MATE ROV / Ocean Exploration Video Challenge

NOAA Ocean Exploration Background

NOAA Ocean Exploration is dedicated to exploring the unknown ocean, unlocking its potential through scientific discovery, technological advancements, partnerships, and data delivery. They lead national efforts to fill gaps in our basic understanding of the marine environment, providing critical ocean data, information, and awareness needed to strengthen the economy, health, and security of the United States and the world. Through live video streams, online expedition coverage, training opportunities, and education and outreach programming, they enable scientists, resource managers, students, educators, members of the general public, and others to actively experience ocean exploration, broadening scientific participation, cultivating the next generation of ocean explorers, and engaging the public in exploration activities.

The data and information collected during expeditions and research supported by NOAA Ocean Exploration are publicly available, aiding stakeholders in identifying, understanding, and managing ocean resources for today and the future.

Data collection typically includes oceanographic and geophysical parameters, video, images, and other information, provided in various data formats. After missions, the office develops data products to disseminate expedition information to a wide audience.

Experts across ocean science disciplines participate in NOAA Ocean Exploration expeditions from around the world, annotating video from a remotely operated vehicle (ROV) in real time or via recordings. Many of the organisms seen during these expeditions are being observed in their natural habitat for the first time and may be completely new to science!

Video Challenge

Problem: The traditional process of counting organisms in underwater video recordings is time-consuming, often requiring extensive human involvement. The 2025 challenge aims to streamline this process by focusing on the enumeration of a single species. This challenge will test the ability of participants to develop an Artificial Intelligence (AI) model that can continuously track and enumerate a specific organism throughout the video, maintaining an accurate bounding box for the entire duration the organism is visible and counting how many bounding boxes/species are seen in the video at any one time.

Task: Participants are to develop an AI model capable of continuously counting the primary organism in the video (in this case the black sea bass, *Centropristis striata*). The source footage for this challenge will be a continuous tracking shot of the ocean floor, captured by diver/videographer Randy Rudd in Gray's Reef National Marine Sanctuary Foundation. Video courtesy of Gray's Reef National Marine Sanctuary. Video: Computer Coding Challenge 2025 on Vimeo
https://vimeo.com/515388373/99dee8df99

Training Data:
Found in the western Atlantic Ocean, the black sea bass, *Centropristis striata*, is an important species for both commercial and recreational fisheries. In Gray's Reef National Marine Sanctuary (GRNMS), it is one of the predominant predators found on the reef. Researchers at the sanctuary use the abundance of fish, particularly the black sea bass, to help them assess the health of the ecosystem and create a management plan for the reef. However, current AI used by GRNMS researchers for seafloor/fish faunal surveys performs poorly. Scientists and researchers are left performing general counts manually and entering that data into a spreadsheet. This is where you come in!
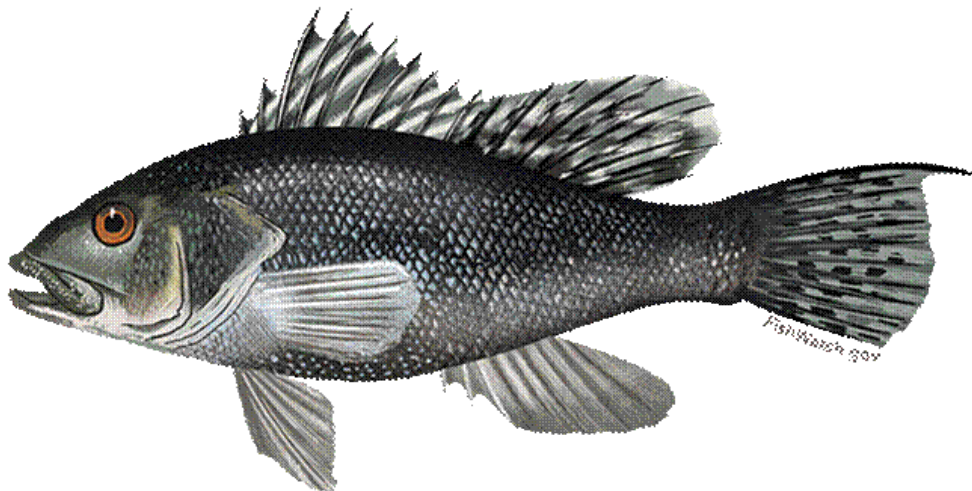

Photo from fisheries.noaa.gov

Your team's challenge is to design a computer program that continually places a bounding box around each black sea bass, determines the percent likelihood the object in the bounding box is a black sea bass, counts how many black sea bass are seen in any one frame of the video transect, and displays that number of the screen. Companies must also provide both a graph and a spreadsheet showing how many fish are seen in a frame at a given interval.

