

# Technical Memorandum

**Date** October 16, 2013

**To:** Dan Pfeifer  
City of Ventura

**From:** Joel Mulder

**RE:** **2013 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary.**

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## 1.0 Introduction

As a condition of the City of Ventura's National Pollution Discharge Elimination System (NPDES) discharge permit, the population status of the federally listed as endangered tidewater goby (*Eucyclogobius newberryi*) in the Santa Clara River Estuary is regularly monitored in relation to the City's wastewater discharge to the estuary. The estuary is located approximately 1.4 kilometers (km) south of the Ventura Harbor mouth and adjacent to Harbor Boulevard in the City of Ventura, Ventura County, California (34° 13' 54" N, 119° 15' 42" W). The wastewater outfall discharges tertiary treated water to a series of ponds which drain into a channel (approximately 500 meters [m] long) located on the northwest side of the estuary (Figure 1). The confluence of the channel with the estuary is immediately adjacent to the ocean beach at the northwestern corner of the estuary.

Cardno ENTRIX performed these surveys bi-annually from 2004 through 2008. Only one tidewater goby survey was required yearly by the NPDES discharge permit for 2009 through 2013. The surveys have been performed concurrently with benthic macroinvertebrate (BMI) sampling by Aquatic Bioassay and Consulting (ABC), also supported by the City. This report presents the results of the 2013 annual survey, completed on September 4, 2013.

## 2.0 Description of the Area

At the time of the survey, the water level in the lagoon was high; similar to what has been encountered in the last several years' surveys (ENTRIX 2008, ENTRIX 2009, Cardno ENTRIX 2010, Cardno ENTRIX 2011, Cardno ENTRIX 2012). However, the water level had very recently been several feet higher due to no breaching of the estuary sand berm for more than a year. The decreased water levels encountered during the survey were a result of the installation of a pump and siphon at the northwest corner of the estuary by Ventura County Watershed Protection District (VCWPD) to relieve flooding of adjacent upland areas, including McGrath State Park, caused by the high water levels (FWS 2013). At the time of survey the estuary was approximately 1.2 km long, was triangular or delta shaped, and was impounded from the beach to upstream of the Harbor Boulevard Bridge. At the

western end of the estuary, adjacent to the Pacific Ocean, a long sand berm and beach formed a barrier between the estuary and the sea. The estuary body was approximately 750 m wide along the beach berm, with a narrow finger (approximately 1,000 m) continuing south along the beach berm (Figure 1).

The southeastern estuary shoreline, from approximately 300 m downstream of Harbor Boulevard, upstream to the river interface, was composed of sand and gravel bars. Very dense stands of willow (*Salix* sp.), up to 4 m high, were present along the wetted shoreline in this area, extending 10s of meters back from the wetted edges. Downstream of these bars and the bridge, the southeastern shore was densely covered with giant reed (*Arundo donax*) for approximately 170 m. Continuing west, in the vicinity of McGrath Beach State Park, a large flat expanse of low salt marsh consisting of grasses, sedges, and pickleweed (*Salicornia* sp.), was present for approximately 85 m, followed by an expanse of dense bullrush (*Scirpus* sp.) for an additional 45 m. The remaining shoreline on the south side of the estuary was comprised of steep, sandy bluffs measuring 3 to 4 m high and extending to the southwestern corner and southern arm of the estuary. The northern shore of the estuary, from the river interface to the ocean and in the vicinity of the wastewater outfall, had gently sloping shorelines vegetated with willow, giant reed, and bullrush. Vegetation was generally restricted to the shorelines with the exception of the southeastern side and far northwestern corner, just downstream of the wastewater treatment plant outflow channel, where large expanses of giant reed and patches of bullrush were inundated by water. The beach sand berm was devoid of any vegetation.

At least 50 percent or more of the estuary was more than 1.5 m deep and an estimated 30 percent of the estuary was less than about 60 cm deep at the time of the survey. Along the beach berm, the water was estimated to be greater than 1.5 m deep along the northern approximately 700 m of shoreline, but became progressively shallower within the arm extending south at the south-western corner of the estuary. Depth became abruptly deeper along the southern perimeter in the area where steep sandy bluffs bordered the shoreline, west of McGrath Beach State Park. Depths became gradually shallower proceeding east towards the State Park. Much of the area between the State Park and Harbor Boulevard Bridge was too deep to wade (more than 100 cm deep), and the recently higher water levels had left behind large expanses of swampy shoreline with very soft sediment and decaying organic substrate, which made sampling for fish infeasible in these areas. Depths at the south side of Harbor Boulevard Bridge ranged from approximately 30-150 cm. Substrate in the estuary was predominantly sand along the beach berm, but finer silts and decaying organics were the dominant substrates at most sampling stations. The water throughout the estuary was very brown colored, apparently from algal matter suspended through the water column, and visibility was limited to less than 10 cm.

