



Near-Field Sturgeon Monitoring for the New NY Bridge at Tappan Zee

Quarterly Report

December 1, 2013 - March 31, 2014

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for

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1.0 SUMMARY

During the monitoring period from December 1, 2013 through March 31, 2014, 5 DEC-tagged shortnose sturgeon were present within the near-field array in the vicinity of the Tappan Zee Bridge. No acoustic-tagged Atlantic sturgeon were detected during this time period. Relative to sturgeon monitoring during the second and third quarters of 2013, there were very few acoustic-tagged sturgeon detected during this most recent quarter. Shortnose sturgeon were present in greatest abundance ($n = 3$ sturgeon) during December and one shortnose sturgeon was present in January and in March; none were present in February. Based on detections of sturgeon at specific receivers during December through March, it was determined that the area of highest concentration was in the main channel, where sturgeon exhibited upstream and downstream movement through the near-field receiver array. Each of the sturgeon spent only a few hours in the array as they transited the monitoring area. Further analysis is currently being conducted to assess the presence, residence time, and movement of acoustic-tagged sturgeon during dredging and impact pile driving, in order to better understand their response to these construction activities. The results of this analysis will be presented in the next quarterly report to be submitted by July 18, 2014.

2.0 INTRODUCTION

This quarterly report for the Near-Field Sturgeon Monitoring program summarizes all available information collected via the near-field array of acoustic receivers deployed in the vicinity of Authorized Activities at the Tappan Zee Bridge during the time period from December 1, 2013 through March 31, 2014. The purpose of the near-field sturgeon monitoring is to detect the presence, residence time, and movement of acoustic-tagged Atlantic and shortnose sturgeon within the vicinity of the Tappan Zee Bridge during construction of the New NY Bridge at Tappan Zee (“Project”). The information presented herein is reported as required by the National Marine Fisheries Service (“NMFS”) and New York State Department of Environmental Conservation (“DEC”).

2.1 PERMIT REQUIREMENTS

On April 2, 2014, NMFS issued a Biological Opinion (“NMFS BO”) for the Tappan Zee Bridge Replacement Project (NER-2013-9592) in accordance with Section 7 of the Endangered Species Act of 1973, as amended. The NMFS BO assessed the potential impacts of the Project on ESA-listed Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). This quarterly report has been developed in compliance with Reasonable and Prudent Measure (“RPM”) #6 of the NMFS BO, which states that:

FHWA must continue to implement a program to monitor impacts to sturgeon resulting from pile installation for permanent piles four feet or more in diameter throughout the duration of pile driving operations.

Term and Condition #11 of the BO further requires that:

To implement RPM#6, FHWA must ensure acoustic telemetry equipment continues to be utilized to monitor for the presence, residence time and movement of tagged Atlantic and shortnose sturgeon in the project area during installation of permanent piles, 4-feet or greater in diameter. FHWA must design a monitoring plan that would ensure the detection of any acoustically tagged shortnose or Atlantic sturgeon in the action area. FHWA must ensure all occurrences of tagged sturgeon in the project area are recorded and reported to NMFS to the extent that detected tags can be identified as shortnose or Atlantic sturgeon. Information collected from any stationary receivers must be downloaded at least every 60 days, unless there are weather or safety concerns in which case downloads must be made as soon as practicable after the relief of the weather or safety concern. Preliminary reports containing information on the number of tagged sturgeon detected must be provided to NMFS on a regular basis, but no less frequently than every 60 days. If reports cannot be provided on that frequency, FHWA must provide an explanation to NMFS within the 60-day period and provide the report as soon as possible. On a quarterly basis, FHWA must provide NMFS a report that summarizes the presence, residence time, and movement of tagged Atlantic and shortnose sturgeon for the 90 day period. The quarterly report must be provided within 30 days of the end of the 90 day period. The report must also include the number of tags that could not be identified to species and document the steps that FHWA took to attempt to identify the species identification (e.g., contact the tag manufacturer). This term and condition does not require FHWA to tag any sturgeon with telemetry tags.

