



Pajaro Lagoon Steelhead and Tidewater Goby Sampling Report– 2012

No steelhead were captured in Pajaro Lagoon in fall 2012. A small population of tidewater goby still existed there. However, its future is uncertain due to potential conflicts between maintaining fish habitat and flood control.

Methods

The sandbar was closed in fall 2012, and the lagoon was extensive and extended more than 3 miles upstream from the beach. The upper lagoon, oriented perpendicular to the beach, was sampled on 2 October (6 seine hauls in two locations) (**Table 36**). The lower lagoon, oriented parallel to the beach, was sampled on 3 October (8 seine hauls in 8 locations along the full extent) (**Table 37**). The 106-foot bag seine (3/8-inch mesh) was used on 2 and 3 October to capture steelhead. On October 4, the periphery of the lower lagoon along the beach berm (6 seine hauls), Watsonville Slough (1 seine haul) and the upper lagoon (1 seine haul) were sampled with the smaller seine (**Table 38**). The 30-foot goby seine (1/8-inch mesh) was used on 4 October. Captured fish were identified, counted and released without mortality.

Water Quality

On sunny 2 October during the warmest days of the dry season, air temperature was 25.2 C at 1430 hr. Slight salinity stratification was detected along the steep LAGOON MARGIN under the Thurwachter Bridge. Salinity and water temperature went from 4.5 ppt and 23.6 C at the surface to 8.9 ppt and 22.8 C at the bottom of 0.75 m (oxygen concentration above 8.7 mg/l throughout). At the model airport at 1500 hr, salinity and water temperature along the steep LAGOON MARGIN went from 4.3 ppt and 23.4 C at the surface to 9.8 ppt and 22.6 C at the bottom at 0.75 m (oxygen concentration above 10.7 mg/l throughout).

On initially overcast 4 October, the lower LAGOON'S MARGIN was uniformly moderate in salinity at about 9 ppt to the bottom at one meter depth, with a water temperature between 18.1 and 18.4 C between 1000 hr and 1300 hr (oxygen concentration above 8 mg/l at 1000 hr and above 11.3 mg/l by 1300 hr throughout the water column), with air temperature between 16 and 18 C. Approximately 3 miles upstream of the Watsonville Slough confluence at 1430 hr, water temperature, salinity and oxygen stratification were detected with 1.8 ppt salinity, 19.1 C water temperature and 5.9 mg/l oxygen at the surface and 12.5 ppt salinity, 24.4 C water temperature and 1.5 mg/l oxygen at the bottom of 1 meter along the LAGOON MARGIN. The air temperature was 21.1 C at 1430 hr, after the cloud layer had burned off.

Sampling Results for Pajaro Lagoon

Table 36. Fish capture results from sampling Upper Pajaro Lagoon with the 106-foot bag seine (3/8-inch mesh), 2 October 2012.

Date	Location	Seine Haul	Tide-water Goby	Yellow fin goby	Hitch	Prickly sculpin	Sac. sucker	Smelt (jack and top)	Staghorn Sculpin	Three-spine Stickle-back
2 Oct 2012	Model Airport- 0.3 miles down-stream of Thurwachter Bridge	1						5	3	2
	Same	2	1					1	1	5
	Same	3				1		14	1	8
	Thurwachter Bridge	1	1		2				8	5
	Same	2			7		1	14	3	
	Same	3			3	1		22	11	2
Total			2		12	2	1	56	27	22

Table 37. Fish capture results from sampling lower Pajaro Lagoon with the 106-foot bag seine (3/8-inch mesh), 3 October 2012.

Date	Location	Seine Haul	Tide-water Goby	Arrow goby	Yellow fin goby	Pacific herring	Bay pipe-fish	Shiner Surf-perch	Smelt (jack and top)	Staghorn Sculpin	Striped Bass	Three-spine stickle-back
3 Oct 2012	East of Watsonville Slough confluence	1				53		1	35			3
	East of #1	2				6		4	62			3
	East of #2	3			1	38		1	104			
	East of #3	4	4	12			6		46	13		2
	East of #4	5				4	1	2	39	2	4	
	East of #5	6				4			23			
	East of #6	7				65	2		73	1		2
	Eastern end of lagoon	8				64			17			2
Total			4	12	1	234	9	8	399	16	4	12

Table 38. Fish capture results from sampling the periphery of lower Pajaro Lagoon, Watsonville Slough and upper Pajaro Lagoon with the 30-foot seine (1/8-inch mesh), 4 October 2012.

