Prepared in cooperation with the U.S. Army Corps of Engineers, Portland District

Detections of Acoustic-Tagged Green Sturgeon in Baker Bay on the Lower Columbia River during September – November 2008

By Michael J. Parsley

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Conversion Factors

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
kilometer (km)	0.5400	mile, nautical (nmi)
meter (m)	1.094	yard (yd)
foot (ft)	0.3048	meter (m)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
°F=(1.8×°C)+32

Datum

Horizontal coordinate information is referenced to the World Geodetic System (WGS-84)

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Abstract

Acoustic transmitters implanted in green sturgeon (*Acipenser medirostris*) captured in rivers in California were detected by acoustic receivers deployed within and around Baker Bay. The receivers were deployed at eight locations in the Bay and adjacent navigation channels of the Lower Columbia River during a period of anticipated channel dredging. Three of the transmitters detected were confirmed to have been implanted into green sturgeon in previous years; two were from the Sacramento River and one was from the Klamath River. The transmitters (fish) were within detection range of the receivers for only a short period, which is consistent with findings of earlier studies that green sturgeon make rapid and extensive intra-estuary movements.

Introduction

The navigation channels leading to the lower Columbia River Washington ports of Ilwaco and Chinook allow passage of a variety of commercial fishing and recreational vessels, and the channel leading to Ilwaco also serves the fleet of motorized lifeboats operated by the U.S. Coast Guard Station Cape Disappointment. In 2008, the U.S. Army Corps of Engineers issued permits for maintenance dredging of these two navigation channels, which also provide ingress and egress for fishes seeking to occupy the shallow waters of Baker Bay. One species of fish, green sturgeon (*Acipenser medirostris)* has been of particular interest since the Southern Distinct Population Segment (DPS) was listed as threatened under the Endangered Species Act in 2006 (National Oceanic and Atmospheric Administration, 2006) and the species is known to seasonally inhabit coastal bays and estuaries of Oregon and Washington (Wydoski and Whitney, 2003; Moser and Lindley, 2007). However, there is a paucity of information regarding green sturgeon use of Baker Bay. Limited sampling with gillnets by the Washington Department of Fish and Wildlife showed that green sturgeon are present in Baker Bay during summer months (Olaf Langness, Washington Department of Fish and Wildlife, oral commun., August 14, 2008), but information on timing of their arrival and departure and their routes of ingress and egress from Baker Bay is lacking.

A number of Federal and State government and Tribal entities have been tagging green sturgeon captured in California, Oregon, and Washington coastal waters and tributaries with acoustic transmitters manufactured by Vemco (Halifax, Nova Scotia, Canada) to gain insight on spatial and temporal movements of the fish. Through communications with other scientists conducting telemetry studies with green sturgeon, it was estimated that there were more than 100 green sturgeon with active acoustic transmitters in Pacific Northwest coastal waters and tributaries during the summer of 2008.

This paper describes a study to determine if green sturgeon were present in Baker Bay and adjoining navigation channels on the Lower Columbia River during September through early November 2008, when maintenance dredging of the channels was expected to occur. Our approach was to deploy acoustic receivers to determine if any of these previously tagged green sturgeon were present in or around Baker Bay. The study was conducted by the U.S. Geological Survey in cooperation with the U.S. Army Corps of Engineers, Portland District.

Study Methods

Vemco VR2 acoustic receivers were deployed at eight locations within and around Baker Bay in September and early October 2008 (fig. 1; table 1). Five receivers were attached underwater near the bases of existing wood pilings and three were attached to mooring lines approximately 2 m beneath buoys. The timing and placement of receivers was dictated by availability of receivers and the expectation that maintenance dredging operations, if conducted[1], would begin in the Ilwaco channel. Given the few receivers available for use, receiver placement was prioritized to provide detection capabilities adjacent to navigation channels. Extensive shallow tidal flats and lack of pilings adjacent to the Chinook channel (fig. 1) required placement of receivers on buoys located farther out into the Columbia River. Acoustic transmitter range testing during a previous study by Parsley and others (2008) showed that the types of transmitters expected to be in green sturgeon could be detected at distances of up to 800 m.

Receivers were retrieved and the data downloaded in mid-November at the conclusion of the study. Vemco User Environment (VUE) software was used to manage the telemetry data and summarize transmitter detections. The information on fish carrying the transmitters detected was obtained by communicating with individuals and entities conducting acoustic tagging of fish in Pacific Northwest coastal waters.

