

Of Pots and People: Investigating Hunter-Gatherer Pottery Production
and Social Networks in the Kuril Islands

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Abstract

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Ethnographic and archaeological research shows that hunter-gatherers have colonized and inhabited a diverse range of environmental settings. One example of this is the occupation of the unique sub-arctic, island environment of the Kuril archipelago located in Northeast Asia. This research aims to investigate the strategies used by hunter-gatherers to meet the challenges associated with colonization and habitation of this dynamic landscape. Building from a human behavioral ecology framework, this research develops a model that provides a series of predictions for the structure of social networks in response to differing levels of environmental uncertainty within the Kuril Islands. Using a novel methodological approach, models of social relationships are derived from the compositional data of pottery indicating the movement of artifacts across the landscape. Once network models from archaeological data have been constructed, social network analysis methods are utilized to visually and quantitatively assess archaeological networks in relation to model expectations.

In addition to investigating social network patterns, this research also provides a thorough and systematic approach to understanding the production and use of pottery within maritime

foraging societies of the Kuril Islands. This includes the development of a regional pottery typology that contributes to the growing body of knowledge concerning the occupation history of the region. The research also investigated the technological attributes of pottery remains by utilizing a range of archaeometric methods to infer the pottery production process as well as regional and cultural differences in the use of pottery technology.

Results of this research suggest that the colonization and settlement of the Kuril Islands is a complex process highly influenced by a range of environmental, cultural and demographic factors. In contrast to the theoretical expectations about the influence of biogeography, results suggest that environmental and geographic variables are not the primary influence on the colonization and long-term habitation of the Kuril Islands. Changes in the production and use of pottery vessels as well as differences in social network structures suggest the major differences recognized in the archipelago are primarily due to socio-cultural influences. This research supports a growing body of knowledge that living in marginal island landscapes is not comparable to living in geographic isolation but rather populations in these regions are highly influenced by broader political and economic conditions.

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Chapter 1: Introduction

Island landscapes have been a valuable source of anthropological and ecological research for more than a century (Fitzhugh and Hunt 1997). As MacArthur and Wilson (1967:3) state in their theory of island biogeography, “By their very multiplicity, and variation in size, shape, degree of isolation, and ecology, islands provide the necessary replications in natural “experiments” by which evolutionary hypotheses can be tested.” Within archaeological research, island landscapes have often provided diverse examples of how societies respond to a range of variables such as population pressure (Diamond 2005; Keegan and Diamond 1987; Evans 1977) , subsistence change (Rick et al. 2005; Nagaoka 2002; Butler 2001) and geographic isolation (Anderson 2002; Weisler 1995; Kirch 1988). While island environments are inherently circumscribed, the impact of isolation on human societies inhabiting island landscapes has, at times, been exaggerated (Erlandson and Fitzpatrick 2006). As Lape (2004) clearly articulates, the isolation metaphor that is so prominent in biogeographical studies is not appropriate to understand the human colonization and habitation of islands, as the biogeographical factors that make islands isolated for plants and animals are also the factors that stimulate interaction for human populations. In fact, many traditional societies do not view their islands as boundaries at all but rather mechanisms of travel and interaction (Erlandson and Fitzpatrick 2006; Moss 2004).

The Kuril Islands located in Northeast Asia provide an exceptional opportunity to evaluate the strategies developed by human populations for settling remote island landscapes. This is because the Kuril archipelago contains a relatively insular geographic setting with diverse environmental and ecological conditions. In order to colonize and survive in this archipelago, populations would have likely required a range of social and technological adaptations that help to mitigate the social and environmental uncertainty of the region. Furthermore, the Kuril

archipelago has pronounced spatial differences in ecological resource diversity and in the occurrence of unpredictable natural catastrophes (Fitzhugh et al. 2004; Pietsch et al. 2003). From an archaeological perspective, the Kuril archipelago also possesses a well-dated archaeological settlement history illustrating a series of demographic booms and busts. The cyclical population structure in consort with spatial resource variability and unpredictable natural hazard events allows for systematic comparison of foraging settlement strategies and outcomes through time and across space. Finally, foraging populations that inhabited the archipelago engaged in widespread ceramic manufacturing and resource exchange leaving an extensive archaeological resource for tracing the social and technological adaptations of hunter-gatherers living in this region. Using this combination of biogeographical and archaeological evidence, this research evaluates a range of behavioral strategies used by human populations that colonized and inhabited the Kuril Islands through examination of interactions with their dynamic socio-natural environment.

1.1 The Kuril Islands

Stretching from the island of Hokkaido to the Kamchatka peninsula, the Kuril Islands consist of approximately 32 island varying in size from 5 km² to 3200 km² with many smaller islets and outcrops. Separating the island chain is a series of large open water straits that serve as major barriers to the movement between islands. The most significant of these straits is the Bussol Strait, which biologically and geographically divides the southern Kuril Islands from the more remote central and northern regions. As identified by Pietsch et al. (2003), the Bussol Strait significantly influences the biogeography of the island chain with substantially lower biodiversity in flora and fauna located north of the strait. In general, the southern islands

maintain a wide diversity of trees and shrubs (Anderson et al. 2008) as well as a range of terrestrial mammals (Hoekstra and Fagan 1998), insects, freshwater and terrestrial mollusks and freshwater fish (Pietsch et al. 2001; 2003). The central islands and north-central islands, while ecologically less diverse and significantly smaller compared to the southern and northernmost islands, presently contain high abundances of marine mammals, particularly sea lions, seals and sea otters.

In addition to their unique biogeography, environmental factors impacting the colonization and habitation of the Kurils would have included the presence of unpredictable natural hazards and weather (Fitzhugh 2012). As part of the active Kuril-Kamchatka subduction zone, major tectonic events are a relatively common occurrence in the region and it is likely these events were frequent throughout the Middle and Late Holocene (Fitzhugh 2012; MacInnes et al. 2009). Over the last 3,000 years, Nakagawa et al. (2008) has documented approximately 80 major volcanic eruptions across the island chain with six eruptions classified as caldera or large Plinian eruptions. In addition to volcanic eruptions, paleo-tsunami deposits in the central islands indicate the regular presence of tsunami events similar in scale to a couplet of twenty meter tsunami waves that struck the island chain in 2006 and 2007 (MacInnes *et al.* 2009). While less catastrophic than tectonic hazards, weather strongly influences uncertainty in movement and travel throughout the archipelago. During winter months in the region, a strong atmospheric Siberian High weather system interacts with the Aleutian Low creating northerly winds that bring in cold air masses from the Asian continent which produce nearly 138 snowstorm days per year and stable snow cover from November until May (Ganzei et al. 2010; Leonov 1990; Razjigaeva et al. 2008). In the summer months, due to the interaction of the cold Oyashio current and the warm Soya current, some areas of the Kuril Islands experience nearly

215 fog occurrence days per year, statistically making it one of the foggiest places on earth (Bulgakov 1996; Razjigaeva et al. 2011; Tokinaga and Xie 2009). The unpredictability of violent storms and the prevalence of fog in the Kuril Islands undoubtedly created dangerous conditions in the movement over large water straits between the southern, central and northern islands.

Our understanding of the direct influence of these environmental conditions on the behavioral strategies of populations inhabiting the Kuril Islands is currently limited by the lack of a detailed cultural history framework for the Kuril archipelago. Research by Zaitseva et al. (1993) and more recently the Kuril Biocomplexity Project (KBP), has made significant progress in understanding the timing and intensity of occupation with initial habitation of the southern Kuril Islands occurring around 8000 cal BP and extending to the present. Based upon current radiocarbon data in combination with pottery typologies from Hokkaido, the two most intensive occupations of the archipelago are associated with the Epi-Jomon and Okhotsk cultures. Peaking around 2000 cal BP, the Epi-Jomon culture represents the first concentrated settlement of the central and northern Kuril regions. After population decline between 2000 cal BP and 1600 cal BP, the Kuril Islands experience a second major period of intensive occupation peaking at 1000 cal BP associated with the Okhotsk culture, a highly marine-oriented population with origins in the Sea of Okhotsk. In general, the Epi-Jomon and Okhotsk cultures appear to demonstrate strong similarities to contemporaneous cultures around the Sea of Okhotsk but do show distinctive cultural differences when compared with each other. Thus, the material evidence of these two cultures, such as pottery remains, provide a valuable source of archaeological evidence that will be used to draw conclusions about the different behaviors of these two cultures within the same landscape.

1.2 A Human Behavioral Ecology Approach to Understanding Uncertainty

Based upon the geography and ecology of the Kuril Islands, one of the most defining features of the archipelago is the *uncertainty* associated with living in the island chain. As defined by Knight (1921), *uncertainty* refers to the lack of information or ignorance surrounding one or more activities. Within hunter-gatherer societies, the role of uncertainty (or incomplete knowledge) and has often been identified as a major influence on the decision making process of individuals and groups, especially concerning the impact of hazardous events and the perception of risk (Winterhalder 2007; Cashdan 1990; Cashdan 1985). In this research, *hazards* are considered those events which have probability of reducing fitness, utility or value (Smith 2013) whereas *risk* is defined as the unpredictable variation in outcomes that influence an individual's fitness, utility or value (Holton 2004; Winterhalder 2007).

Human behavioral ecology (HBE) provides a valuable theoretical framework to evaluate the concepts of *hazards*, *risk* and *uncertainty* within hunter-gatherer societies as it seeks to explain the complexity of human behavior through the use of simplifying models. In general, a HBE approach emphasizes the role of environmental conditions (“ecological selectionism”) on the adaptation of populations, with a starting assumption that ecological forces highly influence certain behaviors of interest (Smith 2000:29). In addition, HBE often frames the study of adaptive strategies in terms of decision rules that conceptualize behavior as a series of complex choices that have a range of variable payoffs (Smith 2000:30). This last feature of a HBE approach is particularly valuable in conceptualizing *uncertainty* as it creates an analytical framework that evaluates the tradeoff between the benefits of collecting information and the cost of obtaining information. Furthermore, the payoffs of the behavioral strategies associated with

collecting information are expected to be closely tied with socio-natural environment of the region.

The theoretical model used to frame this research emphasizes hunter-gatherer behavioral strategies that function in the acquisition and transmission of information between individuals and/or populations. Referred to as the information network model, this model assumes that the ability to acquire accurate social and environmental information from both local and regional spatial scales is highly beneficial within unpredictable environments such as the Kuril Islands. Furthermore, the most likely mechanisms of gaining information are either individual learning through trial and error (guided variation) or through the acquisition of information from social contacts (social networking) (Richerson and Boyd 2005). It is assumed here that individually accessing environmental information at local, regional and distant social scales can be a costly endeavor for any single individual. Dependent upon interaction costs and social relationships, socially transmitted information provides a less accurate but potentially lower cost strategy of information acquisition compared to direct personal acquisition and is likely prominent among many hunter-gatherer populations.

In modelling the relationship between *uncertainty* and networking strategies, this research assumes that all else being equal a higher degree of *uncertainty* encourages the formation of network structures that will be more interconnected, less centralized and extend over a broader spatial range as reduced *uncertainty* is advantageous. In contrast, with all else being equal, individuals with lower or unequal *uncertainty* will be less connected, more highly centralized and have a smaller spatial footprint as the need to acquire information from many different social partners is reduced.

1.3 Aims and Intellectual Contribution

The research aim of this dissertation is to examine how hunter-gatherers colonized and inhabited the diverse environmental setting of the Kuril Islands through the investigation of material remains that can highlight behavioral strategies used to manage hazards, risk and uncertainty. In order to achieve this goal, the primary research objectives are to 1) contribute to establishing a detailed knowledge of hunter-gatherer occupation in the Kuril Islands; 2) investigate and compare the production of pottery by hunter-gatherers living in the Kuril Islands; 3) explore the use of social networking as an adaptive strategy for mitigating environmental uncertainty.

A significant intellectual contribution of this research is a thorough, systematic approach to understanding ceramic manufacture, use and exchange in the Kuril Islands of Northeast Asia. Data developed from this systematic approach will contribute to understanding how the unique sub-arctic, island environment of the Kuril Islands influenced hunter-gatherer populations as well as how these people were related to and influenced by broader cultural trends throughout Northeast Asia. This will be accomplished through the development of a pottery typology for the Kuril archipelago and an evaluation of the cultural and chronological association of pottery types. This research will also investigate the technological attributes of pottery remains from the Kuril Islands by utilizing a range of archeometric methods to examine the pottery production process. The combination of stylistic and technological analysis of pottery remains will provide the baseline data for understanding the occupation history of cultures in the Kuril Islands as well as insights into the differential use of pottery technology.

This research also expands the study of hunter-gatherer adaptations by examining the form and function of networking strategies among foraging societies in the Kuril Islands. Given

assumed dissimilarities in the degree of uncertainty between regions of the Kuril Islands (primarily influenced by differences in island size, degree of isolation, available resources, frequency of hazard events and occupation histories), it is reasonable to expect spatial and temporal variability in the behavioral strategies used by hunter-gatherers for colonization and long-term habitation of these diverse settings. This research will examine these differences in behavioral strategies through the construction of network models based upon the compositional analysis of pottery. These network models will be evaluated by social network analysis based upon predictions extending from a theoretical model that links the degree of uncertainty to network forms. By focusing research on the adaptive role of social networks, this research seeks to contribute to our understanding of the challenges faced by hunter-gathers in the colonization and habitation of diverse environments throughout the globe.

1.4 Dissertation Organization

Chapter 2 outlines the theoretical relationships of how the concepts of *hazard*, *risk* and *uncertainty* influence hunter-gatherer populations and the role of social networking in reducing levels of *uncertainty*. In addition, this chapter proposes an information network model that provides predictions about the structure of networks and its relationship to the degree of *uncertainty* faced by Kuril inhabitants.

Chapter 3 provides an overview of the factors that influence *uncertainty* in the Kuril Islands with an emphasis on the natural environment of the archipelago including geography, flora, fauna, weather, climate and geology. This chapter draws from a human biogeography approach to environmental factors through the use of ethnographic accounts of people inhabiting and travelling through the island chain.

Chapter 4 reviews the history of archaeological work in the region and explores the culture-history of neighboring regions including Hokkaido, Sakhalin and Kamchatka. This chapter also examines the cultures assumed to have inhabited the Kuril Islands throughout its history including the Jomon, Epi-Jomon, Okhotsk and Ainu.

The analysis of pottery remains begins in chapter 5 with a review of pottery production within societies around the Sea of Okhotsk. The analysis of decorative features is provided in this chapter along with details about the sampling of the pottery assemblage and the development of a paradigmatic classification scheme for Kuril pottery. This chapter also contains a chronological analysis of Kuril pottery which compares the occupation history of the archipelago proposed by radiocarbon data with pottery types based upon decorative features. The analysis of pottery continues in chapter 6 with the investigation of pottery production and use in the Kuril Islands. This chapter utilizes a host of archeometric techniques to examine the five stages of pottery production in the Kuril Islands: raw material acquisition, tempering, forming, finishing and drying/firing. Pilot analysis of organic residues extracted from pottery sherds is also presented in this chapter along with implications of this analysis to future research.

Chapter 7 presents the results of the compositional analysis of pottery through the elemental characterization of pottery sherds using inductively coupled plasma-mass spectrometry. Using multivariate statistical techniques these results are used to infer the relative amount of pottery that was locally produced or imported to selected archaeological sites. This data is also utilized to explore the exchange relationships between sites and forms the database with which archaeological networks are constructed. The structures of these networks are evaluated against expectations from the information networks model through the use of visual and statistical assessment methods commonly used in social network analysis.

Chapter 8 concludes the research and outlines the results with regards to original predictions of the model as well as the contribution and implication of this research to future research in Northeast Asia and the discipline of archaeology.

Chapter 2: Modeling Uncertainty: Human Adaptive Strategies for Mitigating Hazards and Managing Risk

2.1 Introduction

Ethnographic and archaeological research has consistently revealed the ability for hunter-gatherer populations throughout the Quaternary to successfully inhabit remote and unpredictable environments. Common examples of this phenomenon include modern hunter-gatherer populations living in the Kalahari Desert, the Amazonian rainforest, the high altitudes of the Himalayas and the extreme northern regions of Alaska and Siberia (Murdock 1967). While the description of human settlement in these remote regions has been a common theme in anthropological research, explanations for colonization and settlement of past human populations have tended to emphasize the “push” and “pull” factors associated with migration (Anthony 1990). Push factors are those conditions that make occupation of a novel region more attractive than staying with the original population. Most commonly, push factors have included population pressure, resource depletion or social regulations (Rockman 2003). In contrast, pull factors are the conditions that make novel destinations viable options and have tended to emphasize economic opportunity as an critical “pull” factor (Rockman 2003).

From an analytical perspective, the push-pull framework aims to balance the costs and benefits of colonization and migration; however, it does not accurately reflect the sociological and psychological reality of population movement. For example, social science data contradicts push-pull models by suggesting individuals severely discount pull factors and are often willing to incur significant declines in economic opportunities in order to stay located within a traditional homeland or territory (Bjarnason and Thorlindsson 2006). Or vice versa, individuals continue to migrate to new locations even though employment opportunities are known to be significantly less in the new region (Schaeffer 1988). Anthony (1997:25) suggests that in many situations

“migrants often simply move to places that are familiar and offer social support, rather than moving to the place that would make the best economic choice”.

Overall, push-pull models have often provided incomplete explanations for the complex costs and benefits associated with relocation. In understanding the migration of hunter-gatherer populations to remote and marginal environments, a more complete explanation must include the increase in *hazards*, *risk* and *uncertainty* associated with these environments. Therefore, this research seeks to expand on previous migration models by understanding the colonization and settlement of remote and unpredictable environments through investigating the adaptive strategies used by hunter-gatherers to mitigate the complex challenges of a new landscape.

2.2 Risk and Uncertainty: Economic and Anthropological Approaches

In the investigation of human decision making, the concepts of *risk* and *uncertainty* play a central role in weighing the costs and benefits associated with any decision. Unfortunately, a unanimous definition of risk is still widely debated with multiple operational definitions co-existing. The most common and colloquial definition of risk derives from insurance theory and highlights *risk* as the probability of loss due to the unpredictable occurrence of hazard, danger or hardship (Rajda and McNamara 2014). In micro-economic theory, a more analytical conception of risk is utilized with emphasis placed on *risk* as the stochastic processes influencing human decisions (Holton 2004). Taken from this perspective, *risk* in a human behavioral ecology approach is defined as the unpredictable variation in outcomes with consequences that matter to the fitness or utility of individuals or groups (Winterhalder 2007:433). This definition of *risk* as variation in outcomes distinguishes it from the more colloquial insurance theory use of *risk* as exposure to danger or hazard [i.e. riding motorcycles can be a high *risk* activity] or from *risk* as

simple chance or odds [i.e. by not washing your hands often you have a higher *risk* of becoming ill] (Winterhalder 2007:433). In order to more clearly distinguish between usages of the word *risk*, this research will substitute the word *hazard* in reference to the probability of lost fitness, utility or value due to hazardous events, dangers and hardships. Alternatively, the term *risk* will be defined following the micro-economics definition as the unpredictable variation in outcomes that influence an individual's fitness, utility or value.

While *hazards* and *risk* are similar in their ability to influence fitness/utility/value, a key difference exists in the analysis of *hazards* and *risk*. Specifically, *risk* can promote losses **and gains** in fitness (or utility/value) through the seeking out of greater variation with the potential for more abundant positive outcomes (Fitzhugh 2001; Winterhalder 2007). This aspect of *risk* is particularly important in foraging theory (Stephens and Charnov 1986) as many species are consistently faced with the decision of engaging in risk-prone strategies that have higher risk and potentially higher payoffs (i.e. large game hunting), risk-averse strategies that have lower risk and potentially lower payoffs (i.e. seed collection) or a combination of both. In contrast, *hazards* cannot produce gains in fitness/utility/value, only varying degrees of loss. Therefore, under hazardous circumstances, individuals likely only exhibit risk-buffering strategies in their attempt to reduce potential fitness losses stemming from unpredictable hazards.

Perhaps more important to this research are not the theoretical differences between *hazards* and *risk* but the idea of *uncertainty* which underlies both concepts. Following from economist Frank Knight (1921), *uncertainty* is defined as the stock of information that each actor has surrounding the variation in potential outcomes and hazards. In theory, the decision by any individual or group on how to respond to a *hazard* or how to assess *risk* is based upon the quantity and quality of previously acquired information. For example, the decision of a forager

to hunt or gather in one particular patch for a day as opposed to another patch is partially determined by the estimated gains or losses in utility (often measured in calories) based upon previous personal experience in the patch or on information about the patch acquired from other individuals.

Given the importance of *uncertainty* in estimating *risk* and/or mitigating losses associated with *hazards*, this research provides an explicit attempt at understanding the information acquisition strategies used by hunter-gatherers in order to reduce *uncertainty*. As suggested by Smith (1988), the reduction of *uncertainty* is always beneficial to an individual or groups as it is a critical component in reducing the variability in outcomes (*risk*) and/or the impact of hazardous events. From an analytical perspective, the reduction of *uncertainty* is a trade-off between the cost of acquiring information and the benefit of the information in lowering *uncertainty*.

	Risk (Economic Theory)	Hazards (Insurance Theory)	Uncertainty
Unit of Measurement	Gain or loss in fitness / utility / value	Loss in fitness / utility / value	Gain or loss of information
Benefit from Increased Levels?	Potentially	No	No
Response	Avoid, buffer or seek out	Avoid, buffer	Reduce (via information collection)
Trade-offs	Higher versus lower variability in outcomes	Cost of replacement versus cost of protection	Benefit of information versus cost of acquiring information

Table 2.1 Comparison between risk, hazards and uncertainty (Adapted from Smith 1988)

2.3 Risk and Uncertainty among Hunter-Gatherers

Compared to fields of research such as economics, psychology and public health the concepts of *risk* and *uncertainty* are fairly new to anthropological research. With the growth of behavioral ecology and micro-economic approaches in anthropology beginning in the late 1970s, the popular anthropological themes of safety, security and information gathering became associated with the ecological and economic concepts of *risk* and *uncertainty* (Cashdan 1990). The integration of anthropological research with economic concepts of *risk* and *uncertainty* had a number of important outcomes for both disciplines. For anthropological research, the concepts of *risk* and *uncertainty* were no longer abstract notions associated with perceived levels of security dependent upon cultural settings and assumptions (Boholm 2003) but rather a set of concepts that could be mathematically modeled as a decision model by quantifying aspects of currency, decision traits and constraints (Stephens 1990). For economic research, cross-cultural examples of *risk* and *uncertainty* from tribal and peasant economies demonstrated the importance of societal institutions and inter-personal relationships to mitigating various forms of *risk* and *uncertainty* (Cashdan 1990).

In review of past (Cashdan 1990, Halstead and O'Shea 1989) and more recent (Bollig 2010, Ember 2013, Oliver-Smith 2013) anthropological literature on *hazards* and *risk* it becomes evident that *uncertainty* manifests itself in a wide array of decisions made by any single individual or group. Incomplete knowledge influences fundamental decisions among hunter-gatherers ranging from foraging strategies to inter-personal relationships. Due to the pervasive nature of *risk*, *hazards* and *uncertainty* in human decisions, this research will use a general classification scheme provided by Baksh and Johnson (1990) to discuss the *hazards* and *risks*

commonly encountered by hunter-gatherer populations, which include physical hazards, subsistence risk and inter-personal risk.

2.3.1 Physical Hazards

Physical hazards refer to the potential losses in fitness/utility/value due to environmental hazards to health that are separate from nutritional failures. This includes common aspects of life including illnesses and diseases, accidental injuries or other miscellaneous health problems (Baksh and Johnson 1990). In their ethnographic example Baksh and Johnson (1990) suggest that physical hazards pose the most serious threat to Machiguenga life with a vast majority of the deaths within the society attributed to modern diseases and their biological vulnerability to these illnesses. In many ethnographic cases, the high threat of disease and illness is largely influenced by the lack of knowledge (high uncertainty) surrounding the spread and treatment of infectious diseases.

In addition to the hazardous consequences and uncertainty of diseases, physical hazards also includes the potential for injury or death directly resulting from catastrophic natural disasters such as volcanic eruptions, earthquakes, tsunamis, hurricanes and violent storms. In this research, a catastrophic environmental disaster is defined as a violent or sudden change in a feature of the earth potentially causing injury or death. For a variety of reasons, the identification and impact of natural disasters on ancient populations has been a popular research topic for academic archaeologists over the last 13 years, with nine books (Bawden and Reycraft 2000; Cooper et al. 2012; Grattan et al. 2007; Hoffman and Oliver-Smith 2002; McFadgen 2007; McGuire 2000; Nur and Burgess 2008; Rowley-Conwy 2002; Torrence and Grattan 2002) and a conservative estimate of 60 articles published on the topic since the start of the millennium. The

popularity of natural disaster research in archaeological contexts can partially be attributed to the broader public attention paid to environmental disasters over the last 20 years by popular books such as *Collapse* by Jared Diamond (2005) and the occurrence of highly publicized natural disasters including three of the deadliest natural disasters ever recorded (2010 Haitian earthquake, 2004 Indian Ocean Tsunami, 2008 Cyclone Nargis).

In order to evaluate the contribution of catastrophic natural disasters to the physical hazards encountered by hunter-gatherer populations, a number of key characteristics are important to consider. First, natural disasters that directly cause injury or death are typically high magnitude environmental events such as an earthquake, volcanic eruption or hurricane. Second, these hazard events often occur as single, infrequent episodes sometimes lasting as little as 30 seconds. The infrequency of these events makes them extremely difficult to predict in both ancient and modern societies.

The infrequent and unpredictable occurrence of catastrophic hazard events has important consequences in the perception and vulnerability of human populations to these natural disasters. For example, in Ainu folklore there is limited causal association between human behavior and the occurrence of a high magnitude, infrequent event such as a volcanic eruption or an earthquake (Etter 1949). Upon the eruption of volcanoes, Ainu people would simply recite three magical words and pray to their gods to change the direction of the wind as to save their houses from burning. Likewise, damage from earthquakes were hopefully avoided by scratching the fireside and simply reciting the words "*Kuma zari, kuma zari*" (Etter 1949). The lack of a strong reaction by hunter-gatherers to these natural disaster events has also been noted among populations in Alaska and New Zealand (Johnson 2002; Lowe et al. 2002; Saltonstall and Carver 2002).

The seemingly lack of attention to catastrophic hazard events by hunter-gatherers can be partially explained through understanding the *uncertainty*, or lack thereof, of the hazard events. It is suggested here that hunter-gatherer populations are inattentive to catastrophic hazards that cause physical harm as the potential outcomes of these events are actually fairly certain. In many instances, the outcomes are either immediate mortality or loss from an event that directly strikes the population or a very limited impact when the event does not directly strike. In the case of geologic and climatic hazard events, foraging populations are largely viewed as highly resilient to direct or indirect impacts of these events based upon their flexible subsistence practices, lower social complexity and ease in moving from an impacted region given their lower infrastructure costs and higher mobility. In general, unless a foraging population resides in a directly impacted region, these high magnitude geologic and climatic hazard events pose a relatively low hazard potential for many hunter-gatherer populations. Interestingly, research from Fitzhugh (2012) suggests that hunter-gatherers in the Kuril Islands strategically place habitation sites in locations that are less likely to be directly impacted by catastrophic events, favoring an outcome of limited impact.

2.3.2 *Subsistence Risk*

Subsistence risk refers to the variability in obtaining an individual's nutritional and/or caloric requirements (after Sobel and Bettles 2000; Winterhalder 1986:374). Using an economic definition of *risk* as the variance in outcomes emphasizes not only *hazard* events that alter the abundance and diversity of subsistence resources but also the foraging strategies used in the acquisition of resources such as hunting, gathering, fishing, gardening/horticulture and agriculture. As Baksh and Johnson (1990) demonstrate, the Machiguenga generally maintain a

nutritious diet both in the diversity and abundance of food; however, extreme variability in the acquisition of calories is very real to them and shapes large areas of their behavior.

The relationship between variability in subsistence outcomes and the behavioral strategies for coping with subsistence variability among foraging populations has been the focus of numerous anthropological publications, including subsistence risk and paleo-environmental hazards (Halstead and O'Shea 1989; Sobel and Bettles 2000), subsistence risk and socio-political evolution (Halstead and O'Shea 1982), the influence of subsistence risk on mythology and oral tradition (Sobel and Bettles 2000) as well as a wide variety of publications emphasizing a human behavioral ecology approach to understanding subsistence strategies.

At its conceptual core, a human behavioral ecology approach to subsistence risk highlights optimal foraging models which propose how resources will be used given a *goal*, *currency*, set of *constraints* and a set of *options* (Kelly 1995, italics in original). An optimal-foraging model *goal* is normally the optimization of foraging efficiency (food gathered per unit time) and the *currency* is typically taken to be the number of calories obtained. *Constraints* include the maximum time which can be spent foraging or the foragers capacity to consume food in a given interval of time. *Options* in optimal-foraging theory include the trade-offs associated with pursuing various subsistence opportunities compared to alternative activities such as childcare.

In many applications of optimal foraging theory to foraging societies, the concept of *risk* and *uncertainty* can largely be associated with the *options* parameter of the model. Specifically, *risk* and *uncertainty* influence the choice on whether or not to pursue certain subsistence resources over others. The decision to pursue a resource is a complex assessment involving the costs associated with finding the resource (search costs) and acquiring the resource (handling

costs). Intuitively, resources that have higher search and handling costs associated with them often have a higher variation in the potential acquisition of the resource (i.e. higher risk) (Kelly 1995). In many contexts, resources with higher search and handling costs also maintain a higher currency payoff leading to a higher overall return rate (kcal per hour).

Evaluation of *risk* and *uncertainty* concepts becomes an important factor in subsistence modeling when the outcome of a subsistence practice is to some degree unpredictable and does not have straightforward consequences for fitness and/or utility (Winterhalder 1999). Of particular importance here are environmental hazards that influence the acquisition of subsistence resources. Similar to hazards impacting human mortality, the abundance and diversity of subsistence resources can be disrupted through immediate resource mortality due to high magnitude, infrequent and unpredictable events such as the aforementioned hazards of earthquakes, tsunamis, volcanic eruptions and hurricanes. These primarily unpredictable geologically-based hazard events often produce a short-term disturbance in the availability in the food supply through immediate mortality but rarely do these events have significant long-term negative impacts on subsistence resources (Turner et al. 1997). In fact, in certain situations these catastrophic events can produce positive long-term impacts by enhancing primary productivity among plants and deciduous forests (Gu et al. 2003).

In addition to direct mortality from unpredictable geologic hazards, the abundance and diversity of subsistence resources are also significantly influenced by climatic hazards that vary in their predictability, magnitude and frequency. Because of their regular occurrence and the more frequent opportunity to gain direct knowledge of their variation, the most predictable of climatic hazards are seasonal resource depressions (i.e. wintertime or rainy seasons) often characterized as low magnitude but long duration (3-8 months) events (Sobel and Bettles 2000).

More unpredictable climatic hazards are typically higher magnitude and less frequent hazards such as droughts, floods, heat waves, hurricanes/typhoons and wildfires (Torrence and Grattan 2002). Furthermore, the predictability, frequency and magnitude of these climatic hazard events can be unpredictably intensified by broader variability in climate patterns such as regional climate change including the El Niño Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO).

In contrast to physical hazards, climatic events associated with altering the variability of obtaining subsistence resources range from single-episode catastrophic natural disasters to long-term, incremental changes in climate and weather. The implication of this temporal variability is that the potential outcomes of climatic events for human populations and subsistence resources are more diverse than the outcomes related to physical hazards. From an analytical perspective, the additional diversity in outcomes favors evaluating the changes in subsistence resources due to climatic events from a human behavioral ecology concept of *risk*. The key difference is that *risk* incorporates the notion that it is not solely information about the occurrence of a *hazard* that impacts populations but rather information concerning the long-term variability of the hazard that is most important. Given the wide range of hazards that influence subsistence variation at multiple spatial and temporal scales, the avoidance of subsistence failure to foraging and farming populations is a common challenge in which hunter-gatherers have developed numerous unique and diverse coping strategies.

2.3.3 *Inter-Personal Risk*

Inter-personal risk refers to the variability in outcomes associated with social relationships between individuals and groups. In contrast to decisions that respond to

environmental stimuli, the outcome of decisions within a social environment are often difficult to directly evaluate as the outcomes are highly dependent on the frequency of behaviors in the population (Winterhalder and Smith 1992; Elster 1986). In many anthropological examples, *risk* in a social environment is largely inferred through evidence for inter-personal or inter-group social conflict. Examples of inter-personal social conflict within hunter-gatherers often include active forms such as fighting and homicide (Fry and Söderberg 2013) as well as more passive forms such as infanticide/fetal neglect and/or banishment. Common examples of inter-group social conflict within hunter-gatherer societies include personal attacks, raiding and possibly warfare (Culotta 2013, Fry and Söderberg 2013, Wiessner and Pupu 2012). Typically, egalitarian inter-personal violence is more infrequent than non-egalitarian groups but is often lethal when it does occur and related to sexual jealousy or marital infidelity rather than competition for political or social status (Kelly 1995). Among non-egalitarian hunter-gatherers, violence is typically more frequent and legitimized as a necessary part of inter-group relationships (Kelly 1995).

As will be discussed in this research, inter-personal violence should not always be considered a hazardous event with only negative outcomes or loss. Similar to subsistence risk, inter-personal violence can have a range of potential outcomes and in specific circumstances individuals may want to seek out more variable inter-personal outcomes in order to gain higher rewards such as engaging in violent behavior or drawing violent responses from other individuals. For instance, among many small-scale mobile hunter-gatherers the need to acquire mates for reproduction and parental effort (Quinlan 2007) as well as environmental information (Fitzhugh et al. 2011) is often of critical importance. Within a dynamic landscape setting or sparse demographic environment, it may be of best interest for certain individuals to invest in

riskier strategies that include violent action in order to access potentially higher payoffs in terms of increased access to mates or environmental information.

In addition to the traditional research focus on inter-personal risk and violent behavior it is important to also acknowledge the more passive violence of banishment, isolation or ostracizing of an individual or group. Given the strong reciprocal relationships that exist within many foraging societies, the cost of being ostracized is among the most serious penalties that can be levied upon any individual group member (Bowles and Gintis 2004). Unlike traditional forms of violent behavior, social isolation of an individual or group is not necessarily an intentional or imposed hazard. For example, in environments that exhibit significant costs associated with group interaction, social isolation may occur through difficulties in maintaining critical support networks due to the variation in broad environmental or socio-political factors (Fitzhugh 2012; Fitzhugh et al. 2011). Within marginal landscapes, social isolation may also be beneficial through a reduction in population size and demand for critical resources or by reducing the negative influence of individuals through removal of membership from a group.

2.4 Hunter-Gatherer Strategies for Mitigating Risk and Uncertainty

In any given society, it is reasonable to expect a balance between the factors that produce variability in potential outcomes (*risk* and *uncertainty* factors) and the strategies that are used to mitigate variability. Within the context of hunter-gatherer societies, we can expect to see a combination, or combinations, of strategies that relate to not only the type of *risk* (physical hazards, subsistence or inter-personal) but also to the costs and benefits of acquiring information to reduce *uncertainty* associated with *hazards* and *risk*.

2.4.1 Strategies for Mitigating Physical Hazards

As identified above, physical hazards refer to the variability in potential losses in fitness/utility/value due to environmental events that are separate from nutritional failures. Physical hazards are often characterized as high magnitude, infrequent and unpredictable but largely non-fatal to populations with low population density and high mobility. These hazard event characteristics would tend to favor long-term, low investment mitigation strategies as the probability of experiencing one of the events and being fatally impacted is fairly low.

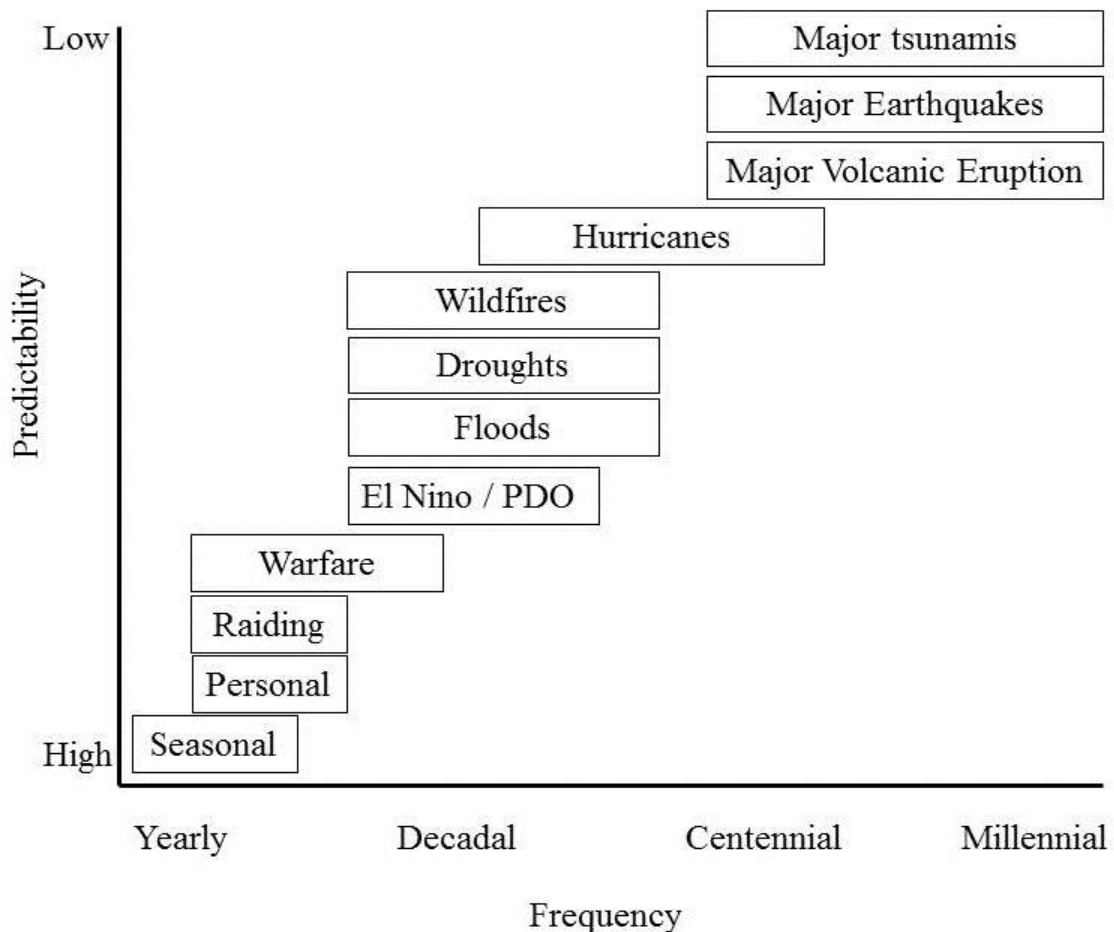


Figure 2.1 Generalized graph of hazard events based upon the relationship between frequency and predictability

One likely strategy for mitigating these events is the development of local and traditional knowledge passed between generations by oral history. For example, Blong (1982) identified that Papua New Guinea natives transmit extraordinarily detailed information about volcanic eruptions by oral history for centuries and possibly up to several millennium, a phenomenon also identified by Krajick (2005) among native populations of the Northwest United States. Perhaps most well-known is the case of the massive 2004 Sumatra-Andaman earthquake and tsunami where native peoples in Thailand, based upon their long oral traditions, took to the sea after the earthquake and easily rode out the ocean swell (Sheets 2012). In these instances, local and traditional knowledge transmitted through oral histories encoded information about human experiences with past hazard events and provided guidance for modern populations in mitigating these hazards. Local and traditional knowledge eventually forms the bedrock of cultural traditions and grows stronger the longer a group lives in a region and experiences the environmental variability of the region (Fitzhugh et al. 2011)

2.4.2 Strategies for Mitigating Subsistence Risk

Subsistence risk is a universal problem among foraging societies; at some point, every individual or social group faces the potential of a food shortage (Sobel and Bettles 2000). Due to the commonness of this problem, anthropological research has often focused on the behavioral strategies used to mitigate subsistence risk, collectively referred to as “buffering mechanisms” (Halstead and O’Shea 1989). Specifically, this includes research emphasizing strategies that lower variability in seasonal resource shortfalls such as resource exchange and sharing (Kaplan and Hill 1985; Wiessner 1982; Winterhalder 1999; 1986), diversification or diet breadth increase (Grayson and Delpech 1998; Meltzer 1999; Nagaoka 2002; Stiner and Munro 2002), mobility

(Binford 1990; 1980; Kelly 1995; 1992), bet-hedging (Allen 2004; Madsen et al. 1999) and the use of storage (Goland 1991; Morgan 2012). In the course of these studies, anthropologists have recognized a common factor in the various responses to subsistence risk, specifically the importance of information about past and present resources that an individual either has or can access without significant costs (Sobel and Bettles 2000). In other words, the degree of uncertainty concerning resources plays a major factor in the strategies used and the variability in outcomes for individuals and groups. In agreement with Sobel and Bettles (2000), despite the recognition concerning the importance of information in subsistence decisions, traditional analytical models have lacked an understanding of how individuals and groups in traditional societies acquire, store, transmit and utilize knowledge of subsistence variation in developing strategies for coping with subsistence risk.

At the most basic level, information concerning subsistence variability, including hazard events that impact resources, can be acquired one of two ways, either by individual monitoring or through social transmission. In general, individual monitoring of the local environment (weather, vegetation, animal behaviors, etc.) can be relatively inexpensive and accomplished through the course of daily activities (Fitzhugh et al. 2011). Alternatively, social transmission of information occurs through a wide variety of channels including but not limited to inter-personal interactions, occasional social aggregations, oral traditions and material culture exchange relationships. Arguably, the most influential research regarding hunter-gatherer information acquisition strategies has been Polly Wiessner's (2002; 1982; 1977) discussion of the *hxaro* trading network among the !Kung hunter-gatherers of the Kalahari desert. In the *hxaro* model, exchange partnerships serve as a mechanism for the sharing of environmental information across a wide variety of spatial scales. Furthermore, through time these partnerships are formalized and

serve as social safety networks that provide places of refuge for individuals to retreat to when hazard events, such as droughts, impact the subsistence resources of the !Kung. Perhaps most importantly to archaeologists, these information networks are highly materialized through the exchange of artifacts (Fitzhugh et al. 2011; Plog 1984; Rautman 1993; Whallon 2006; Wiessner 1977).

2.4.3 Strategies for Mitigating Inter-Personal Risk

Writing in the eighteenth century, early scholars on hunter-gatherers such as Rousseau noted that “nothing is more peaceable than man in his primitive state” (Ralph 2013:1). After decades of research, this perception has been clearly falsified from a wealth of anthropological evidence demonstrating diverse forms of violence between hunter-gatherer individuals and groups. In an ethnographic example from the egalitarian Machigeunga of the Amazon basin, physical expression of violence is seemingly rare; however, nearly one-fourth of deaths in the community can be attributed to inter-personal conflicts such as physical fighting or neglect/abuse of needy individuals including children and elderly adults (Baksh and Johnson 1990). In a non-egalitarian archaeological example, during the late prehistoric period in the North Pacific Rim wars over revenge, status and resources were continuously waged between ethnic groups living on islands over 700 km apart (Maschner and Reedy-Maschner 1998). Overall, the most important conclusion in the broad research concerning hunter-gatherer violence is the diverse forms of inter-personal hazards that can develop including the passive forms of neglect, verbal abuse and social isolation to the active forms of fighting, raiding and warfare.

As expected, the strategies for mitigating inter-personal hazards are as diverse as the types of violent behavior recognized in anthropological studies. According to Baksh and

Johnson (1990), the traditional responses to inter-personal violence among hunter-gatherers include the dispersal of settlements into small kinship based clusters, socialization practices that emphasize non-aggressive or non-fatal behaviors, extensive inter-household or inter-group exchanges, communal feasts and the group ostracizing of angry individuals. Of particular interest in this research is the use of extensive inter-household or inter-group exchange, as this strategy seeks to mitigate inter-personal violence through the reduction of inter-personal uncertainty. In other words, extensive exchanges provide the mechanism for gaining knowledge concerning individuals in other households or groups. The development of this knowledge helps to mitigate inter-personal hazards by allowing peaceful individuals to more easily avoid violent individuals as well as developing a network of trusted partners that can help resolve passive or active violent behavior.

The exchange of information between individuals or households also provides advantages in accessing diverse forms of environmental or demographic information. As acknowledged above, inter-personal risk is not always hazardous with more risky behavior potentially leading to positive outcomes in information or mate acquisition. As identified in the *hxaro* model, the acquisition of partners located at further distances (more risky and costly partners) can provide benefits in the form of friendships outside of local areas. These friendships not only provide a place of refuge from environmental hazards but also from inter-personal hazards (lack of mates or violent behavior) within a community.

2.5 Understanding Uncertainty: The Information Network Model

Prior to outlining a model of information acquisition it is necessary to define the concept of information as:

“a coherent symbolic code of relevance to some topic of interest or concern that can be recorded, supplemented, preserved, transmitted, retrieved, enacted, or even forgotten.”

(Fitzhugh et al. 2011:86)

In addition to this definition, information should also be distinguished from the concept of knowledge in that information refers to what is transmitted between individuals whereas knowledge is the result of processing information into useful patterns. This definition and conceptualization of information has advantages over traditional definitions of information in that it emphasizes the dynamic and contextual nature of information (Fitzhugh et al. 2011). Given the unpredictable nature of events associated with physical hazards, subsistence and interpersonal risk, it is assumed here that no single individual is capable of individually acquiring all the necessary information and the development of complete knowledge in order to fully reduce uncertainty in these socio-natural domains. Therefore, an individual must rely on information acquired and transmitted by others and evaluate their degree of trust in the information (Fitzhugh et al. 2011). In certain instances, a close relationship between individuals provides opportunities for consistent verification of the accuracy of the information. Conversely, more distant relationships between individuals present the opportunity for transmission of intentionally or unintentionally misinterpreted or inaccurate information through the phenomenon of information degradation (Whallon 2011). The result of these different contexts on information transmission

suggests that each individual has variable levels of knowledge that ultimately lead to a range of behavioral responses to hazards and risks.

2.5.1 The Information Network Model

An information network model has been developed here to predict hunter-gatherer social strategies that minimize the impact of hazards and increase the potential knowledge of social and environmental variations through the individual and social acquisition of information. The core concepts of the information network model promoted in this research largely stem from research published by Whallon (2006) and Fitzhugh et al. (2011). In general, the information network model assumes that the ability to acquire accurate environmental and social information across broad geographic regions is highly beneficial within hazardous environments. Here, hazardous environments are defined as environments that contain frequent but unpredictable hazard events capable of direct harm (physical and inter-personal hazards) or indirect harm (subsistence hazard) to individuals through resource loss. Given the higher frequency of unpredictable events, the major benefit of acquiring information through social contacts (i.e. social networking) in uncertain environments is the lower cost of information acquisition compared to individual monitoring. For example, if a foraging population consistently experiences hazard events that locally impact subsistence resources, detailed and accurate knowledge concerning the variability in outcomes is important in deciding whether to “ride out” the hazard event (fight) or “evacuate” to a less impacted region (flight). Individually accessing information about the hazard potential both locally and regionally could be extremely costly whereas relying on socially transmitted information provides a less accurate but lower cost alternative. Furthermore, if confidence and

trust in information sources is established, socially transmitted information can provide an effective strategy for acquiring accurate and up-to-date information and reducing uncertainty.

If, as argued here, social networks function to disseminate information and reduce uncertainty (Hamilton et al. 2007; Kelly 1995; Minc 1986; Minc and Smith 1989; Moore 1981; Rautman 1993; Whallon 2006), then the character of such networks should be implicated in the settlement and exchange history of hunter-gatherer populations. In modeling the relationship between network structure and uncertainty, this research assumes that, all else being equal, higher uncertainty encourages the formation of networks of higher density (more interconnected groups), less centralization (no group dominates the network) and a broader spatial footprint. This structure is predicted due to the reliance of foraging populations on equal parts of environmental, social and resource information from a wide range of regions and partners. This structure is referred to as an “integrated” network. In contrast, with all else being equal, populations living with lower environmental uncertainty would tend to demonstrate properties such as lower density (more egocentric networks), higher centralization and a smaller spatial scale as the need to acquire regional information from friends or exchange partners is reduced. Based upon these assumptions, a continuum of network structures can be expected with three networks forms presented here that summarize this spectrum.

Isolated

Where foraging populations experience low uncertainty due to the infrequent and predictable occurrence of physical hazards and low variability in subsistence availability; an isolated network is expected to develop. Under the circumstances, investment in the cost of interacting and maintaining social relationships is not highly valued given the predictable nature

of the environment (Fitzhugh et al. 2011). Structurally, an isolated social network is defined as a network with few ties that extend beyond the local region. Social relationships are likely to be confined to co-residential family units with occasional exchange and migration of individuals between regional communities. Within higher density settlements, community social networks are expected to develop higher total density, but it is likely that individual or egocentric networks would likely become more fragmented with clusters of individuals tightly connected but still relatively isolated from the larger network.

Intermediate

In contrast to isolated networks, intermediate networks are expected to develop among foraging populations where uncertainty is intermediate or high given the more frequent occurrence of higher magnitude or longer duration unpredictable hazards. Additionally, intermediate networks are also expected to develop in regions with moderate variability in subsistence returns such as environments with migratory or seasonal resources. In some environments, geographic constraints on social interaction may also be significant enough to limit interaction at distant spatial scales leading to social networks occurring at local and regional scales only. Thus, an intermediate social network is described as a network with strong ties at the local scale and moderate social relationships at the regional scale. Social ties are strong with local extended family members while seasonal migration or visiting to neighboring territories provide periodic opportunities for maintenance of social relationships at the regional scale (e.g., meetings for trade and forming marriage alliances).

Integrated

Where uncertainty is high due to the frequent and unpredictable occurrence of hazards and high variability in subsistence returns, it is expected that an integrated social network will develop. An integrated network is characterized as having strong ties that extend across local, regional and distant spatial scales given intermediate to low interaction costs. Based upon the *hxaro* model (Wiessner 1977), it is assumed that within egalitarian communities these social ties will likely be egocentric with each individual (or small group of individuals) actively maintaining the social relationship with other individuals or small groups. In other words, an integrated network can be characterized as a set of nested networks existing at different spatial scales (Fitzhugh et al. 2011).

It is important to note that while social networks are clearly an important strategy for mitigating the impact of environmental **and** social *risks* and *hazards*, the expectations for network structures in this research do not explicitly examine the wide range of social variables that could influence network structure. It is argued here that given the versatility of social networks among foraging societies and the flow of diverse information through them, the structure of a social network constructed in response to social factors, such as demographic inequalities, would not be significantly different in its structure from a network constructed in response to ecological constraints. In other words, the most significant cost to any individual or group is in the construction of the network and the development of reliable partners. Following from a human behavioral ecology approach, it is the initial assumption of this research that within hunter-gatherer societies, environmental factors are one of the most significant constraints and therefore provide the starting point with which to assess the development of adaptive behaviors including social networking.

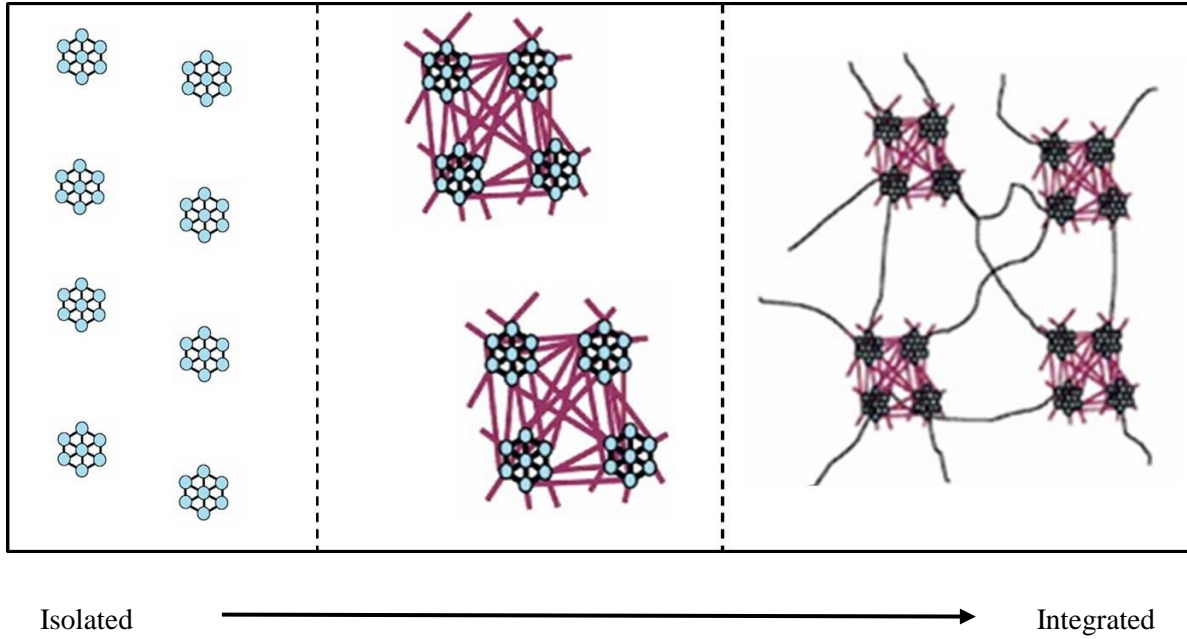


Figure 2.2 Graphical representation of spectrum of network types with three networks representing isolated, intermediate and integrated forms (Image adapted from Fitzhugh et al. (2011))

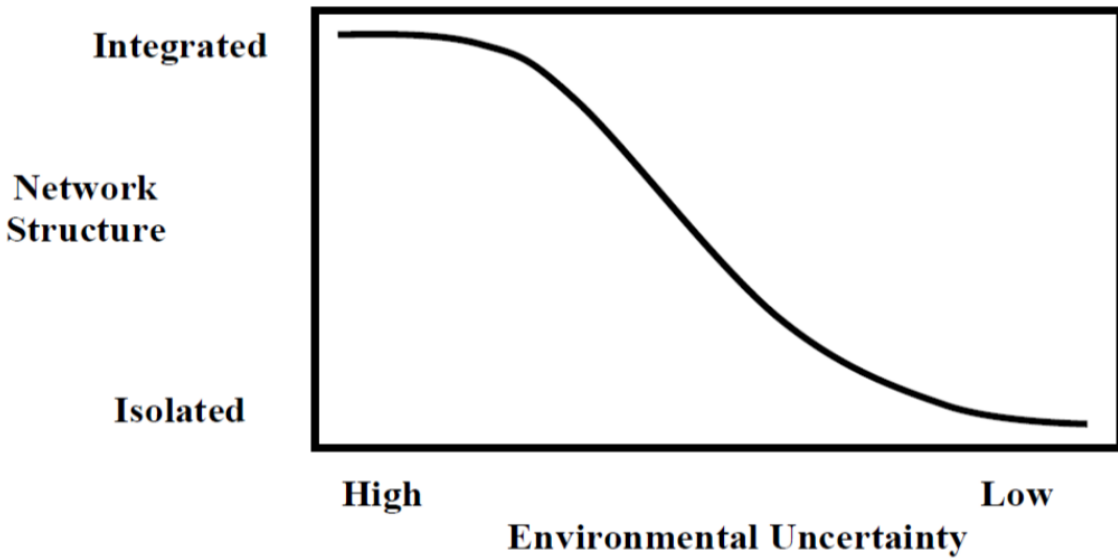


Figure 2.3 Hypothetical relationship between environmental uncertainty and the structure of hunter-gatherer social networks

2.5.2 Predictions for the Kuril Islands

The Kuril Islands of Northeast Asia are an attractive region to explore the reduction of uncertainty through acquisition and exchange of information as they provide an insular and unpredictable environment that likely requires complex social adaptations to colonize and survive. In these environments, it is expected that social networks would be particularly important for colonization and persistence by ensuring a greater degree of adaptive flexibility to deal with infrequent and unpredictable hazardous events (Fitzhugh et al. 2011; Fitzhugh et al. 2004). In these settings, social networking becomes an important strategy for the circulation of information that reduces environmental and subsistence uncertainty by increasing knowledge of hazard events and resource variation as well as establishing formalized relationships between individuals or groups.

Working from the premise that the formation and maintenance of social networks is an adaptive mechanism for mitigating uncertainty in the Kuril Islands, several basic, regional expectations for network structures can be proposed (Gjesfjeld and Phillips 2013). The southern Kuril Islands (Kunashir, Iturup and Urup) demonstrate the first colonization of the Kuril archipelago with the earliest archaeological evidence dated to approximately 7610-8160 cal BP (Yanshina and Kuzmin 2010). As is discussed in further detail in Chapter 3, the southern Kurils are ecologically different to the central and northern regions of the archipelago. The southern islands are significantly larger and maintain a higher degree of biological diversity including trees and shrubs, terrestrial mammals (Hoekstra and Fagan 1998), insects, freshwater and terrestrial mollusks and freshwater fish (Pietsch et al. 2001; Pietsch et al. 2003). Based upon these characteristics, the southern Kuril Islands can be modeled as having lower environmental uncertainty due to the higher levels of ecological diversity, resource predictability and a longer

history of settlement. In accordance with the information networks model, participating in regional and distant networks is less important in these more certain environments and therefore it is expected that networks of archaeological sites in this region will be less integrated, with fewer regional ties extending beyond southern Kuril archaeological sites (isolated network structure). In contrast, the central and northern Kuril Islands present a region with less biological diversity and a shorter history of settlement. The first consistent occupation of the central and northern islands occurs much later than the southern islands with the first documented occupation occurring around 3750 cal BP.

The main features of the central and northern islands are their small geographic size, with the exception of Paramushir, and their relative lack of resource diversity (Fitzhugh et al. 2004). Vegetation of these islands is most similar to tundra conditions with a mix of shrubs thickets and herbs and no substantial tree vegetation (Lozhkin et al. 2010). The central and northern islands, while ecologically less diverse compared to the southern islands, do contain high abundances of migratory marine mammals, particularly sea lions, seals and sea otters, at least at present (Burkanov and Loughlin 2005). Based upon these characteristics, settlement in the central and north-central Kurils, by contrast to the southern islands, would demonstrate a more interconnected network type (higher density, less centralization). In this setting, maintaining a dense network of local, regional and even distant relationships would be considered an optimal strategy for dealing with uncertainty.

In the northern islands, where biological resource diversity and island size is greater than the central / north-central region but significantly less than the southern islands an intermediate network type is expected. Local ties are still prominent but groups would also likely have regional ties, perhaps seasonally, to populations in the Kurils and Kamchatka.

Region	Environmental Uncertainty	Network Structure	Network Density	Network Centralization	Network Spatial Scale
South	Low	Isolated	Low	High/Decreased Mobility	Restricted/Local
Central & North- Central	High	Integrated	High	Low/Increased Mobility	Broad
North	Medium	Intermediate	Moderate	Moderate	Regional

Table 2.2 Predicted network structures given the environmental uncertainty associated with each region of the Kuril Islands

One factor not previously discussed is the time scale in which social networks might shift between network types (integrated, intermediate and isolated). It is possible that foraging populations may be able to quickly engage in the landscape learning process and adapt to a new environment in a matter of months or years that is too small to detect archaeologically (Rockman 2003). In general, it is suggested here that social networks during colonization would typically be more integrated with the desire to acquire diverse forms of environmental information and maintenance of network partners from ancestral locations (Fitzhugh and Kennett 2010). As the landscape learning process progresses, costly partners in the network would like be “trimmed” leading to more intermediate and isolated network structures. However, it should be noted that social networks could also form and function to disseminate alternative forms of information such as political or social information. In more complex societies with multiple regions of long-term settlement, social networks could develop in response to the accessing of political or social information. These alternative forms of information are considered secondary influences in the formation of Kuril Island social networks due to the high degree of environmental uncertainty as

well as the limited evidence for the presence of political and social hierarchies among past Kuril Islands inhabitants (Fitzhugh et al. 2004).

2.6 Chapter Summary

The colonization and habitation of remote and unpredictable environments by hunter-gatherer populations would have likely required complex social adaptations to mitigate the environmental, subsistence and inter-personal risk associated with these regions. While often mentioned in anthropological research, this research aims to explicitly model the influence of uncertainty on the development of behavioral strategies in marginal environments. Given the various types of hazards and risk experienced by hunter-gatherers, reducing uncertainty through information acquisition can be considered one of the most beneficial strategies for living in remote and unpredictable environments.

In the review of anthropological research on hunter-gatherer strategies for mitigating hazards, risk and uncertainty it becomes evident that social transmitted information can be a valuable commodity in reducing uncertainty, managing risk and mitigating the impact of hazards. Given the establishment of trust between information sources, socially transmitted information can provide a low-investment strategy for accessing diverse forms of information from broad spatial scales. Furthermore, ethnographic evidence has demonstrated that trusted social partners can also function as a social safety net to buffer the impact of unpredictable hazard events (Wiessner 1977). In order to model the influence of social networks on hunter-gatherers, an information network model (Fitzhugh et al. 2011) is used to develop initial predictions. In general, the information network model suggests that in geographic regions where uncertainty in hazard events is low, social networking will likely occur on a more

restricted geographic scale with most social relationships existing at a local scale with immediate or extended family members. In contrast, in geographic regions where uncertainty of hazards is high then individuals are more willing to invest in social networking across wide spatial scales leading to more extensive social connections at the local, regional and distant levels.

Finally, it is suggested that the Kuril Islands of Northeast Asia offer a particularly attractive region to investigate the predictions of the information network model archaeologically. This is largely due to the variable and patchy environment of the archipelago with the southern islands demonstrating lower environmental uncertainty than the more remote islands of the central and northern regions. In summary, this research seeks to understand the adaptive role of social networks on mitigating environmental unpredictability and their influence on the settlement of remote and unpredictable environments by prehistoric foragers. By understanding the role of social networks and information acquisition, I hope to contribute to the broader understanding of the complex adaptations successfully used by hunter-gatherers to survive and thrive throughout the globe.

Chapter 3: Uncertainty in the Kuril Islands

3.1 A Human Biogeographical Approach

In understanding the environmental uncertainty that influences the hunter-gatherer settlement of remote and marginal environments, this research favors a human biogeographical approach. A human biogeographical approach, as opposed to landscape and ethnographic approaches, emphasizes the importance of ecology, history and geography to understanding why humans inhabit some habitats and not others (Huggett 2004; Rockman 2003). The concepts of ecology, history and geography are emphasized in this research for their important role in defining the physical boundaries between suitable and unsuitable habitat for colonization and settlement. As originally noted by Charles Darwin (1859:124), these physical boundaries play an important factor in the evolution and distribution of species as “we can thus understand the importance of barriers, whether of land or water, which separate our zoological and botanical provinces. We can thus understand the localization of sub-genera, genera and families”. However, in the application of biogeography to humans, deterministic models of geography and climate are largely inappropriate as human biogeography is a more complex process involving physical, social, economic, technological and historical factors (Fitzhugh and Hunt 1997).

V. Gordon Childe (1946) once noted that human beings adapt not to their real environment but to their ideas of it. Therefore, understanding the distribution of humans from a biogeographical approach requires consideration of the unique physical, ideological and social barriers effecting human colonization and habitation. As suggested by Rockman (2003), significant human barriers include population barriers, social barriers and knowledge barriers. In her view, population barriers refer to physical factors such as the availability or unavailability of suitable landscape space, social barriers refer to impediments to the transfer or movement of

information or material between groups and knowledge barriers refer to the usefulness of environmental information that was previously collected. The presence of any one of these barriers by itself would not necessarily result in a novel region being considered unsuitable but rather various combinations of the three barriers at certain times can significantly impact the successful colonization and settlement of a novel landscape. During colonization of a novel landscape, Rockman (2003) suggests that knowledge barriers likely pose the most significant obstacle. However, after successful (or perhaps unsuccessful) development of an initial knowledge base, the main obstacle becomes the ability to access and acquire up-to-date and accurate information through either individual monitoring or social connections.

Based upon these concepts, perhaps the biggest challenge for colonizing populations is not the travel or movement but the learning process associated with living in a new landscape. As defined by Rockman (2003) the landscape learning process is a social response to situations where there is both a lack of knowledge concerning environmental and subsistence variability as well as a lack of access to previously acquired information about the variability. In the terminology of human behavioral ecology, the landscape learning process is a behavioral strategy to reduce environmental and subsistence uncertainty through the acquisition of information about the landscape. Following Rockman (2003), the landscape learning process involves the acquisition of locational, limitational and social knowledge. Locational knowledge refers to the information relating to the spatial and physical characteristics of particular resources such as marine mammal rookeries, lithic outcrops or clay deposits. Alternatively, limitational knowledge includes information about the usefulness and reliability of accessing key resources which in the Kuril Islands likely includes the knowledge necessary to acquire common subsistence resources such as marine mammals or birds as well as strategies for mitigating

frequently occurring hazardous events and variability in subsistence resources. Finally, social knowledge is the collection of social experiences that transform collections of natural resources into a human landscape and likely includes the development of local and traditional knowledge that can be transmitted between individuals.

In evaluating the colonization and settlement of the Kuril Islands, it is clear that solely examining a “prime mover” of population pressure or economic opportunity would be inadequate given the remote geography and marginal ecology of the archipelago. More appropriately, this research aims to understand the hunter-gatherer colonization settlement of the Kuril archipelago through consideration of human biogeographical barriers and the adaptation of hunter-gatherers to the physical hazards, subsistence risk and environmental uncertainty associated with the island chain.

3.2 Physical Hazards and Uncertainty in the Kuril Islands

3.2.1 Geography

The Kuril archipelago is located in Northeast Asia stretching between the island of Hokkaido and the southern tip of the Kamchatka peninsula (see figure 3.1). In general, the archipelago can be divided into two island ridges, the Greater Kuril Ridge and the Lesser Kuril Ridge. The Lesser Kuril Ridge includes the Nemuro peninsula of eastern Hokkaido, the six small islands of the Habomai Island group and Shikotan Island. The Greater Kuril Ridge extends from the Shiretoko peninsula of eastern Hokkaido to the southernmost tip of the Kamchatka Peninsula including all the islands from Kunashir in the south to Shumshu in the north (Gorshkov 1970). The focus of this research is the Kuril Islands of the Greater Kuril Ridge which stretch in line for nearly 1200 km from Hokkaido to Kamchatka and consist of

approximately 32 islands varying in size from 5 km² to 3,200 km² with many smaller islets and outcrops. The archipelago is bounded to the east by the Kuril-Kamchatka trench which reach depths of 8500 meters and to the west by the Kuril Basin in the Sea of Okhotsk with a depth of over 3400 meters (Gorshkov 1970).

One of the most defining geographic features of the Kuril archipelago are the major open water straits between the Sea of Okhotsk and the Pacific Ocean which divide the island chain into three regional groups, with the northern region subdivided into two smaller regions.

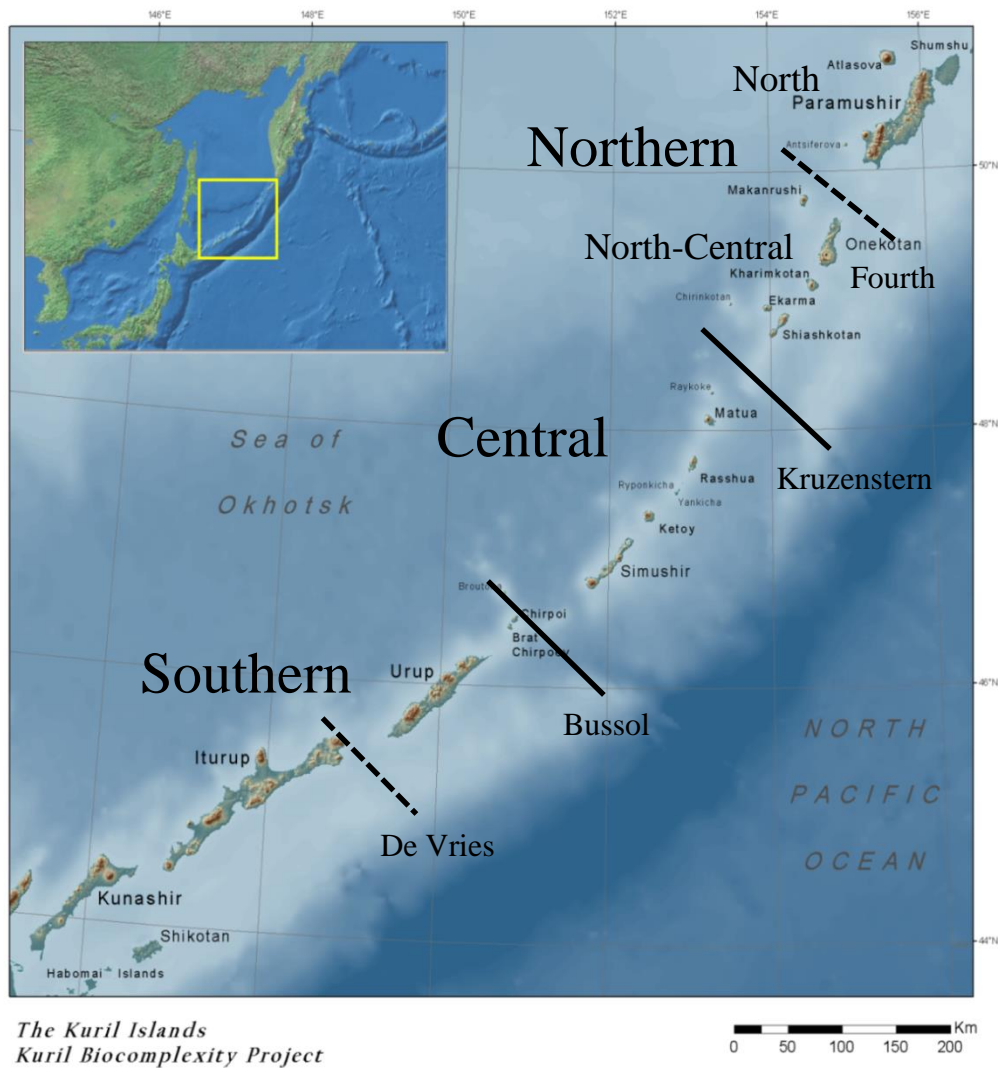


Figure 3.1 Map of the Kuril Islands showing island names, regions and major straits (Map by A. Freiburg)

The southern Kuril Islands consist of the three large islands of Kunashir, Iturup (Etorofu) and Urup. Separating the southern islands from the central islands is the Bussol Strait, a 108 kilometer wide open-water strait, the largest in the Kuril archipelago. North of the Bussol Strait lie the central Kuril Islands including the islands of Simushir, Ketoi, Yankicha, Ryponkicha, Rasshua, Matua, Raikoke and the rocky outcrops of Lovushki. The islands of Chirpoi, Brat Chipoi and Broutona lie within the Bussol Strait and due to their size, ecology and settlement history are classified as central islands throughout this research. Separating the central islands from the northern islands is the 70 kilometer wide Kruzenstern strait. The islands north of the Kruzenstern Strait include the islands of Chirinkotan, Shiashkotan, Ekarma, Kharimkotan, Makanrushi, Onekotan, Antsiferova, Paramushir, Shumshu, Atlasova and the smaller rocky outcrop of Avos Rocks. Additional influential straits include the De Vries Strait which ecologically separates the southern two islands of Kunashir and Iturup from Urup (Pietsch et al. 2003) as well as the Fourth Kuril Strait which separates the larger northern island of Paramushir from the more southerly, northern island of Onekotan.

The geography of the Kuril Islands highlights concepts of isolation and promotes varying degrees of uncertainty in inter-island movement. In some cases, foragers of the Kuril Islands relying on simple boat technology and basic navigation skills would have easily moved between close islands and through narrower straits; however, movement across the wider straits would have presented more difficult challenges (Phillips 2011). As the modern explorer Jon Turk (2005:85) found out in his kayak expedition through the Kuril Islands the real difficulty is navigating the unpredictable changes in ocean current and winds within the larger straits. As Turk writes about his crossing of the Bussol Strait, “without howling wind, rising storm, or warning the plain ocean suddenly reared into fifteen-foot breaking waves”. Similar experiences

with Ainu sailors are also cited by the early explorer Krasheninnikov (1963:35), specifically noting that:

“the channels are crossed in light boats, in less than half a day, but the passage is excessively difficult, because the tide runs very rapid in all of them...In the time of the flood, the waves are rapid and white, so large that even in calm weather they rise two or three fathoms high...The Kuriles [Ainu] have a superstitious awe and veneration for these waves”.

As Turk (2005) makes clearly evident, these tumultuous sailing conditions are fundamentally different than navigation in other island settings, such as the South Pacific. Popular navigation techniques, such as celestial navigation and wave recognition, are not useful techniques in the Kuril Islands as the weather is often too foggy or cloudy to see navigation stars and the quickly changing currents and shear waves are too unpredictable. However, as Turk (2005:85) notes,

“Eventually I began to understand how the seventeenth-century Ainu might have done it. When they were lost in the fog and caught in the swirling current, they stopped padding, lowered their sails, and waited...When the fog lifted and they got a sun or star fix, they would have sailed in the general direction of land until they saw the comforting image of a snow-capped mountain rising out of the sea...this kind of blind sailing in a big ocean takes ‘fierceness, strength and wisdom’.”

3.2.2 *Geology*

In the modern scientific community, the Kuril archipelago is perhaps most well-known for its dynamic tectonic environment. Thirty-three volcanic eruptions have been recorded in the past 300 years with 20 that have erupted since 1945 (Nakagawa et al. 2008, tDAR). Recently, Sarychev Peak on the central island of Matua erupted from June 11-20, 2009. With a Volcanic Explosivity Index (VEI) of 4, the production of 0.4 km³ tephra deposits and a wide spatial range of ash fall, this eruption is considered among the largest in recent historical eruptions within the archipelago (Rybin et al. 2011). While significant, the 2009 eruption of Sarychev Peak was only one of thirteen on Matua since 1923 with clear geologic evidence of a more extensive volcanic eruption history (Fitzhugh 2012). In the southeastern portion of Matua, a minimum of eleven pyroclastic flows and tephra deposits have been identified in the sediments from the last 2,500 years (Fitzhugh et al. 2002; Ishizuka 2001).

The volcanic history of Matua Island mirrors the eruption history of the entire archipelago with a high frequency of comparatively small eruptions punctuated by the occasional Plinian or caldera forming eruption. Over the last 3,000 years, Nakagawa et al. (2008) has documented approximately eighty major volcanic eruptions across the island chain with six eruptions classified as calderas or large Plinian eruptions with one occurring in the south (Medvezhya), three in the central (Sarychev, Ushishir and Zavaritsky) and two in the north (Severgina (2)). Geographically, the approximately eighty major eruptions over the last 3,000 years display an uneven distribution with the southern Kurils experiencing nine eruptions, the central region experiencing nearly thirty eruptions and the northern islands experiencing almost forty.

In addition to volcanic eruptions, the dynamic tectonic environment of the Kuril Islands also produces a high frequency of earthquakes and tsunamis. While the occurrence of earthquakes and tsunamis in the past is difficult to document, geological data collected over the last sixty years identifies the occurrence of at least thirty-four earthquake and related tsunami events within the Kuril archipelago (National Geophysical Data Center 2013). In November 2006, a 8.3 magnitude earthquake occurred near the central Kurils sending tsunami waves onshore and reaching up to 20 meters above normal high tide levels (MacInnes, Bourgeois et al. 2009). Only three months later, a second earthquake and tsunami event occurred in the same region which coupled with the earlier 2006 event damaged many of the islands coastlines, moved large rocks and concrete bunkers from WWII and altered the sub-tidal and intertidal ecosystems (MacInnes, Pinegina, et al. 2009). Analysis of paleo-tsunami deposits in the central island by researchers from the Kuril Biocomplexity Project (KBP) indicate that similar tsunami events likely occurred in the Kuril Islands throughout the Middle and Late Holocene (Fitzhugh 2012; MacInnes, Bourgeois et al. 2009).

While extremely unpredictable, tectonically-based hazard events such as volcanic eruptions, earthquakes and tsunamis do not likely have a strong physical impact on populations of the Kuril Islands. The limited impact of high magnitude events is most likely due to their limited spatial impact and the low population density and high mobility of foraging populations (Sheets 1980). In the case of volcanic eruptions, toxic gases, landslides, pyroclastic flows and lahars can cause immediate death and destruction to proximal areas but the more widespread ash deposits are significantly less hazardous. At the site of Rasshua 1 on Rasshua Island, approximately 15 centimeters of pumice ash are recognized next to pithouse features with occupation of the site occurring before (2010 cal BP) and possibly soon after (1920 cal BP) ash

deposition (Fitzhugh 2012). As for earthquake and related tsunami events, the most significant impact would occur with mariners who would have been working in shallow water or on shore at the direct time of the tsunami strike (Fitzhugh 2012). However, as highlighted in chapter 2, native peoples of Thailand quickly identified the occurrence of the 2004 Sumatra-Andaman tsunami and utilized their traditional knowledge to minimize its physical impact (Sheets 2012).

3.2.3 Weather

Weather, as defined here, is the daily to annual patterns of atmospheric conditions. In the Kuril Islands, the weather is strongly influenced by the archipelago's marine geography and its proximity to both strong ocean currents and major landmasses. During winter months, a strong atmospheric Siberian High weather system interacts with the Aleutian Low creating northerly winds that bring in cold air masses from the Asian continent which produce nearly 138 snowstorm days per year and stable snow cover from November until May (Ganzei et al. 2010; Leonov 1990; Razjigaeva et al. 2008). The frequent occurrence of violent winter storms and intense cooling of the sea surface influence the formation of sea ice which can cover up to 85% of the Sea of Okhotsk (Hays and Morley 2004). At its peak, sea ice surrounds the southern Kuril Islands of Kunashir, Iturup and occasionally Urup as well as the northernmost islands of Paramushir and Shumshu for an average 77 days per year (Bulgakov 1996). Summer weather in the Kuril archipelago is best characterized as cool and moist with extensive fog cover (Razjigaeva et al. 2008). Due to the presence of the Oyashio current carrying cold water from the western Bering Sea and the Soya current carrying warm water from the Sea of Japan, some areas of the Kuril Islands experience nearly 215 fog occurrence days per year, statistically making it one of foggiest places on earth (Razjigaeva et al. 2011; Tokinaga and Xie 2009;

Bulgakov 1996). Violent storms also occur during summer months bringing heavy precipitation, strong winds and storm surges (Bulgakov 1996).