Date	Location	Seine Haul	Tide-water Goby	Arrow goby	Yellow fin goby	Gambusia	Hitch	Bay pipe-fish	Smelt (jack and top)	Staghorn Sculpin	Three-spine stickle-back
4 Oct 2012	Approx. 200 m east of Pajaro Dunes Complex	1	4	25						1	Present
	East of #1	2	1	6							Present
	East of #2	3	9	25				4		9	Present
	East of #3	4	15	39				2	4	3	Present
	East of #4	5	13	49	1			3			Present
	East of #5	6	4					2	4		Present
	Watsonville Slough- 100m from Pajaro confluence	7	1			1				1	Present
	0.8 miles upstream of Thurwachter Bridge and 2.9 miles upstream of Watsonville Slough confl.	8	58			1	3				Present
Total			105	144	1	2	3	11	8	14	Present

Conclusions- Pajaro Lagoon

An expansive lagoon had formed behind the closed sandbar in summer 2012. It extended upstream past Highway 1, more than three miles from the beach. No steelhead were detected in Pajaro Lagoon in 2012, although sampling of the upper lagoon was difficult because of the limited landing areas for the seine. A small population of tidewater goby still existed in Pajaro Lagoon in fall 2012. The highest density was at the uppermost site, 3 miles upstream of Watsonville Slough. The closed lagoon had not converted to freshwater after a below average rainfall winter. However, water quality was adequate for both species' survival at the time of sampling, which was the warmest period of the 2012 dry season. Water quality measurements along the lagoon margin detected some stratification between 2 and 3 miles upstream of Watsonville Slough and oxygen depletion at the bottom, 2.9 miles upstream from the Slough. We suspect that if deeper areas of the lower lagoon had been measured for water quality, stratification would have been detected there, as well. However, oxygen concentrations and water temperature were adequate for steelhead in the upper water column at all locations. The lagoon was eutrophic, with an algal bloom observed. As was indicated on 2 October, in the less saline upper lagoon where steelhead were most likely to inhabit, water temperatures reached 23.6 C near the surface and remained above 22.8 C down 0.75 m, below which oxygen may have been depleted.

After 15 years of water quality monitoring and fish sampling of Santa Rosa Creek Lagoon near Cambria and 20+ years at Soquel Creek Lagoon in Capitola, the following were recommendations to insure steelhead habitation.

- *The 7-day rolling average water temperature within 0.25 m of the bottom should be 19°C or less.*
- *Maintain the daily maximum water temperature below 25°C (77°F).*
- *If the maximum daily water temperature should reach 26.5°C (79.5°F), it may be lethal and should be considered the lethal limit.*
- *Water temperature at dawn near the bottom for at least one monitoring station should be 16.5°C (61.7°F) or less on sunny days without morning fog or overcast and 18.5°C (65.3°F) or less on days with morning fog or overcast.*
- *Maintain the daily dissolved oxygen concentration near the bottom at 5milligrams/liter or greater, though it does not become critically low and potentially lethal until it is less than 2 mg/l throughout the water column for several hours, with the daily minimum occurring near dawn or soon after.*

Recommendations- Pajaro Lagoon

The sandbar should be allowed to close naturally as flows decline in the summer. Artificial breaching should be prohibited in summer. Spatial heterogeneity should be protected in the Pajaro Lagoon/estuary. Slackwater areas with overhanging riparian vegetation should be allowed to form to provide rearing and breeding habitat for tidewater goby during the dry season. Tule beds are valuable rearing habitat and provide winter refuge. Natural training of the Pajaro River outlet channel to the east, as occurs at other local creek mouths, results in a long lateral extent of the summer lagoon to the east of Watsonville Slough. This is significant summer habitat along the beach berm for tidewater goby and arrow goby. There is a long history of emergency breaching of the sandbar which potentially reduces tidewater goby numbers. Our limited lagoon sampling in October 2012 was insufficient to understand how steelhead utilize the lagoon.

- *The sandbar at the mouth of the Pajaro River should be allowed to close naturally as flows decline in the summer. Artificial breaching should be prohibited in summer.*
- *Emergency breaching of the sandbar for flood control should be minimized.*

- *Breaching should be done so that lagoon draining is as slow as possible and with a maximum residual backwater depth in the estuary after draining.*
- *Artificial breaching should coincide with high tide to help maximize the residual estuary depth.*
- *Pursue projects that will reduce the need for emergency breaching.*
- *Spatial heterogeneity should be protected in the Pajaro Lagoon/estuary. Slackwater areas with overhanging riparian vegetation should be allowed to form to provide rearing and breeding habitat for tidewater goby during the dry season. Tule beds are valuable rearing habitat and provide winter refuge. Natural training of the Pajaro River outlet channel to the east, as occurs at other local creek mouths, results in a long lateral extent of the summer lagoon to the east of Watsonville Slough. This is significant summer habitat along the beach berm for tidewater goby and arrow goby.*