ARHC9-C.1

9th Meeting of the Arctic Regional Hydrographic Commission (ARHC)

Murmansk, Russian Federation 17-19 September 2019

Report of the Operations and Technology Working Group (OTWG)

Submitted by:	United States Corey Allen, Chair, OTWG
Executive Summary:	This report contains the current status, activities and recommendations for future collaborative opportunities for the OTWG.
Related Documents:	Arctic Hydrographic Adequacy – an Update Interactive Web Map https://www.iho.int/mtg_docs/rhc/ArHC/ARHC8/ARHC8-C1a_Arctic_Hydrographic_Adequacy_OTWG.pdf OTWG Autonomous Vehicles https://www.iho.int/mtg_docs/rhc/ArHC/ARHC7/autonomous%20vehicles%20as%20of%20August%2018.docx UNH/NOAA Joint Hydrographic Center Performance and Progress Report 2018 https://ccom.unh.edu/sites/default/files/progress_reports/2018_jhc-ccom_executive_summary_0.pdf

I. Introduction

The Operations and Technology Working Group was established at ARHC-1. As codified in the Working Group's Terms of Reference (ARHC2-07A), the objectives of the group are:

a. To provide a core of expertise on hydrographic operations in the Arctic.

b. To develop and maintain documented best practices, lessons learned, an advances in training and technology.

The current membership and contact information of the OTWG:

Canada	Denmark	Finland	Iceland	Norway	Russian Federation	United States
scott.youngblut@dfo-mpo.gc.ca douglas.brunt@dfo-mpo.gc.ca	larsh@gst.dk jepha@gst.dk	seppo.h.makinen@liikennevirasto.fi rainer.mustaniemi@traficom.fi	Hilmar.Helgason@ihg.is	arne.ofstad@kartverket.no Noralf.Slotsvik@kartverket.no Evert.Flier@kartverket.no	main@gunio.ru	Corey.Allen@noaa.gov John.E.Lowell@nga.mil Keith.E.Alexander@nga.mil Keith.E.Dominic@nga.mil Jonathan.Justi@noaa.gov matthew.borbash@navy.mil

The OTWG chair transitioned from CDR Samuel Greenaway (US/NOAA) to Corey Allen (US/NOAA) in November, 2018.

This report addresses the known activities of OTWG members and provides recommendations and future actions of the OTWG.

II. Action Required of the ARHC

The ARHC is invited to:

1. Review the 2019 report
2. Discuss proposed actions for the OTWG
3. Make any adjustments and decisions as warranted
4. Confirm / Update OTWG membership

Of note, the OTWG chair proposes the OTWG plan to meet again virtually following ARHC, in Fall 2019 and will discuss all actions and direction raised at the ARHC meeting.

III. Current Status

A. Unmanned Systems in Hydrography

As cited in the ARHC7-C1b OTWG report on Autonomous Vehicles,

"As the technology for operating autonomous vehicles (including underwater, surface, and airborne) and the experience base of operations in the Arctic are still in early stages of research, testing and development, a discussion paper on the use of autonomous vehicles vis a vis Arctic applications is very limited at this time.

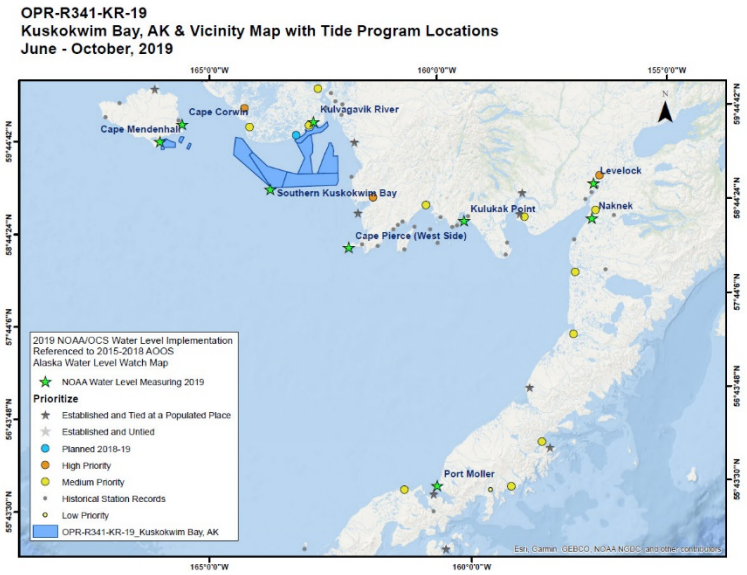
However, information provided by OTWG members since ARHC-6 does indicates that a number of participants have active projects in the prototype or early deployment stages, further confirming that this subject is an area of active and mutual interest. The U.S. unmanned systems strategy may provide a framework for discussion an further collaboration."

