

Biodiversity Hotspots of Satellite-Tracked Marine Turtles in the Florida Keys National Marine Sanctuary

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Use of marine protected areas (MPAs) to preserve habitat for imperiled marine vertebrates is an important tool for conservation managers. The Florida Keys National Marine Sanctuary (FKNMS), one of the MPAs that comprises the U.S. National Marine Sanctuary System, was designated in 1990 in response to a series of ship groundings, mounting threats from coral disease, and declining water quality. The sanctuary covers 9,947 square kilometers of waters surrounding the Florida Keys; these waters are part of the Greater Everglades Ecosystem and include the third largest coral barrier reef ecosystem in the world with more than 6,000 species of marine life and important cultural resources. In order to assess the use of habitats within FKNMS by marine turtles, we satellite-tracked 200 imperiled marine turtles from 2008-2021 including threatened loggerheads (*Caretta caretta*), endangered green turtles (*Chelonia mydas*), endangered hawksbills (*Eretmochelys imbricata*), and endangered Kemp's ridleys (*Lepidochelys kempii*). Tagging sites were located in Florida (Florida Keys, Dry Tortugas National Park, Everglades National Park, Biscayne National Park, Broward County), Alabama (Gulf Shores), and the Yucatan, Mexico. We used various movement modeling tools including a switching state-space model, utilization distributions, and kernel density estimation (KDE) techniques to quantify turtle habitat use. We overlaid individual turtle KDE polygons onto a 5 km x 5 km grid of the study area, which covered the continental shelf on both coasts of Florida from Tampa Bay in the north to ~ 75 km south of Key West. We then summed overlapping polygons in each non-zero grid cell and enumerated these values visually to show counts of species and diversity of tagging locations. Finally, we visualized the turtle high-use zones within FKNMS. Multispecies hotspots were located both inside (60%) and outside (40%) currently designated national wildlife refuges, FKNMS, and national park boundary lines. Several important hotspots serve as year-round habitat for adult marine turtles, including Dry Tortugas and an area to the east of the Marquesas in the Key West National Wildlife Refuge. This unique geospatial dataset provides managers with a marine spatial planning tool, as currently proposed sanctuary protection areas and other areas of human use may be evaluated against high biodiversity zones that have persisted across 14 years of telemetry studies.