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Flaked Glass Artifacts from Nineteenth–Century Native Mounted Police Camps in Queensland, Australia

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Abstract

The invasion of the Australian continent by Europeans caused massive disruptions to Indigenous cultures and ways of life. The adoption of new raw materials, often for the production of "traditional" artifact forms, is one archaeological indicator of the changes wrought by "colonization." Two camp sites associated with the Queensland Native Mounted Police (NMP), a punitive paramilitary government force that operated through the latter half of the nineteenth century in the northeastern part of the continent, contain abundant flaked glass artifacts. These were undoubtedly manufactured by the Aboriginal men who were employed as troopers in the NMP, and/or their wives and children. Produced using traditional stone working techniques applied to a novel raw material, these artifacts are a tangible demonstration of the messy entanglements experienced by people living and working in this particular — and in some ways unique — cross-cultural context. For the Aboriginal troopers stationed in alien landscapes, the easy accessibility of glass afforded a means by which they could maintain cultural practices and exert independence from their employers, unencumbered by traditional normative behaviors.

Additional resources: An online database of interactive 3D models of a small selection of the artifacts used in this study can be viewed at https://une.pedestal3d.com/r/xKYxVSzTPU

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Introduction

The "Age of Discovery" and the subsequent British diaspora resulted in global cross-cultural interactions and change on an enormous scale (Gosden 2004; Torrence and Clarke 2000). Archaeologically, one key marker of those interactions is the changes that took place across the material culture repertoire. While such shifts may at times be visually obvious —the appearance of a new raw material or a new artifact morphology, for example — they are only one element of a much broader suite of transformations, most of which leave little or no archaeological trace. The challenge for archaeologists is therefore to consider what any material culture changes might reveal about other, less tangible cultural shifts, adaptations or adoptions (Flexner 2014; Gosden 2012; Lightfoot 1995; Silliman 2001; Voss 2015). When Europeans permanently arrived in Australia from 1788 onward, Indigenous peoples had already been constantly adapting to at least 60,000 years of changing environments and visitors from the north (Clarkson et al. 2017). As such, in some ways the British invasion was just another in a long line of events that challenged Aboriginal ingenuity and resilience. Unlike earlier sporadic visits from European mariners to isolated parts of the Australian coastline (e.g. Gibbs 2003; McNiven 2001; Ross and Travers 2013) or the carefully socially negotiated arrangements between Makassan trepang fishermen from Indonesia and *Bininj* (Aboriginal people) in Arnhem Land (e.g., Wesley et al. 2014), however, the internal 'frontier' that formed from the late eighteenth century onward heralded new forms of interaction on far greater and more devastating scales. 'Frontier wars' effected the usurping of Indigenous control over their traditional lands but also created a complex historical, cultural, and economic space within which Indigenous people and bodies were brought into a relatively narrow range of controlled relationships with Europeans. Various archaeological attempts to understand the nature and range of cross-cultural interactions within and across such complex spaces have labelled these zones variously as hinterlands (Panich and Schneider 2015), interspaces (Lightfoot et al. 2009), middle grounds (Dietler 2010), third spaces (Harrison 2014; Naum 2010), shatter zones (Ethridge and Shuck-Hall 2009), and borderlands (Romero 2002).

In Australia as elsewhere, Indigenous historical archaeologies have challenged the notion that Indigenous peoples were passive participants in such spaces — merely the recipients and users of new raw materials such as glass, metals and ceramics — instead viewing them as active agents in remaking their worlds (see, for example, Birmingham and Wilson 2010; Lydon and Burns 2010; Morrison et al. 2010, 2019; Paterson and Veth 2020). In this paper we explore the use of glass by a particular group of Aboriginal people — the male troopers of the Queensland Native Mounted Police (NMP), along with probably their wives and children. The NMP was a paramilitary force constituted by the Queensland government over approximately 80 years (from 1849 onward) to eradicate and control Indigenous resistance to European settlement. Led by White officers, the force was staffed largely by a cheap, predominantly Aboriginal workforce that was often forcibly taken from one

part of Australia to subjugate resistance in another (Burke et al. 2018). In this paper we use the glass assemblages recovered from two NMP camps to address questions of meaning and context alongside those relating to technology and reduction strategies. We argue that knapped and/or utilized glass artifacts, produced using traditional stone working techniques applied to a novel raw material, are a tangible demonstration of the complex entanglements experienced by people living and working in this particular cross-cultural context and that the continued practice of making knapped artifacts, in spite of access to metal tools is, as Silliman (2001:203) stated, "a form of political decision that reflects active, daily practices of negotiating colonialism." For the NMP troopers, who were effectively displaced into 'alien' landscapes, the easy accessibility of glass afforded a means by which they could exert independence from their employers, while at the same time maintaining cultural practices unencumbered by traditional normative behaviors pertaining to the use of stone as a raw material.

Previous Studies of Flaked Glass in Australia

Numerous historical and ethnohistorical accounts make it clear that Indigenous peoples across Australia were quick to recognize the potential of glass for making a range of artifacts, including spear points (e.g., Backhouse 1843: 103, 433, 517; Balfour 1903; Bolam 1925: 82; Carnegie 1898; Carter 1798; de Winton 1898: 105–106; Idriess 1937: 59–62; Terry 1925: 264), adzes and other scrapers (e.g., Dawson 1831: 67, 135, 1935; Eden 1874: 54–55; Roth 1899: 69), knives used to incise either human or animal flesh (e.g., Cawthorne 1844: 69; Noble 1879: 64) and razors for shaving (e.g., Gould et al. 1971: 165; Wilkins 1928: 24). Although flaked or otherwise utilized glass artifacts are relatively commonly reported in the archaeological literature, they typically occur in small numbers, including often singly, and are rarely subjected to detailed analysis (e.g., Allen and Jones 1980; Bourke 2005; Colley 2000; Foghlú et al. 2016; Goward 2011; Harrison 1996, 2000; Irish and Goward 2012; McNiven 1998; Proudfoot et al. 1991; Sim and Wallis 2008; Stingemore 2010; Ulm et al. 1999, 2009; Veth and O'Connor, 2005; Walshe et al. 2019; Williamson 2002). There are, however, several notable exceptions.

A seminal study by Allen (1969, 2008) at the Port Essington settlement in the Northern Territory examined 15,275 pieces of glass, of which 2,775 were recorded as potentially being worked. Following some experimentation with treadage, Allen (1969: 221–240) developed key criteria for determining if glass artifacts were genuinely cultural, including:

- The presence of struck flakes in the assemblage;
- The presence of flaking on base cores;
- The presence of continuous (rather than random or partial) damage along edges;
- A tendency toward use of the thicker parts of the bottle base for flake production; and,
- A correlation between the incidence of flaking on bottle bases and the amount of base and wall remaining.

In a later paper, Allen and Jones (1980: 231) cautioned that it is not possible "to produce a set of criteria which would positively identify any single genuine artifact from a fortuitously flaked and shaped non-artifact" and that "the location of objects, coupled with commonsense still provides the best guide to validity."

Freeman (1993) examined 490 artifacts excavated from nineteenth-century Kaurna campsites along the Ongkaparinga River estuary, on the Adelaide Plains, South Australia. Although his criteria for determining if the glass was flaked were unclear, Freeman (1993: 101–102) argued on the basis of edge damage that many had been used for a variety of tasks, including tool manufacture and maintenance (especially wood working), and food processing of both plant and animal material.

Harrison (1996, 2000) examined 238 glass artifacts from several sites in the disparate Shark Bay and Swan River areas in Western Australia. Extending the earlier work of Allen (1969), he determined that glass use could be determined by features other than obvious flaking and heavily worked cores, including the presence of use wear and residues (Harrison 1996: 104–105). Taking this advice, Bolton (1999) subsequently examined glass artifacts from Illamurta Springs police camp, a surface site in the Northern Territory dating from 1893. Of approximately 1,500 glass pieces recovered from the site, she examined 117, finding 52 that had either definite or possible microscopic evidence of use and a further 15 with evidence of flaking or secondary modification (i.e., retouch) (Bolton 1999: 77). Aboriginal people appeared not to have clearly selected either the bottle part or edge angle, though olive glass was preferentially used, and the artifacts were interpreted as having been used for woodworking.

A key finding of Harrison's (2000: 44) work was "the way in which the appearance of glass artifacts is structured by the shape of the glass bottle as a raw material," with the conclusion that regional variation in lithic reduction strategies may have also structured glass reduction strategies. This work was the precursor to his detailed and theoretically advanced studies of glass flaking at pastoral sites in the Kimberley region of Western Australia associated with his subsequent doctoral research (Harrison 2002, 2003, 2004, 2006). In his later work Harrison explored the role that a particular form of knapped bottle glass artifact — the bifacially pressure flaked Kimberley point — played in (post) colonial Aboriginal societies, emphasizing the fascination that such objects held for collectors. Importantly, Harrison saw the use of glass artifacts as transcending mere function to explicitly link their use by Aboriginal people to social agency and to expressions of a degree of control and autonomy in the colonial context.

Most recently, Paterson and Veth (2020; see also Hunter 2014) explored glass Kimberley point production associated with a ca. 1890s pearl fishing camp on Barrow Island off the Pilbara coastline of Western Australia. They concluded there was no evidence of hafting or for the practical use of these distinctive artifacts in relation to hunting and that a possible explanation for their use related to exchange cycles with Aboriginal people in the Kimberley region to the north, as well as possibly with European collectors, as proposed earlier by Harrison. Along with interpreting the reuse of glass as part of an "archaeological signature of isolation," Paterson and Veth (2020: 11) also proposed that, as with glass point production at other locations to which Kimberley Aboriginal people had been relocated after removal from

their own country, such as Rottnest Island, the production of Kimberley points from glass on Barrow Island possibly related to the creation of connective memories of place, the maintenance of group identity, and the nurturing of Kimberley-specific Dreamings.

The highly modified and elaborate flaking process undertaken to produce the distinctive artifact form of the Kimberley point makes them immediately recognizable. In the vast majority of cases, however, it remains notoriously difficult to identify deliberate flaking or usewear on glass in the absence of such elaborate and multi-stage reduction. For example, Knudson (1979) employed conventional lithic analysis methods on an assemblage of artifacts to describe abundant retouch and usewear that appeared to have been produced by use for scraping and shaving, only to reveal that the "artifacts" were in fact glass fragments from an old Colorado homestead. The site had been abandoned around the mid-1930s when the area became a dust-bowl, and the flaking could only be attributed to incidental trampling by cattle and other non-cultural taphonomy. While it is true that in certain cases glass artifacts are unmistakable, as with the Kimberley points of northwestern Australia, such cases are exceptional.

Glass is a raw material that does not have the same constraints as most stone materials for flake formation. Glass is exceptionally brittle, with a lower 'fracture toughness' than other knapping raw materials (Cotterell and Kamminga 1987: 677–678), and at the atomic level it lacks a large-order crystalline structure or molecular planes. As a result, it is exceptionally easy to form a crack initiation in glass which, if near a potential rupture surface, will propagate to form a flake, usually conchoidally (Freiman 1980; Sehgal and Ito 1999; Tsirk 2012). Under the same loading as more crystalline materials, glass will produce larger flakes (Chai 2017) and, like volcanic glass (obsidian), bottle glass fractures down almost to the molecule to produce an exceptionally sharp edge (Cotterell and Kamminga 1987: 677; Neiburger 2015). These features mean that it may be a desirable material for artifact production, but also that non-cultural applications of pressure or impact from trampling, tumbling, or rolling may also initiate a flake and create an "eolith" — an object with attributes that mimic deliberate flaking (Mohajerani and Spelt 2011; Moore 2020). Furthermore, given the findings of Wolski and Loy (1999), it is clear that glass pieces other than struck flakes or well-worked base cores were used by Aboriginal people, with right-angled or even obtuse-angled glass shards being highly sought after for scraping (cf. Deal and Hayden 1987). Even an accidentally broken glass edge may be sharp enough for use, meaning a tool may lack any signs of deliberate modification; indeed this appears to have been a deliberate use strategy in some places (e.g. Deal and Hayden 1987: 239).

In this paper we take a pragmatic, staged approach to glass artifact analysis, identifying only those artifacts that were definitely flaked to consider: firstly, the reduction strategies used by Aboriginal people in two NMP camps in Queensland; secondly, why the artifact producers/users would persist in applying traditional techniques to a novel raw material when European goods would have served the same purpose; and thirdly, how the glass flaking choices made by troopers can be interpreted in the context of their experience in the NMP.

The Queensland Native Mounted Police

Although versions of a Native Police force existed in several Australian colonies in the nineteenth century, the Queensland iteration was the longest lasting of its kind, as well as the most devastating. Initially raised in 1849 to police the then northern portion of New South Wales, by the time that Queensland was constituted as a separate colony in 1859 the NMP consisted of at least 30 White officers and approximately 100 Aboriginal troopers. Although the vagaries of the historical record mean that reconstructing the employee history of the NMP is challenging (Wallis et al. 2021), we have identified more than 430 White officers and 800 Aboriginal troopers who served in the force throughout its history; given a ratio of at least four troopers per commanding officer, we might anticipate there being at least 800 more troopers about whom we know nothing at all. Many Aboriginal members of the force were given a European 'first' name but rarely a surname when they joined, and scant details were recorded about their recruitment or backgrounds, making it difficult to track any but a few in detail.

