NAVARRA CENTER
FOR INTERNATIONAL
DEVELOPMENT

THE OCEAN OF LIFE: THE FATE OF MAN AND THE SEA

BOOK AUTHOR: CALLUM ROBERTS

BOOK REVIEW

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We surely have heard that "those who do not learn from history are doomed to repeat it." Yes, this might be one of the most worn-out quotes in history, but it rings true throughout Callum Robert's The Ocean of Life: The Fate of Man and the Sea. In it, Professor Roberts essentially explains two things: how we have changed the sea and how we could revert some of our most harmful changes.

While some might think this book could be the work of yet another environmental doomsayer, it is fair and balanced in most respects, especially when it comes to evidence in part one. However, as it often happens when a person is passionate, Professor Roberts does overstep in some of his conclusions in part two.

The book dedicates its first two chapters to the historical relevance of the ocean to life in general, and, more specifically, to humankind as a means of resources. One fact that might give us a look at a potential future of ours is the mother of all extinctions. Almost 251 million years ago, it wiped out 90 percent of all species. Why? It is a heated debate but most likely because of runaway global warming and acidic oceans. Ring a bell, anyone?

PART ONE

OVERFISHING

The first item on Professor Roberts's list of changes that we have introduced after industrialization is overfishing. Since the fifties, fisheries have brought almost two-thirds of all species to the brink of collapse. There is so little fish in the oceans that fleets in the 1880s—lacking all the technologies that facilitate catch today—were more successful than we are today. Even worse than that, the average fish size is shrinking as evolution starts favoring the smaller and younger.

Unsurprisingly, some areas have no fish anymore. Of course, this is especially harmful to low-income countries where households rely on fishing for subsistence. One such example is Namibia. There is a dead zone off the coast of Benguela that produces a stench and affects the economies and health of neighboring communities. In the early nineties, an intense phytoplankton bloom killed 80 percent of the population of Cape hake and led to a collapse of catches.
Because of overfishing coupled with global warming, upwellings—currents that take almost anoxic and nutrient-filled waters to the surface—have become more aggressive. Around them, phytoplankton accumulates, but there is not enough fish or zooplankton to eat it. Phytoplankton blooms can turn water anoxic, and when it goes uneaten and dies naturally, it sinks and creates hydrogen sulfide—a foul substance.

Still, we are no closer to bringing a halt to this issue. Each year, fishing quotas in the European Union are a third higher than what scientists recommend.

RISING TIDES AND CORROSIVE SEAS

Overfishing is already troublesome enough without factoring in global warming. As it turns out, between 1870 and 2000, sea level rose by approximately 8 inches. The main culprit is carbon dioxide that leads to warmer seas, and we are compounding these effects. While dams have slowed