Similar sturgeon monitoring requirements are outlined in Condition 40 of the Final DEC Permit (DEC ID 3-9903-00043/00012) issued on March 25, 2013, which states:

As soon as possible, but no more than 60 days after the effective date of this Permit, and before starting installation of permanent piles four feet or more in diameter the Permittee must submit to the Department a plan for monitoring the movement of shortnose and Atlantic sturgeon in the vicinity of the Tappan Zee Bridge.

On December 9, 2013, FHWA finalized the Sturgeon Acoustic Telemetry Monitoring Plan (“Plan”) through consultation with DEC and NMFS. The area of the Hudson River to be monitored was referenced in the DEC Permit as “the vicinity of the Tappan Zee Bridge” and “the vicinity of any Authorized Activities” and in the Plan as “the vicinity of the Authorized Activity.” In the Plan, this area (“the vicinity of the Tappan Zee Bridge”) was defined as

being within 1,000 feet of pile driving in waters deeper than 6 feet (mean low water). This area encompasses the zone in which behavioral effects from pile driving are anticipated for sturgeon based on the NMFS 2013 Biological Opinion (i.e., the 150 dB rms SPL isopleth) and extends 61 meters (m; 200 feet [ft]) beyond this isopleth. It is important to note that the detection range of the near-field array exceeds the vicinity of the Authorized Activity. Therefore, some of the detection data presented in this quarterly report are from sturgeon occurring just outside of the monitoring array.

The Plan¹ defines the monitoring objectives, extent of the survey area (Figure 1 in the Plan), details of the monitoring array, results of range testing, and data-collection methods used to conduct the near-field sturgeon monitoring summarized in this quarterly report. The measures established by the Plan were utilized during monitoring to determine 1) sturgeon presence, 2) residence time, 3) position within the array, and 4) movement within the array. The 32 Vemco receivers that comprise the near-field array was configured to allow the two dimensional (2-D) positioning of acoustic-tagged sturgeon within the vicinity of the Authorized Activity defined by DEC.

As required by Term and Condition #11 of the NMFS BO, and outlined in the Plan, this quarterly report summarizes the presence, residence time, and movement of acoustic-tagged sturgeon detected in the near-field receiver array during the most recent 90-day monitoring period.. The final configuration of the 32 monitoring stations that comprise the near-field array (Figure 1 in the Plan) was in place in October 2013. During the March 2014 data download, it was discovered that several receivers had been lost, most likely as a result of construction activities. A subsequent range-testing analysis conducted by the Thruway Authority demonstrated that several of these stations could be decommissioned without compromising the effectiveness of the array; the other lost stations were replaced. Therefore, this report includes data from the 27 stations that were downloaded during this quarter.

With regard to RPM #6, the ongoing installation of permanent piles four feet or more in diameter began on October 19, 2013. It was originally intended that this report include data from January 1 through March 31, 2014 (i.e., the first quarter of 2014); however, weather and ice conditions in the Hudson River prevented receiver recovery during the scheduled January 2014 download. Consequently, the data from December 2013 were not available at the time the last report was prepared and are therefore included in this report.

¹ Tappan Zee Constructors, LLC. Sturgeon Acoustic Telemetry Monitoring Plan for the Tappan Zee Hudson River Crossing, Revision 2. Submitted to NMFS on December 9, 2013.

3.0 METHODS

3.1 DATA DOWNLOADS

Data summarized in this quarterly report span the period from December 1, 2013 through March 31, 2014. During this quarter, receivers deployed at 27 monitoring stations were downloaded; Stations 5, 7, 9, 10, and 32 were lost between this and the previous download event. To minimize the risk of future loss, Stations 5 and 9 were relocated to moorings that are attached to the bridge. Stations 7, 10, and 32 are no longer active. Stations 2 and 16 were not retrieved during the March 2014 download event, but have since been retrieved and downloaded and those monitoring data are included in this report.

