

NEW YORK STATE

Conservationist

for
Kid!



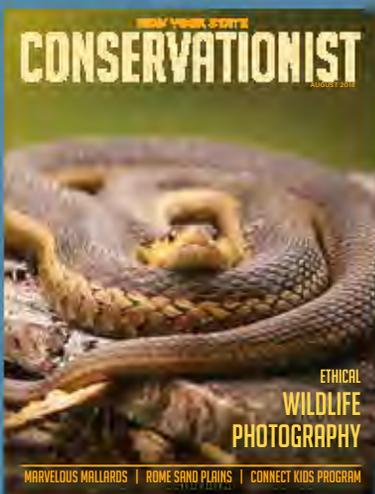
**DIVE
INTO
REEFS!**



NEW YORK STATE Conservationist

KIDS!

IN THIS ISSUE: we take a look at reefs, both natural and artificial, the species they support, and what is being done to help them. A special focus of the issue is the expansion of New York State's artificial reef program.



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Deep sea coral photos courtesy NOAA Office of Ocean Exploration and Research.



WHAT IS A REEF?

Most natural reefs are made of something called coral. Even though they may look like rocks and act somewhat like plants, corals are animals and related to jellyfish and anemones. Plankton is the main food source for corals – including both phytoplankton and zooplankton. Phytoplankton, which are tiny plants, use the energy from the sun to create food (we call this

photosynthesis). Zooplankton differ from phytoplankton because they're actually tiny animals found in the ocean, most of which are too small to be seen without the help of a microscope. These two types of plankton form the basis of the entire ocean food-chain and are extremely important to living corals.



When most people think of reefs, they often imagine a coral reef that is found in warm tropical waters. Tropical coral reefs are primarily made of hard corals, also called stony coral. They produce a skeleton made of calcium carbonate (CaCO₃), which also forms in shells of crabs, lobsters, and other shellfish. Hundreds and thousands of individual corals, called polyps, are joined together by the calcium carbonate skeletons, forming the main structure of the reef. Corals grow slowly, with the fastest-growing tropical species growing at about the same rate as human hair, or about 4 inches per year.

Shallow-water, tropical reefs also play an important role in protecting the coastline from storms like hurricanes, minimizing the impacts of waves. They are also important for tourism, attracting visitors from all over the world.



Often called the rainforests of the sea, coral reefs are home to many different species of fish, invertebrates, and other animals. They are used by many species as nurseries, or places to raise their young. Although they cover less than one percent of the ocean floor, they support roughly twenty-five percent of all marine life. Over 4000 species of fish can be found on coral reefs around the world.

Unlike hard corals, soft corals do not form a rigid skeleton, and do not create reefs. They are still found within reef ecosystems though, and tend to resemble trees, fans, bushes, and other plant-like forms. They too are animals, and what looks like a single organism is actually a colony of individual soft corals combined together.



Just like with other plants and animals, different coral species can be found in different locations and habitats. Some are found in shallow, warm waters, while others can be found in deep, cooler waters.



DEEP-SEA CORALS



Did you know that in the deeper, colder water of the ocean, corals can be found anywhere between a few hundred feet to almost 2 miles deep? Did you also know that some of these deep-water corals are located only a few miles off New York's coasts? The deep-water corals found off the coast of New York State are generally solitary in nature, although they do sometimes join together to form similar reef habitat as tropical coral reefs. Some species attach to hard surfaces like rocks, while others can live in sand or other soft sediments (underwater soils). There are several different types of corals that can be found in the deep water, including stony corals, black corals, true soft corals, gorgonians, and sea pens.

Tropical coral reefs don't do well in water temperatures below around 68 degrees F, but deep-water corals thrive in temperatures ranging from 29 to 55 degrees (ocean water does not freeze at 32 degrees like freshwater, due to the high salt content). Deep-sea corals often grow too deep below the surface for sunlight to reach, and they cannot rely on photosynthesis as a source of food. Instead, they must catch the plankton that they eat using their tentacles. This behavior allows cold-water corals to grow much deeper than tropical corals, which can only grow in shallow waters where the sunlight reaches and rely on a close relationship with algae and phytoplankton.



