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Bleached outplanted and wild staghorn and brain corals, Sombrero Key Reef, Florida Keys, summer 2023

Oceanic Crisis

& Global Warming Denial

Text by Ila France Porcher

Rising ocean temperatures endanger coral reefs, fish and entire ecosystems. Misinformation campaigns stall climate action. However, reducing emissions and protecting habitats can still prevent catastrophic biodiversity loss and ensure a sustainable marine future. Ila France Porcher separates the myths from the facts about the oceanic crisis and global warming.

Marine biodiversity is a fundamental element of the planet's natural balance. It spans the complexity of life, from individual species to entire ecosystems, influencing everything from global weather patterns to the oxygen we breathe. Over the course of Earth's history, marine biodiversity has followed a general trajectory of slow growth, punctuated by natural mass extinctions that shaped the evolution of life.

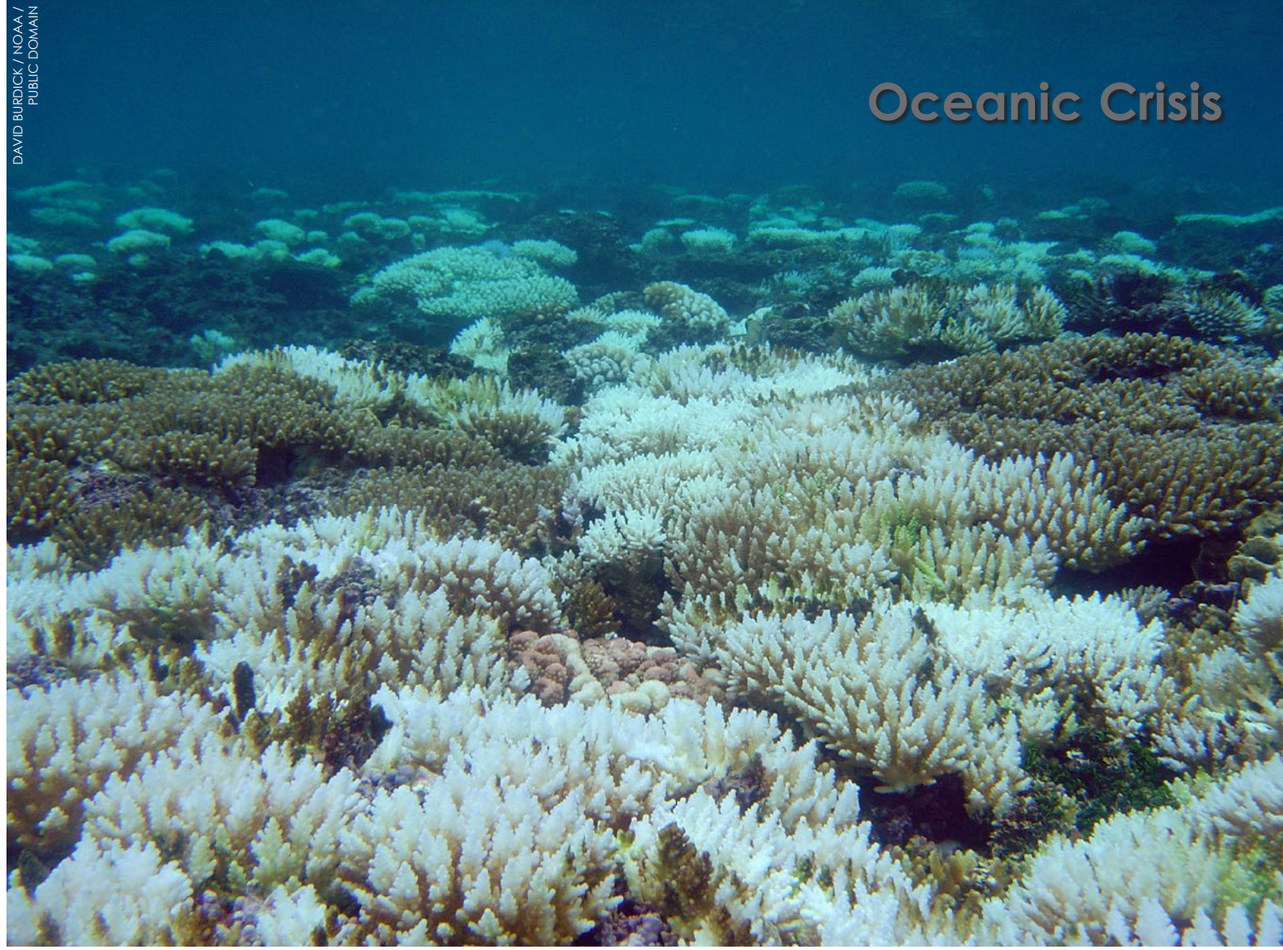
However, in recent times, human activities have triggered a rapid and unprecedented decline in marine biodiversity. Overfishing, habitat destruction, pollution and, most notably, global warming have accelerated this decline at an alarming pace. Yet, as humanity grapples with these challenges, well-funded interest groups, often referred to as "climate change deniers", are actively spreading misinformation to stall climate action, further complicating efforts to address this global threat.

