

Crash in sea-turtle births stumps ecologists

Leading suspect — climate change — doesn't fully explain what is happening to leatherback turtles in the US Virgin Islands.

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While buried in the sand, sea-turtle eggs are very sensitive to several environmental conditions that affect whether they hatch or not.

The mystery behind a dramatic fall in the number of leatherback sea-turtle (*Dermochelys coriacea*) hatchlings in the US Virgin Islands remains unsolved, despite the latest efforts of researchers. Rising temperatures and changes in rainfall patterns — the top two suspects — don't seem to be connected to the decline, according to a study published on 4 October¹. The finding contradicts previous work, leaving researchers scratching their heads over what could be happening.

The latest study focused on a nesting beach in the Sandy Point National Wildlife Refuge on St Croix island in the Caribbean Sea. The researchers found that about 74% of the leatherback sea-turtle eggs laid there in 1990 hatched, but that rate had plummeted to 55% by 2010.

The study analysed detailed temperature and precipitation data at these nests over the 20 years, and found no corresponding trend in either climate-change factor that could fully account for the decline. The researchers reported their results in *Royal Society Open Science*.

Increases in temperature and more-erratic precipitation patterns do affect the nests, but they aren't the sole reason for the hatching declines, says Anthony Rafferty, a marine biologist at Monash University in Melbourne, Australia, and a study co-author.

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This trend is especially confusing in light of the increase in the adult sea-turtle population. "The number of nesting females and the population size has been trending upwards at this site," Rafferty says. "But there's been a decrease in hatching success that we are worried about." That could have negative effects on leatherback populations within one or two decades, he says, when those hatchlings come of age.

Conundrum continues

"It's hard to say how much of that is happening because of climate change," says Vincent Saba, a climate scientist at the US National Oceanic and Atmospheric Administration in Princeton, New Jersey. He co-authored a 2015 study² that did find a relationship between air temperature, precipitation patterns and declines in leatherback hatching success. That study examined data from 1982 to 2010 and looked at seasonal rainfall, unlike the latest paper, which analysed rainfall only during the nesting season. The study predicted that, by 2100, Sandy Point would have the most unfavourable climate conditions out of all leatherback nesting sites around the world.

"I like the study. They looked at the effect of climate in finer detail," says Pilar Santidrián Tomillo, a marine biologist and science director of the Leatherback Trust, based in Playa Grande, Costa Rica.

She was a co-author on the 2015 study, and appreciates the fuller picture of what could be happening at Sandy Point that the most recent study has provided.

Sea-turtle eggs are exquisitely sensitive to climate because heat, carbon dioxide, oxygen and water all pass freely through their permeable shells. The surrounding temperatures determine the sex of the hatchlings: warmer conditions produce more females, whereas cooler conditions yield males. And rainfall can influence hatchling development and their ability to escape the nest, says Rafferty. Too little rain might mean that the sand is too dry for the young turtles to climb out of it; too much rain during the early stages of egg development might lead to a reduction in oxygen supplies to the growing embryo.

“I think changes in precipitation levels or patterns could explain the decline in hatching success partially, but there could be other reasons, too, like decline in fertility or increase in pollutants, for example,” Santidrián Tomillo says.

Rafferty, who specializes in embryo research, now plans to look at how the age and health of a female sea turtle might affect her fertility, or where she lays her eggs.

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