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TO: Eileen Maher,  
Environmental Services  
Port of San Diego  
3165 Pacific Highway  
San Diego, CA 92101-1128

FROM: Marine Turtle Research Program  
NOAA - National Marine Fisheries Service  
Southwest Fisheries Science Center  
8604 La Jolla Shores Drive  
La Jolla, CA 92037

SUBJECT: Data report #2 for green turtle remote tracking stations in San Diego Bay

The following is the second report on green sea turtle tracking efforts in San Diego Bay by the U.S. National Marine Fisheries Service. The activities summarized herein occurred from January to July 2007. A total of 15 ultrasonic transmitters and 3 GPS-linked satellite transmitters were deployed on green turtles in San Diego Bay during this period (Tables 1, 2). We recovered submersible ultrasonic receiver (SUR) stations deployed during Phase 1 of this study (See Report #1) and deployed new SUR stations at these and additional sites in the bay (Table 3). A total of 16 SUR stations are currently installed throughout the Bay (Table 3, Figure 1c). The data included in this report should be cited as "Eguchi and Seminoff, unpublished data."

## **Acoustic telemetry**

### *SUR Deployments*

A total of 9 SUR stations were installed on 4 January 2007 (Figure 1a). One station (SUR 00270) was either removed or was dislodged in the southern most portion of the bay and later recovered by a South Bay Power Plant employee then returned to the NMFS in July 2007. On 22 June 2007, we attempted to retrieve the remaining 8 stations deployed on 4 January 2007 as well as one station deployed on 6 November 2006. Only 5 of these 9 SURs were recovered from their deployment sites. Of the 4 not retrieved, 2 were collected on our next field visit on 19 July 2007, one was missing from its deployment site near Shelter Island, and one has yet to be retrieved. We think the Shelter Island unit was stolen based on the presence of knife-cut mounting line (at 8 m depth). This was the third stolen station, adding to the two that were removed entirely from the Navy Seal training base (see Report #1). Of the 7 SURs retrieved on 22 June and 19 July 2007, 2 were flooded and were sent to the manufacturer for repair and possible data retrieval, 2 functioned properly but had no recorded receptions, and 2 had 'hits' from 5 different turtles (00206 and 00215; Figure 1b).

In addition to the 9 SUR deployments on 4 January 2007 (one of which is still deployed), we installed 8 stations on 22 June 2007 and 9 stations on 19 July 2007. One unit (SUR 00279) from 22 June was dislodged, found by a recreational fisherman, and returned to the Port in early July. These deployments include two ‘fences’ placed in the bay that will monitor the movements of turtles in the southern and northern portions of the bay: these are present near the narrow section of San Diego Bay near the Coronado Ferry Pier, and south end of the bay. Data from the stations deployed in June and July will be retrieved during October 2007.

### *Turtle Presence*

Among successfully retrieved SUR units, turtle-mounted transmitters were detected at two different stations in the southern portion of the bay, green channel marker 21 near southern end of Coronado and green channel marker 13 near Chula Vista Nature Center. The most ‘hits’ occurred at the Coronado site, where transmissions from 4 different turtles were routinely detected for at least a 1 week interval during Phase 2 of this study (January-July). The turtles included Wrinklebutt (heard most often in March and April), CM-8360 (late February- March), CM-8355 (March), CM-126334368 (May), and ‘Oscar’ (February and March). Transmissions were also recorded at the station adjacent to Chula Vista Nature Center; LB-342 was heard routinely from late February to April (Figure 2).

### **Satellite telemetry**

High-spatial resolution GPS transmitters were attached to 3 green turtles between March and May 2007 (Table 2). These included one transmitter attached on 7 March 2007 to X116 (Wrinklebutt), and two transmitters attached on 23 May 2007 to CM3030 (Pappy) and LB358 (Dusk). Reliable location data for Wrinklebutt were transmitted successfully until 19 June 2007 (Figure 3a). This turtle spent the majority of the time in the south end of the bay, with a few outlying location fixes in waters offshore of the Sweetwater Inlet (Figure 3a). CM3030 (Pappy) was tracked in the south end of the bay between 23 May 2007 and 15 July 2007 (Figure 3b). A juvenile green turtle (LB358; Dusk) was tracked between 23 May 2007 and 22 July 2007, making pronounced north-south movements within the south end of the bay (Figure 3c).