The interval (how often your team counts fish in a frame) is up to the team, but all teams must provide a fish count graph showing fish numbers at every 5 second mark (0 second mark, 5 second mark, 10 second mark, etc.). The percent likelihood used to determine if an object is a black sea bass is up to your team (i.e. your algorithm can count any object with 75% likelihood of being a black sea bass, or your company may choose to set your algorithm to consider anything over 90% likelihood to be counted as a black sea bass).

Programs will be judged on the accuracy of their fish counts (false positive and false negative identifications), count and overall presentation of their video, graph, spreadsheet, and description of the algorithm.

Teams must submit a plot of the number of fish seen over time. The example graph below, plots the fish count every 5 seconds over a 150 second time period.
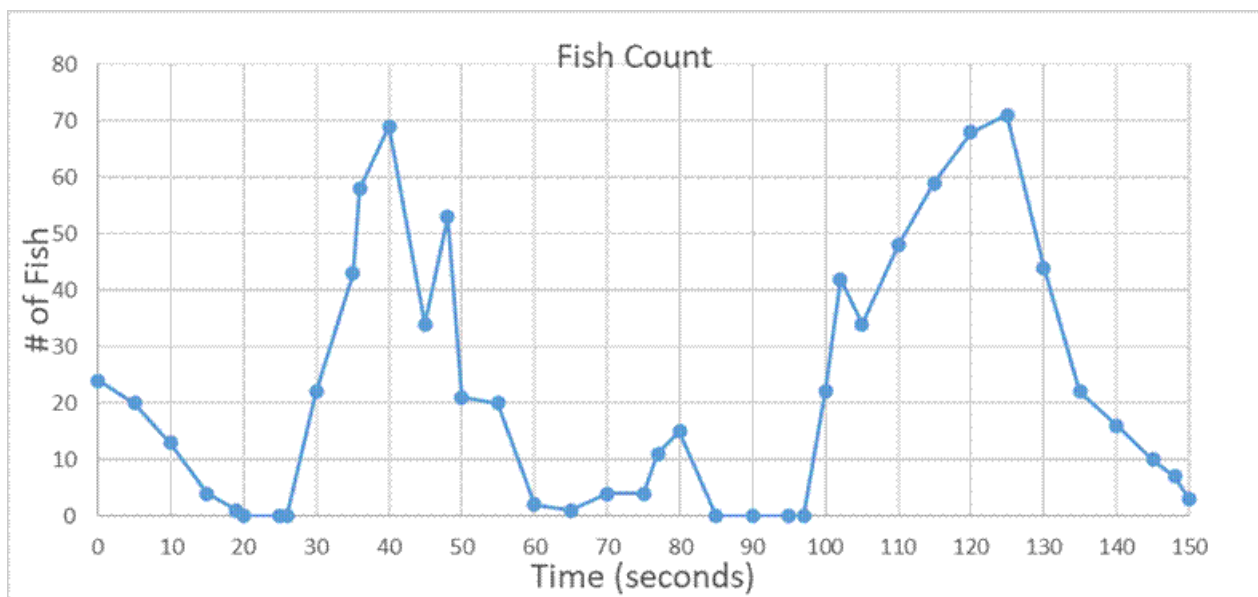
Example fish count graph of a 150 second video transect. Count plotted every 5 seconds.

Registration

Participants wishing to take part in the 2025 Ocean Exploration Video Challenge may register at [2025 MATE/NOAA Ocean Exploration Computer Coding Challenge Registration](#)

Submission Requirements

Companies undertaking the Ocean Exploration Video Challenge will have 9 weeks to create and submit their program, the resulting spreadsheet and graph with fish counts at intervals, an explanation of how the program/algorithm counts fish, and a video demonstrating your solution working real time to MATE ROV Competition officials. The program, graph, spreadsheet, explanation, and video must be submitted to [2025 MATE/NOAA Ocean Exploration Computer Coding Challenge Document Submission](#) no later than 11:59 PM, Hawaii time, September 15, 2025. The following naming convention should be used for your submissions: School or organization name_company name_ document type_2025, where document type is either the program, graph, spreadsheet, or explanation. The explanation can include flow charts, tables, and code snippets, etc. The video should be uploaded to YouTube, Vimeo, or Google and a link should be provided to that video.

Announcement of Winners

The winning student teams will be announced in September 2025. Overall scores and the top three teams in the competition will be posted on the MATE ROV Competition website. The winning team will receive a travel stipend to attend and present at the [2025 Underwater Intervention conference](#) in New Orleans, LA, USA.