Salinas River Lagoon Fish Distribution Study

2023 Summary of Tidewater Goby Surveys

Permit No.: TE-98090C-0

Submitted To:
Monterey County Water Resource Agency

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Background

The tidewater goby (*Eucyclogobius newberryi*) is a federally listed endangered species endemic to California (USFWS 1994). Tidewater goby are found in estuarine habitats that are relatively protected from the marine environment, occurring only in brackish lagoons along the California coast from San Diego to Crescent City. The number of tidewater goby populations greatly declined during the late 20th century, likely due to heavy coastal development, and the species was listed as Endangered under the Endangered Species Act in 1994.

Until their discovery during routine fish monitoring surveys in the Salinas River Lagoon (lagoon) in 2013, tidewater goby were last documented in the lagoon in 1951. Prior surveys for tidewater goby in 1991, 1992, 2004, and 2010-2012 failed to document the species in the lagoon (USFWS 2013, Hagar Environmental Services [HES] 2012, HES 2013). Presumably, tidewater goby were extirpated from the lagoon due to levee construction and channelization (USFWS 2013). Observations in 2013, and again in 2014, likely represented a natural recolonization event for the species from nearby Bennett Slough or Moro Cojo Slough (approximately 11.3 km; HES 2014). Between 2013 and 2014, the tidewater goby population appeared to increase in abundance, and in 2014, tidewater goby were the second most abundant species sampled in the lagoon (only three species were detected; HES 2015). Routine fish monitoring surveys were not conducted by MCWRA or its contractors from 2015 - 2017.

Tidewater goby habitats are typically separated from the Pacific Ocean by sandbars for most of the year, which effectively isolate populations and prevent fish from moving amongst existing populations or colonizing new habitats. Because migration between populations is rare, substantial genetic differences have developed among tidewater goby populations (e.g., McCraney et al. 2010). As a species, the tidewater goby is thought to persist as a metapopulation, wherein individual subpopulations in relatively isolated habitats frequently experience extirpation (localized extinctions). If habitat remains or again becomes suitable, it may be recolonized during comparatively brief periods of connectivity (Lafferty et al. 1999a, Lafferty et al. 1999b). In the metapopulation model, sub-populations survive and/or remain viable through continual exchange of individuals or recolonizations after extirpations. Extinction and recolonization rates are higher in the southern portion of the species' range (Lafferty et al. 1999a, Lafferty et al. 1999b), whereas sub-populations are more stable along California's North Coast (Kinziger et al. 2016).

When estuaries breach, typically during periods of high rainfall and large surf, they often drain rapidly. This is followed by an influx of ocean water over subsequent tidal cycles, which can drastically change the salinity and temperature of the lagoon. Adult tidewater gobies have a broad tolerance for environmental changes to cope with such dramatic fluctuations. While these fish typically inhabit brackish waters with salinities less than 12 parts per thousand (ppt), they have been documented in the wild at salinities greater than that of seawater (up to 42 ppt; Swift et al. 1989). However, juvenile gobies appear less resilient to such breaching events and suffer high rates of mortality when exposed to increases in salinity (Hellmair & Kinziger 2014).

One adaptation that appears to safeguard populations against this natural stressor is the tidewater goby's ability to reproduce across a range of conditions and throughout the year - unlike most fish species - with an increase in spawning activity during summer months (Goldberg 1977; Swift et

al. 1989). As a result, a large range of individual ages and sizes can often be observed concurrently in a given tidewater goby population. This reproductive strategy is thought to balance the risk of high juvenile mortality by maximizing reproductive output: some reproduction can occur during all times of the year (ensuring the continual presence of salinity-tolerant adults), while peak spawning activity is observed during summer, when the chance of estuary breaching (and high juvenile mortality) is lowest (Hellmair & Kinziger 2014).

A review of past collection information, supplemented by periodic fish distribution surveys carried out since 2018, is intended to provide insight about the suitability of the Salinas River Lagoon as tidewater goby habitat, population dynamics following recolonization after more than six decades, and the distribution of tidewater goby within the lagoon. This information about tidewater goby densities and distributions within the lagoon is important for future lagoon management and the ongoing process of creating a Habitat Conservation Plan (HCP) for the Salinas River and Lagoon. As part of the HCP, long-term permits are expected to be issued by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service for water level management in the lagoon (Old Salinas River outflow and facilitated breaching) as well as other operations. Distribution surveys were designed to inform the permit application process and provide information on population resilience to natural and facilitated breaching events.

