Report on spatial movements of great and scalloped hammerhead sharks in the US Atlantic and Gulf of Mexico using Satellite tags

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Report on spatial movements of great and scalloped hammerhead sharks in the US Atlantic and Gulf of Mexico using Satellite tags

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This report summarizes movement of great, *Sphyrna mokarran*, and scalloped, *Sphyrna lewini*, hammerhead sharks in the US Atlantic and Gulf of Mexico, prepared specifically in support of the SEDAR 77 HMS Hammerheads Stock ID assessment.

Movement data are generated from sharks equipped with SPOT tags (smart temperature and transmitting tags). Shark capture, handling, and tagging methods as well as initial data filtering follow Graham et al. (2016) and Calich et al. (2018).

Data for great hammerheads were synthesized for publication in Graham et al. (2016) and Calich et al. (2018). Data for scalloped hammerheads were summarized and published in the Final Essential Fish Habitat 5-Year Review for Atlantic Highly Migratory Species (NOAA 2015).

The focus of this report was to evaluate if any individuals of either *S. mokarran* or *S. lewini* that moved between the US Atlantic and Gulf of Mexico.

Table 1 and 2 provide the meta-data associated with all SPOT-tagged *S. mokarran* and *S. lewini*, respectively, including the location and date of tagging. The satellite tag identification number (SAT ID), sex, and size at capture for each individuals are also included. Table rows highlighted in yellow correspond to individuals tagged in the US Atlantic that transmitted positions from the Gulf of Mexico, indicating movement between the two ocean basins.

Figure 1 and 3 are plots of all raw satellite location data received from ARGOS for *S. mokarran* and *S. lewini*, respectively. Different individuals are color-coded, with SAT IDs corresponding to those in Table 1 and 2.

Figure 2 and 4 are plots of the raw satellite location data received from ARGOS for *S. mokarran* and *S. lewini*, respectively, but restricted to the individuals that travelled from the US Atlantic to the Gulf of Mexico. Different individuals are color-coded, with SAT IDs corresponding to those in Table 1 and 2.

Table 1. *Meta data associated with SPOT-tagged great hammerheads (S. mokarran) reported here. Position data from these individuals are reported in Figure 1 and 2. Table rows highlighted in yellow correspond to individuals tagged in the US Atlantic that transmitted positions from the Gulf of Mexico, indicating movement between the two ocean basins.*

SAT ID	Tag Type	Species	Total Length (cm)	Sex	Date Tagged (MM/DD/YYYY)	Latitude	Longitude
33933	WC-SPOT5	Great Hammerhead	277	M	06/04/2010	24.6974	-80.852269
33938	WC-SPOT5	Great Hammerhead	262	M	03/12/2010	24.6974	-80.852269
68470	WC-SPOT5	Great Hammerhead	244	M	11/13/2010	24.72615	-80.8513167
68472	WC-SPOT5	Great Hammerhead	287	F	01/29/2011	24.6974	-80.852269
68476	WC-SPOT5	Great Hammerhead	240	F	12/05/2010	24.6974	-80.852269
68480	WC-SPOT5	Great Hammerhead	265	F	01/29/2011	24.6974	-80.852269
68481	WC-SPOT5	Great Hammerhead	295	F	01/29/2011	24.6974	-80.852269
98328	WC-SPOT5	Great Hammerhead	235	M	02/20/2010	24.6974	-80.852269
98329	WC-SPOT5	Great Hammerhead	249	M	02/20/2010	24.6974	-80.852269
98331	WC-SPOT5	Great Hammerhead	251	F	02/07/2010	24.72615	-80.8513167
105597	WC-SPOT5	Great Hammerhead	345	M	02/19/2011	26.1	-79.1
105598	WC-SPOT5	Great Hammerhead	235	M	02/26/2011	24.72615	-80.8513167
106663	WC-SPOT5	Great Hammerhead	270	F	07/13/2011	24.66	-80.857
106895	WC-SPOT5	Great Hammerhead	277	F	08/05/2011	25.255	-80.229
106896	WC-SPOT5	Great Hammerhead	301	M	07/18/2011	26.632	-80.451
111546	WC-SPOT5	Great Hammerhead	304	M	04/20/2013	24.6974	-80.852269
111550	WC-SPOT5	Great Hammerhead	263	M	05/01/2012	25.22	-80.329
111551	WC-SPOT5	Great Hammerhead	335	M	04/20/2013	24.6974	-80.852269
128510	WC-SPOT6	Great Hammerhead	240	M	04/28/2013	25.653	-80.168
129955	WC-SPOT5	Great Hammerhead	250	F	06/21/2013	25.00644	-80.99969
129956	WC-SPOT5	Great Hammerhead	265	M	10/17/2013	25.911	79.063
130988	WC-SPOT5	Great Hammerhead	277	M	05/30/2014	25.77537	80.08533
141974	WC-SPOT5	Great Hammerhead	282	M	10/12/2014	25.62658	-80.34542
144021	WC-SPOT5	Great Hammerhead	235	F	03/07/2015	25.7522	-80.1683
144022	WC-SPOT5	Great Hammerhead	221	M	01/07/2015	25.78412	-80.0854
146599	WC-SPOT5	Great Hammerhead	249	F	03/15/2015	25.7522	-80.1683
157777	WC-SPOT6	Great Hammerhead	256	M	02/17/2016	25.8	-80.08
157779	WC-SPOT6	Great Hammerhead	284	M	03/16/2016	25.8105	-80.08445