Most deep-water corals do not grow more than an inch per year. Some of the slowest growing species grow less than $\frac{1}{4}$ of an inch per year, or about the thickness of a couple of grains of rice side by side. Soft corals normally grow faster than hard corals, but still only add a couple of inches of growth each year.

Cold-water coral reefs are very important both for biological diversity and fisheries. Some have been shown to be home to more than 1,300 species of fish and invertebrates, including species that are important to commercial fisheries. Also, because they live a very long time, cold-water corals provide a vital record of past climate conditions on Earth. Even though they have not studied them for nearly as long, many scientists already believe that cold-water coral communities are as important to the biodiversity of the oceans (and perhaps even more important to the sustainability of fisheries) as their better recognized tropical, shallow-sea counterparts.

WHAT IS AN ARTIFICIAL REEF?

How are they made? Why do we need them?

Artificial reefs are manmade structures that imitate many of the properties of natural reefs. They are sometimes created in areas where natural reefs have been damaged or destroyed, or in places where additional reef habitat is wanted. In NY, they are used to create new habitat areas. Sunken shipwrecks form the most common type, but other structures such as oil and gas platforms,

lighthouses, bridges, jetties, and piers can also serve as artificial reefs. Scientists also purposely create artificial reefs in specific locations, using items such as rocks, concrete, and steel. Creating artificial reefs requires careful planning, and is done in a way to enhance the underwater environment and mimic the benefits of a natural reef.

New York State recently announced the largest expansion of the Artificial Reef Program in state history, carried out by a multi-agency coordination and with recycled material from the Department of Transportation, Canal Corporation, and the Thruway Authority. The materials being deployed as additional reef structure include tug boats, barges, scows, clean concrete and steel, such as recycled materials from the demolition of the Tappan Zee Bridge.

Deploying reef material



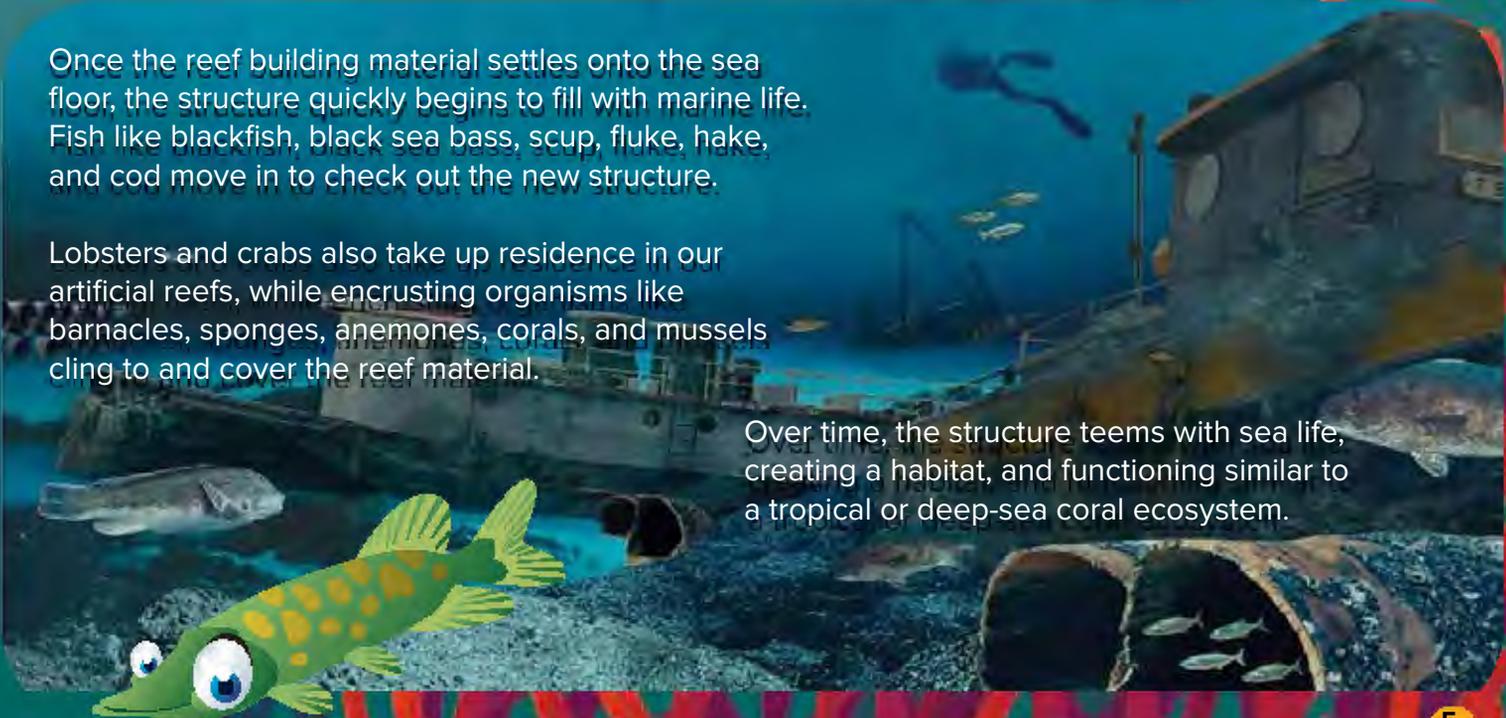
Before material can be used at artificial reef sites it must be inspected and cleaned of pollutants that could harm the marine environment. DEC ensures materials meet strict standards and are appropriate to be used in marine environments. These materials will support the development of artificial reef habitat on sites located off the shores of Long Island.

