

***Katie Eccles*: a preliminary report on the Last Schooners Project's 2019 recording of a late-19th century schooner**

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Au cours de la première saison du projet Last Schooners en 2019, on a effectué un levé cartographique par photogrammétrie à l'aide de véhicules téléguidés de l'épave de la Katie Eccles, une goélette à deux mâts. Construite en 1877 et disparue à la fin novembre 1922, elle a été retenue pour l'étude en raison de sa représentativité du commerce à petite échelle et à courte distance dans le lac Ontario pendant les dernières années de la navigation à la voile. Le levé a réussi à analyser le site et à évaluer le bien-fondé de la photogrammétrie à distance comme moyen d'établir de façon efficace et peu coûteuse des paramètres de référence en matière de surveillance et de gestion des ressources culturelles submergées.

Introduction¹

On 4 August 1985, Prince Edward County divers Barb Carson and Doug Pettingill, located the exceptionally intact remains of a two-masted schooner in

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105 feet (32 metres) of water². The remains of the schooner, 95.5 feet (28.95 m) long on deck and an overall length of approximately 126 feet (38.40 m), were subsequently identified as the *Katie Eccles*, which had foundered in late November 1922. The site, the coordinates of which were released in the 1990s, has been frequently dived and remains a mainstay of local dive charter operations. The wreck remains upright and largely intact apart from damage sustained to the stern during the wrecking process, particularly the port quarter.

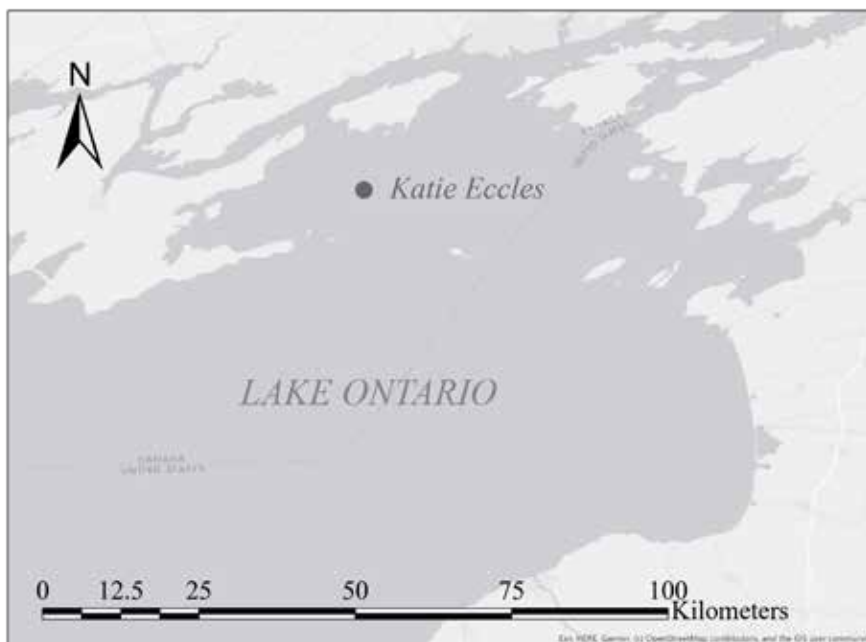


Figure 1 Approximate Location of *Katie Eccles* (ERSI)

In June 2019 a team of nautical archaeologists from Texas A&M University conducted a remote survey and video documentation of the site as part of the pilot season of the Last Schooners Project, the results of which are briefly described herein. Within the limited funding available for the pilot season, the project employed a remote-telepresence based approach to survey and recording utilizing a remotely-operated vehicle. The fieldwork objectives of the pilot season were to: assess the viability of remote videography and photogrammetric modeling of well-preserved intact shipwreck sites, to develop a 3D scale-constrained photo model of the site in Agisoft Metashape Professional Edition, and to assess the viability of this method for establishing a baseline for continued monitoring and management of sites. Furthermore, the project sought to assess shipbuilding methods employed on the Great Lakes at the turn of the twentieth century, and the extent to which novel marine technologies were employed on Lake Ontario schooners and to contextualize the role of these technologies within a wider understanding of vessel

operations and management.

