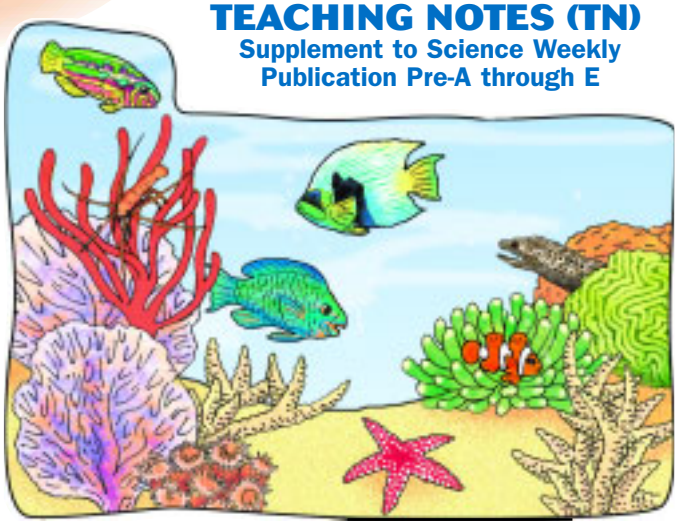
Science Weekly HANDS-ON
"PUT A LITTLE SCIENCE IN YOUR WEEK"
Vol. 21, No. 1

Coral Reefs

TEACHING NOTES (TN)

Supplement to Science Weekly
Publication Pre-A through E



Dear Subscribers:

Welcome to the start of a new school year and a new semester at ***Science Weekly*** magazine. If you are a returning subscriber, we hope you like our new format; if you are new to our magazine, we hope you enjoy our unique approach to building scientific literacy.

My name is H. Michael "Mike" Mogil and I am your new editor. I have an extensive background in science and education with a degree in meteorology. This includes writing, teaching and developing educational materials. While I bring many new perspectives, I will be implementing them on ***Science Weekly's*** existing solid foundation, developed over two decades.

I am also a good listener and want to hear from you. Teaching Notes (TN) will now include a "letters from the editor" section devoted to fostering an ongoing dialogue as I answer your letters and e-mails. And where there is strong justification, and the means to enhance ***Science Weekly,*** we will try to make meaningful changes.

I am thrilled about ***Science Weekly's*** focus on grade-level appropriate reading for content and promise to keep that as our primary focus. It's a great way to offer material students can understand and use and which you can integrate throughout your curriculum. Recently, I have heard too many schools emphasize that they have to "drop science" because there has to be a greater focus on reading. Realistically, reading for science content is important far beyond reading for its own sake; it is able to simultaneously satisfy the requirements of both curricula. To make reading more meaningful to students, it has to be relevant and help them understand how things in their world connect. To meet this goal, we have more fully integrated reading with writing, math, geography and new technologies. For the first time, we will be posting a list of hyperlinks for each edition directly on our **scienceweekly.com** web site. This will provide you and your students with easy "click and go" web accessibility.

One of our writers suggested that we add a "meet the scientist" feature for grades 4–6. Now, in each edition, you can get to know a scientist both as an adult and a youngster interested in science. The intent is to enable students to say, "Hey, I can be a scientist too!" In addition to encouraging students to consider science as a future career, I hope that ***Science Weekly*** will allow students and adults to better use science in their everyday lives and become better observers of their world. It also means that we will be providing better guidance on how ***Science Weekly's*** content matches

(continued on page 8)

Coral polyps on Molasses Reef
Photography by: Brent Deuel
Image courtesy of the Florida Keys National Marine Sanctuary

Background

Coral reefs, often called the "rain forests of the ocean," are one of nature's most ancient and beautiful habitats. Much like "rain forests" on land, the two **ecosystems** are more similar than you may think. Both are located mainly in the tropics in a 3,000 mile-wide belt around the equator. Each supports an incredible diversity of life.

Like rain forests, coral reefs are the permanent home of a huge number of plant and animal species. At least 25% of all ocean creatures (over 5,000 species of fish alone!) live in coral reefs. Many more animals are temporary reef residents. Fish and other sea creatures come here from the open ocean in search of food and a place to bear their young. Also, coral reefs are one of the oldest ecosystems on Earth. Scientists calculate that some may be more than 50 million years old. Corals grow slowly, some less than an inch a year. Yet there are many reefs that are more than a mile thick.