The unpredictability of violent storms and the prevalence of fog in the Kuril Islands undoubtedly created dangerous conditions in the movement and settlement of the southern, central and northern islands. As experienced by KBP researchers, boat landings in stormy conditions are particularly dangerous (with storm waves and high winds pushing driftwood and debris onto low-lying beaches) (Fitzhugh 2012). The frequency of storms in the Kuril Islands is noted by ethnographer Carl Etter (1949:2) in his recording of his journey to the Kuril Islands with his Ainu subjects, “At the end of two days in Tomari, rain began to fall as only it can in the Kurile Islands. Water came down in great torrents, and it looked as though Noah’s flood was to be repeated all over again.” Upon his return trip from Iturup, Etter (1949:112-113) recounts the following story,

“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 eggshell in a tempest...They 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.”

3.3 Subsistence Uncertainty in the Kuril Islands

3.3.1 Flora and Fauna Distribution

The modern-day distribution of flora and fauna in the Kuril archipelago is largely influenced by the geographic history of the island chain and modern ecological barriers. At the time of lowest sea level which coincides with the Last Glacial Maximum (ca. 18,000 years ago), the southern islands of Kunashir and Iturup were united into a single mountainous region with Hokkaido, Sakhalin and the islands of the Lesser Kuril Ridge (Pietsch et al. 2003). Similarly, the northern islands of Paramushir, Atlasova and Shumshu were connected to the Kamchatkan peninsula. During this period, many species likely colonized the modern-day southern and northern islands from the mainland areas of Hokkaido and Kamchatka given the higher overall taxonomic diversity in these regions. As the climate became warmer after 15,000 years ago, sea-level began to rise resulting in the isolation of many islands including Kunashir, Iturup, Chirpoi, Paramushir and Shumshu (Pietsch et al. 2003).

Despite the small geographical area of the entire Kuril archipelago, the biotic diversity of the Kuril Islands is unusually high (Pietsch et al. 2003). Based upon biogeographical species distributions, the Kuril archipelago can be divided into two distinct biogeographic regions, the highly diverse southern islands (Kunashir, Iturup and Urup) and the less diverse more remote islands of the central and northern regions (Pietsch et al. 2003). In general, the remote Kuril Islands demonstrate significantly lower resource diversity particularly among terrestrial mammals, fish and littoral resources (Pietsch et al. 2003; Hoekstra and Fagan 1998). This biogeographical division is largely influenced by the deep and swift-moving Bussol Strait which likely never connected the southern and remote islands by land or ice. This influence of the

Bussol Strait is also reinforced by current climatic conditions separating the relatively warm southern islands and the cold northern islands.

Compared to the remote Kuril Islands, the southern islands support a higher diversity of flora and fauna species. Currently, the southern islands maintain significantly higher floral richness including a broad mosaic of vegetation types across several latitudinal and altitudinal zones (Korotky et al. 2000; Razjigaeva et al. 2004). On the southern islands of Kunashir between sea level and 400 meters, the majority of broad-leaved taxa have been identified including oak (*Quercus crispula*), castor-oil tree (*Kalopanax septemlobus*), maple (*Acer pictum*), elm (*Ulmus laciniata*), birch (*Betula ermanii*) and Kuril bamboo (*Sasa kurilensis*). In addition to open birch forest, northern Kunashir and southern Iturup also contain boreal coniferous forests including Sakhalin Fir (*Abies sakhaliensis*) and spruce (*Picea microsperma*). Within the higher altitudes (400-700 meters) or cooler climates or the more northerly islands of Iturup and Urup, extensive open birch forests are more commonly encountered with 38% of Iturup Island characterized as birch-dominated (Razjigaeva et al. 2004). Within the highest altitudes of the southern Kurils (700-1500 meters), the tundra adapted Siberian dwarf pine (*Pinus pumila*) is prominent.

The fauna of the southern Kurils demonstrates the largest diversity of mammals, birds, insects, fish and shellfish in the archipelago (Hoekstra and Fagan 1998). Terrestrial mammals identified in this region include bear (*Ursus arctos*), fox (*Vulpes vulpes*), river otter (*Lutra lutra*), pine marten (*Martes martes*), sable (*Martes zibellina*) and squirrel (*Sciurus vulagris*) (Hacker 1951). Marine mammals include sea otter (*Enhydra lutris*), northern fur seal (*Callorhinus ursinus*) and sea lions (*Eumetopias jubatus*) which commonly migrate to the southern islands and Hokkaido from rookeries in the central and northern Kurils. In the diaries of Captain H.J. Snow

(1897), several other marine mammals were also observed including dolphins (*Lagenorhynchus obliquidens*) and three species of whale: humpback (*Megaptera novaeangliae*), finback (*Balaenoptera physalus*) and gray (*Eschrichtius robustus*). The most common bird in the Kuril Islands is the Burgomaster gull (*Larus hyperboreus*) with the southern region also maintaining wrens (*Troglodytes troglodytes*), swifts (*Apus pacificus*), crows (*Corvus corone*), falcons (*Falco peregrines*) and eagles (*Haliaeetus albicilla*). Recent biogeographic surveys have also identified the largest diversity of freshwater fish families in the southern islands including a variety of salmon species (chum, pink, sockeye and coho), lamprey (*Petromyzontidae*), carp (*Cyprinidae*) and sculpins (*Cottidae*) (Pietsch et al. 2001). While freshwater fish diversity is higher in the southern islands compared to the remote Kuril Islands, it is substantially lower than the adjacent island of Hokkaido (Pietsch et al. 2001). Finally, shellfish are abundant throughout the Kuril Islands but only the southern region maintains a relatively high diversity of shellfish including both freshwater and terrestrial mollusks, mussels and clams (Pietsch et al. 2003).

The flora of the remote Kuril Islands (central and northern regions) can be characterized as tundra dominated by a mix of shrub thickets and herbs (Lozhkin et al. 2010). Plant communities are typically thickets of brush alder (*Duschekia fruticosa*) and dwarf pine (*Pinus pumila*), cyperaceae-moss bogs or alpine tundra. Significant stands of trees are only found along the Tikharka river on the island of Paramushir (Lozhkin et al. 2010). In the central Kurils, diversity in plant communities is even further reduced with the vegetation largely dominated by crowberry (*Empetrum sibiricum*) and shrubs ranging from high mountain slopes to marine terraces (Grishin et al. 2005 in Phillips 2011).

The fauna of the central and northern regions are most generally characterized by a lack of diversity and absence of terrestrial mammals but large abundances of migratory resources

such as fish, birds and marine mammals. In the northernmost islands of Paramushir and Shumshu, only a few terrestrial mammals have been identified including voles (*Clethrionomys*), shrews (*Sorex caecutiens*), weasels (*Mustela nivalis*) and brown bear (*Ursus actos*). In the central Kurils, only the fox (*Vulpes vulpes*) are known today and is thought to have been introduced by humans to some of the islands (Hoekstra and Fagan 1998). Currently, at the far northern end of the archipelago, fish common to the Sea of Okhotsk and the Bering Sea are frequently encountered such as Alaska pollock (*Theragra chalcogramma*), Atka mackerel (*Pleurogrammus monopterygius*) and rock sole (*Lepidopsetta polyxytra*) (Orlov 2004). In the 1980s, nearly 275 thousand metric tons of fish were harvested commercially from this area (Orlov 2004). Archaeological excavations on the northernmost island of Shumshu (Fitzhugh et al. 2004) demonstrate the presence of similar fish in the past including members of the *Gadidae* family (pollock and cod) as well as flounder (*Pleuronectidae*) and salmon (*Salmonidae*). This contrasts greatly with the archaeological site of Peschnaya Bay on the central islands of Chirpoi where a vast majority of fish remains belong to the Greenling family (*Hexagrammidae*). Bird diversity across the island chain is relatively even with the northern regions maintaining 13 species of birds, the central region 16 species and the southern islands 11 species. However, the central and northern regions exhibit a higher proportion of ground-breeding birds including Pacific fulmars (*Fulmarus pacificus*), petrels (*Procellaria*) auks (*Aethia cristella*), puffins (*Fractercula corniculata*) and guillemots (*Cepphus carbo*). Relative abundances of bird remains in archaeological contexts are also significantly higher at the northern archaeological site of Shumshu than in the central archaeological site of Peschnaya (Fitzhugh et al. 2004).

The most noticeable subsistence feature of the central and northern Kuril Islands is the abundance of marine mammals, particularly Steller sea lions. Early explorers such as

Krasheninnikov (1963) in 1755 and Snow (1897) in 1855 described sea lions inhabiting the entire island chain. Specifically, Snow (1897) counted eighteen breeding rookeries where an estimated one hundred thousand sea lions “haul up” during the summer months. Krasheninnikov (1972) reported that an abundant sea lion rookery exists on Atlasov Island, where residents from Lopatka, Shumshu and Paramushir traveled to by boat for the harvest of Steller sea lion and seals. In the experience of Krasheninnikov (1972), these voyages are considered very dangerous with Ainu mariners commonly driven away by storms, getting lost and starving out at sea. It is likely that given the rough passage to Atlasov Island, had there been rookeries closer to Lopatka, residents would have likely hunted there instead (Burkanov and Loughlin 2005). While Snow’s (1897) sea lion count is not comprehensive or scientific, historical and modern surveys have demonstrated large abundances of sea lions as well as high fidelity in the location of sea rookeries and haul-outs over the last 150 years (Burkanov and Loughlin 2005). In contrast to the general trend of biological diversity in the island chain, the central and northern islands have far higher abundances of sea lions and of rookery and haul-out locations with only seven of the forty-four rookeries and haul-outs located in the southern islands of the greater Kurils (and three of the seven coming from a single locale, see figure 3.2).

The significant biogeographical differences between the southern islands and the central and northern islands likely influenced not only initial colonization of the archipelago but also the material culture of long-term inhabitants such as the Kuril Ainu. In his writings on the Kuril Islands, Capt. Snow (1897) notes that,

“besides their uncleanliness, their fondness for strong drink, and their language, they had few things in common with their brethren of the south... The food of these people consisted of the flesh of the seal, sea-lion, sea-otter, sea-fowl and their eggs, berries, a

few roots, and fish. They did not, however, appear to be large eaters of the last named.”
[18-19]

“The dresses of these natives were made of birdskins, sewn together with sinews of the sea-lion. The feathers were worn inside next the skin. The outside of the dress was usually adorned with the yellow plumes and brilliantly colored beaks of the tufted and horned puffin. The edges, and around the neck, were trimmed with narrow strips of fur sealskin... A cap of sealskin, and moccasins reaching to the knee, the uppers made of sea-lion or seal hide, and the feet of the rubber like skin of sea-lion flippers completed their outfit” [20-21]

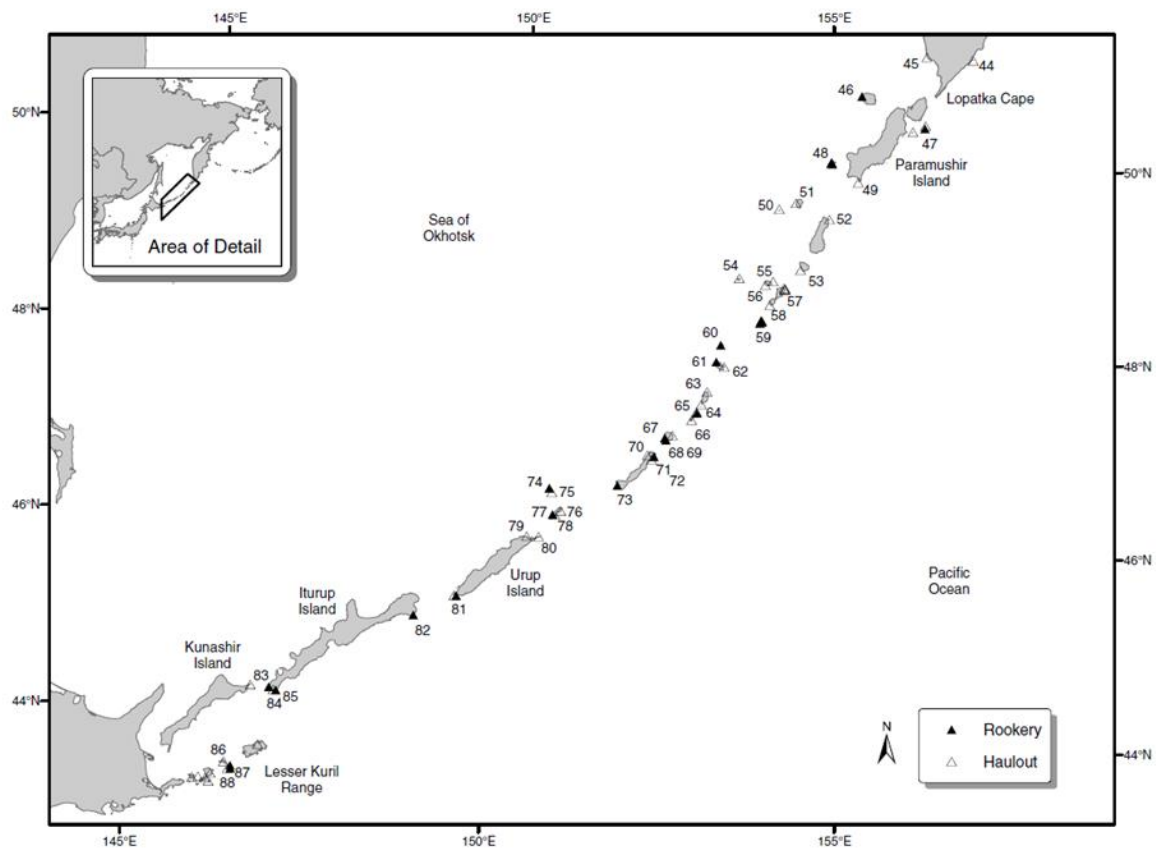


Figure 3.2 Location of Steller sea lion rookeries and haul-outs in the Kuril Islands (from Burkanov and Loughlin 2005)

3.3.2 *Climate and Paleo-environment*

The wide-spread use of marine mammals acknowledged by Capt. Snow (1897) for food and clothing demonstrate a strong reliance by Ainu hunter-gatherers on these species. In the short term, intensive use of specific resources, such as marine mammals, can be considered an adaptive strategy for living in insular and homogenous island environments such as the central and northern Kurils (Fitzhugh et al. 2004). However, in the long term, intensification of only a few migratory marine species can create a vulnerable situation for hunter-gatherers as any perturbation in the environment or further intensification can lead to localized depletion of resources. The influence of even minor seasonal resource depression among the Kuril Ainu is also noted by Capt. Snow (1897:20) in stating:

“Food was plentiful during the summer, but, being improvident and very lazy, they were often hard pushed during the winter and spring, sometimes having to subsist on the few limpets and mussels they could gather around the rocks of the beach. This usually happened when the weather was too cold and boisterous to get about, or when they had used up all their ammunition.”

In addition to these long term trends and sub-annual fluctuations such as seasonality, the Kuril archipelago has also experienced long-term climatic changes. While less catastrophic than volcanic eruptions, 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. Based upon a paleoclimate reconstructions from the Kuril Islands (Razjigaeva et al. 2013), the Late Holocene is characterized by fluctuating short-term cooling and warming events with a general paleoclimatic trend towards cooling. The peak of the Late Holocene cooling in

the southern Kurils is comparable to the cold Kofun stage in Japan dated between 1760-1270 ¹⁴C BP. In the central Kurils, the cooling was accompanied by a decrease in effective moisture and bog desiccation likely caused by windier conditions that limited accumulation of snow cover in open, flat terrain (Razjigaeva et al. 2013). Immediately following the Kofun cold stage is the recognition of the Nara-Heian-Kamakura warm stage (1270-700 ¹⁴C BP) which was characterized by warm winters, hot summers and decreased precipitation. This warming trend most prominently identified throughout Honshu likely had little impact on the Kuril Islands as evidenced by only minor shifts in vegetation within the forests of the South Kurils (Korotky et al. 2000).

Starting around 700 years ago (1300 AD), the Little Ice Age (LIA) appears to have strongly influenced the modern landscape of the Kuril archipelago (Razjigaeva et al. 2013). In Japan, this period was characterized by cold winters, cool summers and high precipitation with mean annual temperatures decreasing 1-2° C. The pronounced cooling in the southern Kurils associated with the LIA heavily influenced landscape changes by promoting a marine regression and exposing vast shallow water sediments. With an increase in windiness, stronger aeolian activity promoted the formation of coastal dunes and a decrease in oak-dominated forests (Razjigaeva et al. 2013). During this period, the cold Oyashio current was intensified and may have increased marine primary productivity in the southern region (Fitzhugh 2012). In the central Kuril Islands, the LIA was characterized by an increase in effective moisture and snow cover.

3.4 Chapter Summary

In summary, environmental and subsistence uncertainty in the Kuril Islands is largely influenced by hazardous events occurring at multiple temporal and spatial scales. For example, the patchy biogeographical distribution of resources is largely a product of geological, atmospheric and oceanographic processes that occurred throughout the entire Holocene. However, during specific time periods and in specific locations, the negative impact of patchy resource distributions on marine forager subsistence might be enhanced (or potentially diminished) by the occurrence of intermediate and small-scale variability in resource abundances and weather conditions.

The unpredictable environmental and subsistence conditions of the Kuril Islands place a premium on the development of accurate limitational and locational knowledge. In a landscape such as the Kuril archipelago, it is simply not enough to know where key resources are available but it is also absolutely critical to know when to acquire these resources or when to change settlements to mitigate local uncertainty. As Capt. Snow (1897:22) notes,

“The Kurilsky inhabiting the central islands frequently shifted their quarters from one island to another. When this “flitting” took place, it was a matter of serious consideration. The weather had to be watched very closely, both for storms and fogs. Should the latter set in when they were at sea, there was great risk of them not being able to find their destination, as they possessed no compass and the currents were strong and uncertain.”

Modern biogeographical and climate data clearly demonstrate significant ecological differences between the southern islands and the more remote islands of the central and northern regions. Overall, the southern islands represent a more predictable landscape with a wide diversity of resources similar to Hokkaido, a lower occurrence of catastrophic hazard events and reduced risks associated with travel. In contrast, the central and northern islands represent a more unpredictable landscape with larger abundances of migratory marine mammals but also a higher occurrence of catastrophic hazard events and higher risks associated with travel. It is important to note that the differences in landscape between the southern and remote Kuril Islands do not necessarily imply the remote Kuril Islands are uninhabitable or marginal environments for maritime foragers. Rather, these differences suggest that the limitational and locational knowledge developed in the southern region is not directly transferable to colonization, settlement and navigation of the remote region. Therefore, successful habitation of the remote Kurils would require a landscape learning process that emphasizes the development and continual updating of knowledge concerning environmental and subsistence variability. Given the frequent occurrence of various hazardous events in the Kuril Islands, this landscape learning process undoubtedly presented a unique set of challenges and required a unique set of adaptations.

Chapter 4: Cultures of the Kuril Islands

4.1 Introduction

The Kuril archipelago lies at the crossroads of past and present cultural traditions extending from Japan, East Asia and Siberia. The unique geographical and environmental setting of the Kuril Islands has often influenced previous and current anthropological research in the region by inhibiting extensive field projects due to political and militaristic conflicts, difficulty in access and elevated costs associated with working in the region (Phillips 2011). In general, this chapter seeks to review the history of anthropological research in the Kuril Islands and understand how previous research influences current perceptions of how ancient populations colonized and settled in the archipelago. More specifically, this chapter attempts to situate the Kuril Islands within the broader scope of Northeast Asia through the development of a working culture-history based upon previous Japanese, Russian and American archaeological research. The working culture-history developed in this chapter will then be used as the conceptual basis with which to analyze and interpret archaeological material in subsequent chapters.

4.2 History of Research in the Kuril Islands

The remote geographical location of the Kuril Islands has long proven to be a significant barrier in performing extensive anthropological research. As discussed in earlier chapters, the first European knowledge of the Kuril Islands came in the form of diaries and reports from explorers, hunters and traders in the seventeenth and nineteenth centuries. Two of the most prominent contributors from this period were two explorers hired by the imperial court of Russia, Georg Wilhem Steller (1709-1746) and his student Stepan Petrovich Krasheninnikov (1711-1755). Steller's manuscripts were eventually collected, translated and published posthumous as

three major works titled *Beasts of the Sea* (1899), *Steller's History of Kamchatka* (2003) and *Journal of a Voyage with Bering* (1988). Upon Steller's death, Stepan Krasheninnikov assumed responsibility for compiling the various manuscripts concerning the ethnographic, medical, linguistic, mineralogical, botanical and zoological information about his and Steller's work through Northeast Asia (Frost 2004). The result of this compilation is Krasheninnikov's wide-ranging work *Opisanie zemli Kamchatki* (Description of the Land of Kamchatka), later translated into English as *The History of Kamtschatka and the Kurilski Islands with the Countries Adjacent* (Krasheninnikov 1963). From these documents, Steller and Krasheninnikov provide some of the earliest accounts of Kamchatdal and Itel'men cultures of Kamchatka and the northern Kuril Islands of Paramushir and Onkotan. These accounts largely discuss various social practices such as marriage rituals and religious beliefs but also include information about house structures, trading practices, hunting methods and manner of dress.

Over 100 years later, another historical account of the Kuril Islands is provided by Captain H.J. Snow in his book titled *Notes on the Kuril Islands* (Snow 1897). Captain Snow, a prolific sea otter hunter, led an expedition into the island chain from 1872-1888 and provided a comprehensive account of the geography, flora and fauna, geology and inhabitants. Perhaps most striking in his accounts of the Kuril Islands is his clear acknowledgement of the difficulty in travel between regions and the cultural differences between inhabitants of the southern region and those of the central and northern regions.

The first systematic archaeological investigations of the Kuril Islands were conducted by Japanese archaeologists during in the late 19th century and first half of the 20th century (1880s-1930s) (Chard 1960; Kuzmin et al. 2012). Prominent Japanese archaeologists during this period included Ryuzo Torii (1919) who excavated in both the northern (Shumshu) and southern

(Kunashir and Iturup) regions of the island chain and Osamu Baba (Baba 1934; 1939) who led five excavations to Paramushir and Shumshu between 1933 and 1938. During this period, Baba excavated nearly 60 house pits and many other archaeological features (Chard 1956). Of primary interest to many of these early research Japanese research projects was the documentation and description of late Okhotsk and early Ainu culture in the island chain (Befu and Chard 1964; Chard 1956).

At the end of World War II (WWII), archaeological research in the Kuril Islands underwent substantial changes as the archipelago came under control of the Union of Soviet Socialist Republics (USSR). The control of the Kuril archipelago by the USSR following WWII and the subsequent dispute over the island chain effectively ended accessibility to the island chain by Japanese archaeologists leading to a vast majority of post-WWII research being performed by Russian archaeologists. Starting in the 1960s and 1970s, Soviet archaeologists returned to the island chain and focused their research and excavations on the southern islands of Kunashir, Iturup and Urup and the northern islands of Paramushir and Shumshu (Kuzmin et al. 2012). The first of these major Soviet expeditions was undertaken by R.V. Chubarova (1960) who surveyed several islands and conducted small-scale excavations on Iturup and Kunashir identifying the archaeological sites of Kasatka and Kuybyshevskaya Bay. Following the initial expeditions by Chubarova, V.A. Golubev conducted extensive surveys and excavations of the Kuril archipelago from 1963 until the late 1980s (Kuzmin et al. 2012). Golubev's most significant contribution to archaeological research in the Kuril Islands was the establishment of a "Yuzhno-Kurilsk" cultural complex which is seen as a regional variant of the Epi-Jomon culture of Hokkaido based upon its distinctive cord-marked pottery decorations (Golubev 1972; Vasilevsky and Shubina 2006).

In the 1970s and 1980s, Soviet research continued in the Kuril Islands with field surveys and small-scale excavations lead by V.O. Shubin, Knorozov and Spevakovsky (Kuzmin et al. 2012). For the first time, research during this period utilized radio-carbon dating at middle and late Neolithic sites in an attempt to link pottery from Kuril archaeological sites with established Hokkaido ceramic typologies (Knorozov et al. 1989). Furthermore, Russian archaeologist V.O. Shubin led research aimed at documenting early Russian settlement of the island chain and the migration of Aleuts to the Kuril Islands during the historic period (Shubin 1994).

The 1990s brought about a reduction in the archaeological research of the Kuril Islands by Russian archaeologists due to the changing political and economic environment of the newly formed Russian Federation (Kuzmin et al. 2012). However, this decade also marked the start for a series of related international research projects that focused on the biogeographical, archaeological and paleoenvironmental features of the archipelago. These related projects included the International Kuril Island Project (IKIP) lasting from 1994 to 2000 and the Kuril Biocomplexity Project (KBP) which extended from 2005 to 2012. Building on previous research in the region, IKIP and KBP archaeologists sought to evaluate questions including the occupation history of the island chain, human vulnerability and adaptation to environmental hazards and the broader understanding of human-environmental interactions in the region. This human biogeographical approach brought together an international and interdisciplinary group of scientists including a wide range of geologists, paleo-ecologists, climatologists and archaeologists from Russian, Japan and the United States.

Starting in the summer of 2006, the KBP initiated on the most extensive archaeological survey project ever conducted in the island chain. Over the course of three field seasons from 2006-2008, over 60 archaeological sites were investigated on 17 different islands (Fitzhugh,

Etnier, et al. 2009; Fitzhugh, Phillips, et al. 2009; Fitzhugh et al. 2007). Most archaeological sites were investigated through minimally invasive methods such as targeted house-pit coring, surface collection and test pit excavations. More extensive excavations by KBP archaeologists occurred at five archaeological sites including Ainu Creek 1, Vodopodnaya 2, Rasshua 1, Ekarma 1 and 2 and Drobnye 1, joining two previous IKIP excavations in 2000 on Chipoi and Shumshu Islands. A massive collection of lithic, ceramic, faunal and geologic material was recovered from KBP field research with culturally modified artifacts (lithics, bone-tools and ceramics) curated at the Sakhalin Regional Museum in Yuzhno-Sakhalin, Russia and remaining items brought to the University of Washington for analysis.

4.3 Chronological History of the Kuril Islands

One of the primary goals of the Kuril Biocomplexity Project was the establishment of a reliable settlement history for the entire Kuril archipelago through radiocarbon dating of human occupations (Fitzhugh et al. 2002). The use of radiocarbon dates to infer occupation periods relies on the fairly simple assumption that “all things being equal, more occupation produces more carbon dates” (Rick 1987:56). Using the combination of 45 previously published radiocarbon dates by Zaitseva et al. (1993) and 396 radio-carbon dates from the IKIP and KBP research projects, an preliminary histogram for the Kuril Island can be constructed (see figure 4.1). The histogram presented here is based upon the full set of calibrated radiocarbon dates and demonstrates five different occupation phases of the Kuril archipelago, initially labeled here as phases I-V. Trends highlighted in figure 4.1 show strong similarities to summed probability distributions from radiocarbon datasets that control for the overrepresentation of more intensively data archaeological deposits (see Fitzhugh et al., *in prep* for additional details).

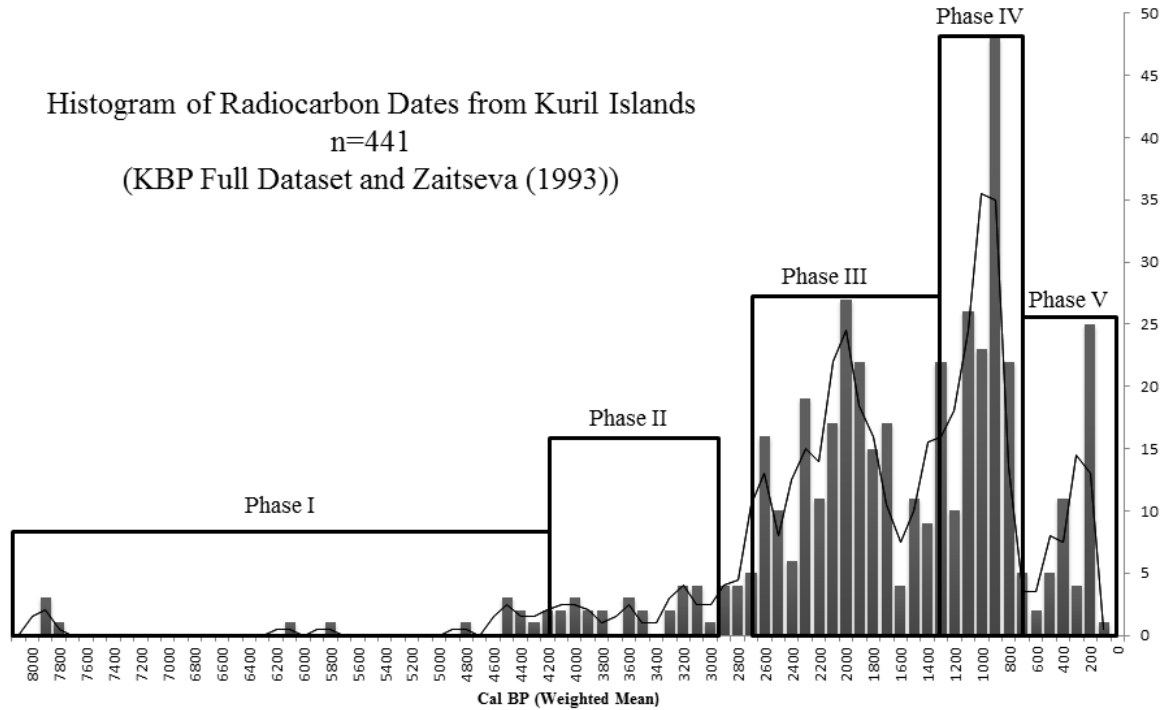


Figure 4.1 Histogram of radiocarbon dates from Kuril Biocomplexity Project, International Kuril Island Project and Zaitseva (1993)

Age Range (cal BP)	Chronological Designation	Estimated Population Density	Primary Regions Occupied
8000 – 4200	Phase I	Low	South
4200 – 2900	Phase II	Low	South, Central
2600 – 1300	Phase III	Moderate	South, Central, North
1300 – 700	Phase IV	High	Central, North
700 – 100	Phase V	Moderate	Central, North

Table 4.1 Occupation history of the Kuril Islands based upon KBP and IKIP radiocarbon dates

4.4 Cultural History of the Kuril Islands

Based upon radiocarbon dates and previously published archaeological research (see Fitzhugh et al. 2002; Fitzhugh et al. 2004; Kuzmin et al. 2012; Phillips 2011), five occupation periods of the Kuril Islands can be assigned a cultural affiliation. Given the similarity of artifacts recovered from the Kuril Islands to artifacts from Hokkaido and southern Sakhalin, this research relies heavily on the established culture-historical designations of the surrounding regions developed through previous Japanese and Russian archaeological research. More specifically, the similarity in decoration and form of archaeological pottery assemblages between the Kuril Islands and Hokkaido favors the Japanese cultural affiliations as most appropriate for this research (see chapter 5 for additional details about the decorative and formal description of the Kuril pottery assemblage).

Age Range (cal BP)	Chronological Designation	Culture-History Period (Japanese)	Culture-History Period (Russian)
8000 - 4200	Phase I	Initial, Early and Middle Jomon	Early Neolithic
4200 – 2900	Phase II	Late and Final Jomon	Middle / Late Neolithic “Yuzhno-Kurilsk”
2600 – 1300	Phase III	Epi-Jomon	Epi-Jomon
1300 – 700	Phase IV	Okhotsk	Okhotsk
700 – 100	Phase V	Ainu	Ainu

Table 4.2 Preliminary culture-history of the Kuril Islands

4.4.1 Phase I: Initial, Early and Middle Jomon Settlement in Japan and the Kuril Islands

The Jomon period in Japan is fundamentally characterized by the emergence of cord-marked pottery in the archaeological record and the presence of broad spectrum foraging (Habu 2004). Based upon the emergence of cord-marked pottery, the Jomon period can conservatively be considered to start around 9500 calibrated years ago (Keally and Muto 1982). However,

evidence of undecorated pottery manufacture from the Odai Yamamatao I site may extend the Jomon period back to nearly 16,000 calibrated years ago (Habu 2004). Based largely on changes in pottery styles, the Jomon period can be classified into five sub-periods (Yamanouchi 1937): Initial Jomon, Early Jomon, Middle Jomon, Late Jomon and Final Jomon with some scholars including an Incipient Jomon period for sites with undecorated pottery older than 9500 years old but younger than 16,000 years old. While the general structure of Jomon sub-periods is accepted throughout Japanese archaeology, the emergence and ending of each sub-period is slightly different in regions throughout Japan based upon regional archaeological evidence.

The Initial Jomon period, tentatively dated between 9500 and 6100 cal BP (Keally and Muto 1982) can largely be associated with the broader East Asia Early Neolithic cultural complexes (Rudnaya and Ustinovka) that are characterized by broad spectrum foraging with evidence for the harvesting of marine resources such as tuna, sea bass, turtle and dolphin (Habu et al. 2011). The trend of increasing marine resource intensification continues during the Early Jomon period (6100-4700 cal BP) and generally corresponds to the transition from highly mobile generalists to more sedentary specialists or collectors (Habu 2002). During this period, large shell mounds develop in the Kanto region around Tokyo Bay with shellfish resources becoming extensively utilized (Habu 2004; Habu et al. 2011). The increased use of marine resources, including shellfish, is largely considered to be a product of increasing sea levels with shell mound construction reaching its height during the Early Jomon period (Imamura 1996).

The Initial and Early Jomon periods are also widely recognized for the development of a sedentary settlement pattern and strong population growth (Habu 2004). In the northern Tohoku region, a sedentary lifestyle appears to have been adopted by the middle of the Initial Jomon period (Okada 2003) with the construction of larger, rectangular pithouses that would have

required significant labor investment to construct. Well-preserved artifacts and ecofacts from the Early Jomon layers at the Sannai Maruyama site also suggest year-round settlement with the presence of wooden artifacts, lacquered bowls, digging sticks, bone needles, harpoon heads; faunal remains such as deer, boar, rabbit, squirrel, tuna, flounder, mackerel; and floral remains including chestnut, walnut, raspberry, gourds, bean and chenopod (Okada 2003). Given the increase in houses, storage pits and shell middens associated with the Incipient and Early Jomon periods at Sannai Maruyama, it is widely considered that the site acted as a “core settlement” of northeastern Japan during this period (Habu 2004).

The Middle Jomon period (4700-4000 cal BP) of Japan represents a continuation of strong population growth in the Chubu and Kanto regions (Aikens and Higuchi 1982). However, settlement patterns during the Middle Jomon become more variable with a dramatic increase in smaller, more seasonal camps (Habu 2004). During this period, strong regionalization begins to occur throughout Japan with distinct ceramic manufacturing zones and the development of highly elaborate pottery decorations, famously known as “fire-flame” pottery. Specifically at Sannai Maruyama, a sharp transition from grinding stones to projectile points is noticed during the end of the Middle Jomon period and coincides with a reduction in settlement size (Habu 2008).

Compared to later periods, the evidence for occupation of the Kuril Islands during Phase I (Initial, Early and Middle Jomon) is fairly scarce. The earliest occupation in the Kuril Islands has been assigned to the Initial Jomon (Yanshina and Kuzmin 2010; Zaitseva et al. 1993). Evidence for occupation during this period stems from radiocarbon dates from the Yankito site complex on Iterup which yielded an initial occupation age range between 8156-7616 cal BP along with pottery remains that can be assigned to the Initial Jomon sub-period based upon

stylistic features. Early Jomon pottery has been recognized at the Kuybyshev site on Iterup Island and the Sernovodsk site on Kunashir based upon their cord-marked patterns and microblade lithics (Vasilevsky and Shubina 2006). Evidence for Middle Jomon occupation of the southern Kuril Islands is more extensive than the Initial Jomon with seven archaeological sites (Olya, Glush, Kasatka, Rybaki, Beriozerka) having radiocarbon dates corresponding to the period and diagnostic Middle Jomon style pottery recovered at 21 different archaeological sites in the island chain (Shubina and Samarin 2009). It is also important to note that one radiocarbon sample from the northern site of Baikova, located on Shumshu Island, provided a calibrated date of 6184-5947 cal BP suggesting an occupation of the northernmost Kuril Islands, potentially by populations deriving from Kamchatka. This occupation is potentially associated with an early phase of the Tar'ia culture as identified at the Avacha site (6266-5735 cal BP) (Dikova 1983). Furthermore, the presence of one large obsidian projectile point and three radiocarbon samples from the northern sites of Okeanskoye and Savushkina, which date between 4245 and 3986 cal BP, suggest a strong association of the northern Kurils with the early part of the Middle Tar'ia culture (5035-1928 cal BP) found at Cape Lopatka in southern Kamchatka (Dikova 1983).

In summary, occupation of the Kuril Islands begins nearly 8000 calibrated years ago in chronological association with the Initial Jomon period in Japan. Throughout the Early and Middle Jomon periods, occupation is more extensive but population density in the Kuril Islands is extremely low with evidence for occupation only occurring at a few archaeological sites on the southern and most northern islands of the archipelago.

4.4.2 Phase II: Late and Final Jomon Settlement in Japan and Kuril Islands

During the Late Jomon period (4000-3000 cal BP), numerous environmental and social changes occur throughout the island of Honshu. Most significant is a continuation of the later Middle Jomon settlement trend towards small, dispersed settlements spread out across the landscape with only a few “core settlements” recognized in northern Tohoku (Habu 2004). Settlements during this period are constructed in locations not previously inhabited, such as on narrow ridges and small ravines (Okada 2003). These changes in settlement patterns are most commonly interpreted as a result of adaptations to a decrease in food resources caused by climatic cooling (Okada 2003). In general, during the Late Jomon period, the climate became cooler after the much warmer Jomon Transgression, causing a receding coastline and shifting the location of commonly exploited marine resources (Habu 2004; 2001).

In addition to traditional settlement sites, a new type of ritual site is archaeologically recognized during the Late Jomon and is characterized by the presence of stone circles with no associated occupation (Okada 2003). In general, two types of stone circles occur in central and northeastern Japan. The first type is a “paved” (*kumiishi*) circle consisting of small stone clusters including “sundial”-type features with pit burials often found directly beneath the stones (Kodama 2003). The second type is identified as a “stone perimeter” (*resseki*) which is a series of large stones outlining a circular area. In general, it can be considered that the spatial dispersion of settlements, the overall reduction in settlement size and the appearance of ritual sites in the Late Jomon period suggest the emergence of a new type of society where rituals play a larger role in defining social relationships and interactions (Okada 2003). The general trend during this period appears to favor a more communal and regional based settlement system with

increased reliance upon maintaining social networks across regional communities and the reinforcement of these networks through ritual activities at “stone circle” sites.

The Final Jomon period (3000-2500 cal BP) in many ways represents the start of significant changes that culminate in the development of the following Yayoi period. During the Final Jomon, clear differences appear between western Japan and eastern/northern Japan due to the influence of Mumun culture from Korea (Habu 2004). Most significant is the large-scale immigration from Korea to Japan and the introduction of rice cultivation to western Japan, which defines the start of the Yayoi period. In eastern and northern Japan, hunter-gatherer subsistence is continued although slightly altered from the Late Jomon period with an increasing reliance on marine resources and the occupation of large aggregated sites near coastal areas (Imamura 1996). Evidence for the increasing reliance on marine resources in northern Japan is provided through identification of more elaborate harpoon technology, higher abundances of fishing-related artifacts and isotope analysis of human skeletal remains (Kusaka et al. 2008; Habu 2004; Yamaura 1998). Variation in pottery forms flourish during the Final Jomon with the presence of a wide range of specialized vessels and a clear differentiation between the production of coarsewares and finewares (Habu 2004). Trading networks of northern and eastern Japan originally developed during Late Jomon period appear to intensify during the Final Jomon with a significant increase in the exchange of exotic, long-distance goods between communities.

It should be noted that using the scheme originally developed by Golubev (1972), Russian archaeologists have often considered artifacts in the Kuril Islands associated with this temporal period as belonging to a regionally specific “Yuzhno-Kurilsk” culture. However, prior to Golubev’s classification of a “Yuzhno-Kurilsk” culture, Chubarova (1960 in Kuzmin et al. 2012) identified pottery remains from the Kasatka site on Iterup to the Late Jomon period,

specifically the Late Jomon Ubayama and Horinouchi styles. More recently, these pottery remains have once again been considered closely related to Late and Final Jomon stage pottery from the Kanto plain in Honshu (Kobayashi 2004). Based upon this evidence, this author does not consider the regionally specific “Yuzhno-Kurilsk” cultural designation appropriate and assigns artifacts associated with this period as variants of the Late and Final Jomon periods.

Given the increased reliance on marine resources and dispersal of settlements across the landscape, it is not surprising that population density appears to slightly increase in the Kuril Islands during the Late and Final Jomon periods compared to the early Middle Jomon. In addition, it has been suggested that the cooling climate during this period may have initiated a shift towards increased sea mammal hunting in Hokkaido and the southern Kuril Islands as local populations of pinnipeds *potentially* increased in these areas (Niimi 1994). Of particular importance during this period is the colonization of the remote central Kuril islands with radiocarbon dates and pottery remains providing evidence for occupation at the site of Drobnye I on Shiashkotan Island and Rasshua I on Rasshua Island. While population densities during this period still remain relatively low, the initial colonization and landscape learning process of the central islands has undoubtedly begun.

4.4.3 Phase III: Epi-Jomon Settlement in Hokkaido and Kuril Islands

The Epi-Jomon period in Hokkaido (2500-1500 cal BP) and the Kuril Islands represents a significant period of change in the subsistence and cultural practices of the entire Japanese Islands. Outside of Hokkaido, this period is classified as the Yayoi period and is the foundation of the traditional Japanese rural economy that persists into modern times (Aikens and Higuchi 1982). At the core of this rural economy is the development of wet rice agriculture based on

paddy field cultivation and the adoption of agricultural subsistence and technology. The widespread changes associated with shifting to agriculture were so dramatic during this period that many early scholars promoted the idea of a massive replacement of Jomon culture by a wave of Korean Yayoi immigrants with only the Jomon way of life persisting in the northern regions of Hokkaido and the Kuril Islands (Aikens and Higuchi 1982).

Following from Aikens and Higuchi (1982), the Yayoi pattern spreads through Japan in three distinct stages. First, during the early Yayoi (2500-2200 cal BP), the culture spreads throughout southwestern Japan as far north and east as the Kyoto-Nagoya region. The second stage, associated the Middle Yayoi (2200-1800 cal BP), sees the spread of agriculture to the mountainous regions of central Honshu, the Tokyo region and northern Honshu. During the Late Yayoi (1800-1500 cal BP), wet rice agriculture becomes more fully established in northern Honshu although wet rice agriculture never crosses the Tsugaru Strait to the northernmost island of Hokkaido until the use of more modern agricultural methods.

The colder climatic conditions of Hokkaido likely provided an ecological barrier to the spread of wet-rice agriculture and allowed the continuation of the subsistence foraging in Hokkaido for an additional 1,000 years, commonly known as the Epi-Jomon (or Zoku-Jomon) period (2500-1500 cal BP) (Imamura 1996). The Epi-Jomon period in Hokkaido is characterized as the continuation of hunting and gathering Jomon culture in light of wet-rice agriculture practices throughout the rest of the Japanese Islands. While Epi-Jomon culture is similar in the persistence of subsistence foraging practices, regional differences can be identified between Epi-Jomon cultures within the island of Hokkaido and surrounding regions. In the earlier half of the Epi-Jomon period, the Esan/Ebetsu culture arises in western Hokkaido with strong influences from the Tohoku Yayoi culture (Okada 1998) but maintains localized variation in material

culture such as pottery decorations and fishing/marine hunting technology (Kikuchi 1986). Pottery decorations and forms during the Esan and Ebetsu periods are similar to Late and Final Jomon pottery styles with the retention of cord-marking and incised patterns on the exterior of the vessel which had long been discontinued on Honshu. During the latter half of the Epi-Jomon period, known as the Kohoku and Hokudai periods, pottery styles in Northeast Hokkaido change with more linear applique, protuberances and peaked rim designs occurring on vessel exteriors. It is important to note that the Epi-Jomon culture is also recognized outside of Hokkaido, namely on the southern tip of Sakhalin Island (Aniva variant) and in the Kuril archipelago (Vasilevsky and Shubina 2006).

In the Kuril Islands, the Epi-Jomon period is recognized as the first concentrated settlement north of the Bussol Strait and south of Paramushir (Fitzhugh et al. 2002; Niimi 1994; Yamaura and Ushiro 1999). Compared to the low population density of the preceding Middle and Late Jomon periods, the Epi-Jomon settlement of the island chain is extensive and dense with archaeological evidence for occupation found on seven different islands from the southernmost island of Kunashir to the north-central island of Shiashkotan. Specifically, the spread of Epi-Jomon culture into the remote Kuril Islands appears to occur during the early half of the Epi-Jomon period as the Simodanosawa pottery type is extensively distributed throughout the southern, central and north-central parts of the archipelago (Tezuka and Fitzhugh 2004). Pottery types associated with the latter half of the Epi-Jomon period, such as Kohoku and Hokudai types, are less widely distributed with no Kohoku types represented north of the island of Chirpoi in the Bussol Strait (Tezuka 2011).

Traditional explanations for the expansion of Epi-Jomon culture into the remote Kuril Islands often highlight the cooling climate during the Final Jomon and Early Yayoi periods.

These explanations suggest that cooler temperatures could have potentially increased the abundance of marine mammals in and around Hokkaido and the southern Kurils (Yamaura 1998). In addition to the cooling climate, demand for maritime products may have increased among Yayoi rice farmers with Epi-Jomon hunters increasing their supply in order to meet Yayoi demand and increase their access to iron products (Yamaura 1998; Akazawa 1986). For reasons currently unknown, artifacts definitively associated with Epi-Jomon culture are not archaeologically recognized in the Kuril Islands after approximately 1750 cal BP coinciding with a general trend of decreasing population density.

In summary, the Epi-Jomon period represents the first significant occupation of the remote Kuril Islands. The expansion into these more remote and isolated areas was potentially influenced by the cooling climate and dramatic subsistence changes on the island of Honshu. The general trend of occupation during this period is for more numerous and dispersed settlements during the early half of the Epi-Jomon with fewer and more aggregated settlements during the Late Epi-Jomon period. After approximately 1,200-1,500 years since initial colonization, Epi-Jomon settlements are no longer identified in the archaeological record of the Kuril Islands.

4.4.4 Phase IV: Okhotsk Settlement in Hokkaido and Kuril Islands

Around 1,500 calibrated years ago, a unique phenomenon occurs in Japanese history. Specifically, the northern and eastern regions of Hokkaido become occupied by a cultural group that maintains a separate cultural identity distinct from previous and contemporary groups (Hudson 2004). Believed to be of proto-Nivkh origin, the earliest variant of the “Okhotsk culture” first appears in the Amur River delta and northern Sakhalin Island. Around 1600 cal BP, Okhotsk culture is recognized in southern Sakhalin as is referred to as the Susuya culture

(Deryugin 2008; Yamaura 1998). Key features of Susuya culture on Sakhalin are a highly developed maritime economy based upon the procurement of marine mammals through water transportation and compound hunting equipment such as toggle-head harpoons (Vasilevsky and Shubina 2006). Archaeological sites assigned to the Susuya culture are numerous on Sakhalin Island with regional variants of Susuya also identified on Rebun Island (Onkoromanai variant).

Starting from Sakhalin Island around 1400 cal BP, the highly developed maritime economy associated with Susuya culture begins to spread to Northern Hokkaido, Eastern Hokkaido and the Kuril Islands and is more generally termed Okhotsk culture. The Okhotsk culture (and earlier Towada variant on Rebun and Rishiri Island) is similarly characterized as highly adapted to maritime environments with archaeological evidence for an extensive and specialized toolkit for hunting marine mammals including toggling and barbed harpoons, composite fishhooks, needles and net sinkers (Befu and Chard 1964). Fauna recovered from archaeological sites in Hokkaido supports the artifact evidence with the presence of numerous and diverse marine fauna including fish bones, sea urchins, fur seals, sea lions, seals and whales (Ohyi 1975). It can be argued that this marine subsistence orientation is more intensive in northern and eastern Hokkaido as previous evidence of pig raising on Sakhalin and Rebun Islands is absent in Hokkaido archaeological sites (Hudson 2004).

The typical Okhotsk complex as commonly identified in Hokkaido is largely based upon commonalities in subsistence patterns, settlement patterns and pottery. The settlement pattern of the Okhotsk culture in Hokkaido was likely seasonal with winter camps containing pentagonal semi-subterranean pithouses and summer camps not containing any permanent structures. These winter camps could be fairly large in size with up to 100 pithouses often arranged around protected bays and coves (Yamaura and Ushiro 1999). At the Moyoro shell mound near modern

day Abashiri, extraordinarily large Okhotsk pithouses were excavated with clay-paved floors, stone hearths and heaps of animal bones found within the house (Ohyi 1975). As described more fully in chapters 5 and 6, Okhotsk pottery is typically sand-tempered, thick-walled (7-12mm) and low-fired with its form being described as having flat bases, expanding lower bodies and upper bodies consisting of constricting necks and flaring rims referred to as a lower recurved form. Common Okhotsk decorations include stamping, linear incisions, punctation and occasional applique near the rim (Deryugin 2008). Interestingly, Okhotsk pottery seems stylistically related to earlier Tokareva cultures located much further north in the Sea of Okhotsk suggesting a possibly ancestral relationship between the two cultures (Lebedintsev 1998; Ponkratova 2006). Some authors have even suggested that Okhotsk culture originally developed around the western Sea of Okhotsk (Mohe and Jurchin cultures) and was forced to abandon this area due to social unrest and conflict with Manchurian dynastic expansion in the Amur River area (Phillips 2011; Kikuchi 1986; Yamaura and Ushiro 1999).

In the Kuril archipelago, archaeological sites assigned to the Okhotsk culture are recognized throughout the island chain starting around 1000 cal BP with radiocarbon dates suggesting intensive occupation of the central and northern islands shortly after (see figure 4.1). Archaeological evidence supports the radiocarbon dates with the greatest abundance of Okhotsk-style pottery and house-pits found in the central and northern regions (Fitzhugh et al. 2007; Fitzhugh, Phillips, et al. 2009). Given their specialized economy centered on marine mammals, the intensive occupation of the central and northern islands is not surprising as these areas contain the largest populations of sea mammals, at least at present (Burkanov and Loughlin 2005). Based upon evidence from Hokkaido, the intensive occupation of the central and northern islands could also have been driven by a rapidly developing East Asian trade market.

As Japanese archaeologists have identified, the economy of post-Medieval Hokkaido relies heavily on trade of animal products to core regions in Japan and China/Manchuria (Hudson 2004). In the case of the earlier Okhotsk period, it is argued that a similar market could have been developing for sea mammal products from the Kurils and the Arctic with the exchange of sea otter pelts and walrus ivory for metal objects (Hudson 2004). The connection between Kuril Okhotsk and trading partners to the further north is strengthened through the presence of caribou antlers in Okhotsk sites (Yamaura 1998) and the overwhelming abundance (95%) of obsidian from Okhotsk layers in Kuril archaeological sites originating in Kamchatka (Phillips 2011)

Perhaps more interesting to this research is not the initial occupation of Hokkaido and the Kuril Islands by the Okhotsk culture, but the rapid disappearance of Okhotsk sites and artifacts from the Kuril archipelago. As identified in the radiocarbon record of the Kuril Islands (figure 4.1), a drastic decline in radiocarbon dates occurs around 800 cal BP with almost no radiocarbon samples providing a date between 600 and 400 cal BP. In Hokkaido, the absence of Okhotsk remains after 800 cal BP is largely considered to be a product of assimilation of Okhotsk culture into the neighboring and contemporaneous Satsumon culture of southern and western Hokkaido (Amano 1979). Partial evidence for this assimilation comes from the hybridization of Okhotsk and Satsumon pottery with Okhotsk designs on Satsumon vessel forms dating towards the end of the established Okhotsk period (Hudson 2004; Okada 1998). In general, it is possible that the Okhotsk populations of the southern Kuril Islands experience a similar process given the presence of Tobintai type pottery at the Olya site, which is suggestive of assimilation with Satsumon groups. However, central and northern Okhotsk populations appear different as only Chinsenmon type pottery (a Northern Hokkaido style) is identified within Late Okhotsk pottery assemblages. The lack of Tobintai pottery in the remote Kuril Islands is suggestive of limited

contact between populations of the southern islands and the more remote islands; however, significant archaeological work needs to be accomplished prior to making a definitive statement concerning Late Okhotsk populations in the remote Kuril Islands. Overall, the exact mechanism for the Okhotsk decline in the central and northern regions of the island chain is not fully understood but this research will contribute to this intriguing question through analysis of Okhotsk pottery and the reconstruction of social relationships between Okhotsk populations.

4.4.5 Phase V: Ainu Settlement in Hokkaido and Kuril Islands

The final indigenous occupation of the Kuril Islands and Hokkaido is associated with the Ainu culture. Based upon archaeological evidence, it has become clear that Hokkaido experiences a major cultural transition at the end of the Satsumon period (Hudson 1999). In Hokkaido, the end of the Satsumon period (around 800 cal BP) is marked by the disappearance of locally produced ceramics, a switch from pithouses to surface dwellings with central hearths, declining plant cultivation and an elaboration of earlier ritual activity such as the *iyomante* or spirit sending ceremony (Hudson 1999; Watanabe 1972). This new cultural complex that arises out of the replacement of Satsumon culture and potential assimilation of the Okhotsk culture is often identified as the initial formation of Ainu culture.

The current literature regarding the biological origin of Ainu populations falls into two main categories: morphological studies and population genetic studies. Morphological studies have been common in Ainu research, with a modern consensus that the Ainu race represents a population that migrated to Japan prior to the migration of modern Japanese people from the Korean Peninsula (Omoto and Saitu 1997). Therefore, the ancestors of the Ainu are often considered to be associated with the Jomon culture. This interpretation has often been based

upon the cranial similarity between Jomon populations and contemporary Ainu populations (Omoto and Saitu 1997). Recently, scholars such as Shigematsu et al. (2004) have questioned these original interpretations and suggested that major differences exist between the cranial features of the Ainu and the Jomon. Furthermore, Shigematsu et al. (2004) proposes that based upon skeletal morphology the Ainu are more representative of the intrusive Okhotsk populations rather than Jomon populations.

The second and more promising category of research is focused on the use of genetic markers to determine Ainu ancestry. In general, research in this area has shown that modern Ainu populations have a complicated genetic history that demonstrates close genetic similarity with Ryukyans, likely from a shared history during Jomon periods, but also have varying degrees of recent and ancient admixture with Japanese populations and Northeast Asia populations (Jinam et al. 2012). Evidence for this admixture is the strong presence of haplogroup Y within modern Ainu populations (Tajima et al. 2004), which indicates that the Northeast Asian gene flow was sufficient enough to significantly alter previous genetic structure and it is likely that Okhotsk people are the main source of this genetic change (Adachi et al. 2011). Overall, these findings provide further evidence that Ainu populations demonstrate a genetic mixture combining two previously isolated populations likely associated with ancient Jomon/Epi-Jomon and Okhotsk populations.

The Ainu cultural complex that develops in Hokkaido around 800 cal BP can be generally characterized as the continuation of broad spectrum foraging, the presence of elaborate ritual ceremonies and integration into regional trading networks. Archaeologically, the Ainu period is recognized by a shift to above ground rectangular dwellings and the incorporation of new materials such as iron (Hudson 1999). Based upon ethnographic research (Watanabe 1972;

Olschleger 1999), Ainu populations in Hokkaido exploited resources from diverse ecological zones including rivers, river banks and terraces, hillsides and mountains. Settlements among Hokkaido Ainu were typically occupied year-round with many of the everyday subsistence resources coming from fishing, plant collecting and hunting near the river. In coastal areas, sea mammal hunting and shellfish collecting was common with nearly sixty shell mound sites identified containing a wide variety of marine species and closed-socket harpoons (Okada 1998). Exploitation of resources from the hillsides and mountain zones typically took place during the spring and autumn season with the hunting of Sika deer and bear a common practice among Ainu men (Olschleger 1999). Of particular importance to Ainu populations in Hokkaido was the annual run of cherry salmon during the summer and dog salmon during the autumn/early winter (Olschleger 1999; Watanabe 1972). The importance of salmon fishing to Ainu survival during the harsh winter months is highlighted by Watanabe (1972) in his account of an extremely small salmon run during the winter of 1725 AD that led to the starvation death of nearly 200 Ainu individuals.

Ritual ceremonies and shamanism are an essential component in understanding the Ainu cultural complex that originally develops in Hokkaido. In particular, Ainu culture is characterized by the practice of spirit-sending ceremonies (*iyomante*) with the most prominent of these rituals being the bear-sending ceremony. In general, spirit-sending ceremonies are performed in order to release the spirits of the gods from their animal forms and allow the gods to be sent back to their own supernatural world (Akino 1999). The *iyomante* bear ceremony is the most sacred of the spirit-sending ceremonies as brown bears represent the mortal disguise of the powerful mountain gods known as *kimun-kamuy*. The *iyomante* bear ceremony typically involves the ceremonial sacrifice of a bear cub through strangulation, decapitation and skinning.

The severed head and skin are then enshrined and ultimately decorated with sacred wood shavings (Akino 1999). While the bear-sending ceremony is most widely known, spirit sending ceremonies also occur with other small mammals (foxes, dogs and mice) as well as material objects such as tools or hunting equipment (Akino 1999). Interestingly, despite the significant contribution of deer and salmon to Ainu subsistence, “deer-sending ceremonies are only found in a few areas” and salmon runs “do not conform to the format of sending ceremonies for other species” (Akino 1999:253). In the research of Akino (1999), it is believed that these species (deer and salmon) do not hold the spirits of the gods but are rather controlled by specific gods that do not take physical forms named *yuk-atte-kamuy* and *chep-atte-kamuy*.

For the sake of simplicity, Ainu culture is often identified as a single, culturally distinguishable unit. While this is true in comparing modern Ainu populations against other hunter-gatherer groups or Japanese populations, spatial variation exists within ethnographically known Ainu cultures. Traditionally, the Ainu have been divided spatially and culturally into Hokkaido, Sakhalin and Kuril cultural groups (Ohnuki-Tierney 1976). Regional differences between the groups can partially be attributed to the variation in ecological zones. In general, smaller populations of sub-arctic adapted animals are present in the Kuril Islands and Sakhalin while temperate dwelling mammals such as the bear, rabbit and squirrel are more abundant in Hokkaido (Ohnuki-Tierney 1976). However, marine birds and sea mammal abundances are significantly greater in the Kuril archipelago. These regional differences in subsistence resources generally led Hokkaido Ainu to focus more on terrestrial hunting and river fishing than the Ainu populations of Sakhalin and the Kuril Islands. In response to these ecological differences, Ohnuki-Tierney (1984; 1976) suggests that the settlements of the Kuril and Sakhalin Ainu are considerably smaller due to the need for more mobile populations to access seasonally

variable resources. Like the Sakhalin Ainu, the Kuril Ainu often spent the summer in settlements near the beach and moved houses towards the interior of islands during the winter (Olschleger 1999). It is not until the introduction of Russian-style log cabins that Ainu populations in Sakhalin and the Kuril Islands eliminate their seasonal migrations (Ohnuki-Tierney 1976).

The development of an Ainu cultural complex occurs in Hokkaido around 800 cal BP but Ainu occupation in the Kuril Islands is not recognized until approximately 500 cal BP (Fitzhugh, Etnier, et al. 2009). Unfortunately, Ainu archaeological deposits have been difficult to recognize in the island chain. Archaeological sites investigated by KBP which contain Ainu artifacts are few with a majority of Ainu remains found on the central islands of Matua, Rasshua, Shiashkotan and Ushishir (Fitzhugh, Etnier, et al. 2009; Phillips 2011). The most significant Ainu remains identified by KBP are from the site of Rasshua I with the recovery of a 18th/19th century glass bead and a house structure that likely corresponds to the Ainu period based upon radiocarbon dates (Fitzhugh, Phillips, et al. 2009). Early accounts by explorers (Krasheninnikov 1963) and previous archaeological research (Dikova 1983) demonstrate the interaction of northern Kuril Ainu with indigenous Kamchadal and Itel'men populations on the southern tip of Kamachatka with the recovery of Ainu Naiji-style pottery at several sites along Cape Lopatka and even further up the coasts of Kamachatka (Dikov 2003).

Starting in the 17th century, the Kuril Ainu were greatly influenced through the colonization of Kamchatka by Russian Cossacks and the rise of the Matsumae clan and trading networks in Hokkaido. In the northern Kurils, Ainu populations began to engage in trading (or tribute) to Russian Cossacks, providing sea mammal furs in exchange for liquor, tobacco, flour, butter and sugar (Walker 2001; Tezuka 1998). Trade between Kuril Ainu populations in the

north and south regions also appears during this time with the exchange of surplus marine mammal products (food and oil) as well as small “treasures” such as beads, earrings, bird feathers and hides (Ohnuki-Tierney 1976; Tezuka 1998). The Ainu populations of the southern Kurils and Hokkaido eventually became more dependent upon trade with the Matsumae clan and were forced to work in forest and fishing industries owned by Japanese merchants during the eighteenth century (Phillips 2011; Walker 2001). In 1875, approximately 1,000 Kuril Ainu were relocated by the Meiji government to the lesser Kuril Island of Shikotan when the island chain was acquired from Russia in exchange for Sakhalin Island (W. Fitzhugh 1999). When Russia gained control of the Kuril Islands after WWII, a final relocation of all Ainu populations from the Kurils to eastern Hokkaido occurred (W. Fitzhugh 1999).

4.5 Chapter Summary and the Contributions of Culture-History

Given the difficult physical and social environment of the Kuril Islands, previous archaeological research largely emphasized the analysis of specific archaeological locations throughout the Kuril archipelago. While this research has provided important findings, more recent research performed by the IKIP and KBP projects has begun to piece together a more holistic understanding of occupation throughout the island chain as a whole. Most importantly has been the establishment of a detailed occupation record for the southern, central and northern regions based upon a large site inventory and numerous radiocarbon dates. Based upon this research, a refined chronology of colonization and settlement specific to the Kuril Islands has been created. Overall, the combination of past and present research has created an intriguing picture of occupation in the island chain with cultural associations corresponding to the Middle/Late Jomon, Final Jomon, Epi-Jomon, Okhotsk and Ainu. Current radiocarbon and

archaeological evidence suggests the heaviest density of occupation likely belongs to the Epi-Jomon and Okhotsk periods that generally stretch from 2600 cal BP to 700 cal BP. Perhaps most interesting is that during this Epi-Jomon and Okhotsk periods the Kuril Islands and Hokkaido experience dramatic environmental and social changes including significant climate shifts (Razjigaeva et al. 2004), increased volcanic activity (Nakagawa et al. 2008) and disorder in broader political and economic networks (Hudson 2004).

The occupation history of the Kuril Islands as identified through pottery remains and radiocarbon dates is a critical component in evaluating the central research themes of risk and uncertainty. Perhaps most importantly, the occupation history of the Kuril Islands clearly demonstrates multiple periods of occupation and abandonment suggesting real challenges in mitigating hazards, managing risk and sustaining long-term habitation within regions of the archipelago. Furthermore, the presence of two intensive but temporally distinct occupations of the island chain, associated with the Epi-Jomon and Okhotsk cultures, presents a unique analytical opportunity to compare and contrast the behavioral strategies of two different populations within the same biogeographic setting. This includes the ability to evaluate the similarities and differences in the technological strategies of pottery production (Chapter 6) as well as networking strategies that may develop in response to hazards, risk and levels of uncertainty (Chapter 7). By highlighting the unique environmental and culture-history of the Kuril Islands, this research hopes to not only contribute to a deeper understanding of archaeology in Northeast Asia but also provide a case study that adds to the ongoing research of human adaptation, resiliency and survival.

Chapter 5: Decorative and Chronological Analysis of Pottery from the Kuril Islands

5.1 Introduction

Traditionally, the most widespread use of ceramics in archaeological research has been for the development of pottery typologies, which have in turn formed the basis for many cultural chronologies (Arnold 1985; Willey and Sabloff 1980). Based upon the assumption that the production and design of pottery is strongly linked with shared cultural practices, ceramic vessels and fragments are often used to infer periods of cultural change, the trade and exchange of ideas/goods or the status of individuals or groups (Orton et al. 1993). More recently, pottery remains have been used to understand the construction and reproduction of cultural values and identity through the evaluation of technological choices (Sillar and Tite 2000). Within this research project, the analysis of pottery remains seeks to draw from previous ceramic approaches by examining the decorative and formal features of pottery vessels in order to refine regional chronologies (Chapter 5) while using the technological features of Kuril pottery to inform our knowledge of the production and use of pottery among ancient maritime hunter-gatherer societies (Chapter 6). Finally, the elemental characterization of pottery remains will be used to examine the movement of pottery vessels and serve as the basis for investigating the network of social relationships between populations in the Kuril Islands (Chapter 7). Based upon this approach, the goals of this chapter are to:

- 1) Review the major pottery traditions from around the Sea of Okhotsk and evaluate the extension of established pottery typologies to the Kuril Island pottery assemblage

2) Describe the decoration and form of pottery recovered by the Kuril Biocomplexity Project in order to establish the central tendencies and spatial distribution of pottery in the Kuril Islands.

3) Compare the spatial and temporal distribution of pottery types with radiocarbon dates to refine the occupation history of the Kuril Islands.

5.2 Pottery Traditions around the Sea of Okhotsk

5.2.1 Phase I: 8000-4200 cal BP (Initial, Early and Middle Jomon / Early Neolithic)

Pottery technology in East Asia first emerges in late Upper Paleolithic societies with the earliest vessel fragments identified from sites in China, Japan and the Russian Far East (Jordan and Zvelebil 2009). At present, radiocarbon dates place the origins of pottery technology in southern China between 21,387 and 20,283 cal BP (Wu et al. 2012). Additional Upper Pleistocene radiocarbon dates have also been associated with pottery fragments from the Odai Yamamoto site located in Japan (17,415-16,504 cal BP) and the Khummy site found in the Russian Far East (16,777-15,448 cal BP) (Keally et al. 2004). While some of these very early pottery fragments have been identified at archaeological sites near the Sea of Okhotsk the use of pottery by populations living in direct proximity to the Sea of Okhotsk (northern and eastern Hokkaido, Sakhalin, Prikhot'e, Kamchatka and the Kuril Islands) does not appear until the early and middle Holocene. In general, the earliest ceramic traditions that develop around the Sea of Okhotsk are largely influenced by cultural impulses from the Japanese Islands where the Jomon pottery tradition was flourishing (Zhushchikhovskaya 2009).

The Jomon pottery tradition represents one of the earliest and longest pottery industries in the world with incipient use beginning nearly 16,000 years ago with consistent pottery production and use for nearly 10,000 years. Currently, the Jomon pottery tradition is divided into six sub-periods referred to as the Incipient, Initial, Early, Middle, Late and Final. Within each of these six sub-periods, approximately ten shorter pottery phases are recognized with a generic typology of around sixty pottery phases with hundreds of additional sub-phases or modes specific to regional differences (Kobayashi 2004). In regions neighboring the Sea of Okhotsk, the oldest pottery has recently been recovered at the Taisho 3 site in the eastern portion of Hokkaido dating to approximately 15,000 years ago (Yamahara 2006). A small amount of plain and surface-manipulated pottery has also been found at the site of Yubetsu-Ichikawa located in northern Hokkaido on the edge of the Okhotsk Sea dating to the Initial Jomon period around 7,000-8,500 calibrated years ago (Aikens and Higuchi 1982). While pottery technology may have been practiced among some foraging societies in northern and eastern Hokkaido during the Incipient and Initial Jomon, the emergence of a pottery industry in this region is most often identified during the Early and Middle Jomon periods.

Pottery technology during the Early Jomon period is largely characterized by a diversification in vessel form and function accompanied by a wide range of novel decorations that originate in the Kanto and Chubu regions (Kobayashi 2004). The diversification of pottery form and decoration is largely considered indicative of a broader use of pottery outside of the traditional purpose of cooking food within the household. In northern Hokkaido, pottery remains attributed to the Early Jomon period demonstrate only slight diversification with an abundance of standardized forms (pointed bottom with wide mouth and straight rim) and decorations (stick impressed) similar to pottery types from northern Honshu.

Prior to the Middle Jomon, a majority of pottery use in Japan was likely associated with cooking, eating or everyday activities with only a small proportion of vessels used outside domestic activities. From the Middle Jomon onwards, pottery becomes fully integrated into a wide range of social activities including the use of vessels for burial urns and ritual incense burners (Kobayashi 2004). Perhaps most indicative of these changes are the elaborate pottery forms and decorations referred to as “fire-flame” pottery due to its exaggerated flame-like rim projections (Kobayashi et al. 1992). Undoubtedly, the appearance of these extremely elaborate pottery forms and design motifs signify the transformation of pottery from largely utilitarian usage to symbolic expressions of cultural identity, technical expertise or social narratives (Kobayashi 2004). In northern Hokkaido, the most widespread pottery type during the Middle Jomon is the Hokuto type characterized as a tall, cylindrical vessels with fully cord-marked bodies and modeled rims (Aikens and Higuchi 1982).

Outside of the Japanese Islands, incipient pottery production also emerges during the middle Holocene (Phase I) in the western Sea of Okhotsk. More specifically, the earliest definitive pottery remains have been found on eastern edge of Siberia (Prihot'e) and Sakhalin Island between 7,000 and 6,000 years ago. In Eastern Siberia, the first pottery appears around 7,000 years ago along the Aldan River and is associated with the Syalakh culture that developed in the Lena Basin (Hoffecker 2005). Given its decoration and vessel form, the net-impressed pottery associated with the Syalakh culture was likely independently innovated from earlier pottery traditions in the Russia Far East and spread to eastward towards the northern Sea of Okhotsk through population migration (Anderson 2011; Zhushchikhovskaya and Shubina 2006). Pottery fragments recovered from Sakhalin Island have also demonstrated incipient pottery production occurring as early as 9,000 years ago but given the paucity of these fragments it is

difficult to provide definitive conclusions about the development of early pottery technology on Sakhalin (Zhushchikhovskaya 2009). The first established pottery tradition on Sakhalin Island occurs towards the end Early Neolithic period (6700 cal BP). Classified as the Yuzhno-Sakhalinskaya tradition, pottery features include unique “box-like” vessel forms with unrestricted walls, flat-bottoms and formed using a slab-construction method (Zhushchikhovskaya 2005). Slightly later, the Imchinskaya pottery tradition is recognized in the northern region of Sakhalin between 5800 cal BP and 2500 cal BP. Perhaps most interesting about Imchinskaya pottery is the use of shell temper, which is not identified in any other pottery traditions around the Sea of Okhotsk before or after its use in northern Sakhalin. In both pottery traditions, Yuzhno-Sakhalinskaya and Imchinskaya, it is fairly evident that traditions from the Russian Far East, and not the Japanese Islands, heavily influence the form, function and decoration of pottery in the western Sea of Okhotsk.

5.2.2 Phase II: 4200-2900 cal BP (Late and Final Jomon / Middle and Late Neolithic)

As highlighted in chapter 4, the Late and Final Jomon periods demonstrate a number of striking changes to settlement and social patterns. In particular, in the Kanto and Chubu regions experience a dramatic decrease in the number of overall sites, going from several thousand sites during the Middle Jomon period to slightly more than two thousands sites in the Late Jomon period (Habu 2004; Hall 2004). Furthermore, archaeological materials and features suggest an increase in ritual activity during this period with an increase in the presence of stone rods, stone phalli and figurines (Hall 2004). In regards to the pottery types produced during the Late Jomon, a noticeable east-west division occurs with pottery from western Japan becoming plain and homogenous with limited decoration. In the east, pottery traditions tend in an opposite direction

with a continuation of ornamental designs and further regionalization of pottery types and decorative features.

The most widely distributed pottery type in eastern and northern Japan during the Late Jomon period is Kasori B. Originating in the Kanto region near present day Tokyo, Kasori B (and the slightly earlier Kasori E type) represents improvements in pottery manufacturing techniques leading to generally thinner walls (6-7 mm), a reduction in porosity and more uniform and even firing atmospheres (Kenrick 1995). It is likely that these technological advancements and increasing specialization influenced greater variation in vessel forms with the introduction of spouted vessels and diverse bowl shapes (deep, shallow, pedestal, footed). In Hokkaido, slight regional variations on typical Late Jomon types can be identified (Tokoshinai type) but most vessels seem to be largely related to the larger Kasori B family identified throughout much of eastern Japan (Kenrick 1995).

During the Final Jomon, nearly 30 different pottery types are recognized throughout Japan, but one type, known as Obora or Kamegaoka, largely overshadows all others based upon its wide ranging distribution and superior craftsmanship (Kidder and Esaka 1976). Centered in the Tohoku region of eastern Japan, Kamegaoka pottery demonstrates a highly sophisticated pottery production process resulting in thin walled vessels (4-5mm) that were almost fully waterproof (Kenrick 1995). In addition, the Kamegaoka type of the Final Jomon period also demonstrates the use of clay for figurine manufacture (dogu) and the use of clay vessels in the production of lacquerware. Upon originating in Tohoku, the Kamegaoka type spreads quickly throughout eastern Japan and can be identified throughout Honshu and Hokkaido (Kobayashi 2008).

In the western and northern Sea of Okhotsk, pottery traditions during this period continue to diffuse from centers of pottery technology towards more remote regions. Likely influenced from early traditions in the Russian Far East and Siberia, such as the Syalakh, pottery assemblages associated with the Bel'kachinsk and Ymyyakhtakh cultures emerge throughout the Siberian Arctic and Chukotka between 5,500 and 4,500 years ago (Anderson 2011). A few net-impressed, thin-walled pottery fragments are also identified dating to around 5,000 years ago at the Ust'Belaya site on the Anadyr River. In general, pottery technology on Sakhalin Island remains consistent throughout this time period.

5.2.3 Phase III: 2600-1300 cal BP (Epi-Jomon)

The regional divisions in pottery traditions between northern/eastern Japan and southern/western Japan that emerged during the Late and Final Jomon periods become strongly formalized during the Epi-Jomon period. As discussed in earlier chapters, the Epi-Jomon is largely conceptualized as the maintenance of a hunter-gatherer lifestyle in northern Japan and Hokkaido in contrast to the adoption of rice agriculture by many populations throughout western and central Japan (Yayoi farmers). The pottery traditions, similar to subsistence and settlement patterns, in northern Honshu and Hokkaido do not change significantly from the earlier Late and Final Jomon styles. Pottery associated with the early Epi-Jomon period, largely retains patterns of cord-marking and linear incision on the exterior of the vessel but does demonstrate minor regional variations. However, as the Epi-Jomon period continues more definitive and widespread patterns become established throughout Hokkaido with pottery styles characterized by higher proportions of linear applique, protuberances and peaked rim designs. During the late

Epi-Jomon period, northern Hokkaido develops a regional variant known referred to as the Hokudai type.

During this period, Epi-Jomon pottery styles spread outside of Hokkaido including the Kuril Islands, discussed in section 5.3, and Sakhalin Island. Referred to as the Aniva tradition, strong similarities in form and decoration exist between Epi-Jomon pottery identified on Hokkaido and Aniva pottery recovered in the southern region of Sakhalin Island, specifically Aniva Bay. The most definitive similarity between pottery fragments is the presence of rope and cord impressions across the entirety of the vessel body, often considered a “calling card” of Jomon and Epi-Jomon ceramics (Aikens and Higuchi 1982; Zhushchikhovskaya and Shubina 2006). In addition, Aniva ceramics often display an external projection or “flange” along the base of the vessel that stylistically connects their origins to Hokkaido (Zhushchikhovskaya and Shubina 2006).

During this time period (phase III), well developed pottery traditions finally emerge on the northern Sea of Okhotsk around 2300 cal BP. Associated with the Tokareva culture, similar pottery remains have been recovered between the northern Kamchatka peninsula westward to northern Priokhot'e (the western Sea of Okhotsk). Based upon research conducted by Lebedintsev (1990) and Ponkratova (2006), Tokareva pottery is characterized by the use of local clay material, no temper and modeling vessels on a base or foundation resulting in a rounded bottom and weakly defined neck. Decoration on Tokareva vessels are comprised of straight, horizontal and wavy lines as well as stamped designs of geometric patterns (circles, rectangles, squares, crosses, etc.). Often these decorations are found bordering the rim of the vessel. Given the lack of flat bottoms, cord-marking and temper, it is obvious that Tokareva style pottery shares no similarities with any pottery traditions originating in Japan. Most likely, Tokareva

pottery is an independent innovation with influences from early hunter-gatherer pottery in western Siberia.

5.2.4 Phase IV: 1300-700 cal BP (Okhotsk)

The term “Okhtosk-type pottery” was first used by a number of Japanese archaeologists such as Ito (1942) to describe the unique pottery type that first appears in Sakhalin and later becomes widespread throughout the Sea of Okhotsk including Hokkaido and the Kuril Islands (Deryugin 2008). The origins of Okhotsk pottery, and more generally Okhotsk culture, is still debated among researchers but it is generally acknowledged that Okhotsk pottery is tied to traditions that emerge in Sakhalin and the Russian Far East around 2500 cal BP, referred to as the Susuya culture. While technological standards were not significantly different from earlier Epi-Jomon or Aniva pottery, the size and form of pottery vessels changed with vessels growing larger in size and the presence of both unrestricted and slightly restricted orifices (Zhushchikhovskaya 2009). Pottery associated with the Susuya culture on Sakhalin demonstrate similarities in decoration with continental influences, namely the presence of comb designs (Deryugin 2008).

After the emergence of Susuya pottery on Sakhalin, very similar vessel forms are recognized in the southwestern part of Sakhalin, the islands of Rishiri and Rebun as well as the northern tip of Hokkaido dating to approximately 1600 cal BP. Referred to as Towada ceramics, slight variations from Susuya ceramics can be recognized such as the presence of pinholes or through-holes located under the rim. Between 1600 and 1350 cal BP, “Okhotsk-type” pottery continues to appear along the northern and northeastern coast of Hokkaido with pottery forms remaining generally consistent with forms classified as Enoura B type by Russian archaeologists,

or the Kokumon type by Japanese archaeologists. Key characteristics of Enoura B/Kokumon vessels include flat bases, with expanding lower bodies leading towards the shoulder of the vessel and continuing to a slight restriction at the neck and eventually expanding again towards the rim, referred to as a recurved form. Decoration of Enoura B/Kokumon vessels largely consists of either comb or stamp impression on the exterior of the body typically near the rim or shoulder regions; however, many Okhotsk ceramics do not show any decorative motifs but do demonstrate polishing or smoothing of the exterior surface.

