Evolution of a Passive Fish Sampling Video Camera System

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Initial Buildout Begins

The Aquatic Species and Habitat Sampling Platform (Platform) was designed to meet low-impact sampling requirements for California native fish populations and provide the ability to sample in the multitude of habitat types found in the California Delta ecosystem. A low-impact fish sampling video camera system has been improved upon since the initial development of the Platform. Studying our past prototypes better informs the modification and buildout of our current and future passive fish sampling video camera systems.

Single camera with live capture.

- Splash Cam-Delta Vision Industrial with hardwired live feed
- Square live box captured fish for physical identification and measurements

Data Collection

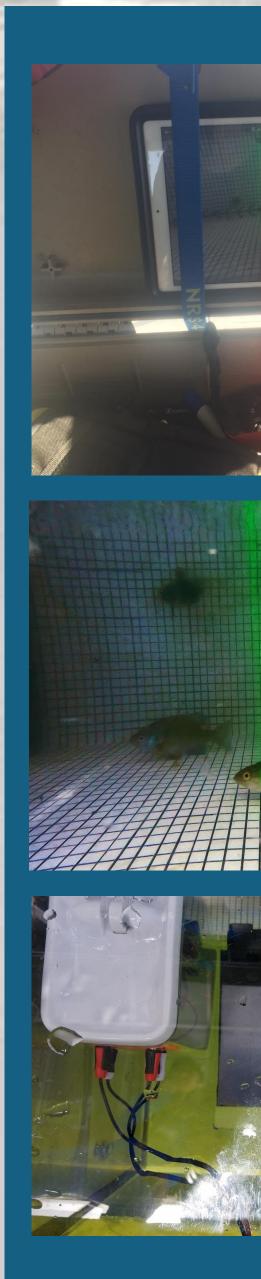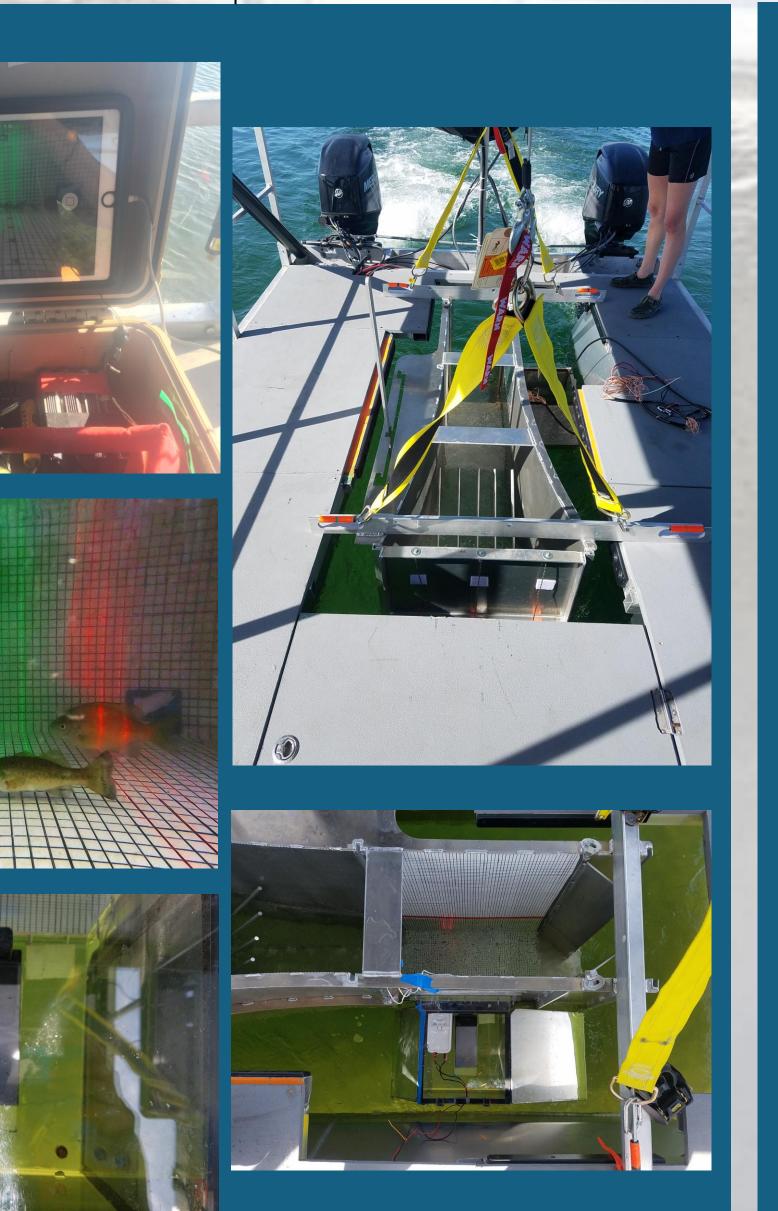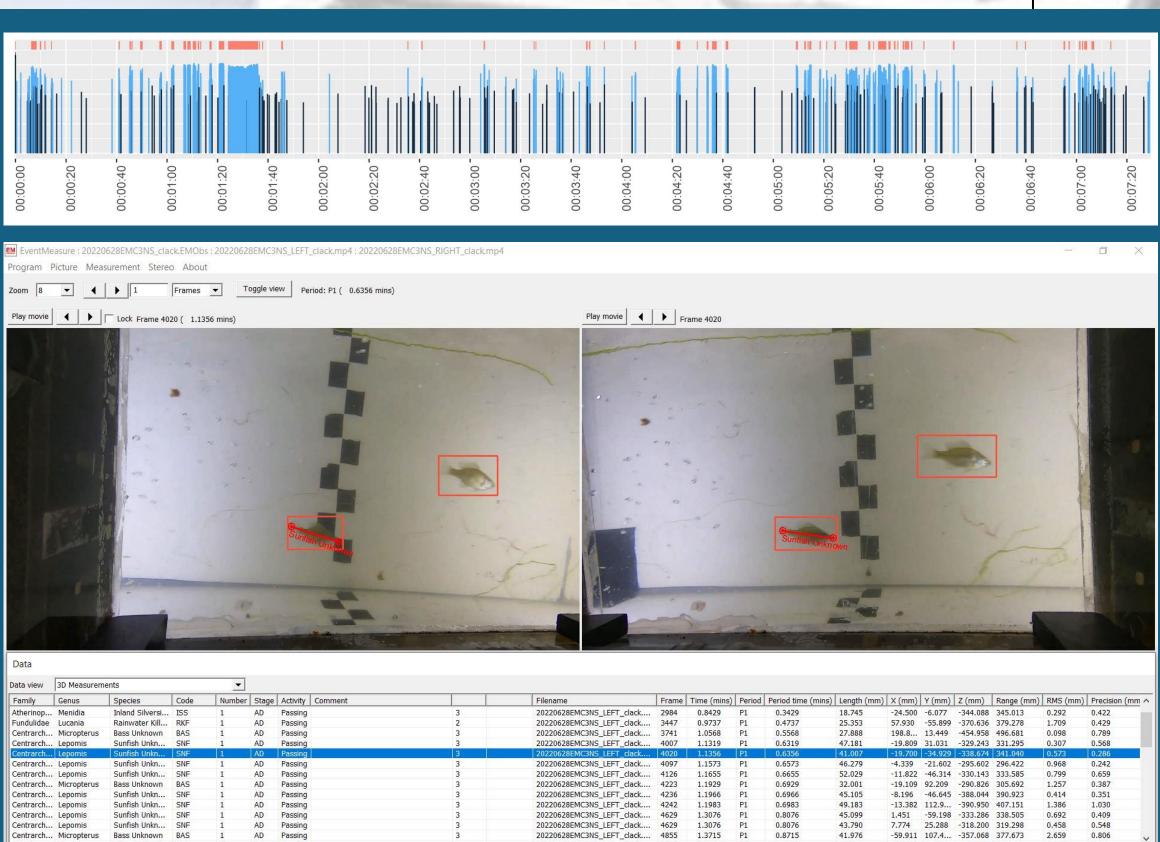- Exo 2 Sonde collecting water Quality
- Single Starboard Lowrance Unit
- Trimble GPS recorded transects