What is a Coral Reef?

Coral reefs are stony underwater landforms built from the remains of tiny animals called **coral polyps**. Coral polyps are about the size of a pea and look much like upside down jellyfish. In fact, corals are related to jellyfish and sea anemones and belong to the same phylum – the **Cnidaria**. There are two groups of corals – hard (or stony) corals and soft corals. It is the hard limestone skeletons of the 1,000 or so species of stony corals that make

up the structures we call coral reefs. Soft corals do not build reefs.

Stony corals grow in colonies or clumps. For protection, they build hard, cup-shaped houses called **corallites** around their soft bodies. They use **calcium carbonate** ($CaCO_3$), a chemical that they extract from seawater to build their houses. $CaCO_3$ is also found in our bones, egg shells and chalk.

A coral polyp reproduces by **budding** and produces a new polyp called a **daughter**. The new polyp remains attached to its parent and builds its own stony corallite. Through this process, huge colonies can evolve. Since the polyps are connected to each other, they can share food and spread warnings of danger throughout their colony.

The shape of a coral colony is determined by its type and also by the depth at which it grows. Branching corals typically grow close to the ocean surface. Plate corals grow in deeper water. Corals take many fantastic forms and can be shaped like antlers, fingers, flowers, trees, nets, and fans, among a myriad of others. Many of their names reflect their shapes – brain coral, elkhorn coral, cabbage coral, cactus coral, mushroom coral, and sea whips.

There are different types of coral reefs as well.[1] A **fringing reef** grows next to the shoreline along coasts or islands; the outer edge of this reef often drops off sharply into deep water. This type of reef is sometimes separated from the shore by a shallow **lagoon**. A **barrier reef** grows farther off-shore and is separated from land by a wide lagoon. These reefs can stretch unbroken for many hundreds of miles and help protect the shoreline from powerful ocean waves, much like a barrier island does.[2] An **atoll** is a ring of coral reefs with a lagoon at its center. They form around volcanic islands.

Reefs are primarily found in regions that lie between 23.5° North and South latitude (the distance from the equator. Recently, scientists have started to study cold-water corals found at higher latitudes and in deep ocean waters. Often reefs grow near shorelines on the eastern sides of coasts and islands. The three primary coral reef regions in the world are located in the Indo-Pacific, the Red Sea, and the Western Atlantic. The Indo-Pacific region is considered to be the richest in coral and fish species.

Coral: Plant or Animal?

A coral polyp is an animal that hunts at night, catching tiny drifting animals called **zooplankton** with their stinging, **harpoon**-tipped **tentacles**. Food enters the polyp's stomach through the slit-like mouth hidden among its tentacles. Unfortunately, this does not provide enough food for the corals, so they rely on **zooxanthellae** (tiny plants living inside the coral) to make food during the day using **photosynthesis**. The zooxanthellae share their food with the coral polyp in exchange for a safe home. Interestingly, it is the zooxanthellae that give corals their color. Without these plants, corals are pale white.[3] In a coral colony, many plants and animals co-exist for the benefit of each other; this is known as a "**symbiotic** relationship."

Day and Night on the Reef

In many ways, a coral reef is like a big underwater city – huge, crowded, colorful, and full of activity. Reefs are formed from millions of corallite "houses," which are joined like apartment buildings. These "houses" provide shelter for many other reef-dwellers, also. Some visit the reefs; others remain for a lifetime. Particularly choice home-sites on the reef are inhabited by dual residents – one set being active in the daytime, the other at night.

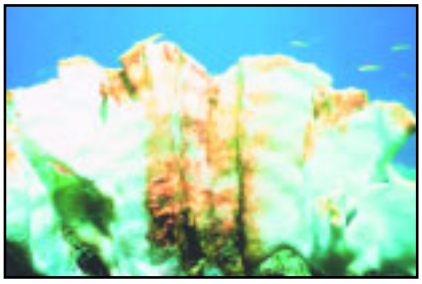
About 2/3 of all reef species are **diurnal**, or active during the day. Most of these have large, well developed eyes and often have bright colors that advertise their presence. About 1/4 to 1/3 of coral reef animals are **nocturnal**, resting during the day and becoming active at night. Most nocturnal creatures operate with their senses of touch, smell, and taste to hunt and find mates. Others have huge eyes to let in what little light is available. Many of the reef's **invertebrates** – boneless animals like lobsters, crabs, octopuses, and the corals themselves – are night-dwellers. A final 10% of reef animals are **crepuscular**, or active around dawn and dusk. The crepuscular animals are most often the largest predators on the reef, taking advantage of the low light conditions when tired fish are returning to their homes.