Of the 27 stations, 25 consisted of a single Vemco receiver and 2 stations consisted of paired Vemco and Lotek receivers. All monitoring stations contain Vemco sync tags, and one station contains a temperature tag for use in the Vemco Positioning System (“VPS”) analysis. Sync tags were used to maintain internal clock synchrony among Vemco receivers within the array, which is necessary to accurately position sturgeon.

Data downloads for this quarter were performed on December 2-4, 2013, March 10-19 2014, and May 5-8, 2014.

4.0 RESULTS

4.1 STURGEON PRESENCE

Presence is defined for the purpose of this monitoring effort as the detection of an individual acoustic-tagged sturgeon within the near-field array independent of the time that the sturgeon spends in the array. Consistent with the manufacturer-recommended use of the Vemco receiver technology, the False Detection Analysis (FDA) tool was used in Vemco’s VUE software to remove likely false detections prior to reporting.

Relative to the second and third quarters of 2013, there were very few acoustic-tagged sturgeon present in the near-field monitoring array. A total of 6 unique tag codes were present in the near-field array during the monitoring period summarized in this quarterly report. Of these, 5 were acoustic-tagged shortnose sturgeon that were tagged by DEC. No acoustic-tagged Atlantic sturgeon were detected during this quarter. A single acoustic-tagged fish has not yet been identified to species, but the tag identification code has been submitted to Vemco for communication to the tag owner.

Three shortnose sturgeon were present in the near-field array during early winter December, one shortnose sturgeon was present in January and one shortnose sturgeon was present in March. No acoustic-tagged sturgeon were detected during February.

Table 1

Locations and deployment times for acoustic receivers within the near-field monitoring array at the Tappan Zee Bridge

Station	Latitude	Longitude	GPS Date	GPS time	Vemco Serial #	Lotek Serial #	Sync Tag	Temperature Tag
St01	41.07460493	-73.90995905	12/3/2013	11:49:04	122371		65006	
St02*	41.07491730	-73.89902114	12/3/2013	12:37:01	122372		65011	
St03	41.06609743	-73.91072601	12/3/2013	14:27:37	122373		65008	
St04	41.06620240	-73.89934361	12/3/2013	13:57:30	122888		65010	
St05**	41.07370594	-73.89345481	8/7/2013	7:45:36	122891		65002	
St06	41.07466667	-73.88828333	12/4/2013	NA	122892	265126	65014	
St07***	41.07843333	-73.87416667	12/4/2013	NA	122887	265127	65012	
St08	41.07285298	-73.87299539	12/3/2013	15:19:42	122890		65013	
St09*	41.06914889	-73.89188441	12/3/2013	13:12:02	122893		65001	
St10***	41.064693940	-73.891978810	12/4/2013	16:00:00	122894	265121	65003	
St11	41.06681667	-73.87360000	12/4/2013	11:35:00	122889	265119	65015	
St12	41.07641667	-73.88453333	12/4/2013	12:51:00	122884		65016	
St13	41.07603333	-73.88080000	12/4/2013	12:33:00	122885		65017	A69-9002-13339
St14	41.07306667	-73.88541667	12/4/2013	13:23:00	122886		65019	
St15	41.07320000	-73.88228333	12/4/2013	13:50:00	122883		65018	
St16	41.07340000	-73.87908333	12/4/2013	14:12:00	122879		65020	
St17	41.06910000	-73.88765000	12/4/2013	14:35:00	122881		65021	
St18	41.06905000	-73.88338333	12/4/2013	NA	122880		65022	
St19	41.06875000	-73.87788333	12/4/2013	NA	122876		65023	
St20	41.06650167	73.88070500	12/31/2013	10:23:00	123572		65009	
St21	41.06606667	-73.88515000	12/4/2013	15:00:00	122877		65004	
St22	41.06575000	-73.87695000	12/4/2013	11:02:00	122878		65007	
St23	41.07356616	-73.91341118	12/3/2013	11:32:27	122871		65024	
St24	41.07311783	-73.90435571	12/3/2013	12:04:14	122872		65027	
St25	41.06857715	-73.90535885	12/3/2013	14:12:59	122875		65026	
St26	41.06802812	-73.89603174	12/3/2013	13:29:27	122873		65025	
St27	41.07571083	-73.91227763	12/3/2013	11:14:06	123565		26747	
St28	41.07062978	-73.91368092	12/3/2013	14:46:13	123568		26743	
St29	41.07025798	-73.90928602	12/3/2013	14:54:34	123566		26746	
St30	41.07033430	-73.91381337	12/3/2013	14:40:05	123567		26741	
St31	41.06993749	-73.90964117	12/3/2013	14:32:43	123569		26739	
St32***	41.07578932	-73.89332477	12/3/2013	12:49:55	123570		26745	

