

OUTREACH

Education About Coral Reefs

Issue 19: Coral Reefs (Part 1)

Issue 20: Coral Reefs (Part 2)

New York
University

WCS

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 - in a series of articles;
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 - in reports;
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 - in a special program devoted to a particular topic;
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 - in training workshops.
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 - for background information for their own classes;
 - for classroom activities;
 - in teacher training workshops;
 - on field trips and in laboratories;
 - in curriculum development.

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We need feedback on the packs. How useful is this material? How can we make it better? Are there special topics you need? Please let us know. Please send us material to which you have added OUTREACH materials. We can pass it on to others to help them in their projects.

We also want to hear about the projects you are working on, and see the materials you produce. We would like to pass on your information and ideas to others in the OUTREACH Network. Please write to: **Dr. James Connor, OUTREACH Director, Teaching & Learning Center, 200 East Building, 239 Greene Street, New York University, NY 10003, USA or Mr. Richard Lumbe, OUTREACH Coordinator, Regional Office for Africa, UNEP, P.O.Box30552, Nairobi, KENYA**

OUTREACH INFORMATION PACKS

(All are available in English, Those so marked are translated into a -Arabic, C -Chinese, f -French, p -Portuguese s -Spanish)

- 1 -26 out of print
27 Trees and fuel wood (1) c f P
28 Trees and fuel wood (2) c f P
29 Trees and fuel wood (3) f P
30 Pests and pesticides (1) P s
31 Pests and pesticides (2) p s
32 Pests and pesticides (3) p s
33 Wetlands (1) a p s
34 Wetlands (2) a p s
35 Wetlands (3) a s
36 Immunization (1) a
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55 Weather s
56 The changing atmosphere (1) the "Greenhouse effect" s
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59 The changing atmosphere (4) acid rain and air pollution s
60 Endangered species (1) Introduction a f P s
61 Endangered species (2) Threats to survival a p s
62 Endangered species (3) Wildlife trade a p s
63 Endangered species (4) Saving wildlife a C P s
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- LEARNING-BY-DOING LEAFLET SERIES**
- Gardening (1) a f p s
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Appropriate Building Technologies
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74 Appropriate Technology (1) Introduction a s
75 Appropriate Technology (2) Education a s
76 Appropriate Technology (3) Water a f s
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80 Appropriate Technology (7) Solar energy a f s
81 Appropriate Technology (8) Biomass Energy f p s
82 Appropriate Technology (9) Wind and Water Energy a f
83 Appropriate Technology (10) Stoves f
84 Appropriate Technology (11) Transportation f
Special issue "All About OUTREACH"
85 see Learning-By-Doing leaflet series "Inventing and Simple Machines"
86 see Learning-By-Doing leaflet series "Water Technologies"
87 see Learning-By-Doing leaflet series "Health Technologies"
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90 Growing Up
91 Waste (1) Global Problems, Local Solutions f
92 Waste (2) Conserving Natural Resources
93 Waste (3) Recycling
94 Waste (4) What to do about Hazardous Waste
95 see Learning-By-Doing leaflet series "Waste and Recycling"
96 Children in Especially Difficult Circumstances (1) Working and street children

97 Children in Especially Difficult Circumstances (2) Children affected by catastrophes
98 Indigenous Peoples (1)
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100 Land degradation (1) Soil Basics
101 Land degradation (2) Causes and consequences
102 Land degradation (3) Some agricultural solutions

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Dr. James Connor, OUTREACH Director, Teaching and Learning Center, 200 East Building 229 Greene Street, New York University, NY 10003, USA

CONTENTS..

Using the chart below, you can see at glance which fields of interest are touched upon in this OUTREACH pack.

Letters in the chart indicate the following:

a -articles b -stories c -activities and games d -teachers /parents page e -resources

Topic	General	Africa	Asia	Middle East	Latin America	Desserts	Forests	Wetlands	Oceans	Mountains
Land (L)										
Water (Wa)										
Atmosphere (A)										
Wild-life (Wi)	ac		a	a	ae				acde	
People (P)										
Human Habitation (Ha)										
Health and Sanitation (He)	a									
Food and Nutrition (F&N)	a				a					
Energy (E)										

Reading levels

I = -for young children aged 8 -10 years

II = for school children aged 11 -13 and adults with basic literacy skills

III. for teachers and / or people with a secondary education.

Articles

Questions and answers on coral reefs and how they are formed

I am a Coral Reef Protector

Eugenie Clark studies the coral reef of Ras Mohammed
(WWF/Central/ Independent Television Plc.)

Why should people care about coral reefs? (WWF)

Ocean fishing , Sharon Kahkonen)

Immunization save lives (Uganda Scouts & Guides/ UNICEF)

Measles Uganda Scouts & Guides/ UNICEF)

Who-o-o Knows Ranger Rick)

Activities and Games

The Coral Reef by day and at night: a puzzle

Who Am I?

Visitors to Coral Reefs: a discussion

A Coral Reef food chain
Threats to Coral Reefs: a puzzle
Green Goodies (WWF-UK)

Teachers' / Parents' Page

Activity: The Coral Polyp anatomy – Building blocks of the reef (WWF)

Resources

Book review: Corals and Coral Reefs in the Caribbean (CCA)

Acknowledgements

Valuable resources used in the compilation of this OUTREACH pack include the following..

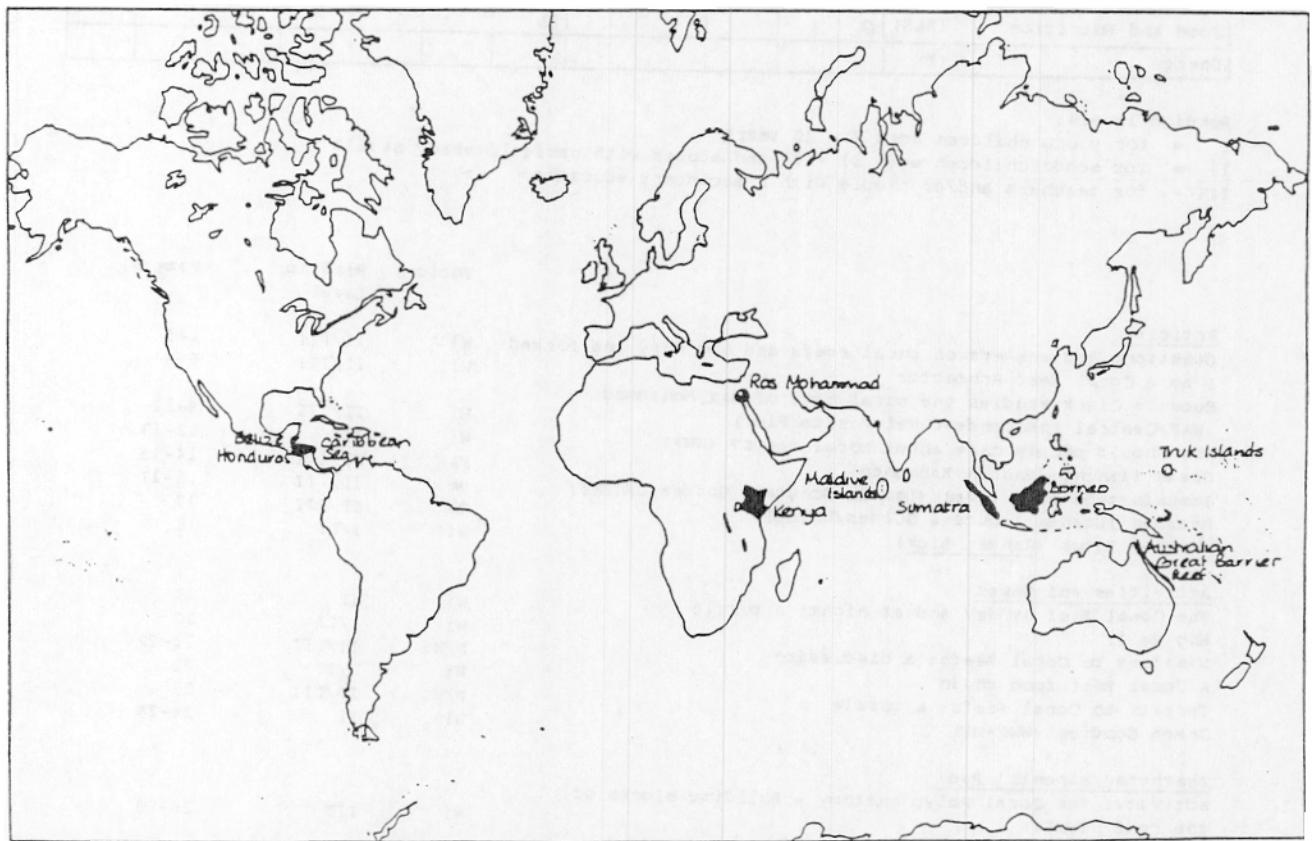
CORAL REEFS; Materials and Activities for Teaching Middle Grades Form land 2). This kit has been produced by World Wildlife Fund and Rare Inc., as part of the Caribbean Environmental Education Program, a project funded by the United States Agency for International Development. The kit contains materials for a teaching unit on the basic biology and ecology of coral reefs. It includes a poster, coloring book, teacher instructions, slide programs and board game. Produced both in English and Spanish, the kit is useful to most countries of the Caribbean whose coral reefs rank among the world's most fascinating and beautiful natural resources. For further information, please contact.. world Wildlife Fund 1255 Twenty-Third Street, NW Washington. DC 20037 U.S.A.

'CORALS AND CORAL REEPS IN THE CARIBBEAN a manual for students' by Stafford A. Griffiths and Eugenie Williams edited and illustrated by Nikki Maith. This 48-page booklet was published by the Caribbean Conservation Association (CCA) in 1985 with funds provided by the United Nations Environment Programme (UNEP) project no. FP/CR/5102-82-12 as part of its contribution to the Caribbean Action Plan. For further information see 'Book Review' OUTREACH issue 19) or contact:

Caribbean Conservation Association, Savannah Lodge, The Garrison,
St. Michael BARBADOS

Location map

The map below shows the location of places mentioned in this pack..



QUESTIONS AND ANSWERS ON CORAL REEFS AND HOW THEY ARE FORMED

These questions may be used as a basis for a radio program or as background information for teachers.

1. What are coral reefs?

Coral reefs are amazing underwater environments teeming with life. Reefs are limestone structures - often enormous in size -that provide food and shelter for brilliantly-colored fish, crabs, sponges, shelled creatures and many more fascinating sea creatures.

2. Who makes coral reefs?

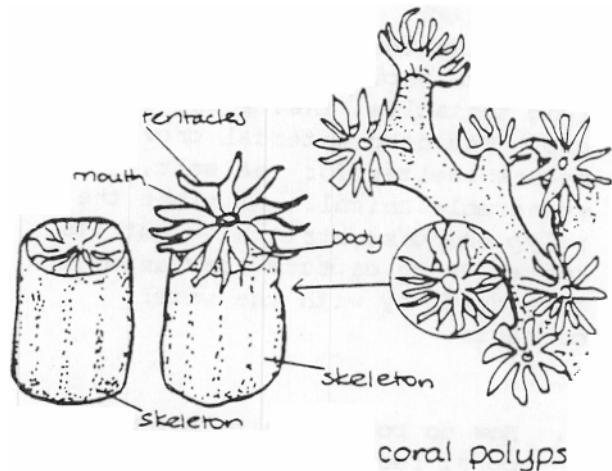
Countless coral animals called polyps, (said.. POLL- ip).

3. What does a polyp look like?

A polyp is tiny -about 1-3 millimeters across. It is a simple creature. Compared to animals such as dogs and fish, a polyp has only a few parts to its body. It is in the shape of a tube, and is made of soft jelly-like tissue. At one end of the tube is an opening or mouth.

This is used to take in food and get rid of waste material. Around the opening are flexible hollow tentacles, (said: TENT-a-culls). The tentacles have special cells which capture or paralyze prey that drift pass them. Then the tentacles pass the stunned or dead animals into the polyp's body. Inside the body is a hollow space called a gut where food is digested, (see picture).

The coral polyp looks like another kind of soft-bodied sea creature, the sea anemone. Both belong to the scientific group or phylum, (said: FI-lum) called Cnidaria, (said: K-ni-DAR-ee-uh). Animals that belong to this group have tentacles with special stinging cells to paralyze and capture their prey.



Although the coral is similar to the sea anemone and other Cnidarians such as jellyfish and hydroids, it has some special features, too.

4. What makes coral polyps special?

One reason is that many polyps secrete hard limestone as protection for their soft bodies.

5. What is limestone?

Limestone is a rocky material made up of a substance called calcium carbonate, (said: KAL-see-um KAR-buhn-ate). Calcium carbonate is the same substance that conchs use to make their shells. Calcium carbonate exists in a dissolved form of sea water. Coral polyps are able to take it from seawater . The cells in the outer layers of the bodies are equipped to do this special work.

6. What does a coral polyp do with the calcium carbonate?

The animal deposits layers of the material beneath or around the lower half of its body so that it forms a kind of cup or skeleton. The cup is called a **corallite**, (said.. KOR-uh-ite). During the day -or when it is

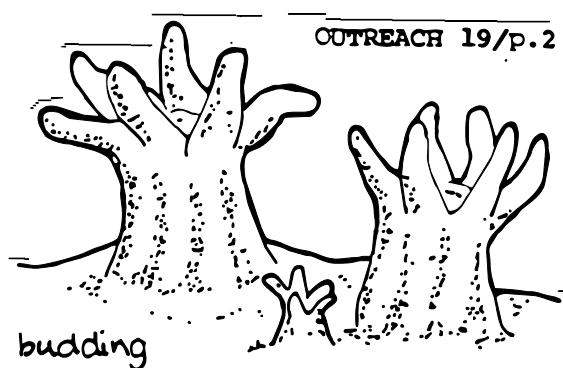
threatened -the polyp pulls its whole body, including its long tentacles, inside the limestone cup. The hard material provides a secure shelter for the soft, vulnerable animal. At night the polyp emerges, stretching out its tentacles to capture tiny animals that drift by with the water currents.

7. How do polyps help to build coral reefs?

A new coral reef is usually begun by a single tiny coral animal floating in the water. Eventually it finds a resting place on some hard surface no more than 150 feet (45 meters) beneath sea level. Once settled, it begins to produce limestone to fix itself to its new home and protect its soft body. This becomes the 'parent' coral polyp.

After the parent polyp grows for a while, little polyps begin budding out of its body. These buds gradually develop into independent polyps with their own corallites next to that of its parent. As the buds grow, they will begin to form buds of their own. The result of this repeating budding is a huge number of polyps living together in a group called a colony (said: COL-uh-nee), see picture.

Corals can reproduce another way. Adult members of the colony can produce a small coral animal that floats away in the water. If it is not eaten, this animal may start a new coral reef thousands of miles away.



limestone cup.

The polyps of hard corals are attached to one another by a layer of tissue which spreads over the skeleton .

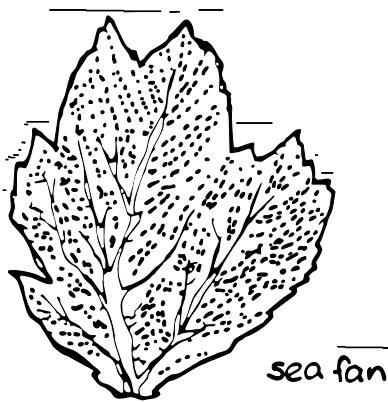
Polyps live only on the outside of the growing coral mass. They grow upwards and outwards, building their skeletons underneath themselves. This pushes them up, and keeps them even with the surface. When polyps die, their linked skeletons remain, and a new generation of polyps can grow on top of them. The hard masses of dead skeletons form most of the reef. After many years, coral growth can form solid rocky structures of great size.

8. How fast do coral reefs grow?

Although coral reefs can be very big, they grow very slowly. The fastest coral growth is about half an inch (a few centimeters) a year. Many corals grow much slower than this. A substantial coral reef takes a thousand or so years to develop.

9. Can all coral Polyps produce hard limestone skeletons that make up coral reefs?

No. Those that do build up coral rock with their skeletons are called hard or stony corals. Other corals which live on or near reefs are soft corals. Their skeletons are formed inside their bodies. Colonies of soft coral may be massive, but they never become as big as many stony coral colonies. A soft coral is shown below. It is called a sea fan. Its branches are so flexible, they wave gracefully in moving water.



10. What does a coral reef look like?

Colonies of stony corals grow in strange and varied shapes. There are corals that look like flat plates or shelves. Some form massive boulder-like structures. Others develop branches and limbs like trees. So a coral reef is a jumble of limestone boulders, branches and other fantastic shapes.

All these separate elements are held together by a kind of cement. This gives the reef its lasting strength. Much of the reef's cement is produced by tiny plants called coralline algae, (said.. COR-uh-line AL-jee). Like coral polyps, the algae can take calcium carbonate from the seawater. The tiny plants cover the surfaces of the coral skeletons, binding them together with a thin coating of limestone.

11. Do other microscopic plants play an important role in the life of a coral polyp?

Yes. There are other algae that live within the bodies of many coral polyps. These algae come in various shades of red, brown, purple and other colors. They give corals their colors. The algae and the polyps are special partners. The algae use sunlight to make food, in the same way plants on land

make food. They share this food with the polyps. This food is especially important to polyps that live in areas where there are few animals for the polyp tentacles to capture. The algae also provide oxygen for the polyps.

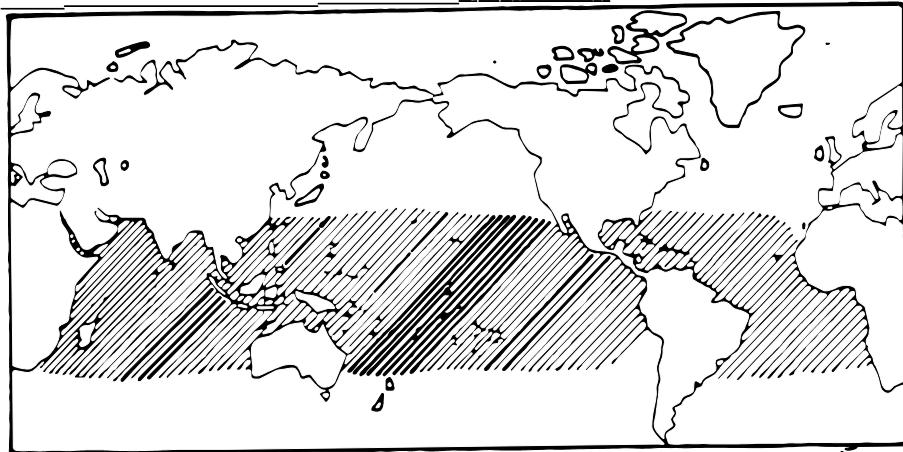
There is another way in which the algae aid the polyps. It is believed that the algae help the coral polyps make their limestone skeletons more quickly. Scientists do not completely understand how this happens.

In return, the polyps provide the algae with fertilizers from their body wastes, and safe places for the algae to live. This kind of partnership, where different living things help each other is called symbiosis, (said.. SIM-bi-OH-sis).

12. Where are coral reefs found?

The corals that build coral reefs live in warm, shallow waters. The water temperature must not be colder than 18 degrees C (64 degrees F). The world map on the next page shows where the water is warm enough for corals to live.

Shallow water is important because the algae that are linked to corals and reefs need sunlight to make food. This means corals cannot grow in deep oceans where sunlight cannot reach. In order to accommodate their algae guests, stony corals grow only in shallow water no more than 150 feet (45 meters) deep. Because shallow water is necessary for reef-building coral, it is not surprising that many coral reefs are found near land. Corals do not grow well where they are exposed to sun and rain for long periods, or where water is too salty or muddy.

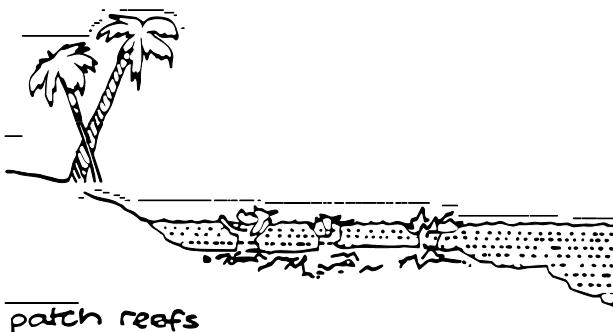


13. How many types of reefs exist?

There are several types of coral reefs: patch reefs, fringing reefs, barrier reefs and atolls.

