



Can aquariums save corals?



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TABLE OF

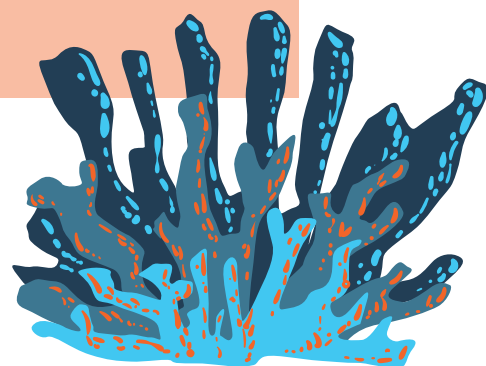
CONTENTS



4	OCEANIC ECOSYSTEM
5	HUMAN IMPACT
6	CLIMATE CHANGE
7	AQUARIUMS' ROLE
9	THE LONG VIEW
12	ABOUT THIS EBOOK

Coral reefs, known as the "rainforests of the sea", are home to 25 percent of all fish species. Yet some scientists predict they could disappear by 2050.

Can aquariums make a difference?



What do you remember the most after visiting an aquarium?

The big sharks swimming around huge tanks?

Or the clown fish that you recognized from watching "Finding Nemo"?

One thing that is usually overlooked is the “rock-like” structure in the background. Far from being lifeless backdrops, corals make for a unique, and colorful, aquarium experience. Without these agents of the sea that hold life together, the exhibit would lose its charm.

Likewise, can you imagine an ocean where the clown fish are swimming around in an empty space? That’s the future we may face if we do not take actions to protect our dying coral reefs.

OCEANIC ECOSYSTEM



THE ENTIRE PLANET DEPENDS ON IT

Undoubtedly, the entire planet depends on the oceans. They are home to a biodiverse collection of ecosystems, providing a wide range of services. Approximately 50 percent of the world's oxygen comes from the oceans, and they provide jobs for nearly 260 million people¹. Moreover, more than 50 percent of the protein in the diet of least-developed countries comes from fish¹. Coral reef plants and animals are also known as the “medicine cabinets” of the 21st century, and scientists are increasingly looking to them as important sources of new medicines for diseases like cancer, arthritis, bacterial infection, Alzheimer's disease, heart disease, viruses and others². Despite these important benefits, the oceans and marine wildlife are suffering damaging impacts, mainly by humans.



Until recently, we believed that ocean resources were infinite and that there was nothing we could do to our vast oceans that might damage them. It wasn't until about a century ago that we started to realize the destructive effects our activities have on the oceans and their ecosystems.

"Medicine cabinets" of the 21st century

BY THE NUMBERS



earth's oxygen



jobs



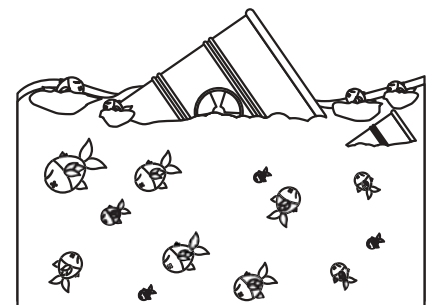
of protein in diet

HUMAN IMPACT ON CORAL REEFS

Overfishing, pollution and the impact of climate change are among the most problematic issues that our oceans are now facing. Together, they might lead to the loss of what are considered the most diverse marine ecosystems: corals.

These so-called rainforests of the sea harbor 32 of the 34 known animal phyla (compared to nine phyla in tropical rainforests!)³ and are home to 25 percent of all the fish species⁴. In 2011, 75 percent of the worldwide coral reefs were considered threatened by human activities⁵, and this number is following an increasing pattern since 2000, according to the International Union for Conservation of Nature (IUCN) Red List⁶.

The most conservative scientists project that some reefs could vanish by 2050⁵, especially due to climate change effects. If these rainforests of the sea disappear, a great part of the immense biodiversity that depends on them will decline as well, such as sharks, sea turtles, sponges and fish, to name a few.