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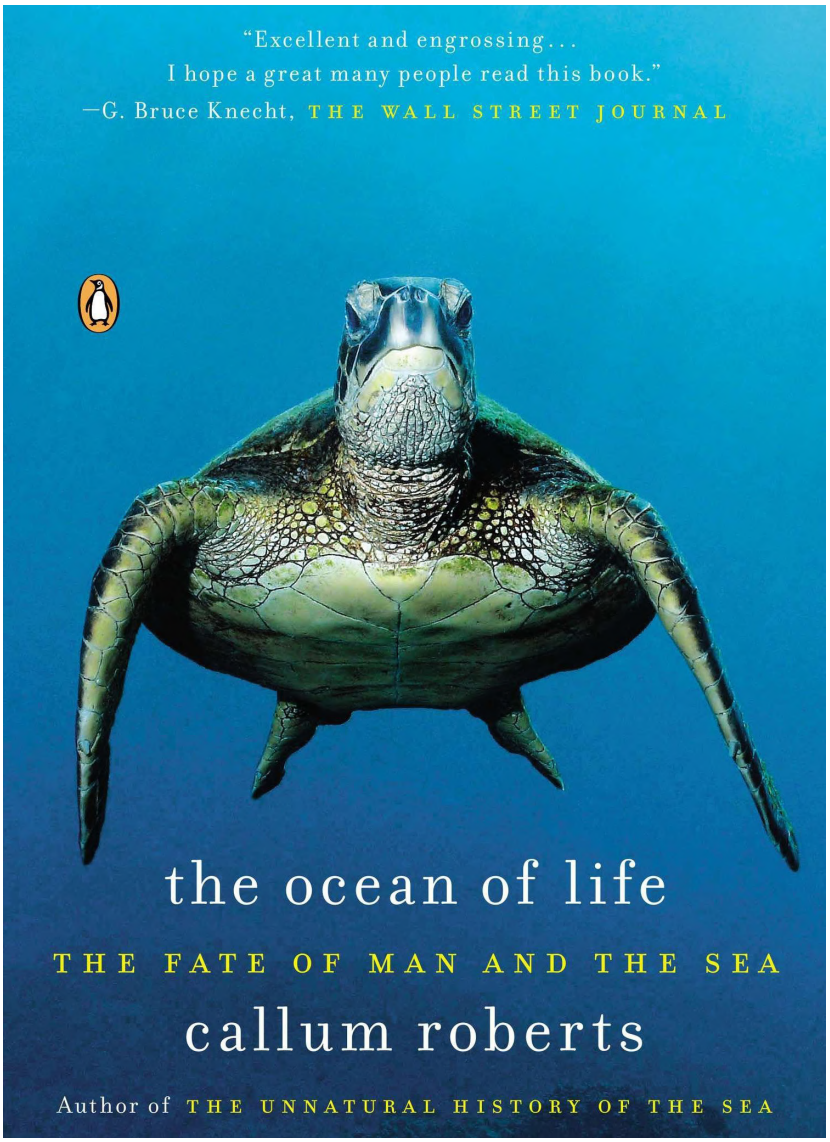
the rate at which sea level increases, they cause erosions and damage river deltas—the breadbasket of the world. Real estate development on estuaries and mangroves have also weakened our natural defenses against rising seas. Corals, a natural defense system, are weak because of higher temperatures and acidity.

Indeed, the future might require human intervention to hold off rising tides. Such an example has been on display since 1984 in London. Perhaps an illustrative example that Professor Roberts uses in the book helps readers comprehend the imminence of rising seas. In the first seven years of operations of the Thames Barrier, the government only closed it four times. Nowadays, they shut it five to ten times a year.

It is likely that, if we continue this dangerous path, we could end up melting two large ice caps. If the Greenland and West Antarctic ice caps were to melt, seas would rise 20 feet and 10 feet, respectively. Such an increase implies the loss of flagship cities like New York, Florida, London, Lagos, and even countries like Bangladesh. Such a reality is still far off. While icecaps are slipping faster into warmer water, snowfall has also increased. It is still up for debate what the dominant effect is. Ten percent of the world's population lives near coasts, and less than 33 feet above the current sea level. Sadly, there is more to the story. The ocean has absorbed most of the carbon dioxide and has fended off further war-



ming. But, at what cost? When carbon dioxide dissolves in seawater, it produces carbonic acid. The ocean's pH has already fallen by 0.1 units. Most of this drop has happened in the last four decades alone. For those of us who are not talented in math, pH is on a log-scale, which means that acidity has increased by 30 percent.

Because Professor Roberts knows that this sounds dangerous, he further explains that while we will not be getting chemical burns from higher acidity anytime soon, this change dramatically affects sea life. The metabolic cost of living increases for species requiring carbonate minerals to develop. A comprehensive list is perhaps too long, but these include crabs, lobsters, snails, shrimp, clams, mussels, oysters, coralline algae, and corals. In 2016, the northern part of Australia's Great Barrier Reef lost almost 30 percent of its shallow-water corals.

Here comes one of the few criticisms there are to Professor Roberts's work. The book does not mention two critical aspects of ocean acidification: its potential economic effects and its current effect on humans. Colt and Knapp (2016) estimate losses between 97 to 301 billion dollars because of the loss of ecosystem services—commercial and subsistence fishing, tourism, and aquaculture. A large part of fishing activities takes place in coral reefs that fish use to fend off predators. Armand and Kim (2020) estimate that through its current effect on nutrition and income, ocean acidification could be behind a sizable amount of neonatal deaths in low-and-middle-income countries.

The good news is that acidification on such a scale has happened before in the Paleocene-Eocene Thermal Maximum, and life adapted well. The bad news is that this change occurred over thousands of years.