Figure 1: *All raw positions received from ARGOS for SPOT-tagged S. mokarran.*

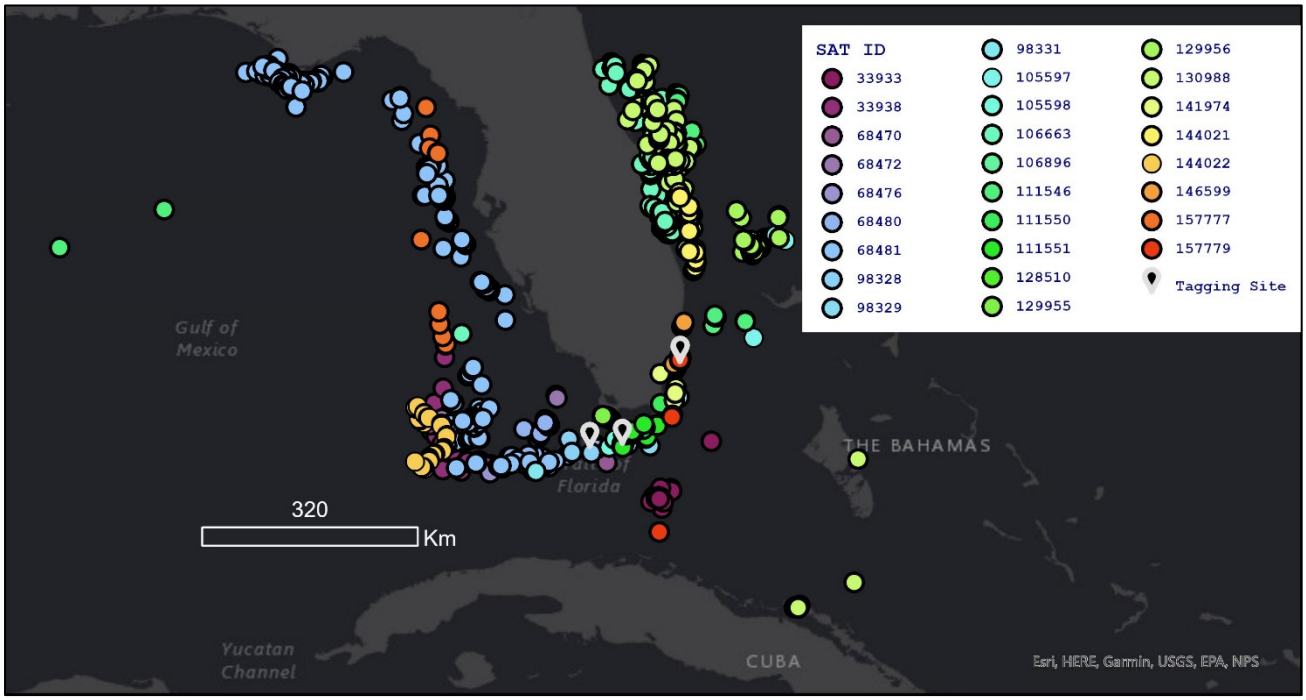


Figure 2: *Raw positions received from ARGOS for SPOT-tagged S. mokarran, restricted to individuals that travelled from the US Atlantic to the Gulf of Mexico*