Notes: *Not downloaded during this quarter.
 **Not recovered since August 2013 download. Determined to have been lost.
 ***Lost since December 2013 download event. These stations have been decommissioned.

All tag codes for sync tags include the prefix "A69-1601"

4.2 RESIDENCE TIME

Residency is defined here as the amount of time spent by individual acoustic-tagged sturgeon within the near-field monitoring array. A sturgeon was considered resident within the array from the time it was first detected to the time it was last detected. If the timespan between subsequent detections was greater than 30 minutes, then the fish was deemed to have left the array. The 30-minute timespan was established via Vemco’s VUE software using variable intervals to determine the most appropriate timeframe based on tag-detection intervals.

Table 2

Monthly detections of acoustic-tagged fish within the near-field monitoring array

Species	Month (2013/2014)			
	Dec	Jan	Feb	Mar
Atlantic sturgeon	0	0	0	0
Shortnose sturgeon	3	1	0	1
Unconfirmed ID	0	1	0	0
Notes:	Values represent the number of unique tag codes detected for each species and month			

The total amount of time (in hours) that tagged sturgeon were resident within the array during each month is summarized in Tables 3 and 4 below. Residence times for shortnose sturgeon were highest during the month of December. In general, residence time was relatively low during this quarter compared to the second and third quarters of 2013.

Table 3

Residence time of Atlantic sturgeon within the near-field monitoring array

Month (2013/2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
December	0.0	0.0	0.0	0
January	0.0	0.0	0.0	0
February	0.0	0.0	0.0	0
March	0.0	0.0	0.0	0

Appendix A contains monthly graphical depictions of presence and residence by tagged sturgeon detected within the array. These figures indicate that most sturgeon entered and left the array multiple times during the monitoring period.

Table 4

Residence time of shortnose sturgeon within the near-field monitoring array

Month (2013/2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
December	1.9	39.0	15.5	3
January	0.8	0.8	0.8	1
February	0.0	0.0	0.0	0
March	1.2	1.2	1.2	1

4.3 STURGEON POSITION

The position of an acoustic-tagged sturgeon can be defined generally in terms of its location relative to a single receiver (i.e., within detection range of a receiver) or with greater certainty through a two-dimensional (“2-D”) positioning technique known as trilateration in which the position of the sturgeon within the near-field array is estimated using simultaneous detections from at least three receivers.

The locations of receivers within the near-field array were selected to allow for the fine-scale positioning of acoustic-tagged sturgeon. Due to ongoing data-sharing negotiations with researchers who have tagged sturgeon that have been detected in the near-field array, the analysis of fine-scale sturgeon positions presented in this quarterly report is limited to sturgeon tagged by DEC, SUNY, and ERC and detected during the time period from December 1, 2013 through March 31, 2014.

Vemco is currently conducting the positioning analysis for the data covered in this report. Only one tagged fish was Vemco-tagged, the other sturgeon were tagged with Lotek Dual Mode transmitters and can not be positioned by Vemco. When permission is granted by the owner of the Vemco tag, the positioning analysis will be conducted and the results of this analysis will be incorporated into the 2nd quarterly report for 2014.

