



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

Quarterly Report

October 1 – December 31, 2014

**Prepared by**

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**for**

New York State Thruway Authority

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## 1.0 SUMMARY

During the monitoring period from October 1 through December 31, 2014, a total of [REDACTED] acoustic-tagged sturgeon and [REDACTED] striped bass were present within the near-field array in the vicinity of the Tappan Zee Bridge. Of these, 10 were shortnose sturgeon (3 tagged by DEC and 7 tagged by NYSTA). There were [REDACTED] Atlantic sturgeon detected during this period (20 NYSTA, [REDACTED]). [REDACTED]

[REDACTED] Relative to sturgeon monitoring during the third quarter of 2014, there were fewer acoustic-tagged sturgeon detected during this most recent quarter. Detections of shortnose sturgeon were highest during October (n=8 sturgeon) but decreased during November (n=4) and December (n=1). Detections of Atlantic sturgeon declined from October ([REDACTED]) into November ([REDACTED]) and December ([REDACTED]).

Detections of Atlantic sturgeon were most frequent within the channel (90% of detections during October-December). Shortnose sturgeon were less frequently detected in the channel (63% of detections) and more common than Atlantic sturgeon in the shallower area to the west of the channel. In October, shortnose sturgeon were fairly evenly distributed between the channel and western shallows on both north and south sides of the Bridge. From October to December though, the frequency of detections of shortnose sturgeon shifted as sturgeon appeared to move from the western shallows into the channel and from the northern side of the Tappan Zee Bridge to the southern side. In contrast, detections of Atlantic sturgeon were consistently highest in the channel, although there was a slight increase in the frequency of detections in the channel from October to December.

Individual Atlantic sturgeon spent, on average, less than a day in the array (i.e., 5 to 11 hours, on average) as they transited the monitoring area. In contrast, shortnose sturgeon spent more time in the monitoring area (i.e., 8 to 25 hours, on average). Residence time for Atlantic sturgeon decreased from 11 hours in October, to 7 hours in November, and to 5 hours in December. For shortnose sturgeon, residence time averaged approximately 16 hours in October, decreased to 8 hours in November, and increased to 25 hours in December.

## 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 October 1 through December 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 September 23, 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 [REDACTED] 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, [REDACTED]. 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 Plan<sup>1</sup> 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 29 Vemco receivers that currently comprise the near-field array were 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 approved configuration of the monitoring stations that comprise the near-field array (Figure 1 in the Plan) was in place in October 2013. Based on stationary range testing

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<sup>1</sup> AKRF, Inc. Sturgeon Acoustic Telemetry Monitoring Plan for the Tappan Zee Hudson River Crossing, Revision 3. Submitted to NMFS on June 30, 2014.

using sync-tag detections, it was determined that Stations 7, 10, and 32 were unnecessary for sturgeon positioning and were therefore decommissioned as discussed with DEC.

To improve monitoring coverage in the northern area of the array and west of the navigation channel, two new stations (Stations 33 and 34) were deployed in December as discussed with DEC staff in New Paltz on November 6, 2014 (Figure 1). The possible placement locations for the two new stations was constrained to the south by the presence of steel piles along the alignment of the new bridge and to the north by the swing radius of the moorings for construction barges. Despite those limitations, the current placement of the new stations is expected to increase the number of detections of acoustic-tagged fish in this part of the array. Based on estimates from the Thruway Authority's range testing analysis (see Attachment C of the Sturgeon Acoustic Telemetry Monitoring Plan), the detection range of the new stations should be approximately 600-1,000 m.

