

Ocean SOS

The world's oceans are fundamental to human survival – they are also in peril. It is time to stop the plunder and preserve this vital resource, writes DR REESE HALTER.

The health and wellbeing of our oceans is vital to life as we know it on our planet. Irrespective of where you reside on the globe, three out of every four breaths of air come from the phytoplankton in our oceans. Frighteningly, Earth's oceans are desperately ill. The time is now for each of us to lend a helping hand. Let me tell you why.

Each day the unintended consequences of burning in excess of 98.6 million tonnes of greenhouse gases has disrupted the deep ocean currents, preventing some upwelling carrying essential nutrients to the surface to grow phytoplankton, which is the basis of the entire global marine ecosystem.

At present, the oceans are missing 40 per cent of their phytoplankton. By 2024, according to the Food and Agriculture Organization of the United Nations, there will be 8 billion people on Earth. That's an immense amount of oxygen required just for everyone to breathe.

Scientists from the National Center for Atmospheric Research in the US have recently re-analysed ocean temperatures from 1958 to 2009, noting that at least 30 per cent of Earth's warming was hidden in the oceans, mixed by winds and currents to depths exceeding 700m.

Not only is this highly visible in the tropical Pacific Ocean and into the subtropics, it is also driving weather patterns. Deep ocean warmer

temperatures have begun surfacing in the Eastern Australian Current and elsewhere. Climate disruption is ravaging every ecosystem in the ocean including lambasting Tasmania's east coast kelp forests, which in less than a decade are almost gone. Ninety-five per cent of the 30m-tall underwater jungles are dead. Warmer nutrient-poor water has brought 40 new species of fish further and further south, including long-spined sea urchins that devoured the kelp forests. Without kelp forests there are no sponges, nor fish especially adapted to its habitat. That ecosystem has collapsed.

Nowhere is climate disruption more evident than in the Arctic Ocean. Its plankton is dangerously close to releasing more CO₂ than it can absorb. The plankton communities 650km north of mainland Europe on Svalbard Island are reaching temperatures near 5°C.

Once they cross this threshold, in scientific parlance, the plankton switches from a sink (absorbing CO₂) to a source (releasing CO₂). The University of Western Australia Oceans Institute predicts those 5°C temperatures will regularly be reached later this decade in the European sector of the Arctic Ocean.

Deep mysteries

The sea is mysterious and it is Earth's final frontier. Would you believe that science knows far more about the face of the moon and the surface of Mars compared to the bottom of the