### 3.0 Methodology

All fish handling was performed under the supervision of Cardno ENTRIX biologist Joel Mulder, who holds a Section 10(a)1(A) permit (Permit Number TE93072A-0) from the U.S. Fish and Wildlife Service for tidewater goby and a current California Department of Fish and Wildlife Scientific Collecting Permit (SC-9186). Mr. Mulder was assisted by ABC staff in the morning and by Cardno ENTRIX biologist Megan Olesen in the afternoon. Sampling began at 8:00 AM and finished at 3:30 PM. Mulder and Olesen were also accompanied by Dario Diehl and Alvina Mehinto of the Southern California Coastal Water Research Project (SCCWRP) who were collecting non-native fish samples for toxicology analysis.

The estuary was surveyed visually and with a beach seine measuring 3 X 1 m with 3 millimeter (mm) mesh. Sampling in the morning was coordinated with a BMI study performed by ABC. The BMI sampling sites, however, were not assessed for tidewater gobies due to water depth that required the BMI samples to be taken from a boat. Mr. Mulder was in communication with ABC and asked their staff to contact him immediately if any fish were found when the samples were being screened to make sure no tidewater gobies had been captured in the small dredge. The tidewater goby survey began at the northwest side of the river under Harbor Boulevard Bridge, progressed southeast along the beach berm, north towards McGrath State Park, then finished along the southeast bank under and upstream of Harbor Boulevard Bridge. Water depths, very soft, silty substrate, and swampy adjacent upland areas, made sampling along the eastern shore, from McGrath State Park to Harbor Boulevard Bridge, and along the western shore, from the outfall channel to Harbor Boulevard Bridge, infeasible. As requested by Chris Dellith of the FWS, prior to conducting the survey, efforts were initially made to avoid sampling in areas already sampled in June by Aquatic Research Specialists (ARS) for the estuary pump-down. However, as the survey progressed and no tidewater gobies were being encountered, the areas sampled within the main estuary body by ARS were re-sampled to confirm tidewater goby absence.

Figure 1 presents the locations of each seine haul and each location is numbered by the order in which the seine hauls were performed so that data for locations could be easily compared. All fish captured were identified, counted, and released alive back into the estuary, with the exception of those retained by SCCWRP personnel.

## 4.0 Results

A total of 24 seine hauls were performed throughout the eastern and western sides of the estuary (Figure 1). Table 1 presents the results of the seine hauls. No tidewater gobies or other native species were captured during seining. Non-native species captured included mosquitofish (*Gambusia affinis*), Mississippi silverside (*Menidia audens*), common carp (*Cyprinus carpio*), green sunfish (*Lepomis cyanellus*), and fathead minnow (*Pimephales promelas*).

Mosquitofish were found primarily in the shallow southern arm and under Harbor Boulevard Bridge. The Mississippi silversides were mostly small juveniles under 3-5 cm and were found throughout the estuary but were most abundant in the wastewater outfall channel (Stations 20 & 21). A total of five juvenile carp, ranging from approximately 12 to 20 cm were captured. Small (all less than 4 cm) juvenile green sunfish were captured throughout the estuary, and three fathead minnows were captured (Stations 17 and 21). All five juvenile carp and numerous green sunfish and Mississippi silversides were retained by SCCWRP personnel.

Table 2 presents the results of the water quality sampling undertaken by ABC.

## 5.0 Discussion

No tidewater gobies were observed in the BMI samples taken by ABC, and impacts to tidewater gobies from the sample dredge are unlikely to have occurred.

Surveys are completed in the fall when the greatest abundance of gobies is expected to inhabit the estuary. However this year no tidewater gobies were captured in any part of the estuary. Last year's surveys also reported lower than expected numbers relative to past surveys (Table 3).

On June 29-30, 2013, prior to the VCWPD pumping down of the estuary, a tidewater goby presence/absence survey was performed by ARS in the flooded portion of McGrath State Park, and in the lower estuary. The survey used similar methods for sampling (2-m beach seine with 3 mm mesh). The survey captured a total of 114 tidewater gobies, all but one of which were taken in the southern lagoon finger along the beach berm and southwestern shoreline between McGrath State Park and the beach berm, or near the wastewater outflow channel (taken in a total of 12 seine hauls in the main lagoon body). All age classes of tidewater goby were captured in the samples. However, 114 individuals is a relatively low number of tidewater gobies compared to some previous years (e.g., 2008 and 2010) where they were much more abundant in the same locations.

