

2022 DELTA SCIENCE FELLOW **FINAL REPORT**



Garfield Kwan

Postdoctoral Fellow

Scripps Institution of Oceanography, UC San Diego

Focus

Assessing and developing a model to determine habitat suitability across temperature and time

Award

\$241,800

Research Mentor

Dr. Nann Fague,
UC Davis

Community Mentors

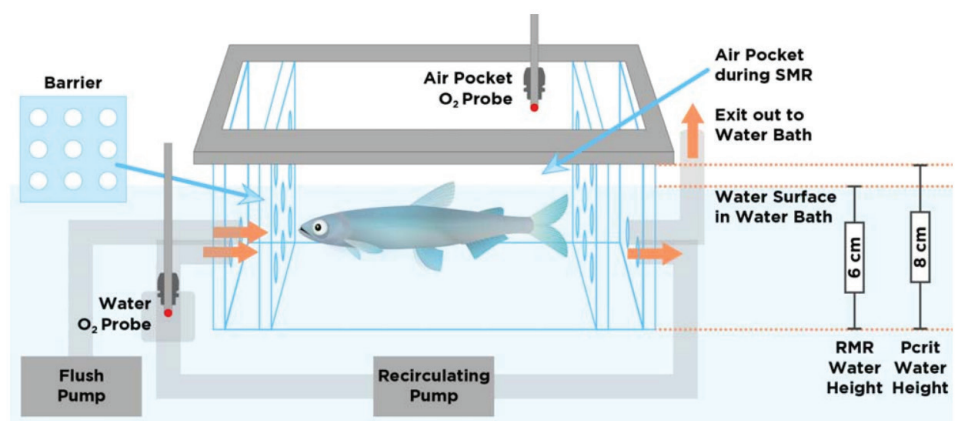
Dr. James Hobbs,
California Department of Fish and Wildlife

PROJECT

In November 2021, nearly an entire run of spawning adult Chinook Salmon died in the San Francisco Estuary – just one of several recent local mass mortality events. As water warms it holds less oxygen and often falls into hypoxic conditions. Both higher temperatures and diminished oxygen levels stress fish, and together they are often deadly. This project aimed to illuminate how Chinook salmon smolts and juvenile Delta smelt tolerate hypoxia across a range of temperatures, which meant first understanding some basic data about these species' metabolic needs.

RESEARCH CONCLUSIONS

To illuminate how Chinook salmon smolts and juvenile delta smelt tolerate hypoxia across a range of temperatures, scientists need to use a technical method called respirometry, a measurement of oxygen consumption. Delta smelt have long been difficult to study using respirometry because they frequently die during testing, likely because they cannot surface to refill their air bladders. Dr. Kwan redesigned and validated a methodology that allows the measurement of delta smelt respiratory parameters by including an air pocket within the respirometry chamber. This enabled the measurement of physiological parameters necessary to create a metabolic index for delta smelt.



Schematic of Delta Smelt respirometry setup.

"Native fishes like the delta smelt and Chinook salmon are particularly vulnerable to warmer and more hypoxic water, but conservation can only succeed if we fully understand a fish's physiological limitations."