Historical Background

Lake Ontario had served a unique role in Great Lakes maritime commerce throughout the nineteenth century, as the individual lakes became increasingly integrated into a continuously navigable waterway, functioning as what John Jensen has characterized as an “expanding western maritime frontier” of the Atlantic.³ The opening of the Erie Canal in 1825, marginalized Lake Ontario’s role as the principal outlet of the Lakes, establishing Buffalo as the most cost-effective eastern terminal for eastbound lake commerce, both American and Canadian. The opening of the Welland Canal across the Niagara Peninsula in 1829 and the Oswego Canal in 1826 succeeded in partially restoring Lake Ontario’s role in down bound commerce, particularly for Canadian shipping, albeit at a substantially smaller scale than on Lake Erie.⁴ For eastbound forwarders exploiting the Erie Canal, bypassing the upper Erie Canal by the Welland Canal, Lake Ontario and the Oswego Canal offered considerable savings per ton on tolls.⁵ For Canadian shipping, the opening of the Welland Canal restored down-bound traffic to the Rideau Canal and Saint Lawrence River.

Commerce under sail on the Great Lakes underwent a protracted decline from the later 1860s and 1870s. After 1867/68 the overall number of sailing vessels reached 1,994 vessels, declining thereafter. American sail tonnage peaked in 1873, though the American classification system for vessel registry aggregated fully-rigged vessels intended to operate under sail-power and rigged vessels that were principally towed.⁶ By the late 1870s and 1880s, steam surpassed sail in both aggregate tonnage and vessel numbers.

The increased emphasis upon high-volume, low-cost transport, and scheduling, conspired to relegate sailing commerce to marginal markets. As a result of this competition and the reliance on the forwarding of grain from the Upper Lakes, the number of sailing vessels registered in American ports on Lake Ontario declined precipitously in the late nineteenth century.⁷ The smaller scale of the Canadian economy along the north shore of Lake Ontario created an economic environment that enabled sailing commerce to persist into the late 1920s. Profitable commerce in the export of grain from north shore ports to Oswego and Kingston forwarders persisted into the 1890s, ceasing after the McKinley Tariff Act of 1890. The cessation of Canadian grain export following 1890 resulted in increased reliance

³ John O. Jensen, *Stories from the Wreckage* (Madison, WI: Wisconsin Historical Society Press, 2018), 6.

⁴ Ben Ford, *The Shore is a Bridge: The Maritime Cultural Landscape of Lake Ontario* (College Station, TX: Texas A&M University Press, 2017), 87.

⁵ *Oswego Palladium*, 24 March 1841.

⁶ Walter Lewis, “Transition from Sail to Steam on the Great Lakes in the Nineteenth Century,” *The Northern Mariner* 25: 4 (October 2015), 374.

⁷ *Oswego Palladium*, 10 March 1880., 26 April 1916.

upon the shipment of grain to Kingston for forwarding down the Saint Lawrence River, and on the importation of coal from New York to Canadian ports. By 1910 sailing vessels had been relegated almost entirely into the coal trade, where they would persist in dwindling numbers until the late 1920s and early 1930s.

The *Katie Eccles* was selected not only because of its exceptional historical records but also because it is representative of localized trade on Lake Ontario, having never sailed beyond the confines of the Upper Saint Lawrence and Lake Ontario in its forty-five-year career. *Katie Eccles* was built by William Jamieson, master shipwright at the H.B Rathburn & Sons Shipyard of Mill Point (now Deseronto), Ontario on the northeastern shores of the Bay of Quinte (Fig.2).⁸ The vessel was first registered out of the port of Napanee, at 122 gross tons, 95 ft. (28.95 metres) length on deck, 24.5 ft. (7.46 metres) wide and 9.5 ft. (2.89 metres) hold depth and owned by Captain Dexter Eccles of Wolfe Island.⁹



Figure 2 *Katie Eccles* (Digital/print image from the Fr. Edward J. Dowling, S.J. Marine Historical Collection, University of Detroit Mercy)

⁸ *The British Whig* (Kingston, ON), 18 June 1878.

⁹ Ship Registrations 1787-1966, Library and Archives Canada, Ottawa, ON, (LAC), RG-42, C-2471, Vol. 232, 11, 21,22, 1877.