14. Where do patch reefs develop?

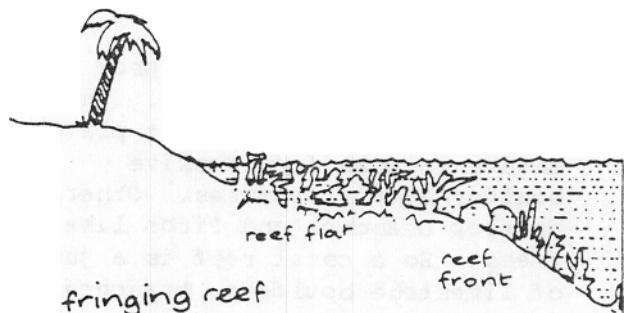
Near the shore. They are small, often roundish patches of coral growing in quiet waters, see diagrams



15. What is a fringing reef?

Fringing reefs grow on the rocky shelves that extend into the sea from the shore of islands or coasts of continents. A fringe of coral forms along the coastline, see diagram. Not too much coral growth takes place on the reef flat. The water may be too salty because water, trapped at low tide, evaporates. Or the water may not be salty enough because fresh water collects there

when it rains. corals grow faster on the ocean side, called the coral front.



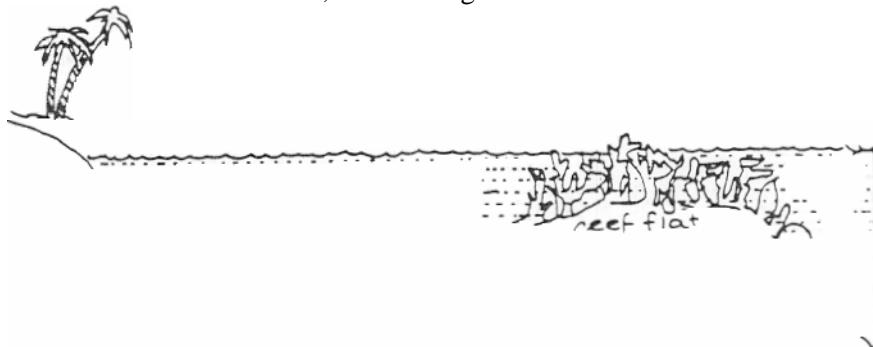
16. Give an example of a fringing reef.

There are fringing reefs in the Malindi / Watamu Marine National reserve along the coast of Kenya. This is one of the better known reef areas of Kenya, and is the largest protected reef in the Indian Ocean.

17. What is a barrier reef?

A barrier reef is formed much farther from shore. It is separated from the shore by an area of water called a lagoon, (said: la-GOON). Ships often use the quiet sheltered waters of the lagoons. But they have to be careful not to run into the reef

where it is near the surface, see the diagram:



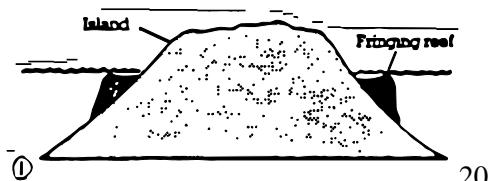
Barrier Reef

18. Give examples of barrier reefs.

There is a barrier reef off the shore of Belize and Honduras in central America. The biggest barrier reef in the world is the Australian Great Barrier Reef. It stretches for more than 1200 miles 11920 kms. } and at its widest is more than 150 miles /241 kms. } from shore.

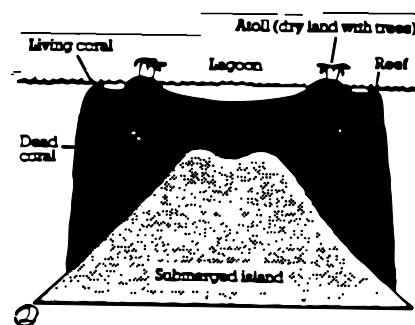
19. What is an atoll?

Most atolls, (said: AH-tolz) are in the ocean, far away from any big area of land. An atoll is a ring of coral surrounding a deep lagoon. It probably began its existence as coral growth on the slowly sinking tops of volcanic islands. Over a period of time, an atoll may develop still further into a coral island, covered with a layer of sand formed from the reef limestone. Trees and plants grow on these ring shaped islands. Their ocean currents or by visiting birds, see diagram.



20. Give examples of atolls.

Many Pacific islands are atolls, for example the Truk Islands in the western Pacific. The Maldives in the Indian Ocean consist of a chain of low atoll structures.



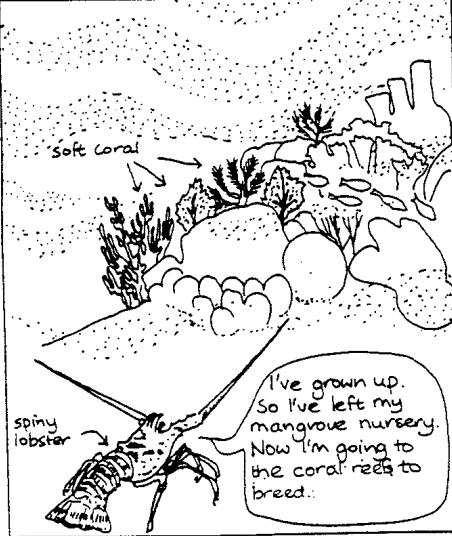
20.



Hello! My name is Michael.
I'm a C.R.P. That stands for
'Coral Reef Protector'
Why did I become a C.R.P.?

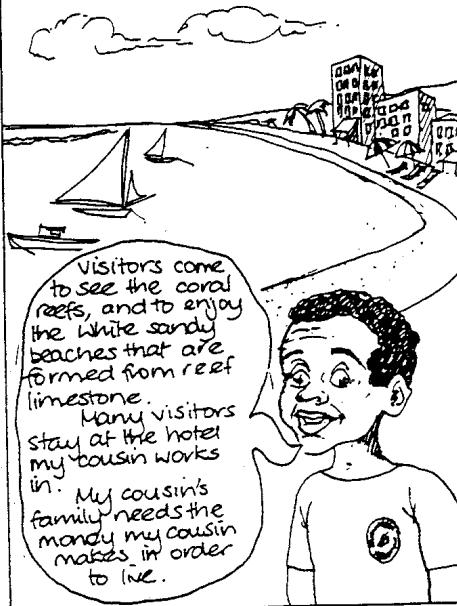
I've always known the coral reefs near my home are places of beauty and wonder. But my grandmother has told me other reasons why the coral reefs are important. Here's what she told me.

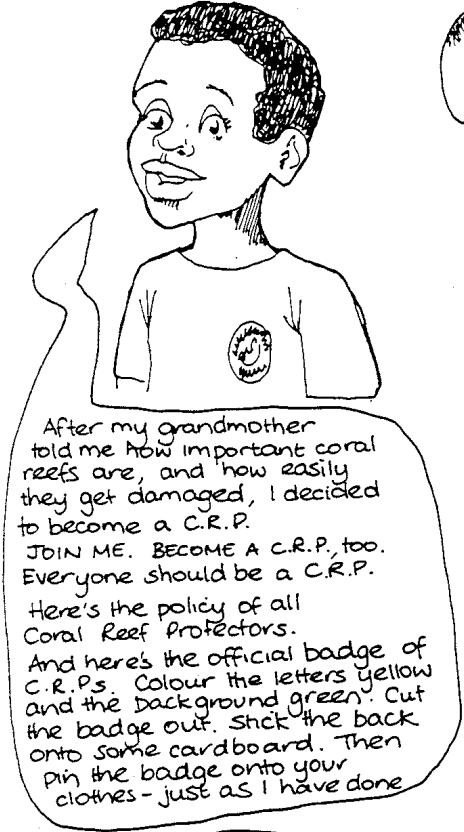
① Important medicines come from soft corals that live on the coral reefs.



Sea creatures that my father catches and that my family eats - depend upon the coral reefs in some way - for food, shelter, a breeding ground, or nursery for their babies.

② The coral reefs protect our beaches. Strong waves break on the reefs before they reach the shore. This creates a sheltered place for my father and other people to anchor their boats.





The policy of a CORAL REEF PROTECTOR

DON'T

Touch or remove any plant or animal found within a coral reef. They all play vital roles in the coral reef environment.

Stand on or touch any coral. This kills the coral polyps on contact.

Harass or frighten any coral reef dweller. Remember that you are the visitor - so watch your manners!

Use a spear gun within, above or around a coral reef. You can cause damage that will take many years to be repaired.

Set pots on or near to a coral reef. These can be moved by water currents and cause lots of damage.

Place a boat's anchor on or too close to a coral reef. Anchors cause damage if dropped on or dragged over a coral reef.

Buy corals, coral souvenirs or coral jewellery. Corals are much better off below the sea - Alive!

DO

Tell others about coral reefs. Explain why it is important to protect reefs and their inhabitants for their sakes and for ours!

This policy is based upon information in the leaflet 'The Coral Reef and You', prepared by the Fisheries Management Unit, Min. of Agriculture, St. Lucia, W.I.

EUGENIE CLARK STUDIES THE CORAL REEF OF RAS MOHAMMAD

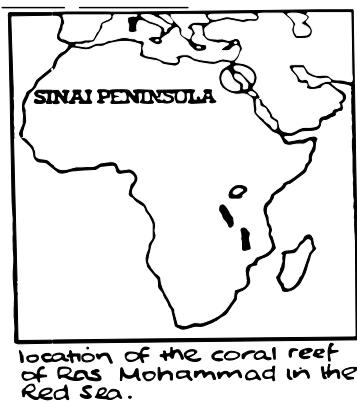
World Wildlife Fund-UK,
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ENGLAND

Adapted from **Nature Watch: The Red Sea**", an information leaflet produced by the World Wildlife Fund-UK Education Department for Central Television's 'Nature Watch' program.

Please give credit to.. world Wildlife Fund/Central Independent Television plc.

For several years, Eugenie Clark, an American biologist, has been finding out about life on the coral reef of Ras Mohammad in the Red Sea.. One animal that she has been studying is the famous "garden eel" of Ras Mohammad.



Garden eels

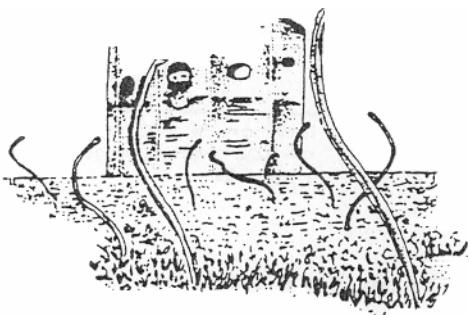
Garden eels are first described by a famous scientist, William Beebe, in 1934. Whilst diving, he had seen the eels on a sandy area near" some reefs. The eels were floating around in an upright position with their back-ends in their sandy burrows. When William Beebe returned from his dive, he exclaimed, "It looked just like a garden of eels." The eels had finally got their name!

Since 1934 we have learned alot more about the life of the eels. Eugenie Clark and her students have discovered that the eels feed only on tiny sea creatures, called **zooplankton**, that are carried by sea currents passing their burrows.

Eugenie thinks the eels probably never leave their sandy burrows. The big males have a territory that is like a do~ over their burrow-opening. They defend this area as far as they can stretch, without taking their tails out of the sand. Smaller males have smaller territories because they cannot stretch as far. They even fight from this fixed position, with the larger males keeping the smaller roes outside their range.

It's just possible that males leave their burrows to get to females for mating: A particular courting male was seen in his own burrow ale minute, and in a female's burrow, the next. But Eugenie thinks males may manage this by 'swimming' through the sand rather than through the sea water.

Whatever the case, the males do not stay with the female for more than two days. Can you think why? Eugenie says the reason seems fairly obvious.. "during the period the male and female are together, the amount of food they get from passing plankton is cut by half because it has to feed two mouths, not the usual one."

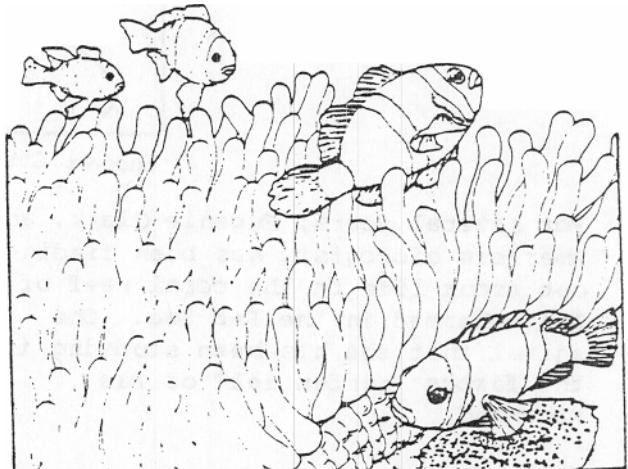


Clown fish and sea anemones

Two other animals Eugenie has observed are the sea anemone and the clown fish. Sea anemones look very much like individual coral polyps. In fact they are related, but sea anemones are generally bigger. The tentacles of the sea anemone are covered in tiny stinging cells. These are used to stun and capture food such as small fish.

The little striped clown fish seems to be immune to the anemone poison. These fish spend most of their life surrounded by anemones deadly tentacles. They avoid getting stung because they are covered with a protective slime which comes from the anemones' tentacles. The anemones cover themselves with this slime so that when they accidentally touch each others tentacles they do not get stung.

As Eugenie explains, "The clown fish look almost as if they are cuddling the anemones in a very affectionate relationship. In fact, they are harvesting the protective coating from the tentacles, and if they don't keep doing this they lose their immunity to the anemone poisons.



clown fish among anemone tentacles

Both the clown fish and the anemones benefit from their strange partnership. The clown fish hide among the tentacles, safe from its enemies. They leave their shelters only to search for food. The clown fish help the anemones, too.

The anemones get to eat the left-over from the fish's meals. The CLOWN fish also swim above the anemone's tentacles, and lure other fish towards the anemones by offering themselves as bait. In this way other kinds of fish are caught by the deadly tentacles of the sea anemones and are gobbled up.

Georgina

Some reef fish are not afraid of people. They swim to divers and allow themselves to be stroked and petted. Georgina is one such fish. She is one of Ras Mohammad's blue green Napoleon wrasse the largest member of the wrasse family. She has become so tame that divers now feed her by hand. Eugenie Clark finds the best way to ensure that Georgina doesn't bite her fingers is to feed her with hard boiled eggs hung on a strong!

RAS MOHAMMAD MARINE NATIONAL PARK FACTFILE

Location Lies off the southern most tip of the Sinai Peninsula.

Area Approximately 66 square miles.

Legal protection Declared a marine park by Egypt in 1983. Formerly, a protected area under Israeli rule.

Reef structure The reef encircles the entire headland. A shallow reef flat ends in cliff-like drop-offs to ledges at 70 metres and thence down to over 100 metres. Offshore are a number of patch reefs. There is a high density and diversity of corals. Coral cover averages 40-50%.

Noteworthy plants and animals The diversity of reef life is extremely high. Giant clams *Tridacna maxima* are common. Numerous large open-water fish such as Napoleon wrasse visit the reefs and are remarkably tame. Sharks are seen frequently. Sparse nesting of green turtles *Chelonia mydas* may occur. Dugong have been reported. Ras Mohammad is an important site during spring and autumn bird migrations, particularly for white storks and birds of prey.

Economic value and social benefits The site is very attractive and is a focus for tourists, particularly divers, in the southern Sinai. Efforts are being made to attract tourists to the area by improving hotel facilities and increasing publicity. Local people have used the area for many centuries for fishing.

Disturbances Currently the area is free from development of any kind and visitor pressure is very low. However, excessive fishing, spear fishing and coral collection has been reported in some areas, but not confirmed. Excessive diving pressure could become a problem in the future. The coastline collects rubbish (from ships etc) and has been affected by oil. Oil from the terminals further north in the Gulf of Suez represents a potential threat. Currently there is no enforcement of conservation decrees in the area and the Egyptian Wildlife Service responsible for this area is severely under-staffed.

However a management plan has been drawn up by the regional wildlife officer. The park is to be managed via zoning.

Source: IUCN Conservation Monitoring Centre.

WHY SHOULD PEOPLE CARE ABOUT CORAL REEFS?

World Wildlife Fund
1255 Twenty-Third Street, NW
Washington, D.C. 20037
U. S.A.

Please include the following credit on the title page..

The following article is from CORAL REEFS: Materials and Activities for Teaching Middle Grades'. This kit has been produced by World wildlife Fund and Rare, Inc., as part of the Caribbean Environmental Education Program, a project funded by the United States Agency for International development. Copyright 1986 by World wildlife Fund. Reprinted with permission of the publisher, World wildlife Fund.

Coral reefs serve many important functions to nearby natural and human communities. Some reefs protect the coastlines and coastal communities of the Caribbean from powerful waves and currents. Thanks to these reefs, big storms wreak far less destruction on beaches.

These same beaches are also built up by a steady supply of sand from the reefs. The skeletons and shells of corals, plants and other reef animals are broken down by waves or by other currents. Currents and wave action bring these tiny fragments of coral and shell fish ashore, helping to create and maintain the beaches that make Caribbean communities so special.

Reefs are important sources of seafood. The reef environment offers shelter and feeding grounds to many types of fish and animals. The Spiny Lobster is a good example. The Caribbean fishing industry is, to a great extent, dependent upon the health of coral reefs.

Protection provided by the reefs also allows certain kinds of animal and plant communities to grow. Many reefs form quiet lagoons, or protected areas of water. In those waters, mangrove trees may take root. And nearby sandy shallows provide ideal conditions for sea-grass beds.

Sea-grass beds and mangrove coasts act in partnership with coral reefs. Many animals need two or more environments to complete their life cycles. Some, such as the queen conch and many young fish, spend the important stages of their lives in the warm placid sea-grass beds. Some later move to the reefs or the open sea. Many fishermen do not realize that adult fish caught in deep waters have spent their youth in sea-grass beds, or shallow parts of the reef.

Other sea animals spend their days hiding among the grasses, and their nights feeding on the reef. Similar "partnership" with reefs hold true for mangroves. Mangroves, in addition, often slow down rivers and streams as they spill into the ocean. Slower waters drop much of the burden of silt they carry, creating near shore mud flats -ideal further mangrove--and clearer, cleaner waters into the sea.. Many a near shore coral reef is thus saved from the smothering effects of silty water.

Coral reefs not only protect our shorelines and provides food for us, but their beauty delights those who dive and snorkel among them. Many tourists, bringing much-needed foreign currency, visit Caribbean shores to see the reefs. Caribbean peoples and visitors alike will always enjoy the reefs--as long as they are used wisely.

Ocean Farming

by Sharon Kahkonen

Recently scientists from the Smithsonian Institute in Washington, D.C. devised a method for raising crabs on the open sea. In the past, the open sea was not considered suitable for ocean farming. This is because most of the ocean's waters are poor in nutrients. Compared to coral reefs which are rich in nutrients, the rest of the tropical ocean is as barren as a desert. If there are not enough nutrients in the water, then ocean plants cannot grow. If plants cannot grow, then there is no food for animals.

But scientists are trying a system of growing algae on plastic screens that are shallowly submerged in the open sea. The algae thrive, despite the fact that there are few nutrients in the water. The algae get enough nutrients because waves are constantly washing over the algae, bringing in more nutrients. In fact, the screens produce five times as much plant material per square meter as the most advanced land farming! The algae itself can be harvested and fed to cattle, or it can be dried and used as a food additive. But it can also be used for growing sea animals.

The Caribbean King Crab is one sea animal that grazes on algae. Previously, the

Caribbean Crab was eaten only occasionally because it is hard to catch. It is nocturnal and hides in crevices at ocean depths of 80 to 90 feet. But the taste of the Caribbean King Crab is reported to be excellent. It is sweeter than blue crab, but with a texture more like lobster!" Moreover, the Caribbean King Crab is very easy to raise.

