



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

Quarterly Report

April 1 - June 30, 2014

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1.0 SUMMARY

During the monitoring period from April 1 through June 30, 2014, a total of [REDACTED] acoustic-tagged sturgeon were present within the near-field array in the vicinity of the Tappan Zee Bridge. Of these, 32 were shortnose sturgeon (15 tagged by DEC and 17 tagged by NYSTA). There were [REDACTED] Atlantic sturgeon detected during this period (13 NYSTA, [REDACTED], and 1 CTDEP). Relative to sturgeon monitoring during the first quarter of 2014, there were substantially more acoustic-tagged sturgeon detected during this most recent quarter. Detections of shortnose sturgeon were relatively low during April (n=9 sturgeon) but more than doubled during May (n=21) and June (n=23). The area of highest concentration of shortnose sturgeon was in the western portion of the river. Detections of Atlantic sturgeon also increased from April (n=[REDACTED] sturgeon) through May (n=[REDACTED]) and were greatest in June (n=[REDACTED] sturgeon). Unlike shortnose sturgeon, the area of highest concentration for Atlantic sturgeon was in the main channel, where sturgeon exhibited upstream and downstream movement through the near-field receiver array. Each Atlantic sturgeon spent, on average, fewer than 12 hours in the array as they transited the monitoring area. In contrast, shortnose sturgeon spent increasingly more time in the monitoring area towards the latter part of the quarter and spent nearly 3 days, on average, during June. While Atlantic sturgeon were detected most commonly in the Channel, detections of shortnose sturgeon decreased in the Channel and concurrently increased in the West region over the course of the quarter. 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.

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 April 1 through June 30, 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 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 final 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 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. Stations 6, 12, and 14 were not retrieved during the July download; however, Station 6 was downloaded in May. Therefore, this report includes data from the 27 stations that were downloaded during the May and July download events for this quarter.

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.

With regard to RPM #6, the ongoing installation of permanent piles four feet or more in diameter began on October 19, 2013.

3.0 METHODS

3.1 DATA DOWNLOADS

Data summarized in this quarterly report span the period from April 1 through June 30, 2014. During this quarter, receivers deployed at 27 monitoring stations were downloaded; Stations 12 and 14 were not retrieved. Stations 7, 10, and 32 were previously decommissioned.

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 1) May 5-8, and 2) July 2-3, 11, and 17-18, 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 first quarter of 2014, there were substantially more acoustic-tagged sturgeon present in the near-field monitoring array. A total of [REDACTED] unique tag codes were detected in the near-field array during the monitoring period summarized in this quarterly report. Of these, 15 were acoustic-tagged shortnose sturgeon that were tagged by DEC and 17 tagged by NYSTA. There were also [REDACTED] Atlantic sturgeon detected during this period (13 NYSTA, [REDACTED] and 1 CTDEP). Forty-six of the [REDACTED] acoustic-tagged fish have not yet been identified to species, but the tag identification codes have been submitted to Vemco for communication to the tag owner.

Few sturgeon were present in the near-field array during April, but the number of detections increased considerably in May and June. Nine shortnose sturgeon were present in the near-field array during April, 21 were present in May and 23 were present in June (Table 2). [REDACTED]

Atlantic sturgeon were present in the near-field array during April, ■ were present in May and ■ were present in June.

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 ^d	Temperature Tag
St01	41.07442056	-73.90979349	5-May-14	5:33:13 PM	122371		65006	
St02	41.07504851	-73.89901612	5-May-14	6:31:37 PM	123574		65011	
St03	41.06606430	-73.91082220	5-May-14	7:36:28 PM	122373		65008	
St04	41.06632976	-73.89950328	5-May-14	6:48:07 PM	122888		65010	
St05 ^a	41.07042226	-73.89384029	7-May-14	3:18:47 PM	123573		65002	
St06	41.07478475	-73.88832534	7-May-14	6:37:04 PM	122892	265126	65014	
St07 ^c	Decommissioned				122887	265127	65012	
St08	41.07280679	-73.8728935	6-May-14	6:56:31 PM	122890		65013	
St09 ^a	41.06982982	-73.8923686	7-May-14	3:03:19 PM	123571		26742	
St10 ^c	Decommissioned				122894	265121	65003	
St11	41.06676583	-73.87337294	6-May-14	6:19:41 PM	122889	265119	65015	
St12 ^b	41.07645226	-73.88470016	10-Mar-14	4:18:37 PM	122884		65016	
St13	41.07570540	-73.88067752	3-Jun-14	7:30:05 PM	122885		65017	
St14 ^b	41.07290109	-73.88536384	10-Mar-14	7:50:17 PM	122886		65019	13339
St15	41.07316709	-73.88229615	8-May-14	8:59:15 PM	122883		65018	
St16	41.07345006	-73.87901380	8-May-14	8:13:57 PM	122879		65020	
St17	41.06899307	-73.88753057	7-May-14	7:52:13 PM	122881		65021	
St18	41.06907932	-73.88330064	7-May-14	4:38:36 PM	122880		65022	
St19	41.06902982	-73.87841902	8-May-14	6:45:13 PM	122876		65023	
St20	41.06601996	-73.88040888	8-May-14	6:06:39 PM	123572		65005	13338 ^e
St21	41.06660527	-73.88492052	3-Jun-14	8:36:38 PM	122877		65004	
St22	41.06557338	-73.87717372	8-May-14	5:42:51 PM	122878		65007	
St23	41.07425208	-73.91305120	5-May-14	5:43:48 PM	122871		65024	
St24	41.07314056	-73.90510616	8-May-14	4:20:17 PM	124817		26744	
St25	41.06898054	-73.90549625	5-May-14	7:03:57 PM	122875		65026	
St26	41.06833727	-73.89623509	6-May-14	4:19:13 PM	122873		65025	
St27	41.07564348	-73.91224511	5-May-14	5:58:06 PM	123565		26747	
St28	41.07062978	-73.91368092	6-May-14	3:53:44 PM	123568		26743	
St29	41.07025798	-73.90928602	5-May-14	7:50:10 PM	123566		26746	
St30	41.07033430	-73.91381337	5-May-14	7:57:13 PM	123567		26741	
St31	41.06993749	-73.90964117	5-May-14	7:42:19 PM	123569		26739	
St32 ^c	Decommissioned				123570		26745	

Notes: ^aStation was relocated to a bridge mooring following discussion with DEC to minimize the risk of future loss of these stations due to movement and mooring of construction vessels.

