

EXPANDING OCEANOGRAPHIC SAMPLING FOR PORTS USING UNCREWED SURFACE VEHICLES AND COMMUNITY OBSERVATORY PROGRAMS

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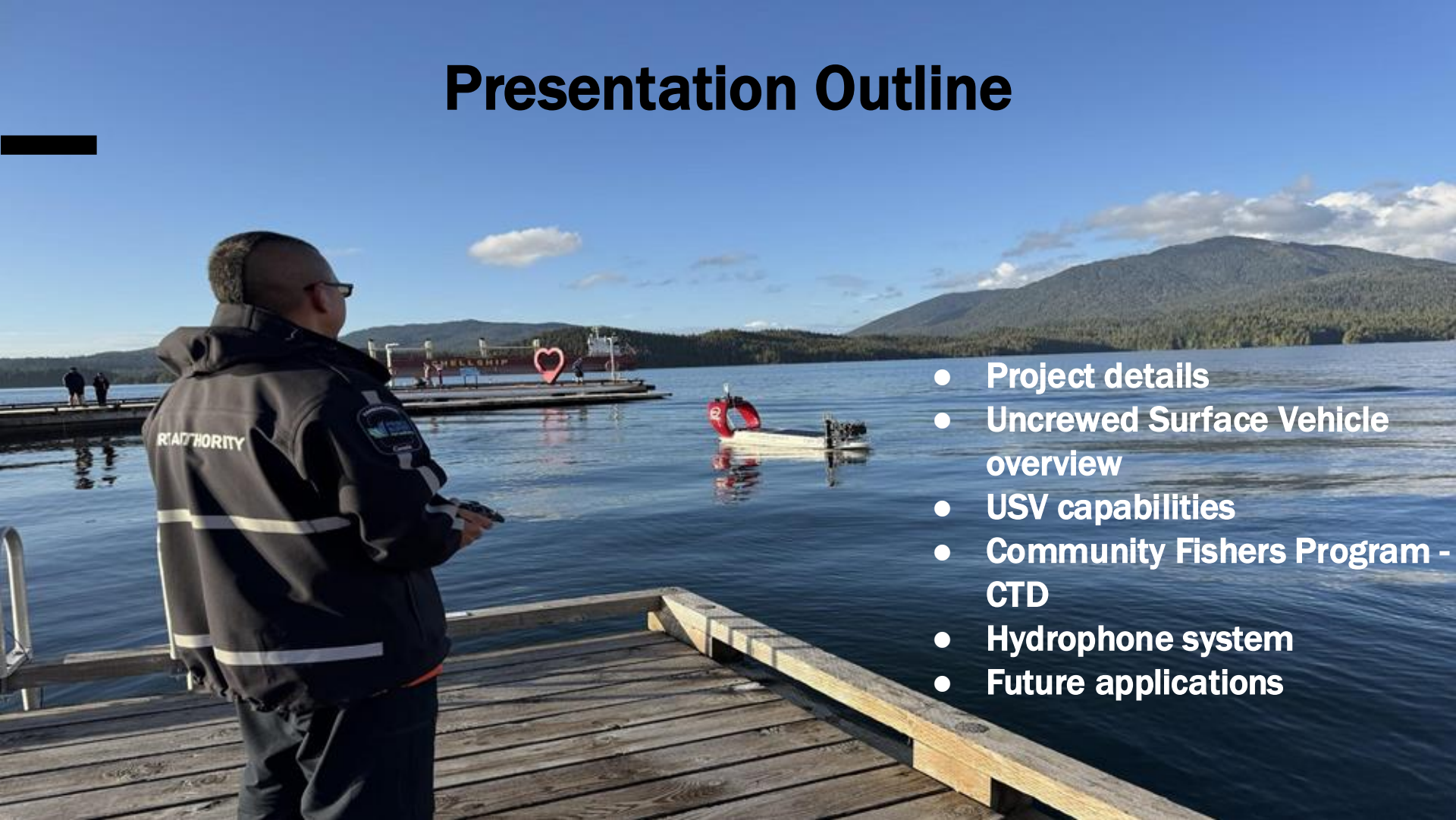
OCEAN NETWORKS CANADA

