region. The observed migration loops and current alignment suggest that the CP-G shapes hawksbill dispersal, likely reduces transit costs, and maintains habitat connectivity across EEZs. Understanding these mechanisms supports coordinated regional management and the recovery of this critically endangered species.

MAKE EFFORT COUNT: GENERATING REPRESENTATIVE MARK-RESIGHT DATA AND APPLYING A STANDARDIZED SITE FIDELITY INDEX TO STUDY GREEN TURTLE FORAGING AGGREGATIONS

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Determining population dynamics and site fidelity of marine turtles in foraging habitats is crucial for effective conservation management, yet few in-water survey designs highlight the importance of statistically robust mark-resight aggregation data. We carried out standardized snorkel photo-ID surveys to generate representative mark-resight histories for green turtles at two adjacent reef sites on Liuqiu Island, Taiwan, across nine quarterly sampling periods (October 2020–November 2022; 105 surveys). We recorded sightings, of which 3,845 (92%) were photo-ID valid, identifying 398 individuals, and the majority (65.4%) were juveniles. To evaluate representativeness, we compared four survey designs (Single-, Double-, Triple-, and > Triple-event) using coverage-based sampling coverage (iNEXT model). > Triple-event surveys (six survey events every three months) achieved > 95% sampling coverage and produced a 1.7-fold higher resighting rate than conventional single-event surveys (one survey event every three months). Detectability varied with tide cycles: flood and high tides had the most sightings, while flood and ebb tides yielded more unique individuals, indicating that tide cycle can bias inference if not accounted for. Using the representative mark-resight dataset, 82% of turtles (n = 327) were resighted on different days, including multi-year stays (>2 years for 16%). The total number of turtles recorded across both sites per sampling period ranged from 75 to 253 (mean 168.8), indicating a large and stable aggregation. We then applied the Standardized Site Fidelity Index (SSFI) to turtles for the first time (range 0–0.0827; mean 0.024) and identified two fidelity groups via one-dimensional hierarchical clustering. Adult-sized turtles had lower SSFI values than juveniles and subadults, consistent with an ontogenetic expansion of home range. Interstudy comparisons using open-access photo-ID data suggest that absolute SSFI values are not directly comparable across datasets because SSFImax varies with sampling frequency and study duration; thus, comparisons should emphasize distributional patterns (e.g., skewness and variability). It also highlights the need for transparent effort metadata to facilitate interstudy comparison. Overall, combining routine sampling-coverage diagnostics, applying SSFI, and strengthening commitments to open data provides a practical framework for comparable site-fidelity inference and evidence-based conservation of foraging turtle aggregations.

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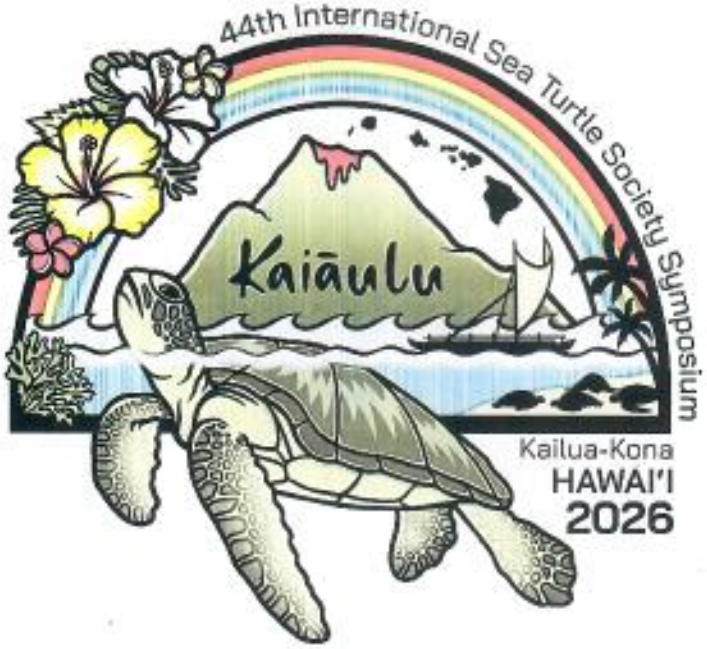

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