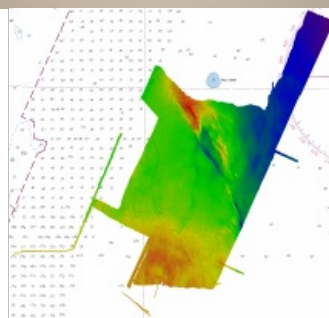
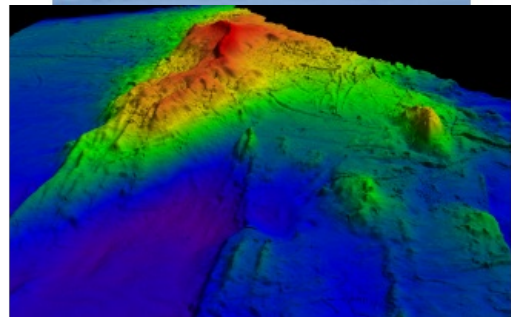
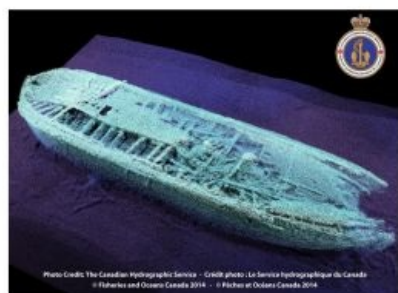


KNOWLEDGE GAINED IN THE SEARCH FOR FRANKLIN

Searching for HMS Terror



“We know where the target is not located” is the only guaranteed result of any search expedition. This statement does not make for exciting headlines, however, the value of knowledge gained during the search itself and its many benefits to a variety of end-users, cannot be easily dismissed. The 2015 Franklin Expedition search coordinated by Parks Canada was the continuing multi-year, multi-partner effort that saw the discovery of HMS *Erebus* in September of 2014. In this article we will discuss the knowledge gained and multiple uses of the data collected toward our conclusion of verifying where HMS *Terror* is not located.

In 1845, Captain Sir John Franklin led an ill-fated expedition to find the final elusive link in the Northwest Passage through

what is now the Canadian Arctic Archipelago. Supplied for three years, HMS *Erebus* (Figure 1) and HMS *Terror* sailed from England outfitted with innovative auxiliary steam engines, coal-fired heating systems, and all manner of internal and external hull reinforcement to better withstand the ice -- including bows sheathed in iron hull plating. Given the experience of Franklin, his hand-picked crew, and the well-equipped ships he commanded, few anticipated the tragedy and ensuing searches that continue to this day. Many motivating factors have contributed to the launch of the searches for the ‘Lost Expedition’. Initially it was a rescue mission, and then a recovery mission, when all hope for any survivors was lost. Modern day searches coordinated and funded by the Government of Canada are motivated not only by the important history the lost expedition represents, but the added substantiation to Canada’s sovereignty claim to the Arctic.

On 2 September 2014, Parks Canada discovered the wreck of one of Franklin’s vessels in Queen Maud Gulf south of King William Island. A month later, the wreck was officially announced as that of HMS *Erebus* by the Canadian Prime Minister on 1 October 2014. Subsequent archaeological dives on HMS *Erebus* have yielded compelling artefacts and new knowledge about the ship, as well as the expedition. With renewed vigour, Parks Canada embarked on ‘The Franklin Expedition: Mission *Erebus* and *Terror* 2015’ to continue diving on HMS *Erebus* and to continue searching for HMS *Terror*.

2015 Search

This year’s search was a dedicated two-week effort using five vessels, each fitted with multibeam echo sounders. The Canadian Coast Guard Ship (CCGS) *Sir Wilfrid Laurier* and the Canadian Hydrographic Service (CHS) launches Gannet and Kinglett, each fitted with R2Sonic 2022s. The Parks Canada survey vessel *Investigator* was fitted with an R2Sonic 2024-UHR (Figure 2) and the Royal Canadian Navy’s HMCS Moncton had an R2Sonic 2026. *Investigator*, *Laurier* and *Moncton* had pole-mounted MBES, while *Gannet* and *Kinglett* had fixed, hull-mounted systems. Unlike previous years, side-scan sonar was not used as the combined factors of increasing water depth, anticipated target size and physical integrity, as well as the advantages of greater swath size and survey speed made multibeam sonar the sensor of choice.

The ice and weather conditions during the search were relatively favourable, resulting in only 36 hours of down time for the smaller survey launches, while the 3812-ton *Sir Wilfrid Laurier* was unaffected. While the marine surveys were underway, Government of Nunavut Archaeologists, CHS Hydrographers and Coast Guard technicians went ashore to various locations via boat and helicopter for archaeological site surveys, tidal analysis water levelling and NAVAID beacon maintenance. The shore parties were regularly greeted by the local polar bear population (Figure 3). Concurrent with the HMS *Terror* search, a Parks Canada dive team was on the HMS *Erebus* site mapping and cataloguing the wreck.