### **Future plans**

The plans for the next step include:

1. Deployments of more SUR units
2. Improvements in anchoring system to deter thefts
3. Deployment of another GPS-linked satellite transmitter
4. Comparison of acoustic and GPS telemetry
5. Calibration and sensitivity tests of SUR units in the field

Table 1. Summary of ultrasonic transmitter deployments on green turtles during the 2005-06 and 2006-07 capture seasons. The tags used in this effort were Model CHP-87L manufactured by Sonotronics Inc. (Tucson, Arizona)

ID	Capture date	SCL (cm)	Mass (kg)	Freq. (kHz)	Pulse width (ms)
CM8360	1/19/2006	-	100	39.0	957
CM8355	1/19/2006	-	152	38.0	942
CM13581	2/1/2006	95.3	109	36.0	910
CM5675 (Charlie)	3/2/2006	82.8	80	37.0	927
CM12114	4/20/2006	76.3	65	35.0	921
CM20003	12/5/2006	107	196	35.0	987
CM3030 (Pappy)	12/14/2006	89.7	131	35.0	900
LB343 (Herman)	12/14/2006	93.9	120	35.0	921
CM5867	1/23/2007	93.0	101	36.0	967
CM7218	1/23/2007	99.3	116	37.0	955
CM2116 (Oscar)	2/8/2007	102.6	130	37.0	990
CM4363A	2/21/2007	60.5	28	36.0	1050
LB353	2/21/2007	100.3	127	40.0	1030
X116 (WB)	3/7/2007	103.1	240	35.0	930

Table 2. Summary of GPS transmitter deployments during the 2006-07 green turtle capture season. The transmitters deployed during this effort had the new GPS fast-loc technology (Mk-10AF, Wildlife Computers, Redmond, Washington).

ID	Capture date	SCL (cm)	Mass (kg)	Tag serial no.	Argos ID
X116 (WB)	3/7/2007	103.1	240	06A1276	52675
CM3030 (Pappy)	5/23/2007	89.7	131	07A0391	37623
LB358 (Dusk)	5/23/2007	70.0	46	07A0288	37616

Table 3. Deployment location and date for Submersible Ultrasonic Receiver (SUR) stations in San Diego Bay. These devices were manufactured by Sonotronics Inc. (Tucson, Arizona).

SUR ID	Latitude	Longitude	Location	Date deployed	Date retrieved
00197	N32.61359	W117.09852	By the ramp (PP)	1/4/2007	7/19/2007
00199	N32.71894	W117.21796	Shelter Island	11/6/2006	line cut
00206	N32.62232	W117.12761	Green 21	1/4/2007	6/22/2007
00207	N32.64672	W117.11829	Sweetwater	1/4/2007	6/22/2007
00208	N32.71250	W117.17590	Fish Mkt	1/4/2007	6/22/2007
00211	N32.61345	W117.11352	W jetty inlet	1/4/2007	-
00213	N32.72705	W117.18537	Convair Lagoon	1/4/2007	6/22/2007
00215	N32.63322	W117.11208	Green 13	1/4/2007	6/22/2007
00270	N32.60292	W117.11785	S end of S Bay	1/4/2007	July 2007
00271	N32.61275	W117.10486	S PP Mid-Chnl	1/4/2007	7/19/2007
00390	N32.72691	W117.18533	Convair Lagoon	6/22/2007	
00391	N32.63316	W117.11207	Green 13	6/22/2007	
00394	N32.62743	W117.11011	Red 18	6/22/2007	
00396	N32.62228	W117.12766	Green 21	6/22/2007	
00403	N32.71226	W117.17609	Fish Mkt	6/22/2007	
00279	N32.70031	W117.16476	Ferry Gazebo	6/22/2007	July 2007
00404	N32.70000	W117.17026	Ferry Landing	6/22/2007	
00408	N32.64671	W117.11837	Sweetwater	6/22/2007	
00392	N32.70031	W117.16476	Ferry Gazebo	7/19/2007	
00399	N32.61353	W117.09976	PP Channel	7/19/2007	
00400	N32.60806	W117.11971	S. Fence 1	7/19/2007	
00401	N32.61168	W117.12108	S. Fence 2	7/19/2007	
00402	N32.61632	W117.12337	S. Fence 3	7/19/2007	
00405	N32.61786	W117.10947	N PP Mid-Chnl	7/19/2007	
00406	N32.72387	W117.21544	Marine Depot	7/19/2007	
00407	N32.61698	W117.11142	N PP Channel	7/19/2007	
00948	N32.61271	W117.10495	S PP Mid-Chnl	7/19/2007	



Figure 1a. Deployment locations of SUR units in San Diego Bay from January to July 2007. Circles indicate approximate conservative range of reception (500m).

