2013 Barataria Bay and Mississippi Sound Dolphin Tracking – Final Report

Order No: AB133C-11-CQ-0050 **Title**: Deepwater Horizon
Activity: A3i **MMST70/170** - *Estuarine Dolphins*
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Introduction

The Chicago Zoological Society (CZS), through its Sarasota Dolphin Research Program (SDRP), was contracted to provide expertise and logistical support for wild bottlenose dolphin capture-release health assessments in the Gulf of Mexico during 2013-2014. The work was performed in support of field and sampling needs for bottlenose dolphin health assessments conducted by the National Centers for Coastal Ocean Science (NCCOS) of NOAA's National Ocean Service and partners. The SDRP was tasked with deploying satellite linked tags on the dorsal fins of up to 40 of the captured dolphins in Barataria Bay, LA and Mississippi Sound, and taking responsibility for all aspects of remote tracking, including monitoring the tags throughout their transmission duration (from the date that the first tag was deployed until the date that the last tag transmission was received), and processing the data received. With regards to specific deliverables related to tagging and tracking, the SDRP was asked to:

1) Prepare satellite-linked tags for deployment, including tag programming and testing, and preparation of attachment hardware, including custom attachment pins and fasteners.
2) Provide daily reports, including maps to summarize signal locations for each transmitting tag for the first month following the deployment of the first tag in Barataria Bay (beginning as early as June 17, 2013) and Mississippi Sound (beginning as early as July 22, 2013). Reports were modeled on those provided to NOAA for comparable work in Barataria Bay in 2011.
3) Provide weekly reports, including maps, to summarize signal locations for each transmitting tag over the entire period of tag transmission, continuing until the last tag transmission is received. Reports were modeled on those provided to NOAA for comparable work in Barataria Bay in 2011-2012.
4) Provide an interim tracking report which includes synthesized location information and maps of signal locations, summarized movements of individuals, and estimated home ranges of individual dolphins using data from satellite-linked tags obtained through September 30, 2013. This report will be provided by October 31, 2013.
5) Provide a final tracking report that includes synthesized location information and maps of signal locations, summarized movements of individuals, and estimated home ranges of individual dolphins using data obtained through March 31, 2014. This report will be provided by April 30, 2014, and will be modeled on the final report provided to NOAA for comparable work in Barataria Bay in 2011-2012.

With the submission of this final report, (Objective #5), all five of the objectives were addressed. This report compiles the complete location records for each of the tagged dolphins, previously presented as daily and weekly updates (Objectives #2 and # 3). Tags and attachments were prepared, (Objective #1); 8 were deployed in Barataria Bay in June 2013, and 19 were deployed

in Mississippi Sound during July-August 2013. Signals were received through April 7, 2014, with the final tag transmitting over a period spanning 256 days (Objectives #2 and #3). It was decided that an interim report (Objective #4) was not necessary, given the weekly reports. The following information summarizes the movements and ranges of the tagged dolphins in Barataria Bay and Mississippi Sound over the entire period of remote tracking, based on the final Argos data provided to the SDRP on May 30, 2014 (Objective #5).

Materials and Methods

Tags and Attachments

We used SPOT-299B satellite-linked tags (Single-point Finmount, 2-Lay, Custom, Wildlife Computers, Redmond, WA) to obtain location data for the dolphins (Figure 1). In 2013, the tags were designed to both send transmissions to satellites for remote tracking, and to produce a signal that could be tracked directly in real time. Each tag included a UHF beacon that sent out low power, very short, unmodulated pings at the same frequency as the Argos transmissions, in the 400 MHz range. These signals were designed to be located in the field by a direction finding receiver and antenna.

The 2013 tag was 10.5 cm long, 2.0 cm wide, 2.5 cm high, weighed 62 g, and had a flexible 17.3 cm-long antenna (Figure 1). Plastic wings, 6.5 cm-long x 2.0 cm-tall, extending forward from the tag body were positioned on each side of the trailing edge of the dorsal fin, with a matching 5/16" diameter hole in each for attaching the tag 3.5 cm from the fin's trailing edge. The basic shape of the tag was slightly different from that used in 2011 with Barataria Bay dolphins. The new version built on recent design developments where single pin attachments were used and follow-up observations were possible (Balmer *et al.* 2011, 2014; Wells *et al.* 2013a,b). Computational flow dynamics (CFD) tests performed by Laurens Howle (Duke University) prior to production of tags for the project resulted in shape and configuration refinements leading to significant reduction in drag as compared to previous designs (Wells *et al.* 2013b). Each tag was coated with Propspeed™ to reduce biofouling (Wells *et al.* 2013b).

Tag attachment to the dorsal fin was identical to the approach used with Barataria Bay dolphins in 2011 (Wells and Balmer 2012). The attachment pin was a 5/16" Delrin pin, machine-bored to accept a zinc-plated steel flathead screw in each end. The screws were 3/8 thread-forming screws for plastic, with 10-14 threads. A stainless steel washer was inserted between the screw head and the wings.

Tag Deployment

Once it was determined that tags would be deployed on dolphins in the capture corral, they were switched from "standby" to "deploy" mode in preparation for attachment, and tested to ensure they were transmitting. The tag attachment process required less than five minutes. The tag was positioned on the fin and the center of the hole in the attachment wing was marked with a permanent marker. The site was cleaned with a Dermachlor scrub followed by methanol. Using a dental injector gun, Lidocaine with epinephrine was injected directly into the center of the hole, with 1-2 injections around the edge of the hole as well. A sterilized stainless steel 5/16" coring tool was centered over the mark, and pushed by hand through the fin into a rubber sanding block held against the fin on the other side. The fin core was saved for genetic analyses in a vial of DMSO. A calibrated 5/16" diameter Delrin measuring pin was then inserted through the hole to

determine the appropriate pin length. From a selection of pins of different lengths soaking in Dermachlor, a pin of appropriate length (typically, 20-24 mm) was selected and secured to one wing of a tag. The wing was folded back, and the beveled edge of the pin was inserted through the hole in the dorsal fin. The free wing of the tag was positioned over the hole in the pin, and the remaining screw and washer were attached. Both screws were secured by hand-tightening with screw drivers, to the point where playing-card-thick spaces remained between each wing and the fin. The tag was tested again for transmission function, the serial number of the tag was recorded and re-checked against the tag ID number, photos were taken of the attachments and fin, and the animal was ready for release. By design, the screws/washers in the ends of the Delrin attachment pins corrode, allowing the tags to fall off the fins after the end of tag's battery life.

Figure 1. Satellite-linked SPOT-299B tag deployed on bottlenose dolphin Y44 in Barataria Bay, LA, in 2013. Ruler indicates cm. Photo by NOAA.

Remote Tracking of Satellite-linked Tags

Transmission windows (duty cycles) were selected to: 1) optimize satellite availability, 2) spread windows out for independence, and 3) make remote tracking data available at the beginning of a field day to facilitate searching for specific individuals in real time. They were all set to the same two 4-hour "on" windows, of hourly blocks 08, 09, 10, 11 UTC (03:00-06:59 local, CDT) and 19, 20, 21, 22 UTC (14:00-17:59 local, CDT), based on the ARGOS on-line satellite pass prediction values, looking for satellites with $>20^{o}$ elevation for at least 3 minutes. The tags were programmed to transmit up to 250 times each day, yielding a maximum estimate of up to 240 tracking days based solely on battery life. Preliminary tracking data (locations plotted on charts) for each dolphin were available from the satellite data processing provider, CLS-America/Argos, within minutes/hours of each transmission, via the internet. Final data were provided by CLS-America/Argos on cd-roms each month following completion of data processing. Summary data were distributed weekly. Original data cd-roms were stored in a secure, locked vault at the Sarasota Dolphin Research Program's base of operations in Sarasota, FL. NRDA chain-of-custody procedures were observed at all times for data designated to contribute to the MC 252 NRDA.

Location Data and Home Range Analyses

Data selection for mapping and home range analyses involved filtering for location plausibility. Argos classifies location quality relative to an estimated error radius. The best quality data, LC3, has an estimated error of <250m. LC2 has an estimated error of <500m. LC1 locations are estimated to be accurate to within 1,500m. Satellite-linked location data of qualities LC3 and LC2 only were used as input data to calculate overall home (95% utilization distribution [UD]) and core (50% UD) ranging areas. To remove the potential for autocorrelation, one randomly selected location per day was retained for home range analysis. Number of locations used for ranging analysis varied from 58 (Y67) to 238 locations (672). Home and core ranging areas were calculated using a fixed-kernel density (Worton 1989) while accounting for land barriers using methods suggested by MacLeod (2013). A utilization distribution represents a probability of finding a given individual in a plane and describes an animal's use of space (White and Garrott 1990). UDs measure areas of intense use; therefore, the resulting ranging areas may not be continuous, but rather broken in space (Powell 2000). Kernel densities are used to calculate specified UDs (Worton 1989). The smoothing parameter (h) or bandwidth is the most important parameter when calculating home and core ranges as it determines the size and shape of spatial use (Wand and Jones 1995, Kie 2013). Bandwidths were calculated using a rule-based *ad hoc* method as described in Rodgers and Kie (2011). Analysis of estimated h parameters was completed using the Home Range Tools for ArcGIS (HRT) extension for ArcGIS 9.0 (ESRI, Inc. 2004). All other ranging pattern analyses were completed using ArcGIS 10.0 (ESRI, Inc. 2011).

Previous studies of dolphin home ranges typically used kernel density methods assuming animals could move anywhere in space. These methods were not ideal for species which encountered a strong barrier, such as land (Benhamou and Cornélis 2010), and often over-estimated individual home range size (MacLeod 2013). However, the kernel density methods used for this report (including a barrier) may under-estimate home range size as this method highlights areas of intense use and may not indicate the connectivity between areas of use (Powell 2000, Kie et al. 2010). Despite this, accounting for barriers in the analysis more adequately accounts for the functional size and shape of home range estimates for species experiencing a hard barrier.

Results

In total, 27 dolphins received satellite-linked tags during 2013, 8 in and around the waters of Barataria Bay, LA (Figure 2), and 19 in and around the waters of Mississippi Sound (Figure 3).

Figure 2. Capture locations for all 8 dolphins fitted with satellite-linked tags in and around the waters of Barataria Bay, LA in June 2013. In some cases, multiple dolphins were tagged at the same site.

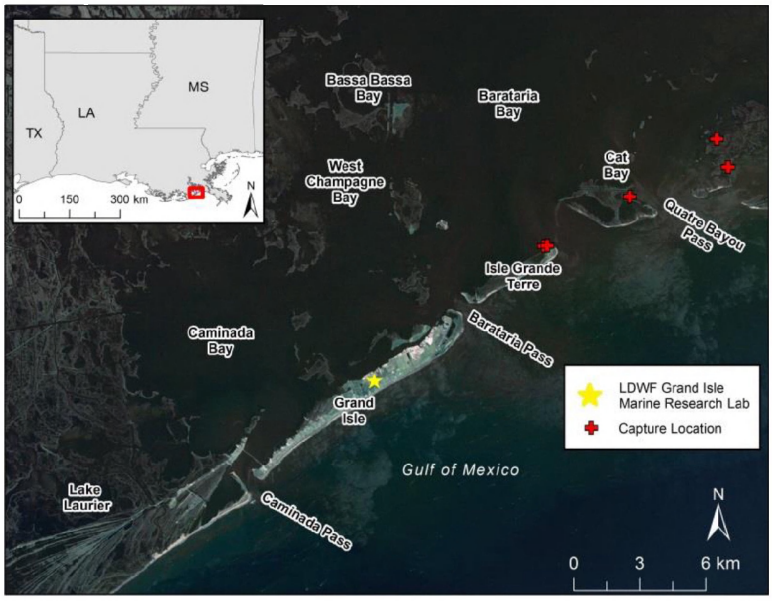
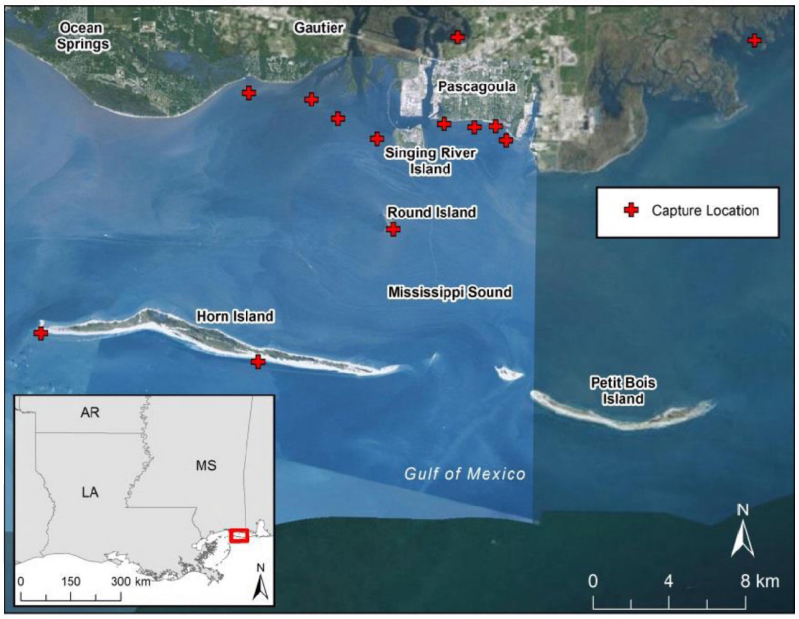


Figure 3. Capture locations for all 19 dolphins fitted with satellite-linked tags in and around the waters of Mississippi Sound in July-August 2013. In some cases, multiple dolphins were tagged at the same site.



Satellite-linked Tag Performance
Satellite-linked transmitter data were received from all 27 dolphins post-deployment (Table 1). Three types of data were received from the satellite-linked tags: locations, transmissions, and status updates. Location data were described above. Some transmissions merely indicated that the tag was still active, but the transmission was of insufficient quality to provide data on tag condition or location. These transmissions were generally interpreted as meaning that the animal was still alive and the tag was still on the fin, unless other information indicated to the contrary. Status updates provided information on the parameters such as battery voltage remaining, and cumulative number of transmissions, allowing assessment of tag condition and potential longevity.

The time from date tagged to final transmission ranged from 80 days (Y65) to 256 days (660), with an average of 140 days (± 46 sd) for Barataria Bay dolphins, and 197 days (± 38 sd) for dolphins in Mississippi Sound. In Barataria Bay, sensors on five of the tags (62%) indicated healthy tags at the time of cessation of transmissions, and the remaining three (38%) indicated low battery voltage (as expected at the end of normal tag function). In Mississippi Sound, sensors on 15 of the tags (79%) indicated healthy tags at the time of cessation of transmissions, and the remaining four (21%) indicated low battery voltage.

Follow-up monitoring showed that three of the Barataria Bay tags were damaged within several months of deployment, in ways that would impede tag performance. During NOAA's November 2013 photographic identification surveys, two tags (Y46 and Y67) were missing their antennae, and another (Y69) was missing the tag body (including antenna), leaving only the tag attachment wings. Four of the Barataria Bay dolphins were observed during April-May 2014 surveys, all without tags; the other four dolphins were not seen during the surveys.

In contrast, none of the tags deployed in Mississippi Sound were observed to be damaged. Photographic identification surveys found 13 of the dolphins in 2014; 12 of these were seen without tags. One dolphin (669) was observed with an intact (but non-transmitting) tag on 18 June 2014.

The tagged dolphins in Barataria Bay showed lower average, minimum, and maximum tag transmission longevity as compared to those in Mississippi Sound. Mechanical damage to tags was only observed in Barataria Bay. The reasons for these differences are not known, but it is possible that the shallower waters and associated feeding patterns used by dolphins in Barataria Bay may lead to increased physical contact with the bay bottom or marsh grasses. As a result of the observations of antenna damage, a new antenna strain reduction design was implemented in 2014.

Location and Home Range Analysis
The number of filtered (LC3, LC2, and LC1) locations for tagged dolphins ranged from 497 (Y67) to 1,995 (672) (Table 2). On average, dolphins in Barataria Bay had 704 filtered locations (± 196 sd), and those in Mississippi Sound had 1,320 (± 325 sd). Up to 710 locations of LC3 and LC2 accuracy (669) were obtained for a given individual over the course of the project. These best quality (LC3 and LC2) locations provided the basis for the following maps, measures, and descriptions.

Combined satellite-linked locations (LC3 and LC2), along with 95% and 50% fixed-kernel home range contours for all dolphins tagged in Barataria Bay, LA are shown in Figure 4, and for Mississippi Sound in Figure 5. Overall, the tagged dolphins did not exhibit long-range movements in either region over the course of this project.

In Barataria Bay, fixed kernel home range size (95%) ranged from 9.0 km^2 (Y67) to 85.9 km^2 (Y44). Fixed kernel home range size (50%) ranged from 1.9 km^2 (Y67) to 15.0 km^2 (Y44). The maximum straight line measures across the longest dimension for a dolphin range varied, from 6.8 km (Y67) to 31.7 km (Y40).

In Mississippi Sound, fixed kernel home range size (95%) was larger than for Barataria Bay, ranging from 32.0 km^2 (680) to 211.0 km^2 (665). Fixed kernel home range size (50%) ranged from 6.8 km^2 (680) to 48.2 km^2 (665). The maximum straight line measures across the longest dimension for a dolphin range varied, from 14.3 km (680) to 79.3 km (674).

Individual dolphin sighting histories and fixed kernel home range contours (95%, 50%), based upon LC3 and LC2 locations, were plotted to illustrate movements in and around Barataria Bay (Figures 6-13) and in Mississippi Sound (Figures 14-32). A brief narrative of each tagged individual's movement pattern is provided below its respective figure.

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Table 1. Satellite-linked transmitter performance data collected in and around the waters of Barataria Bay, LA and Mississippi Sound, from June 2013 to April 2014.

