How has Coral Reef Bleaching affected Fiji and is it reversible ?

Introduction:

Fiji is surrounded by the largest coral reef system in the Southwest Pacific. With an area of 3,869 square miles, there are four major reefs and one major reef system. Coral reefs are a ridge of rock in the sea formed by the growth and deposit of coral; they play a significant role in the world, as they sustain life under the ocean by providing food and shelter for many marine organisms, as well as providing food supplies to our economy.

However, coral reefs are facing a global threat as acidity and temperature of oceans increase, leading to coral reef bleaching causing them to appear white and colourless. Although the clean colour of white corals may be pleasing to the eye, in reality this is the unhealthy effect of coral bleaching leading to unappealing consequences which affect the biodiversity within the ocean and ultimately affect human lives.

In this article, we have focused on an overview of the bleaching problem in Fiji and the threats they face. As well as looking into the causes and consequences of the disappearance of coral reefs and weighing out the facts of reversible solutions.

What is coral reef bleaching?

Caused by severe climate change such as, warming temperature water from the warming planet. Change in water temperature only by 2 degrees Fahrenheit(-16.7 Celsius) can lead to coral reefs bleaching. These changes will lead to a disruption in the balance between zooxanthellae, the microscopic algae that make the coral bright and colourful and coral. (Hancock)This disruption leads to the photosynthesis process not proceeding. This drives out the algae zooxanthellae that were in its tissue into the surrounding water. Without symbionts corals will transform to a pale and white colour. This colour comes from the corals skeleton that is being shown through the thin layer of transparent tissue. (Miller 2013, p.10)You may be wondering whether once the coral has been bleached is it dead? Well, if water temperature cools within days or weeks of the bleaching process then algae does return. Although corals do die if the bleaching is continuously happening.

Overview of bleaching problem in Fiji:

Found in tropical oceans, corals are important reef builders that secrete calcium carbonate to form coral reefs. Corals live in a mutualistic relationship with symbiotic algae, which use sunlight to produce food for

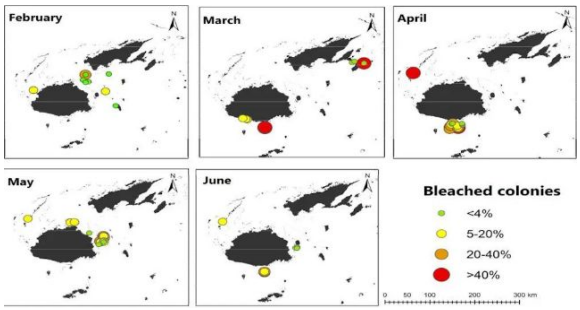
corals and get shelter in return. Under stress, such as elevated seawater temperatures for prolonged periods, corals can start to bleach.

Fiji is starting to face serious and severe bleaching problems in recent years.
Fiji's location near the southern limit of a convergence zone which migrates between latitudes, can be a source of stress for the corals. Oscillation events that occur throughout the year greatly influence Fiji's water which causes major temperature changes. These fluctuations in the temperature of the water in Fiji, can be a lethal problem for the reefs to weaken and die due to its necessity to be under certain conditions.

How many coral reefs have Fiji lost?

The amount of corals Fiji has lost to bleaching and how many are left.
In the last 30 years, over 50% of the world's coral reefs have died, but it is predicted that up to 90% may die within the next century. Major bleaching events between the years 2015 and 2017, has potentially caused a lethal stress response to overly warm water and turning it white. The bleaching event in 2017 alone is believed to have killed as much as half of the coral in Australia's Great Barrier Reef. Furthermore, with bleaching now taking place about once every six years approximately, corals have insufficient time to recover before they are hit again. It is now predicted by scientists that at this rate, the reefs of the world can be gone by the end of the century.

Multiple organizations all around the world have gathered scientists in order to effectively combat the bleaching problem and to better understand the intensity and scale of coral bleaching. Organizations such as Manta Trust, WCS and Marine Ecology Consulting have taken part in restoring the lost coral reefs in Fiji.



These are maps of fiji showing the scale and intensity of coral bleaching in 2019 over 5 months. Coral bleaching is assessed based on the number of coral colonies affected by bleaching.