Two-hundred young crabs can be placed in the ocean in an open cage that also holds screens of algae.¹ As the algae is eaten, the empty screens are replaced with full ones. Eventually, the number of crabs in each cage is reduced to about 150. After 250 days, the crabs weigh one-and-a-half pounds, and are ready for harvest.

Scientists have proven that the system is technically possible, but it has not yet been tried on a commercial money-making scale. The system has the advantage of being low-cost and simple, but it does require a lot of labor including daily maintenance of the screens.

Mariculture may prove to be a very profitable industry that could be a boon to Caribbean fishermen since fish and shellfish populations have been depleted. Scientists believe that as many as 100 species of sea animals can be raised using this system of mariculture.

Here are some questions on ‘Ocean Farming’. You will find the answers in the text..

- 1 . Why was ocean farming not considered suitable in the past?
2. How are scientists trying to grow algae in the ocean?
3. Where do the algae get their nutrients from?
4. Which is more productive - growing algae in the ocean or land farming?
5. What does the Caribbean King Crab eat?
6. Why is the Caribbean King Crab hard to catch?
7. How much does a Caribbean King Crab weigh when it is ready for harvest?
8. What are the advantages and disadvantages of ocean farming?
9. Why may Caribbean fishermen be interested in ocean farming?
10. How many different types of creatures can be raised using this method of farming?

IMMUNIZATION SAVES LIVES

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This article is taken and adapted from.. 'Uganda Scouts and Guides Proficiency Badge Booklet for Immunization Services' produced by Uganda Scouts and Guides with UNICEF

Please give credit to: Uganda Scouts & Guides and UNICEF

Probably everyone knows a family that has lost a baby. Many of the babies die because the child contracted a preventable disease. Preventable means it could have been avoided many deaths need not have happened.

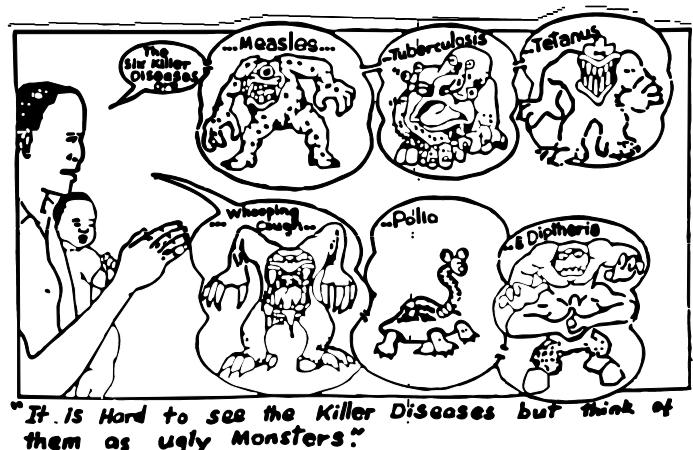
Preventable diseases can be avoided through **immunization**. Immunization means introducing a vaccine in to the body. Some vaccines are given by injection. Others are liquids that are swallowed

When you are given a vaccine, weakened or dead disease germs are injected in to your body. You probably won't know the germs are inside you. However, your body will respond by producing **antibodies** -chemicals to help your body destroy germs. There has to be a special type of antibody for each type of germ.

Then if you are really attacked by those germs, your body will remember. It will quickly make the antibodies needed to stop you from getting sick. The vaccine makes you immune – able to resist – that disease.

Each year 5 million children in the developing world die, and another 5 million are mentally retarded or physically disabled because they have contracted one of the following diseases:

measles
whooping cough
polio
diphtheria
tuberculosis
tetanus



These killer diseases can be prevented by immunization's. Yet each year only one in five children born in the developing world are vaccinated against all or most of these diseases.

It is important to know about the deadly diseases that can be prevented by immunization.

1. MEASLES

Measles is a highly contagious disease caused by a virus. Children that don't eat enough of the good food are likely to suffer most from measles. The illness is made worse when food is not given to children that are sick with measles.

Death occurs when children, weakened by measles, cannot fight off other common illnesses such as diarrhea. In the developing world measles kills two and a half million children each year.

The mother provides her baby with natural immunity against measles. But this immunity only lasts for about six to nine months after birth. After that time the child could contract measles unless vaccinated.

If the infant is given measles vaccine before reaching nine months of age, the natural antibodies might kill the vaccine. If the vaccine is given much later than nine months of age, the period of greatest danger to the child will be past.

ENCOURAGE MOTHERS TO VISIT THEIR HEALTH CENTRE REGULARLY SO THEY CAN HAVE THEIR CHILDREN VACCINATED AT THE RIGHT TIME.



WHO-O KNOWS

National Wildlife Federation,
1412 sixteenth Street, NW
Washington, D.C. 20036
U.S.A.

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National Wildlife Federation.

These questions and answers on wildlife may be reprinted for use in developing countries.

Dear Wise Old Owl,

Why don't spiders get stuck in their own webs?

Matt Hayden

Spiders have two special tricks that keep them from getting stuck in their own webs. The first trick is knowing where to walk. Many spiders make certain strands of their webs sticky but leave the other strands smooth. As they crawl along their webs they make sure to "toe the line" and avoid stepping on the sticky strands.

The other is a "slick" trick. Spiders rub their feet over special glands around their mouths. These glands contain an oily goo that oozes out onto the spiders' feet. The oil is slippery and helps them get "unstuck" if they make a mistake and walk on the sticky strands.

Do giant clams ever kill skin

divers? Gary Burton

It's possible, Gary. There have been many stories about divers getting trapped when accidentally stepping on the dams. But none of these stories has been proved to be true.

Giant clams are huge-sometimes getting to be over four feet (120 cm) long and weighing over 500 pounds (230 kg).

When their shells clamp shut, it is impossible to pry them open with your hands. So if a diver did get a foot caught inside, he or she could drown. But the shell closes so slowly that divers would have more than enough time to get away.



Many people think giant clams will eat people if they get a chance. But they can't. Like all other clams, they are *filter feeders*. When giant clams open their shells to feed, all they gather are tiny plants and animals from the water.

Do hummingbirds sing?

Pamela Bachorz

I don't know whether you can call it singing, Pamela, but hummingbirds do make a lot of noises. And each kind of hummingbird has its own special call, from loud whines and high-pitched twitters to mumbles and squeaky chatter.

But there's another sound you'll hear if you get close to any kind of hummingbird-a loud hum. The hum is caused by the bird's tiny wings beating over 75 times per second. That's so fast all you see is a blur!

WO.O.

THE CORAL REEF BY DAY AND AT NIGHT: A puzzle

The coral reef supports both daytime and nighttime creatures. During the day, the polyps of the brain coral and the star coral pull their whole bodies inside their limestone shelters. But at night they extend to trap tiny prey.

By day, fish such as groupers, butterflyfish and parrotfish swim busily about the reef. Cleaner shrimp are found waving their long antennae. They wait for fish to come to their 'cleaning stations'.

If a customer arrives the shrimp uses its claws to free the fish of its parasites.

As night falls, the daytime feeders shelter in holes and cracks in the reef. Out come the night creatures.

The sentences below describe some reef creatures that feed at night. Match these sentences to the animals shown in the picture of the reef at night.



- A) The sea urchin has sharp spines to protect its back.
- B) The feather stars climb to a perch and unfurl their many arms to filter food from the water.
- C) The spiny lobster has two large antennae to help it defend itself.
- D) Under the elkhorn coral are two big-eyed squirrelfish.
- E) The long, thin moray eel leaves its cave to feed on fish.

Answers: 1A; 2D; 3E; 4C; 5B.

WHO AM I?

Which reef animals are described below? Choose the correct names from the list on the right.

1. I have eight arms which have suckers. I hide in holes and cracks in the reef. I eat fish and crabs. Moray eels eat me. I can squirt ink as a screen for escaping from danger. WHO AM I?

2. I look like an underwater flower. I fix myself to rocks. I use stinging tentacles to catch small fish. WHO AM I?

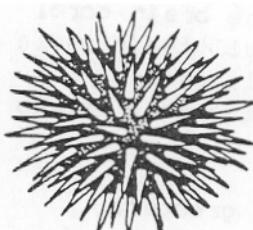
3. I have sharp spines on my back to protect me. I eat plants that grow on the reef and ocean floor. Crabs eat me. WHO AM I?

4. I have a hard outer covering. I have 10 limbs. Two of them are much larger than the rest, and have claws. My claws are strong. They can crush sea urchins and clams which I then eat. WHO AM I?

5. I have a backbone, fins and scales. I am small with a flat deep body. I swim around reefs poking into cracks for small animals to eat. I dart in and out of these places to escape my enemies. WHO AM I?

6. I have a backbone, fins, and scales. I am long and snake-like. I am usually found under a led~ or in a hole in a reef. I have sharp pointed teeth to eat fish. WHO AM I?

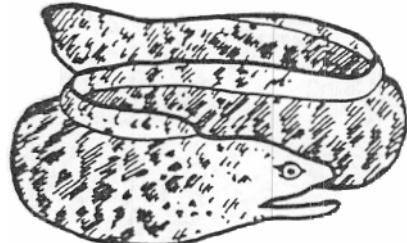
(animals not to scale)



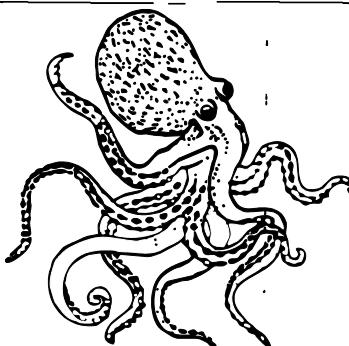
sea urchin



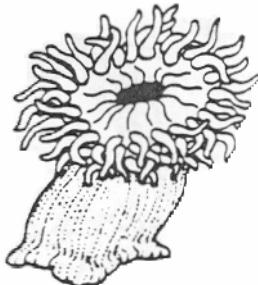
butterfly-fish



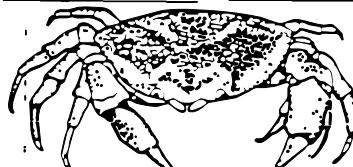
moray eel



octopus



sea anemone



coral crab

Answers 1. octopus 2. sea anemone; 3. sea urchin 4. coral crab; 5. butterfly-fish 6. moray eel.

VISITORS TO CORAL REEFS: A discussion

People come from near and far to see coral reefs. There are several ways they can enjoy the beauty of the underwater world.

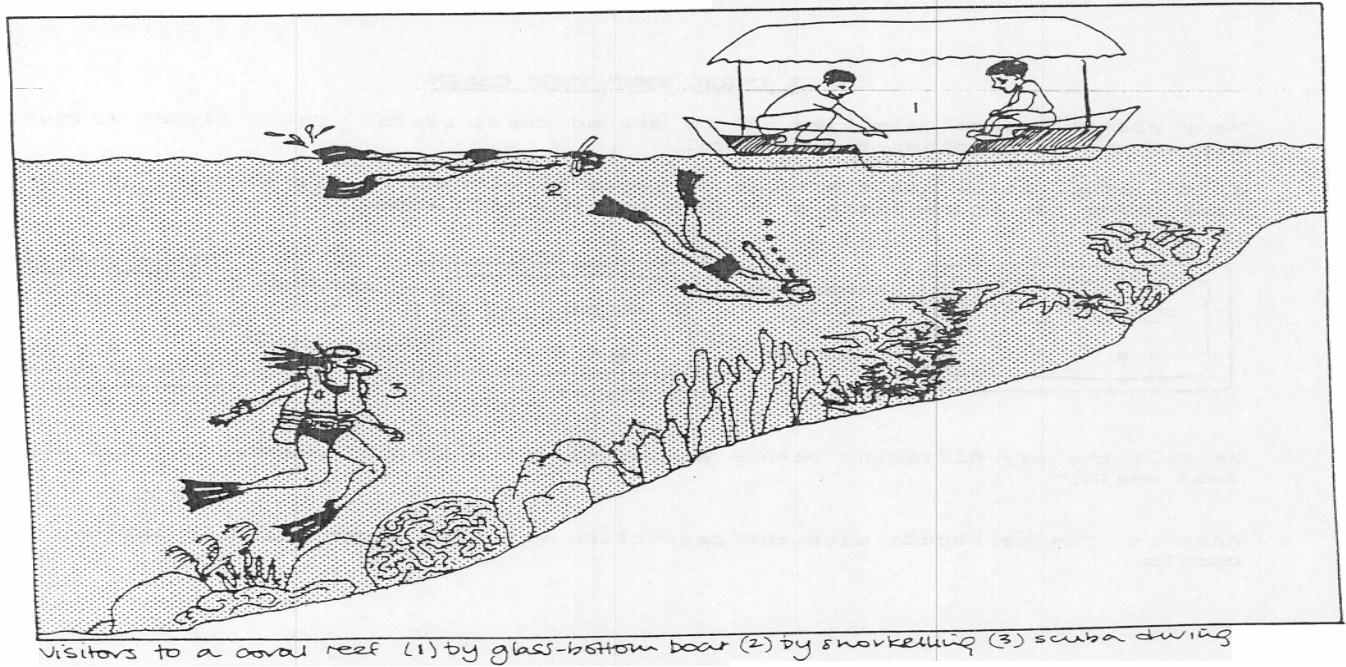
Some people take a trip over the reef in a glass-bottom boat. The visitors look through a large glass window fitted to the bottom of the boat. In this way many people see the reef at one time without disturbing it, see picture.

Other way of getting an even closer look at the reef is to use scuba equipment. Special training is needed to become a scuba diver. The special scuba gear includes a supply of air in cylinders strapped to the diver's body, see picture. This supply of air enables a scuba diver to stay underwater for long periods. This means the diver can get very close to the reef.. Careless divers can easily disturb reef animals or damage coral.

Other people explore the reef by snorkeling. They wear a face mask to see through, and a snorkel to breathe through. On their feet are swim fins to help them swim. Many coral reefs are shallow enough that snorkelers can see them while swimming on the surface of the water.

One way of getting an even closer look at the reef is to use scuba equipment. Special training is needed to become a scuba diver. The special scuba gear includes a supply of air in cylinders strapped to the diver's body, see picture. This supply of air enables a scuba diver to stay under water for long periods. This means the diver can get very close to then reef. Careless divers can easily disturb reef animals or damage coral.

Discussion
Invite students to talk about the recreational use of reefs. You may guide the discussion by asking questions. Here are some suggestions:

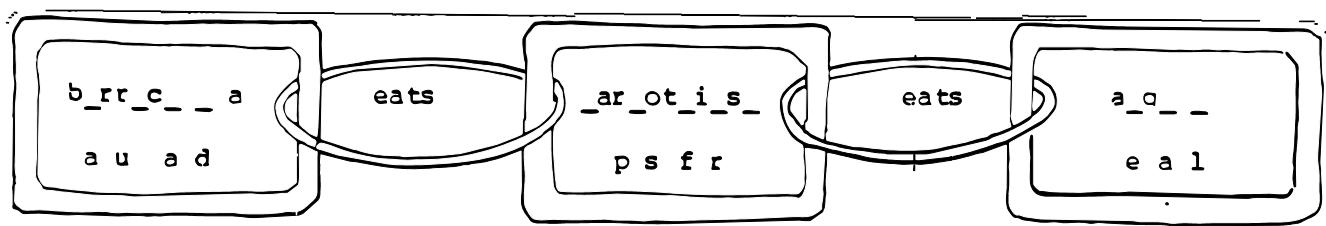


Which is the safest way to see the reef? (by boat) Which way allows more people to see the reef at any one time? (boat) Which is the most adventurous way to see the reef? (scuba diving). Why do fewer people go scuba diving than snorkeling? (Need training , expensive equipment etc). Which way do you explore the reef? Which way would you like to explore the reef? Which way of exploring is likely to disturb reef animals the most? (scuba diving- why?) The least? Which local people benefit from the reef tourist trade? (e.g. hoteliers and their workers; people that sell food and souvenirs to visitors; people that rent boats, equipment etc). What would happen to the tourist trade if the reef was damaged, and people were no longer able to enjoy the spectacular scenery? (It would collapse, and many people would lose their livelihood.)

A CORAL REEF FOOD CRAIN

Many plants and animals live in and around coral reefs. These living things demand upon each other for survival.

In the boxes below are the names of three coral reef dwellers. Fill in gaps using the spare letters to find out who eats whom.



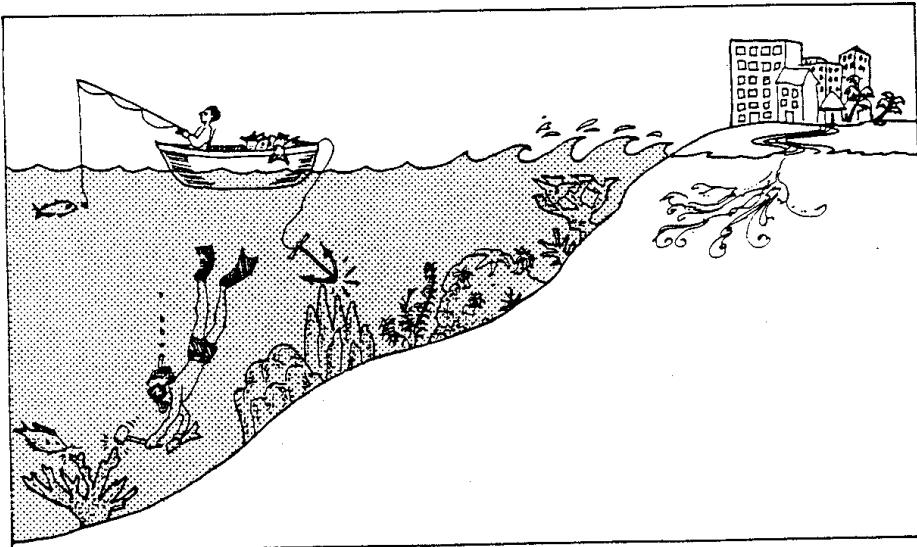
We call the way different plants and animals are linked together in this way a food chain.

Answer: The barracuda eats the parrotfish who eats algae that are inside corals.

THREATS TO CORAL REEFS: A PUZZLE

Caribbean Conservation Association,
Savannah Lodge,
The Garrison,
St. Michael.
BARBADOS

This puzzle is based upon information from "CORALS AND CORAL REEFS IN THE CARIBBEAN: a manual for students" by Stafford A. Griffiths and Eugenie Williams published by the Caribbean Conservation Association 1985.



Here is a picture of a coral reef. Can you find 6 ways that the reef is being damaged? (Younger students may match the answers below to the destructive actions shown in the picture.)

Answers:

1. Overfishing removes too many animals from the reef.
2. The diver collects coral for souvenirs.
3. Fish and other animals eat the hard coral.
4. Coral breaks off when the anchor is lowered.
5. Harsh waves break off coral.
6. Pollution from coastal cities and chemicals and silt from rivers kill corals.

GREEN GOODIES

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ENGLAND

The following article is from 'Wildlife Action Book' produced by the Education Department of WWF-UK and Ken Smith in 1986.

This 18-page publication features a wide range of projects, puzzles and games, and is available from WWF-UK Education Department (price: 75 pence)

Please give credit to.. world **Wildlife Fund-UK**

Orangutans are large, orange - colored and very hairy distant relatives of yours.

A full grown male weighs about 170 lbs and is probably strong enough to hold three or four of you down with both arms behind his back.

