Seasonal habitat use of whale sharks in the northern Gulf of Mexico, USA 2003 - 2013

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Background: Reports of whale sharks (*Rhincodon typus*) in the northern Gulf of Mexico (GOM) date back to the 1930s. In 2003, the Northern Gulf of Mexico Whale Shark Research Program was established and began making directed efforts to document the regional occurrence, seasonal distribution and habitat preferences of whale sharks. **Methods**: Whale shark sightings data (WSS: 1989 – present; n=644) and tagging geoposition data (TD: 2009-2012; n=450) were used in seasonal kernel density (KD) analyses to delineate home range (95%) and core habitat (50%) use areas in the northern GOM. Kernel density estimation of distribution is a statistically robust manner of handling data sources with differing sampling designs (anecdotal vs. directed). Habitat use patterns from the two datasets were used to identify critical use areas. **Results**: In the study area, whale shark home range was 276,000 km^2 (WSS) to 369,000 km2 (TD) in size, with 52,000 km^2 (WSS) to 62,000 km^2 (TD) being core habitat. Whale shark habitat use varied seasonally, with the largest home range occurring during summer (WSS: 213,000 km^2) and fall (TD: 221,000 km^2). Tag data revealed more winter habitat (75,000 km^2) than the sightings dataset (41,000 km^2), which was shifted further offshore to slope waters. Significant use patterns occurred along the continental shelf-edge, encompassing shelf-edge banks south of Louisiana, and near the mouth of the Mississippi River. **Conclusions**: The combination of sightings data and satellite tagging data represents an effective methodology for assessing seasonality of occurrence, distribution, and habitat use of whale sharks. Shelf-edge bank habitats were most commonly used by whale sharks in the region. Satellite tagging data provided additional evidence of connectivity between multiple jurisdictions, which lends support for international management of the species.

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Key Words: Kernel Density, seasonal habitat use