The Center for Coastal and Ocean Mapping / Joint NOAA Hydrographic Center within the Marine School at the University of New Hampshire conducts research and development through funding from NOAA's Office of Coast Survey. As part of that research, the Center has designed and manufactured an autonomous surface vehicle (ASV) to develop and test technologies for robotic marine operations. The Bathymetric Explorer and Navigator (BEN) is a 4 m, diesel powered vessel equipped with state of the art hydrographic and navigation systems, along with the Center's own piloting and autonomy software. BEN was deployed aboard the NOAA Ship Fairweather in July and August of 2018 as a proof-of-concept for survey in Arctic waters, where NOAA has prioritized the update of charts to accommodate increased vessel traffic. BEN operated along side daily operation of NOAA launches while operators remained aboard the Fairweather. Approximately 20% of survey coverage conducted during the deployment was conducted by BEN.

The NOAA-University of New Hampshire Joint Hydrographic Center participated in a cruise on the Swedish Icebreaker *Oden* at Ryder Glacier, Greenland. A *Seafloor Systems, Inc* "EchoBoat" was utilized in a "Pathfinder Scenario" surveying ahead of the ship in uncharted waters. Additional information on the cruise can be found here.

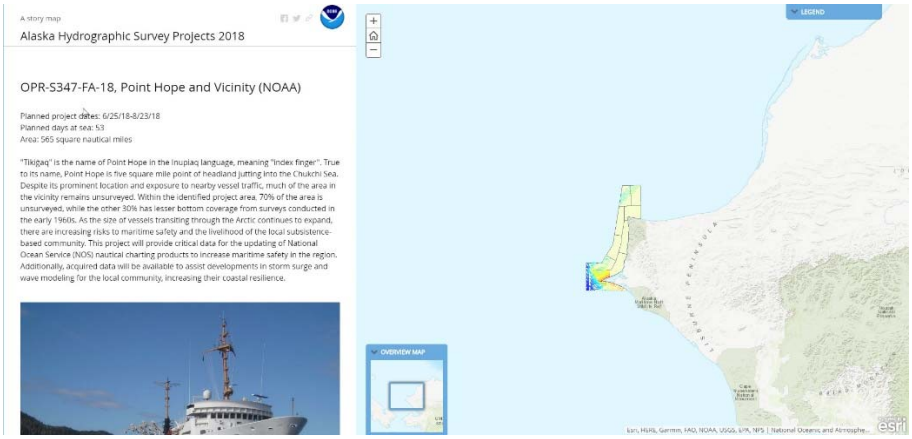
B. Arctic Datum Control

NOAA Office of Coast Survey contracted *Terrasond* to perform a hydrographic survey in the vicinity of Kuskokwim River and Nunivak Island. After assessment of the vertical datum control in the area, and in consultation with NOAA's Alaska Ocean Observing System a network of water level observing stations were deployed at nine locations. Observations were made using traditional water level measuring devices (e.g. acoustic gauges) and emerging technologies (e.g. bottom-mounted pressure gauges, water-level buoys, microwave and GNSS reflectometry).