^bStations were not retrieved during the July data download.

^cStations 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.

^dThe prefix for sync tag codes is "A69-1601-" and the prefix for temperature tags is "A69-9002-"

^eThe temperature tag at Station 20 was lost on October 20, 2013 and has not yet been replaced.

Table 2

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

Species	Month (2014)		
	Apr	May	Jun
Atlantic sturgeon	■	■	■
Shortnose sturgeon	9	21	23
Unconfirmed IDs	5	27	54
Notes: Values represent the number of unique tag codes detected for each species and month.			

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 times for Atlantic sturgeon were generally consistent across months and low compared to shortnose sturgeon. In contrast, residence times for shortnose sturgeon increased from April through June, indicating that shortnose sturgeon were spending increasingly more time in the near-field area. In general, residence time was relatively high during this quarter compared to the first quarter of 2014.

Table 3

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

Month (2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
April	■	■	■	■
May	■	■	■	■
June	■	■	■	■

Table 4

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

Month (2014)	Minimum (hours)	Maximum (hours)	Mean (hours)	N
April	0.9	33.2	8.1	9
May	1.5	166.6	35.4	21
June	1.2	294.8	68.7	23

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.

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 [REDACTED] and ERC and detected during the time period from April through June.

Vemco is currently conducting the positioning analysis for the data covered in this report. When the results of the positioning analysis have been received a supplementary report to this 2nd quarterly report for 2014 will be prepared.

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 throughout the monitoring array during the reporting period, as shown in Table 5 and Table 6. Appendix B includes a series of monthly tables that provide the percentage of detections recorded by receivers in each region. Generally, both shortnose

sturgeon and Atlantic sturgeon were detected in more frequently to the south than to the north of the existing bridge. While Atlantic sturgeon were detected more commonly in the channel, a greater percentage of detections for shortnose shortnose were recorded in the West region. As demonstrated by the monthly tables in Appendix B, the greatest percentage of detections for Atlantic sturgeon across months occurred in the Channel. Although shortnose sturgeon were detected in the Channel most commonly during April, they appeared to move from the Channel to the West region over the course of this quarter's monitoring. By June, shortnose sturgeon were more commonly detected in the West Region and both north and south of the bridge.

4.4 MOVEMENT

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 Vemco's positioning analysis is complete.

Table 5

Percentage of shortnose sturgeon detections within coarsely defined regions of the near-field monitoring array between April 1 and June 30, 2014

Shortnose Sturgeon	West	Channel	East	Grand Total
North	20.4%	11.1%	6.3%	37.8%
South	34.9%	24.3%	3.1%	62.3%
Grand Total	55.3%	35.4%	9.4%	100%

Table 6

Percentage of Atlantic sturgeon detections within coarsely defined regions of the near-field monitoring array between April 1 and June 30, 2014

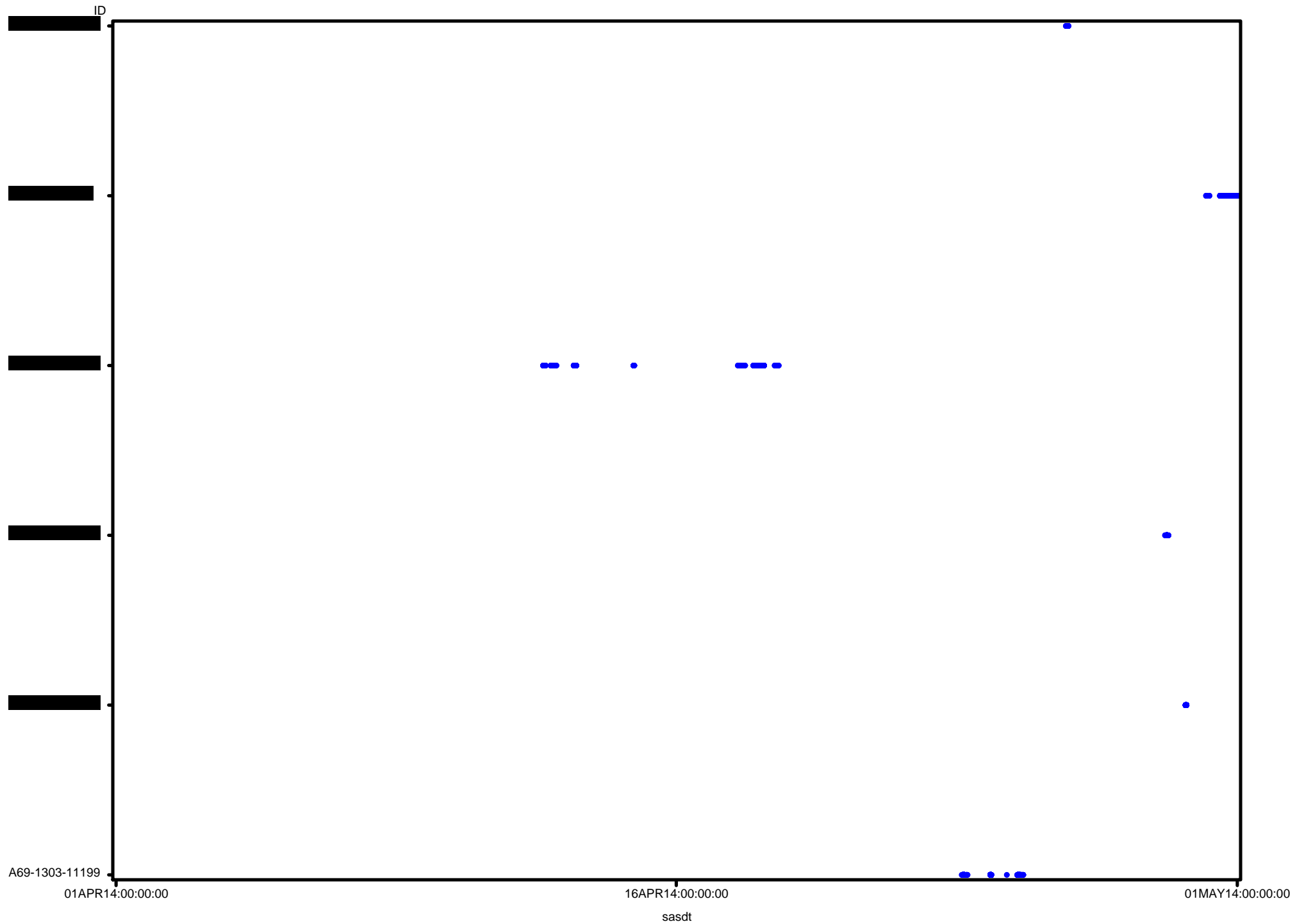
Atlantic Sturgeon	West	Channel	East	Grand Total
North				
South				
Grand Total				