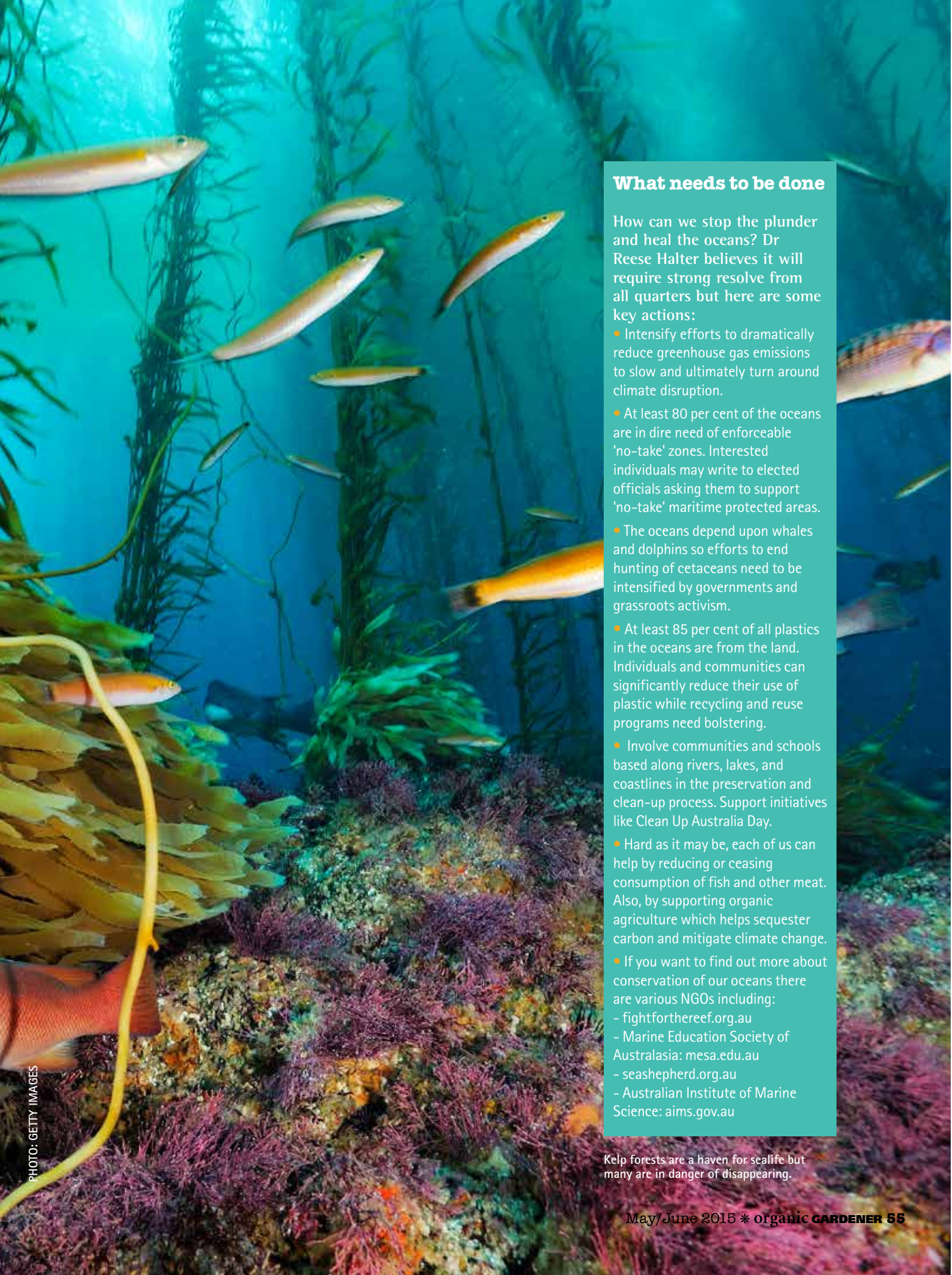


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What needs to be done

How can we stop the plunder and heal the oceans? Dr Reese Halter believes it will require strong resolve from all quarters but here are some key actions:

- Intensify efforts to dramatically reduce greenhouse gas emissions to slow and ultimately turn around climate disruption.
- At least 80 per cent of the oceans are in dire need of enforceable 'no-take' zones. Interested individuals may write to elected officials asking them to support 'no-take' maritime protected areas.
- The oceans depend upon whales and dolphins so efforts to end hunting of cetaceans need to be intensified by governments and grassroots activism.
- At least 85 per cent of all plastics in the oceans are from the land. Individuals and communities can significantly reduce their use of plastic while recycling and reuse programs need bolstering.
- Involve communities and schools based along rivers, lakes, and coastlines in the preservation and clean-up process. Support initiatives like Clean Up Australia Day.
- Hard as it may be, each of us can help by reducing or ceasing consumption of fish and other meat. Also, by supporting organic agriculture which helps sequester carbon and mitigate climate change.
- If you want to find out more about conservation of our oceans there are various NGOs including:
 - fightforthereef.org.au
 - Marine Education Society of Australasia: mesa.edu.au
 - seashepherd.org.au
 - Australian Institute of Marine Science: aims.gov.au

Kelp forests are a haven for sealife but many are in danger of disappearing.

oceans? In fact, we know less than one-tenth of one per cent of the deep ocean surface.