Coral reefs often have several cleaning stations. Here small sea animals provide services to others, like the cleaner shrimp which cleans the teeth of large fish. Others eat decaying food and parasitic organisms from the inside of the mouths and scales of larger reef fish. The anemone provides protective services to small fish, like the clown fish and cleaner wrasse. The anemone uses its poisonous stinging tentacles to capture prey and protect its little residents from enemies. (Small fish that live around the anemone are covered with a slimy substance that keeps them from getting stung, themselves.) In return, the small fish help chase off larger fish who like the taste of anemones. Most predator creatures know not to eat their particular helper species.

Reefs in Danger

Unfortunately, one of the strongest similarities between rain forests and coral reefs is their vulnerability to the ravages of human and natural impacts. Scientists estimate that in some areas up to 90% of coral reefs have been severely damaged or destroyed. Coral reefs are found in 109 countries, but according to the Planetary Coral Reef Foundation, "an estimated 10% of coral reefs have already disappeared and an estimated 58% of all coral reefs are at risk today."[4]

As the Earth's population has grown, coastal building has boomed. Construction of buildings and roads near coast-lines have sent silt, mud, and other pollutants into the



Partially bleached coral

Image courtesy of OAR/National Undersea Research Program (NURP), University of North Carolina at Wilmington

Photography by: S. Miller

waters, sometimes clouding them and smothering coral colonies. Careless boaters and divers often damage coral reefs with their boat hulls and anchors. In many areas, reefs have been overfished for both food and for the exotic fish popular in saltwater aquariums. Sadly, these fishermen often use dynamite and a poison called cyanide to stun the fish they seek. They damage many other sea animals in the process, including corals.

Perhaps the greatest threat to coral reefs is the continued problem of **global warming**. As our atmosphere has begun to heat up, so have our oceans. A sustained rise in ocean temperature of just a few degrees can cause corals to expel their food-providing plant partners and lose their color. This process, called **coral bleaching**, causes corals to starve and die.

Protect our Reefs

1997 was named the **International Year of the Reef**. Countries around the globe worked to raise awareness of reefs (they are among the most beautiful and least explored places on Earth) and the dangers the reefs face. Scientists and others now recognize that the biodiversity and richness of reefs rival that of their land-based counterpart – rain forests. Reefs are a source of many biochemicals and medicines, and may hold the key to many others not yet discovered. Medical research is now using coral as a base for building new replacement bones. Coral reefs also provide storm protection for millions of people.

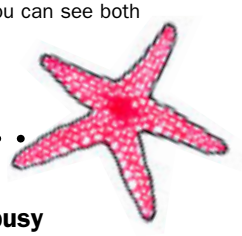
This richness is under siege. So, international organizations, governmental agencies and environmental groups are all working to raise awareness of coral reefs and protect them. From the information contained in this issue of ***Science Weekly*** magazine, you and your students should now recognize how fragile these reefs are. Talk with your students (or with your children at home) about reefs. Read about them; watch special TV shows that showcase reefs; and, talk about ways to make reefs, and all parts of our environment, better places for all species.

[1]See the ***Science Weekly*** web site for links and images showing these different types of reefs.

[2]See the image at NASA-JPL (link #6 on the web link page) to see a high-resolution image of a coral reef from space. The white areas show how the reef "surrounds" large parts of the Philippine Islands. Notice how the waves are stopped by the coral reefs, thereby protecting the land.

[3]See: http://www.pcrf.org/reefsincrisis.html. You can see both healthy and dead reefs in the Florida Keys.

[4]See: http://www.pcrf.org/reefsincrisis.html



Level Pre-A

Main Concepts: Many different kinds of plants and animals live in a coral reef. It is like a busy underwater city. Salt dissolves in water.