POLLUTION AND A BONUS

One of the book's greatest strengths is that it dives masterfully into different subjects while maintaining cohesion and flow. After discussing the perils of overfishing, global warming, and ocean acidification—its evil cousin—Professor Roberts tackles pollution, which comes in various forms. Some are obvious to us, while some are not. Regardless, they all pose a significant danger to food chains and ecosystems and could even expand the reach of dead zones.

The remains of human activity fill our seas with nutrients that come for fertilizers. These nutrient-rich waters make it to the ocean and lead to runaway phytoplankton growth, and waters could become anoxic like in Namibia. Some phytoplankton is toxic and could lead to mass killings. Presently, there are more than 400 dead zones around the globe. Dam-building and crop irrigation only compound the effect of this type of pollution. Dams cut off water flow that pushes water offshore to oxygenate despite massive nutrient flow, and crop irrigation fills rivers with fertilizers.

We also need to consider persistent organic pollutants, oil spills, pharmaceuticals, plastic, and heavy metals like mercury. These contaminants damage the ocean's surface microlayer that contains fats, fatty acids, and proteins and is crucial to develop the eggs and larvae of fish we love to eat. They disrupt food chains and even reproduction habits in marine life and affect us when we eat certain species. Some figures that would do us good to remember are that two-thirds of dead animals have plastic in their guts or that there

is at least six times more plastic by weight in the ocean than there is zooplankton.

To top it all off, we also make noise. It might seem irrelevant at first, but Professor Roberts devotes an entire chapter to help us understand that sound is an essential tool for fish to navigate, detect predators, reproduce, and hunt for food. Our noisy incursions into the sea have left beaked whales disoriented and headed towards certain death. There is an extra consequence of our seafaring. Our marine adventures are moving species around when boats discharge ballast water.

Some of the alien species are aggressive and disrupt local ecosystems. Such is the case of the red lionfish in the Caribbean. It has laid waste to other species and, perhaps worst of all—for us—it targets the youth of just the most popular fish species in restaurants.

All these stresses lower immunity and turn marine species into prime candidates for a virus takeover, which could then affect us. A plague in the Caribbean killed 75 percent of all sea fans, and three-quarters of emerging infectious diseases have had their origins in other animals.

PART TWO

SO, IS THERE HOPE?

After the first fifteen chapters of the book, any reader could feel discouraged and pessimistic. Professor Roberts knows this all too well and dedicates the rest of his book—part two—to what humanity can do to change course. While he explains different tries at alleviating all the problems he mentions, Professor Roberts seems to be a firm advocate for preservation above all.

The first try at alleviating overfishing is probably known to all of us. Almost half of all fish sold for human consumption comes from aquaculture. It has a long history too. The Chinese and Egyptians developed it about 4,500 years ago. The Food and Agriculture Organization estimates production at around 55 million tons. Production growth outpaces population growth. However, this is not doing much to help with overfishing. It can take several pounds of wild-caught fish to produce just one pound of farmed fish. There is a glimmer of hope as the average ratio of wild fish going to farmed fish has fallen from 1:1 to 0.63:1. It could also present an issue to low-and-middle-income countries. Farmed fish eat wild fish species that are vital to the diets of many in these economies.

Besides, Professor Roberts argues that it could pose a health risk. Because of high-density conditions, fish have a higher probability of being exposed to illness. Humans could be affected too. It was not too long ago that we had the swine and bird flu, not to mention the novel coronavirus. Some aquafarmers use antibiotics that bacteria could create resistance to and become even more dangerous.

Regarding pollution, we could do a lot. Several countries —such as France, Kenya, Rwanda, and South Korea— have banned plastic bags and started programs where they pay fishers to pick up litter. Hawaii uses this garbage to produce energy. Private ventures have started producing biodegradable materials from corn starch. It is even possible to resuscitate dead zones by pumping oxygen, although it would take almost 6.6 million tons a year. However, Professor Roberts argues that it is best to reduce nutrient pollution and try to reduce, reuse, and recycle as much as possible. It is easier to enforce preventive measures than to clean up at sea.

