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The "Cast Iron Site"—A Tale of Four Stoves from the 1845 Franklin Northwest Passage Expedition

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ABSTRACT. Few detailed analyses exist for the majority of the sites that comprise the archaeological record of the 1845 Franklin Northwest Passage expedition. This paper presents the results of new investigations of an Inuit site (NgLj-9) at Erebus Bay on King William Island, Nunavut, containing materials derived from the 1845 Franklin expedition. The complex history of the origin and use of artifacts found at the site and its relationship to other Franklin sites and events associated with the expedition are revealed through the analysis and integration of archaeological, historical, and oral historical data.

Key words: Franklin Expedition; King William Island; archaeology; portable stoves; Inuit

RÉSUMÉ. Il existe peu d'analyses détaillées pour la majorité des sites qui composent les données archéologiques de l'expédition du passage du Nord-Ouest de Franklin en 1845. Dans ce document, nous présentons les résultats de nouvelles enquêtes relatives à un site inuit (NgLj-9) situé à la baie d'Erebus de l'île King William, au Nunavut. Ce site renferme du matériel dérivé de l'expédition Franklin en 1845. L'histoire complexe de l'origine et de l'utilisation des artefacts trouvés au site de même que son lien avec les autres sites et événements liés à l'expédition Franklin sont révélés par le biais de l'analyse et de l'intégration des données archéologiques, historiques et orales historiques.

Mots clés : expédition Franklin; île King William; archéologie; cuisinières portatives; Inuit

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INTRODUCTION

Among the items loaded on board HMS *Erebus* and HMS *Terror* in early 1845, as they were being prepared for the voyage that would hopefully see them be the first ships to traverse a Northwest Passage, were a number of small cooking stoves, designed to be used in the ships' boats or by shore parties. Manufactured of sheet metal and cast iron, they were clearly designed to be both compact and efficient. Three years later, in April 1848, with the ships having been locked in the ice far out in Victoria Strait for 19 months, the 105 surviving officers and crew finally deserted both ships and made their way across 28 km of sea ice to the northwest shore of King William Island, where they established and briefly occupied a staging camp for their planned escape from the Arctic via the Back River, nearly 400 km to the south. They took at least four of these stoves ashore with them, and the subsequent fate of those stoves over the next four decades was a complex one, with at least two of them making their way back to Britain, and parts of two more ending up at what its discoverers would dub the "Cast Iron Site." Those stoves and that site represent a particularly fascinating case study of how some of the material culture carried ashore in April 1848 went through a complex series of cultural transforms (Schiffer, 1987) at the hands of the Franklin crew, Inuit, and then both 19th and 20th century Franklin searchers. Their disposition also provides insights into the decisions made by the Franklin expedition survivors as they made their escape attempt.

The recent discoveries of the *Erebus* and *Terror* shipwrecks promise new and interesting insights into the 1845 Franklin expedition, but most of what we presently know about the expedition's last stages still comes from sites on land created after the crews deserted the ships. In recent years, such sites on King William Island and on Adelaide Peninsula have been re-examined to obtain previously undocumented data and to better understand the specific contexts within which the sites are connected to the Franklin expedition. A focal point of this research on King William Island has been Erebus Bay, which extends along the southern half of the west shore of the island (Stenton, 2014a; Stenton et al., 2015, 2017; Stenton and Park, 2017; Thacher, 2018). The importance of Erebus Bay to investigations of the Franklin expedition first emerged in 1859, following the discovery on its south shore of a ship's boat containing supplies, equipment, and the skeletal remains of two members of the expedition (Hobson, 1859; McClintock, 1859; Stenton, 2014a). A second Franklin expedition boat, containing similar items and a considerably larger number of human skeletal remains, was discovered nearby in 1861 (Hall, 1869).

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Based on these discoveries, Erebus Bay has been the subject of archaeological investigations since the early 1980s (Beattie, 1983; Ranford, 1994, 1995; Bertulli, 1995; MacDonald, 1996), and approximately one-quarter of the 40 recorded sites there are directly or indirectly linked with the Franklin expedition. Collectively, these sites have yielded more than 1700 expedition artifacts and the largest collection of human skeletal remains of expedition personnel ever found, totalling more than 500 bones representing a minimum of 21 individuals (Beattie, 1983; Keenleyside et al., 1997; Stenton et al., 2015).

Recent investigations at Erebus Bay have focussed primarily on two Franklin expedition sites, the so-called "boat places" (NgLj-2, NgLj-3), and two nearby Inuit sites (NgLj-8, NgLj-9). This paper presents findings from one of the Inuit sites, NgLj-9, sometimes referred to as the "Cast Iron site" for reasons that will become evident. We begin by presenting an overview of the discoveries and archaeological investigations at NgLj-9, including a detailed description of the artifact assemblage. Historical and oral historical sources are then used to trace the origin of the artifacts and the circumstances leading to their deposition in sites at Erebus Bay. The paper concludes with a discussion of the broader relevance and importance of portable stoves as an equipment category in the context of the April 1848 attempt by the surviving members of the Franklin expedition to reach the Back River.