New York State's artificial reefs are developed to increase fisheries habitat. They provide marine fish and other organisms additional opportunities for shelter and foraging, which increase productivity in the areas where they are placed. Anglers often visit artificial reef sites to benefit from the increased fishing opportunities they provide. Scuba divers also visit our reefs, primarily for nature observation and photography.

Once the reef building material settles onto the sea floor, the structure quickly begins to fill with marine life. Fish like blackfish, black sea bass, scup, fluke, hake, and cod move in to check out the new structure.

Lobsters and crabs also take up residence in our artificial reefs, while encrusting organisms like barnacles, sponges, anemones, corals, and mussels cling to and cover the reef material.

Over time, the structure teems with sea life, creating a habitat, and functioning similar to a tropical or deep-sea coral ecosystem.



DEBRIS AND WASTE VERSUS ACCEPTABLE ARTIFICIAL REEF MATERIAL



Artificial reef materials are different than marine debris. Marine debris is usually carelessly discarded, and is harmful to the environment. Artificial reefs are made of manmade items which are carefully cleaned and prepared to pass strict requirements, and thoughtfully placed to make sure they're

safe and appropriate for the environment. Often, materials placed on artificial reefs are secondary use, meaning that they have served their usable lives as originally designed and are no longer useful for their original purpose. Creating artificial reefs is a form of "aquatic recycling" in the marine environment.



PLASTIC POLLUTION

8 million tons of plastic enters the world's oceans every single year. A school bus weighs around 12.5 tons, so this is the equivalent weight of 640,000 school buses worth of plastic entering the oceans each year. This plastic can be found in all parts of the ocean, from remote beaches to coral reefs to the polar ice caps. Plastic has even been found in the deepest point of the ocean – the Marianas Trench. Many plastic items break down into what is known as microplastics, which are tiny pieces of plastics that are mistaken as food and eaten by coral polyps, fish, and other marine organisms. From there, the plastic particles can begin to move up the food-chain into larger organisms, such as birds, whales, larger fish, and even humans.

A vessel that has been recycled as a reef now teems with life



Herb Segars

Examples of marine debris include plastic, Styrofoam, and discarded fishing gear. Often, debris ends up in the ocean as a result of being washed out to sea by rains or carried by the wind, and unfortunately is sometimes purposely discarded on the beach or even out in the ocean.

Many countries, cities, and other locations are now banning plastic materials such as straws, Styrofoam, and grocery bags in order to help reduce the amount of plastic waste being generated.



THREATS TO REEFS

Natural and artificial reefs and their associated ecosystems face many different threats, including unsustainable fishing, climate change, pollution, development, and physical damage.

Unsustainable fishing practices such as over-fishing can lead to losses of many fish species, some of which are necessary to the health of the reef, and others that are important to humans as sources of food. Destructive fishing methods such as the use of certain types of nets can also cause damage to reefs and the animals that live on them.