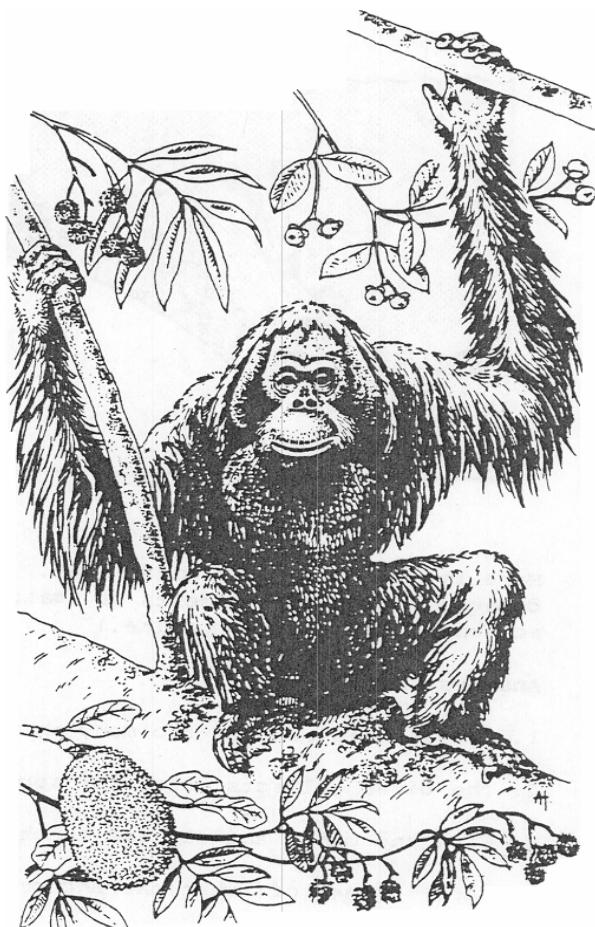
Yet oranges are gentle, peace loving, rather anti-social animals that spend most of their time on their own in the jungles of Sumatra and Borneo.

They clamber and swing about in the trees and vines searching for the plants that they feed on. They also weave plants into hammocks in the trees where they sleep at night.

It's not just oranges that need plants. Have you ever thought that to stay alive we all rely on plants? They give us food, medicine, building and manufacturing materials and clothing materials: they control the air that we breathe, rainfall and river flow.

So next time you take an aspirin, eat an apple or a steak for that matter, drink a cup of coffee, bounce a rubber ball, or breathe, spare a thought for the plants that have made it all possible.

Here is a picture of an orange, surrounded by some of the 79 different sorts of plants that they are known to feed on.



Here is a word square with lots of different things we get from plants. How many can you find?

**DID YOU KNOW that since
1978, 20,000 plants that can
be used for medicine have
been discovered.**

**DID YOU KNOW that 70% of
all the oxygen in the air is
produced by tiny
microscopic plants in the
sea.**

WORD SQUARE ANSWERS:
OXYGEN, RUBBER, WOOD, MEDICINE,
PERFUME, SPICES, OIL, COSMETICS,
ROPE, COFFEE, FRUIT, FUEL, COCOA,
NUT.

O	X	Y	G	E	N	N	G	S	C
C	N	Q	U	T	A	W	O	O	D
O	S	P	I	C	E	S	O	R	O
S	P	E	C	O	F	F	E	E	L
M	A	R	O	P	E	R	T	R	F
E	N	F	C	M	D	U	S	U	O
T	E	U	O	B	N	I	B	B	O
I	T	M	A	O	X	T	S	B	W
C	M	E	D	I	C	I	N	E	O
S	F	U	E	L	U	B	R	R	S

TEACHERS' /PARENTS' PAGE

Activity: THE CORAL POLYP ANATOMY BUILDING BLOCKS OF THE REEF

World Wildlife Fund
1255 Twenty-Third Street, NW
Washington, D.C. 20037
U. S.A.

Please include the following credit on the title page:

The following activity is from 'CORAL REEFS: Materials and Activities for Teaching Middle Grades'. This kit has been produced by World Wildlife Fund and Rare, Inc., as part of the Caribbean Environmental Education Program, a project funded by the United States Agency for International Development Copyright 1986 by World Wildlife Fund. Adapted with permission of the publisher, World Wildlife Fund.

GOAL: To increase student understanding of the anatomy of coral polyps.

OBJECTIVES:

1. Students will be able to label the major body parts of a coral polyp.
2. Students will be able to explain the location of polyps relative to a reef.

TIME: 45 minutes

MATERIALS:

Pencils and paper
Sample of coral rock, if available
Blackboard and chalk

STUDENT BACKGROUND:

Coral reefs can be huge structures, stretching many kilometers underwater and consisting of tons and tons of white stone. How did these reefs get there? What built these great underwater structures?

Certainly, it was no human architect.

Animals no larger than a pea build reefs. They are called coral polyps: They live on the surface of reefs, feeding on even smaller animals in the water. Beneath them, they slowly lay down skeletons made of a rock-like material. Over the years, layers of this skeleton build up to form coral rocks, and together coral rocks make up the coral reefs.

The coral polyp looks something like a tiny bag with tentacles. At the top of the bag, tentacles surround a little mouth. Corals catch their food by using special stinger cells --miniature "harpoons"--in these tentacles to capture tiny animals that swim by. The tentacles sweep the food into the mouth. From there the food moves into a body cavity sometimes called the polyp's "stomach." The stomach digests the food.

Something strange goes on in the polyps stomach. Tiny plants grow in it's lining! These plants are called algae [pronounced al-gee]. Algae come in varied shades of red, brown, purple, and other colors. They give corals and coral reefs their lovely colors.

Algae also supply polyps with a very important part of their body-- their skeletons. Polyps are connected to each other by a skin. But underneath this skin, they build a little cup of rocky material--the skeleton around themselves. Algae supply most of the rocky material.

The bottom of the cup, or skeleton, takes various shapes in different types of coral. Some resemble honeycombs, and others the surface of the human brain. Still others look like small stars. Each type of reef-building coral makes a special pattern in its coral rock. Whatever the pattern, however, all reef-building coral skeletons are six-sided.

The algae help feed coral polyps. Like other plants, they can make food by using energy from the sun. They share the food they make with the polyps. Polyps, in turn, "fertilize" the algae with their body wastes, and provide safe places for algae to grow.

In this activity, you will learn how the coral polyp's body is shaped, and where the different parts of its tiny body are located.,

PROCEDURE:

1. In class, read Student Background aloud to students. If you have sample of coral rock, pass them around the class as you read. Ask students to show you and the class the skeleton of a single polyp within the matrix of this rock.

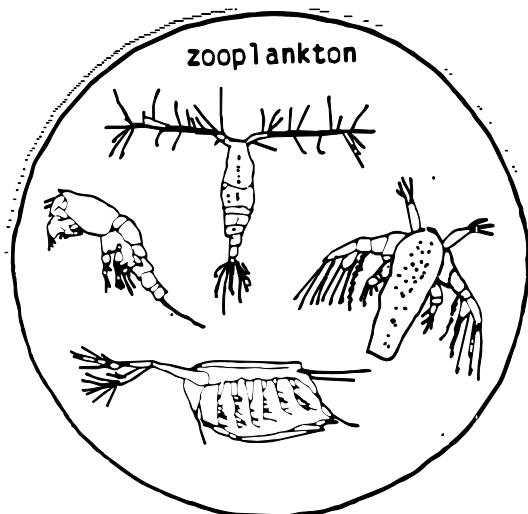
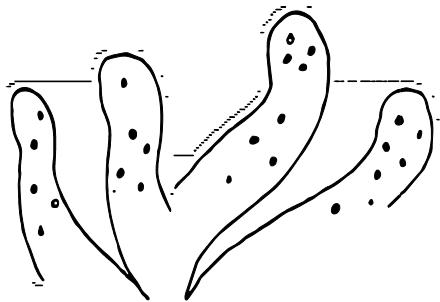
2. Copy the drawing of the Coral Polyp (after procedure) on the blackboard. Do not write labels on the drawing.

3. Tell students that they must now label the polyp. Ask students to come up and indicate locations of polyp body parts. The students should then label the parts correctly. (Refer to Teacher Key.) The following labels should be indicated:

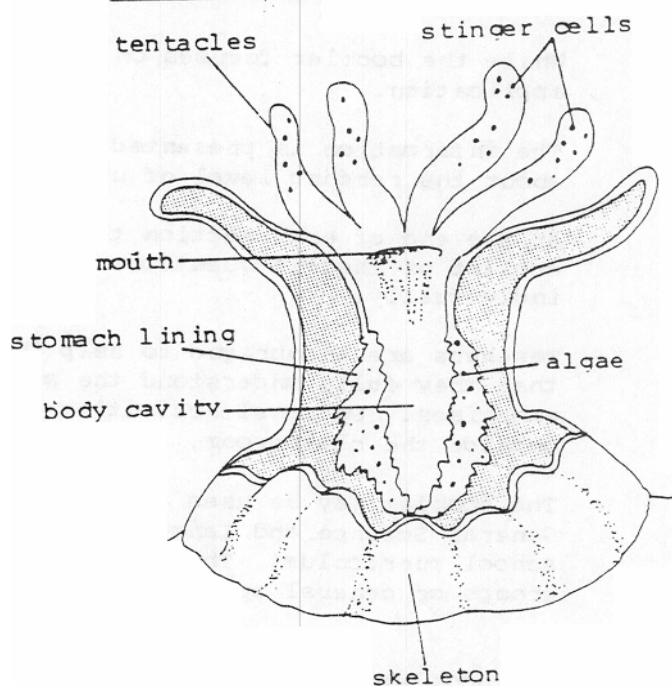
- tentacles
- mouth
- body cavity (stomach)
- stinger cells
- algae
- skeleton

4. Pass out art paper to the students. Ask them to draw pictures of a coral polyp eating zooplankton, the tiny animals that coral polyps eat. In real life, they are so small that you would need a magnifying glass or a microscope to see them...most are smaller than a grain of pepper. (Tell them that zooplankton come in so many shapes and sizes that they can just use their imagination if they wish.) The polyps must show the body parts listed on the blackboard. Provide paints, coloring pencils, or crayons to finish up the pictures. Ask students to sign their pictures, which you can mount for an exhibit on classroom or hallway walls.

A CORAL POLYP



Teacher's Key



BOOK REVIEW:

Caribbean Conservation Association, Savannah Lodge
The Garrison,
St. Michael
BARBADOS

'CORALS AND CORAL REEFS IN THE CARIBBEAN: a manual for students'
by Stafford A. Griffiths and Eugenie Williams
edited and illustrated by Nikki Meith

This 48-page booklet was published by the Caribbean Conservation Association (CCA) in 1985 with funds provided by the United Nations Environment Programme (*UNEP*) project no. FP/CR/5102-82-12 as part of its contribution to the Caribbean Action Plan.

This educational publication is an excellent introduction to coral reefs. The booklet describes coral polyps and types of coral. It looks at how corals feed and where they live. It defines a coral reef and the types of reef that exist. Descriptions are given of the wildlife that depends upon the coral reef for food and shelter. The use of coral reefs by people, and the consequences of people's actions upon the fragile reef ecosystem are also covered.

While the booklet focuses on the Caribbean, much of the material has wider application.

The information is presented in simple language intended for students at or about the reading level of upper primary school.

At the end of each section there is a list of follow -up activities. These consist of thought questions and projects for students; to carry out individually.

Teachers are encouraged to help the students whenever necessary to make sure that they fully understand the material and get maximum benefit from the exercises. Optional activities which may require special equipment, or trips outside the classroom, are also mentioned.

The booklet may be used along with related subjects such as social Studies General Science and Language Arts which may be part of the upper primary school curriculum. The manual may also be adapted for, use with lower age groups or general audiences.

The booklet is available free from CCA, but there is a charge of 2 U.S. dollars for handling and postage.

CONTENTS

Using the chart below you can see at glance which fields of interest are touched upon in this OUTREACH pack. Letters in the chart indicate the following:
 a -articles b -stories c -activities and games d -teachers /parents page e -resources

Topic	General	Africa	Asia	Middle East	Latin America & the Caribbean	Deserts	Forests	Wetlands	Oceans	Mountains	Grasslands
Land (L)	a										
Water (Wa)											
Atmosphere (A)											
Wildlife (Wi)	c	a	a		acd				abcd		
People (P)									a		
Human Habitation (Ho)						:			:		
Health and Sanitation (He)	a		e						a		
Food and Nutrition (Fe N)											
Energy (E)											

Reading levels

- I – for young children ages 8 – 10 years
- II .for schoolchildren aged 11 -13 and adults with basic literacy skills
- III. for teachers and/or people with a secondary education

Topic	Reading Level	Pages(s)
Articles		
An island grows (Ranger Rick)	Wi	II
Does nobody care about sea creatures? (WWF)	Wi	III
Dive into Darkness (Ranger Rick)	Wi	II/ III
Coral Reefs: news and comments (IUCN and TRAFFIC-USA)	P/ Wi	II/ III
Sea Hazards	He	II/ III
Manatees (Sharon Kahkonen)	Wi	II/ III
Whooping cough (Uganda Scouts & Guidelines/ UNICEF)	He	II/ III
Stories		
Help save the Reefs! (Sharon Kahkonen)	Wi	II/ III
Activities and Games		
A visit to the reef - includes a coloring activity (Kathy Orr)	Wi	I/ II
Stony Coral Puzzle	Wi	I/ II
A crossword on Coral Reefs	Wi	II/ III
A spider's web	Wi	I
Teacher's / Parents Page		
Activity suggestions of the Caribbean Conservation Association	Wi	II/ III
Resources		
Film Review: Animating a Thai love story (IPPF)	He	III
		33

Acknowledgements

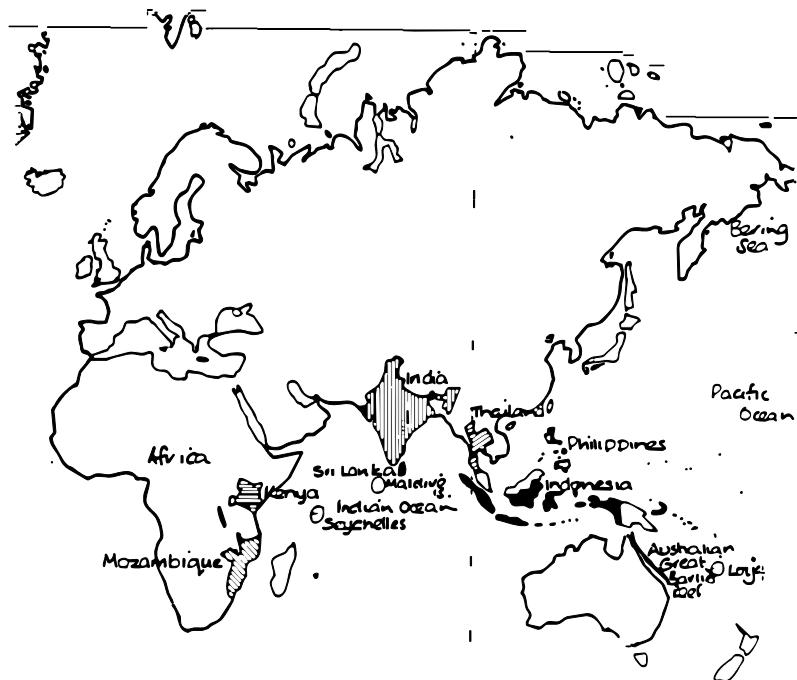
Valuable resources used in the compilation of this OUTREACH pack include the following:

'CORAL REEFS\ Materials And Activities for Teaching Middle Grades (Forms land 2). This kit has been produced by World Wildlife Fund and Rare Inc., as part of the Caribbean Environmental Education Program, a project funded by the United States Agency for International Development. The kit contains materials for a teaching unit on the basic biology and ecology of coral reefs. It includes a poster, coloring book, teacher instructions, slide programme and board game. Produced both in English and Spanish, the kit is useful to most countries of the Caribbean whose coral reefs rank among the world's most fascinating and beautiful natural resources. For further information, please contact World wildlife rand 1255 Twenty-Third Street, NW Washington, DC 20037 U.S.A.

'CORALS AND CORAL REEFS TN THE CARIBBEAN' a manual for students' by Stafford A. Griffiths and Eugenie Williams edited and illustrated by Nikki Meith. This 48-paqe booklet was Published by the Caribbean Conservation Association ICCAI in 1985 with funds provided by the United Nations Environment Programme (UNEP) project no. FP/CR/5102-82-12 as part of its contribution to the Caribbean Action plan. for further in for Illation see 'Book Review' OUTREACH issue 19) or contact: Caribbean Conservation Association, Savannah Lodge, The Garrison. St. Michael BARBADOS

Location Map

The map below, shows the location of places mentioned in this pack..



AN ISLAND GROWS UP: By Jean E. Eckford and Gerry Bishop

National Wildlife Federation
1412 16th Street, N.W.
Washington, DC 20036
U.S.A.

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Born of Fire

Miles below the surface of the water, where the sunlight never reaches, the ocean floor begins to shake. It shakes lightly at first, barely shifting the sand. The creatures that live nearby hardly notice.

Once again the sea floor shakes, a bit harder this time. The sand stirs; drifts upward, and then settles back again. Strange-looking deep sea fish feel the vibrations and are frightened. They swim back and forth wildly, confused as their cold, dark world shakes again and again.

Then a crack appears in the sea floor, quickly growing longer and wider. Hot *lava* or melted rock flows through the crack like great globs of black toothpaste. Its heat turns the cold, still water into a swirling stew. Fish and other creatures quickly leave the scene.

The sea floor erupts on and on spilling millions of tons of lava from inside the earth. New lava piles on top of old, building a mountain - an undersea volcano -higher and higher. Clouds of hissing and crackling steam now rise into the air as the hot rock gets close to the surface. And a huge cloud of gray smoke fills the sky.

Then one day, like a monster from the deep, the tip of the mountain breaks through the ocean surface. A volcanic island has been born.

The Pioneers

Months pass and the volcano keeps on growing. Then one day the eruptions stop. Winds and waves and rain slowly cool the great fiery mountain. And there it sits- a black barren blob in the middle of a vast and sparkling sea.

The volcano is quiet. And the island it has created is lifeless. But it won't be lifeless for long. The sea around it is like living soup, full of tiny floating creatures. Some of the creatures are coral animals. Thousands of them settle onto the sides of the island just beneath the water's surface. Slowly they begin to build stony skeletons around themselves. A coral reef has begun.

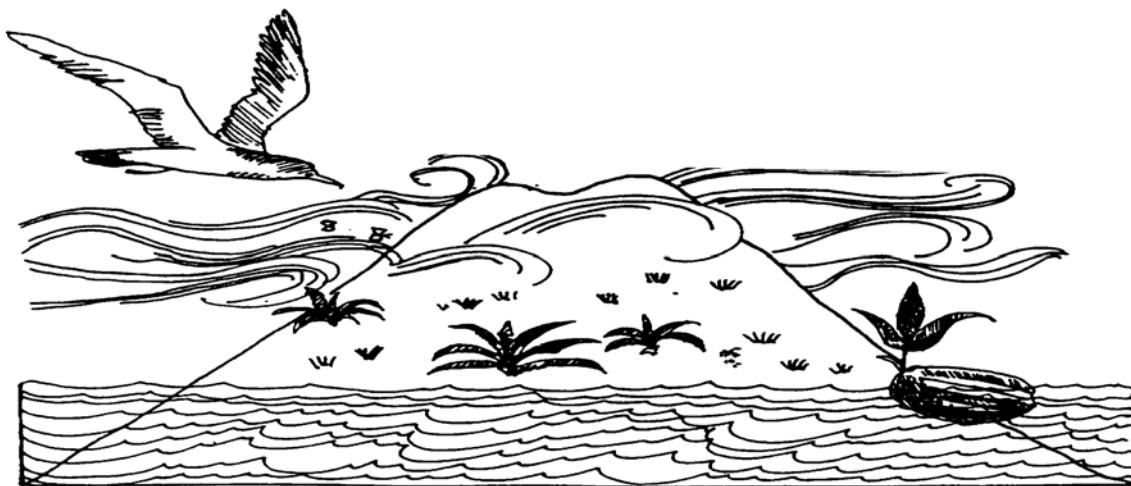
On the surface, waves crash against the volcano. The lava begins to crack and crumble. Seabirds, flying over the island, swoop down to rest. And seals crawl ashore to do the same. Their droppings mix with the crumbling lava, turning it to rich soil.

The first specks of life fight to survive on bare rock.

Then something happens that will change the island forever. Tiny fluffy seeds, blown by a storm from a far away land, drop into a damp, soil-filled crack. They sprout and begin to grow.

Years pass, and the wind sprinkles the island with more seeds and hundreds of spiders and insects. Most land where it's impossible to take root or to find food. But a few settle in more friendly spots...and survive. Other living things come to the island by "hitch-hiking." They are stuck to the feathers and muddy feet of visiting seabirds. When the birds land, a few seeds and insect eggs drop off.