Live Box and Camera Upgrades

- Pass through live box installed. Fish no longer captured
- A single GoPro Hero 7 streams to an iPad via Bluetooth
- Lasers and Grid installed in live box for measurements
- Human video review required

Machine Learning Begins

- Initial attempts at automated fish detection
- Begin building up image library for training

Data Collection

- Second Lowrance Unit installed on Port side of vessel to help capture slope.
- eDNA collected at select transects
- Other data remained the same

Camera Upgrades

- Removeable stereo camera mount installed in video box
- Began Using two GoPro Hero 7s streaming to two iPads via Bluetooth
- SeaGIS Event Measure is used to ID and measure fish
- Bellamare ISIIS-DPI Shadowgraph mounted behind live box system to capture Zooplankton images

Machine Learning Improvements

- Automatic fish detection. Separates blank video from video with fish (Yolo, TensorFlow)
- Automatic Fish ID for several common species: Juveniles are difficult to determine
- Schooling detection and count estimation
- Build out zooplankton image library for three morphs (Daphnia, Copepods, and Amphipods)
- Automatic Zooplankton identification and enumeration, issues with range of imagery
- Refined Zooplankton Automation: preprocess photos for consistent detection.

Data Collection

- Use Arrow GPS device instead of Trimble
- Other data remained the same

Camera Upgrades

- Upgrade to GoPro Hero 12s streaming to a Laptop
- Changes to Camera Mount should allow for easier camera removal and allow for greater adjustability

Machine Learning Improvements

- Continued improvements of previous years

Data Collection

- Install Passive Integrated Transponder antennae to live box system that will allow for the detection of PIT tagged fish
- Other data remained the same

Camera Upgrades

- Continued camera upgrades
- Human video review only used for QC

Machine Learning Improvements

- Tracking algorithms to enumerate detected fish
- Automated zooplankton analysis pipeline start-to-finish

2015

**2016
2017
2018**

**2019
2020**

**2021
2022
2023**

2024

Plans Moving Forward