The temporal changes in distribution of tidewater goby, based on numerous surveys by FISHBIO and other entities, are summarized herein. Details on specific tidewater goby surveys can be found in a comprehensive summary report, prepared on behalf of MWCRA (FISHBIO 2022). This report relies on and incorporates the results of historic collections but focuses on the tidewater goby distributional survey conducted on May 9, 2023.

Methods

Field Methods

Tidewater goby collection surveys conducted by FISHBIO on May 9, 2023, used a two-person crew with a 10 x 4 ft. beach seine (⅛ inch mesh). Numerous locations were sampled throughout the lagoon, distributed from near the sandbar/breach location to the Highway 1 Bridge, as well as in the Old Salinas River (OSR) directly behind the slidegate (Figure 1). No habitat type was initially targeted or favored for sampling when sites were selected in 2018; rather, approximately equidistant sampling locations were chosen to obtain an adequate overview of the spatial distribution of gobies within the lagoon. During subsequent sampling events, initially selected locations were revisited. Areas for sampling by beach seine were generally limited by water depth as most sites along the southern shore of the lagoon quickly became too deep for effective seining.

All targeted sampling for tidewater goby was conducted following protocols developed by the United States Fish and Wildlife Service (USFWS 2005 Appendix F). At each sampling location, one to two seine hauls were conducted (Figure 2), depending on the available area that could be sampled efficiently (multiple seine hauls were only possible where sufficient area with adequate depth was available for sampling, the areas sampled by sequential seine hauls did not overlap). After each seine haul, all captured fish were transferred from the seine to an aerated, temporary

holding bucket. Once all fish were removed from the seine, they were identified to species level, enumerated and measured. Following identification and measurement, all sampled fish, including tidewater goby, were released at the site of capture.

Measurements of tidewater gobies were used to evaluate the reproductive period of the species in the Salinas River Lagoon. As growth in fishes is generally continuous and indefinite, differences in size – or range in individual sizes encountered in a population at a particular point in time – can be used as an approximation of the temporal extent of their reproductive period, particularly in small, short-lived species such as the tidewater goby (Hellmair & Kinziger 2014).

Figure 1. Aerial image indicating collection locations of tidewater goby surveys conducted by FISHBIO and referenced in this report. Of note, Sites A and B are located on the lagoon and OSR-side of the slidegate, respectively. Site C (breach location) could not be sampled in May 2023 due to access restrictions (nesting snowy plovers).

Figure 2. Using a two-person, small-mesh beach seine to sample tidewater goby in the Salinas River lagoon.

Data Analysis

Von Bertalanffy growth parameters (L_∞, k and t_0) estimated for a northern California population of tidewater goby (Big Lagoon, Humboldt Co.; Hellmair & Kinziger 2014) were used to derive approximate daily ages for tidewater goby, according to the following formula:

$$L_t = L_\infty * (1 - e^{-k*(t-t_0)}),$$

where L_t is the length at time of capture, L_∞ is 94.18 (the theoretical maximum size for the species), k is 0.67, t_0 is -0.11 and t is the age, in years.

This can be rearranged as

$$t_{days} = \left(\frac{\ln\left(1 - \frac{L_t}{L_\infty}\right)}{-k} + t_0 \right) * 365$$

to estimate the daily age of an individual tidewater goby of a known total length (TL) L_t. For example, a fish measuring 33 mm (TL) is estimated to be 195 days old.

While density can often be useful in determining critical habitat or habitat preference of a species within a given environment, the methods to estimate density (individuals per unit sampled) must be comparable among sampling methods and events. A review of pre-2018 collection information of tidewater goby in the Salinas River Lagoon revealed that such comparable estimates of fish density cannot be derived. However, surveys since 2018 were conducted according to standardized protocol, the area sampled by each seine haul was visually estimated and can, thus, be used as an indicator of fish densities.

Results

Locations throughout the Salinas River Lagoon where tidewater gobies were documented since confirmed recolonization of this habitat are summarized, by year, in Figure 3.

Similar to the preceding years, tidewater goby were found at most sampled locations during the May 9, 2023, survey. Numbers of tidewater goby captured with each seine haul during the 2023 survey ranged from 0 (along the southwestern shoreline) to 17 (in the OSR). At sampling sites where the species was detected, no subsequent seine hauls were performed following detection. Comparable to previous surveys, estimation of index densities is not biologically meaningful due to low capture numbers. Despite low capture numbers in individual seine hauls, tidewater goby continue to be widely distributed.

