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Threats to Coral Reefs

The natural beauty of coral reefs attract thousands of people from around the world to admire their stunning color. It might surprise some to learn that corals are actually animals, not plants. Algae, which lives inside of the coral and provides them with food, are what give the reefs their natural color. Known as “rainforests of the sea,” coral reefs are the largest structure on earth of biological origin. It is unfortunate that coral reefs around the world are becoming irreversibly damaged. Destructive fishing practices, coral mining, tourism, pollution and climate change are some of main reasons behind their troubles. These threats to coral reefs is not something people should ignore because coral reefs play an important part in our planet’s health and people’s lives. Before further exploring these threats, it is important to understand the important functions of the reefs themselves.

Coral reefs do things that help other living organisms. For example, they protect coastlines from the damaging effects of tropical storms and wave action, help with nutrient recycling, help in carbon and nitrogen fixation, provide shelter and habitats for marine organisms, and are the source of nitrogen and other important nutrients for marine food chains (Bauer, Adriana). Another reason why coral reefs are very important is because the fishing industry depends on coral reefs and the fish they breed. The World Wildlife Fund (WWF) estimates that coral reefs provide an annual \$30 billion worth of goods and services with a billion people depending on coral reefs for food and income from fishing (Witschge, Loes). These beautiful reefs also attract tourism to many coastal cities, which improves the economy. Coral reefs are extremely diverse ecosystems that include thousands of species. Coral polyps are the animals responsible for building reefs. Although they cover less than 1% of the ocean, coral reefs support a wide array of sea life and about 25% of the ocean’s marine species

depend on healthy coral reefs. These reefs provide lots of hiding places and provide fish and other animals with shelter, food, and a place to reproduce (Coral Reef Ecosystems). Coral reefs also help to improve the quality of the surrounding water, by filtering out things floating in the ocean, leading to cleaner water.

How are coral reefs formed? They actually grow very slowly, at an average rate of just two centimeters per year. Coral reefs first start “to form when free-swimming coral larvae attach to submerged rocks or other hard surfaces along the edges of islands or continents” (National Ocean Service). They are found worldwide in tropical and subtropical oceans. Most coral reefs are found in shallow waters (depth under 150 feet), but some extend deeper (up to 450 feet deep). Once they start to grow, reefs will take on one of three characteristic structures: fringing, barrier or atoll. Fringing reefs are the most common and extend toward the sea directly from the shore, which forms borders along the shoreline and surrounds the islands. Barrier reefs are similar to fringing reefs; they border shorelines. However, they do this at a greater distance and are separated by a lagoon of open, often deep water. The circular or oval atoll reef is basically the opposite of fringing reefs. They form completely below sea level, and result from upward growing coral from a fringing reef around a deeply submerged volcanic island.

It is unfortunate that a large portion of the world’s coral reefs are becoming damaged by human impact. One of these damaging activities is using unsustainable fishing methods in the world’s coral reefs. Overfishing threatens the fish stock itself and certain methods of fishing can threaten the environment the fish require to survive. Seafood is a popular food and the increase in demand of fish by fisheries and restaurants is causing overfishing in deep-water commercial fish and key reef species. Overfishing affects more than 50 percent of coral reefs in the world. According to the 2018 WWF Living Planet Report, almost 6 billion tons of fish and invertebrates have been taken from the world’s oceans since 1950 (Tanzer, et al). Overharvesting of fish can

impact the entire food web on a reef. For example, it can reduce the amount of grazing herbivorous fish, which keep the corals clean from overgrowth of algae (Threats to Coral Reefs). When these fish disappear, seaweed-like algae can grow uncontrolled, impacting the entire reef's ecosystem. Destructive fishing methods is another activity that can damage coral reefs. Commercial traps can physically damage coral. As lobster traps are carried by the current, they are heavy enough to damage coral when it flows across a reef, breaking off pieces. In addition, using dynamite, cyanide, and other methods for fishing are hurting the coral reefs and are very unsustainable. Using dynamite, called blast fishing, not only kills the fish indiscriminately, but physically damages the corals. Cyanide stuns the fish, making it easier for the fishermen to catch. These methods damage the coral reef habitat, while decreasing that habitats productivity, resulting in a reduction of fish which impacts the livelihoods of fishermen. In order to prevent further damage to coral reefs, sustainable fishing practices need to increase. Some of these include curtailing destructive and illegal fishing practices, avoiding overfishing, respecting reef habitats, and choosing seafood products that come from certified, well-managed and sustainable fisheries.

