Fish Observations at a Shallow Lagoon in Elkhorn Slough via an Inexpensive Camera System

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Abstract:

The application of multimedia technologies in research and education has increased in popularity over the last decade. Digital video cameras are one of many new multimedia technologies used for studying fish behavior and assemblages in remote field locations. We assessed the effectiveness of using an underwater camera to observe fish moving in and out of Whistlestop Lagoon at Elkhorn Slough National Estuarine Research Reserve (ESNERR) in the central coast of California. Thirty-minute underwater video samples were collected and later viewed. At each fish occurrence a still image from the video was taken and analyzed for species identification, if possible. We found the use of cameras for observing fish serves as a potential educational tool in turbid environments but is not recommended when consistent data are required, such as for resource management.

Introduction:

Many fish, including endangered species, use estuaries as a nursery ground for their young (Yoklavich, et al. 2001). Traditional methods for studying fish assemblages in estuarine habitats involve trawling or seining methods, which are destructive to the habitat and may involve euthanasia of the species sampled (Yoklavitch, et al. 1991). Underwater cameras offer a less invasive method for studying fish and have been shown to have comparable results to other traditional methods (Spencer, et al. 2005; Zedler, et al. 1997). Underwater video footage from cameras also offers recorded data of fish interacting with microhabitats, which is not possible with seining or trawling (Jordan, et al., 2008). However, the effectiveness of underwater cameras, has not been well tested in estuaries. The goal of this project is to evaluate the effectiveness of using underwater cameras in turbid waters as an alternative method for studying fish assemblages in a lagoon or other shallow estuarine habitats.

Objective:

Determine if an underwater video camera is an effective method for assessing fish populations inhabiting lagoons, using ESNERR as a model.

Figure 1. Whistlestop Lagoon (red) is a small, shallow, tidal wetland lagoon at Elkhorn Slough in the California Central Coast.

Methods:

The study took place at Whistlestop Lagoon (Figures 1 and 3) in Elkhorn Slough. Currently, there is only one pipe available for fish to travel in and out of Whistlestop. A stationary household digital video camera with underwater housing was placed in front of the open pipe (Figure 2) during high tide (3-4ft) in order to record fish traffic. Twice a week from June to September 2010, video samples were recorded for 32-minute intervals during each deployment. At the end of the 32 minutes of recording time, the camera was pulled out and reset. The collected video samples were then edited to trim off one minute of video length from the beginning and end of each recording, leaving a total of 30 minutes per sample video. This reduced bias from disturbance when deploying and removing the camera. Each time a fish was observed, a still image was taken from the video to identify the species, if possible. Notes on fish characteristics and behavior were also recorded.

Figure 2. A camera mounted on a PVC pipe frame was placed in front of the pipe to observe fish moving in and out of Whistlestop. By doing this, we would expect to detect many species inhabiting the lagoon without needing to seine or trawl.

Figure 3. Whistlestop Lagoon has the unique property that it only has one open pipe that connects the lagoon to the rest of Elkhorn Slough. Fish are only able enter or leave Whistlestop Lagoon via this pipe.

Results:

A few species were detected and identified (Table 1), others were detected but could not be identified. Note that in addition to the fish shown in Figure 4, we observed some jellyfish and snails. Detecting and identifying fish was easier in video than from still images.

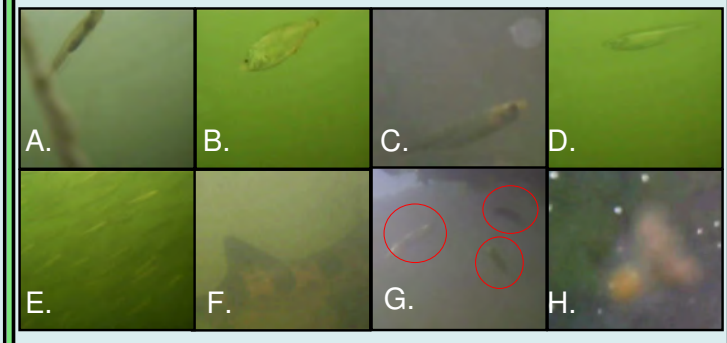

Figure 4. Pictures above are examples of images obtained from the video samples and species seen at Whistlestop Lagoon. Panel A displays an unidentified fish, believed to be a fry. Panel B displays shiner surfperch *(Cymatogaster aggregata)*. Panel C Displays top smelt (*Atherinops affinis*) passing by. Panel D displays a fish yet to be identified. Panel E displays a school of top smelt *(Atherinops affinis)*. Panel F displays an image of the dorsal fin of a leopard shark (*Triakis semifasciata*). Panel G display three unidentified fish (circled) seeking refuge under a floating piece of algae. Panel H Displays an unidentified jellyfish.

Fish Found at Whistlestop Lagoon

Common Name	Scientific Name	Notes
Shiner surfperch	*Cymatogaster aggregata*	Schooling. Seen schooling with top smelt.
Bat ray	*Myliobatis californica*	Swimming.
Top smelt	*Atherinops affinis*	Schooling. Seen schooling with shiner surfperch.
Leopard shark	*Triakis semifasciata*	Swimming.
Fish	Unknown	Some appeared to have a yolk, may have been a fry. Some swam by relatively quickly. Foraging

Table 1. Table shows fish seen from the video footage and the behavior observed. Some species were unable to be identified.

Discussion:

- The poor visibility made it difficult to identify fish the majority of the time (Figure 4, panel G).
- Visibility was variable and unpredictable. Clearer days allowed for clearer images.

Conclusion:

- The ability to see and identify fish reliably is heavily dependent on water clarity. Therefore, continuous long-term monitoring of fish populations in the often turbid water of ESNERR may present a challenge.
- Due to the unreliable visibility, we do not recommend the use of underwater cameras as a tool for most scientific research or resource management applications in turbid environments; however, cameras may prove useful for education-oriented observations or other non-critical applications.
- Funding and time were limiting factors for this project. We did not conduct seining or trawling experiments to compare fish count data with our video footage.

Future work:

- More intensive camera footage can be taken and compared to previous work done at Elkhorn Slough.
- Conduct seining or trawling experiments to compare fish count data with our video footage.
- Using a higher resolution camera might offer better quality images.

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