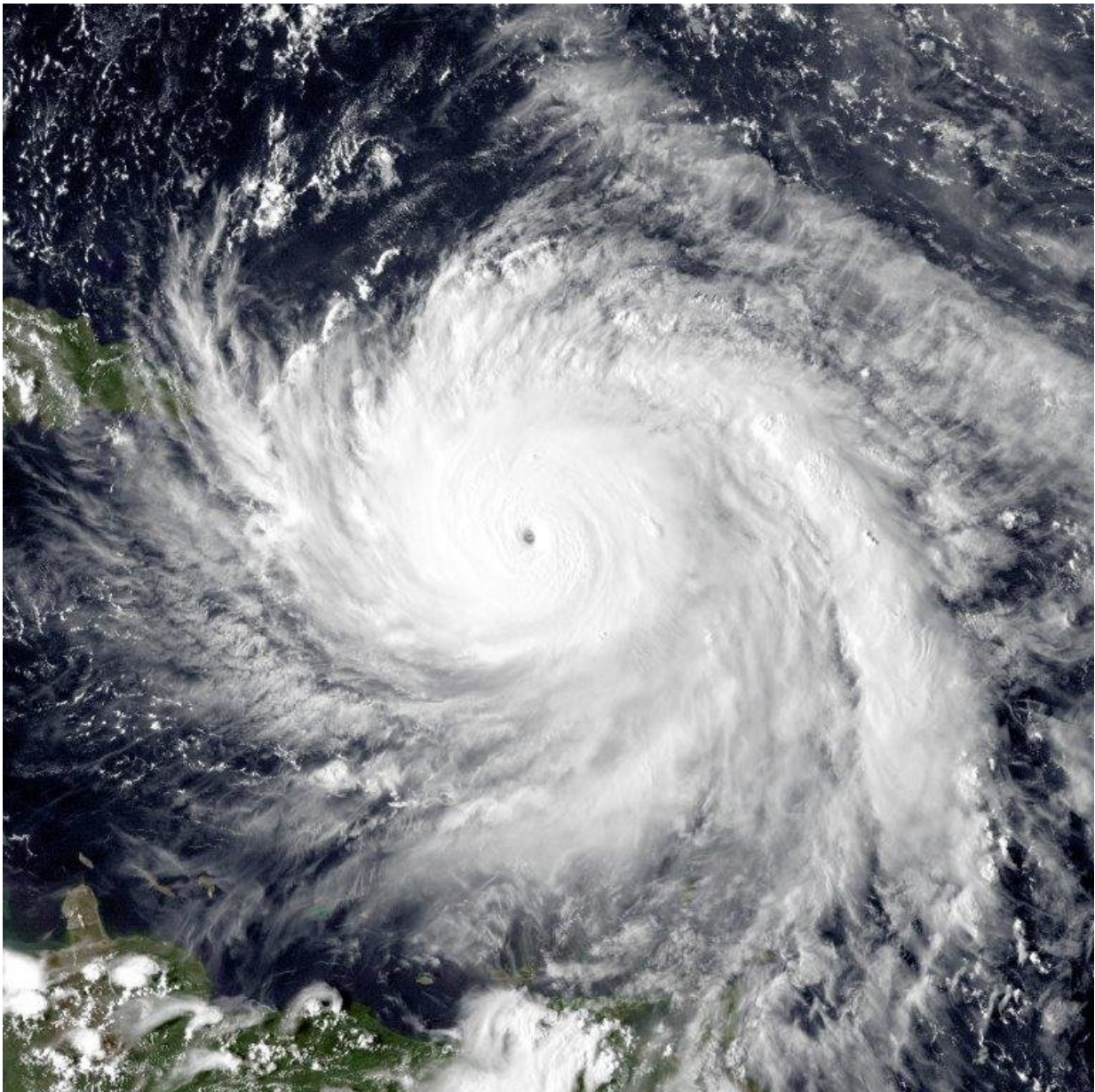


Hurricanes Irma and Maria temporarily altered choruses of land and sea animals

February 15 2018



Hurricane Maria near peak intensity, moving north towards Puerto Rico, on September 19, 2017. New research shows Hurricanes Maria and Irma caused a major disruption in the acoustic activity of snapping shrimp and a reduction in insect and bird sounds in southwestern Puerto Rico. Credit: Naval Research Laboratory/NOAA.