Picture Activity

Ask where WHY FLY is visiting in this issue of *Science Weekly*. He is visiting a **coral reef**. A coral reef is built by soft tiny animals called **coral polyps** that form hard, stony houses around themselves for protection. These houses are all connected together to form a coral reef. Coral polyps live primarily where the **ocean** is warm and **salty** and the **water** is clean and not too deep. Have your students look carefully at the many different types of sea life on the coral reef.

Vocabulary

Go over all the pictures together first – reef, eel, bee, seed, and sheep. Have students trace over the first "**ee**" and then fill in the blank spaces with the same letters.

Weekly Lab

You need: clear cups, spoons, water and Kosher or table salt. *(Kosher salt works best for this lab, because it will not turn the water cloudy when it dissolves.)* Have your students add a heaping spoonful of salt to their cups of water, stirring until the salt disappears (dissolves). **Ask, "Where did the salt go?"** Encourage all answers. Now introduce the word "**dissolves**" and explain that water helps make the salt come apart into tiny specks (or **molecules**). These specks are so small that we can't see them with our eyes. The tiny specks of salt mix in with the water. It may look like the salt has disappeared, but it is still there. Tell the students to **smell their saltwater solution** *(model the proper procedure for wafting their hand over the cup first).* **Can they "smell the salt?"** Ocean water is very salty. Most coral reefs need clean, salty, warm ocean water to stay healthy and grow.

To extend this activity, ***ask "What do you think will happen to the salt when all the water in your cup dries up?"*** *Pour out most of the water then leave their cups on a sunny window sill. Once the water has **evaporated**, students will see dried salt crystals left on their cups. Explain that the salt may have looked like it "disappeared," but it didn't. When the water dries up, they can see the salt again. (Hint: If the students have trouble seeing the salt left on the cup, put a piece of dark construction paper behind or under the cup. This will make the white salt crystals easier to see.*

Math

Answer: 9 teeth. Discuss with students *how* they solved the problem. Did they group by twos; add the number of teeth on the top to the number of teeth on the bottom; or, did they count by ones?

Explain that on a coral reef, some animals help other animals stay healthy by setting up **cleaning stations**. This **cleaner shrimp** cleans the teeth and scales of big fish like groupers and eels. This little shrimp has bright colors and long antennae to help the big fish see it and not eat it by mistake. In exchange for its cleaning services, the shrimp gets a good meal from the things it eats off the big fish.

To extend this activity, have students imagine that the smaller polka dot fish nearby has ___ teeth. How many teeth will this cleaner shrimp clean if it cleans the teeth on both fish?

Storytelling

This activity is designed to let students be creative in a science setting. For example, you can tell the following story *(in the orange box)* to your students. Have them listen carefully as you tell some things to color. **They will need: brown, orange, and green crayons**.

Swimmy Seahorse *and* ***Happy Clown fish*** *liked to explore all over their coral reef home. Sometimes, they would look for food. At other times, they would look for their friends. Sometimes, the coral reef can be dangerous when enemies are around.* ***Swimmy Seahorse*** *can change his color to help him hide when danger is near.* ***(Color Swimmy brown like the Eel Grass right behind him.) Happy Clown fish's*** *bright color makes him easy to see. He is near the bottom of the page.* ***(Color Happy orange, but leave all his thin stripes white; have the students refer to the artwork on Level Pre-A, page PA-1, if necessary.) Happy*** *is lucky. He doesn't change his color for protection. Instead, he stays by the* ***sea anemone****. The sea anemone has "stinging arms" that protect* ***Happy*** *from enemies.* ***Swimmy*** *and* ***Happy*** *always like to explore the strange* ***brain coral*** *with all its curvy and wavy bumps.* ***(Color the brain coral green.)***

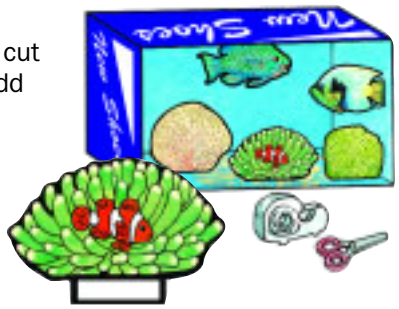
End your story by asking students what part of the coral reef *(page PA-1)* they think **Swimmy Seahorse** and **Happy Clown Fish** will visit next. Can they tell why?

Challenge

Answers: B and **F** are the same. All the sea anemones are identical. If students have any difficulty finding the fish that match, have them look carefully at each fish's eyes, fins and stripes in that order.