Tidewater gobies captured during the survey measured from 33 mm to 52 mm in total length. Using the above-described age-length relationship, this corresponds to estimated individual ages ranging from 195 to 397 days, suggesting a prolonged reproductive period (202 days; Figure 4).

Overall, diversity of fish species captured during the survey was low. Pacific staghorn sculpin, *Leptocottus armatus*, was the most abundant species sampled (n = 139; Figure 5) and was found at all sampled locations, with exception of the OSR. In addition, the survey documented threespine stickleback, *Gasterosteus aculeatus* (n = 8, with seven individuals captured in the OSR), mosquitofish *Gambusia affinis* (n = 18, with 17 individuals captured in the OSR), and one juvenile speckled sanddab, *Citharichthys stigmaeus* (Table 1).

Salinity concentrations (measured with a YSI ProSolo Digital Water Quality Meter) were moderate (Table 1), ranging from only 0.15 ppt (in the OSR) to 3.55 ppt (at locations slightly south of the breach location). Importantly, the Salinas River Lagoon has remained breached since a facilitated breaching event on January 3, 2023. Consequently, the lagoon was subjected to seawater influx during tidal cycles, albeit buffered by freshwater inflow from the Salinas River (approximately 300 cfs on the day of the survey, as measured near Spreckles [USGS 11152500]). However, instantaneous measurements of salinity and temperature recorded at each location are insufficient to characterize or generalize environmental conditions that are associated with tidewater goby occupancy, as these parameters are expected to fluctuate throughout the tidal cycles for as long as the lagoon remains connected to the marine environment.

Tidewater goby are frequently associated with aquatic vegetation, particularly widgeon grass (*Ruppia* sp.), and the presence of *Ruppia* is considered a significant predictor of tidewater goby presence. However, at the time of the survey, and like previous springtime surveys, widgeon grass was not yet present at the surveyed locations or readily detectable in the lagoon. This is likely attributable to the seasonal nature of vegetation growth in the lagoon, with vegetation coverage expected to increase throughout the late spring, summer, and early fall. During that time, tidewater goby are expected to be more densely concentrated in areas where widgeon grass is present or abundant, whereas they are likely more broadly distributed during the winter and spring.

