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INFLUENCE OF LOGGERHEAD EGG AGGREGATION ON SURVIVAL: WHY DO SINGLE EGGS BURIED INTO NATURAL SAND DIE WITHIN A FEW DAYS

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Abstract

The incubation is an essential life period for oviparous species that very often experiences a high mortality. In some reptile species the number of eggs that develop together in the incubation chamber affects survival and hatchling phenotype. Sea turtle eggs develop in underground locations on sandy beaches in large masses that usually have more than 80 eggs. Natural egg mortality seems to vary among species and for the sensitive leatherbacks, external eggs seems to survive better than internal ones within the nest. In the present study we have evaluated whether aggregation have a beneficial effect on loggerhead egg incubation on sandy substrates as well as the spatial distribution of dead eggs within the nest for this species. In Cape Verde, nest incubation monitoring during several seasons (2008-2010) and over several hundreds of loggerhead nests either protected from predators on the beach or relocated to hatcheries show a typical mortality around 75-80 %. Clutch size for this population averages 85 eggs. However when we experimentally incubated single eggs (N=24) on incubators buried in wet sand (29.9 ºC), mortality was total. Most eggs died during the first days of incubation. Single eggs incubated in wet vermiculite in the same incubators and at the same temperature had a mean survival of around 95 %. Spherical masses of 13-14eggs (N=4) incubated on the incubators inside natural sand in the laboratory also suffered a high mortality that averaged 82 %. Survivors were always located in the center or the bottom of the small egg masses. Death eggs had embryos at different developmental stages and 22 % of them were almost fully developed. To evaluate in the field whether mortality also depends on egg position within the nest we analyzed 27 nests relocated to a hatchery immediately after laying. At day 45 of incubation the nests were opened and all eggs were individually extracted and observed. The position within the nest, and different external characteristics that indicates the viability of embryos were recorded. Then, eggs were reburied into the nest chamber and continued their successful incubation. Egg survival averaged 90 % but the distribution of dead eggs was no homogeneous within the nests ($P<0.01$). Only 3 % of eggs located in the center of the nest were dead. However, mortality was of 11 % of eggs located on the sides or the bottom of the nest and 15 % of eggs located on the top of the nest. To increase the volume/surface ratio of the relocated nests may improve their hatching success. Large clutch size on sea turtles is related to their explosive reproductive strategy and the large adult/hatchling size ratio. Large egg masses also are important to facilitate the emergence of hatchlings from the nest to the beach surface. Additionally it seems that large egg aggregations are necessary for a successful incubation on nesting beaches. We discuss possible causes to explain why eggs that had most of their surface with physical contact with the substrate died.