Marine biodiversity loss

Scientists warn us that the Earth is experiencing its sixth mass extinction, and that the oceans are beginning to feel the full brunt of this catastrophe. Rising temperatures, ocean acidification and habitat loss are all playing a role in accelerating marine life's descent into crisis.

The oceans cover more than 70 percent of the Earth's surface and are home to the vast majority of life forms on the planet. Marine biodiversity includes everything from microscopic plankton to whales, as well as ecosystems, such as coral reefs, mangroves and the depths of the oceans. These ecosystems support vital services that sustain human life, including carbon

Coral bleaching in the Mariana Islands, Guam (right); Coral bleaching of Acroporid colonies at Orpheus Island, Great Barrier Reef, Australia, 2017 (bottom left)



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sequestration, oxygen production and the provision of food.

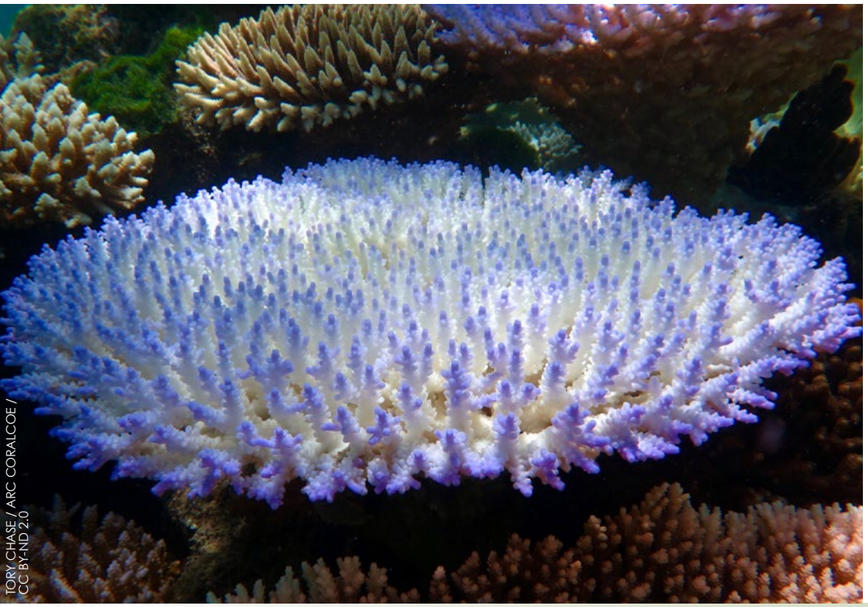
However, over the past few decades, these ecosystems have been under siege. The driving forces behind this decline are clear and include overfishing, pollution and coastal development. The most insidious of these threats, however, is global warming, which is altering the very conditions that marine species depend on for survival.

Climate change and extinctions

As global temperatures rise, the oceans are warming at a rapid pace, disrupting ecosystems and pushing species beyond their tolerance limits. In tropical regions, where many of the world's most biodiverse ecosystems are found, heat stress is causing widespread coral bleaching events.

Coral reefs are not only one of the most beautiful natural wonders of the world, but they are rich and vital ecosystems that support about 25 percent of marine species. They are highly sensitive to temperature changes, and when water temperatures rise above certain thresholds, corals expel the symbiotic algae that live within their tissues. These algae are their primary food source, and without them, corals starve, turning white and often dying, along with the rest of the ecosystem that depends upon them.