In March 2012, film producer and explorer James Cameron and crew journeyed in the *Deepsea Challenger* submarine to the Mariana Trench, located about 320km southwest of Guam. This area is home to Challenger Deep, the world's deepest known point at about 10,920m, more than a 1.5km greater than Mt. Everest.

Cameron and his team journeyed to the bottom of Challenger Deep and brought back high-resolution 3D images and footage of unprecedented clarity. They also collected sediment, physical oceanographic data and biological samples. Analysis of that data has led to the discovery of 68 new species of life. Currently, there are over 226,000 kinds of marine life that scientists have recorded, including 20,000 new species in the last decade alone. The open oceans are far from void deserts as once believed. The astounding seafloor topography creates habitat for plankton, and where there's plankton there's prolific sea life.

Glorious submerged mountains, known as 'seamounts', jut upwards from the seafloor. Only 1000 of the estimated 50,000 in the Pacific Ocean have even been named. Strong currents bathe seamounts and superb ancient sea coral gardens, sea fans and sponges carpet their summits.

The corals filter and feed from the fast-moving ocean currents, creating exquisite habitat, providing nutrients, attracting phytoplankton, allowing fish filter-feeding whales and all deep-sea marine life to prosper. Where there are small fish, there are also large predators such as tuna, and squid that are food for the superlative albatrosses.

Acidifying oceans

As the oceanic phytoplankton absorbs rising levels of CO₂, converting the sun's energy into green cells, oxygen is released into the atmosphere and a weak carbonic acid is released into the

Anxious fish

Every day, the oceans are currently attempting to digest over 38.5 million tonnes of CO₂ and it has now reached a tipping point. Marine physiologists, neuroscientists, pharmacologists and behavioural psychologists have revealed a shocking outcome from the immense increase of CO₂ uptake in our oceans: anxious fish that are losing their ability to detect the correct chemical cues, in some cases becoming attracted to the smell of predators. The high levels of CO₂ are actually interfering with the fundamental neurotransmitters in the brains of fish, causing them to take unnecessary and dangerous risks.

sea as a byproduct of this reaction. As a result, the oceans are now acidifying faster than the previous 300 million years.

This is horrible news for all sea life, in particular for coral reefs and all shellfish because they are made up of calcium carbonate, which melts under acidic conditions.

Although coral reefs occupy less than one-tenth of one per cent of ocean area globally, they brim with biodiversity, being home to at least one-quarter and perhaps as much as one-third of all known fish or about 8000 to 10,600 species.

Coral reefs support more species per square kilometre than any other marine environment, providing food as well as spawning and nursery grounds. At least 500 million humans depend on coral reefs for food, coastal protection and ecotourism.

Alarmingly, warming seas and acidity have killed at least 50 per cent of all coral reefs globally; the mortality may be as high as 80 per cent in the Caribbean Sea. The Great Barrier Reef, the largest on the globe, has lost an area much larger than the size of England. Coral reefs are to biodiversity in the ocean what the Amazon rainforest is to land: hotbeds of life.

Medical riches

As coral reefs are harmed or destroyed, we lose the potential to discover the powerful medicines that come from them. Soft corals from northwestern Australia are the most efficacious anti-cancer compounds

ever found, while Caribbean sea squirts are used to treat melanoma and breast cancers.

Since 1969, sponges from the Florida Keys have played a valuable role in treating leukaemia, and it was research into these that led scientists to develop the important AIDS drug AZT. Coral is the most effective treatment in regrowing human bones, with patients requiring no immunosuppressant drugs.

From a dollar value, the ecosystem services that healthy, vibrant coral reefs provide us has been estimated at \$1 trillion dollars annually worldwide. Coral reefs are our children's legacy.

Thoughtless plunder

In addition to the deleterious effects of burning fossil fuels, our oceans are being harvested at least 72 times greater than what they can possibly sustain. Domestic cats eat more tuna than all the seals in the world!