Tag: PTT ID	Dolphin: FB	Deploy Date	Deploy Lat	Deploy Lon	Date Final Location Received	Deploy to Final Location (# of Days)	Most Recent Signal Date	Deploy to Final Signal (# of Days)	Date Final Status Rept	Last Date Seen with Tag	First Date Seen without Tag	Final Tag Status
Barataria Bay												
129996	Y38	Jun 25, 2013	29.34182	-89.83232	Nov 19, 2013	147	Nov 19, 2013	147	Nov 19, 2013	Jun 25, 2013	May 13, 2014	Sensor values indicate a healthy tag
129998	Y65	Jun 27, 2013	29.31742	-89.87219	Sep 15, 2013	80	Sep 15, 2013	80	Sep 14, 2013	Nov 17, 2013	Apr 25, 2014	Sensor values indicate a healthy tag, but voltage may be trending down prematurely
130005	Y69	Jun 27, 2013	29.29645	-89.91178	Oct 14, 2013	109	Oct 14, 2013	109	Oct 14, 2013	Jun 27, 2013	Nov 10, 2013	Sensor values indicate a healthy tag; Seen with missing tag body Nov 10, 2013; tag
130006	Y67	Jun 27, 2013	29.29645	-89.91178	Sep 21, 2013	86	Dec 29, 2013	185	Dec 29, 2013	Nov 11, 2013	Apr 23, 2014	Low battery voltage; Seen with missing antenna Nov 11, 2013
130015	Y44	Jun 25, 2013	29.33051	-89.82697	Sep 19, 2013	86	Sep 19, 2013	86	Sep 19, 2013	Jun 25, 2013	N/A	Sensor values indicate a healthy tag
130024	Y40	Jun 25, 2013	29.33051	-89.82697	Nov 07, 2013	135	Nov 07, 2013	135	Nov 07, 2013	Jun 25, 2013	N/A	Low battery voltage
130025	Y46	Jun 27, 2013	29.29663	-89.91016	Sep 21, 2013	86	Dec 26, 2013	182	Sep 21, 2013	Nov 17, 2013	N/A	Sensor values indicate a healthy tag; Seen with missing antenna Nov 17, 2013
130028	Y42	Jun 25, 2013	29.33051	-89.82697	Jan 07, 2014	196	Jan 08, 2014	197	Jan 08, 2014	Jun 25, 2013	N/A	Low battery voltage
Mississippi Sound												
129991	668	Jul 26, 2013	30.35471	-88.66377	Jan 06, 2014	164	Jan 06, 2014	164	Jan 06, 2014	Jul 30, 2013	May 16, 2014	Sensor values indicate a healthy tag
129992	680	Aug 01, 2013	30.34131	-88.55694	Jan 04, 2014	156	Jan 04, 2014	156	Jan 04, 2014	Dec 02, 2013	May 16, 2014	Sensor values indicate a healthy tag
129999	671	Jul 30, 2013	30.34308	-88.61510	Jan 21, 2014	175	Jan 21, 2014	175	Jan 21, 2014	Jul 30, 2013	May 16, 2014	Sensor values indicate a healthy tag
130000	677	Jul 31, 2013	30.34054	-88.52859	Mar 01, 2014	213	Mar 01, 2014	213	Mar 01, 2014	Feb 10, 2014	Jun 09, 2014	Sensor values indicate a healthy tag
130002	667	Jul 24, 2013	30.29126	-88.58398	Mar 14, 2014	233	Mar 14, 2014	233	Mar 12, 2014	Jul 24, 2013	Jun 12, 2014	Sensor values indicate a healthy tag; Roto tag intact with biofouling
130003	673	Jul 30, 2013	30.34308	-88.61510	Feb 18, 2014	203	Feb 18, 2014	203	Feb 17, 2014	Jul 30, 2013	N/A	Low battery voltage
130004	661	Jul 23, 2013	30.38281	-88.38773	Dec 28, 2013	158	Dec 28, 2013	158	Dec 28, 2013	Jul 23, 2013	N/A	Sensor values indicate a healthy tag
130007	674	Jul 29, 2013	30.22740	-88.65663	Oct 10, 2013	73	Dec 20, 2013	144	Oct 10, 2013	Jul 29, 2013	N/A	Sensor values indicate a healthy tag
130008	682	Aug 01, 2013	30.34131	-88.55694	Feb 05, 2014	188	Feb 05, 2014	188	Feb 05, 2014	Oct 28, 2013	May 16, 2014	Sensor values indicate a healthy tag
130009	660	Jul 25, 2013	30.38247	-88.55014	Mar 10, 2014	228	Apr 07, 2014	256	Mar 09, 2014	Oct 28, 2013	N/A	Low battery voltage
130010	676	Jul 29, 2013	30.23939	-88.77570	Jan 10, 2014	165	Mar 20, 2014	234	Jan 10, 2014	Jul 29, 2013	N/A	Sensor values indicate a healthy tag
130013	678	Jul 30, 2013	30.35204	-88.62978	Dec 27, 2013	150	Dec 27, 2013	150	Dec 27, 2013	Jul 30, 2013	May 16, 2014	Sensor values indicate a healthy tag
130014	672	Jul 28, 2013	30.33396	-88.52287	Apr 06, 2014	252	Apr 06, 2014	252	Apr 06, 2014	Dec 02, 2013	May 16, 2014	Sensor values indicate a healthy tag
130017	670	Jul 26, 2013	30.35471	-88.66377	Mar 11, 2014	228	Mar 11, 2014	228	Mar 10, 2014	Jul 26, 2013	Jun 12, 2014	Low battery voltage
130019	669	Jul 30, 2013	30.33381	-88.59351	Apr 09, 2014	253	Apr 09, 2014	253	Apr 09, 2014	Jun 18, 2014	N/A	Low battery voltage; Tag intact, no biofouling
130023	675	Jul 31, 2013	30.33985	-88.54031	Jan 04, 2014	157	Jan 04, 2014	157	Jan 04, 2014	Jul 31, 2013	Jun 18, 2014	Sensor values indicate a healthy tag
130027	662	Jul 25, 2013	30.38247	-88.55014	Jan 30, 2014	189	Jan 30, 2014	189	Sep 02, 2013	Oct 28, 2013	Feb 10, 2014	Sensor values indicate a healthy tag; Tag intact, no biofouling on Oct 28, 2013
130029	664	Jul 26, 2013	30.35471	-88.66377	Jan 13, 2014	171	Jan 13, 2014	171	Jan 11, 2014	Jul 30, 2013	May 16, 2014	Sensor values indicate a healthy tag
130030	665	Jul 23, 2013	30.38281	-88.38773	Feb 26, 2014	218	Feb 26, 2014	218	Feb 25, 2014	Jul 23, 2013	N/A	Sensor values indicate a healthy tag

Table 2. Location and home range analysis for satellite-linked transmitter data collected in and around the waters of Barataria Bay, LA and Mississippi Sound, from June 2013 to April 2014.

Tag: PTT ID	Dolphin: FB	Deploy Date	Deploy Lat	Deploy Lon	Most Recent Signal Date	No. Days	Date Final Location Received	Deploy to Final Location (# of Days)	# of Locations	Location Class 3 (~250 m)	Location Class 2 (~500 m)	Location Class 1 (~1500 m)	95% Fixed Kernel Home Range Area (km^2)	50% Fixed Kernel Home Range Area (km^2)	Maximum Distance Between Locations (km)	Distance Between Capture and Farthest Location (km)
Barataria Bay																
129996	Y38	Jun 25, 2013	29.34182	-89.83232	Nov 19, 2013	147	Nov 19, 2013	147	940	113	286	187	38.44	7.92	18.51	10.08
129998	Y65	Jun 27, 2013	29.31742	-89.87219	Sep 15, 2013	80	Sep 15, 2013	80	511	86	158	110	13.60	3.32	14.60	8.52
130005	Y69	Jun 27, 2013	29.29645	-89.91178	Oct 14, 2013	109	Oct 14, 2013	109	805	39	137	156	32.56	7.36	17.85	14.02
130006	Y67	Jun 27, 2013	29.29645	-89.91178	Sep 24, 2013	89	Sep 21, 2013	86	497	51	131	106	8.96	1.92	6.78	4.98
130015	Y44	Jun 25, 2013	29.33051	-89.82697	Sep 19, 2013	86	Sep 19, 2013	86	597	59	180	148	85.88	14.96	31.49	23.01
130024	Y40	Jun 25, 2013	29.33051	-89.82697	Nov 07, 2013	135	Nov 07, 2013	135	893	78	233	239	49.08	9.28	31.68	24.73
130025	Y46	Jun 27, 2013	29.29663	-89.91016	Dec 26, 2013	182	Sep 21, 2013	86	498	52	125	114	17.52	4.44	14.70	14.95
130028	Y42	Jun 25, 2013	29.33051	-89.82697	Jan 08, 2014	197	Jan 07, 2014	196	887	77	169	181	41.64	7.64	27.32	18.68
Mississippi Sound																
129991	668	Jul 26, 2013	30.35471	-88.66377	Jan 06, 2014	164	Jan 06, 2014	164	888	102	229	201	56.84	15.44	23.96	12.10
129992	680	Aug 01, 2013	30.34131	-88.55694	Jan 04, 2014	156	Jan 04, 2014	156	1,138	69	153	223	32.04	6.76	14.32	10.84
129999	671	Jul 30, 2013	30.34308	-88.61510	Jan 21, 2014	175	Jan 21, 2014	175	1,250	165	337	281	87.56	23.56	29.22	18.31
130000	677	Jul 31, 2013	30.34054	-88.52859	Mar 01, 2014	213	Mar 01, 2014	213	1,626	173	335	360	44.84	8.92	19.90	13.89
130002	667	Jul 24, 2013	30.29126	-88.58398	Mar 14, 2014	233	Mar 14, 2014	233	1,525	201	362	333	166.60	30.64	36.89	27.05
130003	673	Jul 30, 2013	30.34308	-88.61510	Feb 18, 2014	203	Feb 18, 2014	203	1,608	208	442	414	120.72	27.40	28.09	17.40
130004	661	Jul 23, 2013	30.38281	-88.38773	Dec 28, 2013	158	Dec 28, 2013	158	1,077	192	363	251	101.20	21.76	31.83	20.69
130007	674	Jul 29, 2013	30.22740	-88.65663	Dec 20, 2013	144	Oct 10, 2013	73	536	74	151	113	125.20	18.64	79.29	57.56
130008	682	Aug 01, 2013	30.34131	-88.55694	Feb 05, 2014	188	Feb 05, 2014	188	1,484	159	342	357	131.08	27.92	23.08	15.69
130009	660	Jul 25, 2013	30.38247	-88.55014	Apr 07, 2014	256	Mar 10, 2014	228	1,597	189	459	385	164.36	28.52	33.23	29.36
130010	676	Jul 29, 2013	30.23939	-88.77570	Mar 20, 2014	234	Jan 10, 2014	165	1,199	108	257	327	190.52	36.88	69.52	49.07
130013	678	Jul 30, 2013	30.35204	-88.62978	Dec 27, 2013	150	Dec 27, 2013	150	1,121	113	220	239	107.84	26.68	34.09	25.91
130014	672	Jul 28, 2013	30.33396	-88.52287	Apr 06, 2014	252	Apr 06, 2014	252	1,995	250	423	380	48.80	10.92	18.21	23.72
130017	670	Jul 26, 2013	30.35471	-88.66377	Mar 11, 2014	228	Mar 11, 2014	228	1,491	163	367	333	95.36	23.12	23.59	15.74
130019	669	Jul 30, 2013	30.33381	-88.59351	Apr 09, 2014	253	Apr 09, 2014	253	1,577	262	448	287	101.80	27.44	25.26	15.45
130023	675	Jul 31, 2013	30.33985	-88.54031	Jan 04, 2014	157	Jan 04, 2014	157	1,183	101	230	285	62.80	15.00	16.43	11.43
130027	662	Jul 25, 2013	30.38247	-88.55014	Jan 30, 2014	189	Jan 30, 2014	189	1,265	81	187	247	61.60	12.88	17.11	11.81
130029	664	Jul 26, 2013	30.35471	-88.66377	Jan 13, 2014	171	Jan 13, 2014	171	1,114	111	236	226	88.48	27.36	24.99	14.93
130030	665	Jul 23, 2013	30.38281	-88.38773	Feb 26, 2014	218	Feb 26, 2014	218	1,414	213	464	274	210.96	48.16	42.28	29.68

Figure 4. (a) Satellite-linked locations (LC3 and LC2), and (b) 95% and (c) 50% fixed-kernel home range contours for all dolphins tagged in Barataria Bay, LA from June 2013 to January 2014.

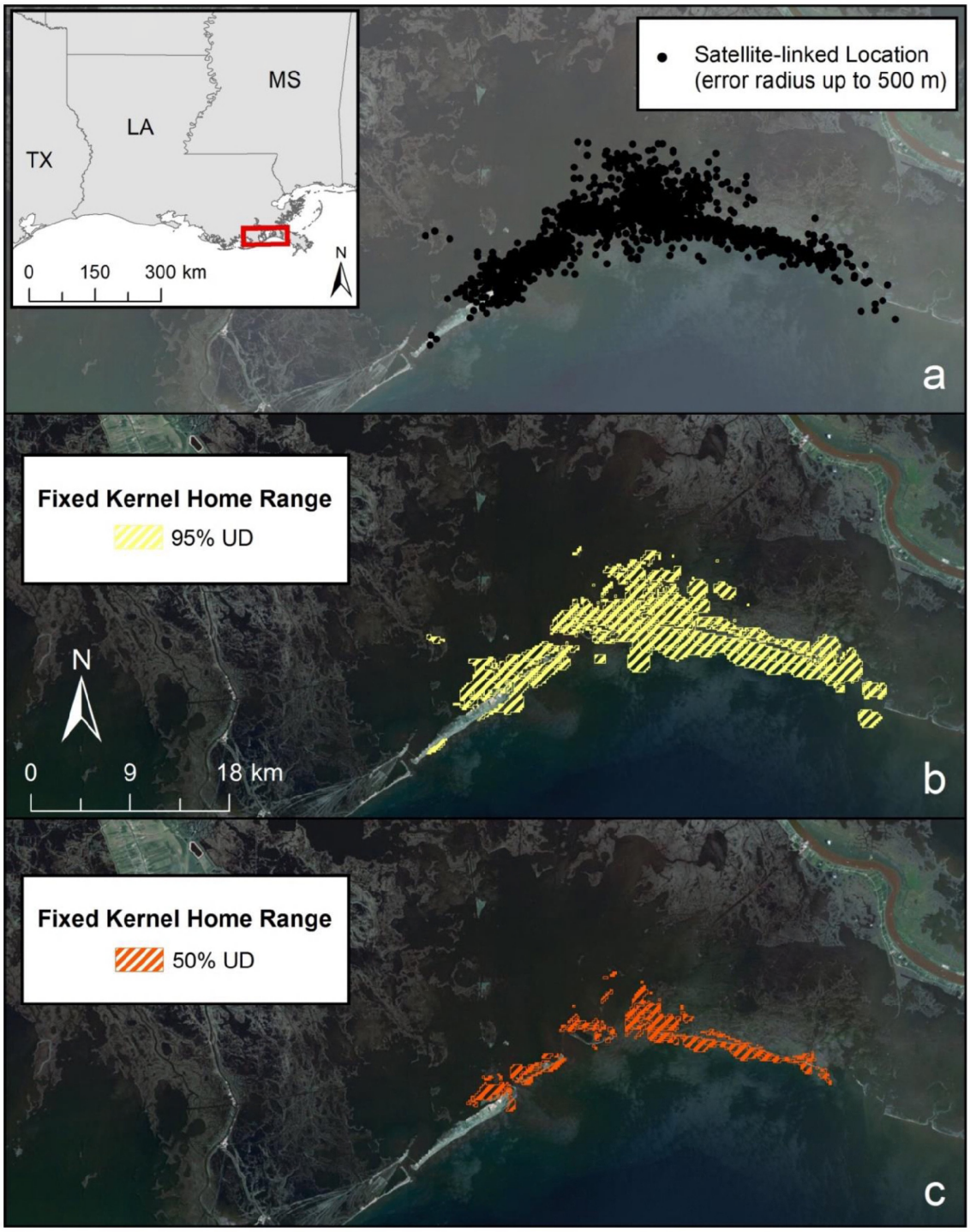


Figure 5. (a) Satellite-linked locations (LC3 and LC2), and (b) 95% and (c) 50% fixed-kernel home range contours for all dolphins tagged in Mississippi Sound from July 2013 to April 2014.

