USING MARINE TURTLES TO IDENTIFY HABITAT AND ASSESS CONNECTIVITY OF THE AUSTRALIAN NORTH AND NORTH-WEST MARINE PARK NETWORKS AND SEA COUNTRY*

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Marine turtles predominantly feed on the benthos, consequently their foraging locations identified by satellite telemetry may be useful to identify benthic communities. Given turtles are highly migratory, their movements can also inform how connected marine ecosystems are across multiple spatial management units. We compiled satellite tracking data for four marine turtle species: green (*Chelonia mydas*, n=126), flatback (*Natator depressus*, n=164), hawksbill (*Eretmochelys imbricata*, n=59) and olive ridley (*Lepidochelys olivacea*, n=27) turtles from 2000-2018, and modelled benthic habitat data from Northern Australia. Tracking data were used to build species-level movement network models to identify connectivity among marine spatial management units (State, Indigenous and Commonwealth managed Marine Parks (AMPs) and nesting grounds) across the North (N) and North-West (NW) Marine Regions of Australia. We also quantified the foraging areas and overlaid them with the habitat data to assess how well turtle foraging areas can be used to identify benthic habitats by calculating simple spatial overlap as well as assessing statistical relationships using regression. Green and flatback turtles displayed a high degree of connectivity across all spatial management units between and within the N and NW, while hawksbill and olive Ridley turtle networks connected spatial management units within the N and NW only, with limited connection between them. There was only low overlap between turtle foraging and marine parks in the N but there was a paucity of turtle tracking data available for the N. The links between spatial management units suggests a need for collaborative management. The percentage overlap of the core foraging area (50% KUD) of the turtles with the habitat data ranged from 4.2 to 33% in the North-West and 11 to 42% in the North. Green and hawksbill turtle 50% KUDs overlapped hard coral, macroalgae, seagrass, filter feeders, turfing algae, and bare substrate habitats. This was in line with their documented habitat and diet. For olive Ridley and flatback turtles, their 50% KUD predominantly overlapped bare substrate habitat (78% and 56%

respectively) with much lower contributions of the other habitats. We conclude that turtle species with lower association with soft bottom habitats such as green and hawksbill turtles, are the most useful at indicating important habitat. While the spatial overlap analysis has shown that foraging turtles can inform on the occurrence of benthic communities, our regression analysis between the probability of green and hawksbill turtle foraging and proportion of underlying coral reef and seagrass habitat indicated positive relationships in only a few small areas. This was most probably due to a mismatch in the scales between the data types; km's for turtle tracking data compared to m's for the habitat maps. Areas within and adjacent to the Limmen and Gulf of Carpentaria AMPs within the North network, and Eighty Mile Beach, Roebuck and Kimberley AMPs within the North-West network had the highest turtle foraging activity and are thus likely locations that have important sensitive benthic communities (e.g., seagrass, hard and soft corals) and where future benthic habitat mapping can be targeted to validate foraging turtles as habitat indicators.

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