

FACT SHEET

Delta Smelt Loss of Predators Using Genetics (SA-10)

Deliverables: Manuscript for publication on use of DNA testing to determine actual predation on delta smelt by Mississippi silversides.

Status: Manuscript on use of qPCR genetic testing techniques to detect predation published *Transactions of the American Fisheries Society* 141:1600-1607 "**Detection of threatened delta smelt in the gut contents of the invasive Mississippi silverside in the San Francisco estuary using TaqMan assays**".

Primary Investigator: Melinda Baerwald

Recipient Organization: UC Davis

Project Cost: \$251,400

SFCWA Funding: \$111,509

Partners: Cramer Fish Sciences and UC Davis jointly performed the genetic testing. CA Department of Water Resources conducted the field sampling. Additional funding support provided by IEP.

Introduction

Predation of delta smelt by the invasive Mississippi silverside *Menidia audens* has been hypothesized but unconfirmed in the wild due to difficulties in reliably identifying egg or larval fish remains in gut contents. Besides direct predation, Mississippi silversides are hypothesized to be an intra-guild predator on delta smelt by competing for nesting and rearing sites. Development of a simple genetic testing methodology to detect delta smelt DNA in the guts of predators is essential to understanding the extent and seriousness of predation on this threatened species.

Objective

To determine if invasive Mississippi silversides prey on larval delta smelt in the San Francisco estuary. A previously developed delta smelt TaqMan assay (Baerwald et al. 2011) along with a newly developed Mississippi silverside TaqMan assay were both verified for species specificity.

Results

Quantitative PCR (qPCR) was performed on serial dilutions to identify the minimal amount of delta smelt DNA that can be detected, while a feeding trial experiment was conducted to determine how long after consumption delta smelt DNA can be detected in Mississippi silverside gut contents. Wild Mississippi silversides were collected from several locations in the Delta and their guts were analyzed for the presence of delta smelt DNA. The methodology was demonstrated to be effective along with establishing the sensitivities of the qPCR method.

Conclusions

1. qPCR is a viable method for detecting predation on delta smelt.
2. Genetic methods of detecting predation are more sensitive than visual identification studies.

Use of qPCR genetic sampling techniques can be expanded to other species, including lower food web organisms, to gain a more thorough understanding of a complete food web.

Relevance

Predator management as a conservation measure is included in both the Bay Delta Conservation Plan and the Delta Stewardship Council's Delta Plan. Availability of peer-reviewed research on the subject will help advance those strategies.

Next Steps

A follow-up study of predation in the north Delta was performed using techniques developed for this study. The follow-up study needs to be published.