After approximately 1350 cal BP, Okhotsk vessels experience regional variation in decorative motifs. In Sakhalin, vessels with gently curved profiles and stamped or incised ornamentation are assigned to the Minami-Kaizuka variant with likely influences from pottery traditions around the Amur River delta (Deryugin 2008). In northern Hokkaido, linear incised decorative features become prominent and are referred to as a Chinsemon type. In eastern Hokkaido, wavy decorative patterns emerge and are referred to as Haritsukemon type pottery. Towards the end of the established Okhotsk period in Hokkaido (1000-700 cal BP), pottery traditions in eastern Hokkaido become hybridized with strong cultural and stylistic influences from Satsumon potters in the southern and western regions of Hokkaido. The hybridization of pottery traditions has been suggested by some scholars as indicative of a larger cultural hybridization of Okhotsk and Satsumon populations during this period (Okada 1998).

5.2.5 Pottery traditions during Phase V: 700-100 cal BP (Ainu)

During the later stages of the Okhotsk period in Sakhalin and Hokkaido, ceramic assemblages generally demonstrate a decrease of cooking containers (Zhushchikhovskaya 2009). This decrease is likely due to the emergence of iron cauldrons in the region which proved to be

more effective and durable cooking containers than previous ceramic vessels. Given the less than optimal environmental conditions for creating pottery in these maritime environments, ceramic containers quickly lost their practical importance and largely disappear from the archaeological record in Hokkaido and Sakhalin by 500 years ago. While limited, some pottery remains can be associated with Ainu populations living in the southern Kamchatka peninsula and northern Kuril Islands, referred to as Naiji pottery (Takase 2013). Distinctive characteristics of this pottery are thick walls and the presence of interior lugs near the rim of the vessel similar to iron cauldrons also manufactured around this time. Recent radiocarbon dating demonstrates that Naiji pottery in the northern region was largely manufactured between the second half of the 15th century (1450-1500 cal AD; 650-500 cal BP) and the mid-17th century (1650-1700 cal AD; 350-300 cal BP) (Takase 2013).

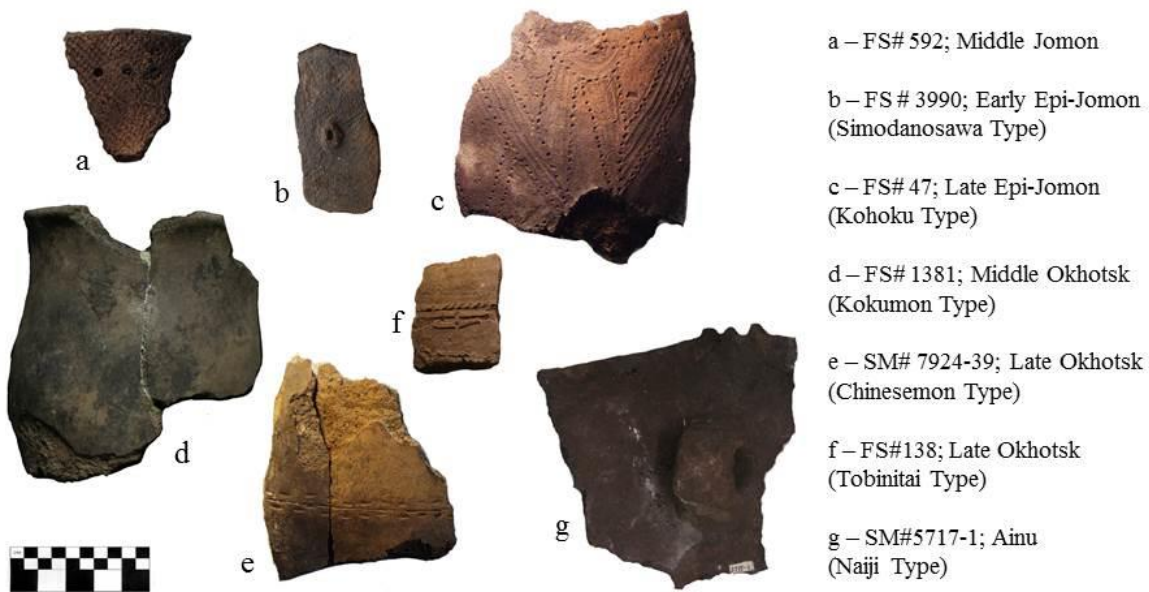


Figure 5.1 Photos of Kuril pottery representing a range of pottery types

5.3 Analysis of Decoration on Pottery from the Kuril Islands

The review of pottery traditions in around the Sea of Okhotsk was provided above in order to situate the descriptive analysis of pottery remains from the Kuril Islands. The major goal of descriptive analysis is to evaluate the extension of pottery types from Hokkaido and Sakhalin to the ceramic assemblage recovered from the Kuril Islands. Furthermore, this research seeks to determine the distribution of pottery types across the Kuril archipelago and evaluate the spatial and temporal trends in pottery types.

5.3.1 Collection and Sampling of Kuril Ceramic Assemblage

In this research, a sample of 1,114 vessel sherds out of a total of 4,344 sherds were analyzed from 25 different archaeological sites located throughout the southern, central and northern regions of the Kuril archipelago. All pottery sherds used in this analysis were recovered through survey and excavation performed by the Kuril Biocomplexity Project during the 2006, 2007 and 2008 field seasons. Pottery remains from previous excavations in the Kuril Islands were reviewed for examples of decorative motifs and vessel forms but not included in this descriptive analysis due to uncertainty regarding collection practices. Descriptive analysis was performed during the fall of 2009 while in residence at the Sakhalin Regional Museum. The descriptive data collected for this research can be found in Appendix A and is archived with The Digital Archaeological Record (tDAR) accessible at <https://core.tdar.org/dataset/393044>.

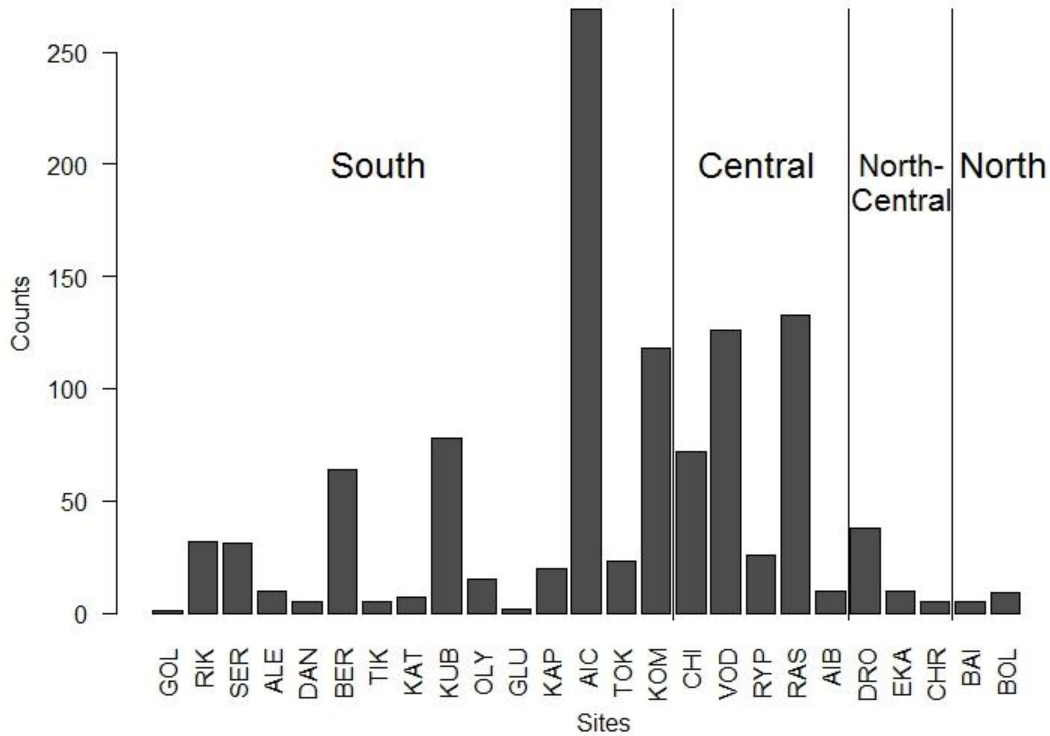


Figure 5.2 Barplot of sample sizes across site assemblages.

Sampling of pottery sherds for descriptive analysis employed a multi-stage strategy using a combination of non-random judgment sampling and random sampling. Sampling of pottery sherds proceeded by separating sherds within each site assemblage that contained distinctive features such as recognizable decorative motifs including cord-marking, applique, incisions, geometric patterns or stamping. After sampling for distinctive sherds, all rim or base sherds not yet included in the sample were selected for analysis. Finally, non-distinctive medium to large sherds (those greater than 20 mm in any one dimension) from each site were randomly sampled until at least 25% of the total site assemblage was analyzed. Depending upon site assemblage size and a qualitative assessment for the likelihood of sherds deriving from the same vessel, some sites had more than 25% of sherds selected for analysis. Selection of random sherds for analysis was accomplished through the generation of a random number list and selecting the sherd corresponding to that number with all sherds from a single site laid out on a table starting

with the pottery fragment at the top left of the table. Due to high fragmentation rates associated with a few site assemblages, see section 5.3.2, descriptive analysis of over 25% of the total site assemblage was not achieved at five sites. Overall, 25.6% of the total sherd assemblage recovered by the Kuril Biocomplexity Project was analyzed with 44.3% of analyzed sherds characterized as distinctive and 55.7% characterized as non-distinctive.

Descriptive characterization of the sampled assemblage involved the measurement and description of all sampled sherds. Descriptive information collected included weight, average wall thickness, length, width, interior curvature, interior curvature depth, vessel part (body, rim, base), surface treatment and width of decoration, if applicable. For sherds identified as rims, additional descriptions included rim thickness, rim dimensions, rim symmetry and lip type. For sherds identified as bases, additional measurements included base thickness, base angle and base diameter. For sherds with decorative motifs, additional descriptions included the location of the design (interior/exterior), the style of decoration (cord-marking, incisions, applique, etc.), dimensions of the motif and a written description and/or photograph of the decorative elements. (descriptive data can be found in Appendix A)

5.3.2 Assessing Fragmentation and Collection Sample Biases

In any ceramic assemblage, the number and size of sherds sampled for analysis from each site is related to the size of the site assemblage which is influenced by the rate of fragmentation and the collection strategy at the site. In order to estimate the influence of fragmentation rates in the sampled pottery assemblage, the weight and average thickness, based upon two thickness measurements, were calculated for all sherds (n=1114). The weight to thickness ratio provides a general measure of sherd fragmentation with lower values suggesting a higher presence of small

sherds and a higher rate of fragmentation. As presented in figure 5.3, the comparison of weight to thickness reveals highly variable rates of fragmentation across site assemblages. Given the non-normal distribution of fragmentation rates (Shapiro-Wilk test, $p < 0.001$), a non-parametric Kruskal-Wallis test was used to compare mean site assemblage fragmentation rates with a significant difference between sites recognized ($p < .001$).

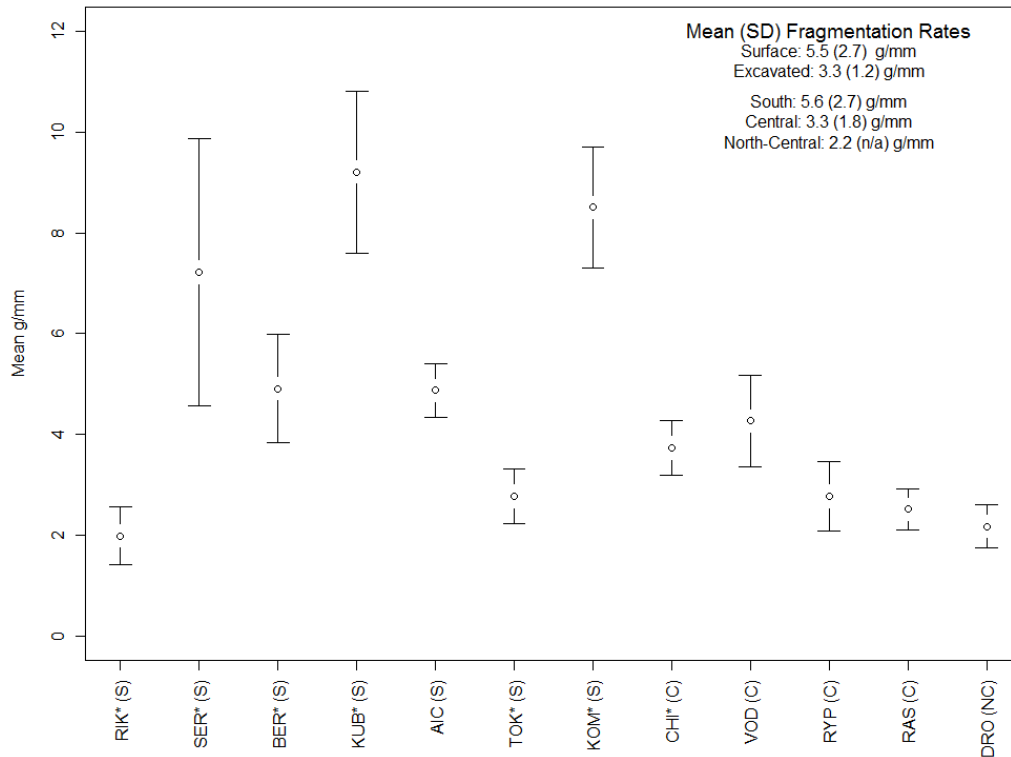


Figure 5.3 Plot of site assemblage fragmentation rates (mean g/mm) with error bars indicating 95% confidence interval. Only sites with greater than 20 analyzed sherds are plotted. Assemblages with an * indicate a majority of sherds were surfaced collected. (S)-South; (C)-Central; (NC)-North Central

High variability in the mean and spread of fragmentation rates can potentially reveal the influence of various factors on the size composition of site assemblages. In this research, site assemblages primarily recovered through surface collecting in the southern region on average contain larger and more variable sherd sizes as opposed to assemblages recovered through excavation. This pattern is fairly typical in archaeological research as there is a natural tendency for the surface recovery of larger and more easily identified remains (Orton 2000; Orton et al.

1993). Other factors influencing the size composition of a site assemblage include the degree of weathering, the intensity of occupation and the amount of ground cover, to name only a few. More importantly, even though fragmentation rates are highly variable among sites this pattern does not significantly influence samples sizes as only a weak and non-significant correlation can be identified between higher fragmentation rates and higher sample sizes (see figure 5.4).

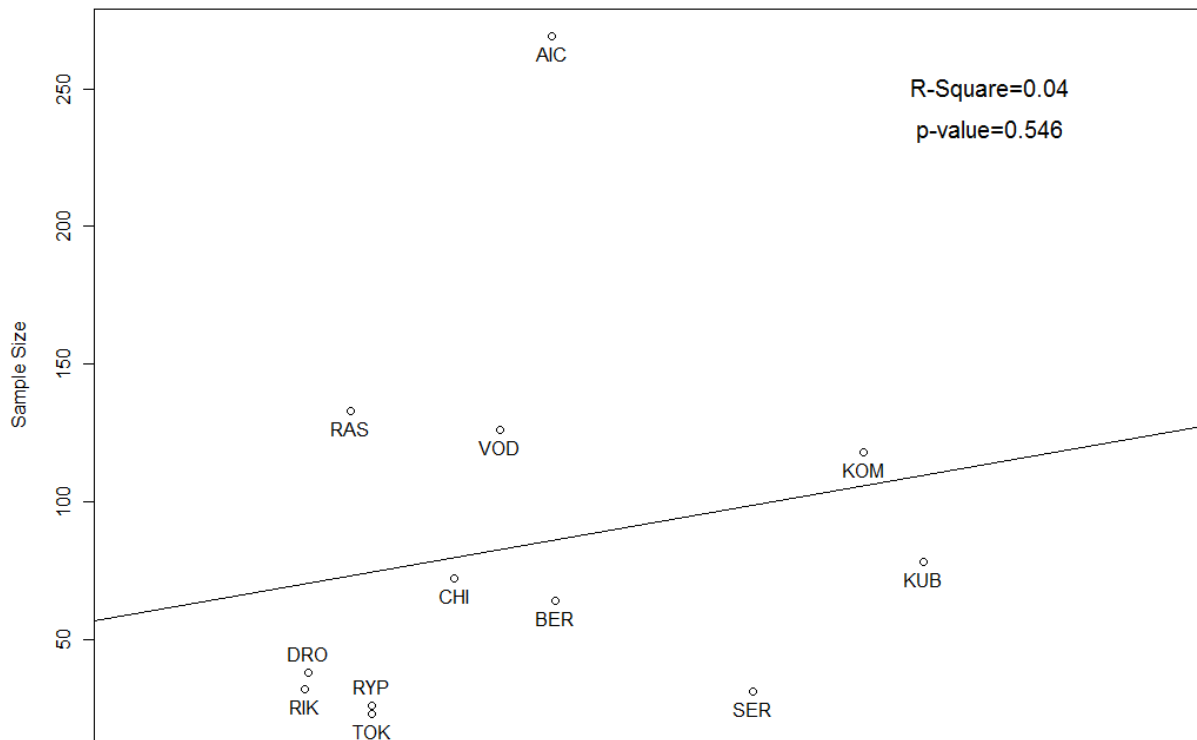


Figure 5.4 Plot of fragmentation rates and sample sizes from each site with a line of best fit indicating weak correlation.

In addition, the collection strategy (surface collecting or excavation) does not significantly influence the sample size chosen for analysis from each location. Using logistic regression, due to the presence of a nominal variable, sites that have different sample sizes have virtually the same odds (1:1.01) of being from either surface collected or excavated site (see figure 5.5).

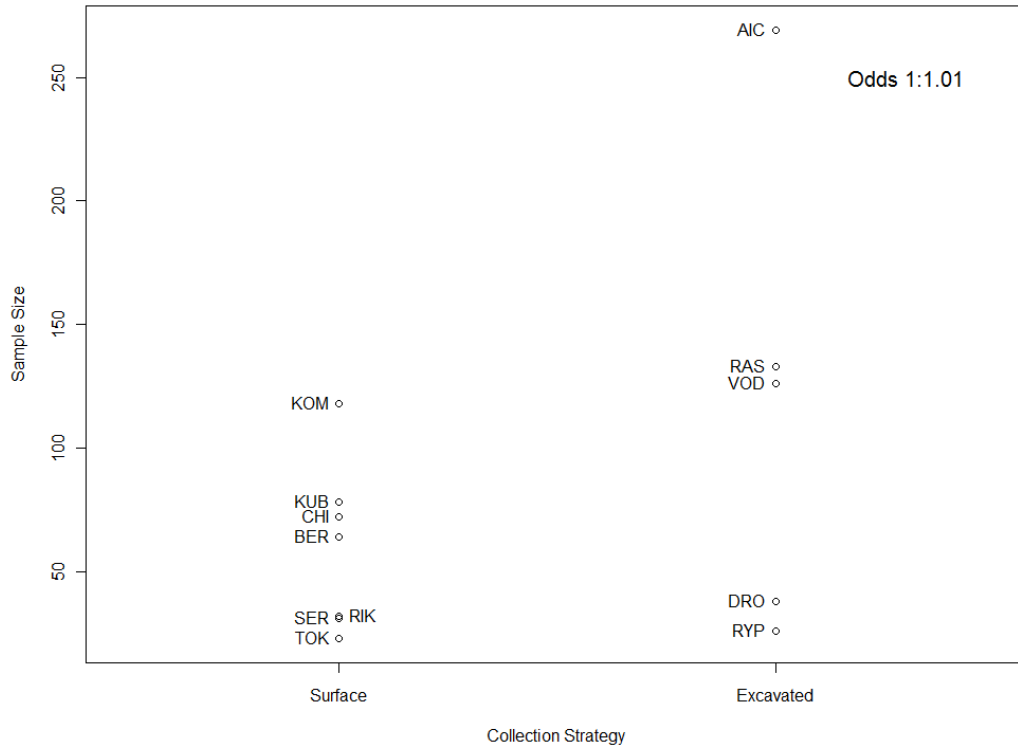


Figure 5.5 Plot of collection strategy and sample sizes from each site with odds ratio indicating equal probability of different sample sizes to be from either surface or excavated sites

The implication of these results suggest that while substantial differences exist between the sample sizes of site assemblages in this research, the sample size differences between sites are not strongly influenced by fragmentation rates or by collection strategy biases. Therefore, it can generally be assumed that larger sample sizes from each site indicate either longer occupation period and/or more substantial production and use of pottery at the archaeological sites of interest.

	SiteName	Total Sherd Count	Distinctive Sherd Count	Non-Distinctive Sherd Count	Total Sherds Analyzed	% of Total Sherds Analyzed	% of Distinctive/Non-Distinctive Sherds	Body Sherd Count	% of Analyzed Sherds	Base Sherd Count	% of Analyzed Sherds	Rim Sherd Count	% of Analyzed Sherds
North	Baikova	16	1	4	5	31.3%	20.0% / 80.0%	4	80.0%	1	20.0%	0	0.0%
	Bolshoi	16	0	9	9	56.3%	0.0% / 100.0%	6	66.7%	1	11.1%	2	22.2%
North-Central	Chrinkotan	12	2	3	5	41.7%	40.0% / 60.0%	4	80.0%	0	0.0%	1	20.0%
	Drobnye	173	17	21	38	22.0%	44.7% / 55.3%	30	78.9%	2	5.3%	6	15.8%
	Ekarma	16	2	8	10	62.5%	20.0% / 80.0%	8	80.0%	1	10.0%	1	10.0%
Central	Ainu Bay	64	0	10	10	15.6%	0.0% / 100.0%	3	30.0%	2	20.0%	5	50.0%
	Chirpoi	230	45	27	72	31.3%	62.5% / 37.5%	41	56.9%	5	6.9%	26	36.1%
	Rasshua	920	78	55	133	14.5%	58.6% / 41.4%	77	57.9%	20	15.0%	36	27.1%
	Ryponkicha	194	1	25	26	13.4%	3.8% / 96.2%	16	61.5%	2	7.7%	8	30.8%
	Vodopodanaya	500	16	110	126	25.2%	12.7% / 87.3%	73	57.9%	8	6.3%	45	35.7%
South	Ainu Creek	~1000	91	178	269	26.9%	33.8% / 66.2%	87	32.3%	30	11.2%	152	56.5%
	Alekhina	13	8	2	10	76.9%	80.0% / 20.0%	7	70.0%	2	20.0%	1	10.0%
	Berezovka	148	59	5	64	43.2%	92.2% / 7.8%	31	48.4%	2	3.1%	31	48.4%
	Danilovo	5	2	3	5	100.0%	40.0% / 60.0%	4	80.0%	0	0.0%	1	20.0%
	Glush	3	2	0	2	66.7%	100.0% / 0.0%	0	0.0%	0	0.0%	2	100.0%
	Golovino Beach	1	1	0	1	100.0%	100.0% / 0.0%	1	100.0%	0	0.0%	0	0.0%
	Kapsul	48	1	19	20	41.7%	5.0% / 95.0%	13	65.0%	1	5.0%	6	30.0%
	Katayeva Bay	12	3	4	7	58.3%	42.9% / 57.1%	3	42.9%	1	14.3%	3	42.9%
	Kompaniskii	457	42	76	118	25.8%	35.6% / 64.4%	27	22.9%	19	16.1%	72	61.0%
	Kuybyshevskaya	140	59	19	78	55.7%	75.6% / 24.4%	30	38.5%	9	11.5%	39	50.0%
	Olya	44	11	4	15	34.1%	73.3% / 26.7%	12	80.0%	0	0.0%	3	20.0%
	Rikorda	173	19	13	32	18.5%	59.4% / 40.6%	25	78.1%	1	3.1%	6	18.8%
	Sernovodkoe	86	31	0	31	36.0%	100.0% / 0.0%	18	58.1%	3	9.7%	10	32.3%
	Tikhaya	25	0	5	5	20.0%	0.0% / 100.0%	4	80.0%	1	20.0%	0	0.0%
	Tokotan	48	3	20	23	47.9%	13.0% / 87.0%	19	82.6%	2	8.7%	2	8.7%
Kuril Assemblage Totals		4344	494	620	1114	25.6%	44.3% / 55.7%	543	48.7%	113	10.1%	458	41.1%

Table 5.1 Table of Sherd Counts across all sites assemblages

5.3.3 Analysis of Decorative Features

Pottery sherds with decorative features on the vessel surfaces account for approximately 11% of the total (sampled and not sampled) Kuril ceramic assemblage with plain undecorated sherds comprising the remaining 89%. The archaeological site with the highest counts of decorated pottery sherds is Ainu Creek (AIC), located on Urup Island and the archaeological site with the highest percentage of decorated pottery is Berezovka (BER), located on Iturup Island, see figure 5.5. Overall, the southern region contains the highest proportion of decorated pottery with a total assemblage average of 15.8% and a sampled assemblage average of 49.4%, see figure 5.6. The central region averages the lowest proportion of decorated pottery with only 7.5% of all pottery sherds and 39.2% of sampled sherds demonstrating decorative surface features.

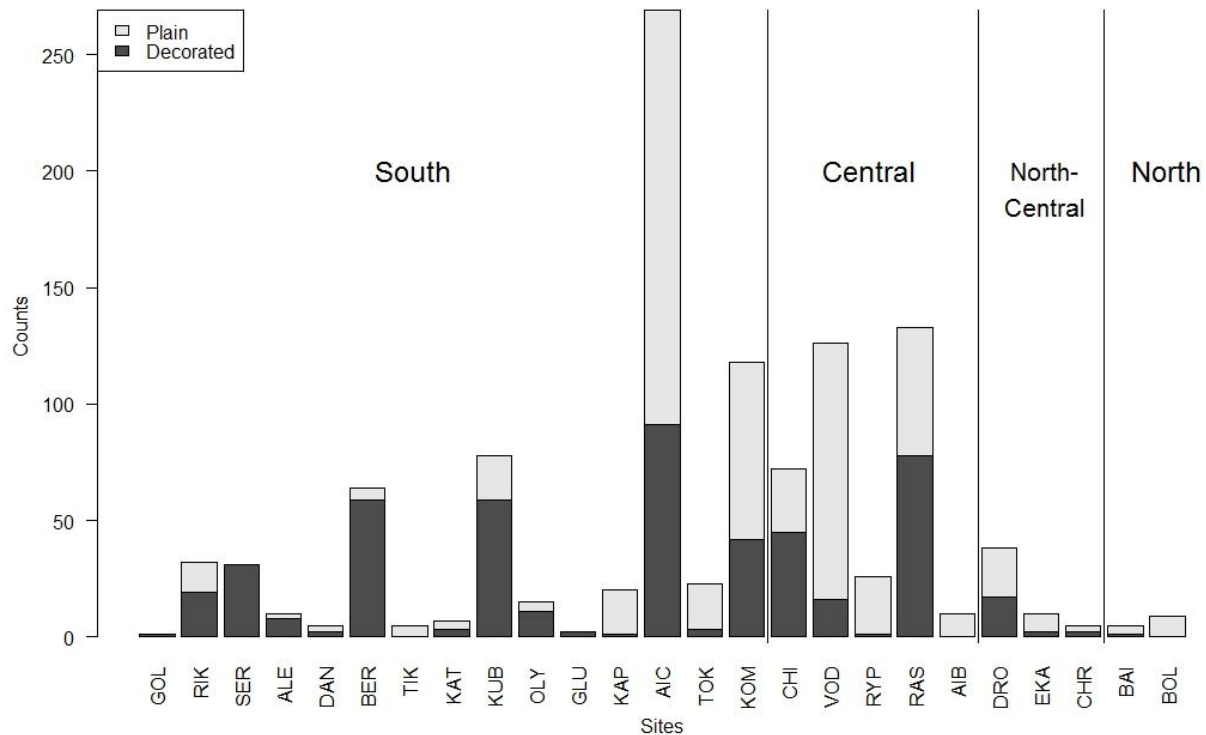


Figure 5.6 Counts of decorated and plain pottery sherds from sampled assemblage at each site

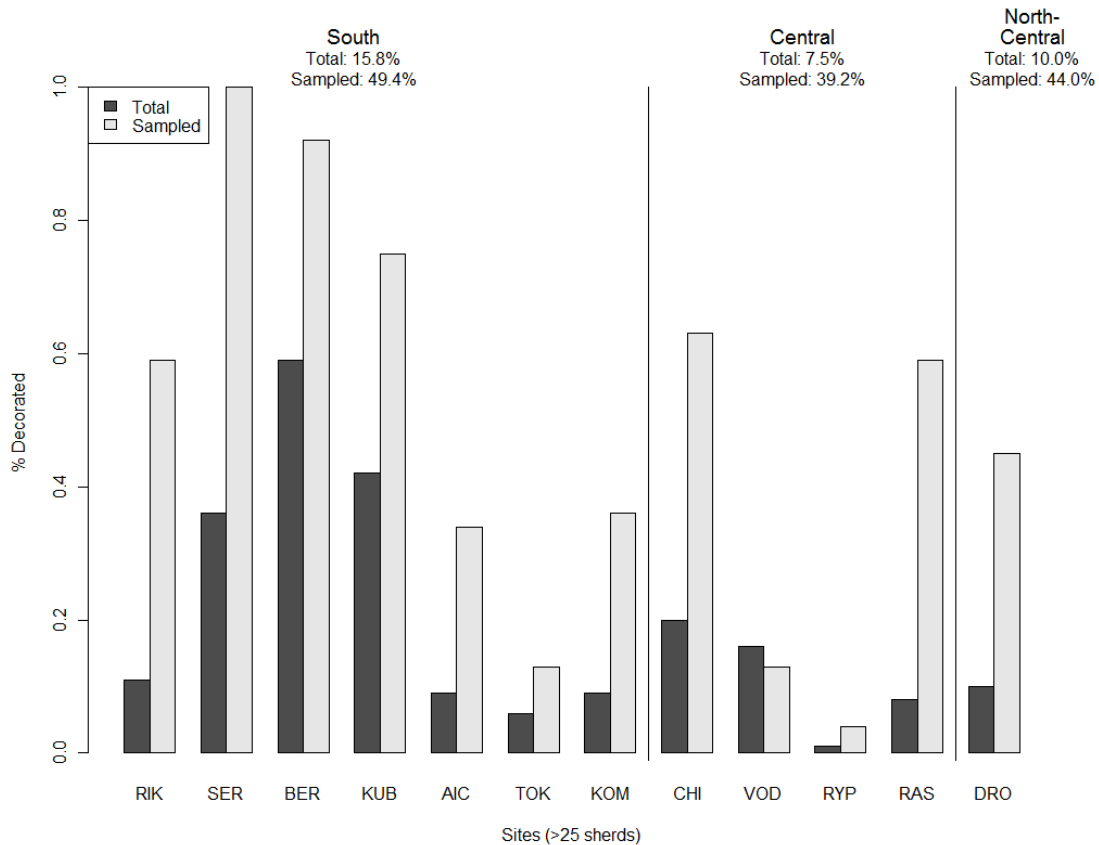


Figure 5.7 Proportions of total and sampled sherd assemblages from each site that are decorated (each site must contain at least 25 sherds) with mean values for each region

In order to evaluate the influence of various sampling biases (sample size, fragmentation rates, collection strategy) on the distribution of decorated sherds this research utilizes a logistic regression framework. Logistic regression (with a binomial distribution) is favored here as the proportion of decorated sherds to total assemblage size at many sites is below 0.2 (20%) which can produce erroneous estimations of probability values (p-values) when using standard linear regression. Furthermore, the independent variable of collection strategy is of nominal scale. In order to utilize logistic regression with a binomial distribution, sites were binarized into those characterized by higher proportions of decorated sherds (>30% of total sherd assemblage, n=3) and those with lower proportions of decorated sherds (<30% of total sherd assemblage, n=9). A value of 30% was chosen as this represents the threshold for the upper quartile of decorated

sherd proportion values. Results of logistic regression fail to demonstrate that any of the sampling bias variables (sample size, collection strategy and fragmentation rate) significantly predict a high proportion of decorated sherds at each site. Using the odds ratios developed from logistical regression coefficients it can be identified that higher fragmentation rates (larger sherds) tend to be more strongly associated (although not a significant predictor) with a higher proportion of decorated samples. As highlighted in table 5.2, the odds of a site having a high proportion of decorated sherds is 4.12 times more likely when sherd fragmentation rates increase. Interpretation of these results suggest that while significant variation exists between the proportion of decorated sherds at different sites, these differences are not due to sampling biases. Rather, the variability in the decorated sherds reflect meaningful variation between archaeological sites such as the intensity of pottery production or the cultural practice of pottery decoration at each site.

Outcome (Response): High Proportion of Decorated Sherds

Sampling Biases (Predictors)	Estimate	Std. Error	p-value	Odds
Sample Size	-0.08	0.09	0.33	0.91
Fragmentation Rate	1.42	1.35	0.24	4.12
Collection Strategy	-17.58	5707.83	1.00	0.00

Table 5.2 Results of logistic regression indicating that sampling biases variables are not strong predictors of sites with high proportions of decorated sherds

After establishing that the distribution of decorated sherds is not significantly influenced by various sampling biases, the presence and abundance of specific decorative features was quantified between site assemblages using a paradigmatic classification scheme. In contrast to taxonomic classification, a paradigmatic classification uses an unordered and unweighted structure of predetermined characters (attributes) and their states to construct artifact classes (Dunnell 1971; O'Brien et al. 2002). The main advantage of a paradigmatic classification scheme in analyzing pottery decorations is that multiple character states can be combined in order to provide unambiguous assignment of pottery sherds with no sherds remaining unassigned. Predetermined attributes were based upon decorative features highlighted in published literature (Amano 2006; Deryugin 2008; Ohyi 1975; Tezuka and Fitzhugh 2004) and included cord-marking, applique, incisions, punctuation, scratching, and rim projections (see figure 5.7 for full list of characters (attributes) and their character states). As an example of the paradigmatic classification scheme, four pottery sherds are presented in figure 5.8 with their paradigmatic classification code (PCC) based upon the presence or absence of various character states. For example, a pottery sherd from the site of Rasshua 1 (FS#3990; SM#8077-641) is given a paradigmatic classification code (PCC) of 321113 which indicates a sherd with small-knot cord marking (3), an elevated doughnut applique (2), the absence of incisions, stamping or scratching (111) and the presence of a small rim projection (3). In total, 58 unique types were identified within the Kuril pottery assemblage using this paradigmatic classification scheme.

X. Character

x. Character State

A. Cord-Marking

1. Absent
2. Aligned – Large Knots
3. Aligned – Small Knots
4. Aligned – Braided
5. Geometric

B. Applique

1. Absent
2. Elevated – Doughnut
3. Elevated – Pellet
4. Elevated – Linear
5. Flat

C. Incisions

1. Absent
2. Thick – Geometric
3. Thick – Linear
4. Thin – Geometric
5. Thin – Linear

D. Punctuation

1. Absent
2. Circular
3. Stamped

E. Scratching

1. Absent
2. Present

F. Rim Projection

1. Absent
2. Large
3. Small



Figure 5.8 Paradigmatic classification scheme for decorative features with examples of common decorations including the field sample number (FS#), Sakhalin Museum accession number (SM#) and paradigmatic classification code (PCC)

Small knot cord-marking represented the most common decorative feature (n=329) in the sampled assemblage accounting for 66.0% of all decorative features (figure 5.8). As highlighted in figure 5.9, cord-marking decoration constitutes a high proportion of the decorative features identified in both southern and central pottery assemblages. In general, decorative features for regional assemblages demonstrate a similar pattern to the full sampled assemblage with small knot cord-marking representing the most common feature with applique or incised features identified on a significantly smaller number of sherds (figures 5.10, 5.11 and 5.12). In order to test whether the distribution of decorative features for regional datasets are significantly different from each other a Kolmogorov-Smirnov (K-S) test is utilized by comparing whether two regional datasets can be considered to have been drawn from the same unknown parent

distribution. A K-S test is advantageous for determining similarity between regional samples as the test is distribution-free and unaffected by sample size differences. Results of the K-S test indicate that the distribution of decorative features of the southern region is significantly different from the central and the north-central/northern region. However, the central region and the north-central-northern region are not significantly different from each other with their distribution of decorative features assumed to have been drawn from the same population (see table 5.3).

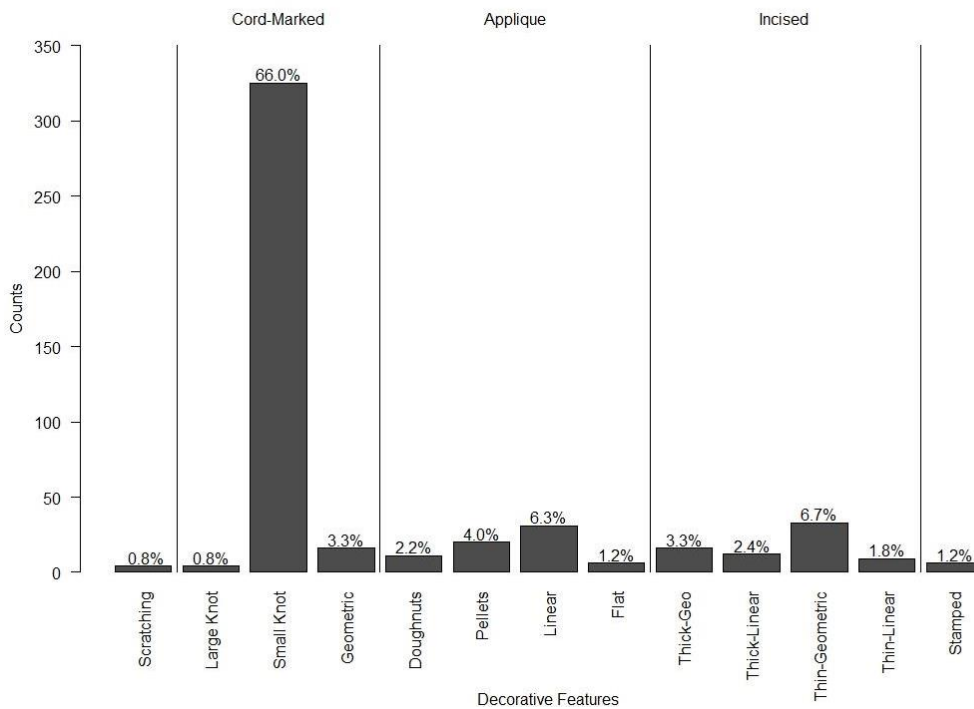


Figure 5.9 Distribution and percentage of common decorative features within the full assemblage of sherds with surface decoration.

Results of Two-sided Kolmogorov-Smirnov Test

Regions	D	p-value	Significant at p<0.05
South ~ Central	0.636	0.023	Yes
South ~ North-Central/North	0.727	0.006	Yes
Central ~ North-Central/North	0.272	0.808	No

Table 5.3 Results of K-S test demonstrating statistically significant differences between regional assemblages

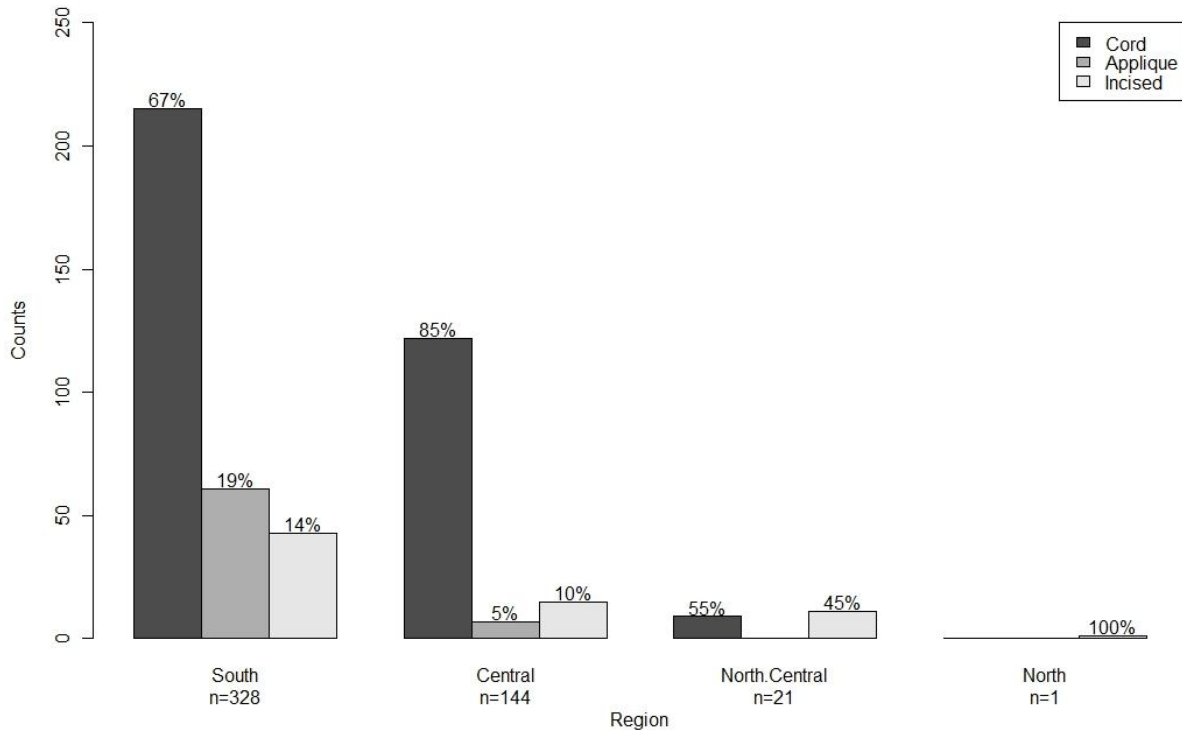


Figure 5.10 Distribution and percentage of common decoration techniques by region

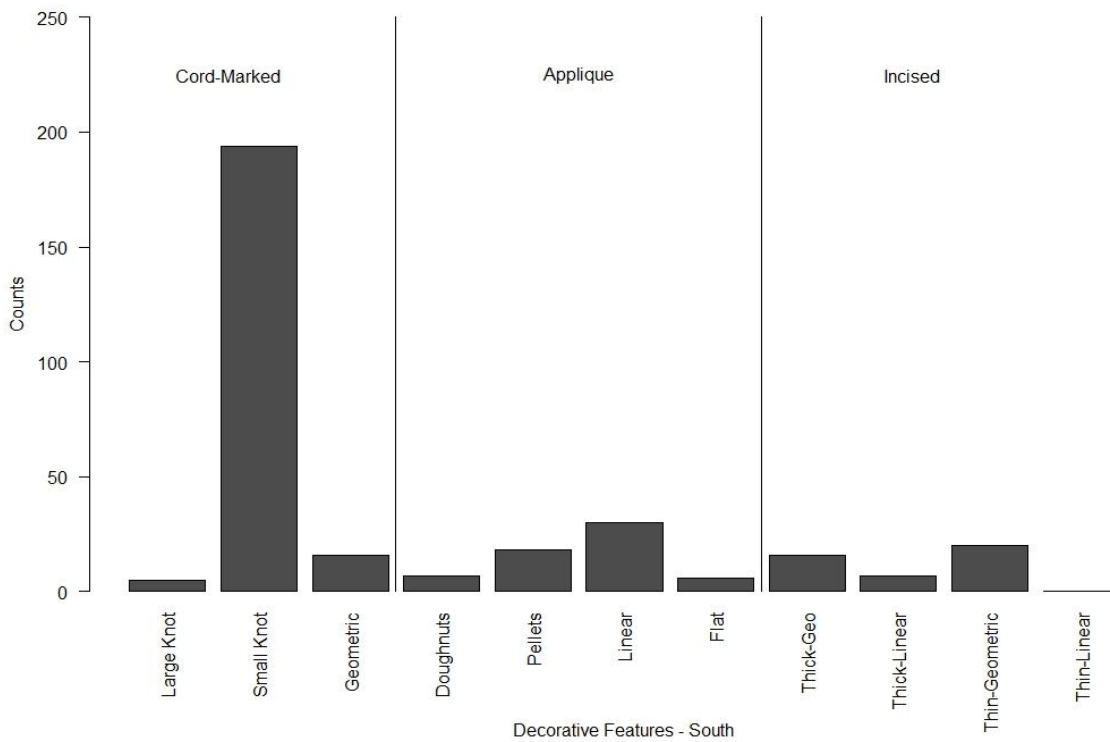


Figure 5.11 Distribution of common decorative features in the southern region

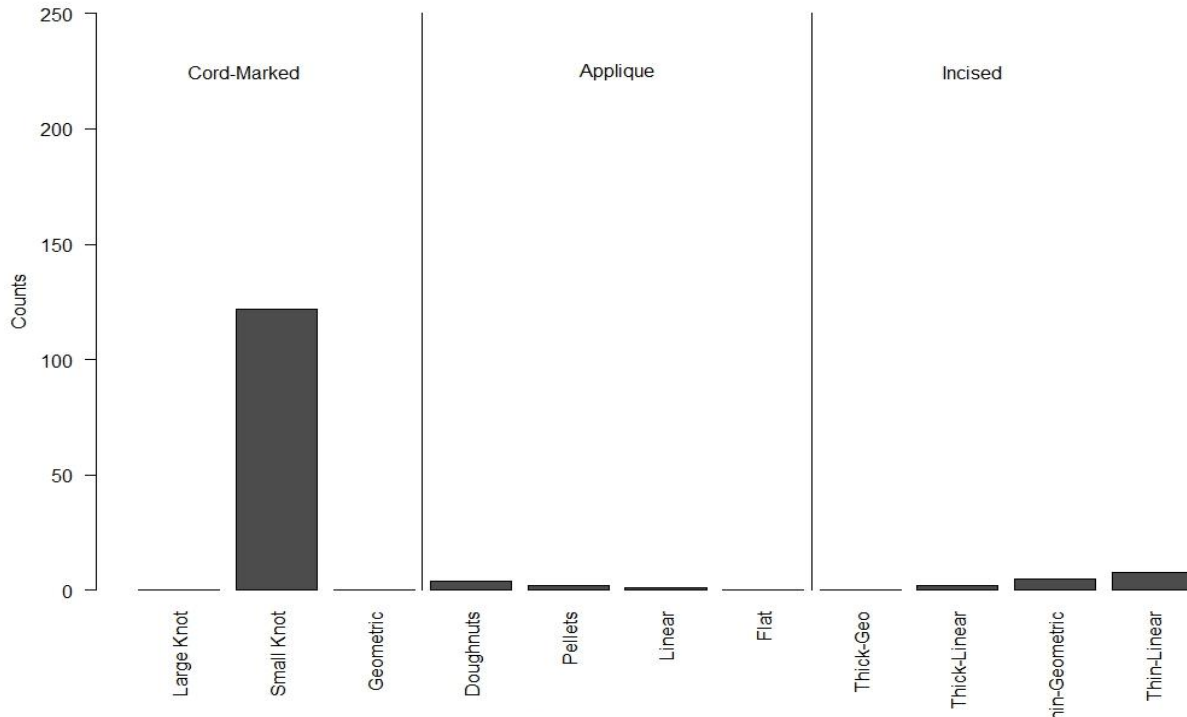


Figure 5.12 Distribution of common decorative features in the central region

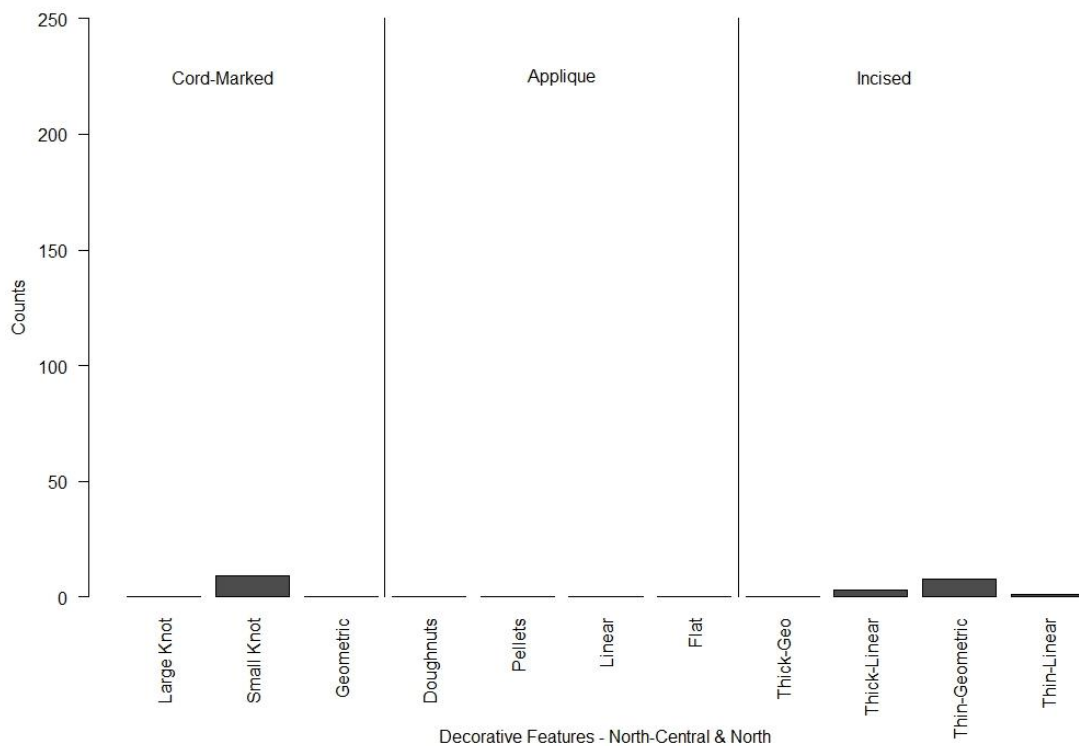


Figure 5.13 Distribution of common decorative features in the north-central and north region

5.3.4 Analysis of Vessel Form

In addition to the describing the decorative features of pottery from the Kuril assemblage, descriptive analysis of vessel form was also performed. Specifically, four aspects of the vessel form were investigated that are often considered to be informative about the cultural affiliation and possible function of the vessel (Anderson 2011; Cochrane 2009). These aspects included the form of the rim/lip, the form of the rim/neck, the orifice size and base shape.

The rim/lip area of a vessel is defined as the edge or margin of the vessel nearest to the end point of the vessel orifice (Rice 1987). In addition to surface decoration, the rim/lip region of any vessel is often one of the most common areas to find diversity in form either for decorative or functional purposes. In the analysis of the Kuril assemblage, all available rims (n=458) were included in the descriptive analysis; however, only 417 rims were evaluated for lip form as 41 rim sherds did not have clearly identifiable lip forms. Overall, lip forms were identified based upon two characteristics, lip vertex and lip symmetry. Lip vertex has three character states including straight, pointed and rounded. Lip symmetry has seven character states including parallel, interior-exterior contracting, interior-exterior expanding, exterior expanding, interior expanding, exterior contracting and interior contracting (Figure 5.13).

In the examination of lip types, which include both lip form and lip symmetry characteristics, similar trends can be identified between regions in the Kuril Islands (Figure 5.14). The most prevalent character state of lip symmetry is parallel (67%) with a vast majority of parallel lips demonstrating straight or rounded lip forms (92%). The common occurrence of similar lip forms and symmetry across regions in the Kuril Islands preliminarily suggests that the function of pottery vessels was similar between population inhabiting different regions as lip types are often modified in relation to the use of the vessel (Rice 1987).

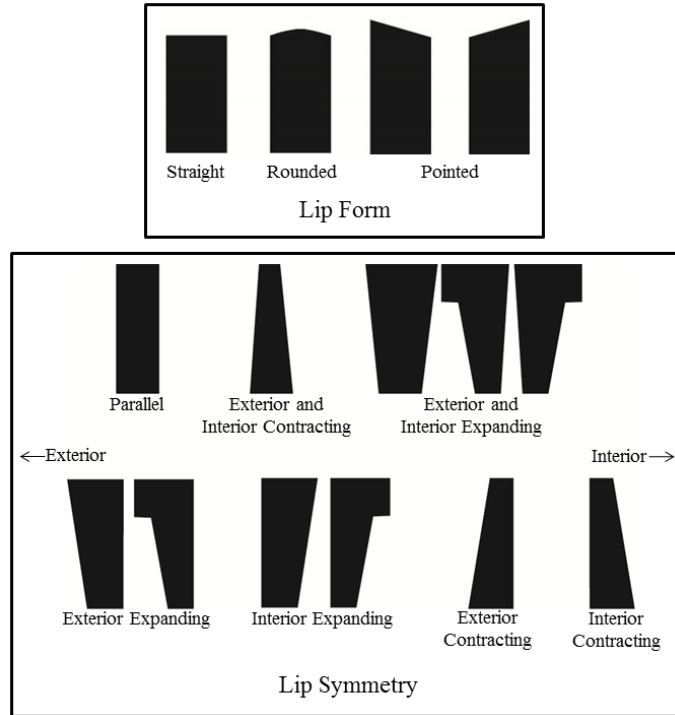


Figure 5.14 Character states of lip form and lip symmetry

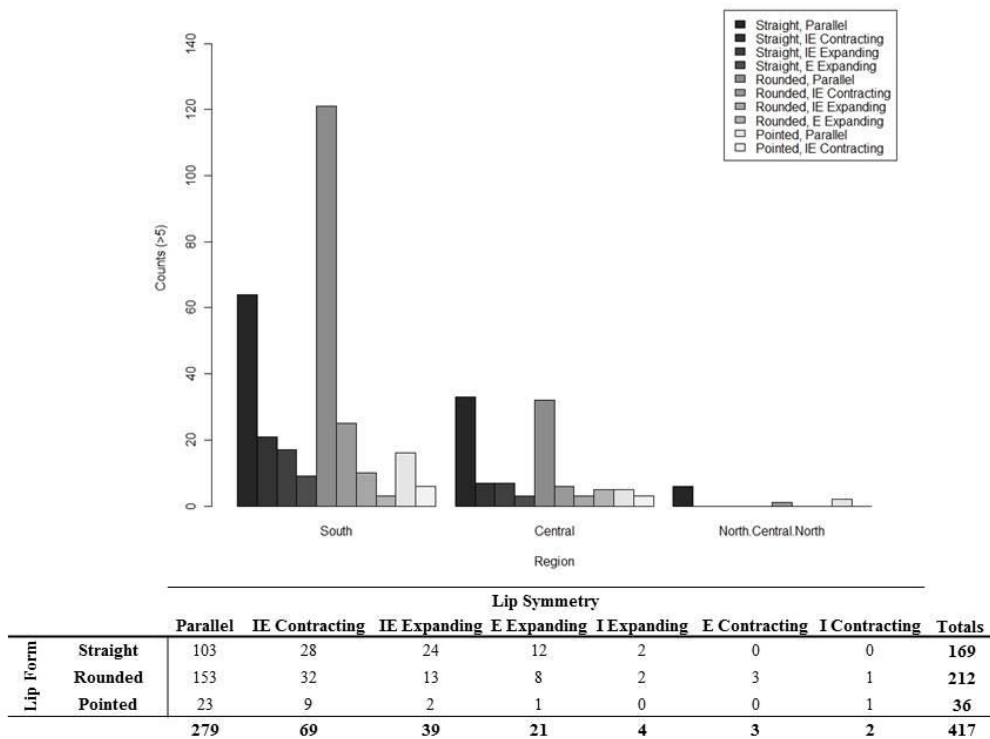


Figure 5.15 Numerical distribution of lip types (form and symmetry) with graphical distribution of lip types across regions

The second feature examined in association with vessel form is the shape of the neck. Using a classification scheme based upon characteristic points of curvature or angling, the neck of a vessel is defined here as the vessel region from just below the rim end point (lip) extending down to the first inflection point above the maximum diameter of the vessel (see figure 5.15) (Rice 1987). Based upon this scheme six different neck types were identified within the Kuril pottery assemblage including lower recurved, upper recurved, lower incurve, upper incurved, vertical and everted. Given the difficulty in distinguishing between vertical and everted rim sherds without full vessels, these types were combined for a more generic neck type referred to as “direct”. In contrast to the distribution of decorative features and lip types, neck types tend towards a more even distribution with lower recurved, lower incurve and direct neck types evenly represented within the southern and central regions of the island chain (see figure 5.16), sample sizes in the north and north-central regions are too small to permit interpretation. Given the strong affiliation between lower recurved body types and Okhotsk-type pottery (Deryugin 2008), the distribution of neck types suggests that the pottery assemblage in the Kuril Islands is likely a fairly even combination of both Epi-Jomon and Okhotsk-style pottery.

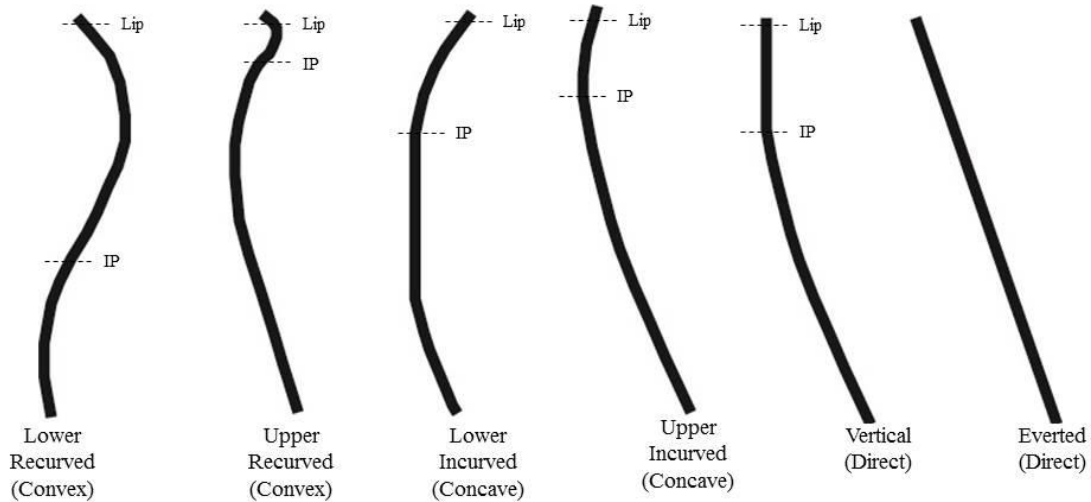
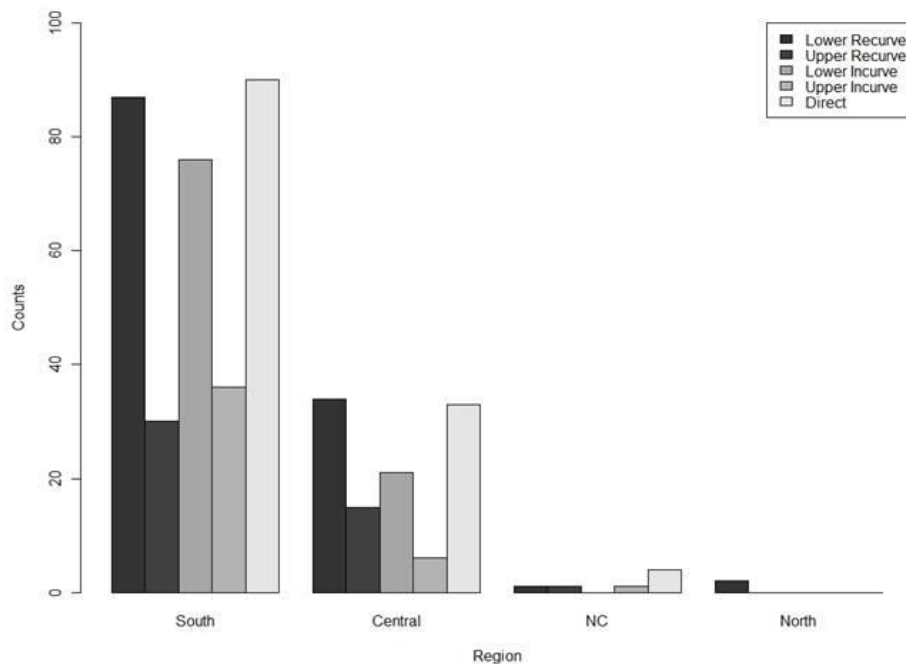


Figure 5.16 Profiles of neck types identified in the Kuril pottery assemblage. (IP refers to the location of the first inflection point)



	Neck Type					Totals
	Lower Recurve	Upper Recurve	Lower Incurve	Upper Incurve	Direct	
South	87	30	76	36	90	319
Central	34	15	21	6	33	109
North-Central	1	1	0	1	4	7
North	2	0	0	0	0	2
	124	46	97	43	127	437

Figure 5.17 Numerical and graphical distribution of neck types across regions

Reconstructing vessel size from pottery sherds relies heavily on the use of rim sherds to determine the orifice diameter, which in turn is used to broadly estimate overall vessel size. In this research, orifice diameter was calculated by orientating rim sherds and measuring the rim chord and rim depth (see figure 5.17) using digital calipers and a depth micrometer. Diameter of the orifice is calculated by using a modification of the Pythagorean Theorem to determine the rim radius ($\text{rim radius} = (\text{rim chord} + \text{rim depth}) / 2 * \text{rim depth}$) and doubling this value to obtain rim diameter. Sherds with rim chord lengths less than 30 mm were not included in the analysis as small errors in measurement can produce large errors in diameter calculations. Based upon vessel sizes from nearby regions including Hokkaido and Sakhalin, small vessels are considered to be less than 15 cm (~6 inches) in orifice diameter, medium vessels are between 15 and 30 cm

(~6-12 inches) and large vessels have orifice diameters greater than 30cm (12 inches). Overall, medium size vessels are the most commonly occurring vessels within the Kuril Islands. In the southern islands, medium vessels account for 57% of vessel sizes whereas in the central islands medium-size vessels account for only 42% of vessel sizes with a greater proportion of small vessels represented (see figure 5.17). Using a chi-square test of association, the differences in orifice sizes between the southern and central regions are significantly different and not due to random variation ($p=0.02$) suggesting the higher proportion of medium orifice sizes in the southern islands is not due to chance.

Base sherds are often less informative than rim sherds on reconstructing vessel size and form although neither provides direct information concerning vessel height (Rice 1987). The most useful information to infer vessel form from base sherds includes the base type, base diameter and the base angle. From an analytical perspective, base sherds can provide only a very general classification between tall or short vessel forms with a wide base angle and large diameter suggesting flatter and shorter forms such as a platter or shallow bowl. Base sherds with a higher angle (closer to 90°) and smaller base diameter suggest taller and more cylindrical forms. In the Kuril pottery assemblage, very few basal fragments were recovered with base sherds only totaling 10.1% of the total pottery assemblage. Of these basal sheds, all base types are flat with an average diameter of 10.2 cm and an average base angle of 106° with a minimum angle of 95° and a maximum angle of 118° , see figure 5.16. These average dimensions suggest that the most common vessel form was likely a tall, cylindrical bowl.

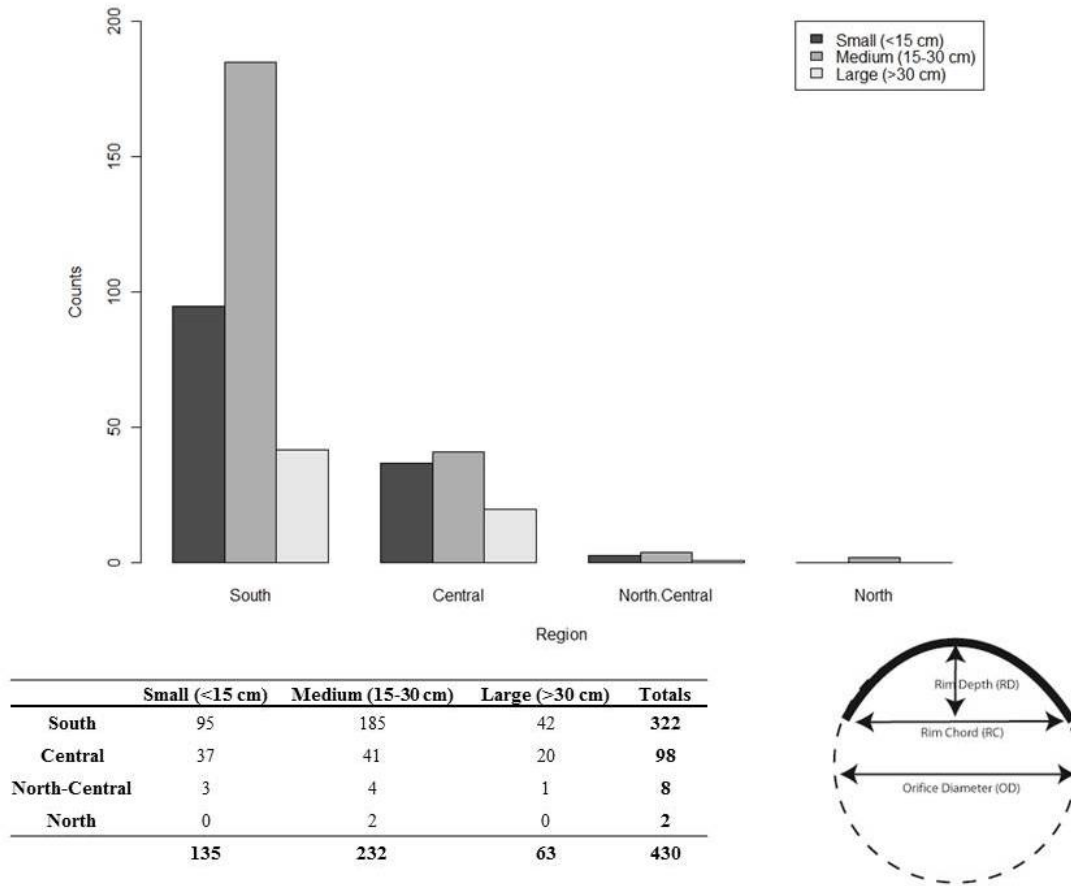


Figure 5.18 Numerical and graphical distribution of vessels sizes (determined through orifice size) by region. Additionally, graphical representation of rim chord and rim depth measurements used to determine orifice size.

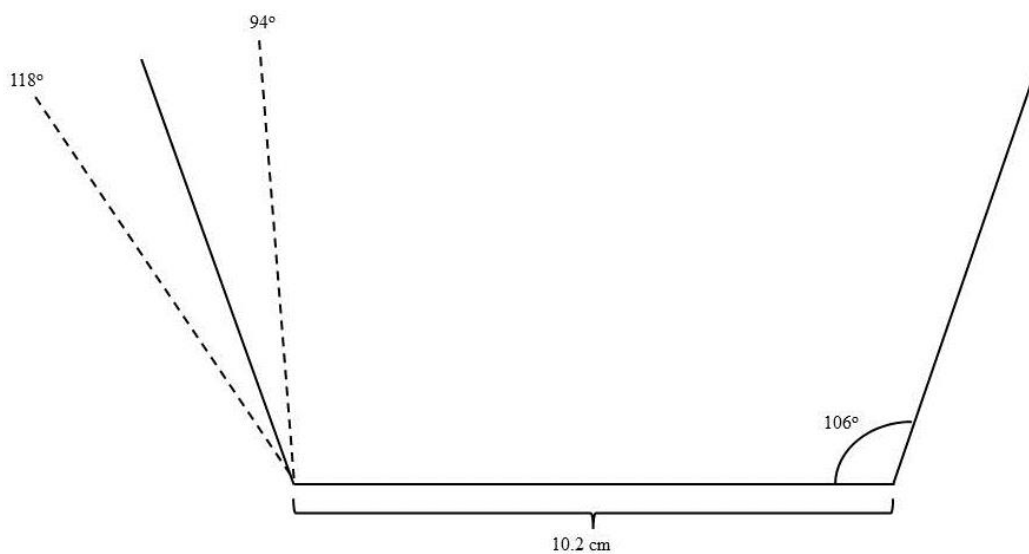


Figure 5.19 Visual representation of the average base type, base diameter and base angle (including minimum and maximum angles) of the Kuril pottery assemblage.

5.3.5 Conclusions about Kuril Decoration and Form

The descriptive analysis of pottery decoration and form provides a few general insights into the cultural affiliation of Kuril Island inhabitants and their use of pottery. Most clearly recognized in the analysis of pottery decoration and form is the strong association with pottery traditions originating from the Japanese Islands, especially the nearby regions of northern and eastern Hokkaido. The most direct evidence for this association is the strong use of cord-marking decorations, which is a reliable indicator for the influence of Jomon and Epi-Jomon pottery traditions. Furthermore, the majority of vessel forms are similar to the tall, cylindrical bowls found throughout Hokkaido and the Japanese archipelago during the Jomon and Epi-Jomon period. While samples sizes are small, the influence of the Jomon and Epi-Jomon pottery tradition can be recognized as far north as the site of Drobnye on the island of Shiashkotan, nearly 900 kilometers from Hokkaido. The strong association with northern and eastern Hokkaido is also recognized in the presence of Okhotsk-style pottery throughout the Kuril archipelago. Perhaps most indicative of the Okhotsk presence in the Kuril Islands is the abundance of lower recurved vessel forms, which are often highlighted as one of the most distinguishing features of Okhotsk-style pottery in Northeast Asia (Deryugin 2008). While most often undecorated, sherds from the Kuril pottery assemblage do demonstrate decorative features including linear incisions and stamping that are characteristic of Okhotsk-style pottery throughout the Sea of Okhotsk.

In examining the variation and central tendencies of pottery sherds from the Kuril Islands, it is proposed that a vast majority of the pottery was used for utilitarian purposes such as cooking or food storage. Evidence for utilitarian usage includes the general lack of diversity in decoration and vessel form including the lip and neck types. Sherds identified as either

undecorated or simple cord marked, which is potentially a functional surface treatment rather than decorative feature, comprise nearly 85% of all sherds analyzed in the research. Furthermore, vessel forms also appear to be highly standardized with a vast majority of forms classified as tall bowls. Only at a few archaeological sites, solely located in the southern region, do pottery assemblages demonstrate decorative features that might suggest use of pottery for ritual purposes. Specifically, this includes the use of geometric applique and grooving decorations at the archaeological sites of Kuybyushevskaya (KUB) and Berezovka (BER) located on the island of Iturup.

5.4 Investigating Occupation through Diagnostic Pottery and Radiocarbon Dates

The use of pottery styles to infer cultural changes through time is perhaps one of the most fundamental uses of pottery in archaeology. One of the greatest examples of matching pottery types with chronological periods are the comprehensive regional typologies developed over decades of Japanese research (Kidder and Esaka 1976; Kobayashi 2004; Yamanouchi 1937). Using the basic paradigmatic classification of Kuril decorative features developed earlier in this chapter, the occupation history of the Kuril archipelago inferred through radiocarbon dates will be evaluated through examination of the spatial and temporal distribution of diagnostic pottery types.

Prior to comparing occupation trends developed from radiocarbon dates and pottery types, it is necessary to establish the extent to which diagnostic pottery types from the Kuril Island conform to their inferred radiocarbon ages. Out of the 58 unique pottery types identified through paradigmatic classification, 40 types can be considered diagnostic to one of six chronological periods: Middle / Late Jomon, Early Epi-Jomon, Late Epi-Jomon, Middle

Okhotsk, Late Okhotsk and Tobinitai. The total number of sherds assigned to these 40 diagnostic types is 457 or approximately 41% of the total sherd assemblage analyzed in this research. Unfortunately, only 12 of these 40 diagnostic types, totaling 110 sherds, can be chronologically affiliated with at least one radiocarbon date that corresponds to the same excavation level. This discrepancy is due to 41.4% of pottery sherds in this analysis recovered from surface contexts and 33.2% of sherds from excavation levels in which a radiocarbon date was not available. Due to the high proportion of surface collected pottery and fewer radiocarbon dates, the southern region demonstrates the largest disparity between chronometrically affiliated and unaffiliated diagnostic sherds, with the exception of a single affiliated diagnostic sample from the northern region (see figure 5.19).

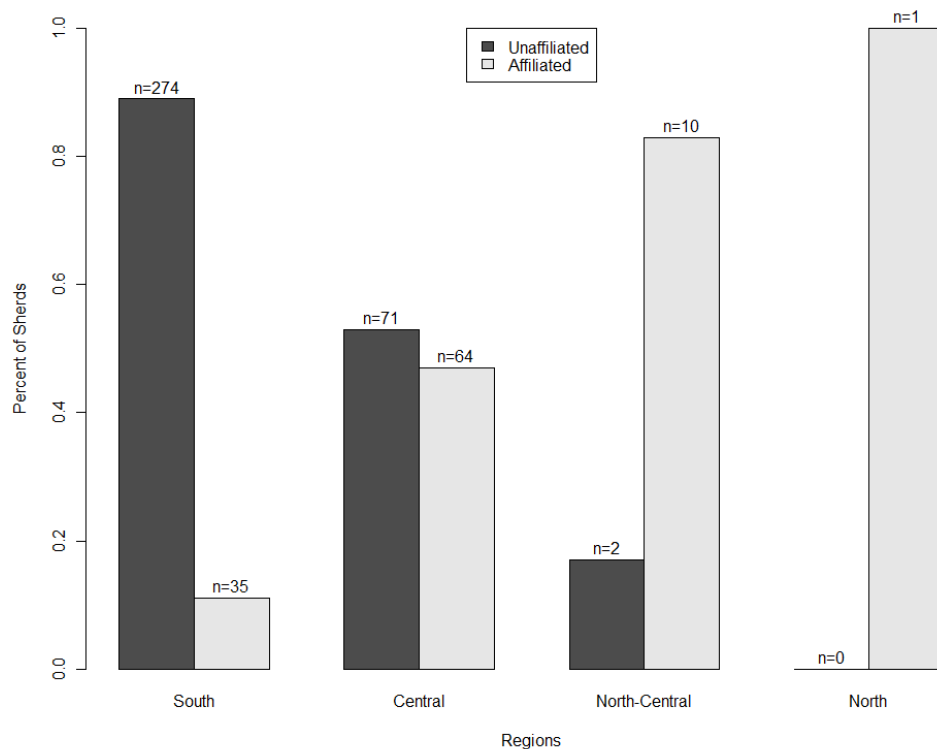


Figure 5.20 Barplot of sherds percentages divided by region that are chronologically unaffiliated or affiliated (same excavation level) with at least one radiocarbon date

Based on these 110 chronologically affiliated sherds, the 12 diagnostic pottery types with associated radiocarbon data demonstrate decent chronological accuracy with 75% (9 of 12) of pottery types having at least 50% of sherds corresponding to the expected age range of the pottery type (see table 5.4). Radiocarbon dates and pottery type data can be found in Appendix B and is archived with The Digital Archaeological Record (tDAR) accessible at <https://core.tdar.org/dataset/393045>.

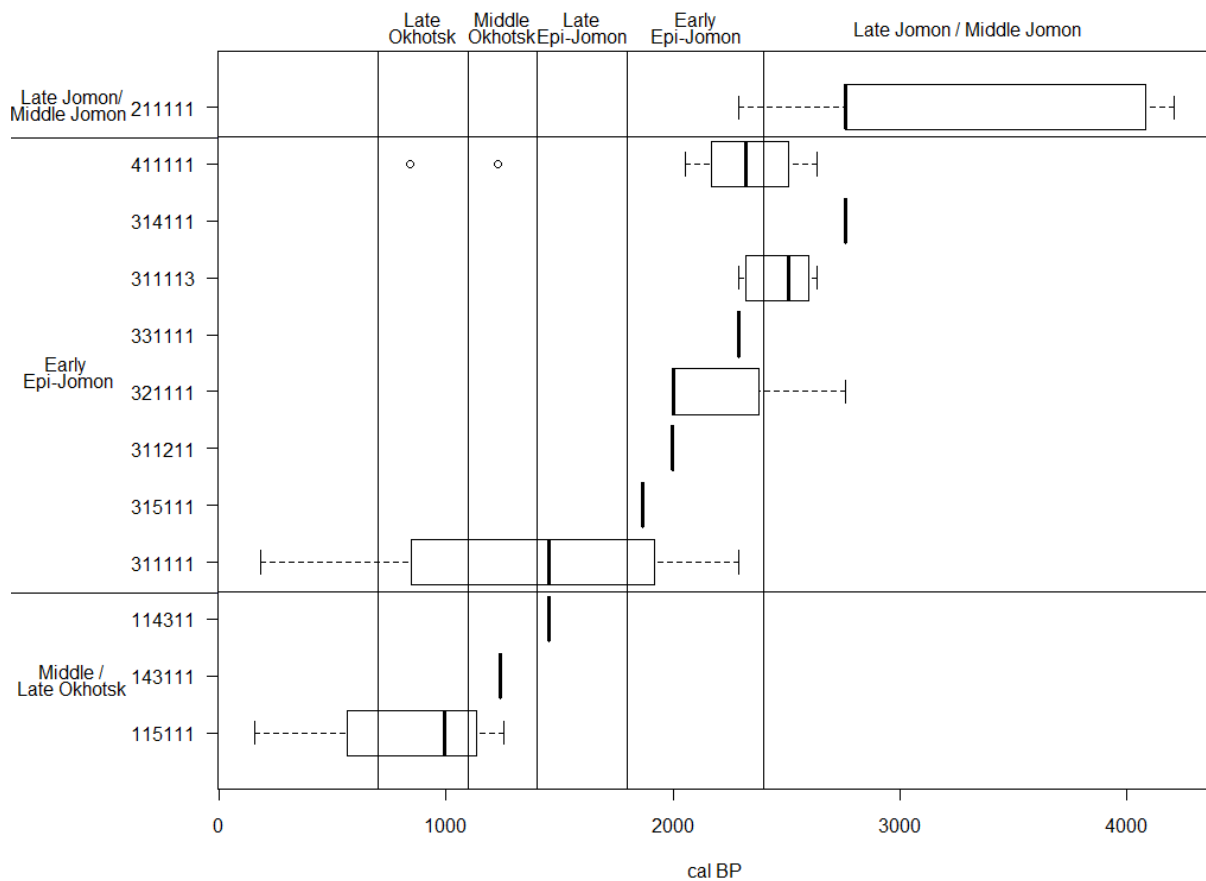


Figure 5.21 Boxplots of radiocarbon dates (weighted mean) with diagnostic pottery types and their associated cultural period (y-axis) as well as chronological periods with their associated cultural period (x-axis)

PCC	# of Pottery Sherds	# of RC Dates	Pottery Type Description	Most Likely Culture Period	Expected Age Range (cal BP)	Actual Age Range (cal BP)	% of Sherds within Expected Age Range	% of Sherds Older	% of Sherds Younger
115111	4	4	Thin Linear Incision	Late Okhotsk	700-1100	157-1252	50.0%	25.0%	25.0%
114311	1	1	Thin Geometric Incision; Stamping	Middle Okhotsk	1100-1400	1453	0.0%	100.0%	0.0%
143111	1	1	Linear Applique; Thick Linear Incision	Middle Okhotsk	1100-1400	1241	100.0%	0.0%	0.0%
311111	79	15	Small Cord	Early Epi-Jomon	1800-2400	184-4211	35.4%	30.5%	34.1%
311113	4	6	Small Cord; Small Rim Projection	Early Epi-Jomon	1800-2400	2290-2263	100.0%	0.0%	0.0%
311211	2	2	Small Cord; Circular Punctuation	Early Epi-Jomon	1800-2400	1998-2000	100.0%	0.0%	0.0%
314111	1	1	Small Cord; Thin Geometric Incision	Early Epi-Jomon	1800-2400	2762	0.0%	100.0%	0.0%
315111	1	1	Small Cord; Thin Liner Incision	Early Epi-Jomon	1800-2400	1866	100.0%	0.0%	0.0%
321111	2	3	Small Cord; Doughnut Applique	Early Epi-Jomon	1800-2400	1998-2762	50.0%	50.0%	0.0%
331111	1	1	Small Cord; Pellet Applique	Early Epi-Jomon	1800-2400	2290	100.0%	0.0%	0.0%
411111	7	11	Braided Cord	Early Epi-Jomon	1800-2400	842-2633	71.4%	28.6%	0.0%
211111	7	4	Large Cord	Late/Middle Jomon	2600-4200	2290-4211	85.7%	14.3%	0.0%

Table 5.4 Table of chronologically affiliated diagnostic pottery and associated radiocarbon dates

The chronological expectations of diagnostic pottery types generally conform to the actual age range of pottery sherds based upon radiocarbon dates. As highlighted in table 5.4 and figure 5.21, the Early Epi-Jomon period (often characterized by small-knot cord marking) demonstrates the highest chronological accuracy of pottery types. The exception to this trend is radiocarbon dates associated with type 311111 (small-knot cord marking with the absence of other decorative features). The 311111 type is the most prevalent diagnostic type in the Kuril assemblage with sherds used in this chronological analysis recovered from six different archaeological sites and 24 different excavation levels of which eight levels are known to have mixed or disturbed contexts, undoubtedly enhancing the variability in type ages (see Appendix B for the full list of excavation levels associated with radiocarbon dates and pottery types).