The warming of the oceans also affects the distribution and migration patterns of marine species that are forced to move towards the poles as water temperatures rise. This results in shifts in the ecology of various regions. As animals move to cooler waters, they face new challenges, including competition with native species and the loss of their familiar habitats.



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Ocean acidification

The acidification of the oceans is another major impact of warmer seawater. The oceans act as a carbon sink, absorbing excess carbon dioxide (CO_2) from the atmosphere. As CO_2 levels in the atmosphere rise, the oceans absorb more CO_2, causing the water to become more acidic. Ocean acidification is especially lethal to those that rely on calcium carbonate to form shells, such as molluscs, corals and certain plankton species. As the process accelerates, the entire ecosystem is disrupted.

Ocean acidification is a symptom of the broader changes in the Earth's carbon cycle as a result of a warming planet. At the same time, global warming has resulted in rising sea levels, threatening coastal habitats such as mangrove forests and salt marshes. Ocean currents and stratification patterns are also being altered, impacting the distribution of nutrients that are available to oceanic life. These changes threaten the stability of marine ecosystems globally.

The science behind ocean warming

The oceans act as the planet's heat sink, absorbing more than 90 percent of the excess heat as it warms. This heat is initially stored in the surface waters, and it moves deeper with the oceanic currents. Warmer water results in more extreme weather events, such as hurricanes and typhoons, and they are increasing in intensity.

As scientists project future scenarios for the ocean, the outlook is grim. Under high-emissions scenarios, the world's oceans will experience continued warming, acidification and oxygen depletion, which will cause the collapse of a variety of marine ecosystems, as they are all interconnected and interwoven. Many marine species, particularly those at the top of the food chain, including fish, sharks, reptiles, mammals and birds, are at risk of extinction if the current trends continue.

Climate change alarm

James Hansen, a pioneer climate scientist, found the first evidence that the results of global warming were becoming evident, and sounded the alarm in 1988. It had already been predicted a century before. He had been studying Venus and why it is so hot, and found that the reason was its heavy cloud cover, which enveloped it like a blanket. Removing carbon from Earth and putting it into the atmosphere was having the same effect, preventing the escape of some of the Sun's warmth back into space, and he called it the Greenhouse Effect.

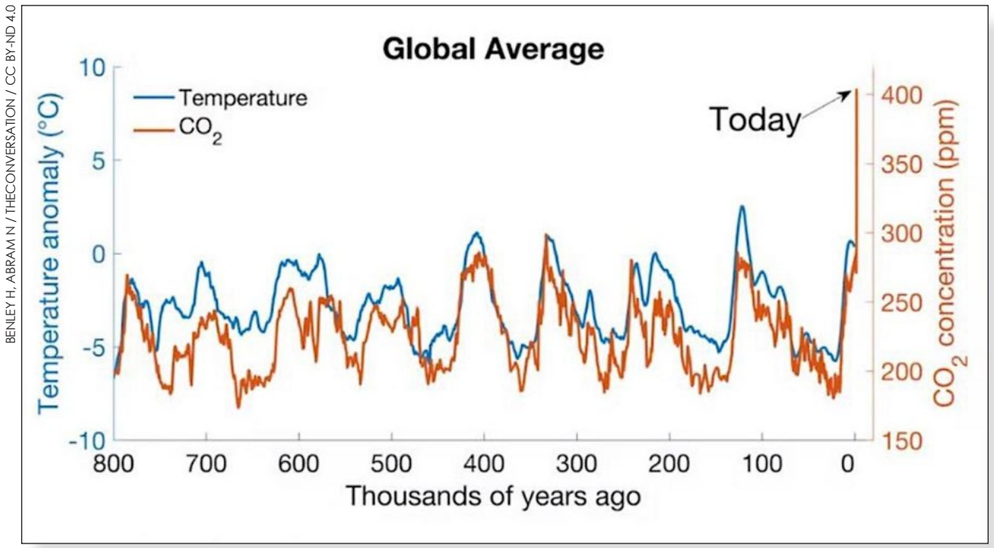
At that time, the scientific

community assumed that politicians and other leaders would make the required changes to ensure that the threat was avoided. They formed the Intergovernmental Panel on Climate Change (IPCC) to intensively study the situation.

The rise of climate change denial

As the science of climate change gained traction, industries tied to fossil fuels, such as oil, coal and gas, began funding campaigns to cast doubt on the science. Many of these companies feared the economic implications of regulation and policy changes aimed at reducing carbon emissions.