Initially recruited from as far south as the border regions of New South Wales and Victoria in the late 1850s and early 1860s, troopers in the later nineteenth century were drawn from areas of Queensland other than those in which they were stationed (Burke et al. 2018). This dislocation served two purposes: it discouraged desertion by placing the troopers in foreign country, and prevented existing kinship or other social networks from influencing troopers' behaviors or actions. While the cultural backgrounds and personal histories of the vast majority of troopers are entirely unknown — most not having been recorded in any historical documentation even by name — coercion was a recurring pattern in their recruitment (Burke et al. 2018). The longevity of the NMP as an institution, its geographic reach across all parts of Queensland, and the aggression and intolerance exhibited toward Aboriginal people by both settlers and government officials alike, rendered the Queensland NMP a particularly violent instrument of colonialism, with a sanguinary reputation that far exceeded any other iteration of a Native Police force in Australia. The material footprint of this force is represented chiefly in the existence of at least 150 NMP camps across Queensland, 34 of which were surveyed and seven excavated as part of the "Archaeology of the Queensland NMP Project," which ran from 2016 until 2020 (Barker et al. 2020; Burke and Wallis 2019).

The Study Sites

In this paper we focus on two excavated NMP camps with substantial assemblages of knapped glass artifacts: Mistake Creek (also known as the Belyando River NMP camp), which operated between 1863 and 1879 in Central Queensland and Boralga (also known as the Lower Laura River NMP camp), in operation from 1875 until 1894 in far north Queensland (Fig. 1).

The Mistake Creek NMP camp is situated near a large waterhole on the alluvial plain beside Mistake Creek, approximately 54 km due west of the township of Clermont in Central Queensland (Fig. 1). Although staffing records for the camp

are incomplete and lack detail even when available, it was initially staffed by two White officers and between six and 11 Aboriginal troopers over a period of 13 years (Fig. 2) (Burke and Wallis 2019: Entry ID 3983). The surviving archaeological remains are almost entirely non-structural, and include a large surface assemblage

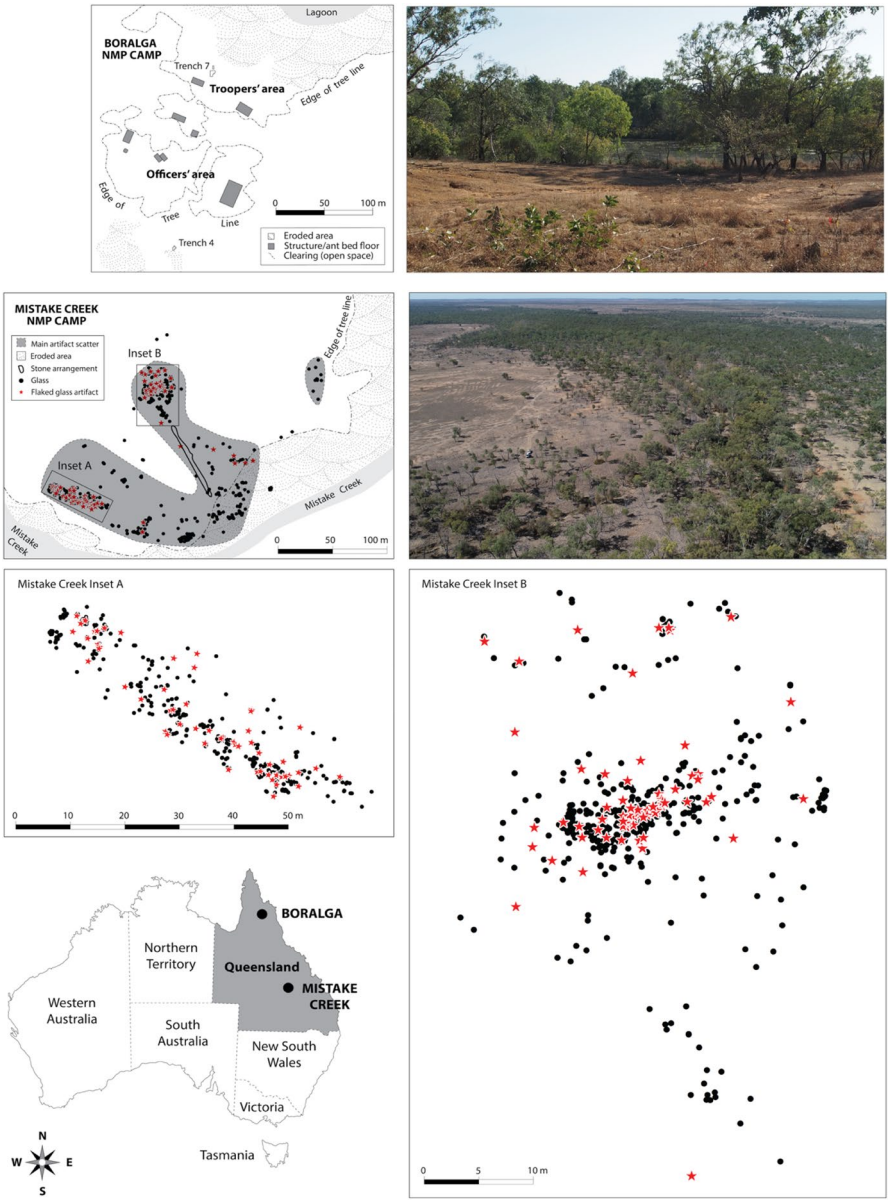

Fig. 1 Plans of the Mistake Creek and Boralga Native Mounted Police camp sites showing locations of analysed glass assemblages

of metal, glass and ceramic fragments, several graves, an Aboriginal stone arrangement and occasional Aboriginal artifacts (including grindstones and flaked stone) distributed over an area of approximately 3 ha (see Fig. 1). The landscape has been affected by tree clearing and erosion along the adjacent creekline, but is otherwise relatively intact. All glass artifacts analyzed from the Mistake Creek camp derived from surface contexts.

Fig. 2 Aboriginal troopers of the Queensland NMP. **A.** On parade at the Mistake Creek NMP camp (undated) (Queensland Police Museum PM3691) and **B.** Troopers, their wives, and families outside the troopers' huts at Boralga, ca. 1881 (Queensland Police Museum PM0637)

The Boralga NMP camp is situated on the Laura River alluvial plain, at the southern extremity of Rinyirru National Park, about 18 km downstream from the small township of Laura on Cape York Peninsula (see Fig. 1). Boralga was a larger operation than Mistake Creek, hosting up to four White officers and between 3–24 Aboriginal troopers throughout its 19-year life span (Burke and Wallis 2019: Entry ID 4072). Again, only scant details of the troopers are known, with only three being named in documents: Jack Noble (1879–80), "Sambo" (aka "Quambo") (1879) and Willie (1877). Rare photographs of the camp also show Aboriginal women and children as part of troopers' families (see Fig. 2). The archaeological remains include culturally modified trees (Cole et al. 2020), standing and fallen ironwood posts and ant bed floors representing structures (Lowe et al. 2018), metal, glass and ceramic fragments (Bateman 2020), and occasional Aboriginal surface artifacts (including grindstones and flaked stone), distributed over an area of approximately 9 ha (see Fig. 1). The landscape has been affected by tree clearing and other impacts, including the construction of colonial infrastructure, cattle grazing, floods, fire, tropical cyclones (most recently in 2014 and 2015), erosion, and disturbance by feral pigs. All artifacts analyzed from the Boralga camp derived from one excavated context, Trench 7.

Methods

Given the well-recognized difficulties of definitively identifying glass knapping and use, we took a highly conservative approach and considered that objects in this analysis could belong to one of three categories:

1. Deliberately knapped (hereafter referred to as "modified" or "knapped" artifacts), where features are clear and unambiguous.
2. Possibly modified pieces, where the potential knapping features are not definitive; and,
3. Glass that shows no signs of knapping (hereafter referred to as "unmodified glass"). This category is made up of broken bottle fragments with no evidence of convincing flake scars, cultural or otherwise.

Only glass that fell into the first category – those that were unmistakable knapped – were treated as artifacts and used in the following analysis. Our approach starts on the premise that all pieces are unmodified, and it must be "proven" that each piece has been knapped. Consequentially, the analysis presented here almost certainly underrepresents the true number of repurposed or deliberately modified pieces of glass, since it does not include Categories 2 and 3 despite the fact that both these categories may contain objects that were utilized but that could not convincingly be argued to have been knapped or used. The value of such a minimalist approach, however, is that the identification of deliberate flaking is as robust as is possible in the absence of usewear and/or residue analyses.

Based on previous studies (e.g., Allen 1969; Harrison 1996; Shea and Klanck 1993), and our own (YLP) experience, a combination of several features were required in order to identify deliberate modification and assign a glass fragment to Category 1. We considered that well-formed flakes with a conchoidal initiation (forming a bulb of percussion) and a deep, well-defined platform are unlikely to have occurred by chance; likewise a platform at the rounded heel of the bottle should be deep enough to have an acute exterior platform angle (Fig. 3). Unlike an edge blow, these "deep" blows require control to produce a complete flake, and deliberate flaking seems the most plausible cause. This is because the successful removal of a large flake requires an acute exterior platform angle, the correct level of force, the correct direction of a blow and the targeting of an area of high mass (e.g., Moore 2010, 2019: 181); without any one of these factors edge crushing, deep hinges and/or step fractures occur or, in glass vessels, the propagating crack may spiral through the body following a path of least resistance and break it in two (e.g., Mohajerani and Spelt 2010). Bending and wedging initiated flakes were more difficult to classify as artificial, as these initiations do not require the same strict conditions as conchoidal initiations (Cotterell and Kamminga 1987; Mohajerani and Spelt 2010).

Smaller glass flakes are more difficult to identify as the parameters for flake initiation on glass are particularly wide, so a small non-cultural flake may form with a conchoidal initiation and feather termination. Furthermore, due to the low tensile strength of glass a flake can initiate from a broken edge without much force (e.g., Mohajerani and Spelt 2010, 2011), and the exterior platform angle of many glass

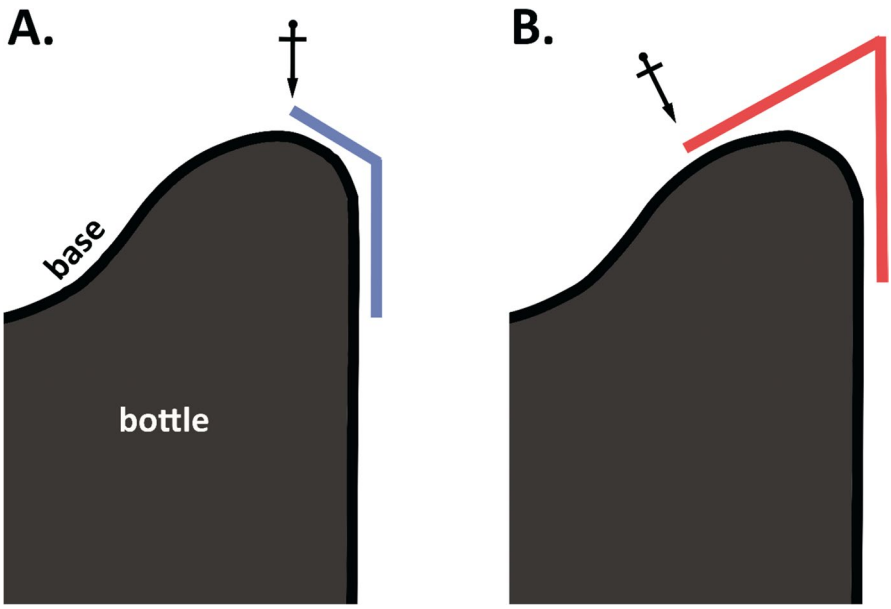

Fig. 3 Side view of an upturned bottle heel showing the overall exterior platform angle at different points of impact: (**A**) Owing to the cross-sectional curve, a blow close to the edge will form an obtuse angle and fail to initiate. (**B**) A heel platform needs to be deep to form an acute exterior platform angle overall. This is particularly pronounced for bottle bases with a deep kick-up or push-up

fragments is naturally suitable for initiation. Therefore, small glass flakes, or those with edge platforms, were the most difficult to categorize as culturally derived, and many such objects were allocated to Category 2 and therefore not included in the analysis.

As with flakes, regular, large and neat negative conchoidal scars on an object were also considered to be good evidence for controlled flaking. Smaller scars were more ambiguous and, as previous studies have found (e.g., Allen 1969; Harrison 1996), regular and exceptionally extensive unifacial flaking that travels through the bottle body – what may be called "retouch" – needs to be assessed according to context. Embedded Hertzian cones occur where impact failed to induce the "catastrophic failure" required for flake formation (Mohajerani and Spelt 2010), and, while one or two cones can be the result of pressure from trampling (Cotterell and Kamminga 1987: 679), multiple embedded Hertzian cones more likely indicate that a platform has been struck deliberately a number of times in an attempt to initiate a flake. This phenomenon can also be observed on stone artifacts (e.g., Moore et al. 2009: 518, 520). Given our conservative approach, edge damage or possible retouch was excluded from the analysis unless it was particularly convincing (e.g., the possible retouch was associated with embedded cones, occurred on protected concave edges, was associated with larger flake scars, etc.).

