Environmental Defense Fund
Smart Boat Initiative

Request for Proposals: 2019 Fisheries Electronic Technology Service Provider

UNDERWATER SMART CAMERAS TO ENABLE REAL TIME BYCATCH AVOIDANCE (PHASE 1)

DATE: April 17th, 2019

POINT OF CONTACT: Christopher Cusack; ccusack@edf.org

BACKGROUND:

Environmental Defense Fund (EDF) is an internationally recognized non-profit working to forge practical solutions that help nature and people prosper sustainably. EDF recently launched the SmartBoat Initiative (SBI) which focuses on leveraging the technological advances and plummeting costs in sensors, artificial intelligence, broadband communication and data analytics to equip and surround fishing vessels of all sizes with digital tools and infrastructure that can increase sustainability, accountability, profitability and transparency in fishing. Through the SBI we're working with fishermen, government, and industry partners to test sensor, network, data analysis and other technologies to open new frontiers for fishing fleets globally, recognizing that success depends not only on the use of new technologies, but on science-based catch limits, good governance and incentives for fishermen to comply — the hallmarks of well-managed fisheries.

Trawl gear is one of the most commonly used fishing gears throughout the world, and is responsible for the prosecution of many of the highest yield fisheries globally. Historically one of the most environmentally destructive and indiscriminate gear types, fishing technologies have improved to the point where fishermen can now acoustically visualize the shape of the net opening (which indicates how effectively it is fishing), the presence of fish going into the net, and approximately how full the codend is, all in real time. In addition to better aggregation, analysis, and dissemination of actionable data (such as through the use of Seastate Inc.[1] in the Alaska and West Coast trawl fisheries) which is helping fishing fleets to avoid sensitive bycatch species, much work has also gone into the development of passive bycatch excluders which rely on fish behavior to self-select out of an opening built into the net. Salmon excluders and halibut excluders are currently in use in the Alaska pollock and West Coast hake fisheries. However, a major challenge that has remained intractable until recently is the real time identification of species entering trawl nets and the development of an active response to this information.

[1] www.seastateinc.com

There has been some development of underwater video cameras that transmit video to the wheelhouse in real time and which allow fishermen a view of what is happening down below. However, these systems are very costly which puts them out of reach of all but a few fishermen. These systems also transmit video data through coaxial cables to the vessel from the net which limits the quality of the video and inserts a cost hurdle into the system as these cables require a bespoke winch mounted onto the vessel which pays out and retrieves cable at the same rate and direction as the trawl gear. There are two other major barriers that must be overcome to make real time bycatch avoidance in trawl fisheries a reality. First, a way for fishermen to actively respond to the presence of undesirable species in the net must be developed. Research in this area is ongoing and includes the development of active escape panels, light stimulus to direct certain species out of a net, and other avenues. The second barrier is determining how to improve the link between collection of video data and a bycatch avoidance action. A real time video feed of fish passing through a net presented to the captain comes with an inherent problem: captains are responsible for many tasks during fishing operations and constantly watching video to identify bycatch events is simply not realistic in most situations. We believe that the solution to this second barrier is enabled by the development of Artificial Intelligence (AI) to automatically identify bycatch species in real time and alert fishermen, or a bycatch avoidance system directly, to their presence in a net. Furthermore, we believe that by enabling AI functionality to be incorporated into the underwater camera housing, and developing a communication protocol (such as an acoustic signal) that alerts fishermen to the presence of certain species in the net will overcome the significant costs involved in the transmission of real time video data to the wheelhouse and catalyze the development and spread of active bycatch avoidance in trawl fisheries globally.

This project aims to address this second barrier while wholesale reducing the costs of active bycatch avoidance in trawl fisheries. Working with fishing industry partners and technology service providers we aim to develop an AI system that can automatically identify particular species (such as salmon in the Alaska pollock fishery, rockfish in the West Coast hake fishery, and halibut in the Bering Sea flatfish fishery) entering or passing through a net and create real time alerts of these events. We envision that development of this system will occur in parallel with the development of active bycatch avoidance procedures for trawl fisheries, eventually resulting in an accessible and effective system that enables fishermen to identify and actively exclude undesirable bycatch species in real time.