Still other seeds catch a ride on the waves. After long journeys across the sea, floating seeds of all kinds wash up onto the volcanic shore. Those that find a patch of sand or soil sometimes sprout and grow. Over many more years, these plants- these pioneers- cover the island with a carpet of green.



An Explosion of Life

Castaways from far-off lands ride *the winds and waves* to a strange new home.

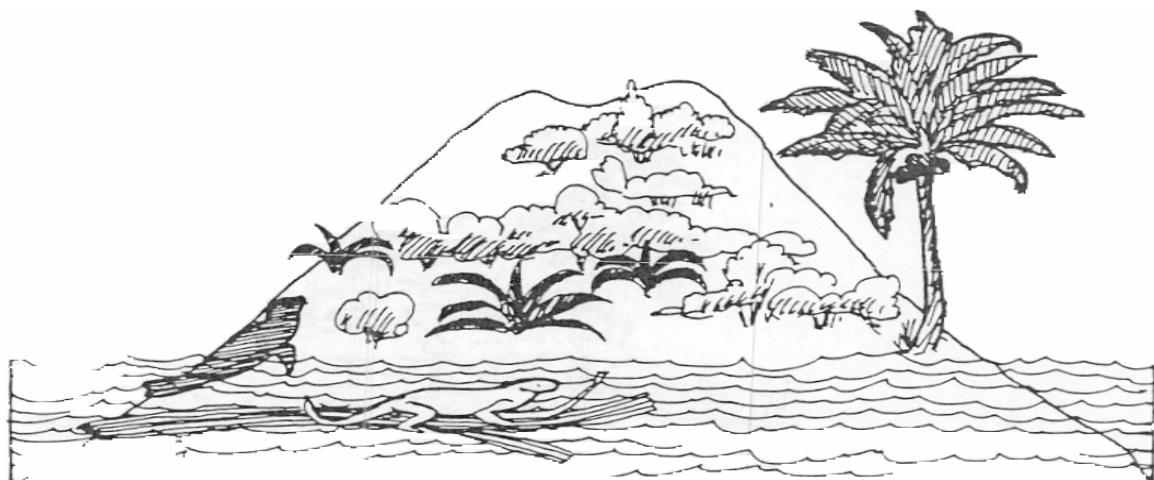
The pioneers are busy making *life* possible for everything that is to follow. The plants' roots squeeze into cracks and break apart the rocks. Their leaves fall and rot, making the soil richer and deeper. Their spreading branches shade the soil, keeping it cool and damp. Forest trees and vines that never could have survived before now begin to poke up here and there.

Insects and other small animals keep coming, drifting on the wind and clinging to birds. More and more of them find the right things to eat, the right places to hide, and a mate.

One day something very special comes to the island It's a raft -a huge clump of floating trees, vines, roots, and weeds. The plants had been uprooted by a flood on a large island hundreds of miles away. Then they were packed into a clump by the rushing water and carried out to sea. Day after day the raft was driven by the wind and pushed by ocean currents. And now, only by incredible luck, it washes up onto a beach on the young island Somehow it has survived the fierce winds and waves all in one piece. And so has its passenger -a fat, green lizard

The lizard crawls off the raft and onto the island She has no mate. But just by luck she's full of fertile eggs. They soon hatch, and now the island has a whole family of lizards. Thousands of years pass. Storms beat against the island, turning more rock to sand and soil More rafts and floating seeds and drifting insects arrive.. A powerful hurricane blows a few sparrows and a pair of pigeons from far away and drops them, hungry but unhurt, on the island.

The sparrows and pigeons make themselves at home, multiply, and soon spread over the island Sea- birds, which once stopped here only to rest, now make the island their home. Seals and sea turtles now nest or raise their young on the beaches.



Filling the Gaps

A special kind of magic fills the island with weird and wonderful things.

As millions of years pass, many more kinds of animals find their way to the island. But still there are far fewer kinds here than in other, larger, lands. So some of the animals that live here have been changing. They've begun to "fill in" for animals that aren't here. They've begun to do the kinds of things that the missing animals would have done,

For example, some of the sparrows now have long, skinny beaks -like hummingbirds -and sip nectar from flowers. Others have heavy beaks -like cardinals -and crunch large, hard seeds. Still others have strong, pointed beaks- like woodpeckers - and dig beetles from tree bark. So instead of one kind of sparrow on the island there are now many- each a new and different species.

Some of the pigeons change too. Over the years they have become larger and have taken to feeding and nesting on the

ground. There also are no enemies here for them to escape from. So the pigeons no longer need to fly. Their wings slowly become smaller and smaller until they are useless. Birds that once were strong fliers are now as flightless as ostriches.

Every where, it seems, ordinary animals are becoming strange, one-of-a-kind creatures. A special kind of island magic is at work. It's creating a weird and wonderful world -a place like no other on earth.

After even more time has passed, the island seems full of life. There are seed eaters and weed eaters, fish eaters and fruit eaters. There are tree nesters, cliff nesters, beach nests and bush nesters. There are hoppers and creepers and runners and leapers. The island has finally grown up.



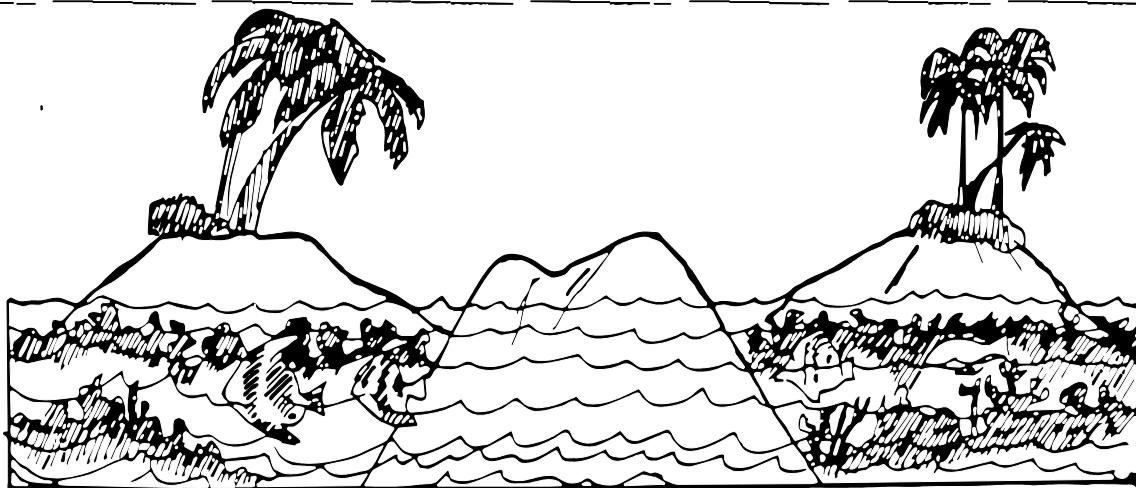
Back to the Sea

The island sinks from sight forever, but another treasure rises to take its place.

Almost from the very beginning, the huge, heavy volcano has been sinking slowly into the sea floor. And year after year, rain and crashing waves keep nibbling away at the island. So the island grows smaller and smaller, and many of its creatures and plants begin to die out.

But the coral reef around the island keeps growing larger and more beautiful. Endlessly, the tiny coral animals build their stony skeletons and then die. New coral grows on top of old, and the reef rises a bit faster than the volcano sinks. Countless fish, octopuses, and other sea creatures move in and make it their home. Parts of the reef poke above the surface, and a ring of tiny coral islands -an *atoll*- is formed.

Deeper and deeper the volcano sinks. Finally, after about 20 million years, the tip of the ancient mountain slips beneath the surface of the sea. The volcanic island is gone, and so is the life that once grew on it. Only the coral atoll is left to mark its burial place. But not far away deep down where the sunlight never reaches, the ocean floor begins to shake -lightly at first, then harder and harder.



DOES NOBODY CARE ABOUT SEA CREATURES?

Public Affairs Division,
World Wildlife Fund International (WWF),
CH-1196 Gland,
SWITZERLAND

Dr. Rod Salm is an expert on marine conservation. Since the early 1970's he has been working on conservation projects in many parts of the world. The projects have been funded by World Wildlife Fund, and planned, managed or coordinated by the International Union for Conservation of Nature and Natural Resources (IUCN) the leading independent organization concerned with conservation.

In an interview with Peter Jackson -for WWF in 1983 -Dr Salm described his concern for reefs and other coastal environments, '...which are rapidly becoming degraded by pollution, over-fishing and construction. The interview was included in **WWF Monthly Report August 1983**. WWF Monthly Report is a publication of the WWF Divisions of Conservation and public Affairs.)

Here is an abridged version of the 1983 interview. While the interview was conducted 3 years ago, most of Dr. Salm's comments are relevant today. The material may be used in classroom discussion or as a basis for a radio program .

Please give credit to **World Wildlife Fund**

PJ - Which parts of the world have you been in?

RS -Conservation work has been on the coast of Kenya, in the Indian Ocean, the north of Alaska (on walruses) and the Bering Sea, in the United States for marine mammals, in the Caribbean, principally Mexico, Honduras, and Belize and in the Bahamas and Turks and Caicos Islands. I have been in Indonesia, India, Sri Lanka and Pakistan, as well as Indian Ocean islands. I spent my first 23 years in Mozambique, which has the most spectacular coastline I have ever seen. It is very wild and beautiful. There are huge tracts that are totally unspoiled, where one does not see a human footprint on the beach, just turtle tracks. There are vast estuarine areas, huge mangroves very rich coastal resources, shrimp fisheries, estuary-related fisheries and coral reefs.

PJ -.Having seen all these places, how would you sum up the main challenges in conservation?

RS – The big challenge is to get the people interested in doing something and then trained and working in the field. Often a country will indicate a sincere interest in marine conservation, but they do not have the people with the expertise to get the programs going. Policy has to be developed and a legal framework has to be devised. Surveys have to be made, conservation areas identified and people trained to manage them.

PJ- - Do you find coastal communities, such as fisherman, responsive to conservation or resistant because they think it may affect their interests?

RS- That varies. In Kenya, people are proud to have protected area in their district. In other places people sometimes want to measure the benefits in terms of direct cash. It is hard to argue that there will be a benefit sometime in the future if one protects a breeding stock of fish. With turtles, people may have to wait 40 years before they can see the results of protection.

PJ- Where have you found the most serious situations in the Caribbean, for example Indonesia?

RS- Indonesia is rich in reefs and wetlands and differing coastal habits. It has not only diversity, but great expanses of the different habitats. The Caribbean islands have relatively little reef around them and there are relatively few types of reef and low diversity of practically everything in the sea. In Indonesia the extent of the resource is much bigger and can absorb more abuse. But Indonesian reefs have taken a hammering. I have never seen reefs reduced to underwater deserts as some have been in Indonesia, with no fish or anything living, just rubble slowly moving back and forth with the tide.

PJ- Has this been caused by mining coral?

RS- There has been a lot of explosive fishing, and traffic of people over the reefs at low tide. People go out and keep turning over all the rocks and corals, possibly every two weeks when there are low spring tides. The result is that some areas are denuded because corals don't get a chance to reestablish.

PJ- When you have re-visited areas after some years, have you found any deterioration?

RS- When I first went to Indonesia in 1973, I had already dived extensively through the Caribbean and the Western Indian Ocean and all the way down Australia's Great Barrier Reef, and across the South Pacific. But Indonesia had the most spectacular reefs I had seen anywhere. Almost everywhere we went we found beautiful reefs and abundant fish. When I went back in 1981 – less than 10 years later – it had some of the worst reefs that I had ever seen. Even reefs that are far way from everywhere have sustained heavy pressure from explosive fishing and from collectors of mother - of-pearl shells. A wealthy merchant will send a boatload of 30 divers to sea for toiseshell and mother-of-pearl shells. They glide with the currents over the reefs at all depths with their scuba gear, breaking up and turning over corals, wrenching the pearl oyster shells off and looking for Trochus and green snail, collecting everything they find.

Nevertheless, in Indonesia there seems to have developed a huge interest in the seas. The previous Director General of Conservation, Wartono Kadri, said that he wanted to make marine conservation the highest priority during the next five year development cycle. If that happens I think that some of the sea will be redressed. Already marine conservation has been elevated in status from a section to a full sub-directorate. This is a positive sign.

PJ- What waters have you enjoyed most?

RS- The most adventurous times were in Indonesia, where I saw some of the most unusual sights, such as a salt-water crocodile on a coral reef.

PJ- Was the crocodile aggressive?

RS- Not at all. We had chartered an outrigger boat in the West Irain and as we went into a bay in an uninhabited group of islands, we scared the crocodile off a rocky ledge where it was basking. I jumped into the water to see what it looked like underwater and it simply settled down on the reef and looked at me, and I looked at it. I have also had exciting times in the Galapagos Islands where the penguins swim with toy over coral reefs. Diving in the kelp jungles of the Falkland Islands with sea lions was fascinating. Diving in high Arctic is again different because the fish are torpid and one can pick them up and count the fin rays in order to identify them later. Coming out of the water it is so cold that a very thin plastic sheet of ice lies on the top. Diving in

the Caribbean is always pleasant among the spectacular elk-horn coral formations, but I prefer the Indo-Pacific areas, because they are more vibrant with color and life.

PJ- Have you had adventures with sharks?

RS- Not for a long time now. Only in my less responsible days when I was a spear-fisherman in Mozambique. They would chase us out of the water. Two or three of us would end up beating the sharks off us with spear guns. On one occasion I was hit from behind by a tiger shark of over two meters, which pushed my legs right out of the water. I practically did a somersault. It didn't bite me. I think it was chasing a speared fish and I happened to be in their way.

PJ- Don't these experiences put you off diving?

RS- I was not responsible in those days. The moment I stopped spearing fish, I stopped having these experiences. There are a lot of dangerous underwater creatures, but they usually have weapons of defense rather than offense. If you stand on a stone fish or sea urchins, or poisonous cone shells, you will be hurt, possibly killed by the sting. If you pick up a blue-ringed octopus and it has a chance to bite you, it can kill you. The box jelly, or sea wasp, that you get off the coast of Australia, is a poisonous kind of jelly fish that kills people.

PJ- What is the public response to conservation of rare marine species?

RS- One great problem in the sea is that we are dealing with species that do not have the same emotional appeal to people as some of the cuddlier terrestrial species or beautiful birds. People are not so likely to donate money to protect coconut crabs or giant clam or mother-of-pearl shells as they are to save the panda or tiger. Certain species in the seas may suddenly become extinct after having reasonably viable populations, before people get around to protecting them. The giant clam seems to have been totally eliminated from most, if not all of western Indonesia. It is hard to find any in Indonesia, whereas the shells of dead ones are easy to find. The largest of these clams, Tridacna gigas grows up to a meter or more in size. The coconut or robber crab (Birgus latro) used to extend from East Africa to the Western Pacific, but it only exists now in small isolated pockets. Who bothers to donate thousands of dollars to protect the coconut crab or to reintroduce it to areas from which it has disappeared?

With species that nest in huge colonies, such as green turtles or leatherback turtles, one can at least protect major concentrations in one habitat. But to protect hawksbill turtles and coconut crabs and some of the reef species, limited that have a short life and limited ability to colonize further areas, you have to establish a network of dozens and dozens of little reserves, because there are only a few in each little area.

The swirling seas around my coral
reef come alive at night. Join me for a...
DIVE INTO DARKNESS
by Nano, as told to Judy Braus

National Wildlife Federation,
1412 16th Street, N.W.
Washington, D.C. 20036 U.S.A.

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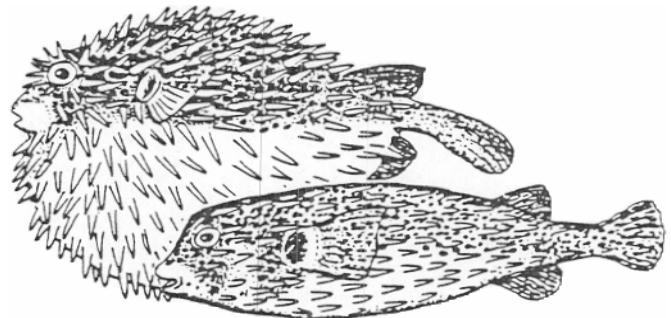
This article may be adapted for use in developing countries.

Hello, my friends. Come with me as I take a nighttime dive into the warm, wild waters that surround my coral island home. It's a strange, moving world of flashy fish and twisted coral canyons. Every now and then I can hear the muffled sounds of reef creatures moving in the distance. But most of the time there is a magical silence.

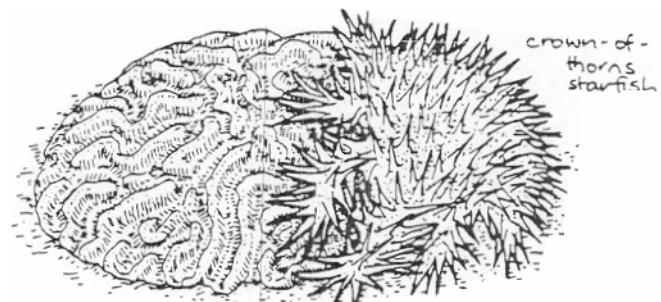
As I search the water with my flashlight, I always wonder what might come zipping *out* of the blackness. When I was younger, the darkness frightened me. Now my fear has turned to excitement. But I never forget that the reef is filled with danger as well as adventure.

My light cuts through the dark water like a knife. On a ledge there's a slipper lobster! I call them "flat heads" because of their flat, lip-like antennae, or feelers many of us on the island eat these lobsters. They're so good. And since they have no pincers or claws, they are easy to grab.

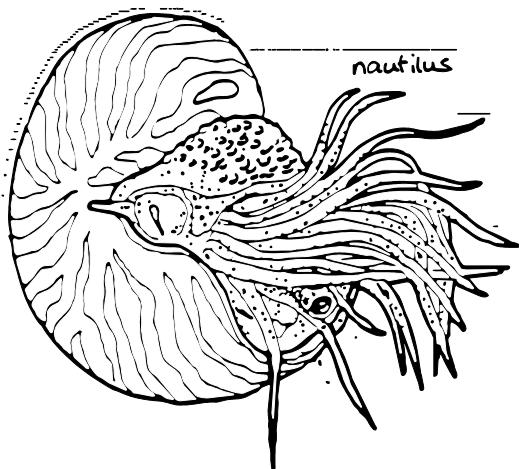
Watch out a'! the left: These roly-poly pin-cushions are **porcupine** fish. Their sharp spines can really hurt! When disturbed, the fish gulp down water and blow up like prickly balloons. When danger swims away, they let out the water and shrink back to normal size.



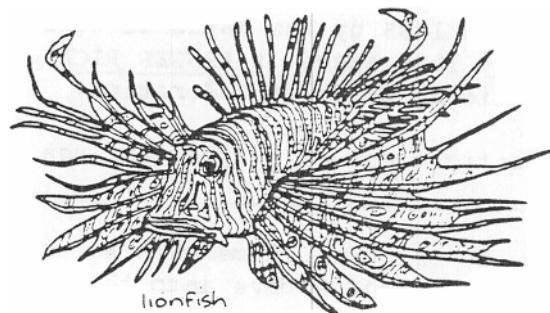
Look -feeding on the coral -a **crown-of-thorns** starfish! Armed with poisonous spines, this starfish has few enemies. If it should break off one of its 16 arms, a new one will grow to replace it. underneath each arm are hundreds of slender tubes capped with tiny suction cups. These "tube feet" grip the coral tightly.



Striped like a tiger, the chambered **nautilus** is a beautiful but fierce reef predator. At night it floats up to the surface to feed on fish and crabs. It grabs its prey with tentacles. Then it chomps them into bite-size pieces with its parrot like beak.



What a lucky dive! A **lionfish** is out hunting. Like a underwater butterfly, it slowly floats along, searching for small fish to eat. But its beauty is a 'warming'. A lionfish's spines are needle sharp with poison. I know I must watch this "butterfly" from afar.



CORAL REEFS: NEWS AND COMMENTS

In the Caribbean region there are now over 50 protected areas which include -or are next to -coral reefs.