A water stage and temperature data logger (Solinst Levelogger Jr. M5, Georgetown, Ontario, Canada) programmed to record water level and water temperature every 15 minutes was installed on October 10, 2008, and removed on November 10, 2008. The Levelogger was mounted inside a stilling basin composed of a 3-m long aluminum pipe attached to an existing wood piling. Water-stage measurements were compensated for changes in atmospheric pressure by simultaneous measurement with a barometric pressure logger (Solinst Barologger Gold) located nearby.

[1] When the study began, there was a high level of uncertainty regarding whether or not dredging operations, particularly in the Chinook channel, would occur in the fall of 2008.

Detections of Tagged Fish

Five Vemco transmitters were detected, three of which were confirmed to have been surgically implanted into green sturgeon in previous years (table 2). Two green sturgeon (ID 243 and ID 245) had been captured and tagged near river km 330 in the Sacramento River, California, during August 2006 (Vogel, 2008) and are considered to be Southern DPS origin fish. One green sturgeon (ID 535) had been captured and tagged at river km 57 in the Klamath River, California in April 2005 (Barry W. McCovey, Jr., Yurok Tribal Fisheries Program, written commun., November 25, 2008) and is considered to be a Northern DPS fish. One transmitter (ID 18679) was confirmed to be in a steelhead (*Oncorhynchus mykiss*) kelt tagged and released in the Columbia River (Ryan Branstetter, Columbia River Inter-tribal Fish Commission, written commun., November 17, 2008). One transmitter (ID 234) was detected only once (table 3) whereas all others had two or more detections. Because single detection events can not be validated, no attempt was made to obtain information on a fish that might have carried this transmitter.

The two distal receivers along the Ilwaco navigation channel recorded the greatest number of detections, and all four fish were detected by the outermost receiver (VR2-6712; fig. 1). The detection events (table 3) show that the steelhead kelt (ID 18679) and one green sturgeon (ID 535) each moved up the Ilwaco channel a short distance, then reversed direction and moved back toward the Columbia River. One green sturgeon (ID 243) moved into Baker Bay after being detected on the outermost receiver along the Ilwaco navigation channel, as indicated by the detections at receivers VR2-6712 and VR2-6713. No transmitters were detected by the other receivers.

It is probable that additional fish may have been present or that residency by those fish detected was longer than indicated by the individual receiver detections. On the basis of detection events (table 3), all transmitters were resident around the receivers for relatively brief periods of time. Moser and Lindley (2007) reported that green sturgeon make rapid and extensive intra-estuary movements, which could explain why the transmitters were within detection ranges of the receivers only for short periods of time. Local environmental conditions also may have reduced or precluded reception of transmitter signals at the receivers. In this study, all detections of green sturgeon occurred during rising tides or shortly after high tides were projected to occur. Receiver detection ranges were expected to be greatest at high tides, when water depth over the hydrophones was greatest. Reduced water levels during low tides (fig. 2) would have influenced the capability of the receivers to detect transmitters by reducing the effective range of the receivers. At the lower low tide levels, the hydrophones on some receivers that were fixed to pilings would not have been submerged, and the receivers attached to moorings on the buoys may have settled onto the substrate.

Extensive areas of Baker Bay, particularly along the Eastern and Southern edges, had spatial and temporal gaps in coverage by the acoustic receivers. Two of the receivers along the Eastern border of the Bay were not installed until October 10, 2008. Given the detections of green sturgeon at other receivers prior to this date, it's possible that green sturgeon may have been present in this area before all receivers were installed. More receivers would have to be deployed to ensure complete spatial coverage of Baker Bay and the adjoining channels. Regardless, this study did reveal that green sturgeon from the Southern and Northern DPSs were present in Baker Bay and the Ilwaco channel during September and October.

Acknowledgments

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References Cited

Moser, M.L., and Lindley, S.T., 2007, Use of Washington Estuaries by subadult and adult green sturgeon: Environmental Biology of Fishes v.79, p. 243-253.

National Oceanic and Atmospheric Administration (NOAA), 2006, Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon: Federal Register, v.71, p. 17557-17766.

Parsley, M.J., Popoff, N.D., van der Leeuw, B.K., and Wright, C.D., 2008, Seasonal and diel movements of white sturgeon in the lower Columbia River: Transactions of the American Fisheries Society v.137, p. 1007-1017.

Vogel, D.A., 2008, Evaluation of adult sturgeon migration at the Glenn-Colusa Irrigation District gradient facility on the Sacramento River: Final Report, Natural Resource Scientists, Inc. April 2008, 33 p.

Wydoski, R.S., and Whitney R.R., 2003, Inland fishes of Washington: University of Washington Press, Seattle, Washington, 322 p.