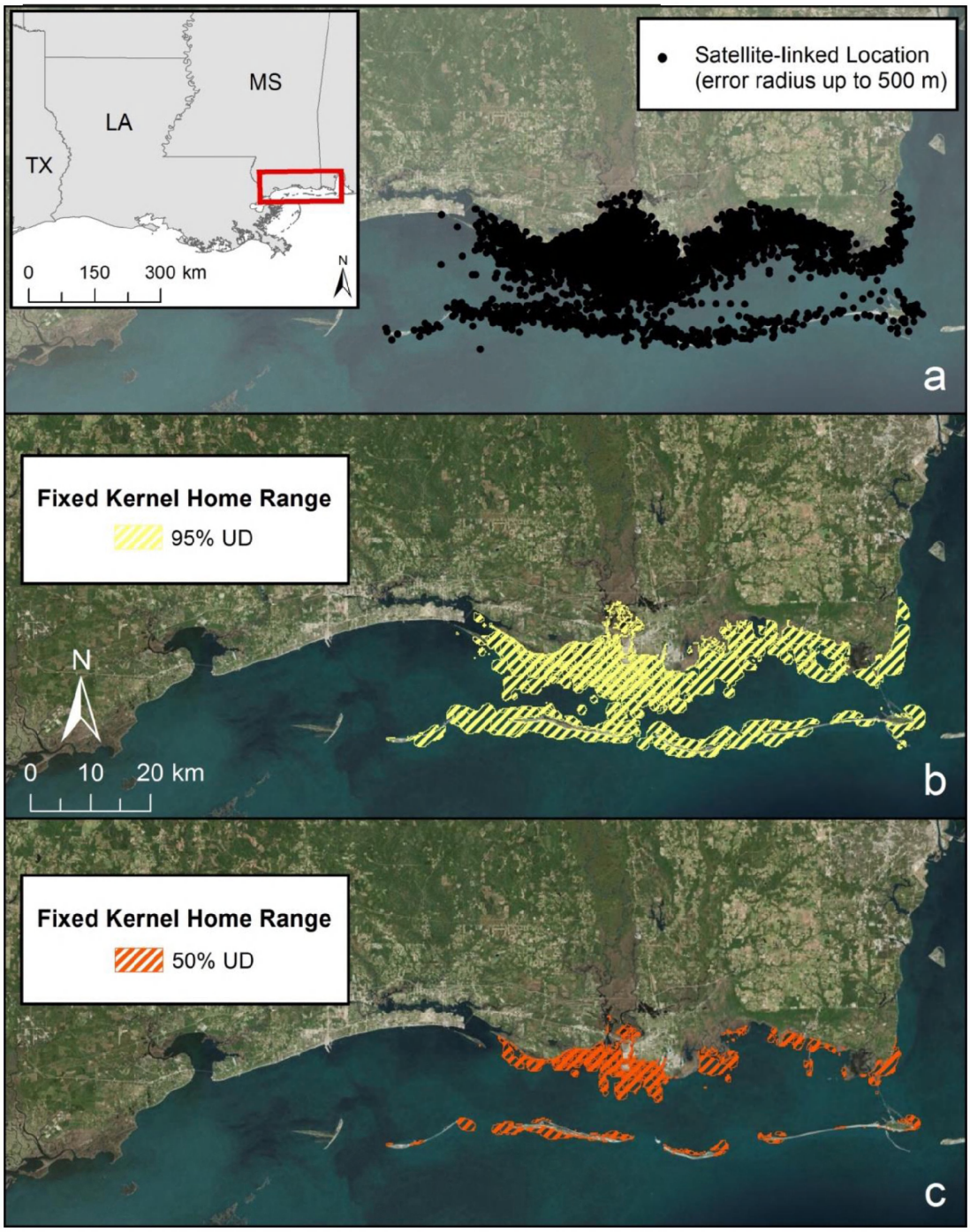
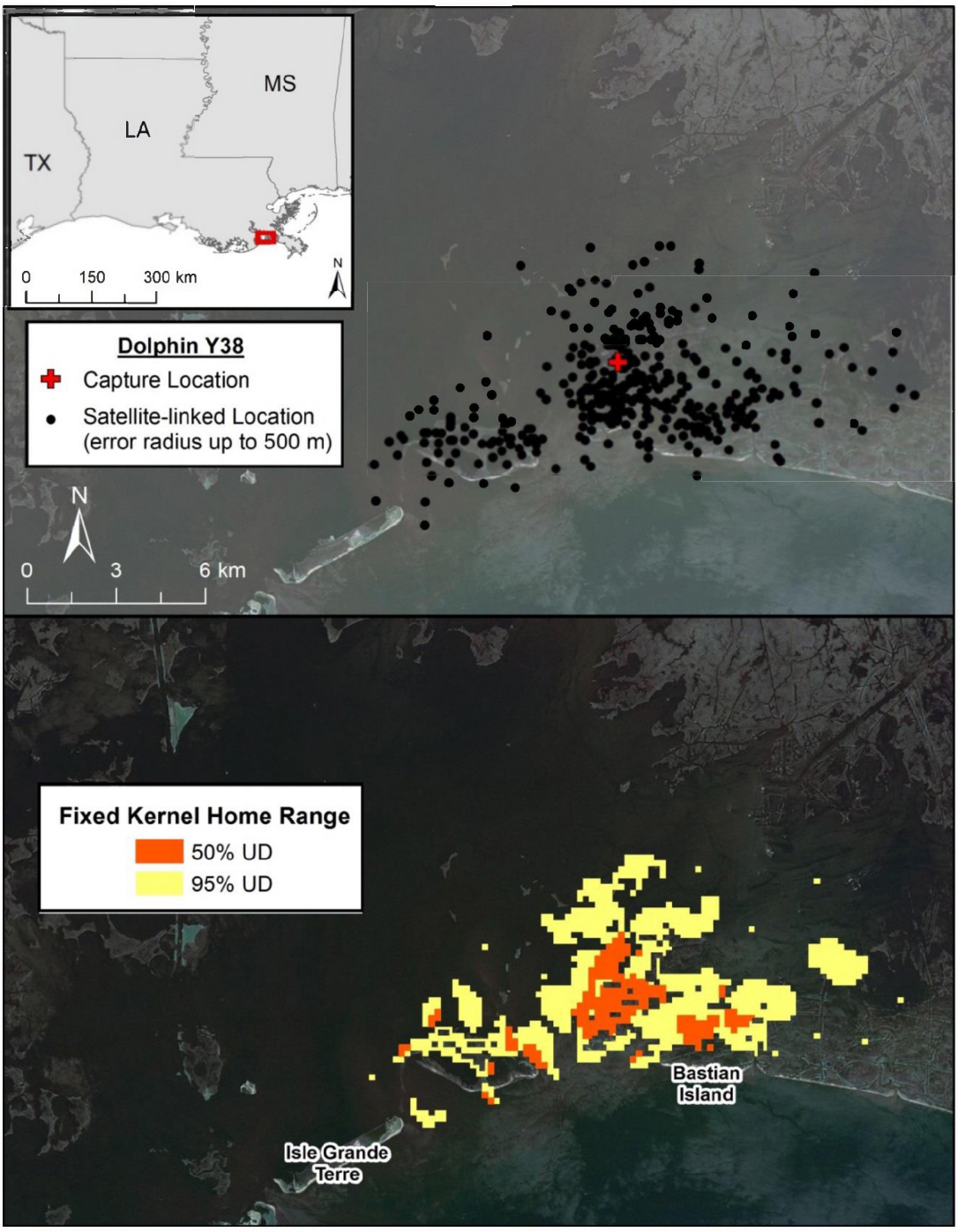
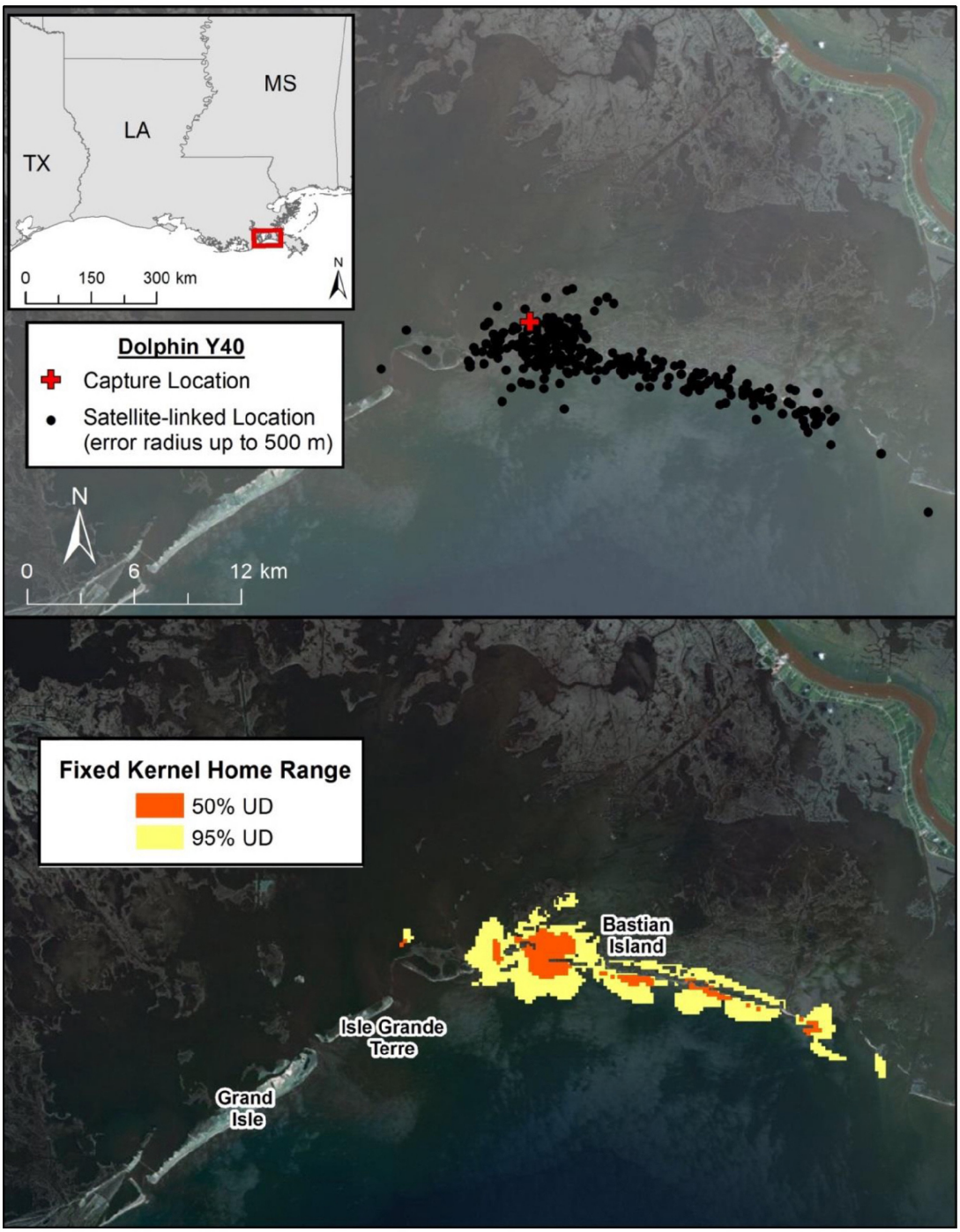


Figure 6. Y38's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



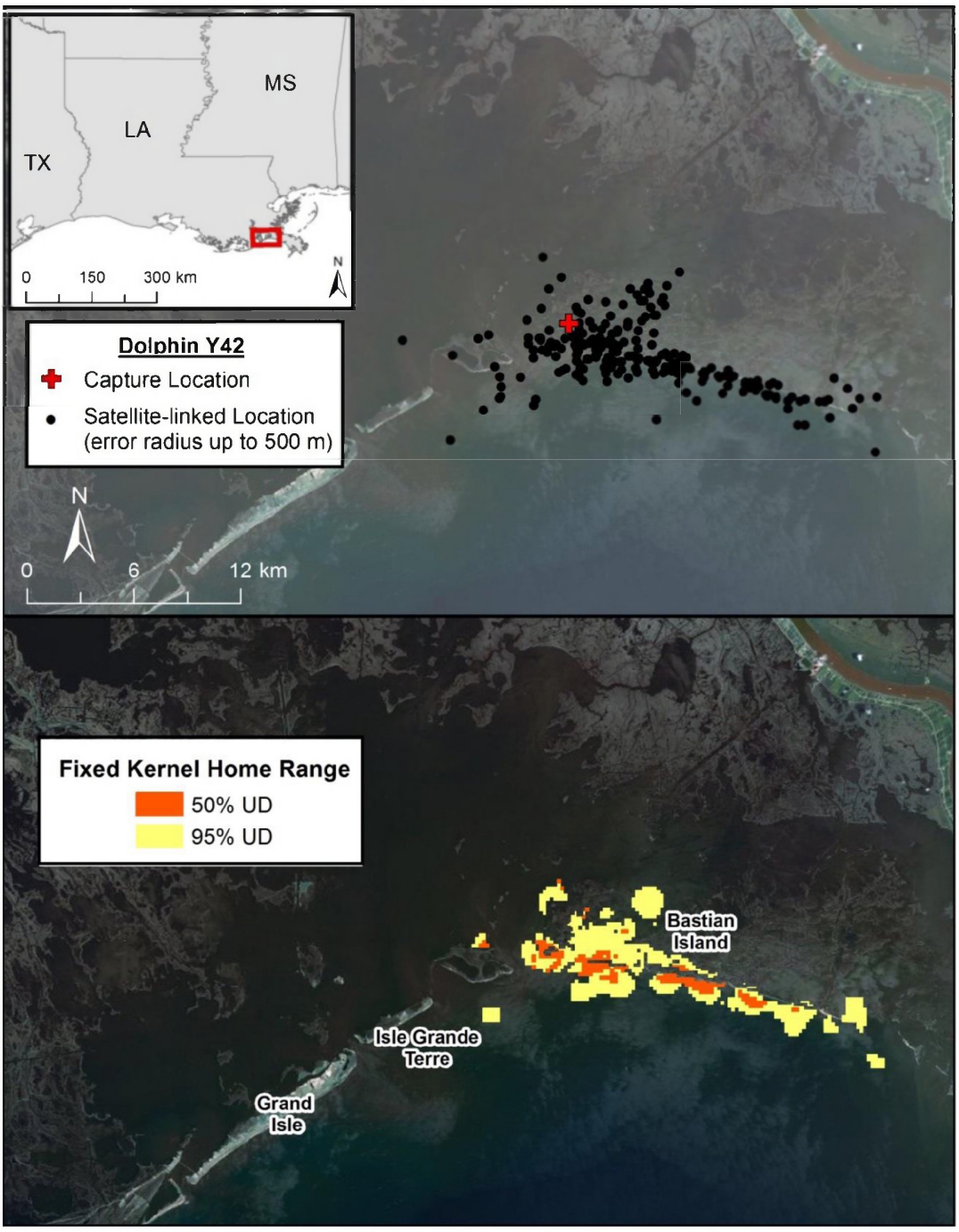
Dolphin Y38 made extensive use of the marshes on the eastern side of Barataria Bay, east of Isle Grande Terre, with occasional trips into the nearshore Gulf of Mexico waters.

Figure 7. Y40's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



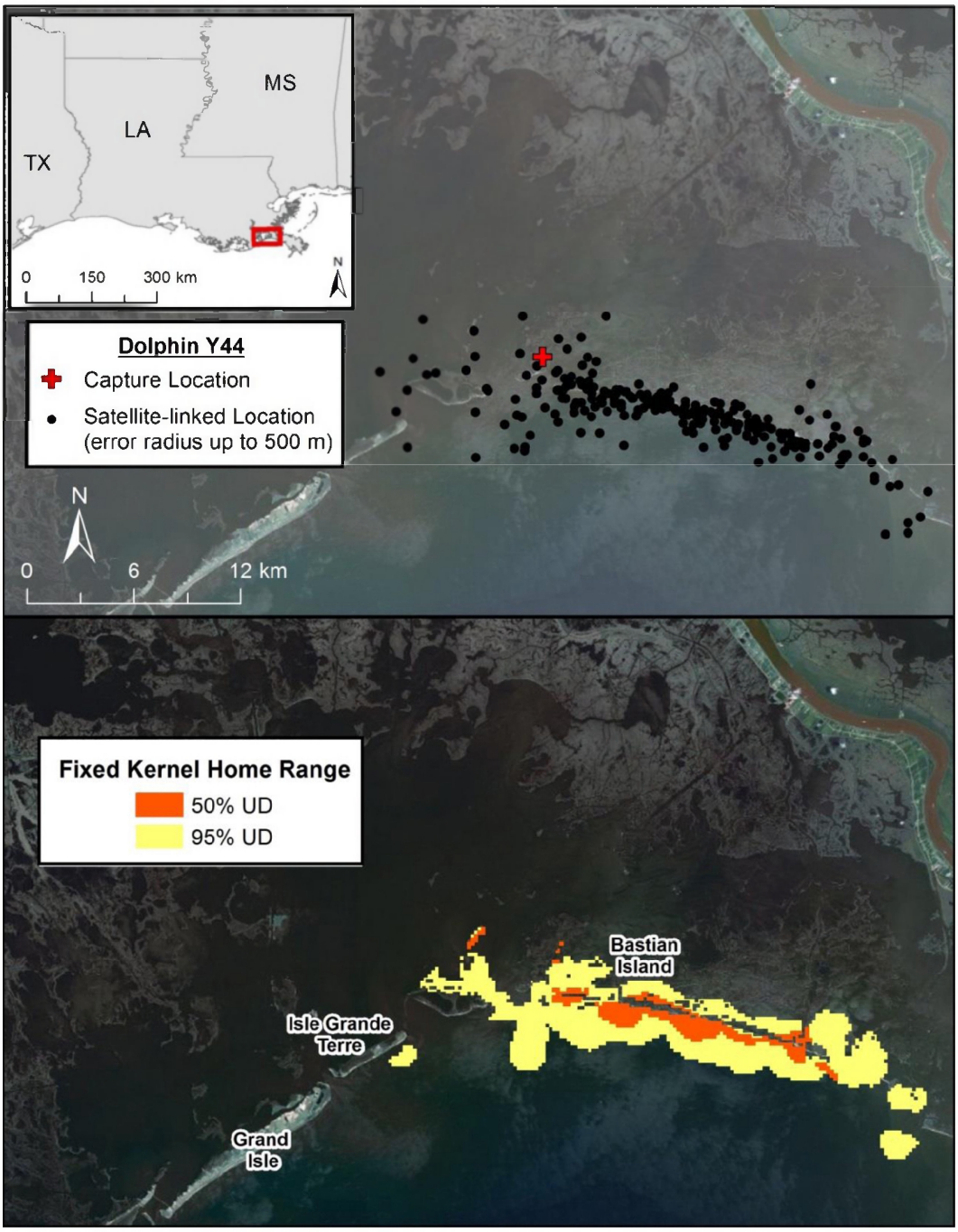
Dolphin Y40's movements were concentrated around both the bay and Gulf sides of the barrier islands on the eastern side of Barataria Bay, east of Isle Grande Terre.

