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Kate Helwig, Valery Monahan, Jennifer Poulin, Thomas D. Andrews

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Ancient Projectile Weapons from Ice Patches in Northwestern Canada: Identification of Resin and Compound Resin-Ochre Hafting Adhesives

Kate Helwig (corresponding author)[a], Valery Monahan[b] , Jennifer Poulin[a] and Thomas D. Andrews[c]

[a]Canadian Conservation Institute, 1030 Innes Road, Ottawa, Ontario, Canada, K1A 0M5 (kate.helwig@pch.gc.ca, jennifer.poulin@pch.gc.ca), 011-1-613-998-3721.
[b]Valery Monahan, Department of Tourism and Culture, Government of Yukon, Box 2703, Whitehorse, Yukon, Y1A 2C6 (valery.monahan@gov.yk.ca,)
[c]Thomas D. Andrews, Prince of Wales Northern Heritage Centre, PO Box 1320, Yellowknife, Northwest Territories X1A 2L9 (tom_andrews@gov.nt.ca)

*This article describes a study of adhesive residues on 16 projectile weapons, 15 from ice patches in southwest Yukon and one from the Selwyn Mountains, Northwest Territories. The objects selected for analysis cover much of the Holocene, with radiocarbon dates from 8103 to 170 cal. yr. BP and represent both throwing-dart and bow-and-arrow technology. The goal of the study was to identify the residues associated with hafting and to determine if patterns of material use exist. The residues were analyzed using a combination of analytical techniques: Fourier transform infrared spectroscopy (FTIR), gas chromatography-mass spectrometry (GC-MS), Raman spectroscopy, scanning electron microscopy-energy dispersive spectrometry (SEM-EDS) and polarized light microscopy (PLM). Hafting adhesive residues were found on nine objects that relate to throwing-dart technology and on two objects related to bow-and-arrow technology. In all cases where adhesive was found, the projectiles included chipped stone components. All adhesives, regardless of age, were found to be conifer resin, more specifically identified as spruce (*Picea *sp.). While the majority of adhesives were relatively pure, homogeneous spruce resin, in the case of three stone dart points, the spruce resin was intentionally mixed with red ochre to produce a compound adhesive. A fourth stone dart point showed the use of spruce "callus" resin, a type of resin produced during wound closure on the surface of the tree, which has a unique chemical signature.*

Keywords: hafting adhesive; natural resin; spruce; red ochre; projectile weaponry; Yukon, Northwest Territories

1. Introduction

Since 1997, over 200 artifacts have been recovered from melting alpine ice patches in northwestern Canada, primarily in the Yukon Territory (Hare et al., 2004; Hare et al., 2012) and a smaller number in the Northwest Territories (Andrews et al., 2012a). These ice patches were caribou hunting locations for indigenous people for thousands of years. Caribou sought out the high alpine ice patches in the summer and left behind a record of their occupation, mostly in the form of layers of fecal matter in the ice, as annual net accumulations of winter snow and surface depositions of dung were gradually compressed into permanent ice lenses. The caribou attracted early hunters, who in turn left evidence of their presence in the form of lost or discarded projectile weapons. Due to global climate change over the last few decades, these hunting