While fewer samples are available (due to fewer overall decorated sherds), Okhotsk pottery types also generally coincide with their expected chronological age although only six radiocarbon dates can be associated with Okhotsk diagnostic types. Of particular interest is the tentative agreement of pottery type 115111 (thin linear incisions) with the Late Okhotsk chronological period as this pottery type stylistically corresponds to decorative features recognized in Northern Hokkaido, known as the Chinsemon type. If accurate, this small sample of pottery sherds represents one of the first definitive pottery types in the Kuril assemblage that is not associated with types found in Eastern Hokkaido and is suggestive of a potential cultural connection between populations of the Kuril Islands and Northern Hokkaido between approximately 1100 and 700 cal BP. Based upon agreement between the 12 diagnostic pottery types and their chronological ages, it is recommended that diagnostic pottery types from the Kuril Islands can be broadly associated with chronological periods. Therefore, using all the available diagnostic types (40) and sherds (457), expectations derived from the radiocarbon

occupation history can be broadly examined through comparison with diagnostic pottery types. In particular, three expectations derived from the radiocarbon occupation history will be examined, 1) initial occupation of the archipelago during the Early Jomon; 2) limited occupation of the island chain during phases I and II (Early, Middle and Late Jomon); 3) substantial increase in occupation followed by reduced occupation during phases III and IV (Epi-Jomon and Okhotsk).

Based upon stylistic features, the first expectation is confirmed as pottery remains recovered at the Yankito site complex on Iturup Island provide strong evidence for the earliest occupation of the archipelago occurring during the Early Jomon (Yanshina and Kuzmin 2010). Compared to pottery from Hokkaido, the Yankito pottery assemblage shows strong similarities with contemporaneous Initial and Early Jomon Urahoro-type ceramics identified at numerous archaeological sites including Taisho 3. Characteristics of Yankito pottery include a mixture of organic and mineral temper, a flat base, average wall thickness between 0.8 and 1 cm and decoration that consists of thick horizontal cord impressions near the rim of the vessel and comb trails on the internal and external body of the vessel (Yanshina and Kuzmin 2010).

During the Middle and Late Jomon periods (phases I and II), diagnostic pottery counts and radiocarbon counts used in this analysis generally agree and suggest fairly low occupation during this period (see figure 5.23). However, if pottery data from Shubina and Samarin (2009) is considered in addition to data presented here, assumptions for low occupation during the Middle Jomon can be questioned. Based upon pottery collections from the Sakhalin Regional Museum (Shubina and Samarin 2009), 21 archaeological sites contain Middle Jomon pottery types compared to only three sites each for the Early and Late Jomon periods. This includes diagnostic Middle Jomon pottery types recovered from 11 sites on Iturup and 10 sites on

Kunashir (Shubina and Samarin 2009). The most distinctive of these finds includes an intact vessel from the Shana site on Iturup island with form and decoration (figure 5.22) showing strong similarities to the contemporaneous Hokuto type on Hokkaido with thick walls (>1 cm), large rope/cord cells and the use of organic temper. Unfortunately, only 38% (8 of 21) of archaeological sites in the southern islands where Middle Jomon pottery has been recovered have been dated. The limited radiocarbon dating at these sites is primarily due to a majority of surface collected sherds and extensive site damage from erosion and dune formation. Future research that involves the luminescence dating of Middle Jomon artifacts is imperative to further investigate the density of occupation during the this period.

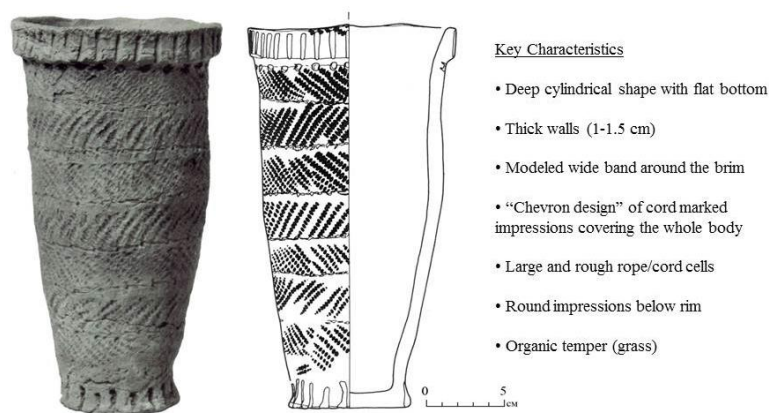


Figure 5.22 Hokuto-type vessel from the Shana Site, Iturup Island
(Image adapted from Olga Shubina)

In order to examine the third archaeological expectations, diagnostic sherds for each chronological period were plotted against the number of radiocarbon dates obtained for the same period. As highlighted in figure 5.23, pottery sherds in the Kuril assemblage were most often assigned to the Early Epi-Jomon period. In addition, radiocarbon dates were also most abundant during this period which provides solid evidence for the more intensive occupation of the archipelago. It should be noted that the significantly higher counts of diagnostic pottery sherds compared to radiocarbon dates during this period should not be considered as evidence for

inferring even more intensive occupation but rather is indicative of a higher abundance of pottery sherds compared to radiocarbon dates and the ease in identifying and classifying Early Epi-Jomon pottery types.

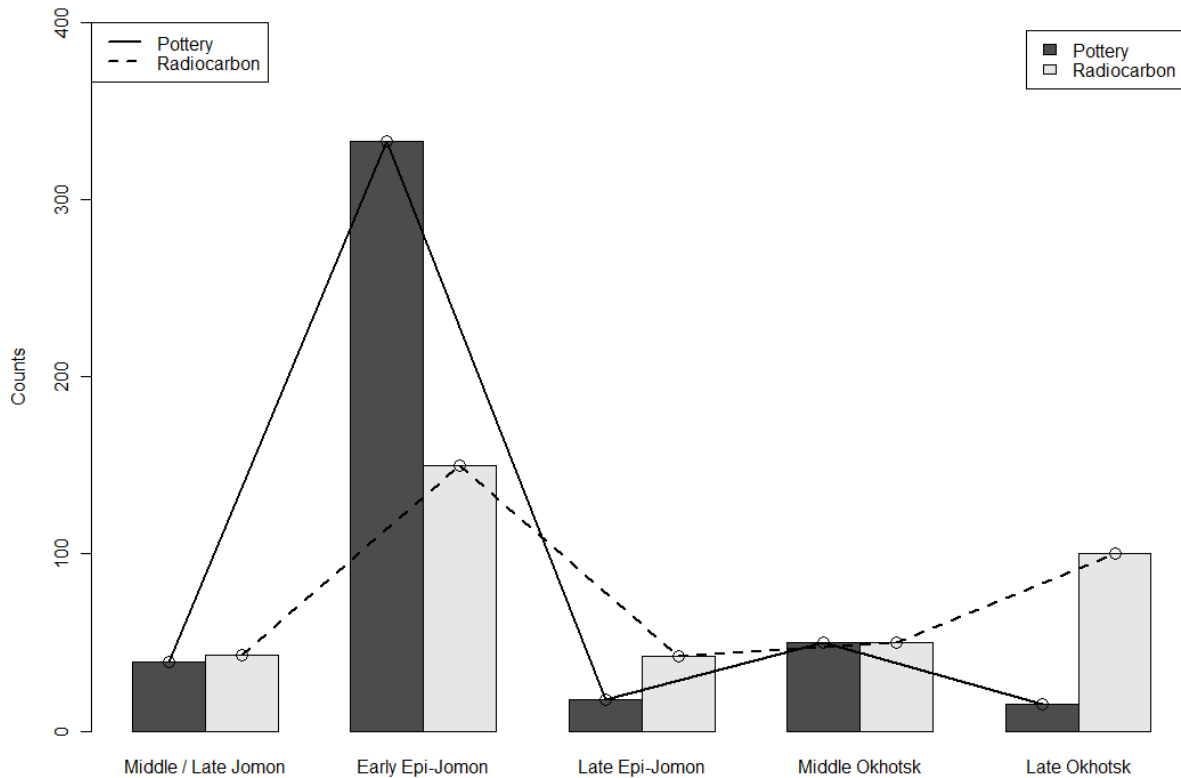


Figure 5.23 Histogram of diagnostic pottery counts and radiocarbon counts for five chronological periods (Excluding data from Shubina and Samarin (2009) and Yanshina and Kuzmin (2010))

The Late Epi-Jomon period shows a substantial reduction in the number of diagnostic pottery sherds and radiocarbon dates compared to the Early Epi-Jomon period. This pattern generally conforms to the expectations of limited occupation based upon radiocarbon dates. It is intriguing to note that 100% of Late Epi-Jomon diagnostic sherds were recovered from archaeological sites located in the southern islands whereas only 56% of radiocarbon dates attributed to this time period were from sites in the south region. While numerous factors may influence this discrepancy (radiocarbon calibrations, inaccurate Late Epi-Jomon age range), it is suggested here that one major factor are the established pottery types considered to be diagnostic

to this period. The decorative features associated with Late Epi-Jomon pottery used in this analysis are based solely on styles and forms from Hokkaido and Honshu that display fairly elaborate decorations such as geometric grooving (occasionally with circular punctates) characteristic of the Hokudai type or the geometric applique of the Kohoku type.

Given the generally utilitarian and plain decorative features of the central, north-central and northern pottery assemblages, it is proposed here that the inhabitants of the central and northern Kuril Islands maintained simple decorative features and did not produce pottery with such elaborate decorative styles leading to an inability to clearly distinguish Late Epi-Jomon pottery from these sites. Evidence for this includes eight sherds from the north-central site of Drobnye (Unit 1, Levels 3 and 4) with small-knot cord marking, stylistically associated with the Early Epi-Jomon but chronologically affiliated with the end of the Late Epi-Jomon period (1455-1565 cal BP). Okhotsk-type fragments are also recognized in association with these Late Epi-Jomon ceramics suggesting the mixing of cultural layers by Okhotsk populations by digging into previous Epi-Jomon materials (Fitzhugh et al. 2009:66) Based upon this initial evidence, it is plausible that population sizes in the Kuril Islands were substantially reduced during this period as suggested by pottery types and radiocarbon dates but the central and northern regions were not completely abandoned as may be interpreted if only considering the absence of traditional Late Epi-Jomon diagnostic pottery types (Kohoku, Hokodai) in this central and north-central regions.

Pottery types and radiocarbon dates for the Middle Okhotsk period show strong similarities in their counts and generally conform to the expectation of moderate occupation between 1400 and 1100 cal BP. One factor influencing Middle Okhotsk pottery counts is the lack of strong diagnostic pottery types associated with this period. As previously discussed in this chapter, Middle Okhotsk pottery is largely characterized as undecorated with only a few

decorative traits that can be considered diagnostic (thin, geometric incisions and stamping). In order to develop a more accurate representation of Middle Okhotsk pottery, it is necessary to incorporate both formal and technological traits (neck type, wall thickness, base thickness, etc.) into the paradigmatic classification scheme and establish the chronological trends of these combined decorative and technological pottery types. Given the wide range of formal and technological traits available, these modifications to the Kuril classification scheme are outside the scope of this chapter but will form the basis for future research that utilizes biological systematics (cladistics and phylogenetics) in evaluating chronological patterns of complex archaeological types.

The Late Okhotsk period is perhaps the most intriguing chronological period as it demonstrates a significant difference between radiocarbon dates and diagnostic pottery sherds. The increase in radiocarbon dates during this period are tied to a rapid increase in occupation in the central and north-central areas of the island chain with 85% of radiocarbon dates associated with sites in these two regions. Similar to Middle Okhotsk sherds, Late Okhotsk sherds do not typically demonstrate decorative features that are strong chronological indicators with the possible exception of thin linear incisions associated with the Chinsemon type. Given the coarse temporal resolution and low abundance of diagnostic pottery types during this period it is difficult to critically assess the rapid increase and decrease in population between 1100 and 700 cal BP as suggested by radiocarbon dates.

Based upon the entire Okhotsk pottery assemblage (including unaffiliated sherds), it is speculated that the pattern displayed in the Late Okhotsk period is characteristic of two different Okhotsk populations simultaneously inhabiting the Kuril Islands, one population with social ties to Northern Hokkaido occupying the central and northern islands and a different Okhotsk

population inhabiting the southern islands with social ties to Eastern Hokkaido (Amano 2011). This speculation is partially based on the presence of two different yet contemporaneous Late Okhotsk pottery types, the Chinsemon type found in the remote Kuril Islands often associated with Northern Hokkaido types and the Tobinitai type found in the southern islands commonly associated with Okhotsk cultures in Eastern Hokkaido. The rapid rise and fall of radiocarbon dates around this temporal period is a potential product of the short and intense occupation of the remote islands by populations with ties to Northern Hokkaido in addition to the smaller but more consistent occupation of the southern islands by populations with ties to Eastern Hokkaido. For approximately 100 years, (900-1000 cal BP), these two populations co-inhabited the Kuril Islands. Due to either broad environmental changes or disturbances in social and/or political connections (discussed further in chapter 7) both populations appear to have abandoned the island chain after 700 cal BP.

Chapter 6: The Production and Use of Pottery in the Kuril Islands

6.1 Introduction

Archaeological evidence from hunter-gatherers demonstrates that a majority of foraging societies do not produce pottery (Arnold 1985). It is perhaps surprising that one of the most noticeable features of the Northeast Asia archaeological record is the abundance of pottery artifacts associated with hunter-gatherer societies. As discussed in previous chapters, pottery remains are found on nearly every island in the Kuril archipelago from the large and ecologically diverse southern islands to the small and remote islands of the central and northern regions. Furthermore, radiocarbon dates from the southern islands demonstrate a long history of pottery use with ceramic production stretching over nearly 8,000 years until the adoption of metal implements. Given the importance of regional differences to expectations of the information network model (Chapter 2), the technological analysis of pottery remains from the Kuril archipelago provides an important set of data with which to compare populations inhabiting these different regions. It is expectation of this research that cultural or regional differences in the production and use of pottery can therefore be informative to the broader aims of this dissertation by providing a preliminary sense of how populations are interacting with and adapting to their local and regional environment.

6.2 The Pottery Production Process in the Kuril Islands

As established in Chapter 5, the decorative features and vessel forms of pottery in the Kuril Islands are very similar to pottery styles found throughout the northern and eastern Hokkaido. However, given climatic and geological differences, the pottery producing environment in the Kuril Islands is unlike Hokkaido. Key differences include the reduced

availability of raw pottery resources (clay and wood) and longer drying times due to increased precipitation and fog. In this section, results from a materials science approach to pottery analysis are presented which explore the five general stages of pottery production: raw material acquisition, tempering, forming, finishing and drying/firing (Rice 1987).

6.2.1 Raw Clay Acquisition

The availability and quality of clay resources is perhaps the most frequently cited factor favoring or restricting pottery production (Arnold 1985:20). Clays are a product from the weathering of rock, with rocks highest in aluminum typically producing the highest amount of clays (alumno-silicates). In addition to their elemental properties, clay mineral sizes are less than two microns and have a flat particle shape (with opposite charges at either end). The weathering process for clays is largely a combination of chemical and mechanical processes with water, containing small amounts of acid, weathering away rocks into smaller particles with physical factors such as temperature and rainfall greatly facilitating the weathering process. Clays are generally deposited into two forms, primary (or residual) clays and secondary (transported or sedimentary) clays (Rice 1987:36). Primary clays are characterized as being deposited in more or less the same location as their parent material, typically through hydrolic groundwater reactions plus weathering. These clays can form from various rocks or parent material such as granite, basalt, diorite or volcanic ash/tuff. Due to the process of alteration and rock/parent decomposition primary clays are often low in organic content (<1%) and plasticity while containing coarse, irregular fragments of the parent material. Secondary (or transported) clays are typically identified in clay deposits or beds, often at some distance from the parent material. The process of transportation commonly creates a more homogenous composition and

smooth texture of secondary clays compared to residual clays (Rice 1987:37). Secondary clays often demonstrate higher organic content (5-10%) depending upon depositional environment. The primary method of transport is used to classify secondary clay deposits with common descriptions including marine clays, lacustrine clays and aeolian clays.

Clay formation in the Kuril Islands can be characterized as either primary or secondary. Secondary clay deposition is likely more prominent on the large islands where mechanisms for the transportation of clay minerals are more common, such as landscapes with streams or rivers that may deposit clay particles in low energy water environments such as deltas/estuaries, swamps or lacustrine areas. The formation of clay on smaller islands that do not maintain low energy transport mechanisms (due to the steepness of the slopes), clay formation may occur in connection with histosols or organic-rich soils that commonly form in depressional areas, seeps or marshes (Lindbo and Kozlowski 2006). The process of clay formation in histosols is influenced by the strong effect of acidic humic material on the transformation of aluminum and iron-rich material including pyroclastic rocks and volcanic ash (Mizota and Reeuwijk 1989). The strong chemical reaction between acidic soil conditions and pyroclastic material leads to the formation of clays with fluids such as rainwater moving clay particles downwards to the water table and depositing them in layers through the process of percolation (Velde and Barre 2010). Field research by the KBP demonstrates evidence for this process in the smaller Kuril Islands with many of the organic-rich peat bogs sampled for pollen analysis are underlain by mixed clay deposits (Razzhigaeva et al. 2009).

Based on previous clay mineralogy research in the southern islands (Volchenkova et al. 1973) and the presence of acidic soils and pyroclastic material, it is the initial expectation of this research that clay formation in the Kuril Islands produces kaolinites (including halloysite) and

smectites. The specific formation of kaolinites or smectites is largely influenced by the localized depositional environment. In environments that are more acidic, such as swamps or peatbogs, pyroclastic material such as volcanic ash typically alters into kaolinite (Moore and Reynolds 1989). In a milder alkaline environment, such as a marine landscape, volcanic ash more likely alters into smectites (Moore and Reynolds 1989).

In order to investigate differences in clay minerals used for pottery production throughout the island chain, 25 samples (23 pottery, 2 raw clay) were analyzed using x-ray diffraction (XRD) for mineral classification. Within unfired clay samples, XRD analysis is capable of detecting structural differences among mineral groups based upon the constructive and destructive interference of x-rays reflected off of the crystal lattice structure of various clay minerals. In general, four different types of clay minerals can be recognized based upon their crystalline structure: kaolinites, illites, smectites and chlorites (Velde 1992). The identification of these minerals by XRD is largely based upon their differing lattice structures with kaolinite exhibiting a 1:1 layer structure with one silica (Si) layer for every one aluminum (Al) layer, which gives kaolinite a distinctive lattice width of around seven angstroms (\AA). Smectite and illite clay minerals have a 2:1 layer structure with two silica layers for every one aluminum layer, producing lattice widths around 10 \AA for illites and between 12 and 15 \AA for smectites (Moore and Reynolds 1989). The weak bonds that hold smectites together can be easily infiltrated by water, meaning that smectites (or montmorillonites) will often expand significantly when hydrated. The swelling properties of smectites are often utilized in their identification as smectite clays will uniformly expand to a lattice width of 17.2 \AA when hydrated.

While commonly used in the analysis of unfired clays, the use of XRD analysis for the classification of fired clays, which are most archaeological samples, can be more problematic.

The most significant issue associated with the XRD analysis of fired clays is that at temperatures necessary for firing ceramics (>550° C), many clay minerals lose their lattice structure causing amorphous lattice structure due to the fusing of clay minerals. However, not all clay types respond in similar ways to elevated temperatures. While kaolinites and smectites generally lose their structure, and their distinctive lattice width around 550°C, illites generally maintain their lattice structure until much higher temperatures (>1000°C). Based upon loss-on-ignition analysis indicating fairly low firing temperatures (section 6.2.5), it was expected that some pottery samples may have been fired at temperatures low enough that clay lattice structures would be partially modified but not completely lost. Therefore, determining exact clay mineral types of fired ceramics using XRD was not anticipated but obtaining a general classification of clays (kaolinites/smectites versus illites) and their non-plastic components was expected.

Given restrictions concerning the exportation of cultural artifacts from the Sakhalin Regional Museum, the 25 ceramic samples used in the XRD analysis were obtained from an assemblage of pottery sherds recovered from bulk soil samples exported to the University of Washington by the KBP. For each sample, approximately 5 grams of material was removed and pulverized. Clay-sized particles were separated by allowing the larger fraction to settle in a column of water and deflocculant, with clay-sized particles removed using a pipette placed at a specific depth based upon density and settling time (Stoke's Law). The clay-size fraction was then coated onto a glass slide for preferred orientation of clay minerals, and if necessary, ethylene glycol was used to saturate samples for analysis. The XRD analysis presented here was performed at the X-Ray Diffraction Laboratory in the Department of Materials Science and Engineering at the University of Washington on a Bruker Focus D8. Samples were run on a continuous scan rate of 0.50 seconds at step increments of 0.01 degrees with settings of 40 KeV

and 40 μA over a range of 5-60 degrees, ethylene-glycol saturated samples were analyzed over a range of 3-35 degrees.

Results of XRD analysis demonstrate that the primary peaks of analyzed samples are largely associated with non-clay minerals and do not provide direct evidence for specific clay mineral types but do indicate general patterns of clay minerals. In all samples, peaks associated with the presence of quartz ($3.3 \text{ \AA} / 26.4 2\theta$) and plagioclase feldspar ($4.0 \text{ \AA} / 21.7 2\theta$ and $3.2 \text{ \AA} / 27.7 2\theta$), ranging from anorthite to albite, dominate the spectra (see figure 6.1). As expected, most samples do not demonstrate any significant peak between 15 and 7 \AA ($5\text{-}10 2\theta$), suggesting the collapse of peaks due to the exposure of higher temperatures associated with firing. However, the absence of any peaks in this range is informative as it suggests that most samples are kaolinitic or smectitic in origin and not illitic, as illite-based clays would have likely maintained a 10 \AA peak.

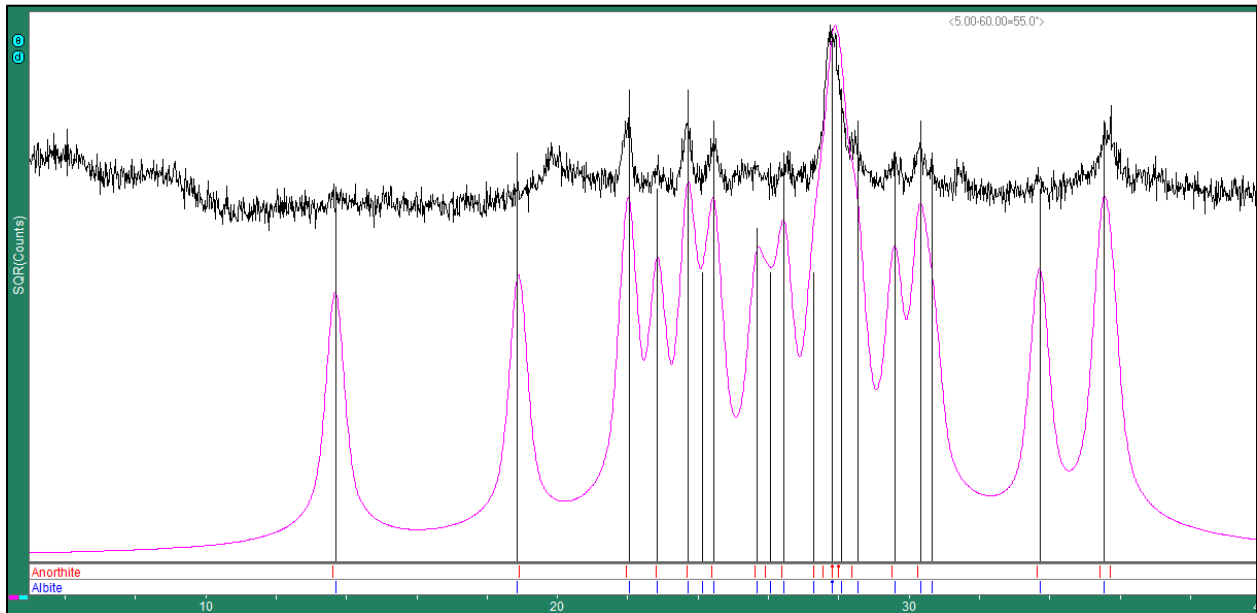


Figure 6.1 XRD spectra of sample FS#658 (Simushir Island) demonstrating the matching of sample spectra peaks to plagioclase feldspar peaks (anorthite/albite) (x-axis is labeled in 2θ spacing)

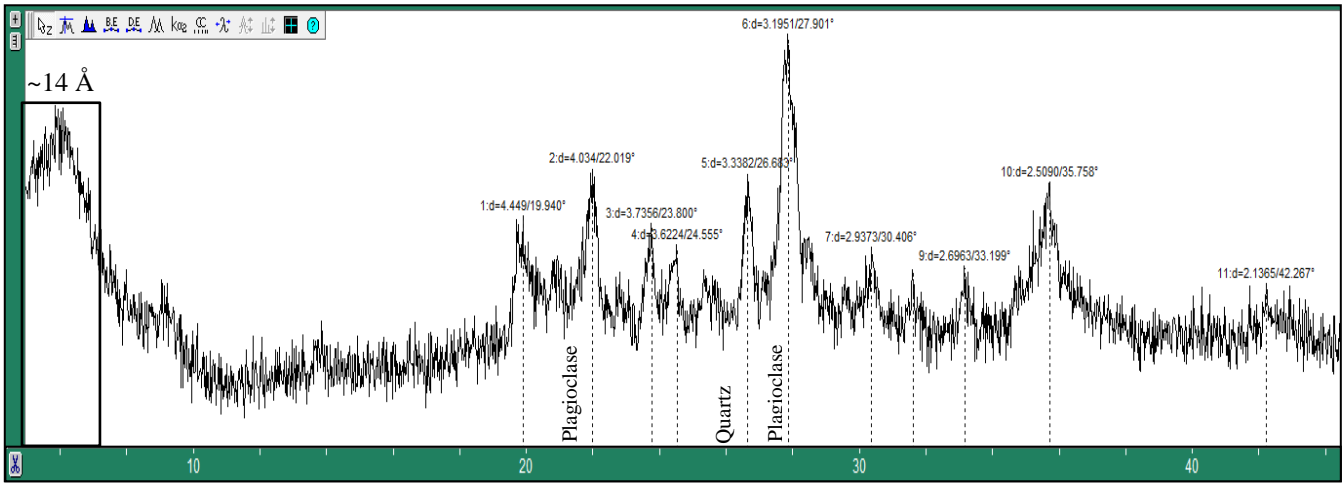


Figure 6.2 XRD spectra of sample FS#1874 (Ryponkicha Island) demonstrating main peaks associated with the presence of quartz, plagioclase feldspars and possible smectite peak

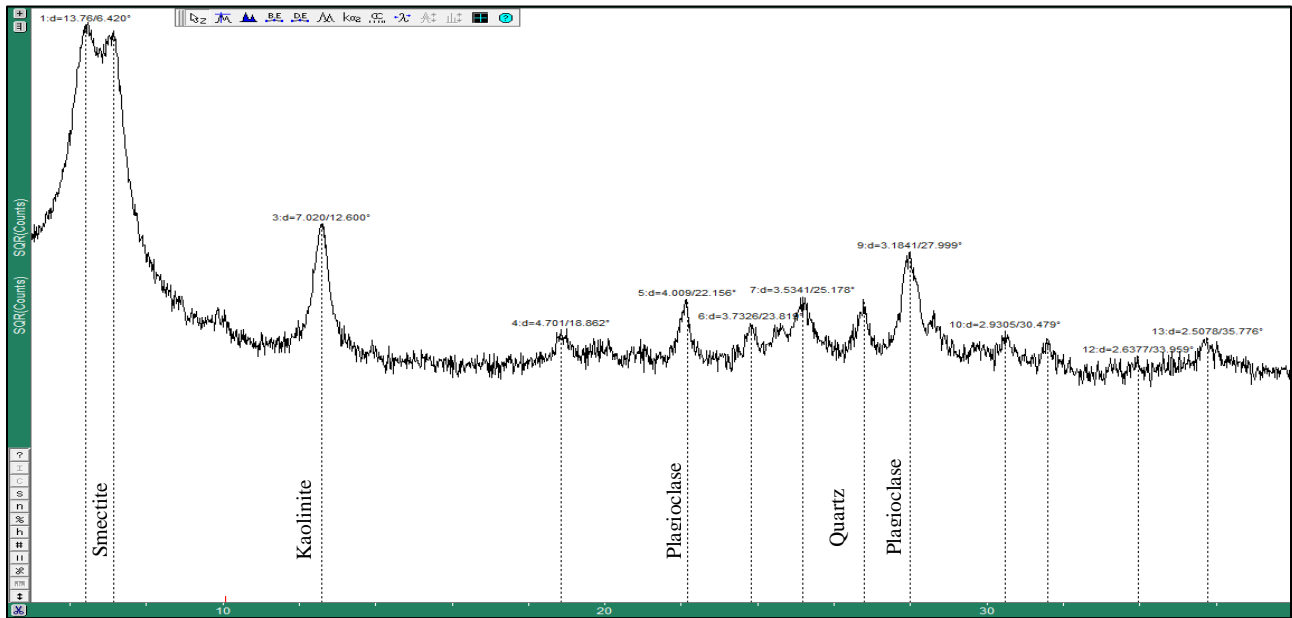


Figure 6.3 XRD spectra of sample Milna Bay raw clay (Simushir Island) demonstrating main peaks associated with the presence of quartz, plagioclase feldspars and mixed layer kaolinite-smectite peaks.

Sample FS#	Site	Cultural Affiliation	Non-Clay Minerals		Spectra Peaks (and associated clay minerals)				Expandable
			Quartz	Plagioclase	14A (Vermiculite)	10A / 9.5A (Illite/Heated Smectite)	7A (Kaolinite)	12-15 A (Smectite)	
2091	AIB	Okhotsk	X	X					no
1288.01-1	AIC	Epi-Jomon	X	X		X			no
2594-1	AIC	Okhotsk	X	X					
2563-2	AIC	Okhotsk	X	X		tr			
2569	AIC	Epi-Jomon	X	X		tr			
2567	AIC	Okhotsk	X	X					
2352-1	AIC	Epi-Jomon	X	X					
2263-6	AIC	Epi-Jomon	X	X					
905-1	BAI	Unknown	X	X					no
827	BOL	Unknown	X	X		tr	tr		
4849	CHI	Epi-Jomon	X	X					
1874	RYP	Okhotsk	X	X				X	yes
558-1	VOD	Okhotsk	X	X					
562-1	VOD	Okhotsk	X	X					yes
638-3	VOD	Okhotsk	X	X				X	
1024-1	VOD	Okhotsk	X	X					
658	VOD	Okhotsk	X	X					no
1236-1	VOD	Okhotsk	X	X					
1554-1	VOD	Okhotsk	X	X		tr		tr	yes
1554-2	VOD	Okhotsk	X	X				X	yes
1579-1	VOD	Epi-Jomon	X	X		tr			
1464-1	VOD	Epi-Jomon	X	X		tr			
Raw Clay	Milna Bay		X	X			X	X	
Raw Clay	Rasshua		X	X					no

Table 6.1 Summary of XRD spectra identifications for non-clay and clay minerals (x denotes presence of mineral, tr denotes trace identification of mineral, expandable refers to expansion of peaks due to ethylene glycol treatment)

Direct evidence for the presence of smectite clays can be partially identified in a few samples with the presence of diffuse peaks in the 12-15 Å region (see figure 6.2 sample spectra with peaks around 14 Å). The presence of peaks in this region suggests that at least some pottery sherds from the Kuril assemblage were fired at lower temperatures (< 550° C) and maintain similar mineralogical characteristics to unaltered raw clay. These similarities can be identified in comparing the Milna Bay raw sample which demonstrates a strong 7.0 Å peak and two 12-15 Å peaks, which is characteristic of raw kaolinitic-smectite mixed clays (see figure 6.3). The raw clay sample from the Rasshua I site was largely amorphous indicating clay material was less structured and potentially more similar to silt with high plasticity (see appendix B for all XRD spectra).

Overall, the evaluation of XRD spectra indicates that raw clay resources throughout the Kuril Islands are extremely similar in their non-clay minerals (quartz and plagioclase) but general differences exist in their clay minerals. At the sites of Vodopodnaya and Ryponkicha, located in the central islands, evidence of smectite (swelling) clays can be identified with both raw clay and archaeological samples demonstrating peaks in the 12-15 Å range and expansion of peaks to near 17.2 Å with ethylene glycol treatment. In contrast, archaeological samples from the southern site of Ainu Creek show only small peaks appearing in the 9.5 – 10 Å range suggesting the limited use of smectite clays or significantly higher firing temperatures. The utilization of smectite clays at these sites suggests some degree of adaptation by potters to local clay conditions as smectite clays are typically more challenging to work with as they have a greater probability of breaking or cracking during the firing process if a majority of water is not expelled in the drying of the vessel (Rye 1981).

An additional factor in the variability of raw clay resources is the content of organic matter in the clay. The presence of organic matter can help infer the depositional environment of clays as secondary clays often demonstrate a higher proportion of organic matter compared to primary clays. Organic content of pottery sherds was determined through the use of loss-on-ignition (LOI) tests which weighed pulverized samples before and after their heating to 550°C. Since these methods are necessary prior to inductively-coupled-plasma mass-spectrometry (ICP-MS), all 300 samples submitted for ICP-MS analysis in 2012 underwent LOI analysis at the Institute of the Earth's Crust, Russian Academy of Sciences, Irkutsk, Russia. Results from LOI analysis indicate the organic content of clay from pottery samples is fairly stable across regions of the Kuril Islands (see figure 6.4). Preliminary interpretation of LOI data suggests that raw clay resources used for pottery production are likely secondary clays or primary clays formed within organic rich environments. Thermal-gravimetric analysis (TGA) of six samples confirms that the weight loss associated with LOI results can be attributed to the loss of organic matter between 200-400° C rather than the dehydroxilation of clay minerals that often occurs at higher temperatures (see figure 6.5).

The implication of these analyses for archaeological research are that differences in clay resources in the Kuril Islands are connected with different landscape features, such as the presence of rivers, swamps, peatbogs or lakes. XRD results suggest that clay quality differed between locations but was not different enough to require the development of novel production strategies. Given the mobility of foraging population in this region, the location of high, medium and low quality clay deposits was probably well known with potters having preferences for certain deposits. If necessary, potters would have been able to produce usable vessels using whatever raw clay resources were immediately available.

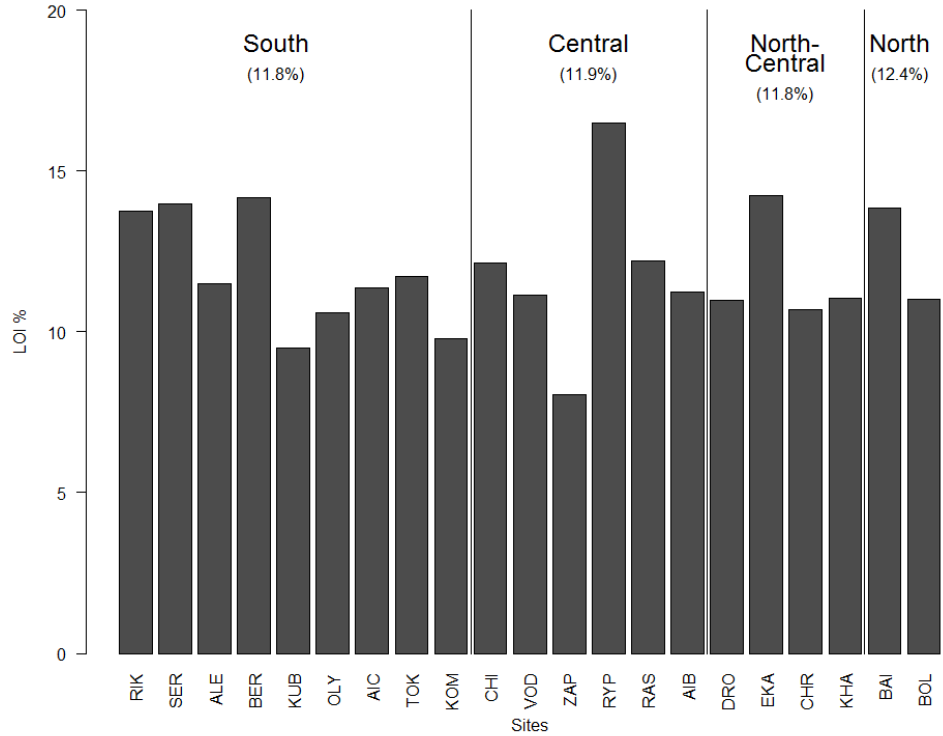


Figure 6.4 Results of LOI showing the average percent of weight loss for each site assemblage and regional assemblage after heating to 600°C (n=300).

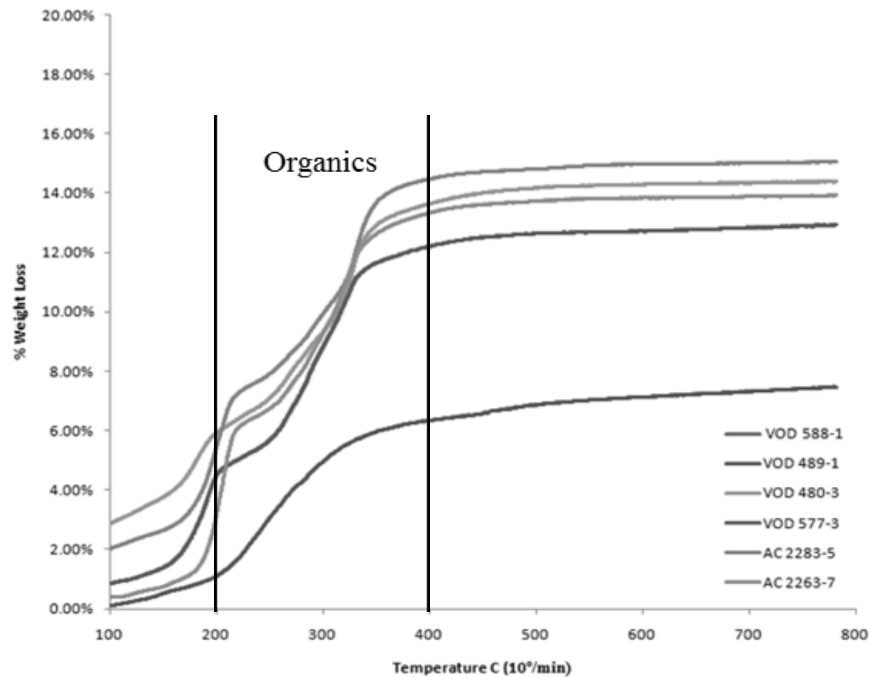


Figure 6.5 Results of TGA analysis demonstrating majority of weight loss derives from the loss of organic matter between 200 and 400° C

6.2.2 Tempering

In general, raw clays (particularly smectites) become hard and strong after firing at fairly low temperatures but are often too plastic for forming vessels without the inclusion of non-plastic additives, referred to as temper (Rye 1981). Temper is one of the most used, abused and imprecise terms in pottery analysis, defined as either the non-plastic components intentionally or unintentionally added to clay paste or to the action of adding these components (Rice 1987). Analysis of temper in this research will address three questions, 1) what type of temper is primarily used in production of pottery? 2) How abundant is temper in the clay pastes of Kuril pottery? 3) Are there spatial or cultural differences in temper type and abundances?

In order to evaluate tempering in Kuril pottery, this research used a combination of 45 petrographic thin section images and 244 polished section images. Petrographic thin sections were created by Burnham Petrographics using samples available at the University of Washington. Polished section images were obtained from selected sherds at the Sakhalin Regional Museum by producing a fresh break that was smoothed with the use of a grinding wheel and polished with a buffering wheel attached to a Dremel tool. Images of polished sections were taken using a portable digital microscope (Scalar DG-3) at 25x and 50x magnifications (see figure 6.6 for image example).

In the manufacture of pottery throughout the world, a wide variety of temper types are often recognized including organic materials (plants, animal feces and/or shells) and inorganic materials (sand, volcanic ash, crushed rock or crushed pot sherds/grog) (Arnold 1985). However, in the previous analysis of ceramics from around the Sea of Okhotsk (Deryugin 2008; Hall 2004; Kidder 1976; Tezuka and Fitzhugh 2004; Zhushchikhovskaya and Shubina 2006), a vast majority of vessels are solely tempered with inorganic mineral temper. Exceptions to this

include the use of organic temper (fiber temper) among early pottery traditions of the Initial, Early and Middle Jomon periods and the use of shell temper among the Imchin culture of northern Sakhalin (see chapter 5). In the Kuril pottery assemblage, visual analysis of petrographic thin sections and polished sections clearly demonstrate that the primary temper type is mineral-based, specifically the use of sand.

In order to investigate the abundance of mineral temper in Kuril pottery, this research examined the proportion of mineral temper to clay paste within selected sherd profiles. Evaluation of temper percentage was accomplished through quantitative image analysis of 45 petrographic thin sections and qualitative image analysis of 245 polished sections. Quantitative image analysis was performed using the Image Pro Plus 7.0 (IPP 7) software. Using IPP 7, mineral grains were selected by color with automatic calculation of the area occupied by these mineral grains compared to the total sherd profile area (see figure 6.6b). In the qualitative analysis of polished sections, images were classified into high (>25%), moderate (<25%, >10%) and low (<10%) temper percentages. The determination of temper abundance categories is based upon a one standard deviation (7.1%) increase or decrease from the mean temper percentage (17.1%) based upon quantified petrographic thin sections (see figure 6.7). This threshold generally corresponds to experimental work by Rye (1976) that suggests mineral temper percentages over 30% significantly alter the workability and performance characteristics of the clay paste. In order to evaluate the accuracy of polished section classifications, 45 polished section classifications were compared to the calculated values of 45 petrographic sections. Classification of polished section images correctly corresponded to quantified temper percentages in 36 out of 45 images (80% success rate).

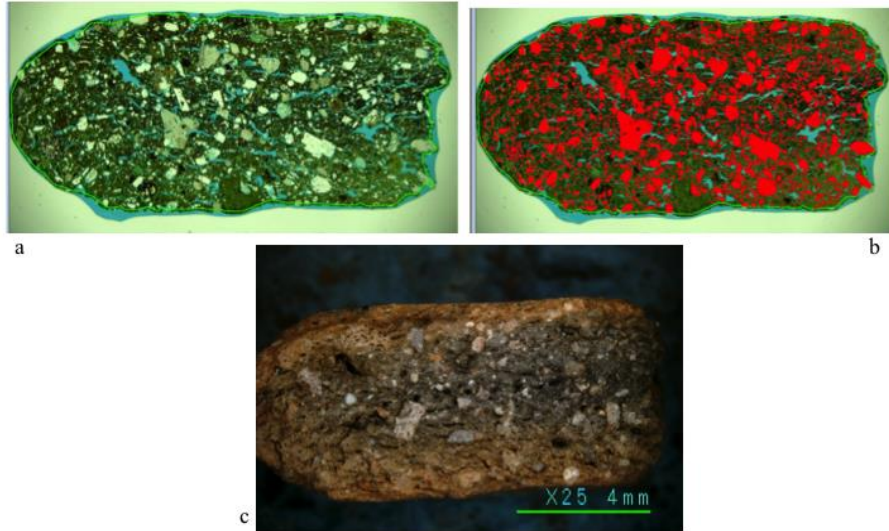


Figure 6.6 Images of sherd from the site of Vodopodnaya (FS#1579) which demonstrates a high percentage of temper (27.9%) in a standard petrographic thin section (a), a thin section with highlighted temper (b) and a 25x non-impregnated polished section (c); scale is the same for all images.

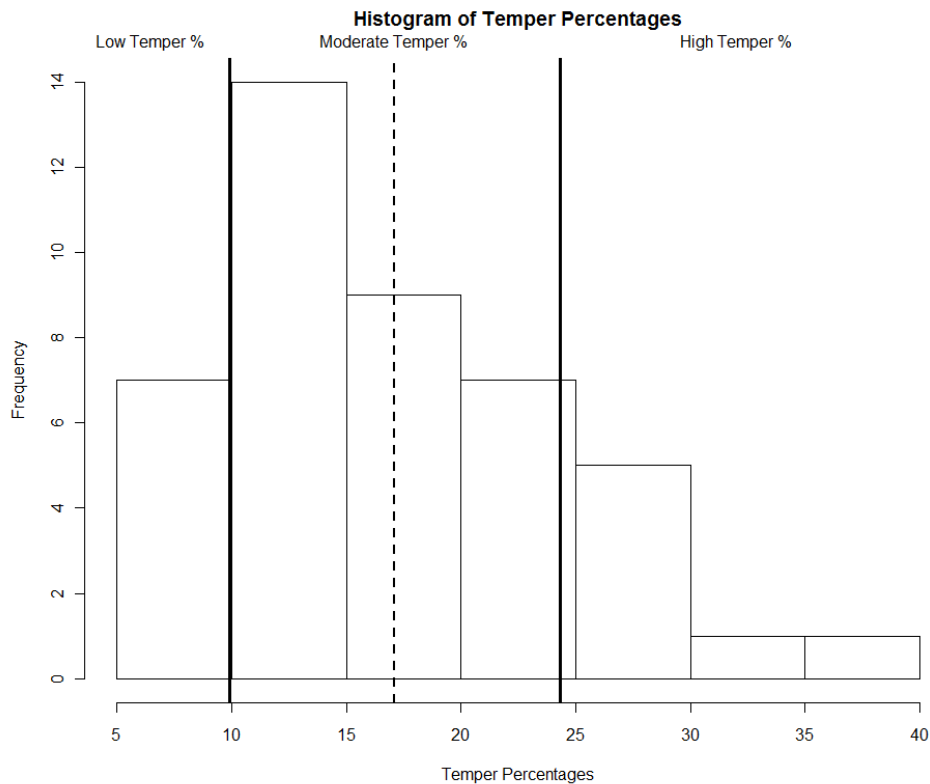


Figure 6.7 Histogram of temper percentages from image analysis of thin sections with a mean of 17.1% (dashed line) and a one standard deviation increase to 24.2% and decrease to 9.9% (thick lines).

The distribution of quantified temper percentages from thin sections (Figure 6.7) indicates that a majority (66%) of the 45 petrographic thin sections have temper abundances within the moderate range of workability (10-25%). The major advantages of temper abundances in this range is an increase in clay paste workability (especially if raw clay resources are very sticky or wet) and a reduction in thermal stress and cracking without producing significant changes to the clay performance. If sherd temper classifications are evaluated based upon their chronological affiliation (see figure 6.8), a general shift can be recognized from predominantly high and moderate abundances during earlier periods (2800-1600 cal BP) to low and moderate abundances during later periods (1600-700 cal BP). These results suggest that the amount of temper used in pottery manufacture has cultural affiliations with Epi-Jomon population generally using more temper than Okhotsk populations.

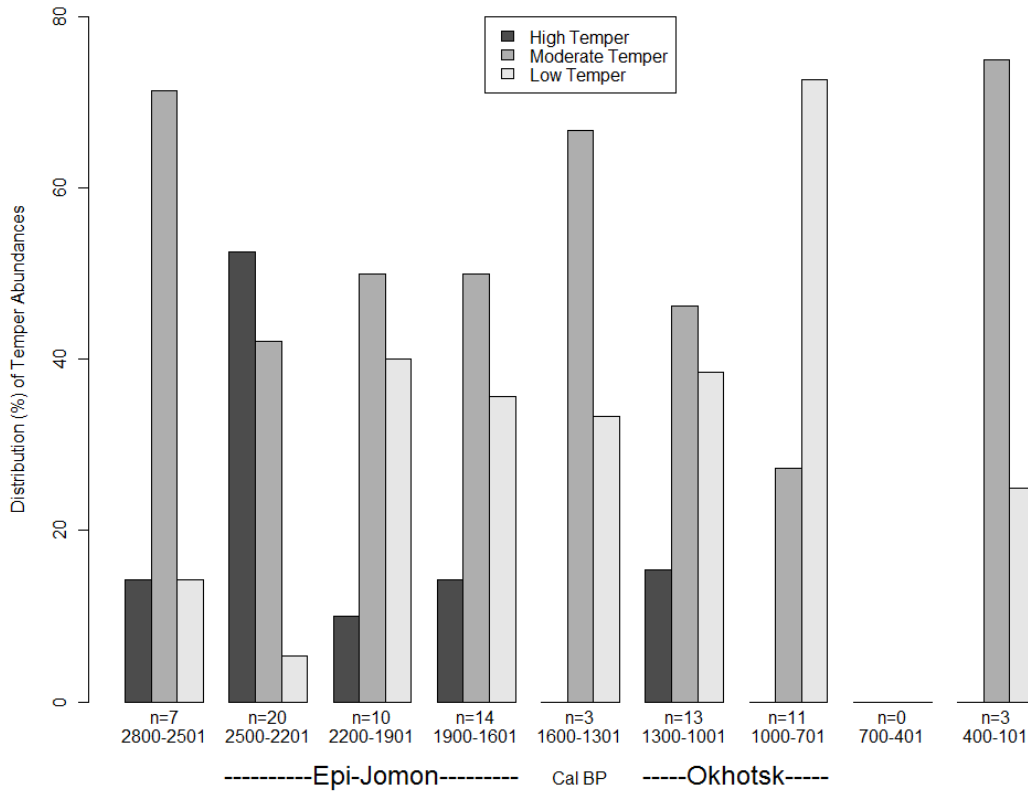


Figure 6.8 Distribution of temper abundances for chronologically affiliated sherds (n=81)

6.2.3 *Forming*

Previous technological choices in the acquisition of raw clay and tempering are largely influenced by the intended size and shape of the vessel and the general method used for forming and firing (Rice 1987). While several methods for vessel construction are commonly used among ethnographic hunter-gatherers, previous research on Jomon ceramics (Bleed 1978; Kidder 1976) indicates that vessel formation was largely accomplished by hand-forming techniques with coiling as the most prominent method used. The term coiling refers to the process by which coils are built up to establish vessel circumference and gradually increase the height of the vessel (Rye 1981). These coils are initially formed by rolling clay into long ropes whose diameter is typically two to three times the intended thickness of the vessel (Rice 1987). While commonly used, coiling methods are not ideal for vessel formation as the method can produce fractures in fired vessels if coils are not properly bonded together. Thus, coil-constructed pottery often requires additional forming methods such as beating, paddling or scraping in order to bond together coils, remove coil irregularities, thin walls and alter the general shape of the vessel. In the construction of most Jomon vessels (Middle to Late), scholars have suggested pottery was primarily formed using the coiling method (or possibly broad ribbons) on a flat surface with the aid of small mats made of leaves, with mat impressions occasionally identified on vessel bases (Kidder 1976). Once the general shape of the vessel was constructed, Jomon potters likely used cord-wrapped paddles to not only produce their diagnostic decorative features but also improve the overall durability of the vessel.

Perhaps one of the most significant choices any potter has in the formation of ceramic vessels is the thickness of vessel walls and bases. The thickness of walls is an important consideration as they are directly related to the size of the container as well as its intended use.

In general, thick walled vessels are advantageous in the use of pottery as storage vessels as it may be desirable to keep moisture in or out of the vessel (Rice 1987:227). Furthermore, thick walls are assumed to be more resistant to breakage through the course of everyday activities including pounding, stirring or mixing (Rice 1987:227). However, thick walled vessels are often more susceptible to stress and thermal fracturing during the drying and firing process due to their increased weight, challenges in removing remnant water and the differential expansion between the interior and exterior of the vessel during firing (Rye 1981). In cooking practices that use direct heating methods, thick vessels are often a disadvantage as thin walls are more resistant to thermal shock and conduct heat better, allowing food to cook faster and saving fuel (Henrickson and McDonald 1983:631). However, thick walled vessels can be considered advantageous in the use of hot-stone cooking methods as the thick walls reduce the loss of heat by providing greater insulation (Reid 1989).

In order to investigate vessel formation, body wall and base thickness were measured. Wall thickness was determined by averaging digital caliper measurements from two different locations on body sherds. Base thickness was determined by averaging digital caliper measurements from two different locations on broken base sherds. Based on these measurements, no significant spatial trends in wall thickness values can be identified in the assemblage as ANOVA results suggests no significant differences exist in wall thicknesses means between sherds from different regions (see figure 6.9 and table 6.2). Base thickness measurements also do not demonstrate statistically significant differences based upon their region of recovery (see figure 6.10 and table 6.2). Temporal trends in wall thickness were assessed by regressing wall thickness values with radiocarbon dates affiliated with sherds. No

statistically significant changes in wall thickness through time are identified with only a slight trend towards increased wall thickness from the Late Jomon to the Okhotsk period (figure 6.11).

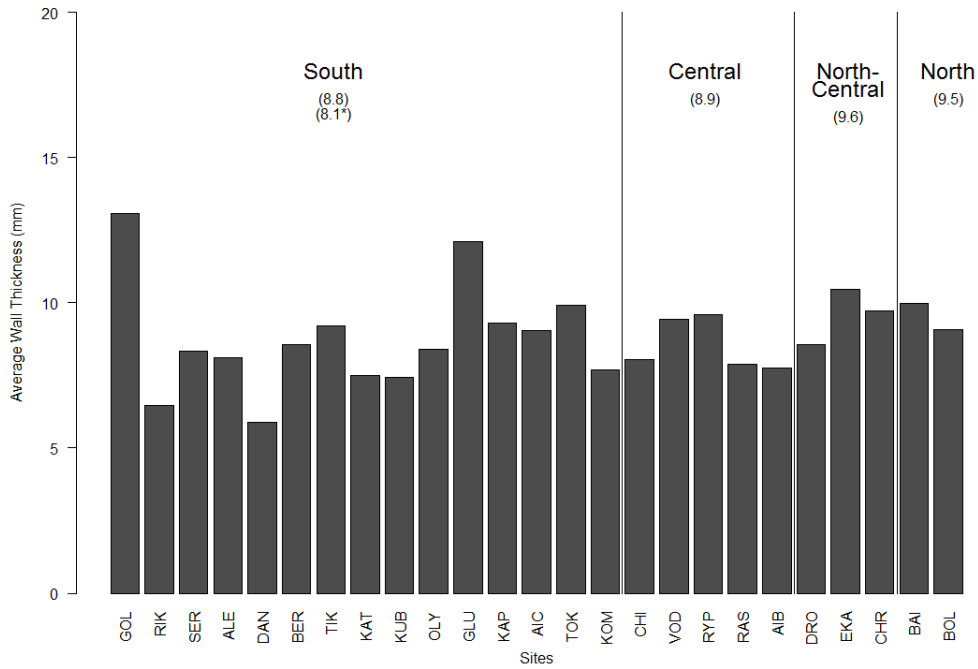


Figure 6.9 Average wall thickness of site assemblages with regional averages (* indicates regional average excluding two Middle Jomon sherds from GOL and GLU)

Wall Thickness		Base Thickness	
Regions	p-value	Regions	p-value
South - Central	0.562	South - Central	0.771
South - North Central	0.113	South - North Central	0.831
South - North	0.573	Central - North Central	0.889
Central - North Central	0.382		
Central - North	0.752		
North Central - North	0.997		

Table 6.2 One-way analysis of variance (ANOVA) results on the average wall and base thickness of sherds based upon their region of recovery to determine statistical significance.

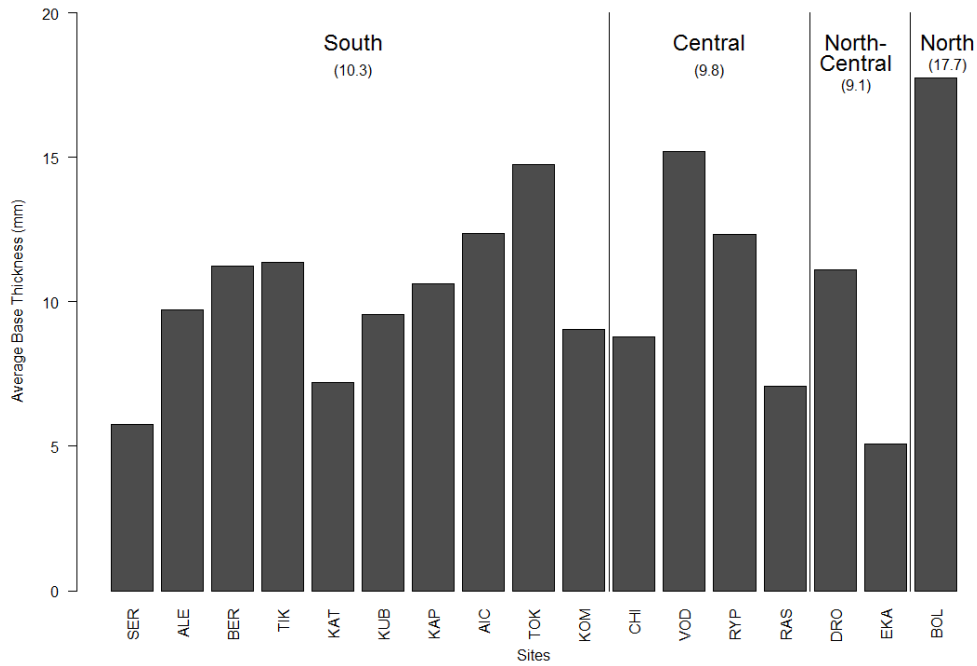


Figure 6.10 Average base thickness of site assemblages with regional averages

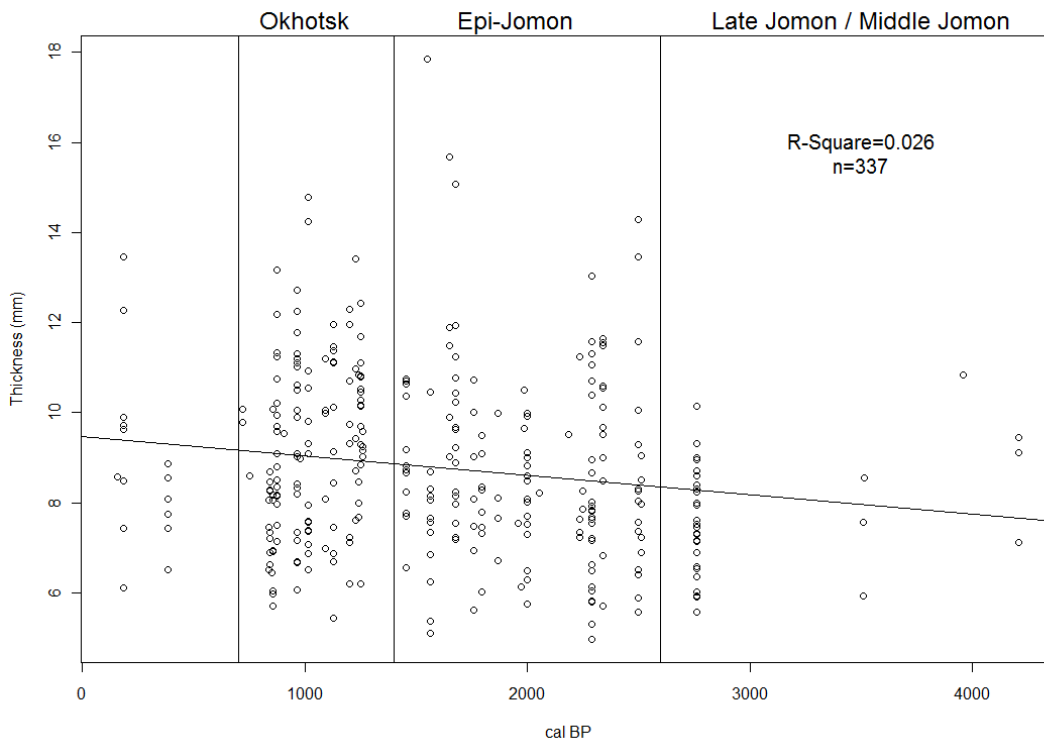


Figure 6.11 Scatterplot for wall thickness values of chronologically affiliated sherds with line of best fit and cultural periods

The differences in wall thickness between regions in the Kuril Islands may be partially explained by the more intensive occupation of the north-central and northern regions by Okhotsk populations. Based upon previous research around the Sea of Okhotsk (Zhushchikhovskaya and Shubina 2006) differences in wall thickness are often characteristic of pottery traditions associated with different cultures, specifically Epi-Jomon and Okhotsk. Using the classification scheme developed in chapter 5, pottery sherds with diagnostic traits were assigned cultural affiliation with cord-marking indicating Epi-Jomon affiliation and either linear incision, stamping or clear evidence of lower recurved body form indicating Okhotsk affiliation. Sherds stylistically assigned to the Okhotsk dataset based upon style had an 80% agreement with chronologically affiliated sherds (sherds with a radiocarbon date in the same level) with likely incorrect assignments stemming from mixed layers at Ainu Creek. Sherds stylistically assigned to the Epi-Jomon dataset based upon style had a 78% agreement with chronologically affiliated sherds (with incorrect assignments stemming from mixed layers at Rasshua). Table 6.3 indicates that the pottery assemblage from the Kuril Islands meets expectations from previous research, in that statistically significant differences (* = $p < .001$) in average wall and base thickness does occur between pottery sherds from different cultural traditions.

	Wall Thickness (mm)			Base Thickness (mm)		
	n	Mean	S.D.	n	Mean	S.D.
Epi-Jomon	354	8.2*	5.2	33	7.2*	1.5
Okhotsk	178	9.4*	2	54	12.1*	4.5

Table 6.3 Average wall and base thickness of sherds classified as either Epi-Jomon or Okhotsk. Welch's two-sample t-test for populations of different sizes and variances was utilized to determine the statistical significance of the mean differences.

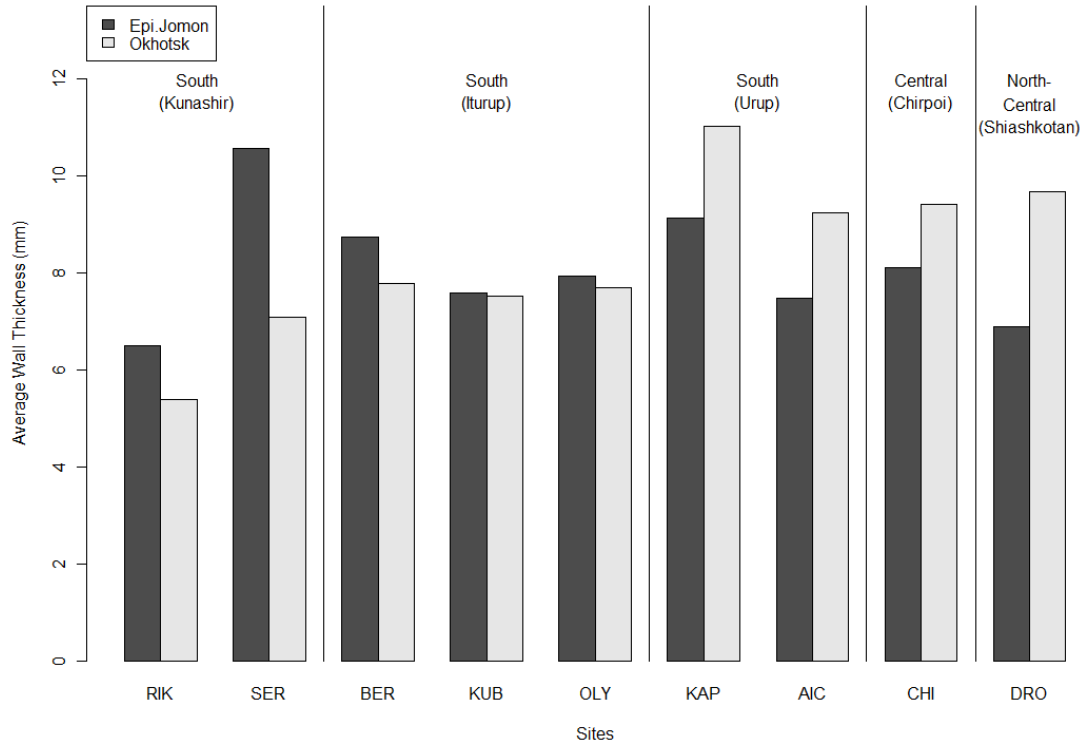


Figure 6.12 Barplot of average wall thickness from sites with sherds stylistically assigned to the Epi-Jomon and Okhotsk cultural traditions and arranged by region and island

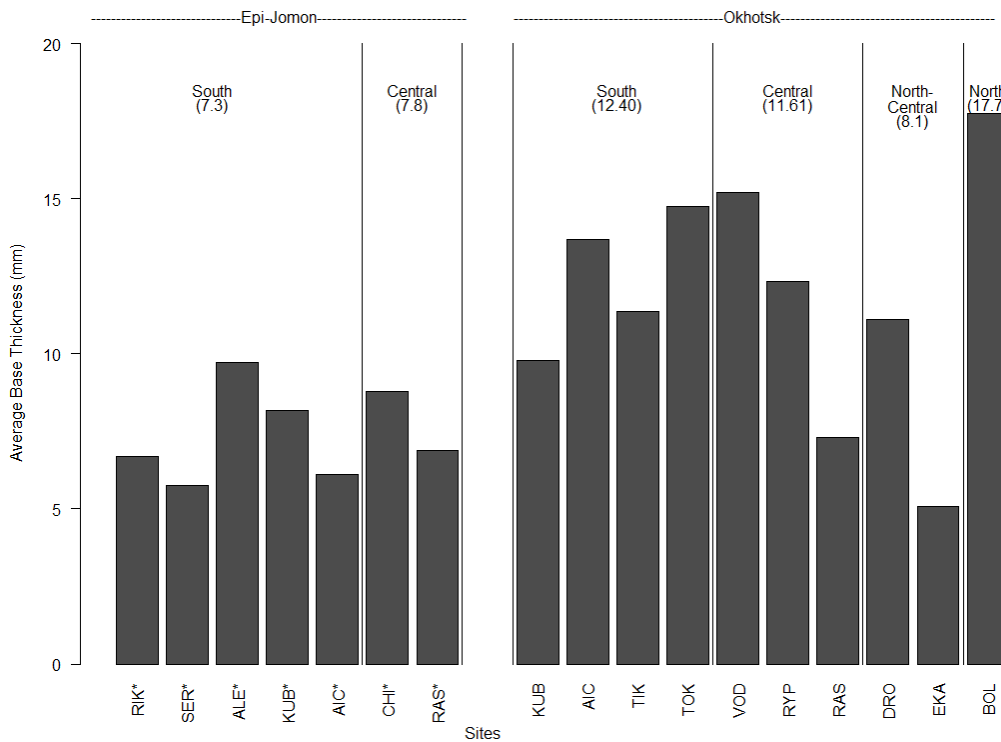


Figure 6.13 Barplot of average base thickness from sherds stylistically assigned to either the Epi-Jomon and Okhotsk cultural tradition and arranged by region (with regional averages)

In a spatial comparison of Epi-Jomon and Okhotsk wall thickness measurements, it is evident that thicker walls are associated with Okhotsk pottery fragments that are recovered from sites not located in the southernmost islands of the archipelago (Iturup and Kunashir). Comparing sites with both Epi-Jomon and Okhotsk assemblages (figure 6.12), Okhotsk sherds recovered from the most southern island of Kunashir are thinner on average than Epi-Jomon sherds. However, Okhotsk sherds recovered from the most northern island of the southern region (Urup) as well as sites in the central and north-central regions, have thicker walls than Epi-Jomon sherds on average. The same trend can be found with base thickness measurements as Okhotsk base sherds have a higher average thickness compared to Epi-Jomon base sherds recovered in the south and central regions (smaller sample sizes limit the direct comparison of Epi-Jomon and Okhotsk base sherds from the same site).

The implication of these formational differences in wall and base thickness within the Kuril pottery assemblage provide preliminary evidence for differential cooking strategies between Epi-Jomon and Okhotsk populations. Based upon research by Reid (1989), the design characteristics displayed by Okhotsk pottery in the remote islands suggest a cooking style based more upon hot-stone boiling methods rather than traditional open fire cooking methods. The thick fabric of Okhotsk vessels works as an insulator of heat rather than a conductor of heat, since the primary objective of hot-stone boiling methods is to retain heat inside of the vessel. Furthermore, Reid (1989:173) suggests that vessels used in conjunction with hot-stone boiling methods should display “an over-thickened, flat, stable base that can absorb the radiant and impact energy of hot stones”. The most significant advantage of hot-stone boiling compared to open fire cooking is a greater control over cooking temperature. Based upon ethnographic evidence from northwestern North American groups (Reid 1989), hot-stone boiling methods are

most commonly used when a long simmer (85-88° C), rather than a boil, is desired. Long simmer cooking strategies are typically employed in the reduction of bone collagen or fat to produce bone grease or oils. Additionally, carbonized remnants of marine fats (as identified through organic residue analysis) are more commonly identified on the surface of Okhotsk sherds (24%) compared to Epi-Jomon sherds (16%). While far from conclusive, the data presented here suggest the potential use of pottery by Okhotsk populations for the rendering of marine oils, a scenario to be examined in section 6.3 through the use of organic residue analysis.

6.2.4 Finishing

Prior to drying and firing clay vessels, secondary formations, or finishing techniques, are often employed to enhance certain performance characteristics or to enhance the surface of the vessel through decorative motifs. Common techniques used to enhance performance characteristics include beating or paddling, scraping, trimming or burnishing which also may provide decorative features. Finishing techniques used for surface enhancement on vessels are extremely diverse with the most common being those that displace the surface (punctuation, incision, impression, stamp) or those that add to the surface (applique, joins, slips, glazes, paint) (Rice 1987).

Within the Kuril pottery assemblage, decorative features applied during the finishing stage are useful for constructing ceramic typologies and were described in detail in Chapter 5. It is important to note that Jomon and Yayoi pottery throughout the Japanese archipelago demonstrate a wide array of finishing techniques that often transcend pottery vessels into artistic works by having intricate decorative motifs, paint colors, elaborate applique and even the use of lacquer to name only a few. However, due to either preservation issues or the largely utilitarian

nature of pottery in the Kuril Islands, almost no traces of these more intensive finishing techniques are recognized in the archipelago.

6.2.5 Drying / Firing

The drying and firing of pottery is perhaps one of the most crucial and challenging stages in the pottery production process. The main difficulty associated with the drying and firing process is the high variability in outcomes due to numerous factors that influence the process including the porosity and temper of the paste, the size and shape of the vessel, the firing temperature, fuel type, wind velocity and relative humidity (Arnold 1985; Shepard 1956). The process of drying and firing often requires the most time, effort and resources with the complete process sometimes lasting as long as three to four weeks and typically involving numerous individuals. As outlined by Eerkens et al. (2002), the constraints associated with drying and firing are one of the most significant limitations to producing pottery within small-scale societies as pottery production would only be beneficial when large numbers of pottery can be produced in a single firing event.

The drying and firing process would have likely been the most significant constraint to producing pottery in the Kuril Islands given the extremely foggy, damp and cold climate of the region. Based upon ethnographic pottery production in cool and rainy climates, pottery vessels can require between 2 to 4 weeks to be sufficiently dry in order to withstand firing without fracturing (Arnold 1985; Rice 1987). If only a few vessels were made or fired at any given time, drying may have occurred within pit-house structures. Additionally, many of the remote Kuril Islands only have driftwood resources, making fuel a potentially limiting resource in the firing of pottery vessels. Finally, radiocarbon data suggest that population sizes were comparatively small

during the Epi-Jomon and Okhotsk occupations potentially leading to limited demand for pottery and greater costs associated with single firing events. Given the challenges associated with drying and firing pottery in the remote Kuril Islands it is reasonable to hypothesize that pottery could have been formed and fired in regions more conducive to pottery production (such as the southern region) and imported to the remote islands. The need to import pottery into this region may also help to explain the overall lower number of pottery sherds recovered from the remote Kuril Islands, an issue that will be examined in more detail in chapter 7.

In order to examine firing conditions in the Kuril Islands, the firing core for 243 sherds was recorded. In an attempt to limit destructive analysis of sherds, firing core data was only recorded for sherds that were also selected for ICP-MS analysis or petrographic thin sections. Firing core was recorded from each polished section image as either fully or partially oxidized (1), oxidized on both surfaces and reduced in middle (2), oxidized on exterior and reduced in the interior (3), reduced on the exterior and oxidized on the interior (4), reduced on both surfaces and oxidized in the middle (5) and fully or partially reduced (6) (Rye 1981). Oxidized regions of the sherd were identified by the presence of brown to reddish-brown colors and reduced regions of the sherd were identified by grey to black colors (see figure 6.14 for examples). It is important to note that examining sherd surface and core colors without complimentary experimental firings only reveals the general firing atmosphere (open fire or kiln) and rarely provides direct evidence of firing temperature. This is due to the common alteration of sherd colors by post-firing use and/or postdepositional processes such as leeching or staining of the surface.

The firing core data presented here suggests the firing of Kuril pottery vessels took place within uncontrolled environments, most likely in open fire pits that are commonly identified within ethnographic contexts. This interpretation is based upon the high variability in firing

cores with a majority of sherds demonstrating either complete or partial reduction or complete and partial oxidization. The variability in these firing cores is largely attributed to variability in the firing atmosphere with numerous factors influencing the firing core, such as the placement of the vessel within the fire or the amount of organic material present in the clay paste (Rye 1981). In more controlled firing atmospheres, it would be expected that either all the pottery is reduced or all the pottery is oxidized, rather than the bimodal distribution of firing cores characteristic of open firing methods (see figure 6.15).

Based upon XRD and LOI results, it is estimated that the firing temperature of pottery in the Kuril Islands is typically between 550°C and 750° C. These temperatures are congruent with low open pit firing temperatures which are generally between 550° C and 900° C with maximum temperatures attained at or just after the fuel covering the pottery has been consumed (Rice 1987). This temperature range can be considered fairly low but should be considered decent given the difficult weather conditions of the archipelago. While open pit firing methods have numerous disadvantages such as high fuel use, high vessel fracture rates and susceptibility to weather (Rice 1987), this technique generally provides a satisfactory solution for nonindustrial potters, such as those in the Kuril Islands, simply seeking to produce a usable ceramic vessel.