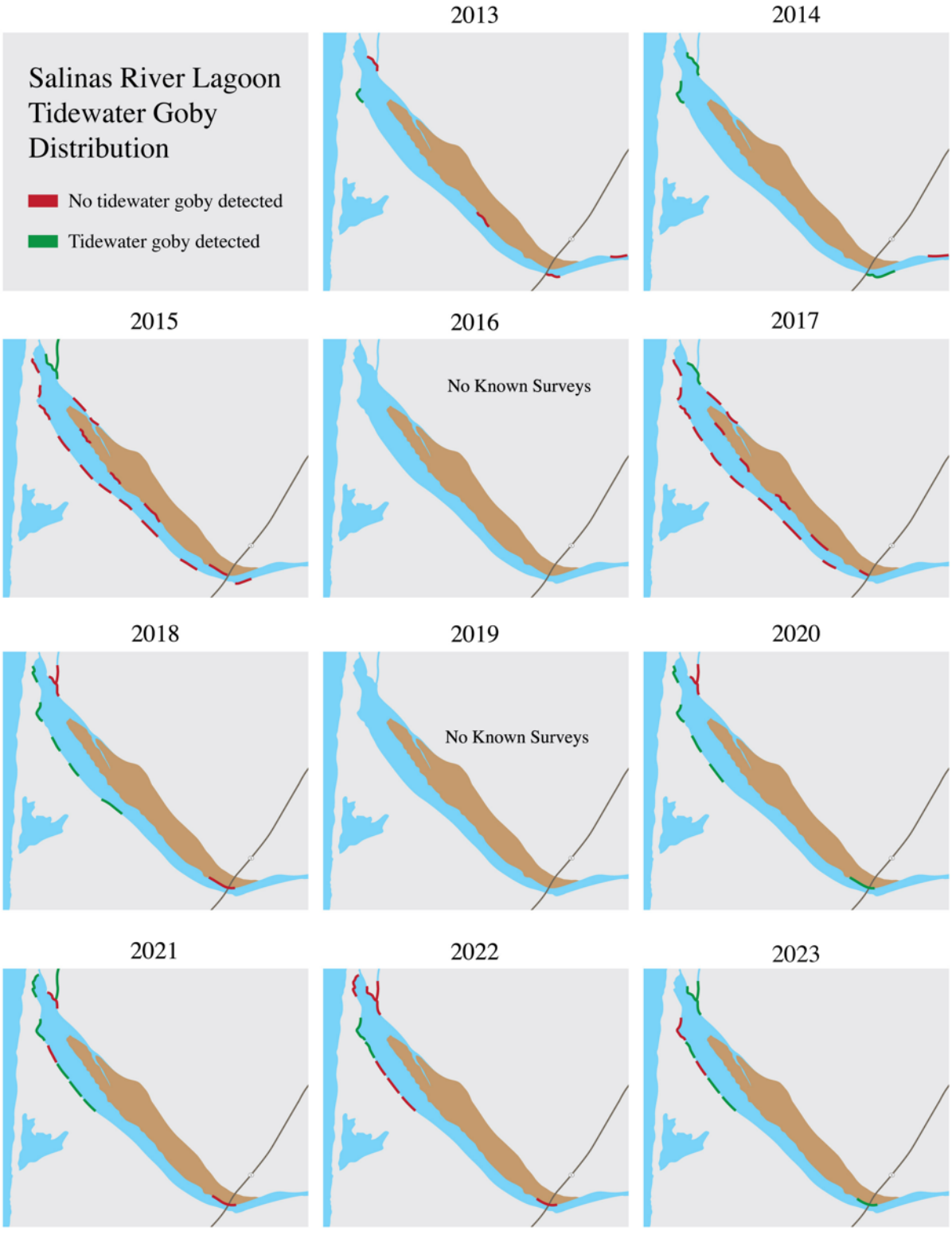

Figure 3. Summary of post-recolonization detection records of tidewater gobies in the Salinas River Lagoon, illustrating presence (green) and non-detection (red). Note: Methods and effort are not standardized.

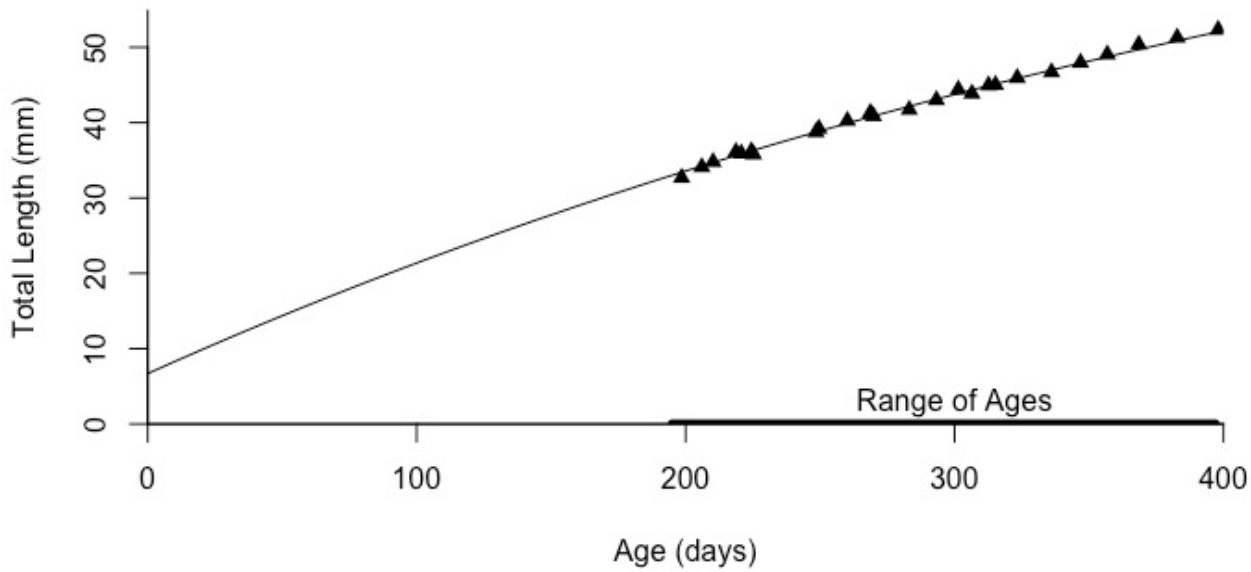

Figure 4. Total lengths (in millimeters [mm]) of tidewater goby (n = 25) captured during surveys conducted on May 9, 2023, and their estimated age, based on Von Bertalanffy growth parameters (Hellmair & Kinziger 2014).