The reason for the lack of tidewater gobies encountered during the September survey is unknown. Possibly, the lack of estuary breaching for more than a year has led to increasingly poor water quality conditions that are unsuitable for tidewater gobies. The water column was observed to be particularly cloudy and turbid with brownish algal growth this year. Additionally, the water quality parameters over the past two years have not been conducive to spawning. Studies have shown tidewater gobies reproduce in water with salinities of 2 to 27 parts per thousand (ppt) and between 9 to 25 degrees Celsius (Swenson 1999, as cited in FWS 2007). The salinity in the estuary has measures below 2 ppt during the fall surveys and over the past two years (2011 and 2012) and the water temperature has increased to an average of 24.4° C in 2012 and 24.6° C in 2013, up from 18.3° C in 2010 and 19.7° C in 2011 (Cardno ENTRIX 2010, Cardno ENTRIX 2011, Cardno ENTRIX 2012). Higher water temperatures coupled with low salinity may contribute to the reduced numbers of tidewater gobies captured over the past two years, though the ARS results from June suggest that at least some reproduction occurred this summer, and temperatures are still within the reported range for successful breeding. It is also possible that tidewater gobies had moved into deeper water in September, possibly to escape warmer surface temperatures or as a result of the lowering water levels due to the VCWPD pumping, making their capture using a 1-m deep beach seine unlikely.

Also notably absent were native sculpins, specifically staghorn sculpin (*Leptocottus armatus*) and prickly sculpin (*Cottus asper*), partially-armored threespine stickleback (*Gasterosteus aculeatus microcephalus*), California killifish (*Fundulus parvipinnis*), and topsmelt (*Atherinops affinis*), all of which have been captured in previous surveys. Stickleback and staghorn sculpin were detected in June 2013 by ARS, however. Non-native species detected previously but absent during this survey included arroyo chub (*Gila orcutti*), red swamp crayfish (*Procambarus clarkii*), and African clawed frogs (*Xenopus laevis*) (ENTRIX 2008, ENTRIX 2009, Cardno ENTRIX 2010, Cardno ENTRIX 2011).

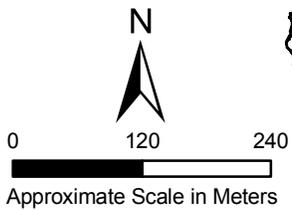
Non-native species were prevalent, representing all of the fish captured. The most abundant non-native species captured were Mississippi silversides and green sunfish. Carp and fathead minnow were only represented by a total of eight individuals. Mississippi silverside juveniles were very abundant and, judging by their size, were likely the result of successful reproduction over the summer. The Mississippi silverside was introduced to northern California in the 1960s, became widespread in the San Francisco

Bay and delta, and dispersed down the California aqueduct in the early 1990s (Moyle 2002) and have become common in the lower Santa Clara River and the estuary (ENTRIX 2008, ENTRIX 2009, Cardno ENTRIX 2010, Cardno ENTRIX 2011) as well as at a few other coastal estuarine sites in southern California.

Water quality results (Table 2) indicated that the estuary appeared to be essentially freshwater throughout (conductivity less than 2 ppt at all sampling stations and depths) as expected due to the high water levels that come from freshwater input and lack of breaching. However, sampling was not conducted deeper than 2 m; stratification could exist at depths greater than those sampled. Temperatures were relatively uniform from surface to bottom at each water quality sampling station indicating the water was well mixed throughout the at least the upper 1 to 2 m of the water column. Station WQ-004 had noticeably lower temperatures, pH, and dissolved oxygen (DO). The other stations have inflowing water while the sand berm location was essentially ponded due to the berm closure, possibly explaining the lower DO, temperature, and pH values.

