



the weekly anthropocene

dispatches from the wild, weird world of humanity and its biosphere

by Sam Matey

Weather. Two separate studies have conclusively found that Hurricane Harvey (pictured) was made worse by climate change. One study was published in *Geophysical Research Letters* (GRL) and the other in *Environmental Research Letters* (ERL). The GRL study examined weather data from the Houston area from 1950 to 2016, then compared these data to climate records. The team found that when compared to a 1950s hurricane, climate change increased Harvey's rainfall by as much as 38 percent, and may have made it about 3 times likelier to occur. The ERL study used Gulf Coast rainfall records from as far back as 1880, and found that climate changes makes a Harvey-level storm in the Gulf Coast 1.5 to five times more likelier, and increases its rainfall by up to 19 percent. This study also estimated that if current trends continue, Harvey-level storms will be three times likelier by 2100, and could have their rainfall boosted by up to 50 percent. Sobering news.



Pennsylvania. A Princeton University study team has discovered that infants born within 1 kilometer of a fracking well are 25% more likely to have low birth weights (under 5.5 pounds) than infants more than 3 kilometers away. Fracking, a controversial method of natural gas extraction, is banned in Maryland and New York due to health concerns, but is embraced in Pennsylvania, which has over 10,000 fracking wells. This is some of the clearest evidence that fracking can harm local communities. The study was led by health economist Janet Currie and was published in *Science Advances*. Professor Currie hypothesizes that air pollution or increased industrialization from the wells may be responsible for the low birth weights, as most water sources in the study were not near fracking wells.

Zanzibar, Tanzania. A team of scientists from the Wildlife Conservation Society has just completed the first population-wide census of the Zanzibar red colobus monkey (pictured), an endangered species that lives only in the Zanzibar archipelago, a part of Tanzania. They found over 5,800 individuals, over three times as many as previously thought, but also discovered that infant survivorship is low and that hunting and deforestation threaten the species' future. They also found that 69% of the monkeys already live in reserves, and groups there are larger and have more females. The researchers suggested making the monkey the official animal of Zanzibar to raise awareness about the species.





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Australia (1). The crest-tailed mulgara (pictured) is a species of carnivorous marsupial closely related to the Tasmanian devil. Long thought locally extinct in the state of New South Wales, it was recently rediscovered in Sturt Natural Park by a team of scientists from the Wild Deserts project. Wild Deserts seeks to fence off parts of the park to exclude invasive species, creating a safe place to reintroduce several native Australian marsupials, including the burrowing bettong, the Western barred bandicoot, the greater bilby, and the Western quoll. Wild Deserts is also planning to reintroduce the crest-tailed mulgara, but nature has beaten them to the punch. Great news!



Australia (2). Corals around the world are doubly in danger from human carbon emissions, as climate change-induced warm waters kill the algae inside them and a chemical reaction between carbon dioxide and seawater acidifies their homes, melting their calcium skeletons. Much of the northern part of the Great Barrier Reef in Australia has already been “bleached out” by warming seas. Now, a team of scientists are working to collect and freeze coral sperm in order to preserve their genetic diversity for the future. The Taronga Conservation Society of New South Wales and the Smithsonian Conservation Biology Institute are working together on the project, which aims to collect sperm from all of the approximately 400 species of coral in the Great Barrier Reef. They are making progress—a recent expedition to Heron Island collected 171 billion sperm from 31 coral colonies of 8 species, and have collected enough sperm to account for a large part of the genetic diversity of 16 species over the last six years. The researchers are also working on methods to freeze the larger and more fragile coral eggs, and possibly even coral larvae. Once frozen, the sperm could theoretically last for centuries.

Republic of Congo. For the past twelve years, Benjamin Mbondo, known as “Benz,” has been operating as an infamous poaching and ivory smuggling kingpin in the northern Republic of the Congo. He was finally arrested in August 2017, and during questioning confessed to involvement in multiple poaching expeditions in Nouabale-Ndoki National Park, including one that led to the murder of two elephants and the theft of 75 kilograms of ivory. The local authorities also obtained information that allowed them to identify 17 other members of his gang. Now, the notorious poacher has been sentenced by a local court: he will serve five years in prison and pay a fine of 1.2 million Central African francs (about \$2,100). His arrest is a sign that the Republic of Congo is finally cracking down on wildlife crime.