Figure 5. Pacific staghorn sculpin captured during the tidewater goby survey on May 9, 2023.

Table 1. Summary of sampling locations, effort and catch in the Salinas River Lagoon, May 9, 2023.

Location	Coordinates	Surface Temperature (ºC)	Surface Salinity (ppt)	Area Sampled (sq ft)	TWG Catch	Other species (n)	Comment
(A)	36.749704; -121.801128	18.8	2.93	540	1	Pacific staghorn sculpin (2)	*Ruppia* absent
(B)	36.750070; -121.801114	20.7	0.15	500	17	Threespine stickleback (7), Mosquitofish (17)	*Ruppia* absent
(C)	36.750506; -121.803841	Not sampled due to access restrictions					
(D)	36.747189; -121.803235	18.7	3.55	1,500	0	Pacific staghorn sculpin (58)	*Ruppia* absent
(E)	36.742671; -121.799886	17.7	3.14	240	0	Pacific staghorn sculpin (7)	*Ruppia* absent
(F)	36.739192; -121.795568	16.7	2.76	600	2	Pacific staghorn sculpin (11)	*Ruppia* absent
(G)	36.731993; -121.783053	16.7	1.9	150	1	Pacific staghorn sculpin (2), Mosquitofish (1)	*Ruppia* absent
(H)	36.746134; -121.802480	18.5	3.55	720	1	Threespine stickleback (1), Pacific staghorn sculpin (8)	*Ruppia* absent
(I)	36.741381; -121.798735	17.4	2.86	960	3	Pacific staghorn sculpin (51), speckled sanddab (1)	*Ruppia* absent

Discussion

The tidewater goby population in the Salinas River Lagoon has most likely persisted since recolonization. As this species rarely lives longer than one year (Hellmair & Kinziger 2014), continuous presence of tidewater goby in the Salinas River Lagoon is a strong indication that the species can successfully reproduce in the Salinas River Lagoon over multiple generations. While the exact time period of recolonization is unknown, repeated collections since 2013 confirm that the lagoon provides suitable habitat for tidewater goby growth, survival, and reproduction. It seems likely that the initial recolonization (pre-2013 documentation) occurred via the Old Salinas River, as the species has been found consistently within the Elkhorn Slough/Moro Cojo Slough complex. However, no recent survey data for this area is available and a broader, regional survey of hydrologically connected brackish habitats in the region has not yet been conducted.

Continued persistence in the lagoon and the Old Salinas River (although not verified in 2018 or 2020) is a testament to the broad environmental tolerances of tidewater goby, as they can withstand very low levels of dissolved oxygen (e.g., < 3 mg/l, November 2014) and a broad range of salinities (0 ppt to over 42 ppt; Swift et al. 1989), although juveniles appear susceptible to rapid salinity fluctuations (Hellmair & Kinziger 2014). Tidewater gobies from Salinas River Lagoon and the Old Salinas River likely intermix and should be considered the same population.

It appears that the (seasonally) harsh environmental conditions in the Salinas River lagoon, particularly during the summer months when little or no freshwater enters the lagoon, are partially responsible for maintaining the tidewater goby population in the lagoon, including through limiting invasion or permanent colonization by other species. In contrast, the relatively high abundance of tidewater goby in the OSR documented during the May 2023 sampling event indicates that the OSR may serve as an important refuge habitat for tidewater goby during periods of environmental stochasticity in the lagoon, such as breaching and subsequent tidal influence over extended periods of time. The slidegate connecting the Salinas River Lagoon to the Old Salinas River, generally used to manage or maintain water levels in the lagoon when a sandbar has formed, is closed when the lagoon is breached. This creates a sheltered, low salinity environment where tidewater goby may persist in high abundances, serving as a potential source of tidewater goby movement into the lagoon environment and other (downstream) habitats. The frequency of movement between the OSR and the lagoon (through the slidegate, in either direction) remains unknown, but appears likely when the gate is open.

Based on the individual condition of tidewater goby observed during the recent survey, reproduction appeared to be actively occurring during that period. Several specimens captured in the lagoon and the OSR appeared gravid (containing eggs, prior to spawning), while others appeared spawned out and emaciated (Figure 6). Most sampled individuals showed coloration indicative of recent or ongoing spawning activity. It is expected that larval and juvenile tidewater goby will become abundant in the OSR and lagoon in subsequent weeks. Rapid growth of aquatic vegetation (*Ruppia*), in combination with anticipated closure of the sandbar is expected to provide adequate rearing conditions for larval and juvenile tidewater goby.