Climate change affects corals in many ways. Increasing ocean temperatures, sea level rise, changes in weather patterns, stronger storms, and changes in ocean currents are all ways they can be impacted. Increases in carbon dioxide in the atmosphere can make the oceans more acidic, which negatively impacts the ability of tropical and deep-sea coral growth. Coral bleaching can occur as a result of these changes in environmental conditions, causing natural algae that lives on tropical corals to be lost and making the reefs more vulnerable to disease.

One of the major threats to deep-sea corals is oil, gas, and mineral exploration. Exploration for these resources may destroy the corals or disturb the natural habitat in which they live, making it harder for these corals to thrive. Corals need a clean, healthy environment to live in. When accidents such as an oil spill occurs, this can have a significant negative impact on corals and their ecosystems.

Other threats to corals and reefs include poaching (both of the corals themselves and the fish that live on them), invasive species, physical damage from boat anchors, and a variety of coral diseases, many of which only cause harm in great numbers when the reefs are already stressed.

Because corals grow very slowly, any damage or disturbance can take decades for them to recover. Thus, it is important for us to do what we can to protect these fragile ecosystems from human disturbance or destruction.



WHAT CAN YOU DO TO HELP?

Quite simply, follow the 4Rs (refuse, reduce, reuse, recycle). Spread the word so others will follow suit, and safely clean up what's out there (see the Outside Page for more information about holding a cleanup event). Never touch reefs in the wild when you are swimming, diving, or fishing.

HOLD A CLEANUP EVENT

Although certain days of the year such as World Oceans Day (June 8th) and the International Coastal Cleanup (3rd Saturday in September) often focus on doing beach and other coastal cleanups, you can do one any time! The NYS Beach Cleanup is run by the American Littoral Society and The Ocean Conservancy. To get some great tips on how to hold an event for your classroom, your family, or even a club or other organization, visit the NYS Beach Cleanup website at www.nysbeachcleanup.org/.



	A	K	P	Y	C	Y	J	L	K	S	E	Z	Q	P	P
ARTIFICIALREEF	S	R	A	Y	O	A	X	Z	O	V	P	E	H	N	H
BLACKSEABASS	O	P	T	C	L	X	Q	E	K	L	L	Y	P	O	O
CORALREEF	F	N	S	I	O	O	E	P	K	A	T	L	E	T	T
DEEPSEA	T	Z	D	S	F	R	P	D	R	O	A	G	G	K	O
MARINEDEBRIS	C	L	I	P	A	I	A	O	P	S	U	G	X	N	S
PHOTOSYNTHESIS	O	E	L	J	M	B	C	L	T	W	Z	V	Z	A	Y
PHYTOPLANKTON	R	Z	H	J	G	Y	A	I	R	N	T	A	L	L	N
PLASTIC	A	C	D	X	N	N	C	E	A	E	A	X	I	P	T
POLYP	L	O	O	O	K	A	T	D	S	L	E	O	X	O	H
SOFTCORAL	Q	F	T	T	L	D	U	P	W	K	R	F	J	O	E
STONYCORAL	Q	S	O	A	E	S	P	E	E	D	C	E	L	Z	S
UNDERWATER	U	N	D	E	R	W	A	T	E	R	K	A	E	V	I
ZOOPLANKTON	S	I	R	B	E	D	E	N	I	R	A	M	L	F	S
	H	R	I	O	C	R	P	I	F	B	I	R	U	B	Y

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Conservationist for Kids **Supplement for Classroom Teachers – Dive into Reefs!** **October 2018**

Why Reefs?

For many people, coral reefs are something found in far-away, tropical places, so you might be wondering why we are talking about them in *Conservationist for Kids*. Although New York does not have tropical coral reefs, many species of deep-sea corals can be found in the waters off the coast. This issue introduces students to reefs, and compares and contrasts tropical coral reefs, deep-sea corals and artificial reefs. While they may not be as accessible or as widely studied as tropical coral reefs, deep-sea corals are extremely important habitats for many different species of marine life. More than 1,300 species of fish and invertebrates call them home, some of which are important to the sustainability of commercial fisheries. Deep-sea corals also provide an excellent record of past climate conditions, helping scientists to not only understand the past, but also better predict the future. 2018 is the International Year of the Reef, so what better time to learn about them!

