



## **INFORMATION ITEM**

### Lead Scientist's Report

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**Summary:** This month, we conclude our spotlight on the 2018 class of Delta Science Fellows by highlighting a recent paper by Megan Sabal (UC Santa Cruz) that sought to further open the black box on how predation impacts Chinook salmon populations. Through a series of field experiments, Sabal et al. measured the behavioral response of juvenile Chinook salmon to predatory largemouth bass in different types of habitats. They found that, compared to other factors, the presence of shade seemed to elicit the biggest antipredator response in Chinook salmon. This study advances Action 4 of the 2017-2021 Science Action Agenda (SAA): Improve understanding of interactions between stressors and managed species and their communities.

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#### **SHADE AFFECTS MAGNITUDE AND TACTICS OF JUVENILE CHINOOK SALMON ANTIPREDATOR BEHAVIOR IN THE MIGRATION CORRIDOR. SABAL ET AL., BEHAVIORAL ECOLOGY, 2021.**

Chinook salmon that hatch in the Delta watershed must traverse the Delta as juveniles as they migrate out to the ocean for the next stage in their life cycle. Mortality during this outmigration is extremely high, with less than ten percent survival common. The extent to which predation by nonnative species, such as the largemouth and striped bass, contributes to these low survival numbers is an open question. For example, the need to identify location-specific “hotspots” of predation appears in the 2022-2026 SAA, building on the earlier Action 4 of the 2017-2021 SAA. This action is management-relevant because, if hotspots were identified and associated with certain types of habitat, modifications could be made in those locations to reduce the risk of predation. A related science question relevant to understanding predation is whether hatchery-sourced fish—a critical component of species recovery plans—are more vulnerable to predation than wild fish, which may have evolved location-specific traits that make them more resilient to predation.

Sabal et al. conducted a series of experiments to address the roles of both habitat and fish origin (i.e., hatchery or wild) in sculpting the behavioral response of Chinook salmon to the presence of a predator. They conducted a series of trials in flumes (i.e., a long, open-topped enclosed channel oriented with the direction of flow) in the Mokelumne River. In each trial, they introduced a juvenile Chinook salmon upstream and monitored its behavior and how long it took to exit the flume downstream. They compared behaviors with and without a largemouth bass

predator present in the flume and across trials with different types of habitat (characterized by the presence/absence of shade and presence/absence of sticks and vegetation) and juvenile salmon of different origin (hatchery or wild).

Results revealed that the difference in salmon behavior between trials with and without the predator was most pronounced when the flume was shaded. When shade was present, the salmon slowed down, synonymous with exhibiting cautionary behavior in this study. Contrarily, salmon sped up when shade was absent. Salmon origin (hatchery or wild) had no significant impact on anti-predator behavior and impacts of vegetation and sticks in the flume were small compared to that of shade. Though evasive behavior in shaded areas (e.g., near trees on levees or riparian areas) may help salmon avoid predation, if this behavior significantly delayed the salmon's migration, it could miss out on an optimal arrival time for feeding or prolong its exposure to a risky environment. However, extrapolating the impacts of these behavioral modifications to Chinook salmon populations would require additional studies on the type of habitats in which successful predation events tend to occur and how migration duration impacts survival probabilities.

#### DELTA SCIENCE PROGRAM ACTIVITIES

##### *2022-2026 Science Action Agenda*

After considering and addressing comments from the public review period, including those from the Delta Independent Science Board (Delta ISB), on the draft 2022-2026 SAA, Delta Science Program (DSP) staff released the final document on Earth Day (April 22) and will present it to the Council at this month's meeting.

##### *Salinity Management Workshop Report-Out and Upcoming Workshop Dates*

The first public salinity management workshop was scheduled for April 26 and 27, 2022, with a discussion focus on:

- framing the challenge of future salinity management in the context of climate change, environmental justice, and current laws and regulations;
- building towards a shared understanding of how salinity management affects different people, industries, and ecological systems;
- identifying knowledge gaps that could be filled with future research and scenario-based modeling; and
- starting conversations around goals for long-term adaptive management and laying the foundation for a scenario-based modeling exercise.

Focus groups are planned for summer 2022 and will focus on:

- diving into the details of developing several management and climate action scenarios that could be modeled;
- fostering deeper discussions about the impacts and tradeoffs of different management strategies; and
- generating pilot scenarios to be evaluated with computer models whose output will be summarized for the fall workshop.