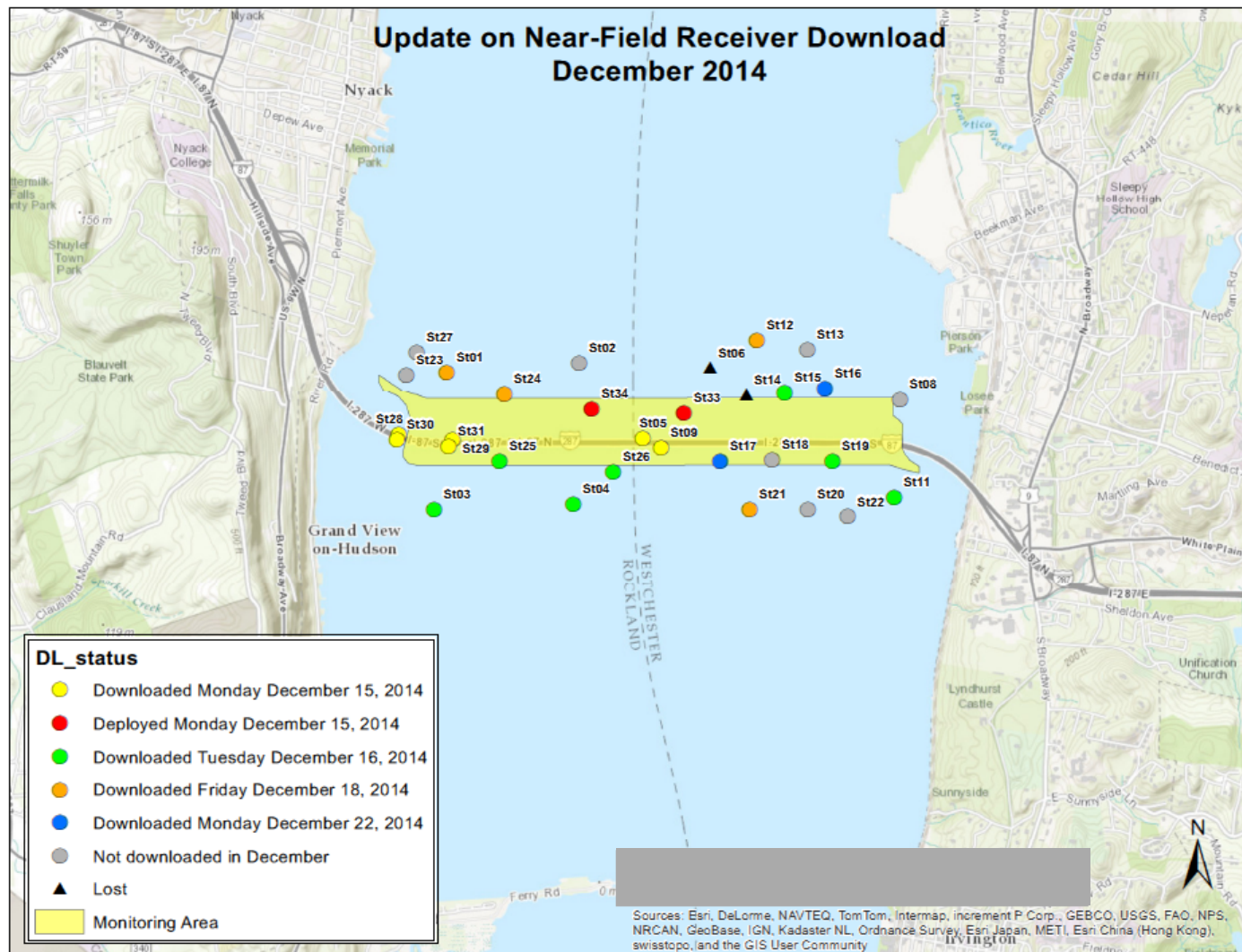
### **3.0 METHODS**

#### *3.1 DATA DOWNLOADS*

Data summarized in this quarterly report span the period from October 1 through December 31, 2014. During this quarter, receivers deployed at Stations 2, 8, 13, 20, and 23 were not able to be retrieved for download. Stations 33 and 34 were added on December 15, 2014. Locations of receiver stations at the beginning of this quarter's monitoring period and other relevant information is shown in Table 1.

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 beginning on: 1) October 28th, 2) December 15th, and 3) March 31, 2015. The scheduled February 2015 download was delayed due to ice on the river.



**Figure 1** – Locations of acoustic receivers within the near-field monitoring array, as of the December 2014 downloads.



## 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 third quarter of 2014, there were fewer acoustic-tagged sturgeon present in the near-field monitoring array. A total of [REDACTED] unique tag identification codes were detected in the near-field array during the monitoring period summarized in this quarterly report. Of these, 3 were acoustic-tagged shortnose sturgeon that were tagged by DEC and 7 tagged by NYSTA. There were also [REDACTED] Atlantic sturgeon detected during this period (20 NYSTA, [REDACTED]). In addition to acoustic-tagged sturgeon, there were [REDACTED] striped bass detected in the array: [REDACTED]

Sturgeon were present in the near-field array throughout this three-month monitoring period. As shown in Table 2, detections of shortnose and Atlantic sturgeon were relatively low during all three months and declined from October to December.

### 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.

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 time for Atlantic sturgeon averaged 5 to 11 hours for an individual sturgeon. In October, average residence time for Atlantic sturgeon was higher compared to the later months and the number of sturgeon decreased from October to December, suggesting that Atlantic sturgeon were emigrating from the Tappan Zee area of the river from October into November. Residence times for Atlantic sturgeon were generally low compared to shortnose sturgeon and reflected the transient nature of sub-adult and adult Atlantic sturgeon in the river. Residence time for



shortnose sturgeon was higher, averaging 16 hours in October, 8 hours in November, and 25 hours in December (for 1 sturgeon), reflecting the more localized spatial distribution and long-term residency of individual shortnose sturgeon.