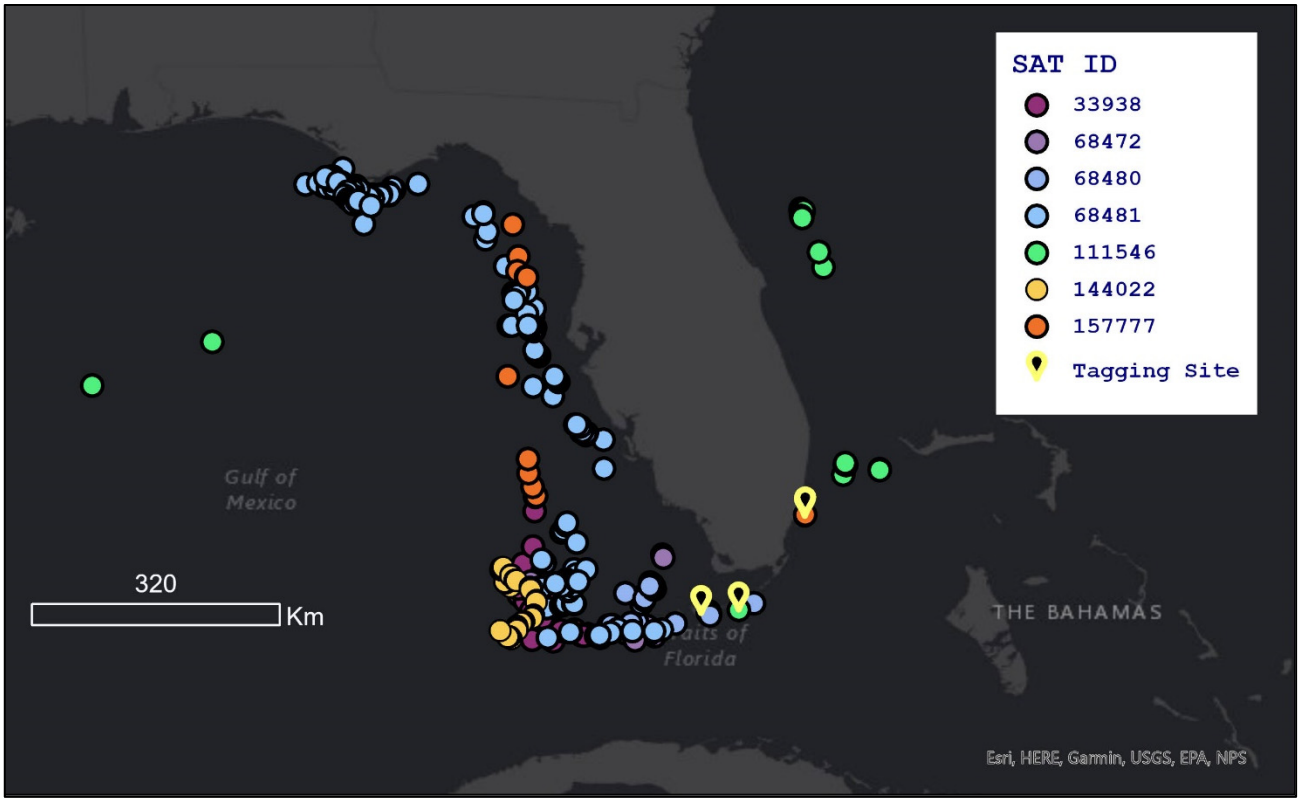


Table 2. *Meta data associated with SPOT-tagged scalloped hammerhead (S. lewini) reported here. Position data from these individuals are reported in Figure 3 and 4. Table rows highlighted in yellow correspond to individuals tagged in the US Atlantic that transmitted positions from the Gulf of Mexico, indicating movement between the two ocean basins.*

SAT ID	Tag Type	Species	Total Length (cm)	Sex	Date Tagged (MM/DD/YYYY)	Latitude	Longitude
33994	WC-SPOT5	Scallopped Hammerhead	200	F	03/17/2010	24.804883	-80.445817
106662	WC-SPOT5	Scallopped Hammerhead	255	M	04/30/2011	24.6974	-80.852269
111542	WC-SPOT5	Scallopped Hammerhead	335	M	05/10/2013	24.6974	-80.852269
111548	WC-SPOT5	Scallopped Hammerhead	350	M	04/12/2013	24.697	-80.852
128509	WC-SPOT6	Scallopped Hammerhead	243-274	M	03/17/2013	25.42862	-80.08315