CLIMATE CHANGE

HOW IT AFFECTS CORAL REEFS



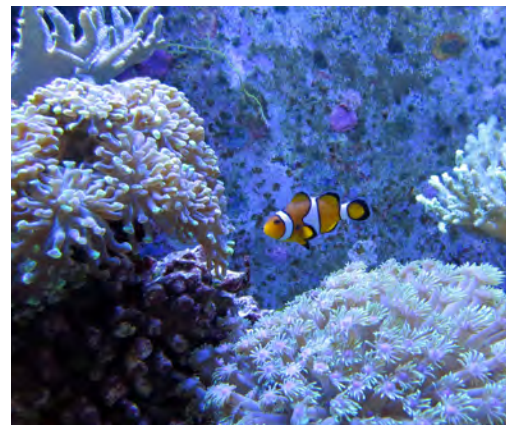
One of the main effects of climate change on the oceans is warmer water temperatures, which can stress corals and result in their bleaching. This phenomenon happens when the symbiotic algae that live in the coral tissues stop producing food, causing the corals to expel them and become whiter than normal⁷. The relationship between these two organisms is crucial for the well-being of the coral, so once they are separated the health of the entire reef is at risk.

RECOVERY FROM BLEACHING

While it is true that coral reefs are degrading rapidly, they do have a high capacity for recovery after a disturbance. After bleaching they might be able to return within a decade, but returning to their original status might be impossible or take much longer than a decade.

BLEACHING TRENDS

- In 1998, high surface temperatures triggered the first major coral bleaching event killing 16 percent of the corals around the world⁸.
- In 2010, a second global bleaching event occurred and, in 2015, the third and longest event began which still continues today⁸.
- Given the high frequency of bleaching events, some coral reefs won't be able to fully recover which will likely lead to the disappearance of these reefs.



Aquariums' role

Instead of trying to fully recover coral reefs, a new strategy is needed for the coming centuries. Management of coral reefs has been largely passive in the past. The assumption was that the reefs would recover over time if we prevent people from damaging them. Given the rapid rate of decline, this approach may no longer work. It's time to start investing in different strategies, such as the propagation of coral fragments, assisted migration or selective breeding of corals, which have had low success rates in the past.

This is where aquariums can help.

Aquariums to the rescue!

Aquariums hold a wide variety of coral species, as well as the fish and sponges that depend on them – these can play an essential role in repopulating newly recovered reefs where biodiversity has vanished.

Collectively, the aquarium members of Species360 hold 257 different species of corals⁹. This comprises ~4% of the total number of described corals in the world, according to Catalogue of Life¹⁰. These include important populations of corals, from different threatened categories, including critically endangered species, such as the staghorn coral (*Acropora cervicornis*)¹¹ and elkhorn coral (*Acropora palmate*)¹², considered to be one of the most important reef-building corals in the Caribbean.



AQUARIUMS & CONSERVATION

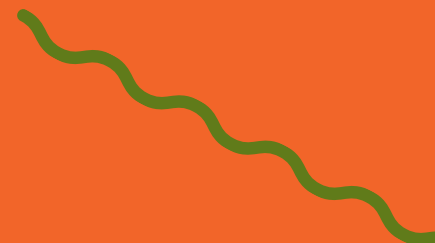
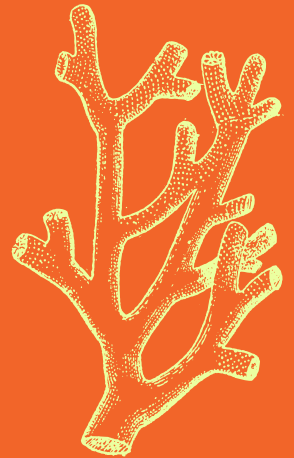
THE LONG VIEW