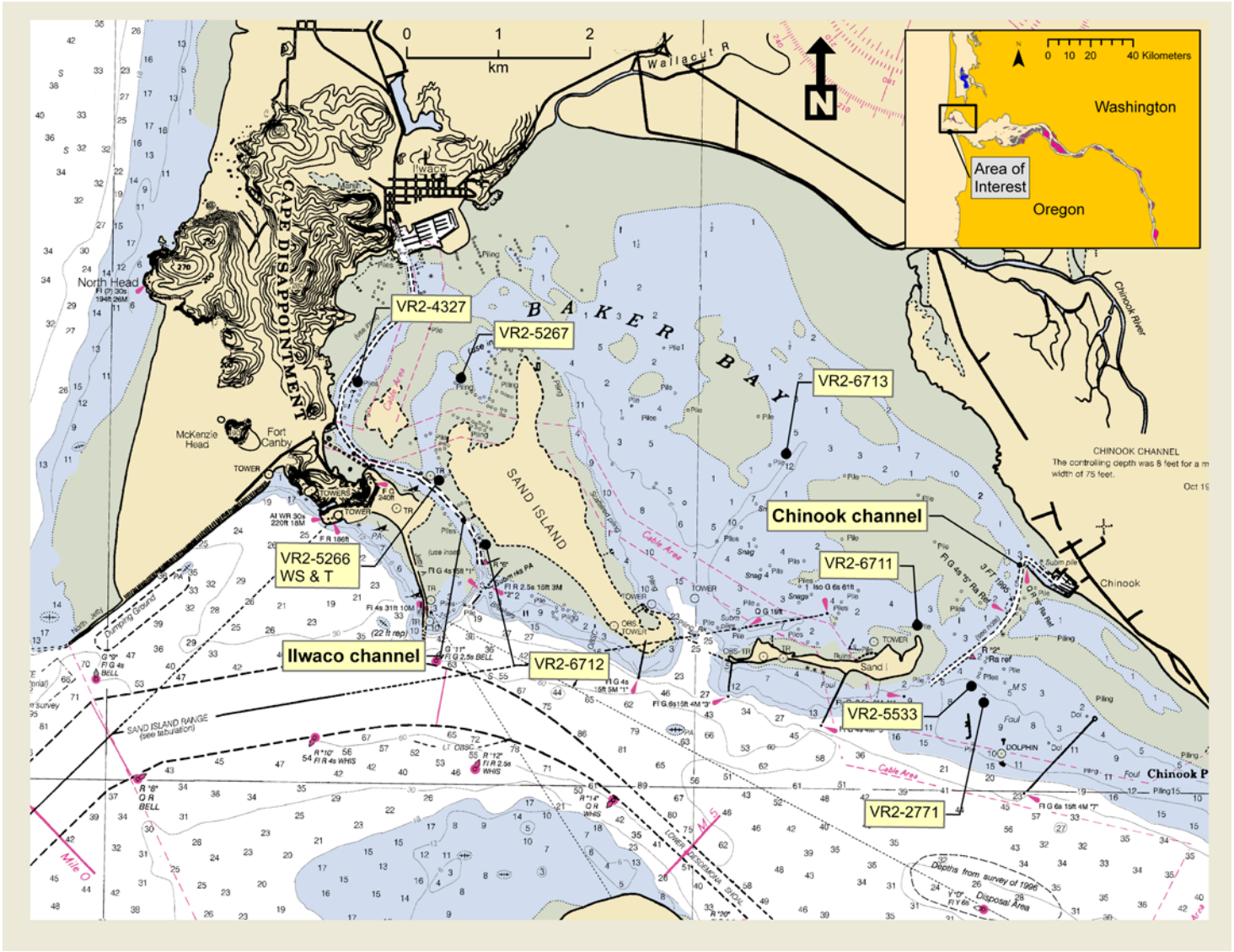

Figure 1. Locations of acoustic receivers (VR2-serial number) and a water stage and temperature recorder (WS & T) in and adjacent to Baker Bay, Lower Columbia River. Background image is taken from NOAA navigation chart 18521. Soundings are in feet.