Usewear on glass is particularly difficult to identify (e.g., Shea and Klanck 1993). On flaked tools usewear largely takes the form of scarring, striations, polish, and edge rounding (Fullagar 2004: 221–222; Grace 1996). Scarring is produced as a result of a load being applied to the edge during use, or from heavier impact in the case of a chopping tool. However, trampling also puts a load on the edge that can create flaking. Microflaking in the form of spontaneous secondary retouch can also occur at the moment of the glass breaking (Nelson and Revell 1967). Striations can be caused by use, trampling, or weathering, since a Mohs hardness of 4–7 means that most glass can be scratched by quartz sand particles. Such striations can be regular, linear, and unifacial, meaning that the criteria outlined by Hunter (2014: 47) are not easily applicable to these assemblages.

All instances of edge damage on glass objects were recorded, as was the occurrence and location of abrasion, noting that abrasion and striations are not to be confused with lances, Wallner lines, or other linear features of flake propagation and breakage. Micropolish and rounding may occur from repeated use, along with residue deposition, and require specialist microscopic analysis to determine (Fullagar 2004: 221–222). This was beyond the scope of this study, though a preliminary assessment of modified edges was made under 10–15 × magnification.

Further complicating the issue of identifying usewear, ethnographic reports frequently describe glass use for expedient tools that would acquire minimal wear. For example, Radcliffe Brown (1922: 445) reported glass flakes used for shaving and scarification being discarded immediately after use, and Akerman (1974) recorded apparently expedient glass artifacts being used as scrapers in spear manufacture. Owing to the brittle nature of this material, the thin edges of glass flakes dull after only one or two cuts (Gorman 2000). If glass use was similarly expedient at our study sites the tools may not have been used heavily enough to develop usewear for

identification under low magnification, and the absence of these features may not equate to the absence of use.

Artifact analysis focused on defining the reduction sequence or *chaîne opératoire* (Sellet 1993). The first step was to assess each glass piece for signs of deliberate modification as per the system outlined above. Following this, only the most definitive artifacts (Category 1 objects) were analyzed according to 30 tailored criteria. Measurements were taken in millimeters, accurate to 0.01 mm, and weight was measured to the nearest 0.01 g. Tests of statistical significance were done using an unpaired *t* test calculated in R 4.0.2. Broken artifacts were also measured, but only the values of unbroken dimensions were used to report the results. Category 2 and 3 pieces were collectively analyzed only as "unmodified pieces".

Following Moore (2015; Moore et al. 2009, 2020), the term "early reduction flakes" is used to describe flakes that do not demonstrate signs of core reduction, encompassing both the "primary" and "secondary" flakes of some systems. "Redirecting flakes" refer to flakes which have been struck roughly perpendicular to a prior platform and therefore have removed this prior platform edge along the dorsal face of the flake — these sometimes fall under the category of "burin spalls" elsewhere in the literature (e.g., Tomášková 2005). Cores are categorized by platform location (i.e., "single platform cores" having a single, continuous platform; "radial/centripetal" cores are a subcategory of this with bifacial flaking along a single platform edge that extends around the entire core; and "multiplatform cores" have two or more discontinuous platforms). A "retouched piece" refers, in this paper, to a fragment with a linear series of small flake scars, usually numerous, along at least one margin, while an "assayed piece" describes a fragment of glass with only one or two definitively knapped flake scars. Cores, retouched pieces, and assayed pieces can hereafter be collectively referred to as "flaked pieces," but "knapped artifact" is applied to any artifact that is the product of flintknapping (including flakes). We define a "Janus" flake the accidental byproduct of flake production that can detach from the bulb of percussion during flake formation – this differs from the definition employed by some authors, who use the term interchangeably with deliberately struck Kombewa flakes (e.g., Newcomer and Hivernel-Guerre 1974: 124–126; Tixier 1963: 90). "Conjoins" differ from "refits" in that conjoins are flakes that can be conjoined to the corresponding scar, while refits are incidental breaks (often postdepositional) that can be fitted back together. "Cortex" describes the faces that were the original inner and outer surfaces of the unbroken bottles. Length, width, and thickness were measured along the maximum dimensions relative to the percussion axis. Glass color was defined according to Lindsey (2020).

Results

Despite the routine difficulties in identifying knapped glass, both the Mistake Creek and Boralga NMP camp assemblages included unambiguous examples of deliberately knapped cores and flakes, documenting consistent and repeated approaches to bottle reduction. A total of 15% ($n = 194$) of the Mistake Creek glass assemblage and 4% ($n = 50$) of the Boralga Trench 7 glass assemblage could be identified as

definitely knapped (i.e., Category 1). Usewear could not confidently be identified on any pieces under low magnification. Twelve of the artifacts had a golden or silvery "iridescence" on the surface, indicative of postdepositional exposure to moisture (e.g., Barbana et al. 2004; Emami et al. 2016).

The Mistake Creek assemblage consists of 1,536 glass fragments, with 194 knapped artifacts. This consisted of 67 flaked pieces (cores, retouched pieces, or assayed pieces) and 127 flakes (including retouched flakes), although only 79 of the flakes were complete enough to measure all dimensions (Table 1). In the 45 cases where the original diameter of the bottle base could be calculated, these ranged from 5.08–10.16 cm. Just over half of the artifacts from Mistake Creek are broken ($n = 103$, 53%), including four refit sets. Three artifacts have been distorted by heat. Just over half of the artifacts are early reduction flakes ($n = 108$, 56%), while two (1%) are redirecting flakes and 17 (8.8%) are broken flakes that could not be categorized (Fig. 4). Seventy-two of the flakes have up to six prior scars on the dorsal face, at an average of 1.18 ± 1.45 scars per flake (mean ± standard deviation). Complete artifact dimensions are listed in Table 1.

Of the cores, 24 (12% of artifacts) are single platform cores and a further 17 (9%) are multiplatform, two (1%) are retouched pieces, 17 (9%) are assayed pieces, with

Table 1 Summary of metric data for the glass pieces recovered from the Mistake Creek surface collection (*cores, retouched pieces, assayed pieces and unidentified broken cores)

		Flakes	Flake platforms	Flaked pieces*	Flake scars	Unmodified
Length (mm)	*n*	79		67	408	
	Max	55.42		81.39	48.83	
	Min	10.06		14.78	2.09	
	Mean	23.32		47.96	15.41	
	SD	8.68		13.29	7.39	
Width (mm)	*n*	112	103	67	408	
	Max	54.61	41.77	70.64	40.73	
	Min	8.62	0	17.89	2.08	
	Mean	25.58	15.79	37.38	15.50	
	SD	8.81	8.01	11.58	7.19	
Thickness (mm)	*n*	127	103	67		81
	Max	37.94	24.13	53.90		10.83
	Min	2.44	0.83	8.42		1.81
	Mean	8.15	5.93	20.58		5.22
	SD	4.28	3.71	9.66		2.14
Weight (g)	*n*	127		67		923
	Max	43.05		144.83		434.33
	Min	0.30		4.66		0.01
	Mean	6.69		41.63		6.58
	SD	7.66		34.99		19.71
	Total	849.02		2789.33		6076.51

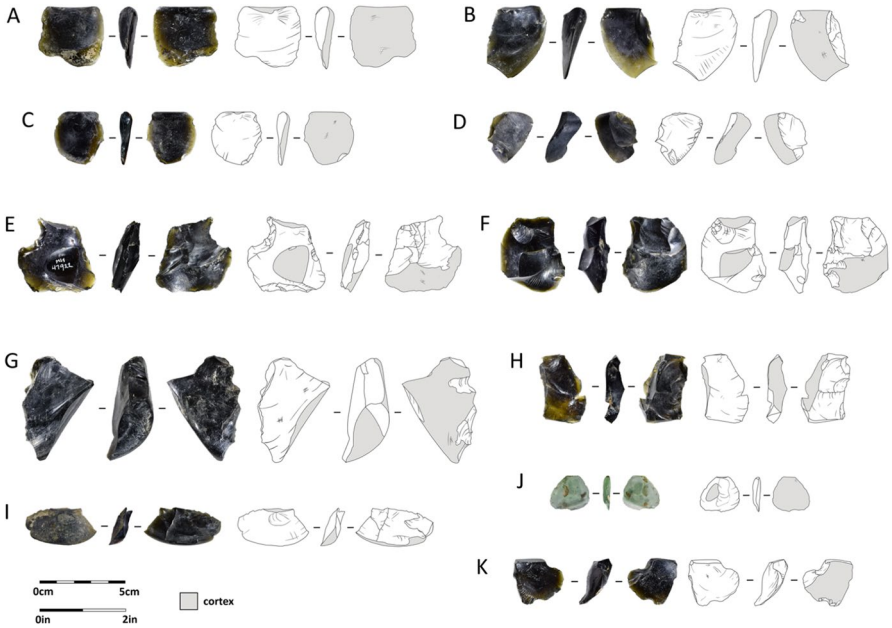

Fig. 4 A selection of glass flakes from Mistake Creek: **(A–D)** Type 1a flakes (see Reduction Strategies), struck using the heel as a platform (MIS-48131, MIS-48022, MIS-48138, MIS-48144); **(E, F)** Type 1b flakes, struck using the heel as a platform and expanding through the bottle body (MIS-47922, MIS-47924); **(G, H)** Type 2 flakes, running across the heel (MIS-55442, MIS-48919) (H is a redirecting flake); **(I, J)** Type 6 flakes, struck across the body (MIS-47927, MIS-55419); and **(K)** Type 3 flakes, struck through bottle base (MIS-55436)

one ($n=9$) or two ($n=8$) scars that could be attributed to deliberate knapping, and seven (4%) flaked artifacts are too broken to classify (Fig. 5). These artifacts have a mean of 6.9 (± 5.6) flake scars, and a maximum of 28 scars on a single artifact. Multiplatform and single platform cores were always made using the base or heel of the bottle, while retouched and assayed pieces included bases, heels, and body sections, but not the neck of the bottle. No bipolar reduction was observed. No conjoins were identified among the Mistake Creek assemblage.

Black (i.e., very dark olive green) glass was the dominant material used for artifact production at Mistake Creek ($n=180$, 93%). The remaining artifacts were made on olive green, green, and amethyst glass. Of the unmodified pieces of glass, 48% ($n=727$) of fragments were black glass and 24% ($n=270$) olive green, with cobalt, aqua, green, amethyst, and colorless glass making up the remainder ($n=330$, 29%).

Of the pieces where part of the bottle body remained ($n=37$), the vessel selected for flaking originally had body walls around 8.3 mm thick (see Table 1). Body thickness data was taken from a sample of 81 unknapped fragments where the original bottle wall remained intact, and at around 5.2 mm these are significantly thinner than the pieces selected for flaking ($t(116)=7.8848$, $p<0.0001$). In 23 (12%) cases the artifacts also show macroscopic abrasions or striations on a knapped surface

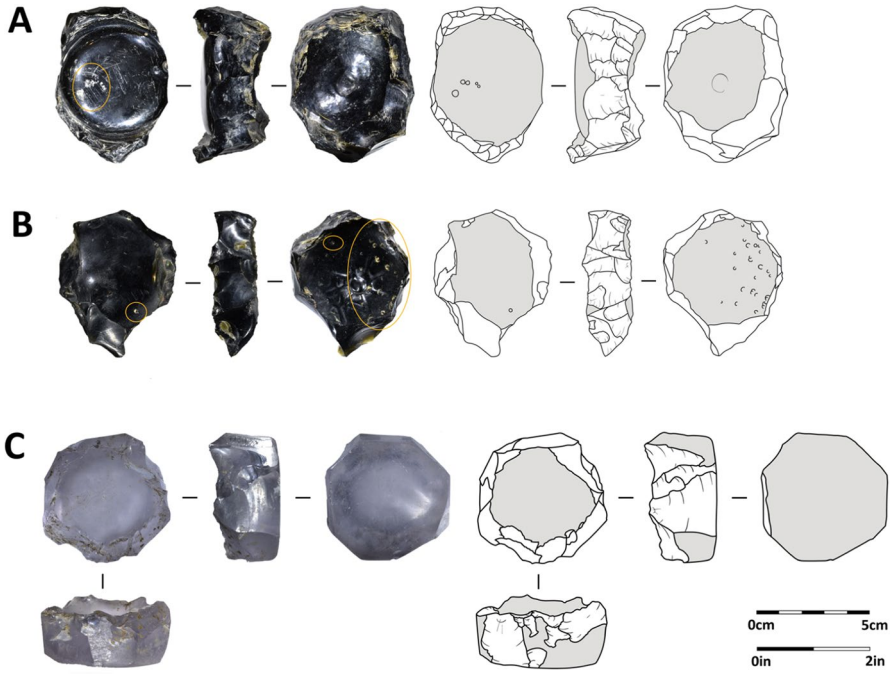

Fig. 5 Glass cores at Mistake Creek: **(A, B)** Multiplatform cores made on glass bottle bases (MIS-48372, MIS-48132). Incipient cones from blows that failed to initiate a flake are circled in yellow; and **(C)** Single platform core made on a manganese glass vessel base which has solarized to a light amethyst-color (MIS-41544)

(i.e., the abrasion occurred after the glass was knapped [e.g., Figures 4B, 6A and C]), while a further 39 artifacts have macroscopic striations restricted to the original cortex surface. While 120 (61%) artifacts have varying degrees of edge damage, it is not definitive enough to be classed as usewear or retouch, especially as some of the most "retouch-like" damage clearly occurred well after discard as it was much cleaner than the knapped surfaces (e.g. Figure 4E). Polish and rounding were not observed under 10–15 × magnification.