*

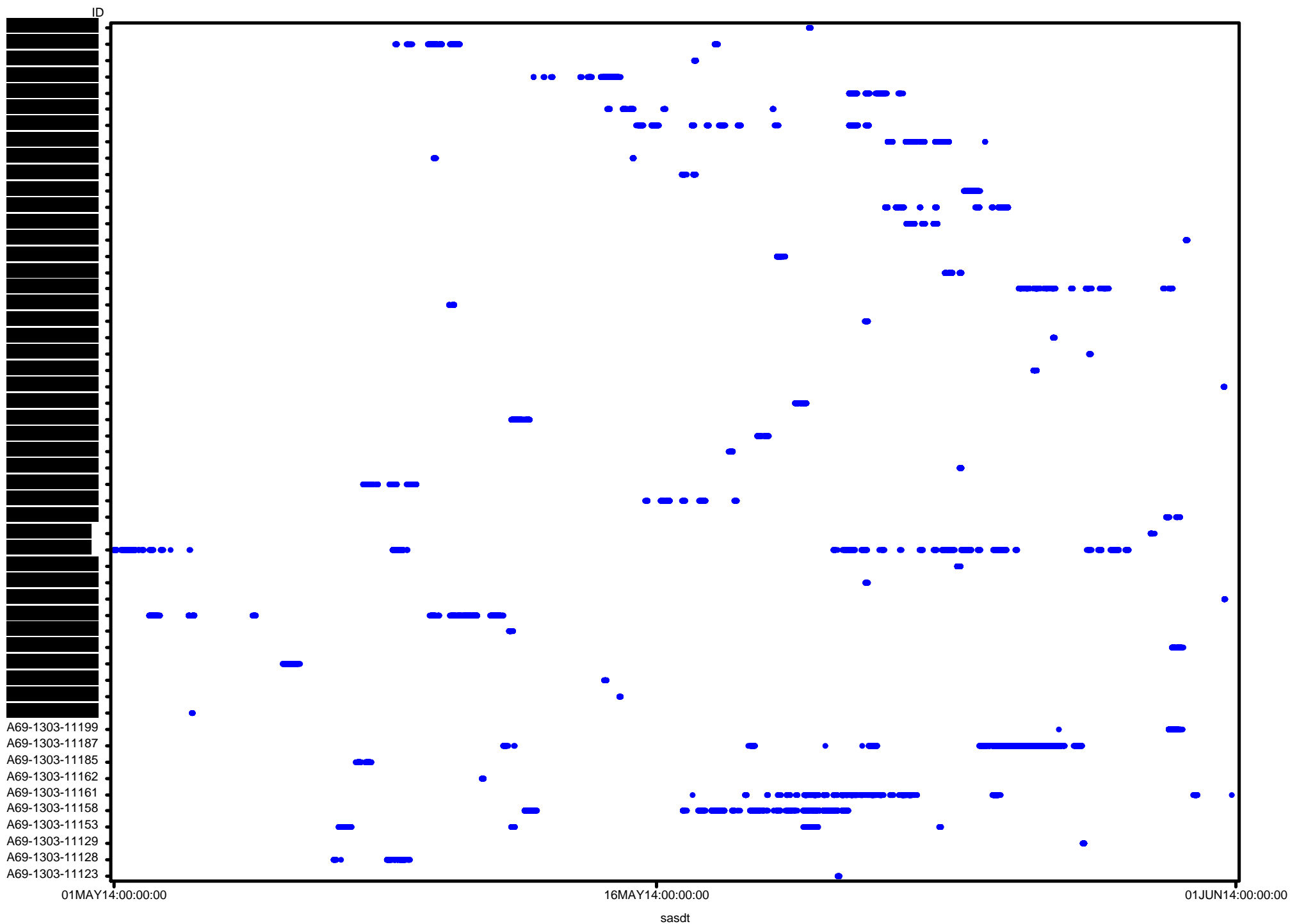
Appendix A

Sturgeon Presence and Residence within the Near-Field Monitoring Array

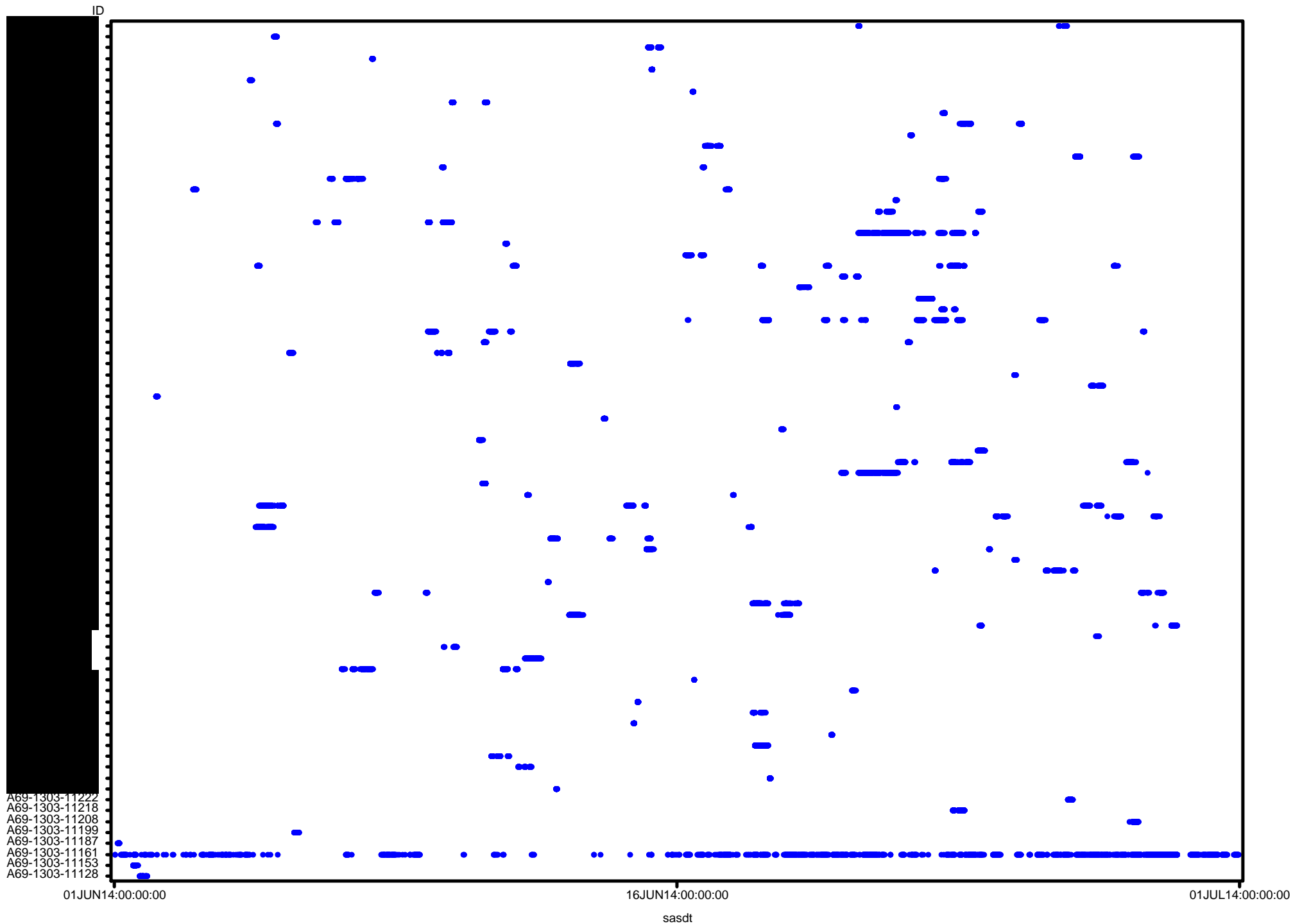
April - Atlantic Sturgeon - Vemco



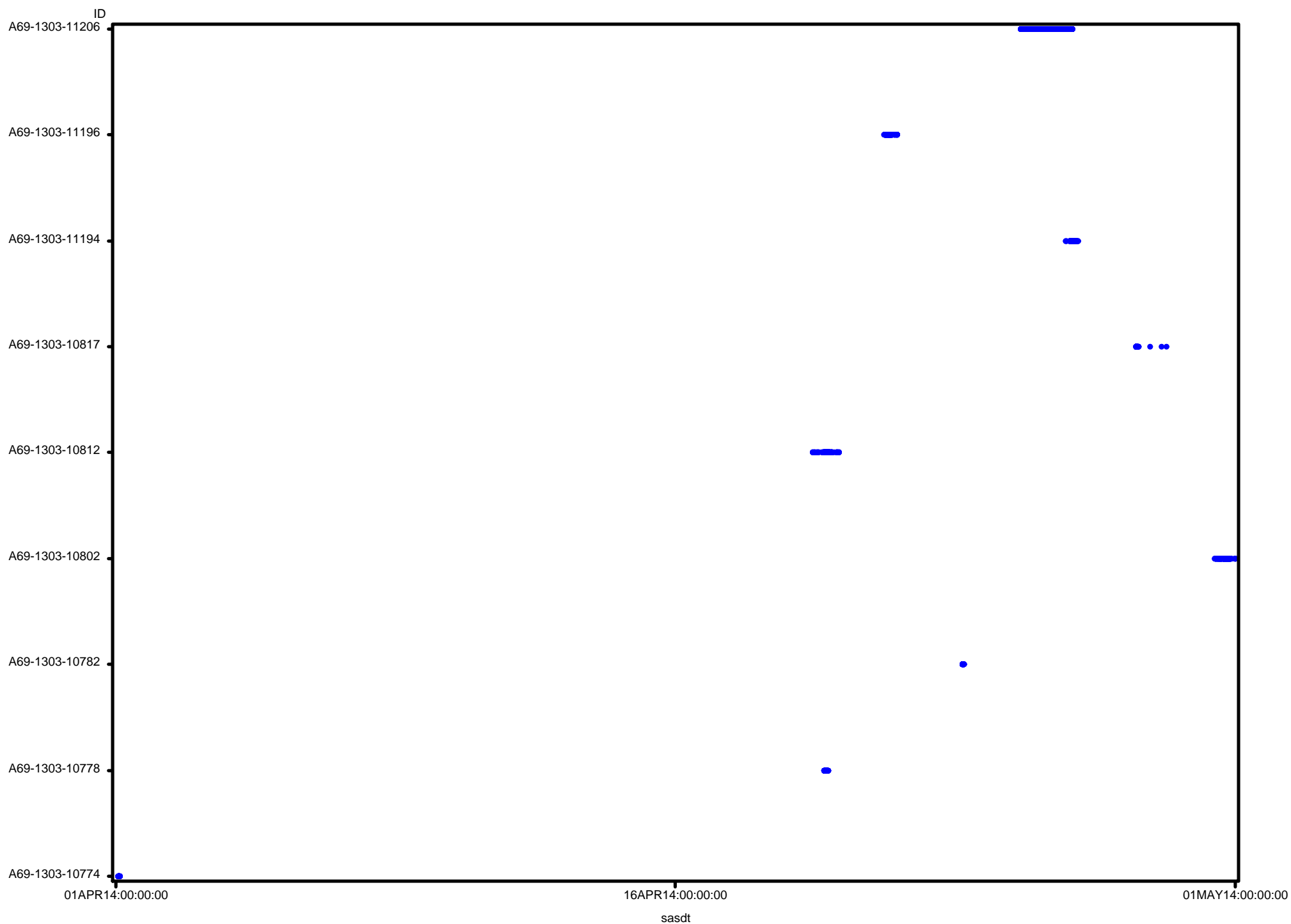
May - Atlantic Sturgeon - Vemco



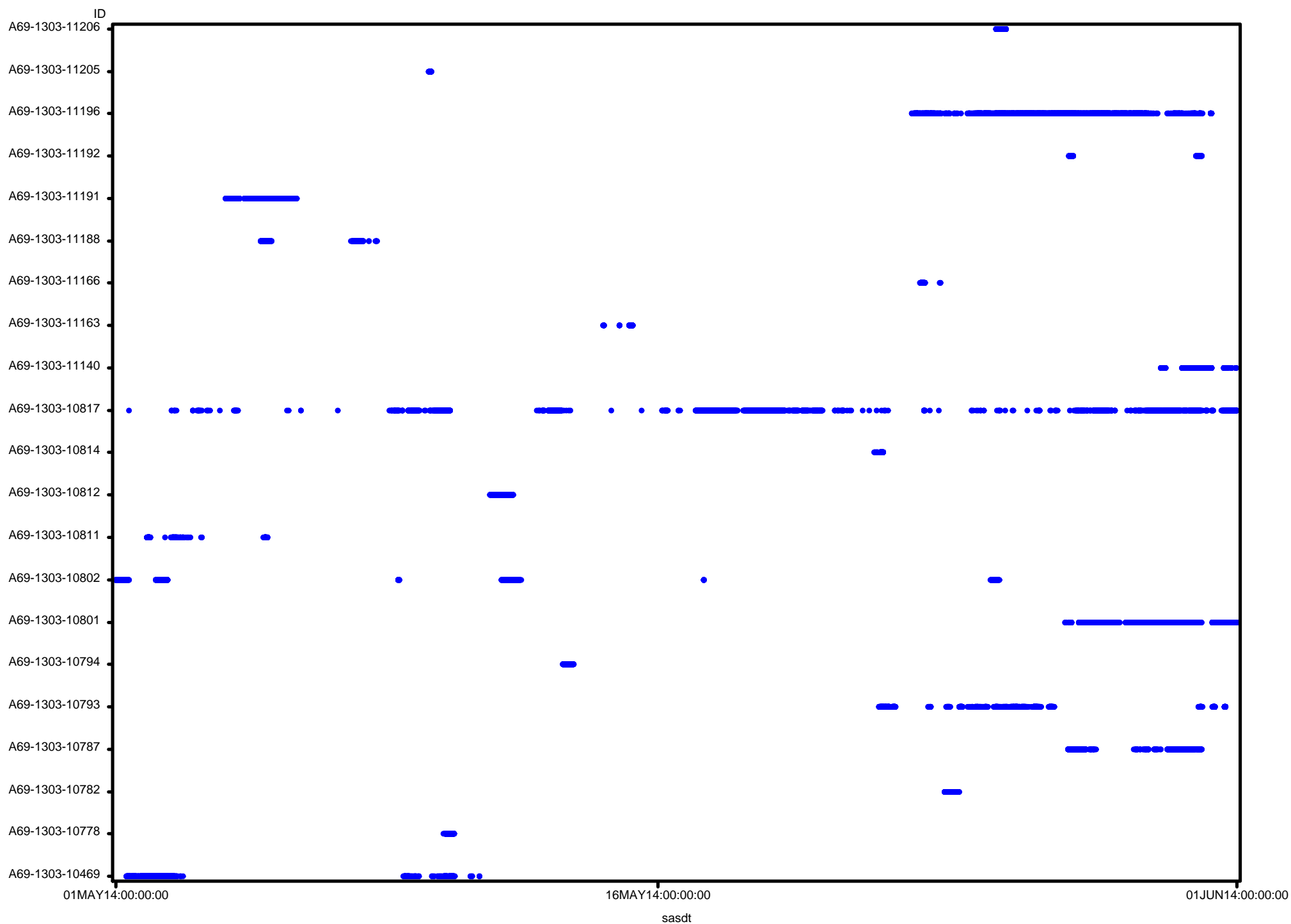
June - Atlantic Sturgeon - Vemco



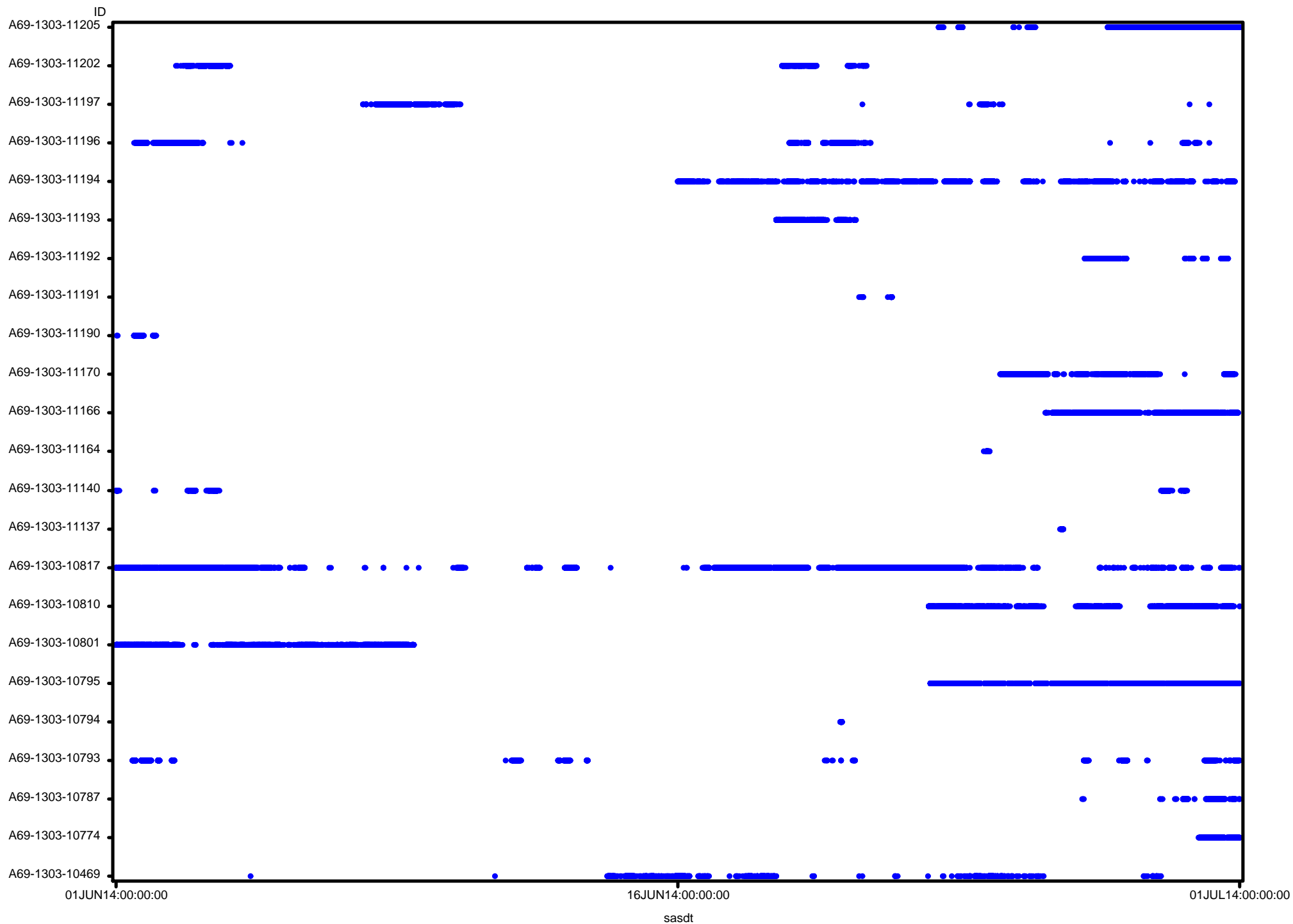
April - Shortnose Sturgeon - Vemco



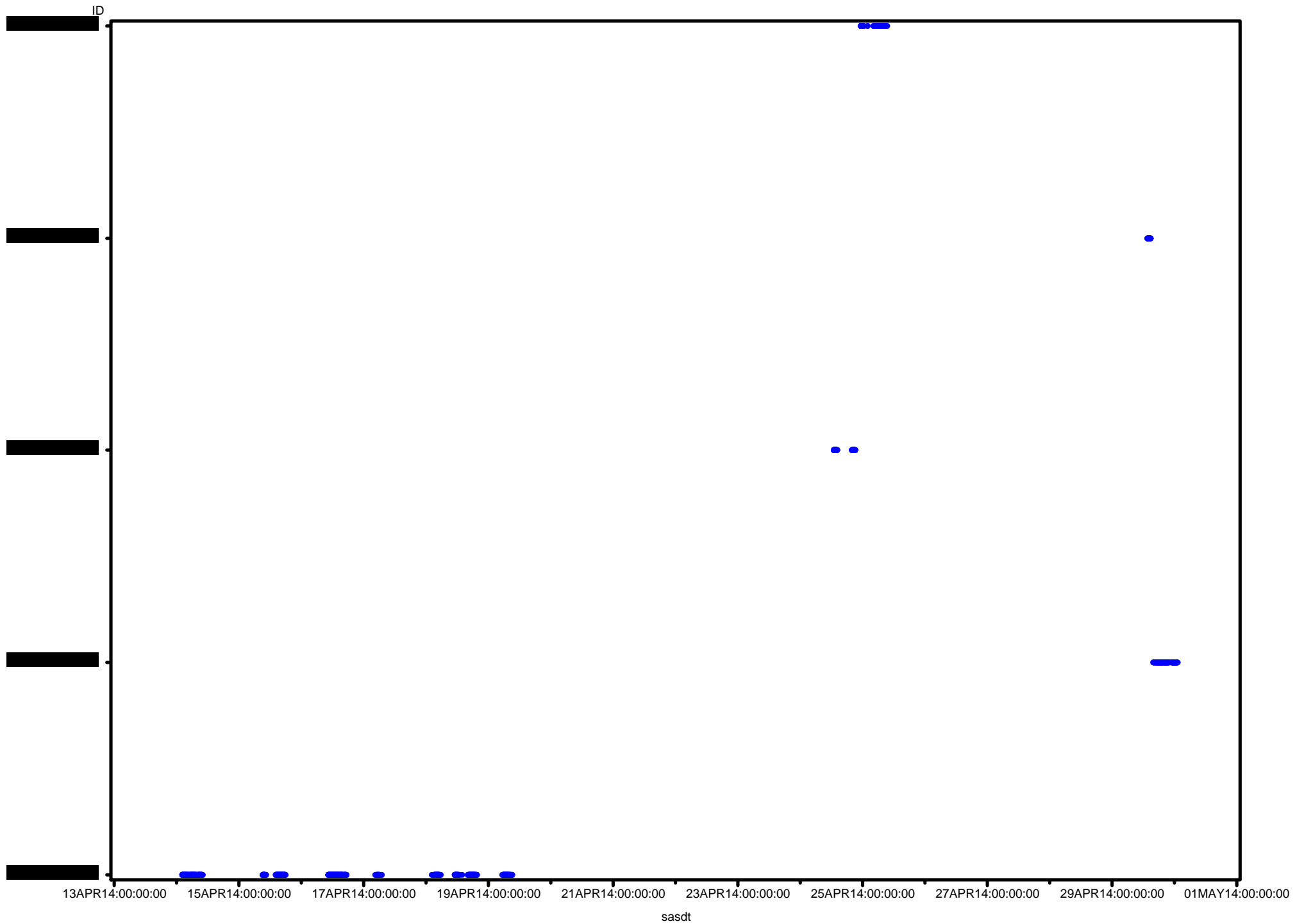
May - Shortnose Sturgeon - Vemco



