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Nest Moisture Content Affects Loggerhead Hatchling Size and Neonate Development

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How increased moisture levels and lower temperatures in nests lead to larger hatchlings and increased post emergence growth rates in southeast Florida

SOURCE: Chelonian Conservation and Biology
By Kelly Detmer ***7 December 2020***

Multiple environmental factors are known to impact embryonic development of sea turtles, including temperature, gas content, and sand moisture levels of their nests. Temperature specifically affects sex determination with higher temperatures producing a higher ratio of females to males. However, temperatures too hot can result in lowered hatch success for the entire clutch. Gas and moisture levels within nests regulate metabolic functioning and growth rates of the embryos, which also affects incubation time. Different combinations of these factors will have varying effects among individual nests, changes in which could give insights to long-term hatchling survival and population shifts of species.

A recent study by Erb *et al.* compared the effects of sand moisture content on the size of loggerhead hatchlings at emergence and postemergence growth rates over a three-month period. They designed an experiment that allowed eggs from the same clutch to be exposed to two different environmental conditions. Researchers relocated and divided naturally laid clutches into two separate egg chambers, allowing one group from each nest to experience only ambient rainfall while the other group received daily watering in addition to natural rainfall. Upon emergence, hatchlings from both groups were collected and reared under the same conditions in a laboratory where individual growth rates could be monitored.

Environmental data from the nests showed that nests with lower moisture were hotter. Upon emergence, the hatchlings from wetter and cooler incubation environments were larger in three different body size measurements. After rearing conditions were standardized across all hatchlings over approximately three months, those from the wetter nests still showed increased growth rates in one body size measurement.

This is the first time that incubation environment has been shown to have lasting impacts on loggerhead hatchlings beyond embryonic development and initial emergence from the nest. Wetter and cooler nests produce larger hatchlings and could improve early survival rates. Bigger initial body size on top of faster growth rates provides immediate advantage by reducing the number of predators that hatchlings are vulnerable to. On the other hand, hatchlings that experience hot and dry conditions during incubation could be more susceptible to the elements and predators. Depending on how local weather conditions are altered, climate change could play a big role in the success of sea turtle hatchlings and long-term species survival.

In some locations climate change is predicted to increase temperature and reduce seasonal rainfall, which will almost certainly have lasting negative impacts on hatchling development and survival rates. Identifying conditions that provide early advantages or disadvantages to neonatal turtles will help narrow and implement the most effective conservation strategies, such as watering nests. Understanding how environmental conditions affect nests will also help to provide more accurate predictions of population changes in loggerhead turtles and other threatened species.

Citation: Erb, V., A. Lolavar, and J. Wyneken. (2018). The role of sand moisture in shaping loggerhead sea turtle (Caretta caretta) neonate growth in southeast Florida. *Chelonian Conservation and Biology* **17**(2): 245-251, https://doi.org/10.2744/CCB-1301.1. Published on 18 December 2018.