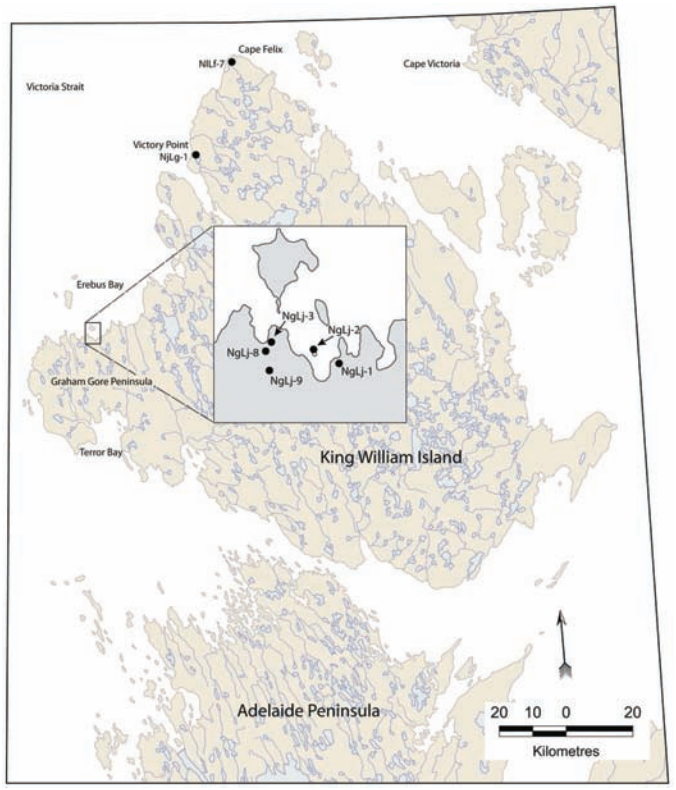

FIG. 1. Map of King William Island showing site locations mentioned in the text. Base map courtesy of Department of Culture and Heritage, Government of Nunavut.

SITE NgLj-9

NgLj-9 (Fig. 1) was identified in 1993 and first documented in 1994 and 1995 (Ranford, 1994:5, 1995:4, Appendix C; MacDonald, 1996:5). It consists of two features located approximately 1.4 km inland (south) from the southern shore of Erebus Bay, on the southwest coast of King William Island (MacDonald, 1996). Feature 2 appears to have been a tent ring, near which several small pieces of wood, one with a square nail hole, were observed when it was first investigated (MacDonald, 1996). Feature 1 was a well-defined tent ring, consisting of a circular arrangement of tightly fitted boulders around which were placed approximately a dozen larger rocks. The positions of these rocks suggest they might have been used to secure guy lines. A gap in the boulders on the west side of the feature may have functioned as the entrance. Several wood fragments were observed along its southwest exterior, but when it was first investigated the most common and distinctive material found was cast iron. In 1994, 19 pieces of cast iron were found along the inner perimeter of the southeast and southwest sides of Feature 1 (Ranford, 1995:4). Eleven pieces were found on the surface of the limestone shingle, and eight pieces were located beneath a large, flat rock situated just inside the west side of the feature's entrance (Ranford, 1995:4). Collection of artifacts had not been authorized in 1994; consequently, the pieces of cast iron were only photographed and sketched (Ranford, 1995: Appendix B). Individual artifacts were not described in detail, but the assemblage was inferred to be pieces from a European ship's stove (Ranford, 1994:4; MacDonald, 1996:7).

The next documented investigation of NgLj-9 was in 2013, when it was recorded in greater detail, and the cast iron assemblage was recovered for analysis (Stenton, 2014b). Feature 1 measures 2.6 × 2.3 m and the gap functioning as the presumed entrance is 90 cm wide. The large, flat rock beneath which pieces of cast iron had been found in 1994 measures 50 × 30 cm. Feature 2, situated 60 m south-southwest of Feature 1, is constructed of widely spaced rocks forming a loose circle, measuring 3.4 × 2.5 m (Figs. 2 and 3).

Investigation of Feature 1 in 2013 expanded the inventory of cast iron artifacts to 32 items; these are discussed in detail below. One piece of surface cast iron recorded in Feature 1 in 1994 (Ranford, 1995: Appendix C, Item 10) was no longer present in 2013; the timing and circumstances of its disappearance in the intervening 19 years are unknown.

Ten small pieces of weathered wood were recovered from the surface of a 1 × 2 m area on the southwest exterior of the feature. No collections were made from Feature 2 in 2013 and the wood with the nail hole reported in 1994 was not seen. NgLj-9 was revisited again in 2016 to map Feature 1 using LiDAR. Seven additional small artifacts (e.g., copper tacks, roves, lead shot) were recovered from

FIG. 2. Feature 2, NgLj-9, showing locations of surface and subsurface concentrations of cast iron objects.

the interior of the feature where they had fallen between the cracks in the limestone shingle. A modern steel bobby pin was also found beneath a small flat stone on the west exterior side of the feature. Investigation of Feature 2 in 2016 yielded eight small metal artifacts, including copper roves and square nail fragments found between and beneath small flat rocks.

The attributes of Features 1 and 2 suggest that they reflect warm season, short-term Inuit occupations. Although they contain few specimens, the artifact assemblages are uniform in that they contain only objects of categories (e.g., nails, roves, stove parts) and materials that are identical (e.g., iron, copper) or similar (e.g., wood) to objects found at Franklin expedition sites. To date, no Inuit artifacts have been found at NgLj-9. The proximity of NgLj-9 to Franklin expedition boat sites NgLj-2 and NgLj-3, less than 3 km away and where large quantities of identical artifact and material categories have been found, suggests that the items in the NgLj-9 feature assemblages originated from one or both of these sites.

A temporal association between the occupations of Features 1 and 2 at NgLj-9 cannot be firmly established. As will be discussed, the Feature 1 cast iron assemblage suggests an occupation post-dating 1879, long after the period of 1859–61 when the undisturbed Franklin expedition boat at NgLj-3 was first discovered (Hobson, 1859; McClintock, 1859; Stenton, 2014a), and when the first recorded account of Inuit visitation and their discovery of a second Franklin expedition boat nearby (NgLj-2) also apparently occurred (Hall, 1869). However, an earlier occupation of one or both features cannot be ruled out.