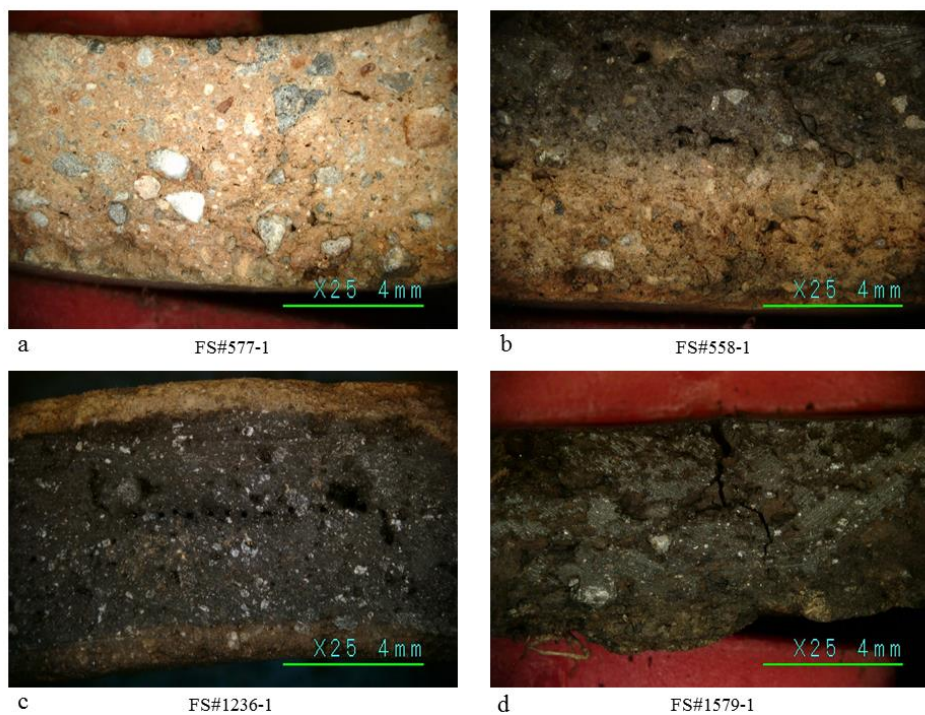


Figure 6.14 Examples of various firing cores from the Vodopodnaya 2 (VOD) pottery assemblage. a) fully oxidized; b) oxidized exterior, reduced interior, c) oxidized exterior surfaces, reduced middle; d) fully reduced

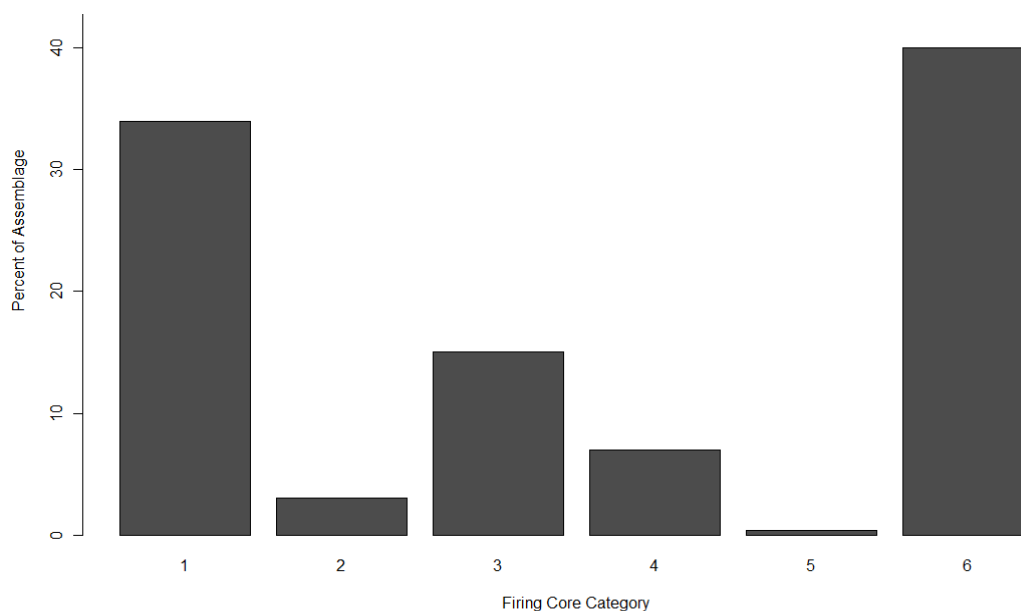


Figure 6.15 Distribution of firing cores from 243 pottery sherds from across the Kuril Islands. 1) fully oxidized; 2) oxidized surfaces, reduced middle; 3) oxidized exterior, reduced interior; 4) reduced exterior, oxidized interior; 5) reduced surfaces, oxidized middle; 6) fully reduced

6.3 Exploring Cooking Strategies in the Kuril Islands

Variability in wall and base thickness between Okhotsk and Epi-Jomon pottery potentially suggest the use of different cooking strategies between these populations. In order to more explore this issue, pilot lipid residue analysis was conducted to identify potential resources that were cooked and the temperature to which these resources were cooked. If pottery was primarily used in cooking practices that utilize direct heat, it is expected that lipid residues extracted from sherds would demonstrate clear biomarkers of the utilized resources. If pottery was used for low heat practices, such as the rendering of marine oils, it is expected that organic residues extracted from vessels would demonstrate similar lipid signatures but lack clear biomarkers that are produced by the repeated heating of fatty acids to higher temperatures.

The identification of organic residues associated with marine fats/oils has often been difficult to identify due to the rapid degradation of unsaturated fatty acids during pottery vessel use and burial (Evershed et al. 2008). However, despite these issues recent research (Craig et al. 2011; Copley et al. 2004; Evershed et al. 2008; Hansel et al. 2004; Heron et al. 2010) has demonstrated the presence of two biomarkers that provide clear evidence for the presence of marine fats/oils. These biomarkers include two isoprenoid acids, phytanic acid (3,7,11,15-tetramethylhexadecanoic acid) and 4,8,12-TMTD (4,8,12-trimethyltridecanoic acid) as well as the family of ω -(*o*-alkaphenyl) alkanolic acids. Experimental work has demonstrated that ω -(*o*-alkaphenyl) alkanolic acids are only produced through the prolonged heating of unsaturated fatty acids at 270° C or above (Evershed et al. 2008; Heron et al. 2010). Identification of these biomarkers within Kuril lipid samples was performed through analysis of ion chromatograms with the identification of each biomarker based upon their specific mass to charge ratio (m/z) of their trimethylester (TME) derivative (see figures 6.16 and 6.17).

Lipid residue analysis of extracted fatty acids was performed at the Sachs Lab at the University of Washington on 16 ceramic sherds from four archaeological sites in the Kuril Islands (Ainu Creek (south), Vodopodnaya (central), Rasshua (central) and Ainu Bay (central)). In cooperation with fellow University of Washington graduate student Seungki Kwak, lipid analysis was performed following established laboratory protocols (Evershed et al. 1990; 1994) by pulverizing pottery sherds and extracting lipids by accelerated solvent extraction (ASE) in a dichloromethane: methanol (DCM) solvent. The solvent extract was evaporated under N₂ to obtain a total lipid extraction (TLE). The total lipid extract was silylated and analyzed by gas chromatography-mass spectrometry (GC-MS).

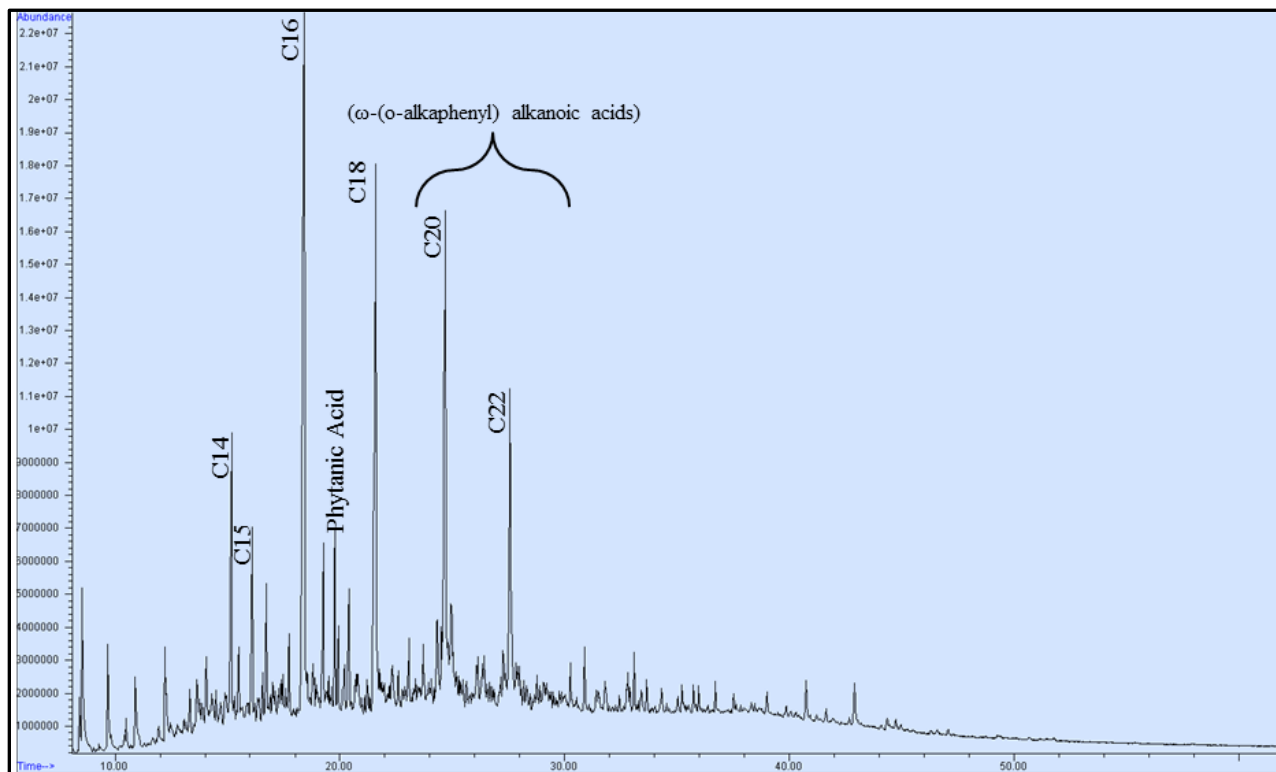


Figure 6.16 Total ion chromatogram of sample 2352-2 from Ainu Creek showing common monocarboxylic acids (C14-C22), phytanic acid and the region of alkanolic acids.

ω -(o-alkylphenyl) alkanolic	m/z	Isoprenoid Acids	m/z
ω -C18s	333.60	4,8,12 TMTD	313.498
ω -C20s	361.60	Phytanic acid	369.608
ω -C22s	389.70		

Table 6.4 Mass to charge ratio of key marine biomarkers (TME derivative)

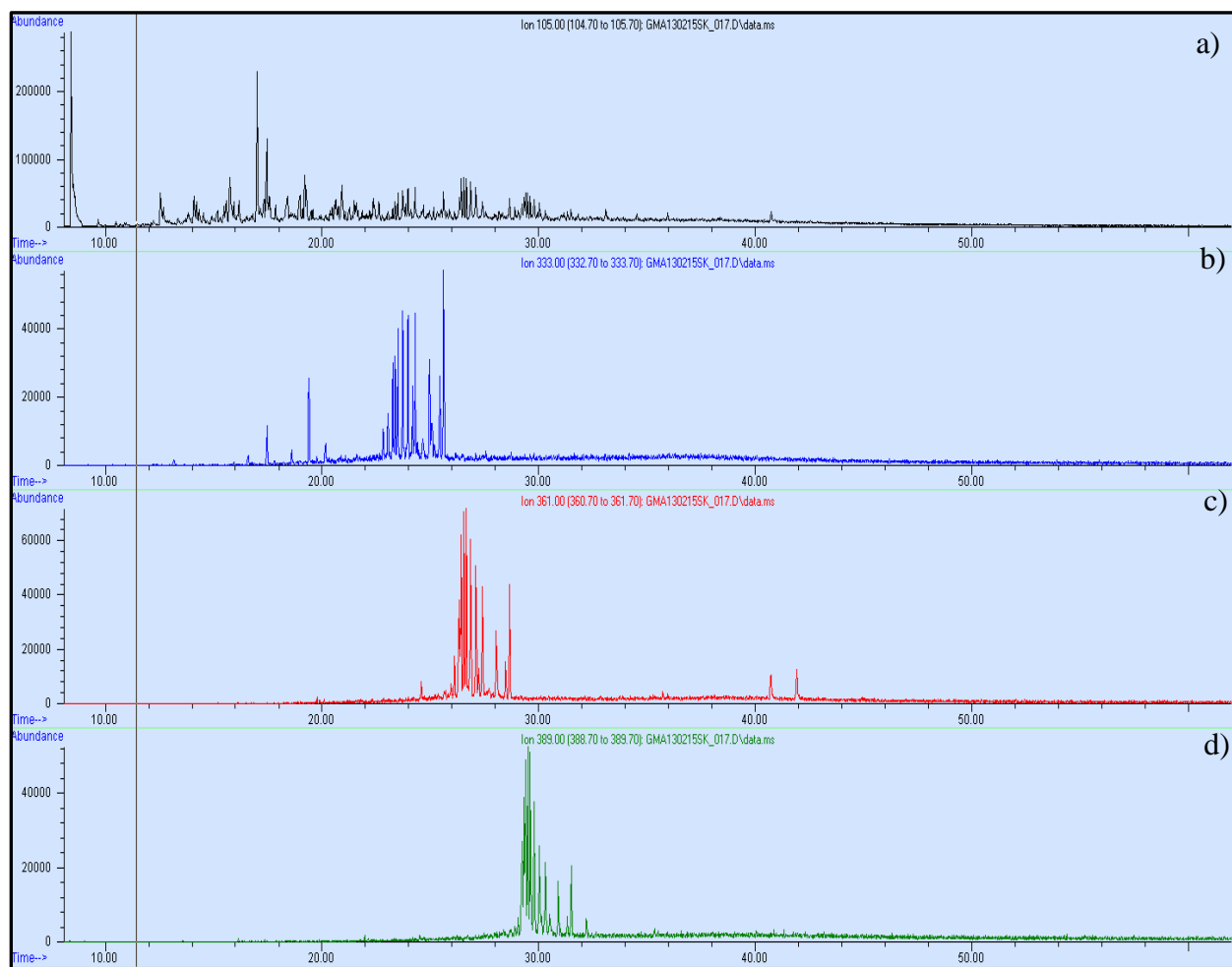


Figure 6.17 Four ion chromatograms from EG1-AIC (FS#2283-5) showing a) the 105 m/z chromatogram highlighting the range of ω -(o-alkylphenyl) alkanolic, b) the presence of ω -C18s (333 m/z), c) the presence of ω -C20s (361 m/z), and d) the presence of ω -C22s (389 m/z)

Sample Name (Sachs Lab)	FS#	Site	Unit	Level	Cultural Affiliation	Radiocarbon Date(s) (cal BP)	Biomarker Present?
EG12-AIB	AIB Surface	AIB	Surface	Surface	Unknown	n/a	Yes
EG4-AIC	2253-4	AIC	UA4	L2	Unknown	n/a	No
EG5-AIC	2263-1	AIC	UC5	L2	Okhotsk	n/a	No
EG3-AIC	1288.016-2	AIC	UA1	L2	Epi-Jomon	2305; 2377	No
EG1-AIC	2283-5	AIC	UA1	L2	Epi-Jomon	2305; 2377	Yes
EG3-AIC	2263-7	AIC	UC5	L2	Okhotsk	n/a	Yes
EG6-AIC	2563-1	AIC	Ub2	L2	Epi-Jomon	2232	Yes
EG1-AIC	2352-2	AIC	Ub3	L3	Epi-Jomon	2491	Yes
EG4-AIC	2263-3	AIC	UC5	L2	Okhotsk	n/a	Yes
EG11-RAS	RAS Surface	RAS	Surface	Surface	Unknown	n/a	No
EG5-RAS	3845	RAS	TP1A	L7	Epi-Jomon	n/a	No
EG7-VOD	558-1	VOD	TP1	L1	Okhotsk	1760	No
EG8-VOD	1024	VOD	TP3	L4	Okhotsk	1244; 1648; 2141	No
EG9-VOD	1277-1	VOD	TP3	Wall	Okhotsk	n/a	No
EG10-VOD	1378	VOD	U1	L4c	Okhotsk	1648	No
EG6-VOD	658	VOD	TP3	L4	Okhotsk	1244; 1648; 2141	Yes

Table 6.5 Summary table of sherds analyzed by GC-MS showing sherd provenience, cultural affiliation, affiliated radiocarbon dates and the presence of an identifiable marine biomarker

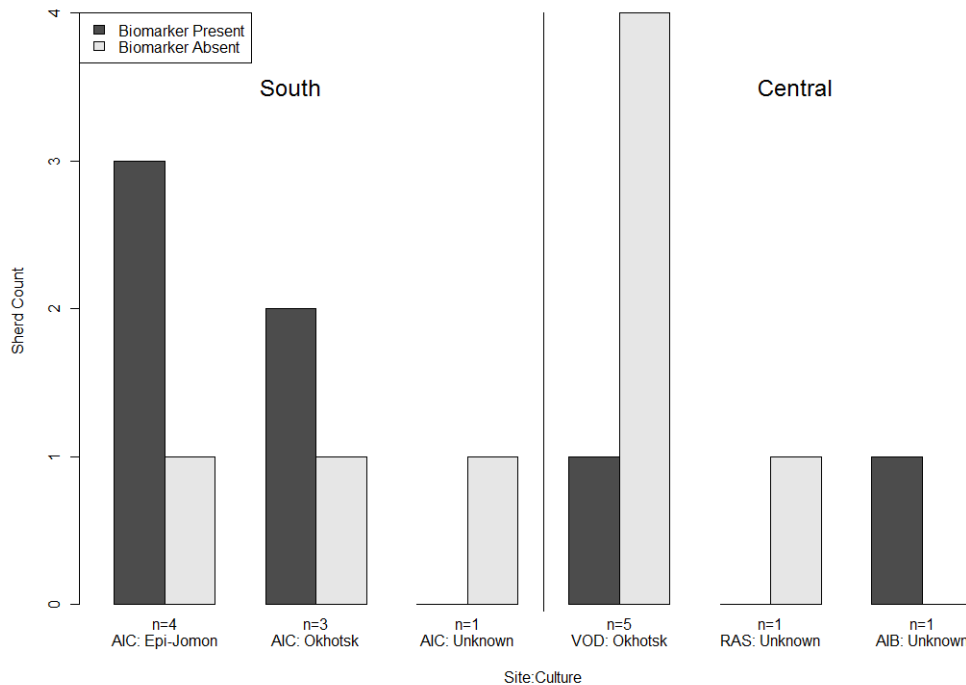


Figure 6.18 Barplot of sherds with marine biomarkers present or absent arranged by region, site and cultural affiliation of sherd



Figure 6.19 Plot of sherds analyzed by GC-MS with wall thickness measurements (logistic regression demonstrates no significant influence of wall thickness on biomarker presence ($p=0.577$))

Results of residue analysis suggest the use of direct heat cooking techniques at the southern archaeological site of Ainu Creek (see table 6.5 and figure 6.18) with a majority of samples (62.5%) demonstrating marine aquatic biomarkers that are produced from repeated heating to 270° C, including both Epi-Jomon and Okhotsk affiliated samples. The most common biomarkers identified included ω -(*o*-alkaphenyl) alkanolic acids as isoprenoid acid biomarkers often colluded with other organic compounds. Interestingly, pottery remains from the site of Vodopodnaya, in which all sherds are stylistically or chronologically associated with the Okhotsk culture, demonstrate a significantly lower proportion of sherds (20%) with marine aquatic biomarkers that are produced from prolonged heating. One possible explanation for the

lack of aquatic biomarkers in Okhotsk pottery is the use low heat cooking strategies. The relative absence of these biomarkers suggests the use of pottery as either storage devices or for the low-heat rendering of marine oils from fish or marine mammals that would not transform marine fatty acids into their aquatic biomarker form (ω -(o-alkaphenyl) alkanolic acids). Given the intriguing results of lipid residue analysis, future research (summer 2014) will emphasize a more detailed analysis of resource types used in the cooking process through the use of compound specific isotope analysis (CSIA).

6.4 Chapter Summary

In comparison with hunter-gatherer societies throughout human history, the extensive production and use of pottery by small-scale maritime hunter-gatherers in the Kuril Islands can be considered fairly unique. However, in the context of the pottery producing cultures of the Russian Far East and Japan, the production and use of pottery is not distinctive given the long history of pottery production and the strong social, ritual and historical connection of pottery and the Jomon tradition (Kobayashi 2004). While the social-cultural environment of the Jomon and Epi-Jomon populations living in the Kuril Islands may have promoted the production of pottery, the natural environment of the archipelago would have posed many unique challenges and choices to the pottery production process.

Perhaps the most significant technological constraint faced by potters in the Kuril Islands would have been the drying and firing of vessels. With the presence of swelling clays in combination with damp and foggy summer conditions, the drying and firing of the ceramic vessels in the would have been particularly problematic and a potentially novel challenge. This combination of geologic and climatic factors would have likely caused significant shrinkage

within vessels during the firing process and could potentially lead to large fractures and vessel failure. In fact, partial evidence for the shrinkage of vessels at Ainu Creek can be identified in petrographic thin sections by the presence of long, linear and parallel pores within the vessel matrix (Reedy 2008) (see figure 6.20). Solutions to the shrinkage problem would have likely included the addition of large quantities temper that could provide stability during firing by increasing vessel porosity.

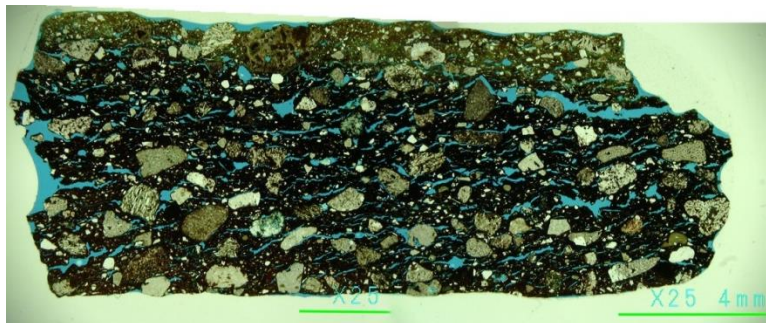


Table 6.20 Image of petrographic thin section from Ainu Creek showing the presence of long, linear and parallel pores (in blue) likely indicating vessel shrinkage

Overall, the regional pottery assemblages of the Kuril Islands appear to be relative similar in their pottery production process which is partially unexpected given the major biogeographical and geological differences between regions of the archipelago. This conclusion suggests that populations moving into the remote Kuril Islands did not need a significant landscape learning process in order to effectively access and use raw materials of the remote islands. It is important to note that key cultural differences in pottery production are apparent Okhotsk pottery potentially indicating that at least a portion of the assemblage may have been used in combination with low-heat cooking practices. This preliminary finding presents the possibility that Okhotsk populations were engaging in the production of marine oils. While significant future research is necessary to test this hypothesis, it should at least be considered that the rapid occupation and abandonment of the remote Kuril Islands by Okhotsk populations could be influenced by the demand for marine oil by populations living in or around Northeast Asia.

Chapter 7. Compositional and Network Analysis of Kuril Pottery

7.1 Information Network Model Expectations

The conceptual model used to frame this research (chapter 2) highlights the role of social networks within small-scale societies for minimizing the influence of uncertainty in social and environmental settings. Referred to as the information network model, this model assumes that information acquisition and transmission between individuals and/or populations living in the Kuril Islands was an important component of colonizing and inhabiting the archipelago, particularly in regions that experience unpredictable hazard events with variable outcomes. With all else being equal, this model expects that in locations where uncertainty about environmental conditions (social and natural) is greater, individuals would invest more heavily in acquiring information through more intensive monitoring of the local environment and increased social networking at multiple spatial scales. In environments with lower uncertainty, investment in social networking would be reduced as the costs associated with acquiring information from multiple and diverse sources are not as important to successful and long-term habitation of these more predictable regions.

The archaeological expectation of the information network model is that in the more uncertain environments of the Kuril Islands the structure of social networks should be of higher density, less centralized and consist of social ties occurring at local, regional and distant spatial scales. This structure, referred to as an “integrated” network would form in these regions as it provides the greatest flexibility in acquiring information as well as frequent opportunities to evaluate the accuracy of transmitted information through comparison of information with multiple sources. Integrated networks are expected to occur in the remote Kuril Islands (central

and north-central regions) due to their increased geographic isolation, reduced biological diversity and more frequent occurrence of unpredictable hazards (see chapter 3). In contrast, regions of the archipelago in which more complete knowledge of the social and natural environment is assumed, the archaeological expectation is for the formation of isolated or intermediate networks. These networks would tend to have lower density, higher centralization and a smaller spatial scale. This network structure is predicted to occur as the costs associated with maintaining social ties (interaction costs, material costs, etc.) outweigh the benefit of the information acquired.

It is important to note that exceptions to these model predictions may occur when interaction costs are extremely high (i.e. very isolated populations) which would favor isolated network structures, or if socio-political information from nearby and distant communities is highly valued which would favor a more integrated network structure. Given the lack of evidence for political hierarchies in the Kuril Islands (Fitzhugh et al. 2004) and the frequent movement of the ethnographic Kuril Ainu in between islands and regions of archipelago (see chapter 3), neither of these exceptions appears to significantly influence past Kuril inhabitants.

7.1.1 Expectations for Epi-Jomon and Okhotsk Networks

As highlighted in Chapter 4, the Kuril Islands experience two significant cultural periods of occupation, the Epi-Jomon and the Okhotsk. In both of these occupations, settlement data demonstrates that these cultures inhabited multiple regions of the island chain with contemporaneous populations potentially experiencing varying degrees of uncertainty based upon their geographic location. Based upon this spatial distribution of Epi-Jomon and Okhotsk sites, the networks for each cultural occupation are expected to a combination of the various

network types previously outlined (integrated, intermediate and isolated). In the Epi-Jomon period, 57% of sites identified by the KBP are located in the southern region with 36% located in the central region and 7% in the north-central region. Given the anticipated degree of uncertainty associated within different regions, the Epi-Jomon network is expected to be a display a range of network types with sites in the southern region tending towards isolated networks with only a few ties between nearby sites. In the remote Kuril Islands, denser and more centralized connections would develop with ties occurring at the local, supra-local and possibly even a few long-distance ties, more similar to an integrated network structure. The Okhotsk network, with 53% of sites located in the central and north-central region, would tend towards a more integrated network structure with south and north regions displaying intermediate and isolated sub-networks (see table 7.1 for details).

Culture	Region of Occupation	# of Sites	% of Sites	Expectation of Uncertainty	Predicted Network Structure
Epi-Jomon	South	8	57%	Low	Combination of integrated and isolated networks with sites in the southern region having only a few ties with nearby sites; denser and more centralized connections among sites in the central and north-central region with a few possible long-distance connections to sites in the southern region
	Central	5	36%	High	
	North-Central	1	7%	High	
Okhotsk	South	4	27%	Low	Combination of integrated, intermediate and isolated networks. Most ties will be clustered between central and north-central sites with fewer ties between sites in the southern and northern regions of the archipelago. Overall tie distances should be longer with more inter-regional ties extending from the central and north-central regions.
	Central	5	33%	High	
	North-Central	4	27%	High	
	North	2	13%	Medium	

Table 7.1 Summary of the expected Epi-Jomon and Okhotsk network structures

7.2. Constructing Network Models from Compositional Data

In order to compare predictions derived from the information networks model with archaeological networks, this research relied on the analysis of network models constructed from elemental compositional data that highlighted the exchange or movement of ceramic artifacts between archaeological sites. The use of compositional data to infer the structure of exchange relationships or mobility between archaeological sites differs from more traditional network construction methods that use a combination of technological and stylistic similarities (Mills et al. 2013; Mizoguchi 2009).

Networks ties using technological or stylistic similarities are constructed based upon the assumption that archaeological sites which contain artifacts with similar design motifs or production sequences have a higher probability of a social relationship, a concept known in network research as homophily (Wasserman and Faust 1994; McPherson et al. 2001). In other words, networks ties are given between archaeological sites that share an obsidian source or a design motif even though no direct evidence of information or material exchange exists between the two sites (Mills et al. 2013; Phillips 2011). By using elemental composition data, network ties in this research are not constructed based upon perceived similarities between artifact assemblages but rather the direct assessment of artifact movement between archaeological sites. This provides advantages in network construction as social ties are not based upon the use of stylistic typologies or archaeological assumptions of similarity in design patterns or production sequences. However, compositional data can produce alternative problems for network construction as it requires that the elemental signatures of artifacts clearly demonstrate clear spatial differences between archaeological sites or raw clay deposits. Based upon these factors, this research proceeded to construct and analyze network models by:

- 1) Classifying the relative proportion of locally and non-locally produced pottery at each archaeological site using elemental composition data from pottery sherds.

- 2) Investigating the movement or exchange of pottery between archaeological sites in the Kuril archipelago

- 3) Evaluating predictions of the information network model through analyzing archaeological network structures using social network analysis methods.

7.2.1 Review of Compositional Analysis using Archaeological Pottery

The goal of compositional analysis using pottery remains is to geographically classify artifacts on the basis of where they were geologically produced, referred to here as the process of creating source groups. However, the sourcing of ceramic artifacts requires a number of unique considerations compared to the more traditional compositional analysis of obsidian (Eerkens et al. 2002; Neff 2000). Perhaps most significant is that raw clay resources are often numerous throughout any landscape making the sampling of potential raw clay sources a tedious and expensive process that often yields poor results (Eerkens et al. 2002). Raw clay sources are also typically larger than obsidian sources making the inference between a geographic region and the presence of a raw clay source more difficult (Neff 2000). Finally, raw clay is formed and transported through a wide variety of geologic processes, such as the weathering of volcanic ash or alluvial deposition, which can cause the blending of clay particles and obscure what would otherwise be distinct clay source groups by creating a continuous distribution of chemically variable clays across a region (Eerkens et al. 2002; Pollard and Heron 2008).

While the compositional analysis of pottery is often more challenging than obsidian sourcing, the ubiquity of clay sources can be an advantage in investigating the production and exchange of pottery artifacts. Given that obsidian is only found in localized areas of Hokkaido and Kamchatka and not in the Kuril Islands, previous provenance studies using obsidian emphasize the long-distance movement and non-local exchange of this resource (Phillips 2011; Phillip and Speakman 2009). Thus, interpretations of obsidian compositional data are more relevant to exchange relationships located at the ends of the archipelago and is less informative about exchange relationships among populations within the island chain. In contrast, provenance studies using ceramics artifacts can be used to examine exchange relationships among populations *within* the Kuril Islands as many clay sources are utilized throughout the archipelago (see chapter 6). Therefore, tracing ceramic artifacts from their location of geologic origin to their archaeological place of recovery can help to infer the movement of pottery between archaeology sites or geographic regions as well as providing a basis for exploring social exchange relationships between Kuril populations.

Inductively coupled plasma-mass spectrometry (ICP-MS) is one of the most commonly used methods in the natural sciences for characterizing the elemental composition of materials (Pollard and Heron 2008; Speakman and Neff 2005). In general, the ICP-MS process works by ionizing sample material using a plasma torch (Pollard and Heron 2008). Common delivery methods of sample material to the plasma torch are laser ablation, chemical digestion or microwave digestion using a flow of argon gas. Once ionized, the sample material is introduced to the mass spectrometer by a series of high pressure cones. Upon entering the mass spectrometer, ions are separated by a series of charged rods, collectively known as the quadrupole mass filter. Once the ions are separated by their mass-to-charge (m/z) ratio they are

counted by a mass spectrometer which produces an elemental concentration value based upon the quantity of unique elemental counts (Pollard and Heron 2008).

While the use of ICP-MS methods for elemental characterization in the natural sciences is common, the method of choice for provenance studies among archaeologists is often Instrumental Neutron Activation Analysis (INAA). The prevalence of INAA among archaeologists is largely due to strong historical research connections between archaeologists and INAA research facilities as well as its high sensitivity and precision across a broad spectrum of elemental masses (Kennett et al. 2002). However, INAA does have a number of drawbacks for research including a higher cost per sample than ICP-MS and the need for access to a nuclear reactor which are becoming increasingly limited due to high costs of maintenance. Besides the reduced cost per sample, ICP-MS methods also allow for the analysis of smaller samples (~200 mg), the detection of more elements (up to 70 elements) and generally lower detection limits (Kennett et al. 2002). In this research, given the inability to export ceramic artifacts from the Sakhalin Regional Museum, access to an INAA facility was not possible. However, access to an ICP-MS instrument was available at the Institute of the Earth's Crust at the Russian Academy of Sciences Irkutsk (IEC-RAS-Irkutsk), Russia.

All samples used in this analysis were analyzed by ICP-MS with sample preparation carried out in the Laboratory of Geochronology and Isotopes at the Institute of the Earth's Crust, Russian Academy of Sciences-Irkutsk. Acid digestion of samples was performed in Teflon containers by heating a mixture of nitric (HNO_3) and hydrofluoric (HF) acid in a microwave with the addition of hydrogen peroxide for a more complete oxidation of the sample. Once digested in acid, measurements were performed on an Agilent 7500se quadrupole mass spectrometer with the use of USGS geologic standards (DNC-1, QLO-1, RGM-1) for calibration.

The use of either INAA or ICP-MS methods for provenance research on archaeological ceramics has various disadvantages. The most significant of these is that samples are often analyzed through bulk characterization, meaning that elemental profiles of archaeological ceramics reflect not just clay geochemistry but also other ingredients used in pottery manufacture (temper) as well as changes that result from use and diagenesis (Stoltman et al. 2005). The influence of intentionally added temper on the elemental characterization of pottery has been the subject of debate among pottery analysts (Eerkens et al. 2002; Neff 2012; Neff et al. 1989; Stoltman et al. 2005) with differing opinions as to the ultimate influence of temper on the chemical composition of raw clays. Recent commentary and literature review presented by Neff (2012), suggests that tempering is likely to have only a small influence on the identification of chemical source groups as empirical studies have demonstrated convincing source group matches without factoring in the effect of temper (Neff et al. 2006). Experimental data by Neff and colleagues (Neff et al. 1988) suggests that the addition of heterogeneous temper can create overlap between pottery assemblages from different clay sources, but pottery paste would need to include approximately 80% temper before unresolvable overlap between samples is reached. Furthermore, Eerkens et al. (2002) suggests the presence of sand temper, made up of primarily silicon and oxygen, will not sufficiently influence the characterization of minor and trace elements, unlike shell temper which can elevate a range of trace elements. Based upon the relatively high percentage (75.4%) of normal to low tempered sherds used in this analysis (see section 6.2.2), a dilution factor for sand temper (the only temper identified in the Kuril pottery assemblage) is not considered necessary to correct elemental concentration values.

7.2.2 Statistical Methods for the Identification of Ceramic Source Groups

The statistical methodology for identification of ceramic source groups used in this research endorses the creation of source groups using four statistical methods which include log-transformation, cluster analysis, principal component analysis (PCA) and group membership probabilities using Mahalanobis distances (similar to Glascock et al. 2004). The approach was pioneered by the Archeometry Laboratory at the University of Missouri Research Reactor and has been routinely applied with success (see Baxter 2001 for a detailed statistical discussion of the BNL/MURR approach).

Given that clay composition often contains a variable mixture of elemental concentrations, it is necessary prior to analysis to reduce the large differences between elemental concentrations through the practice of log-transforming original concentration data (Baxter 1995). This transformation produces statistically comparable values as well as enhancing the use of principal component analysis (PCA) in the identification of source groups, as PCA is a method known to be highly influenced by large differences in scale (Baxter 1995).

Cluster analysis is the measurement of the similarity or dissimilarity of observations and the use of a routine, or algorithm, for forming clusters based upon those similarities (Bartholomew et al. 2008). In analyzing compositional data, cluster analysis is used to provide initial groupings in the data that are further interpreted by principal component analysis and Mahalanobis distance probabilities (Glascock et al. 2004). In this research, cluster analysis is performed using Euclidean distance to determine similarity and a hierarchical single-linkage/nearest neighbor routine to form initial clusters. Only preliminary interpretation of group membership is drawn from cluster analysis as dendrograms produced by this method are easily manipulated by the choice of scaling, distance measure and clustering algorithm. In

addition, Euclidean distance is highly influenced by correlated variables which are common in geochemical data (Glascock et al. 2004).

Once initial clusters are identified through cluster analysis, this research used principal components analysis to identify key elements that are contributing most to the variability of the dataset. The goal of PCA is to reduce the overall dimensionality of the dataset to two variables that clearly demonstrate clustering patterns (source groups) within the geochemical data. In general, PCA seeks to replace the total amount of metrical variables with a much smaller number of uncorrelated variables which still contain a majority of the information in the original set (Bartholomew et al. 2008). If diagnostic elements that clearly indicate clusters in the data are not identified, PCA can also provide principal components with which to visually assess for the presence of clusters (see figure 7.1). Ultimately, the goal of the PCA transformation is to produce plots in which the first few principal components will reveal structure not readily observed when plotting combinations of original variables (Glascock et al. 2004).

Once initial cluster groups have been defined and evaluated through PCA, Mahalanobis distances (MD) probabilities are used to capture the uncertainty within cluster assignment. MD is defined as the squared Euclidean distance between the specimen and the group centroid divided by the group variance in the direction of the specimen (Glascock et al. 2004). . The main advantage of MD is calculating the probability that a particular specimen belongs to a group based upon both its proximity to the centroid but also the rate at which the density of the specimen decreases away from the centroid. However, one key limitation of using MD is that the number of group members must exceed the number of elements under consideration (Glascock et al. 2004). When group sizes are small, MD probabilities can and should be calculated on the largest principal components. Statistical analysis presented in this research was

performed using MURRAP statistical routines v8.8 with the GAUSS v8.0 runtime environment (freely available at <http://archaeometry.missouri.edu/>).

7.3 Sampling Strategy for Compositional Data

In total, 297 sherds and 3 standards were analyzed by inductively coupled plasma-mass spectrometry at the IEC-RAS-Irkutsk facility. Funding for the analysis of these sherds was provided by a National Science Foundation Doctoral Dissertation Improvement Grant from the Arctic Social Sciences division. Sherds were selected for analysis through a stratified random sampling process in which sampling strata were defined by region, island, site, excavation unit and level, vessel part and decorative features. When possible, sherds with distinctive decorative or formal features were selected first as these sherds would provide the easiest determination of cultural affiliation. If distinctive sherds were not available for sampling, either through absence of diagnostic traits or restrictions on physically modifying the sherds (sherds tagged for museum display were not to be sampled), samples were randomly selected within each excavation level. Given the drastic differences in site assemblage sizes and limitations on funding, sherds abundances were not equal across the sampling strata. For sherds with no diagnostic features, cultural affiliation was based upon the chronological period (Jomon, Epi-Jomon, Okhotsk, Naiji) of the radiocarbon date that was obtained nearest to the sherd. If no associated radiocarbon date was available, samples were classified as having an unknown cultural affiliation.

7.4 Identification of Local and Non-Local Pottery

Using elemental composition data from pottery artifacts recovered in the Kuril Islands, this research reconstructed archaeological networks through the classification of 297 pottery

samples as either locally or non-locally produced based upon their geochemical and spatial similarity. In this research, a local group is defined by a cluster of ceramic samples (≥ 3) that demonstrate similarities in their geochemical signature and have the same location of archaeological recovery. The MURR statistical approach was the preferred method to identify the presence of geochemically similar clusters at each archaeological site in this analysis. Given pilot data that demonstrated modern raw clay deposits cannot be reliably associated with archaeological pottery remains, the identification of local source groups in this research relies on the “provenance postulate” (Glascocock et al. 2004; Neff 2000; Weigand et al. 1977). The “provenance postulate” is a theoretical assumption that the chemical difference between two sources will exceed the variation within one source (within-source variability < between-source variability). Therefore, when samples cluster close together in dendrograms (cluster analysis) and hyperspace (PCA) it is assumed that these samples represent a single geologic source. In addition, this research also relies on the “criterion of abundance” (Bishop et al. 1982) which assumes that if a majority of samples in a single cluster come from the same archaeological site, it is assumed that the raw clay source (location of geologic origin) is likely found within the local vicinity of that site.

In this research, locally produced ceramics are classified as those samples which show geochemical similarity with other samples (cluster together in both cluster analysis and PCA biplots) and were also recovered from same archaeological site. Pottery samples that are not assigned to a local group (unassigned) are assumed to be non-local and will be examined for their probability of belonging to a local source group associated with a different archaeological site potentially indicating the movement of the artifact between sites (see section 7.5).

7.4.1 Results of Local and Non-Local Identification

Results of research on locally or imported pottery provide a number of interesting insights into pottery production and exchange in the Kuril Islands. Perhaps most interesting are the differences between archaeological sites in the number of samples that are unassigned and therefore considered to be non-local pottery samples. Archaeological sites, such as Rasshua I (figure 7.2), show strong clustering among many samples with nearly 90% of analyzed samples affiliated with a single cluster. Alternatively, archaeological sites such as Lake Lazournye I, demonstrate no clear clustering patterns with 0% of their samples associated with an identifiable cluster, in which case all samples were recorded as being non-local (see figure 7.3). In total, seven sites demonstrate the presence of two local source groups (clusters), seven sites indicate one local source group and two sites have no identifiable local source groups (see figures 7.1, 7.2 and 7.3 for examples of each, compositional plots for all sites can be found in appendix E). Linear regression indicates that the number of clusters at each site is not related to the sample sizes of each site assemblage ($r^2 = 0.03$). Interestingly, differences in the proportion of local and non-local sherds at each site tend to be associated with the region in which the archaeological site is located (see table 7.2 and figure 7.4). Sites in the remote islands (with the exception of Rasshua (RAS) and Drobnye (DRO)) have a tendency for a higher proportion of unassigned sherds compared to the southern region; however, this is likely influenced by the different settlement patterns associated with Epi-Jomon and Okhotsk occupations.

		# of Sherds	# of Local Source Groups	% of Sherds Assigned to a Local Source Group	% of Sherds Unassigned
South	RIK	15	2	93%	7%
	ALE	10	2	80%	20%
	SER	14	2	79%	21%
	BER	17	1	88%	12%
	KUB	17	1	83%	18%
	OLY	15	2	93%	7%
	AIC	30	1	30%	70%
	TOK	10	2	70%	30%
	KOM	20	1	65%	35%
Central	PES	13	1	31%	69%
	VOD	25	2	24%	76%
	ZAP	10	0	0%	100%
	RYP	8	1	63%	38%
	RAS	25	1	88%	12%
	AIB	8	1	38%	63%
North-Central	DRO	25	1	76%	24%
	EKA	5	0	0%	100%
	LAL	10	0	0%	100%
North	BAI	8	1	38%	63%
	BOL	10	2	90%	10%

295

Table 7.2 Table of the number of local groups identified at each site and the proportion of sherds that are either assigned or unassigned to the local groups

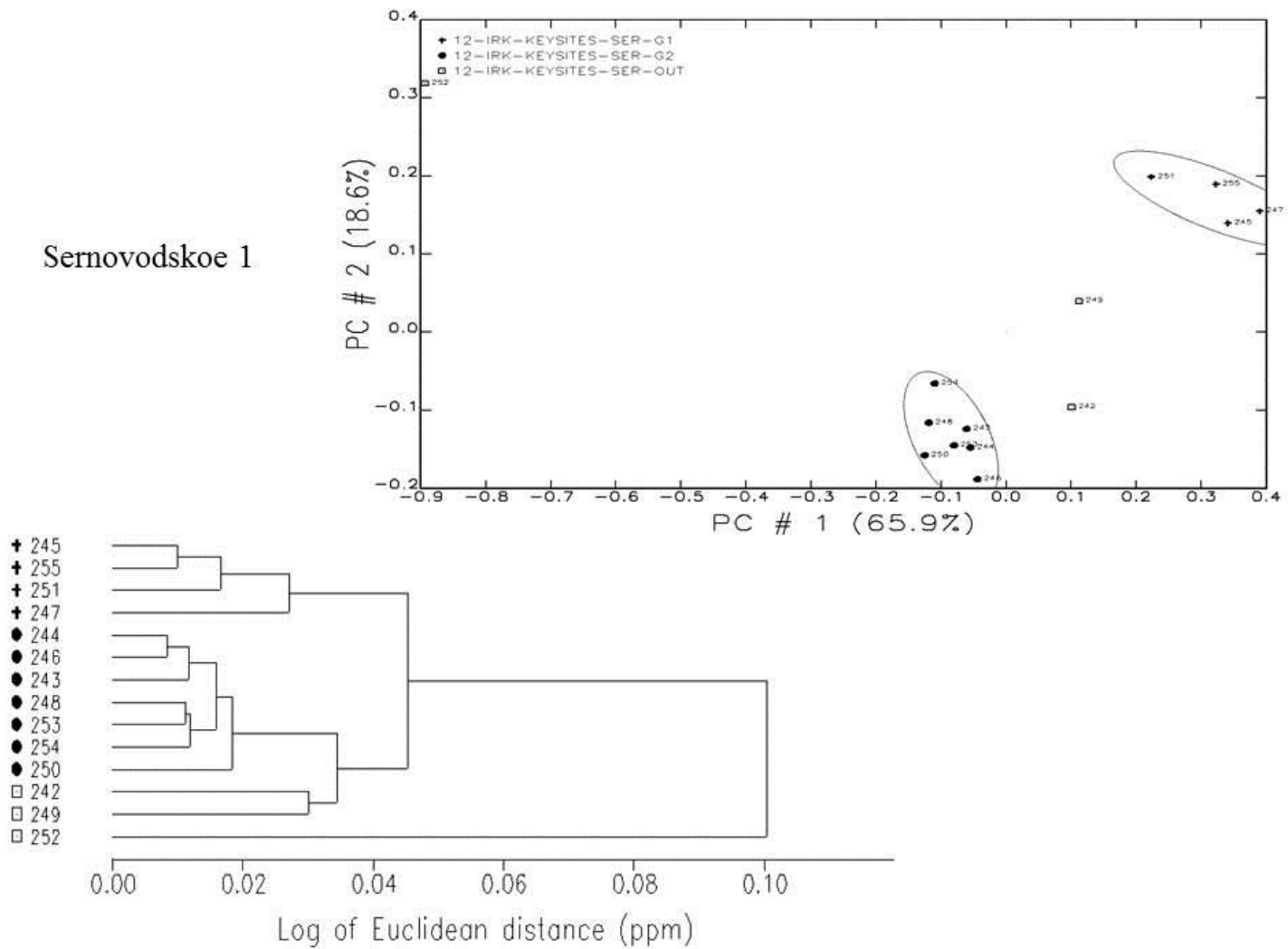


Figure 7.1 Cluster dendrogram (bottom) and PCA bivariate plot (top) of first two components (summarizing 84.5% of total variation) showing the presence of two clusters (local sources). Samples belonging to either cluster are considered to be locally produced pottery given their geochemical and spatial similarity.

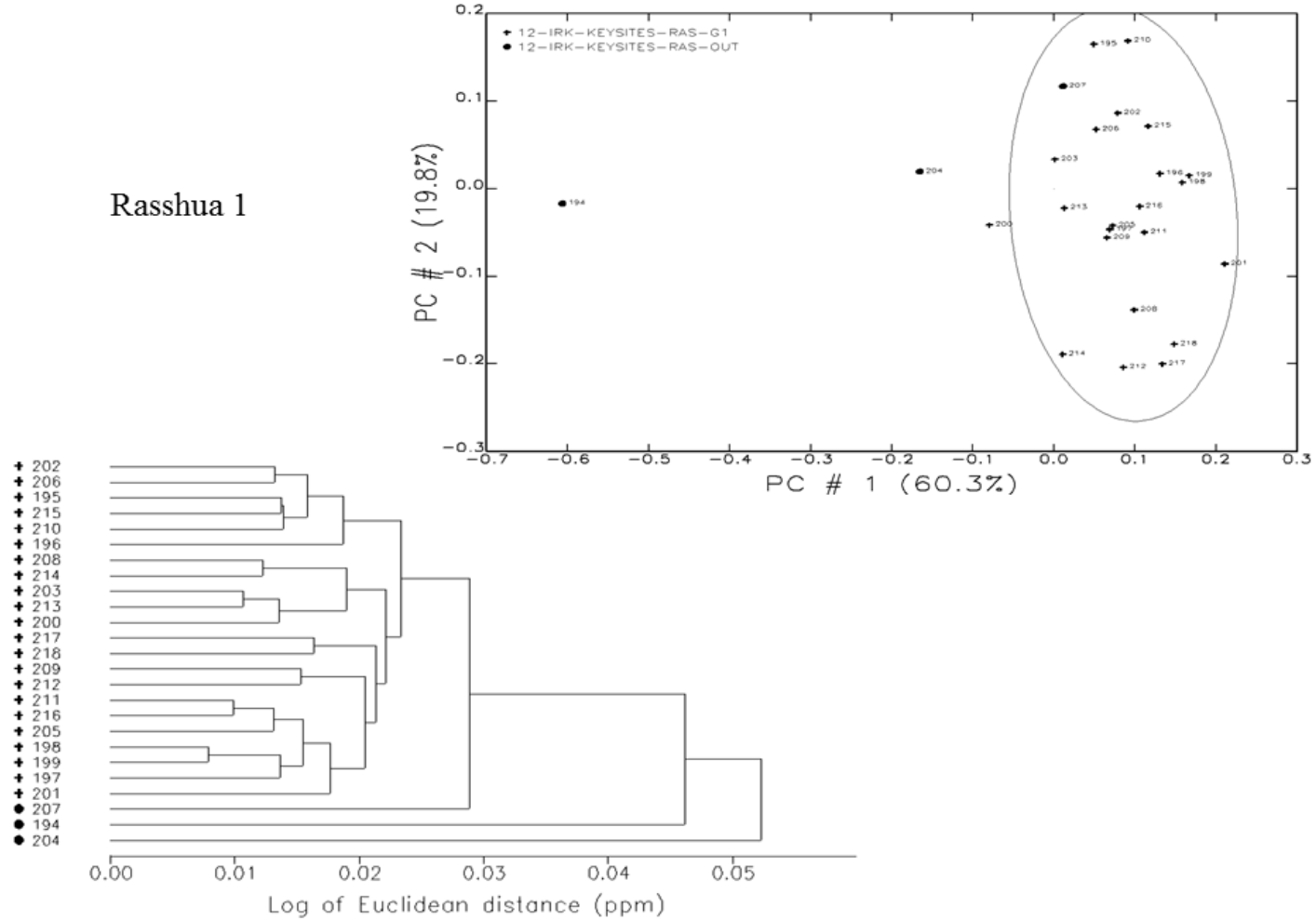


Figure 7.2 Cluster dendrogram and PCA biplot of first two components (summarizing 80.1% of total variation) showing the high proportion of Rasshua samples (88%) that can be attributed to a cluster (local group)

Lake Lazournye 1

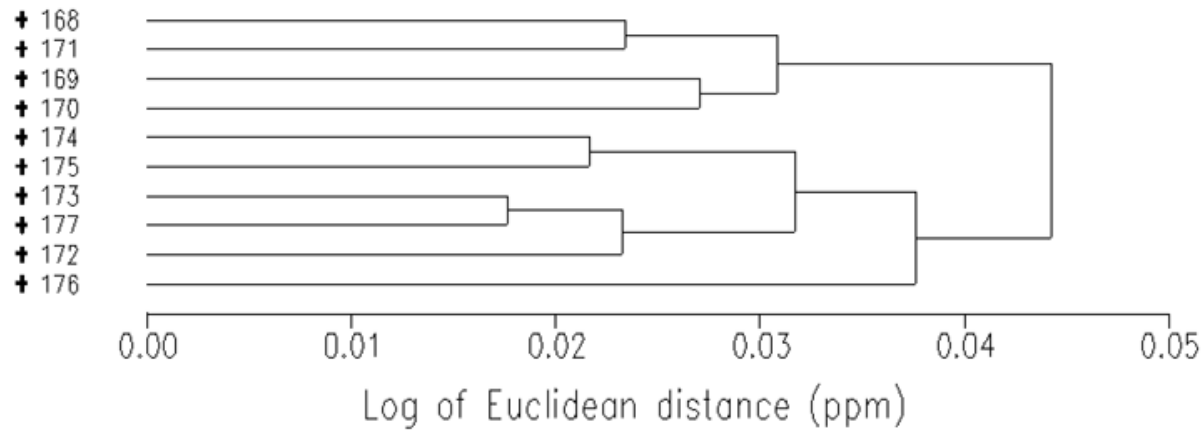
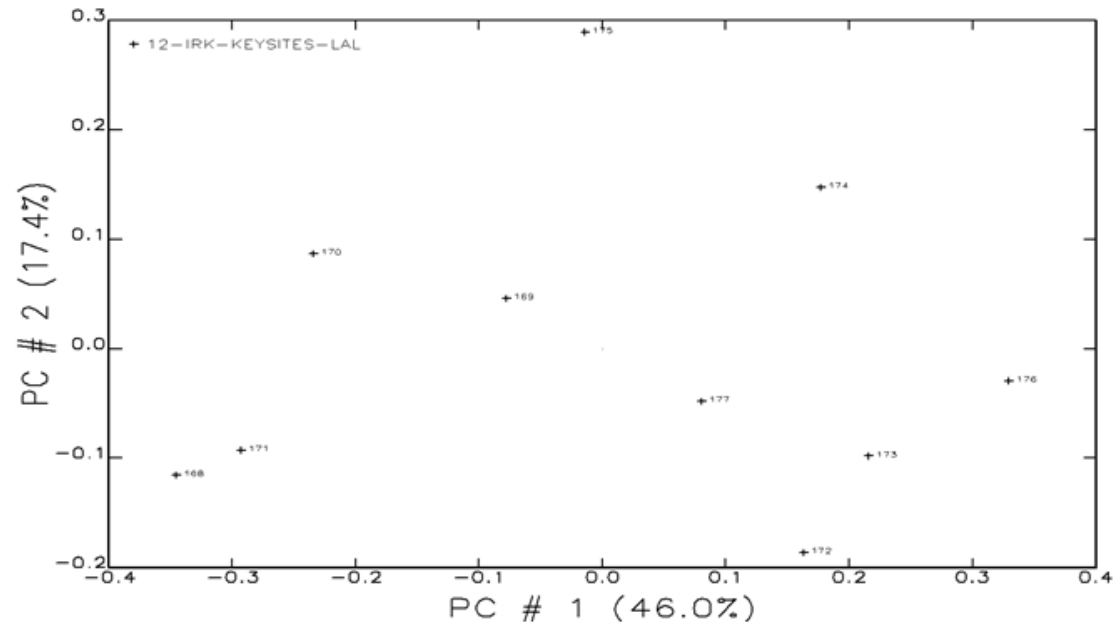


Figure 7.3 Cluster dendrogram and PCA biplot of first two components (summarizing 63.4% of total variation) showing a low proportion of Lake Lazournye samples (0%) that can be attributed to a cluster

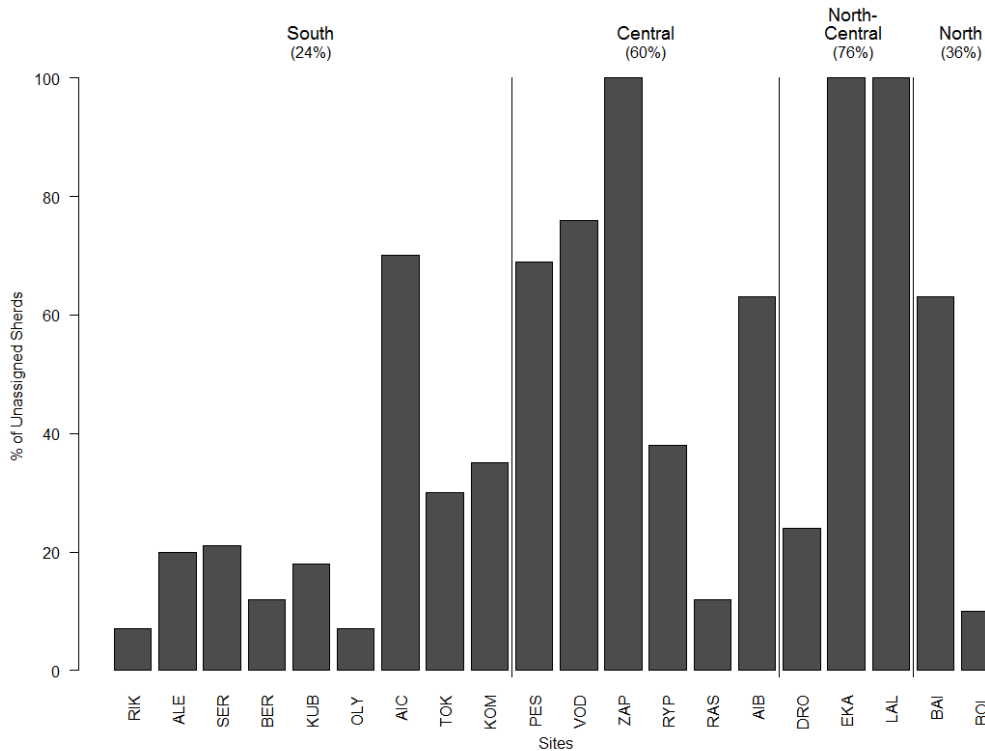


Figure 7.4 Barplot of the percent of unassigned sherds for each site analyzed by ICP-MS. Regional averages are provided in parentheses.

In order to investigate the tendency of more unassigned sherds within central and north-central archaeological sites, two hypotheses are examined that explore the potential influences of sample size effects and natural variability in clay sources. The first hypothesis emphasizes the potential influence of smaller sample sizes from archaeological sites in the central region, with the suggestion that fewer analyzed samples favors a higher proportion of unassigned sherds. However, as seen in figure 7.5, this hypothesis can be rejected as the proportion of unassigned sherds from each site has no correlation with the number of samples analyzed from each site.

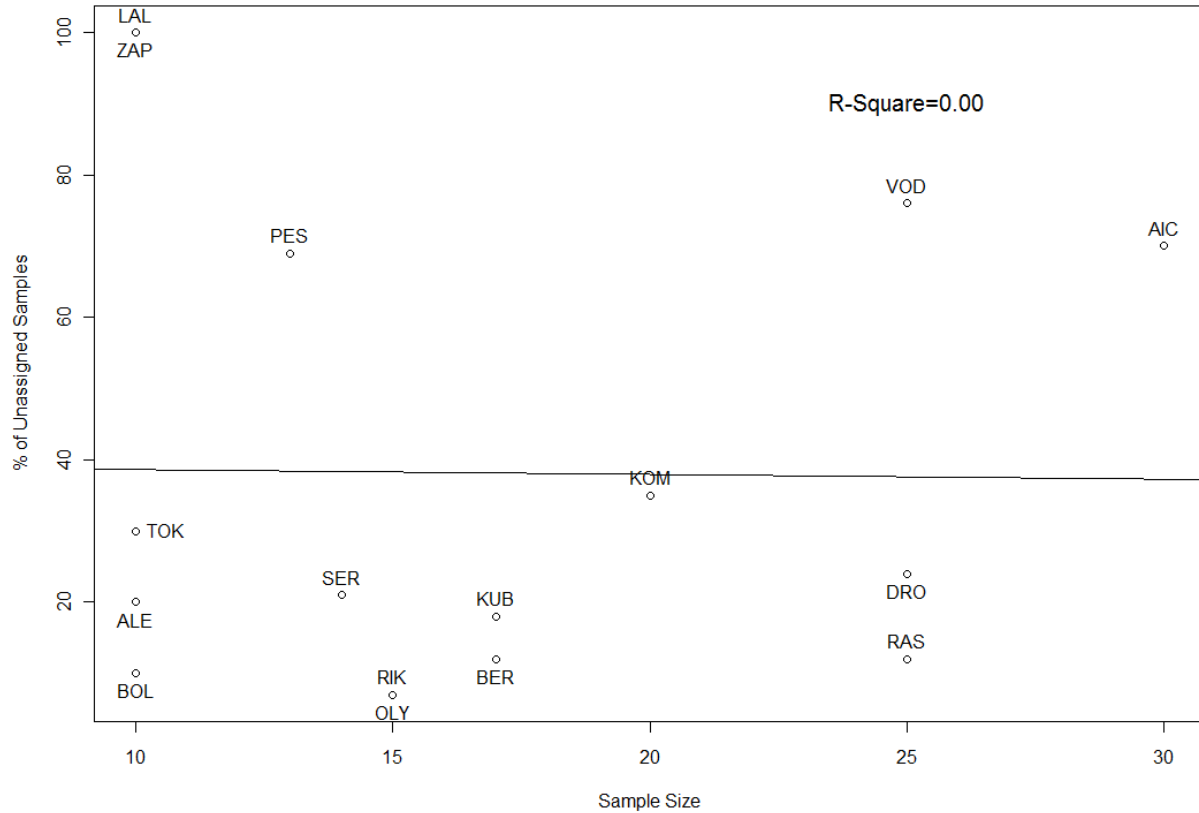


Figure 7.5 Scatterplot of the proportion of unassigned sherds and the sample size analyzed by ICP-MS from each site (with more than 10 sherds) with line of best fit

The second hypothesis suggests that pottery sherds in the central and north-central regions are more often unassigned due to higher elemental variability in the raw clay sources of these regions. In other words, clay geochemistry in these regions has higher potential for increased elemental variability due to different depositional processes. This includes clay deposits formed from contact between organic rich soils and volcanic ash, which can be deposited over a large spatial range creating clay deposits with variable compositions. Using relative variances (variance of log ratios of principal components) to summarize the total elemental variability (as proposed by Aitchison (1990)), no significant correlation between total elemental variation and the geographic region of sites can be established (see figure 7.6).

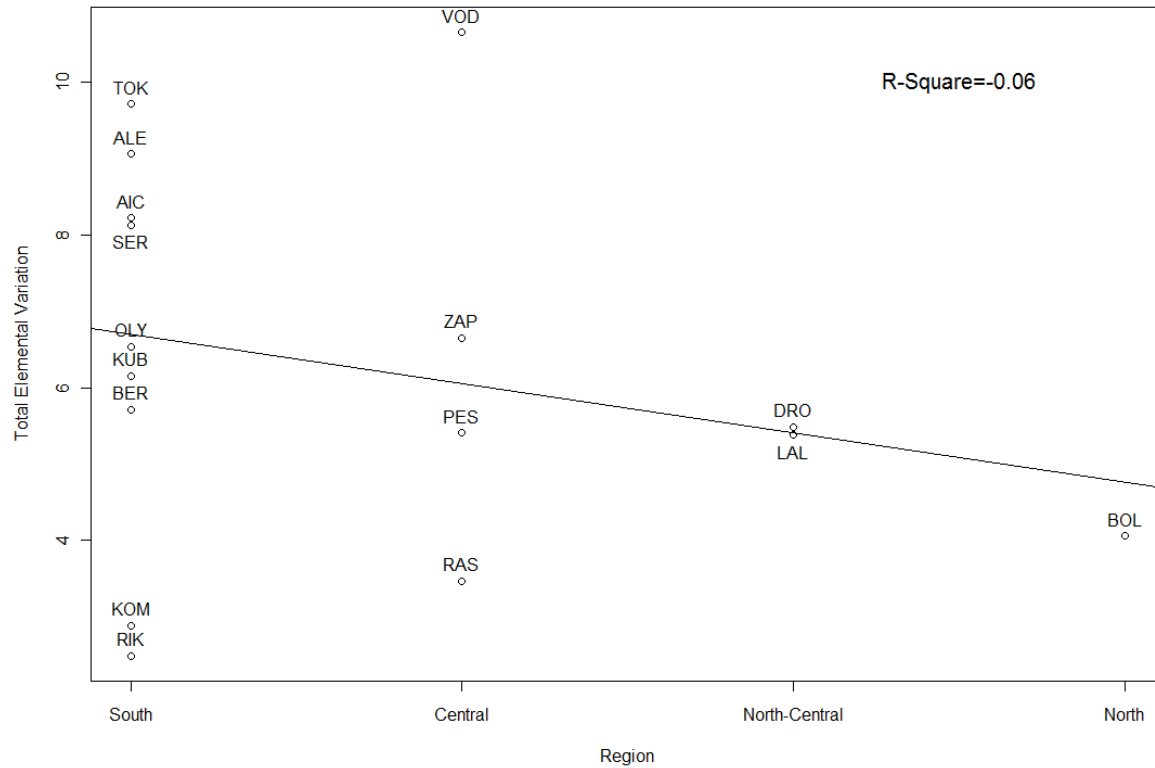


Figure 7.6 Scatterplot of total elemental variation for each site (with more than 10 sherds) compared across regions with line of best fit and r-square value.

Without significant correlation between the proportion of unassigned sherds at each site and their sample sizes or total elemental variation, it is assumed here that the higher proportion of unassigned sherds from sites in the central and north-central regions is the product of sherd movement between archaeological sites rather than sampling biases or natural clay variability.

7.5 Investigating Artifact Movement from Compositional Data

In order to evaluate the movement of artifacts between archaeological sites in the Kuril Islands, it is necessary to clearly distinguish previously identified local source groups at a regional scale. In order to accomplish this, a second iteration of the MURR statistical approach (cluster analysis, PCA, MD) is performed on only those samples assigned to local groups which

have cultural affiliation (Epi-Jomon, Okhotsk or mixed) as determined by the proportion of source group members that contain key diagnostic features or affiliated radiocarbon dates (see table 7.3 for cultural affiliation of local groups).

The iterative process used in this research has advantages in helping to narrow the variability within each local source group by identifying samples which can be considered as having the highest probability of belonging to the local source group. Samples that are considered to cluster the strongest, and therefore remain in the group, are those which have greater than a 50% probability of belonging to a local source group based upon their Mahalanobis distance (see section 7.2.2 for details on MD). In the Epi-Jomon dataset, five local groups did not have any samples with membership probabilities of over 50% and therefore are unable to be reliably used in the identification of artifact movement at a regional scale. This is primarily because at a regional scale these local source groups do not meet the criteria of having less within group variability than between group variability (provenance postulate). The Okhotsk dataset had eight local groups that did not have any samples with greater than 50% probability of membership.

Once local groups were clearly identified at a regional scale, these groups were considered reference groups (location of geologic origin) for the determination of artifact movement or exchange (Epi-Jomon: 8 reference groups; Okhotsk: 6 reference groups). Similar to obsidian sourcing studies (Phillips 2011), artifact movement is determined by statistically mapping non-local pottery samples (as determined in section 7.4) onto these reference groups. Using Mahalanobis distances, membership probabilities are calculated for the likelihood of all non-local samples belonging to any of the reference groups. If a previously identified non-local sample has over a 50% probability of belonging to a reference group, that pottery sample is

	Site	Local Group	# of Sherds	% of Sherds Affiliated with:			Cultural Affiliation
				Epi-Jomon	Okhotsk	Naiji	
South	Rikorda	RIK-1	6	100%			Epi-Jomon
	Rikorda	RIK-2	8	100%			Epi-Jomon
	Alekinha	ALE-1	4	75%	25%		Epi-Jomon
	Alekinha	ALE-2	4	75%	25%		Epi-Jomon
	Sernovodskoe	SER-1	4	75%		25%	Epi-Jomon
	Sernovodskoe	SER-2	7	86%		14%	Epi-Jomon
	Berezovka	BER-1	15	53%	47%		Mixed
	Kuybshevskaya	KUB-1	14	100%			Epi-Jomon
	Olya	OLY-1	9	77%	23%		Epi-Jomon
	Olya	OLY-2	5		100%		Okhotsk
	Ainu Creek	AIC-1	13	23%	77%		Okhotsk
	Tokotan	TOK-1	3		100%		Okhotsk
	Tokotan	TOK-2	4		100%		Okhotsk
	Kompaniskii	KOM-1	13	92%	8%		Epi-Jomon
Central	Peschanaya Bay	PES-1	4	50%		50%	Epi-Jomon
	Vodopodnaya	VOD-1	3		100%		Okhotsk
	Vodopodnaya	VOD-2	3		100%		Okhotsk
	Zapadnaya	N/A	0	70%	30%		Mixed*
	Ryponkicha	RYP-1	5		100%		Okhotsk
	Rasshua	RAS-1	22	73%	5%	22%	Epi-Jomon
	Ainu Bay	AIB-1	3			100%	Naiji
North-Central	Drobnye	DRO-1	19	37%	58%	5%	Mixed
	Ekarma	N/A	0		100%		Okhotsk*
	Lake Lazournye	N/A	0		100%		Okhotsk*
North	Baikova	BAI-1	3		100%		Okhotsk
	Bolshoy	BOL-1	5		100%		Okhotsk
	Bolshoy	BOL-2	4			100%	Naiji

180

Table 7.3 Table showing the cultural affiliation of each local source group (*Indicates cultural affiliation determined through assessing entire site assemblage)

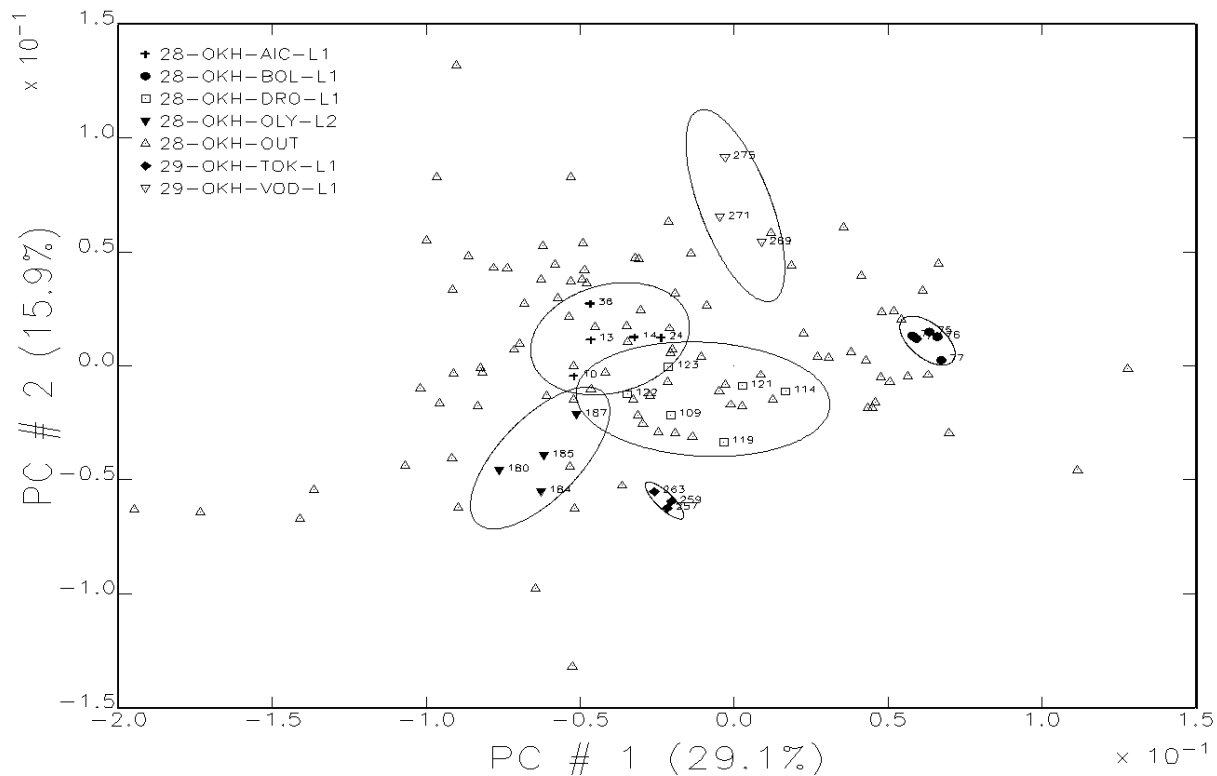


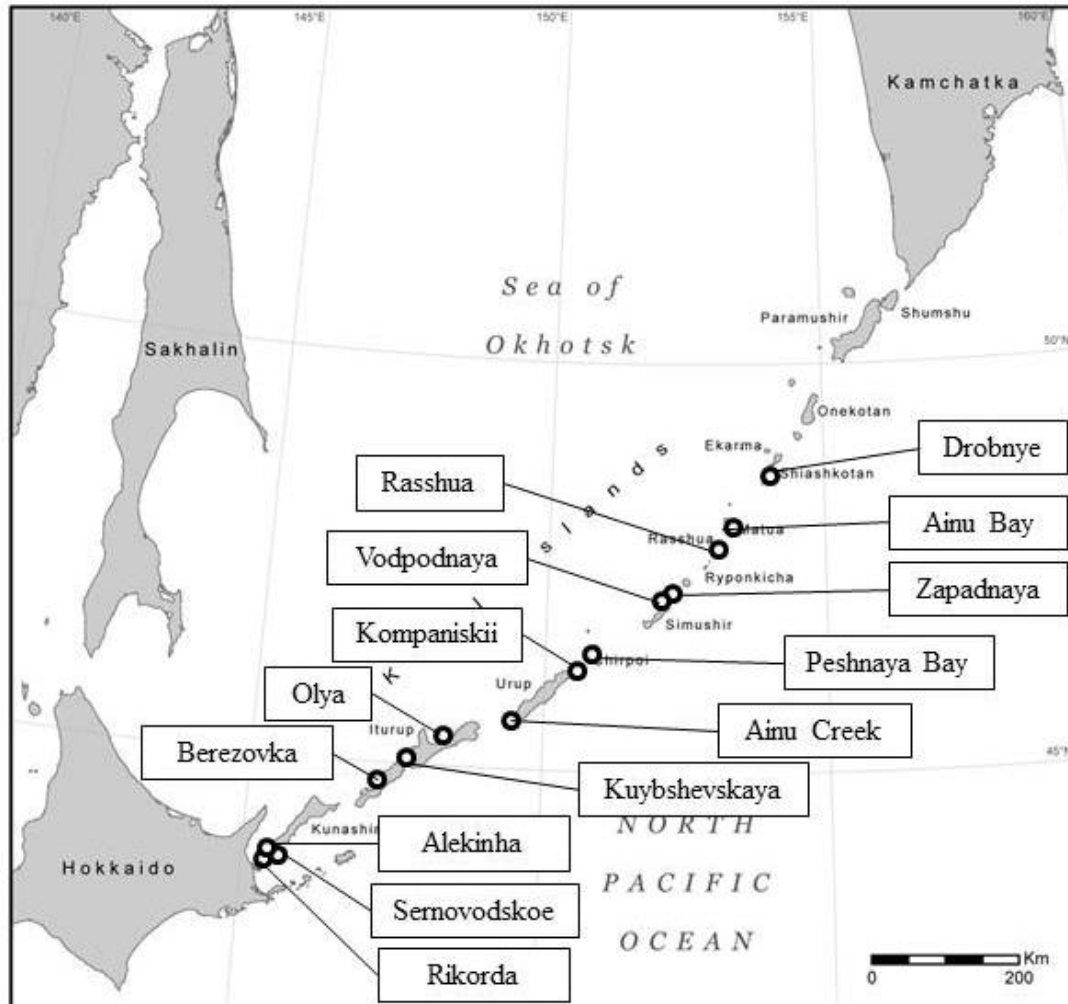
Figure 7.8 Biplot of first two PCA components for 6 Okhotsk reference groups and non-local samples

7.5.1 Network Construction

The identification of pottery sherds that are assumed to have been moved between locations in the Kuril Islands provides a preliminary set of data with which to construct network models. As previously stated, network ties are drawn between archaeological sites in which at least one pottery sample has been identified as moving in-between based upon compositional analysis. It is important to note that these network models by no means represent all or even a small fraction of the possible exchanges or movement of pottery during the occupation of the Kuril Islands. Rather, these network models represent a highly oversimplified and generalized model of interaction based upon a fragmented archaeological record. In order to conceptually overcome this issue, it is often acknowledged within social network analysis research that social exchange can occur as episodic or momentary interactions between individuals but the

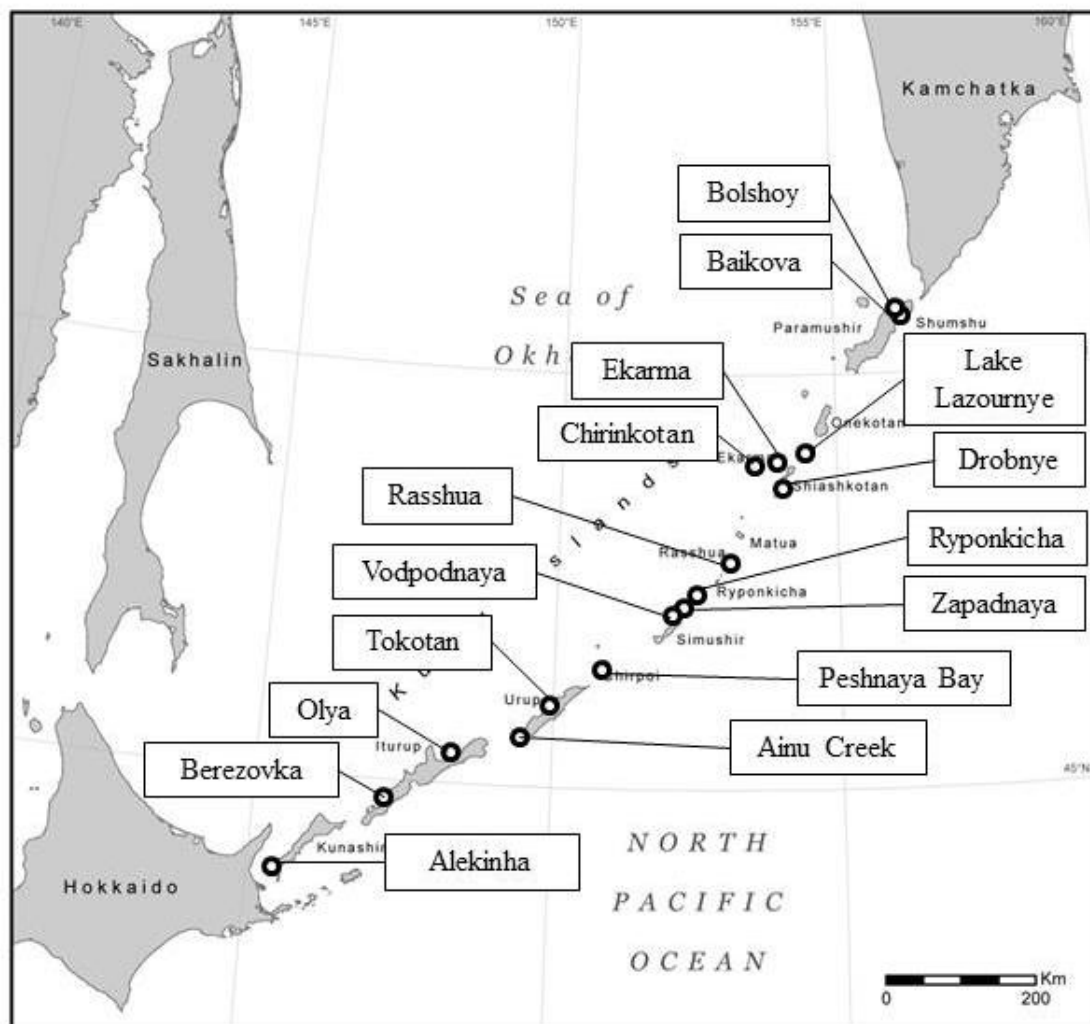
relationships identified by researchers are often the most routinized or consistently reproduced interactions (Huston and Robins 1982). This research adopts a similar assumption when modeling networks constructed from compositional data in that consistently performed actions causing the movement of pottery vessels are considered have a greater chance of recognition hundreds or thousands of years after their last occurrence.