Audio recordings of Hurricanes Irma and Maria's passage over Puerto Rico document how the calls of coastal critters changed in response to the deadly storms. The hurricanes caused a major disruption in the acoustic activity of snapping shrimp, a reduction in insect and bird sounds, and potentially an intensification of fish choruses, according to new research presented at the Ocean Sciences Meeting Friday.

In March 2017, researchers set up acoustic monitoring sites in coastal forests and [coral reefs](#) on Puerto Rico's southwest coast to continuously record the area's ambient sounds. Their goal was to capture the region's land and sea soundscapes - especially the cacophony of sounds created by animal vocalizations - and document how and why they change over time.

But the passage of Hurricanes Irma and Maria over Puerto Rico in September gave the researchers an unexpected look at how coastal soundscapes change in response to natural disasters. Although the hurricanes did not directly hit the study area, [audio recordings](#) reveal the storms had noticeable short-term effects on fish choruses, snapping [shrimp](#) activity in coral reefs, and bird and insect calls on land.

The recordings show fish increased the intensity of their nightly choruses in the days following Hurricane Irma. The clicking of snapping shrimp, which are among the loudest animal noises in the ocean, plummeted during Hurricane Maria, and the daily snapping rhythm was disrupted

for several days.

In nearby dry forests, Maria had longer-lasting effects on the soundscape. There was a marked reduction in insect sounds during the three weeks after the [storm](#). Listen to time-lapse recordings of changes to insect sounds, fish choruses and snapping shrimp activity [here](#).

The results show how scientists can use the soundscape as a measure of biodiversity and environmental change, according to the researchers. Capturing responses from a variety of species at the same time can help scientists better understand how the ecosystem is affected as a whole, according to Ben Gottesman, a PhD candidate at Purdue University in West Lafayette, Indiana, and lead author of the new research.

"Sometimes you can't visually assess an impact, but you can certainly capture that through changes in the soundscape," said Felix Martinez, an ecologist and Program Manager at the NOAA National Centers for Coastal Ocean Science in Ann Arbor, Michigan, who will present the new findings Friday at the 2018 Ocean Sciences Meeting, co-sponsored by the Association for the Sciences of Limnology and Oceanography, The Oceanography Society and the American Geophysical Union. "We really need to understand when those changes are natural versus due to some kind of stressor, whether it's human or natural."

Similar to birds and frogs, fish call to find mates and defend spawning territories, producing choruses at specific times of day and specific times of the year. Gottesman suspects one reason the fish may have chorused more after Hurricane Irma—which coincided with the full moon—was because the water became very turbid, making it harder for them to be seen by predators.

While the fish increased their activity following Hurricane Irma, shrimp snaps declined steeply during Maria and rebounded in the first few days

after the storm. Snapping shrimp make a loud cracking noise with their claws to stun and catch prey. The snapping shrimp recorded in Puerto Rico displayed a very precise schedule of when they snapped the most, almost like clockwork, Gottesman said. After the storms, peaks of snapping activity at dawn and dusk were less pronounced, and it took several days for them to recover to pre-storm levels.

The researchers suspect the shrimp could have snapped less for several reasons. During the storms, the intense current and turbidity likely dissuaded the shrimps from seeking prey, or else the extreme turbidity muffled the high-frequency shrimp snaps. After the storm, Maria may have disturbed their rocky coral habitats, the shrimp could have been spending time cleaning out their burrows, or they may not have been able to see their prey when the water became turbid.

Post-storm recordings show the land and sea animals' vocalizations in this part of Puerto Rico, which was not in the eye of the storm, did eventually rebound to pre-storm levels. Maria was a catastrophic disaster, causing an estimated \$90 billion worth of damage, but the new findings show how resilient this coastal ecosystem was in response to the storm, according to the researchers.

More information: Abstract: Altered Soundscapes Help Reveal Hurricane Maria's Impact on Three Coral Reef Habitats off the Coast of Puerto Rico, agu.confex.com/agu/os18/meetin...app.cgi/Paper/332300

Provided by American Geophysical Union

Citation: Hurricanes Irma and Maria temporarily altered choruses of land and sea animals (2018, February 15) retrieved 24 July 2024 from <https://phys.org/news/2018-02-hurricanes-irma-maria-temporarily-choruses.html>

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