In 1880, Captain Eccles sold the schooner to Archibald Campbell and Captain Henry I. Matthews of Lakeport, Ontario. The former, the proprietor of the wharf, grain elevators and coal sheds at Lakeport, employed the *Eccles* in the export of Canadian grain from north shore and Bay of Quinte ports to Oswego and to Kingston forwarders with return cargoes to Lakeport.¹⁰ In 1898 it was sold to Charles J. McCallum of Cobourg and afterwards was increasingly employed in the coal trade.¹¹ She carried intermittent cargoes in grains only at the outset of the shipping season and at the harvest. McCallum retained ownership until 1904 when *Eccles* passed through a succession of owners, first being sold to Captain James Dougherty of Deseronto, then Captain Frank Barnhardt, also of Deseronto. By 1905 the *Eccles* was owned by Captain John McCullough of Napanee and Alexander Foot of Deseronto.¹² Its final owner, Captain T. Harry Mitchell of Bowmanville, purchased the *Eccles* the following year. After 1915 all reported cargoes carried by the *Eccles* were coal.¹³

On 26 November 1922, the *Katie Eccles*, laden with coal, departed Oswego bound for Belleville on its final trip of the season, with only three crew aboard. Five miles out of Oswego, the *Eccles*' rudder became unresponsive. After failing to return to Oswego, the *Eccles* ran north for the shelter of the Canadian shore amidst snowstorm and gale. After narrowly averting going ashore on False Duck Island, the *Eccles* eventually anchored in the lee of Timber Island early on the morning of 27 November, where it rode at anchor through the morning of 29 November. On 29 November, a gale arose and shifted to bring the *Eccles* out of the lee of Timber Island and the *Eccles* began to drag its anchor drifting north. Mitchell decided to abandon the vessel. The crew took shelter on Timber Island, from which they were rescued on 30 November.¹⁴

With *Katie Eccles* adrift, much speculation ensued over where the vessel might come ashore, however, by the first week of December it became generally believed that it had foundered. On 5 December the upper portion of the stern came ashore at Reid's Bay, Wolfe Island.¹⁵ The loss was further confirmed when, in late December, the *Eccles* was located by Captain Claude W. Cole, who, while taking the lightkeepers off Pigeon, False Duck and Timber Islands spotted the *Eccles*' topmasts protruding above the surface opposite the Upper Gap.¹⁶

¹⁰ *The British Whig* (Kingston, ON), 7 April 1880; Census of Canada 1871, LAC, Roll C-4983, 23.; Census of Canada 1881, LAC, C-13240, 62.

¹¹ *The British Whig* (Kingston, ON), 4 March 1898.

¹² *The British Whig* (Kingston, ON), 11 April 1904, 17 April 1904, 29 December 1904, 17 April 1905; *The Enterprise of East Northumberland* (Colborne, ON), 7 April 1904

¹³ *The British Whig* (Kingston, ON), 29 August 1908.

¹⁴ *Daily British Whig* (Kingston, ON), 29 November 1922; *Daily Intelligencer*, 28 November 1922, 30 November 1922; *Republican-Journal* (Ogdensburg, NY), 1 December 1922; 2 December 1922. *Sandy Creek News*, 30 November 1922; *The Toronto Telegram*, 29 May 1943, 5 June 1943; *Toronto Globe*, 28 November 1922; *Watertown Daily Times*, 29 November 1922.

¹⁵ *Republican-Journal* (Ogdensburg, NY), 7 December 1922.

¹⁶ *Cape Vincent Eagle*, 28 December 1922; *Sandy Creek News*, 28 December 1922.

Katie Eccles Site and Conditions

The *Eccles* lies within the northeastern extent of Prince Edward Bay, 8.9 km miles northeast of Timber Island and 9.7 km south of Amherst Island (Fig. 1) in Eastern Lake Ontario. The surrounding bottomland is characterized by featureless mudflats. At a depth of thirty-two metres, the wreck is situated in a low-energy environment, and lies within the hypolimnion, between 4-5.5°C (39-42F). Though the wreck itself lies in a low-energy environment, the site is exposed, with waves between 0.9 and 1.5 metres on some days of the survey on site. Visibility during the period of fieldwork was exceptional, exceeding twenty metres at depth on the first days of the survey, following a period of rough weather and high winds.

The 2019 Survey

A Teledyne Seabotix LBV-150-2 observation-class remotely operated underwater vehicle, donated for the project's use by the Institute of Nautical Archaeology, was utilized to remotely-access the site. Due to the lower resolution of the onboard camera, the video was recorded with a GoPro Hero7 as well as a GoPro Hero 3/3+ mounted externally to the frame of the remotely operated vehicle. The LBV-150-2's internal camera was used for piloting but was not recorded.

The investigation of the site was non-intrusive without attempts to access the interior of the hull or record internal features that could not be photographed without penetration. Eight dives were conducted over three days, 14, 16 and 17 June 2019 accumulating nearly eight hours of digital video of the site. The recording was conducted in consecutive passes at varying depths around the periphery of the hull and above the deck, with addition top-down passes being made to ensure complete coverage of the site. Scaling measurements were taken of identifiable site features using a scale bar attached to the LBV-150.