At Boralga we were particularly interested in glass recovered from Trench 7 (T7), associated spatially with the Aboriginal troopers' huts (see Fig. 1). The T7 assemblage consisted of 1,391 glass fragments, of which 50 (4%) were categorized as knapped artifacts (Category 1), representing 46 artifacts after several broken pieces were refitted. This consisted of 22 flaked pieces and 24 flakes, 19 of which were complete flakes (Table 2). Again, these artifacts were made from pieces of glass bottles, as opposed to other glass items. The original base diameter of the vessel could be determined in 13 instances, and these range from 7.62–10.16 cm (3-4 in). Average dimensions for the glass pieces from T7 are listed in Table 2. For comparative purposes we also considered a further 375 glass pieces from Trench 4 (T4), a rubbish pit spatially associated with the officers' buildings (see Fig. 1). While several

Fig. 6 A selection of glass flakes at Boralga: **(A)** Type 1a flake (see Reduction Strategies) showing what appears to be retouch associated with multiple embedded cones on the ventral face (BOR-27745). This artifact is also heavily abraded on the ventral face. Incipient cones on the ventral face circled in yellow; **(B)** Type 1b flake, which travelled through the bottle wall (BOR-31579); and **(C)** Type 1a flake, struck from heel platform (BOR-55475), showing some edge damage

of the T4 glass fragments had flake-like features or edge damage, none could be indisputably classified as being knapped or utilized.

Of the glass artifacts in T7, 21 (46%) are early reduction flakes, one is a Janus flake and two flakes (4%) are too damaged to classify (see Fig. 6). Nearly half ($n=9$, 20%) of these flakes are broken. Fifteen flakes have prior scars on the dorsal face, averaging 1.80 ± 1.28 to a maximum of six scars. Two broken bottle bases could be refitted, as could one large broken flake that also conjoined to part of the original core (Fig. 7B). One small olive green flake had been struck across the body from a single facet platform, and could be conjoined to a section of bottle body, and incipient cones along the platform supported the observation that this piece had been deliberately flaked.

Cores and other flaked pieces (i.e., retouched pieces and assayed pieces) make up 45% ($n=22$) of the artifacts identified in the T7 assemblage at Boralga (see Fig. 7). Eight (17%) of the artifacts are single platform cores, one of which was broken into three refitting fragments by a blow to the center of the base after it was knapped; it is not clear if this final blow was deliberately struck. Three artifacts (7%) are multi-platform cores, one of which is broken in two. Two pieces of glass (4%) have regular unifacial flaking along a curved, concave margin, accompanied by embedded Hertzian cones close to the flaked margins, providing clear evidence of deliberate retouch (Fig. 8). The retouched pieces have 16 and 18 scars. Retouch was also identified on an early reduction flake which has two large flake scars along one margin that are associated with four embedded cones on the ventral face (see Fig. 6A). A further nine artifacts (20%) are assayed pieces. On average, flaked glass pieces (multi- and single platform cores, retouched pieces and assayed pieces) have 5.8 ± 6.8 flake

Table 2 Summary of metric data for the glass pieces recovered from Boralga, Trench 7 (*cores, retouched pieces, assayed pieces and unidentified broken cores)

		Flakes	Flake platforms	Flaked pieces*	Flake scars	unmodified
Length (mm)	*n*	19		22	137	
	Max	33.76		81.17	27.75	
	Min	6.14		19.40	2.52	
	Mean	19.18		48.94	11.45	
	SD	8.20		14.87	5.97	
Width (mm)	*n*	21	13	22	137	
	Max	52.57	39.48	70.86	42.95	
	Min	10.31	6.15	19.58	2.99	
	Mean	24.02	19.00	36.69	13.27	
	SD	10.20	9.99	10.52	7.83	
Thickness (mm)	*n*	24	13	22		189
	Max	32.23	28.25	42.04		10.91
	Min	1.83	0.64	4.36		1.06
	Mean	7.23	6.38	19.02		4.87
	SD	6.11	7.54	11.27		1.67
Weight (g)	*n*	24		22		225
	Max	33.35		79.22		278.29
	Min	0.14		4.49		0.21
	Mean	5.81		32.97		18.34
	SD	9.19		24.59		43.70
	Total	139.40		725.28		4126.26

scars, ranging from one to 30 scars per artifact. In addition to this, 34 (74%) of the glass artifacts have edge damage, ten of which also have abrasions on flaked surfaces and 21 of which have abrasions on the cortex only. No polish or edge rounding was observed.

Most of the artifacts were made on black ($n=19$, 41%) or olive green glass ($n=25$, 55%), colors which made up less than half of the unmodified glass assemblages in both T4 and T7 (43% and 26% combined, respectively). The remaining artifacts were made on amber and apple/light green glass ($n=2$, 5%). Category 2 and 3 glass fragments at T7 included colorless glass ($n=399$, 30%), light green (23%), and small amounts of cobalt blue, amber, and aquamarine glass (1–2% each). The T4 assemblage was largely dominated by colorless (64%) and olive green glass (26%), and had only traces of black, aquamarine, amethyst, amber, and light green glass (all < 5%). The colorless glass included fragments of small bottles that may have been protected from solarization by overlying deposits, as well as thin, flat fragments, possibly from a windowpane. The mean bottle body thickness of glass pieces selected for knapping at T7 was 6.75 ± 1.21 mm ($n=21$), significantly thicker than the mean of 4.9 mm for the sample of 189 unmodified glass pieces ($t(208)=4.9948$, $p<0.001$).

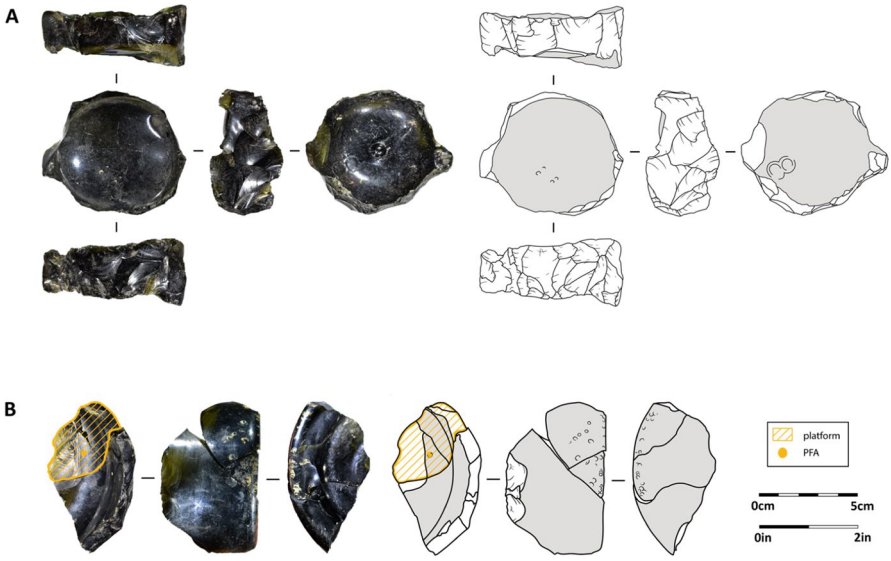

Fig. 7 Glass cores at the Boralga NMP site: **(A)** Multiplatform core (BOR-27741); and **(B)** Two fragments (BOR-26075, BOR-26074) refit to form a large flake with a bending initiation, which can be conjoined to a fragment of the core (BOR-26073). Multiple incipient cones from heavy battering can be seen on the flake at the heel area. Incipient cones circled in yellow

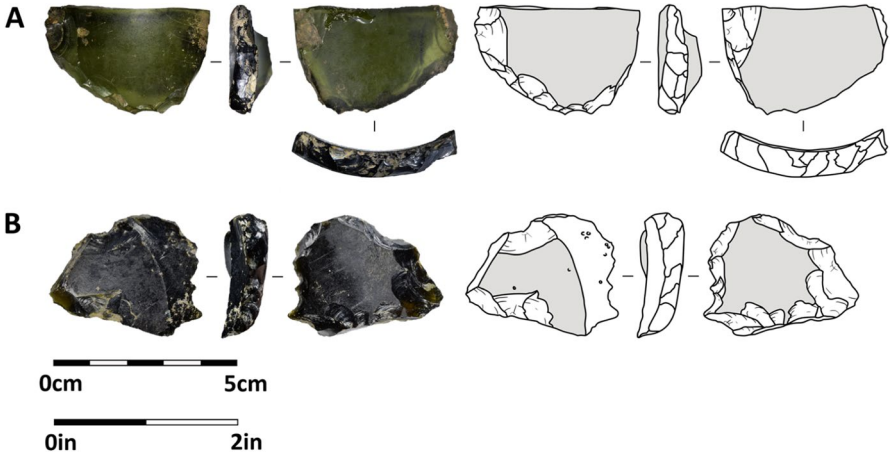

Fig. 8 Two retouched pieces of bottle body from Boralga T7 with Type 5 and 6 flaking scars (see Reduction Strategies): **(A)** BOR-230341; and **(B)** BOR-27762

Discussion

Reduction Strategies

At both sites we found that six approaches were adopted to strike a flake from a

bottle body (Fig. 9). Only the body, heel, and base appear to have been targeted, and flakes could either be struck through these areas, using the original outer bottle surface as the platform, or across these areas by using a broken facet or flake scar as a platform and thereby removing the outer bottle surface on the flake's dorsal face. These six approaches are explained below.

1. **Reduction through heel.** The only way to strike a flake without first breaking the bottle was to use the outer face of the rounded heel of the bottle as a platform. This took advantage of the acute angle between the heel and the body wall on bottles with push-ups or kick-ups (see Fig. 3). This was the most common flake type (Table 3), and also the most easily recognizable. There were two variations of this:

    a. Using the basal side of the heel as a platform, a flake was struck into the body of the bottle, removing the outer bottle surface (and prior scars) on its dorsal face; and,
    b. Using the basal side of the heel as a platform, a flake was struck into the body of the bottle but the flake propagated right through the bottle to the inner surface. The propagating flake divided and travelled in both directions around the body wall to meet again in a small ridge. This created an island of inner bottle surface (cortex) surrounded by the ventral face of the flake.

2. **Across heel.** Using a broken facet or flake scar, a flake was struck along the heel of the bottle.
3. **Through base.** Using either the outer or inner surface of the bottle, a flake could be struck through the base.
4. **Across base.** Using a broken or flaked facet a flake could be struck across the base, usually across the concave inner surface of the base, but in some instances the base was flat enough to strike a flake from the outer surface.
5. **Through body.** Flakes could be struck through a fragment of the bottle body. These flakes were very small, and may be difficult to distinguish from accidental flaking.
6. **Across body.** Using a broken or flaked facet a flake could be struck across the body of the bottle. These striking platforms are very thin, and these flakes are often difficult to differentiate from incidental, non-cultural flaking. However, in some cases incipient Hertzian cones on the platform confirm that the platform was being deliberately targeted.

All flakes were removed using direct percussion, and bottle bases and heels were always reduced to single and multiplatform cores. On the more heavily knapped cores, flakes were often initially removed around the entire heel. Here, the angle formed at the heel between the base and the wall was used as a "natural" platform (see Fig. 3) to remove a series of Type 1 flakes (see Fig. 9) — sometimes followed by Type 3 and 4 flaking — creating a round core with jagged flake scar edges around the perimeter (e.g., Figs. 5A, B and 7A). In other cases the bottle wall was used as a platform to strike Type 5 and 6 flakes towards the heel and base (e.g., Figure 5C).

