Using Underwater Video Analysis to Understand Fish Responses to Bottom Trawls and Reduce Bycatch of Threatened Green Sturgeon

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Background

- The southern distinct population of green sturgeon in California is listed as threatened under the Endangered Species Act
- The California halibut bottom trawl fishery has encountered green sturgeon as bycatch in commercial fishing
- Post-release mortality rate of green sturgeon is 18% due to stress and injury during handling
- Cameras were mounted onto bottom trawl gear to study the behavioral responses of species when they encounter the gear
- Observations will aid in creating bycatch mitigation techniques

Research Questions

1) Is there significance in how green sturgeon respond to a light-touch bottom trawl relative to a traditional bottom trawl?
2) Can the use of illumination be added to bottom trawls to act as a bycatch mitigation technique?

Internship and Methods

- Internship with NOAA Fisheries
- Analyzed video footage and recorded each species encounter as an event, recording gear responses for priority species
- Conducted video analysis to address bottom trawl type question
- Conducted a literature review to address illumination technique question
- Synthesized data analysis in a report to NOAA Fisheries

Figure 1: A diagram of a traditional bottom trawl that is towed along the ocean floor to target California halibut and other flatfish found at this depth in the water column

Figure 2: Camera mounted on a traditional bottom trawl that collects the footage for data collected. Photo courtesy of Kyle Pemberton.

Results

Figure 3: Green sturgeon responses to traditional bottom trawls compared with responses to light-touch bottom trawls. Data was collected between 3/31/2021 and 8/26/2022 on the vessels Johnny L. (traditional) and Tern (light-touch). Observer data indicates that one of the green sturgeon observed in the traditional net was accounted for on deck as bycatch. There is no record of the remaining sturgeon being caught.

- California halibut and other target flatfish were categorized as "darting into net" or "moving into net" for over 70% of observations with traditional bottom trawl gear, suggesting awareness of the net
- There is no dominant response from California halibut and other target flatfish to light-touch bottom trawl gear

Results (Continued)

Figure 4: Percentages of species observed across all hauls relative to green sturgeon and target catch. The most abundant species, including surfperch, forage fish, and roundfish, were typically observed in groups and small enough to pass through the nets, not contributing to bycatch rates.

- Surfperch 63.3%
- Forage fish 33.5%
- Green sturgeon 4.1%
- Roundfish 7.6%

Figure 5: A green sturgeon oriented away from the camera/net from my video analysis on Tern, a vessel equipped with a light-touch bottom trawl

Significance

- Data collected on all species will aid in future fishery management
- Data collected on green sturgeon and California halibut will aid in modifications of bottom trawl gear in the California halibut fishery
- Improving the target catch to bycatch ratio will ensure the sustainability of the fishery and aid in the threatened green sturgeon population rebound
- Improved biodiversity promotes healthy ecosystems, increasing ocean productivity and species adaptability to environmental change

Next Steps

- Continued observations are needed to draw significance around the impact of bottom trawl gear types on green sturgeon
- A study to observe the effect that strobing red illumination has on California halibut and other target flatfish
- A cross-design study that uses light-touch and traditional bottom trawl gear, alternating red strobe illumination between them, may be utilized to observe all species responses in their natural environment

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