Another damaging activity on coral reefs is coral mining. Why do people harvest coral? Coral can be used as a cement substitute/bricks for use as a building material; beautiful and colorful coral species are used to make jewelry; branching corals are broken off and sold as souvenirs; live coral is harvested for the marine aquarium industry; coral can be burned to produce lime to raise the pH of soil for healthier crops; it is also useful in the medical field for bone graft trials. The impact of coral mining results in a loss of biodiversity, erosion/land retreat, and economic loss. Biodiversity is greatly reduced when chunks of coral are taken from a reef, resulting in substrate loss. Therefore, "any coral polyps that come to the area cannot attach themselves to permanent structures and recruitment is decreased"(Coral Mining). In

addition, when coral is removed, remnants are left behind which can disturb the sea floor and cause sedimentation. Too much sediment can cover the coral and prevent the necessary sunlight it requires for survival. Coral reefs help to protect the land. When a reef is partially/completely removed, the shore becomes vulnerable to storms. This leads to the land drawing back and any remaining reef will be vulnerable. Economic losses also occur. Many communities depend on coral reefs for food and tourism. Coral mining leads to damaged reefs, which leads to fewer fish, a loss of tourism and loss of money. According to coraldigest.org, since reefs are extremely slow growing, it can take more than 20 years for an extensively mined reef to recover.

Everyone loves to head to the beach, soak up the sun, and play in the ocean while on vacation. Tourism is actually a threat to coral reefs though. It's fun to explore the beautiful coral reefs around the world, but accidents happen. Snorkeling and diving is a popular tourist activity, but with all the excitement and kicking, divers' fins can come into contact with the delicate coral and damage it. Snorkelers may touch or break off coral, which may lead to permanent damage. In addition, snorkelers and divers can kick up sediment that is damaging to coral reefs. Simply standing on corals can stress or kill the coral. In addition, boat propellers and dropping anchors on the reef can harm the coral. Even sunscreen is damaging to coral reefs. According to the NOAA, "in a 2016 study, a team of international scientists found that a common chemical in many sunscreen lotions and cosmetics is highly toxic to juvenile corals and other marine life" (US Department of Commerce, and National Oceanic and Atmospheric Administration). The compound, Oxybenzone, or BP-3, is found in thousands of skin care products. This damaging chemical can threaten the coral and marine life as it enters the ocean on a swimmer's skin and then contaminates the reef. It may not be deliberate, but tourists' direct interaction with a coral reef can cause it great harm.

Pollution can be devastating to the earth's natural environment. This is especially true of our oceans and coral reef health. There are two main sources of pollution contaminating coral reefs; land-based sources and marine debris. Land-based activities in agriculture, road construction, forestry, and stormwater runoff can cause sedimentation. When it rains, pollutants-pesticides, fertilizers, and sediments run off the land and end up in the ocean where they are deposited onto the reefs. These pollutants can smother corals and interfere with their ability to feed, grow, and reproduce (Threats to Coral Reefs). In addition to sedimentation, other pollutants flow from land to ocean, including nutrients (nitrogen and phosphorous), pathogens, trash and microplastics, and toxic substances. Discharged sewage and untreated wastewater from places like septic tanks allow many nutrients like nitrogen and phosphorous, chemicals and pathogens to flow right into the marine environment. The excessive amount of nutrients that are entering the marine environments is distressing the fragile balance of coral reef ecosystems. All of these nutrients are promoting the growth of algae, putting the corals in danger. Too much algae can kill reefs by covering them, thus blocking any access to sunlight which leads to the growth of harmful bacteria (Direct Threats). There are many ways to help prevent pollution from land-based sources: use fertilizers and pesticides sparingly, pick up after your pets, deposit lawn clippings into a compost pile, don't dump paint, oil, debris, and other household chemicals into street gutters or storm drains, and maintain a proper septic system (US Department of Commerce, and National Oceanic and Atmospheric Administration). All these steps can help prevent the death of coral reefs.