Figure 8. Y42's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



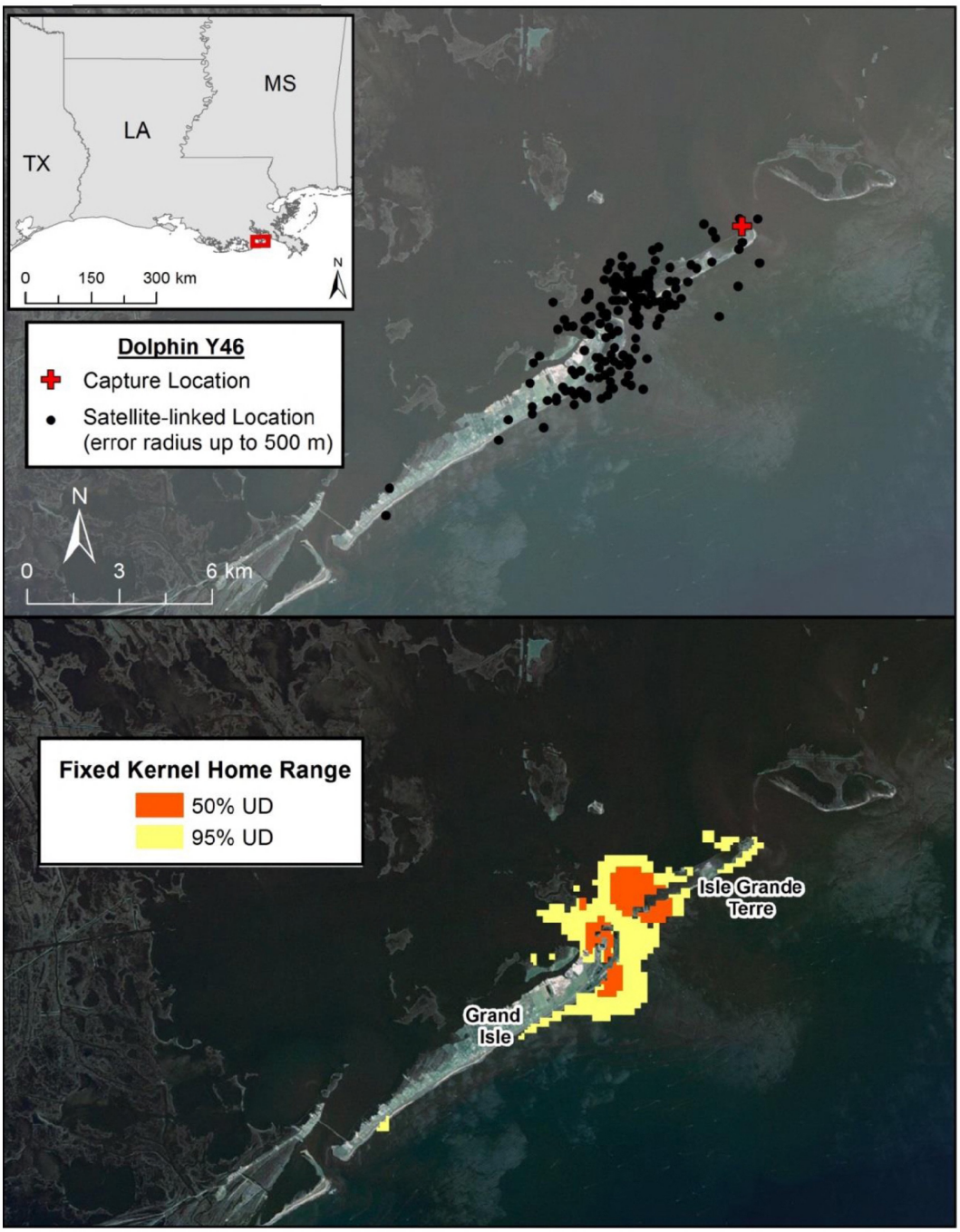
Much like Dolphin Y40, Dolphin Y42's movements were concentrated around both the bay and Gulf sides of the barrier islands on the eastern side of Barataria Bay, east of Isle Grande Terre.

Figure 9. Y44's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



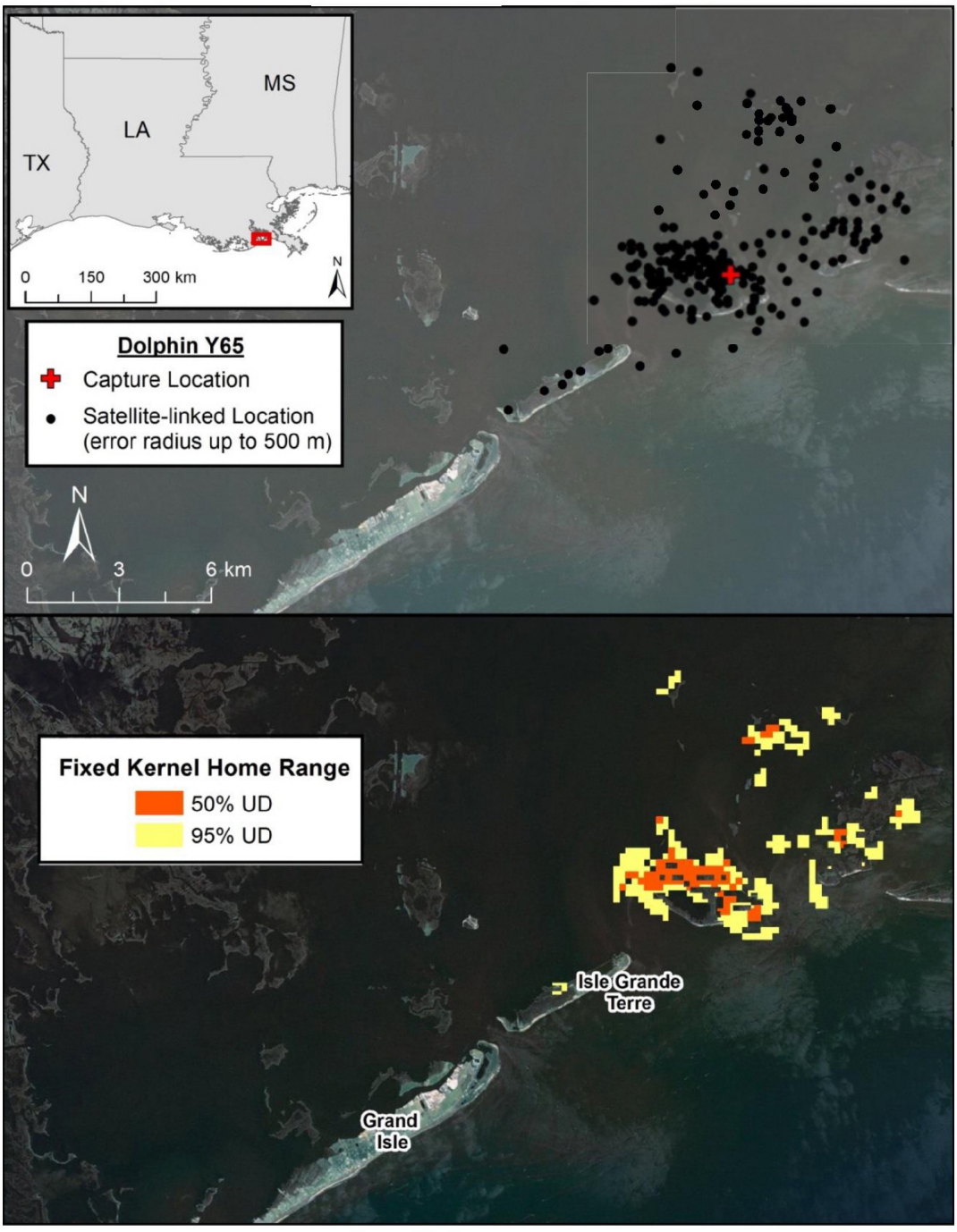
Much like Dolphins Y40 and Y42, Dolphin Y44's movements were concentrated around both the bay and Gulf sides of the barrier islands on the eastern side of Barataria Bay, east of Isle Grande Terre.

Figure 10. Y46's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



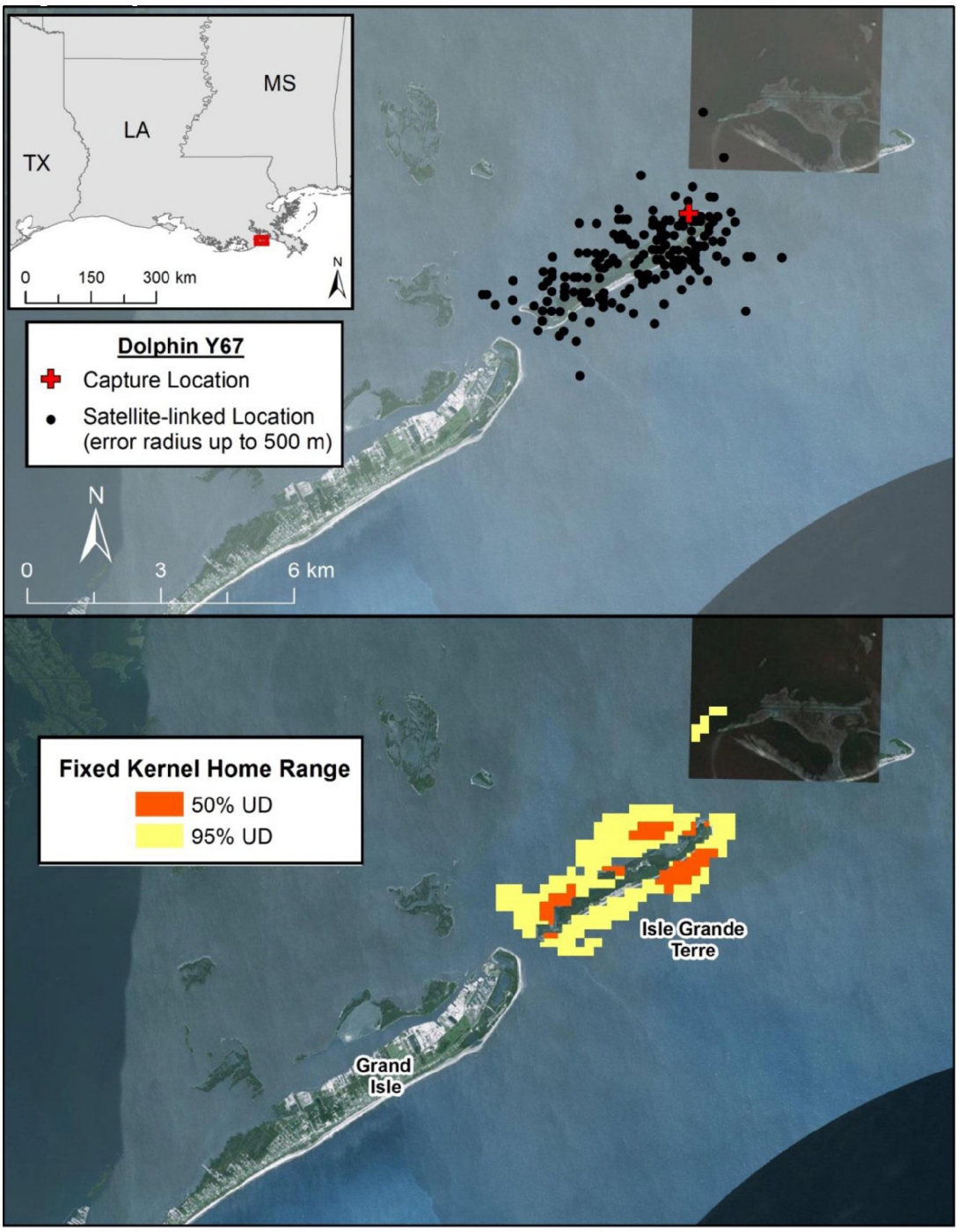
Dolphin Y46 emphasized the coastal waters on each side of Barataria Pass.

Figure 11. Y65's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



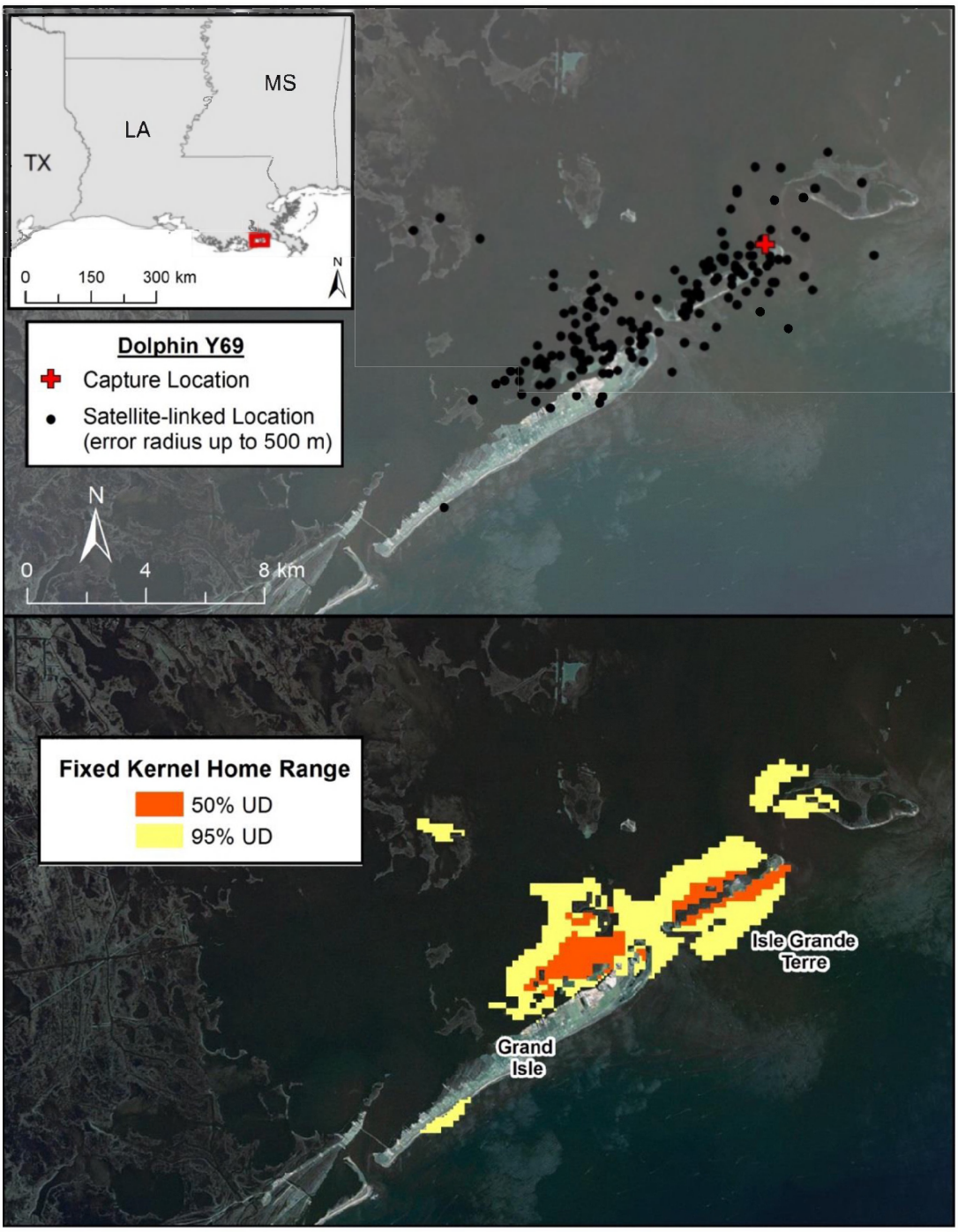
Dolphin Y65 made extensive use of the waters NE of the Grand Terre Islands, including Cat Bay and Bay Ronquille, with occasional trips into the nearshore Gulf waters.

Figure 12. Y67's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



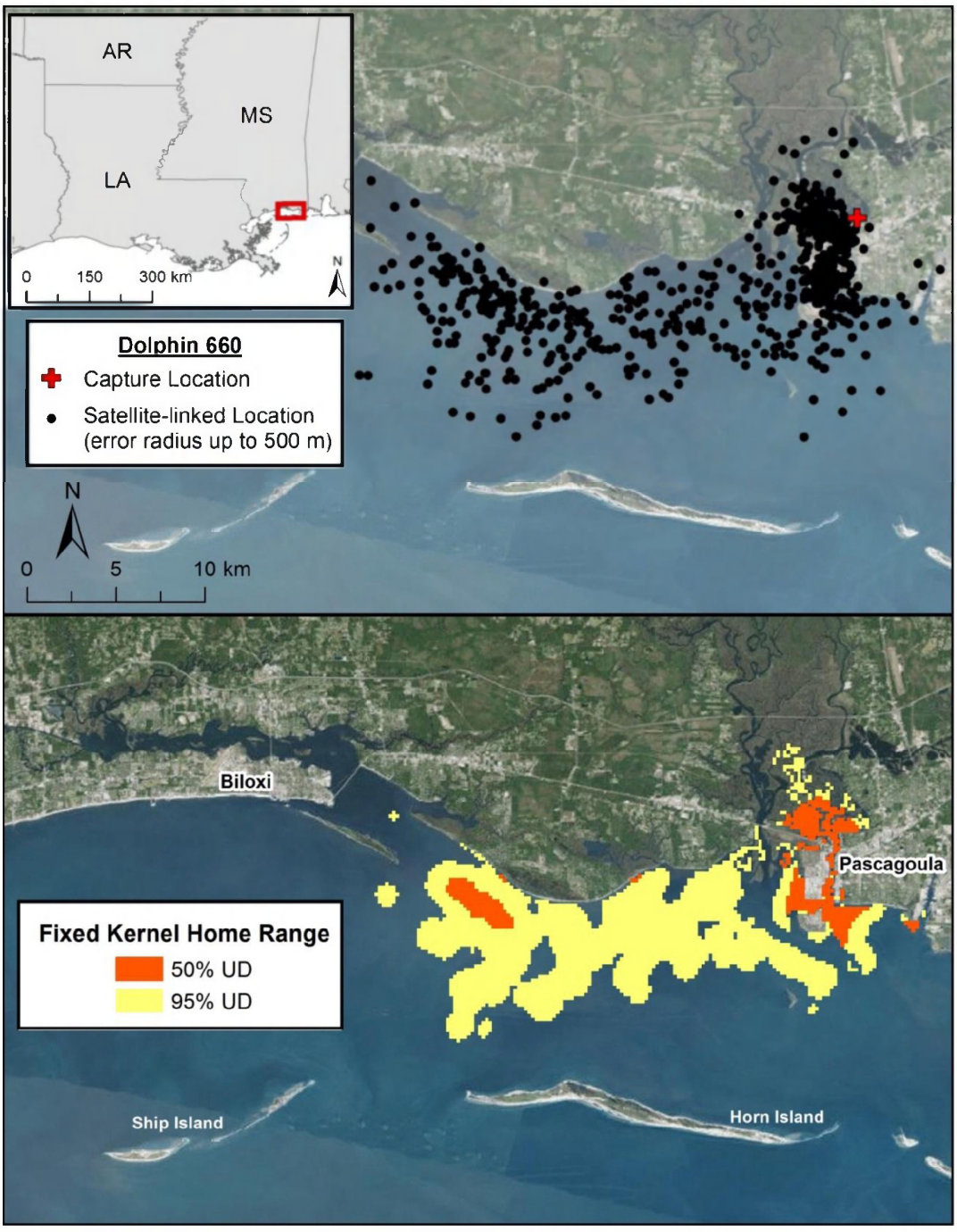
Dolphin Y67 primarily used the waters surrounding Isle Grande Terre, both inside the bay and in nearshore Gulf waters.

