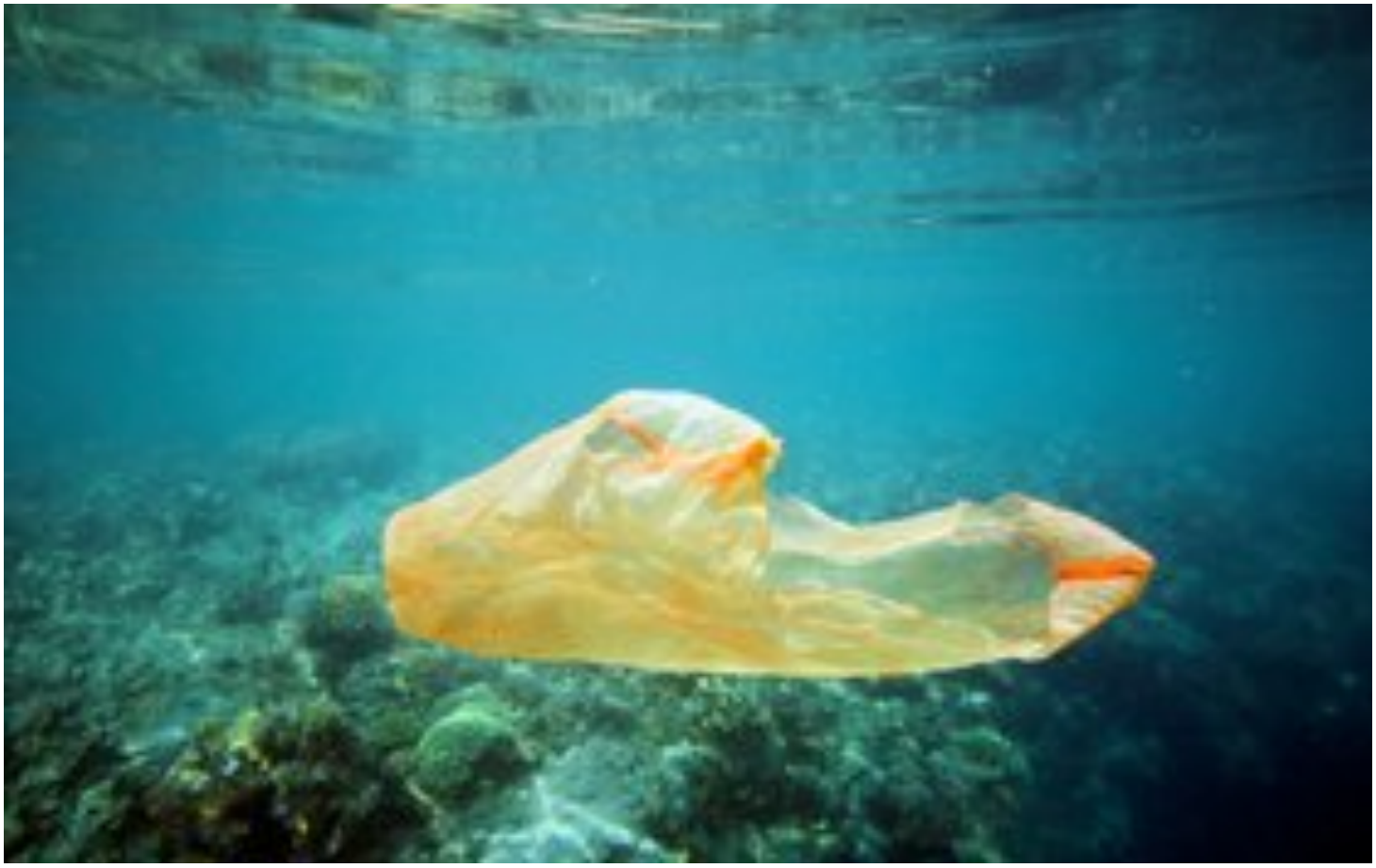
ENVIRONMENT

Where Plastic Goes, Coral Disease Follows

An onslaught of bottles, bags and other litter makes reefs 20 times more likely to get sick. Scientists are scrambling to learn why

By Andrea Thompson on January 30, 2018



Plastic bag floating over coral reef at Pulau Bunaken. *Credit: Paul Kennedy Getty Images*

In the relatively pristine waters of the Great Barrier Reef marine disease ecologist Joleah Lamb spent years looking for the ways human activities—from pollution that warms the ocean to commercial fishing to scuba diving and other tourist activities—could affect how often the legendary corals off the Australian coast get sick.

One thing she and her team did not see much of was plastic trash. “So it wasn’t something I thought about a lot,” Lamb says. That changed when she and colleagues began studying the reefs off Indonesia, Myanmar and other parts of Southeast Asia. They were floored by the ubiquity of diapers, water bottles and plastic bags littering the fragile ecosystems. The researchers kept a record of the detritus they came across in their work in the region—and

the data shows that after plastic comes into contact with a reef, the coral is 20 times more likely to be afflicted by disease.

“This is just astounding to see that much of an increase,” says Mark Eakin, who heads up the National Oceanic and Atmospheric Administration’s Coral Reef Watch program. He was not involved in the latest study but has collaborated with several of the authors. The problem “is far more important than we realized,” he adds.

