Nesting Biology

HONU RESILIENCE: REPRODUCTIVE BEHAVIORS MAY BUFFER IMPACTS OF CLIMATE WARMING IN THE WORLD'S HIGHEST-LATITUDE GREEN TURTLE (*CHELONIA MYDAS*) POPULATION

Jamie Adkins[1,2], Summer Martin[3], Marylou Staman[3], Camryn Allen[3], Mikayla Newbrey[1], Andrew Glinsky[3], Elizabeth Clark[1], Mary Rutter[1], Kayla Evans[1], Peter H. Dutton[4], Amy Frey[4], T. Todd Jones[3], Lisa M. Komoroske[1]

[1]University of Massachusetts, Amherst, Massachusetts, United States of America
[2]Marine Mammal and Turtle Division, Southeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Miami, FL, United States
[3]Pacific Islands Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Honolulu, HI, United States of America
[4]Marine Mammal and Turtle Division, Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, La Jolla, CA, United States of America

Anthropogenic climate change impacts wildlife on a global scale. For sea turtles, which rely on terrestrial habitats for reproduction and exhibit temperature-dependent sex determination, there is widespread concern that warming sand temperatures may drive sex-ratio skew and eventual population collapse. Breeding sex ratio (BSR) is a key parameter for modeling population viability and informing management decisions, but is poorly understood for many sea turtle populations. Importantly, reproductive behaviors (e.g., sex-specific differences in remigration interval, polygamy, paternal contribution modes) can alter BSR and potentially buffer against the negative effects of sex ratio skew, but are challenging to robustly quantify in larger, wild populations. Hawaiian green turtles, or honu, comprise an ideal study system for quantifying how reproductive behaviors affect BSRs as honu have been extensively monitored for decades and are one of the few green turtle populations that exhibits male basking behavior, thus facilitating bio-sampling of males. It is also the highest latitude nesting rookery of green turtles globally, making it a potential key refugia population for the species. Here, we quantified honu mating strategies and BSR using 2,470 hatchling samples with known mothers (n=147 females) and males sampled while basking on the nesting beach (n=136) over a 3-year breeding cycle (2021-2023). Using a high-throughput Single Nucleotide Polymorphism panel we developed for genotyping and pedigree reconstruction, we found that the current BSR in honu is male-biased (1.00F:1.86M). The male-biased BSR in honu is likely due at least in part to complex reproductive behaviors, including high rates of multiple paternity (>65% of all nests), more frequent breeding by males, and substantial polygyny within a breeding season. We provide the first genetic evidence to our knowledge of male green sea turtles siring offspring in consecutive years as well as providing genetic evidence of polygyny, which has been rarely documented for green turtles. These findings collectively support that a 1F:1M sex ratio may not be required for population sustainability, and the reproductive behaviors identified here are likely positive indicators for the persistence of honu as nesting beaches continue to warm. However, continued monitoring is needed to understand possible impacts of time lags; because sea turtles are long-lived and reach sexual maturity around 25 years old, adult BSR does not necessarily reflect the current primary sex ratio, which is unknown for honu. Monitoring is also required to assess emerging environmental and human-caused threats on population persistence. Our study provides critical but previously unknown metrics that will be used to build more robust population viability models for honu and adds to the limited knowledge of reproductive strategy and adult sex ratios in green sea turtles.

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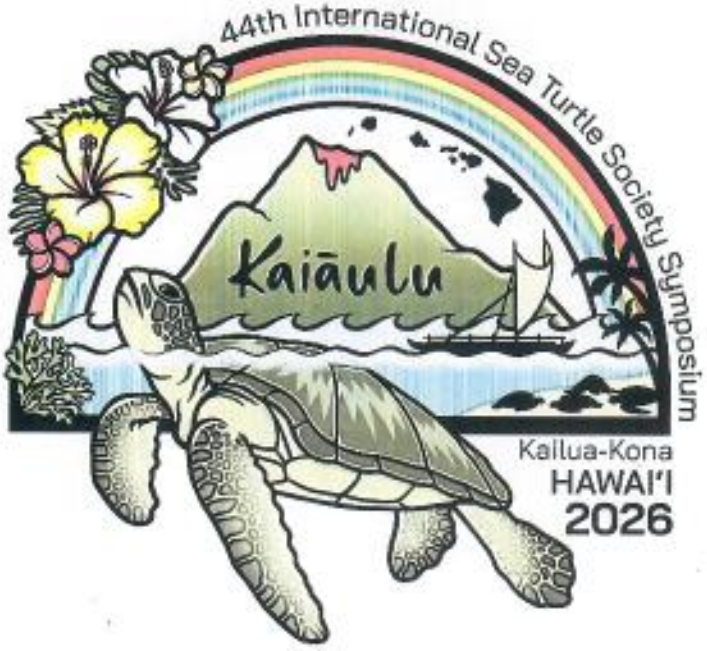

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Compiled by:
Paul A. Whittock, Lisa C. Belskis, & Joseph B. Pfaller

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