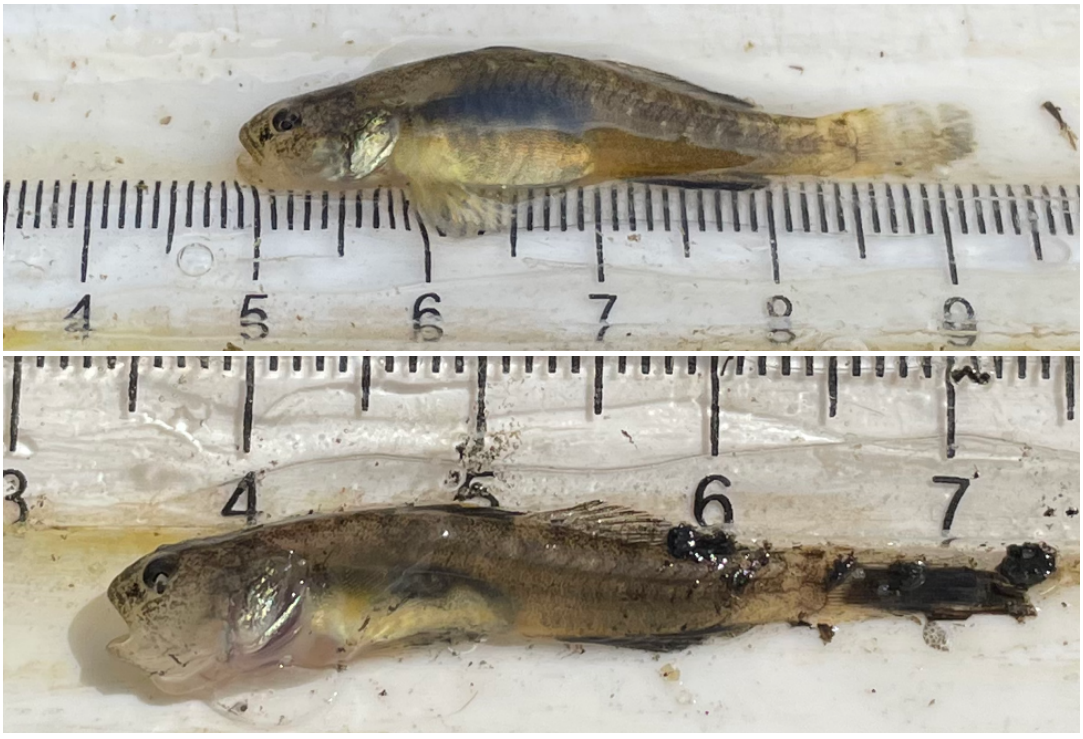

Figure 6. Tidewater goby collected in the Salinas River lagoon, adjacent to the Salinas NWR, on May 9, 2023, showing robust, presumably pre-spawn (top) and emaciated, presumably post-spawn (bottom) individuals.

It has been noted that arrow gobies (*Clevelandia ios*) can be found in large numbers in the Salinas River Lagoon, particularly while the sandbar is breached and for some time thereafter (B. Spies, pers. comm.). However, the species rarely co-occurs with tidewater gobies for extended periods of time, and no arrow goby were sampled in May 2023, despite prolonged connectivity to the marine environment. Both species have a salinity tolerance of 0-55 ppt (based on laboratory trials), yet tidewater gobies appear to prefer salinities below 15 ppt, and arrow gobies prefer those greater than 15 ppt (Capelli 1997, as cited in Dawson et al. 2002). It appears likely that continuous inflow of freshwater from the Salinas River following several months of above-average precipitation has maintained a low-salinity environment in the lagoon, reducing habitat suitability for arrow goby.

During lagoon closure, ambient salinity levels likely limit the ability of exotic species, such as largemouth bass (*Micropterus salmoides*) and sunfishes (*Lepomis* spp.), to occupy the lower estuary. While largemouth bass have been documented in salinity levels up to 16 ppt in their native range, they seem to generally avoid salinity levels above 5 ppt in California (Moyle 2002). Green sunfish likely have a lower salinity tolerance and appear to avoid salinities greater than 2 ppt. Although recent fish community surveys, including the tidewater goby survey, did not document the presence of these exotic freshwater species, their presence in the upper reaches of the lagoon is likely. The extent of interactions between tidewater goby and non-native freshwater species (in the upper lagoon, upstream of Hwy 1) is currently unknown, as targeted tidewater goby seining surveys have been limited to margin habitat in the lower lagoon that is sufficiently shallow for wading. Small otter trawls have successfully evaluated the distribution of tidewater goby in deeper water (up to 16ft; Greg Goldsmith; pers. comm.) and may constitute a useful technique to determine the upstream limit of tidewater goby distribution in the Salinas River Lagoon in the future.