Plastic is only the latest in a litany of human-linked stressors that are imperiling coral reefs—the incubators of ocean biodiversity. And the synthetic substance is apparently driving up disease rates even in the types of reefs that have proved hardiest in the face of other forces. The new study shows that plastic must be taken into account when planning how to manage and protect reefs, and that many countries need to overhaul their waste

management systems to keep plastic from getting into the ocean, several experts say.

Reducing plastic pollution will not be enough on its own to save reefs, but it could help ease the pressure they face from the threats that still worry coral experts the most: overfishing and warming-driven bleaching. Because of these pressures reefs face an impending “climate bottleneck,” with overall reef numbers expected to drop and changes in the types of reefs that survive. But removing as much plastic as possible from the equation could make that bottleneck just a little bit wider.

Images of sea turtles trying to eat plastic bags they have mistaken for jellyfish, and the vast mass of debris swirling in the Great Pacific Garbage Patch, have been making news for years. But the sheer amount and pervasiveness of plastic in the ocean is enough to astound even seasoned marine researchers. Terry Hughes, director of the Australia-based ARC Center of Excellence for Coral Reef Studies, says even in the remote reefs of Indonesia he has “just been shocked by the density of plastic bags washing by.”

The new study, detailed in the January 26 *Science*, provides hard data and a new understanding about the mechanics of how all that plastic affects reefs. Lamb, a postdoctoral researcher at Cornell University, and her colleagues found that where plastic was present on reefs around Southeast Asia—home to more than half the world’s coral reefs—the likelihood of seeing one of the key coral-killing diseases rose from 4 to 89 percent. Considering the 11 billion pieces of plastic the team estimates are entangled on reefs from Myanmar to Australia, plastics could significantly affect the health of reefs that are not only linchpins of ocean biodiversity but key to many economies in the region.

Just how corals become diseased from their encounters with bags, water bottles and fishing lines is still something researchers are exploring, but they have some suspicions. For one thing, the pathogens that cause some of the most common and deadly diseases may be hitching rides on the plastic pieces. Plastic can also damage the delicate surfaces of corals as it rubs against them, introducing bacteria and forcing the coral to expend energy on its immune response as it tries to repair itself. Plastic also smothers the coral, covering the surface and blocking sunlight and oxygen to create conditions that help many kinds of bacteria thrive. They include those that cause black band disease, in which a dark strip of infection eats away at coral tissue.

Certain types of coral, especially staghorns and others with elaborate branches that can easily snag debris, are more likely to become entangled. This is a major concern for reef ecologists because these are the same corals whose “nooks and crannies” foster the explosive diversity of reef ecosystems, says Hughes, who also was not involved in the new study. These types of coral are particularly important as fish nurseries.

Various boulder-shaped species known as massive corals are less likely to come into contact with plastic—but if they do, they are nearly twice as likely to fall ill, the team reported. This finding is even more troubling because “those corals are the survivors of the bleaching events,” Eakin says. “Now you’ve got something that is targeting those.”

But plastic is just one threat among many: nutrient pollution from fertilizer, ocean acidification and overfishing, along with the steadily warming ocean temperatures that drive bleaching—the process whereby coral lose the symbiotic algae that provide them

with food and energy. The last two remain the major concerns of most reef researchers. “Plastic’s not good for the reefs, but it’s an order of magnitude less significant than bleaching,” Hughes says.

A three-year-long global bleaching event recently hit 75 percent of the world’s reefs. Even the relatively well-protected Great Barrier Reef lost 30 percent of its corals in just eight months as a result, Hughes notes. The time between bleaching events is also shrinking as the oceans heat up, leaving corals with less time to recover, according to a *Science* study led by Hughes that was published earlier this month. “All of that sounds pretty bleak until you start thinking about what else can be done to offset the damage that’s being done,” says Douglas Rader, a co-author on the new study and chief oceans scientist at the Environmental Defense Fund. With global efforts to tackle climate change progressing at a glacial pace, Rader and several other coral experts say managing fisheries is probably the most immediately effective way to address reef health, as fish stocks seem to rebound fairly quickly when fishing pressures ease. The EDF is currently working in Belize with its government as well as local communities dependent on fishing to manage fish populations along the Mesoamerican Reef.

Curtailing the flow of plastic into the ocean could also lighten the burden on reefs, for example by making the recovery from bleaching events less steep a climb. David Levine, a coral reef biologist at the Scripps Institution of Oceanography, likens it to a person who smokes, drinks and gets too little sleep: Any one of those factors increases the risk of illness, and mitigating even one of them decreases that risk.

Efforts to reduce plastic pollution have already progressed at a much faster pace than those to tackle climate change, says Nicholas Mallos, director of the Trash Free Seas program at the Ocean Conservancy. This is partly because mounds of colorful, unnatural-looking plastic garbage are more visible and visceral. Some governments around the world have instituted bans or surcharges on plastic bags, for example, and major companies are looking to reduce the amount of plastic in their supply chains and packaging, Mallos says. He is optimistic that the political will to confront the problem exists in the Southeast Asian nations whose reefs are hardest hit. Indonesia, which just declared a “garbage emergency” on the beaches of tourism-dependent Bali, has drawn up a National Action Plan on Marine Plastic Debris to curtail the amount of waste it sends into the ocean.

This does not, of course, address the plastic already in the ocean, where it slowly degrades into microscopic particles. Their effects on corals and marine life are only beginning to be explored. But even with those and other questions scientists still want to answer, Hughes says this study makes one matter glaringly clear right now: “Can we please stop dumping plastic into the ocean?”