Still frames from the digital video were imported into Agisoft Metashape, a software program that generates a three-dimensional point cloud from overlapping photograph's Exchangable Image File Format (EXIF) data, provided a point that appears in no fewer than three photos. The use of video eliminated concerns over capturing sufficient overlap between each still frame. Through the Agisoft workflow, the program generated a sparse and dense point cloud of the subject, which was processed into a textured mesh. When scaling measurements were entered, the result was a scale-constrained, measurable model. Due to the number of photographs included within the photo model, the model was processed in several smaller chunks which were later aligned and merged to form a unified model.

The methods employed in developing the photo model possess inherent limitations. Fine detailing is often lost, likely the result of slight edge blurring in individual video frames, resulting in a reduction of edge resolution in the 2019 photo model. Experimentation with the best methods for remote-telepresence based photogrammetry, including experimentation with results from still capture

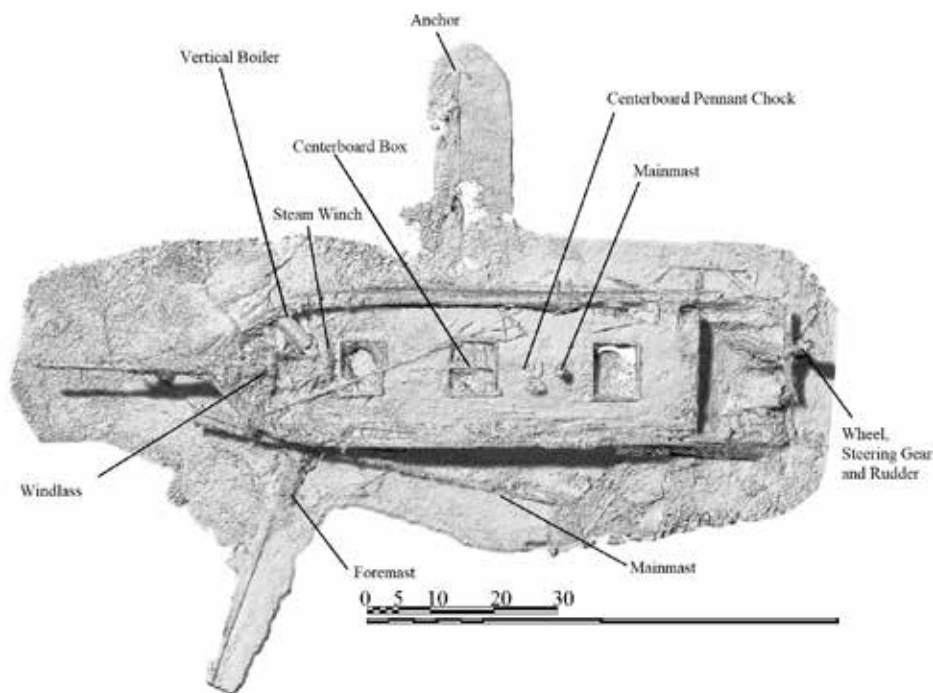


Figure 3 Preliminary site plan generated from the photo model

digital photos instead of digital video, and the incorporation of scaling bars and Agisoft-provided coded targets will be conducted during future field seasons.

Description of the *Katie Eccles* Site

Though the intact hull and rigging rest within a relatively small area, portions of the *Katie Eccles*' remains are scattered over a wide area, the limits of which could not be defined. The hull lies on a southeasterly heading. The hull retains a length of 95.5 feet (29.1 metres) on deck, 24.5 feet (7.46 metres) wide with a maximum profile of 12.6 ft. (3.84 metres) at the starboard bow. The bow has a list to port of 3-3.5 degrees.

The forward two-thirds of the hull is almost entirely intact. The bow, with straight stem, retains an intact bowsprit and large portion of the jib boom, the outer extent of which has broken off and lies on the bottom below. The bowsprit retains its chain standing rigging including the bowsprit shrouds, inner and outer bobstay shrouds, and footropes, though the port bowsprit shroud is broken near its inboard end. The jumbo jib stay and horse for the jumbo jib boom remain fastened to the upper face of the jib boom. The jumbo jib boom lies across the foredeck.

A substantial portion of the rigging lies on the bottom off the port side, including the foremast doubling and foretopmast, the mainmast, preserved to the head of the lower mast, and which overlies the doubling of the foremast. The



Figure 4 The Starboard bow



Figure 5 The rigging of the bowsprit

attachment of wire shrouds around the hounds of the masts has resulted in a considerable quantity of wire rigging covering the foredeck and draped over the port rail between the cathead and port fore chains.