Bringing it Home

This activity can be done at home or in class. Your students will be building a coral reef **diorama**. Have them paint or paper the inside of their boxes blue *(blue foil paper works especially well)*. You may wish to have them glue some sand to their "ocean floor" also. Then have the students cut out the 5 shapes and add them to their dioramas. Some fish can be hung on thread, too. They can also wrap the entire box with blue-colored plastic wrap.



DID YOU KNOW?? 97% of all the world's water is in its oceans.

Level A

Main Concepts: Many different kinds of plants and animals live on a coral reef. It is like a busy city under the sea. Salt dissolves in water and re-appears when saltwater evaporates.

Picture Activity

See TN Level Pre-A.

Vocabulary

Go over all the pictures together first – reef, jeep, sleep, and sweep. Have them trace over the first "**ee**" and then write it in the other blank spaces. Then have them read the words. Have the students think of one four-letter and one five-letter word that have an "**ee**" inside. Have them draw a picture in the box too.

*To extend this activity, have students work in small teams to see who can make the longest list of "**ee**" words (e.g., deep, seed, creek, etc.). NOTE: the "**ee**" can appear anywhere in the word.*

Weekly Lab

See TN Level Pre-A; and, also follow the instructions in the student issue. In addition, students can also use a paintbrush to "paint" some saltwater designs or their first name on a piece of black construction paper. Once the water evaporates, students will see the dried salt crystals left on their paper.

Math

Answer: 9 teeth. 5 + 4 = 9. Have students use the **number sentence,** adding the **top** and **bottom** teeth to solve the problem.

Explain that on a coral reef, some animals help other animals stay healthy by setting up **cleaning stations**. (See TN Level Pre-A.)

To extend this activity, have students imagine that the smaller polka dot fish nearby has a total of ___ teeth. Ask students "How many teeth will this cleaner shrimp clean if it cleans the teeth on both fish?" From the first number sentence, create another number sentence:

"**Number of teeth on big fish + Number of teeth on little fish = Number of teeth for both fish.**"

Writing in Science

See TN Level Pre-A – STORYTELLING. In addition, at the end of the story add: Color the big fish near the top all yellow, but make the spot near his eye (his cheek) bright blue. Be sure to have students look at the coral reef picture on Level A, page A-1 if they need help deciding what colors to use.

Challenge

Answers: Clown Fish B and **H** are exactly the same. All the sea anemones are identical *(although sea anemones can come in various colors).* If students have any difficulty finding the fish that match, have them look *carefully* at each fish's eyes, fins, and stripes, in that order. **A** and **F** have eyes that are different than any other fish; all the fins are the same.

Bringing it Home

See TN Level Pre-A. Students can "create" their own sea anemone from two egg carton cups and curling ribbon. Have the students *carefully* poke a small hole in the center of each of the egg carton cups. They can then push through several pieces of curling ribbon to create the anemone's arms (**tentacles**). Then have the students place the clown fish near the tentacles for protection. If needed, explain to them how clown fish use the sea anemone for protection. Remind them about **Happy Clown Fish** in the STORYTELLING story (level Pre-A), too.

Level B

Main Concepts: Coral reefs grow primarily in warm, salty and clean ocean waters. Reefs are built by tiny animals called coral polyps. Many different kinds of plants and animals live on coral reefs. Saltwater is more dense than fresh water.

Vocabulary

The answers have been letter- and color-coded.

Weekly Lab

This lab will demonstrate that salty water is more dense (or "crowded" with molecules) **than fresh water.** *(Kosher salt works best for this lab, because it will not turn the water cloudy when it dissolves.)* Have students fill their tall cups A and B with water about 2/3 full. Then stir 3 tablespoons (Tbls.) of salt into Cup B until the salt is completely dissolved. Ask them to explain where they think the salt in Cup B is now that it has disappeared. You can explain that when a substance dissolves, it comes apart into very, very small pieces (molecules). These pieces are far too small for our eyes to see. The tiny molecules of salt mix in with the water. It may look like the salt has disappeared, but it is still in the water. Tell students to smell their saltwater solution *(model the proper procedure for wafting their hand over the cup first).* Can they "smell the salt?" Ocean water is very salty. Most coral reefs need clean, salty, warm ocean water to stay healthy and grow. Next, have students **predict** what they think will happen when they add 3 drops of food coloring to Cup A. **They should write their prediction on a worksheet.** Then have students carefully put 3 drops of food coloring into cup A. **Tell them NOT TO STIR OR MOVE either cup!!** Tell them just to watch and wait for any motions that may be created in this experiment to stop. They will see the food coloring slowly "fall" to the bottom of the water and begin to spread out in a layer at the bottom. They should draw a side view of the cup on their worksheet.

