World Academy of Science, Engineering and Technology
International Journal of Marine and Environmental Sciences
Vol:15, No:06, 2021

Supplementing Aerial-Roving Surveys with Autonomous Optical Cameras: A High Temporal Resolution Approach to Monitoring and Estimating Effort within a Recreational Salmon Fishery in British Columbia, Canada

Authors : Ben Morrow, Patrick O'Hara, Natalie Ban, Tunai Marques, Molly Fraser, Christopher Bone

Abstract : Relative to commercial fisheries, recreational fisheries are often poorly understood and pose various challenges for monitoring frameworks. In British Columbia (BC), Canada, Pacific salmon are heavily targeted by recreational fishers while also being a key source of nutrient flow and crucial prey for a variety of marine and terrestrial fauna, including endangered Southern Resident killer whales (Orcinus orca). Although commercial fisheries were historically responsible for the majority of salmon retention, recreational fishing now comprises both greater effort and retention. The current monitoring scheme for recreational salmon fisheries involves aerial-roving creel surveys. However, this method has been identified as costly and having low predictive power as it is often limited to sampling fragments of fluid and temporally dynamic fisheries. This study used imagery from two shore-based autonomous cameras in a highly active recreational fishery around Sooke, BC, and evaluated their efficacy in supplementing existing aerial-roving surveys for monitoring a recreational salmon fishery. This study involved continuous monitoring and high temporal resolution (over one million images analyzed in a single fishing season), using a deep learning-based vessel detection algorithm and a custom image annotation tool to efficiently thin datasets. This allowed for the quantification of peak-season effort from a busy harbour, species-specific retention estimates, high levels of detected fishing events at a nearby popular fishing location, as well as the proportion of the fishery management area represented by cameras. Then, this study demonstrated how it could substantially enhance the temporal resolution of a fishery through diel activity pattern analyses, scaled monthly to visualize clusters of activity. This work also highlighted considerable off-season fishing detection, currently unaccounted for in the existing monitoring framework. These results demonstrate several distinct applications of autonomous cameras for providing enhanced detail currently unavailable in the current monitoring framework, each of which has important considerations for the managerial allocation of resources. Further, the approach and methodology can benefit other studies that apply shore-based camera monitoring, supplement aerial-roving creel surveys to improve fine-scale temporal understanding, inform the optimal timing of creel surveys, and improve the predictive power of recreational stock assessments to preserve important and endangered fish species.

Keywords : cameras, monitoring, recreational fishing, stock assessment
Conference Title : ICSAF 2021 : International Conference on Sustainable Aquaculture and Fisheries
Conference Location : Montreal, Canada
Conference Dates : June 14-15, 2021