OPENOCEAN ROBOTICS

PRINCE RUPERT Port Authority

Presentation Outline



- Project details
- Uncrewed Surface Vehicle overview
- USV capabilities
- Community Fishers Program - CTD
- Hydrophone system
- Future applications

THE PROJECT

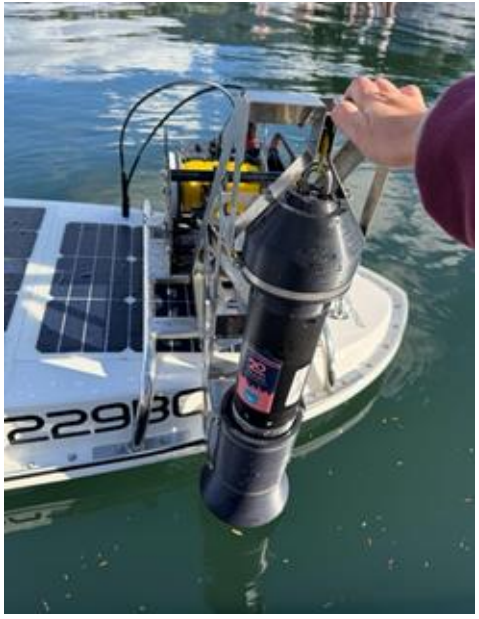
A collaborative initiative of Prince Rupert Port Authority (PRPA), Open Ocean Robotics (OOR), and Ocean Networks Canada (ONC) funded through InnovateBC's Integrated Marketplace.

Objectives:

- Demonstrate how autonomous USV technology can complement conventional vessel-based monitoring for operational, environmental, and scientific applications
- Integrate high-quality ocean monitoring capabilities on USV
- Train PRPA staff to operate UVS and sensor systems
- Demonstrate efficiency and cost effectiveness of using remotely operated technology in an active port environment

innovate BC





DATAXPLORER UNCREWED SURFACE VEHICLE (USV)

- DX is an all electric, solar-charged, remotely operated vehicle
- Patented self-righting system for extended operations in challenging marine environments
- Shallow draft to support operations in coastal, estuary, and offshore environments
- Standard sensors: 360-deg camera system, weather station, depth & water temp, AIS, cellular and satellite comms system
- PRPA's DataXplorer also has:
    - Ocean Sonics icListen hydrophone on 10m tow-cable
    - Seaview SVS-603HR wave sensor
    - Upgraded cameras (narrow-field RGB and thermal)
    - Reach Systems Caimen winch for profiling CTD
    - AML-6 CTD, per ONC specifications & calibrations for Community Fishers Program





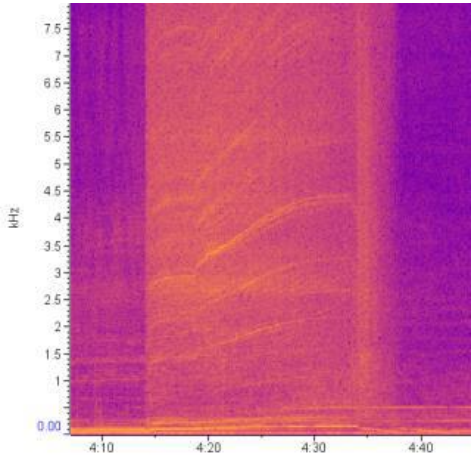
USV CAPABILITIES FOR PORT MONITORING

- Acoustic marine mammal detections and vessel noise monitoring with Ocean Sonics hydrophone and OOR's Underwater Listener
- Mobile weather station for remote anchorages & passages
- Construction noise monitoring with calibrated hydrophone to support nearshore construction compliance
- Enhanced situational awareness to support safe port operations and maritime security with cameras, AIS, and acoustics
- Real-time situational awareness and data collection to support emergency incident assessment and response
- Environmental sampling and monitoring with remote sensor systems such as CTD, ADCP, pCO_2, pH, eDNA, etc.