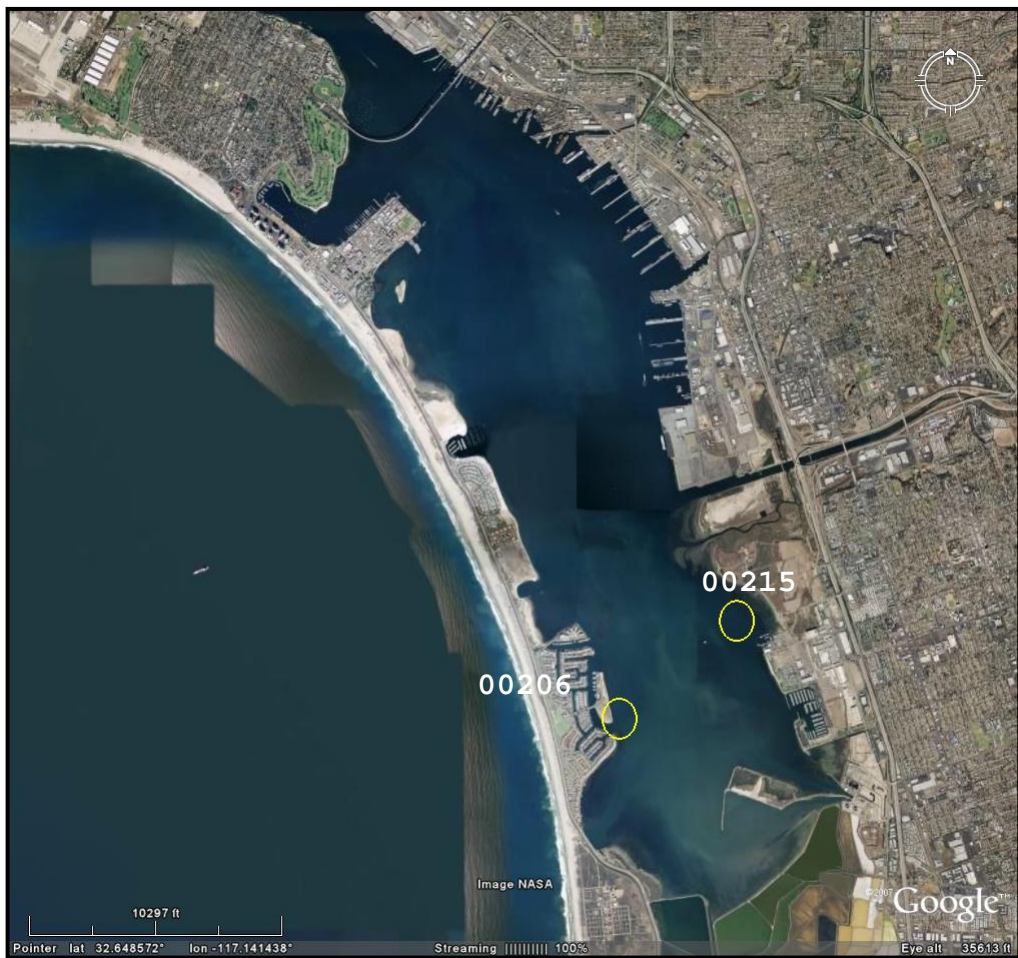


Figure 1b. SUR units that detected presence of tagged green turtles between January and July 2007. Circles indicate approximate conservative range of reception (500m).