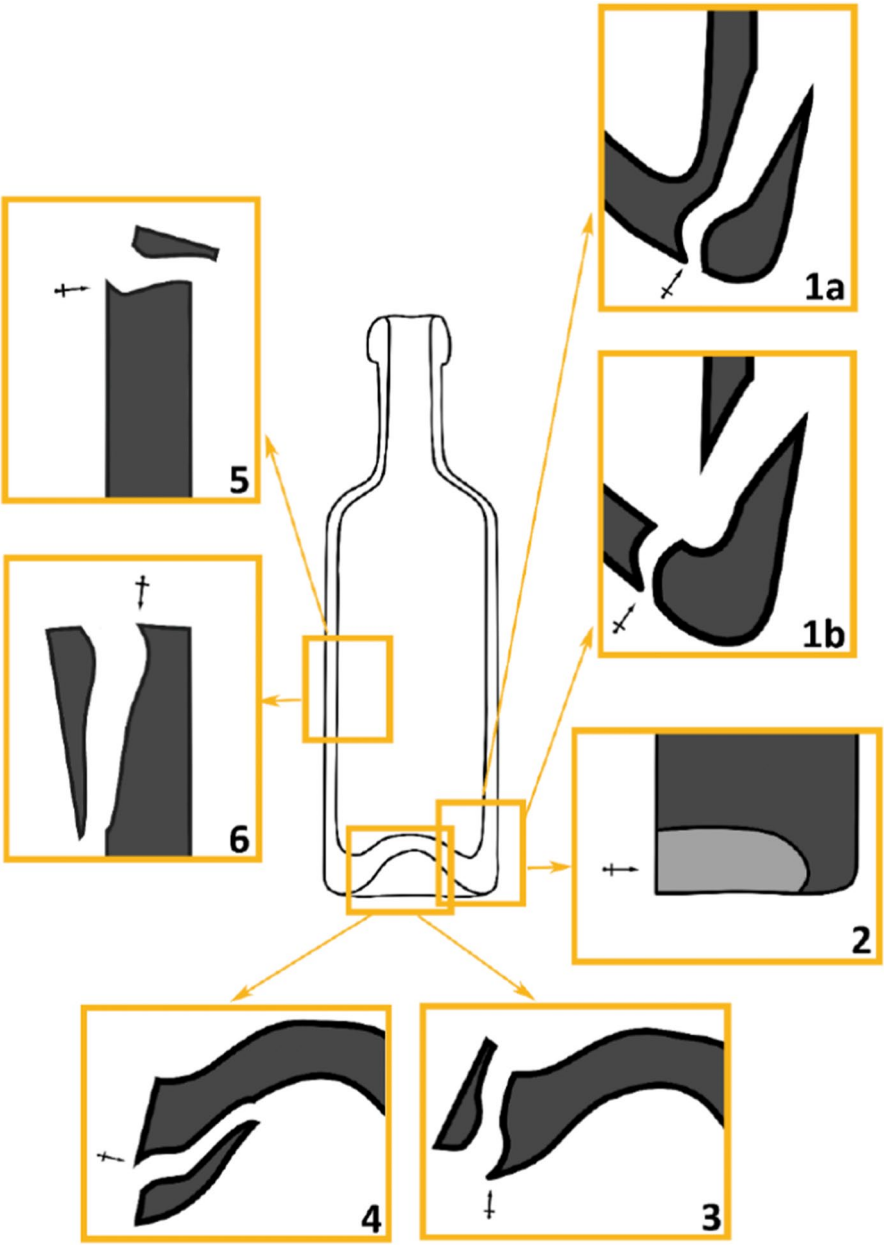

Fig. 9 Six different approaches to removing flakes from glass vessels adopted at Mistake Creek and Boralga

The platforms of these scars were often heavily crushed, suggesting they may have been used as tools, although as these edges were quite fragile the crushing could be due to taphonomic damage or edge collapse during reduction. In contrast to many of

Table 3 The frequency of each kind of flake versus the number of remaining scars that were produced by each kind of flake

	Mistake Creek		Boralga	
Flake removal type	Flakes	Negative scars	Flakes	Negative scars
1a	57 (45%)	65 (16%)	4 (17%)	5 (4%)
1b	18 (14%)	16 (4%)	1 (4%)	1 (1%)
2	4 (3%)	21 (5%)	2 (8%)	2 (1%)
3	6 (5%)	108 (26%)	3 (13%)	40 (29%)
4	2 (2%)	74 (18%)	4 (17%)	7 (5%)
5	1 (1%)	69 (17%)	1 (4%)	31 (23%)
6	11 (9%)	51 (13%)	2 (8%)	51 (37%)
unidentified	28 (22%)	4 (1%)	7 (29%)	0
Total	127	408	24	137

the flaked bases, body fragments were not heavily flaked, and were typically classified as assayed pieces. The exceptions to this are the two retouched pieces at Boralga that were made on fragments of bottle body, using the concave inner face as a platform to strike a series of small Type 5 flakes through the bottle body, although each piece also had a number of Type 6 flakes struck across the body using a broken facet as a platform (see Fig. 8).

The exploitation of the potential platform provided by the morphology of the bottle heel (Type 1 flaking) is almost identical to the glass bottle reduction strategies described at sites in Western Australia (Cooper and Bowdler 1998; Harrison 2000), Antigua (Gorman 2000; Pitt Rivers Museum 2011) and the Andaman Islands (Cooper and Bowdler 1998; Gorman 2000). However, on some of the cores in our study Type 5 and 6 flaking was also used to flake towards the heel, and these instead resemble the glass artifacts recorded by Allen (1969) in the Northern Territory. This suggests a convergence on the most practical way to strike flakes from a glass bottle.

In addition to the above reduction strategies, some artifacts from both sites also display unusual heavy flaking or retouch along the basal edge of the heel. Here most of the bottle base has broken off and the remnants of the base have been heavily retouched toward the heel with Type 3 or 4 flaking, to become almost flush with the body wall (Fig. 10). This retouch occurs on a concave edge that is protected from heavy trample damage, ruling out taphonomic damage, and is often associated with incipient cones from blows that failed to initiate a flake. Further, the Boralga glass assemblage has been buried at shallow depth for approximately 125 years, largely protecting it from exposure to the elements and trampling. In one instance the bottle wall has been largely removed and the heel retouched with Type 3 flaking to become flush with a deep kick-up (Fig. 10B), creating a stout, convex edge. Six artifacts with retouch on the edge of the heel were identified among the Mistake Creek assemblage, and two were identified among the Boralga T7 assemblage, including a section of heel that broke during retouch (Fig. 10C).

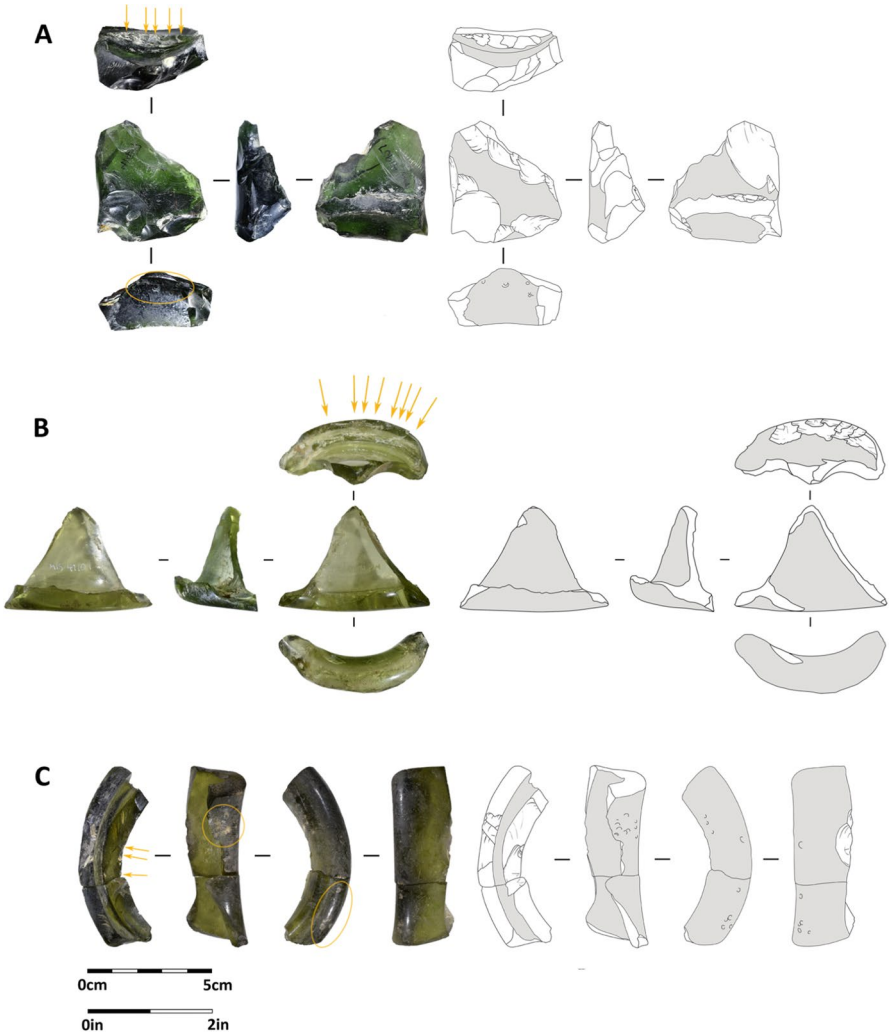

Fig. 10 Fragments of bottle heel with retouch along the base (arrows): **(A)** Artifact from Mistake Creek (MIS-41957) with Type 4 flaking along the base as well as Types 5 and 1 flaking across the body; **(B)** The remnants of a deep kick up at the base of a bottle from Mistake Creek (MIS-47101), with retouch through the heel to remove the heel and wall (Type 3 flaking); and **(C)** Refitting pieces from Boralga T7 (BOR-29282 and BOR-29277), which broke during retouch through the base (Type 3 flaking). Incipient cones circled in yellow

Contact Sites as Quarries?

When confronted with glass artifacts on Australian archaeological sites, researchers have tended to view the site as one of "social contact between Aboriginal people and

settlers" (Gibbs and Harrison 2008: 66). Based on their analysis of material at the Geraldine Mine site in Western Australia, however, Gibbs and Harrison (2008: 66) suggested that at least some sites with glass artifacts "may represent places associated with the procurement phase of glass artifact manufacture, and that such abandoned settlements were being used by Aboriginal people as glass quarries." This was certainly how Carver (2005) interpreted an 1860s copper mining site and associated town of Nuccaleena in the northern Flinders Ranges, South Australia. In further support of the "contact sites as quarries" proposition, Akerman (1983) noted that an old Bunaba man (from the Kimberley region), who had shunned interaction with Europeans as much as possible, would visit station homestead rubbish dumps very briefly to replenish his supply of glass for tool manufacture. Akerman (2006) also noted that in Western Australia Aboriginal stockmen droving cattle would visit rubbish dumps to select glass to pass on to craftsmen back in their local communities.

The glass in the T4 assemblage at Boralga was thinner, on average, than glass elsewhere on site and included a high proportion of colorless glass. Given that both T4 and T7 were contemporaneous, it seems that Aboriginal people were deliberately removing thick black and olive colored bottles from the officers' rubbish dumps in order to repurpose them, bearing in mind that the figures might be artificially inflated as deliberate flaking was also easiest to conclusively identify on thicker glass, which is most often black. Nonetheless, it appears that the officers' rubbish dumps at NMP camps may have functioned as quarries in the manner Gibbs and Harrison (2008: 66) suggested. The difference in this instance is, however, that the NMP camps were not abandoned at the time they were 'mined' Rather, their use as quarries was contemporaneous with their occupation by the Aboriginal occupants of the camps — a proposition that Gibbs and Harrison (2008) rejected for Aboriginal workers at the Geraldine Mine site, but which is more in line with behaviors of the Aboriginal occupants at both the Wybalenna settlement on Flinders Island, Tasmania (Birmingham 1992: 104) and the Illamurta Springs police camp in the Northern Territory (Bolton 1999: 88) (see also Paterson and Veth 2020; Stingemore 2010).

There are several reasons we argue this is the case. Firstly, following Allen and Jones (1980), the context of glass artifact assemblages from Mistake Creek and Boralga forms a strong argument for their being cultural and deliberately knapped. At Boralga, the material was excavated from a shallow rubbish pit (Trench 7) associated spatially with an area identified by Aboriginal colleagues as having contained the troopers' huts, and whose other material culture items also supported their having been discarded by Aboriginal people rather than White people (e.g., native faunal remains and a dearth of ceramics). The flaked glass artifacts were clearly associated with other debris from the NMP occupation period, rather than being stratigraphically distinct from it, such as was the case at the Geraldine Mine (Gibbs and Harrison 2008). One of the first White officers stationed at Boralga, Stanhope O'Connor (1877), noted troopers using hoop and other iron to fashion axes, so it is clear that Aboriginal camp residents at this locale were actively repurposing European materials, although he made no specific mention of the same being done with glass. The association with NMP occupation is more difficult to ascertain at the Mistake Creek site, where the majority of artifacts were recovered from a palimpsest on the ground surface. Production date ranges for glass, ceramic, metal, weapons, and

ammunition artifacts at Mistake Creek, however, cluster between 1860 and 1900, with the majority dating between 1860 and 1880, suggesting only intermittent activity beyond the period of NMP occupation.

