2020 DELTA SCIENCE FELLOW FINAL REPORT

Alexandra McInturf

Doctoral Fellow University of California, Davis

Focus The effect of temperature on predation of juvenile salmonids

Award $123,868

Research Mentor
Dr. Nann Fangue, UC Davis

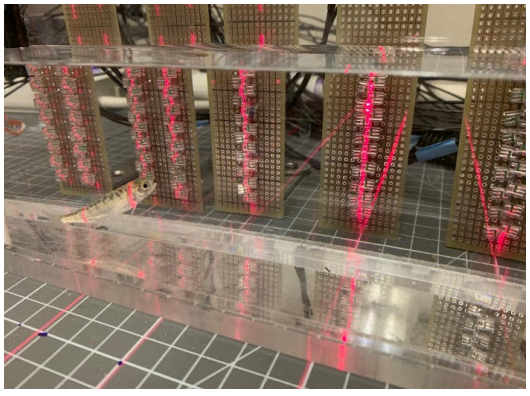
Community Mentor
Cyril Michel, NOAA Fisheries/ UC Santa Cruz

Investigating the effect of temperature on predation of juvenile salmonids

Does metabolic performance impact interactions between predators and prey across different temperature ranges?
This research project focused on California's threatened juvenile Chinook salmon and their interactions with known predators in the Sacramento-San Joaquin River Delta system (Delta): largemouth bass, rainbow trout and striped bass. McInturf studied the physiology of salmon and these predators across temperature ranges and used these data to predict the outcome of predator-prey interactions across the temperature ranges.Her work seeks to understand the indirect effects of increasing temperatures in the Delta and will provide managers with a framework to model, if not functionally suppress, predation upon juvenile salmon.

Research Conclusions

The team assessed swim performance metrics (aerobic scope, swimming burst speed and the ability to burst repeatedly) and predation across temperatures commonly experienced in the Delta to determine if a temperature advantage predicts salmon survival in predation scenarios. The results suggest that temperature effects are species or population specific. Largemouth bass performed best physiologically and had the highest predation rates at the warmest test temperatures. These more thermally adapted largemouth bass will likely consume juvenile salmon with an increasing frequency as waters warm. Results were less conclusive for rainbow trout and striped bass.



Late fall-run juvenile Chinook salmon showed no effect of temperature on aerobic scope, although fall-run juvenile Chinook salmon did show an effect. However, the team observed a potential tradeoff between swimming burst speed and number of bursts with temperature.
The results challenge the use of a single physiological trait for determining the fundamental impacts of temperature on a species and predicting ecological outcome. Ultimately, absolute burst swimming ability and burst performance between predator and prey were stronger indicators of trophic dynamics than aerobic scope. The research team recommends future physiological studies expand beyond traditional measurements and explore other physiological variables that may have more predictive power for ecosystem interactions.