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Ocean Acidification Will Make Climate Change Worse

As we emit more carbon dioxide, the oceans will become more acidic. That will be bad for sealife—but it may also speed the rate of global warming

By Bryan Walsh @bryanrwalsh | Aug. 26, 2013

Given that they cover 70% of the Earth's surface—and provide about 90% of the planet's habitable space by volume—the oceans tend to get short shrift when it comes to climate change. The leaked draft of the forthcoming coming new report from the Intergovernmental Panel on Climate Change highlighted the atmospheric warming we're likely to see, the rate of ice loss in the Arctic and the unprecedented (at least within the last 22,000 years) rate of increase of concentrations of greenhouse gases like carbon dioxide and methane. But when it came to the oceans, press reports only focused on how warming would cause sea levels to rise, severely inconveniencing those of us who live on land.

Reinhard Dirscherl via Getty Images

Bleaches corals off the coast of Indonesia. Ocean acidification could have disastrous impacts on sealife—and the climate

Some of that ignorance is due to the out of sight, out of mind nature of the underwater world—a place human beings have only seen about 5% of. But it has more to do with the relative paucity of data on how climate change might impact the ocean. It's not that scientists don't think it matters—the reaction of the oceans to increased levels of CO_2 will have an enormous effect on how global warming impacts the rest of us—it's that there's still a fair amount of uncertainty around the subject.

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But here's one thing they do know: oceans are absorbing a large portion of the CO_2 emitted into the atmosphere—in fact, oceans are the largest single carbon sink in the world, dwarfing the absorbing abilities of the Amazon

Nature Climate Change shows, acidification will make the oceans much less hospitable to many forms of marine life—and acidification may actually to serve to amplify overall warming.

The first study, by the German researchers Astrid Wittmann and Hans-O. Portner, is a meta-analysis looking at the specific effects rising acid levels are likely to have on specific categories of ocean life: corals, echinoderms, molluscs, crustaceans and fishes. Every category is projected to respond poorly to acidification, which isn't that surprising—pH, which describes the relative acidity of a material, is about as basic a function of the underlying chemistry of life as you can get. (Lower pH indicates more acidity.) Rapid changes—and the ocean is acidifying rapidly, at least on a geological time scale—will be difficult for many species to adapt to.

Corals are likely to have the toughest time. The invertebrate species secretes calcium carbonate to make the rocky coastal reefs that form the basis of the most productive—and beautiful—ecosystems in the oceans. More acidic oceans will interfere with the ability of corals to form those reefs. Some coral have already shown the ability to adapt to lower pH levels, but combined with direct ocean warming—which can lead to coral bleaching, killing off whole reefs—many scientists believe that corals could become virtually extinct by the end of the century if we don't reduce carbon emissions.

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The *Nature Climate Change* study found that mollusks like oysters and squids will also struggle to adapt to acidification, though crustaceans like lobsters and crabs—which build lighter exoskeletons—seem likely to fare better. With fish it's harder to know, though those species that live among coral reefs could be in trouble should the coral disappear. But ultimately, as the authors point out, "all considered groups are impacted negatively, albeit differently, even by moderate ocean acidification." No one gets out untouched.

The other *Nature Climate Change* study—by American, German and British researchers—looked at the effects that ocean acidification could have on atmospheric warming. It turns out there may be some feedback—the researchers found that as the pH of the oceans dropped, it would result in lower concentrations of the biogenic sulfur compound dimethylsulphide (DMS). Why does that matter? Marine emissions of DMS are the largest natural source of atmospheric sulfur. (Manmade sources of sulfur include the burning of coal.)

Sulfur, in the form of sulfur dioxide, isn't a greenhouse gas. But higher levels of sulfur in the atmosphere can reduce the amount of solar energy reaching the Earth's surface, causing a cooling effect. (In the aftermath of the eruption of Mt. Pinatubo in the Philippines in 1991, which threw millions of tons of sulfur dioxide into the atmosphere, average global temperatures the two years fell by about 0.5 C.) If acidification decreases marine emissions of sulfur, it could cause an increase in the amount of solar energy reaching the Earth's surface, speeding up warming—which is exactly what the *Nature Climate Change* study predicts. It's one more surprise that the oceans have in store for us.

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