**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 #	Sync Tag <sup>c</sup>	Temperature Tag	Lotek Serial #
St01	41.0745510	-73.9098880	29-Oct-14	11:27:09 AM	122371	65006	--	--
St02 <sup>a</sup>	41.0751381	-73.8988418	3-Jul-14	5:44:52 PM	123574	65011	--	--
St03	41.0664060	-73.9110461	29-Oct-14	1:19:32 PM	122373	65008	--	--
St04	41.0668128	-73.8997080	29-Oct-14	2:42:36 PM	122888	65010	--	--
St05	41.0665212	-73.8995928	28-Oct-14	2:58:36 PM	123573	65002	--	--
St06	Decommissioned				122892	65014	--	265126
St07 <sup>d</sup>	Decommissioned							265127
St08 <sup>a</sup>	41.0724296	-73.8733492	22-Aug-14	3:01:12 PM	122890	65013	--	--
St09	41.0698298	-73.8923686	28-Oct-14	2:58:55 PM	123571	26742	--	--
St10 <sup>d</sup>	Decommissioned							265121
St11	41.0667688	-73.8731350	30-Oct-14	12:24:21 PM	122889	65015	--	265119
St12 <sup>g</sup>	41.07645226	-73.8847001	10-Mar-14	4:18:37 PM	124816	26131	--	--
St13 <sup>a</sup>	41.0759160	-73.8807816	22-Aug-14	10:36:55 AM	122885	65017	--	--
St14	Decommissioned				122886	65019	13339	--
St15	41.0735294	-73.8823494	28-Oct-14	11:36:10 AM	122883	65018	--	--
St16	41.0730813	-73.8789994	4-Nov-14	1:36:08 PM	122879	65020	--	--
St17	41.0689435	-73.8874908	4-Nov-14	2:54:59 PM	122881	65021	--	--
St18 <sup>a</sup>	41.0690659	-73.8837919	22-Aug-14	12:26:45 PM	122880	65022	--	--
St19	41.0686852	-73.8784345	28-Oct-14	3:24:34 PM	122876	65023	--	--
St20 <sup>a</sup>	41.0661133	-73.8802760	25-Aug-14	12:01:25 PM	123572	65005	13338 <sup>d</sup>	--
St21	41.0668134	-73.8850517	22-Aug-14	12:26:45 PM	122877	65004	--	--
St22 <sup>a</sup>	41.0655986	-73.8771129	4-Nov-14	11:25:32 AM	122878	65007	--	--
St23 <sup>a,b</sup>	41.0745703	-73.9131982	21-Aug-14	12:38:57 PM	122871	65024	--	--
St24	41.0736221	-73.9051729	29-Oct-14	1:00:28 PM	124817	26744	--	--
St25	41.0689678	-73.9054488	29-Oct-14	1:52:47 PM	122875	65026	--	--
St26	41.0683299	-73.8961401	5-Nov-14	11:29:09 AM	122873	65025	--	--
St27 <sup>a</sup>	41.0756624	-73.9123129	29-Oct-14	11:27:10 AM	123565	26747	--	--
St28	41.0706298	-73.9136809	29-Oct-14	2:56:56 PM	123568	26743	--	--
St29	41.0702580	-73.9092860	29-Oct-14	2:57:49 PM	123566	26746	--	--
St30	41.0703343	-73.9138134	29-Oct-14	2:57:17 PM	123567	26741	--	--
St31	41.0699375	-73.9096412	29-Oct-14	2:58:11 PM	123569	26739	--	--
St32 <sup>d</sup>	Decommissioned							--
St33 <sup>c</sup>	41.0723708	-73.890814	15-Dec-14	11:52:00 AM	122731	65037	--	--
St34 <sup>c</sup>	41.0728583	-73.898142	15-Dec-14	11:36:00 AM	122732	65039	--	--

**Notes:** <sup>a</sup>Stations were not retrieved during the December data download.

<sup>b</sup>Station was obstructed by a construction barge during the December data download.

<sup>c</sup>Stations were deployed to improve coverage in the vicinity of Stations 02, 05, and 06.

<sup>d</sup>Stations 7, 10, and 32 were determined to be unnecessary for sturgeon positioning based on stationary range testing using sync-tag detections and were decommissioned as discussed with DEC.

<sup>e</sup>The prefix for sync tag codes is "A69-1601-" and the prefix for temperature tags is "A69-9002-"

<sup>f</sup>The temperature tag at Station 20 was lost on October 20, 2013 and has not been replaced.

<sup>g</sup>Original Station 12 (presumed to have been lost) was retrieved during this download; the replacement Station 12 was not downloaded in December.

**Table 2**  
**Monthly detections of acoustic-tagged fish within the near-field monitoring array**

Species	Month (2014)		
	Oct	Nov	Dec
Atlantic sturgeon	■	■	■
Shortnose sturgeon	8	4	1
Striped bass	■	■	■
Unconfirmed IDs	1	0	0
<b>Notes:</b> Values represent the number of unique tag IDs detected for each species and month.			

**Table 3**  
**Residence time of Atlantic sturgeon within the near-field monitoring array**

Month (2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
October	■	■	■	■
November	■	■	■	■
December	■	■	■	■

**Table 4**  
**Residence time of shortnose sturgeon within the near-field monitoring array**

Month (2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
October	2.1	33.4	16.2	8
November	0.1	26.7	8.2	4
December	25.2	25.2	25.2	1

Appendix A contains monthly graphical depictions of presence and residence time by tagged sturgeon detected within the array. These figures indicate that most shortnose sturgeon entered and left the array multiple times during the monitoring period, while most Atlantic sturgeon were detected once and only for a short time.

#### 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 during this quarterly reporting period is limited to sturgeon tagged by [REDACTED] and detected during the time period from October through December.

Vemco recently completed the positioning analysis for detection data collected through December 15, 2014. The results of this analysis, which includes sturgeon detections for near-field monitoring conducted from August 27 through December 15, 2014 are currently being summarized by the Thruway Authority in a supplementary report and will be submitted to DEC and FHWA by May 29, 2015.

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).

As shown in Tables 5 and 6, sturgeon were detected throughout the monitoring array during the reporting period, except along the eastern side of the river north of the Tappan Zee Bridge where the receiver at Station 8 was unable to be retrieved during downloads this quarter. Appendix B includes a series of monthly tables that provide the percentage of detections recorded by receivers in each region. Generally, shortnose sturgeon were more frequently detected to the south of the existing bridge and commonly occurred in the channel, although detections of shortnose sturgeon in the western shallows was not uncommon (Table 5). In October, shortnose sturgeon were fairly evenly distributed between the channel and western shallows on both north and south sides of the Bridge. From October to December though, the frequency of detections of shortnose sturgeon shifted as sturgeon appeared to move from the western shallows into the channel and from the northern side of the Tappan Zee Bridge to the southern side.













In contrast to shortnose sturgeon, Atlantic sturgeon were detected far more frequently in the channel and in equal proportion to the north and south of the existing bridge (Table 6).