Secondly, the aim of the NMP was to "disperse" Aboriginal people, which usually meant killing them. By the time the NMP relocated from one camp to another, Aboriginal populations in the vicinity of the initial camp had typically plummeted. Accordingly, after the departure of the NMP only small numbers of Aboriginal people were left in a region. Those who remained were "allowed in" to stations where they formed fringe camps, providing the pastoral industry with cheap labor (May 1983, 1994). As such, there were not many people maintaining traditional subsistence rounds in the vicinity of former NMP camps. Additionally, given the extremely negative associations that surviving Aboriginal people had with the NMP, we consider it highly unlikely that they would have chosen to spend time at abandoned NMP camps, even on a short-term basis to source raw materials. Even today, several generations later, our Aboriginal colleagues display considerable reticence about visiting such camps, associating such sites with extreme sadness given their history. There is no reason to suspect similar sentiments were not equally, if not more strongly, held by their ancestors who, as survivors, were firsthand witnesses to NMP violence.

Role of Glass Artifacts

Although in northwest Australia knapped glass was highly desired by collectors (Harrison 2004, 2006), there is no indication that any such impetus was driving the knapping of glass on NMP camps. Few of the glass artifacts we analyzed from NMP camps are formal types and documented museum collections from such camps rarely contain glass artifacts (though Walter Roth, one of the main ethnographic collectors in the late nineteenth century, gathered "glass chips" from other places, as well as numerous non-glass items from the Palmer River NMP camp; see, for example, Khan 2004). So what other factors may have driven their production?

The first and most obvious element in answering the aforementioned question is to consider the artifacts' uses. While we have yet to conduct use wear or residue studies on any of the glass artifacts, one strong possibility exists linking the use of glass to the tasks required customarily of troopers when in camp. Although only a tiny fraction of the journals required to be kept at each NMP camp survive to document the daily routine, those few that do indicate a range of domestic tasks assigned to troopers, including caring for saddlery and the various accoutrements that kept a mounted police patrol functioning. Co-author Col McLennan, a senior traditional owner for the area around the Mistake Creek camp, detailed the skills of Aboriginal stockmen in making, curating and repairing leather harnesses, bridles, saddles, and other horse gear in the twentieth century using glass flakes. Broken glass is exceptionally sharp and produces a clean and even cut in leather and was considered superior to a metal knife. It was therefore often used for paring the insides of the skin (i.e., removing the hard, dry, fatty layer and exposing the softer, supple leather beneath) and for evenly removing the hair on the outside (e.g., Delaunay et al. 2017).

Glass flakes were also used by stockmen to cut leather into strips and to shave when metal razors were not available. Indeed, the use of glass as a razor is one of the most commonly reported activities in the ethnographic literature (e.g., Gorman 2000; Martindale and Jurakic 2006; Radcliffe Brown 1922: 445). The heavy dependency of the NMP on horses and the extremely parsimonious nature of it as an organization makes it likely that troopers would have used glass for a similar range of activities, given that maintaining horse tack was a regular part of their camp duties.

Beyond purely functional tasks, it is also possible that flakes made from glass fulfilled other, more symbolic, roles for the NMP troopers. Martindale and Jurakic (2006: 425) argued that the production of glass artifacts from a nineteenth-century village on the north coast of British Columbia, Canada, derived from the Tsimshian "desire to distinguish themselves from European values by recycling broken objects in a manner that was both unfamiliar to Europeans and somewhat contrary to the consumer aesthetic of the market economy." We suggest a similar factor may have also been at play in the NMP camps. Certainly, from a functional point of view, troopers would have had easier access to various European goods (such as razors, knives, adzes, etc.) than most other Aboriginal people. At the same time, the differences between rubbish assemblages in the troopers' and officers' areas at Boralga make it clear that, whether from choice or restricted access, the troopers used and discarded much less of this material than officers. It could be argued that, having been torn asunder from so much of the rest of their culture, the production of glass artifacts allowed them to retain a connection with what they had otherwise lost, and that this helped them construct a separate, unique identity within the NMP.

An alternative, but complementary, incentive for the adoption of glass might have arisen from the desire to circumvent established traditional power structures (Harrison 2002, 2006). Harrison (2006: 65) suggested that the production of points in glass in the northwest of Australia gave their makers "access to raw materials for spear points normally …controlled by powerful older men," allowing younger men to create new forms of identity for themselves. Harrison's study focused on a particular type of formal artifact, however, a situation that was not applicable to the troopers of the NMP. In their case the social dynamics were even more complex, since they were isolated in multiple ways. Unlike local Aboriginal people, they could not draw on access to refuge areas for seclusion, social and ceremonial gatherings, or identity creation, as was so important across the colonial world (Cole 2010; Panich and Schneider 2015; Schneider 2015), and, unlike other displaced (i.e., forced labor) groups (e.g., Paterson and Veth 2020), they occupied a highly precarious position in relation to the Aboriginal people around them. Predicated as the NMP was on taking Aboriginal men from one part of Queensland for service in another, its success relied on the existence of local hostility toward troopers to prevent desertion and the creation of social connections. Troopers were thus both controlled and marginalized by their superiors (many of whom were brutal and exacted various corporal punishments up to, and including, extrajudicial execution for infractions, see Richards 2008) and constrained from easy or effective escape from such routines by the threat of being killed by surrounding Aboriginal peoples.

Troopers' lives to a certain extent would thus have been constrained to the camp and its environs, apart from when on patrol or until such time as local resistance had

been eliminated, suppressed, or renegotiated sufficiently to prevent payback killing. In terms of their material culture, troopers may have had few opportunities to identify local stone raw materials for themselves and their knowledge about high quality raw material sources in the vicinity of NMP camps would have initially, and perhaps always, been limited. They could potentially have sourced low quality stone expediently when they encountered it, but it would have been fortuitous if their patrols brought them into proximity with high-quality stone sources. It is also possible that troopers may have been reluctant to use such sources even if they did encounter them due to entrenched cultural concerns about the dangers of doing so without appropriate permissions. The counterargument to this is how much, if any, credence troopers would have given to cultural norms in their new circumstances, and whether they might have deliberately transgressed such norms as part of consciously remaking their worlds. As outsiders they were also excluded from the traditional trade routes and relationships that typically provided access to resources not immediately available in one's traditional country.

Troopers' access to European goods seems also to have been fitful. Some White officers prohibited trooper access to guns — and presumably other weapons — outside of patrol duties, and there was no guarantee that a trooper could always or easily replace a traditional tool with a formal European counterpart. The immediate availability of glass would have alleviated their lack of knowledge about, or access to, local raw materials and any prohibitions on the acquisition of European implements. Bottle glass offered Aboriginal people living in NMP camps an accessible raw material source with no cultural restrictions, and it transcended any necessity for an intricate understanding of resource distribution in the local landscape.

Another consideration is gender. The manufacture of stone artifacts is often presented as being primarily in the male domain, including as a means to symbolize and negotiate various forms of masculinity. This is despite abundant evidence that women also made stone artifacts, as well as being involved in the transportation of stone as a raw material (e.g., Arthur 2010; Bird 1993; Gould 1977: 166; Hamilton 1980: 7; Hayden 1977: 183, 185; Jones and White 1988: 61, 83; Love 1936; Tindale 1972: 246). Indeed, in the Andaman Islands glass knapping for hair removal purposes was exclusively the domain of women (Radcliffe-Brown 1922: 483; see also Lane Fox 1878; Man 1883). The idea that only men knapped stone is largely a construct of the highly male-biased ethnographic research on stone knapping throughout the nineteenth and twentieth centuries (Gero 1991). Since Aboriginal women are known to have been resident in NMP camps there is no reason why they, like their partners, could not also have been responsible for knapping glass bottles. Just as the availability of a new raw material would have opened up its use to Aboriginal men without the normal cultural considerations about access, so too would it have opened new options for Aboriginal women, and may also have removed any reticence about women carrying out such tasks.

At one level, the production of remanufactured glass artifacts is merely functional, and represents the use of a new, abundant raw material by Indigenous peoples (Martindale and Jurakic 2015). As Cooper and Bowdler (1998: 81) found from a comparison between flaked glass in Australia and the Andaman Islands, "there are fundamental processes involved in flaking (knapping) behavior, and… people

familiar with these will react similarly when new materials are made available to them." But functionality itself is a cultural construct and to accept this simplistic explanation is inadequate in and of itself. The use of glass may have had greater symbolic value, as suggested by Silliman (2005, 2009) and Harrison (2002, 2003). In the North American context, Martindale and Jurakic (2006) have argued that use of glass also represents an aesthetic shift from a desire for European goods toward a reimagination of traditionalness. Remanufactured glass artifacts were "part of a commentary on the history of colonialism and an assertion of the value of traditional practices of expedient tool use combined with an explicit critique of a new economic regime that, among other things, littered the landscape with broken glass" (Martindale and Jurakic 2015). Martindale and Jurakic (2015) also argued that remanufactured glass artifacts "reflect [I]ndigenous views on the process of colonization, giving voice to an alternate understanding." In this context, Harrison (2003: 327) sees the "power of glass artifacts as residing in the practice of reproducing the technology of one culture using the raw material of another, literally transforming "European" into "Aboriginal" objects as a means of "subverting the power of the colonial 'West' by remaking it in their own image."

Conclusion

Two decades ago, Harrison (2000: 38) noted a need to systematically analyze flaked glass assemblages at contact sites to better understand the ways in which European materials shaped postcontact technologies and social systems. Such incorporation would have been mediated by the contextual specifics of prior histories and reveals to some extent the degrees of social proximity and scales of interactions between Indigenous peoples and settler colonists. In the context of the NMP, these dynamics were unlike many other relationships commonly situated in this space. Troopers were in effect doubly displaced. Recruited, often forcibly, from areas that were already "pacified," they were unmoored from many of the traditional structures that would formerly have sustained them and taken into foreign country. This has interesting implications for why troopers might seek glass suitable for knapping and how they would view and comprehend such objects (both the original bottles and the resulting knapped artifacts).

In NMP camps it is possible that the decision of Aboriginal residents to knap glass served a variety of purposes. Glass bottles were considered waste by the White officers, but provided an opportune source of desirable tools for Aboriginal people engaged in camp activities. The use of this glass may have been a conscious choice that both extricated the troopers from the power of White superior officers while at the same time obviating any need to locate and obtain stone raw materials from sites in the local landscape. Asking to buy or borrow a knife or adze was another form of servitude; being able to source an alternative cutting or scraping implement would likely have contributed to at least some degree of independence from their employers, as well as reinforcing the self-sufficiency of Aboriginal people operating in the NMP world. In effect, we would argue that, in the context of the NMP, refuge may have been as much a practice as a place. NMP camps were foreign territories in

more ways than one. Selecting, knapping, and utilizing bottle glass may have been in some ways a deliberate rejection of the system being imposed upon them by the usurpers of their lands and a means of safely negotiating an otherwise unsafe space in foreign territory.

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References

Akerman, K. (1974). Spear making sites in the Western Desert, Western Australia. *Australian Journal of Anthropology* **9**(4): 310–313.

Akerman, K. (1983). Mangatji's memorial. In Smith, M. (ed.), *Archaeology at ANZAAS 1983, Proceedings of Section* 25A. Canberra Archaeological Society, Canberra, pp. 81–85.

Akerman, K. (2006). High tech-low tech: lithic technology in the Kimberley region of Western Australia. In Apel, J. and Knutsson, K. (eds.), *Skilled Production and Social Reproduction: Aspects of Traditional Stone Tool Technologies*. Department of Archaeology and Ancient History, Uppsala University, Uppsala, pp. 323–346.

Allen, J. (1969). *Archaeology and the History of Port Essington*. Doctoral dissertation, Australian National University, Canberra.

Allen, J. (2008). *Port Essington: The Historical Archaeology of a North Australian Nineteenth Century Military Outpost*. Sydney University Press, Sydney.

Allen, J. and Jones, R. (1980). Oyster Cove: archaeological traces of the last Tasmanians and notes on the criteria for the authentication of flaked glass artifacts. *Papers and Proceedings of the Royal Society of Van Diemen's Land* **114**: 225–233.

Arthur, K. W. (2010). Feminine knowledge and skill reconsidered: women and flaked stone tools. *American Anthropologist* **112**(2): 228–243.

Backhouse, J. (1843). *A Narrative of a Visit to the Australian Colonies*. Hamilton, Adams, London.

Balfour, H. (1903). On the method employed by the natives of Northwest Australia in the manufacture of glass spearheads. *Man* **3**(35): 65.

Barbana, F., Bertoncello, R., Milanese, L., and Sada, C. (2004). Alteration and corrosion phenomena in Roman submerged glass fragments. *Journal of Non-Crystalline Solids* **337**(2): 136–141.

Barker, B., Wallis, L. A., Burke, H., Cole, N., Lowe, K., Artym, U., Pagels, A., Bateman, L., Hatte, E., De Leiuen, C., Davidson, I., and Zimmerman, L. J. (2020). The archaeology of the "Secret War": the material evidence of conflict on the Queensland frontier 1849–1901. *Queensland Archaeological Research* **23**: 25–41.

Bateman, L. (2020). *Aboriginal-European Interaction on the Queensland Frontier: An Archaeological Study of the Boralga Native Police Camp, Cape York Peninsula*. Doctoral dissertation, Univeristy of Southern Queensland, Toowoomba.