Parks and reserves are important for protecting coral reef resources. But they will only work well if they have been set up for the benefit of people, and are not 'no-go' areas. So says Sue Wells, a coral reef expert working on the IUCN's Directory of Coral Reefs of International Importance. She says, "Local people must be involved at the start. The most successful reserves seem to be those where local people are still allowed to fish in certain areas using traditional methods, as at OIlea Island in the Loyalty Islands. There, fishing by anyone other than the villagers is banned. Tourists are restricted to one side of the lagoon."

source.. 'Nature-Watch.. the Red Sea'
produced by WWF-UK Education Dept.

Perhaps the best known reef areas of Kenya are the Malindi (Watumi National Reserves and Marine National Parks. The fringing reefs attract 50,000 visitors each year. Half of which are Kenyans. The visitors take boat trips, swim, sail, snorkel.

The biggest threat to these reefs - and to the tourist industry -is the increasing amount of silt that is carried down the Sabaki River. Uncontrolled farming in the UKambani Hills is causing soil to be lost from the land, and washed down the river to the sea.

source: 'Directory of Coral Reefs of International Importance Vol.2 Indian Ocean, Red Sea and Gulf' by UNEP/IUCN

Hurricanes - especially Hurricane Hattie (30-31 October 1961) -have caused some of

the greatest damage to the reefs that form the Belize Barrier Reef.

source: 'Directory of Coral Reefs of International Importance Vol. Atlantic and Eastern Pacific' by UNEP /IUCN .

On the Maldives Islands, coral rock is the main building material for houses and other buildings such as mosques. It is soon to be used for road construction. Most rock is mined from the surface of the reefs where living coral is found. The reefs may take at least 50 years to recover from the mining. Some may never recover.

source: **IUCN Monitoring Unit**

Some people in the Philippines are collecting pieces of coral from their reefs, and selling them to Americans. Tons of Philippine coral enter the U.S.A.

	tons
1982	340
1983	244
1984 (Jan.-Oct.)	306

Many coral reef experts believe that this coral trade is a big threat to the Philippines' reefs.

Laws exist both in the Philippines and in the United States to control the coral trade. There is a Philippine presidential Decree (1980) which bans coral collection and export. This law is not enforced strongly at present. U.S. authorities have the power to seize illegally-exported coral. If the U.S. efforts are to be successful, the Philippine government needs to strongly enforce its ban on coral exports.
source.. **TRAFFIC (U.S.A.)**

SEA HAZARDS

The underwater world is exciting, beautiful and mysterious. Few sea animals are dangerous. But there are some that sting or bite.

JELLYFISH

Jellyfish have stinging cells on their tentacles. These stinging cells contain coiled threads. When touched, the threads shoot out and release a dose of poison.

Do not touch jellyfish. Do not pick up jellyfish lying on the beach that look dead.

What happens if you accidentally touch jellyfish tentacles? The skin which touches the tentacles becomes red. It may swell or a rash may form. There may be a burning pain. You may feel sick, and even vomit. You may suffer from shock, and it may be difficult for you to breathe. You may even collapse.

WHAT TO DO

1. Remove tentacles with a clean cloth. (Cover tentacles with dry sand if you are on the beach.)
2. Wash the affected skin with (a) rubbing alcohol or (b) household ammonia stirred in fresh water .
3. Watch out for shock. Get medical help if you can.

Do you know any local remedies for jellyfish stings ?



SEA URCHINS

Sea urchins are found around underwater rocky areas or reefs. They have long, brittle spines with needle-sharp tips. The sea urchin uses its sharp, so time poisonous, spines for protection or for burrowing into rock and sand for shelter.

Do not pick up sea urchins.

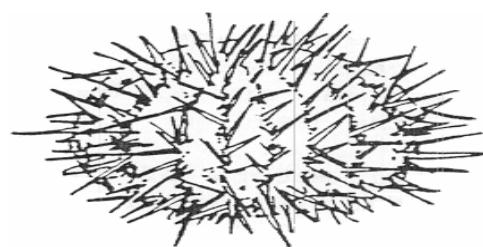
If you do touch them, the spines will pierce your skin. Often the tip of the spines will break off under the skin. This is uncomfortable, even painful. It can also cause infection and swelling.

WHAT TO DO

Remove the spines with tweezers or a needle that has been sterilized, (made clean and free from living micro-organisms by boiling or heating).

The spines of sea urchins such as the long-spine sea urchin or the purple and white sea urchin are poisonous. If you touch these spines with your arm or leg, you must.

1. Place a tight band two inches around the wound.
2. Soak the area in hot water or apply a hot compress for about half an hour.
3. Remove the band.



MANATEES by Sharon Kahkonen

Have you ever seen a manatee? It is a very unusual sight! The manatee is a huge blimp-shaped animal that can grow to more than 12 feet (3.6 meters) long, and weigh as much as a ton (about 1000 kgs.)! It lives a peaceful life, slowly swimming through warm coastal waters.

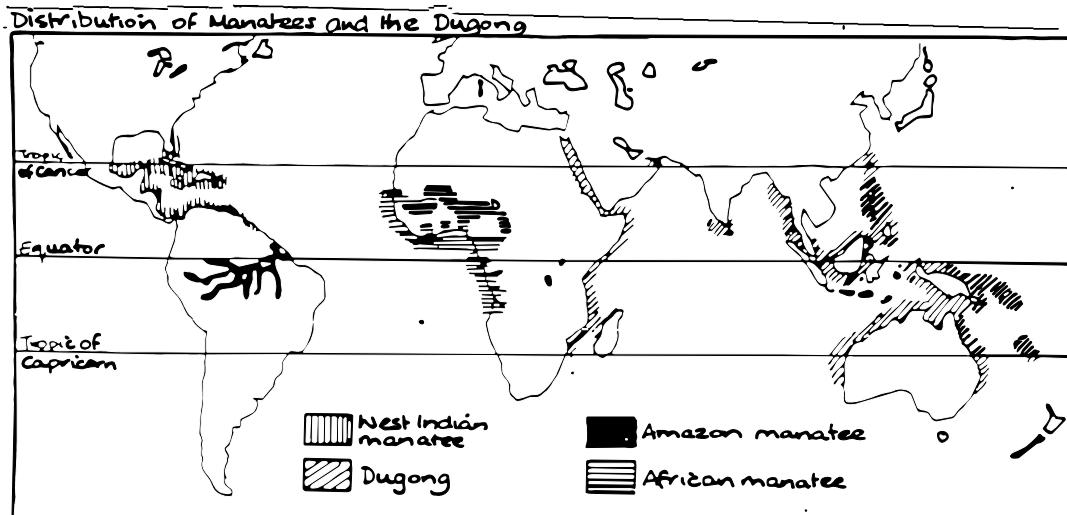
The manatee is a marine mammal. Other marine mammals include whales, dolphins, seals and walruses. Marine mammals spend most, if not all, of their lives in the sea.. They have certain things in common with other mammals that live on land. They are warm-blooded. They have lungs and breathe air. They also nurse their young with milk.

Manatees are perhaps the most unusual of all marine mammals. They eat large amounts of water plants. For this reason they are sometimes called "sea cows". Adults eat up to 100 pounds /45 kg.) of food a day. In some areas they are used to keep waterways free of weeds.

When they need air, they float just under the surface and poke their nostrils out of the water to take deep breaths. While swimming, they breathe every 3 or 4 minutes. When they are resting, they can stay underwater for as long as 15 minutes at a time. To swim, the manatee strokes its flattened tail up and down, and uses its fins to steer. In shallow water, the manatee uses its flippers to walk along the bottom.

Manatees are very gentle creatures. They do not fight for food, or attack other animals or people. They have no natural enemies. Their only defense is to swim away from danger. Manatees cruise alone, in pairs, or in small groups .Touch seems to be an important form of communication between them. They nuzzle, nudge, and butt one another. Sometimes they give each other hugs with their front flippers:

There are three kinds of manatees, (see map). The Amazon manatee lives in the Amazon River in South America.



It has been hunted for its meat, fat and hide. Today there are probably only a few thousand left alive, even though the animal is now protected in Brazil, Colombia and Peru.

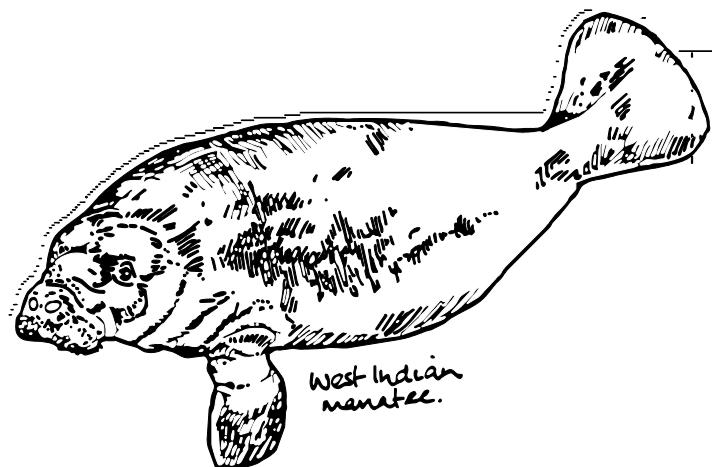
The African manatee lives along the Atlantic coast of Africa, and in the rivers of West Africa. It, too, has been hunted. Some animals are accidentally caught in fishing nets.

The West Indian or Caribbean manatee is found in the Caribbean Sea from the southern shores of the United States to the coast of Guyana. The animal is hunted, is commonly struck by boat propellers, and has been harassed by tourists. Much of its natural habitat has been destroyed.

by development and pesticides. It may number only 5,000 to 10,000.

The manatees have two close relatives. The Stellar's sea cow used to live in the Pacific Ocean. Due to over-hunting it has been extinct since the late 18th century. The dugong lives in the Indian and Pacific Oceans. This animal may be in danger of becoming extinct, too.

There are only a small number of manatees left in the world today. In some coastal areas there are social refuges for manatees, where boats are not allowed. With a little help from people, the gentle manatees may continue to live their peaceful lives.



2. WHOOPING COUGH (Pertussis)

Scouts and Guides,
c/o UNICEF Uganda,
Uganda Teachers' Association Building,
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Plot 28/30 Bombo Road,
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Kampala.
UGANDA

Postal address
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This article is taken and adapted from.. 'Uganda Scouts and Guides proficiency Badge Booklet for Immunization Services' produced by Uganda Scouts and Guides with UNICEF.

It is the second in a series of articles about deadly but preventable diseases, (see OUTREACH issue 19 'Immunization saves lives').

Please give credit to: Uganda Scouts & Guides and **UNICEF**

Whooping cough is a powerful bacterial infection that gets in the throat of a child.

The disease is called 'whooping cough' because it is the 'whooping' sound of the cough that makes the disease easy to recognize. However, when young children contract the disease, they do not 'whoop'. So it is difficult to tell if they have the disease.

Whooping cough is highly contagious in the first two weeks of illness. Children under five months of age are at greatest risk of dying from this disease. Whooping cough claims the lives of a million and a half children in the developing world each year.

Immunization should be done three months after birth. For complete coverage the child must receive 3 immunizations. These immunizations must be spaced at about one month apart.

If the mother takes her child regularly to the Health Centre, the immunizations will be done at the right time.

Many mothers fail to bring their children to the Health Center for all three doses of immunization.

Children with less than three doses of vaccine are not immunized. They could catch the disease just as easily as if they had never received their first immunization.

MOTHERS MUST MAKE SURE THEIR CHILDREN RECEIVE THREE DOSES OF WHOOPING COUGH VACCINE.



3 doses are needed to scare away the whooping cough monster.

HELP SAVE THE REEFS! by S1aroo Kahkonen

This story looks at animal classification, and describes the abundant marine life that lives in and around coral reefs.

The story maybe adapted and printed as a complete article, or it maybe appear as a series of episodes.

You may invite children to color the illustrations

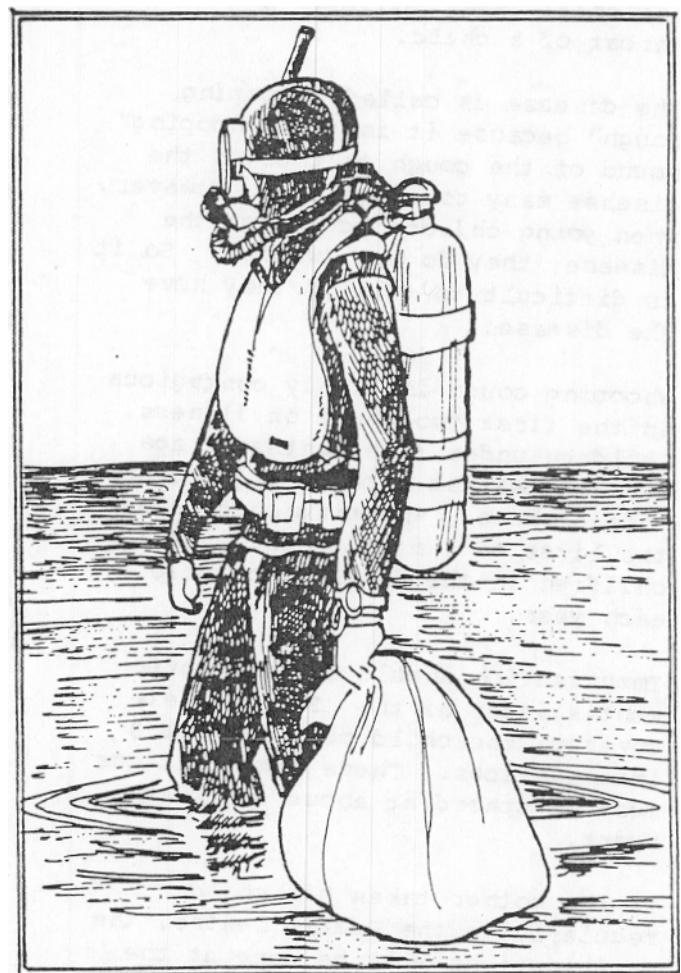
It was a perfect *day* for George and Matrid IS favorite pastime --beachcombing! As *they* walked along the beach, *they* looked for shells, bits of coral, and anything else that the waves might have washed up to the shore. Matrid liked to make things out of the shells, like necklaces and bracelets.

George just liked to collect things. He thought that someday he would open a museum in his back *yard* for the kids in the neighborhood. He had found some pretty interesting stuff --like pieces of driftwood, crab shells over a foot long, and some shark's teeth. *Every* time *they* went to the beach, Matrid and George found something new and different. It was like going on a treasure hunt.

But that *day*, *they* found something really extraordinary. At first they couldn't even believe their *eyes*. Matrid had been examining a piece of coral when she caught something out of the corner of her *eye*. It was something big and black coming out of the water! Her heart skipped a beat. She wanted to run but she was too curious to find out what it was.

"George, look!" Matrid shouted, as she pointed out to the water.

Both Matrid and George stood still, frozen in their tracks. They watched closely, as the head of a sea creature with a huge *eye* came out of the water. Then its shiny black body emerged from the water. It had two long yellow cylinder-shaped objects on its back. Very clumsily the



sea creature came out the water
creature walked to the shore. Its huge
webbed feet were obviously better suited for
swimming than for walking!

Once on shore, off came the tanks from its
back, off came its mask, off came its flippers
and off came its black rubber wet suit.

This weird sea creature was only a man! He had been scuba diving just off the shore where Matrid and George were collecting shells.

"Hi. there!" the scuba diver greeted them.

"Hi! What are *you* doing?" asked Matrid.

The scuba diver pointed out to the ocean. "I'm studying the coral reef out there."

"Why are *you* doing that?" asked George.

"The reef is in danger.

I'm trying to see what we can do to save it."

"What do *you* have in the sacks?" asked George.

"I've collected some specimens to take back to the Marine Biology laboratory down there." He pointed down the beach to a cement two-storey building. "I'm going to see what effect pollution has had on their growth."

Matrid and George were getting very curious.

"Can we come with *you*?" asked Matrid.

"Please. please!" shouted George.

The man hesitated. He was extremely busy, and time was running out. The coral reef would not last much longer-if something were not done about it soon. But Matrid and George looked so keenly interested.

"I'll tell *you* what. You go tell your parents where *you* are, and I'll meet *you* back at the lab. By the way, my name is Professor Fisher."

"This is George, and I'm Matrid. See *you* later!" They ran half way down the beach

before Dr. Fisher had a chance to change his mind.

The Marine Biology Lab

Later that day, Dr. Fisher was showing Matrid and George the rows and rows of tanks in the lab. There were corals and sponges of all colors, shapes and sizes and brilliantly-colored fish. Matrid and George were amazed.

"All these things live out there in the reef?" asked George, his mouth wide open.

"Yes, and many more. There are thousands of different animals living out there. These are only some of the most common types."

"These animals don't look common to me. I've never seen them before. They're dazzling!" Matrid replied, her eyes getting wider and wider. Dr. Fisher laughed. Then he got a far look in his eyes and became very serious.

"You're right, Matrid. Coral reefs are dazzling. Nowhere else in nature has so much beauty and variety of life been crowded into so small an area. Every square foot holds new surprises."

"What are all these things, Dr. Fisher?" "Are they plants or animals?" "Can they move?" "How do they eat?..." Matrid and George had an endless string of questions.

"Hold it! Hold it!" replied Dr. Fisher, "If you want to learn about the creatures living in coral reefs, we'll have to take it a step at a time."

Dr. Fisher really wanted to answer Matrid's and George's questions, but he was terribly busy, and he felt the need to get back to work.

Then an idea came to him. His main concern was to save the reefs from being destroyed.

To do this, he needed to reach people. They needed to know how important it was to save the reefs and how they could help. Perhaps the children could help him. He could tell them about the reef. They could tell their parents. In turn, their parents could tell other people.

"How would you like to bring your whole class to the lab?" Dr. Fisher asked.

"Do you mean it?" asked Matrid.

"When?" asked George.

"Let's see what we can arrange. But just now, let me get back to my work. But, I promise. I'll see you again soon!"

Dr. Fisher's Lecture ...Later that week the students in George and Matrid's classes came to Dr. Fisher's lab. They, too, were dazzled by the animals in the tanks and had many questions about them. Dr. Fisher began his talk by saying, "To answer a question that many of you may have, all of these creatures are animals, just like we are."

"But they don't all look like animals. Why don't corals and sponges move like other animals?" asked Matrid.

Dr. Fisher replied, "Corals and sponges are very primitive animals. First let's talk- about how animals are grouped. This will help you to better understand all of the animals that live in coral reefs. The animals in these tanks are arranged into groups. Scientists have classified all animals into groups based on their characteristics. Animals with similar traits are placed together in the same group."

Alicia, a girl in George's class, asked. "What group do humans belong to?" Dr. Fisher answered. "First of all, humans belong to the animal kingdom, rather than the plant kingdom. But kingdom is just the first level of classification. A kingdom

includes the largest number of different organisms. Altogether there are seven levels of classification.

Human beings would be classified like this:

Kingdom: Animal
Phylum: Chordates
Class: Mammals
Order: Primates
Family: Hominids
Genus: Homo
Species: sapiens."

Alicia looked puzzled.

"That seems very complicated. Are all animals classified in that way?"

Dr. Fisher nodded. "Yes, all living things fit into this system of classification. You see, it actually makes things a lot simpler. There are over a million different animals on the earth. But they can all be grouped together based on their characteristics. For example, humans belong to the chordate phylum. This is because they have backbones. What other animals do you think belong to this phylum?" "I know. Dogs and cats have backbones. So do birds and fish." George replied.

"Exactly", said Dr. Fisher. "Many of the animals that are most familiar to us are chordates. The next level of classification is class. Humans belong to the class mammalia. This is because they are warm blooded. They also give birth to their young and have mammary glands to suckle their young. Humans are more closely related to other mammals, like dogs and cats, than they are to other chordates like fish or frogs or birds."

"What about the animals in the ocean. Are we closely related to them?" asked Matrid. Dr. Fisher answered. "There are a few mammals that live in the ocean. Whales and porpoises are mammals.

Of course, there are many fish which belong to the same phylum (chordate) as humans. But most of the animals that live in the ocean are much more primitive."

"Why is that?" asked Matrid.