Figure 3: *All raw positions received from ARGOS for SPOT-tagged S. lewini.*

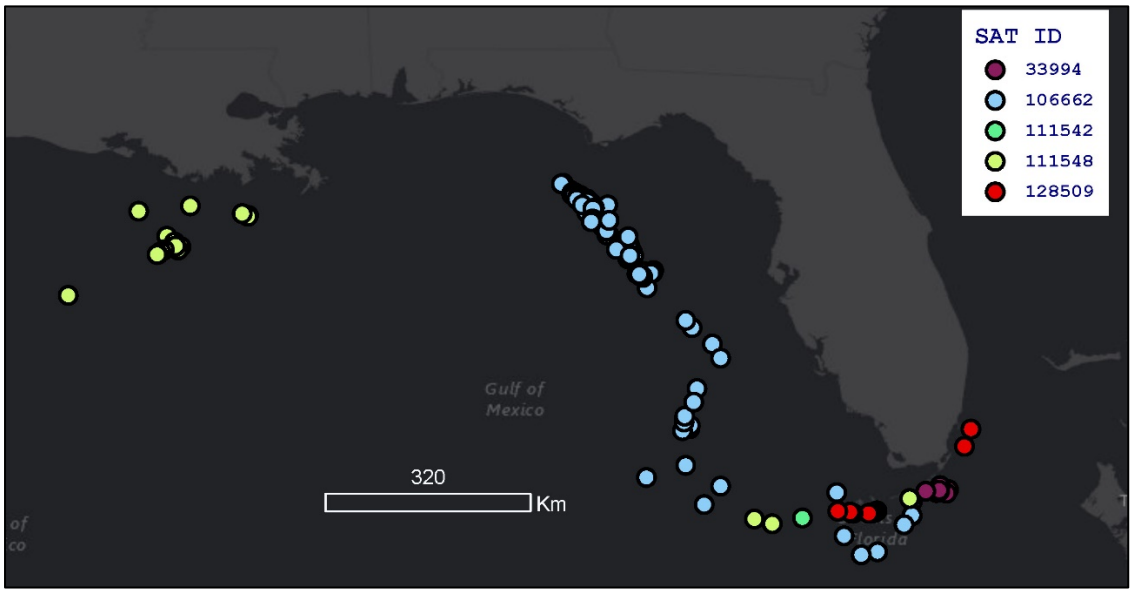
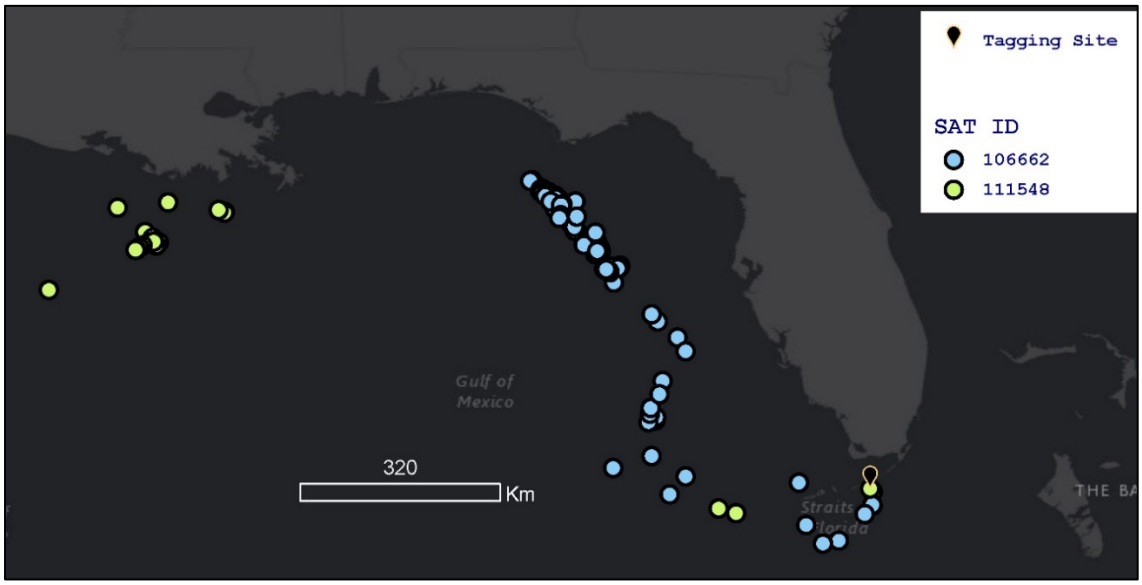


Figure 2: *Raw positions received from ARGOS for SPOT-tagged S. lewini, restricted to individuals that travelled from the US Atlantic to the Gulf of Mexico*



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