In summary, the species has continued to be widely distributed throughout the lower lagoon over the past several years (Figure 3). Prolonged time period(s) of lagoon closure likely benefit the tidewater goby population in the Salinas River lagoon by providing stable environmental conditions, as the species is rarely found in areas with strong tidal fluctuations or current. However, the population has persisted in the lagoon despite the wet 2016/2017 and 2022/2023 winters, when the Salinas River Lagoon breached and remained connected to the marine environment for extended periods of time, likely through a favorable combination of suitable environmental conditions and accessible refuge areas.

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Appendix A – Invasive Species Prevention Plan

All field gear used in the Salians Lagoon was properly disinfected following California Department of Fish and Wildlife Aquatic Invasive Species Disinfection/Decontamination Protocols prior to the start of fieldwork.

A detailed list of the relevant disinfection procedures and preventative measures that were used to prevent the spread of aquatic invasive species in the Salinas Lagoon is listed below.

If equipment is used on the project that was previously working in another stream, river, lake, pond, or wetland within 10 days of initiating work, we implement one of the following procedures to prevent the spread of New Zealand Mud Snails and other aquatic hitchhikers:
(1) Remove all mud and debris from equipment (waders, nets, watercraft, etc.) and keep the equipment dry for 10 days. OR
(2) Remove all mud and debris from Equipment (waders, nets, watercraft, etc.) and spray/soak equipment with either a 1:1 solution of Formula 409 Household Cleaner and water, or a solution of Sparquat 256 (5 ounces Sparquat per gallon of water). Treated equipment must be kept moist for at least 10 minutes. OR
(3) Remove all mud and debris from equipment (waders, nets, watercraft, etc.) and spray/soak equipment with water greater than 120 degrees F for at least 10 minutes. OR (4) Remove all mud and debris from equipment (waders, nets, watercraft, etc.) and freeze equipment below 0 degrees F for at least 48 hours.

Appendix B – Data Management Plan

This data management plan is designed to ensure that project data are collected using peer–approved methods, undergo a quality control and accuracy assessment process, include metadata that meet CDFW's minimum standards.

The following documentation provides evidence of the methods and quality control procedures that were used to meet Grant Agreement requirements.

1. **Who collected the data:** Michael Hellmair, Elizabeth Ramsay, Marinn Browne
2. **When the data was collected:** May 9, 2022
3. **Where the data was collected:** Salinas River Lagoon
4. **How the data was collected (description of methods and protocols):** Surveys conducted by FISHBIO used a two-person crew with a 10 x 4-foot beach seine (⅛ inch mesh). No particular habitat type was preferentially targeted or favored for sampling; rather, approximately equidistant sampling locations were chosen to obtain an adequate overview of the spatial distribution of gobies within the lagoon. During subsequent sampling events, initially selected locations were revisited. At each sampling location, one to two seine hauls were conducted. All fish captured during each survey, regardless of method, were identified to species, and all tidewater gobies were enumerated and measured. All targeted sampling for tidewater goby was conducted following protocols developed by the U.S. Fish and Wildlife Service (USFWS 2005). All data sheets collected in the field were scanned (with electronic copies stored on a server) before the data was entered into a database. Prior to data analyses, the database underwent QA/QC procedures including being checked against field datasheets by two separate individuals. All datasheets were also stored as hard copies at the FISHBIO office.
5. **The purposes for which the data was collected:** Salinas Lagoon sampling is intended to assist in determining the presence and spatial distribution of tidewater goby in the lower Salinas River and Lagoon. The purpose of these sampling efforts is to capture any tidewater goby that may be inhabiting the lagoon. Objectives include evaluating presence or absence, condition, relative abundance (i.e., catch per unit effort; CPUE), and distribution of tidewater goby in the Salinas Lagoon.
6. **Definitions of variables, fields, codes, and abbreviations used in the data, including units of measure:** All species field codes are included below.
7. **The terms of any landowner access agreement(s), if applicable:** Not Applicable
8. **References to any related Department permits or regulatory actions:** Not Applicable
9. **Peer review or statistical consultation documentation:** All reports were reviewed by multiple parties, including the Grant recipient, and will also be published online and therefore subject to external peer review.
10. **Data licensing and disclaimer language:** All data is the property of Monterey County Water Resources Agency and is subject to their data licensing and disclaimer requirements.