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China. On December 19th, China launched the world's biggest carbon market, almost twice the size of the EU's and ten times the size of California's. Carbon markets are a highly effective market-based method of reducing emissions, in which companies are given permits to emit a certain amount of carbon and pay a fine if they exceed those permits. However, they can also sell their unused permits to companies that exceed the limits, creating a financial incentive to go green. So far, China's carbon market only applies to the electricity generation sector, but is set to expand to other carbon-intensive parts of the economy. This is a major step forward in the fight against climate change, and further highlights America's embarrassing backsliding on climate commitments. As former Secretary of State John Kerry said regarding China's climate efforts: "There's no grass growing under the feet of the Chinese." Great news!



Mozambique. Bazaruto Archipelago National Park, in Mozambique, is a jewel of an ecosystem, home to whales, dolphins, sea turtles, manta rays, over 2,000 species of fish, and some of the last dugongs (pictured) in the western Indian Ocean. However, since its establishment in 1971, new threats have burgeoned in the park: illegal fishing, uncontrolled tourism, and uncontrolled resource extraction. Now, the Mozambican government has turned over administration of Bazaruto to African Parks, an NGO that specializes in bringing order to national parks in peril. African Parks has plans to train locals in tourism and help them launch new businesses in order to create legal income sources, as well as instituting airborne surveillance to help rangers protect the park. They also plan to monitor local species' conservation status. Great news!



Brazil/UK. Brazil's government has approved PM 795, a bill that allows offshore oil drilling in the "pre-salt region" of its coastline and offer huge tax breaks to oil companies. This is bad news in itself, but Greenpeace has leaked diplomatic telegrams that reveal an extra layer of intrigue: the UK apparently lobbied the Brazilian government on behalf of major oil companies like BP and Shell. This is a blatant violation by both countries of the purpose and spirit of the Paris Accords, as exploiting all of the oil in the pre-salt region would emit 74.8 billion tons of carbon, potentially enough to ruin the Paris Accords' goal of keeping warming beneath 2 degrees Celsius. It is to be hoped that legal challenges, public outcry, and/or victory of a more environmentally conscious candidate in Brazil's 2018 elections prevent this outcome and keep that oil in the ground.



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Biobanking, De-Extinction, and Long-Term Future Planning in Conservation

Special Supplement Article

By Sam Matey.

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San Diego's Frozen Zoo. The Svalbard Global Seed Vault (pictured). The coral sperm bank discussed earlier in this newsletter. These are just a few high-profile examples of biobanking, a technique that is increasingly important in conservation. The basic principle of conservation biobanking is collecting genetic material (usually in the form of sperm, eggs, embryos, or seeds) from a species in danger of going extinct or losing much of its genetic diversity. That genetic material is then stored (usually by freezing it) so that it is preserved for the future.



For some species, biobanking may already be their greatest chance at survival. The vaquita, the world's smallest species of porpoise, is critically endangered, with less than 30 individuals remaining in a small corner of the Gulf of Mexico. Vaquita CPR, a recent attempt to capture vaquitas for captive-breeding, failed when they found that vaquitas become too stressed out in captivity to ethically keep them there. However, Vaquita CPR did manage to take some tissue samples, some of which they sent to the Frozen Zoo, a major biobank in San Diego. The Frozen Zoo also hosts cells from the po'ouli, a Hawaiian honeycreeper that went extinct in 2004. The po'ouli now only exists as frozen cells in San Diego, and the vaquita looks like going the same way. However, those cells' existence offers hope that they may someday be reborn.

Continued efforts to biobank endangered species are extremely important, but it may now be time to begin addressing the next phase of such projects: de-extinction. Only one animal has been successfully brought back from extinction: the Pyrenean ibex in 2003. However, that infant lived for only a few seconds due to birth defects, and funding soon dried up. Today, the de-extinction project closest to success is arguably Revive and Restore's passenger pigeon initiative, which counts George R.R. Martin as a donor and famed ecologist Stewart Brand as a sponsor. There were no biobanks around when the passenger pigeon went extinct, but there is some viable genetic material preserved in museum specimens. R&R's lead scientist, Ben Novak, is currently using this material to mutate common rock pigeons to display traits similar to passenger pigeons. If his work succeeds, a new age of conservation will have dawned: one in which humanity has begun to fix its most irreversible-seeming mistakes.