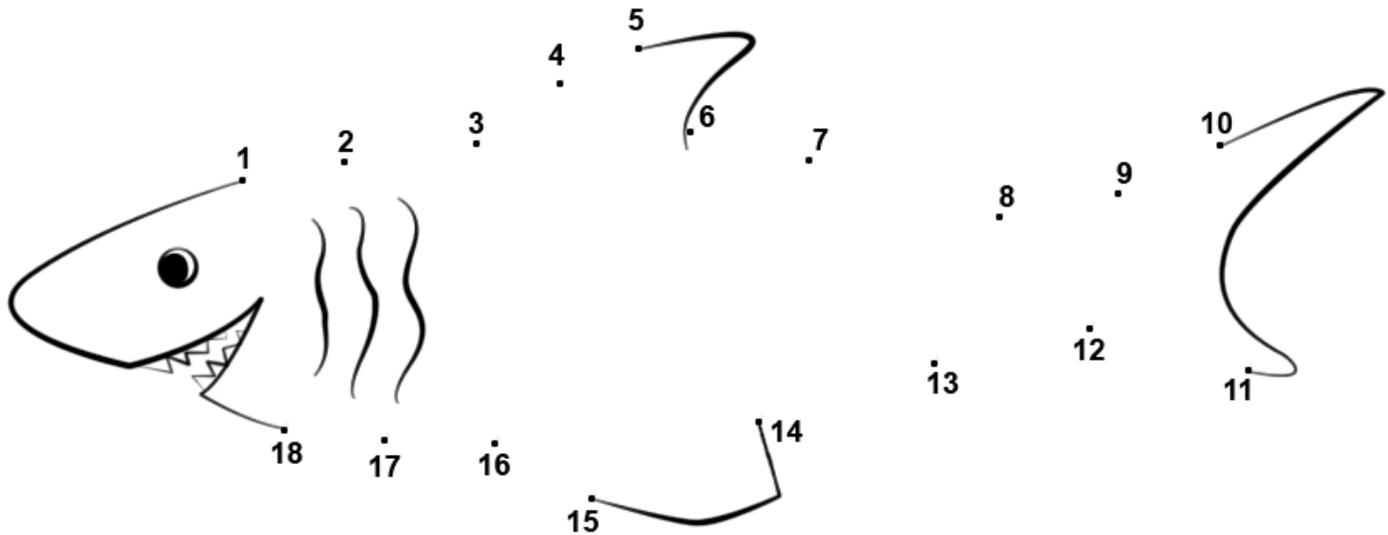
Color the Jellyfish

Jellyfish are invertebrates and don't have a backbone.



Connect-the-Dots: Shark

Sharks are fish. Almost all sharks are **carnivores** or meat eaters. They live on a diet of fish and sea mammals (like dolphins and seals) and even turtles and seagulls. The teeth of the carnivores are sharp and pointy.



Rainbow Fish Craft

From: http://www.dltk-teach.com/books/rainbowfish/rainbow_fish_craft.htm

Materials:

- template of the fish (or you can draw your own)
- 1/2 inch or so pieces of various colored tissue paper or construction paper
- small amount of tinfoil
- thin strips of various colored tissue paper or construction paper
- one big blue piece of tissue or construction paper OR a blue marker or crayon
- glue
- scissors



Instructions:

1. Print rainbow fish template on next page (or draw the outline of a fish on a piece of paper)
2. Color the head in blue, or glue on a piece of tissue or construction paper. It doesn't have to be perfect as we're going to cut out the fish at the end.
3. Glue strips of various colored tissue or construction paper on the fins and tail (see photo).
4. Glue 1/2 inch (ish) squares of tissue paper or construction paper onto the body.
5. Glue a few strips and 1/2 inch squares of tinfoil over the fish (or just glue on one square scale to show Rainbow Fish after he shared).
6. Cut out along the lines (if you used tissue paper you'll be able to see the lines through it... if you used construction paper, just estimate where the lines are). This step will require adult assistance for younger children.

Rainbow Fish Craft (Cont'd)

From: http://www.dltk-teach.com/books/rainbowfish/rainbow_fish_craft.htm