Figure 13. Y69's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



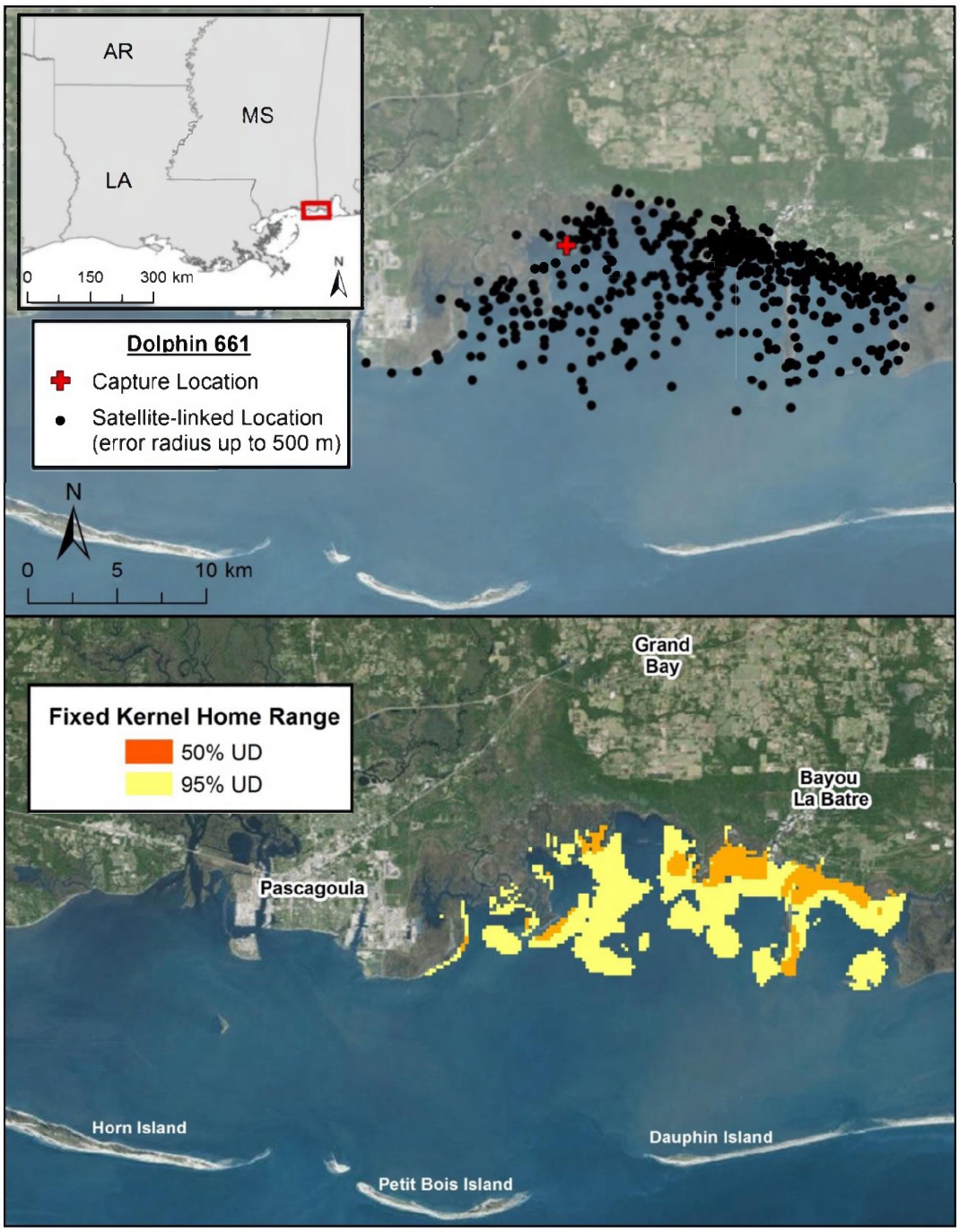
Dolphin Y69 emphasized use of waters north of the eastern half of Grand Isle, as well as those surrounding Isle Grande Terre.

Figure 14. Dolphin 660's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



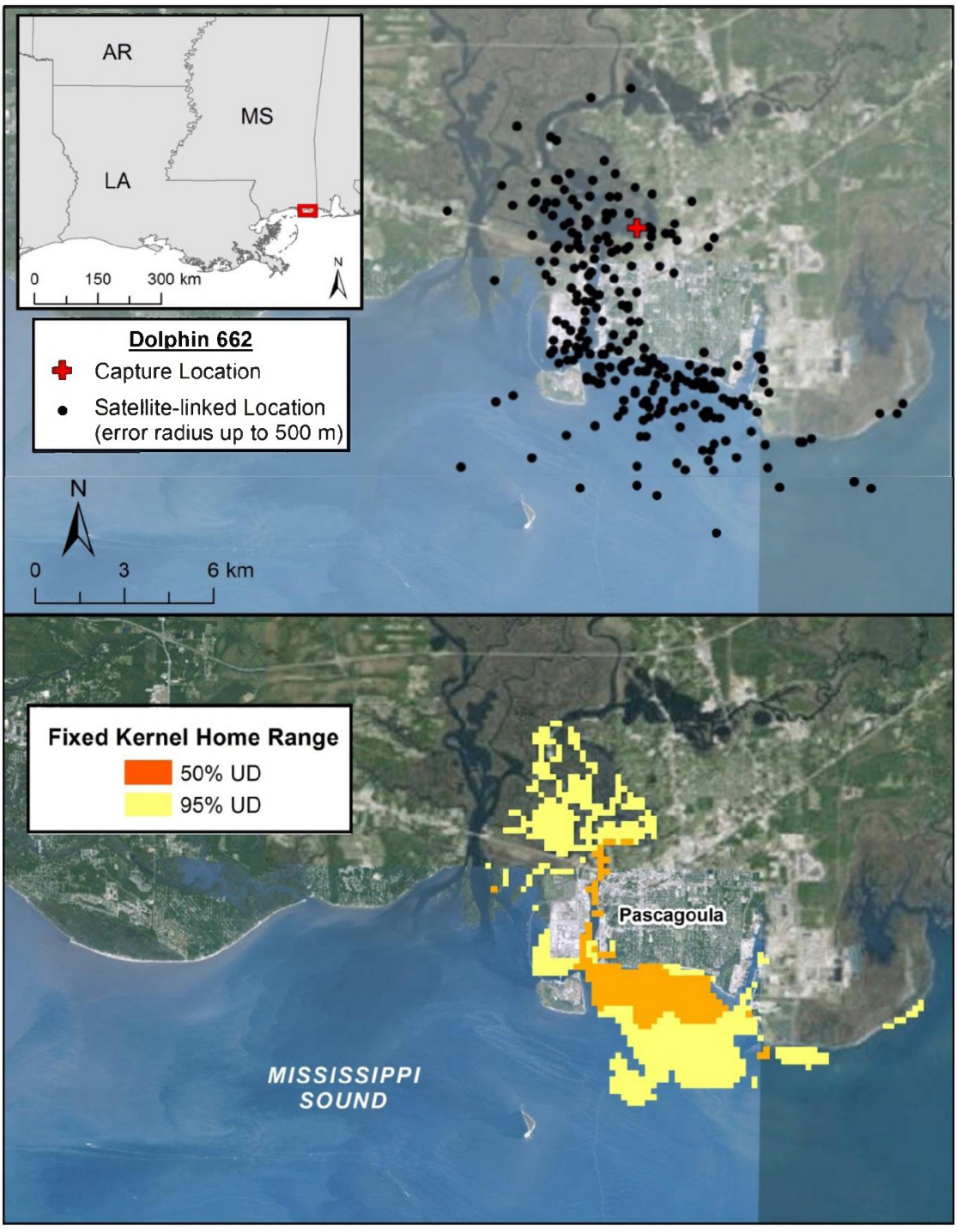
Dolphin 660 emphasized use of waters near Pascagoula, MS, including the Singing River and associated marshes, but ranged through nearshore waters as far west as Ocean Springs, MS.

Figure 15. Dolphin 661's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



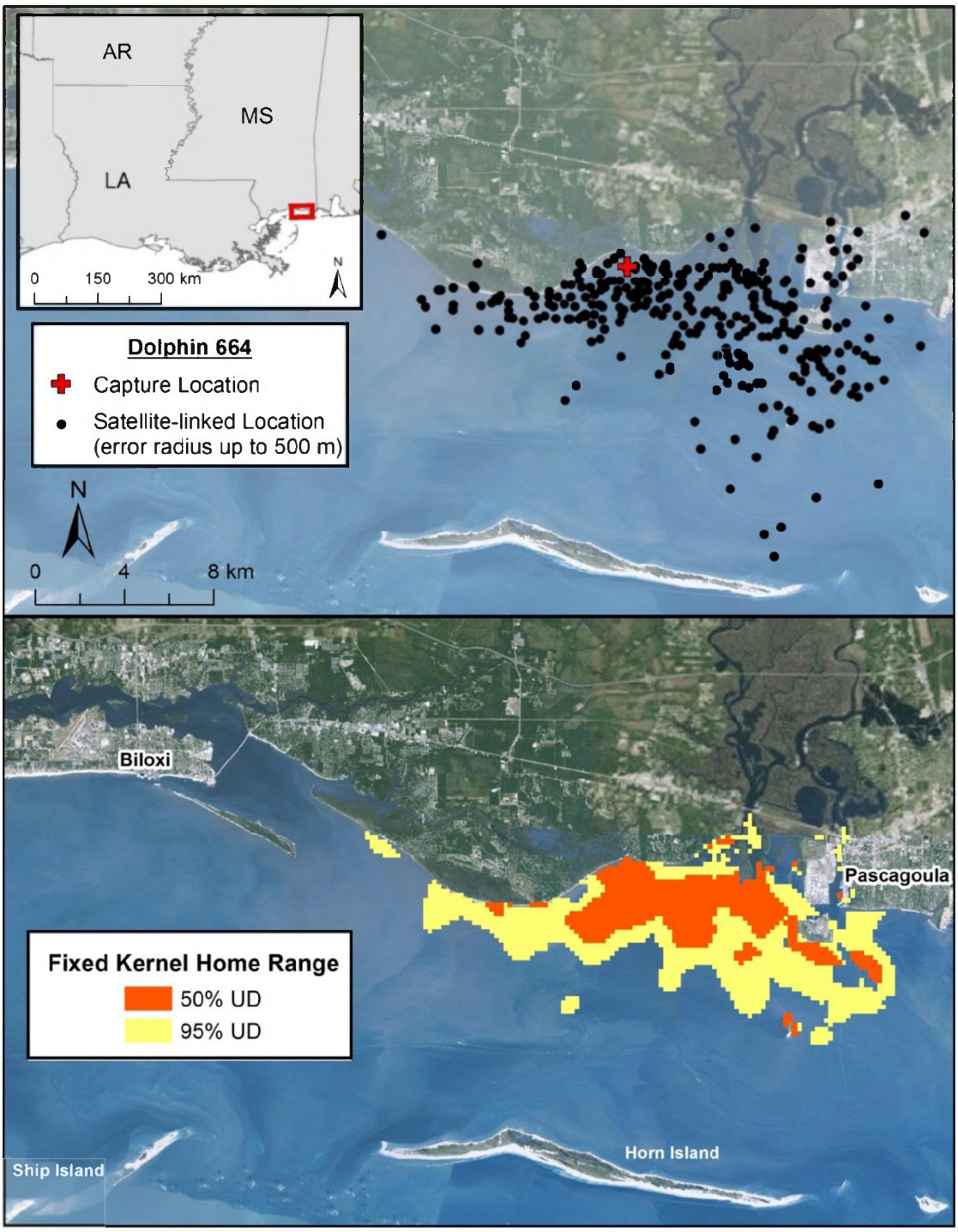
Movements of Dolphin 661were concentrated east of Pascagoula, especially between Bangs Island, MS, and Isle aux Dames, AL.

Figure 16. Dolphin 662's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



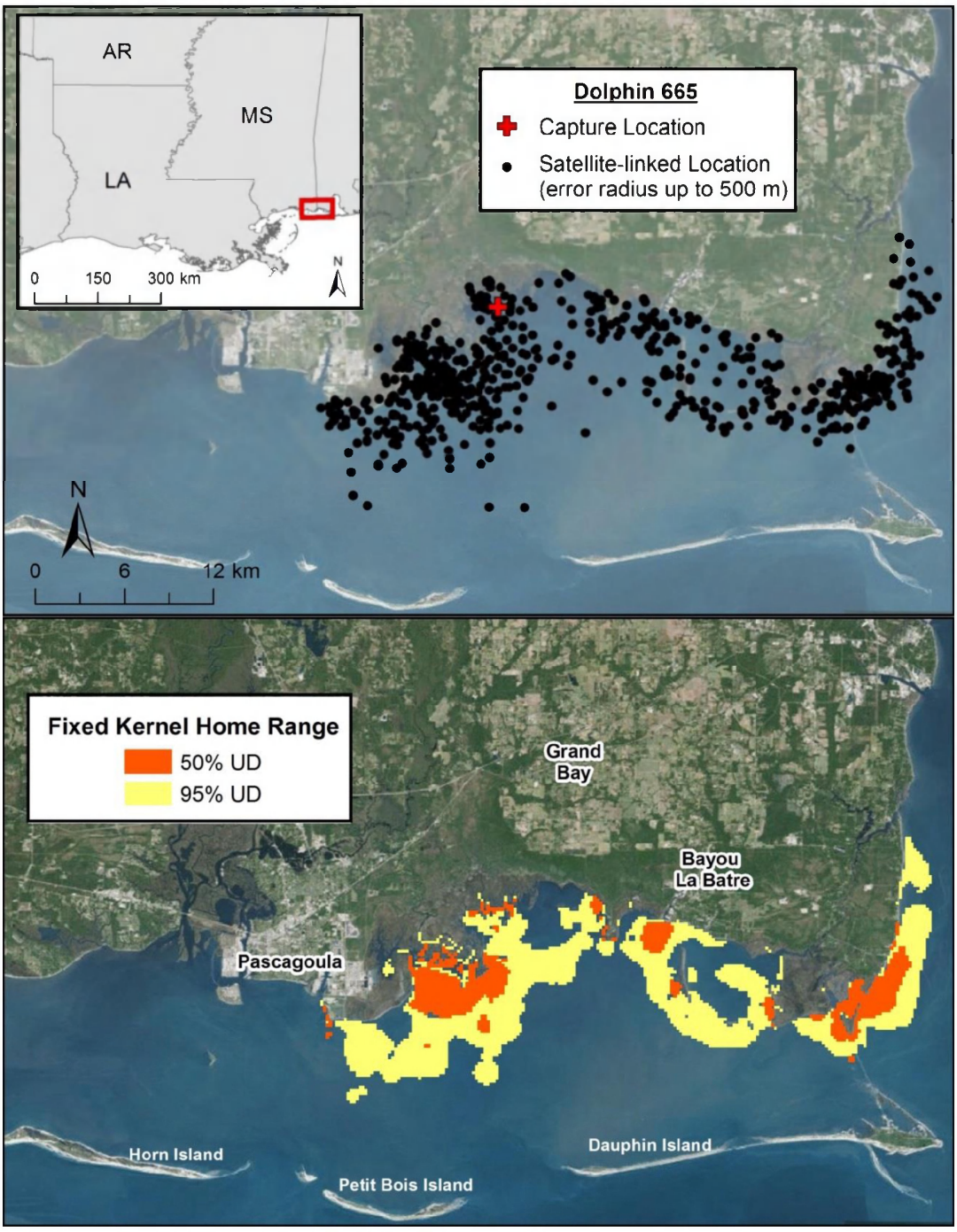
Dolphin 662 emphasized the coastal waters and marshes surrounding Pascagoula in its range.

