ENHANCING MARK-RECAPTURE METHODOLOGIES IN ORDER TO PRODUCE UPDATED POPULATION ABUNDANCE ESTIMATES FOR THE HAWAIIAN GREEN SEA TURTLE*

Shelbie Ishimaru[1,2,3,4], Janelle Badger[3], Devin Johnson[3], Marylou Staman[3,4], Andrew Glinsky[2,3,4], William Kendall[5], Summer Martin[3,4], Lisa McManus[1]

[1]Marine Biology Graduate Program, University of Hawai'i at Mānoa
[2]Cooperative Institute of Marine and Atmospheric Research, University of Hawai'i at Mānoa
[3]Protected Species Division, Pacific Island Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA) Fisheries
[4]Marine Turtle Biology and Assessment Program, Pacific Islands Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA) Fisheries
[5]U.S. Geological Survey, Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University

The Hawaiian green sea turtle (honu) population is a geographically isolated and genetically distinct population of green sea turtles (*Chelonia mydas*) found across the Hawaiian Archipelago. An assessment of the honu population abundance trend spanning 1973-2012 estimated a total of 3,846 breeding females and concluded that the population was recovering at 5.4% annually, but a global species status review in 2015 listed this population as threatened under the Endangered Species Act due to continued threats facing the population (e.g., vulnerability to climate change and lack of nesting habitat diversity). From 2018 to 2023 (excluding the year 2020 due to the corona virus pandemic), a saturation tagging effort identified 1,752 unique breeding individuals, less than half of what was estimated in the previous assessment. This finding necessitates updated abundance and trend estimates for the honu population. Thus, we are developing a new model using adult female mark-recapture data from Lalo within the Papahānaumokuākea Marine National Monument. Specifically we are using a Bayesian multi-state open robust mark-recapture framework to ultimately provide updated abundance estimates of the honu population. Current data inputs for this model are five years of female nesting data collected from East Island and Tern Island from 2018 to 2023. Use of the multi-state open robust mark-recapture model framework is motivated by sea turtles' unique reproductive strategy which includes a remigration interval and internesting interval. This leads to periods of unobservability where researchers are unable to resight individuals. The multi-state aspect utilizes four states to describe a honu's general movement through a nesting season. States in our model include: Reproductive Migration (movement from Main Hawaiian Islands to Lalo), Nesting (female honu hauling up on the beach to lay a clutch of eggs), Internesting Interval (the period between each clutch), and Migration Back to Foraging Grounds (migration from Lalo to the Main Hawaiian Islands). Initial model explorations identified capture probability and survival of individuals between nesting seasons as the primary drivers of population size estimates. For capture probability, this finding illustrates the importance of understanding and accounting for imperfect detection in nesting studies. Similarly, survival of individuals between nesting seasons exemplifies the importance of multi-year datasets capable of observing individual turtles across multiple nesting seasons. Although challenging to collect for sea turtles, such datasets allow researchers to reliably estimate the remigration interval and refine other important demographic parameters like internesting interval and total nests per year. Next steps for the model are to incorporate more survey data from long-term monitoring efforts by NOAA Pacific Islands Fisheries Science Center. Leveraging this dataset will be highly insightful in assessing the current population trajectory for honu along with updating our understanding of internesting and remigration intervals. Incorporating data not collected under a saturation tagging effort will also allow for evaluation of the impacts of survey effort on abundance estimation and investigate the level of effort needed to produce reliable estimates.

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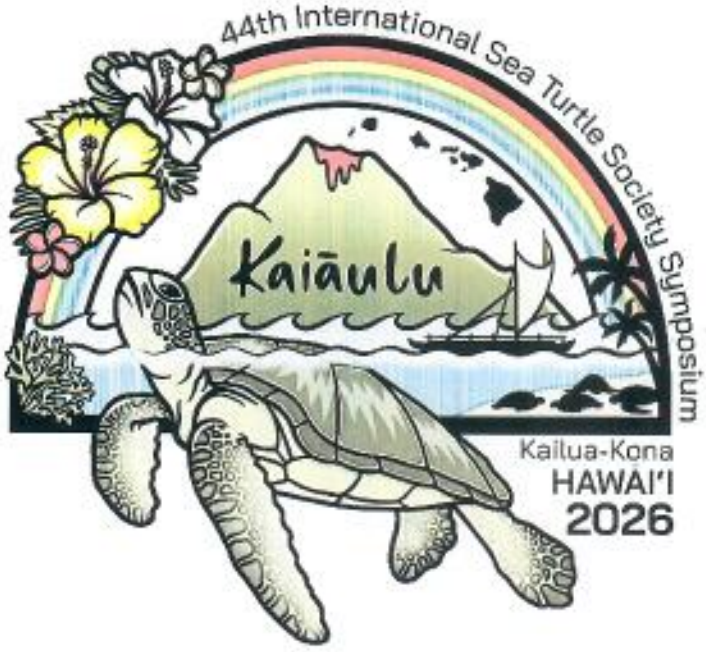

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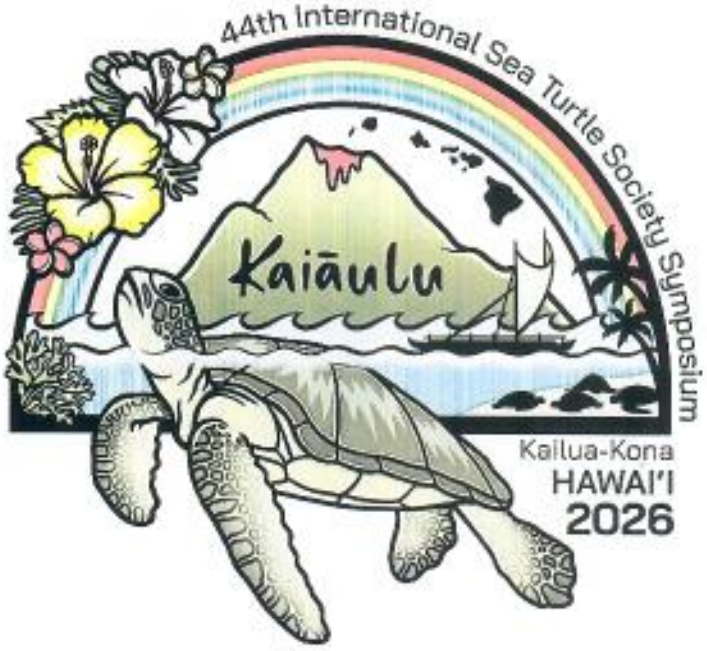

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