In February, the percentage of bleached colonies was mostly under 4% but in the next month, bleaching was >40% at Beqa and Taveuni islands, 5–20% along the Coral Coast, whilst the rest of the sites had <4% bleaching. In April, bleaching was 40% in the Yasawa islands, while reefs around Beqa Island varied from very low (<4%) on deeper reefs to low-moderate (5–40%) on shallow reefs. Furthermore, in May, bleaching in the Lomaiviti waters and Yasawa islands varied from very low (<4%) to low-moderate (5–30%). Finally, bleaching at the majority of the sites was <4%, with only a few sites in Yasawa islands having >10% in June. In the data, we can infer that bleaching was higher on shallow reefs compared to deeper reefs. Overall, coral bleaching levels were considered low to moderate across Fiji in 2019 in comparison to bleaching levels recorded in 2000-2002 and 2006, when mass coral bleaching events caused coral mortality across Fiji.

What human actions affect coral reefs ?

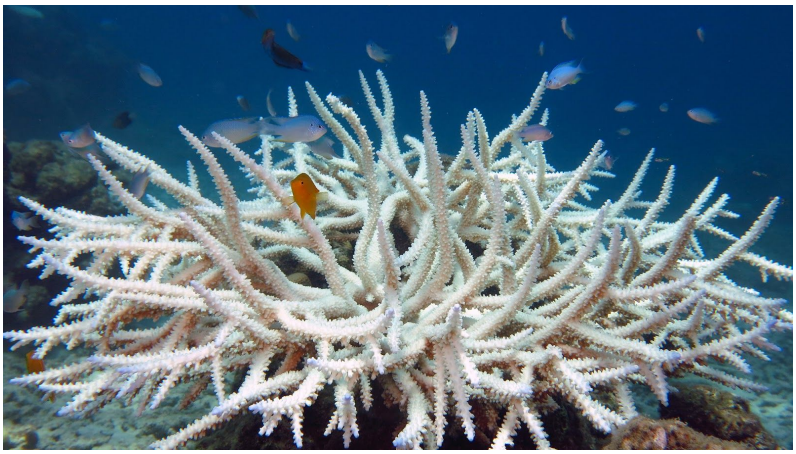
Fiji is a small island, made up of around 880,000 people who have a sustainable mindset to decrease the amount of waste produced to protect their natural resources. This suggests that the damage of coral reefs is caused by the careless disposal of waste from richer and unsustainable oversea countries.

Some of the actions of these countries that have a major effect on coral reefs in Fiji include chemical pollution, the runoffs of pesticides and fertilisers, overfishing, increase in CO2 emissions and disposal of litter and rubbish including by tourists. These actions that once were seen as practical by oversea countries are now having a major side effect on the Fijijan natural environment.
Firstly, the increase in the disposal of chemical pollution into the sea leads to coral destruction as it kills the coral reefs, speed up the growth of damaging algae and lower water quality. Furthermore, pollution causes corals to be more vulnerable to diseases, restrain coral growth and reproduction, and causes changes in food structures on the reef.

Secondly, overfishing affects the majority of the world's reefs, including Fijian reefs. Overfishing leads to an average reduction in the size of the fish and a decrease in predatory fish and results in large scale ecosystem change. This may cause an increase in algae especially if the area also suffers from chemical pollution as they will quickly dominate the ecosystem causing harm for the other organisms in the same habitat.

Thirdly, the incorrect disposal of litter and rubbish is having an extreme impact on the Fijan environment. As artificial products take over 50 years to decompose, this damages the organisms which live in the environment. Furthermore, the increase of tourists in Fiji who are taken to the reefs for snorkelling activities leads to an increase in litter in natural environments as they may be uneducated of the damage it leaves. Also, the construction of tourism infrastructure (resorts, roads, dams, artificial islands) may increase CO2 emissions and nutrient runoffs into coral reefs.

How does the disappearance of coral reefs affect fiji's ecosystem ?



The disappearance of coral reefs will have environmental, economical and a social cost, affecting the lives of many.