New York State has had an artificial reef program since 1962. Earlier this year, the largest expansion of the program in state history was announced. There are currently 12 artificial reef sites in the waters off Long Island, with 6 of them receiving new materials during the expansion. Materials from the old Tappan Zee Bridge, as well as old tug boats, barges, and other suitable rock, concrete, and steel materials are being deployed to enhance the artificial reefs. The artificial reefs were created to increase fisheries habitat and biodiversity, and provide recreational opportunities for anglers and divers. As soon as the new materials settle to the bottom, marine life begins to move in. Many commercially and recreationally important species such as blackfish, black sea bass, scup, fluke, hake, cod, lobsters, and crabs will call the new reef structures home. You can download a brochure describing the program with a map of all the reef sites at www.dec.ny.gov/outdoor/7896.html.

While many people may not get a chance to visit an artificial reef or see deep-sea corals in person, both are very important parts of New York's marine habitat. Many fish and other marine species we eat depend on them, and the commercial and recreational opportunities they provide are vital to the local economies. For those who visit artificial reefs, there are volunteer angler and diver survey programs in which we encourage people to submit their observations to DEC, in order to help manage the artificial reef program. More information about DEC's Reef Monitoring Program is available at www.dec.ny.gov/outdoor/9211.html.

By learning more about New York's deep-sea corals and artificial reefs, students will not only gain a better appreciation of these resources, they will also learn about some of the threats facing them and ways that they can help to protect them.

This Issue's "Outside Page"

The "Outside Page" in this issue of *Conservationist for Kids* introduces the idea of holding a beach cleanup event, which can be done as a class or at home with parents, a club, or other organization. While the International Coastal Cleanup is held annually on the 3rd Saturday in September, any time can be a good time to plan a cleanup. Although the International Coastal Cleanup is geared towards coastal areas, even if you don't live near one you can still hold a cleanup. Many waterways eventually lead to the ocean, so no matter where you live, you can help keep the ocean or your local water body clean by picking up trash along lakes, rivers, streams, or even storm drains. More information can be found on the New York State Beach Cleanup website at <http://nysbeachcleanup.org/> or the Ocean Conservancy website at <https://oceanconservancy.org/>. The "Outside Page" also includes a word search, highlighting some of the key words found in this issue.

Online Resources*

DEC Artificial Reef Program www.dec.ny.gov/outdoor/7896.html

DEC Artificial Reef Locations www.dec.ny.gov/outdoor/71702.html

DEC Reef Monitoring Program www.dec.ny.gov/outdoor/9211.html

International Year of the Reef www.iyor2018.org/

NOAA Coral Reef Conservation Program <https://coralreef.noaa.gov/>

NOAA Deep-Sea Coral Data Portal <https://deepseacoraldata.noaa.gov/>

NOAA National Ocean Service: Coral Reefs <https://oceanservice.noaa.gov/ocean/corals/>

NOAA National Ocean Service: What is an artificial reef?

<https://oceanservice.noaa.gov/facts/artificial-reef.html>

NOAA Ocean Explorer Deep-sea Canyons

<https://oceanexplorer.noaa.gov/edu/themes/canyons/welcome.html>

Video Resources*

Building an Artificial Reef (DEC YouTube Channel): www.youtube.com/watch?v=5sZwYTAE1gY

Smithtown Artificial Reef Expansion (DEC YouTube Channel):

www.youtube.com/watch?v=3_ger2NBHTQ

Strange Stuff in the Sea (PBS Kids Design Squad): <http://pbskids.org/designsquad/blog/strange-stuff-sea/>

Books*

Islands in the Sand: An Introduction to Artificial Reefs in the USA. Charlie Hudson.

Booklocker.com, Inc., 2009.

**Please note, the listing of websites, books, and video resources is not to be considered an endorsement, as not all have been reviewed by the editor.*

Conservationist for Kids and an accompanying teacher supplement are distributed free of charge to public school 4th grade classes in New York State three times per school year (fall, winter and spring). If you would like to be added to or removed from the distribution list, need to update information, or if you have questions or comments, please e-mail the editor at KidsConservationist@dec.ny.gov or call 518-402-8047. Limited quantities of some back issues are also available on request. The full archives can be found online at www.dec.ny.gov/education/100637.html