Dr. Fisher explained. "Life began in the sea. For millions of years, life was present only in the sea. About 300-400 million years ago, life came out onto the land. Today there are still many primitive forms of animals living in the sea. Come, let me show you some of them."

Dr. Fisher took the students on a tour through the lab. He told them about six different phyla of animals that live in coral reefs. From simplest to most complex, they are the sponges, segmented worms, cnidarians, mollusks, echinoderms, arthropods, and chordates. This is what the students learned.

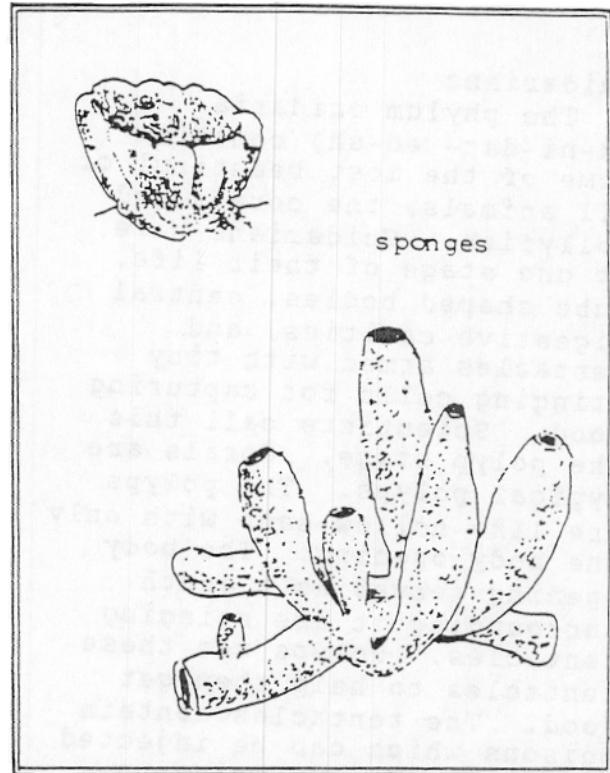
The Sponges

Sponges are very primitive animals. They are usually attached to one place for most of their lives. Their body walls are two layers thick. The walls are held up by fibers that act like a skeleton. Some types of sponges are collected and dried. The sponges die leaving behind their fibrous skeletons. The fibers have a lot of space between them that can hold a lot of water. Thus, sponges can be used for washing.

In the centre of the sponge is a space called a central cavity. The walls contain a

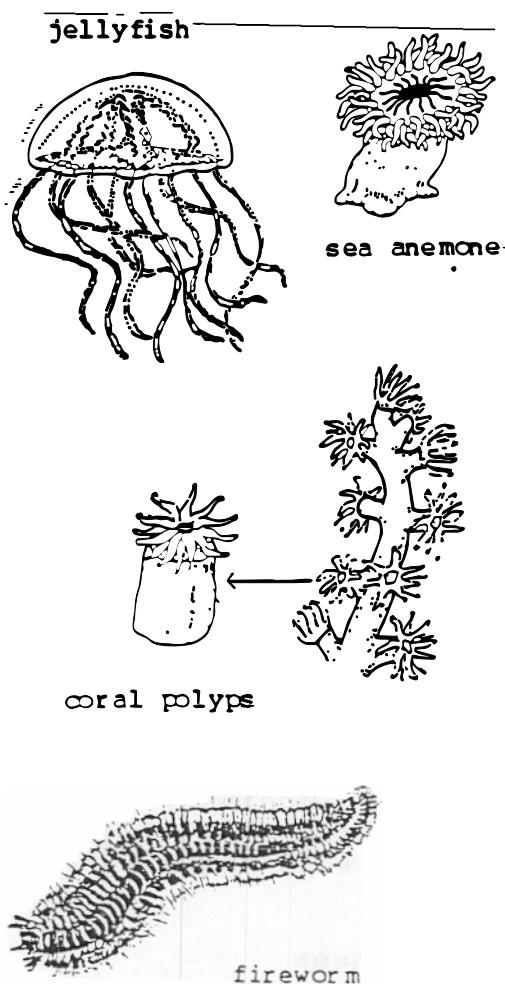
number of tiny holes called pores. These pores lead into the central cavity of the sponge. In the central cavity, the pores are surrounded by flagella. The flagella are like tiny whips that are constantly moving. As they move, they draw water and pieces of food into the sponge, where the food is digested.

Sponges, like many other simple animals, have the ability to grow new body parts. If a sponge is cut in pieces, each piece will grow into a whole new sponge!



Cnidarians

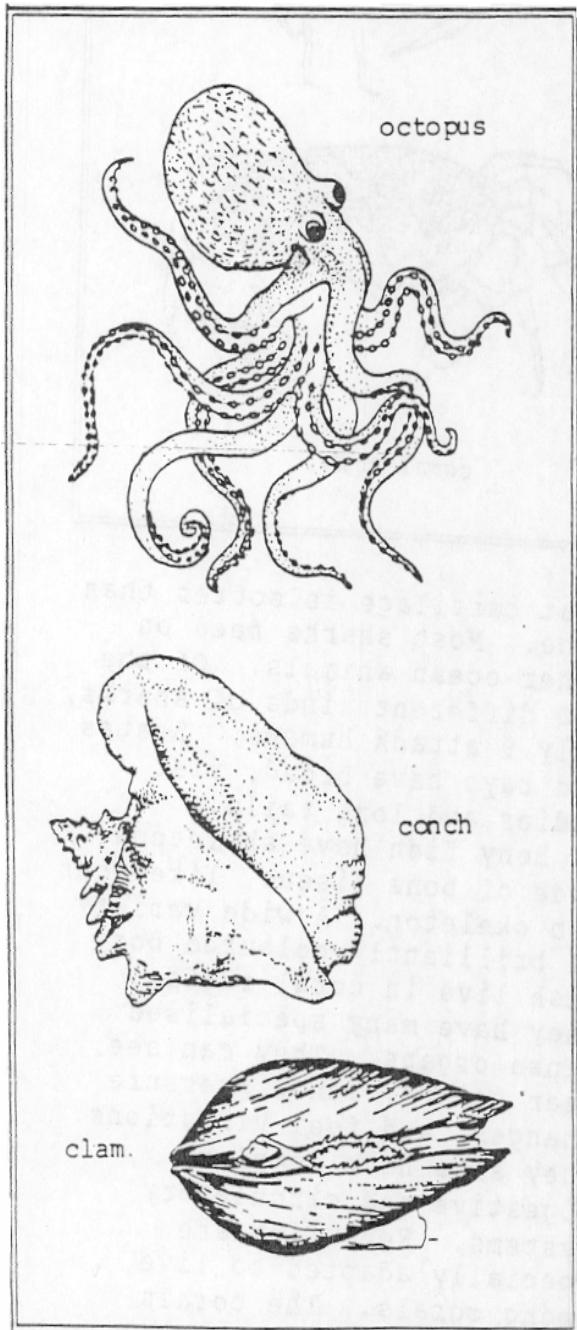
The phylum cnidaria (k-ni-dar- ee-uh) contains some of the most beautiful of all animals. the corals and jellyfish. Cnidarians have, at one stage of their life, tube shaped bodies, central digestive cavities, and tentacles armed with tiny stinging cells for capturing food. Scientists call this the polyp stage. Corals are typical polyps. The polyps are like hollow sacs with only one body opening. The body opening serves as a mouth. Surrounding it are stinging tentacles. Polyps use these tentacles to help them get food. The tentacles contain poisons which can be injected into their prey. Then the polyps use their tentacles to push the food into their mouths.



The coral formations *you* see are made by millions of tiny coral polyps. Most of them are less than an inch long. They live together in colonies. They attach their bodies to each other by a sheet of tissue that connects to the middle of each body. They deposit limestone around the lower half of their bodies. As new coral animals grow, the limestone coral formation also grows larger and larger. They may look like branching trees, large domes, or even organ pipes. The living coral animals form a cover over the limestone formation in beautiful shades of yellow, orange, purple and green.

Segmented Worms

You are probably very familiar with one segmented worm that lives in soil, the earthworm. But segmented worms do not only live on land. They also live in the ocean. The bristle-worm and the fire-worm live in coral reefs. Segmented worms are much more complex than sponges and corals. They have many tissues that are organized into organs and organ systems. They also have a head and a tail. In their heads, they have a tiny nerve centre that connects to the muscles. They also have a complete digestive system with two body openings, a mouth and anus. Blood vessels carry blood to all parts of their bodies by contracting and relaxing.

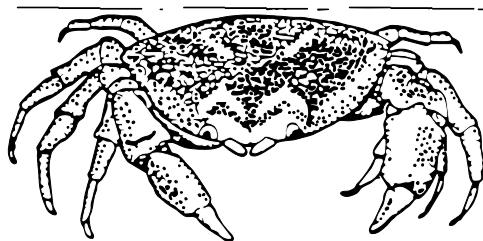
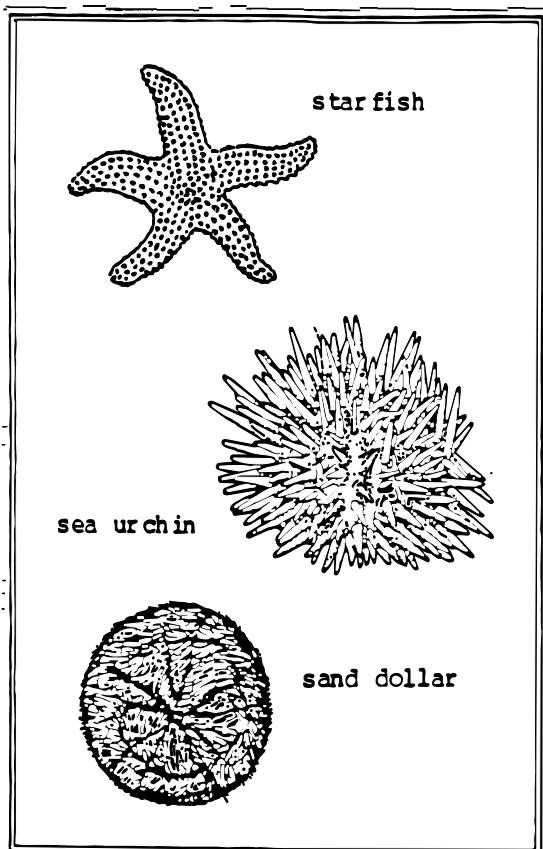


Mollusks

Clams, snails, oysters, octopuses and squids are examples of mollusks. The word mollusk means soft. The mollusks have very soft bodies. All but octopuses and squids have hard shells to protect their soft bodies. Clams, scallops, and mussels are bivalves, so-called because they have two sides, or valves. A bivalve can open its shell and stretch out its foot. It can also stretch out a special food tube. Water containing food particles is sucked through the tube into the bivalve's gill. The gill filters out food particles. Squids and octopuses do not have shells. They have tentacles that extend from their heads. They can move quickly by squirting a jet of water from their bodies.

Echinoderms

Starfish, sea urchins, and sand dollars are echinoderms (eh-kie-no- derms). The word echinoderm means spiny skin. As you have probably guessed, most of the echinoderms have spiny skin. They also have well developed digestive systems and simple nervous systems. Starfish are the best known echinoderms. The underside of their arms are covered with tube feet, which act like tiny suction cups. A starfish can wrap its arms around a clam, using its tube feet to hold on. Then the starfish's stomach stretches out of its mouth and enters the clam. It digests the body of the clam and then sucks the digested material into its own body.



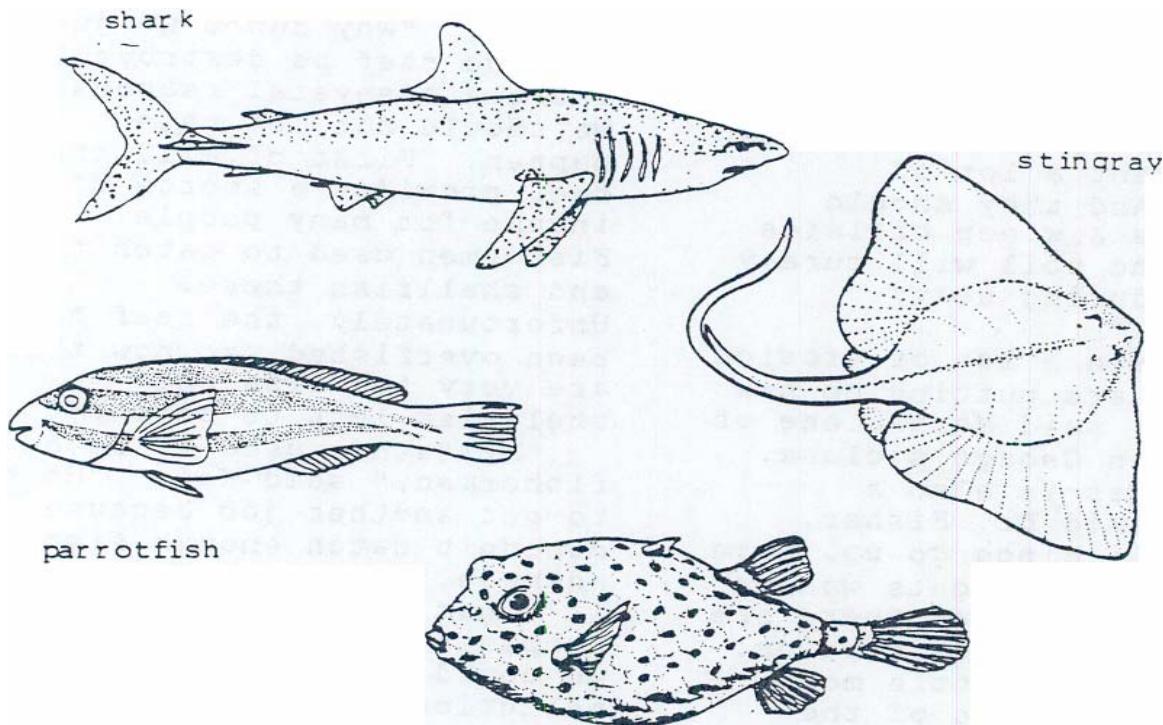
Bony fish have skeletons made of bone tissue, like your own skeleton. A wide variety of brilliantly-colored bony fish live in coral reefs. They have many specialized sense organs. They can see, hear noises, sense pressure changes, and feel vibrations. They also have complex digestive and circulatory systems. Reef fish are specially adapted to live among corals. The corals provide endless nooks and crannies where they can hide.

Arthropods

Lobsters and crabs are examples of arthropods (ahr-throw-pods) that live in the ocean. Insects and spiders are examples of arthropods that live on the land. All arthropods have bodies made of several parts and hard external skeletons. They also have jointed feet, which is what the name arthropod means.

Fish

Fish are chordates, which means they have skeletons and backbones. Sharks, rays and skates are fish that have skeletons made of cartilage (car-till-ig). Parts of your own body, like the end of your nose, are made of cartilage. If you feel the end of your nose, you will see that cartilage is softer than bone. Most sharks feed on other ocean animals. Of the 250 different kinds of sharks, only 9 attack humans. Skates and rays have broad, flat bodies and long tails.



The fish are as brilliantly-colored as the corals themselves. In open waters they would be very conspicuous, but among the brightly-colored corals they are much less noticeable.

The Student Decide to Help

The more the students learned about the animals, the more fascinated they became. Then Dr. Fisher told them the bad news. "Unfortunately, the animals in the reef may not be able to survive for much longer, since their environment is being destroyed," he said.

"Why is that happening?" asked George.

Dr. Fisher replied. "Too much sediment is washing into the ocean. The water is getting too cloudy. Corals need very clear water in order to thrive. If the corals die, then none of the other animals can live there either."

"Why is sediment washing into the ocean?" asked Matrid's friend Ken.

Dr. Fisher answered. "Farmers are clearing more and more land on the hillsides. This is causing the soil to erode away. The soil is being washed into the ocean."

"What can be done about it?" asked Ken.

Dr. Fisher answered,

"People should try to prevent erosion. They should learn how to keep the soil in place. For example, if they ploughed across a hillside, rather than up and down, this would prevent a lot of erosion. And they should never leave a steep hillside barren. The soil will surely wash away during heavy rainstorms."

"I've seen a lot of erosion where they are putting up new buildings," said Maria. one of the girls in George's class.

"Yes, this is also a problem," said Dr. Fisher. "As more buildings go up, more and more sediment gets washed into the water. But there are ways to prevent this erosion. It just takes a little more concern on the part of the builders.

"I've seen stinky chemicals going into the water. Don't they hurt the reef?" asked Alicia.

Dr. Fisher replied, "Yes, they do. Pollution from factories is also damaging the reef. Dumping raw sewage into the ocean is having a harmful effect as well. This must be stopped in order to save the reef. Besides this, people are taking pieces of coral from the reef as souvenirs.

It takes hundreds of years to build a piece of coral, and only a few moments to chop it down."

John, a boy from Matrid I.S class, objected. "I don't see what difference it makes if the reef gets destroyed. I mean. who cares?" John and his older brother collected coral to sell to the tourists for extra money, and he didn't want to lose his source of spending money.

"I've been waiting for that question," replied Dr. Fisher. "Why don't we just let the reef be destroyed? There are several reasons why we should not let this happen. First of all, the reef provides a source of income for many people. Fishermen used to catch fish and shellfish there. Unfortunately, the reef has been over-fished, so now there are very few fish and shellfish left to catch."

"My father used to be a fisherman," said Ken. "He had to get another job because he couldn't catch enough fish anymore."

"That has happened to many people," said Dr. Fisher. ",If we could stop

sediments and pollution from harming the reef, and let the fish and shellfish populations come back, then maybe some day people could fish there again."

"My parents earn their living from the reef," said Alicia. "They take tourists out to see the reef in a glass-bottom boat."

"Yes, the entire tourist industry is dependent on the reef," said Dr. Fisher. "But there are other reasons why the reef should be saved, other than economic reasons. Coral reefs are amazing places that have a tremendous diversity of living things. Scientists are always discovering something new about the animals that live in coral reefs. Sometimes they even discover new medicines that can help save people's lives."

John was still not convinced. He asked, "Aren't there lots of coral reefs in the world? I mean, even if this one gets destroyed, there would still be lots of others left to explore."

"Unfortunately there aren't that many reefs in the world, John," replied Dr. Fisher. "They only exist in tropical areas where the water is shallow.

The water must be warm all year round for the animals in coral reefs to survive. The plants that live in coral reefs need shallow water so that sunlight can reach them. But can you think of other reasons why our reef should be saved?" asked Dr. Fisher.

"I think the reef should be saved just so people can go and look at it," said Matrid. Dr. Fisher replied, "You're right about that, Matrid. The world would be a less beautiful place if the reefs were gone. And the reefs cannot save themselves. It is up to us as human beings to try to save them rather than destroy them.

"What can we do to help save the reef?" asked Matrid

Dr. Fisher smiled. "I've been waiting for that question, too," he said. "One thing you can do is learn all you can about the reef, and tell other people what you have learned."

"Let's make some posters! We can put them up around town," said George.

"We could write to the newspaper," said Alicia.

"I think we should write- letters to the builders and factory owners who are polluting the water," said John. It seemed that Dr. Fisher had convinced John that saving the reef was a worthwhile project.

"Maybe you and *your* brother could stop chopping off pieces of coral!" George teased, as he elbowed John.

"You're right. I didn't know I was harming the reef by taking pieces of coral, but now I see that I was. Anyway, I just thought of a new business to go into. I'm going to start selling 'Save the Reef' T-shirts! The tourists should really go for that!"

Dr. Fisher laughed. "Not a bad idea, John," he chuckled.

Dr. Fisher was delighted. From then on he didn't have to fight to save the reef *by himself*. He had an army of students to help him! And to this day, they are still fighting.

The following activities could be used to supplement this story:

- As a class, draw a mural of a coral reef that includes animals from all the animal groups mentioned in the story. Draw a smaller black-line copy of the mural, and label the outlines of the animals with a number key. Then write a key for the drawing, including the numbers and names of the animals in the mural.
- Have the students find out more about the animal phyla mentioned in the story.
- Ask the students to bring in different kinds of shells and pieces of coral. Have them find out what they are, and what they looked like when they were alive. You could set aside a table where they could be displayed, along with cards that give some information about them.
- Have a contest to see who can make the best "Save the Reef!" poster. The posters could include information about how the reefs are being damaged. and what can be done to stop the damage.
- Find out how to set up a salt water aquarium in your classroom.
- Have the students create crossword puzzles. word scrambles. and other games, using the information in the story.
- Have the students adapt the story into a play, and perform the play for other students in the school.