In the absence of fine-scale positioning information, coarse spatial positioning of acoustic-tagged sturgeon was determined based on the location of the receiver(s) that recorded the detections and the detection range for the receiver(s). In order to summarize sturgeon positions on a coarse scale, the near-field array was sub-divided into six regions. These regions encompassed the areas north and south of the existing Tappan Zee Bridge, which were further sub-divided into the areas west of the navigation channel (West), within the navigation channel (Channel), and to the east of the navigation channel (East).

Sturgeon were detected in the Channel throughout the reporting period, as shown in Table 5. Appendix B includes a series of monthly tables that provide the percentage of detections recorded by receivers in each region. Generally, sturgeon were detected in more frequently to the north than to the south of the existing bridge.

4.4 MOVEMENT

Sturgeon generally moved from north to south and south to north within the main channel of the river. There was relatively little lateral movement outside of the channel even from sturgeon that moved through the array multiple times. Based on the locations of the receivers at which sturgeon were most frequently detected, it was determined that all of the acoustic-tagged sturgeon detected during this quarter were located within the Channel or along the edges of the Channel. As discussed above, the results of the VPS positioning analyses for the data covered by this quarterly report are not yet available. A full discussion of movement will be developed once the analysis is complete.

Table 5

Percentage of sturgeon detections within coarsely defined regions of the near-field monitoring array between December 1, 2013 and March 31, 2014

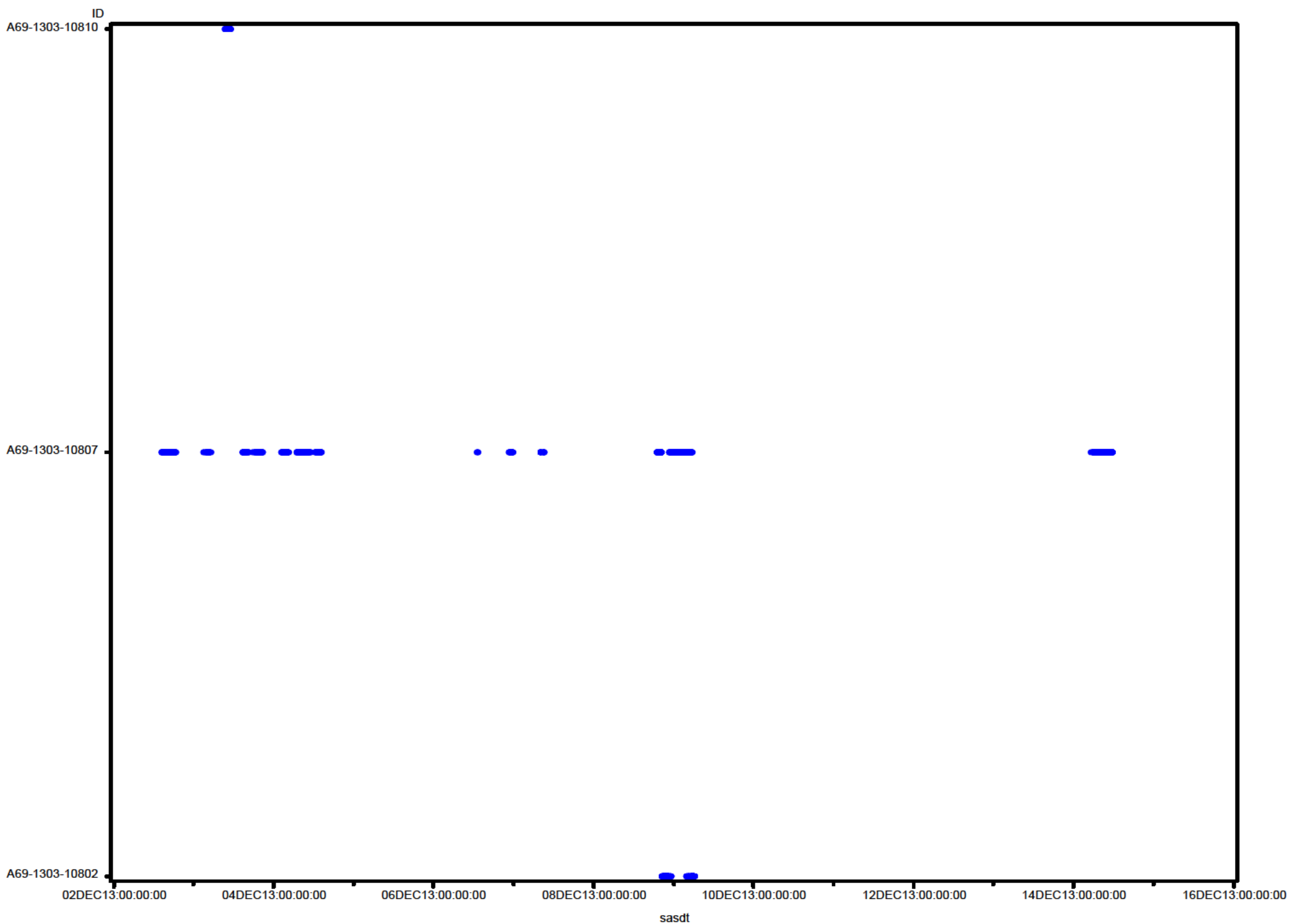
Shortnose Sturgeon	West	Channel	East	Grand Total
North	0.1%	58.9%	1.6%	60.6%
South	1.6%	32.7%	5.1%	39.4%
Grand Total	1.7%	91.6%	6.7%	100%

