Journal of Archaeological Science: Reports xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

The compositional analysis of hunter-gatherer pottery from the Kuril Islands

Erik Gjesfjeld

UCLA Institute of Society and Genetics, University of California, Los Angeles, United States

ARTICLE INFO

Article history:
Received 14 October 2015
Received in revised form 18 March 2016
Accepted 27 March 2016
Available online xxxx

Keywords:
Archaeometry
Pottery
Kuril Islands
Exchange networks
Maritime hunter-gatherers

ABSTRACT

Archaeological analysis of pottery remains from Northeast Asia has traditionally emphasized macroscopic traits such as decoration and vessel form. While these features are important in characterizing the cultural affiliation of pottery, compositional analysis can provide new lines of evidence that highlight social processes such as migration and exchange. Using a ceramic assemblage recovered from the Kuril Islands of Northeast Asia, this research investigates the regional exchange of pottery associated with the Epi-Jomon and Okhotsk cultural traditions. Results of this study indicate cultural differences highly influence the geographic distribution of compositional groups and patterns of regional exchange.

1. Introduction

Archaeological research in Northeast Asia has a long tradition of examining macroscopic traits of ceramic artifacts including decorative features and vessel forms. The widespread use of these traits is largely due to their value in constructing regional typologies and chronological sequences (Aikens and Higuchi, 1982; Deryugin, 2008; Kenrick, 1995; Kidder and Esaka, 1968; Mizoguchi, 2002; Ponkratova, 2006; Takase, 2013; Zhushchikhovskaya, 2009). While macroscopic features are likely to remain at the center of pottery analysis in this region, this research contributes to a small but growing body of literature that demonstrates the potential of compositional analysis (Anderson et al., 2011; Habu et al., 2003; Habu and Hall, 1999; Hall, 2001, 2004; Hall et al., 2002). As the first comprehensive ceramic sourcing study in this region the goals of this project are 1) to establish the reliability of compositional analysis using ceramic artifacts, 2) to examine the diversity of geochemical sources between regions of the Kuril Islands and 3) to explore the potential of geochemical data to make inferences about exchange patterns. Broadly speaking, this study aims to contribute a new line of evidence, elemental composition data, to enhance our current knowledge of pottery exchange among maritime hunter-gatherers of the North Pacific.

2. Study area

Stretching in line for almost 1200 km from Hokkaido to Kamchatka, the Kuril Islands are composed of 32 islands that vary in size from 5 km^2 to 3200 km^2 (see Fig. 1). The most significant geographic features of the island chain are two major open water straits, the Bussol and Kruzenstern, which divide the archipelago into three distinct biological and geographical regions (Fitzhugh et al., 2004; Pietsch et al., 2003).

2.1. Biogeography

The pattern of biological diversity in the Kuril Islands is strongly influenced by the geographic barriers of the major straits, the large disparity in island sizes and the proximity of each island to the larger land masses of Hokkaido and Kamchatka (Pietsch et al., 2003). In general, higher biological diversity is recognized on islands located in the southern region with significantly lower resource diversity in the more remote central and northern islands. This pattern is observable in the flora of the archipelago with the southern islands maintaining a wide diversity of trees and shrubs including spruce, larch and oak as compared to the grasses of the tundra-covered northern and central islands (Anderson et al., 2008). The fauna of the archipelago also demonstrates this pattern with the southern islands containing a much higher diversity of terrestrial mammals, insects, freshwater mollusks, terrestrial mollusks and freshwater fish (Hoekstra and Fagan, 1998; Pietsch et al., 2001, 2003). The central islands, while ecologically less diverse compared to the southern and even northernmost islands, do contain high abundances of marine mammals, particularly sea lions, seals and sea otters, at least at present.

2.2. Weather and climate

The climatic conditions of the Kuril Islands are strongly influenced by the northwestern winds deriving from Siberia (Leonov, 1990). Winters are cold and harsh with nearly 138 snowstorm days per year and stable snow cover from November until May (Ganzei et al., 2010). Due

E-mail address: egjesfjeld@socgen.ucla.edu.