Repeat with Cup B. This time students will see the food coloring descend just a little way into the saltwater and then bob upward. The color will then spread out in a layer on the top. Ask students why they think the food coloring behaved differently. Explain that in Cup B, the tiny salt molecules are taking up the room in between the water molecules. The food coloring stays at the top of Cup B, because there is no room for it in the water.

Math

Answer: **There are 24 teeth. This is an example of the "associative property" of addition. The order of the addends does not matter; the answer is the same.**

Explain that on a coral reef, some animals help other animals stay healthy. (See TN Level Pre-A.)

Writing in Science

Encourage your students to use their imaginations to write a paragraph about their adventures in an octopus garden on a coral reef.

Challenge

Answers: E and **J** are exactly the same. To find the exact match, students can look at many attributes of the fish including eyes, fins, tails, stripes and even the direction the fish are swimming. Have them tell what traits they used to find the two matched fish.

Puzzle

Answers: They are called **ZOOXANTHELLAE** and they give coral its **COLOR**. *(Not all the letters are used.)*

Level C

Main Concepts: Coral reefs grow primarily in warm, salty and clean ocean waters. Reefs are built by tiny animals called coral polyps. Many different kinds of plants and animals live on coral reefs. Reefs are being harmed by pollution, changes in the Earth's climate and human carelessness. Saltwater is more dense than fresh water.

Vocabulary

Answers: A) 6 **B)** 4 **C)** 7 **D)** 5 **E)** 1 **F)** 3; #**2** and #**8** are not shown.

Weekly Lab

See TN Level B. The blueberry should float in the very salty water but sink in the fresh and the slightly salty water. Grapes should behave in a similar manner. Other objects may float in both or sink in both. Discuss predictions and observations with students what they observed. Have them write journals about the experiment and draw pictures to document their observations.

Math

Answer: 3 hours. This is a multi-step problem. First, students have to find the total number of teeth (see TN Level B); then, they have to determine how many hours it will take to clean all the teeth. The students can solve the problem by making groups of 8 teeth and then counting the number of groups or they can perform repeated addition or subtraction. Note that the teeth are already grouped as 7, 8 and 9; thus, simply moving one tooth from the group with 9 teeth to a group with 7 teeth immediately creates the necessary regrouping.

Writing in Science

See TN Level B. Encourage students to illustrate their story. One way to do this is to create a coral reef or octopus garden mural. Every student can either draw or paint on the mural or they can cut and paste their art onto it. Display in the school for others to enjoy.

Challenge

CORALS GROW AT ABOUT THE SAME RATE AS YOUR FINGERNAILS. In fact, many corals grow even slower – less than an inch per year! Use the arrows to match up missing letters with known letters. The two dashed letter **O**'s should get students started.

Puzzle

Answers: They are called **ZOOXANTHELLAE** and they give coral its **COLOR**. (Not all the letters are used.)

Level D

Main Concepts: A coral reef is a special ecosystem in the ocean. Growing mainly in warm tropical waters near coasts and islands, reefs are formed by tiny animals called coral polyps which live together in colonies. Corals depend on tiny plants to help make their food. Many other kinds of plants and animals live in coral reefs too. Today, coral reefs are in danger from many human and natural causes.

Challenge

See TN Level C. It takes coral reefs thousands of years to grow. To find out how slowly they grow, carefully follow the arrow clues and fill in the missing letters.

Weekly Lab

See TN Level B. In addition, students are asked to learn more about "**dense**/**density**." We have specifically allowed FLY-pothesis to make an incorrect prediction or hypothesis here. This is to show students that it is okay to have your experiment produce an unexpected or unpredicted result.