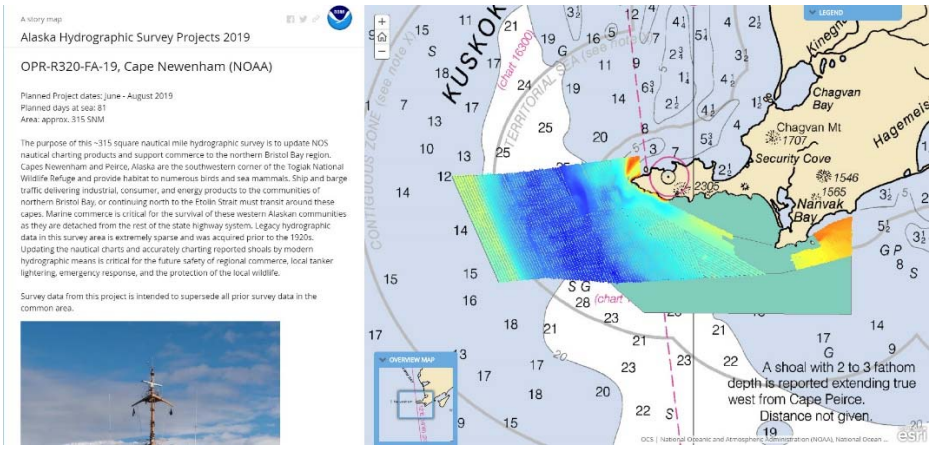


C. Arctic Survey Activity since ARHC8

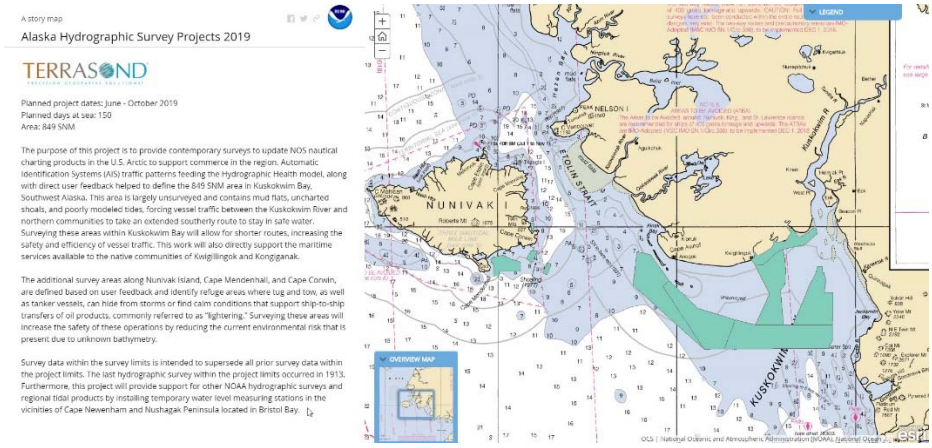
Since ARHC8, NOAA has acquired new arctic hydrographic survey data in Point Hope, Cape Newenham and Kuskokwim River. These data cover approximately 1,400 square nautical miles addressing survey requirements identified in the Arctic Hydrographic Adequacy risk assessment.



Point Hope, AK



Cape Newenham, AK



Kuskokwim River & Nunivak Island, AK

D. Personnel exchanges

The U.S. and Canada conducted personnel exchanges over the last year. Shauna Neary, Michael White and Jennie Fortier from the Canadian Hydrographic Service (CHS) sailed on the NOAA Ship Rainier and participated in U.S. hydrographic survey work in the vicinity of Kodiak Island. The personnel exchange provided valuable learning experiences for the NOAA crew and the CHS personnel, gaining a better understanding NOAA survey methodology and were presented by Jennie Fortier a technical talk about the challenges of surveying the Canadian St. Lawrence Seaway. The working group will continue to discuss opportunities to expand on this practice.

E. Acoustic Propagation and Marine Mammals

Scientists from the University of New Hampshire are actively studying the radiated field from multibeam echo sounders and investigating potential impacts of the radiated sound on the environment, particularly with respect to marine mammals. For more information please refer here.

IV. Recommendation and Invited Actions of the OTWG

The OTWG chair recommends the ARHC perform an Arctic Hydrographic Adequacy risk assessment every five years, next update due 2023. To facilitate the risk assessment and make the adequacy evaluation efficacious all member states will need to provide quality assessment data (e.g. CATZOC).

The OTWG chair further recommends the ARHC collaborate to prioritize and perform an assessment of arctic vertical datum control, cataloging historic and active water level observations to identify and prioritize gaps in coverage.