Figure 17. Dolphin 664's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



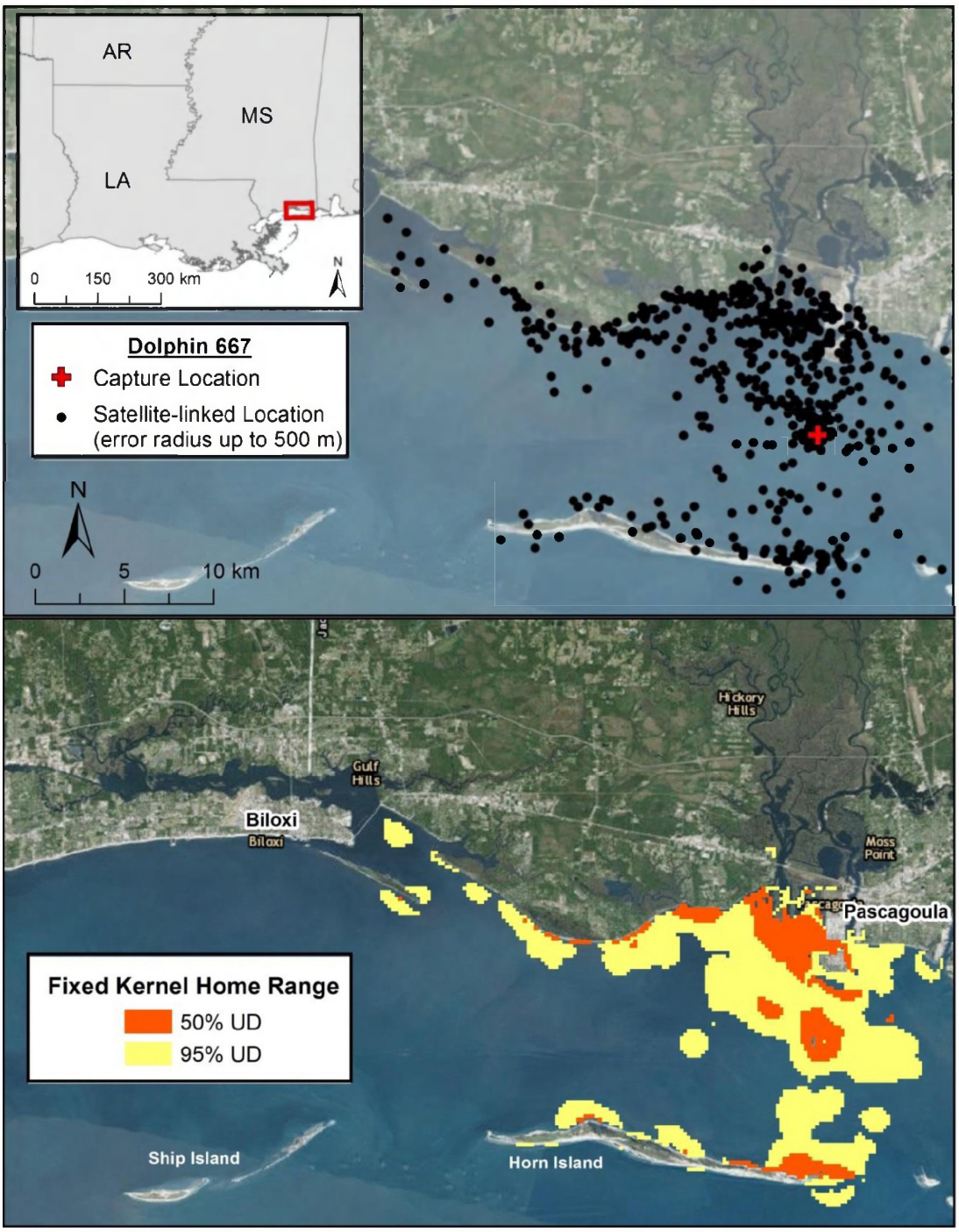
Dolphin 664 primarily used the coastal waters from Pascagoula to Ocean Springs.

Figure 18. Dolphin 665's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



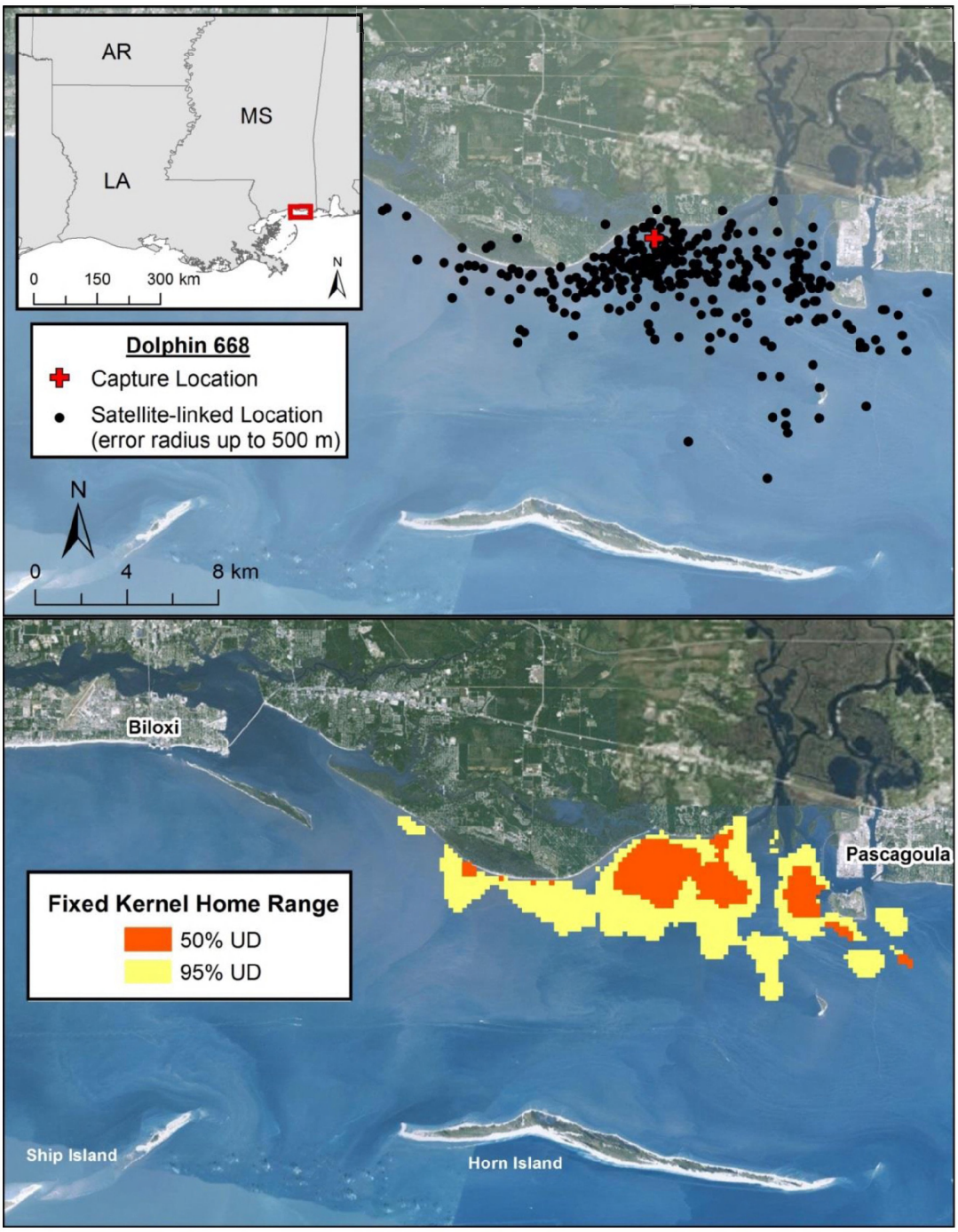
Dolphin 665 used a fairly large area of coastal waters east of Pascagoula, extending into the mouth of Mobile Bay, AL.

Figure 19. Dolphin 667's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



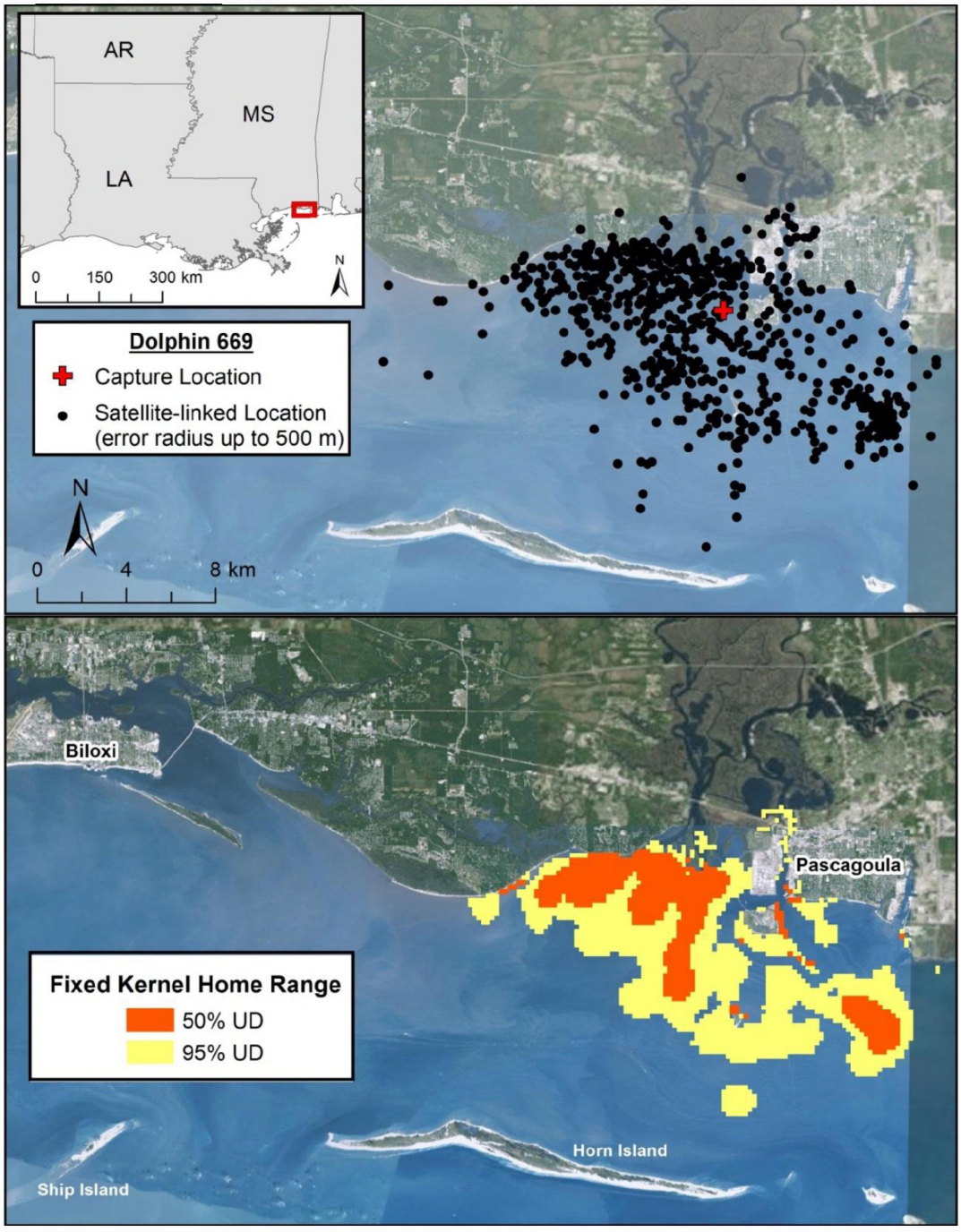
Dolphin 667 ranged from the coastal waters off Pascagoula, across Mississippi Sound, to the shore of Horn Island.

Figure 20. Dolphin 668's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



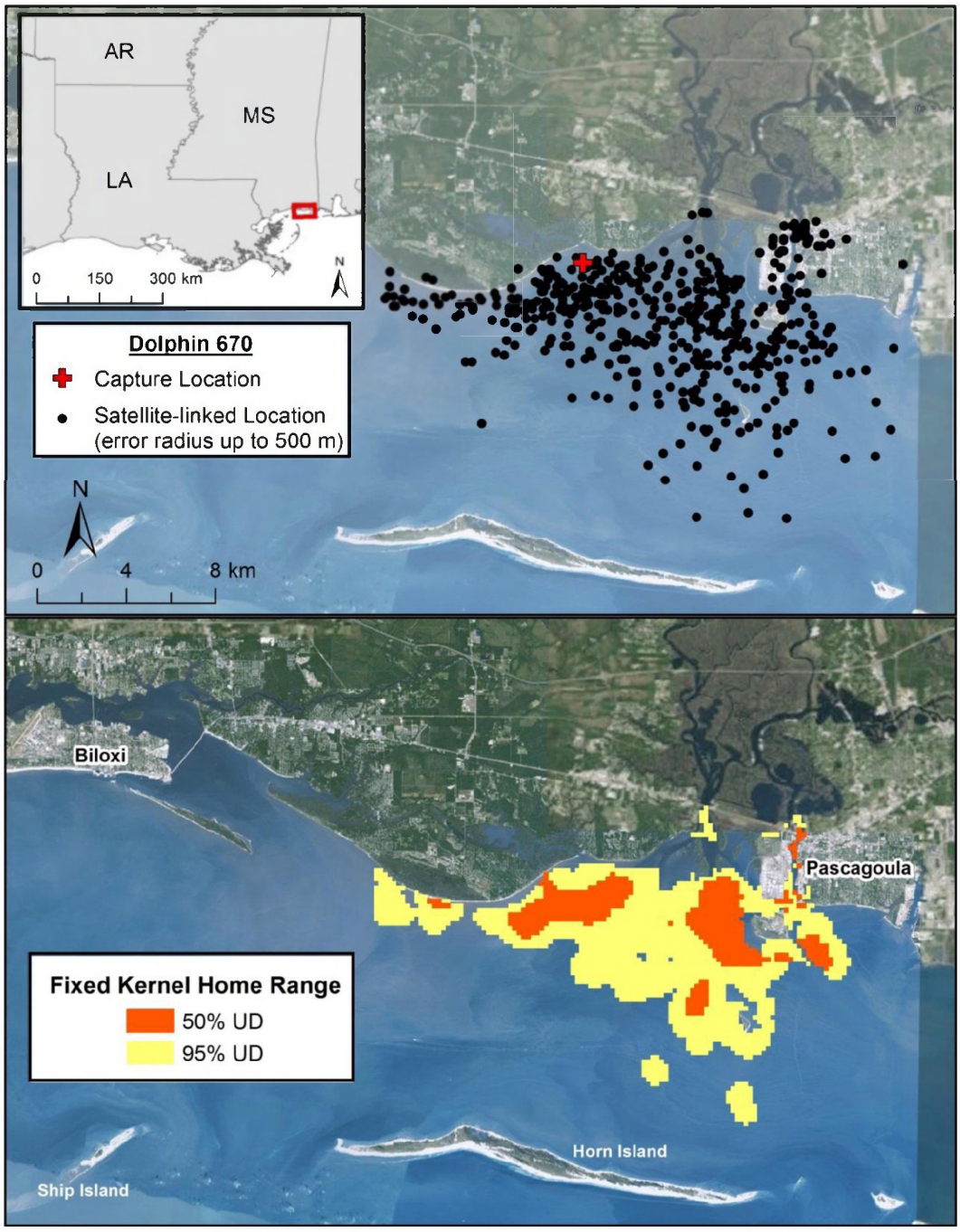
The movements of Dolphin 668 were concentrated in the coastal waters between Pascagoula and Ocean Springs.

Figure 21. Dolphin 669's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



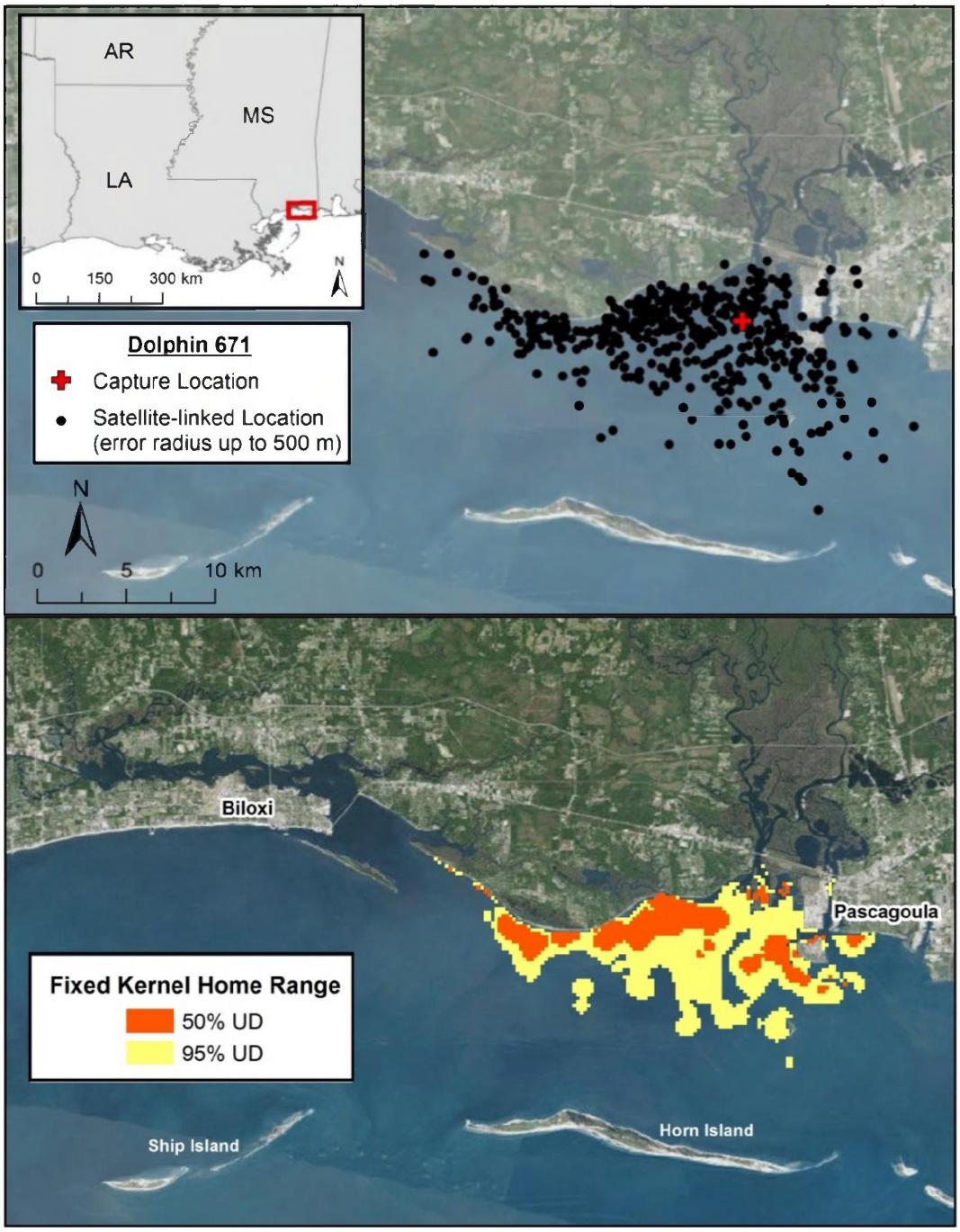
Dolphin 669 extended its range about half-way across Mississippi Sound, emphasizing coastal waters off Gautier and offshore of Pascagoula.