There's a global fishing fleet of 4 million vessels, 44,000 of which are industrial factory ships as long as two football fields, employing 2 per cent of the global fishermen yet catching more than 55 per cent of our edible sea life.

In addition, there are more than





At the present annual rate of annihilation, the oceans would become lifeless during the fourth decade of this century.

1.4 billion hooks attached to longlines about 90km in length that, if connected, would encircle the equator 522 times. And in the wake, a massive amount of sea life, known as 'bycatch', are needlessly killed and haphazardly discarded annually, including albatrosses, sea turtles, sharks, dolphins and whales. These creatures are accidentally hooked or caught in nets so large that a dozen 747 Boeing jets can easily fit inside the mouth of one net.

While much has been made of sustainable fishing programs, the truth is that nine out of 10 of the world's surface fisheries are teetering on collapse. Instead of drastically reducing the worldwide harvest, humans have been depleting all deep-sea fisheries and inflicting irreparable damage to the ocean floor and its salubrious seamounts with ancient corals that were once teeming with life.

The destruction of the seafloor is so vast that NASA satellites regularly detect 25km of devastating, sediment clouds blanketing the seas. And the destruction of 3000-year-old seamount corals and seabeds is estimated to be 150 times in area greater than clear-cutting forests on land each year.

Sharks on the brink

Nowhere have the effects of our plunder been more devastating than against all shark species. Over the past eight years, more than 660 million sharks have been massacred worldwide for their fins, which wind up in meals such as sharkfin soup. This means that at least 90 per cent of sharks globally have been poached in all oceans.

Sharks, as Jeff Hansen, managing director of Sea Shepherd Australia, aptly named them are "doctors of the sea". Sharks keep their populations of prey fit by culling the old, weak and sick, thus also preventing diseases from becoming epidemics.

Unless immediate corrective actions are taken, in less than a decade and a half we will have exterminated all sharks, which until recently stood the phenomenal test of 400 million years of rigorous evolution.

A team of scientists led by Dr Boris Worm of Dalhousie University, in Canada, concluded that at the present annual rate of annihilation, the oceans would become lifeless during the fourth decade of this century.

Whales and climate change

Whales have been hunted almost to the point of extinction but the fight is on to save them, with some success. Yet

few people know that whales play an integral role in combating climate change. Filter-feeding whales carry huge quantities of nitrogen and iron from the deep sea, where they feed, up to the surface and release flocculent faecal plumes.

These nutrients allow more phytoplankton to grow, which increases the food supply at the base of the marine food web, therefore promoting bigger fisheries and higher abundance where whales occur in greater densities. That phytoplankton helps remove rising greenhouse gases.

Furthermore, the role of these magnificent creatures irrefutably debunks the claims by Japan, Norway, Denmark, Russia, Iceland and South Korea, who are conducting whaling for purported scientific research, that whales compete with their commercial fisheries. Instead, they enhance them.

Oceans of garbage

Finally, over the past half-century the oceans – an area in excess of 315 million square kilometres – have become the largest continuous, ever-growing garbage dump in the history of the Earth. Each day an additional 3.5 million pieces of plastic enter our oceans.

If this weren't distressing enough, US research* discovered that trillions of micro-plastics trapped in the Arctic ice are now being released into the Arctic Ocean as global warming melts the polar cap. And each year mega tonnes of micro-plastics are being consumed by fish worldwide and entering the ocean food web. We have much to do to turn this all around. **OG**

* <http://news.sciencemag.org/earth/2014/05/trillions-plastic-pieces-may-be-trapped-arctic-ice>

• Conservation biologist Dr Reese Halter's latest book is *Shepherding the Sea: The Race to Save our Oceans*. See page 84 for a review.

Dedicated to my dear sister Diana Rachel Halter, 24 May 1951 – 1 February 2015.
Always a supporter of my ocean work.