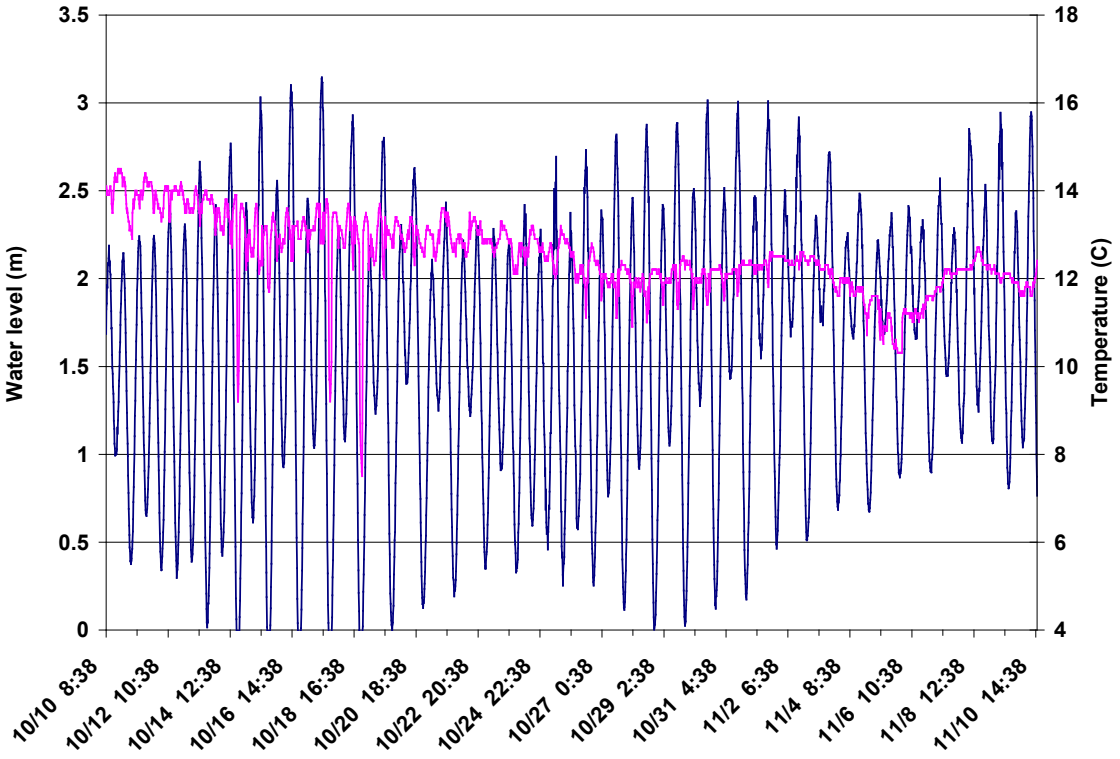

Figure 2. Water level (blue line) and water temperature (red line) recorded every 15 minutes during October 10 – November 10, 2008. Location of recorder shown in figure 1. Water levels represent depth over the sensor and are not referenced to a vertical datum. The low temperature spikes recorded during mid October are likely due to dewatering of the sensor during extreme low tides and low ambient air temperatures.

Table 1. Receiver deployment and recovery in Baker Bay, Lower Columbia River, during 2008.

[Geographic coordinates were obtained with a hand-held GPS and represent approximate locations]

Receiver serial number and type of deployment	Date deployed	Geographic coordinates	Date recovered	Transmitter IDs detected (# detections)
5266 – piling	12 Sep	N46 16.786 W124 02.915	10 Nov	535 (12) 18679 (7)
6711 – piling	12 Sep	N46 15.902 W123 57.800	13 Nov	None
6712 – piling	12 Sep	N46 16.417 W124 01.791	10 Nov	234 (1)[b] 243 (12) 245 (2) 535 (5) 18679 (12)
5267 – piling	26 Sep	N46 17.393 W124 02.029	13 Nov	None
6713 – buoy	26 Sep	N46 16.971 W123 59.251	10 Nov	243 (16)
4327 – piling	10 Oct	N46 17.363 W124 02.907	10 Nov	None
5533 – buoy	10 Oct	N46 15.616 W123 57.653	10 Nov	None
2771 – buoy	10 Oct	N46 15.528 W123 57.541	10 Nov	None

[b]A single detection cannot be validated and is considered to be a false detection. No additional information was sought for this transmitter ID code.

Table 2. Species and capture information for fish carrying transmitters detected near Baker Bay, September – November 2008.

ID	Species	Capture location	Tagging entity	Additional information
243	Green sturgeon	Sacramento River, river km 330	Natural Resource Scientists, Inc.	Tagged August 2006, 178 cm in length
245	Green sturgeon	Sacramento River, river km 330	Natural Resource Scientists, Inc.	Tagged August 2006, 208 cm in length
535	Green sturgeon	Klamath River, river km 57	Yurok Tribe	Tagged April 2005, 175 cm in length
18679	Steelhead	Columbia River	Columbia River Intertribal Fish Commission	None available

Table 3. Transmitter detections from all receivers in chronological order.