Figure 22. Dolphin 670's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



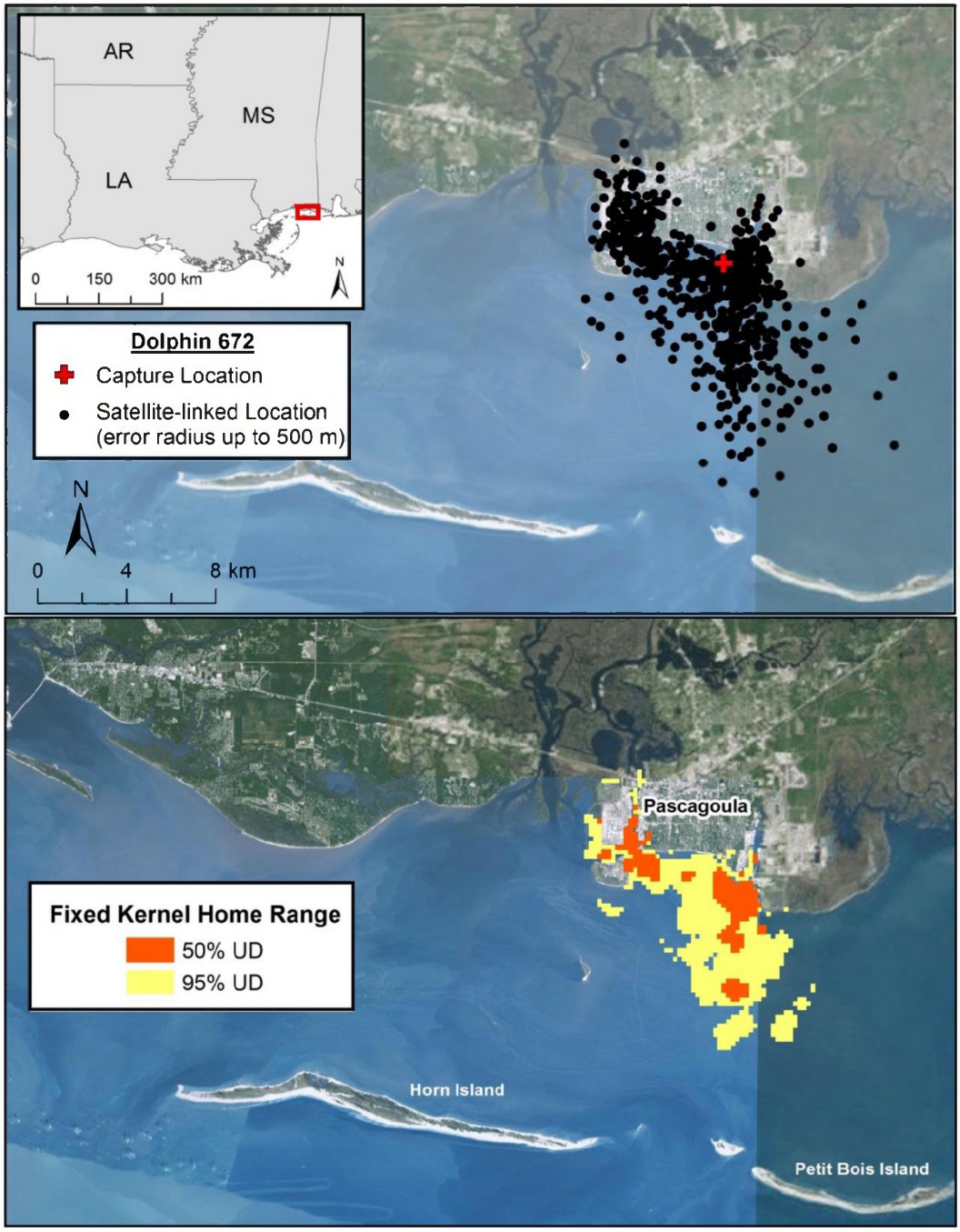
Dolphin 670 primarily used the coastal waters between Gautier and Pascagoula, but ranged offshore to Round Island and surrounding waters.

Figure 23. Dolphin 671's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



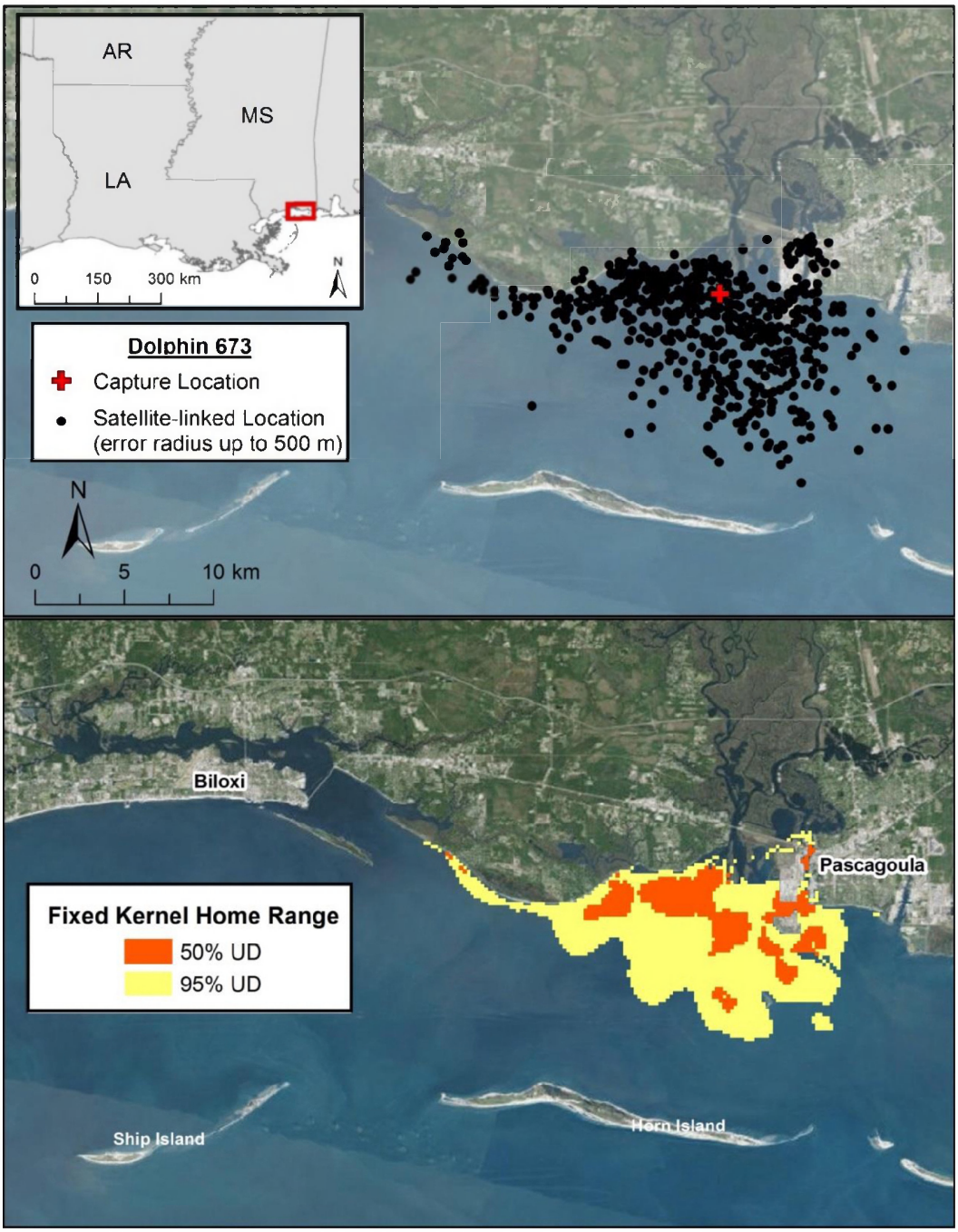
Dolphin 671 primarily used the coastal waters from Pascagoula westward to Ocean Springs.

Figure 24. Dolphin 672's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



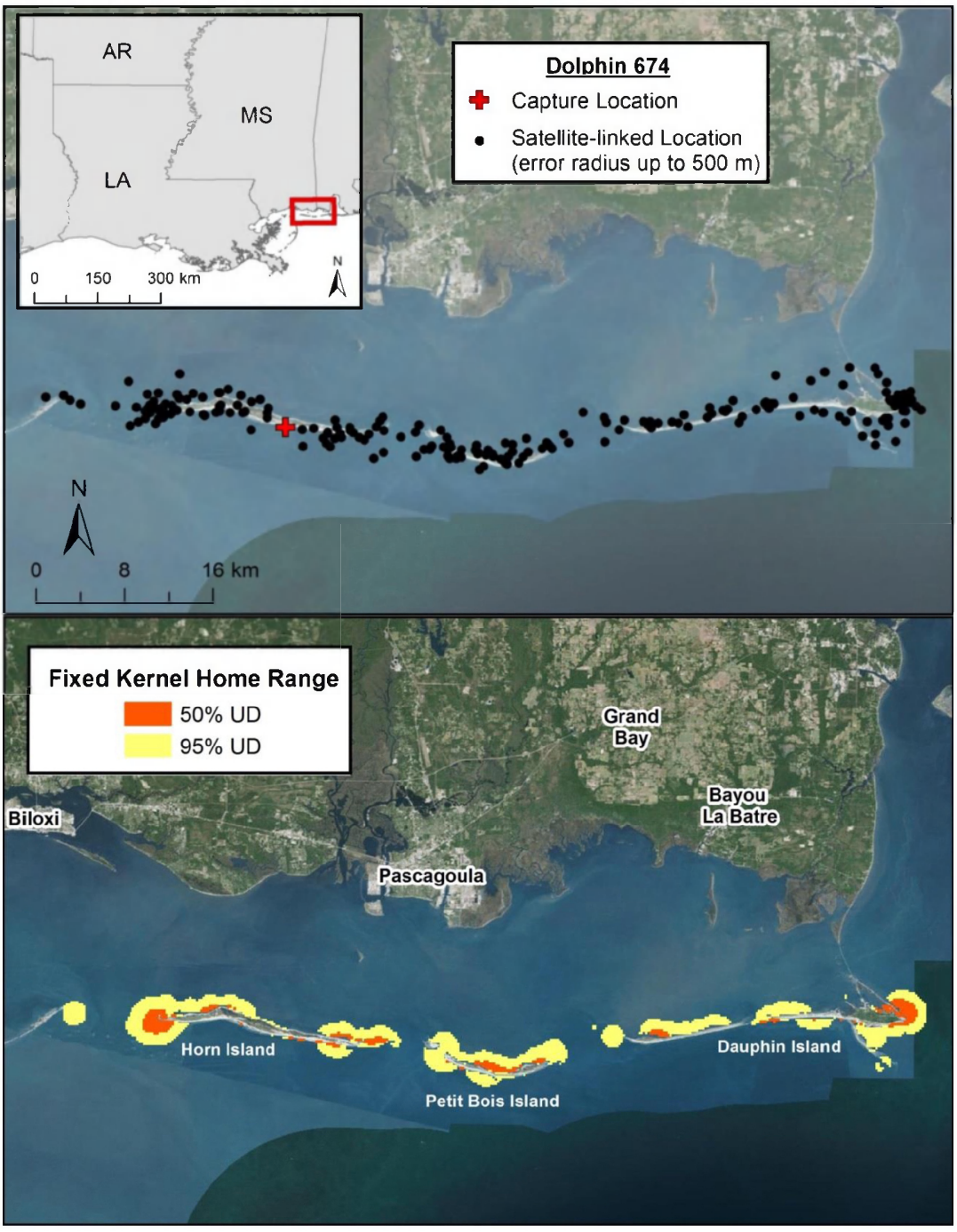
Dolphin 672 remained primarily in waters from Pascagoula, including the Singing River, through the large ship channel extending through Mississippi Sound to the SE.

Figure 25. Dolphin 673's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



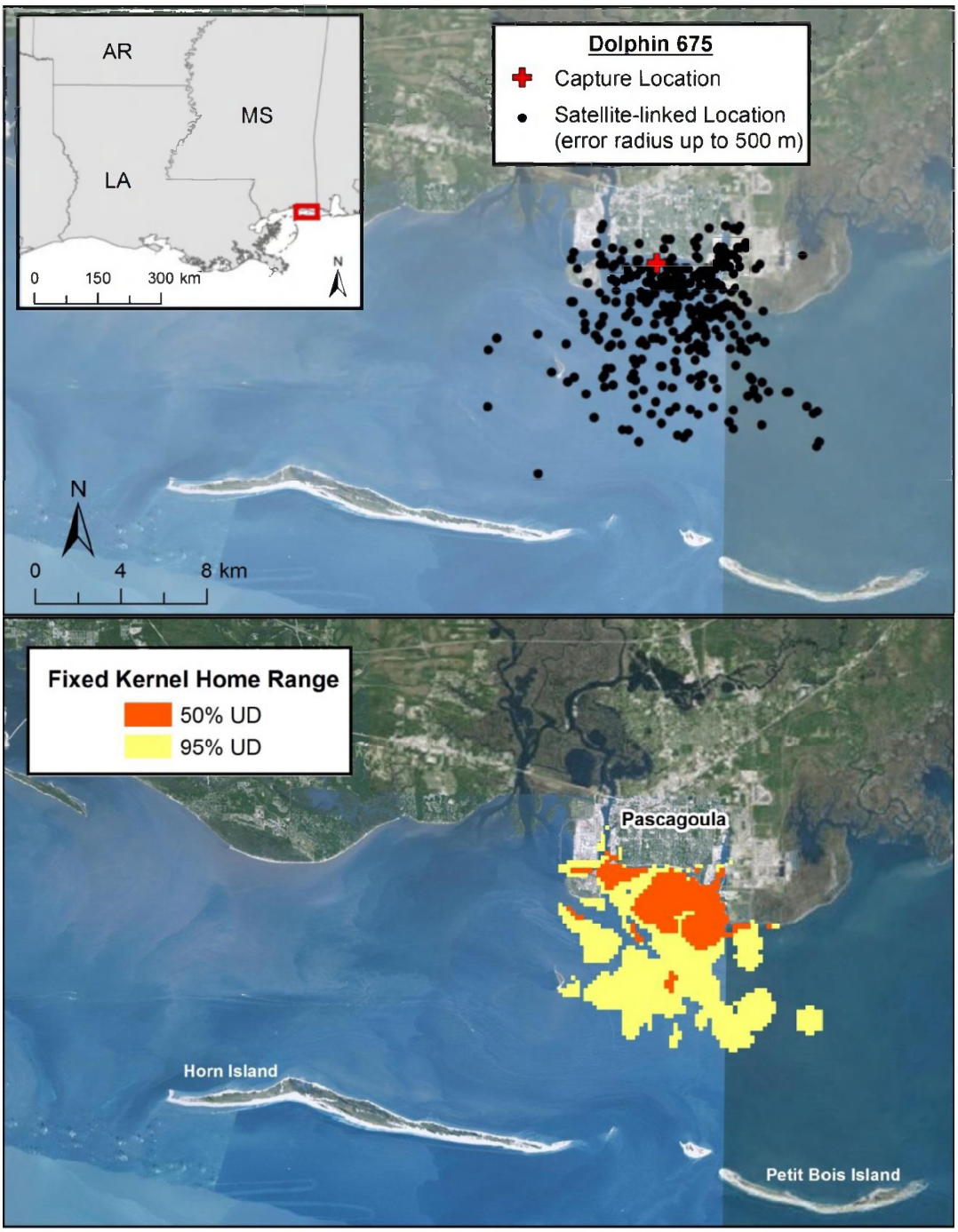
Dolphin 673 primarily used the waters from Pascagoula and Gautier offshore to about Round Island.

