**Tables**

Table 1.

Metadata for all acoustically tagged sharks, including animals that never recorded any detections. Summaries of each individual’s acoustic, visual census, satellite telemetry, and multimethod tracking data are included.

Table 2.

Generalized additive mixed models fit to the acoustic monitoring and visual census records. Models are ordered from lowest to highest by the Akaike Information Criterion (AIC). Models with the lowest AIC were used for all further analysis.

Table 3.

Metadata for all receiver stations. Summaries of each station’s raw detection record and Spatial Residence Index (Rspatial) values are included. Asterisks (\*) indicate that male and female values were found to be significantly different.

**Figures**

Figure 1.

Map of the acoustic array. Top-left inset shows the position of Shib Habil within the Red Sea. Bottom-center inset provides a zoomed in view of the offshore array. Receiver stations are represented by ● markers and are colored to show the regional divisions within the array as indicated by the legend in the bottom right.

Figure 2.

Visual and acoustic recapture odds vs (A) seasonality and (B) time lag. The dashed line represents the mean odds of recapture for both methods, putting the visual and acoustic data on the same relative scale. There are clear peaks for both methods in relation to seasonality, though the visual census data is restricted to the spring months when surveys were conducted. Recapture odds are comparatively flat in response to temporal lag, indicating high interannual fidelity in at least a few sharks.

Figure 3.

Visual and acoustic recapture probability over time for the mixed models’ “typical” Shib Habil shark. The acoustic model assumes maximum receiver effort throughout the study and both models assume that the hypothetical shark was tagged/photographed in 2010 and is of average size (4 meters). Annual peaks in recapture probability are clear for both methods and occur at roughly the same time each year but are consistently higher in the acoustic model.

Figure 4.

Map of the array with graduated symbols representing the number of detections per day of monitoring effort at each station. While detections are clearly not evenly distributed throughout the array, most stations show similar patterns of selection between the sexes. Only three stations reported significant sexual differences in either detection counts or Rspatial values. One station (shown in blue) recorded higher values for males while two (shown in pink) recorded higher values for females.

Figure 5.

The maps show representative movements by whale sharks tagged at Shib Habil including (A) Emigration from the Red Sea (three tracks shown), (B) seasonal migrations away from and returning to Shib Habil (two tracks shown), (D) Multiple return migrations (one track shown), and (E) apparent permanent emigration from Shib Habil (one track shown). The inset map in (E) also gives an example where no migration behavior was tracked. Finally (C) shows the latitudinal distribution of tracking data and number of tracked sharks for each month. The data is clearly concentrated around Shib Habil during the spring months associated with the aggregation, but is also largely confined to the southern central Red Sea throughout the year.