ARTIFACT SUMMARY

The types of artifacts found at the NgLj-9 site provide insights into the processes that brought them to this location. With the exception of the hairpin, which must be a very recent intrusion to the site, the artifacts recovered from NgLj-9 are of varieties well-represented at Franklin expedition sites at Erebus Bay and elsewhere on King William Island. Apart from the cast iron, the assemblage

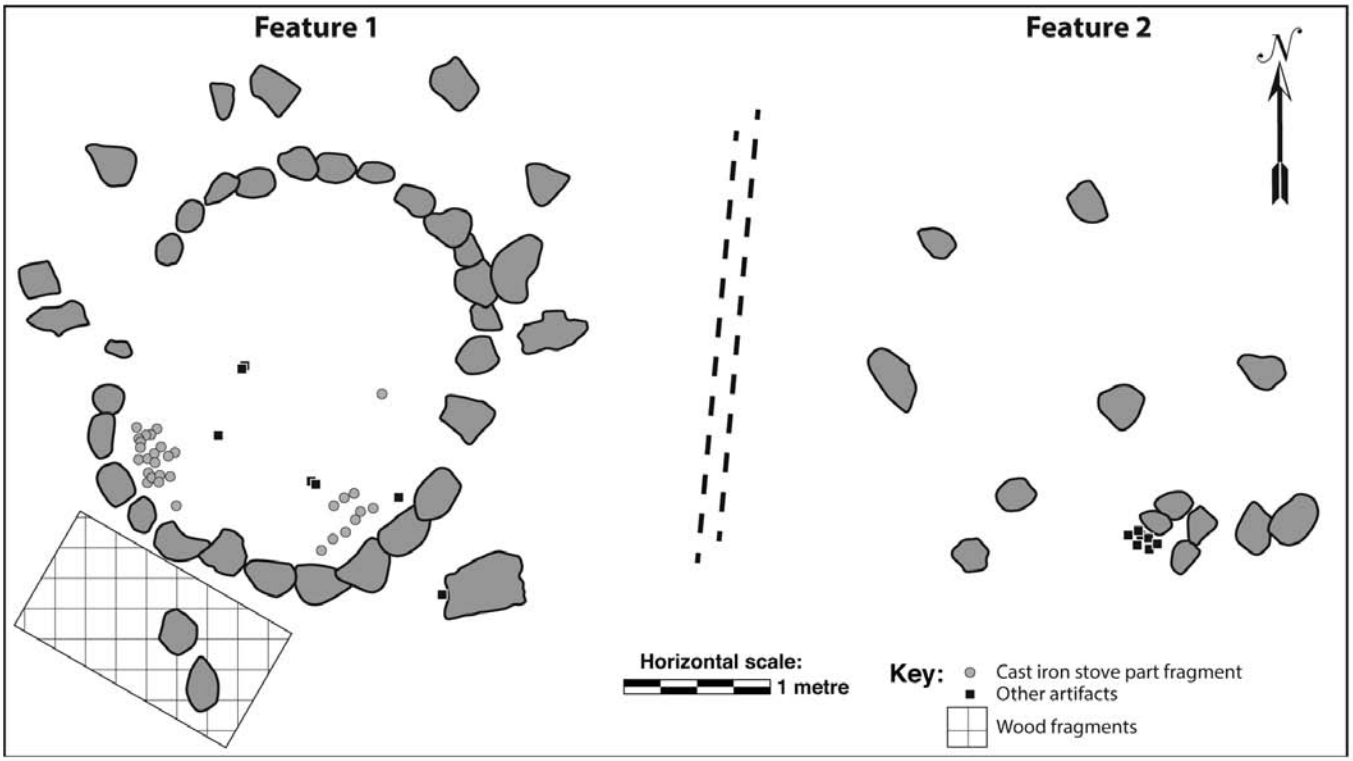

FIG. 3. Plan views and artifact distributions in Features 1 and 2, NgLj-9.

FIG. 4. Small copper and wood artifacts from NgLj-9. Feature 1: a) copper nail/spike head fragment, b) splayed square rove, c – d) copper tacks, e) sawn (?) wood fragment. Feature 2: f) square copper rove, g) round copper rove.

consists predominantly of copper and iron fasteners such as nails, roves, and tacks (Fig. 4). Most are incomplete and exhibit varying degrees of damage. The nails are bent and broken, and the roves are bent and, in one case, splayed. Their presence suggests the possibility that they had been extracted from the pieces of wood at NgLj-9. However, except for a small rectangular piece that might have been cut or sawn (Fig. 4e), none of the wood pieces retain attributes indicative of their possible function. A single lead shot was also found.

The cast iron found at NgLj-9 consists of 32 pieces recovered from within Feature 1. Eleven pieces were found on the surface, and 21 pieces were found beneath the limestone shingle. Most of the subsurface items were found beneath the large, flat rock situated just inside the west side of the presumed entrance to the feature and beneath smaller adjacent pieces of shingle.

Of the 32 iron objects, 28 have been confirmed as parts of two portable cast iron stoves. Of the four remaining items, one is a small unidentifiable fragment while the others are a small iron knee brace, a broken iron rove or washer, and the head of an iron rivet. Iron knee braces from ship's boats have been found at NgLj-3 and at NgLj-8, and they undoubtedly originated from the two Franklin expedition boats found at Erebus Bay in the 19th century (NgLj-2 and NgLj-3), both of which were later completely disassembled by Inuit (Hobson, 1859; Hall, 1869; Schwatka, 1879; Stenton and Park, 2017; Thacher, 2018). The NgLj-9 example is almost certainly from one of the same boats. It is broken at the first bolt hole on the arm and the second bolt hole on the body, but it appears to have been a small brace. Cut marks at the junction of the body and arm of the brace and at the bolt hole on the arm presumably reflect the dismantling strategy employed by Inuit, or subsequent

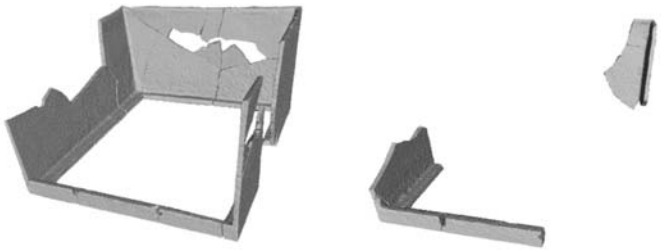

FIG. 5. 3D scans of reassembled stove liners from pieces recovered at NgLj-9 and NgLj-8.

efforts to modify the material for other purposes (Thacher, 2018).

Stove Artifacts

Before describing the NgLj-9 stove assemblage, it should be noted that three additional artifacts recovered from Franklin expedition sites near NgLj-9 and identified as stove parts are included in the present study, increasing the total number from 28 to 31. One of the three additional specimens is a flat piece of cast iron recovered from the interior surface of a tent ring at site NgLj-8, located 850 m north of NgLj-9. NgLj-8 was first recorded in 1995 (Ranford, 1995) and professionally documented in 2013 (Stenton, 2014b). The artifact (NgLj-8:53) is very similar to the pieces of flat cast iron found at NgLj-9 and is included in the present study because it was found to fit with two pieces from NgLj-9 (NgLj-9:5, NgLj-9:16).