Math

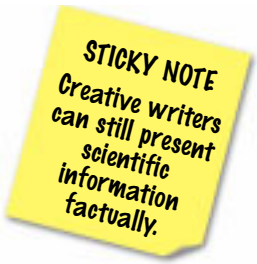
Answers: 73° F and **84**° **F**. Some coral reefs can grow where it is warmer or colder. However, most lie within **23.5 degrees latitude of the Equator**. Have students look at maps in atlases, books and on the Internet to find the locations of coral reefs around the world.

To extend this activity, especially for more advanced students, you may want to use the following formula

$$°C = \frac{5}{9}(°F - 32),$$

for converting from Fahrenheit to Celsius, to introduce algebra, higher level formulas and other math concepts. Round your answer to the nearest whole number. Have them compute the optimal temperature range in whole degrees Celsius for coral reef growth.

***Answers: 23° C** and **29° C**.*

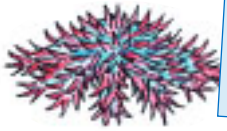


Writing in Science

This journal is based on research, not an actual coral reef exploration. However, it can provide a vehicle for blending creative writing with scientific fact finding.

FYI – Further Your Interests

Use this postage stamp art as a springboard to creating a large wall mural. Emphasize **camouflage**, hiding as many sea animals as possible. Challenge other classes to find the hidden animals.



DID YOU KNOW??
The greatest natural enemy of corals is the crown-of-thorns sea star. It eats living coral.

Meet the Scientist

Dr. Lindquist is just one of many scientists studying about coral reefs. Study about and report on other scientists and their work. This can include biological or physical sciences, technology and other disciplines.

DID YOU KNOW??
The ocean contains enough salt to cover all the land on Earth with a layer 500 feet thick!

Level E

Main Concepts: A coral reef is a special ecosystem in the ocean. It is formed by tiny animals called coral polyps which live together in colonies. To survive, coral polyps rely on zooxanthellae, small plants living inside the coral to produce food in exchange for a safe home. Scientists use special instruments, satellite data and other tools to monitor the health of coral reefs.

Weekly Lab

You need: salt, water, food coloring in red, yellow and blue. *Before beginning this lab, you will need to prepare 3 sample solutions:* yellow sample – 1 measure of salt, red sample – 2 measures of salt and blue sample – 3 measures of salt. For a class of 30, three 2-liter bottles of water and a measure of 1 cup works well. Whatever "measure" or amount of salt you use, just use a 1:2:3 relationship.

Prepare batches and have student teams come to a central place to collect their samples and needed "construction" materials.

In this lab, your students will be testing the density of three saltwater samples by layering them in pairs. (NOTE: With three colored samples, one can create 3 combinations of two colors at a time.) The students will find that the denser samples, with more salt, will sink through the less dense samples and produce mixed colors. The less dense samples will float above the more dense samples.

As the students conduct the tests, they should make hypotheses at each step. After they conduct each test, they should color the test tubes shown on Level E, page E-2. At the conclusion of the activity, they should summarize their findings in an appropriate lab write-up (see page E-3). **For Test A:** Blue – the most dense sample – will sink into the yellow making green, but yellow – the least dense – will remain above blue. **For Test B:** Red – with more salt – will sink into yellow making orange. Yellow – the least dense – will remain above the red. **For Test C:** Red will stay above the blue. Blue – the most dense – will sink into red making purple. The "**BIG TEST**" will produce 3 separate layers, if the blue sample is placed in first, the red sample next, and the yellow sample last. If not done in this order, they will see mixed colors. Have them try until they succeed in producing the 3 separate layers. Tell them to squeeze their eye droppers slowly and carefully. (They want to avoid mixing the samples accidentally by the force of a squirting dropper.) Their eye droppers should stay above and not touch their test tubes.

This activity can further reinforce the concepts behind primary and secondary colors.

Math

The **coral reef watch** web site contains real-time and historical sea surface temperature (**SST**) graphs for 24 locations. Information about coral bleaching threshold temperatures is also included. The temperature at the water surface is a good measure of the danger of bleaching because corals generally grow in shallow water. The data was obtained from weather satellites.

Students should select any **6 locations** for this activity (with 3 from the Northern Hemisphere and 3 from south of the Equator). Then, they should record the following station information on their data sheet: SST on the first day of the current month, latitude, longitude, and name.

After collecting the data, students graph the data according to the order they collected it and then in an organized format.