Figure 26. Dolphin 674's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



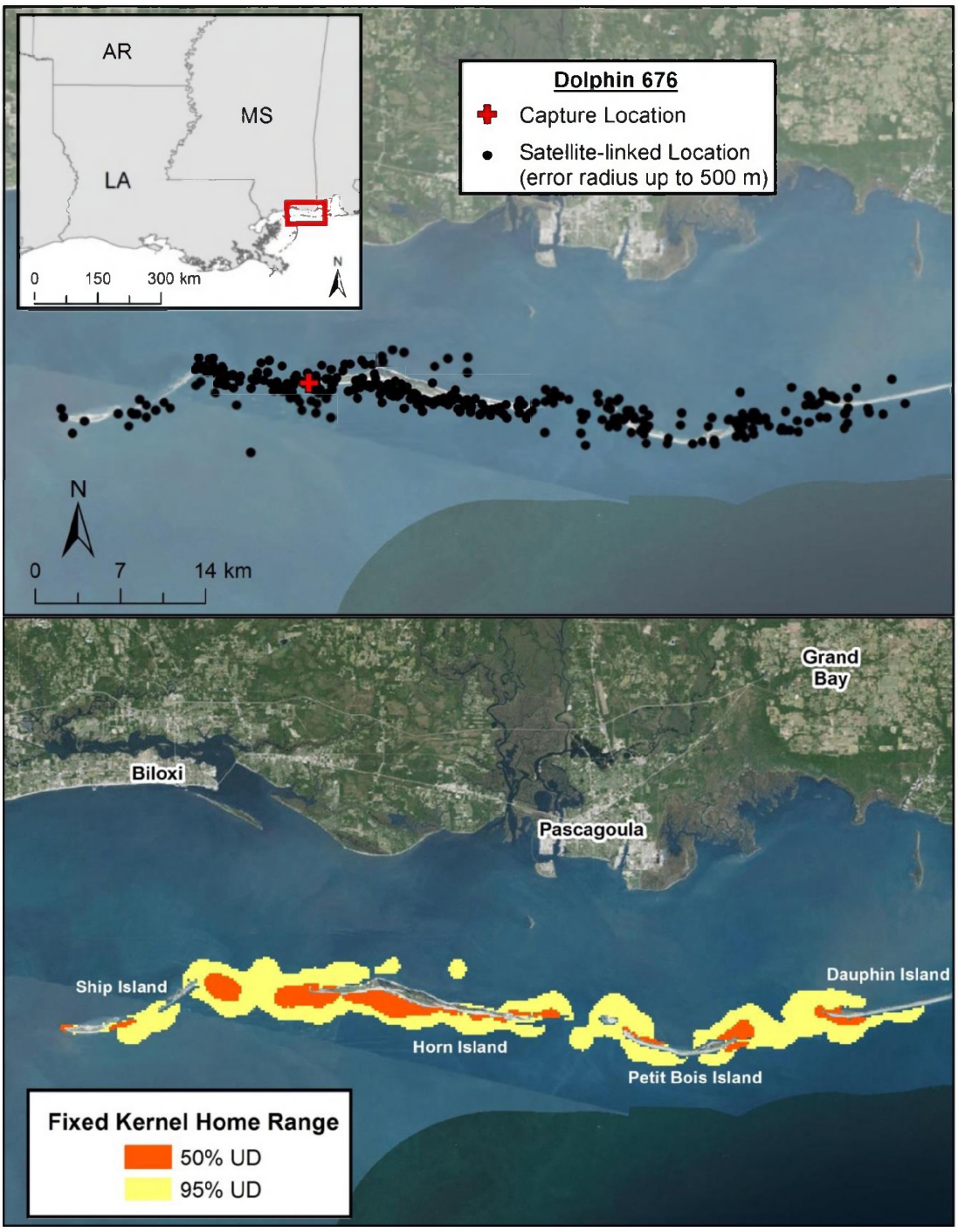
The range of Dolphin 674 was limited to waters surrounding the barrier islands, from the east end of Ship Island, eastward to the east end of Dauphin Island.

Figure 27. Dolphin 675's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



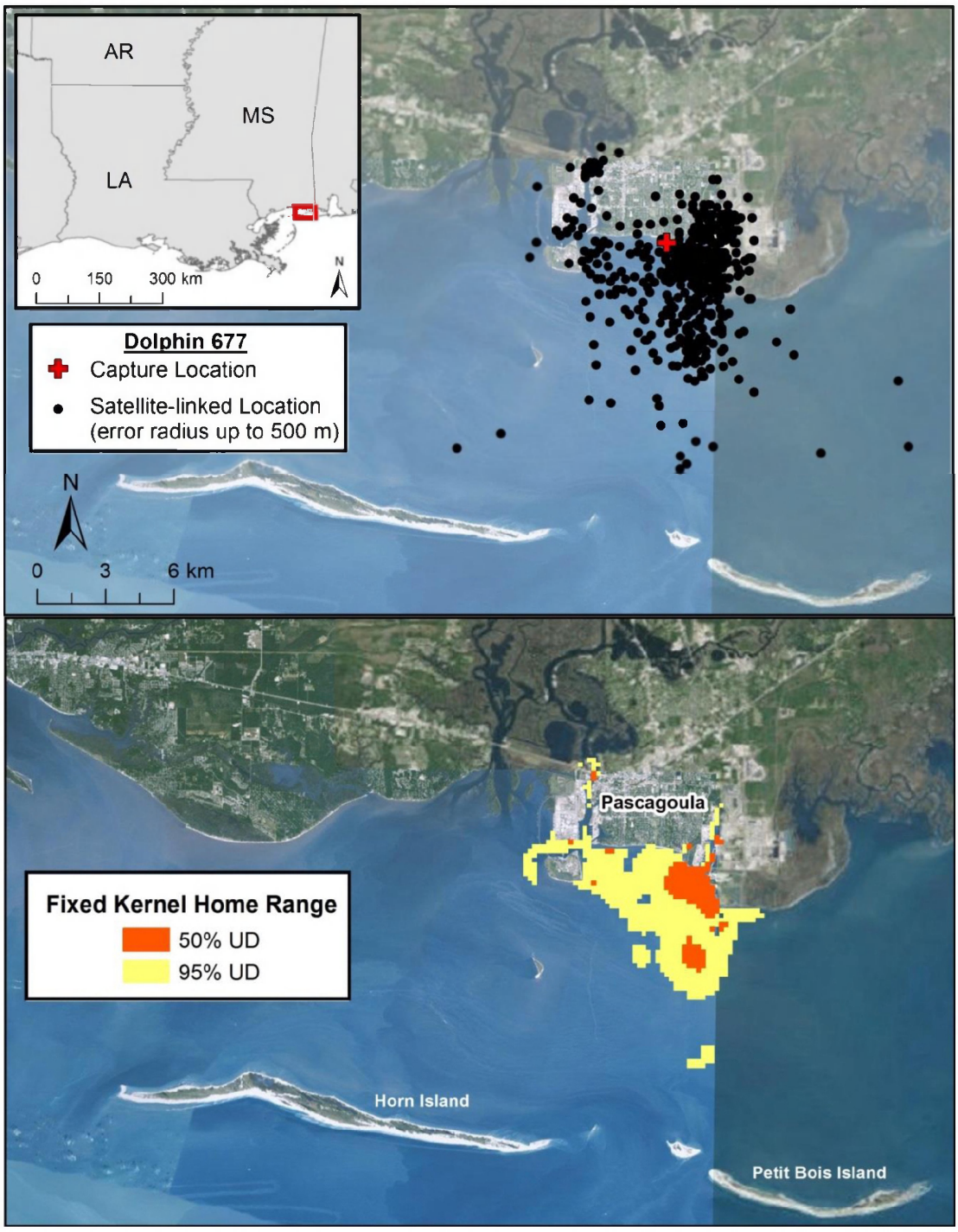
Dolphin 675 used a fairly small area near and offshore of Pascagoula.

Figure 28. Dolphin 676's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



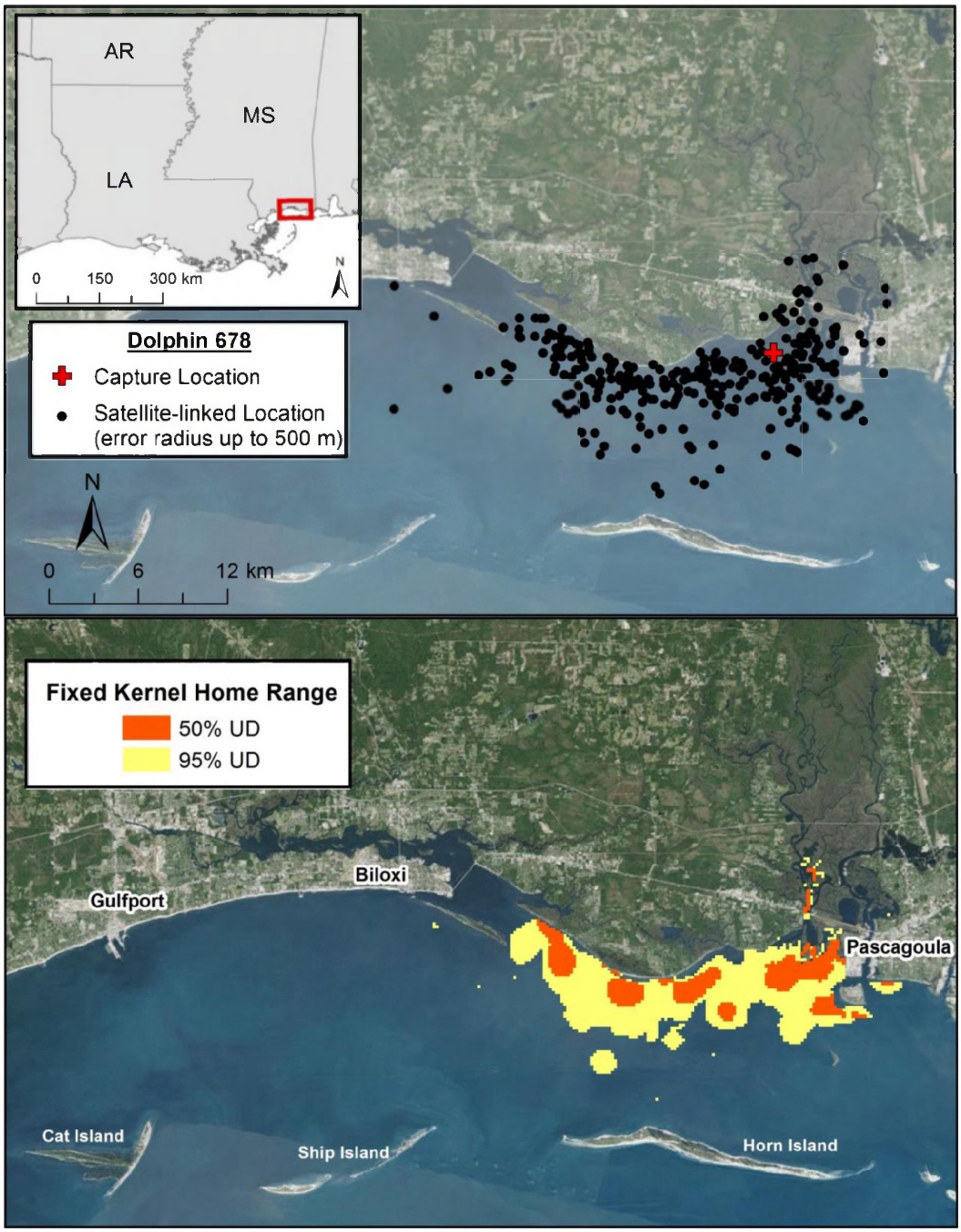
The range of Dolphin 676 was limited to the barrier islands, from Ship Island to the western portion of Dauphin Island.

Figure 29. Dolphin 677's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



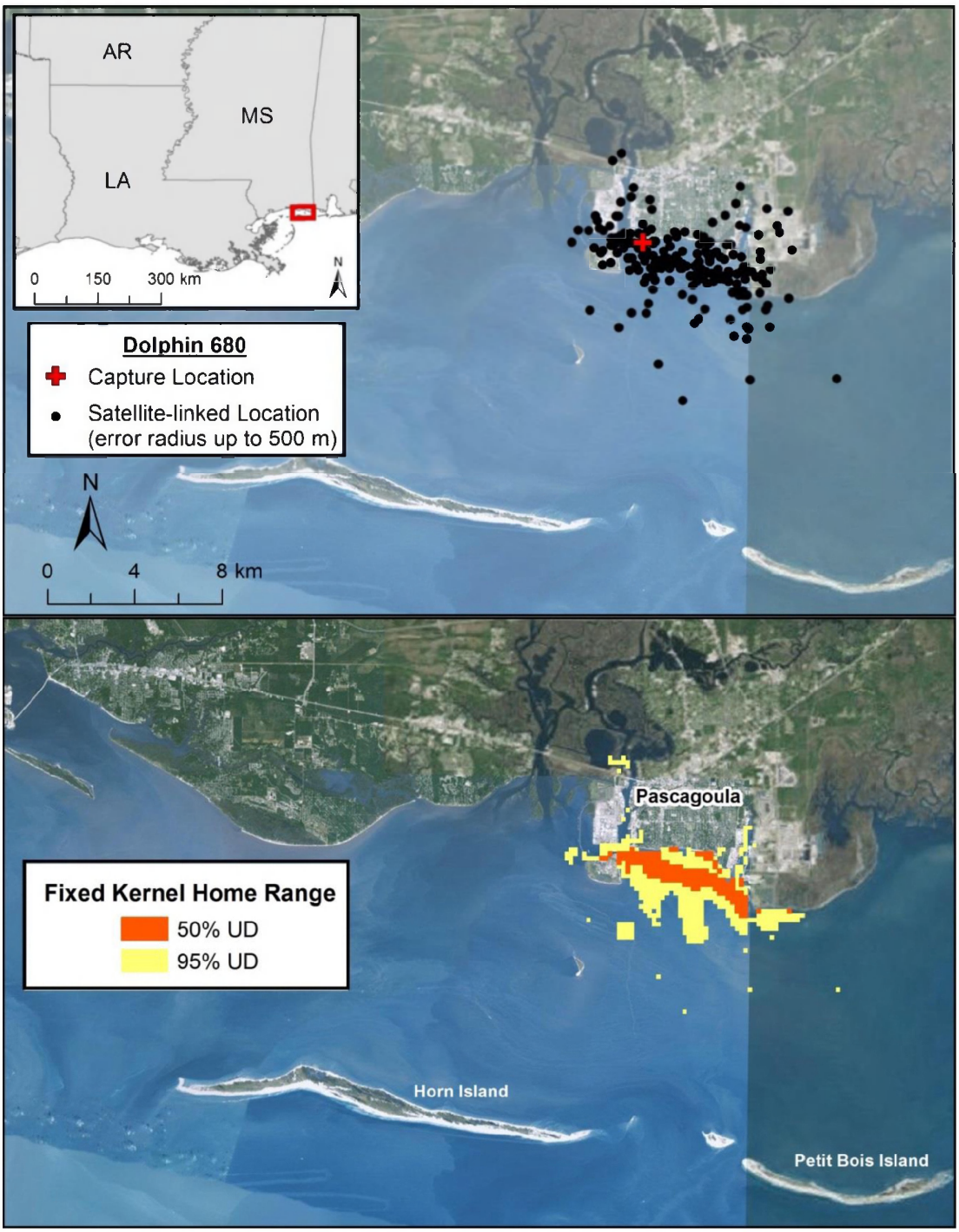
Dolphin 677 used a fairly small area near and offshore of Pascagoula.

Figure 30. Dolphin 678's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



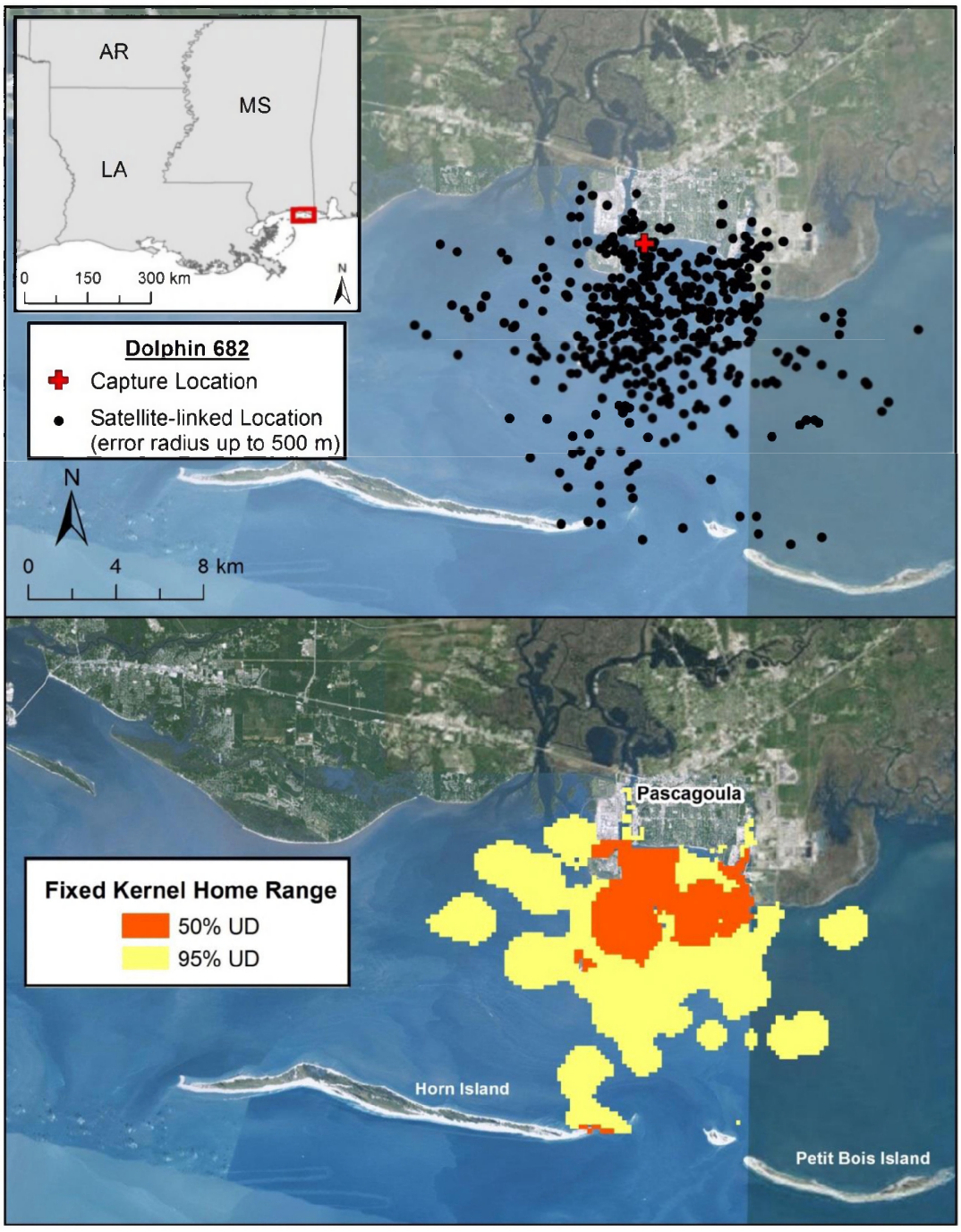
Dolphin 678 primarily used the coastal waters from Pascagoula to Ocean Springs, but included some marsh/river habitat as well.

Figure 31. Dolphin 680's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



Dolphin 680 remained primarily in the coastal waters off Pascagoula and Greenwood Island.

Figure 32. Dolphin 682's capture location and satellite-linked locations (LC3 and LC2), and 95% and 50% fixed-kernel home range contours.



Dolphin 682 ranged from the Pascagoula shoreline, across Mississippi Sound, to the eastern tip of Horn Island.