Biggs, A. J. W. and Philip, S. R. (1995). *Soils of Cape York Peninsula*. Queensland Department of Primary Industries, Mareeba.

Bird, C. F. M. (1993). Woman the toolmaker: evidence for women's use and manufacture of flaked stone tools in Australia and New Guinea. In du Cros, H. and Smith, L. J. (eds.), *Women in Archaeology: A Feminist Critique*. Research School of Pacific Studies, The Australian National University, Canberra, pp.22–30.

Birmingham, J. (1992). *Wybalenna: The Archaeology of Cultural Accommodation in Nineteenth Century Tasmania*. Australian Society for Historical Archaeology, Sydney.

Birmingham, J. and Wilson, A. (2010). Archaeologies of cultural interaction: Wybalenna settlement and Killalpaninna Mission. *International Journal of Historical Archaeology* **14**: 15–38.

Bolam, A. G. (1925). *The Trans-Australian Wonderland*. Modern Printing, Melbourne.

Bolton, S. (1999). *Towards a Functional Analysis of Glass Artifacts from Central Australia*. Bachelor's (Honors) thesis, University of Sydney, Sydney.

Bourke, P. M. (2005). Identifying Aboriginal "contact period" sites around Darwin: long past due for Native Title? *Australian Aboriginal Studies* **2005**(1): 54–65.

Burke, H. and Wallis, L. A. (2019). *Frontier Conflict and the Native Mounted Police in Queensland Database*. https://doi.org/10.25957/5d9fb541294d5.

Burke, H., Barker, B., Cole, N., Wallis, L. A., Hatte, E., Davidson I., and Lowe, K. (2018). The Queensland Native Police and strategies of recruitment on the Queensland frontier 1849–1901. *Journal of Australian Studies* **42**(3): 297–313.

Carnegie, D. W. (1898). *Spinifex and Sand: A Narrative of Five Years' Pioneering and Exploration in Western Australia*. C. Arthur Pearson, London.

Carter, B. (1798). Journal of Ann and Hope 1798–1799. Rhode Island Historical Society. (SLNSW Microfilm 769, pp.80–82).

Carver, G. (2005). *Post-Contact Archaeology at Nuccaleena, South Australia: An Investigation of Glass Tool Use by Indigenous Australians*. Master's thesis, Flinders University, Adelaide.

Cawthorne, W. A. (1844). Rough notes on the manners and customs of the Natives. *Proceedings of the Royal Geographic Society of Australia (South Australia)* **27**: 44–77.

Chai, H. (2017). Modelling edge chipping in flint knapping, cutting tools and sharp teeth using a trapezoidal prism structure. *International Journal of Solids and Structures* **104–105**: 1–7.

Clarkson, C., Jacobs, Z., Marwick, B., Fullagar, R., Wallis, L.A., Smith, M., Roberts, R. G., Hayes, E., Lowe, K., Carah, X., Florin, S. A., McNeil, J., Cox, D., Arnold, L. J., Hua, Q., Huntley, J., Brand, H. E. A., Manne, T., Fairbairn, A., Shulmeister, J., Lyle, L., Salinas, M., Page, M., Connell, K., Norman, K., Murphey, T., and Pardoe, C. (2017). Human occupation of northern Australia by 65,000 years ago. *Nature* **547**: 306–310.

Cole, N. (2004). Battle Camp to Boralga: a local study of colonial war on Cape York Peninsula, 1873–1894. *Aboriginal History* **28**: 156–189.

Cole, N. (2010). Painting the police: Aboriginal visual culture and identity in colonial Cape York Peninsula. *Australian Archaeology* **71**: 17–28.

Cole, N., Wallis, L. A., Burke, H., Barker, B., and Rinyurru Aboriginal Corporation (2020). "On the brink of a fever stricken swamp": culturally modified trees and land-people relationships at the Boralga Native Mounted Police camp, Cape York Peninsula. *Australian Archaeology* **86**(1): 21–36.

Colley, S. M. (2000). The colonial impact? contact archaeology and [I]ndigenous sites in southern New South Wales. In Torrence, R. and Clarke, A. (eds.), *The Archaeology of Difference: Negotiating Cross-Cultural Engagements in Oceania*. Routledge, London, pp. 285–307.

Cooper, Z. and Bowdler, S. (1998). Flaked glass tools from the Andaman Islands and Australia. *Asian Perspectives* **37**(1): 74–83.

Cotterell, B. and Kamminga, J. (1987). The formation of flakes. *American Antiquity* **52**(4): 675–708.

Dawson, R. (1831). *The Present State of Australia, A Description of the Country, Its Advantages and Prospects, with Reference to Emigration: and a Particular Account of the Manners, Customs, and the Condition of Its Aboriginal Inhabitants*. Smith, Elder, London.

Deal, M. and Hayden, B. (1987). The persistence of pre-Columbian lithic technology in the form of glass working. In Hayden, B. (ed.), *Lithic Studies Among the Contemporary Highland Maya*. University of Arizona Press, Tuscon, pp. 235–331.

Delaunay, A. N., Belardi, J. B., Marina, F. C., Saletta, M. J., and Angelis, H. D. (2017). Glass and stone-wear knapped tools among hunter-gatherers in southern Patagonia and Tierra del Fuego. *Antiquity* **91**(359): 1330–1343.

De Winton, G. J. (1898). *Soldiering Fifty Years Ago: Australia in the Forties*. Ludgate Circus, European Mail.

Dietler, M. (2010). *Archaeologies of Colonialism: Consumption, Entanglement and Violence in Ancient Mediterranean France*. University of California Press, Berkeley.

Eden, C. H. (1874). Australian search party. In H.W. Bates (ed.), *Illustrated Travels: A Record of Discovery, Geography, and History*. Cassell, Petter and Galpin, London.

Emami, M., Nekouei, S., Ahmadi, H., Pritzel, C., and Trettin, R. (2016). Iridescence in ancient glass: a morphological and chemical Investigation. *International Journal of Applied Glass Science* **7**(1): 59–68.

Ethridge, R. F. and Shuck-Hall, S. M. (2009). *Mapping the Mississippian Shatter Zone*: *The Colonial Indian Slave Trade and Regional Instability in the American South*. University of Nebraska Press, Lincoln.

Flexner, J. L. (2014). Historical archaeology, contact and colonialism in Oceania. *Journal of Archaeological Research* **22**(1): 43–87.

Foghlú, B. Ó., Wesley, D., Brockwell, S., and Cooke, H. (2016). Implications for culture contact history from a glass artifact on a Diingwulung earth mound in Weipa. *Queensland Archaeological Research* **19**: 1–22.

Freeman, S. (1993). *A Preliminary Analysis of the Glass Artifacts Found on the Onkaparinga River Estuary*. Bachelor's (Honors) thesis, Flinders University, Adelaide.

Freiman, S. W. (1980). Fracture mechanics of glass. In Uhlmann, D. R. and Kreidl, N. J. (eds.), *Glass Science and Technology, Volume 5*. Elsevier, Amsterdam, pp. 21–78.

Fullagar, R. (2004). Residues and usewear. In Balme, J. and Paterson, A. (eds.), *Archaeology in Practice: A Student Guide to Archaeological Analyses*. Blackwell, Malden, pp. 232–263.

Gero, J. M. (1991). Genderlithics: women's roles in stone tool production. In Gero, J. M. and Conkey, M. (eds.), *Engendering Archaeology: Women and* Prehistory. Blackwell, Oxford, pp. 163–193.

Gibbs, M. (2003). The archaeology of crisis: shipwreck survivor camps in Australasia. *Historical Archaeology* **37**: 128–145.

Gibbs, M. and Harrison, R. (2008). Dynamics of dispersion revisited? archaeological context and the study of Aboriginal knapped glass artifacts in Australia. *Australian Archaeology* **67**(1): 61–68.

Gorman, A. C. (2000). *The Archaeology of Body Modification: The Identification of Symbolic Behaviour Through Usewear and Residues on Flaked Stone Tools*. Doctoral dissertation, University of New England, Armidale.

Gosden, C. (2004). *Archaeology and Colonialism: Cultural Contact from 5000 BC to the Present*. Cambridge University Press, Cambridge.

Gosden, C. (2012). Postcolonial archaeology. In Hodder, I. (ed.), *Archaeological Theory Today.* Polity, Cambridge, pp. 251–266.

Gould, R. A. (1977). Ethnoarchaeology, or, where do models come from? In Wright, R. V. S. (ed.), *Stone Tools as Cultural Markers*. Australian Institute of Aboriginal Studies, Canberra, pp. 162–177.

Gould, R. A., Koster, D. A., and Sontz, A. H. L. (1971). The lithic assemblage of the Western Desert Aborigines of Australia. *American Antiquity* **36**(2): 149–169.

Goward, T. (2011). *Aboriginal Glass Artifacts of the Sydney Region*. Bachelor's (Honors) thesis, University of Sydney, Sydney.

Grace, R. (1996). Use-wear analysis: the state of the art. *Archaeometry* **38**(2): 209–229.

Hamilton, A. (1980). Dual social systems: technology, labour and women's secret rites in the eastern Western Desert of Australia. *Oceania* **51**(1): 4–19.

Harrison, R. (1996). *It's the Way it Shatters that Matters: An Analysis of the Technology and Variability of Aboriginal Glass Artifacts in the Shark Bay and Swan Regions of Western Australia*. Bachelor's (Honors) thesis, University of Western Australia, Crawley.

Harrison, R. (2000). "Nowadays with glass": regional variation in Aboriginal bottle glass artifacts from Western Australia. *Archaeology in Oceania* **35**: 34–47.

Harrison, R. (2002). Archaeology and the colonial encounter: Kimberley spearpoints, cultural identity and masculinity in the north of Australia. *Journal of Social Archaeology* **2**(3): 352–377.

Harrison, R. (2003). The magical virtue of these sharp things: colonialism, mimesis and knapped bottle glass artifacts in Australia. *Journal of Material Culture* **8**(3): 311–336.

Harrison, R. (2004). Kimberley points and colonial preference: new insights into the chronology of pressure flaked point forms from the southeast Kimberley, Western Australia. *Archaeology in Oceania* **39**(1): 1–11.

Harrison, R. (2006). An artifact of colonial desire? Kimberley points and the technologies of enchantment. *Current Anthropology* **47**(1): 63–88.

Harrison, R. (2014). Shared histories and the archaeology of the pastoral industry in Australia. In Ferris, N., Harrison, R., and Wilcox, M. V. (eds.), *Rethinking Colonial Pasts Through Archaeology.* Oxford University Press, Oxford, pp. 37–56.

Hayden, B. (1977). Stone tool functions in the Western Desert. In Wright, R. V. S. (ed.), *Stone Tools as Cultural Markers*. Australian Institute of Aboriginal Studies, Canberra, pp. 178–188.

Hunter, J. (1793). *An Historical Journal of the Transactions at Port Jackson and Norfolk Island with the Discoveries which have been made in New South Wales and in the Southern Ocean, since the publication of Phillip's Voyage, compiled from the Official Papers; Including the Journals of Governor Phillip and King, and of Lieut. Ball; and the Voyages of the first Sailing of the Sirius in 1787, to the Return of that Ship's Company to England in 1792*. University of Sydney Library, Sydney.

Hunter, P. (2014). *Fragments of the Past: Investigating the History of Bandicoot Bay through Glass Artifacts*. Master of Professional Archaeology thesis, University of Western Australia, Crawley.

Idriess, I. (1937). *Over the Range: Sunshine and Shadow in the Kimberley*. Angus and Robertson, Sydney.

Irish, P. and Goward, T. (2012). Where's the evidence? the archaeology of Sydney's Aboriginal history. *Archaeology in Oceania* **47**(2): 60–68.

Jones, R. and White, N. (1988). Point blank: stone tool manufacture at Ngilipitji quarry, Arnhem Land 1981. In Meehan, B. and Jones, R. (eds.), *Archaeology with Ethnography: An Australian Perspective*. Research School of Pacific Studies, Australian National University, Canberra, pp. 51–87.

Khan, K. (2004). Catalogue of the Roth Collection of Aboriginal artifacts from North Queensland, volume 4. Items collected from Nassau River, Night Island, Palmer River, Peak Point Electric Telegraph Office, Princess Charlotte Bay, Staaten River, Starcke River, Tinaroo, Tully River, Vanrook and Weipa (Embley River), in 1896–1903. *Technical Reports of the Australian Museum* **18**: 1–112.

Knudson, R. (1979). Inference and imposition in lithic analysis. In Hayden, B. (ed.), *Lithic Use Wear Analysis: Proceedings of the Conference on Lithic Use-Wear.* Academic Press, New York, pp. 269–281.

Lane Fox, A. (1878). Observations on Mr. Man's collection of Andamanese and Nicobarese objects. *Journal of the Anthropological Institute of Britain and Ireland* **VII**: 434–469.

Lightfoot, K. G. (1995). Culture contact studies: redefining the relationship between prehistoric and historical archaeology. *American Antiquity* **60**(2):199–217.

Lightfoot, K. G. Gonzalez, S. L., and Schneider, T. D. (2009). Refugees and interethnic residences: examples of colonial entanglements in the north San Francisco Bay area. *Pacific Coast Archaeological Society Quarterly* **42**(1): 1–21.