Date/Time (PDT)	Vemco code space	Transmitter ID	Receiver serial number
12-Sep-08 14:58:52	A69-1206	245	6712
12-Sep-08 14:59:29	A69-1206	245	6712
15-Sep-08 04:56:48	A69-1206	234	6712
15-Sep-08 15:52:11	A69-1303	18679	6712
15-Sep-08 15:53:09	A69-1303	18679	6712
15-Sep-08 15:53:53	A69-1303	18679	6712
15-Sep-08 15:54:55	A69-1303	18679	6712
15-Sep-08 15:55:46	A69-1303	18679	6712
15-Sep-08 15:56:14	A69-1303	18679	6712
15-Sep-08 15:56:47	A69-1303	18679	6712
15-Sep-08 15:57:28	A69-1303	18679	6712
15-Sep-08 15:58:27	A69-1303	18679	6712
15-Sep-08 15:59:12	A69-1303	18679	6712
15-Sep-08 16:00:19	A69-1303	18679	6712
15-Sep-08 16:17:32	A69-1303	18679	5266
15-Sep-08 16:18:44	A69-1303	18679	5266
15-Sep-08 16:19:53	A69-1303	18679	5266
15-Sep-08 16:20:57	A69-1303	18679	5266
15-Sep-08 16:21:51	A69-1303	18679	5266
15-Sep-08 16:22:25	A69-1303	18679	5266
15-Sep-08 16:23:09	A69-1303	18679	5266
16-Sep-08 09:06:06	A69-1303	18679	6712
16-Sep-08 23:09:14	A69-1206	535	6712
16-Sep-08 23:10:42	A69-1206	535	6712
16-Sep-08 23:12:35	A69-1206	535	6712
16-Sep-08 23:55:27	A69-1206	535	5266
16-Sep-08 23:57:37	A69-1206	535	5266
17-Sep-08 00:00:18	A69-1206	535	5266
17-Sep-08 00:02:09	A69-1206	535	5266
17-Sep-08 00:04:47	A69-1206	535	5266
17-Sep-08 00:06:59	A69-1206	535	5266
17-Sep-08 00:08:16	A69-1206	535	5266
17-Sep-08 00:09:48	A69-1206	535	5266
17-Sep-08 00:11:49	A69-1206	535	5266
17-Sep-08 00:20:14	A69-1206	535	5266
17-Sep-08 00:24:48	A69-1206	535	5266
17-Sep-08 00:26:18	A69-1206	535	5266
17-Sep-08 00:28:15	A69-1206	535	5266
17-Sep-08 01:08:38	A69-1206	535	6712
17-Sep-08 01:10:28	A69-1206	535	6712
19-Oct-08 02:52:29	A69-1206	243	6712
19-Oct-08 02:53:59	A69-1206	243	6712
19-Oct-08 02:54:34	A69-1206	243	6712

Table 3. Transmitter detections from all receivers in chronological order. — Continued.

Date/Time (PDT)	Vemco code space	Transmitter ID	Receiver serial number
19-Oct-08 02:55:03	A69-1206	243	6712
19-Oct-08 02:55:24	A69-1206	243	6712
19-Oct-08 02:55:51	A69-1206	243	6712
19-Oct-08 02:56:06	A69-1206	243	6712
19-Oct-08 02:56:23	A69-1206	243	6712
19-Oct-08 02:56:42	A69-1206	243	6712
19-Oct-08 02:57:07	A69-1206	243	6712
19-Oct-08 02:58:16	A69-1206	243	6712
19-Oct-08 02:58:44	A69-1206	243	6712
19-Oct-08 12:56:50	A69-1206	243	6713
19-Oct-08 12:57:26	A69-1206	243	6713
19-Oct-08 12:59:47	A69-1206	243	6713
19-Oct-08 13:00:16	A69-1206	243	6713
19-Oct-08 13:00:59	A69-1206	243	6713
19-Oct-08 13:03:09	A69-1206	243	6713
19-Oct-08 13:03:29	A69-1206	243	6713
19-Oct-08 13:03:55	A69-1206	243	6713
19-Oct-08 13:06:11	A69-1206	243	6713
19-Oct-08 13:06:29	A69-1206	243	6713
19-Oct-08 13:08:13	A69-1206	243	6713
19-Oct-08 13:09:28	A69-1206	243	6713
19-Oct-08 13:09:44	A69-1206	243	6713
19-Oct-08 13:13:21	A69-1206	243	6713
19-Oct-08 15:17:55	A69-1206	243	6713
19-Oct-08 15:42:53	A69-1206	243	6713