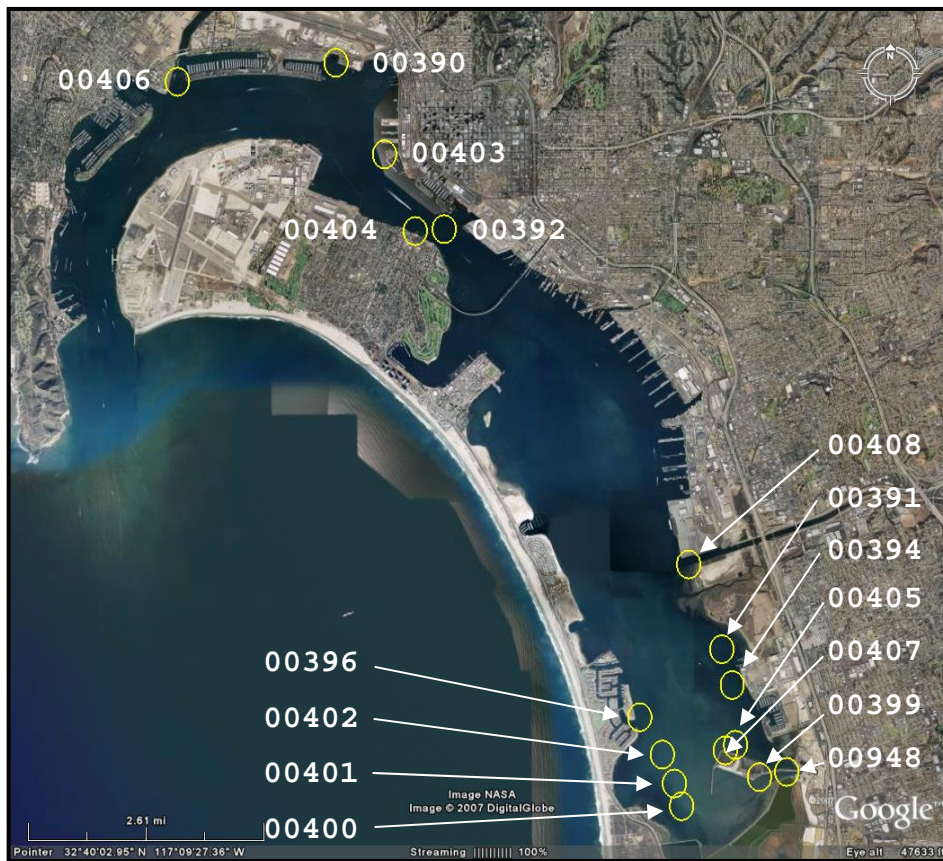


Figure 1c. Deployment locations of SUR units in San Diego Bay from July 2007. Circles indicate approximate conservative range of reception (500m).

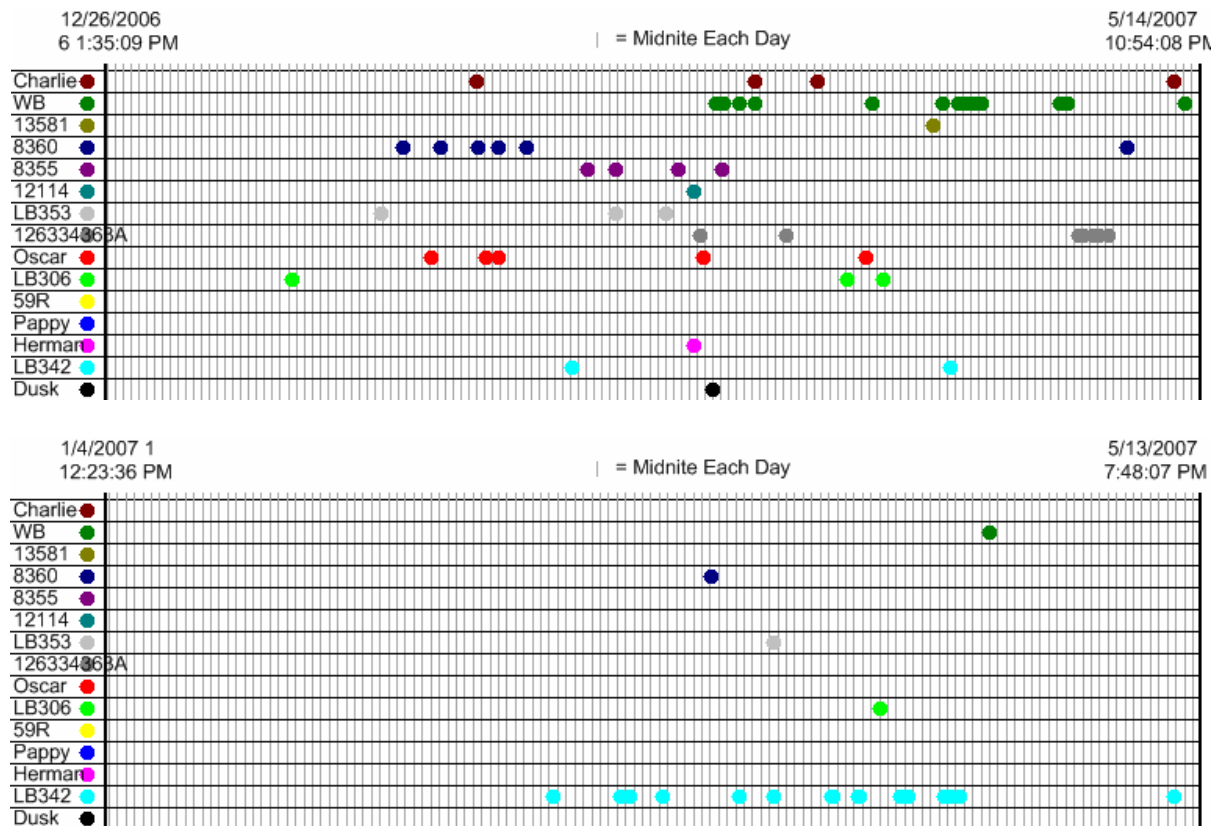


Figure 2. Turtles detected by three SUR units in San Diego Bay. The top figure is for SUR 206 at the Coronado side of the south bay, and the bottom figure is for SUR 215 at the green channel marker 13, which is off Chula Vista Nature Center. Single dots may be ‘false positives’ where an SUR detects ambient noise as a signal.



Figure 3a. Smoothed GPS track of Wrinklebutt between 7 March 2007 and 19 June 2007.



Figure 3b. Smoothed GPS track of Pappy between 16 May 2007 and 15 July 2007.



Figure 3c. Smoothed GPS track of Dusk between 16 May 2007 and 24 June 2007.