Lindsey, B. (2020). Historic Glass Bottle Identification and Information Website. Retrieved from https://sha.org/bottle/colors.htm

Love, J. R. B. (1936). *Stone Age Bushmen of Today: Life and Adventure among a Tribe of Savages in North-Western Australia*. Blackie and Son, London.

Lowe, K. M., Cole, N., Burke, H., Wallis, L. A., Barker, B., Hatte, E., and Rinyurru Aboriginal Corporation (2018). The archaeological signature of "ant bed" mound floors in the northern tropics of Australia: case study on the Boralga Native Mounted Police Camp, Cape York Peninsula. *Journal of Archaeological Science: Reports* **19**: 686–700.

Lydon, J. and Burns, A. (2010). Memories of the past, visions of the future: changing views of Ebenezer Mission, Victoria, Australia. *International Journal of Historical Archaeology* **14**: 39–55.

Man, E. H. (1883). On the Aboriginal inhabitants of the Andaman Islands (Part III). *The Journal of the Anthropological Institute of Great Britain and Ireland* **12**: 327–434.

Martindale, A. and Jurakic, I. (2006). Identifying expedient glass tools from a post-contact Tsimshian village using low power (10–100×) magnification. *Journal of Archaeological Science* **33**(3): 414–427.

Martindale, A. and Jurakic, I. (2015). Glass tools in archaeology: material and technological change. In *Oxford Handbooks Online*. Oxford University Press, Oxford. https://doi.org/10.1093/oxfordhb/9780199935413.013.4.

May, D. (1983). *From Bush to Station: Aboriginal Labour in the North Queensland Pastoral Industry, 1861–1897*. History Department, James Cook University, Townsville.

May, D. (1994). *Aboriginal Labour and the Cattle Industry: Queensland from White Settlement to the Present*. Cambridge University Press, Cambridge.

McNiven, I . J. (1998). Aboriginal archaeology of the Corroboree Beach dune field, Fraser Island: re-survey and re-assessment. *Memoirs of the Queensland Museum, Cultural Heritage Serie*s **1**(1): 1–22.

McNiven, I. J. (2001). Torres Strait Islanders and the maritime frontier in early colonial Australia. In Russell, L. (ed.), *Colonial Frontiers: Indigenous European Encounters in Settler Societies*. Manchester University Press, Manchester, pp. 175–197.

McNiven, I. J., Wright, D., Sutton, S., Weisler, M., Hocknull, S., and Stanisic, J. (2015). Midden formation and marine specialisation at Goemu village, Mabuyag, Torres Strait, before and after European contact. *Memoirs of the Queensland Museum, Culture* **8**(2): 377–475.

Mohajerani, A. and Spelt, J. K. (2010). Edge chipping of borosilicate glass by blunt indentation. *Mechanics of Materials* **42**(12): 1064–1080.

Mohajerani, A. and Spelt, J. K. (2011). Edge chipping of borosilicate glass by low velocity impact of spherical indenters. *Mechanics of Materials* **43**(11): 671–683.

Moore, M. W., Sutikna, T., Jatmiko, Morwood, M. J., and Brumm, A. (2009). Continuities in stone flaking technology at Liang Bua, Flores, Indonesia. *Journal of Human Evolution* **57**(5): 503–526.

Moore, M. W. (2010). "Grammars of action" and stone flaking design space. In Nowell, A. and Davidson, I. (eds.), *Stone Tools and the Evolution of Human* Cognition. University Press of Colorado, Boulder, pp. 13–43.

Moore, M. W. (2015). Bifacial flintknapping in the northwest Kimberley, Western Australia. *Journal of Archaeological Method and Theory* **22**: 913–951.

Moore, M. W. (2019). Flake-making and the "Cognitive Rubicon": insights from stone-knapping experiments. In Overmann, K. A. and Coolidge, F. L. (eds.), *Squeezing Minds from Stones: Cognitive Archaeology and the Evolution of the Human Mind.* Oxford University Press, New York, pp. 179–199.

Moore, M. W. (2020). Eoliths. Museum of Stone Tools. https://a13552e0-9352-4408-b066-7f4dbdff7565.filesusr.com/ugd/3bcda9_0efb272fa63f45f0aa206c8a0e25b7da.pdf

Moore, M. W., Westaway, K., Ross, J., Newman, K., Perston, Y. L., Huntley, J., Keats, S., Kandiwal Aboriginal Corporation, and Morwood, M. J. (2020). Archaeology and art in context: excavations at the Gunu Site Complex, Northwest Kimberley, Western Australia. *PLOS ONE* **15**(2): e0226628. DOI :https://doi.org/10.1371/journal.pone.0226628.

Morrison, M., McNaughton, D., and Shiner, J. (2010). Mission-based Indigenous production at the Weipa Presbyterian Mission, western Cape York Peninsula (1932–66). *International Journal of Historical Archaeology* **14**: 86–111.

Morrison, M., Della-Sale, A., and McNaughton, D. (2019). War capitalism and the expropriation of country: spatial analysis of Indigenous and settler-colonial entanglements in north eastern Australia, 1864–1939. *International Journal of Historical Archaeology* **23**: 204–234.

Naum, M. (2010). Re-emerging frontiers: postcolonial theory and historical archaeology of the borderlands. *Journal of Archaeological Method and Theory* **17**(2): 101–311.

Neiburger, E. (2015). Testing obsidian: "sharper than a scalpel". *Central States Archaeological Journal* **62**(3): 176–178.

Nelson, D. F. and Revell, B. C. (1967). Backward fragmentation from breaking glass. *Journal of the Forensic Science Society* **7**(2): 58–61.

Newcomer, M. H. and Hivernel-Guerre, F. (1974). Nucléus sur éclat: technologie et utilisation par différentes cultures préhistoriques. *Bulletin de la Société Préhistorique Franĉaise* **71**(4): 119–128.

Noble. (1879). The Flinders Range tribes. In Taplin, G. (ed.), *The Folklore, Manners, Customs, and Languages of the South Australian Aborigines: Gathered from Inquiries Made by Authority of South Australian Government*. E. Spiller, Adelaide, p. 64.

O'Connor, S. (1877). Letter to Police Commissioner 1/12/1877 and plan of police reserve on the Laura River. Queensland State Archive A/40117 File 1449. File 1449, 4072/77.

Panich, L. M. and Schneider, T. D. (2015). Expanding mission archaeology: a landscape approach to Indigenous autonomy in colonial California. *Journal of Anthropological Archaeology* **40**: 48–58.

Paterson, A. (2017). Unearthing Barrow Island's past: the historical archaeology of colonial-era exploitation, northwest Australia. *International Journal of Historical Archaeology* **21**: 346–368.

Paterson, A. and Veth, P. (2020). The point of pearling: colonial pearl fisheries and the historical translocation of Aboriginal and Asian workers in Australia's northwest. *Journal of Anthropological Archaeology* **57**: 101–143.

Pitt Rivers Museum. (2011). Pitt Rivers Virtual Collection. http://web.prm.ox.ac.uk/bodyarts/index.php/temporary-body-arts/toiletries/53-makeshift-razors.html

Proudfoot, H., Bickford, A., Egloff B., and Stocks, R. (1991). *Australia's First Government House*. Allen and Unwin, Sydney.

Radcliffe-Brown, A. R. (1922). *The Andaman Islanders*. Cambridge University Press, London.

Richards, J. (2008). *The Secret War: A True History of Queensland's Native Police*. Queensland University Press, St Lucia.

Romero, F. G. (2002). Foucault and a singular technology of power development at the borderlands of 19th-century Argentina. *Journal of Social Archaeology* **2**(3): 402–429.

Ross, J. and Travers, M. (2013). "Ancient mariners" in northwest Kimberley rock art: an analysis of watercraft and crew depictions. *The Great Circle* **35**(2): 55–82.

Roth, L. (1899). *The Aborigines of Tasmania*. F. King and Sons, Halifax.
Schneider, T. D. (2015). Placing refuge and the archaeology of Indigenous hinterlands in colonial California. *American Antiquity* **80**(4): 695–713.
Sehgal, J. and Ito, S. (1999). Brittleness of glass. *Journal of Non-Crystalline Solids* **253**(1): 126–132.
Sellet, F. (1993). Chaîne opératoire: the concept and its applications. *Lithic Technology* **18**(1–2): 106–112.
Shea, J. J. and Klanck, J. D. (1993). An experimental investigation of the effects of trampling on the results of lithic microwear analysis. *Journal of Archaeological Science* **20**: 175–194.
Silliman, S. W. (2001). Agency, practical politics and the archaeology of culture contact. *Journal of Social Archaeology* **1**(2): 184–204.
Silliman, S. W. (2005). Culture contact or colonialism? challenges in the archaeology of Native North America. *American Antiquity* **70**(1): 55–74.
Silliman, S. W. (2009). Change and continuity, practice and memory: Native American persistence in colonial New England. *American Antiquity* **74**(2): 211–230.
Sim, R. and Wallis, L. A. (2008). Northern Australian offshore island use during the Holocene: the archaeology of Vanderlin Island, Sir Edward Pellew Group, Gulf of Carpentaria. *Australian Archaeology* **67**: 95–106.
Stingemore, J. (2010). *Surviving the "Cure": Life on Bernier and Dorre Islands under the Lock Hospital Regime*. Doctoral dissertation, University of Western Australia, Crawley.
Terry, M. (1925). *Across Unknown Australia: A Thrilling Account of Exploration in the Northern Territory of Australia*. Herbert Jenkins, London.
Terry, M. (1925). *Across Unknown Australia: A Thrilling Account of Exploration in the Northern Territory of Australia*. Herbert Jenkins, London.
Tindale, N. B. (1972). The Pitjandjara. In Bicchieri, M. G. (ed.), *Hunters and Gatherers Today*. Holt, Rinehart and Winston, New York, pp. 217–268.
Tixier, J. (1963). *Typologie de l'Epipaléolithique du Maghreb, Mémoires du Centre de Recherches Anthropologiques. Préhistoriques et Ethnographiques d'Alger*. Arts et Métiers Graphiques, Paris.
Tomášková, S. (2005). What is a burin? typology, technology and interregional comparison. *Journal of Archaeological Method and Theory* **12**: 79–115.
Torrence, R. and Clarke, A. (eds.) (2000). *Negotiating Difference: the Archaeology of Cross-Cultural Engagement*. Unwin and Hyman, London.
Tsirk, A. (2012). Fractography lessons from knapping. In Varner, J. R. and Wightman, M. (eds.), *Fractography of Glasses and Ceramics VI: Ceramic Transactions*. American Ceramic Society and Wiley and Sons, Hoboken, NJ, pp. 123–132.
Ulm, S., Eales, T., and L'Estrage, S. (1999). Post-European Aboriginal occupation of the southern Curtis Coast, Central Queensland. *Australian Archaeology* **48**: 42–43.
Ulm, S., Vernon, K., Robertson, G., and Nugent, S. (2009). Historical continuities in Aboriginal land-use at Bustard Bay, Queensland: results of use-wear and residue analysis of Aboriginal glass artifacts. *Australasian Historical Archaeology* **27**: 111–119.
Veth, P. and O'Connor, S. (2005). Archaeology, claimant connection to sites and native title: employment of successful categories of data with specific comments on glass artefacts. *Australian Aboriginal Studies* **2005**(1): 2–15.
Voss, B. (2015). What's new? rethinking ethnogenesis in the archaeology of colonialism. *American Antiquity* **80**(4): 655–670.
Wallis, L. A., Burke, H., and Dardengo, M. (2021). A comprehensive online database about the Native Mounted Police and frontier conflict in Queensland. *Journal of Genocide Research.* https://doi.org/10.1080/14623528.2020.1862489
Walshe, K., Malone, G., Telfer, K., and Gully, G. (2019). Aboriginal historical archaeological site, Kanyanyapilla camp, McLaren Vale, South Australia. *Australian Archaeology* **85**(2): 196–209.
Wesley, D., Jones, T., O'Connor, S., Fenner, J., and Dickinson, W. (2014). Earthenware of Malara, Anuru Bay: a reassessment of potsherds from a Macassan trepang processing site, Arnhem Land, Australia, and implications for Macassan trade and the trepang industry. *Australian Archaeology* **79**(1): 14–25.
Wilkins, G. H. (1928). *Undiscovered Australia, Being an Account of an Expedition to Tropical Australia to Collect Specimens of the Rarer Native Fauna for the British Museum, 1923–1925*. Ernest Benn, London.
Williamson, C. (2002). Finding meaning in the patterns: the analysis of material culture from a contact site in Tasmania. In Harrison, R. and Williamson, C. (eds.), *After Captain Cook: The Archaeology*

of the Recent Indigenous Past in Australia. Archaeological Computing Laboratory, University of Sydney, Sydney, pp. 75–101.

Wolski, N. and Loy, T. H. (1999). On the invisibility of contact: residue analyses on Aboriginal glass artifacts from western Victoria. *The Artifact: The Journal of the Archaeological and Anthropological Society of Victoria* **22**: 65–73.

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