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Demographics of an Island-Associated Manta Ray (*Manta birostris*) Population in Maui, Hawaii, and Implications for Management

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During 2005 - 2007, 187 individual manta rays were photo-identified from a single cleaning station site in Maui, Hawaii. A discovery curve showed no asymptotic trend, indicating the number of individuals using the site is considerably larger than the total identified. Of these individuals, 58% were observed on more than one occasion within and across years, suggesting philopatry to this area. Males accounted for 47% of the individuals in the population, of which 69% were considered sexually mature based on the claspers extending beyond the pelvic fins. The average encounter rate per dive was 5.50 manta rays per hour. They were habitually absent at first light, with encounter rates increasing throughout the day. No matches were found when compared against 133 individuals photo-identified from a well-studied population off the Big Island (www.mantapacific.org), a distance of only 60 miles. Evidence of shark predation was seen in 12% of the population, and 6% had a missing or non-functional cephalic fin, likely caused by entanglement in monofilament fishing line. During an intensive survey period from September to December 2007, a mean of 140 individuals (95% CI = 119-175) was estimated to be using the area at this time. Estimated annual apparent survival (survival minus emigration) was 0.77 (95% CI = 0.65 – 0.86). These findings are consistent with a population of manta rays moving into and out of the cleaning station vicinity, with a varying portion of the total population temporarily resident at the study site at any given time. These findings add further support to the existence of demographically independent, island-associated populations in Hawaii. The lack of protection for these populations makes them vulnerable to impacts from target and non-target fisheries, and from exploitation of manta ray aggregation sites by commercial scuba diving operations. Management on an island-area basis is recommended.