http://dx.doi.org/10.1016/j.jasrep.2016.03.049
2352-409X/

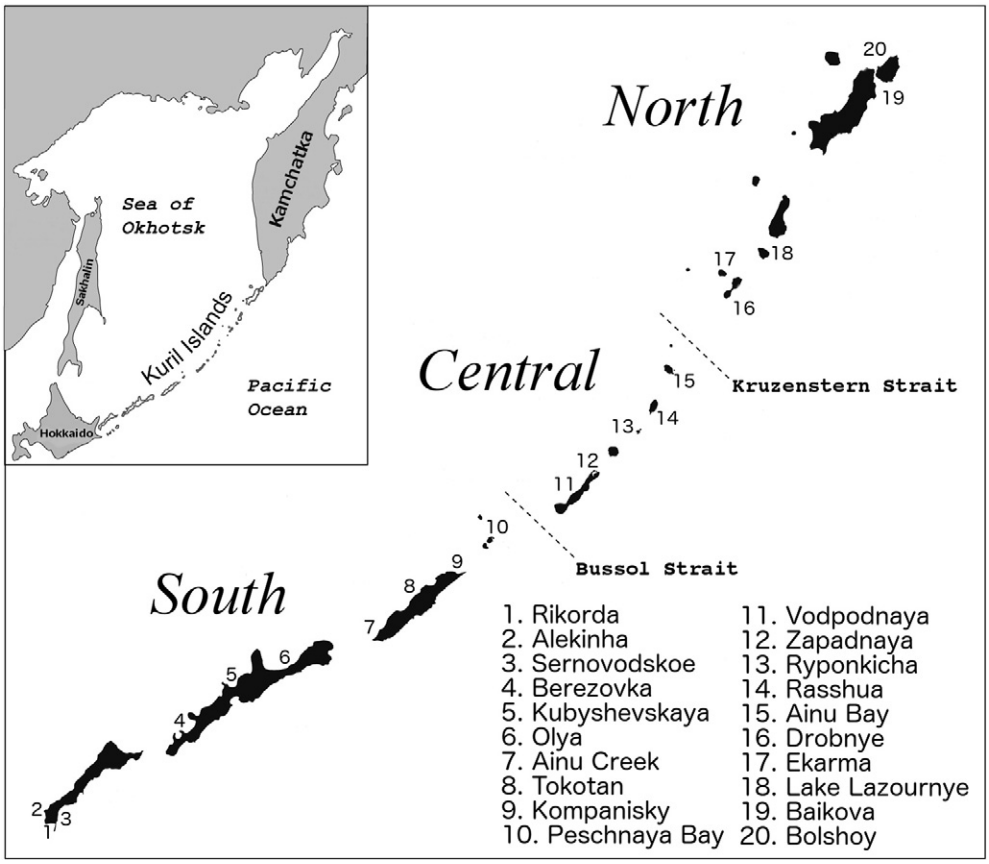

Fig. 1. Map of the Kuril Islands with names of key straits, region names and sites used in this study.

to the interaction of the cold Oyashio current and the warm Soya current, some areas of the Kuril Islands experience nearly 215 fog days per year, making this region of one of the foggiest places on earth (Bulgakov, 1996; Razjigaeva et al., 2011; Tokinaga and Xie, 2009). Summers are wet and short with very high air humidity and unpredictable violent storms that bring heavy precipitation, strong winds and storm surges (Belousov et al., 2009).

The frequency of storms in the Kuril Islands is noted by ethnographer Carl Etter (1949: 112–113) in the recording of his journey to the Kuril Islands, "It was the middle of the summer when one might expect pleasant weather. However, the Kurile climate was the most uncertain thing I found in all my journeys in the Orient…Our boat was loaded to full capacity and freight…We went on deck and made our bed under some tarpaulins, which were wet and cold. The fog was thick enough to cut with a knife and a cold east wind blew all night, keeping us cold and unable to sleep. The Japanese crew that brought us through that fog must surely know these Kurilian waters. The sea was rolling mountains high, and our little craft seemed like an eggsell in a tempest… There are tales in which the gods provided miraculous boats for Ainu who were in distress. I would almost be willing to admit that the boat in which I returned from Etorofu was one of those miraculous boats."

While less catastrophic than violent storms, earthquakes and typhoons, long-term climate change alters the frequency of storminess and the productivity of the marine ecosystem in which hunter-gatherers rely on so heavily (Fitzhugh et al., in press). Paleoclimate data from a variety of sources on or near the Kuril Islands point to major fluctuations in temperature and aridity through the Holocene. In general, the late Holocene was cooler and stormier than the early Holocene with intense cold and dry winds coming off the Siberian mainland (Razjigaeva et al., 2013). A detailed list of mid to late Holocene climate trends and their impact on the demography of the Kuril Islands can be found in Fitzhugh et al. (in press).

2.3. Geology

The Kuril archipelago is situated on the central portion of the Kuril-Kamchatka Island Arc formation, which also includes Eastern Hokkaido and Southern Kamchatka. The Kuril archipelago begin forming during the Late Cretaceous period (100 million years ago) but sediment record indicate that the greater arc of Kuril Islands did not emerge above the sea surface until the Pliocene or early Pleistocene (Bulgakov, 1996). Results of K-Ar dating show that the ages of volcanic rocks shift from old in the south islands (8.36–4.2 Ma), young in the central islands (3.3–0.6 Ma) to old in the north (7.0–3.5 Ma) (Ishizuka et al., 2011). The rock composition of the Kuril Islands, especially the uppermost geologic sequences, is dominated by andesitic formations with a lower prevalence of basaltic, dacitic and rhyolitic formations (Belousov et al., 2009).

Due to a high subduction rate, the Kuril Islands are among the most active volcanic areas in the world, with the highest volcanic activity observed north of the Bussol Strait (Belousov et al., 2009). In the last three millennia, approximately eighty volcanic eruptions occurred across the island chain including two caldera-eruptions and four large Plinian eruptions. The eruptive history of the Kuril Islands in combination with their sub-arctic, marine environment creates a dynamic history of landform modification that includes sea-level change, volcanic eruptive processes, coastal aggradation and dune formation (MacInnes et al., 2014).

2.4. Culture history

The earliest evidence of human occupation in the Kuril archipelago are pottery remains with a calendar age of 7610–8160 cal BP, recovered from the archaeological sites of Yankito and Kuibyshevo located on the southern island of Iturup (Yanshina and Kuzmin, 2010). Ceramic

Please cite this article as: Gjesfjeld, E., The compositional analysis of hunter-gatherer pottery from the Kuril Islands, Journal of Archaeological Science: Reports (2016), http://dx.doi.org/10.1016/j.jasrep.2016.03.049