Two other stove parts in the study were among a collection of Franklin expedition artifacts in the possession of Barry Ranford and found following his death in 1996. The collection was given to the Canadian Museum of History and subsequently transferred to the Government of Nunavut. The provenance of the artifacts is uncertain, but because southern Erebus Bay was the primary geographic focus of Ranford's investigations, they were provisionally catalogued by the Canadian Museum of History as originating from NgLj-2. Some have since been traced to other nearby Franklin sites (D.R. Stenton, unpubl. data), and we consider any of NgLj-1, 2, 3, 8, or 9 to be the probable sites from which the objects originated. One is a fragment of the back corner of the upper cast iron frame of a stove into which the copper boiler fit. The flange contains two rivets, one on each side; these were used to secure the boiler frame to the metal sides of the stove. The second is a hinge knuckle and strap piece. The key attributes of this item are indistinguishable from one found at NgLj-9 (NgLj-9: 21).

Twenty-five of the 31 stove parts from NgLj-9 (n = 28), NgLj-8 (n = 1), and the Ranford collection (n = 2) could be refitted, and when reassembled they were identified as portions of the interior liners of two stoves (Fig. 5). Nineteen pieces are from one nearly complete liner, and six pieces assembled to form the left front and right back corners of a second liner. Both liners appear to be of the

TABLE 1. Summary of events leading to the presence of cast iron stove parts at NgLj-8 and NgLj-9, Erebus Bay, King William Island.

Date	Event
1845	Portable stoves loaded on HMS *Erebus* and HMS *Terror*.
April 1848	Portable cast iron stoves and accessories transported from HMS *Erebus* and HMS *Terror* to NjLg-1 ("Crozier's Camp").
May 1859	Four cast iron stoves and accessories found at NjLg-1 by McClintock search expedition.
ca. 1863	Cast iron stove parts and accessories seen by Inuit at or near NjLg-1.
July 1879	Four cast iron stoves and accessories found at NjLg-1 and removed by Schwatka search expedition.
July 1879	Two of four cast iron stoves removed from NjLg-1 by Schwatka search expedition abandoned at Erebus Bay (NgLj-3).
1881	Two cast iron stoves and accessories removed from NjLg-1 by Schwatka search expedition and given to British Admiralty.
Unknown	Cast iron stoves abandoned by Schwatka search expedition at NgLj-3 in 1879 removed, dismantled, and repurposed by Inuit.
1993	Parts from two portable cast iron stoves found at NgLj-8 and NgLj-9.

same type and size, with the near-intact example measuring 32 × 32 cm at the top, tapering slightly at the bottom to 29 × 30 cm, and 17 cm high. The thickness of the cast iron varies, but averages 7.9 mm with a range of 6.4 – 10 mm. The total weight of the nearly complete liner is 6.3 kg.

The six remaining stove pieces are exterior parts consisting of the two Ranford collection specimens, a short section of the edge from one of the sides of the boiler frame, a hinge knuckle and strap piece, a barrel hinge pin, and a square head, threaded bolt. Photographs of cast iron item #10, recorded in 1994 but missing in 2013, show it to have been a section of the edge of the boiler frame. No parts of the thinner, flat metal that formed the sides of the stoves have been found at NgLj-9. This might reflect a higher value for stove materials having inherent utility for specific purposes (e.g., thin, flat metal for edged implements such as knives or scrapers) and being potentially simpler for Inuit to modify than were the thicker and heavier parts.

SOURCE OF THE NgLj-9 STOVES

With certain exceptions noted (i.e., knee brace, rove, rivet), the 1994 investigation of NgLj-9 correctly identified the pieces of cast iron as Franklin expedition stove fragments (MacDonald, 1996:11), but the circumstances under which they might have arrived at the site were not discussed. The close proximity of two Franklin expedition boat sites (NgLj-2, NgLj-3), both containing large quantities of equipment and supplies, provides an uncomplicated and plausible scenario: that the stoves were among the items found at one of the boat sites from which they were removed by Inuit and then modified at NgLj-9. No stoves are listed, however, in the detailed inventory of items found in 1859 in and around the undisturbed boat at NgLj-3 (McClintock, 1859; Hobson, 1859). Both Hobson and McClintock did report the stoves they observed elsewhere (see below), so their failure to mention any at NgLj-3 suggests that none were present. A much less complete inventory exists for NgLj-2, and while a cooking or fireplace was reported at the site, a stove was not among the brief list of items (primarily cutlery and dishes) described by Inuit who first discovered the site in 1861 (Hall, 1869:112). If the stoves were not part of the equipment inventory of these two Franklin expedition boats abandoned in the spring of 1848 just a few hundred metres from NgLj-9, where did they come from?

The answer lies in the details of documented historical events that preceded the arrival of the Franklin expedition survivors at Erebus Bay (Table 1). Weeks earlier, on 25 April 1848, the 105 surviving officers and crew of HMS *Erebus* and HMS *Terror*, under the command of Captain Crozier, assembled and briefly camped on the northwest shore of King William Island, a few kilometres south of Victory Point (Cyriax, 1939). Before departing southward on 26 April, they divested themselves of gear that they either did not want or could not transport farther. Eleven years later, the McClintock search expedition discovered the campsite, where they found a large quantity and variety of abandoned clothing, gear, and equipment (Hobson, 1859; McClintock, 1859; Stenton, 2014a). Their site inventory included "4 sets of heavy boats' coppers" (Hobson, 1859; Stenton, 2014a:515), described by McClintock as "four heavy sets of boat's cooking stoves" and "four sets of boat's cooking apparatus complete" (McClintock, 1859:304, 368). Several years later, around 1863, an Inuk named Su-pung-er also saw an object thought to be a stove at or near the Crozier camp (Hall, 1866; Gross and Taichman, 2017) while searching parts of the northwest coast of King William Island for items from the Franklin expedition:

> Su-pung-er [sic] has just told us that when he and his uncle were on Ki-ik-tung (as the natives denominate King William's Land) they saw something that was a great curiosity to them, and they could not make out what it was for. From his description of it, Too-koo-li-too suggests that it was a cook stove—it was very heavy and all iron. It had on one side or end a great many small pieces of iron close enough together to make it look something like spears—fish spears. By his language and symbolizing, these pieces of iron can be none other than a grate in the stove for burning hard coal. There were several heavy Oot-koo-eeks (kettles) with handles or bales.
>
> The place where this curiosity (stove) was, was close by the large tu-pik (tent). The tent they found was close by the coast above Back's Bay, not far from Victory Point as Su-pung-er [sic] has shown on the chart that I placed before him.
>
> (Hall, 1866: Journal Entry 4 June 1866)

None of the stoves or accessories described by these searchers were removed by them. In 1859, Hobson and McClintock each took several small and easily portable relics from the site (McClintock, 1859:Appendix III), but the stoves and accessories were not among the items taken, possibly because of their size and weight and because, as impersonal and utilitarian objects, they held little interest or importance. Similar reasons appear to have influenced Su-pung-er's actions; when asked why he did not take the kettles, he responded that they were very heavy, and that they had already acquired as many items as could be carried (Hall, 1866).

The next recorded search of the Crozier camp was conducted in June 1879 by Frederick Schwatka, who reported finding four "rust eaten blubber stoves" (Schwatka, 1879:137), as well as pots and other cooking accessories (Gilder, 1881:124; Klutschak, 1987:84). A published illustration of relics found at the Crozier camp by the Schwatka expedition includes several objects whose sizes and shapes suggest the possibility that they are the stoves he described (Anon., 1881; Schwatka, 1965:81). Based on their number and descriptions, we conclude that the stoves and accessories found at the site in 1879 were the same ones earlier described by Hobson, McClintock, and possibly also by Su-pung-er—although whether Su-pung-er was at the Crozier camp, or a nearby location, and saw more than one stove is unclear.

Unlike his predecessors, Schwatka was not constrained by the size and weight of Franklin expedition relics as evidenced by his collection of large and heavy items, including three oak sledge runners, measuring between 2 and 4 m long, and a 1.8 m section of the stem of an 8.5 m ship's boat found at Erebus Bay (Schwatka, 1965; Stenton and Park, 2017:210). His reasons for doing so are unstated, but in addition to other items, Schwatka removed at least three (the evidence from NgLj-9 indicates all four) of the four stoves from the Crozier camp, and at least one (other records indicate several) of the kettles (Klutschak, 1987:155).

That at least three of the stoves were taken is confirmed in the account of events that subsequently occurred at Erebus Bay in late July 1879 (Gilder, 1881; Schwatka, 1965; Klutschak, 1987). The sudden and rapid breakup of the sea ice in Erebus Bay on 24 July 1879 forced Schwatka to cease conveying equipment and supplies by sledge on the sea ice bordering the west shore of King William Island. To reach Terror Bay and points beyond on their return journey, Schwatka's party instead decided to cross Graham Gore Peninsula to the head of Terror Bay on foot. This development required not only that they carry all their gear and provisions, but also all the Franklin expedition relics that they had amassed by that date. The overland trip commenced on 25 July (Klutschak, 1987:98) and it was a lengthy and labour intensive exercise that required 11 days to traverse the approximately 22 km from Erebus Bay to Terror Bay. Gilder's (1881:159) account of the journey includes a specific reference to the stoves and to the decision to abandon at least one of them at Erebus Bay:

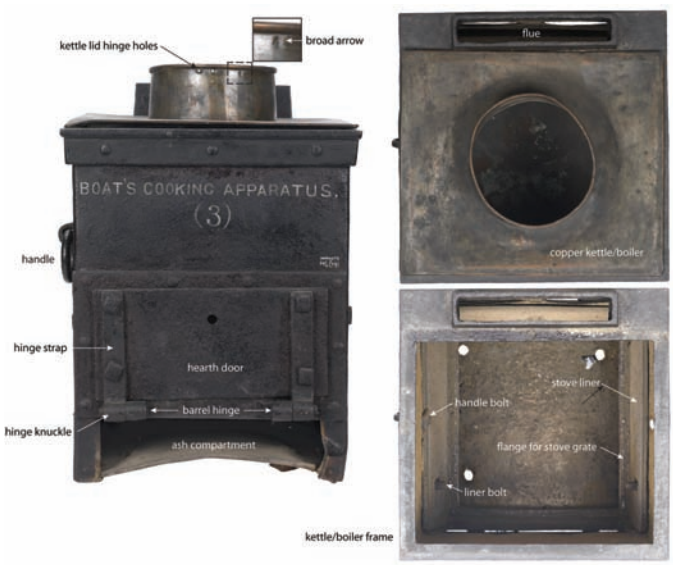

FIG. 6. Portable cast iron stove AAA4275, National Maritime Museum. Photo credit: National Maritime Museum, Greenwich, London.

> It was necessary to make two and often three, trips between camps before everything was brought up, consequently only two of the Franklin stoves were brought along. The largest and heaviest of these Henry took in charge, and carried all the way overstrapped to his back like a knapsack.

Confirmation that two stoves were taken back to the United States and that they were collected from the Franklin expedition site near Victory Point is found in Gilder's general remarks about the relics that the Schwatka expedition had returned with: "There were also two sheet-iron stoves from the first camp on King William Land ..." (Gilder, 1881:xii). Gilder stated that the stoves were offered to and accepted by the British Admiralty and accessioned at the Royal Navy Museum in Greenwich Hospital and at the United Service Institution in London (Gilder, 1881:xii). The Schwatka collections are currently held by the National Maritime Museum in Greenwich, but the catalogue of those collections does not include any stoves. However, the National Maritime Museum's polar equipment and relics collection does include item AAA4275, described in the catalogue as a portable iron cooking stove and "possibly a relic of an Arctic expedition" (https://collections.rmg.co.uk/collections/objects/256424.html).