Several think tanks have become central players in promoting climate scepticism. These think tanks received funding from the fossil fuel industry and used this money to launch media campaigns, produce reports, organise events, publish op-eds and influence policymakers and lobby lawmakers to challenge climate action and scientific consensus. Some think tanks did nothing but crank out global warming denial articles daily.



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The above graph shows the concentration of CO_2 in the atmosphere during the past 800,000 years, showing the correlation between temperature and CO_2. It is clear that the temperature is just beginning to catch up to the rise in CO_2 generated by our current civilisation.

RYAN GOEHRUNG / WIKIMEDIA / CC BY-SA 4.0

These corals under heat stress in the Philippines turned vibrant colours just before full coral bleaching and death (above).

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Coral bleaching, Mission Beach, Great Barrier Reef, Australia

The media, too, amplified climate change denial. In the 1990s and 2000s, many mainstream outlets gave a platform to both climate scientists and those paid to argue against them, presenting the two sides as though they were equally credible.

Thus, the public gained the impression that global warming was something on which scientists disagreed. But the climate scientist was pitted against an oil lobbyist with an agenda that was not based on facts. Like lawyers defending guilty clients, the lobbyists only presented information that favoured their arguments.

Political polarisation

Climate change denial is particularly prevalent in certain conservative political circles, notably within the conservative and far-right parties in the United States and Europe, with conservative politicians and media outlets consistently downplaying or rejecting the science behind climate change, while liberals and environmental groups push for stronger action. It is also seen in countries where economic interests tied to fossil fuels are strong, such as Canada. Conservative media networks, along with certain social media platforms, have also been instrumental in disseminating climate scepticism.

The influence of disinformation campaigns

A growing body of evidence shows that disinformation campaigns have been successful in sowing confusion and spreading doubt about climate change. They have succeeded in delaying the implementation of climate policy.

Social media platforms, including three of the most popular ones, have amplified climate change denial in recent years. Algorithms favouring sensational or polarising content have allowed climate change denial to spread widely, often outpacing scientific facts and expert opinions.

It is all about delusion and distraction from the actual findings of science. For example, to gain wide support for their claims, the tobacco industry broadcast the idea that those wanting to regulate cigarettes and smoking were attacking basic American freedoms. Similarly, climate change deniers frame government regulation and environmental protection policies as unnecessary government overreach.

Some conservative-leaning outlets focus on framing climate change as an issue of economic cost or individual freedom, rather than outright denial.

The arguments

Climate change deniers base their arguments on several key points:

1. Natural climate variability

ARGUMENT: Earth's climate has always fluctuated naturally, and current warming could simply be part of

Bleached and dying corals (right)

