estuary, those located in the high zone near the vegetation only reached Stage I, while those located in the middle zone reached Stage II. These preliminary data suggest that studying differential hatchling success rates among different beach zones is an area that deserves further investigation. Our results also show that embryos categorized into earlier development stages weigh less than those in later development stages. Thus, categorizing embryos into development stages could be a useful tool in determining hatchling success rates and embryo development. However, the high standard deviations in the embryo weights within the defined development stages indicate that the methodology may need improvement.

BEACH AND NEST TEMPERATURES, AND ESTIMATES OF LEATHERBACK HATCHLING SEX RATIOS AT BIRD'S HEAD PENINSULA, PAPUA, INDONESIA

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Sex determination and hatching success in sea turtles is temperature dependent. Warmer sand temperatures may skew sea turtle population sex ratios towards predominantly females and high sand temperatures may also decrease hatching success. Therefore, understanding beach and nest temperatures is important for conservation programs, including the evaluation of the long-term impact of temperature changes. We recorded sand temperatures during the boreal and austral summer nesting seasons for eight years (2005 to 2012) to estimate sex ratios and evaluate hatching success at the two primary nesting beaches for the western Pacific leatherback (both located on Bird's Head Peninsula, Papua, Indonesia). We also measured rainfall, sand albedo, and sand particle size at both beaches during the main nesting months in 2009-2010. During the boreal summers (2005-2012), the daily average sand temperatures at nest depth (80cm) ranged from 26.4 to 34.9^{o}C. During the austral summers, sand temperatures ranged from 27.2 to 33.0^{o}C. Typically, the average monthly temperatures at nest depth were relatively warm suggesting the production of female-biased sex ratios. Furthermore, average monthly temperatures were very high during certain months, potentially lowering hatching success. Location, sand color, and vegetation affected sand temperature throughout the boreal and austral summer nesting seasons; the lower-open beach sections with dark grey sand were significantly warmer (0.5-3^{o}C) than the white sandy beach and the upper beach section adjacent to the vegetation. Rainfall occurs throughout the year at Bird's Head and had a significant episodic effect resulting in decreasing sand and nest temperatures. The size distribution of sand particles was similar among beaches with predominantly small particle size (500um or less). Thermal absorbance varied between beaches, with the highest absorbance occurring on beaches with darker sand (Wembrak of Jamursba Medi and Wermon). Nest temperatures were positively correlated with beach temperatures and increased up to 2.9^{o}C above sand temperatures during the later part of incubation due to metabolic heating. Histological examination of dead hatchlings from the boreal and austral summer nesting seasons in 2009-2010 produced a female-biased sex ratio. This finding is consistent with the relatively warm thermal profiles of the majority of the nesting beaches. This also included some extremely warm sand temperatures that were associated with lower hatching success. However, certain areas of the nesting beaches (the white sandy areas and also some vegetated areas in the upper zones of the dark grey beach) were relatively cool, resulting in high hatching success potentially producing both male and female hatchlings. Information from this study provides a foundation for developing conservation strategies for enhancing hatchling production with optimal sex ratios at the most important nesting beaches for the western Pacific leatherbacks. Further, this information represents the initiation of a long-term database that can be used at a local level to develop strategies that could potentially offset the impact of long-term climate change on the Pacific leatherback turtle.

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