The secure identification of the cast iron assemblage from NgLj-9, the specimens from NgLj-8, and the Ranford collection as parts of portable cooking stoves is based on comparison of those artifacts with AAA4275, which is made of cast and sheet iron and measures 52 cm high, 35 cm wide, 51 cm deep, and weighs 29 kg (E. Beech, pers. comm. 2017) (Fig. 6). Its basic components are a cast iron top frame incorporating a rectangular, slightly tapered flue. The frame provides structural support and serves as a receptacle for the copper boiler, a sealed container within which to cook (boil) food. The boiler has a round pipe-like opening that tapers

FIG. 7. Comparison of reassembled stove parts from NgLj-9 and NgLj-8 with stove AAA4275. Photo credit: National Maritime Museum, Greenwich, London.

slightly in height from back to front. Two holes on the back of the pipe presumably held a hinge to attach a lid, and a mark stamped in the copper to the right of the holes appears to be a Royal Navy broad arrow. The stove front has a rectangular cast iron door, secured by barrel hinges and straps. Below the door is a compartment that likely held a metal tray to collect the ashes for removal. The exterior of the stove is formed from a single piece of thin, flat iron that is bent at right angles to form the four sides and is riveted at the rear right corner and around the bottom edge. On each side of the stove is an iron ring with a round, single post backplate. The backplates are bolted through the sides of the stove just above the top edge of the inner liner and secured with a nut. The rings would serve as handles for carrying the stove and as a means of securely lashing it down when required (e.g., when transporting it by boat). The stove interior contains a cast iron liner held in place by three threaded bolts: one in the centre of the back of the liner, and one on each side near the front. The stove grate (missing) was held in place by a narrow flange at the bottom of the liner.

Comparison of the NgLj-9 assemblage with photographs of stove AAA4275 revealed striking similarities, suggesting that the Erebus Bay stoves were very similar, if not identical, to AAA4275 (Fig. 7). The similarities raise the possibility that 1) AAA4275 is in fact one of the two Franklin expedition stoves removed from the Crozier camp by the Schwatka search expedition in 1879 and subsequently given to the Royal Navy Museum and, more importantly, 2) the stove parts found at NgLj-9 and nearby sites are from the two other stoves also collected by Schwatka from the Crozier camp, but discarded on 25 July 1879 at Erebus Bay as he prepared to travel overland to Terror Bay. Historical evidence suggests that these two stoves were left at or very near the site of Schwatka's 63rd encampment, which expedition records place a short distance west of the grave site at NgLj-3. Given their weight, and the difficult logistics associated with the overland journey to Terror Bay, we consider it unlikely that the Schwatka team themselves carried the two stoves the approximately 1.6 km from the Schwatka camp to the NgLj-9 location before abandoning them. It seems more likely that the intact stoves were subsequently discovered at Schwatka's abandoned campsite by Inuit revisiting the Erebus Bay boat sites for useful materials (Thacher, 2018), who then made or re-used the NgLj-9 and NgLj-8 tent rings. The Inuit reduced the stoves to useful parts and left behind the cast iron fragments, perhaps to be collected on a future visit that never happened. Thus, after having been transported to the Arctic in 1845 aboard *Erebus* and *Terror*, moved from the ships to NjLg-1 ("Crozier's Camp") in April 1848, then from NjLg-1 to near NgLj-3 in July 1879, and then to NgLj-9 perhaps in the 1880s, the remains of these two stoves may have lain undisturbed for more than a century, when one fragment that was observed in 1994 disappeared between then and 2013, completing the complex life history of these stoves.

The Schwatka expedition is the only Franklin search expedition known to have collected stoves from the Crozier camp, to have discarded some of them at Erebus Bay, and to have turned two others over to the British Admiralty. That some of the stoves and accessories collected by Schwatka from the Crozier camp made it to Britain is not in question; they were exhibited as part of the Royal Navy Exhibition in Chelsea in May 1891 and described in the Official Catalogue and Guide as: "Found at Irving Bay—Tin Cover. Stove and Kettle. Cooking Stoves and Kettles" (Anon., 1891:6). Irving Bay is the name given by Schwatka for the slight indentation in the coast of King William Island between Victory Point and Cape Jane Franklin (Schwatka, 1965:85). Stove AAA4275 has not, however, been confirmed within the Franklin expedition context (J. Michell, pers. comm. 2018), and future archival research is needed to verify our inference that it might be one of the stoves collected by the Schwatka expedition. The results of preliminary archival research indicate that the history of the two stoves following their return to Britain was also complex and involved multiple institutions (e.g., McClintock, 1881:67). This complex history is a contributing factor to current uncertainty about the provenance of AAA4275 (J. Michell, pers. comm. 2019).

USE OF PORTABLE STOVES—ESCAPE TOWARDS BACK RIVER

Having established that the portable stoves from which parts were found in archaeological sites at Erebus Bay were transported there not by the Franklin expedition survivors themselves, but decades later by the Schwatka search party and by Inuit investigating the boat sites for useful materials, one question of obvious interest is whether the Franklin survivors abandoned all of the stoves they brought ashore from the ships at NjLg-1, or whether they took other stoves with them, like these or of another design. Information concerning the use of portable stoves during the Franklin crew's journey from NjLg-1 to the Back River is quite limited. Rae (1855:251) included a reference to "kettles" in his reporting of Inuit observations interpreted as incidences of cannibalism at Franklin expedition sites, but specific site locations were apparently not provided, possibly because none of Rae's informants had visited any of the sites. It is also unclear if Rae's use of the word "kettles" reflects

FIG. 8. Comparison of modified copper kettle from portable stove found in 1859 at Cape Felix (NlLf-7) with stove AAA4275. Photo credits: National Maritime Museum, Greenwich, London.

details provided by Inuit or his writing style. More detailed information about portable stoves is found in the journals of Anderson and Stewart's 1855 overland search (Barr, 1999). On 30 July 1855, they encountered Inuit camped near the rapids at the eastern outlet of Franklin Lake and noted that among their possessions were "copper and tin kettles, both round and of a square form, longer than broad, evidently belonging to cooking stoves" (Barr, 1999:130). On 13 August, on their return trip, they revisited this same group and recorded additional details about some of the items: "tin boilers about 18 in. long by 12 in. broad; an oval frying pan; … 7 copper boilers and tin soup tureens …" (Barr, 1999:138). These items were assumed to have been acquired from a ship's boat believed to have been dismantled on Montreal Island, approximately 100 km north of the Inuit camp (Barr, 1999:133).