A VISIT TO THE REEF

World Wildlife Fund
1255 23rd Street, NW
Washington, D.C. 20037
U. S.A.

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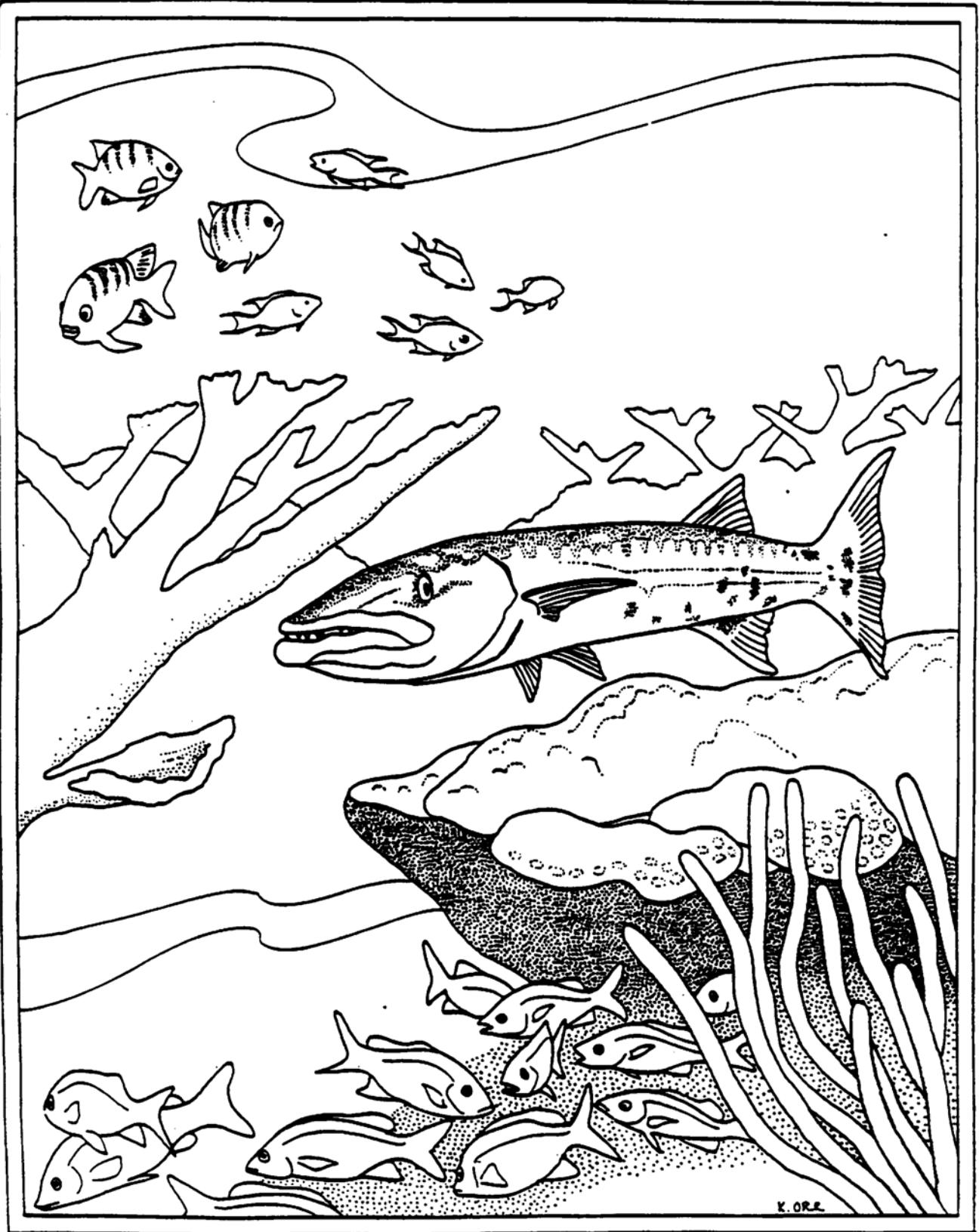
The material is from 'CORAL REEFS: Materials and Activities for Teaching Middle Grades'. This kit has been produced by World wildlife Fund and Rare, Inc., as part of the Caribbean Environmental Education Program, a project funded by the titled States Agency for International Development.

The sun's rays shine down through the clear, blue water. Sparkling reflections dancing across the smooth coral heads. Above the reef, bright blue chromis and striped sergeant major fish feed on tiny floating plants and animals called "plankton." To us, plankton looks like floating specks in the water. But plankton is important food for the coral reef. Corals, tube worms, sponges, and many small fish eat plankton.

Schools of snappers and grunts drift in and out of coral crevices. They hide in the shadows as a barracuda glides near. Suddenly, the barracuda streaks past like a long silver bullet. He has swallowed a small yellow grunt. Perhaps the grunt was sick and too slow to escape. Barracudas are important to the reef. By catching sick and old fish, they keep the population healthy.

Una Visita Al Arrecife

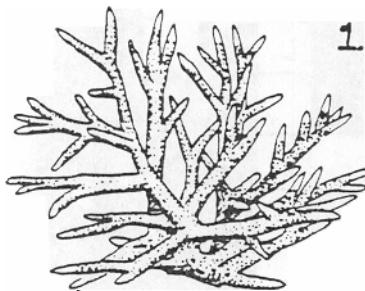
Los rayos del sol brillan a traues del agua azul y cristalina. Reflejos chispeantes bailan sobre las suaves cabezas de coral. Sabre el arrecife, brillantes cromis azules y moharras rayadas se alimentan de las pequelias plantas y animales flotantes llamados "plancton. Para nosotros, el plancton parece como pequelias motitas flotantes. Pero el plancton es un alimento importante para el arrecife de coral. Corales, gusanos rubulares, esponjas y muchos otros pequelios peces comen plancton. Agrupaci6nes de pargos y roncadores salen y entran nadando par las grietas del coral. Se esconden en las sombras en el momenta que una barracuda se desplaza cerca. De repente la barracuda paso uelozmente como una bola de plata. Se ha tragado un pequelios roncador amarillo. Tal uez el rdnccador estaba enfermo y fue muy lento para escapar. Las barracudas son importantes para el arrecife. Al atrapar pescados uiejos y enfermos, mantienen la poblaci6n saludable.



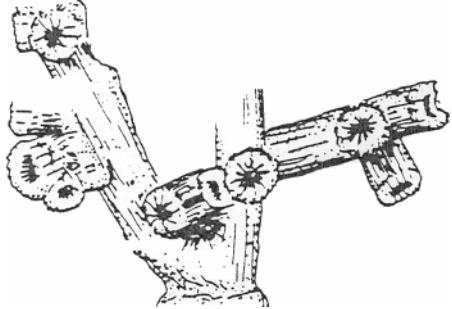
K. ORR

STONY CORAL PUZZLE

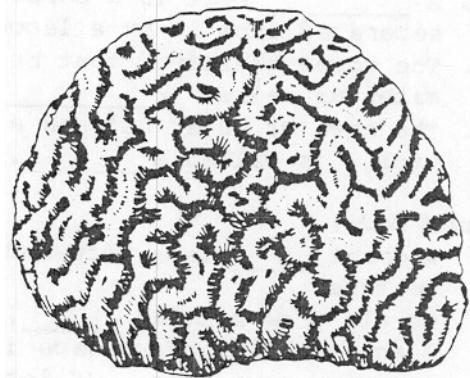
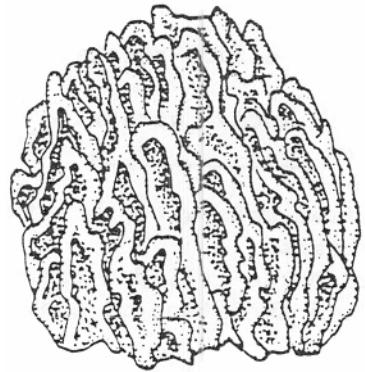
Corals that make a hard skeleton are called hard or stony corals. These are the ones that build the hard structures known as coral reefs. These corals can have very different forms. Their names often match their appearance. Match the names and the pictures of the stony corals shown below:



1.

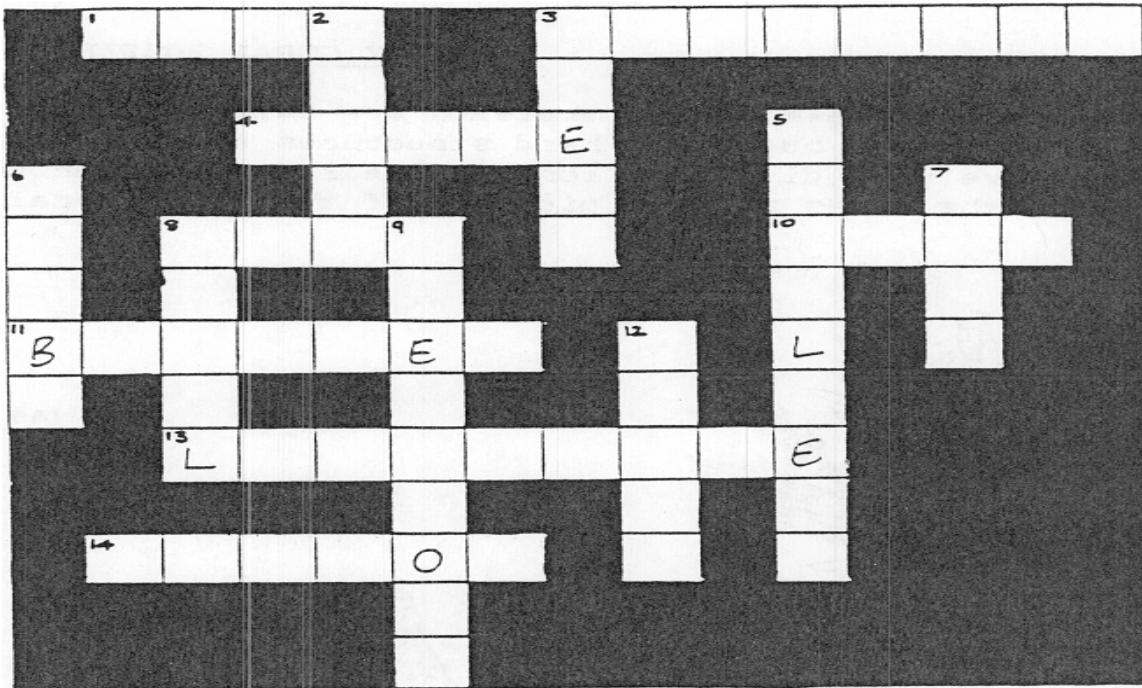


3.



A CROSSWORD ON CORAL REEFS

This crossword may be used to test coral reef vocabulary. Some of the letters are already in place to help you.



Clues Across:

1. Corals are found in shallow, not _____ waters. (4 letters)
3. polyps live together in large _____. (8 letters)
4. _____ live inside the bodies of coral polyps, and live in close partnership with them. (5 letters)
8. Corallites are the limestone_____ in which coral polyps live. (4 letters)
10. Corals grow in _____, not cold waters (4 letters)
11. A _____ reef a coral reef that runs parallel to the shore and is separated from it by a lagoon. (7 letters)
13. The coral skeletons that build up to form coral reefs are made of a rocky material called _____.(9 letters)
14. The area of water between a barrier reef and the shore, or within an atoll, is called a_____ (6 letters)

Clues Down :

2. A coral _____ is a soft-bodied creature related to the sea anemone. (5 letters)
3. Corals grow best in _____ , not muddy, waters. (5 letters)
5. Black coral is often made into _____, and for this reason is becoming very rare. (7 letters)
6. A diver with this self-contained underwater breathing apparatus can get very close to a reef. (5 letters)
7. Stony corals build a hard structure called a coral _____.(4 letters)
8. _____ is built from the joined skeletons of tiny animals called polyps. (5 letters)
9. When polyps die, their _____ are left, and a new generation of polyps grow on top of them. (9 letters)
12. Corals that produce a hard skeleton are called _____ corals. 15 letters)

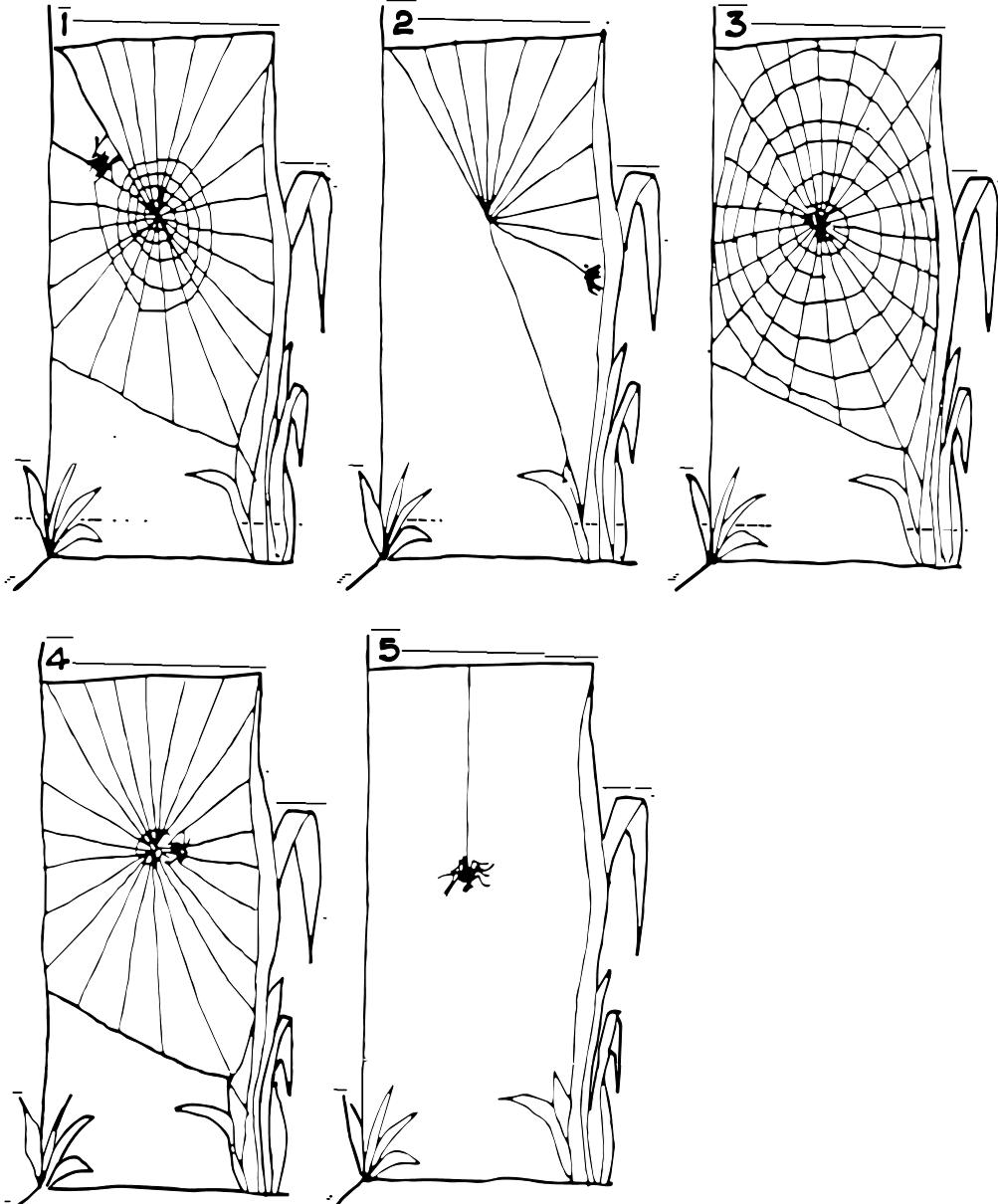
Answers..

Across. 1. deep., 3. colonies; 4. algae., 8. cups; 10. warm., 11. barrier., 13. 1imestcne., 14. lagoon. Down: 2. polyp; 3. clear., 5. jewelry, 6. scuba., 7. reef., 8. coral; 9. skeleton., 12. stony.

A SPIDER'S WEB

Spiders are helpful. They eat insects like flies, mosquitoes and grasshoppers. Many spiders weave webs. Their webs are sticky. Insects caught in the sticky webs.

Here are five pictures. They show a spider making its web. But the pictures are in the wrong order. Can you put them in the right order so that you can see how a spider weaves its web?



Answer..

5,2,4,1,3.

TEACHERS' /PARENTS' PAGE

Caribbean Conservation Association,
Savannah Lodge, **The** GarrisCX1,
St. Michael BARBADOS

OUTREACH 20/p.32

Here are so~ activities on coral reefs, They are taken from 'CORALS AND CORAL REEFS IN THE CARIBBEAN', a manual for students' by Stafford A, Griffiths and Eugenie Williams 'published in 1985 by the Caribbean Conservation Association with funds from UNEP)

Please give credit to.. Caribbean Conservation Association

Here are some questions and activities that *you* may like to do with your students.

* When you visit the beach, collect some pieces of coral. Examine them carefully. Do you see coral polyps or just the skeleton? Look for holes and tiny animals which might live in them. Rub your fingers on the coral to see how smooth or rough it is. What color is it?

How hard is the coral skeleton? Try crushing a few pieces with a hammer or a big rock. Were they easy or difficult to crush?

* What are the two ways corals use to produce young ones? Try to find out some other animals and plants that use each of these methods. Ask your teacher to help you find this information.

*Corals which are best at catching prey tend to live in deeper and darker parts of the coral reef. Can you see why this might be so?

* Find out what local remedies are applied to person who suffer from having touched a ~ea urchin or a fire-worm.

* Find out the names of 50me reef fish we use as food.

* Try to list ways in which you and your classmates might try-to help save the coral reefs from further destruction.

FILM REVIEW: ANIMATING A THAI LOVE STORY

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The film 'Good Kasem and Clever Manee' was produced in co-operation with the Family Health Division of the Thai Ministry of Public Health, see address above.

Animating a Thai love story

Japanese skills at cartoon animation have been turned to good use in a 16mm film about a rural couple in Thailand *Good Kasem and Clever Manee* who fall in love and learn to plan their lives.

The standard color movie tells the story of the poor young man and his clever girl-friend Manee, who want to get married but cannot even afford the wedding. The warm and humorous imagery shows how the lovers ponder and decide their present and future lives.

The 15-minute film was produced by the Sakura Motion Picture Company in co-operation with the Japanese Organization for International Co-operation in Family Planning (JAICFP) and the Family Health Division of the Thai Ministry of Public Health.

The theme of the film is that young people have to plan for their future, and the target audience is the 10 million young people

between 15 and 20 in rural Thailand who leave school in the fourth grade or earlier.

The hope is that Kasem and Manee will convince the audience that family planning is an essential part of a happy family life. The story tells how Kasem's parents are unable to give him enough land to prepare for a wedding and how he leaves home to find work as a construction worker in the city. Meanwhile Manee receives advice from a visiting midwife about "the wisdom to have a planned life", so that the children can be timed and spaced to make a healthy, happy family, and the trees preserved to avoid erosion and flooding.

Eventually Kasem returns and the couple light traditional candles and float them on the river in a symbolic boat of love. The film, with voices by the same actors and actresses who worked on some of the most popular animated films in Thailand, is the fourth in a series relating to family planning and maternal and child health made by the same group. The first three have been seen by some 7 million people a year in 73 provinces of Thailand.

The Health Ministry credits the films with contributing substantially to the drop in infant mortality in rural Thailand from 40 per 1,000 live births in 1980 to under 30 today.

Good Kasem Clever Manee is part of a continuing communication campaign aimed at reducing Thailand's population growth rate to 1.1 per cent by 1991.

Why animation? Ms Patama Bhiromut of the Family Health Division explains: "People want to watch the film for entertainment although the contents are very serious. We wanted to include a serious message. So animation was selected to shift the emphasis. It will be seen by villages of all ages."

