



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Environmental

JULY 2015

Project Title:
Develop a Tidewater Goby Survey
Method Using Environmental DNA

Task Number: 2724

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Completion Date: December 31, 2018

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Developing a Tidewater Goby Survey Method Using Environmental DNA

Designing an environmental DNA survey protocol to determine if the endangered tidewater goby is present in Caltrans right-of-way.

WHAT IS THE NEED?

Caltrans coastal districts are frequently required to initiate Endangered Species Act (ESA) Section 7 consultation with U.S. Fish and Wildlife Service (USFWS), on behalf of the Federal Highway Administration, for projects that may affect the tidewater goby.

The goby is a small fish species currently listed as endangered under the federal Endangered Species Act. It has a patchy and fragmented range along the entire coastline of California in estuaries, lagoons, and brackish water habitats from near the Smith River in the north to San Diego County in the south.

Sloughs and roadside ditches that Caltrans' maintenance crews maintain or repair can be suitable tidewater goby habitats. Facilities within watersheds that lead to lagoon systems are also suitable habitats, since these fish can be found several kilometers upstream of a lagoon. Thus, routine maintenance activities are subject to ESA consultation requirements if the activities can affect a tidewater goby habitat. Often, Caltrans is required to provide mitigation for this species even when the tidewater goby is not detected, since it is difficult to definitely prove its presence or absence using the current survey methods.

An established survey protocol exists for tidewater goby, but the survey protocol is invasive. It requires two survey periods conducted at least 30 days apart, and the results are not always accurate or definitive. Additionally, five consecutive years of negative survey results are needed to establish a history of absence which adds additional survey and mitigation costs for Caltrans's project delivery and maintenance programs.

Consequently, there needs to be an easy to use, noninvasive, accurate, cost effective, and timely survey method to determine tidewater goby presence or absence that the USFWS allows for use to accompany the currently established protocol. Environmental DNA (eDNA) technology may provide an appropriate approach for determining the presence or absence of this fish species.



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WHAT ARE WE DOING?

Caltrans will collaborate with the USFWS and others to develop a reliable protocol for detecting the Tidewater Goby using eDNA. Major considerations for any method used to determine the presence or absence of a rare species are:

- Effective use of the method throughout the range of the species
- False negatives due to non-detection when the species is actually present at a site

The specific aspects of this research task are to:

- Expand and improve the existing eDNA methodology that detects tidewater goby populations in Del Norte, Humboldt, and Mendocino Counties to be able to detect tidewater populations throughout the range of the fish in coastal California; and
- Devise a sound occupancy model for the Tidewater Goby that can be used to assure that the ultimate eDNA methodology developed in this project will meet the detection probability standards of the US Fish and Wildlife Service which jurisdictionally establishes survey protocols.

WHAT IS OUR GOAL?

The objective of this task is to collaborate with USFWS and others to develop a reliable protocol for detecting the Tidewater Goby using eDNA. The product will be an eDNA methodology that can be used as a tool by Caltrans personnel in quickly, economically, and accurately determining if this endangered fish is present at or near a project site.

WHAT IS THE BENEFIT?

Caltrans project delivery and maintenance activities in areas within this species range would be streamlined if there were a definitive method of quickly determining presence or absence of the tidewater goby. Improving survey methods would allow more accurate and streamlined consultation with resource agencies.

Development of this methodology could lead to use of eDNA from water samples for additional species, including amphibians which will also simplify and expedite section 7 consultations with the USFWS.

This project will help develop a tool that will assist Caltrans in meeting its obligations under environmental law and regulations and expedite the completion of sustainable transportation projects in a cost effective manner.

WHAT IS THE PROGRESS TO DATE?

This research task was part on DRISI's call for submissions in June 2015. A contract for the research is under preparation.