Atlantic sturgeon were infrequently detected outside the deeper waters of the navigation channel. Although the percentage of detections of Atlantic sturgeon in the channel increased slightly from October through December, Atlantic sturgeon were most commonly detected in the channel during all months this quarter.

**Table 5**  
**Percentage of shortnose sturgeon detections within coarsely defined regions of the near-field monitoring array between October 1 and December 31, 2014**

Shortnose Sturgeon	West	Channel	East	Grand Total
North	8.7%	26.7%	-	35.4%
South	25.8%	36.2%	2.6%	64.6%
Grand Total	34.5%	62.9%	2.6%	100%

**Table 6**  
**Percentage of Atlantic sturgeon detections within coarsely defined regions of the near-field monitoring array between October 1 and December 31, 2014**

Atlantic Sturgeon	West	Channel	East	Grand Total
North				
South				
Grand Total				

#### 4.4 MOVEMENT

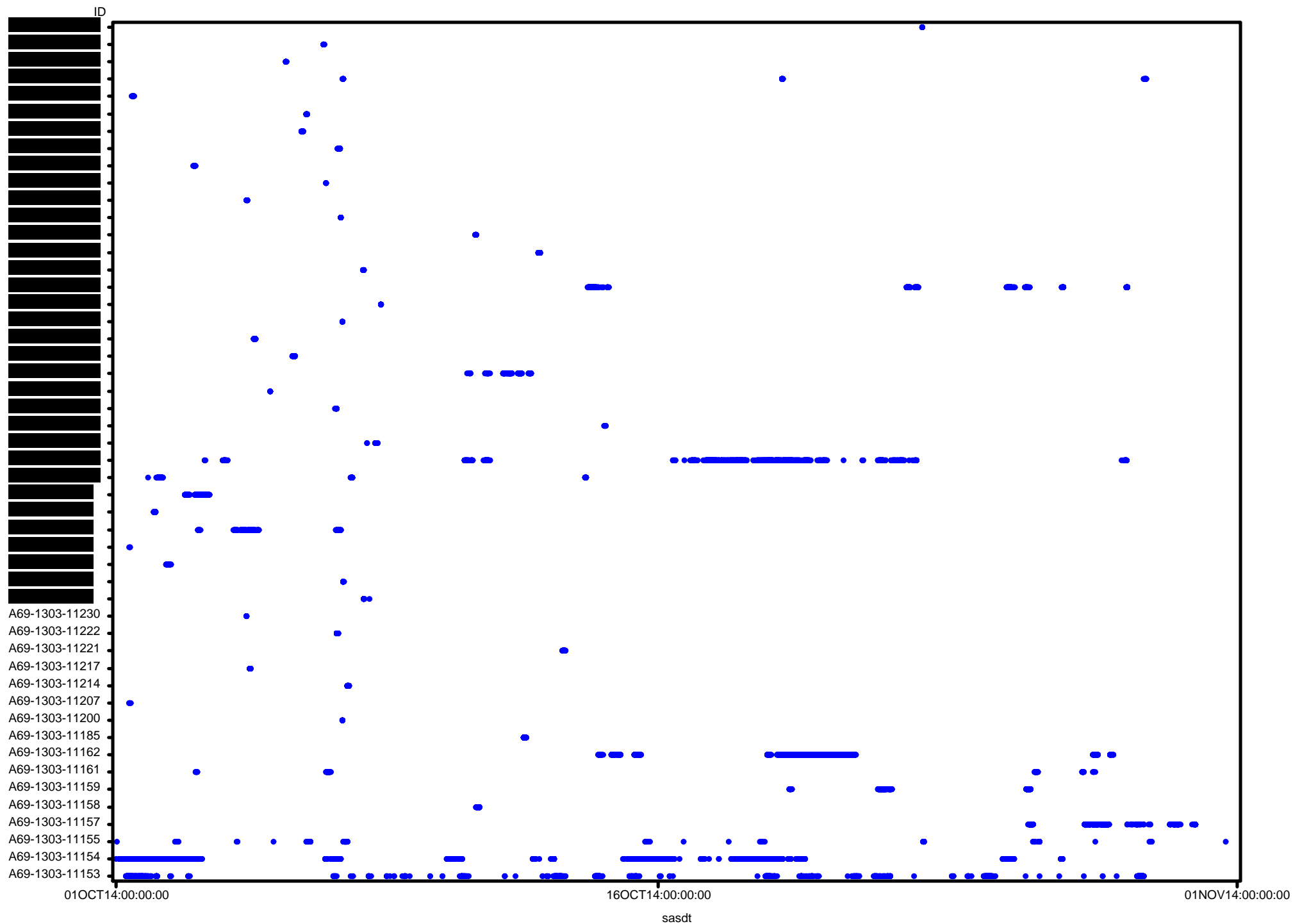
As discussed above, the results of the VPS positioning analyses for much of the data covered by this quarterly report have recently been received from Vemco by the Thruway Authority. A full discussion of movement will be developed as part of the sturgeon positioning report to be submitted to the DEC and FHWA by May 29, 2015.

