

# Warming temperatures threaten sea turtles

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This research suggests that that warmer temperatures associated with climate change may lead to higher numbers of female sea turtles and increased nest failure. Credit: Kostas Papafitsoros

The study by Dr Jacques-Olivier Laloë of the University's College of Science and published in the *Global Change Biology* journal, argues that

warmer temperatures associated with climate change could lead to higher numbers of female sea turtles and increased nest failure, and could impact negatively on the turtle population in some areas of the world.

## **The effects of rising temperatures**

Rising temperatures were first identified as a concern for sea turtle populations in the early 1980s as the [temperature](#) at which sea turtle embryos incubate determines the sex of an individual, which is known as Temperature-Dependent Sex Determination (TSD).

The pivotal temperature for TSD is 29°C as both males and females are produced in equal proportions - above 29°C mainly females are produced while below 29°C more males are born. Within the context of climate change and warming temperatures, this means that, all else being equal, sea turtle populations are expected to be more female-biased in the future. While it is known that males can mate with more than one female during the breeding season, if there are too few males in the [population](#) this could threaten population viability.

The new study also explored another important effect of rising temperatures: in-nest survival rates. Sea turtle eggs only develop successfully in a relatively narrow thermal range of approximately 25-35°C, so if incubation temperatures are too low the embryo does not develop but if they are too high then development fails. This means that if incubation temperatures increase in the future as part of climate warming, then more sea turtle nests will fail.

The researchers recorded sand temperatures at a globally important loggerhead sea turtle nesting site in Cape Verde over 6 years. They also recorded the survival rates of over 3,000 nests to study the relationship between incubation temperature and hatchling survival. Using local

climate projections, the research team then modeled how turtle numbers are likely to change throughout the century at this nesting site.



This research suggests that that warmer temperatures associated with climate change may lead to higher numbers of female sea turtles and increased nest failure. Credit: Kostas Papafitsoros

## **Research results**

Dr Laloë said: "Our results show something very interesting. Up to a certain point, warmer incubation temperatures benefit sea turtles because they increase the natural growth rate of the population: more females are produced because of TSD, which leads to more eggs being laid on the beaches.

"However, beyond a critical temperature, the natural growth rate of the population decreases because of an increase of temperature-linked in-  
nest mortality. Temperatures are too high and the developing embryos  
do not survive. This threatens the long-term survival of this sea turtle  
population."

The researchers expect that the numbers of nests in Cape Verde will  
increase by approximately 30% by the year 2100 but, if temperatures  
keep rising, could start decreasing afterwards.

The new study identifies temperature-linked hatchling mortality as an  
important threat to sea [turtles](#) and highlights concerns for species with  
TSD in a warming world. It suggests that, in order to safeguard [sea turtle  
populations](#) around the world, it is critical to monitor how hatchling  
survival changes over the next decades.

Dr Laloë said: "In recent years, in places like Florida—another  
important sea turtle nesting site—more and more turtle nests are  
reported to have lower survival rates than in the past. This shows that we  
should really keep a close eye on incubation temperatures and the in-nest  
[survival rates](#) of [sea turtles](#) if we want to successfully protect them.

"If need be, conservation measures could be put in place around the  
world to protect the incubating turtle eggs. Such measures could involve  
artificially shading turtle nests or moving eggs to a protected and  
temperature-controlled hatchery."

Climate change and temperature-linked hatchling mortality at a globally  
important sea turtle nesting site was published this week by *Global  
Change Biology*. Authors: Jacques-Olivier Laloë, Jacquie Cozens, Berta  
Renom , Albert Taxonera and Graeme C. Hays:

**More information:** Jacques-Olivier Lalo et al, Climate change and

temperature-linked hatchling mortality at a globally important sea turtle nesting site, *Global Change Biology* (2017). [DOI: 10.1111/gcb.13765](https://doi.org/10.1111/gcb.13765)

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