SCIENTISTS ARE NOT SHORT ON IDEAS TO SOLVE CLIMATE CHANGE ISSUES

Regarding global warming, Professor Roberts outlines all the ideas that have come up to cool temperatures and avoid catastrophe. Part of this comes from renewable energies. Offshore wind farms are a viable option, and evidence shows that they are not harmful to diversity. If we were to tap this type of energy, it could provide a third of the world's energy demand and save us a substantial amount of carbon dioxide emissions.

Additionally, some scientists propose using waves to power generators, while others suggest climate engineering. In the book, Professor Roberts dislikes these ideas and provides some reasons as to why he does. Powering generators with waves could destroy entire ecosystems and requires significant investments that make it commercially unattractive.
Regarding climate engineering, Professor Roberts outlines some of the ideas that scientists have in mind. One such idea is carbon sequestration. It would entail extracting carbon dioxide from the atmosphere to pump it into the ocean as a liquid. Of course, it would only worsen acidification. However, Professor Roberts does enjoy the notion of pumping carbon dioxide back into oil wells, as it could save up to 20 percent in emissions and does not require much investment.

Another proposal is to use silicate rocks to break down carbon dioxide and produce bicarbonate. Other concepts look

to reflect heat using artificial clouds or sulfuric acid in the atmosphere. Professor Roberts rejects most of these ideas because of their potential danger. Artificial clouds and sulfuric acid could worsen droughts, while mining for silicate rocks is costly and dangerous.

The good news is that the reader can quickly realize that scientists are not short on potential approaches to alleviate these issues. In this context, Professor Roberts dedicates the rest of the book to make a passionate claim for preservation as the best possible and cost-effective solution and provides credible arguments for it.

Salt marshes, mangroves, and seagrass beds collectively trap half of the carbon dioxide emissions from the world's transport network, and they only cover five thousandths of the world's terrestrial vegetation. According to the World Bank report The Sunken Billions, by fishing less, we could produce 40 percent more. A network of protected areas near fisheries could also do much good.

Lastly, and this is perhaps the harshest criticism of the book's argumentation, Professor Roberts makes a case for population control in developing countries. It is too easy of a solution and carries dire consequences, as many Western economies have learned. He supports such a claim by saying that we consume one and a half planets of sustainable development. While it is hard to argue that we are exploiting more than our fair share of resources, it is also true that efficiency has increased over the years. We now produce much more with much less.

Yes, humanity needs to learn its lesson and do its share to reduce pollution, preserve habitats, and transition into renewable energies. However, we cannot do it that at the expense of our perpetuation and lower-and-middle income economies. While Professor Roberts does have a point about the importance of preservation, his dismissal of innovative scientific proposals is too quick. It is not the first time that we have faced issues that seemed impossible. The Great Manure Crisis that spelled the end of New York and London finished when we invented the car. In the nineties, we had damaged the Ozone layer severely. Now it is healing itself because we coupled innovation with behavioral changes. We must adapt and leverage our valuable scientific knowledge to tackle these issues.

FOR FUTURE READERS

The Ocean of Life: The Fate of Man and the Sea is a perfect book to get a grasp of how we are impacting the ocean. It does not take an androcentric point of view, but it does highlight how these changes could affect us. The author writes to a general, although knowledgeable, audience. The book describes relevant topics using secondary sources—sometimes Professor Roberts's academic work. The topics covered are broad, but the author does a great job of outlining the essentials. Also, there is an extensive bibliography so that readers can further their understanding of specific issues. Professor Roberts tries to be impartial but does occasionally become resolute on debatable subjects. At the end of the book, Professor Roberts offers a useful list of seafood that we could eat with a clear conscience and charities we could help. Essentially, he recommends to avoid eating long-lived species that mature later in live such as sharks, swordfish and some tunas, and buying products caught with methods that have terrible impact to the environment such as bottom trawlers and hydraulic clam dredges.

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CALLUM ROBERTS is a marine conservation biologist at the University of York in England and the author of The Unnatural History of the Sea, which won the Rachel Carson Environmental Book Award and was chosen by the Washington Post as one of the Ten Best Books of the Year 2007. A frequent keynote speaker at environmental conferences, he both advised and was featured in The End of the Line, a documentary on the global fishing crisis and appeared in the National Geographic documentary America Before Columbus. He is also on the board of Seaweb and provided the scientific basis for the creation of the world's first high seas protected network.●