The fall workshop is scheduled for October 11 and 12 and will include discussions on:

- comparing modeling outputs from the pilot scenarios developed in the focus groups;
- apparent tradeoffs of various management strategies;
- refining ideas about future research and scenario-based modeling needs
- identifying partners and a plan for creating a collaborative adaptive; and management framework for Delta salinity management in the face of severe and sustained drought and sea-level rise.

This event will be held virtually, and registration is free and open to the public. Info on how to register will be provided in a future report.

*Delta Lead Scientist "Ask-Me-Anything" (AMA) Series*

The March 28 Delta Lead Scientist Ask-Me-Anything, which featured the Delta Science Program's Lauren Hastings and ISB's Lisa Wainger, focused on the ISB and the Delta Science Program's recent assessment of the ISB. The upcoming session, on April 2, will feature California Sea Grant Extension Specialist Dr. Jessica Rudnick and focus on the integration of social science in the Delta, with an emphasis on the Delta Residents Survey. Join the AMA by logging into Instagram and visiting the @deltacouncil feed for the livestream. As a reminder, past events are archived on the Council's IGTV tab.

*Delta Science Tracker*

The Delta Science Tracker is an online tool to organize and communicate information about science activities in the Delta. The tool contains an inventory of science activities with details related to funding, collaborators, and management

linkages for each activity. Products and outputs related to each project, such as reports, publications, and links to project data, are also available on each activity page. The platform is currently in the final stage of development and testing. A full public launch is anticipated for late spring/early summer 2022.

#### ON YOUR RADAR

##### *Delta Governance Brown Bag Webinar Series*

The second DSP webinar took place on April 13 and focused on collaborative governance, highlighting how partnerships and decentralized structures and processes are used by government and non-government actors to influence decision-making. The featured panelists were Brett Milligan (UC Davis), Andrea Gerlak (University of Arizona), Matthew Moore (United Auburn Indian Community), and Jessica Law, Water Forum. The goal of this three-part brown bag webinar series is to foster discussion of the complex and multi-faceted governance of the Sacramento-San Joaquin Delta by featuring speakers from federal, state, local, and tribal government; collaborative partnerships between government and non-government entities, and academic social scientists to speak on different social scientific frameworks that can be used to understand Delta governance.

The next webinar will take place on May 5 and will focus on adaptive governance. Registration information can be found at: <https://deltacouncil.ca.gov/pdf/science-program/flyers/2022-02-01-what-is-delta-governance-anyway-flyer.pdf>

Recordings of previous webinars are available at:  
<https://www.youtube.com/watch?v=ju8v2d5LLYM>.

##### *Delta Science Fellows*

The DSP and California Sea Grant released a request for applications for the 2022 class of Delta Science Fellows on January 25, 2022. Delta Science Fellowship awards provide Masters, Ph.D. students, and postdoctoral researchers up to two years of research funding. This program pairs the next generation of Delta scientists with academic and community mentors to conduct critical science investigations targeting high-priority Delta issues identified in the 2022-2026 Science Action Agenda (SAA). This year there was an increased emphasis on recruiting social science applicants, supported by separate review panels for social science and biophysical science applications. Notices of Intent (NOI) to apply were due on February 28, 2022. Applications from those who submitted an NOI were due April

20, 2022. The announcement of 6 to 8 awards will take place in June and Fellows will begin work in August/September 2022.

#### *Modeling Summit*

The Delta Science Program is planning a Modeling Summit for late summer 2022. The summit aims to bring together members of the Delta science and modeling community to discuss the vision and identify the next steps toward the development of a modeling collaboratory for the Delta. A collaboratory is a term used to describe a virtual center that facilitates the use, reproducibility, and transparency of models for planning and prediction of future conditions in the Delta. A collaboratory enables easy integration of data with models, integration or linking of different types of models (e.g., flow, water quality, habitat, fish, economics) with each other, and publication and visualization of model results. Implicit in the concept is the building of a community around modeling, so that new users can gain help and insight from veteran users in the nuances and application of the models.

At the modeling summit, external partners will be invited to share “lessons learned” from setting up similar collaboratories for other regions (e.g., the Everglades, Chesapeake Bay). Additionally, there will be panel and breakout discussions to provide opportunities to establish collaborative partnerships and identify pilot efforts or projects that would have immediate use and benefit from collaboratory development. The expected outcomes of the Summit include a refined plan to guide the development of the collaboratory and the identification of opportunities to create a proposal with which to pursue additional funding through competitive solicitations.

#### 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 (provided at the Council Meeting)

Attachment 2: Article Visual of Sabal et. al. (2021)

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