*

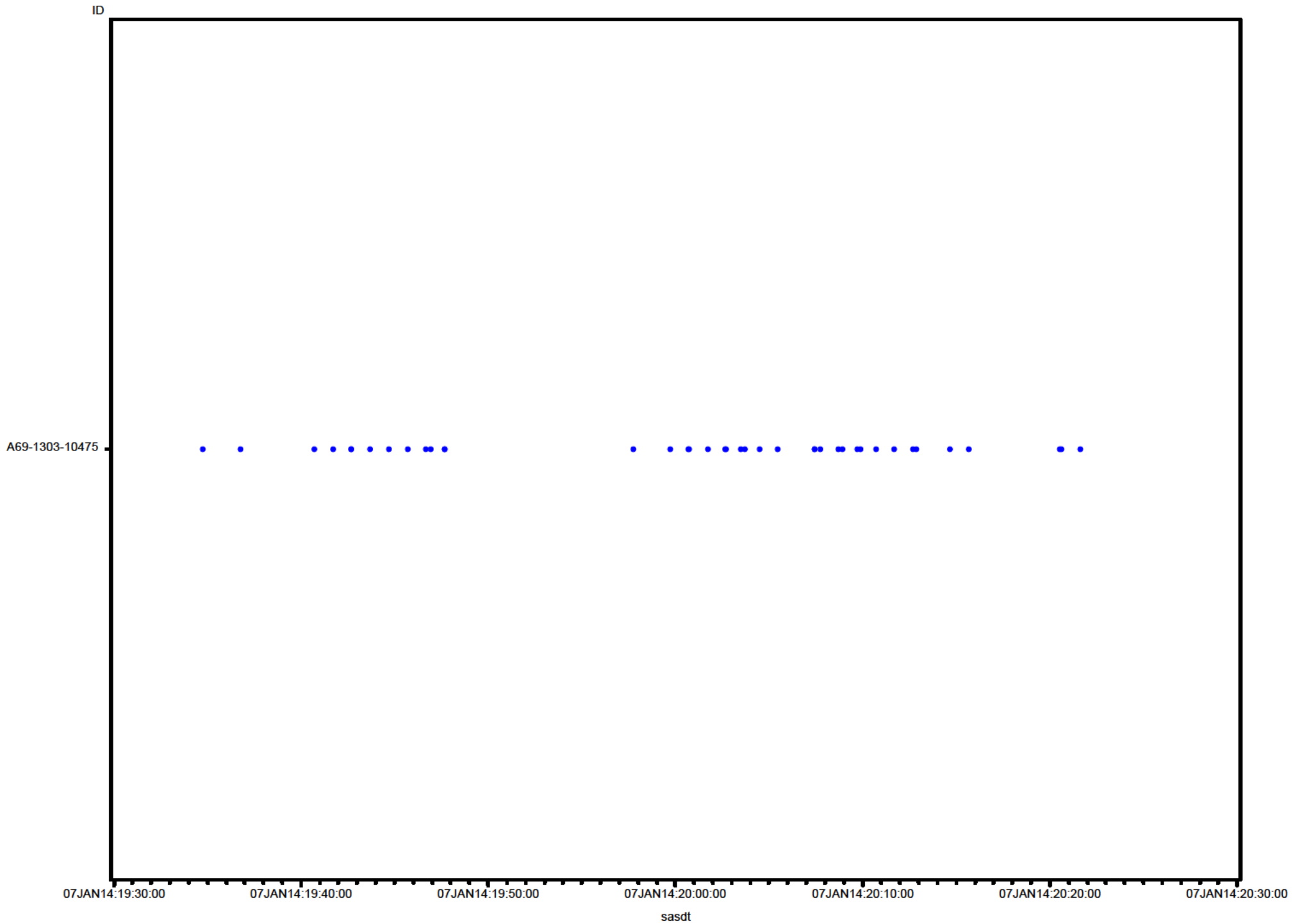
Appendix A

Sturgeon Presence and Residence within the Near-Field Monitoring Array

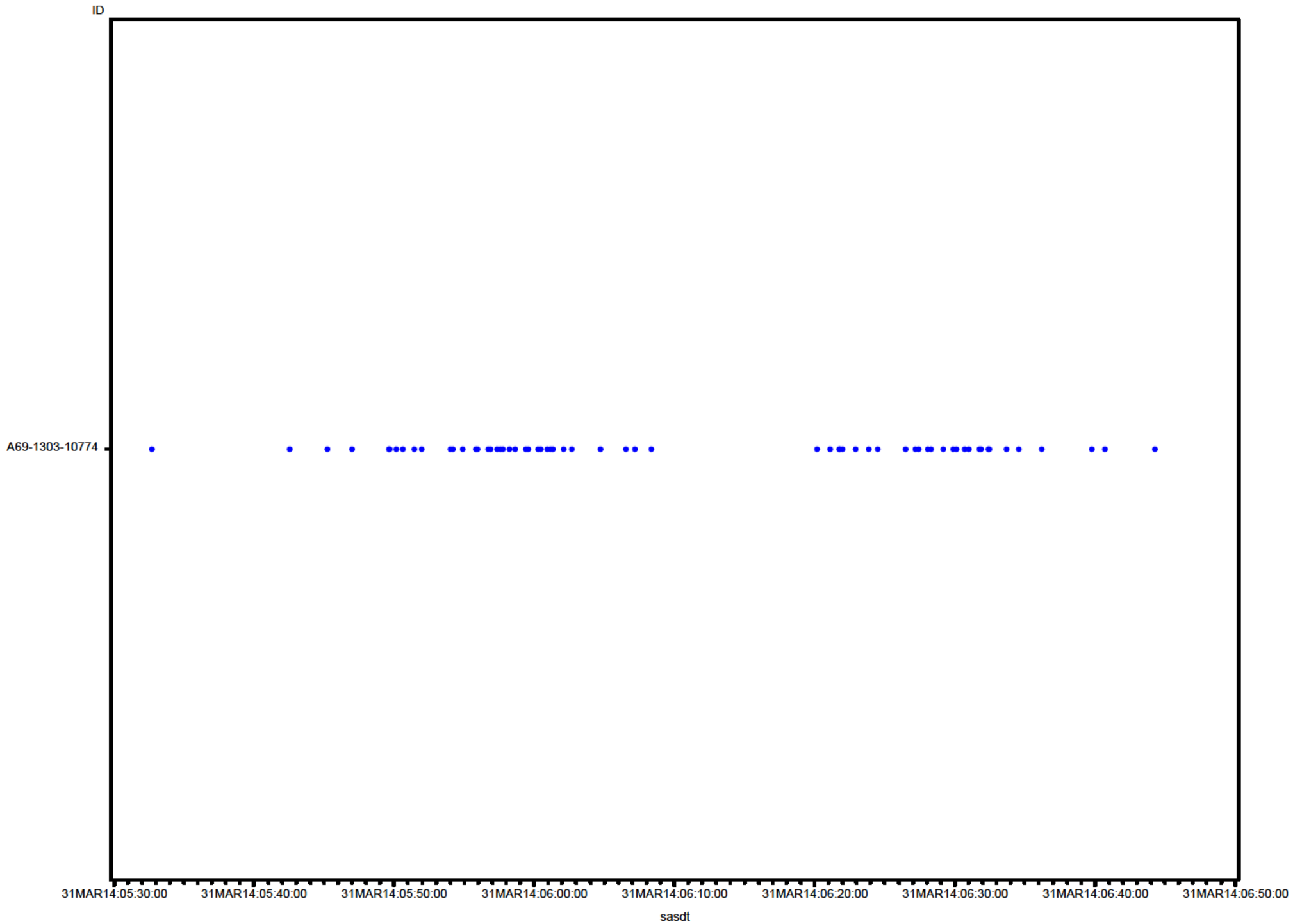
December - Shortnose Sturgeon - Vemco



January - Shortnose Sturgeon - Vemco



March - Shortnose Sturgeon - Vemco



Appendix B

Sturgeon Position within the Near-Field Monitoring Array

December 2013 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location

Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	0.1%	58.9%	1.6%	60.6%
South	1.7%	32.5%	5.2%	39.4%
Total	1.8%	91.4%	6.8%	100.0%

Species Detection by Station during the Month of December

Species	Stations																															
	West																Channel										East					
	1	2	3	4	5	9	10	23	24	25	26	27	28	29	30	31	32	6	12	13	14	15	16	17	18	19	20	21	22	7	8	11