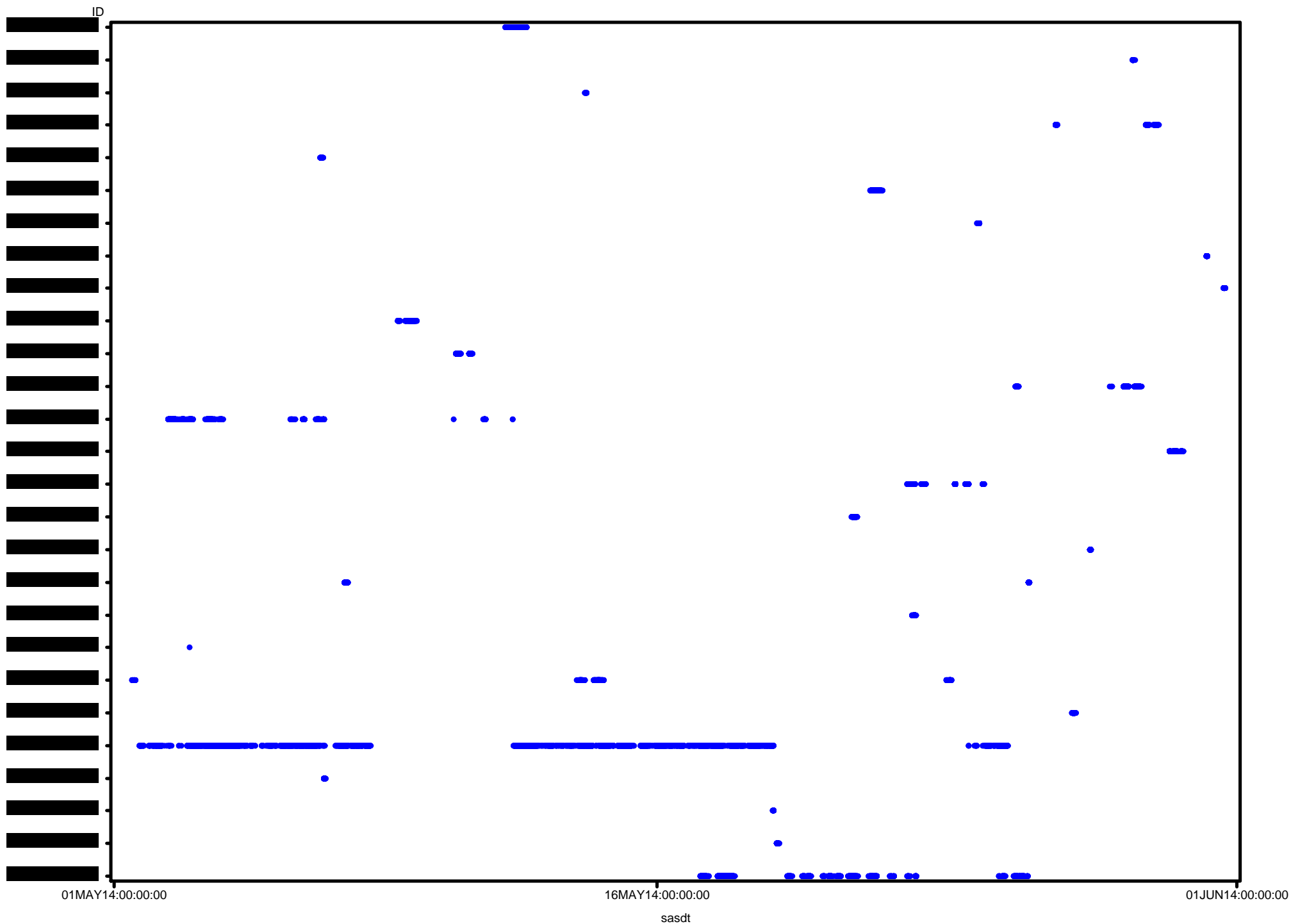
June - Shortnose Sturgeon - Vemco



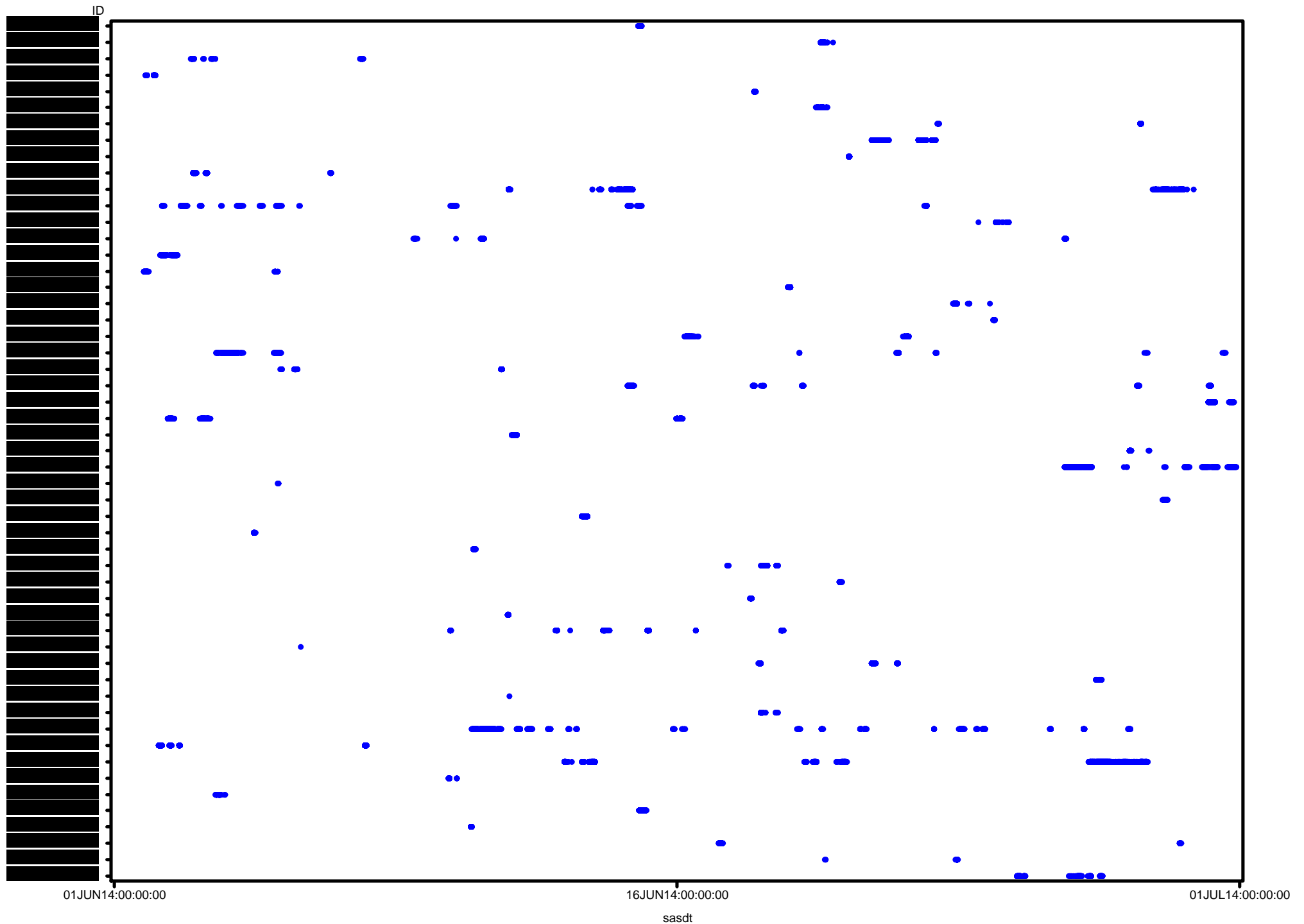
April - Unknown - Vemco



May - Unknown - Vemco



June - Unknown - Vemco



Appendix B

Sturgeon Position within the Near-Field Monitoring Array

April 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	2.7%	12.3%	0.0%	15.0%
South	4.2%	77.0%	3.8%	85.0%
Total	6.9%	89.3%	3.8%	100.0%

Species Detection by Station during the Month of April

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	6	51	0	0	0	0	0	0	29	0	0	28	80	59	38	0	0	0	150	0	211	155	156	1040	203	477	933	430	0	0	162

