DIVISION OF RESEARCH, INNOVATION & SYSTEM INFORMATION

Research Initial Scope of Work
SUBMITTAL FORM - FY 15/16

I. **Project Number**: 1002
Project Title: Develop a Tidewater Goby Survey Method Using Environmental DNA

II. **Task Number**: 2724
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III. **Project Problem Statement**:
Caltrans Districts 1, 4, 5, 7, 11, and 12 are often 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 (FHWA), for projects that may affect the federally listed tidewater goby, a fish species whose current range is patchy and fragmented along the entire coastline of California where suitable habitat occurs. Often, Caltrans is required to incorporate avoidance and minimization measures and/or provide other mitigation for this species and/or critical habitat since it is difficult to definitely prove its presence or absence through current survey methods. Sloughs and roadside ditches that Caltrans' maintenance crews need to maintain or repair can be suitable tidewater goby habitat, as are facilities within watersheds that lead to lagoon systems 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 could affect tidewater goby habitat. A formal established survey protocol exists for tidewater goby but the survey protocol is invasive, 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 and potential project delays for Caltrans' Project Delivery and Maintenance Programs. Therefore, there needs to be an easy to use, noninvasive, accurate, cost effective, and timely survey method to determine tidewater goby presence or absence that is established for use by the USFWS to accompany the currently established protocol. Environmental DNA (eDNA) technology may provide another appropriate survey methodology to aid in determining the presence or absence of this fish species.

IV. **Objective**:
The objective of this work is to participate and collaborate with USFWS and others to develop a reliable survey methodology for detecting the tidewater goby including eDNA as a tool to help streamline endangered species consultations for this fish. Specific objectives of the task are:

- Expand and improve the existing eDNA methodology which can currently detect populations in Del Norte, Humboldt, and Mendocino Counties to be able to detect populations throughout the range of the fish in coastal California (particularly in large bodies of water like coastal lagoons); and

- Devise a sound occupancy model for the tidewater goby that can be used to assure that the ultimate eDNA methodology developed will meet the detection probability standards of the USFWS which is responsible for Section 7 consultation for this species under the ESA.

While the USFWS is charged with establishing survey protocols for federally threatened and endangered species other entities such as Caltrans can participate and collaborate in protocol development.

V. **Task Description of Work and Expected Deliverables**:

This task is for Caltrans to participate and collaborate with USFWS and others to develop a reliable survey methodology for detecting the tidewater goby that includes eDNA. Major considerations for any method used to determine the presence or absence of a rare sensitive species are that the method is able to be used effectively throughout the species' range and the problem of false negatives due to non-detection during surveying 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 which can detect 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 USFWS which jurisdictionally establishes survey protocols.

VI. **Background**:

The USFWS is jurisdictionally responsible for establishing survey methodologies for endangered species such as the tide water goby. This project is for Caltrans to participate and collaborate with USFWS and others to include an eDNA method in the survey protocol along with the current seining surveys. Caltrans is required to initiate ESA Section 7 consultation, on behalf of the FHWA, with USFWS for projects that may affect the federally listed, organisms such as the tidewater goby when Caltrans' activities may result in impacting a listed species. This project and task are to help Caltrans meet its obligations when working in the potential tidewater goby habitat.

VII. **Estimate of Duration**: Two Years

VIII. **Related Research**:

Researchers at Humboldt State University have done significant work on tidewater goby genetics and toward developing an eDNA identification methodology for the fish. Primers and probes were developed for populations in Del Norte, Humboldt, and Mendocino Counties and field work was done to begin testing the eDNA approach. Using eDNA for detecting organisms is a rapidly evolving field with an expanding literature on both aquatic and terrestrial uses. There is no related Caltrans research.

IX. **Deployment Potential**:
This task is part of a larger research and coordination effort to develop an effective and economical eDNA method for determining the presence or absence of the tidewater goby that can become part of the survey methodology. This research is in the proof of concept stage. Caltrans District 1 and the Headquarters Division of Environmental Analysis are the sponsors.

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