Except for Su-pung-er's report, no descriptions of stoves were found in other 19th century Inuit accounts. As earlier noted, Inuit described a cooking or fireplace at site NgLj-2 (Hall, 1869:112), but no stoves were reported there or at NgLj-3, both places where ship's boats containing large quantities of equipment and supplies were discovered (Hobson, 1859; Hall, 1869; Schwatka, 1879, 1881; Stenton and Park, 2017). The apparent absence of stoves at these two sites is noteworthy given that the remains of 21 expedition personnel have also been found at and near these sites (Keenleyside et al., 1997; Stenton et al., 2015). Similarly, Inuit descriptions of the mass casualty site at Terror Bay, while not presumed to be exhaustive, contain no mention of stoves or accessories, nor are there references to stoves in Inuit and Euro-American records concerning Starvation Cove (Hall, 1869; Schwatka, 1965). As implied by Su-pung-er's account, heavy, cast iron stoves were objects unfamiliar to Inuit and had any been observed at these sites or in other locations, it seems unusual for them not to have been mentioned.

Archaeological evidence for the use of portable stoves by Franklin expedition personnel other than at NjLg-1 is also limited. Two artifacts found there in 1982 were tentatively identified as an iron stove lid and a possible stovepipe fragment (Beattie, 1983), but later investigations there and at other Franklin expedition sites have not produced artifacts identified as stoves or parts thereof (e.g., Bertulli, 1995; Kowal, 1996; Stenton, 2017; Stenton and Park, 2017). The only other Franklin expedition site where a portable stove has been found is near Cape Felix (NlLf-7), at the northern tip of King William Island. It was found in 1859 by the McClintock expedition and is in the collection of the National Maritime Museum (NMM AAA2127) (Hobson, 1859; McClintock, 1859). Analysis of the NgLj-9 stove assemblage allows additional observations about the Cape Felix specimen. Evidently handmade, the small, copper stove kit (AAA2127.1-3; **https://collections.rmg.co.uk/collections/objects/2126.html**) consists of a burner compartment fitted with a hinged door. Found with the stove was a deep, rectangular, copper container measuring 15 × 34.5 × 29.5 cm that presumably functioned as the receptacle within which to cook food. Comparison of the photographs of container AAA2127.3 with stove AAA4275 indicates clearly that the container is a copper kettle, identical in basic form to that from stove AAA4275, with the exception that the top has been removed (Fig. 8). The discovery at Cape Felix of a modified portable stove part is interesting when considered in the context of the availability of factory-made stoves and with few obstacles to transporting them to and from Cape Felix. If removal of the top of the kettle found at Cape Felix was related to food preparation and not for other purposes (e.g., a pressing need for a piece of copper), it seems unusual for a kettle purpose-built for a portable cast iron stove to have been modified in this manner. The complete removal of the top of the kettle would presumably have reduced its efficiency in terms of heat retention and, by extension, fuel conservation.

The Franklin site at Cape Felix is presumed to predate the April 1848 desertion of *Erebus* and *Terror*, and the frequency of occupation and number of personnel present at any one time is unknown. Hobson speculated that the three collapsed tents he observed at the site in 1859, while small, might have accommodated as many as 10–12 men (Hobson, 1859; Stenton, 2014a:514), and the small copper stove found at the site seems inadequate to support a group of that size. Hobson also described three fireplaces at the site around which were found used and unused matches, ptarmigan feathers, salt meat bones, and very small fragments of burnt wood. Thus, and although Hobson speculated that wood for fuel was at a premium (Hobson, 1859; Stenton, 2014a:514), open fires were evidently also used at the Cape Felix camp. Further research is needed to clarify the circumstances underlying the use of manufactured and improvised portable stoves and open fires at NlLf-7.

DISCUSSION

The fact that portable stoves were used at Cape Felix and were brought from the ships to the staging camp

for the retreat to the Back River is unsurprising, but the abandonment of four of them at that camp, combined with the absence of evidence for stove use at other locations such as Erebus Bay, Terror Bay, and Starvation Cove is intriguing. Woodman (1991:116) speculated that the stoves found at NjLg-1 might have been left there not because they were an encumbrance or superfluous, but by design based on the premise that a return to the site was anticipated. No convincing evidence for this scenario has yet been found. Historical, oral historical, and archaeological data suggest that stoves were not present at either of the two Franklin boat sites at Erebus Bay nor, based on limited available evidence, at the Terror Bay camp or the boat site at Starvation Cove. This raises interesting questions about issues fundamental to the success of the attempt to reach the Back River. For example, how was food being prepared for more than 100 men engaged in strenuous physical activity under extreme environmental conditions? And how was the risk and occurrence of hypothermia being mitigated during that journey? In both contexts, portable stoves were arguably vitally important.

Food Preparation

The quantities and types of food provisions remaining as of April 1848 are unknown, but they would have been apportioned in some manner amongst the teams of men assigned to each of the boats being hauled on the sledges. These supplies would have been supplemented whenever possible by hunting; however, 19th-century observations (Hobson, 1859; McClintock, 1859) and 20th-century land use studies (Freeman, 1976; Riewe, 1992) indicate the availability of game on the west coast of King William Island at that time of year would have been quite limited and thus unreliable. Upon reaching the south shore of the island, the opportunities for obtaining fresh food would be expected to have improved, particularly during July and August. For example, Inuit who encountered a group of Franklin's men near Washington Bay reported that the men were hunting caribou, ducks, and geese, and cooking them using not wood for fuel, but a "fine, light moss" (Hall, 1869: Diary 24). The report of the encounter contains no mention of stoves, and because the meeting was thought to have occurred in July, the food was presumably cooked over an open fire. It is questionable, however, whether the use of open fires would have been feasible or sufficient during the initial weeks of the journey when travelling under winter conditions, which might have required substantial quantities of wood (or coal) for fuel. Assuming that the men were not subsisting entirely on cold rations, it is suggested that the equipment inventory for the journey to the Back River would have included stoves and fuel needed for food preparation.

