



INFORMATION ITEM

Lead Scientist's Report

Summary: Delta Lead Scientist Dr. Laurel Larsen will provide an update on Delta Science Program activities. The Delta Lead Scientist provides the Council with unbiased advice on matters of scientific importance in the Delta. This monthly report provides an opportunity to discuss relevant advances in science impacting the Delta and highlight Delta Science Program activities' relevance and impact.

RESISTANCE AND RESILIENCE OF PELAGIC AND LITTORAL FISHES TO DROUGHT IN THE SAN FRANCISCO ESTUARY. ECOLOGICAL APPLICATIONS. OCTOBER 2020.

[HTTPS://DOI.ORG/10.1002/EAP.2243](https://doi.org/10.1002/EAP.2243)

Many estuarine systems and associated fish communities have witnessed significant ecological change resulting from human-caused stressors. Drought has proven to be one of the most influential stressors, and climate change models predict increases in drought frequency and intensity (Williams et al. 2020). Droughts are known to affect the physical environment and biological community, but how they will change species abundances and composition of species who may live in similar areas and compete for the same resources has not received as much attention. This study examined more than half a century of fish monitoring data to better understand the resilience and resistance of fish communities within the San Francisco Estuary (Estuary) to prolonged drought stress.

To investigate this issue, the research team, led by Brian Mahardja of the U.S. Fish and Wildlife Service, used the California Department of Fish and Wildlife's (CDFW) water year hydrologic classification index to identify drought periods and obtained occurrence data from two long-term fish monitoring programs to understand species-specific responses. This enabled researchers to most accurately identify when droughts occurred but also to pull from reliable datasets of high resolution to make inferences about species responses to drought stress. The monitoring programs collected data on pelagic (water column-dwelling) and littoral (margin-dwelling) fish. Namely, pelagic fish data came from CDFW's Fall Midwater Trawl Monitoring Program, while littoral fish data came from the U.S. Fish and Wildlife Services' (USFWS) Delta Juvenile Fish Monitoring Program.

The researchers defined resistance as a decline in species occurrence during a wet period following a drought period and resilience as an increase in species

occurrence from a drought period to a wet period. They found that littoral fishes, dominated by nonnative species, tended to be resistant to drought, with some species even exhibiting increases relative to pre-drought levels. In contrast, they found that pelagic species, which included most native fishes in the study, exhibited low resistance to drought, and some pelagic species (Delta Smelt and Longfin Smelt) exhibited extreme declines. However, pelagic fishes were found to be resilient, often rebounding following a drought period. Nevertheless, despite many fishes' ability to rebound in wet years, recovery commonly fell short of pre-drought baselines. Importantly, this finding suggests that freshwater flow is crucial but not necessarily sufficient for conserving estuarine biodiversity.

In summary, species habitat preference, meaning whether a species is littoral or pelagic, is the primary variable determining fish species' responses to drought in the Estuary and Delta. Littoral species (which also tend to be nonnative in the Estuary) are better equipped to handle drought stress than pelagic species, which tend to be native. While pelagic species often increase in abundance following drought periods, the wetter conditions are not sufficient to promote full recovery for some species.

This study was conducted under the auspices of the Interagency Ecological Program (IEP) for the Estuary. One of the paper's authors, IEP lead scientist Dr. Steve Culberson, is housed within the Council and collaborates with the Delta Science Program to better understand the status and needs of Bay-Delta science. The Science Program's Deputy Executive Officer Dr. Louise Conrad is also a co-author of the paper. This article addresses Action 4.C of the Science Action Agenda, which advocates understanding the relationships between flows and aquatic species. Increased drought frequency in the future has the potential to lead to further declines or extinctions of Estuary pelagic fishes of concern such as Delta and Longfin Smelt, whereas littoral (often nonnative) fishes may proliferate following drought stress. As a result, water managers must be increasingly sensitive to water release timing and location to optimize benefits for human use and environmental needs. This study also relies on the synthesis of existing datasets, which addresses Action 4.2 of the 2016-2021 Science Action Agenda.

