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Detecting early tattooing in the Pacific region through experimental usewear and residue analyses of obsidian tools

Nina Kononenko [a,b,*], Robin Torrence [a,b], Peter Sheppard [c]

[a] Geosciences and Archaeology, Australian Museum, 1 William Street, Sydney, NSW 2010, Australia
[b] Archaeology, SOPHI, University of Sydney, NSW 2006, Australia
[c] Anthropology, University of Auckland, Human Science Building, 10 Symonds Street, Auckland 1010, New Zealand

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ABSTRACT

Although tattoos have been observed on mummies dated to over 5000 years old, the generally poor preservation of human remains makes it difficult to use this type of adornment to understand how inscriptions on the body have been used to define self and social ascriptions. A potential method for detecting tattooing is to identify the tools used to make the markings. To assist recognition of tattooing tools, an extensive set of experiments was conducted in which retouched obsidian flakes bearing various pigments were used to pierce pig skin. Diagnostic use wear and residues associated with tattooing were identified. To illustrate the value of these results, traces preserved on a highly recognizable class of obsidian retouched artefacts from the Nanggu site (SE-SZ-8) in the Solomon Islands were analysed. Results indicate that these tools were used to pierce skin and may therefore have been tattooing implements involved in social, ritual and/or medical practices.

1. Introduction

Inscribing the human body through tattooing is a culturally significant form of behaviour that actively creates social identities of various kinds, or what Turner (2012) has aptly termed the 'social skin.' Making marks and patterns in the skin helps define boundaries between self and the wider social group, between social groups, and also divides humans from the spirit world (Schildkrout, 2004: 338). It is important to distinguish tattooing from other forms of body decoration, such as ornaments, clothing or pigment, because it comprises permanent changes that become the skin of a person (Rainbird, 2002) and therefore create who they are.

Although discoveries of mummified human remains provide reliable evidence that body modification by tattooing with pigments dates back beyond 5000 years ago in the European Alps (e.g., Deter-Wolf et al., 2016; Alvrus et al., 2001, Poon, 2008:12), it is very difficult to trace the ancient history and geographical distribution of this practice across the globe because such excellent preservation is exceptional. Since tattooing is integral to many recent Pacific societies (e.g. Gell, 1993; Ambrose, 2012), it is particularly important to trace the prehistory of tattooing in relation to wider social changes. A useful approach might be to target archaeological finds of implements used for tattooing, although to date these have also been extremely rare, probably because perishable materials were often used. Ethnographic accounts from Melanesia, however, report that obsidian, quartz and chert were employed for incising and piercing skin both to create tattoos or scars and for medicinal purposes (e.g., Ambrose, 2012; Barton, 1918:24–26; Buckland, 1888:321; Comrie, 1877:110; Fullagar, 1998; Parkinson, [1908] 1999:96; Specht, 1981:347).

Previous use-wear research on obsidian has identified a number of characteristics related to the nature and development of wear patterns as a consequence of working soft, pliable materials such as skin, flesh and fish (e.g. Brose, 1975, Kamminga, 1982:45–47, Fullagar, 1991, 1998; Hurcombe, 1992:44–46; Aoyama, 1995, Kononenko, 2011:31–34, Lewenstein, 1981, Vaughan, 1985:9). These provide useful background for understanding use wear resulting from working skin with obsidian, but experimental confirmation of the specific wear traces and residues resulting from tattooing are still essential.

Through comparison with wear traces formed during a small set of experiments involving chicken and reptile skins, Kononenko and Torrence (2009) and Kononenko (2012) identified stone tools from middle and late Holocene deposits in Papua New Guinea and Vanuatu used for piercing and cutting skin possibly in association with tattooing and/or scarification. The purpose of this study is to improve the methods for identifying tattooing tools by significantly expanding the experimental base of wear traces associated specifically with piercing skin. The results obtained from 26 experiments are then used to interpret the usewear and residues observed on a sample of 15 obsidian artefacts recovered from the Nanggu (SE-SZ-8) site in the Solomon Islands

* Corresponding author at: Geosciences and Archaeology, Australian Museum, 1 William Street, Sydney, NSW 2010, Australia.

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(Green 1976; Sheppard 1993; Sheppard et al. 2015) (Figs. 1, 2). The case study reinforces the importance of the experimental results for the identification of skin modification in other parts of the world.

2. Tattooing techniques

To create a tattoo, the surface of the skin must be broken by piercing so that pigment can be embedded in such a way that the colouring remains permanently after the wound heals. Tattooing methods include puncturing the skin, sewing thread beneath the skin, or cutting, scraping or scratching to divide the skin cells so that pigment can be rubbed into the cut (e.g., Poon, 2008:12–16). Human skin averages between 2–3 mm in thickness and is composed of three primary layers. (1) The epidermis is a tough protective layer with no blood vessels. (2) The dermis acts as a cushion against injury and aides healing by forming new tissue, which is rich in new blood vessels and cells. (3) The hypodermis is a fatty layer of subcutaneous tissue. Tattooing aims to reach the dermis layer. Since pigment injected into the epidermis breaks down by metabolism, but is held in the upper dermal layer (Poon, 2008: 61, Shimada et al., 2002), the length of the point on a tattooing implement is closely constrained.