EXPERIENCE+INSIGHTS

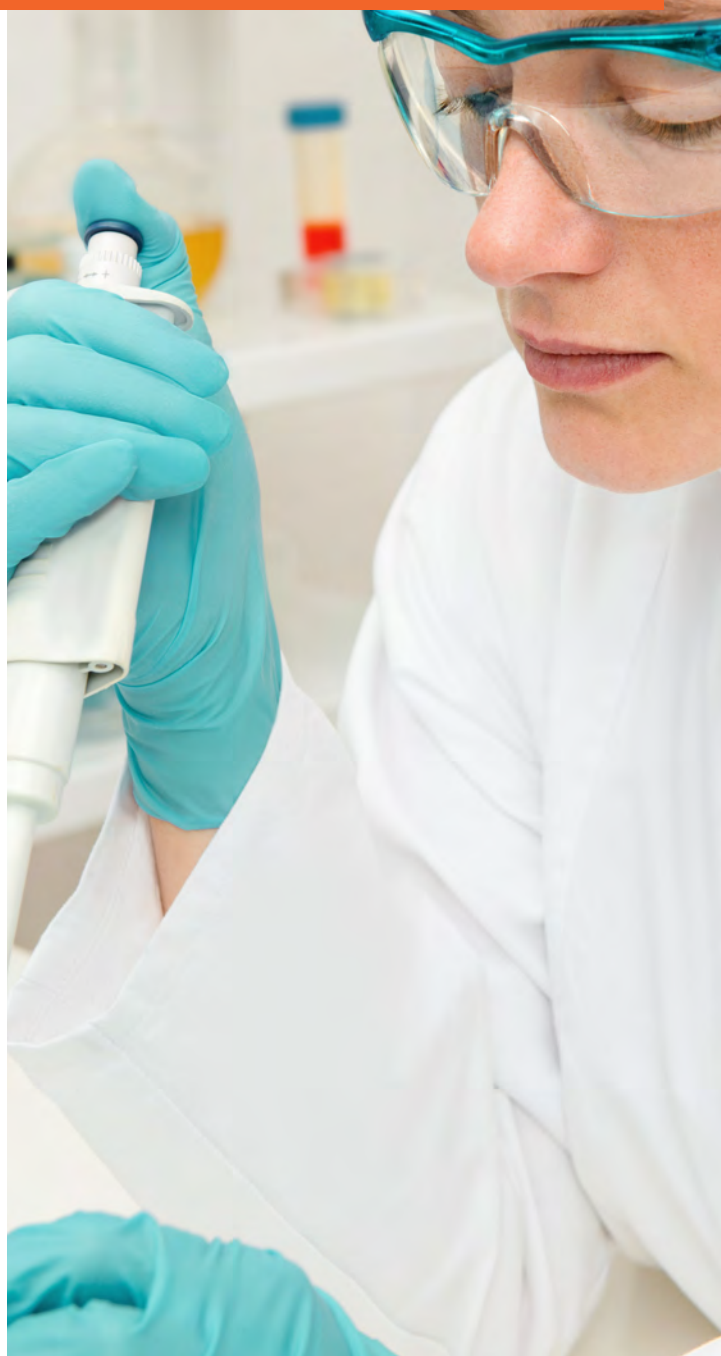
While this might seem too low to make a difference, aquariums are uniquely equipped to lead the way in coral reef conservation efforts. The experience they have in breeding marine species for different habitats is invaluable for a sensitive species like coral.

To help aquariums discover the areas where they have the highest conservation potential, Species360 is integrating ZIMS data with other biodiversity databases, such as IUCN and CITES, and assessing species vulnerability to climate change. One of the indices we are using is the Evolutionary Distinct and Globally Endangered (EDGE) score. Species with high EDGE scores are those that are endangered, have few close relatives and have been evolving independently for many millions of years¹³. We believe this analysis will help aquariums and conservation organizations identify the optimal opportunities for conservation actions.

Repopulating damaged corals or selective breeding in the wild to restore reefs is not an easy job. Pairing these insights with the coral management knowledge that aquariums and in-situ conservation partners have will be crucial to the development of new species survival plans for these important ecosystems.



AQUARIUMS LEADING THE WAY



Cryopreservation

SMITHSONIAN'S NATIONAL ZOO & CONSERVATION BIOLOGY INSTITUTE

Some aquariums have already started their journey toward the demanding challenge of restoring coral reefs. One example is the Smithsonian's National Zoo & Conservation Biology Institute's¹⁴ work in developing a pioneer reproductive program that successfully cryopreserves corals and important algae that live within the corals.

Research, education & outreach

SECORE INTERNATIONAL

Another example is the SECORE international program¹⁵, which aims to restore and conserve coral reefs through research, education, outreach, and restoration. Several zoos and aquariums, such as the Columbus Zoo and Aquarium participate in this program. Through programs like this, aquariums do not have to start their own conservation platform but can have a big impact in the world of conservation by taking part in a bigger community working with the same goal.

It is also important to note that some aquariums are also involved in various management programs of wild populations¹⁶.

For the next generation



The remarkable work of aquariums is of undeniable value to present and future conservation programs. Only through the knowledge and collaboration made possible through Species360 ZIMS can we make the coral reefs strong enough to pass the “only natural structure clearly visible from space” on to the next generation.

ABOUT THIS EBOOK

About the Author



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Learn more about her projects on the Species360 science page.

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