On the foredeck are situated a brake-operated windlass, the focsle companionway hatch, the foremast hole, and to starboard of the foremast, the baseplate and boiler body of a vertical boiler, likely of the vertical cross-tube type. The body of this boiler lies against the bulwarks to starboard of the baseplate. This boiler was connected to a steam hoist situated forward of the fore hatch.

The deck is interrupted by three hatches, forward, amidships and abaft the mainmast. The centerboard case, which is largely obscured by the deck and beneath coal extends between the after head ledges of the fore hatch, across the midships hatch to just forward of the mainmast, where the pennant chock is situated. To port of the pennant chock, resting on its side with the pennant chain still attached is the centerboard winch. The mainmast is snapped off approximately 4.4 ft. (1.34) m above the deck, immediately above the boom saddle.

Abaft the after hatch, the sides of the hull have split away from the deck along the waterways, displacing some of the deck planks and exposing the ends of the deck beams. As a result, the position of all beams aft of the fore hatch are known. Aft of the break of the deck the port quarter is disarticulated. A section between the lower and upper turns of the bilge lays flat on the bottom with the upper quarter sloping downward from its

forward end, which remains partially articulated with the bulwarks with its aft end embedded in the bottom. The port quarter and half-frames are separated from the deadwood and sternpost. To starboard, the stern is more intact, but the quarter above the upper turn of the bilge is missing along with the cabin, cabin floor, counter and quarter deck.

The inner post, sternpost, and rudder remain standing at the stern, with the disarticulated steering gear hanging from the forward face of the wheel box from the head of the rudder post. The iron wheel consists of an eight-spoke design and is attached to a worm-simplex type steering gear with the worm mounted forward of the head of the rudder which hangs down along the aft side of the rudder post. Other notable site features include a large spar, tentatively identified as the main gaff, in the debris field off the port quarter and a single straight-stock admiralty anchor approximately ten metres off the starboard side amidships.



Figure 6 The foredeck, windlass and forecabin companionway hatch.

Discussion

The 2019 season demonstrated the viability of the remotely-operated vehicle photogrammetry and generation of a scaled photo model of the *Katie Eccles* site in a relatively short amount of time and with minimal funding and equipment requirements. Several limitations involving methods of obtaining scaling measurements and of loss of resolution of edges resulting from edge-blurring in the video still frames were noted, a refinement of data and methods will be on-going in future field seasons. Furthermore, this research has implications for advancing methods for the management and monitoring of submerged heritage sites, proving the viability of remote-telepresence photogrammetry for the efficient establishment of a site baseline.

While limitations of scaling measurement and the inability to penetrate the hull prevented a comprehensive study of all preserved constructional features, the study generated a large quantity of information regarding shipbuilding and rigging techniques employed aboard the late nineteenth- and early twentieth-century schooners. The latter half of the nineteenth century was an innovative period for sailing vessels. As innovations attributable to industrialization were applied

to sailing vessels, it brought immense steps forward in sailing technology and in shipboard operations, innovations that, if they had occurred a century earlier, might have been hailed among the greatest innovations of sailing technology, yet they arrived too little, too late. Accordingly, these technologies and the extent to which they were implemented aboard Great Lakes sailing vessels have received little contemporary or subsequent comment.

The complete complement of deck machinery and equipment on *Katie Eccles* allows insight into the role which these technologies played in the perpetuation of the viability of sailing commerce through increased efficiency. This was particularly true of the adoption of steam winches and auxiliary boilers and the adoption of more durable wire and chain rigging materials and iron hardware within the rig. As a result, *Katie Eccles* represents an invaluable archaeological resource attesting to these transitions in sailing operations and the technology of sail for the late-nineteenth and early-twentieth centuries. Continued research of *Katie Eccles* will culminate in a reconstructed set of ship lines derived from station lines extracted from the completed photo model as well as a construction plan. Furthermore, the rig will be reconstructed from a combination of the on-site remains and historical photographs. These same historical photographs corroborated the correct identification of the wreck as *Katie Eccles*.

The next field season will focus on the refinement of methods for remote-telepresence photogrammetry, improving the quality of the preliminary 2019 photo model by experimentation with photography settings, the flight path by which the site is recorded, and the use of timed still photography. Further recording will be conducted on the *Eccles* as well as the three-masted schooner *Oliver Mowat* as part of our efforts to conduct a wider study of sailing vessel operations on Lake Ontario after sail had been eclipsed by steam.