We aim to achieve this goal in three phases. The first phase will involve a proof of concept and efficacy test for the development of AI for the automatic underwater identification of bycatch species entering a trawl net. This phase will utilize existing underwater footage

collected during the development of salmon excluder devices in the Bering Sea, as well as new footage captured during the course of the project. The second phase will involve the development of an underwater 'smart' camera which can automatically identify bycatch species underwater by leveraging AI in the underwater system. The third phase will involve the development of an underwater alert system that takes the real time identification from phase 2, and alerts the fisherman in real time to the presence of undesirable species via an underwater communication system.

PROJECT DESCRIPTION:

EDF is seeking a suitably qualified technology and services provider (*provider*) to work with us and our fishermen partners to design, implement, and test a set of AI tools and physical technologies that improve the automatic identification of real time bycatch in trawl fisheries. This project encompasses the work outlined in phase 1 in the previous section: the proof of concept and efficacy test for the development of AI for the underwater identification of bycatch species entering or passing through a trawl net. We expect to issue subsequent RFPs for the second and third phases in the future.

The selected provider will analyze existing video footage of salmon passing through a pollock trawl net to quantify the potential of an AI protocol to automatically identify salmon in the Alaska pollock fishery. The provider will also install and maintain an underwater camera system on a single trawl net (in a fishery location to be confirmed) that can record high quality video footage of catch entering or passing through a trawl net, and will further develop an AI protocol to automatically identify species of interest.

SERVICE PROVIDER RESPONSIBILITIES

- ◊ Assess and quantify the potential of AI to automatically identify salmon bycatch in the Bering Sea pollock fishery using existing footage that will be provided
- ◊ Provide, install, and maintain a single underwater camera system on a purchase or lease basis on a vessel located either on the west coast of the U.S. or Alaska (to be decided in collaboration with EDF during the course of the project).
- ◊ Develop an AI protocol, and assess and quantify the potential of AI to automatically identify bycatch species using the new video footage collected during the course of the project.
- ◊ Provide secure and readily accessible storage for all data collected and used during the course of the project.
- ◊ Provide cost and technical performance information for all aspects of the system and statistics describing the system's performance during the course of the project
- ◊ Respond quickly to maintenance or troubleshooting requests from the project manager or project partners.
- ◊ Provide a brief project report at the end of the project term summarizing the economic

and technical performance of the system.

TERM: June 1st, 2019 to September 15th, 2019, with possible extension.

APPLICATION:

Interested parties should submit a proposal with descriptive budget via email as a Microsoft Word or PDF attachment to kfairman@edf.org, by midnight EST on Monday 13th May, 2019. The budget may be submitted in spreadsheet form. The proposal should consist of:

- A **cover letter** explaining the provider's interest and qualification for the contract including a description of previous experience with the types of work proposed in the RFP.
- A **narrative proposal** outlining how the provider intends to fulfill the responsibilities outlined in the previous section.
- A **descriptive budget** outlining the total cost of fulfilling the terms of the project.
- A **proposed timeline** for completing the project.
- **Resumes/CVs** of key project personnel.

SELECTION CRITERIA:

In addition to a preference for providers that show the ability to engage in all three phases of the overarching project, EDF will select the provider based on the following rubric:

Evaluation Area	Weight
Experience working with underwater video cameras	20%
Experience working with the development of AI protocols to automatically identify fish species	20%
Experience with development of the types of hardware required for all three phases of this project.	20%
Availability to engage in project activities before June 1st, 2019	20%
Proposed cost	20%

QUESTIONS:

Any questions related to the RFP should be sent via email to ccusack@edf.org no later than Midnight EST, May 10th, 2019.

SUBMISSION DEADLINE: Midnight EST, May 13th, 2019

SUBMISSION: Please submit all bids to: kfairman@edf.org