PROPOSAL SOLICITATION NOTICE UPDATE

In early November, the Delta Science Program, in coordination with the U.S. Bureau of Reclamation (Reclamation) and California Sea Grant, announced a solicitation for scientific research proposals in the Delta. We are seeking to fund 12- to 31-month

projects that directly inform Delta natural resource management and advance the 2017-2021 Science Action Agenda. The total award amount is expected to be up to \$9 million, including up to \$5.5 million from the Council and up to \$3.5 million from Reclamation.

Interested applicants must submit a letter of intent by December 15, 2020, and final proposals are due by February 12, 2021. Please visit the website <https://deltacouncil.ca.gov/delta-science-program/delta-science-proposal-solicitations> for more details and help spread the word about this opportunity!

DELTA SCIENCE PROGRAM ZOOPLANKTON SYMPOSIUM SUMMARY

The Delta Science Program, along with CDFW and DWR, hosted a 2-day symposium on zooplankton data, monitoring, and ecology from October 27-28. The symposium featured speakers from government agencies, consulting firms, and academia from the San Francisco Estuary (Estuary) as well as other aquatic and marine systems in other states. The first day featured talks and discussions on zooplankton monitoring in the Estuary, data integration and interoperability, management relevance, and advanced technologies for monitoring. The second day featured talks by leading zooplankton experts on zooplankton ecology and biology, highlighting topics of high management relevance such as habitat restoration, outflow, carbon cycling, harmful invasive species, and climate change. Symposium attendance was high, peaking at around 150 people, and the audience was engaged with a particularly lively and active conversation in the meeting chat.

Please direct any questions to sam.bashevkin@deltacouncil.ca.gov.

ON YOUR RADAR

11th Biennial Bay-Delta Science Conference

Call for abstracts for the 11th Biennial Bay-Delta Science Conference has officially opened and will close **November 23**. The conference will be held virtually **April 6-9, 2021**, and is jointly sponsored by the Council and the U.S. Geological Survey. It represents a forum for sharing scientific information relevant to managing the connected San Francisco Bay and Sacramento-San Joaquin Delta systems. This year's conference theme is *Building Resilience through Diversity in Science*. Participants include, but are not limited to, natural scientists, engineers, resource managers, and stakeholders working on Bay-Delta issues. Questions regarding the technical program or the abstract submittal process should be directed to Program Co-Chairs Sam Bashevkin (sam.bashevkin@deltacouncil.ca.gov), Mike Chotkowski

(mchotkowski@usgs.gov), and Josh Israel (jaisrael@ucdavis.edu). All other general questions should be directed to BDSC@deltacouncil.ca.gov.

Steelhead Trout Workshop

The 2021 California Central Valley Steelhead Workshop will be held over three half-days, February 16 - February 18, 2021. The impetus for this workshop was the Biological Opinion on the Long-Term Operation of the Central Valley Project and the State Water Project-3.6.2, which highlights that the U.S. Bureau of Reclamation (USBR) proposes to coordinate with the Collaborative Science and Adaptive Management Program (CSAMP) to sponsor a workshop for developing a plan to monitor steelhead populations within the San Joaquin Basin and/or the San Joaquin River downstream of the confluence of the Stanislaus River. This includes steelhead and rainbow trout on non-project San Joaquin tributaries.

Workshop topics may include but are not limited to:

- Discussing historic and ongoing steelhead monitoring programs and identifying collaborations and partnerships that affect the development of comprehensive monitoring of Central Valley *Oncorhynchus mykiss*;
- Exploring analytical approaches for measuring the impact of management actions, such as estimating juvenile and adult abundance, growth, age structure, smolting, anadromy, and entrainment among other life history and population variables; and
- Discussing what information is needed to address the impact of management actions, methods for acquiring that information, and spatial and temporal requirements.

The workshop represents a collaborative effort between the Council, USBR, National Oceanic and Atmospheric Administration, Metropolitan Water District, California Department of Water Resources, CDFW, and USFWS. Please direct any questions to pascale.goertler@deltacouncil.ca.gov.

By the Numbers

Delta Science Program staff will provide a summary of current numbers related to Delta water and environmental management. The summary (**Attachment 1**) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

LIST OF ATTACHMENTS

Attachment 1: By the Numbers Summary

Attachment 2: Visual Abstract of Article Summary 1

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