Prior to inferring social network ties between archaeological sites using ceramic compositional data it is necessary to provide justification that pottery exchange was a component of social network maintenance. Archaeologically, the evidence for regional and long-distance trading has been clearly identified in the movement of obsidian from Hokkaido and Kamchatka throughout the island chain during the Epi-Jomon and Okhotsk periods (Phillips 2011; Phillips and Speakman 2009). In addition, ethnographic evidence from Ainu populations demonstrates an extensive local, regional and distant trading network of various products (Ohnuki-Tierney 1976). This included exchange between near islands as well as distant trading of surplus marine mammal products (food and oil) and small “treasures” such as beads, earrings, bird feathers and hides (Ohnuki-Tierney 1976; Tezuka 1998). While not directly identified in the ethnographic records, it is assumed here that these traded items would have been transported within a variety of containers, including pottery vessels. Given the vast majority of pottery artifacts are attributed to Epi-Jomon and Okhotsk cultural periods, it is assumed here that trade either directly or indirectly involving pottery vessels was fairly constant during these occupation periods in the Kuril Islands.



Site	Reference Groups Present at Site
Drobnye	DRO-1
Rasshua	RAS-1
Kompaniskii	KOM-1 KUB-1
Ainu Creek	DRO-1 SER-2 RAS-1
Olya	OLY-1 KUB-1
Kuybshevskaya	KUB-1
Berezovka	KOM-1 RAS-1
Sernovodskoe	SER-2
Rikorda	RIK-1 RIK-2

Figure 7.9 Map showing location of archaeological sites used in Epi-Jomon compositional analysis along with the reference groups identified at each site (sites with no reference groups identified are not included)



Site	Reference Groups Present at Site
Bolshoy	BOL-1
Baikova	DRO-1
Lake Lazournye	TOK-1
Drobnye	DRO-1
	AIC-1
	TOK-1
Ekarma	DRO-1
Ryponkicha	VOD-1
Zapadnaya	TOK-1
Vodpodnaya	VOD-1
	OLY-2
Peshnaya Bay	TOK-1
	DRO-1
Tokotan	TOK-1
	AIC-1
Ainu Creek	AIC-1
	DRO-1
	TOK-1
Olya	OLY-2
Alekinha	VOD-1

Figure 7.10 Map showing location of archaeological sites used in Okhotsk compositional analysis along with the source groups identified at each site (sites with no source groups identified are not included)

7.6 Evaluating Model Predictions using Social Network Analysis

7.6.1 Introduction to Social Network Analysis

Network models constructed using elemental compositional data provide the basis for conceptualizing the structure of exchange relationships or mobility patterns among Epi-Jomon and Okhotsk inhabitants in the Kuril Islands. In order to compare predictions of the information network model with network models constructed from compositional data, this research utilized social network analysis (SNA) methods. Social network analysis is a systematic approach that uses a combination of mathematical methods and visualizations to explore network structure and the effects of that structure on participants within a network (Freeman 2004). As demonstrated in section 7.6, network structure in this research is constructed through connecting a set of nodes (archaeological sites) by a set of ties (based upon geochemical similarity). Perhaps most importantly, SNA provides this research with a broad set of tools that can measure the characteristics of network graphs and provide the ability to compare the similarity or differences between multiple network graphs.

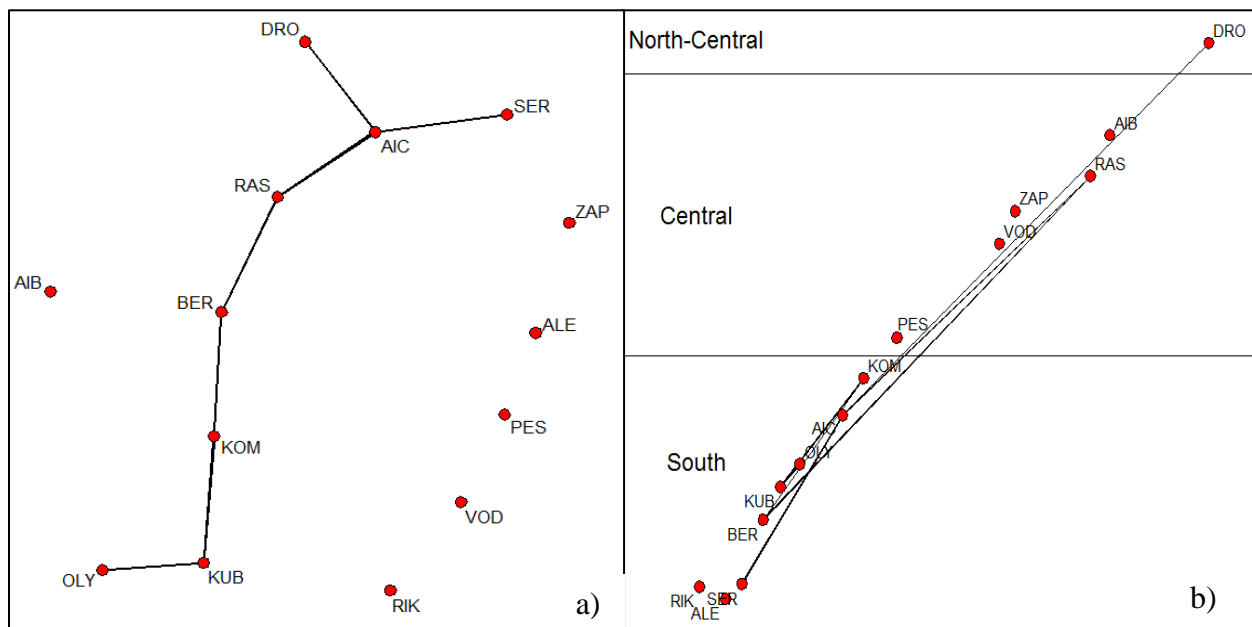


Figure 7.11 Network graphs of Epi-Jomon network derived from compositional data in abstract space (a) and geographic space (b) with line width indicating strength of tie

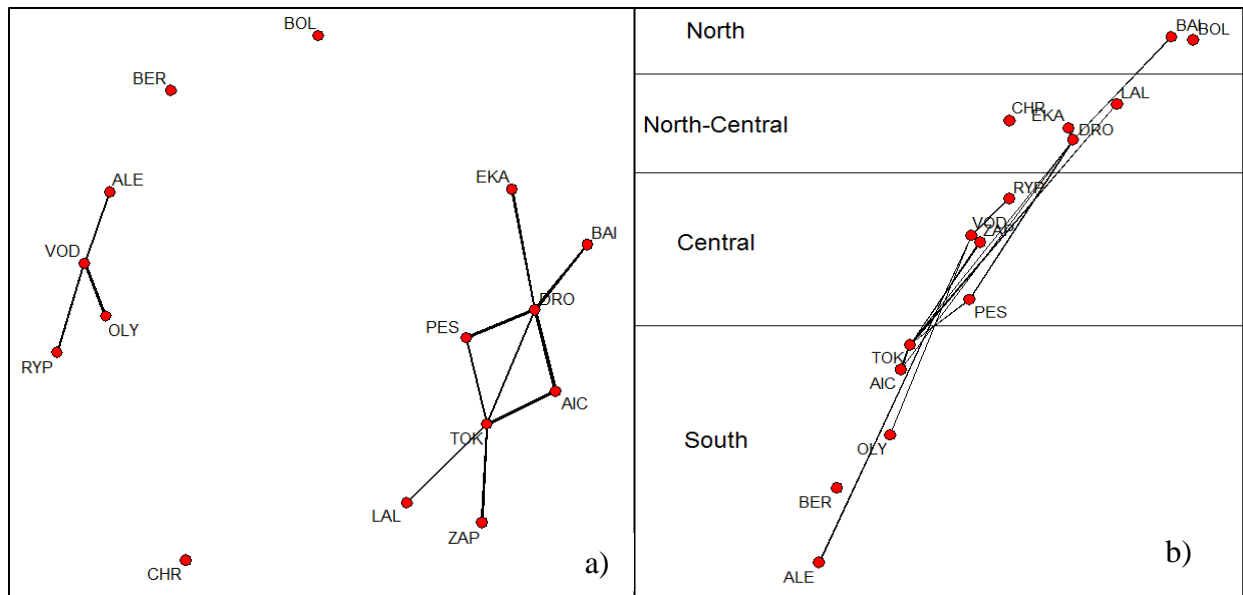


Figure 7.12 Network graphs of Okhotsk network derived from compositional data in abstract space (a) and geographic space (b) with line width indicating strength of tie

Based upon predictions of the information network model, the key network characteristics used in this analysis include degree centrality, graph density, graph centralization (conditioned on degree centrality) and spatial length of ties. Without reiterating the extensive research concerning centrality measurements in sociology and archaeology (Bonacich 1972; Borgatti 2005; Brughmans 2010; Freeman 1977; Freeman 1979; Freeman et al. 1991; Mizoguchi 2009; Peeples and Roberts Jr 2013; Wasserman and Faust 1994), degree centrality is simply calculated by summing the total number of connections to and from a single node. Graph density is a graph-level index of the number of connections in a network given the total number of possible connections. Graph centralization measures the tendency for any single point to be more central than all other points in the network (Freeman 1979). In both graph-level measurements calculations produce a standardized score between 0 and 1 with values closest to one representing a more centralized or more dense network graph and values closest to zero representing a less centralized or less dense graph. The spatial length of ties is based upon a straight geodesic distance (in kilometers) between archaeological sites.

7.6.2 Evaluating Model Predictions for Epi-Jomon and Okhotsk Networks

Following from predictions of the information network model (see Chapter 2 and section 7.1.1); Epi-Jomon and Okhotsk networks constructed from compositional data (figures 7.11 and 7.12) should differ in their degree centrality, graph density, graph centralization and spatial scale. The first expectation of the information networks model is that archaeological sites in more uncertain regions should develop a higher number of ties (degree) leading to a greater overall graph density. When comparing the degree centrality of Epi-Jomon and Okhotsk sites located in the central and north-central regions this prediction is not confirmed. In the Epi-Jomon network, archaeological sites in the central region show a strong tendency towards isolation with four of five sites identified as isolates and a low average degree centrality (table 7.4). Okhotsk archaeological sites in the central and north-central region demonstrate the opposite tendency with more connections (higher degree); however, this tendency is not unique to the central regions as other regions occupied during the Okhotsk period have similar centrality values. The discrepancy between Epi-Jomon and Okhotsk centrality scores suggests that sites in the central islands during the Epi-Jomon are far less involved in the exchange or movement of pottery and by extension of the information network model less involved in regional or inter-regional networking.

Epi-Jomon				Okhotsk			
Region	Site Name	Degree	Average Degree	Region	Site Name	Degree	Average Degree
South	RIK	0	2.75	South	ALE	2	3.6
	SER	2			BER	0	
	ALE	0			OLY	2	
	BER	4			AIC	4	
	KUB	4			TOK	10	
	OLY	2		Central	PES	4	3.5
	AIC	6			VOD	6	
	KOM	4			ZAP	2	
Central	PES	0	0.8	North-Central	RYP	2	3.5
	VOD	0			DRO	10	
	ZAP	0			EKA	2	
	RAS	4			CHR	0	
	AIB	0			LAL	2	
North-Central	DRO	2	2	North	BAI	2	1
					BOL	0	

Table 7.4 Degree values (total number of ties) for each site in the undirected Epi-Jomon and Okhotsk networks

In evaluating Epi-Jomon and Okhotsk networks at a graph-level, it is expected that the higher number of ties in the Okhotsk network would produce a higher graph density value. As expected, the Okhotsk model does maintain higher graph density than the Epi-Jomon networks, although only by a small margin (table 7.5). The low graph density values suggest that graph density calculations are highly influenced by the presence of numerous isolates within the archaeological networks. Given that the presence of isolates are an important component of assessing model structure it is recommended that when analyzing archaeological networks with potentially sparse or missing data, it is necessary to test for the stability of networks under a variety of conditions. While outside the scope of this chapter, methods for assessing the network

stability of sparse networks through the use of bootstrap simulation and sensitivity analysis can be found in Gjesfjeld (*accepted*), Mills et al. (2013) and Costenbader and Valente (2003).

	Pottery Networks	
	Epi-Jomon	Okhotsk
# of Ties	8	20
Graph Density	0.08	0.11
Centralization (Degree)	0.18	0.28
Average Tie Distance (km)	349	331
% of Inter-Regional Ties	50%	75%

Table 7.5 Statistics for network models constructed from compositional data.

Based upon predictions developed in chapter 2, networks in more uncertain areas such as the central and north-central Kuril Islands should demonstrate lower graph centralization as having a wide range of multiple partners is advantageous for the transmission of information. Therefore, the Okhotsk cultural occupation which has a higher proportion of sites located in the central and north-central islands should display lower centralization scores. Similar to degree centrality, this expectation is not confirmed as Okhotsk networks maintain a higher centralization value when compared to Epi-Jomon networks.

One potential factor influencing centralization values is the difference in the total number of ties associated with each network. With more ties expected and identified in the Okhotsk network, there is simply a greater probability that one site will have more than one tie. Therefore, it is likely that a few sites will be more centrally located in the graph than others, with the effect of elevating graph centralization values. While centralization values do not conform to theoretical expectations, it is important to not disregard these values in developing interpretations

of the network. As the degree centrality measures of the Okhotsk network clearly indicate (table 7.4), a few archaeological sites (Tokotan (TOK) and Drobnye (DRO)) appear to have higher centrality and could be considered regional centers for the production and/or exchange of pottery. If anything, centralization scores indicate the need to revise simplifying theoretical assumptions about how individuals might access information from a wide range of partners, with the potential for formalized systems of information exchange such as seasonal macro-band gatherings.

The final expectation of the information networks model is that populations living in the more remote and uncertain locations would tend to have network ties at multiple spatial scales including local, regional and distant (inter-regional). Once again, given the higher proportion of Okhotsk sites that are located in the central and north-central region, the Okhotsk network should demonstrate a higher proportion of ties that extend outside of local or regional area.

Unexpectedly, the proportion of inter-regional ties within both networks constructed from archaeological data is fairly high in both networks with the Okhotsk network having 15 out of 20 ties (75%) connecting archaeological sites in two different regions of the archipelago. If network ties are further classified based upon the specific regions being connected and the direction of those ties (see figures 7.13, 7.14 and 7.15), it is evident that a majority of the Epi-Jomon network consists of ties in between sites in the south (S-S) with only a few connections extending out from sites in the central (RAS) and north-central (DRO) regions to sites in the southern region. This suggests that at least a few pottery vessels were manufactured at sites in the remote islands and transported long-distances to sites in the southern region. The Okhotsk network demonstrates numerous intra-regional ties occurring within all regions. The direction of ties in the Okhotsk network suggest pottery was being primarily produced and moved between multiple

locations on Urup and the remote Kuril Islands (multiple ties in and out of sites) but also exported from these locations to sites in the far south (ALE) and north (BAI).

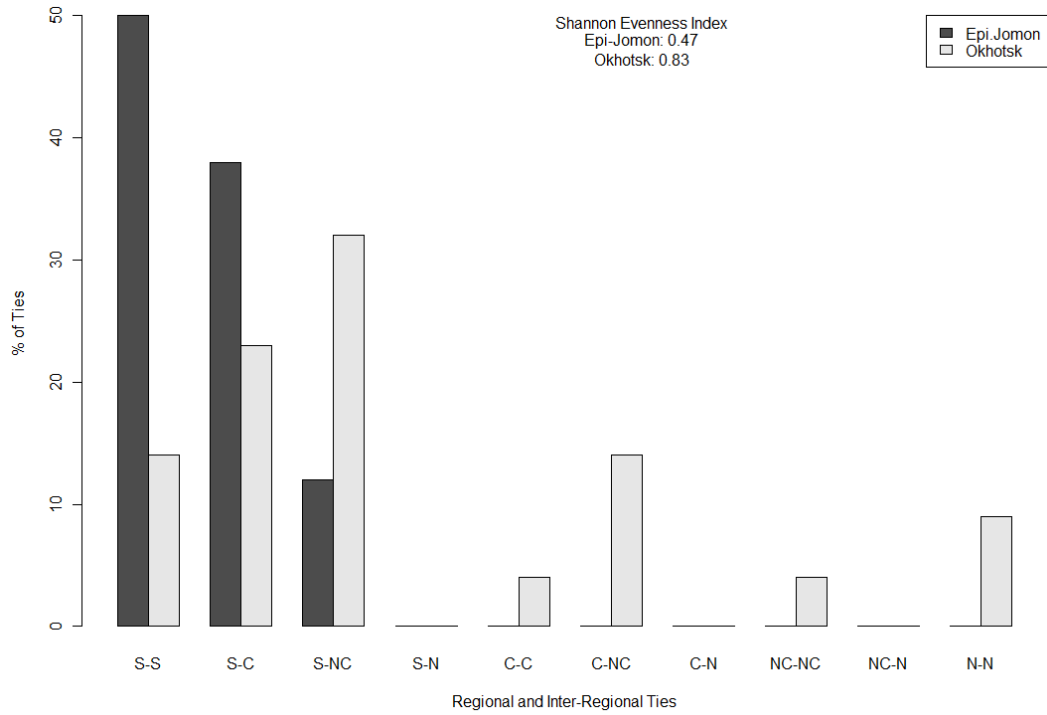


Figure 7.13 Distribution of regional and inter-regional ties for networks constructed from compositional pottery data. (S=South, C=Central, NC=North-Central, N=North)

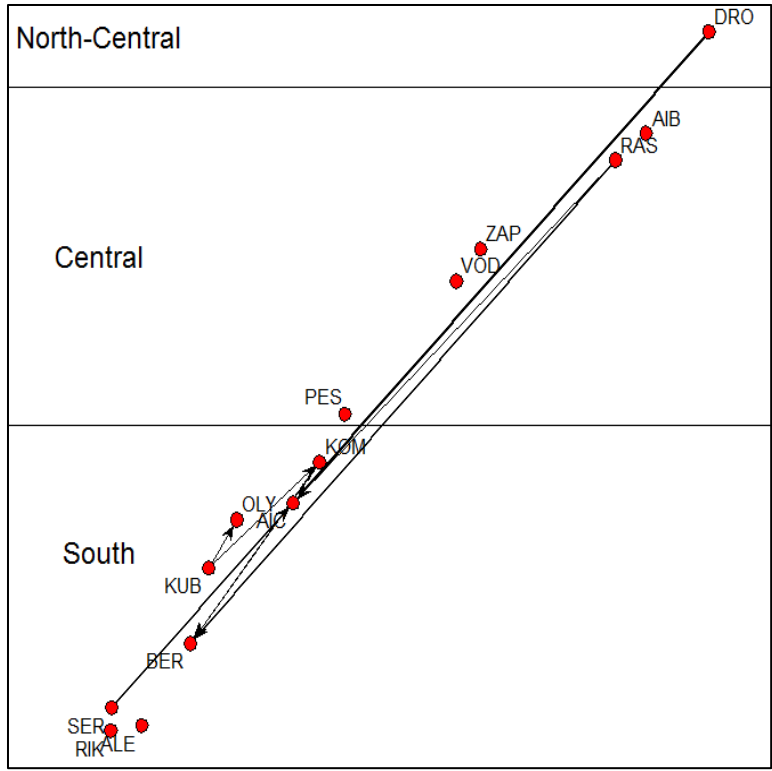


Figure 7.14 Epi-Jomon network constructed from compositional data in geographic space with directed ties

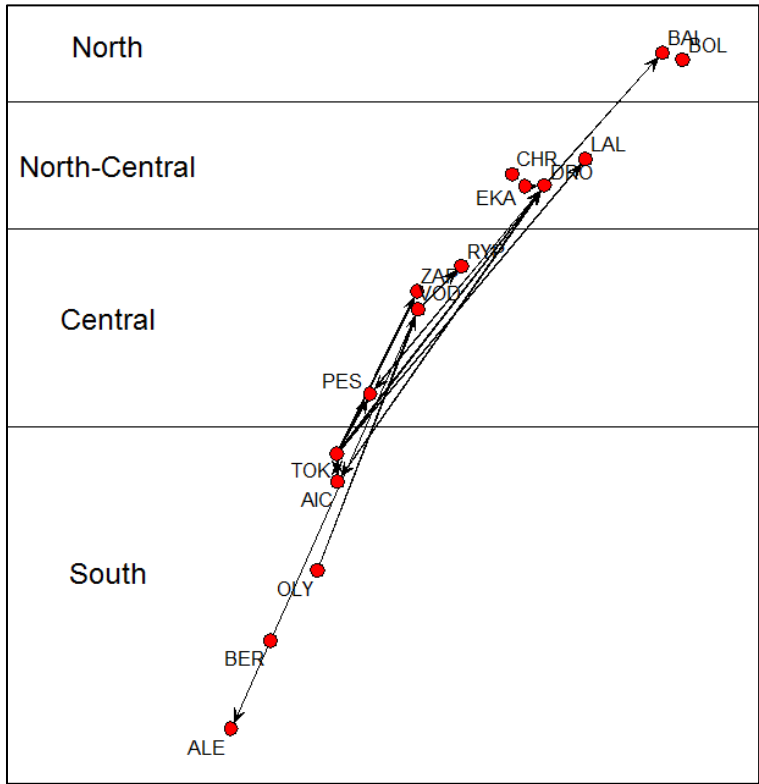


Figure 7.15 Okhotsk networks constructed from compositional data in geographic space with directed ties

It is important to note that the high presence of inter-regional ties and the large average of spatial distance for each tie (Epi-Jomon: 349 km; Okhotsk: 331 km) is potentially a product of using elemental composition data to construct networks. While geochemical differences are likely to occur at more local scales, the probability in identifying local source groups at a regional scale is more likely to occur when local source groups are located further away as there is a greater probability that significant geochemical differences exist. In order to obtain higher resolution evidence for the exchange or movement of pottery, sample sizes would need to be increased as to potentially gain greater confidence (through statistical separation) of clay sources located in close proximity to each other.

7.6.3 Cautionary Notes of Compositional and Network Analysis using Kuril Pottery

This research attempted a novel approach to the construction of archaeological networks through the use of elemental compositional data from ceramic artifacts in the Kuril Islands. In the evaluation of this approach and its potential application to future archaeological research, a few cautionary notes should be recognized. Perhaps the greatest factor influencing the ability to identify the exchange or movement of artifacts is something largely out of the archaeologist's control, namely the variability in elemental concentrations of pottery samples. In the Kuril pottery assemblage, elemental variability is extremely high compared to similar ceramic sourcing studies (see Anderson 2011) (elemental summary statistics for the Kuril pottery assemblage can be found in appendix G). This variability is likely a complex combination of diverse clay formation processes occurring in the island chain, ICP-MS measurement error as well as anthropogenic alteration of clay resources (temper). The effect of this variability on the conclusions provided here is that specific ties or exchanges between sites should be viewed with

some skepticism. However, broader conclusions about regional network structures, such as the higher degree of inter-regional ties within the Okhotsk network are considered analytically more robust.

Given the inherent elemental variability within the Kuril pottery assemblage, future compositional research requires an increase sample size as well as complementary mineralogical data. The increase in sample size would provide substantial analytical benefits by increasing the number of samples necessary to form local groups (set at 3 in this research), thereby increasing confidence in the elemental signature of these clusters. In addition, an increase in sample size will presumably also produce more “non-local” samples which can be mapped onto reference groups. Exchange ties between sites can therefore be constructed based upon the presence of multiple ties that can more clearly establish the strength of association between archaeological sites. Mineralogical data of pottery samples would also be highly beneficial in assessing the source group clusters with the assumption that if geochemical and spatial similarities exist, mineralogical similarity should also be present. However, given the inconclusive results of XRD mineralogical analysis (see chapter 6), optical petrography is likely the most beneficial method for assessing mineralogical composition.

7.7 Chapter Conclusions

Building from predictions of the information network model developed in chapter 2, this chapter evaluated theoretical expectations by utilizing an analytical approach that constructed network models from ceramic compositional data and analyzed network structures through social network analysis. In summary, social network analysis statistics failed to quantitatively confirm the expectations of the information network model, but network structures do visually and

qualitatively correspond to model predictions for the Epi-Jomon and Okhotsk cultural periods. This includes a largely “isolated” network structure corresponding to the Epi-Jomon period where most ties are regional ties between sites in the south with only a few inter-regional ties extending from sites in the more remote central and north-central regions. The Okhotsk network generally conforms to its predicated “integrated” network pattern by displaying a higher abundance of connections with many ties occurring at regional and inter-regional spatial scales.

The premise of this research aimed to evaluate the role of environmental uncertainty on populations living in the Kuril Islands and the role of social networking strategies in the adaptation to these environments. Based upon the results presented here, the structures of social networks do not appear to be a response to the environmental conditions of regions throughout the archipelago. In other words, it can be argued that environmental or biogeographical factors are not the major influence on social networking behaviors as would be initially expected within a human behavioral ecology framework. Therefore, the decision to engage in social networking strategies and accept higher risk as well as increased costs associated with maintaining social connections is likely intertwined with a range of demographic and cultural conditions within each cultural occupation period. By recognizing the potential importance of cultural practices to the structure of social relationships in the Kuril Islands, this research provides a valuable source of evidence that directs current and future research towards a more in-depth understanding of the diverse ways in which hunter-gatherers adapted to this unique natural **and social** environment.

Chapter 8: Summary and Conclusions

The broader goal of this dissertation research was to investigate the strategies used by hunter-gatherer populations in the past to colonize and inhabit diverse landscapes throughout the globe. Due to their relative geographic isolation, unpredictable natural environment and dynamic culture-history, the Kuril Islands provided an attractive social and natural setting with which to investigate the range of adaptations necessary for living in regions at the limits of marginality. By combining the distinctive sub-arctic, island environment of the Kuril archipelago with problem-oriented archaeological research, this dissertation aimed to contribute to the understanding of how hunter-gatherers adapted to the demands of extreme environments and the hazard, risks and uncertainty associated with these unique landscapes. In order to achieve dissertation goals, this study focused on three primary research objectives. These included 1) contributing to knowledge concerning the occupation history of the Kuril Islands, 2) investigation of spatial and temporal changes in hunter-gatherer pottery production/use and 3) exploring the identification and adaptive role of social networks in mitigating environmental uncertainty within hunter-gatherer populations.

One of the most significant contributions of this research is a thorough and systematic study of the history, production and exchange of pottery remains recovered within the Kuril archipelago. The data and interpretations generated by this research will add to not only our understanding of regional patterns within the archaeological record of the Kuril Islands but also more broadly to maritime foraging societies throughout the North Pacific Rim. Of particular interest to this research was the role of social networking as an adaptive strategy for helping individuals and groups reduce their degree of uncertainty through the acquisition of material goods and information. Building from a human behavioral ecology framework, a simplifying

model was developed that provided a series of predictions for the structure of social networks within varying environmental settings of the Kuril archipelago. The model expected that in regions of the island chain with increased hazards and risks, inhabitants would invest in social networking strategies in order to increase their knowledge base and reduce uncertainty. These predictions were evaluated through a novel research framework that constructed social network models from the elemental composition of hunter-gatherer pottery and the evaluation of these networks with social network analysis methods.

8.1 Research Results and their Significance

8.1.1 Cultural and Chronological Associations of Kuril Pottery

One of the central objectives of this study was the systematic evaluation of Kuril pottery styles and their cultural and chronological implications for understanding the occupation of the archipelago. As outlined throughout chapter 5, pottery styles in all regions of the Kuril archipelago reflect strong cultural influences from eastern and northern Hokkaido. Nearly every occupation period in the Kuril Islands can be associated with analogous ceramic styles to Hokkaido with numerous styles showing clear diagnostic similarities. It can be argued that while some cultural influence from Kamchatka was likely in the past, and known to occur during the Ainu period (Snow 1897), the vast majority of pottery remains in the island chain are clearly related to ceramic traditions in Hokkaido. Therefore, in developing broader interpretations about the colonization and habitation of the Kuril Islands the strong cultural connections or possible absence of these connections to Hokkaido should not be underestimated.

The association between diagnostic pottery styles and occupation periods of the Kuril Islands provides a source of evidence for correlating pottery styles with chronological periods.

As highlighted in section 5.4, at least seven different diagnostic types demonstrate strong affiliation with their expected radiocarbon ages including types assigned to the Middle and Late Jomon, the early Epi-Jomon and the middle Okhotsk periods. Furthermore, the temporal distribution of these pottery types generally conforms to the occupation history presented in the temporal frequency distributions of radiocarbon dates. The significance of the association between pottery types and radiocarbon dates is that future research in the Kuril Islands can reliably use selected pottery styles to infer cultural and chronological occupation.

8.1.2 Kuril Pottery Production and Use

The goal of investigating pottery-manufacturing techniques in the Kuril Islands was to broadly understand how Kuril potters adapted their production processes to an environmental setting with new challenges and constraints. Within many hunter-gatherer groups in Arctic and sub-Arctic regions, pottery vessels are often crudely and quickly constructed with little to no firing of the ceramic vessels (Harry et al. 2009). By evaluating the production process of both Epi-Jomon and Okhotsk potters, it is clear that the pottery created in the Kuril Islands was neither crude nor expedient. The production sequence, especially during the Epi-Jomon, shows technological skill in producing strong yet thin-walled vessels that are very effective in the transfer of heat as well as remaining durable. Producing such well-made vessels in the damp and foggy environment of the Kuril archipelago undoubtedly required some trial and error with novel raw materials and firing conditions but likely utilized a well-developed knowledge base from the strong historical tradition of pottery manufacture in East Asia. The presence of well-constructed pottery suggests that populations in the archipelago were at least semi-permanent residents at specific locations in order to complete the entire pottery production process.

Perhaps unexpectedly, major differences in technological attributes of pottery are not based upon variability in environmental conditions between regions but rather the cultural affiliation of pottery vessels. As demonstrated in chapter 6, minor variations occur in wall thickness, base thickness and temper abundances between regions but more significant variation in these attributes occur between Epi-Jomon and Okhotsk affiliated pottery. In combination with differences in the presence of organic residue biomarkers, it can be hypothesized that different cooking strategies are being utilized by the two different cultures. While more definitive evidence is still lacking, the use of different cooking strategies implies an alternative use and preparation of resources. Drawing upon work from Reid (1989), the technological features of Okhotsk pottery (thicker walls and much thicker bases) along with the absence of alkylphenyl alkanolic biomarkers suggests the use of pottery vessels to maintain a low simmering heat rather than a rapid boil. Experimental evidence (Reid 1989) highlights that lower temperature cooking is most often accomplished through the placement of hot stones inside of the vessel and commonly used in the rendering of oil from animal fats. Furthermore, it is acknowledged that within hunter-gatherer societies that rely on fish or deer, marine oil is one of the most highly valued prestige items (Hayden 1990).

In comparing the Kuril Islands with maritime environments in the eastern North Pacific, the production of marine oil from whale, seal, sea lion or fish fat is not surprising. As ethnographic evidence from populations on Kodiak Island demonstrate, oil was an important commodity in the winter storage of edible roots, stems, berries and leaves that were collected during the summer months (Holmberg 1985:41-42). Early explorer Davydov (1976:16) goes so far as to remark, “without [oil] they could barely exist and would never be happy”. As suggested by Fitzhugh (2003:69) drawing from Speth and Spielmann (1983), the importance of oil within

communities around Kodiak may be a biological response to supplement the nutritional deficiencies of a lean-meat, high protein diet with marine fats essential for surviving late winter and early spring resource depressions.

8.1.3 Exchange of Kuril Pottery and Networking Strategies

The investigation of pottery movement and/or exchange between archaeological sites in the Kuril archipelago aimed to demonstrate a methodological process for evaluating local production as well as exploring the ability of archaeological networks to evaluate predictions of the information network model. Results of this research (chapter 7) indicate that the amount of pottery produced locally at each archaeological site in the Kuril archipelago is highly variable ranging from 0% to 93% of site assemblages. These results suggest that pottery is not manufactured in all habitation locations throughout the island chain and that certain locales are more conducive to pottery manufacture. In general, archaeological sites located in the southern region tend to have a higher proportion of locally produced pottery compared to sites in the central and north-central region. This pattern is likely due to a wide variety of factors including higher quality and/or more abundant clay resources and/or environmental conditions that are more favorable for pottery production.

Given the fragmented and often incomplete archaeological record of small-scale and mobile hunter-gatherers, interpretations of prehistoric social relationships have often relied upon ethnographic accounts and projected these onto material traces. The intellectual merits of this research come from novel and quantitative approach to reconstructing and evaluating network models of past hunter-gatherer networks through the sole use of material remains. Specifically,

this included the developing models of past networks using geochemical sourcing methods and quantitatively analyzing these networks with tools adapted from social network analysis.

Results of analyzing network models for Epi-Jomon and Okhotsk networks conclude that the structure of these archaeological networks both agree and disagree with expected model patterns. For example, the Epi-Jomon network generally meets expectations as it tends to be more isolated with fewer network ties occurring at the inter-regional scale. However, in contrast to model expectation of higher tie density, Epi-Jomon sites in the central region demonstrate an isolated structure similar to the south region. The Okhotsk network largely meets model expectations as the distribution of ties from sites in the central and north-central region consists of numerous regional and inter-regional relationships suggesting a more integrated network form. The results of this network research are generally support interpretations of social relationships identified through the compositional analysis of obsidian in the Kuril Islands (Phillips 2011). As Phillips (2011) identified, networks connections shift from an even spatial distribution of connections during the Epi-Jomon period to connections exclusively to the north during the Okhotsk period. The implication is that the Epi-Jomon and Okhotsk settlement of the remote islands is fundamentally different in how they structure their social relationships and likely the motivation for inhabiting this unique region.

While the form of networks broadly agrees with model predictions, the function of the network as a strategy for mitigating uncertainty remains inconclusive. This assertion is based upon differences in the connectedness of sites in the central and north-central regions between the Epi-Jomon and Okhotsk periods. Assuming uncertainty remains fairly constant through time, Epi-Jomon sites in these regions remain isolated whereas in the Okhotsk network these same sites are more connected. This conclusion is informative for current and future research as it

suggests that the influence of hazards, risk and uncertainty on social network structures in the Kuril Islands is mediated by a host of political, cultural, economic and technological practices. These outcomes propose a host of additional research questions concerning how other strategies might influence the impact of uncertainty on foraging populations such as the presence of alternative behaviors for acquiring information (micro-band, macro-band); the impact of innovations in transportation (boating) technology or the influence of a regional trading system throughout Northeast Asia. While these questions require future archaeological research to answer, the compositional and network analysis of pottery sherds from the Kuril Islands provide a valuable source of current and future evidence with which to build future research questions.

8.2 Broader Research Implications

One of the broader outcomes of this research is a new perspective on hunter-gatherer colonization and habitation of marginal landscapes throughout the globe. As highlighted by Rockman (2003) and Anthony (1997), the colonization of unfamiliar landscapes is inherently a social process that is fundamentally influenced by diverse range of social, political, demographic and economic factors. The implication is that each colonization or abandonment of a region by a population is a unique amalgamation of individual decisions formalized into a related set of physical actions.

8.2.1 Implications for Understanding the Epi-Jomon Settlement of the Kuril Islands

In reviewing the results of this research, the occupation of the Kuril Islands by Late Jomon/Epi-Jomon and Okhotsk populations can both be considered as migratory events to unfamiliar landscapes that likely differ in their underlying motivations for migration. The spatial

and temporal pattern of Jomon/Epi-Jomon settlement, as identified by pottery styles and radiocarbon dates, correlates with a stepping stone migration pattern extending from south to north throughout the Late and Final Jomon into the Early Epi-Jomon. The implication of this stepping-stone pattern is that sites in newly colonized areas are not likely to differ strongly from each other in terms of their material culture. This suggestion is generally supported, as stylistic and technological traits of Epi-Jomon pottery and settlements are quite similar throughout the archipelago.

Around 3200 cal BP, the Jomon/Epi-Jomon migration process extended across the Bussol Strait to the remote Kuril Islands and into an unfamiliar but not completely novel landscape. Using compositional data it can be identified that some of the earlier migrants to this region may have maintained connections back to the southern region. While limited, three pottery sherds are identified that were produced at sites in the central islands (Rasshua and Drobnye) and moved to sites in the southern islands (Ainu Creek) prior to 2290 cal BP (the earliest phase of the Epi-Jomon period). The interpretation of this pattern is that the Jomon/Epi-Jomon colonization of the Kuril Islands is an incremental process of individuals and populations extending their landscape knowledge and ultimately their boundaries. Therefore, it is proposed that the colonization of the remote Kuril Islands is not a result of a major economic or social crisis but rather a gradual extension of Jomon/Epi-Jomon culture into a potentially productive landscape of abundant marine mammals and birds.

8.2.2 Implications for Understanding the Okhotsk Settlement of the Kuril Islands

The occupation of the Kuril Islands by Okhotsk populations also represents a migration and re-colonization of the remote islands but evidence does not indicate the same stepping-stone

type of migration pattern. While Okhotsk sites exist in the southern islands, the majority of settlements and pottery remains are found at sites in the central and north-central regions of the archipelago. This pattern indicates either a strong “push” out of Hokkaido or more likely a strong “pull” of the central islands. These “push” or “pull” factors seemingly cause Okhotsk populations to bypass settlement of the more diverse southern region in favor of the less diverse and more unpredictable central and north-central regions. In other words, the rapid and focused pattern displayed by Okhotsk settlement suggests the purposeful migration and occupation of the more marginal remote Kuril Islands. In drawing from preliminary evidence from this research, one potential “pull” factor in the settlement of the central and north-central islands would be the ability to produce and trade larger quantities of marine oil.

If Okhotsk populations were engaging in the production and exchange of marine oil, it is expected that exchange networks associated with Okhotsk populations would display increased number of ties and a greater proportion of ties extending beyond the central and north-central regions; a network structure previously identified (chapter 7) within the Okhotsk pottery assemblage. Similar to an information sharing network, the higher density and more distant ties would be advantageous in an economic trade network by allowing the more efficient dissemination of products and/or information to trade partners. Based upon obsidian sourcing data presented by Phillips (2011), if Okhotsk populations inhabiting the archipelago exported marine oil it would have most likely moved northwards (potentially in exchange for obsidian), to populations inhabiting the southern coast of Kamchatka, where Kamchadal populations of the “Relic Neolithic” were known to have a well-developed fishing economy (Chard 1974). While still preliminary, the “marine oil” hypothesis, as developed here, presents a complementary and

intriguing hypothesis that might help explain the structure and function of the Okhotsk social relationships.

The more northern orientation of Kuril Okhotsk social relationships, possibly for the trade of marine products, also provides potential insights into the rapid abandonment of the central and north-central regions around 800 cal BP. During the Middle and Late Okhotsk period in the Kuril Islands, an extensive regional exchange system develops between Hokkaido, Sakhalin and Manchuria (Hudson 2004). However, most archaeological and historical evidence suggests the Okhotsk were not actively incorporated into the regional exchange systems due to social disputes with neighboring Satsumon populations that were more typically involved in the exchange system (Hudson 2004). With the onset of yet another cold period, the Little Ice Age (Razjigaeva et al. 2012), it can be hypothesized that the exchange relationships the Kuril Okhotsk maintained with populations in Kamchatka (and not Hokkaido) did not provide the necessary access to materials or exchange partnerships to remain viable in the central and north-central regions. With increasing long winters, more difficult travel conditions and potentially less demand or increased costs for marine products, the incentives for continued habitation in the remote Kurils may have declined. Given the concurrent combination of economic, social and environmental factors constraining habitation of this region, Okhotsk populations may simply have chosen to abandon their settlements in the Kuril Islands.

8.2.3 Implications for Archaeological Research in Island Settings

Over the last few decades, archaeological research within island environments has moved from the margins to a more central role in anthropological studies particularly concerning research on human evolution, migration, cultural change and human adaptation (Erlandson and

Fitzpatrick 2006:21). The research presented here provides evidence that foraging societies inhabiting island environments may have dealt with unique biogeographical constraints but often successfully managed the environmental challenges associated with living in these landscapes. It is proposed that as a result of this research, biogeographical variables were not a dominant influence on the behavioral strategies utilized by maritime hunter-gatherer in the Kuril Islands, as was initially posited within my human behavioral ecology framework. Rather, the technological and social adaptations of populations to island environments are influenced by a multifaceted combination of demographic, socio-cultural, economic and historical factors. In the development of future research in the Kuril Islands, these alternative factors will be important for understanding how the social and natural conditions of island environments influence social networks patterns and shape culture change.

8.3 Future Research

The results of research reported in this dissertation have intriguing insights into the complex occupation patterns of the Kuril Islands and facilitate a range of new research questions. The current study, which only utilized radiocarbon dates to infer the chronological association of pottery types, could benefit significantly from the direct luminescence dating of pottery types that were not clearly associated with a radiocarbon date (around 70% of diagnostic pottery types). This is especially true for surface collected pottery samples that do not demonstrate culturally diagnostic decoration but contain formal or technological attributes that suggest affiliation with either Epi-Jomon or Okhotsk cultures (such as wall thickness, base thickness or body design). Currently, 14 pottery samples are being analyzed at the University of Washington

Luminescence Lab to help provide higher chronological resolution for Epi-Jomon and Okhotsk pottery types recovered at various sites in the Kuril Islands.

The investigation of pottery production conducted as part of this research has contributed an intriguing hypothesis about the potential importance of marine oil production during the Okhotsk occupation of the archipelago. However, future research is necessary to further test this hypothesis. Of particular importance will be establishing a better understanding of how hot stone boiling methods would have benefitted the production of marine oils and whether this cooking strategy actually does provide greater control over temperatures. Based upon current industrial rendering methods, low temperature heating (~60° C) is typically used in the more delicate extraction of oils from liver or blubber (Shahidi et al. 1994) rather than the higher temperatures associated with extraction from bone marrow (Church and Lyman 2003). These lingering questions clearly lend themselves to future experimental research that more fully investigates the link between the production of marine oil and our archaeological expectations for the technological traits of pottery. Research to obtain compound specific isotopes of extracted lipids is currently underway, which will provide clarity into the types of species used for production. Future funding of experimental work will likely be pursued to highlight the production methods of marine oil with different cooking strategies.

In future research, I also plan to continue refining the novel methodology presented for the construction of social networks from the compositional analysis of pottery remains. As highlighted in Chapter 7, the sourcing of pottery remains provides numerous conceptual advantages for archaeological research but methodological challenges in the identification of source groups has traditionally reduced the confidence in the interpretations drawn from this pottery provenance research. An area of methodological refinement is the use of model-based

and probabilistic methods (Papageorgiou et al. 2001) for the statistical identification of geochemical similarity rather than the established multivariate approach. Preliminary statistical research in this area has provided encouraging outcomes with the use of a regression-based framework to identify local and non-local samples within site assemblages.

Perhaps most important to future research is further investigation into how the Kuril Islands fits within the larger regional system of Northeast Asia. Given the perceived importance and connections of both Epi-Jomon and Okhotsk cultures with populations in Hokkaido and Kamchatka, the hunter-gatherers of the Kuril Islands are clearly not a set of people living in isolation but rather directly and indirectly influenced by the economic, environmental, social and political dynamics of the surrounding regions. Key aspects of this future research will include more fully investigating the origins of the Ainu and evaluating the assimilation hypothesis (Hudson 2004) of Okhotsk and Satsumon cultures in Hokkaido and the potential implication of the assimilation process on peripheral Okhotsk populations in the Kuril Islands. It is proposed that similar geochemical sourcing studies of pottery from this period may be a profitable research method to evaluate the degree of contact between Okhotsk and Satsumon groups.

At a broader level, this research contributes our understanding of how social dimensions of human behavior can be evaluated within the premises of human behavioral ecology models. While social networks have not traditionally been analyzed within an HBE framework, the development of simple theoretical models is clearly beneficial to investigating and testing expectations concerning the structure and function of prehistoric social relationships. More importantly, the modeling framework provides clear indications of where archaeological expectations are not sufficient and therefore highlights avenues of future research to help refine and enhance our understanding of the complex history of the Kuril Islands.

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Appendix A: Descriptive Measurements

Archived at: <https://core.tdar.org/dataset/393044>

FS# - KBP Field Sample Number

SM# - Sakhalin Museum Accession Number

W/T - Weight to Thickness Ratio

Site Codes: AIB-Ainu Bay; AIC-Ainu Creek; BER-Berezovka; CHI-Chirpoi (Peschnaya Bay); DRO-Drobnye; EKA-Ekarma; GLU-Glush; GOL-Golovina Beach; KAP-Kapsul; KAT-Katayeva Bay; KOM-Kompaniskii; KUB-Kuybshevskaya; OLY-Olya; RAS-Rasshua; RIK-Rikorda; RYP-Ryponkicha; SER-Sernovodskoe; TIK-Tikhaya; TOK-Tokotan, VOD-Vodopodnaya; ZAP-Zapadnaya

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Matua	AIB	4192	8055-1	GPS223	GPS223	4.10	7.30	6.83	7.07	0.58	30.52	23.12	25.33	0.76	6.00	n/a					
Matua	AIB	4204	8055-10	GPS225	GPS225	36.50	8.08	7.66	7.87	4.64	64.55	78.24	62.92	4.26							
Matua	AIB	4192	8055-2	GPS223	GPS223	8.20	6.04	5.90	5.97	1.37	35.39	35.28	29.94	3.50							
Matua	AIB	4208	8055-3	GPS228	GPS228	83.30	10.19	10.49	10.34	8.06	73.06	67.15	45.27	4.17	11.25	n/a					
Matua	AIB	4208	8055-4	GPS228	GPS228	78.90	n/a	n/a	n/a	n/a	91.32	91.90	n/a	n/a							
Matua	AIB	4208	8055-5	GPS228	GPS228	48.60	8.73	8.39	8.56	5.68	52.49	80.96	66.47	11.14							
Matua	AIB	4204	8055-7	GPS225	GPS225	21.90	6.19	6.80	6.50	3.37	53.41	50.26	40.84	1.43	5.76	4.19					
Matua	AIB	4204	8055-8	GPS225	GPS225	36.40	5.24	5.37	5.30	6.86	45.85	79.13	69.10	4.16	5.42	3.15					
Matua	AIB	4204	8055-9	GPS225	GPS225	36.50	7.29	7.34	7.31	4.99	28.13	94.64	69.50	7.24			109.00	n/a	80.48	9.17	
Matua	AIB	2090	n/a	surface	surface	47.80	10.95	10.95	10.95	4.37	58.07	77.39	64.28	3.92	8.58	n/a					
Urup	AIC	2466	4	A1	L1	16.00	10.23	10.01	10.12	1.58	31.11	41.16	26.26	0.90	10.88	n/a	n/a				
Urup	AIC	2466	5	A1	L1	16.10	8.35	7.82	8.09	1.99	42.93	33.32	23.98	1.12	6.27	n/a	n/a				
Urup	AIC	2466	6	A1	L1	30.90	11.04	10.59	10.82	2.86	48.07	44.02	37.85	2.05	11.76	n/a	n/a				
Urup	AIC	2466	7	A1	L1	60.30	11.07	10.87	10.97	5.50	71.30	57.71	41.29	2.50	7.95	n/a	n/a				
Urup	AIC	2466	10	A1	L1	98.50	8.65	9.12	8.88	11.09	99.57	83.76	69.56	5.26							
Urup	AIC	2466	13	A1	L1	40.50	10.73	9.54	10.13	4.00	70.13	53.84	47.40	2.66							
Urup	AIC	2466	17	A1	L1	18.30	9.87	9.46	9.66	1.89	34.24	43.77	38.26	1.79							
Urup	AIC	2466	19	A1	L1	7.50	7.32	7.32	7.32	1.02	26.06	46.07	40.64	1.53							
Urup	AIC	2466	20	A1	L1	6.00	5.10	5.26	5.18	1.16	24.75	25.16	20.02	0.42	6.97	1.69	22.67				
Urup	AIC	2410	31	A2	L1	56.90	10.33	10.19	10.26	5.55	53.78	85.74	77.12	5.66	8.71	2.98	47.35				
Urup	AIC	2410	32	A2	L1	249.10	12.60	12.60	12.60	19.77	124.03	43.25	n/a	n/a				110.00	19.39	100.47 (diameter)	
Urup	AIC	2410	33	A2	L1	42.40	10.70	10.75	10.72	3.95	45.38	72.45	65.20	5.67	8.26	0.88	44.10				
Urup	AIC	2410	34	A2	L1	83.20	n/a	n/a	#n/a!	n/a	65.32	83.71	56.82	5.01	11.75	n/a					
Urup	AIC	2410	35	A2	L1	52.90	11.64	13.64	12.64	4.19	72.58	45.01	39.97	2.52	12.98	4.19	67.85				
Urup	AIC	2410	36	A2	L1	35.80	10.27	8.63	9.45	3.79	52.31	50.16	38.99	1.84	9.22	1.44	50.55				
Urup	AIC	2410	37	A2	L1	13.10	12.81	12.81	12.81	1.02	45.43	24.05	17.69	0.17	12.73	n/a	n/a				
Urup	AIC	2410	39	A2	L1	75.20	12.81	12.82	12.81	5.87	84.01	66.66	55.90	4.41							
Urup	AIC	2410	43	A2	L1	33.90	11.96	12.22	12.09	2.80	44.37	57.48	42.39	3.49							
Urup	AIC	2410	44	A2	L1	26.80	8.75	9.99	9.37	2.86	51.54	45.49	37.34	2.44							
Urup	AIC	2410	47	A2	L1	20.30	11.95	12.07	12.01	1.69	39.30	50.24	44.99	2.43							
Urup	AIC	2410	49	A2	L1	13.50	6.48	5.54	6.01	2.25	34.21	55.69	47.19	1.99							
Urup	AIC	2410	50	A2	L1	38.30	8.57	8.61	8.59	4.46	70.73	59.03	54.06	4.29							
Urup	AIC	2432	74	A3	L1	84.70	10.17	10.12	10.15	8.35	50.19	69.74	51.21	7.18			98.00	n/a	42.69	6.55	
Urup	AIC	2432	76	A3	L1	35.60	14.00	12.93	13.46	2.64	52.12	52.55	37.97	4.20							
Urup	AIC	2432	77	A3	L1	115.90	9.35	8.70	9.03	12.84	77.73	103.95	90.28	12.83							
Urup	AIC	2432	79	A3	L1	53.90	8.98	10.26	9.62	5.60	62.89	61.90	51.42	1.42							
Urup	AIC	2432	80	A3	L1	86.60	9.52	8.75	9.14	9.48	106.11	68.09	59.24	5.84							
Urup	AIC	2432	81	A3	L1	87.90	9.12	9.08	9.10	9.66	79.55	119.19	102.00	16.60							
Urup	AIC	2432	90	A3	L1	56.10	6.98	6.38	6.68	8.40	73.55	92.52	78.60	6.25							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	AIC	2432	91	A3	L1	12.70	6.55	6.75	6.65	1.91	38.92	29.59	25.62	1.02							
Urup	AIC	2416	106	A4	1	39.20	9.43	9.53	9.48	4.14	61.62	60.83	29.04	0.53	7.89	2.31	35.03				
Urup	AIC	2416	107	A4	1	25.20	10.86	10.63	10.74	2.35	44.27	49.17	43.26	5.37	8.75	n/a	direct				
Urup	AIC	2416	108	A4	1	31.10	12.02	10.64	11.33	2.74	48.66	54.48	30.47	3.43	9.58	n/a	direct				
Urup	AIC	2416	109	A4	1	5.40	6.67	6.27	6.47	0.84	21.92	33.80	29.20	1.48	6.75	n/a	direct				
Urup	AIC	2416	111	A4	1	43.30	10.95	10.49	10.72	4.04	70.65	70.74	22.24	1.94	10.66	3.15	61.17				
Urup	AIC	2416	112	A4	1	22.20	8.40	8.24	8.32	2.67	48.86	48.45	42.64	2.97	8.52	n/a	direct				
Urup	AIC	2416	113	A4	1	31.40	9.87	8.41	9.14	3.44	57.62	57.64	58.08	4.42	5.78	2.10	20.82				
Urup	AIC	2416	114	A4	1	77.80	10.51	9.49	10.00	7.78	32.84	58.32	23.67	1.43				104.00	16.86	48.78	10.35
Urup	AIC	2416	115	A4	1	72.70	10.79	10.69	10.74	6.77	39.65	72.19	53.46	6.55				110.00	12.80	63.25	18.04
Urup	AIC	2416	116	A4	1	42.80	8.73	8.33	8.53	5.02	41.71	52.39	33.47	8.38				105.00	17.03	40.70	8.91
Urup	AIC	2416	117	A4	1	173.20	10.79	10.68	10.74	16.13	81.18	81.39	41.93	1.71	12.47	5.74	75.14				
Urup	AIC	2416	118	A4	1	137.60	9.46	9.26	9.36	14.70	106.20	107.58	80.82	8.92							
Urup	AIC	2416	119	A4	1	218.00	9.23	9.72	9.48	23.01	151.77	97.91	93.55	8.57							
Urup	AIC	2416	120	A4	1	129.50	10.92	13.00	11.96	10.83	70.69	111.53	91.91	13.91							
Urup	AIC	2416	121	A4	1	53.60	9.27	9.78	9.53	5.63	66.22	64.79	52.78	2.61							
Urup	AIC	2416	122	A4	1	87.30	11.12	11.28	11.20	7.80	83.94	76.87	66.84	6.01							
Urup	AIC	2416	123	A4	1	77.80	10.17	9.34	9.76	7.97	70.59	86.89	76.06	8.85							
Urup	AIC	2416	124	A4	1	41.30	11.80	11.49	11.64	3.55	45.70	70.06	47.26	0.65							
Urup	AIC	2416	125	A4	1	55.50	10.61	10.38	10.50	5.29	66.82	57.19	40.65	5.10							
Urup	AIC	2416	132	A4	1	46.70	7.94	9.11	8.53	5.48	81.83	64.12	58.38	7.69							
Urup	AIC	2416	133	A4	1	52.10	9.47	8.10	8.78	5.93	75.68	54.52	46.04	3.10							
Urup	AIC	2334	194	B2	1	68.10	10.67	9.17	9.92	6.86	93.32	65.72	56.69	4.66	8.80	2.87	59.81				
Urup	AIC	2334	195	B2	1	39.00	6.05	7.57	6.81	5.73	55.69	57.62	49.74	6.39	8.94	6.80					
Urup	AIC	2334	196	B2	1	32.30	9.45	8.82	9.14	3.54	66.02	66.20	21.07	1.56	8.31	2.73					
Urup	AIC	2334	197	B2	1	12.60	8.68	8.53	8.60	1.46	29.84	29.98	25.96	1.09	7.79	n/a	n/a				
Urup	AIC	2334	198	B2	1	12.20	9.57	10.59	10.08	1.21	33.75	33.61	28.80	2.44	9.35	n/a	n/a				
Urup	AIC	2334	199	B2	1	21.60	7.46	7.03	7.25	2.98	23.88	59.23	21.65	4.24				105.00	7.68	53.72	17.84
Urup	AIC	2334	200	B2	1	22.30	n/a	n/a	#n/a!	n/a	20.91	45.99	n/a	n/a				n/a	10.50	37.26	8.11
Urup	AIC	2334	201	B2	1	164.60	15.09	15.01	15.05	10.94	95.97	93.76	81.93	8.06							
Urup	AIC	2334	202	B2	1	76.60	13.33	12.81	13.07	5.86	65.52	74.03	55.63	2.18							
Urup	AIC	2334	203	B2	1	21.00	10.67	10.11	10.39	2.02	28.00	54.36	47.76	3.96							
Urup	AIC	2334	204	B2	1	34.70	10.25	10.17	10.21	3.40	64.22	48.06	42.08	2.24							
Urup	AIC	2334	205	B2	1	27.30	7.21	7.79	7.50	3.64	69.52	37.48	34.40	2.39							
Urup	AIC	2334	206	B2	1	31.10	7.82	7.86	7.84	3.97	53.82	54.67	45.55	4.29							
Urup	AIC	2334	209	B2	1	23.80	7.74	7.55	7.64	3.11	55.24	45.92	38.35	2.62							
Urup	AIC	2334	210	B2	1	8.10	4.86	4.41	4.64	1.75	41.61	43.41	36.84	1.51							
Urup	AIC	2428	217	B1	1	37.70	n/a	n/a	#n/a!	n/a	12.46	69.12	n/a	n/a				113.00	12.47	18.65	2.82
Urup	AIC	2428	218	B1	1	102.80	11.85	12.45	12.15	8.46	107.73	66.81	57.57	4.07							
Urup	AIC	2428	219	B1	1	49.70	10.67	9.87	10.27	4.84	64.47	58.20	49.88	2.97							
Urup	AIC	2428	220	B1	1	37.70	8.62	8.29	8.46	4.46	63.41	55.36	40.47	1.25							
Urup	AIC	2428	221	B1	1	40.40	13.15	12.80	12.98	3.11	38.36	65.01	47.35	1.89							
Urup	AIC	2428	223	B1	1	32.20	9.52	8.93	9.23	3.49	47.88	54.20	46.30	4.13							
Urup	AIC	2428	224	B1	1	40.60	10.24	9.08	9.66	4.20	86.12	45.65	34.56	2.91							
Urup	AIC	2428	226	B1	1	8.50	8.24	8.05	8.14	1.04	30.35	31.61	n/a	n/a							
Urup	AIC	2417	299	65	L1	32.00	6.69	6.31	6.50	4.92	15.00	79.60	74.69	19.70				111.00	5.80	68.91	17.57
Urup	AIC	2417	300	65	L1	10.80	6.05	5.84	5.94	1.82	27.28	39.87	33.13	2.65				110.00	n/a	n.a	n/a
Urup	AIC	2417	302	65	L1	12.70	8.83	8.54	8.68	1.46	53.78	23.84	13.69	0.19	9.21	n/a					
Urup	AIC	2417	303	65	L1	14.30	6.66	6.19	6.42	2.23	36.74	45.88	44.52	5.47							
Urup	AIC	2417	304	65	L1	10.60	5.24	4.91	5.08	2.09	45.45	31.33	39.16	3.17							
Urup	AIC	2417	307	65	L1	15.10	7.59	8.61	8.10	1.86	32.45	51.47	37.06	1.03							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	AIC	2417	310	65	L1	16.90	7.21	7.50	7.35	2.30	47.22	50.81	41.13	4.20							
Urup	AIC	2414	481	A2	L2	112.70	7.55	7.30	7.43	15.17	106.54	89.63	47.85	5.26	8.67	3.65	58.30				
Urup	AIC	2414	482	A2	L2	67.30	10.35	10.26	10.30	6.53	95.20	59.60	52.81	3.38	8.71	4.80					
Urup	AIC	2414	483	A2	L2	39.10	9.66	9.35	9.50	4.11	61.72	49.51	31.07	2.19	6.90	3.31					
Urup	AIC	2414	484	A2	L2	74.10	11.21	11.74	11.47	6.46	72.17	70.03	45.93	8.81	7.56	3.80					
Urup	AIC	2414	485	A2	L2	33.80	9.16	8.35	8.75	3.86	66.13	44.72	29.05	3.70	7.60	2.52					
Urup	AIC	2414	486	A2	L2	37.70	8.16	8.34	8.25	4.57	55.90	58.07	54.13	7.09	7.33	3.40					
Urup	AIC	2414	487	A2	L2	37.00	12.38	12.30	12.34	3.00	51.83	60.86	55.31	3.52	11.12						
Urup	AIC	2414	488	A2	L2	34.20	8.18	9.30	8.74	3.92	58.58	53.73	40.13	0.56	8.98	direct					
Urup	AIC	2414	489	A2	L2	32.10	10.46	10.11	10.28	3.12	51.26	55.31	30.85	2.98	9.91	2.71					
Urup	AIC	2414	490	A2	L2	44.80	12.34	12.55	12.44	3.60	48.77	58.91	34.04	1.89	9.55	1.41					
Urup	AIC	2414	491	A2	L2	46.60	10.55	11.73	11.14	4.18	52.09	58.31	37.77	4.37	9.06	3.18					
Urup	AIC	2414	493	A2	L2	39.90	9.52	11.66	10.59	3.77	45.52	58.23	49.04	6.92	8.24	direct					
Urup	AIC	2414	494	A2	L2	34.20	12.23	12.48	12.36	2.77	73.19	33.70	25.66	2.23	8.96	1.05					
Urup	AIC	2414	495	A2	L2	21.50	7.37	7.18	7.27	2.96	40.09	48.43	44.43	2.56	8.21	1.66					
Urup	AIC	2414	497	A2	L2	20.50	9.10	9.52	9.31	2.20	45.91	44.62	20.16	1.17	8.45	direct					
Urup	AIC	2414	498	A2	L2	27.20	10.41	10.53	10.47	2.60	46.46	49.29	32.20	2.76	10.93	direct					
Urup	AIC	2414	500	A2	L2	21.40	11.59	11.76	11.67	1.83	43.60	30.17	25.55	0.15	12.12	2.31					
Urup	AIC	2414	501	A2	L2	18.10	9.82	10.89	10.35	1.75	33.12	46.27	18.60	0.75	10.57	direct					
Urup	AIC	2414	502	A2	L2	11.30	10.78	10.76	10.77	1.05	33.09	30.13	25.72	0.66	11.24	direct					
Urup	AIC	2414	503	A2	L2	10.30	6.89	6.90	6.89	1.49	37.57	30.23	25.80	0.82	8.36	1.61					
Urup	AIC	2414	504	A2	L2	199.70	n/a	n/a	n/a	n/a	39.48	107.37	93.79 (diameter)					110.00	13.47	76.56 (diameter)	
Urup	AIC	2414	505	A2	L2	66.70	n/a	n/a	n/a	n/a	39.56	69.91	41.28	7.68				110.00	15.54	55.70	8.78
Urup	AIC	2414	506	A2	L2	73.20	n/a	n/a	n/a	n/a	22.18	96.87						108.00	15.63	77.90	22.22
Urup	AIC	2414	508	A2	L2	51.00	n/a	n/a	n/a	n/a	36.94	61.95	41.94	4.54				104.00	15.37	n/a	n/a
Urup	AIC	2414	510	A2	L2	52.80	n/a	n/a	n/a	n/a	49.16	68.33	54.78	11.69				95.00	n/a	45.10	8.07
Urup	AIC	2267	512	A2	L2	82.50	7.84	8.22	8.03	10.27	90.95	68.71	61.91	3.71	5.94						
Urup	AIC	2267	513	A2	L2	39.50	8.77	9.22	9.00	4.39	55.30	57.47	47.17	4.91	8.10						
Urup	AIC	2267	514	A2	L2	21.60	6.79	7.74	7.27	2.97	46.42	56.08	47.18	2.18	7.67						
Urup	AIC	2267	515	A2	L2	9.80	n/a	n/a	n/a	n/a	16.69	50.66	43.07	2.55	9.63						
Urup	AIC	2267	516	A2	L2	22.80	6.39	6.63	6.51	3.50	49.25	60.34	50.91	4.85		4.56					
Urup	AIC	2267	517	A2	L2	43.80	10.01	10.09	10.05	4.36	82.10	48.00	23.52	0.60	6.92						
Urup	AIC	2267	518	A2	L2	32.00	8.01	7.76	7.88	4.06	60.39	46.57	36.19	1.44	7.17						
Urup	AIC	2267	519	A2	L2	23.10	12.59	12.24	12.42	1.86	39.28	40.99	31.31	1.00	12.47						
Urup	AIC	2267	520	A2	L2	11.50	8.22	8.11	8.16	1.41	44.63	26.87	23.67	1.04	5.54	1.38					
Urup	AIC	2267	522	A2	L2	10.90	6.07	5.81	5.94	1.84	32.38	43.50	29.31	1.26	5.60						
Urup	AIC	2267	525	A2	L2	10.10	7.53	7.36	7.44	1.36	33.09	33.19	18.77	0.36	6.02						
Urup	AIC	2267	537	A2	L2	17.10	9.56	9.64	9.60	1.78	24.48	58.37	50.50	1.95							
Urup	AIC	2267	538	A2	L2	7.20	6.71	6.44	6.58	1.09	30.45	40.89	36.57	1.65							
Urup	AIC	2267	542	A2	L2	13.40	7.63	7.45	7.54	1.78	33.31	34.40	30.11	2.04							
Urup	AIC	2430	569	A3	L2	75.00	8.03	7.98	8.00	9.37	76.62	70.61	56.06	2.68	15.51	12.32					
Urup	AIC	2430	570	A3	L2	57.20	8.27	7.52	7.89	7.25	68.93	73.45	40.95	3.24	8.31	10.43	65.40				
Urup	AIC	2430	571	A3	L2	36.30	6.40	6.79	6.60	5.50	56.40	63.32	46.37	3.99	7.93	2.39					
Urup	AIC	2430	572	A3	L2	49.20	14.30	15.10	14.70	3.35	67.94	50.12	26.20	3.77	8.09	3.06	34.51				
Urup	AIC	2430	573	A3	L2	21.90	5.88	6.36	6.12	3.58	41.55	54.07	49.57	2.42	10.85	2.49					
Urup	AIC	2430	574	A3	L2	18.00	7.56	7.67	7.61	2.36	29.68	53.50	40.25	2.31	8.62	direct					
Urup	AIC	2430	577	A3	L2	9.90	6.52	7.84	7.18	1.38	32.36	31.21	19.87	0.87	8.02	direct					
Urup	AIC	2430	579	A3	L2	7.40	5.58	5.70	5.64	1.31	36.97	27.80	31.44	3.88	5.66	direct					
Urup	AIC	2430	580	A3	L2	46.50	9.28	8.76	9.02	5.16	49.18	59.31	42.55	11.87				117.00	13.10	38.26	2.50
Urup	AIC	2430	582	A3	L2	70.80	13.46	13.21	13.33	5.31	48.07	84.06	66.52	4.99							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve	
Urup	AIC	2430	583	A3	L2	86.80	11.57	12.74	12.16	7.14	69.32	76.39	63.12	5.20								
Urup	AIC	2430	586	A3	L2	54.40	10.06	9.72	9.89	5.50	89.41	57.78	51.81	1.65	9.77	direct						
Urup	AIC	2430	587	A3	L2	15.60	8.31	8.19	8.25	1.89	43.00	42.71	38.06	1.05	8.04	direct						
Urup	AIC	2430	588	A3	L2	19.00	7.36	7.07	7.22	2.63	39.44	65.93	53.65	2.37	7.85	1.65						
Urup	AIC	2433	598	A4	L2	9.40	7.04	6.86	6.95	1.35	33.49	28.58	22.26	0.82	7.10	0.84						
Urup	AIC	2433	599	A4	L2	13.30	6.95	6.95	6.95	1.92	32.81	48.65	35.75	3.15	9.19	2.79						
Urup	AIC	2433	601	A4	L2	5.40	5.92	5.78	5.85	0.92	24.35	32.76	24.35	1.48	4.55	1.04						
Urup	AIC	2433	602	A4	L2	15.50	8.13	7.91	8.02	1.93	38.62	39.08	35.48	0.54	8.74	0.83						
Urup	AIC	2433	603	A4	L2	76.60	12.77	13.11	12.94	5.92	56.54	80.96	69.81	6.60								
Urup	AIC	2433	605	A4	L2	62.30	8.00	8.11	8.06	7.73	74.35	69.56	62.86	8.05								
Urup	AIC	2433	606	A4	L2	37.70	8.35	9.35	8.85	4.26	30.27	53.01	n/a				100.00	12.14	41.53 (diameter)			
Urup	AIC	2411	625	A5	L2	70.10	9.61	10.37	9.99	7.02	88.74	63.12	52.03	4.09								
Urup	AIC	2411	626	A5	L2	66.00	9.54	10.10	9.82	6.72	73.22	51.98	39.94	3.46	10.55	5.54						
Urup	AIC	2411	627	A5	L2	36.70	7.82	7.54	7.68	4.78	62.87	56.32	44.62	6.71	7.72	2.74	52.82					
Urup	AIC	2411	628	A5	L2	35.10	9.62	8.81	9.22	3.81	60.19	51.26	33.24	1.09	8.97	1.41						
Urup	AIC	2411	629	A5	L2	22.20	10.30	10.17	10.23	2.17	44.82	53.15	35.33	0.95	8.93	direct						
Urup	AIC	2411	630	A5	L2	23.60	8.99	8.99	8.99	2.62	65.76	35.44	31.10	3.25	9.37	1.87	50.88					
Urup	AIC	2411	631	A5	L2	17.00	n/a	n/a	n/a	n/a	41.69	40.48	29.94	1.06	9.26	0.61						
Urup	AIC	2411	632	A5	L2	17.10	9.82	10.12	9.97	1.72	34.44	39.72	33.57	1.04	8.21	direct						
Urup	AIC	2411	633	A5	L2	10.60	6.50	6.40	6.45	1.64	39.18	30.63	22.24	1.79	6.99	1.55						
Urup	AIC	2411	636	A5	L2	13.80	8.65	8.65	8.65	1.60	35.97	34.62	22.28	0.59	8.33	direct						
Urup	AIC	2411	637	A5	L2	12.10	7.41	7.33	7.37	1.64	32.98	39.58	29.87	1.45	5.62	0.59						
Urup	AIC	2411	640	A5	L2	13.20	11.88	12.03	11.95	1.10	27.78	29.95	18.41	0.53	11.35	0.45						
Urup	AIC	2411	645	A5	L2	62.90	10.18	10.77	10.48	6.00	30.62	65.64	57.60	17.35				110.00	16.56	56.33 (Diameter)		
Urup	AIC	2411	646	A5	L2	11.60	7.14	6.87	7.00	1.66	43.29	27.68	15.82	0.20	6.72	0.71	28.57					
Urup	AIC	2411	649	A5	L2	23.50	6.83	5.90	6.36	3.69	57.61	42.42	35.49	4.12				108.00	n/a	n/a	n/a	
Urup	AIC	2411	650	A5	L2	26.60	8.21	7.89	8.05	3.30	36.49	58.50	42.30	6.45				112.00	n/a	37.84	6.69	
Urup	AIC	2411	651	A5	L2	29.80	6.61	6.72	6.66	4.47	40.85	61.05	50.40	10.67				111.00	n/a	44.07	9.97	
Urup	AIC	2411	652	A5	L2	26.40	8.13	8.60	8.36	3.16	46.82	51.70	39.27	1.62								
Urup	AIC	2411	653	A5	L2	24.80	7.58	7.31	7.44	3.33	45.50	52.52	50.52	3.07								
Urup	AIC	2429	669	61	L2	303.30	8.96	8.56	8.76	34.64	140.00	144.00	102.00	21.04	9.27	6.82	89.65					
Urup	AIC	2429	670	61	L2	118.90	11.59	11.35	11.47	10.37	104.49	89.83	71.21	14.21	6.78	3.43	66.71					
Urup	AIC	2429	671	61	L2	82.60	11.06	11.55	11.30	7.31	60.67	84.62	63.65	5.06	8.96	1.86						
Urup	AIC	2429	672	61	L2	85.30	13.04	13.56	13.30	6.41	80.73	61.95	49.09	3.44	8.46	direct						
Urup	AIC	2429	673	61	L2	105.70	7.83	7.75	7.79	13.57	33.20	68.46	62.52	13.73				117.00	10.06	67.95	14.07	
Urup	AIC	2429	676	61	L2	11.10	7.82	7.82	7.82	1.42	32.16	32.99	23.86	2.06	5.86	2.41						
Urup	AIC	2429	678	61	L2	124.70	n/a	n/a	n/a	n/a	18.43	110.66	n/a	n/a				111.00	9.72	104.6 (diameter)		
Urup	AIC	2429	679	61	L2	31.90	10.39	10.21	10.30	3.10	48.48	52.29	38.76	3.50								
Urup	AIC	2429	682	61	L2	60.50	10.71	10.10	10.40	5.82	73.87	62.98	70.25	5.66								
Urup	AIC	2429	684	61	L2	43.30	11.31	11.06	11.18	3.87	73.44	41.87	37.42	1.43								
Urup	AIC		688	61	L2	43.20	6.04	6.41	6.23	6.94	51.23	69.20	64.07	7.51	6.65	direct						
Urup	AIC		689	61	L2	36.50	8.66	9.46	9.06	4.03	55.52	64.19	49.03	4.50	6.95	direct						
Urup	AIC		691	61	L2	33.10	6.63	7.41	7.02	4.72	49.88	68.38	58.84	4.16								
Urup	AIC		692	61	L2	18.20	7.21	7.39	7.30	2.49	39.20	56.46	48.78	2.38	7.87	direct						
Urup	AIC		693	61	L2	18.80	7.55	6.65	7.10	2.65	42.25	45.96	27.19	1.24	7.08	direct						
Urup	AIC		694	61	L2	24.20	7.16	6.90	7.03	3.44	47.14	58.80	42.91	1.81	10.25	2.52						
Urup	AIC		695	61	L2	23.40	7.54	7.77	7.66	3.06	58.77	41.30	27.46	0.29	8.42	direct						
Urup	AIC		696	61	L2	6.00	5.31	5.15	5.23	1.15	33.71	23.89	13.65	n/a	7.99	1.28						