## 6.0 References

- Cardno ENTRIX. 2010. 2010 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary. City of Ventura, Ventura County, California. October 22.
- Cardno ENTRIX. 2011. 2011 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary. City of Ventura, Ventura County, California. November 11.
- Cardno ENTRIX. 2012. 2012 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary. City of Ventura, Ventura County, California. September 27.
- ENTRIX, Inc. 2008. Results of Survey for Tidewater Gobies, *Eucyclogobius newberryi*, in the Santa Clara River Lagoon with Aquatic Bioassay, Inc. on October 14, 2008 for City of Ventura NPDES Assessment. November 21.
- ENTRIX, Inc. 2009. 2009 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary. City of Ventura, Ventura County, California. November 19.
- United States Fish and Wildlife Service (FWS). 2007. Tidewater Goby (*Eucyclogobius newberryi*) 5-Year Review: Summary and Evaluation. September.
- United States Fish and Wildlife Service (FWS). 2013. Biological Opinion for a Water Siphon in the Santa Clara River Estuary, Ventura, Ventura County, California (8-8-13-F-31)(SPL-2013-464-AJS). July 18.
- Moyle, P.B. 2002. Inland fishes of California. University of California Press, Berkeley, CA. 502 pp.



**Legend**

- TIDEWATER GOBY SURVEY LOCATIONS  
(SEINE HAUL LOCATION NUMBER)
- WATER QUALITY SAMPLING LOCATIONS  
(STATION NUMBER)

Aerial Imagery:  
National Agriculture Imagery Program 2010



**TIDEWATER GOBY SURVEY  
SANTA CLARA RIVER ESTUARY**

SEPTEMBER 4, 2013  
CITY OF VENTURA

October 16, 2013

2013 Survey for Tidewater Goby, *Eucyclogobius newberryi*, in Santa Clara River Estuary.



Table 1 – Results of fish survey in Santa Clara River Estuary, September 4, 2013.							
Seine Haul	Area (m <sup>2</sup> )	Cyprinus carpio common carp	Gambusia affinis mosquitofish	Menidia audens Mississippi silverside	Lepomis cyanellus green sunfish	Pimephales promelas fathead minnow	TOTAL
1	3	--	35	--	14	--	49
2	3	--	4	--	--	--	4
3	5	1	4	--	2	--	7
4	27	--	--	7	--	--	7
5	30	--	--	17	--	--	17
6	12	2	--	19	1	--	22
7	15	--	--	32	2	--	34
8	9	1	--	1	1	--	3
9	6	--	--	--	1	--	1
10	25	--	--	4	1	--	5
11	30	--	--	7	1	--	8
12	25	--	--	2	1	--	3
13	25	--	3	70	3	--	76
14	6	--	12	55	2	--	69
15	9	--	9	6	2	--	17
16	6	--	--	21	4	--	25
17	6	1	1	45	--	1	48
18	4	--	--	50	1	--	51
19	9	--	--	17	1	--	18
20	15	--	--	300	--	--	300
21	20	--	--	160	1	2	163
22	9	--	16	--	2	--	18
23	6	--	2	--	--	--	2
24	5	--	5	--	1	--	6
<b>TOTAL</b>	-	5	91	813	41	3	953

Table 2 – Water quality sampling results from Santa Clara River Estuary, September 4, 2013.

Water Quality Station	Depth (ft.)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (µS/cm)	Salinity (ppt)
3	Surface	24.8	8.92	9.11	2589	1.33
	0.5	24.8	8.67	9.11	2589	1.33
	1.0	24.8	8.62	9.11	2590	1.33
	1.5	24.8	8.38	9.11	2590	1.33
	2.0	24.6	6.21	8.92	2611	1.34
4	Surface	23.9	3.26	7.55	2221	1.14
	0.5	23.7	3.62	7.56	2216	1.13
	1.0	23.7	3.56	7.56	2214	1.13
5	Surface	25.1	11.42	9.03	2627	1.35
	0.5	25.1	10.58	9.00	2630	1.36
	1.0	25.0	10.50	8.95	2637	1.36

Table 3 – Results of fish surveys in Santa Clara River Estuary, 2008 - 2013.

Year	Seine Halls	tidewater goby	mullet	common carp	California killifish	mosquitofish	partially armored threespine stickleback	arroyo chub	Mississippi silverside	green sunfish	topsmelt	staghorn sculpin	prickly sculpin	fathead minnow	TOTAL
2008	35	462	3	4	--	63	--	2	60	1	47	--	--	6	648
2009	38	186	--	3	--	297	1	1	339	8	--	--	1	30	866
2010	28	1855	--	97	1	51	10	15	15	114	--	2	63	102	2325
2011	25	244	--	27	2	2	17	3	75	--	--	--	--	--	370
2012	18	139	--	1	>5	27	8	>51	>6	1	p	--	--	1	>239
2013	21	--	--	5	--	68	--	--	813	38	--	--	--	3	927
TOTAL	-	2886	3	137	8	508	36	73	1308	162	47	2	64	141	5375

\*p indicates that species was present but not counted due to large numbers