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Regional connectivity of whale sharks demonstrated using photo-identification – Western Atlantic, 1999 - 2013

Background: Although whale sharks (*Rhincodon typus)* occur circum-globally, most studies focus on feeding aggregations in small regional areas. Photo identification is a proven tool in assessing population size and structure. While population estimates have been obtained for individual aggregation sites, there has been a lack of broader estimates despite known movement. The aim of this work is to demonstrate connectivity throughout the Gulf of Mexico (GOM) and Caribbean, and provide the first regional population estimate.

Methods: Photographs submitted to the ECOCEAN Whale Shark Photo-ID Library Sightings were used to identify individual sharks using techniques described in Holmberg et al. (2009). Sightings data were used to assess the lagged identification rate (LIR) in order to investigate residency, regional mixing, population size, and transition probabilities using modules within SOCPROG 2.4.

Results: Identifications from 1998 – 2013, were obtained from Belize (n =132), Mexico (n=3642), Honduras (n = 360), and the USA (n=147). Fifty-four individual sharks were seen in more than one country and used for analysis. For the entire study area, LIR decreased rapidly between one and 64-127 (mean 94.4) days then slightly increased between 256-511 (mean 381.2) days, suggesting a near-annual resighting periodicity. Estimates of mean population size from the best-fitting model were 1897.39 ± 414.30 S.E. (95% C.I. 1191.77 – 2784.03). Evidence suggests individual heterogeneity in movement patterns. Resightings were most likely to occur in the country where initial identification occurred, with the exception of Belize. The highest site fidelity was in Mexico, followed by USA.

Conclusions: This study demonstrated individual heterogeneity, fidelity to initial identification site and regional linkages. These data suggest that national and regional cooperation is required for successful whale shark management in the West Atlantic.

Key Words: regional population estimate, movement, photo-identification