Hypothermia

For ships overwintering in the Arctic, controlling temperature and heat distribution to reduce condensation and for the general health, comfort, and safety of the men were crucially important matters. For the 1845 Franklin Northwest Passage expedition, *Erebus* and *Terror* were fitted with a centralized warm air heating and ventilation system invented by Charles Sylvester (Battersby and Carney, 2011:200). If needed, the main heating system could be supplemented through strategic placement of small portable stoves that were standard equipment for shore parties conducting reconnaissance or scientific observations (e.g., Parry, 1824:124, 136; Ross, 1835:680–681).

The journey to the Back River commenced on 26 April, under winter conditions and, undoubtedly, sub-zero temperatures. For the health and safety of the men, portable stoves would have served a vital function as heat sources. Weather conditions in the spring of 1848 are unknown, but the experiences of searchers who traveled through the general area at the same time of year as Franklin's men were en route to the Back River are instructive concerning their potential severity. In April 1848, two sledging parties led by McClintock and his second-in-command, William Hobson, traveled south from Bellot Strait en route to King William Island. McClintock (1859:266–267) reported temperatures hovering around −34°C accompanied by strong winds, bright sun, and snow glare. Despite wearing protective eyewear,

> almost all suffered great inconvenience and considerable pain from inflamed eyes. Our faces were blistered, lips and hands cracked, never were men more disfigured by the combined effects of bright sun and bitterly cold winds; fortunately no serious frost-bites occurred, but frost-bitten faces and fingers were universal.
>
> (McClintock, 1859:248)

McClintock's and Hobson's search parties separated on 28 April 1859 at Cape Victoria, on the west coast of Boothia Peninsula, and as he proceeded south along the east side of King William Island during the first two weeks of May, McClintock (1859:267) reported fluctuating temperatures, blizzards, heavy snowfall and generally poor weather: "We have not had a single clear day since the 1st of the month." On McClintock's orders, Hobson proceeded south along the west coast of King William Island and in his report to McClintock he summarized the weather conditions his party experienced during the month of May as follows:

> We left King William Island on the 31st of May, after having been a month on its most inhospitable coast. In no part of the world have I ever experienced such a continuation of bad weather. From the 8th, the day we left Cape Franklin, to this date I scarcely saw the sun. It snowed almost incessantly. The wind held almost continuously from the NW varying in force from a strong breeze to a hard gale. The force of the wind was generally sufficient to raise snow drift.
>
> (Hobson, 1859; Stenton, 2014a:518)

Twenty years later, Frederick Schwatka's account of weather conditions experienced in May 1879, while en route to King William Island following the course of the Hayes River, echo those of Hobson and McClintock. On 31 May 1879 while encamped at Barrow Inlet, he summarized the month's weather: "The day was a very disagreeable one interspersed with driving snow squalls and my journal of that date records that 'thus ends May with not one single solitary decent day in it; a perfectly continuous storm.'" (Schwatka, 1879:129).

These accounts offer a sense of what the general weather conditions confronted by Franklin expedition personnel might have been like between late April and early June of 1848, during the initial stage of their retreat to the Back River. For men already in poor health, traveling under conditions similar to those experienced by the McClintock and Schwatka expeditions, the risk of hypothermia would have exacerbated an already extremely arduous and dangerous journey. Although hypothermia has garnered little attention, possibly because it is widely assumed to have occurred and has been overshadowed by emphases on other causes of morbidity and mortality (e.g., scurvy, lead poisoning, tuberculosis) (Park and Stenton, 2019), the risk of hypothermia could not have been a trivial consideration during the retreat to the Back River and particularly during the initial weeks of the journey. For example, at Erebus Bay, approximately 75 km south of the Crozier camp, 20% of the men who had set out for the Back River perished for reasons that remain unclear (Stenton et al., 2017). They would have been en route to Erebus Bay in May, and if weather conditions at the time were comparable to those recorded by search expeditions between 1859 and 1879, the debilitating effects of hypothermia cannot be excluded as a contributing factor in the large number of fatalities. In that context, portable stoves would have served a crucial role not only with respect to food preparation, but also in mitigating the effects of exposure to sub-zero temperatures by providing sources of heat within enclosed spaces (i.e., tents), and as a means of drying clothes and footwear. Under inclement weather conditions, the stoves offered an additional advantage of being easier to light and to control than, for example, an open fire.

CONCLUSION

The cast iron stove fragments from NgLj-9 provide a lens through which to connect and to better understand the context of certain events that form part of the complex archaeological record of the Franklin expedition. The site uniquely links an important equipment category with the desertion of HMS *Erebus* and HMS *Terror* in April 1848, with issues related to food, health, and safety during the journey to the Back River, with the search expeditions of 1859 and 1879, and the acquisition and modification of expedition materials by Inuit.

Prior to the commencement in the 1980s of formal investigations, archaeological sites associated with the Franklin expedition had undergone modification by natural processes and by human interventions that included excavation, dismantling, rebuilding, and adding of site features, and the displacement and removal of artifacts and human remains. Despite the transformations in material content and context, the sites are a critical evidentiary component of reconstructions and interpretations of events that occurred during the Franklin expedition. With few exceptions (e.g., Beattie and Savelle, 1983; Bertulli, 1995), however, detailed site data have been a missing dimension of interpretations of many sites that figure prominently in reconstructions of expedition events. This lack of data has contributed to a reliance on other sources of information, some of which can provide clarity and, as we have argued elsewhere (Stenton and Park, 2017), in other cases can lead to questionable or incorrect interpretations.

As this study demonstrates, the collection and analysis of more detailed archaeological data from sites connected with the Franklin expedition, when combined with historical data, can help establish a broader range of evidence for interpretive purposes and help reduce explanatory errors arising from ambiguities in both data sets.

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