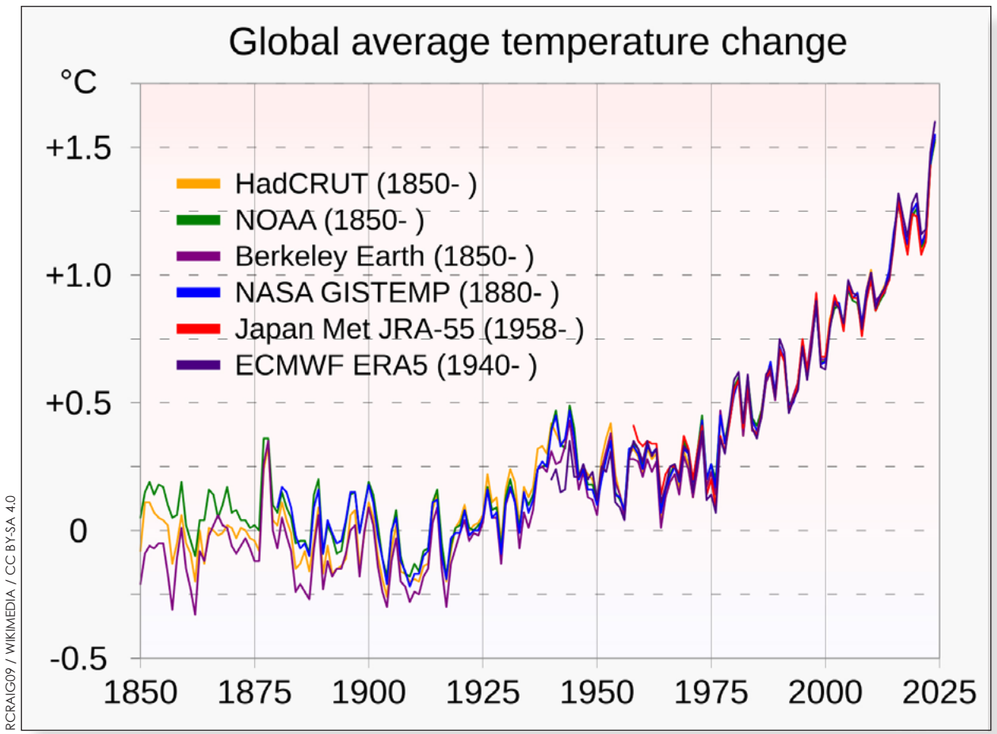

ILA FRANCE PORCHER

a natural cycle. Deniers often point to past climate changes, such as the Medieval Warm Period or the Little Ice Age, as evidence that the climate has always undergone shifts due to natural factors, like volcanic activity, solar radiation and ocean currents.

FACT: While natural variability has been ongoing since the planet formed, the current rate of warming is unprecedented and coincides with the Industrial Revolution and a sharp rise in greenhouse gas emissions from the burning of fossil fuels.

2. Uncertainty in climate models
ARGUMENT: Climate models are unreliable and have been inaccurate in predicting temperature.

FACT: While no model is perfect, they are based on a deep understanding of the climate system and have correctly predicted broad trends. Models have become more refined over time, and their predictions are consistent with the observed warming and the climate anomalies that have been recorded.



Graph showing global average temperature as measured by several different scientific organisations, including HadCRUT, NOAA, Berkeley Earth, NASA GISTEMP, Japan Met JRA-55 and ECMWF ERA5 (above)

3. The role of the Sun
ARGUMENT: Changes in solar activity (the amount of solar radiation the Earth receives) could be the primary cause of recent warming, not human activity.
FACT: While solar activity does influence the Earth's climate, studies show that the Sun's activity has been relatively stable, or even declining slightly, over the past few decades, while global temperatures have risen. The speed at which atmospheric CO_2 has increased since fossil fuels began to be used as an energy source, and the correlation between rising CO_2 levels and rising temperatures, indicate that human activities are the cause of the warming.

4. Lack of consensus or disagreement among scientists
ARGUMENT: Not all scientists agree that human activities are driving global warming. There is significant disagreement within the scientific community about the extent and causes of climate change.

FACT: While scientific debate is a normal part of the process, the overwhelming majority of climate scientists (over 97 percent) agree that human activities are the primary cause of global warming. The argument of "lack of consensus" is misleading because the consensus is based on a vast body of peer-reviewed research.

5. Misinterpretation of historical data
ARGUMENT: There has been little warming in the past few decades, or the warming observed is due to urban heat island effects or data manipulation.

FACT: Temperature data is carefully adjusted to account for factors like the urban heat island effect, and long-term data shows a clear upward trend. Short-term fluctuations, like a colder year or a temporary slowdown, are not evidence against long-term warming, which continues to accelerate.

6. The carbon dioxide argument
ARGUMENT: CO_2 is not harmful as scientists claim and may not be the primary driver of warming. Some even argue that higher CO_2 levels could be beneficial by fostering plant growth.

FACT: While CO_2 can have benefits for plant growth, the negative impacts of rising greenhouse gases—rising temperatures, ocean acidification and extreme weather events—are the problem. The physics behind CO_2's greenhouse effect is well understood

RICHARD VEVERS, XL CATLIN SEAVIEW SURVEY, THE OCEAN AGENCY / FLICKR / CC BY 2.0

Coral bleaching at Heron Island, Australia

and is supported by multiple lines of evidence. Furthermore, CO_2 is not the only greenhouse gas. Methane, nitrous oxide and others also contribute significantly to warming.

7. Lack of immediate catastrophe
ARGUMENT: There has been no immediate, catastrophic effect from global warming, and past predictions of disaster have not come to pass.

FACT: The argument overlooks the long-term and cumulative nature of climate impacts. Extreme weather events, such as heatwaves, flooding, wildfires and droughts, are becoming more frequent and severe. In addition, the long-term consequences, such as sea-level rise, species extinction, desertification and agricultural disruption, are ongoing, and are projected to worsen over time. Indeed, some of the problems are worsening much faster than predicted in past years.