\*

## **Appendix A**

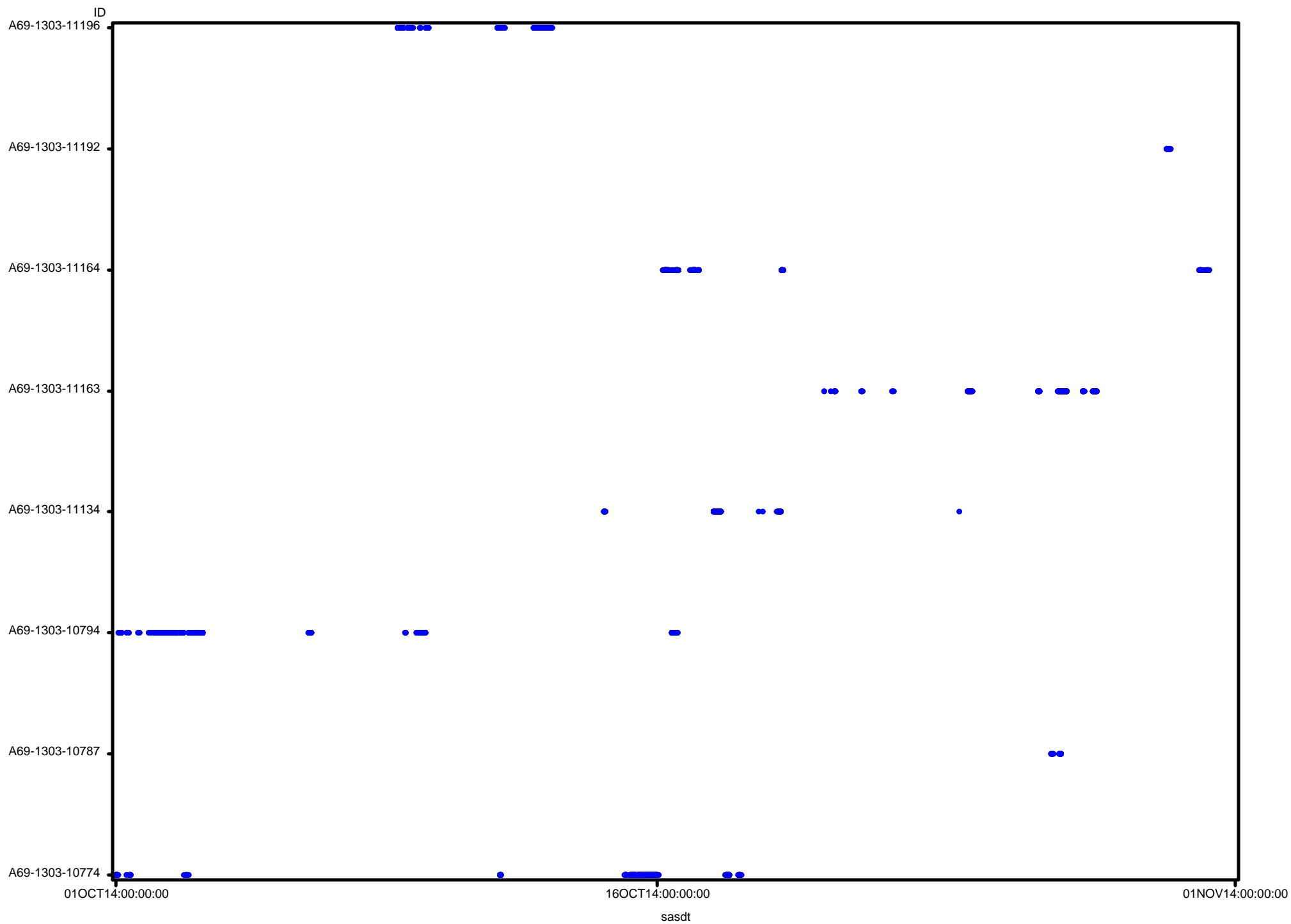
### **Sturgeon Presence and Residence within the Near-Field Monitoring Array**