The students can also be challenged to compare (in tabular and graphical formats) the SST to the coral beaching threshold temperature or the current SST with that from 3 or 6 months ago. This data gathering and assessment activity can become a springboard for science fair investigations.

NOTE: At the **coral reef watch** web site, click on the link that says "nighttime SSTs" to see a digital image showing global SSTs. Click on the "+" sign underneath the image to zoom in for a more detailed view.

Writing in Science

For the Weekly Lab (Level E, page E-2), students should use a lab write-up format that includes: **hypotheses**, **materials**, **method/procedure**, **observations/data**, **conclusions**, **and questions for further investigations.**

To encourage further research, you might mention that the density tube concept is used in many real-life applications, including testing antifreeze in cars and measuring the iron content of blood samples.

In this science and writing extension activity, students drop a grain of cooked rice into the density tube. The rice will sink through some of the salty levels, but probably not through all of them. After sitting in the salty water for a few moments, the grain of rice will

absorb saltwater, become more dense, and sink to the bottom. Students can then add another grain of rice to see the rice at two distinct levels in the tube.

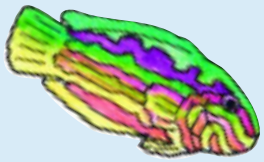
FYI – Further Your Interests

See TN Level D. In addition to simply tallying the number of animals and plants, students can **tally by sub-categories** (e.g., number of plants, number of animals, number of small fish, number of large fish). The data can be graphed in various formats. Students can also create **Venn Diagrams** to study data relationships.

Meet the Scientist

See TN Level D.

DID YOU KNOW??
Most of the sand found on beaches near coral reefs is made of coral that has been eaten, digested, and passed through parrot fish.



Helpful Sources for Planning Your Science Weekly Classroom Activities

Recommended Resources

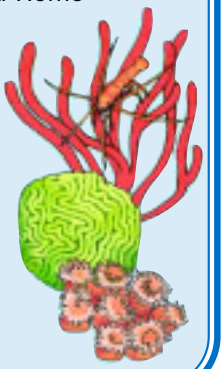
- Albert, Toni. **The Incredible Coral Reef.** Mechanicsburg, PA: Trickle Creek Books, 2001
- Cerrulo, Mary M. **Coral Reef: A City That Never Sleeps.** New York: Cobblehill Books, 1996
- Earle, Sylvia A., **Jump into Science: Coral Reefs.** Washington, D.C.: National Geographic, 2003
- Green, Jen. **A Coral Reef.** New York: Crabtree Publishing, 2002
- Kalman, Bobbie and Niki Walker. **Life in the Coral Reef.** New York: Crabtree Publishing, 1997
- MacLeod, Beatrice and Anita Ganeri. **Coral Reefs.** New York: McGraw-Hill Children's Publishing, 2001
- Massa, Renato. **The Coral Reef: Deep Blue Planet.** Austin, TX: Steck-Vaughn Co., 1998
- Walt Disney Pictures/Pixar Animation Studios (2001). **Finding Nemo.** Burbank, CA: Buena Vista Home Entertainment Group, Inc., DVD release date: 2003

Internet Resources

You will find a complete listing of Internet resources on ***Science Weekly's*** web site at:

http://www.scienceweekly.com/vol21.1.coral_reefs.html

There you will be able to click on the available links to take you directly to the source sites.



National Science Education Standards for Coral Reefs

Please refer to ***Science Weekly's*** web site (above) for information pertaining to National Science Education Standards and benchmarks.

(continued from page 1)

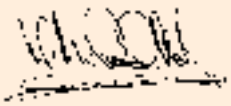
National Science Education Standards. Look to our web site for details.

We've also added photographs and digital images to ensure a more realistic perspective on science. We have still kept the fun-filled cartoon feel, however, by giving WHY FLY two new "pals" to help him in his science work. While WHY FLY wonders, FLY-pothesis hypothesizes and SCIENCE provides factual information.

Please enjoy both the old and the new as we embark on a scientific voyage that will take us to many new venues around the world. This edition focuses on coral reefs. Look for clouds, meteors and Lewis and Clark's scientific explorations in the months ahead. Our full 2004–2005 schedule is posted at our web site.

On behalf of the entire ***Science Weekly*** team, thank you for being a part of this learning adventure.

Sincerely,



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