Firstly, the loss of coral reefs will be devastating as it'll lead to the loss of biodiversity and many marine organisms that exist in the ocean. Coral reefs help sustain the ocean, provide shelter and food to a complex web of organisms including humans. The destruction of coral reefs will lead to disruptive changes in ecosystems as reproduction cycles will be alternated and affect complex food webs and ultimately lead to an extinction of an whole ecosystem. Fiji's ecosystem is already facing threats as many marine organisms are unable to rapidly evolve to changes in their ecosystem such as increase in temperature and acidity causing them to develop diseases and suffer irreversible damage. With the increasing acidity of oceans and rapid increase in the pace of global warming, this is threatening the irreversible destruction of coral reefs and the extinction of many marine organisms. Many scientists predict the atmospheric carbon dioxide levels to reach 450 parts per million by 2040. This level is thought to be the point of no return for coral reefs and after this point regardless of a decrease in carbon emission, coral reefs will be extinct by 2100. Ultimately, without coral reefs the ocean wouldn't be able to absorb much carbon dioxide, leaving even more CO2 in the atmosphere.

Secondly, the disappearance of coral reefs will result in a severe economic disaster especially in Fiji, impacting the country's economy as job and income fall and threaten the amount of food supplies. The income revenue for many individuals will decrease as fishing and tourism is the main source of income in Fiji. Also, it will force people to search for more expensive forms of protein as coral reefs are the main source of nitrogen and other essential nutrients for marine food chains. Furthermore, the loss of reefs will impact the economy of larger industrialized countries due to their heavily dependency on seafood which is sustained by the coral reef ecosystems.

Lastly, the disappearance of coral reefs will bring significant social damage as coral reefs act as natural barriers to shorelines that protect civilians from the effects of water. As the number of coral reefs decrease this threatens the safety of coastal communities as they become more vulnerable to the damage caused by storms, hurricanes and cyclones. This highlights the vitality of coral reefs when protecting human lives as those who live on coastlines will struggle to survive if their property can be easily damaged by natural disasters.

Is coral bleaching reversible ?

In simple terms the only way to reverse coral bleaching is by a significant action of reversing global warming. As Terry Hughes a coral reef ecologist says, "We can't climate-proof reefs".(Normile, 2017)

Although actions by the Fijian government are being taken in an attempt to reduce coral bleaching. Local policies of the ban of selling live corals will do a minimal change of reducing coral decline. But the effect it would have to reverse sea temperatures caused by global warming is low. Organisations such as the UN, the WWF, and the International Coral Reef initiative have helped promote awareness by designating 2018 as the international Year of the Reef. This two-day event hosted on Fiji's northern island Vanua Levu, which holds the third-largest barrier reef used this opportunity to motivate nations to take action to protect reefs. Protecting the reef is particularly important for Fijians as a large part of their diet relies on the Great Sea Reef and it is also a significant source of income from fishing and tourism. (Witschge, 2018) Scientists and companies all over the world are also working on various potential solutions to help prevent all coral reefs from dying as in this worrying rate of coral reefs being bleached has led to scientists thinking within 20 years, 70-90% of coral reefs will likely die.(Secon,2020) A company has discovered a way to grow corals and re-distribute them into the sea so they can healthily grow again. A method called microfragmenting. This is where fragments of coral are extracted from the reef and these fragments are used to grow new collections on "coral farms". The way that these corals grow is by breaking these fragments into tiny pieces leading to it growing again. After corals are fully grown they are brought back into the reefs. These corals grow at an incredible rate of 50 times faster than it would naturally. As these corals have withstanded various conditions outside of the reef it has a higher chance of survival as it is more resilient towards difficult conditions. This process allows corals to grow in the time frame of months rather than decades

Conclusion:

In conclusion, the bleaching problem is reversible, only if global warming is reversed. This is due to the fact that global warming is influencing the conditions of the ocean water of Fiji. Although there may be solutions being produced by scientists such as redistributing corals grown in a coral farm this is still not a permanent solution for such great volumes of coral reefs such as the Great Barrier Reef in Australia. This is very worrying in various viewpoints such as economies that rely on income from the ocean and ecosystems. Finally, as a solution to the bleaching problem in Fiji, people should be practicing safe and responsible diving and snorkeling by avoiding touching reefs or anchoring your boat on the reef. Contact with the reef will damage the delicate coral animals, and anchoring on the reef can kill corals, so looking for other available spaces is better. Furthermore, marine debris can be harmful to coral reefs. Recycling your trash at home is just a very easy way of reducing the amount of trash in the ocean. When disposing of trash, putting it in proper bins, avoiding trash being blown or washed away into waterways and oceans is crucial to help reduce debris.

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