# October - Atlantic sturgeon - Vemco

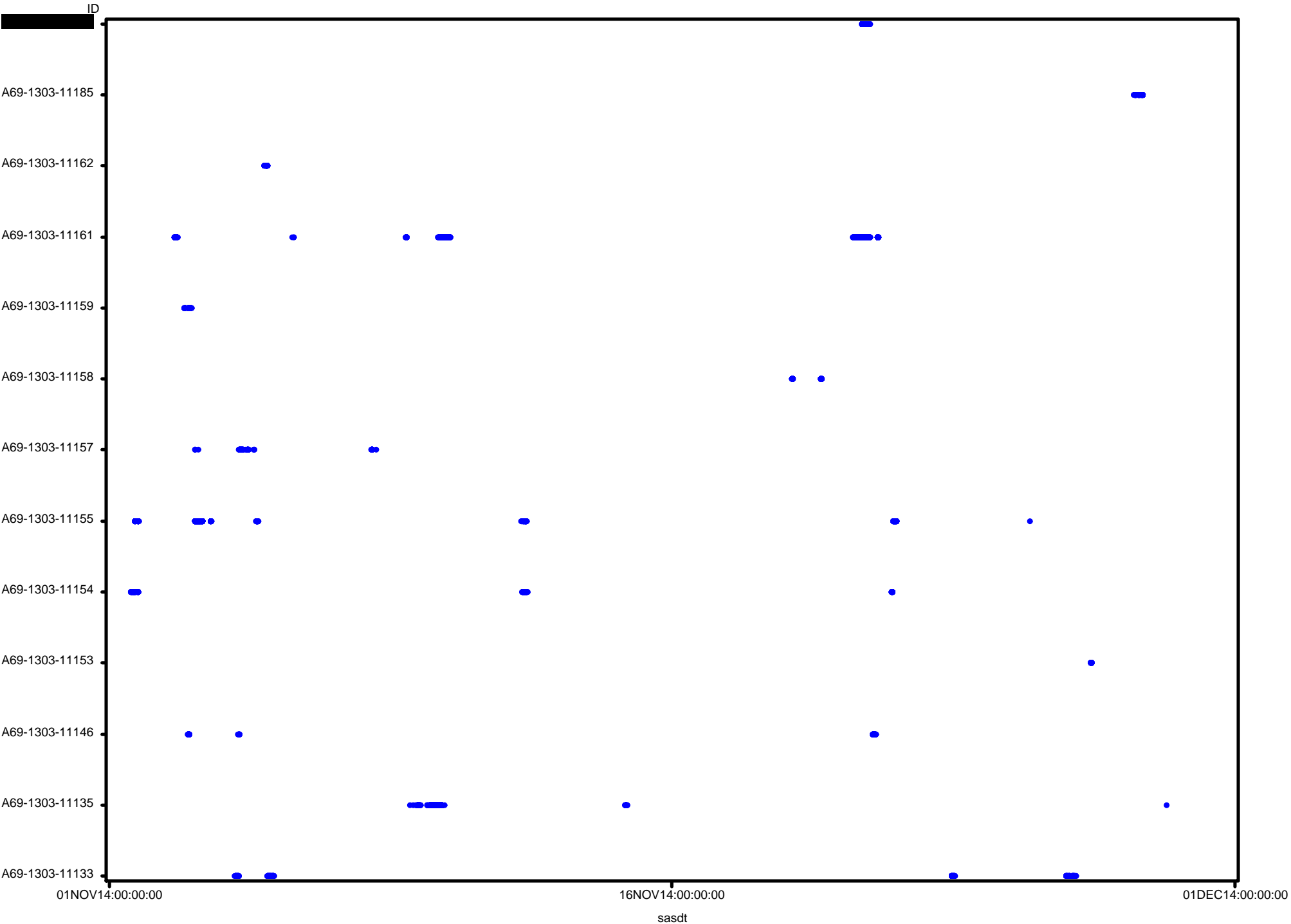




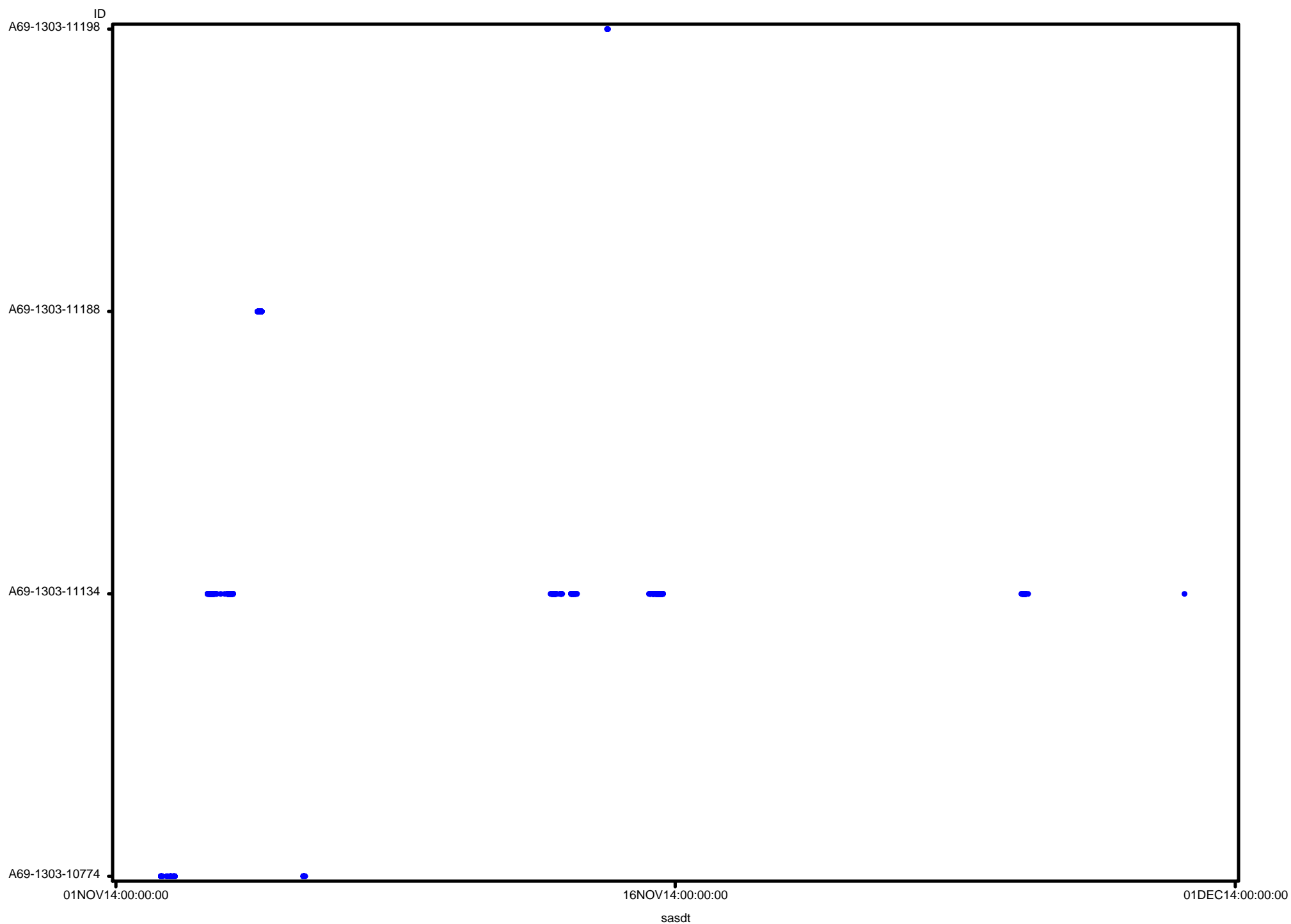
# October - Shortnose Sturgeon - Vemco



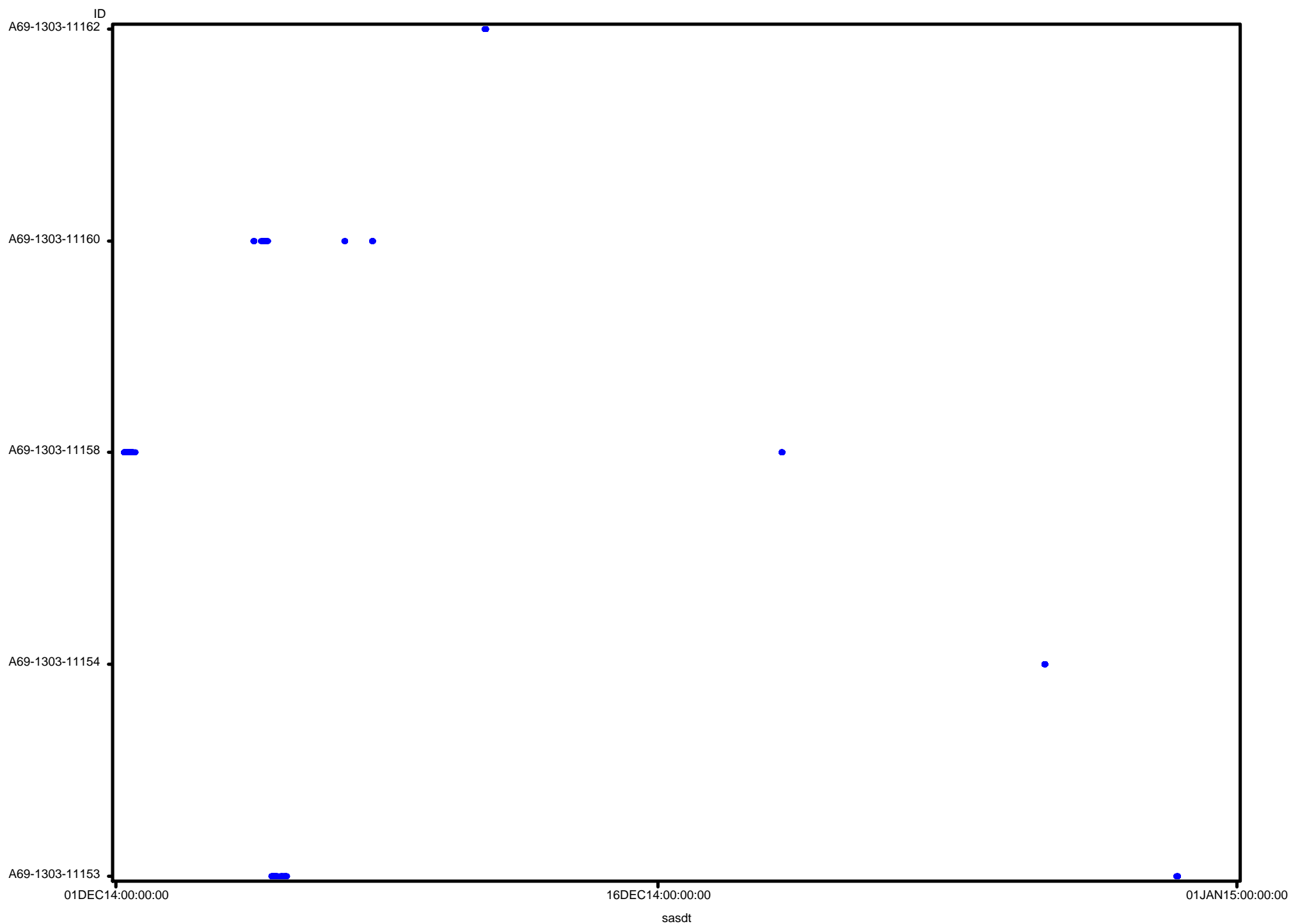
## November - Atlantic sturgeon - Vemco



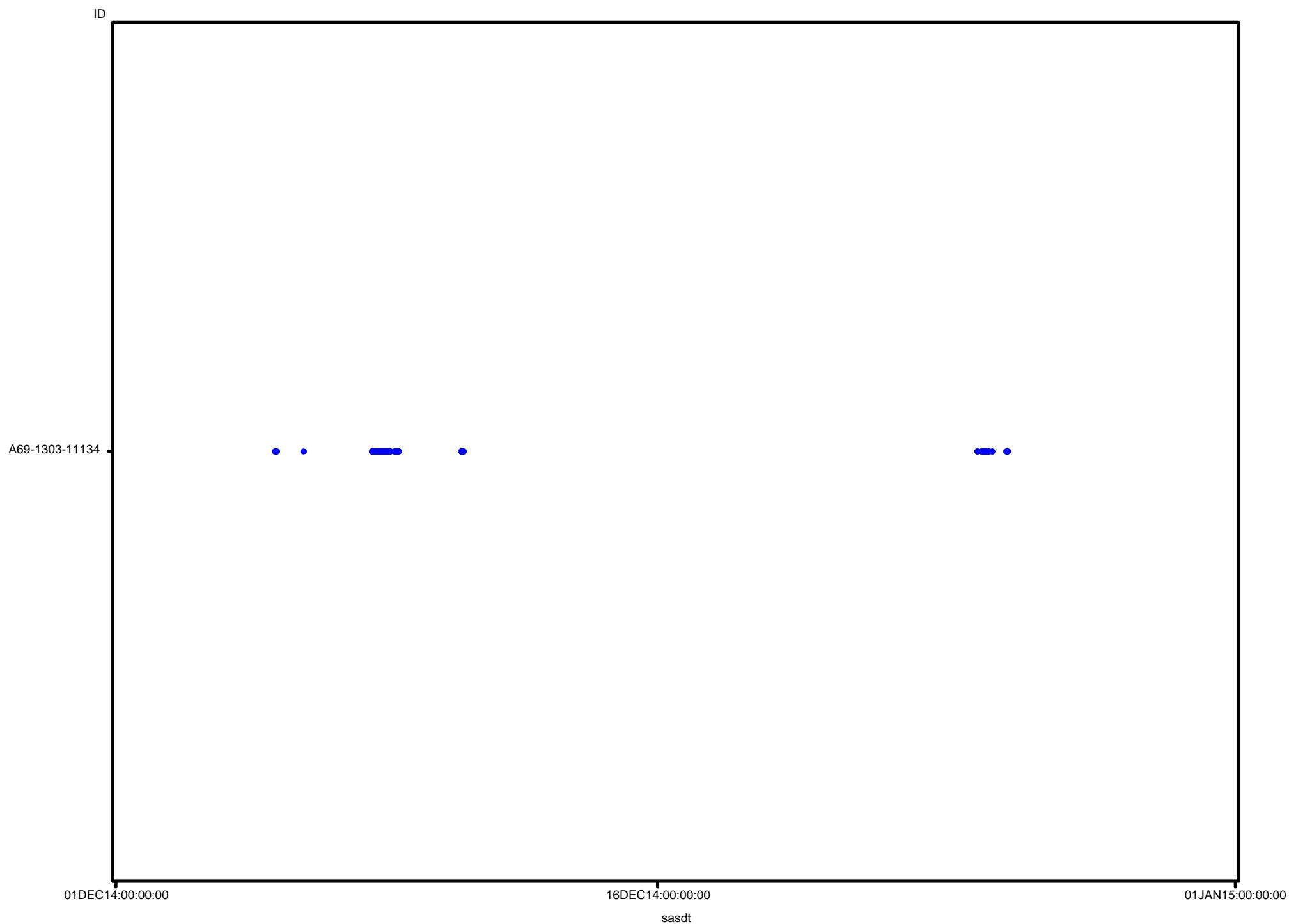
# November - Shortnose Sturgeon - Vemco



# December - Atlantic sturgeon - Vemco



## December - Shortnose Sturgeon - Vemco



## **Appendix B**

### **Sturgeon Position within the Near-Field Monitoring Array**

October 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	12.5%	29.1%	0.0%	41.6%
South	29.4%	26.9%	2.2%	58.5%
Total	41.9%	56.0%	2.2%	100.1%

Species Detection by Station during the Month of October

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Shortnose	6	.	668	8	93	228	.	418	132	.	.	61	80	190	321	.	.	625	.	496	410	290	343	13	.	465	303	.	114



November 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	0.8%	24.2%	0.0%	25.0%