Ethnographic and historical accounts from the Pacific region indicate that cutting and piercing were the two principle modes of tattooing. The most simple and, therefore, possibly the oldest method was to make a series of incisions (2 to 4 mm long) forming a line into which pigment was rubbed (e.g., Ambrose, 2012; Buckland, 1888; Comrie, 1877:110; Poon, 2008:16, van Gulik, 1982:190) or sketching the design pattern on the skin with charcoal or ochre pigments followed by the incisions (Davenport, 2002). The second common tattooing technique was piercing the skin (e.g., Ambrose, 2012; Buckland, 1888). Either the sharp point of the tool used to pierce the skin was dipped into a prepared pigment, or pigment drawn on the skin was inserted by pricking. Sometimes additional pigment was rubbed into pierced skin (e.g., Ambrose, 2012; Barton, 1918:26; Buckland, 1888:319; Gorman, 2000:70; Krieger, 1932:16; Kononenko, 2012: 26; Poon, 2008:12–16).

Pigments used in tattooing can either be organic or mineral, but the particles must be insoluble and of a reasonable size so they remain in the dermis and are not ingested by the immune system (Poon, 2008:6). Powdered organic pigments, like charcoal, and mineral pigments, such as ochre and burnt lime, were usually mixed with water or sap and grease (e.g., Alvrus et al., 2001; Ambrose, 2012; Bell, 1949; Davenport, 2002).

Depending on the technique of tattooing and the method of pigment delivery, tools were usually chosen for their ability to be sharpened to a point or form a sharp edge (e.g., Ambrose, 2012; Buckland, 1888; Poon, 2008:12). Ethnographically recorded tattooing tools in the Pacific include two distinctive categories: (1) simple tools which were widely distributed in Melanesia and (2) complex, multi-toothed tools restricted to Polynesia (Ambrose, 2012). Simple tattooing implements of natural plant thorns, fish spines, or pointed bones were used for skin puncture, whereas single sharp blades made of obsidian, quartz, chert or bamboo made incisions and/or punctures (e.g., Ambrose, 2012; Barton, 1918:24–26; Buckland, 1888:321; Comrie, 1877:110; Fullagar, 1998; Parkinson, [1908] 1999:96). Multi-toothed tattooing tools were usually made from perishable materials—typically mammal or large bird bone (e.g., Ambrose, 2012; Booth, 2001; Firth, 1936:174–175; Krieger, 1932:16; Parkinson, [1908] 1999:232–233).

3. Experimental design and methodology

Twenty-six experiments designed to replicate tattooing were undertaken for two purposes. First, they aimed to investigate the factors and processes that contribute to wear formation on stone tools used to pierce skin. Secondly, the experiments produced an empirical database of wear traces that could aid the recognition, verification and interpretation of wear patterns on prehistoric artefacts. Following recommendations in Kononenko (2011:10), experimental tools of similar size

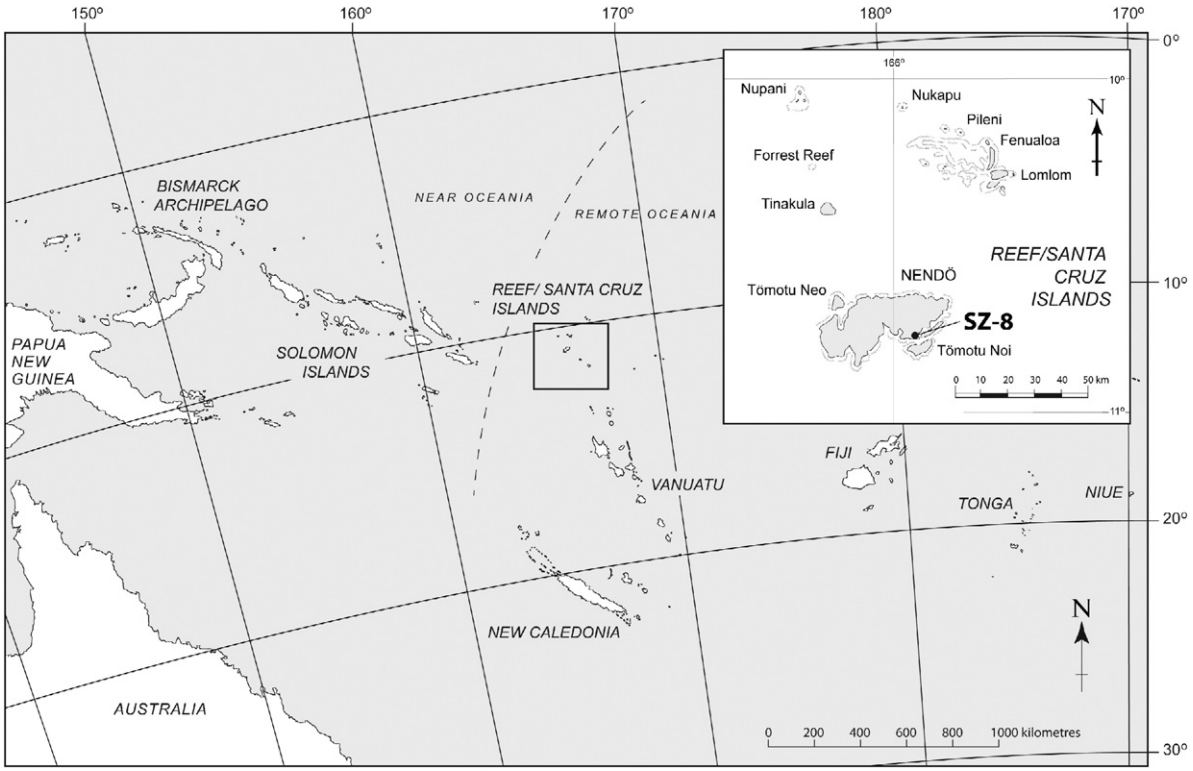

Fig. 1. Location of the Nanggu site (SE-SZ-8) in the Solomon Islands.