HYDROPHONE AND ACOUSTIC CAPABILITIES ON USV

- PRPA's DataXplorer uses an Ocean Sonics icListen omni-directional hydrophone for marine mammal monitoring and near shore construction monitoring
- OOR's Underwater Listener (UL) AI-based software runs onboard to perform real-time acoustic data-processing to detect signals of interest, e.g., Humpback whales, engine-noise, pile-driving, etc.
- Full 128KS/s loss-less codec (FLAC) audio streaming available.







COMMUNITY FISHERS OCEANOGRAPHIC PROGRAM

What is *Community Fishers*?

- A program to collect standard oceanographic data in coastal regions by community members.
- **Purpose**: Monitoring ocean conditions; establishing baselines for water properties; understanding fish/mammal habitat.
- **Data collected**: Temperature, salinity, turbidity, chlorophyll, dissolved oxygen, CDOM (coloured dissolved organic matter) and the presence of crude/refined fuels.
- **Data is managed** to meet OCAP, FAIR and CARE principles and is accessible to users on Oceans 3.0



Jason Groven and Warren Bolton from Kitsumkalum First Nation deploy their CTD to collect water properties data, October 2022

COMMUNITY FISHERS OCEANOGRAPHIC PROGRAM

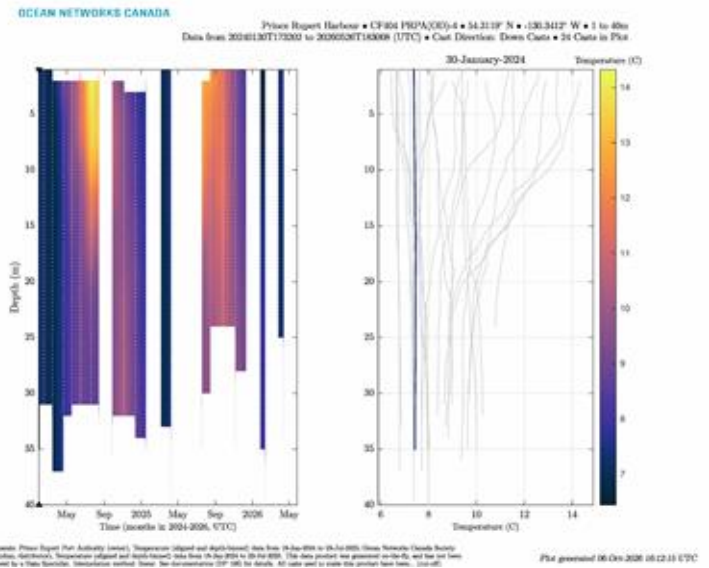


PRPA started collecting CTD data with Community Fishers in 2024. Now occupy 26 stations and have submitted ~900 casts. They want to continue participating, but using their new USV and remain cohesive with Community Fishers end-end support. Thus a partnership was formed – PRPA, ONC, and OOR.

PRPA – ONC – OOR COLLABORATION

- Goal: incorporate Community Fishers system into PRPA's new USV – hardware, software, and processes
- Add winch and housing to USV to conduct AML-6 CTD casts remotely at all PRPA sites
- Adjust CFP methodology and approach for remote cast operations to ensure continuity & quality
- Incorporate GPS locations from USV into ONC data submission process – minimum changes for PRPA
- All data collected via PRPA's USV & CTD will be available in Oceans 3.0 with existing data https://data.oceannetworks.ca/CastDataMap





FUTURE POTENTIAL APPLICATIONS FOR PRPA'S USV

- Conduct hydrographic surveys with additional multi-beam unit (Norbit)
- Conduct remote eDNA collection with additional sampler (McLane RoCSI)
- Hold info sessions with local First Nations on DataXplorer use & potential to improve environmental monitoring



Together PRPA, OOR, and ONC are developing a scalable model for autonomous marine monitoring to support safer port operations and coastal management

