Delta Stewardship Council
A CALIFORNIA STATE AGENCY

INFORMATION ITEM

Lead Scientist's Report

Summary: With the announcement of the 2022 class of Delta Science Fellows this month, we highlight research conducted by Denise Colombano, a 2018 and 2020 Delta Science Fellow and currently a postdoctoral scholar at the University of California, Berkeley. Dr. Colombano's research advances the "One Estuary, One Science" concept by evaluating how marine and watershed drivers influence the abundance and stability of fish communities in the San Francisco Estuary. Leveraging a dataset that spans four decades, the work is relevant to understanding the extent to which Delta inflow and changing water temperatures impact the abundance of 18 fish species. It addresses Management Need 5 (Acquire new knowledge and synthesize existing knowledge of interacting stressors to support species recovery and ecosystem health) and Action 6A (Evaluate how climate change, sea level rise, and more frequent extremes will impact habitats, water supply, water quality, sediment supply, long-term species persistence, primary productivity, and food webs) of the 2022-2026 Science Action Agenda.

COLOMBANO, D.D., S. M. CARLSON, J. A. HOBBS, AND A. RUHI. FOUR DECADES OF CLIMATE FLUCTUATIONS AND FISH RECRUITMENT STABILITY ACROSS A MARINE-FRESHWATER GRADIENT, GLOBAL CHANGE BIOLOGY, 2022.

Estuaries, like the San Francisco Estuary (Estuary), are highly productive, biologically diverse transitional zones that provide numerous ecosystem services, including functioning as nursery habitat for various biologically and economically important species. Estuaries are also dynamic ecosystems that are mosaics of ever-changing driving factors (i.e., gradients of freshwater flow and surface temperature). This variability in space and time makes it challenging to assess how individual driving factors, such as inflow, influence the abundance and stability of species ecological communities, especially for fish species with wide ranges. However, understanding these relationships is imperative to managing the recovery of native species affected by the Pelagic Organism Decline of the early 2000s and preventing further decline. Using statistical models, Colombano et al. leveraged four decades of data (1980-2018) to examine the spatiotemporal stability of 18 juvenile fish species

(native and non-native species) within the Estuary with the goals of 1) elucidating the role of flow and sea-surface temperature in controlling the abundance of different species throughout the Estuary, and 2) understanding how diversity in species, the spatial and temporal variability in their abundance, and their life-history strategies (i.e., anadromous—completing part of their life cycle in the ocean, marine opportunists that optionally use ocean habitat, and estuarine-dependent) contribute to the stability of the whole community.

Results showed that anadromous Longfin Smelt and Striped Bass exhibited decreasing abundance over time. Anadromous species tended to be found in the upper Estuary and tended to increase in abundance with higher freshwater flow. In contrast, marine opportunists exhibited increasing trends, were more abundant in the lower estuary, and tended to decrease in abundance with high flow and high sea-surface temperature. Meanwhile, estuarine-dependent species were found throughout the Estuary and exhibited various responses. Overall, fish community stability was enhanced by biocomplexity, specifically diverse life histories, species diversity, and diversity in where individuals are found in space. However, how and to what degree these relationships will vary with climate change remains an open question.

The article can be found here (https://bit.ly/3PObhkr)

DELTA SCIENCE PROGRAM ACTIVITIES

Implementation of the 2022-2026 Science Action Agenda

Since releasing the 2022-2026 Science Action Agenda (SAA) in late April, the Delta Science Program has worked to distribute the document widely, with presentations to the Collaborative Science and Adaptive Management Program, the California Water Quality Monitoring Council, the State Water Resources Control Board, and the Delta Plan Interagency Implementation Committee, and developing a strategy to implement the SAA's priority Science Actions. The Science Program's Proposal Solicitation has been a primary mechanism for implementing the SAA, but for the 2022-2026 SAA, the Science Program is promoting more collaborative strategies for implementation collaboratively. To this end, Science Program staff have met with

agency partners to identify opportunities for coordinated funding and collaboration on Science Actions.

Water Temperature Modeling Platform Peer Review

On July 19-20, 2022, the Delta Science Program will convene an Independent Review Panel to evaluate the US Bureau of Reclamation's Water Temperature Modeling Platform (WTMP) for the Shasta/Keswick/Sacramento River system. This review will be followed by another, tentatively scheduled for fall 2023, assessing the WTMP for the American River and Stanislaus River systems and the overall Central Valley Project. The panel's findings and recommendations will guide the Bureau of Reclamation to improve modeling tools that predict water temperatures over short time frames for real-time operations, seasonally for developing temperature management plans, and across longer time frames for planning studies.

BY THE NUMBERS

Delta Science Program staff will summarize 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 (provided at the Council Meeting)

Attachment 2: Article Visual of Colombano et al., 2022

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