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	AIC		697	61	L2	7.70	5.81	5.81	5.81	1.32	18.04	41.77	37.65	2.17	7.17	0.67					
Urup	AIC		698	61	L2	5.00	4.98	4.98	4.98	1.00	26.00	27.21	23.11	1.47	7.71	1.72					
Urup	AIC		701	61	L2	4.30	5.79	5.79	5.79	0.74	13.67	25.86	n/a	n/a				110.00	5.40	n/a	
Urup	AIC		702	61	L2	9.80	6.14	5.78	5.96	1.64	27.49	46.61	n/a	n/a				109.00	n/a	30.50	2.08
Urup	AIC		703	61	L2	101.00	8.01	8.74	8.38	12.06	100.06	79.08	64.28	3.49	6.17	direct					
Urup	AIC		706	61	L2	28.30	n/a	n/a	n/a	n/a	59.53	58.06	n/a	n/a							
Urup	AIC		710	61	L2	12.10	7.69	7.93	7.81	1.55	31.74	43.42	n/a	n/a							
Urup	AIC		715	61	L2	38.80	6.48	7.31	6.90	5.63	86.17	47.78	80.35	7.09							
Urup	AIC		716	61	L2	34.40	7.64	7.76	7.70	4.47	69.30	50.54	59.90	7.85							
Urup	AIC		720	61	L2	40.10	7.92	7.76	7.84	5.11	57.18	58.68	62.89	3.25							
Urup	AIC		780	63	L2	88.10	9.54	9.57	9.55	9.22	75.79	94.19	64.91	1.61	7.34	direct					
Urup	AIC		807	64	L2	26.20	6.67	6.47	6.57	3.99	34.63	59.27	46.22	3.20	7.86	direct					
Urup	AIC		808	64	L2	14.60	8.57	8.02	8.29	1.76	37.15	43.76	31.46	1.90	7.25	direct					
Urup	AIC		870	A1	L3	35.00	6.90	7.62	7.26	4.82	76.59	51.41	46.00	1.88	9.06	3.09					
Urup	AIC		874	A1	L3	13.60	8.51	8.09	8.30	1.64	51.82	27.43	n/a	n/a	6.66	direct					
Urup	AIC		877	A1	L3	29.70	9.04	8.39	8.72	3.41	50.93	75.26	43.43	3.39	6.91	direct					
Urup	AIC		878	A1	L3	35.40	7.97	8.16	8.06	4.39	44.37	71.55	61.98	5.61	6.39	direct					
Urup	AIC		879	A1	L3	26.80	7.24	7.93	7.58	3.53	49.41	74.61	65.52	5.92	7.37	direct					
Urup	AIC		1105	surface	surface	565.60	n/a	n/a	n/a	n/a	37.92	139.00	n/a	n/a				95?	19.53	128 (diameter)	
Urup	AIC		1166	surface	surface	114.50	7.83	8.57	8.20	13.96	80.66	103.74	91.01	14.98	8.24	7.37					
Urup	AIC		1168	surface	surface	285.20	16.30	16.30	16.30	17.50	103.45	152.00	102.00	8.77	12.41	direct					
Urup	AIC		1170	surface	surface	172.60	9.44	9.25	9.35	18.47	84.80	111.86	102.00	13.49	11.52	5.28					
Urup	AIC		1171	surface	surface	192.00	9.49	9.61	9.55	20.11	100.36	120.07	59.13	4.98	12.96	6.44	64.96				
Urup	AIC		1172	surface	surface	130.10	11.69	12.01	11.85	10.98	63.88	97.97	84.86	7.55	11.31	direct					
Urup	AIC		1174	surface	surface	92.90	11.88	12.38	12.13	7.66	74.23	77.49	49.68	3.72	10.74	n/a					
Urup	AIC		1176	surface	surface	62.70	7.94	7.22	7.58	8.27	66.67	70.82	55.19	6.53	7.10	7.11	41.79				
Urup	AIC		1177	surface	surface	85.10	13.09	12.38	12.73	6.68	85.18	67.44	59.36	6.07	12.36	direct					
Urup	AIC		1179	surface	surface	37.80	7.37	7.17	7.27	5.20	59.05	65.75	52.69	5.48	6.03	direct					
Urup	AIC		1185	surface	surface	43.90	n/a	n/a	n/a	n/a	70.40	57.86	46.16	4.94	6.96	direct					
Urup	AIC		1210	surface	surface	34.90	8.61	7.65	8.13	4.30	56.40	49.39	39.63	3.25	6.12	3.62					
Urup	AIC		1215	surface	surface	36.30	7.17	7.21	7.19	5.05	56.23	71.72	30.18	0.85	4.97	1.91					
Urup	AIC		1219	surface	surface	36.70	6.59	6.57	6.58	5.58	71.93	57.75	43.08	3.01	6.71	3.98	47.92				
Urup	AIC		1220	surface	surface	118.80	9.38	10.27	9.83	12.09	85.75	103.83	76.71	5.86	7.36	direct					
Urup	AIC		1224	surface	surface	15.90	5.91	6.53	6.22	2.56	38.15	38.92	34.12	2.38	8.17	4.89					
Urup	AIC	2417	7971-273	65	L1	227.10	8.60	8.95	8.77	25.88	125.57	135.43	102.00	6.81	10.34	direct					
Urup	AIC	2417	7971-274	65	L1	94.00	11.11	11.58	11.34	8.29	63.20	91.63	79.11	10.47	11.92	direct					
Urup	AIC	2417	7971-275	65	L1	65.10	12.53	14.50	13.51	4.82	49.85	74.64	53.84	2.72	13.97	direct					
Urup	AIC	2417	7971-276	65	L1	33.20	9.47	9.30	9.39	3.54	53.69	54.64	44.98	1.77	10.17	direct					
Urup	AIC	2417	7971-277	65	L1	35.50	7.63	7.45	7.54	4.71	51.18	59.15	51.31	4.74	8.37	3.33					
Urup	AIC	2417	7971-278	65	L1	36.90	7.43	7.64	7.54	4.90	50.71	54.76	26.86	0.87	7.61	3.29					
Urup	AIC	2417	7971-279	65	L1	26.40	9.28	9.54	9.41	2.81	51.45	45.52	34.26	1.70	6.58	direct					
Urup	AIC	2417	7971-280	65	L1	20.50	9.27	9.08	9.17	2.23	42.94	54.65	34.41	0.43	7.75	direct					
Urup	AIC	2417	7971-281	65	L1	14.90	7.13	6.62	6.87	2.17	43.04	48.33	27.99	1.02	5.91	1.57					
Urup	AIC	2417	7971-282	65	L1	9.00	6.76	6.67	6.71	1.34	33.22	36.30	30.98	0.68	6.93	direct					
Urup	AIC	2417	7971-283	65	L1	13.40	8.50	8.28	8.39	1.60	48.79	31.97	24.42	2.35	7.54	direct					
Urup	AIC	2417	7971-284	65	L1	15.80	9.51	8.93	9.22	1.71	34.17	42.26	28.14	0.80	8.98	direct					
Urup	AIC	2417	7971-285	65	L1	10.20	8.05	8.39	8.22	1.24	43.70	23.93	17.79	0.14	6.84	2.14					
Urup	AIC	2417	7971-287	65	L1	66.50	n/a	n/a	n/a	n/a	37.83	62.23	33.04	8.11				110.00	12.83	45.07	4.73
Urup	AIC	2417	7971-291	65	L1	24.80	8.09	7.46	7.77	3.19	39.70	62.06	52.57	10.89							
Urup	AIC	2417	7971-294	65	L1	60.40	12.07	12.66	12.37	4.88	56.56	70.03	57.29	6.46							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	AIC	2417	7971-296	65	L1	37.90	10.89	10.05	10.47	3.62	48.60	47.62	45.31	2.10							
Urup	AIC	2417	7971-297	65	L1	29.70	10.58	9.73	10.15	2.92	63.89	45.73	55.68	2.64							
Urup	AIC	2417	7971-311	65	L1	33.80	11.81	9.17	10.49	3.22	54.97	55.71	46.25	1.90							
Urup	AIC	2413	7971-442	A1	L2	42.50	11.50	12.53	12.01	3.54	52.47	55.84	43.52	1.03	7.52						
Urup	AIC	2413	7971-443	A1	L2	61.40	10.60	9.76	10.18	6.03	67.98	70.57	34.74	2.04	10.02	1.71					
Urup	AIC	2413	7971-444	A1	L2	22.50	11.64	11.64	11.64	1.93	52.45	32.28	21.37	0.57	11.80						
Urup	AIC	2413	7971-445	A1	L2	12.00	n/a	n/a	n/a	n/a	29.67	60.05	53.78	1.64	n/a						
Urup	AIC	2413	7971-446	A1	L2	14.00	8.48	7.56	8.02	1.75	33.65	47.16	43.07	1.40	7.85						
Urup	AIC	2413	7971-447	A1	L2	28.50	n/a	n/a	n/a	n/a	17.36	55.10						102.00	9.54	46.55	11.94
Urup	AIC	2413	7971-448	A1	L2	68.10	11.55	12.31	11.93	5.71	56.75	76.95	50.39	0.90							
Urup	AIC	2413	7971-449	A1	L2	59.00	9.51	12.49	11.00	5.37	83.11	54.17	52.96	3.15							
Urup	AIC	2413	7971-450	A1	L2	49.20	10.56	10.66	10.61	4.64	65.53	70.91	61.85	3.39							
Urup	AIC	2413	7971-451	A1	L2	47.50	9.68	10.59	10.14	4.69	53.24	63.40	49.51	2.60							
Urup	AIC	2413	7971-452	A1	L2	43.50	8.99	9.89	9.44	4.61	71.80	54.21	62.03	5.48							
Urup	AIC	2290	7971-454	A1	L2	16.90	10.12	8.82	9.47	1.78	33.19	48.65	44.03	0.24							
Urup	AIC	2290	7971-456	A1	L2	17.80	5.71	5.63	5.67	3.14	62.76	50.73	43.75	2.85	5.89	n/a	n/a				
Urup	AIC	2291	7971-459	A1	L2	9.80	6.82	6.80	6.81	1.44	30.02	35.49	24.90	0.76							
Urup	AIC	2267	7971-526	A2	L2	19.80	5.65	5.06	5.36	3.70	17.48	44.99	n/a	n/a				108.00	5.63	46.84 (diameter)	
Urup	AIC	2267	7971-527	A2	L2	33.00	7.21	7.81	7.51	4.39	24.25	73.39	47.10	12.42				113.00	7.64	66.42	22.48
Urup	AIC	2267	7971-528	A2	L2	32.00	5.63	5.48	5.56	5.76	79.53	52.31	36.31	5.79				110.00			
Urup	AIC	2267	7971-529	A2	L2	39.70	7.18	7.99	7.58	5.23	48.56	63.31	48.03	5.90				118.00			
Urup	AIC	2267	7971-530	A2	L2	30.40	10.45	10.71	10.58	2.87	41.69	54.73	46.20	2.02							
Urup	AIC	2267	7971-531	A2	L2	21.60	6.77	7.81	7.29	2.96	48.81	54.23	46.97	3.02							
Urup	AIC	2267	7971-532	A2	L2	41.30	8.10	9.00	8.55	4.83	69.97	50.97	46.10	2.27							
Urup	AIC	2267	7971-533	A2	L2	62.90	8.88	7.76	8.32	7.56	93.29	70.02	57.25	2.07							
Urup	AIC	2267	7971-534	A2	L2	45.40	8.47	8.08	8.27	5.49	63.70	83.44	75.12	4.82							
Urup	AIC	2267	7971-535	A2	L2	25.90	6.87	7.25	7.06	3.67	54.15	44.59	38.30	2.78							
Urup	AIC	2267	7971-536	A2	L2	37.80	7.06	7.26	7.16	5.28	54.37	71.53	60.24	4.21							
Urup	AIC	2432	7971-61	A3	L1	144.60	9.14	9.67	9.41	15.37	78.29	128.65	102.00	16.34	10.48	6.11	75.21				
Urup	AIC	2432	7971-62	A3	L1	77.20	12.11	11.30	11.70	6.60	78.87	64.59	51.83	2.99	9.90	direct					
Urup	AIC	2432	7971-63	A3	L1	37.30	8.96	9.03	9.00	4.15	43.95	63.51	58.34	4.16	8.19	direct					
Urup	AIC	2432	7971-64	A3	L1	35.80	9.36	9.36	9.36	3.83	50.74	61.37	54.87	8.30	9.42	2.93	31.28				
Urup	AIC	2432	7971-65	A3	L1	45.90	9.66	10.25	9.96	4.61	55.87	66.82	41.90	1.95	11.82	direct					
Urup	AIC	2432	7971-66	A3	L1	25.50	8.59	7.73	8.16	3.12	53.90	49.53	30.79	1.58	8.40	direct					
Urup	AIC	2432	7971-67	A3	L1	15.60	10.72	10.72	10.72	1.45	30.37	45.67	36.40	1.11	10.26	1.01					
Urup	AIC	2432	7971-68	A3	L1	18.20	11.57	11.72	11.65	1.56	38.39	31.86	23.29	0.37	11.55	direct					
Urup	AIC	2432	7971-69	A3	L1	11.40	9.34	8.43	8.89	1.28	45.79	23.85	16.73	0.77	6.49	direct					
Urup	AIC	2432	7971-70	A3	L1	7.70	8.24	7.78	8.01	0.96	20.03	33.77	26.06	0.94	7.22	direct					
Urup	AIC	2432	7971-71	A3	L1	19.80	9.41	9.08	9.25	2.14	42.86	37.39	24.03	1.47	11.51	direct					
Urup	AIC	2432	7971-72	A3	L1	72.10	9.16	8.32	8.74	8.25	54.26	90.26	82.36	12.45	7.16	direct					
Urup	AIC	2432	7971-73	A3	L1	127.90	10.33	10.49	10.41	12.29	88.47	95.91	85.48	7.43	10.11	8.58					
Kunashir	ALE	135	7863-1	Unknown	Unknown	412.00	8.08	9.09	8.58	48.00	89.07	154.41	142mm (Diameter in middle)					114.00	10.69	74.72 (diameter)	
Kunashir	ALE	175	7863-10	Unknown	Unknown	22.30	12.49	8.98	10.74	2.08	40.37	44.70	33.46	1.36	6.72	n/a	n/a				
Kunashir	ALE	136	7863-2	Unknown	Unknown	32.80	8.70	7.39	8.04	4.08	65.08	51.54	54.69	5.15							
Kunashir	ALE	175	7863-3	Unknown	Unknown	34.20	9.03	8.83	8.93	3.83	43.76	62.89	58.23	3.32							
Kunashir	ALE	175	7863-4	Unknown	Unknown	17.80	7.36	6.24	6.80	2.62	55.76	55.87	47.53	4.68							
Kunashir	ALE	175	7863-5	Unknown	Unknown	6.60	8.10	7.93	8.01	0.82	27.97	28.07	n/a	n/a							
Kunashir	ALE	175	7863-6	Unknown	Unknown	8.40	6.48	6.44	6.46	1.30	34.91	36.03	25.50	0.91							
Kunashir	ALE	175	7863-7	Unknown	Unknown	13.10	6.81	8.38	7.59	1.73	46.86	29.26	20.07	0.53							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Kunashir	ALE	175	7863-8	Unknown	Unknown	16.10	6.56	7.27	6.92	2.33	48.38	41.35	40.90	1.32							
Kunashir	ALE	175	7863-9	Unknown	Unknown	19.40	8.80	10.44	9.62	2.02	24.98	43.47	n/a	n/a				114.00	8.78	41.17	6.18
Shumshu	BAI	915	7928-15	TP2	L2		n/a	n/a	#n/a!	n/a	40.00	46.19	n/a	n/a							
Shumshu	BAI	915	7928-16	TP2	L2		8.57	8.45	8.51	8.48	24.11	48.12	40.05	2.87							
Shumshu	BAI	915	7928-18	TP2	L2		n/a	n/a	n/a	n/a	28.45	42.14	33.55	2.13							
Shumshu	BAI	933	7928-8	Surface	Near TP2		n/a	n/a	#n/a!	n/a	41.38	48.93	33.60	1.29							
Shumshu	BAI	933	7928-9	Surface	Near TP2		11.52	11.52	11.52		26.62	78.47	57.12	17.73				110.00	n/a	n/a	n/a
Iturup	BER	45	125	Surface	Surface	94.10	10.47	10.96	10.71	8.78	82.90	96.71	80.40	8.73	9.48	n/a					
Iturup	BER	45	126	Surface	Surface	37.90	9.38	9.44	9.41	4.03	78.48	51.48	62.05	4.62							
Iturup	BER	45	127	Surface	Surface	24.40	5.62	5.67	5.64	4.32	79.38	39.13	33.14	2.26							
Iturup	BER	45	128	Surface	Surface	61.40	6.95	6.72	6.83	8.99	79.27	83.42	63.07	2.85							
Iturup	BER	45	143	Surface	Surface	52.90	9.83	8.27	9.05	5.85	57.72	79.48	74.84	8.56	6.35						
Iturup	BER	45	144	Surface	Surface	30.80	8.29	8.19	8.24	3.74	47.26	56.94	51.43	2.15	7.91						
Iturup	BER	45	145	Surface	Surface	37.60	7.38	7.49	7.44	5.06	72.15	60.96	33.26	1.94	6.39						
Iturup	BER	45	146	Surface	Surface	19.20	7.25	7.69	7.47	2.57	36.75	51.72	43.01	2.05	5.69						
Iturup	BER	45	147	Surface	Surface	24.50	8.20	8.27	8.24	2.97	44.61	60.17	23.96	2.27	6.19						
Iturup	BER	45	148	Surface	Surface	21.10	6.68	6.85	6.76	3.12	55.46	55.96	51.74	8.06	3.86	1.55	32.70				
Iturup	BER	45	149	Surface	Surface	24.80	8.70	8.14	8.42	2.95	57.35	39.54	29.67	0.93	5.96						
Iturup	BER	45	150	Surface	Surface	26.10	9.83	10.30	10.06	2.59	47.57	56.54	47.10	2.74	8.97						
Iturup	BER	45	151	Surface	Surface	8.60	n/a	n/a	n/a	n/a	40.42	27.80	n/a	n/a	n/a						
Iturup	BER	45	152	Surface	Surface	65.50	10.75	10.85	10.80	6.06	71.38	75.43	65.50	2.93							
Iturup	BER	45	153	Surface	Surface	76.50	11.28	11.18	11.23	6.81	110.99	60.31	50.83	1.25							
Iturup	BER	45	154	Surface	Surface	52.00	11.50	11.70	11.60	4.48	80.26	65.98	56.62	3.03							
Iturup	BER	45	155	Surface	Surface	9.40	n/a	n/a	n/a	n/a	36.48	43.15	n/a	n/a							
Iturup	BER	45	156	Surface	Surface	14.10	7.95	7.95	7.95	1.77	38.58	40.59	35.05	1.67							
Iturup	BER	45	157	Surface	Surface	19.90	5.86	5.82	5.84	3.41	59.90	43.43	38.53	1.61							
Iturup	BER	45	158	Surface	Surface	27.50	6.08	6.67	6.38	4.31	63.21	51.50	43.53	2.06							
Iturup	BER	45	159	Surface	Surface	30.80	8.05	9.13	8.59	3.58	54.74	56.75	47.58	3.81							
Iturup	BER	45	160	Surface	Surface	28.20	9.62	10.44	10.03	2.81	52.94	49.06	44.09	1.42							
Iturup	BER	45	161	Surface	Surface	64.40	8.72	8.87	8.79	7.32	58.39	105.98	99.68	9.12							
Iturup	BER	45	164	Surface	Surface	114.60	9.09	9.09	9.09	12.61	36.19	95.20	37.66	8.64				106.00	11.25	71.62 (Diameter)	
Iturup	BER	47	165	Surface	Surface	16.60	n/a	n/a	n/a	n/a	42.69	36.49	28.35	1.17	6.70						
Iturup	BER	47	166	Surface	Surface	24.30	n/a	n/a	n/a	n/a	49.11	42.03	36.56	1.18	6.90						
Iturup	BER	47	167	Surface	Surface	364.30	14.61	12.50	13.56	26.88	140.00	174.00	102.00	7.18							
Iturup	BER	47	168	Surface	Surface	40.60	4.54	6.19	5.37	7.56	52.54	66.12	61.34	4.90	7.92	2.30	25.29				
Iturup	BER	47	169	Surface	Surface	52.90	7.32	6.61	6.96	7.60	89.35	71.36	61.03	5.21							
Iturup	BER	47	170	Surface	Surface	47.80	8.89	8.88	8.88	5.38	74.14	70.15	61.62	5.54							
Iturup	BER	46	171	Surface	Watch Tower	9.30	n/a	n/a	n/a	n/a	38.96	40.26	27.90	1.28	6.95	1.96	34.47				
Iturup	BER	46	172	Surface	Watch Tower	22.50	6.41	7.04	6.73	3.35	43.39	52.47	47.79	3.69	7.17	1.97	40.28				
Iturup	BER	46	173	Surface	Watch Tower	23.00	8.66	8.76	8.71	2.64	40.85	53.59	44.64	1.53	7.06						
Iturup	BER	46	174	Surface	Watch Tower	15.70	9.51	9.51	9.51	1.65	46.90	37.18	28.75	1.20	7.45						
Iturup	BER	46	175	Surface	Watch Tower	13.40	n/a	n/a	n/a	n/a	41.35	46.67	25.15	0.87	7.94	2.72	24.73				
Iturup	BER	46	176	Surface	Watch Tower	17.70	7.51	7.56	7.54	2.35	37.21	46.36	40.05	1.79	8.62						
Iturup	BER	46	177	Surface	Watch Tower	30.10	8.79	8.72	8.75	3.44	49.97	52.20	46.05	1.84	8.66						
Iturup	BER	46	178	Surface	Watch Tower	29.10	9.74	10.03	9.89	2.94	49.79	62.60	59.20	2.56	8.69	3.66	42.29				
Iturup	BER	46	179	Surface	Watch Tower	6.20	6.65	6.79	6.72	0.92	25.42	30.65	25.66	0.94	5.78						
Iturup	BER	46	185	Surface	Surface	34.00	12.70	11.75	12.23	2.78	44.72	53.26	48.05	3.34	9.42						
Iturup	BER	46	186	Surface	Surface	41.30	8.81	8.38	8.60	4.80	44.28	67.87	56.23	4.14	6.13						
Iturup	BER	46	187	Surface	Surface	14.40	6.42	6.41	6.42	2.24	39.74	41.46	35.34	1.60	6.78						

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Iturup	BER	46	188	Surface	Surface	17.10	7.56	6.60	7.08	2.42	37.46	50.61	32.68	1.70	6.06						
Iturup	BER	46	189	Surface	Surface	21.30	6.35	6.02	6.18	3.44	48.06	62.55	22.98	0.60	8.31						
Iturup	BER	46	190	Surface	Surface	39.50	6.72	6.82	6.77	5.83	56.73	58.99	52.56	2.86							
Iturup	BER	46	191	Surface	Surface	24.10	6.10	6.30	6.20	3.89	53.07	46.67	39.47	2.98							
Iturup	BER	46	192	Surface	Surface	23.90	6.83	6.85	6.84	3.49	54.75	42.68	37.67	1.66							
Iturup	BER	47	204	Surface	Surface	146.60	9.29	9.47	9.38	15.63	78.02	102.26	69.64	11.05	7.32	n/a					
Iturup	BER	47	205	Surface	Surface	73.80	9.97	11.01	10.49	7.03	92.00	71.11	n/a	n/a	8.57	n/a					
Iturup	BER	226	210	Surface	Surface	66.80	12.06	12.66	12.36	5.40	52.09	71.62	58.68	13.51	9.73	n/a	n/a				
Iturup	BER	226	211	Surface	Surface	65.90	8.07	8.26	8.16	8.07	66.61	86.70	77.98	4.10							
Iturup	BER	226	212	Surface	Surface	64.70	11.10	10.79	10.94	5.91	79.94	88.54	72.31	7.00							
Iturup	BER	226	213	Surface	Surface	18.60	9.81	9.96	9.89	1.88	44.71	45.88	n/a	n/a							
Iturup	BER	226	214	Surface	Surface	100.90	9.04	8.61	8.83	11.43	99.98	70.27	60.30	8.66				108.00	n/a	65.68	20.52
Iturup	BER	57	216	Profile 2	S5	33.60	9.66	9.01	9.34	3.60	43.25	75.69	67.62	6.81							
Iturup	BER	57	217	Profile 2	S5	74.40	10.51	11.28	10.89	6.83	87.21	65.73	66.64	4.43							
Iturup	BER	57	218	Profile 2	S5	31.70	n/a	n/a	n/a	n/a	76.21	62.01	52.78	2.20							
Iturup	BER	54	220	Profile 2	Base of 5	13.20	8.22	8.24	8.23	1.60	33.76	49.28	41.76	3.95							
Iturup	BER	62	225	Left Bank	Left Bank	15.50	8.33	8.09	8.21	1.89	35.29	49.71	20.51	0.98	8.48	n/a	n/a				
Iturup	BER	62	226	Left Bank	Left Bank	5.60	6.45	6.65	6.55	0.85	26.01	30.72	n/a	n/a							
Iturup	BER	62	227	Left Bank	Left Bank	5.30	7.25	7.49	7.37	0.72	27.64	24.03	n/a	n/a							
Iturup	BER	62	228	Left Bank	Left Bank	7.30	9.74	9.87	9.80	0.74	29.01	21.81	n/a	n/a							
Iturup	BER	62	229	Left Bank	Left Bank	44.70	9.43	7.41	8.42	5.31	84.40	56.74	49.10	2.60							
Iturup	BER	71	230	Profile 1	150cmbd	37.50	8.55	8.11	8.33	4.50	82.52	64.32	60.16	1.72							
Iturup	BER	61	231	Right Bank	Right Bank	16.00	9.00	9.03	9.02	1.77	43.91	33.19	35.63	2.37							
Shumshu	BOL	840	7929-10	Surface	Surface	16.10	9.87	8.89	9.38	1.72	35.45	51.45	28.21	1.69							
Shumshu	BOL	840	7929-13	Surface	Surface	9.40	9.71	9.62	9.67	0.97	28.21	40.72	27.09	1.31							
Shumshu	BOL	840	7929-19	Surface	Surface	40.00	9.19	10.29	9.74	4.11	58.94	70.35	43.97	1.66	9.90	1.40	52.00				
Shumshu	BOL	840	7929-4	Surface	Surface	80.50	7.19	9.23	8.21	9.81	92.68	73.41	64.93	6.53							
Shumshu	BOL	840	7929-5	Surface	Surface	215.40	8.89	7.19	8.04	26.80	139.81	114.82	98.22	12.88	10.29	3.87	102.00				
Shumshu	BOL	840	7929-6	Surface	Surface	232.20	9.74	10.17	9.96	23.32	71.17	108.89	102.00	23.98				103.00	17.74	57.10	9.49
Shumshu	BOL	840	7929-7	Surface	Surface	17.30	7.31	7.17	7.24	2.39	45.77	62.31	58.27	4.69							
Shumshu	BOL	840	7929-8	Surface	Surface	27.90	8.54	9.78	9.16	3.05	57.95	46.83	37.95	2.27							
Shumshu	BOL	840	7929-9	Surface	Surface	38.10	9.06	9.38	9.22	4.13	53.97	62.96	54.28	4.62							
Chirpoi	CHI	4232	8073-10	surface	surface	24.30	7.76	7.82	7.79	3.12	51.53	49.31	43.46	3.66	7.11	4.93					
Chirpoi	CHI	4232	8073-11	surface	surface	15.50	6.00	6.07	6.04	2.57	50.05	56.98	53.11	3.19							
Chirpoi	CHI	4232	8073-12	surface	surface	11.60	8.61	8.41	8.51	1.36	47.08	31.98	n/a	n/a							
Chirpoi	CHI	4232	8073-13	surface	surface	23.20	10.90	10.93	10.92	2.13	33.01	60.03	58.88	3.24	9.17	0.51					
Chirpoi	CHI	4232	8073-14	surface	surface	30.00	9.09	9.06	9.08	3.31	47.38	58.92	46.60	0.37							
Chirpoi	CHI	4232	8073-15	surface	surface	8.30	8.17	8.73	8.45	0.98	16.89	44.47	n/a	n/a							
Chirpoi	CHI	4232	8073-16	surface	surface	26.90	7.42	7.54	7.48	3.60	74.40	37.18	30.52	1.14							
Chirpoi	CHI	4232	8073-17	surface	surface	14.00	5.84	6.13	5.99	2.34	38.85	43.92	39.56	4.65							
Chirpoi	CHI	4232	8073-18	surface	surface	11.30	7.67	7.47	7.57	1.49	30.72	41.29	33.16	2.11							
Chirpoi	CHI	4232	8073-19	surface	surface	18.70	8.38	8.36	8.37	2.23	37.83	50.65	36.63	1.69							
Chirpoi	CHI	4232	8073-2	surface	surface	8.30	7.91	7.86	7.89	1.05	24.16	42.23	31.21	1.65	7.05	2.45					
Chirpoi	CHI	4232	8073-20	surface	surface	26.60	8.53	8.66	8.60	3.09	64.56	39.49	58.83	4.99							
Chirpoi	CHI	4232	8073-21	surface	surface	34.50	8.79	8.46	8.62	4.00	62.24	76.35	39.67	2.28							
Chirpoi	CHI	4232	8073-22	surface	surface	27.50	6.04	6.36	6.20	4.43	65.85	61.50	52.40	4.43							
Chirpoi	CHI	4232	8073-24	surface	surface	22.80	8.26	8.28	8.27	2.76	26.80	62.16	27.72	1.37				103.00	7.98	61.16	9.38
Chirpoi	CHI	4232	8073-26	surface	surface	6.70	n/a	n/a	n/a	n/a	33.57	36.39	n/a	n/a	7.02	4.12					
Chirpoi	CHI	4232	8073-27	surface	surface	20.00	9.03	8.67	8.85	2.26	33.68	44.11	29.24	1.66				103.00	n/a	41.70	4.76
Chirpoi	CHI	4232	8073-28	surface	surface	31.50	7.63	7.42	7.52	4.19	70.68	57.58	38.73	2.68							
Chirpoi	CHI	4232	8073-29	surface	surface	25.80	7.01	6.37	6.69	3.86	59.62	52.14	35.97	4.78	3.82	4.03					

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Chirpoi	CHI	4232	8073-3	surface	surface	35.50	8.11	8.65	8.38	4.24	63.71	40.22	28.13	1.37	9.73	direct					
Chirpoi	CHI	4232	8073-30	surface	surface	24.80	9.50	9.14	9.32	2.66	49.66	48.57	45.18	0.76							
Chirpoi	CHI	4232	8073-31	surface	surface	18.30	9.27	9.32	9.29	1.97	52.37	40.58	n/a	n/a							
Chirpoi	CHI	4232	8073-32	surface	surface	10.90	7.63	7.46	7.55	1.44	27.65	44.30	37.73	2.09							
Chirpoi	CHI	4232	8073-33	surface	surface	7.30	9.00	9.23	9.12	0.80	19.04	34.18	27.85	0.77							
Chirpoi	CHI	4232	8073-34	surface	surface	7.80	n/a	n/a	n/a	n/a	43.21	33.62	28.75	1.08	7.08	n/a (direct)					
Chirpoi	CHI	4232	8073-4	surface	surface	12.80	8.58	8.23	8.41	1.52	27.46	44.84	31.32	2.19							
Chirpoi	CHI	4232	8073-5	surface	surface	22.60	7.09	7.37	7.23	3.13	49.34	48.36	37.91	2.30							
Chirpoi	CHI	4232	8073-6	surface	surface	42.00	8.69	8.62	8.66	4.85	60.91	66.66	58.46	6.11	6.50	direct/slight inclusive					
Chirpoi	CHI	4232	8073-7	surface	surface	38.30	8.61	8.76	8.69	4.41	69.43	55.22	47.81	3.08							
Chirpoi	CHI	4232	8073-8	surface	surface	26.70	8.23	8.66	8.45	3.16	49.05	72.17	38.74	2.46				107.00	9.26	40.83	4.43
Chirpoi	CHI	4232	8073-9	surface	surface	33.30	7.81	8.07	7.94	4.19	60.62	64.12	47.37	1.13							
Chirpoi	CHI	4232	Tray 1	surface	surface	37.10	8.35	7.61	7.98	4.65	57.61	62.00	56.62	6.31	7.35	4.87					
Chirpoi	CHI	4232	Tray 1	surface	surface	32.00	8.07	7.55	7.81	4.10	64.37	55.45	30.72	2.17	6.68	3.08					
Chirpoi	CHI	4232	Tray 1	surface	surface	38.10	6.75	6.06	6.40	5.95	55.99	78.15	60.49	2.63	6.04	n/a					
Chirpoi	CHI	4232	Tray 1	surface	surface	53.90	8.44	8.24	8.34	6.46	81.78	71.55	47.30	4.99	7.56	5.51					
Chirpoi	CHI	4232	Tray 1	surface	surface	51.10	8.79	8.41	8.60	5.94	67.08	81.25	62.86	7.81	7.45	n/a					
Chirpoi	CHI	4232	Tray 1	surface	surface	20.10	6.66	6.21	6.43	3.13	47.69	55.35	30.61	3.20	3.86	n/a					
Chirpoi	CHI	4232	Tray 1	surface	surface	9.60	6.74	6.81	6.77	1.42	35.83	43.26	n/a		5.25	n/a					
Chirpoi	CHI	4232	Tray 1	surface	surface	10.30	7.19	7.71	7.45	1.38	47.08	29.70	n/a		9.09	1.94					
Chirpoi	CHI	4232	Tray 1	surface	surface	77.40	11.15	10.86	11.01	7.03	83.54	85.64	61.17	3.08	13.61	5.47					
Chirpoi	CHI	4232	Tray 2	surface	surface	9.30	5.88	6.33	6.11	1.52	35.66	44.55	37.00	0.85	6.16	n/a					
Chirpoi	CHI	4232	Tray 2	surface	surface	59.90	8.74	9.04	8.89	6.74	68.79	80.39	47.67	3.18	7.33	4.62					
Chirpoi	CHI	4232	Tray 2	surface	surface	46.80	8.00	6.27	7.13	6.56	78.23	73.10	41.84	4.17	3.98	1.88		109.00			
Chirpoi	CHI	4232	Tray 2	surface	surface	10.50	5.27	5.03	5.15	2.04	45.49	41.44	31.38	1.60	5.40	1.30					
Chirpoi	CHI	4232	Tray 2	surface	surface	35.10	8.51	8.89	8.70	4.03	53.21	59.69	48.76	4.29	10.30	2.43					
Chirpoi	CHI	4232	Tray 2	surface	surface	85.00	9.52	9.35	9.43	9.01	74.92	107.25	97.75	8.12	7.58	1.57					
Chirpoi	CHI	4232	Tray 2	surface	surface	35.80	7.31	8.22	7.77	4.61	69.95	54.45	49.76	2.21	7.70	n/a (direct)					
Chirpoi	CHI	4232	Tray 2	surface	surface	88.00	11.06	12.22	11.64	7.56	81.02	88.30	45.57	1.78	14.11	5.05					
Chirpoi	CHI	4232	Tray 2	surface	surface	45.40	8.35	7.89	8.12	5.59	55.99	84.39	78.69	6.32	8.43	1.21					
Chirpoi	CHI	4232	Tray 3	surface	surface	31.60	8.17	8.47	8.32	3.80	38.58	56.28	45.58	6.43				108.00	9.17	53.25	7.16
Chirpoi	CHI	4232	Tray 3	surface	surface	64.00	8.10	7.71	7.90	8.10	52.52	95.96	90.54	5.35							
Chirpoi	CHI	4232	Tray 3	surface	surface	11.80	5.92	5.28	5.60	2.11	35.77	47.30	37.46	2.64							
Chirpoi	CHI	4232	Tray 3	surface	surface	32.20	7.47	7.46	7.46	4.31	73.83	51.77	45.52	2.75							
Chirpoi	CHI	4232	Tray 3	surface	surface	19.00	n/a	n/a	n/a	n/a	24.23	39.01	n/a	n/a				102.00	n/a	34.28	3.14
Chirpoi	CHI	4232	Tray 3	surface	surface	8.80	n/a	n/a	n/a	n/a	33.35	55.86	51.46	3.90							
Chirpoi	CHI	4232	Tray 3	surface	surface	7.60	6.51	6.62	6.56	1.16	24.38	42.17	36.79	1.18							
Chirpoi	CHI	4232	Tray 3	surface	surface	14.40	6.97	7.09	7.03	2.05	43.33	40.38	31.48	1.12							
Chirpoi	CHI	4232	Tray 3	surface	surface	9.50	6.68	6.46	6.57	1.45	31.99	44.61	35.45	2.27							
Chirpoi	CHI	4232	Tray 3	surface	surface	19.80	6.62	6.78	6.70	2.96	62.57	49.05	36.69	2.03							
Chirpoi	CHI	4232	Tray 3	surface	surface	50.90	6.76	7.02	6.89	7.38	54.68	93.50	84.52	14.66							
Chirpoi	CHI	4232	Tray 4	surface	surface	35.00	9.25	9.46	9.35	3.74	58.69	61.98	51.86	3.73							
Chirpoi	CHI	4232	Tray 4	surface	surface	28.60	9.58	9.77	9.67	2.96	43.42	67.48	37.39	1.83							
Chirpoi	CHI	4232	Tray 4	surface	surface	36.20	9.30	8.62	8.96	4.04	52.92	65.13	46.21	5.57							
Chirpoi	CHI	4232	Tray 4	surface	surface	16.30	8.66	8.75	8.70	1.87	49.77	39.65	30.23	1.59							
Chirpoi	CHI	4232	Tray 4	surface	surface	38.80	8.46	8.58	8.52	4.56	60.08	52.32	47.57	2.28							
Chirpoi	CHI	4232	Tray 4	surface	surface	17.80	9.01	9.01	9.01	1.98	55.37	33.92	32.65	1.86							
Chirpoi	CHI	4232	Tray 4	surface	surface	18.20	9.17	9.36	9.26	1.97	32.93	46.00	36.64	1.37							
Chirpoi	CHI	4232	Tray 4	surface	surface	27.70	6.95	7.47	7.21	3.84	50.84	65.85	55.46	4.20							
Chirpoi	CHI	4232	Tray 4	surface	surface	32.60	9.45	9.61	9.53	3.42	63.65	48.17	41.71	2.16							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Chirpoi	CHI	4232	Tray 4	surface	surface	25.20	7.59	8.13	7.86	3.21	64.30	55.86	41.67	2.98							
Chirpoi	CHI	4232	Tray 4	surface	surface	56.50	8.40	7.60	8.00	7.06	76.78	85.97	68.05	7.54							
Chirpoi	CHI	4232	Tray 4	surface	surface	123.30	9.67	9.08	9.37	13.15	87.33	113.87	95.24	9.66							
Chrinkotan	CHR	n/a	8057-1	n/a	n/a	13.50	10.21	10.14	10.18	1.33	36.26	40.39	36.22	1.12	8.86	n/a (straight)					
Chrinkotan	CHR	n/a	8057-2	n/a	n/a	39.50	9.54	9.90	9.72	4.06	50.15	70.34	64.34	4.90							
Chrinkotan	CHR	n/a	8057-3	n/a	n/a	4.80	8.53	9.27	8.90	0.54	25.01	22.84	n/a	n/a							
Chrinkotan	CHR	n/a	8057-4	n/a	n/a	14.80	9.37	9.02	9.19	1.61	34.03	40.27	n/a	n/a							
Chrinkotan	CHR	n/a	8057-5	n/a	n/a	10.80	10.36	10.31	10.34	1.04	33.85	32.50	n/a	n/a							
Kunashir	DAN	132	1	TP1	70cmbd	5.00	5.15	4.56	4.86	1.03	32.43	28.13	n/a	n/a							
Kunashir	DAN	127	2	TP1	15-20cmbd	5.20	6.33	6.17	6.25	0.83	27.69	28.54	25.34	0.97	4.47	n/a					
Kunashir	DAN	130	3	TP1	56-60cmbd	7.90	6.70	6.69	6.70	1.18	36.24	40.35	37.44	1.12							
Kunashir	DAN	130	4			4.70	6.22	5.94	6.08	0.79	21.41	27.94	n/a	n/a							
Kunashir	DAN	130	unknown			6.60	6.69	6.08	6.38	1.09	19.20	41.54	n/a	n/a							
Shiashkotan	DRO	1631	7973-10	1	2	20.30	9.42	8.40	8.91	2.28	22.05	45.78	31.16	3.03				107.00	10.07	39.91	6.10
Shiashkotan	DRO	1718	7973-102	1	3	72.50	10.63	12.33	11.48	6.32	69.61	67.43	49.87	6.09	11.55	1.98					
Shiashkotan	DRO	1718	7973-103	1	3	17.50	7.70	8.24	7.97	2.20	39.36	43.81	37.02	2.82	7.79	n/a (straight)					
Shiashkotan	DRO	1718	7973-104	1	3	43.70	10.75	10.03	10.39	4.21	65.19	59.15	50.87	2.26	8.64	0.59					
Shiashkotan	DRO	1718	7973-105	1	3	14.00	7.76	7.71	7.74	1.81	39.40	35.19	28.26	1.59							
Shiashkotan	DRO	1718	7973-106	1	3	22.50	10.71	10.76	10.74	2.10	48.72	34.65	28.31	0.51		2.46					
Shiashkotan	DRO	1718	7973-107	1	3	16.00	8.83	8.56	8.69	1.84	42.05	40.55	33.36	1.86							
Shiashkotan	DRO	1718	7973-108	1	3	10.40	8.67	8.64	8.66	1.20	36.51	33.78	26.40	1.35							
Shiashkotan	DRO	1718	7973-109	1	3	10.40	8.23	7.26	7.75	1.34	36.50	30.79	23.69	0.59							
Shiashkotan	DRO	1718	7973-111	1	3	3.80	6.55	6.62	6.58	0.58	23.89	24.19	n/a	n/a							
Shiashkotan	DRO	1631	7973-12	1	2	6.00	7.62	7.52	7.57	0.79	25.30	24.24	24.28	0.63							
Shiashkotan	DRO	1626	7973-126	2	3	30.90	10.00	9.70	9.85	3.14	37.28	64.26	61.58	6.17							
Shiashkotan	DRO	1626	7973-127	2	3	18.60	7.73	7.26	7.50	2.48	46.91	40.75	35.98	3.86							
Shiashkotan	DRO	1626	7973-128	2	3	21.60	8.88	9.16	9.02	2.39	54.44	35.78	31.15	1.28							
Shiashkotan	DRO	1626	7973-129	2	3	26.70	9.65	8.68	9.17	2.91	30.84	63.91	55.89	6.04							
Shiashkotan	DRO	1631	7973-13	1	2	44.80	10.97	11.87	11.42	3.92	66.04	51.89	46.12	3.66							
Shiashkotan	DRO	1626	7973-130	2	3	12.80	6.91	7.48	7.20	1.78	37.29	36.41	28.68	1.03							
Shiashkotan	DRO	1631	7973-14	1	2	17.20	13.42	12.58	13.00	1.32	30.21	44.21	n/a	n/a							
Shiashkotan	DRO	1805	7973-141	1	4	13.30	10.45	10.17	10.31	1.29	38.94	37.18	28.59	0.42	11.42	n/a (straight)					
Shiashkotan	DRO	1805	7973-142	1	4	8.50	8.30	8.28	8.29	1.03	27.59	34.76	31.29	1.90	7.19	0.67					
Shiashkotan	DRO	1805	7973-143	1	4	25.70	8.69	10.22	9.45	2.72	57.64	41.60	38.38	3.24							
Shiashkotan	DRO	1805	7973-144	1	4	16.20	8.07	8.72	8.39	1.93	48.57	40.62	44.81	2.29							
Shiashkotan	DRO	1805	7973-149	1	4	25.90	8.14	7.29	7.71	3.36	35.44	56.86	50.74	10.70				118.00	12.16		
Shiashkotan	DRO	1808	7973-150	1	4	18.90	7.56	8.22	7.89	2.40	37.78	57.75	48.35	2.30							
Shiashkotan	DRO	1808	7973-151	1	4	10.80	7.33	6.85	7.09	1.52	33.37	39.46	30.48	3.50							
Shiashkotan	DRO	1808	7973-164	1	4	6.90	6.23	5.93	6.08	1.13	29.80	25.02	23.70	1.11							
Shiashkotan	DRO	1808	7973-165	1	4	4.40	5.10	5.35	5.23	0.84	35.92	31.33	26.12	1.37							
Shiashkotan	DRO	1808	7973-168	1	4	6.00	7.66	7.90	7.78	0.77	29.67	26.70	n/a	n/a							
Shiashkotan	DRO	1808	7973-169	1	4	5.60	5.38	5.33	5.35	1.05	24.88	30.25	n/a	n/a							
Shiashkotan	DRO	1808	7973-170	1	4	5.70	6.85	7.08	6.97	0.82	34.69	28.97	n/a	n/a							
Shiashkotan	DRO	1704	7973-197	3	5	15.10	8.86	9.30	9.08	1.66	35.89	39.00	27.04	3.14							
Shiashkotan	DRO	1809	7973-3	1	1	10.60	10.27	8.62	9.44	1.12	30.87	35.20	31.49	1.04							
Shiashkotan	DRO	1616	7973-30	2	2	42.10	7.77	8.02	7.90	5.33	64.02	81.18	62.69	8.67							
Shiashkotan	DRO	1616	7973-31	2	2	39.80	9.55	9.04	9.30	4.28	60.54	55.29	45.97	4.88							
Shiashkotan	DRO	1718	7973-70	1	3	32.40	8.73	8.96	8.85	3.66	45.25	75.93	50.31	3.05							
Shiashkotan	DRO	1718	7973-71	1	3	25.60	9.18	9.46	9.32	2.75	51.92	52.78	45.54	2.15							
Shiashkotan	DRO	1718	7973-74	1	3	20.80	10.38	10.22	10.30	2.02	46.08	35.04	31.90	0.71							
Shiashkotan	DRO	1631	7973-9	1	2	2.90	8.72	7.90	8.31	0.35	20.33	24.55	21.48	0.56	6.61	n/a (straight)					

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Ekarma	EKA	2945	8075-1	TP2	L2	33.20	8.60	8.02	8.31	4.00	45.43	76.40	61.69	5.36							
Ekarma	EKA	2950	8075-21	TP2	L3	27.10	8.99	9.45	9.22	2.94	61.53	40.38	36.58	2.78							
Ekarma	EKA	3098	8076-16	TP2	L3C	95.70	12.29	11.77	12.03	7.95	111.87	59.46	51.05	4.21							
Ekarma	EKA	2998	8076-28	TP2	L3F	88.60	11.14	10.47	10.81	8.20	93.11	61.75	53.55	5.25							
Ekarma	EKA	3006	8076-36	TP2	L3F	25.20	8.72	9.05	8.89	2.84	37.65	57.55	50.84	3.60							
Ekarma	EKA	3008	8076-38	TP2	L3F	81.50	11.78	13.35	12.56	6.49	58.34	102.55	84.63	11.80	12.03	n/a (straight)					
Ekarma	EKA	3010	8076-40	TP2	L3F	63.60	13.90	12.83	13.36	4.76	48.92	73.12	62.41	3.49							
Ekarma	EKA	3030	8076-42	TP2	L3G	42.00	9.02	8.11	8.56	4.90	80.32	46.96	41.82	5.12							
Ekarma	EKA	3049	8076-43	TP2	L4	127.70	9.54	10.97	10.25	12.45	88.43	77.03	66.51	15.22				112.00	5.09	49.25 (Diameter)	
Iturup	GLU	592	1	56-80		248.10	10.84	12.53	11.69	21.23	122.63	135.95	102.00	21.81	13.31	n/a					
Iturup	GLU	590	2	Erosion		77.60	11.47	11.67	11.57	6.71			68.00	10.61	10.67	n/a					
Kunashir	GOL	119	unknown	surface	surface	38.00	13.60	13.08	13.34	0.35	52.32	53.61	45.09	2.05							
Urup	KAP	240	8	TP1	L1	207.80	10.12	11.11	10.62	19.58	102.18	134.09	102.00	9.43	11.72	6.00	95.34				
Urup	KAP	240	9	TP1	L1	73.20	11.46	12.52	11.99	6.10	78.02	78.14	69.27	3.02							
Urup	KAP	668	12	TP1	L1	7.50	6.87	6.90	6.88	1.09	31.09	36.52	32.70	1.48							
Urup	KAP	668	13	TP1	L1	4.60	5.44	5.52	5.48	0.84	26.19	29.15	24.66	2.06	5.42	n/a	n/a				
Urup	KAP	242	20	TP1	L1	20.60	8.44	9.34	8.89	2.32	42.13	41.82	36.54	5.01				95.00	10.61	n/a	n/a
Urup	KAP	666	22	TP1	L1	63.50	11.37	12.02	11.70	5.43	59.30	81.55	71.29	3.18							
Urup	KAP	666	23	TP1	L1	73.00	9.13	9.12	9.13	8.00	66.16	88.74	85.35	6.22							
Urup	KAP	666	26	TP1	L1	4.30	n/a	n/a	n/a	n/a	22.01	22.56	18.36	0.38	10.97	n/a	n/a				
Urup	KAP	666	28	TP1	L1	12.40	11.95	13.19	12.57	0.99	34.74	31.15	20.52	0.40							
Urup	KAP	666	29	TP1	L1	9.90	6.70	6.72	6.71	1.48	37.62	39.64	32.97	2.56							
Urup	KAP	666	30	TP1	L1	2.10	n/a	n/a	n/a	n/a	17.90	22.67	18.31	0.30							
Urup	KAP	666	39	TP1	L1	32.00	11.10	11.79	11.44	2.80	61.28	50.66	37.94	0.53	10.18	2.38	60.44				
Urup	KAP	234	41	TP1	L1	10.40	11.13	9.81	10.47	0.99	24.95	37.24	34.58	1.05							
Urup	KAP	234	42	TP1	L1	10.60	11.38	10.89	11.14	0.95	22.25	36.62	16.79	0.58							
Urup	KAP	234	45	TP1	L1	5.70	7.45	7.64	7.54	0.76	20.57	36.45	23.93	0.98							
Urup	KAP	233	53	TP1	L2	7.50	6.57	6.43	6.50	1.15	29.60	24.88	30.56	1.26							
Urup	KAP	233	54	TP1	L2	6.70	7.76	7.67	7.71	0.87	32.02	32.61	29.52	0.92							
Urup	KAP	233	55	TP1	L2	4.00	6.85	6.94	6.89	0.58	25.73	20.69	13.75	0.47							
Urup	KAP	263	57	TP4	L1	9.40	10.08	10.08	10.08	0.93	36.75	41.74	31.70	1.51	10.39	n/a	n/a				
Urup	KAP	263	58	TP4	L1	12.80	9.79	9.79	9.79	1.31	25.95	32.33	28.86	0.83							
Iturup	KAT	n/a	surface	surface		8.50	6.26	5.34	5.80	1.47	42.30	34.31	29.73	1.69							
Iturup	KAT	n/a	surface	surface		48.40	8.11	8.58	8.34	5.80	79.99	63.13	46.92	1.80							
Iturup	KAT	n/a	surface	surface		38.20	8.13	8.07	8.10	4.72	33.54	73.07	33.60	5.42				110.00	9.49	60.26	18.48
Iturup	KAT	n/a	surface	surface		55.70	9.35	10.16	9.75	5.71	73.33	73.10	64.91	3.21							
Iturup	KAT	n/a	surface	surface		19.10	5.04	5.23	5.14	3.72	53.46	54.18	49.48	3.70							
Iturup	KAT	n/a	surface	surface		215.40	9.40	9.21	9.30	23.15	74.98	91.66	59.40	14.10	8.42	4.01		112.00	n/a	50.65 (base diameter)	
Iturup	KAT	n/a	surface	surface		21.00	5.95	6.35	6.15	3.41	46.46	52.46	49.70	3.59							
Urup	KOM	Tray6	1	Surface	Surface	270.90	7.07	6.54	6.80	39.82	100.14	123.66	102.00	20.85				113.00	11.51	65.65 (Full Base Diameter)	
Urup	KOM	Tray 1	2	Surface	Surface	153.90	6.94	7.60	7.27	21.16	49.04	104.06	53.62	8.88				109.00	10.37	84.16 (Diameter)	
Urup	KOM	Tray6	3	Surface	Surface	61.00	6.81	5.81	6.31	9.67	44.66	81.59	58.15	14.37				110.00	7.57	51.15	28.81
Urup	KOM	Tray6	23	Surface	Surface	139.70	7.08	7.51	7.29	19.16	99.10	121.10	102.00	9.10	7.46	n/a (Straight)					
Urup	KOM	Tray6	24	Surface	Surface	50.00	8.63	8.10	8.36	5.98	47.53	80.35	72.76	6.53	9.49	2.70					
Urup	KOM	Tray6	25	Surface	Surface	158.50	7.95	8.84	8.39	18.88	78.49	136.17	102.00	10.43	7.67	n/a (Straight)					
Urup	KOM	Tray6	26	Surface	Surface	123.60	8.77	9.32	9.05	13.66	73.80	103.89	84.92	6.81	9.89	n/a (Straight)					

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	KOM	Tray6	27	Surface	Surface	158.80	9.10	9.23	9.16	17.33	95.24	137.01	102.00	13.82	7.61	n/a (Straight)					
Urup	KOM	Tray6	29	Surface	Surface	170.00	9.67	7.63	8.65	19.66	83.53	134.25	102.00	9.72	10.23	n/a (Straight)					
Urup	KOM	Tray6	30	Surface	Surface	64.80	7.21	9.27	8.24	7.86	95.34	72.75	62.84	3.86	7.53						
Urup	KOM	Tray6	32	Surface	Surface	120.10	8.11	7.84	7.97	15.06	90.43	112.91	97.15	8.96							
Urup	KOM	Tray6	33	Surface	Surface	47.80	6.67	6.73	6.70	7.13	70.60	67.47	36.79	1.53	7.85						
Urup	KOM	Tray6	44	Surface	Surface	109.20	9.75	10.01	9.88	11.05	85.80	95.63	52.56	1.96	9.32	n/a (Straight)					
Urup	KOM	Tray6	46	Surface	Surface	141.60	8.72	7.81	8.26	17.13	96.08	105.85	90.22	8.37	6.07	2.47					
Urup	KOM	Tray6	49	Surface	Surface	62.10	7.71	7.84	7.77	7.99	78.54	65.96	69.20	5.94	7.52	n/a (Straight)					
Urup	KOM	Tray6	69	Surface	Surface	59.70	7.83	8.53	8.18	7.30	45.79	84.00	75.89	7.61	8.18	2.32					
Urup	KOM	Tray6	465	Surface	Surface	87.40	9.00	8.28	8.64	10.12	89.37	88.20	76.83	5.17							
Urup	KOM	Tray 1	566	Surface	Surface	63.40	7.83	7.56	7.70	8.24	64.59	80.44	65.39	5.92	6.94	1.57					
Urup	KOM	Tray 1	567	Surface	Surface	38.10	7.80	7.65	7.72	4.93	50.26	72.74	64.99	6.77							
Urup	KOM	Tray 1	573	Surface	Surface	49.90	7.41	7.66	7.53	6.62	59.76	86.34	70.84	4.74							
Urup	KOM	Tray 1	574	Surface	Surface	47.40	7.09	7.83	7.46	6.36	60.24	71.88	50.12	4.88	4.94	n/a (Straight)					
Urup	KOM	Tray 1	583	Surface	Surface	51.30	6.48	6.50	6.49	7.91	69.81	85.84	56.19	3.98	6.93	1.42					
Urup	KOM	Tray 1	589	Surface	Surface	13.00	5.41	5.03	5.22	2.49	44.99	43.67	37.26	4.13	3.88	n/a (Straight)					
Urup	KOM	Tray 1	589	Surface	Surface	26.40	8.80	9.00	8.90	2.97	47.82	49.34	43.60	4.28	5.90	n/a (Straight)					
Urup	KOM	Tray 1	594	Surface	Surface	58.60	6.81	6.52	6.66	8.79	81.08	73.13	50.82	9.23	3.62	0.79					
Urup	KOM	Tray3	724	Surface	Surface	37.80	7.61	7.12	7.37	5.13	58.61	72.58	58.59	4.63							
Urup	KOM	Tray3	729	Surface	Surface	33.60	7.60	7.64	7.62	4.41	71.35	51.62	40.28	2.60							
Urup	KOM	Tray3	738	Surface	Surface	95.50	9.49	8.51	9.00	10.61	71.50	107.20	79.65	7.17							
Urup	KOM	Tray3	744	Surface	Surface	36.60	6.44	6.88	6.66	5.49	77.51	44.39	38.37	2.13							
Urup	KOM	Tray3	746	Surface	Surface	52.50	8.43	8.60	8.51	6.17	65.30	66.35	56.70	2.92							
Urup	KOM	Tray3	762	Surface	Surface	91.80	8.10	8.03	8.06	11.39	92.80	93.41	73.61	5.98							
Urup	KOM	Tray3	763	Surface	Surface	78.00	7.30	7.20	7.25	10.76	89.74	73.46	71.75	6.27							
Urup	KOM	Tray3	766	Surface	Surface	29.40	7.12	7.06	7.09	4.15	63.34	47.27	32.44	1.44	6.20	n/a (Straight)					
Urup	KOM	Tray3	772	Surface	Surface	16.10	5.59	5.56	5.57	2.89	47.00	49.49	30.03	1.05	5.73	0.55					
Urup	KOM	Tray3	805	Surface	Surface	34.70	6.60	7.33	6.96	4.98	51.81	70.38	63.05	6.53							
Urup	KOM	Tray3	807	Surface	Surface	25.50	5.41	5.45	5.43	4.70	54.18	54.59	47.70	3.23	6.09	n/a (Straight)					
Urup	KOM	Tray3	820	Surface	Surface	24.30	6.70	6.48	6.59	3.69	44.25	68.81	58.37	3.19							
Urup	KOM	Tray3	848	Surface	Surface	42.00	7.84	7.73	7.78	5.40	70.70	57.51	47.15	3.29							
Urup	KOM	Tray3	855	Surface	Surface	46.20	7.45	7.65	7.55	6.12	59.06	67.84	57.57	4.66							
Urup	KOM	Tray3	857	Surface	Surface	46.40	7.86	7.80	7.83	5.92	64.67	68.39	61.92	4.24							
Urup	KOM	Tray3	860	Surface	Surface	78.50	7.31	5.54	6.43	12.22	67.98	104.37	89.22	5.83							
Urup	KOM	Tray 2	892	Surface	Surface	299.50	9.57	9.72	9.65	31.05	109.80	186.25	102.00	10.80							
Urup	KOM	Tray 2	912	Surface	Surface	174.80	9.96	9.82	9.89	17.67	106.68	119.44	102.00	11.84							
Urup	KOM	Tray 2	922	Surface	Surface	67.80	8.17	7.54	7.85	8.63	72.80	83.98	74.02	5.98							
Urup	KOM	Tray 2	934	Surface	Surface	45.50	7.65	6.86	7.25	6.27	57.63	74.06	57.86	6.32	5.64	n/a (Straight)					
Urup	KOM	Tray 2	949	Surface	Surface	18.30	5.82	5.44	5.63	3.25	45.04	61.63	51.32	5.08							
Urup	KOM	Tray 2	982	Surface	Surface	43.10	7.32	7.73	7.52	5.73	79.57	49.50	33.49	1.24							
Urup	KOM	Tray 2	986	Surface	Surface	30.60	6.77	6.44	6.60	4.64	66.21	52.15	44.91	2.79							
Urup	KOM	Tray 2	989	Surface	Surface	37.70	8.15	8.76	8.46	4.46	62.55	60.25	46.68	2.57							
Urup	KOM	Tray 2	995	Surface	Surface	16.60	8.08	9.04	8.56	1.94	47.98	44.28	40.15	1.43	6.41	0.25					
Urup	KOM	Tray 2	998	Surface	Surface	44.30	8.06	7.82	7.94	5.58	76.20	65.05	58.04	5.49							
Urup	KOM	Tray 2	1001	Surface	Surface	44.30	7.93	7.36	7.64	5.80	70.80	63.90	66.48	2.66							
Urup	KOM	Tray4	1065	Surface	Surface	96.00	8.35	8.71	8.53	11.26	84.56	84.71	59.16	3.42	9.74						
Urup	KOM	Tray4	1067	Surface	Surface	72.90	7.97	7.94	7.95	9.16	64.39	82.47	73.39	4.47	9.28						
Urup	KOM	Tray4	1068	Surface	Surface	26.90	7.92	7.99	7.95	3.38	54.99	46.20	35.31	2.57	5.37	1.18					
Urup	KOM	Tray4	1070	Surface	Surface	33.70	7.73	7.95	7.84	4.30	41.91	66.68	50.29	1.84	7.56						
Urup	KOM	Tray6	1074	Surface	Surface	43.40	6.85	7.27	7.06	6.15	73.61	58.79	33.28	4.86	3.28	0.82					
Urup	KOM	Tray4	1076	Surface	Surface	48.20	8.34	8.09	8.22	5.87	74.43	57.39	49.98	3.12	6.03						

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	KOM	Tray4	1077	Surface	Surface	40.60	6.76	7.48	7.12	5.70	44.44	98.49	79.30	7.09	7.13						
Urup	KOM	Tray4	1079	Surface	Surface	136.10	n/a	n/a	n/a	n/a	13.49	117.40	n/a	n/a				n/a	9.80	112.65 (Diameter)	
Urup	KOM	Tray4	1080	Surface	Surface	55.40	9.03	9.40	9.22	6.01	62.02	67.89	52.90	3.62	7.75						
Urup	KOM	Tray4	1082	Surface	Surface	57.10	8.06	7.32	7.69	7.43	72.33	67.18	60.23	3.92	7.73	0.81					
Urup	KOM	Tray4	1085	Surface	Surface	59.50	8.93	8.84	8.88	6.70	62.10	59.20	59.43	3.89	8.59						
Urup	KOM	Tray4	1086	Surface	Surface	50.50	7.86	7.50	7.68	6.57	35.67	80.13	48.92	4.55				110.00	9.33	77.93	19.27
Urup	KOM	Tray4	1088	Surface	Surface	52.10	9.39	8.56	8.97	5.81	66.05	70.26	61.42	4.70	7.72						
Urup	KOM	Tray4	1089	Surface	Surface	59.10	6.80	7.65	7.23	8.18	81.04	72.66	45.03	1.97	6.68						
Urup	KOM	Tray4	1090	Surface	Surface	63.90	7.40	7.34	7.37	8.67	82.03	63.22	45.93	3.41	7.12						
Urup	KOM	Tray4	1091	Surface	Surface	42.00	7.36	6.67	7.01	5.99	62.35	80.65	73.33	6.08	7.26						
Urup	KOM	Tray4	1093	Surface	Surface	86.10	n/a	n/a	n/a	n/a	17.59	101.71	n/a	n/a				108.00	11.83	100.44	32.03
Urup	KOM	Tray4	1094	Surface	Surface	72.00	7.56	7.45	7.50	9.59	52.13	89.50	62.40	4.30				105.00	8.40	69.02	14.09
Urup	KOM	Tray4	1096	Surface	Surface	44.90	7.97	8.34	8.15	5.51	54.35	53.71	46.64	2.27	9.42						
Urup	KOM	Tray4	1097	Surface	Surface	62.20	8.54	8.20	8.37	7.43	50.91	98.50	88.11	5.85	8.34						
Urup	KOM	Tray4	1098	Surface	Surface	99.30	9.15	9.06	9.10	10.91	48.65	88.68	74.36	15.15				114.00	9.42	79.40	29.96
Urup	KOM	Tray4	1099	Surface	Surface	49.30	5.86	5.84	5.85	8.43	27.52	77.22	59.35	6.36				110.00	7.87	70.04	21.94
Urup	KOM	Tray4	1101	Surface	Surface	41.20	7.19	7.38	7.28	5.66	55.41	59.08	50.89	2.42	6.85						
Urup	KOM	Tray4	1102	Surface	Surface	79.30	n/a	n/a	n/a	n/a	21.63	105.40	n/a	n/a				100.00	8.78	107.76	40.34
Urup	KOM	Tray4	1103	Surface	Surface	244.70	9.94	10.04	9.99	24.49	125.96	115.86	96.20	9.56	7.78						
Urup	KOM	Tray4	1104	Surface	Surface	88.70	8.47	8.12	8.29	10.70	76.22	89.26	70.02	5.97	8.14						
Urup	KOM	Tray4	1106	Surface	Surface	162.70	9.10	9.36	9.23	17.63	105.62	119.47	99.73	10.80	9.26	1.58					
Urup	KOM	Tray4	1107	Surface	Surface	107.20	7.32	7.62	7.47	14.35	80.40	112.74	95.73	6.93	7.99						
Urup	KOM	Tray4	1109	Surface	Surface	115.60	8.89	9.33	9.11	12.69	82.60	97.96	85.48	6.88	8.45						
Urup	KOM	Tray4	1110	Surface	Surface	63.30	6.02	6.12	6.07	10.43	80.14	75.99	61.36	6.63	5.61						
Urup	KOM	Tray4	1111	Surface	Surface	43.50	6.78	6.96	6.87	6.33	64.58	77.41	69.90	5.89	7.09						
Urup	KOM	Tray4	1112	Surface	Surface	23.00	6.54	6.73	6.64	3.47	50.27	68.02	59.95	4.60	6.95						
Urup	KOM	Tray4	1113	Surface	Surface	67.20	8.35	9.23	8.79	7.65	78.15	94.27	78.33	4.33	8.54						
Urup	KOM	Tray4	1114	Surface	Surface	81.40	9.41	8.90	9.16	8.89	67.71	82.60	69.46	4.84	8.36						
Urup	KOM	Tray4	1115	Surface	Surface	35.60	6.87	7.65	7.26	4.90	41.53	69.59	59.49	4.94	6.38						
Urup	KOM	Tray4	1116	Surface	Surface	114.90	8.71	9.12	8.91	12.89	73.32	100.46	78.41	5.91	9.78						
Urup	KOM	Tray4	1117	Surface	Surface	66.10	8.76	8.35	8.56	7.73	86.95	63.09	33.50	1.60	7.63						
Urup	KOM	Tray4	1118	Surface	Surface	42.60	6.94	7.08	7.01	6.08	69.01	60.61	53.20	3.32	6.72						
Urup	KOM	Tray6	1120	Surface	Surface	120.70	10.53	10.86	10.69	11.29	93.93	91.88	73.32	4.60	7.73	n/a (Straight)					
Urup	KOM	Tray4	1121	Surface	Surface	79.30	7.04	6.97	7.01	11.31	59.03	51.35	43.82	4.78				110.00	8.08	50.22	8.39
Urup	KOM	Tray4	1123	Surface	Surface	76.30	6.82	6.87	6.84	11.15	28.26	99.38	93.17	22.33				109.00	9.92	91.59	26.94
Urup	KOM	Tray4	1124	Surface	Surface	30.10	n/a	n/a	n/a	n/a	12.85	73.46	n/a	n/a				n/a	5.66	71.07 (near full diameter)	
Urup	KOM	Tray4	1127	Surface	Surface	32.10	7.29	7.59	7.44	4.31	55.18	66.11	44.38	4.89				108.00	8.69	52.05	6.85
Urup	KOM	Tray5	1132	Surface	Surface	32.20	7.14	7.01	7.07	4.55	61.34	63.76	57.36	5.14	6.50						
Urup	KOM	Tray5	1133	Surface	Surface	45.20	10.25	9.81	10.03	4.50	44.97	73.98	66.24	4.79	9.56						
Urup	KOM	Tray5	1134	Surface	Surface	18.80	6.92	7.01	6.96	2.70	46.11	47.39	44.07	2.18	6.57						
Urup	KOM	Tray5	1135	Surface	Surface	35.50	9.78	9.39	9.59	3.70	25.82	61.85	n/a	n/a				101.00	11.01	28.24	4.14
Urup	KOM	Tray5	1138	Surface	Surface	19.50	7.11	7.49	7.30	2.67	41.65	56.31	39.04	4.91	6.97	1.76					
Urup	KOM	Tray5	1139	Surface	Surface	36.80	7.44	8.82	8.13	4.53	50.34	63.95	59.13	2.98	9.14						
Urup	KOM	Tray5	1144	Surface	Surface	28.00	6.78	7.07	6.93	4.04	50.39	63.57	51.97	5.87	6.17						
Urup	KOM	Tray5	1146	Surface	Surface	9.40	6.28	6.63	6.46	1.46	28.88	41.59	25.78	1.71	5.86	1.25					
Urup	KOM	Tray5	1148	Surface	Surface	47.00	7.27	6.48	6.87	6.84	47.07	65.62	60.49	9.66				108.00	10.92	58.46	14.49
Urup	KOM	Tray5	1150	Surface	Surface	56.20	8.11	7.71	7.91	7.10	63.91	59.59	46.40	2.43	9.86						
Urup	KOM	Tray5	1153	Surface	Surface	24.50	7.07	7.08	7.07	3.46	40.88	58.64	48.74	2.22	5.92						

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	KOM	Tray5	1154	Surface	Surface	44.60	8.17	8.70	8.43	5.29	63.24	67.07	54.13	2.06	6.09						
Urup	KOM	Tray5	1156	Surface	Surface	42.60	8.37	8.33	8.35	5.10	35.49	54.99	70.09	13.81				105.00	8.08	70.78	17.42
Urup	KOM	Tray5	1157	Surface	Surface	22.10	6.70	6.64	6.67	3.31	29.47	77.78	27.77	2.63				100.00	5.80	55.74	8.50
Urup	KOM	Tray5	1159	Surface	Surface	28.70	6.65	5.63	6.14	4.68	63.76	54.28	45.04	3.61	6.28						
Urup	KOM	Tray5	1160	Surface	Surface	26.90	7.01	6.53	6.77	3.97	46.19	59.56	46.56	3.10	5.31	0.62					
Urup	KOM	Tray5	1162	Surface	Surface	22.00	5.87	7.37	6.62	3.32	49.63	54.73	47.43	3.80	5.21						
Urup	KOM	Tray5	1164	Surface	Surface	29.30	8.06	8.06	8.06	3.64	35.73	54.55	38.63	2.14				109.00	8.77	41.12	4.74
Urup	KOM	Tray5	1167	Surface	Surface	34.40	6.01	6.40	6.20	5.55	53.65	74.69	57.20	6.14	5.23	0.52					
Urup	KOM	Tray5	1168	Surface	Surface	38.70	7.12	7.53	7.33	5.28	48.58	66.24	61.28	3.19	7.84						
Urup	KOM	Tray5	1171	Surface	Surface	40.20	7.61	7.70	7.65	5.25	73.00	60.28	40.12	1.53	7.95						
Urup	KOM	Tray6	1180	Surface	Surface	236.20	6.01	5.66	5.83	40.49	75.12	106.59	88.13 (rim diameter)		4.26	n/a (bulge out)		109.00	n/a	69.34(base diameter)	
Urup	KOM	Tray6	67/73	Surface	Surface	46.90	6.44	7.33	6.89	6.81	63.16	68.95	55.74	8.65	5.60						
Iturup	KUB	3	2	Surface	Surface	117.80	7.06	8.05	7.55	15.60	134.23	92.51	79.58	7.80	5.49	2.19	11.16				
Iturup	KUB	3	3	Surface	Surface	43.60	5.41	4.46	4.93	8.84	87.50	58.41	49.05	5.20	4.00						
Iturup	KUB	3	4	Surface	Surface	47.00	6.81	5.49	6.15	7.65	79.42	78.76	60.79	8.67	4.08						
Iturup	KUB	3	7	Surface	Surface	85.50	6.78	6.09	6.44	13.28	105.26	82.27	73.10	7.36	6.28						
Iturup	KUB	3	8	Surface	Surface	56.70	6.56	6.68	6.62	8.56	86.44	91.95	64.78	4.89	5.21						
Iturup	KUB	3	11	Surface	Surface	96.70	7.20	8.63	7.92	12.22	130.65	74.46	71.45	4.43							
Iturup	KUB	3	12	Surface	Surface	49.40	6.72	7.12	6.92	7.14	84.79	75.48	69.53	1.93	5.87	2.49	55.00				
Iturup	KUB	3	13	Surface	Surface	74.30	5.69	6.15	5.92	12.55	104.63	73.48	72.67	4.37							
Iturup	KUB	3	18	Surface	Surface	82.80	6.68	6.15	6.41	12.91	61.91	113.40	102.49	17.75							
Iturup	KUB	3	21	Surface	Surface	23.90	7.79	6.87	7.33	3.26	57.70	44.95	37.49	2.35	6.25	(slight)	(slight)				
Iturup	KUB	5	22	Surface	Surface	38.70	5.70	6.13	5.91	6.54	86.27	66.03	52.42	1.30	2.89						
Iturup	KUB	5	23	Surface	Surface	30.20	n/a	n/a	n/a	n/a	80.17	90.12	77.74	5.96							
Iturup	KUB	5	26	Surface	Surface	190.60	8.91	11.17	10.04	18.98	119.55	143.48	102.00	9.70							
Iturup	KUB	5	28	Surface	Surface	45.70	12.57	12.12	12.35	3.70	61.23	52.42	46.44	1.09							
Iturup	KUB	5	30	Surface	Surface	16.00	6.45	6.47	6.46	2.48	53.86	43.03	29.22	0.67	3.84						
Iturup	KUB	5	33	Surface	Surface	202.60	7.65	6.80	7.23	28.03	73.23	109.87	71.35					103.00	7.09	80.18	diameters
Iturup	KUB	5	34	Surface	Surface	190.30	5.89	5.72	5.80	32.80	41.75	111.31	92.54 (diameter)					105.00	9.22	96.39	diameters
Iturup	KUB	5	35	Surface	Surface	180.00	12.18	11.59	11.88	15.15	42.75	109.72	91.43 (diameter)					97.00	12.25	106.35	diameters
Iturup	KUB	5	36	Surface	Surface	45.50	7.78	7.78	7.78	5.85	29.57	66.38	n/a	n/a				100.00	5.99	60.47	diameters
Iturup	KUB	5	37	Surface	Surface	217.90	n/a	n/a	n/a	n/a	20.40	118.00	n/a	n/a				n/a	13.66	113.50	diameters
Iturup	KUB	5	38	Surface	Surface	225.50	9.30	9.95	9.62	23.43	146.66	127.58	93.67	10.58	6.26						
Iturup	KUB	5	39	Surface	Surface	86.20	10.72	10.64	10.68	8.07	76.50	78.25	73.05	7.13	4.85						
Iturup	KUB	5	40	Surface	Surface	19.10	7.31	6.31	6.81	2.81	54.09	57.68	22.71	1.47	5.64						
Iturup	KUB	5	41	Surface	Surface	41.10	6.30	5.33	5.81	7.07	82.30	70.07	56.59	6.27	4.12						
Iturup	KUB	5	42	Surface	Surface	38.50	6.32	6.26	6.29	6.12	86.69	64.92	18.09	0.52	5.25						
Iturup	KUB	5	45	Surface	Surface	40.30	6.16	5.95	6.05	6.66	100.93	65.09	46.03	3.51	3.37	2.45	71.48				
Iturup	KUB	5	48	Surface	Surface	40.00	8.41	8.14	8.27	4.84	63.36	56.18	47.97	2.38							
Iturup	KUB	5	49	Surface	Surface	34.60	8.07	7.96	8.01	4.32	47.47	63.10	57.03	3.37							
Iturup	KUB	5	51	Surface	Surface	53.20	4.74	5.09	4.91	10.83	70.15	95.96	70.46	6.87	3.86	straight					
Iturup	KUB	5	52	Surface	Surface	26.90	5.62	5.86	5.74	4.68	63.78	46.42	47.85	4.48							
Iturup	KUB	5	53	Surface	Surface	33.10	5.75	6.14	5.95	5.57	72.79	61.53	56.36	3.97							
Iturup	KUB	25	59	Surface	Surface	49.10	6.28	5.59	5.94	8.27	70.05	93.56	87.81	7.47							
Iturup	KUB	25	60	Surface	Surface	59.50	6.59	7.21	6.90	8.63	85.45	64.75	47.90	3.61	5.78	0.72	50.00				
Iturup	KUB	25	62	Surface	Surface	108.40	6.35	5.88	6.12	17.73	58.13	69.53	55.19	17.20				96.00	8.52	69.87	(diameter)

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Iturup	KUB	25	63	Surface	Surface	70.20	8.12	8.34	8.23	8.53	40.11	86.27	71.65	25.05				100.00	8.51	77.00	30.68
Iturup	KUB	25	65	Surface	Surface	108.80	5.64	6.15	5.90	18.45	101.61	108.65	97.82	18.89							
Iturup	KUB	unknown	66	Surface	Surface	71.80	8.31	8.50	8.41	8.54	76.49	87.38	77.21	8.65							
Iturup	KUB	unknown	67	Surface	Surface	43.20	7.03	8.20	7.61	5.67	71.79	84.31	33.05	1.18	5.33						
Iturup	KUB	unknown	68	Surface	Surface	31.80	9.18	9.22	9.20	3.46	67.96	58.24	56.19	3.56							
Iturup	KUB	unknown	69	Surface	Surface	51.30	6.20	6.14	6.17	8.31	84.03	73.42	63.89	4.85	4.59						
Iturup	KUB	unknown	73	Surface	Surface	51.30	7.87	7.69	7.78	6.59	92.99	55.24	29.52	0.96	4.23						
Iturup	KUB	unknown	74	Surface	Surface	11.10	5.49	5.34	5.41	2.05	36.35	60.96	41.66	3.52	2.53	0.74	28.03				
Iturup	KUB	4	98	Surface	Surface	159.70	6.57	9.57	8.07	19.79	151.71	102.48	74.94	10.13	6.53	n/a					
Iturup	KUB	4	99	Surface	Surface	79.60	6.59	6.54	6.56	12.13	100.84	100.30	93.58	9.69	5.56	n/a					
Iturup	KUB	4	100	Surface	Surface	44.70	5.89	5.55	5.72	7.82	73.83	77.56	75.07	5.03	5.81	n/a					
Iturup	KUB	4	101	Surface	Surface	49.40	5.13	5.08	5.11	9.68	104.45	64.81	56.24	5.58	7.48	n/a					
Iturup	KUB	4	102	Surface	Surface	34.20	6.80	6.60	6.70	5.10	52.77	68.20	44.18	6.07	4.71	n/a					
Iturup	KUB	4	105	Surface	Surface	86.20	8.05	8.66	8.35	10.32	50.91	114.86	102.00	20.05	6.16	n/a					
Iturup	KUB	4	106	Surface	Surface	42.90	4.64	4.37	4.51	9.52	102.47	65.06	61.07	4.21	4.99	n/a					
Iturup	KUB	4	107	Surface	Surface	37.50	8.23	8.04	8.14	4.61	87.02	58.33	52.91	2.33	6.09	n/a					
Iturup	KUB	4	108	Surface	Surface	72.30	7.68	8.08	7.88	9.17	95.75	81.64	72.69	4.85							
Iturup	KUB	4	109	Surface	Surface	49.20	8.54	7.87	8.21	5.99	85.18	70.87	61.46	7.83							
Iturup	KUB	4	113	Surface	Surface	48.30	7.78	7.72	7.75	6.23	58.58	82.74	72.04	4.76							
Iturup	KUB	4	114	Surface	Surface	43.90	8.24	8.29	8.27	5.31	66.60	69.27	55.17	5.47							
Iturup	KUB	4	119	Surface	Surface	28.80	7.56	7.15	7.35	3.92	64.59	48.21	57.54	2.38							
Iturup	KUB	4	120	Surface	Surface	48.00	9.22	8.70	8.96	5.36	61.64	67.16	51.31	8.26							
Iturup	KUB	4	123	Surface	Surface	59.70	7.01	6.97	6.99	8.54	74.67	82.61	75.70	8.25							
Iturup	KUB	14	127	N deflation zone		17.60	n/a	n/a	n/a	n/a	51.69	42.04	45.86	2.27							
Iturup	KUB	169	128	Charcoal Exposure	Delation zone	17.00	6.32	5.59	5.96	2.85	43.64	44.62	36.94	2.10							
Iturup	KUB	10	129	East Deflation		181.40	7.95	8.51	8.23	22.04	81.92	87.60	65.13	15.23				97.00	9.90	78.65 (Diameter)	
Iturup	KUB	10	130	East Deflation		28.60	5.24	5.88	5.56	5.14	50.32	42.98	45.50	(diameter)				99.00	10.82	26.27 (Diameter)	
Iturup	KUB	169	132	Charcoal Exposure	Delation zone	13.90	9.00	8.84	8.92	1.56	36.66	37.08	32.98	1.12	5.04	0.50					
Iturup	KUB	183	133	N of Creek Deflation		6.90	5.30	5.14	5.22	1.32	33.11	43.20	28.17	1.52							
Iturup	KUB	8	136	Eastern deflation zone		60.50	7.02	7.59	7.31	8.28	87.44	68.05	60.49	8.50	5.36	n/a					
Iturup	KUB	22	137	Surface	North of Creek	119.10	12.68	13.55	13.12	9.08	94.09	87.81	76.89	8.61	12.70	4.21	80.48				
Iturup	KUB	22	138	Surface	North of Creek	77.90	16.99	16.00	16.50	4.72	50.73	75.39	58.83	3.52							
Iturup	KUB	unknown	?	Surface	Surface	79.00	8.55	7.93	8.24	9.59	100.40	102.65	80.10	7.72							
Iturup	KUB	unknown	?	Surface	Surface	29.40	6.51	6.20	6.36	4.62	61.50	61.87	51.28	4.92	4.06						
Iturup	KUB	13	7868-134	Relict Dome	Below Pink Tephra	69.10	8.35	8.39	8.37	8.26	75.31	90.01	78.40	8.51							
Iturup	KUB	25	7868-87	Surface	Surface	370.00	8.44	9.17	8.80	42.03	180.16	145.77	102.00	16.74	5.54	4.46	78.42				
Iturup	KUB	25	7868-88	Surface	Surface	48.80	7.91	7.19	7.55	6.46	71.63	79.89	73.88	10.20	4.05	3.37	51.99				
Iturup	KUB	25	7868-89	Surface	Surface	25.10	7.92	7.55	7.73	3.25	49.00	55.33	49.04	3.43	6.23	1.92	43.21				
Iturup	KUB	3	n/a	Surface	Surface	31.90	6.54	6.10	6.32	5.05	48.65	87.49	81.63	6.92	4.85						
Iturup	KUB	4	unknown	Surface	Surface	47.10	8.43	8.02	8.22	5.73	65.35	89.26	66.97	2.71							
Iturup	KUB	4	unknown	Surface	Surface	21.60	5.82	6.70	6.26	3.45	61.72	51.23	46.37	2.12							
Iturup	KUB	4	unknown	Surface	Surface	78.90	7.78	8.17	7.98	9.89	122.13	75.32	72.39	6.79	3.82	n/a					
Iturup	KUB	25	unknown	Surface	Surface	80.10	6.28	6.12	6.20	12.92	102.13	105.86	95.40	13.01							
Iturup	KUB	25	unknown	Surface	Surface	31.20	6.09	6.51	6.30	4.95	85.70	62.12	52.71	1.94	3.06	n/a	n/a				