May 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	14.6%	11.9%	0.8%	27.3%
South	36.2%	34.4%	2.0%	72.6%
Total	50.8%	46.3%	2.8%	100.0%

Species Detection by Station during the Month of May

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	1236	109	25	46	335	595	0	310	65	572	4419	2105	449	396	1995	4713	0	28	0	1600	0	1293	1150	1490	2081	1404	2000	2751	2045	0	288	687

June 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Shortnose Sturgeon

Receiver Location	West	Channel	East	Total
North	25.3%	10.5%	10.1%	46.0%
South	36.4%	13.9%	3.7%	54.0%
Total	61.7%	24.4%	13.8%	100.0%

Species Detection by Station during the Month of June

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	3812	54	513	165	265	1052	0	187	48	740	5064	5067	3343	1210	5271	7281	0	0	0	2538	0	1208	2070	1662	809	746	1478	1598	1399	0	5570	2050

April 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	0.4%	23.9%	0.0%	24.3%
South	0.1%	70.4%	5.2%	75.7%
Total	0.5%	94.3%	5.2%	100.0%

Species Detection by Station during the Month of April

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
Atlantic	0	11	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	6	0	250	0	252	240	109	547	352	530	270	393	0	0	164

May 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	5.2%	22.3%	2.8%	30.3%
South	15.0%	51.2%	3.4%	69.6%
Total	20.2%	73.5%	6.2%	100.0%

Species Detection by Station during the Month of May

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
Atlantic	325	223	88	41	421	743	0	5	39	569	2265	457	174	183	367	1195	0	2	0	3164	0	2336	2339	2660	2651	2005	3634	3666	3362	0	984	1195

June 2014 -- VEMCO Data

Percent of Total Detections by Species and Receiver Location
Atlantic Sturgeon

Receiver Location	West	Channel	East	Total
North	1.1%	22.5%	2.2%	25.8%
South	2.9%	67.5%	3.8%	74.2%
Total	4.0%	90.0%	6.0%	100.0%

Species Detection by Station during the Month of June

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
Atlantic	58	33	3	1	198	219	0	0	2	21	487	54	2	0	30	108	0	0	0	2592	0	2150	2093	2272	2674	2666	4616	3564	4752	0	672	1165