Shortnose	0	0	1	17	0	2	17	0	1	3	34	0	0	0	0	0	3	192	581	676	417	462	425	126	325	265	0	376	428	50	27	245

January 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	0.0%	67.5%	0.0%	67.5%
South	0.0%	32.5%	0.0%	32.5%
Total	0.0%	100.0%	0.0%	100.0%

Species Detection by Station during the Month of January

Species	Stations																														
	West																Channel												East		
	1	2	3	4	5	9	10	23	24	25	26	27	28	29	30	31	32	6	12	13	14	15	16	17	18	19	20	21	22	7	8
Shortnose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	3	2	7	5	0	1	0	10	0	2	0	0	0

February 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	0.0%	0.0%	0.0%	0.0%
South	0.0%	0.0%	0.0%	0.0%
Total	0.0%	0.0%	0.0%	0.0%

Species Detection by Station during the Month of February

Species	Stations																																	
	West																Channel												East					
	1	2	3	4	5	9	10	23	24	25	26	27	28	29	30	31	32	6	12	13	14	15	16	17	18	19	20	21	22	7	8	11		
Shortnose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

No acoustic-tagged sturgeon were detected during February monitoring.

March 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	0.0%	52.4%	0.0%	52.4%
South	0.0%	47.6%	0.0%	47.6%
Total	0.0%	100.0%	0.0%	100.0%

Species Detection by Station during the Month of March

Species	Stations																														
	West																Channel										East				
	1	2	3	4	5	9	10	23	24	25	26	27	28	29	30	31	32	6	12	13	14	15	16	17	18	19	20	21	22	7	8
Shortnose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	12	7	3	7	1	3	11	5	0	0	0