South	28.1%	46.7%	0.2%	75.0%
Total	28.9%	70.9%	0.2%	100.0%

Species Detection by Station during the Month of November

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Shortnose	.	.	.	7	.	61	.	3	139	17	.	.	9	20	193	.	.	202	.	109	66	204	165	90	.	216	52	.	3

December 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	.	16.6%	.	16.6%
South	0.3%	73.3%	9.7%	83.3%
Total	0.3%	89.9%	9.7%	99.9%

Species Detection by Station during the Month of December

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Shortnose	.	.	.	1	.	1	.	.	.	1	.	.	.	.	.	.	.	38	.	58	50	36	111	113	.	110	274	.	85

October 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	0.7%	44.4%	.	45.1%
South	7.2%	44.3%	3.4%	54.9%
Total	7.9%	88.7%	3.4%	100.0%

Species Detection by Station during the Month of October

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Atlantic	.	.	613	152	61	325	.	76	86	.	.	.	2	52	284	.	.	2824	.	3175	3296	1231	2825	121	.	2605	2506	.	715

November 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	3.8%	52.6%	.	56.4%
South	5.0%	38.0%	0.5%	43.5%
Total	8.8%	90.6%	0.5%	99.9%

Species Detection by Station during the Month of November

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Atlantic	.	.	5	.	123	100	.	17	1	55	.	7	18	30	25	.	.	975	.	711	577	197	351	451	.	278	360	.	22

December 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location  
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	0.1%	34.2%	0.0%	34.3%
South	0.0%	63.7%	2.0%	65.7%
Total	0.1%	97.9%	2.0%	100.0%

Species Detection by Station during the Month of December

Species	Stations																												
	West																	Channel										East	
	1	2	3	4	5	9	23	24	25	26	27	28	29	30	31	33	34	12	13	15	16	17	18	19	20	21	22	8	11
Atlantic	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	133	.	200	234	133	225	246	.	243	211	.	34