8. Economic and political motivations
ARGUMENT: The push to address climate change is politically motivated and driven by financial or political interests, such as the promotion of green technologies or imposing environmental regulations, rather than genuine scientific concern.

FACT: The scientific consensus on climate change is rooted in decades of research and data collected in many ways by many scientists in many parts of the world. Addressing climate change could lead to new economic opportunities and innovation, particularly in the clean energy and technology sectors. The oil companies have been making spectacular profits during all these decades. They could have invested some of their billions in renewable energy research and led the world in switching to clean technologies.

But they did not.

9. Focus on regional or short-term data
ARGUMENT: Some sceptics emphasise short-term regional data or anomalies that show no warming, or even cooling, in certain parts of the world, to challenge the idea of global warming.

FACT: Climate change refers to long-term global trends, not short-term regional fluctuations. The overall trend, measured across the entire planet over decades, shows a clear rise in temperatures. Localised cooling events or colder years do not invalidate the broader global trend of warming.

These arguments have been consistently challenged by a wide body of scientific research and a deep understanding of the factors influencing the Earth's climate. The burning of fossil fuels and deforestation are, without doubt, the primary drivers of global warming. Global warming denial is a stance motivated by political and commercial agendas, rather than scientific inquiry.

The consequences of inaction

The delay caused by climate change denial has profound implications for marine life. The longer we wait to take meaningful action, the more difficult it will be to prevent catastrophic biodiversity loss. Coral reefs, fisheries and coastal communities are already experiencing the devastating effects of ocean warming, acidification and habitat loss. If current trends continue, entire ecosystems will collapse, leaving behind barren seascapes devoid of life.

The loss of marine biodiversity does not just affect the oceans. As the oceans become less productive, they lose their ability to absorb carbon and regulate the Earth's climate. This creates a feedback loop where the loss of marine life accelerates global warming, which in turn speeds up the destruction of marine ecosystems. The loss of biodiversity also reduces the ocean's ability to provide the essential ecosystem services that keep us terrestrial life forms alive, including atmospheric oxygen and coastal protection.

Hope for the future

While the situation is dire, there is still hope. We have the tools, the knowledge and the ability to take action to protect our oceans and preserve marine biodiversity. The first step is to reduce greenhouse gas emissions by transitioning to renewable energy sources, improving energy efficiency and investing in sustainable agriculture and transportation systems. By addressing the root causes of climate change, we can slow the warming of the oceans and give marine ecosystems a fighting chance to recover.

In addition to mitigating climate change, we must also adapt to the changes that are already underway. This includes protecting and restoring critical marine habitats, such as coral

Bleached cauliflower coral in Hawaii

KEVIN LINO / NOAA

reefs, mangroves and seagrass meadows, which provide the vital services of carbon sequestration and coastal protection. Marine protected areas (MPAs) can also help to preserve biodiversity and promote ecosystem resilience, providing safe spaces for species to thrive.

Climate change and biodiversity loss are problems that transcend national borders, and only through international cooperation can we hope to achieve meaningful change. By listening to scientists, rejecting misinformation and taking collective action, we can still turn the tide in favour of the oceans.

Conclusion

The warming of the oceans presents an existential threat to marine biodiversity. Coral reefs, fish populations and entire ecosystems are being pushed to the brink of collapse. Climate change deniers, armed with misinformation and well-funded campaigns, continue to undermine efforts to address this crisis, delaying the necessary action that could save marine life.

The situation is urgent, but it is not too late to act. By embracing the science, combating misinformation and taking bold steps to reduce emissions and protect marine habitats, we can still safeguard the oceans for future generations. The window of opportunity is closing, but with swift and decisive action, we can prevent the mass extinction of marine life and create a sustainable future for all. ■

Ethologist ***Ila France Porcher****, author of* **The Shark Sessions** *and* **The True Nature of Sharks****, conducted a seven-year study of a four-species reef shark community in Tahiti and has also studied sharks in Florida with shark-encounter pioneer Jim Abernethy. Her observations, the first of their kind, have yielded valuable details about the reproductive cycles, social biology, daily behaviour patterns, roaming tendencies and cognitive abilities of sharks.*

SOURCES:
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