In a combined effort to ‘collect once and use many times’, all the survey platforms collected data suitable for charting purposes according

to Canadian Hydrographic Service standards. A total of 8083 line km and 555.8km² of multibeam seafloor data were collected (Figure 4) and included an extensive 3.5m shoal that was previously uncharted, as well as hundreds of ice scours (Figure 5). Unfortunately, the final resting place of HMS *Terror* was not located this year, but the data collected are of great value to a diverse community of users as we will see in the next section.

Data Assembly/Usage

Several months of preparation were required to assemble existing background data, prepare survey equipment and plan the 2015 survey expedition. The survey platforms needed to be assembled, calibrated and tested, and then all equipment shipped from Ontario to Victoria, British Columbia, to be installed or stored aboard CCGS *Sir Wilfrid Laurier*, prior to her departure for the Canadian Arctic. The intended purpose of the 2015 mission was to collect high-quality multibeam data for use in charting within high priority navigation corridors in Victoria Strait and to support the ongoing search for the still unaccounted for Franklin Expedition vessel HMS *Terror*. As marine traffic volumes increase in the Arctic, along with increasing ship drafts, it is incumbent upon the CHS to collect as much quality data as possible to create hydrographic products that allow safe and efficient navigation in these corridors.

The navigators who are dependent upon this navigational information come from various vectors. With increased commercial activity in resource extraction, those commercial entities need safe and reliable navigational routes to get their product to the intended markets. Similarly, the permanent residents and those who make their livelihood in Arctic communities are dependent upon the goods brought in from the south, as seasonal conditions permit. The most cost effective means of doing this is through marine shipping. The more efficient and reliable these routes, the more cost effective and timely the availability of essential goods, resulting in an enhancement of the quality of life for Northerners.

Additionally, marine tourism is experiencing an increase in Arctic waters. Cruise ships will likewise benefit from the enhanced safety and access derived from updated and accurate navigational products. Finally, when all does not go as planned, as is frequently the case in the potentially harsh Arctic environment, Emergency Response (ER) platforms such as CCG vessels, need access to the most accurate information available to be able to arrive on the scene as quickly as possible. The ER situations may range from a Search and Rescue (SAR) for individuals reported lost or overdue to return home, emergency evacuation of personnel from a marine incident, or the environmental containment of a contaminant spill.

While collecting data during the 2015 mission, as is standard practice, new data was continually compared to existing data holdings, especially in areas considered to be critical to navigation. Several Notices to Shipping (NOTSHIP), and resultant Notices to Mariners (NOTMAR), were issued. These notices give a quick 'heads-up' to any vessels navigating in these areas to exercise caution with recognition of a newly determined potential hazard. One notable feature, found in 2015, was a lengthy 3.5 metre shoal that was previously unknown, or erroneously positioned. While this shoal fell outside areas that were previously adequately charted, it was adjacent to a route that might prove, once charted, to be a suitable alternate (and time saving) route to the one currently taken. Awareness of a hazard such as this shoal factors into where future recommended routes may be established. The seafloor from the multibeam imagery around this shoal showed the area to be extremely ice scoured. Being the Arctic, certain areas are frequently ice covered or strewn, so even where adequately charted corridors exist, they may not be a safe or efficient option should ice cover persist. Widening known corridors and charting new ones, creates more manoeuvring room and opens up a vessel's safety options.

One other priority of the 2015 mission was to deploy and recover year-long water level gauges on the seafloor; establishing permanent vertical benchmarks on nearby land features, occupying those benchmarks with Geodetic grade Global Positioning System (GPS) receivers, and using them to perform in-situ water level observations. This resultant information will allow CHS to better model the tide constituents for future tidal predictions and contribute toward tying that information directly to the ellipsoid and densifying Canada's Continuous Vertical Datum (CVD) model for the Arctic.

Conclusion

Many years of archaeological work remain: on the wreck site of HMS *Erebus*, along the coastlines where the original Franklin Expedition members left clues after they abandoned their ships, and in the search for HMS *Terror*. It is in the continuing search for HMS *Terror* that new knowledge of the Arctic seafloor and environment will directly benefit many different areas including safety of navigation, environmental protection, and the northern residents themselves. It is only a matter of time before the word 'not' is definitively removed from the sentence "We know where the target is not located".

Acknowledgements

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More Information

- <http://www.pc.gc.ca/eng/culture/franklin/mission2015.aspx>
- <http://r2sonic.com/gallery.php>