Abbreviation Codes

Common Name	Species Code
American Shad	AMS
Bass Unknown	BAS
Bigscale Logperch	LP
Black Bullhead	BKB
Black Crappie	BKS
Blue Catfish	BLC
Bluegill	BGS

Common Name	Species Code
Rainbow / Steelhead Trout	RBT
Red Shiner	RSN
Redear Sunfish	RES
Redeye Bass	REB
Riffle Sculpin	RFS
River Lamprey	RL
Sacramento Blackfish	SCB

Brook Trout	BKT
Brown Bullhead	BRB
Brown Trout	BT
California Roach	CAR
Catfish Unknown	CAT
Channel Catfish	CHC
Chinook Salmon	CHN
Common Carp	C
Delta Smelt	DSM
Fathead Minnow	FHM
Golden Shiner	GSN
Goldfish	GF
Green Sturgeon	GST
Green Sunfish	GSF
Hardhead	HH
Hitch	HCH
Inland Silverside	MSS
Kern Brook Lamprey	KBL
Kokanee Salmon	KOS
Lamprey Unknown	LAM
Largemouth Bass	LMB
No Catch	NONE
Pacific Lamprey	PL
Pacific Brook Lamprey	BL
Pacific Staghorn Sculpin	PSS
Prickly Sculpin	PRS
Pumpkinseed	PKS

Stanislaus River Station	**Station Code**
Caswell State Park	ST004X
Caswell State Park – North Trap	ST004N
Caswell State Park – South Trap	ST004S
Oakdale Recreation Area	ST040X
Stanislaus Weir	ST031X
Calaveras River Station	**Station Code**
Shelton Rd.	CR028X
Merced River Station	**Station Code**
Gallo Ranch	ME041X
Hatfield Park – North Trap	ME002N
Hatfield Park – South Trap	ME002S

Condition Code	**Description**
1	Good
2	Fair (partial cell block)
3	Poor (total cell block)
4	No sample taken

Debris Code	**Description**
LIT	Light
MED	Medium
HVY	Heavy

Weather Code	**Description**
CLD	Cloudy
RAN	Rainy
CLR	Clear
NIT	Night

Sacramento Perch	SP
Sacramento Squawfish	SASQ
Sacramento Sucker	SASU
Sculpin Unknown	SCP
Shimofuri Goby	SHM
Smallmouth Bass	SMB
Speckled Dace	SPD
Splittail	SPLT
Spotted Bass	SPTB
Striped Bass	STB
Sturgeon Unknown	STG
Sunfish Unknown	SNF
Threadfin Shad	TFS
Threespine Stickleback	TSS
Tule Perch	TP
Unknown (Unid Juvenile Fish)	UNID
Unknown Centrarchid	CENT
Wakasagi	WAG
Warmouth	W
Western Mosquitofish	MQK
White Catfish	WHC
White Sturgeon	WST
Yellow Bullhead	YEB
Yellowfin Goby	YFG

Tuolumne River Station	**Station Code**
Grayson	TU005X
Grayson – North Trap	TU005N
Grayson – South Trap	TU005S
Waterford	TU030X
Tuolumne Weir	TU024X
Arroyo Seco River	**Station Code**
Arroyo Seco River	AS012X
Nacimiento River	**Station Code**
Nacimiento River	NR001X
Salinas River	**Station Code**
Upper Salinas	SR109X
Salinas Weir	SR003X

Mark Codes	**Description**
CFG**N**	Natural Origin
CFG**H**	Hatchery Origin
CFG*	Caudal Fin Green
CFR*	Caudal Fin Red
CFO*	Caudal Fin Orange
CFP*	Caudal Fin Pink
CFB*	Caudal Fin Blue
AFG*	Anal Fin Green
AFB*	Anal Fin Blue
TCR**	Top Caudal Fin Red
BCR**	Bottom Caudal Fin Red
DCB**	Double Caudal Fin Red
(*) Always indicate stock origin (H or N)	
(**) Indicate if mark is specific to location on fish (T or B or D)	

Gear Status	**Description**
0	Set trap
3	Check and raise trap