Marine debris pollution, also known as human trash is another danger coral reefs face. It is astonishing that millions of tons of plastic waste gets thrown in the ocean every year and since plastic is almost indestructible, all that trash stays there (Joyce, Christopher). The trash ranges from grocery bags to kids' toys to water bottles to straws. Not only does marine debris

harm or kill corals, but they do the same to the animals living in them as well. Plastic finds its way into the ocean by land, boats and ships. Just like the land-based pollution, floating trash that gets hooked on the reefs can block the sunlight that the corals need for photosynthesis to happen for their symbiotic algae. Another type of trash that gets put into the ocean, whether lost or discarded, are fishing nets, also called “ghost” fishing gear. The fishing nets can get caught on reefs as well as get tangled on sea turtles, fish, and marine mammals (Direct Threats). The main type of coral that plastic clings to is branching coral, as this type of coral has longer branches that reach out from the reef and are easily snagged. Where the plastic clings is where it sickens or kills. Researchers from Cornell University studied the health of reefs in Myanmar, Thailand, Indonesia, and Australia, and they learned that plastic pollution correlated strongly with disease and death. Joleah Lamb, the lead researcher explains, “we came across chairs, chip wrappers, Q-Tips, garbage bags, water bottles, and old nappies” (McCarthy, Joe). The results of the study were staggering! In normal conditions, around 4% of corals suffer from disease, but that rate jumps to 89% when corals encounter plastic pollution (Lamb, Joleah B., et al). There is a simple answer to how to help-don’t litter, recycle and dispose of trash responsibly.

Climate change, either from seasonal shifts in water temperature or from human-caused global warming, make coral reefs more susceptible to bleaching. When coral becomes bleached it is more susceptible to disease. The temperature of the sea has been increasing over the past century and is continuing to rise. When water temperatures get too warm, corals will expel the algae (zooxanthellae) living in their tissue, which provide them with the nutrition they need to survive. Without the zooxanthellae, the tissue of the coral animal appears transparent, revealing the coral’s bright white skeleton. This is called coral bleaching. The coral can die of starvation if they are without the algae for too long. According to the NOAA, “in 2005, the U.S. lost half of its

coral reefs in the Caribbean in one year due to a massive bleaching event” (National Ocean Service). Bleaching can devastate reefs anywhere in the world, as seen in Australia, where bleaching is believed to have killed as much as half the coral in the Great Barrier Reef in recent years (Witschge, Loes). The bleaching is a stress response to the warm temperature. Not all coral dies when it bleaches, and they can survive if the temperature decreases/normalizes. However, they are under more stress and are subject to disease and mortality. If conditions (water temperatures) return to normal, corals can regain their zooxanthellae, return to their normal colour and survive (Anwar, Shakeel). Coral reefs that have high rates of coral death following bleaching can take many years or decades to recover. Although there are other stressors which cause bleaching, such as freshwater inundation (low salinity) and poor water quality from sediment or pollutant runoff, the main cause is heat stress resulting from high sea temperatures. A minimal temperature increase of only one degree Celsius for only four weeks can trigger bleaching events. If these temperatures persist for eight weeks or more, corals begin to die (Anwar, Shakeel). According to Erik Solheim, the head of the UN Environment Program, "we see globally a very, very, steep decline in the corals. It's for sure already one of the biggest casualties of climate change" (Witschge, Loes). Human activities, such as the burning of fossil fuels and clearing of forests have contributed to global warming. This has impacted the rise in sea surface temperatures, resulting in putting coral reefs in danger.

Simply stated, coral reefs are in danger. Destructive fishing practices, coral mining, tourism, pollution and climate change threaten the health of coral reefs worldwide. Coral reefs are extremely important to the health of our planet and its people. These stunning “rainforests of the sea” are one of the most biologically diverse and valuable ecosystems on Earth. Found throughout the world’s oceans, they provide an important habitat for marine life. Thousands of species of fish and marine life depend on coral reefs to live, reproduce, and find shelter.

Millions of people depend on coral reef ecosystems for income from tourism and fisheries, coastal protection from storms, and food. It's no wonder coral reefs are so highly valued. The importance and beauty of coral reefs have prompted many groups around the world to help save them through conservation efforts. For example, many reefs are being labeled as Marine Protection Areas and destructive fishing practices have been banned in many countries (Threats on Coral Reefs). Also, the United Nations has drafted a resolution to compel countries to ban plastic from entering the oceans; this would be a huge step in preventing damage to coral reefs (McCarthy, Joe). The US is doing its part too. The Environmental Protection Agency has taken several steps to help save its coral reefs. These include Clean Water Act programs, which protect water quality in coastal zones; supporting efforts to monitor and conduct research into the causes of coral reef deterioration; and developing tools to help coral reefs better handle changing conditions (What the EPA is Doing to Protect Coral Reefs). What can you do? Don't litter, avoid touching coral, don't boat or fish near a reef, don't purchase coral souvenirs, oppose global warming, support well managed and sustainable fisheries, stay at hotels that embrace environmentalism, practice conservation (i.e. use organic fertilizer, recycle), and the list goes on. These small steps can make a big impact in saving the world's coral reefs.

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