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Iturup	OLY	146	3	TP2	Top 25cm	8.80	6.83	7.10	6.96	1.26	53.48	47.85	43.38	2.52	6.01	n/a					
Iturup	OLY	146	7	TP2	Top 25cm	18.00	5.70	5.85	5.78	3.12	36.96	35.38	n/a	n/a							
Iturup	OLY	138	8	TP2	Erosion Face Cut	16.70	8.46	8.12	8.29	2.01	29.93	42.77	37.42	1.53	10.18	n/a					
Iturup	OLY	138	9	TP2	Erosion Face Cut	17.00	n/a	n/a	n/a	n/a	36.63	45.68	25.30	0.41	11.35	n/a					
Iturup	OLY	138	10	TP2	Erosion Face Cut	44.80	7.85	7.16	7.51	5.97	65.58	58.59	50.97	2.26							
Iturup	OLY	138	11	TP2	Erosion Face Cut	38.70	7.90	8.60	8.25	4.69	54.66	53.75	46.02	2.48							
Iturup	OLY	138	12	TP2	Erosion Face Cut	34.00	7.99	7.68	7.83	4.34	53.77	58.08	49.85	2.15							
Iturup	OLY	138	13	TP2	Erosion Face Cut	17.30	8.80	8.78	8.79	1.97	48.41	39.46	33.75	2.34							
Iturup	OLY	138	14	TP2	Erosion Face Cut	13.40	7.43	7.36	7.39	1.81	40.13	43.37	34.13	1.30							
Iturup	OLY	138	16	TP2	Erosion Face Cut	7.40	n/a	n/a	n/a	n/a	29.06	40.72	n/a	n/a							
Iturup	OLY	138	19	TP2	Erosion Face Cut	38.20	7.64	7.80	7.72	4.95	51.34	63.90	58.01	2.34		4.09					
Iturup	OLY	149	22	TP2	50-80cm	23.20	9.10	8.64	8.87	2.62	41.78	55.36	47.34	3.95							
Iturup	OLY	149	23	TP2	50-80cm	14.60	7.12	7.13	7.12	2.05	41.90	42.91	37.69	2.20							
Iturup	OLY	149	24	TP2	50-80cm	8.80	9.46	10.46	9.96	0.88	27.93	29.93	n/a	n/a							
Iturup	OLY	151	28	TP3	L5	49.40	9.74	12.87	11.30	4.37	63.05	69.87	60.11	9.15							
Iturup	OLY	150	31	surface	surface	15.40	10.43	10.13	10.28	1.50	29.22	45.84	40.55	1.97							
Rasshua	RAS	3496	8077-106	TP1A	L2	10.00	6.52	6.62	6.57	1.52	41.06	27.45		0.27							
Rasshua	RAS	3545	8077-113	TP1A	L2	6.70	7.46	7.22	7.34	0.91	26.25	25.99		0.84							
Rasshua	RAS	3545	8077-114	TP1A	L2	9.90	8.05	7.02	7.53	1.31	38.85	31.29	22.53	0.67							
Rasshua	RAS	3596	8077-129	TP1A	L4	16.50	6.45	6.90	6.68	2.47	47.86	41.37		1.53							
Rasshua	RAS	3732	8077-140	TP1A	L5	15.40	8.74	9.07	8.91	1.73	44.56	31.77		0.19							
Rasshua	RAS	3732	8077-141	TP1A	L5	15.80	9.12	8.28	8.70	1.82	40.71	36.76		0.47							
Rasshua	RAS	3732	8077-142	TP1A	L5	10.20	9.20	9.38	9.29	1.10	28.56	27.45		0.54							
Rasshua	RAS	3793?	8077-151	TP1A	L6	6.20	8.20	8.07	8.14	0.76	21.35	26.79		0.42							
Rasshua	RAS	3793?	8077-157	TP1A	L6	6.30	7.04	5.93	6.49	0.97	35.39	23.86	21.13	0.01		1.10					
Rasshua	RAS	3793?	8077-159	TP1A	L6	10.80	7.83	7.98	7.91	1.37	19.53	39.35		1.71			105.00	8.28			
Rasshua	RAS	3864?	8077-175	TP1A	L8	4.10	5.92	5.48	5.70	0.72	23.45	29.18		0.60							
Rasshua	RAS	3864?	8077-182	TP1A	L8	8.80	7.57	8.02	7.80	1.13	28.77	26.97		1.54							
Rasshua	RAS	3864?	8077-184	TP1A	L8	5.50	n/a	n/a	n/a	n/a	45.17	17.56		n/a			107.00	n/a			
Rasshua	RAS	3527	8077-293	TP1B	L2	9.50	7.71	7.50	7.61	1.25	38.26	28.70		0.41							
Rasshua	RAS	3527	8077-299	TP1B	L2	7.10	7.89	8.05	7.97	0.89	34.63	22.67		0.46							
Rasshua	RAS	3527	8077-300	TP1B	L2	4.40	9.51	7.66	8.58	0.51	19.95	20.54		0.53							
Rasshua	RAS	3527	8077-303	TP1B	L2	3.00	5.58	6.08	5.83	0.51	26.65	27.86	26.86	1.10							
Rasshua	RAS	3517	8077-309	TP1B	L2	11.70	7.10	7.44	7.27	1.61	41.30	41.09		1.39							
Rasshua	RAS	3525	8077-310	TP1B	L2	13.70	6.17	5.66	5.92	2.32	42.04	32.77		2.29			104.00	6.99			
Rasshua	RAS	3621	8077-311	TP1B	L3	14.70	6.61	5.92	6.27	2.35	43.43	28.36		2.66			101.00	6.30	37.21	5.14	
Rasshua	RAS	3529	8077-314	TP1B	L3	16.10	7.33	8.38	7.85	2.05	62.76	26.67		n/a		1.51					
Rasshua	RAS	3584?	8077-315	TP1B	L3	7.30	8.28	6.80	7.54	0.97	24.58	31.52		1.84							
Rasshua	RAS	3584?	8077-317	TP1B	L3	4.70	6.89	6.60	6.74	0.70	31.20	20.55		0.56							
Rasshua	RAS	3584?	8077-320	TP1B	L3	12.80	8.25	8.24	8.25	1.55	42.81	38.74		1.98							
Rasshua	RAS	3584?	8077-324	TP1B	L3	10.10	8.45	8.60	8.52	1.18	36.04	28.79		0.25							
Rasshua	RAS	3639	8077-326	TP1B	L3B	11.20	6.91	7.35	7.13	1.57	44.64	24.34		1.82				107.00	7.67	44.03	5.88
Rasshua	RAS	3629	8077-327	TP1B	L3B	17.30	5.70	6.04	5.87	2.95	41.99	41.81		2.29				117.00	5.74	18.93	2.28
Rasshua	RAS	3604	8077-328	TP1B	L3	6.80	7.22	7.62	7.42	0.92	31.00	20.02		0.47				110.00	6.97		
Rasshua	RAS	3632	8077-329	TP1B	L3B	22.10	8.17	8.57	8.37	2.64	54.60	46.96		1.75							
Rasshua	RAS	3630	8077-330	TP1B	L3B	25.60	10.07	9.76	9.91	2.58	55.92	38.07		2.35							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Rasshua	RAS	3637	8077-332	TP1B	L3B	3.30	5.70	5.70	5.70	0.58	25.73	20.85									
Rasshua	RAS	3637	8077-337	TP1B	L3B	4.70	6.05	7.29	6.67	0.71	31.38	23.10		0.40							
Rasshua	RAS	3637	8077-340	TP1B	L3B	6.40	6.94	6.80	6.87	0.93	42.15	20.73		3.13							
Rasshua	RAS	3637	8077-341	TP1B	L3B	8.40	8.05	7.50	7.78	1.08	42.07	24.73		1.63							
Rasshua	RAS	3637	8077-342	TP1B	L3B	9.10	5.98	6.60	6.29	1.45	30.17	42.55		1.97							
Rasshua	RAS	3717	8077-343	TP1B	L3D	7.30	7.58	7.53	7.55	0.97	29.36	27.94		0.77							
Rasshua	RAS	3717	8077-345	TP1B	L3D	13.40	7.36	7.83	7.59	1.76	43.81	38.60		2.63							
Rasshua	RAS	3717	8077-346	TP1B	L3D	8.90	10.30	10.32	10.31	0.86	27.81	28.34		0.41							
Rasshua	RAS	3716	8077-351	TP1B	L3D	9.40	9.98	9.44	9.71	0.97	26.85	27.22		1.41							
Rasshua	RAS	3716	8077-353	TP1B	L3D	18.80	9.16	10.10	9.63	1.95	49.10	33.01		2.70							
Rasshua	RAS	3716	8077-354	TP1B	L3D	7.10	6.55	6.21	6.38	1.11	40.13	25.86		0.82							
Rasshua	RAS	3745	8077-359	TP1B	L3E	7.00	5.83	5.95	5.89	1.19	28.62	29.57		0.77							
Rasshua	RAS	3745	8077-365	TP1B	L3E	7.50	6.57	7.36	6.97	1.08	29.14	29.43		0.95							
Rasshua	RAS	3775	8077-372	TP1B	L3E	8.80	8.29	6.78	7.53	1.17	40.11	22.97		1.06		0.31					
Rasshua	RAS	3777	8077-373	TP1B	L3E	16.90	7.90	8.92	8.41	2.01	40.97	36.37		2.08							
Rasshua	RAS	3608	8077-378	TP1B	L3	32.40	8.68	8.17	8.42	3.85	53.38	52.37	44.36	3.24							
Rasshua	RAS	3904	8077-379	TP1B	L3G	15.20	8.86	9.15	9.00	1.69	47.92	31.53		1.60							
Rasshua	RAS	3904	8077-388	TP1B	L3G	9.60	6.51	6.56	6.53	1.47	31.93	35.40	32.42	1.94		1.15					
Rasshua	RAS	3904	8077-390	TP1B	L3G	18.90	7.74	7.75	7.75	2.44	44.72	48.55		2.42							
Rasshua	RAS	3904	8077-391	TP1B	L3G	13.90	8.08	8.24	8.16	1.70	38.65	36.91		1.72			109.00	7.03			
Rasshua	RAS	3913	8077-393	TP1B	L3G	30.70	8.55	7.04	7.79	3.94	47.74	72.33		6.39							
Rasshua	RAS	3914	8077-394	TP1B	L3G	19.20	7.43	7.63	7.53	2.55	51.78	43.92		4.03							
Rasshua	RAS	3888	8077-396a	TP1B	L3I		9.90	10.44	10.17	n/a				n/a				112.00	6.11		
Rasshua	RAS	3888	8077-396b	TP1B	L3I	113.20	9.62	10.66	10.14	n/a	111.57 (Vessel Diameter)			n/a				107.00	5.50		
Rasshua	RAS	3888	8077-396c	TP1B	L3I		9.72	9.94	9.83	n/a	83.20 (Base Diameter)			3.03				110.00	6.61		
Rasshua	RAS	3888	8077-397	TP1B	L3I	17.90	8.49	10.18	9.33	1.92	53.09	38.85	27.48	2.97							
Rasshua	RAS	3888	8077-398	TP1B	L3I	24.20	13.46	11.96	12.71	1.90	54.01	35.37		6.38							
Rasshua	RAS	3888	8077-399	TP1B	L3I	23.30	12.28	11.42	11.85	1.97	50.63	45.62		2.42							
Rasshua	RAS	3900	8077-402	TP1B	L3I	6.30	6.10	6.02	6.06	1.04	27.16	33.98		1.15							
Rasshua	RAS	3900	8077-403	TP1B	L3I	14.10	7.44	7.65	7.54	1.87	40.65	38.32		1.72							
Rasshua	RAS	4142	8077-409	TP1B	L3J	4.20	7.24	7.17	7.20	0.58	22.94	22.61		0.74							
Rasshua	RAS	4142	8077-412	TP1B	L3J	4.40	7.33	7.99	7.66	0.57	24.98	24.67		0.50							
Rasshua	RAS	4143	8077-415	TP1B	L3J	8.00	7.63	7.69	7.66	1.04	28.50	24.79	19.85	0.53		0.40					
Rasshua	RAS	4145	8077-416	TP1B	L3J	12.20	11.23	7.93	9.58	1.27	47.84	27.78		1.69							
Rasshua	RAS	4160	8077-426	TP1B	L5	21.90	7.45	6.85	7.15	3.06	53.48	51.96	25.31	2.39		0.40					
Rasshua	RAS	4172	8077-432	TP1B	L6	5.50	6.69	7.17	6.93	0.79	35.17	19.70	19.67	0.67							
Rasshua	RAS	4172	8077-433	TP1B	L6	7.30	6.89	6.72	6.81	1.07	44.28	28.83		2.65							
Rasshua	RAS	4172	8077-434	TP1B	L6	6.90	7.58	7.47	7.52	0.92	29.88	26.97		0.77							
Rasshua	RAS	4172	8077-435	TP1B	L6	4.40	7.00	6.98	6.99	0.63	31.81	20.10		0.96							
Rasshua	RAS	3583	8077-486	TP2	L2	21.40	8.35	8.30	8.33	2.57	43.17	43.80	41.27	2.48	8.80						
Rasshua	RAS	3657?	8077-488/489	TP2	L2	55.30	9.49	9.59	9.54	5.80	48.93	63.09	51.88	6.80				104.00	10.38		
Rasshua	RAS	3668	8077-490	TP2	L2	27.80	7.32	7.42	7.37	3.77	22.65	64.14	31.63	3.45				108.00	6.54		
Rasshua	RAS	3660	8077-491	TP2	L2	19.40	8.28	8.29	8.28	2.34	43.33	37.88	28.83	1.08	9.28	0.74					
Rasshua	RAS	3660	8077-492	TP2	L2	8.50	7.46	7.77	7.62	1.12	22.24	36.43	24.80	0.87	9.58	0.18					
Rasshua	RAS	3660	8077-494	TP2	L2	51.60	7.33	8.15	7.74	6.67	68.15	80.39	67.11	8.02							
Rasshua	RAS	3660	8077-496	TP2	L2	19.60	9.09	8.76	8.92	2.20	45.75	49.94	47.96	3.69							
Rasshua	RAS	3659	8077-525	TP2	L2	18.10	6.02	6.34	6.18	2.93	48.10	56.95	54.82	0.26							
Rasshua	RAS	3659	8077-526	TP2	L2	20.60	7.80	7.78	7.79	2.64	60.70	38.42	32.55	1.67							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Rasshua	RAS	3663	8077-538	TP2	L3	10.30	9.98	9.35	9.66	1.07	37.73	30.57	27.57	0.43	10.20	0.95					
Rasshua	RAS	3663	8077-539	TP2	L3	18.60	7.65	7.33	7.49	2.48	53.96	39.62	28.90	1.24	7.04	0.91					
Rasshua	RAS	3663	8077-540	TP2	L3	21.00	8.09	8.43	8.26	2.54	44.26	54.53	22.18	0.58							
Rasshua	RAS	3663	8077-544	TP2	L3	39.60	6.71	8.36	7.54	5.26	76.18	56.57	73.41	6.52							
Rasshua	RAS	3649	8077-549	TP2	L4	5.80	8.26	8.24	8.25	0.70	25.30	21.72	15.13	0.43							
Rasshua	RAS	3649	8077-550	TP2	L4	11.60	7.85	8.08	7.97	1.46	41.61	30.26	36.63	2.25							
Rasshua	RAS	3656	8077-555/556	TP2	L5	14.40	7.54	8.28	7.91	1.82	47.90	40.55	36.46	1.08	10.09						
Rasshua	RAS	3819	8077-557	TP2	L6	12.90	6.12	6.52	6.32	2.04	31.33	47.84	26.86	1.01							
Rasshua	RAS	3835	8077-561	TP2	L7A(L7C)	27.50	9.01	8.65	8.83	3.11	46.09	53.10	36.44	1.07	5.52						
Rasshua	RAS	3835	8077-562	TP2	L7A(L7C)	11.00	8.49	8.41	8.45	1.30	31.28	32.84	29.33	1.28	6.64						
Rasshua	RAS	3835	8077-567	TP2	L7A(L7C)	43.20	8.60	8.38	8.49	5.09	57.51	66.73	61.17	7.86	7.40(not rim)						
Rasshua	RAS	3835	8077-572	TP2	L7A(L7C)	18.70	6.28	6.78	6.53	2.86	40.77	54.87	46.65	1.83							
Rasshua	RAS	3835	8077-575	TP2	L7A(L7C)	14.90	6.50	6.72	6.61	2.25	40.60	40.59	32.71	1.52							
Rasshua	RAS	3835	8077-592	TP2	L7A(L7C)	26.00	9.98	9.32	9.65	2.69	43.07	46.31	33.51	0.46							
Rasshua	RAS	3835	8077-597	TP2	L7A(L7C)	17.80	7.51	8.25	7.88	2.26	15.86	52.53	30.50	2.88				105.00	8.07		
Rasshua	RAS	3824	8077-598	TP2	L7A	73.00	9.12	9.48	9.30	7.85	82.91	87.02	71.40	7.38	7.96	n/a (straight)					
Rasshua	RAS	3838	8077-601	TP2	L7B	18.00	9.50	9.35	9.43	1.91	57.26	42.85	32.88	2.36							
Rasshua	RAS	3984	8077-604	TP2	L7C	5.00	5.76	7.09	6.43	0.78	20.24	32.15	19.48	0.66	4.94 (5.60)	n/a (straight)					
Rasshua	RAS	3981	8077-606-610	TP2	L7C	82.80	8.83	9.37	9.10	9.10	112.19	63.40	49.08	4.38							
Rasshua	RAS	3982	8077-611	TP2	L7C	24.40	7.30	7.75	7.53	3.24	62.73	56.82	46.23	3.42							
Rasshua	RAS	3982	8077-612	TP2	L7C	15.30	8.02	8.95	8.48	1.80	43.85	37.68	40.67	2.44							
Rasshua	RAS	3982	8077-615	TP2	L7C	17.90	6.50	6.48	6.49	2.76	40.70	46.78	35.02	2.39							
Rasshua	RAS	3984	8077-624	TP2	L7C	25.40	9.92	9.65	9.78	2.60	50.72	47.23	31.57	1.87	6.96	0.51					
Rasshua	RAS	3984	8077-627	TP2	L7C	14.70	7.71	5.84	6.77	2.17	60.99	34.94	46.92	3.94							
Rasshua	RAS	3984	8077-628	TP2	L7C	8.00	8.07	8.08	8.08	0.99	28.53	32.44	27.74	0.68							
Rasshua	RAS	3983	8077-633	TP2	L7D	19.70	8.25	8.11	8.18	2.41	42.93	62.69	29.57	2.81	7.22	n/a (straight)					
Rasshua	RAS	3990	8077-640	TP2	L8A	52.30	9.00	9.46	9.23	5.67	64.85	73.58	42.08	2.35	7.73	0.34					
Rasshua	RAS	3990	8077-641	TP2	L8A	44.40	8.95	8.69	8.82	5.03	75.94	51.02	33.27	0.79	7.89	1.28					
Rasshua	RAS	3990	8077-642	TP2	L8A	30.70	10.14	9.40	9.77	3.14	70.23	39.27	37.19	1.26	7.95	0.86					
Rasshua	RAS	3990	8077-643	TP2	L8A	6.00	7.33	7.33	7.33	0.82	19.23	37.12	21.51	0.02	7.58	n/a (straight)					
Rasshua	RAS	3990	8077-644	TP2	L8A	10.70	6.53	6.38	6.46	1.66	27.09	47.08	40.58	4.87	5.40	3.44					
Rasshua	RAS	3990	8077-645	TP2	L8A	6.20	5.93	6.25	6.09	1.02	26.75	27.22	25.15	0.58	6.71	n/a (straight)					
Rasshua	RAS	3990	8077-646	TP2	L8A	9.10	6.01	6.36	6.19	1.47	22.62	46.23	39.84	3.67	5.28	1.57					
Rasshua	RAS	3990	8077-649	TP2	L8A	21.80	6.36	5.58	5.97	3.65	62.17	34.13	27.88	0.82							
Rasshua	RAS	3990	8077-650	TP2	L8A	28.50	7.17	6.67	6.92	4.12	56.13	55.34	54.89	2.78							
Rasshua	RAS	3990	8077-654	TP2	L8A	27.90	7.52	7.49	7.50	3.72	51.69	51.93	45.69	3.10							
Rasshua	RAS	3990	8077-656	TP2	L8A	19.50	6.90	8.25	7.57	2.57	63.78	36.79	32.88	0.83							
Rasshua	RAS	3990	8077-661	TP2	L8A	19.60	7.61	8.54	8.07	2.43	49.30	45.45	38.31	1.93							
Rasshua	RAS	3990	8077-688	TP2	L8A	26.60	7.29	7.47	7.38	3.61	57.02	47.89	36.18	4.04							
Rasshua	RAS	3990	8077-689	TP2	L8A	22.20	5.92	6.06	5.99	3.71	31.22	59.90	48.09	4.28	3.44	n/a (straight)		114.00	7.64	21.13	6.64
Rasshua	RAS	3990	8077-690	TP2	L8A	8.20	9.32	10.08	9.70	0.85	25.21	28.43	n/a	n/a				115.00	8.42	n/a	n/a
Rasshua	RAS	3998	8077-691	TP2	L8A	29.10	8.59	8.84	8.71	3.34	65.90	39.97	35.28	1.72	7.26	n/a (straight)					
Rasshua	RAS	3998	8077-693	TP2	L8A	18.80	7.46	7.14	7.30	2.57	44.89	48.70	42.64	3.91	6.14	n/a (straight)					
Rasshua	RAS	3998	8077-695	TP2	L8A	25.20	7.13	7.14	7.14	3.53	45.01	62.00	29.07	1.77	6.55	n/a (straight)					
Rasshua	RAS	3998	8077-697	TP2	L8A	92.50	8.71	9.38	9.04	10.23	68.50	100.10	93.21	11.33							
Rasshua	RAS	3998	8077-698	TP2	L8A	71.90	8.24	9.06	8.65	8.31	70.30	85.40	68.07	5.13							
Rasshua	RAS	3998	8077-700	TP2	L8A	48.10	6.59	7.23	6.91	6.96	65.49	78.75	60.89	4.27							
Rasshua	RAS	3998	8077-701	TP2	L8A	51.80	7.95	8.11	8.03	6.45	80.38	56.41	50.50	3.86							
Rasshua	RAS	3998	8077-711	TP2	L8A	14.00	8.31	8.46	8.38	1.67	33.18	36.94	31.34	0.72							
Rasshua	RAS	3998	8077-714	TP2	L8A	9.20	7.99	6.85	7.42	1.24	30.31	29.83	26.25	1.54							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Rasshua	RAS	3998	8077-722	TP2	L8A	13.70	5.57	5.55	5.56	2.47	29.62	59.12	46.21	4.90	4.00	n/a (straight)		110.00	5.12	n/a	n/a
Rasshua	RAS	3989	8077-725	TP2	L8A	132.70	8.39	9.06	8.72	15.21	110.23	96.94	60.48	7.61	7.64	0.90					
Rasshua	RAS	3993	8077-726	TP2	L8B	157.50	9.47	9.91	9.69	16.25	97.85	129.88	124.03	9.09	7.20	n/a (straight)					
Rasshua	RAS	3997	8077-727	TP2	L8B	11.40	8.10	7.45	7.77	1.47	43.47	32.38	25.68	0.56							
Rasshua	RAS	3997	8077-728	TP2	L8B	9.40	9.48	10.09	9.79	0.96	32.73	24.05	22.05 (ext.)	0.308 (ext.)							
Iturup	RIK	Unknown	1	n/a	n/a	4.10	5.98	5.98	5.98	0.69	21.49	29.04	26.42	1.42	8.81	1.82	20.91				
Iturup	RIK	Unknown	3	n/a	n/a	10.10	5.06	5.21	5.14	1.97	42.14	43.05	40.28	5.27							
Iturup	RIK	Unknown	4	n/a	n/a	10.30	6.80	7.57	7.18	1.43	35.53	36.17	n/a	n/a							
Iturup	RIK	Unknown	5	n/a	n/a	9.50	9.12	9.08	9.10	1.04	38.03	31.26	n/a	n/a							
Iturup	RIK	Unknown	7	n/a	n/a	8.00	7.46	7.68	7.57	1.06	40.45	26.07	n/a	n/a							
Iturup	RIK	Unknown	9	n/a	n/a	6.30	6.87	6.36	6.62	0.95	30.47	28.29	n/a	n/a							
Iturup	RIK	Unknown	11	n/a	n/a	16.80	6.94	8.03	7.49	2.24	57.38	36.96	35.98	1.53							
Iturup	RIK	Unknown	13	n/a	n/a	7.10	6.37	7.20	6.79	1.05	37.22	23.70	n/a	n/a							
Iturup	RIK	Unknown	16	n/a	n/a	29.40	6.60	8.09	7.35	4.00	72.38	46.94	28.27	2.02				112?			
Iturup	RIK	Unknown	17	n/a	n/a	6.00	6.79	6.63	6.71	0.89	28.12	27.31	n/a	n/a							
Iturup	RIK	Unknown	22	n/a	n/a	29.20	5.60	5.50	5.55	5.26	61.29	74.89	67.64	10.15							
Iturup	RIK	Unknown	23	n/a	n/a	16.40	6.94	8.40	7.67	2.14	49.05	41.52	n/a	n/a							
Iturup	RIK	Unknown	24	n/a	n/a	17.40	8.48	7.85	8.16	2.13	44.22	42.78	38.33	1.75							
Iturup	RIK	Unknown	25	n/a	n/a	14.40	4.69	5.34	5.01	2.87	58.69	39.08	29.56	2.51							
Iturup	RIK	Unknown	29	n/a	n/a	9.70	7.25	8.09	7.67	1.26	39.75	27.45	n/a	n/a							
Iturup	RIK	Unknown	30	n/a	n/a	8.20	8.06	7.85	7.95	1.03	28.78	32.53	n/a	n/a							
Iturup	RIK	Unknown	34	n/a	n/a	11.00	7.14	6.64	6.89	1.60	32.52	20.65	n/a	n/a							
Iturup	RIK	Unknown	35	n/a	n/a	7.40	7.89	8.22	8.05	0.92	39.07	21.10	n/a	n/a							
Iturup	RIK	Unknown	36	n/a	n/a	33.80	5.38	4.82	5.10	6.63	47.79	61.21	52.33	10.19				114.00	6.68	57.58	21.21
Iturup	RIK	Unknown	37	n/a	n/a	10.90	4.89	3.98	4.43	2.46	38.84	48.00	44.29	4.99	4.22	3.94	35.81				
Iturup	RIK	Unknown	38	n/a	n/a	5.50	5.85	5.79	5.82	0.95	31.57	26.23	27.82	0.61	5.68	2.24	23.47				
Iturup	RIK	Unknown	39	n/a	n/a	2.70	4.04	4.11	4.08	0.66	21.50	26.13	22.25	1.01	6.78	2.40	21.41				
Iturup	RIK	Unknown	40	n/a	n/a	3.20	5.57	5.57	5.57	0.57	16.75	23.26	n/a	n/a	7.95	n/a	n/a				
Iturup	RIK	Unknown	41	n/a	n/a	2.60	n/a	n/a	n/a	n/a	23.99	29.26	n/a	n/a	6.89	2.20	24.90				
Iturup	RIK	Unknown	42	n/a	n/a	3.90	n/a	n/a	n/a	n/a	17.47	38.69	37.32	2.55	n/a	n/a	n/a				
Iturup	RIK	Unknown	44	n/a	n/a	4.50	5.27	5.05	5.16	0.87	26.98	27.32	24.64	1.02							
Iturup	RIK	Unknown	45	n/a	n/a	3.40	5.43	5.25	5.34	0.64	21.17	25.79	n/a	n/a							
Iturup	RIK	Unknown	46	n/a	n/a	51.10	8.10	8.78	8.44	6.05	62.87	74.67	69.14	4.94							
Iturup	RIK	Unknown	50	n/a	n/a	17.60	6.15	6.35	6.25	2.82	46.57	58.18	54.93	5.99		2.50	45.35				
Iturup	RIK	Unknown	57	n/a	n/a	10.50	6.78	6.30	6.54	1.61	41.55	36.41	n/a	n/a							
Iturup	RIK	Unknown	58	n/a	n/a	16.30	5.20	5.72	5.46	2.98	37.66	59.57	33.70	1.83							
Iturup	RIK	Unknown	59	n/a	n/a	2.70	4.99	4.33	4.66	0.58	30.09	14.88	n/a	n/a							
Ryponkicha	RYP	1858	n/a	Unit 1	L2	7.50	7.84	8.13	7.99	0.94	36.29	28.01	29.26	1.49							
Ryponkicha	RYP	1858	n/a	Unit 1	L2	11.70	9.03	8.72	8.87	1.32	28.82	38.57	25.42	1.12							
Ryponkicha	RYP	1862	n/a	Unit 1	L3	52.20	10.86	11.50	11.18	4.67	59.43	62.84	53.58	4.43							
Ryponkicha	RYP	1862	n/a	Unit 1	L3	13.20	12.30	12.51	12.41	1.06	33.90	38.72	n/a	n/a							
Ryponkicha	RYP	1867	n/a	Unit 1	L3B	33.00	10.94	11.43	11.18	2.95	66.97	47.44	66.01	3.26							
Ryponkicha	RYP	1867	n/a	Unit 1	L3B	12.40	9.35	10.37	9.86	1.26	42.71	26.88	n/a	n/a							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	45.20	11.24	11.41	11.32	3.99	38.92	58.26	32.77	3.28				112.00	11.31	n/a	n/a
Ryponkicha	RYP	1872	n/a	Unit 1	L4	20.60	10.22	10.11	10.16	2.03	48.83	36.27	29.65	3.77							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	44.70	8.80	8.55	8.68	5.15	61.10	98.00	86.65	9.65							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	22.50	9.59	9.45	9.52	2.36	54.26	37.46	n/a	n/a							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	26.00	9.08	9.01	9.04	2.87	61.61	51.90	n/a	n/a							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	11.30	7.98	8.06	8.02	1.41	40.32	32.23	n/a	n/a		0.78					
Ryponkicha	RYP	1872	n/a	Unit 1	L4	3.60	8.17	8.17	8.17	0.44	27.49	19.43	n/a	n/a							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Ryponkicha	RYP	1872	n/a	Unit 1	L4	17.30	8.36	7.87	8.11	2.13	44.67	37.50	31.64	1.57							
Ryponkicha	RYP	1872	n/a	Unit 1	L4	3.70	8.15	8.20	8.18	0.45	19.72	20.47	n/a	n/a							
Ryponkicha	RYP	1873	n/a	Unit 1	L4	40.90	n/a	n/a	n/a	n/a	36.86	52.70	21.57	2.54				114.00	13.35	n/a	n/a
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	84.90	12.19	11.14	11.66	7.28	76.41	90.50	62.97	5.10							
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	90.60	13.16	14.70	13.93	6.50	69.90	99.00	76.14	9.63							
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	36.70	10.75	10.92	10.83	3.39	57.81	50.69	43.34	2.45							
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	21.00	7.50	7.12	7.31	2.87	50.06	47.60	42.73	2.37							
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	21.00	7.15	7.38	7.26	2.89	46.18	54.65	50.31	4.05							
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	35.90	11.32	8.17	9.75	3.68	49.04	86.64	69.05	2.55	9.46	n/a (direct)					
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	27.40	8.17	8.74	8.46	3.24	66.72	53.45	39.24	0.76	8.46	1.36					
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	25.90	8.50	8.66	8.58	3.02	54.49	59.66	53.65	4.98	6.75	2.63					
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	17.10	9.94	10.64	10.29	1.66	42.95	44.60	31.96	0.14	6.20	n/a (direct)					
Ryponkicha	RYP	1882	n/a	Unit 1	L4 (Below)	16.00	9.70	9.13	9.41	1.70	42.20	43.02	37.82	0.92	8.37	n/a (direct)					
Kunashir	SER	99	1	TP1	L2	111.40	11.29	10.82	11.06	10.08	93.44	123.86	102.00	11.39	9.67	n/a (straight)					
Kunashir	SER	unknown	2	unknown	unknown	28.10	8.28	8.10	8.19	3.43	62.92	50.32	30.77	0.86	7.52	n/a (straight)	n/a				
Kunashir	SER	unknown	4	unknown	unknown	50.70	9.16	8.91	9.03	5.61	61.20	73.92	63.53	6.70							
Kunashir	SER	unknown	5	unknown	unknown	36.90	9.97	10.21	10.09	3.66	69.51	43.95	38.98	2.51							
Kunashir	SER	99	8	TP1	L2	154.80	10.16	10.65	10.40	14.88	87.91	127.87	98.79	9.88	10.45	n/a (straight)					
Kunashir	SER	unknown	9	unknown	unknown	56.90	8.66	10.18	9.42	6.04	81.88	60.06	49.06	3.21	8.95	n/a	n/a				
Kunashir	SER	unknown	14	unknown	unknown	15.60	7.13	6.90	7.01	2.22	39.50	42.83	25.02	1.46	5.72	6.25	36.99				
Kunashir	SER	unknown	15	unknown	unknown	12.20	7.03	8.41	7.72	1.58	37.07	46.65	32.03	2.46	7.90	n/a (straight)	n/a				
Kunashir	SER	unknown	16	unknown	unknown	41.00	8.76	8.85	8.80	4.66	73.03	67.26	61.50	5.43							
Kunashir	SER	unknown	19	unknown	unknown	12.70	9.21	9.56	9.38	1.35	30.90	42.50	35.41	0.37	8.97	n/a (straight)	n/a				
Kunashir	SER	99	20	TP1	L2	27.60	9.11	8.73	8.92	3.09	64.05	44.99	40.45	1.95							
Kunashir	SER	99	21	TP1	L2	280.50	10.07	8.18	9.13	30.73	115.78	178.70	156.00	53.46	9.88	n/a (straight)	n/a				
Kunashir	SER	99	22	TP1	L2	7.00	8.27	7.59	7.93	0.88	27.01	31.48	29.72	0.46	8.40	2.12	24.74				
Kunashir	SER	unknown	24	unknown	unknown	93.60	9.42	9.78	9.60	9.75	94.22	69.90	61.90	6.06							
Kunashir	SER	unknown	29	unknown	unknown	86.50	8.14	7.81	7.98	10.84	64.11	71.48	53.81	13.49				106.00	7.34	69.60 (Diameter)	
Kunashir	SER	unknown	30	unknown	unknown	77.40	8.94	9.52	73.93	88.42	88.25	74.26	66.48	4.72							
Kunashir	SER	unknown	31	unknown	unknown	41.40	9.27	11.04	73.93	88.42	77.87	46.17	42.24	2.78							
Kunashir	SER	unknown	32	unknown	unknown	21.90	10.70	10.69	10.69	2.05	44.76	43.60	29.39	0.87	8.21	n/a	n/a				
Kunashir	SER	unknown	33	unknown	unknown	25.60	9.84	8.85	9.35	2.74	39.97	69.38	64.84	5.28							
Kunashir	SER	unknown	34	unknown	unknown	34.40	8.89	8.33	8.61	4.00	62.93	60.74	52.30	4.96							
Kunashir	SER	unknown	35	unknown	unknown	23.20	8.94	9.08	9.01	2.57	61.80	49.32	50.54	1.83							
Kunashir	SER	unknown	36	unknown	unknown	17.60	7.00	7.23	7.12	2.47	38.00	52.58	47.29	1.88							
Kunashir	SER	unknown	39	unknown	unknown	13.60	6.52	6.42	6.47	2.10	43.03	51.35	40.66	3.14							
Kunashir	SER	98	52	TP1	L1	34.30	7.76	7.10	7.43	4.62	73.96	46.29	33.40	1.86							
Kunashir	SER	98	55	TP1	L1	27.60	6.30	6.47	6.39	4.32	64.94	66.13	58.21	3.98							
Kunashir	SER	unknown	?	unknown	unknown	7.70	9.72	9.66	9.69	0.79	22.82	35.71	n/a	n/a							
Kunashir	SER	unknown	3, 23	unknown	unknown	210.80	9.30	9.28	9.29	22.69	166.74	122.64	102.00	6.58							
Kunashir	SER	98	43, 51	TP1	L1	19.30	6.12	5.82	5.97	3.23	52.02	55.41	51.20	6.19							
Kunashir	SER	98	47, 48, 56	TP1	L1	132.30	6.69	5.64	6.16	21.47	161.00	125.22	74.99	4.68				115.00	4.36	75.43	14.87
Kunashir	SER	98	49, 60	TP1	L1	40.60	5.84	5.76	5.80	7.00	56.91	116.45	37.95	3.36				115.00	5.62	76.58	25.07
Kunashir	SER	98	53, 54	TP1	L1	118.40	5.50	5.07	5.29	22.40	134.60	157.00	79.19	6.33							
Urup	TIK	33	3	TP2	Below 80	223.70	6.99	7.57	7.28	30.73	87.64	132.14	87.70 (diameter)					108.00	11.38	78.55 (diameter)	
Urup	TIK	35	6	TP2		21.40	9.99	8.54	9.26	2.31	48.43	51.43	n/a	n/a							
Urup	TIK	35	7	TP2		13.30	11.20	11.58	11.39	1.17	27.78	37.90	n/a	n/a							
Urup	TIK	35	9	TP2		9.20	8.08	8.02	8.05	1.14	28.49	32.27	n/a	n/a							
Urup	TIK	35	Unknown	TP2		5.80	10.05	10.27	10.16	0.57	25.31	26.74	n/a	n/a							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Urup	TOK	414	1	TP1	L1	49.00	9.29	8.85	9.07	5.40	70.06	58.67	52.94	2.51							
Urup	TOK	414	2	TP1	L1	37.00	11.12	11.12	11.12	3.33	40.40	58.59	50.22	n/a				112.00	n/a	n/a	n/a
Urup	TOK	414	3	TP1	L1	48.20	12.42	12.60	12.51	3.85	53.79	52.55	45.55	3.07							
Urup	TOK	414	4	TP1	L1	31.90	10.81	10.86	10.84	2.94	47.18	60.15	41.65	1.02							
Urup	TOK	414	5	TP1	L1	24.00	10.27	9.85	10.06	2.39	41.07	42.21	33.21	1.53							
Urup	TOK	414	6	TP1	L1	12.40	10.52	10.91	10.72	1.16	26.19	41.84	27.67	0.61							
Urup	TOK	414	8	TP1	L1	9.60	10.78	11.14	10.96	0.88	30.66	26.75	n/a	n/a							
Urup	TOK	414	11	TP1	L1	21.80	9.69	10.41	10.05	2.17	38.86	41.94	37.70	1.52							
Urup	TOK	414	12	TP1	L1	14.70	8.83	7.78	8.30	1.77	49.48	35.98	25.73	1.42	n/a	straight	n/a				
Urup	TOK	414	13	TP1	L1	19.70	11.69	11.09	11.39	1.73	48.57	35.06	25.60	0.99							
Urup	TOK	414	15	TP1	L1	15.80	10.45	10.21	10.33	1.53	37.15	35.87	30.96	0.91	10.44	1.08	n/a (use L)				
Urup	TOK	414	16	TP1	L1	23.10	10.15	10.83	10.49	2.20	44.40	41.92	38.48	1.63							
Urup	TOK	414	27	TP1	L1	23.60	10.17	9.64	9.91	2.38	42.34	47.23	40.92	1.55							
Urup	TOK	414	28	TP1	L1	4.00	6.21	6.43	6.32	0.63	18.56	31.06	29.19	1.16	8.75	3.87	23.85				
Urup	TOK	418	29	TP1	L2	59.10	10.71	10.45	10.58	5.59	76.32	64.03	49.50	1.55							
Urup	TOK	418	30	TP1	L2	17.90	6.21	6.43	6.32	2.83	57.23	51.73	38.38	7.36							
Urup	TOK	418	31	TP1	L2	44.70	n/a	n/a	n/a	n/a	35.55	47.77	n/a	n/a				98.00	14.75	45.70	3.87
Urup	TOK	418	32	TP1	L2	39.90	12.30	11.37	11.83	3.37	54.08	47.04	43.11	2.29							
Urup	TOK	418	33	TP1	L2	39.80	9.73	9.03	9.38	4.24	63.20	59.12	47.99	2.27							
Urup	TOK	418	34	TP1	L2	28.60	9.31	9.44	9.37	3.05	64.08	48.05	38.22	1.31							
Urup	TOK	418	35	TP1	L2	48.00	11.95	11.90	11.92	4.03	66.88	64.41	61.51	3.45							
Urup	TOK	418	36	TP1	L2	25.90	7.23	10.28	8.76	2.96	60.37	51.61	34.37	2.28		2.73					
Urup	TOK	418	37	TP1	L2	18.80	7.12	7.41	7.27	2.59	59.03	38.41	33.74	2.19							
Simushir	VOD	1306	7672-79	Unit 3	L2	13.30	7.40	7.45	7.42	1.79	44.19	43.30	28.74	2.48	5.53	n/a (straight)					
Simushir	VOD	1306	7672-86	Unit 3	L2	28.00	14.79	14.31	14.55	1.92	53.66	33.47	n/a	n/a							
Simushir	VOD	1306	7672-87	Unit 3	L2	14.00	9.32	9.12	9.22	1.52	38.23	33.52	26.96	2.11							
Simushir	VOD	494	7918-160 (1)	TP3	L3	343.30	9.02	10.36	9.69	35.42	108.37	109.37	88.53	17.14				104.00	12.40	87 (diameter)	
Simushir	VOD	494	7918-160 (2)	TP3	L3	196.50	9.25	9.25	9.25	21.25	181.01	134.18	102.00	17.55	7.79	7.73	75.56				
Simushir	VOD	494	7918-160 (3)	TP3	L3	101.60	9.17	8.36	8.76	11.60	139.12	75.52	55.71	5.16	8.71	3.23	48.20				
Simushir	VOD	494	7918-205	TP3	L3	50.70	n/a	n/a	n/a	n/a	21.89	60.51	n/a	n/a				113.00	14.38	41.99	5.56
Simushir	VOD	497	7918-208	TP3	L4	114.60	8.15	8.38	8.27	13.86	44.16	87.18	78.3 (diameter)					107.00	14.08	58.82 (diameter)	
Simushir	VOD	497	7918-209	TP3	L4	38.60	8.90	9.12	9.01	4.29	46.96	69.96	39.59	2.96	9.20	2.85	43.38				
Simushir	VOD	497	7918-211	TP3	L4	14.80	7.22	7.32	7.27	2.04	60.95	32.08	17.90	1.05	6.68	0.51	39.74				
Simushir	VOD	497	7918-212	TP3	L4	36.90	11.94	11.31	11.63	3.17	64.37	52.25	47.93	3.12							
Simushir	VOD	579	7918-222	TP3	L3	51.40	9.58	9.13	9.35	5.50	60.01	72.78	68.25	6.80	8.41	5.73	55.87				
Simushir	VOD	486	7918-51	TP3	?	342.70	12.27	10.72	11.49	29.82	160.49	127.39	90.47	10.78	9.20	8.63	101.70				
Simushir	VOD	497?	7918-52	TP3	L4?	45.50	n/a	n/a	n/a	n/a	57.76	82.17	75.65	5.82	11.40	5.51	53.83				
Simushir	VOD	497?	7918-53	TP3	L4?	57.00	11.24	10.64	10.94	5.21	61.60	76.56	70.87	5.76	10.19	3.93	52.53				
Simushir	VOD	497?	7918-54	TP3	L4?	13.60	7.55	7.44	7.50	1.81	35.97	46.48	27.39	1.59	8.64	1.27	29.88				
Simushir	VOD	497?	7918-55	TP3	L4?	15.10	9.23	8.85	9.04	1.67	31.95	54.99	42.75	1.27	9.47	n/a (straight)					
Simushir	VOD	497?	7918-56	TP3	L4?	37.00	7.96	7.92	7.94	4.66	67.30	55.85	41.06	0.86	9.01	5.09	58.87				
Simushir	VOD	497?	7918-57	TP3	L4?	49.70	10.76	11.00	10.88	4.57	66.92	68.14	42.98	3.09	10.79	n/a (straight)					
Simushir	VOD	497?	7918-58	TP3	L4?	16.30	8.24	8.43	8.33	1.96	48.88	35.76	26.77	1.11	8.30	3.45	39.98				
Simushir	VOD	497?	7918-59	TP3	L4?	9.10	9.63	8.70	9.17	0.99	29.35	35.85	28.96	1.32	9.31	n/a (straight)					
Simushir	VOD	497?	7918-61	TP3	L4?	4.10	n/a	n/a	n/a	n/a	15.59	35.10	18.79	n/a	10.75	n/a (straight)					
Simushir	VOD	497?	7918-62	TP3	L4?	3.90	n/a	n/a	n/a	n/a	15.68	26.06	27.43	1.10	10.88	n/a (straight)					
Simushir	VOD	497?	7918-63	TP3	L4?	30.70	10.23	10.20	10.22	3.00	53.62	53.58	34.03	2.16							
Simushir	VOD	497?	7918-64	TP3	L4?	38.50	9.67	9.67	9.67	3.98	67.39	51.17	41.14	2.16							
Simushir	VOD	497?	7918-66	TP3	L4?	24.30	7.20	7.14	7.17	3.39	42.97	57.13	45.80	8.37							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Simushir	VOD	497?	7918-71	TP3	L4?	51.30	10.43	10.91	10.67	4.81	58.52	68.26	63.82	5.27							
Simushir	VOD	1382	7972-103	Unit 2	L4	169.40	11.69	11.80	11.75	14.42	94.47	122.84	101.94	11.40	10.76	9.24					
Simushir	VOD	1380	7972-104	Unit 1	L4C	112.90	15.67	14.57	15.12	7.47	99.29	63.19	51.25	5.54							
Simushir	VOD	1380	7972-105	Unit 1	L4C	4.90	9.91	9.87	9.89	0.50	18.99	27.70	n/a	n/a	9.69						
Simushir	VOD	1380	7972-106	Unit 1	L4C	9.20	11.48	11.94	11.71	0.79	19.62	35.03	21.81	0.62	11.15						
Simushir	VOD	1380	7972-107	Unit 1	L4C	14.70	9.01	12.26	10.63	1.38	36.59	37.86	26.37	3.58							
Simushir	VOD	1380	7972-108	Unit 1	L4C	34.50	11.89	11.96	11.93	2.89	47.66	40.53	39.42	2.40							
Simushir	VOD	1935	7972-109	Unit 2	L4	10.70	8.40	7.97	8.18	1.31	34.86	40.13	32.22	1.59	6.65	2.70					
Simushir	VOD	1935	7972-110	Unit 2	L4	13.70	8.41	6.80	7.61	1.80	50.09	33.45	40.69	2.92							
Simushir	VOD	1935	7972-111	Unit 2	L4	15.90	12.29	12.67	12.48	1.27	38.65	38.23	35.16	2.58		1.98					
Simushir	VOD	1935	7972-113	Unit 2	L4	10.20	11.41	10.94	11.18	0.91	29.99	24.48	30.56	2.85							
Simushir	VOD	1411	7972-115	Unit 1	L4C	24.80	11.48	11.51	11.49	2.16	57.79	32.96	27.13	0.80							
Simushir	VOD	1403	7972-117	Unit 1	L4A	101.20	7.75	6.82	7.28	13.90	30.09	78.21	n/a	n/a				110.00	12.58	55.47 (Base diameter)	
Simushir	VOD	1403	7972-118	Unit 1	L4A	38.00	8.25	8.20	8.22	4.62	52.65	49.23	37.23	7.26				108.00	8.20	31.47	5.98
Simushir	VOD	1403	7972-119	Unit 1	L4A	59.60	10.22	10.61	10.41	5.72	76.24	61.64	54.05	4.22							
Simushir	VOD	1403	7972-120	Unit 1	L4A	27.50	10.70	11.08	10.89	2.52	45.12	51.73	41.22	0.46							
Simushir	VOD	1403	7972-121	Unit 1	L4A	29.10	11.41	11.42	11.42	2.55	42.62	55.89	46.55	2.53							
Simushir	VOD	1403	7972-122	Unit 1	L4A	25.80	10.58	10.57	10.58	2.44	58.04	37.40	32.08	2.12							
Simushir	VOD	1403	7972-123	Unit 1	L4A	22.00	10.10	9.38	9.74	2.26	49.02	35.05	28.96	1.22							
Simushir	VOD	1236	7972-26	Unit 2	L2	50.80	9.89	9.11	9.50	5.35	54.86	76.55	52.73	10.75	8.71	7.53					
Simushir	VOD	1235	7972-27	Unit 2	L2	79.40	9.02	8.35	8.68	9.15	92.61	85.81	79.87	10.63	8.34	n/a (straight)					
Simushir	VOD	1235	7972-28	Unit 2	L2	27.40	9.89	9.79	9.84	2.79	45.44	56.83	48.84	2.34	8.61	1.62					
Simushir	VOD	1235	7972-29	Unit 2	L2	9.30	10.06	10.09	10.07	0.92	33.03	30.55	19.56	0.90	9.60	0.48					
Simushir	VOD	1444	7972-298	Unit 1	L5	44.20	13.98	13.81	13.89	3.18	43.27	45.21	n/a	n/a				114.00	24.87	35.87	5.19
Simushir	VOD	1444	7972-299	Unit 1	L5	68.00	12.00	12.53	12.27	5.54	59.26	73.97	52.14	4.48							
Simushir	VOD	1273	7972-3	Unit 1	L2	13.20	8.45	8.16	8.31	1.59	38.61	36.12	31.46	1.10	9.99	2.27					
Simushir	VOD	1235	7972-30	Unit 2	L2	8.10	7.16	7.22	7.19	1.13	28.15	35.35	28.89	1.21	7.05	2.41					
Simushir	VOD	1444	7972-300	Unit 1	L5	16.10	7.42	7.81	7.62	2.11	56.23	40.15	38.45	2.70							
Simushir	VOD	1444	7972-301	Unit 1	L5	23.30	10.29	11.25	10.77	2.16	40.86	45.15	62.03	7.16		4.35					
Simushir	VOD	1445	7972-302	Unit 1	L5	8.00	5.99	6.98	6.49	1.23	25.01	40.38	35.20	2.39	4.53	1.10					
Simushir	VOD	1445	7972-304	Unit 1	L5	90.80	12.32	12.74	12.53	7.25	79.55	70.09	87.12	11.23							
Simushir	VOD	1235	7972-31	Unit 2	L2	4.80	6.70	6.46	6.58	0.73	31.15	32.26	26.07	1.77							
Simushir	VOD	1552	7972-319	Unit 2	L5	13.20	7.01	7.26	7.13	1.85	48.55	39.36	38.61	2.89	5.45	0.80					
Simushir	VOD	1552	7972-320	Unit 2	L5	32.50	7.08	5.40	6.24	5.21	82.46	58.21	54.47	3.61							
Simushir	VOD	1553	7972-321	Unit 2	L5	14.30	7.21	7.90	7.55	1.89	40.02	46.58	37.64	1.96							
Simushir	VOD	1553	7972-322	Unit 2	L5	14.20	7.34	7.05	7.19	1.97	36.07	47.86	45.25	2.31							
Simushir	VOD	1553	7972-323	Unit 2	L5	16.30	8.04	8.88	8.46	1.93	48.24	42.02	40.51	3.06							
Simushir	VOD	1553	7972-324	Unit 2	L5	6.20	5.81	4.92	5.36	1.16	37.95	31.14	29.94	3.14							
Simushir	VOD	1553	7972-327	Unit 2	L5	9.00	5.46	6.12	5.79	1.56	43.40	41.79	41.97	2.85							
Simushir	VOD	1927	7972-329	Unit 2	L5	11.70	8.55	8.69	8.62	1.36	31.53	36.91	30.48	1.64	7.76	0.97					
Simushir	VOD	1235	7972-33	Unit 2	L2	47.10	11.12	11.41	11.26	4.18	51.85	73.90	59.58	3.32		2.26					
Simushir	VOD	1461	7972-333	Unit 3	L2	94.90	6.51	6.28	6.40	14.84	66.62	137.57	129.32	52.15	7.66	2.11					
Simushir	VOD	1461	7972-336	Unit 3	L5	23.40	10.01	10.36	10.18	2.30	28.99	47.85	30.94	3.92				94.00	9.61	39.68	10.73
Simushir	VOD	1461	7972-337	Unit 3	L5	53.60	9.01	7.45	8.23	6.51	91.12	54.97	51.61	3.70							
Simushir	VOD	1461	7972-338	Unit 3	L5	15.00	6.93	8.63	7.78	1.93	50.61	44.79	31.89	1.06							
Simushir	VOD	1461	7972-339	Unit 3	L5	13.60	8.08	6.11	7.10	1.92	56.06	30.55	27.82	1.41							
Simushir	VOD	1461	7972-340	Unit 3	L5	8.30	5.61	5.88	5.74	1.45	39.24	35.84	25.57	0.80							
Simushir	VOD	1461	7972-342	Unit 3	L5	64.00	10.72	12.34	11.53	5.55	56.84	77.02	32.09	2.08				104.00	25.48	n/a	n/a
Simushir	VOD	1461	7972-343	Unit 3	L5	24.50	7.47	8.23	7.85	3.12	57.47	59.32	50.24	1.78							

Island Name	Site	FS #	SM #	Unit	Level	Weight	Thickness			W/T	Length	Width	Interior Curvature (y)	Curvature Depth (x)	Rim Thick	Collar Depth	Rim to Shoulder	Base Angle	Base Thick	Base Chord	Base Curve
Simushir	VOD	1461	7972-344	Unit 3	L5	11.20	9.03	8.55	8.79	1.27	39.89	36.45	27.13	1.49							
Simushir	VOD	1564	7972-353	Unit 4	L5	8.50	7.95	7.64	7.80	1.09	27.07	46.54	43.45	2.90							
Simushir	VOD	1564	7972-354	Unit 4	L5	17.30	7.07	7.59	7.33	2.36	40.96	48.40	41.24	1.65							
Simushir	VOD	1543	7972-356	Unit 1	L6	9.10	5.54	6.42	5.98	1.52	31.20	39.37	32.25	2.55	6.84	0.30					
Simushir	VOD	1543	7972-357	Unit 1	L6	25.50	6.61	6.47	6.54	3.90	51.29	66.16	56.59	6.17	4.77	1.28					
Simushir	VOD	1543	7972-359	Unit 1	L6	18.80	8.93	8.83	8.88	2.12	42.37	58.46	52.35	3.35							
Simushir	VOD	1917	7972-36	Unit 2	L2	28.50	11.31	11.26	11.28	2.53	37.67	53.83	48.65	2.31							
Simushir	VOD	1543	7972-360	Unit 1	L6	24.20	11.01	9.99	10.50	2.30	56.97	34.29	43.68	2.63							
Simushir	VOD	1264	7972-37	Unit 2	L2	39.30	8.19	8.69	8.44	4.66	58.79	73.21	60.89	7.74		3.71					
Simushir	VOD	1350	7972-38	Unit 2	L2	31.10	9.09	8.38	8.73	3.56	65.57	64.06	49.22	4.57	8.02	n/a (straight)					
Simushir	VOD	1350	7972-39	Unit 2	L2	13.10	9.02	8.44	8.73	1.50	41.80	29.40	24.68	0.40	7.70	0.48					
Simushir	VOD	1350	7972-40	Unit 2	L2	2.70	6.06	6.05	6.05	0.45	19.84	24.73	21.40	0.16	6.04	0.70					
Simushir	VOD	1316	7972-405	Unit 4	L1	15.70	10.08	9.89	9.99	1.57	38.19	29.33	19.20	0.24	10.06	0.98					
Simushir	VOD	1316	7972-407	Unit 4	L1	14.00	9.90	10.09	10.00	1.40	46.31	32.62	n/a	n/a							
Simushir	VOD	1326	7972-410	Unit 4	L2	83.50	8.11	8.43	8.27	10.10	78.73	117.73	87.12	8.49							
Simushir	VOD	1319	7972-411	Unit 4	L2	49.20	9.12	9.85	9.49	5.19	102.77	59.87	56.45	11.25							
Simushir	VOD	1319	7972-412	Unit 4	L2	95.10	10.85	10.45	10.65	8.93	76.59	83.25	57.92	10.16							
Simushir	VOD	1320	7972-414	Unit 4	L2	9.10	8.97	9.37	9.17	0.99	28.69	30.34	23.31	0.60	9.10	1.19					
Simushir	VOD	1320	7972-415	Unit 4	L2	26.10	11.08	8.94	10.01	2.61	52.89	53.32	28.76	2.18							
Simushir	VOD	1320	7972-417	Unit 4	L2	33.30	9.46	9.93	9.69	3.44	51.10	57.47	53.33	1.71							
Simushir	VOD	1320	7972-418	Unit 4	L2	25.40	9.42	8.97	9.20	2.76	55.42	40.25	36.25	2.36							
Simushir	VOD	1320	7972-419	Unit 4	L2	26.30	11.67	12.16	11.92	2.21	44.39	39.62	29.76	0.52							
Simushir	VOD	1350	7972-42	Unit 2	L2	22.20	12.25	13.40	12.82	1.73	43.85	38.90	33.42	1.61							
Simushir	VOD	1344	7972-427	Unit 4	L4	30.90	9.03	9.61	9.32	3.31	50.59	60.92	53.10	3.39	10.48	3.30					
Simushir	VOD	1350	7972-43	Unit 2	L2	40.20	11.01	10.36	10.68	3.76	63.42	40.84	35.09	2.58							
Simushir	VOD	1344	7972-430	Unit 4	L4	28.00	10.26	9.03	9.65	2.90	44.47	57.66	49.04	3.25							
Simushir	VOD	1340	7972-432	TP3	L4	275.40	15.08	15.78	15.43	17.85	100.45	107.68	98.78	7.80	14.11	2.15					
Simushir	VOD	1343	7972-433	Unit 4	L3	18.70	8.98	8.51	8.74	2.14	38.50	68.31	53.11	4.09							
Simushir	VOD	1334	7972-434	TP3	L6	659.10	17.84	16.75	17.30	38.11	164.62	164.80	142.39	26.21							
Simushir	VOD	1235	7972-44	Unit 2	L2	8.50	8.43	8.23	8.33	1.02	33.11	33.47	20.91	0.07	8.46	0.90					
Simushir	VOD	1235	7972-45	Unit 2	L2	12.60	11.78	12.09	11.93	1.06	30.64	29.41	24.84	0.56	10.75	0.97					
Simushir	VOD	1235	7972-48	Unit 2	L2	92.00	12.72	11.68	12.20	7.54	78.19	100.04	90.31	8.84							
Simushir	VOD	1235	7972-50	Unit 2	L2	35.50	7.34	7.92	7.63	4.66	48.45	74.66	65.83	6.46							
Simushir	VOD	1235	7972-51	Unit 2	L2	20.40	6.67	5.77	6.22	3.28	54.52	42.53	37.30	3.39							
Simushir	VOD	1235	7972-52	Unit 2	L2	37.10	10.62	10.61	10.62	3.49	53.65	54.60	46.09	3.62							
Simushir	VOD	1235	7972-53	Unit 2	L2	32.40	10.50	10.46	10.48	3.09	64.44	46.08	34.15	1.06							
Simushir	VOD	1235	7972-54	Unit 2	L2	27.10	11.20	11.97	11.58	2.34	40.03	49.87	46.87	4.43							
Simushir	VOD	1235	7972-55	Unit 2	L2	24.20	8.32	8.48	8.40	2.88	58.72	56.41	52.96	6.13							
Simushir	VOD	1273	7972-6	Unit 1	L2	15.40	7.67	9.45	8.56	1.80	33.51	56.89	49.38	7.26							
Simushir	VOD	1273	7972-7	Unit 1	L2	26.50	10.83	8.59	9.71	2.73	50.41	46.55	36.03	0.73							
Simushir	VOD	1298	7972-76	Unit 3	L2	24.30	6.87	7.70	7.29	3.34	46.07	58.42	42.37	3.01	6.82	n/a (straight)					
Simushir	VOD	1298	7972-77	Unit 3	L2	27.80	9.82	10.63	10.22	2.72	47.82	49.66	44.66	2.24							
Simushir	VOD	1304	7972-78	Unit 3	L2	31.90	14.23	13.43	13.83	2.31	51.75	36.98	27.23	0.72	12.60	0.87					
Simushir	VOD	1273	7972-8	Unit 1	L2	11.30	7.98	7.75	7.86	1.44	40.39	28.48	24.84	0.99							
Simushir	VOD	1304	7972-80	Unit 3	L2	25.00	9.09	9.20	9.14	2.73	49.81	44.03	37.49	2.76							
Simushir	VOD	1304	7972-81	Unit 3	L2	21.00	10.93	10.87	10.90	1.93	43.67	44.70	30.46	1.41							
Simushir	VOD	1304	7972-82	Unit 3	L2	10.60	7.60	9.46	8.53	1.24	34.44	33.15	30.16	1.94							
Simushir	VOD	1304	7972-83	Unit 3	L2	11.40	10.54	10.21	10.37	1.10	30.94	27.82	n/a	n/a							
Simushir	VOD	1304	7972-84	Unit 3	L2	6.20	7.57	7.89	7.73	0.80	32.69	30.43	24.85	0.68							
Simushir	VOD	1304	7972-85	Unit 3	L2	10.40	7.35	7.81	7.58	1.37	40.81	31.89	26.68	2.02	7.59	n/a (straight)					
Simushir	VOD	1344	7973-431	Unit 4	L4	15.60	7.94	8.16	8.05	1.94	31.06	47.38	42.29	3.61		1.54					

Appendix A: Descriptive Measurements (Continued)

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Matua	AIB	4192	8055-1	GPS223	GPS223	rim	111111	none	none			really small rim, thinning walls until rim	
Matua	AIB	4204	8055-10	GPS225	GPS225	body	111111	none	none			exterior carbonization and interior carbonization on interior base of vessel	
Matua	AIB	4192	8055-2	GPS223	GPS223	body	111111	none	none				grayish exterior very similar to 8055-1
Matua	AIB	4208	8055-3	GPS228	GPS228	rim	111111	none	none			exterior carbonization	
Matua	AIB	4208	8055-4	GPS228	GPS228	base?	111111	none	none			exterior carbonization	ledge thickness is 16.50
Matua	AIB	4208	8055-5	GPS228	GPS228	body	111111	none	none			exterior carbonization	
Matua	AIB	4204	8055-7	GPS225	GPS225	rim	111111	none	none			exterior carbonization	bulge area or ledge is 8.3 mm thick
Matua	AIB	4204	8055-8	GPS225	GPS225	rim	111111	none	none			sherd has exterior carbonization	bulge area or ledge is 8.3 mm thick
Matua	AIB	4204	8055-9	GPS225	GPS225	base	111111	none	none			exterior carbonization	
Matua	AIB	2090	n/a	surface	surface	rim	111111	n/a	n/a			slight interior carbonization, missing exterior façade	
Urup	AIC	2466	4	A1	L1	rim	111111					little temper	
Urup	AIC	2466	5	A1	L1	rim	111111					sand temper, small inclusions	interior carbonization
Urup	AIC	2466	6	A1	L1	rim	111111					sand temper, few inclusions	interior carbonization
Urup	AIC	2466	7	A1	L1	rim	111111					sand temper	interior carbonization
Urup	AIC	2466	10	A1	L1	body	111111					small amount of temper	exterior carbonization
Urup	AIC	2466	13	A1	L1	body	111111					small amount of temper	
Urup	AIC	2466	17	A1	L1	body	111111					small amount of temper	heavy interior carbonization
Urup	AIC	2466	19	A1	L1	body	311111	E	cord	1.73		small amount of temper	
Urup	AIC	2466	20	A1	L1	rim	441113	E	cord, applique, peak	1.55	V	small applique piece 10.31mm from rim, braided cord	
Urup	AIC	2410	31	A2	L1	rim	111111					small amount of temper	mending hole drilled from inside
Urup	AIC	2410	32	A2	L1	base	111111					mending hole near base?	
Urup	AIC	2410	33	A2	L1	rim	111111					small amount of temper, well made piece	mending hole, drilled from outside
Urup	AIC	2410	34	A2	L1	rim	111111					missing exterior so will not be included in rims	one very large inclusion but not much else
Urup	AIC	2410	35	A2	L1	rim	111111					sand temper, medium inclusions	interior carbonization
Urup	AIC	2410	36	A2	L1	rim	111111					small amount of temper, greyish in color	heavy interior carbonization
Urup	AIC	2410	37	A2	L1	rim	111111					probably collared vessel but missing exterior, small amounts of temper	interior carbonization
Urup	AIC	2410	39	A2	L1	body	111111					sand temper, medium inclusions	
Urup	AIC	2410	43	A2	L1	body	111111					sand temper, few inclusions	interior carbonization
Urup	AIC	2410	44	A2	L1	body	111111					sand temper, few inclusions	oily interior
Urup	AIC	2410	47	A2	L1	body	111111					sand temper, small inclusions	probably small part of neck, dark exterior
Urup	AIC	2410	49	A2	L1	body	411111	E	cord	1.81		sand temper, small to medium inclusions	
Urup	AIC	2410	50	A2	L1	body	111111	E	cord	1.97	H, V	knotted and braided cord, parallel lines of braided cord (two sets) and perpendicular knotted cords	sand temper, interior carbonization
Urup	AIC	2432	74	A3	L1	base	111111					sand temper, medium inclusions	
Urup	AIC	2432	76	A3	L1	body	111111					sand temper, few inclusions	interior carbonization and mending hole
Urup	AIC	2432	77	A3	L1	body	111111					small amount of sand temper, some inclusions (small to medium)	slight interior carbonization, mending hole
Urup	AIC	2432	79	A3	L1	body	111111					very high vertical curvature	possible wide bowl or platter, small amount of temper, some slight interior carbonization
Urup	AIC	2432	80	A3	L1	body	111111					part of shoulder area, slight depression in middle of sherd	exterior carbonization right in depressed shoulder area, depression is only 1.5mm down
Urup	AIC	2432	81	A3	L1	body	111111					few inclusions on exterior, but some medium size inclusions in matrix	interior and exterior carbonization
Urup	AIC	2432	90	A3	L1	body	311111	E	cord	1.37		lower amounts of sand temper	
Urup	AIC	2432	91	A3	L1	body	311111	E	cord	1.35		lower amounts of sand temper	possible interior carbonization
Urup	AIC	2416	106	A4	1	rim	111111					slight collar	
Urup	AIC	2416	107	A4	1	rim	111111					direct neck, with interior carbonization	
Urup	AIC	2416	108	A4	1	rim	111111					direct neck, heavy interior carbonization	
Urup	AIC	2416	109	A4	1	rim	111111					slight thickness increase right on lip	straight lip (not rounded at all)

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Urup	AIC	2416	111	A4	1	rim	113111	E	relief			slight horizontal rows of slight depression, 29mm and 46mm from rim	lesser quality clay matrix than other artifacts in assemblage, many more inclusions and larger inclusions, more fragile
Urup	AIC	2416	112	A4	1	rim	111111					straight lip	
Urup	AIC	2416	113	A4	1	rim	111111					slight collar, slight curled lip, thinning greatly from body to rim	interior carbonization
Urup	AIC	2416	114	A4	1	base	111111					large inclusions	
Urup	AIC	2416	115	A4	1	base	111111					slight recurve just above very bottom of sherd	
Urup	AIC	2416	116	A4	1	base	111111					straight walls from rounded bottom	large inclusions
Urup	AIC	2416	117	A4	1	rim	111111					large sherd, with very large collar/neck area	larger inclusions
Urup	AIC	2416	118	A4	1	body	111111					sherd from underneath rim, top measure is near rim, then neck, then body	large inclusions
Urup	AIC	2416	119	A4	1	body	111111					consistent curvature, medium to large inclusions	
Urup	AIC	2416	120	A4	1	body	111111					consistent curvature, medium to large inclusions	exterior carbonization
Urup	AIC	2416	121	A4	1	body	111111					consistent curvature, medium to large inclusions	
Urup	AIC	2416	122	A4	1	body	111111					consistent curvature, medium to large inclusions	exterior carbonization
Urup	AIC	2416	123	A4	1	body	111111					consistent curvature, medium to large inclusions	
Urup	AIC	2416	124	A4	1	body	111111					very slight bulge (possibly ledge on interior), thins toward top of sherd	
Urup	AIC	2416	125	A4	1	body	111111					sand temper, medium inclusions	
Urup	AIC	2416	132	A4	1	body	111111					slight greasy interior	sand temper with large inclusions
Urup	AIC	2416	133	A4	1	body	111111						sand temper (gritty), small inclusion
Urup	AIC	2334	194	B2	1	rim	111111					straight rim with slight collar, flat lip	exterior carbonization near rim
Urup	AIC	2334	195	B2	1	rim	111111					good sizable collar/neck, thicker ri	slight lip curve, smooth/oil interior and exteriors
Urup	AIC	2334	196	B2	1	rim	111111					slight collar, flat lip	interior carbonization
Urup	AIC	2334	197	B2	1	rim	111111					straight rim	interior carbonization
Urup	AIC	2334	198	B2	1	rim	111111					straight rim	interior carbonization
Urup	AIC	2334	199	B2	1	base	111111					sand temper, medium inclusions	
Urup	AIC	2334	200	B2	1	base	111111					sand temper, medium inclusions	
Urup	AIC	2334	201	B2	1	body	111111					diameter taken at bulge, very thick sherd, limited collar, possible small incisions just above bulge but also likes holes from burned off inclusions	interior carbonization
Urup	AIC	2334	202	B2	1	body	111111					sand temper, medium inclusions	interior carbonization
Urup	AIC	2334	203	B2	1	body	111111					sherd from just above bulge with mending hole	
Urup	AIC	2334	204	B2	1	body	111111					diameter comes from probably just above base (looks similar to base 200)	sand temper medium inclusions
Urup	AIC	2334	205	B2	1	body	131111	E	applique			small part of a protuberance, slight horizontal depression, sherd is likely from mid-section (bulge), very glossy and smooth (oily) exterior	interior carbonization
Urup	AIC	2334	206	B2	1	body	131111	E	applique			possible area where protuberance was applied but now off, very similar to #205,	interior carbonization
Urup	AIC	2334	209	B2	1	body	411111	E	cord	2.28	<<◇>>	cord marking in a <<◇>> pattern	slight interior carbonization
Urup	AIC	2334	210	B2	1	body	111311	E	stamp	18.52mmx2.67	V	vertical stamping pattern with 7 small (2m^2) squares,	very thin sherd, sand temper small inclusion
Urup	AIC	2428	217	B1	1	base	111111					partial base of rim, sand temper	
Urup	AIC	2428	218	B1	1	body	111111					very thick piece, reduced interior, large inclusions, sand temper	
Urup	AIC	2428	219	B1	1	body	111111					sand temper, medium inclusions	interior carbonization
Urup	AIC	2428	220	B1	1	body	111111					well made piece, few inclusions	
Urup	AIC	2428	221	B1	1	body	111111					sand temper, medium inclusions	
Urup	AIC	2428	223	B1	1	body	111111					interior carbonization	
Urup	AIC	2428	224	B1	1	body	111111					piece shows bulge of vessel, then starts to recurve towards rim	Diameter is that taken at bulge
Urup	AIC	2428	226	B1	1	body	311111	E	cord	1.9		small piece of cord marked pottery found with mostly okhotsk material	
Urup	AIC	2417	299	65	L1	base	311111	E	cord	2.03	D	Epi-J, sand temper, few small inclusions	
Urup	AIC	2417	300	65	L1	base	311111	E	cord	1.73	D	Epi-J, sand temper, few small inclusions	
Urup	AIC	2417	302	65	L1	rim	311111	E	cord	1.96	D	Epi-J, sand temper, few small inclusions	

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Urup	AIC	2417	303	65	L1	body	311111	E	cord	1.89		Epi-J, sand temper, few small inclusions	wider spaced cords
Urup	AIC	2417	304	65	L1	body	311111	E	cord	2.69		Epi-J, sand temper, few small inclusions	
Urup	AIC	2417	307	65	L1	body	311111	E	cord	2.68		Epi-J, sand temper, few small inclusions	
Urup	AIC	2417	310	65	L1	body	311111	E	cord	2.02		Epi-J, sand temper, few small inclusions	
Urup	AIC	2414	481	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	482	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	483	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	484	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	485	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	486	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	487	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	488	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	489	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	490	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	491	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	493	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2414	494	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	495	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	497	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	498	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	500	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	501	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	502	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2414	503	A2	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2414	504	A2	L2	base	111111					sand temper, small to medium inclusions	
Urup	AIC	2414	505	A2	L2	base	111111					sand temper, small to medium inclusions	
Urup	AIC	2414	506	A2	L2	base	111111					sand temper, small to medium inclusions	
Urup	AIC	2414	508	A2	L2	base	111111					sand temper, small to medium inclusions	
Urup	AIC	2414	510	A2	L2	base	111111					sand temper, medium inclusions	some very shiny inclusions
Urup	AIC	2267	512	A2	L2	rim	411111	E	cord	1.63	H, D	set of parallel cord lines at top of rim, inside of sherd has organic fibers stuck to the inside	
Urup	AIC	2267	513	A2	L2	rim	321111	E	cord, applique	1.93	D	applique donut protuberance on top of sherd near rim	interior carbonization, also could be highly detoironated interior
Urup	AIC	2267	514	A2	L2	rim	145113	E	incision, applique, peak	1.7	H	set of parallel incision lines just below rim, peak of rim, medium peak and applique just below peak	
Urup	AIC	2267	515	A2	L2	rim	115111	E	incision	1.87	H	belongs with piece 516	Okhotsk piece?
Urup	AIC	2267	516	A2	L2	neck	115111	E	incision	1.2	H	see photo	neck piece for sherd 515
Urup	AIC	2267	517	A2	L2	rim	211111	E	cord	3.14	H, D	all tend to have low sand temper and few inclusions	
Urup	AIC	2267	518	A2	L2	rim	211111	E	cord	3.47	D		
Urup	AIC	2267	519	A2	L2	rim	111111					Okhotsk piece?	
Urup	AIC	2267	520	A2	L2	rim	111113	E	peak			see photo	
Urup	AIC	2267	522	A2	L2	rim	211111	E	cord	3.21	D	see photo	
Urup	AIC	2267	525	A2	L2	rim	311111	E	cord	2.12	D	see photo	
Urup	AIC	2267	537	A2	L2	body	311111	E	cord	1.39		see photo	
Urup	AIC	2267	538	A2	L2	body	311111	E	cord	1.23		see photo	
Urup	AIC	2267	542	A2	L2	body	311111	E	cord	1.53		see photo	
Urup	AIC	2430	569	A3	L2	rim	113111	E	relief			large ridge that is 48mm from rim see photo	interior carbonization at interior neck
Urup	AIC	2430	570	A3	L2	rim	111111					like before, low sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2430	571	A3	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	572	A3	L2	rim	111111					like before, low sand temper, few inclusions	heavy interior carbonization
Urup	AIC	2430	573	A3	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	574	A3	L2	rim	111111					like before, low sand temper, few inclusions	

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Urup	AIC	2430	577	A3	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	579	A3	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	580	A3	L2	base	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	582	A3	L2	body	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	583	A3	L2	body	111111					like before, low sand temper, few inclusions	
Urup	AIC	2430	586	A3	L2	rim	431111	E	cord, applique	1.51	V	like before, low sand temper, few inclusions	two large applique measuring 25mm and 20mm with a braided cord running inbetween them, stick up about 3mm
Urup	AIC	2430	587	A3	L2	rim	311111	E	cord	2.09	D	like before, low sand temper, few inclusions	heavy exterior carbonization
Urup	AIC	2430	588	A3	L2	rim	311111	E	cord	1.93		like before, low sand temper, few inclusions	
Urup	AIC	2433	598	A4	L2	rim	111111					like before, low sand temper, few inclusions	interior carbonization
Urup	AIC	2433	599	A4	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2433	601	A4	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2433	602	A4	L2	rim	111111					like before, low sand temper, few inclusions	
Urup	AIC	2433	603	A4	L2	body	144111	E	applique relief, incisions	see photo	H	line of pointed ovals, in diagonal line pattern, below on is applique relief with similar pointed ovals on the applique piece	like before, low sand temper, few inclusions
Urup	AIC	2433	605	A4	L2	body	131111	E	applique	see photo	V	large oval applique piece running vertical down sherd, right above depression of the shoulder	like before, low sand temper, few inclusions
Urup	AIC	2433	606	A4	L2	base	111111					like before, medium sand temper, small inclusions	
Urup	AIC	2411	625	A5	L2	body	111111					curve measurement taken right at inflection of vessel (shoulder), mending hole	low sand, few inclusions, interior carbonization just below shoulder area
Urup	AIC	2411	626	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	627	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	628	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	629	A5	L2	rim	111111					low sand, few inclusions	
Urup	AIC	2411	630	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	631	A5	L2	rim	111111					low sand, few inclusions	
Urup	AIC	2411	632	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	633	A5	L2	rim	111111					low sand, few inclusions	
Urup	AIC	2411	636	A5	L2	rim	111111					low sand, few inclusions	
Urup	AIC	2411	637	A5	L2	rim	111111					low sand, few inclusions	interior carbonization
Urup	AIC	2411	640	A5	L2	rim	111111					low sand, few inclusions	
Urup	AIC	2411	645	A5	L2	base	111111					sand tempered but still low, few inclusions	
Urup	AIC	2411	646	A5	L2	rim	411111	E	cord (braided)	1.08	H, D	see photo	like before, low sand temper, few inclusions, interior carbonization
Urup	AIC	2411	649	A5	L2	base	311111	E	cord	1.56	D	see photo	
Urup	AIC	2411	650	A5	L2	base	311111	E	cord	2.2	D	see photo	like before, low sand temper, few inclusions, interior carbonization
Urup	AIC	2411	651	A5	L2	base	311111	E	cord	1.08	D	see photo	like before, low sand temper, few inclusions, interior and exterior carbonization
Urup	AIC	2411	652	A5	L2	body	311111	E	cord	0.94		see photo	
Urup	AIC	2411	653	A5	L2	body	311111	E	cord	1.38		see photo	
Urup	AIC	2429	669	61	L2	rim	111111					sand tempered but still low, few inclusions	
Urup	AIC	2429	670	61	L2	rim	111111					sand tempered but still low, few inclusions	
Urup	AIC	2429	671	61	L2	rim	114111	E	incisions			sand tempered but still low, few inclusions	has incisions along the shoulder, pointed ovals diagonal in a horizontal line
Urup	AIC	2429	672	61	L2	rim	111111					sand tempered but still low, few inclusions	same vessel as 673?
Urup	AIC	2429	673	61	L2	base	111111					sand tempered but still low, few inclusions	same vessel as 672?
Urup	AIC	2429	676	61	L2	rim	111111					sand tempered but still low, few inclusions	
Urup	AIC	2429	678	61	L2	base	111111					sand tempered but still low, few inclusions	
Urup	AIC	2429	679	61	L2	body	141111	E	applique			applique ridge on the shoulder, neck sherd	sand tempered but still low, few inclusions
Urup	AIC	2429	682	61	L2	body	111111					near neck	sand tempered but still low, few inclusions
Urup	AIC	2429	684	61	L2	body	111111					near neck	sand tempered but still low, few inclusions
Urup	AIC		688	61	L2	rim	311113	E, R	cord, peak	2.2	D	interior carbonization	see photo

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Urup	AIC		689	61	L2	rim	311111	E, R	cord	2.84	D	interior carbonization, platter?	see photo
Urup	AIC		691	61	L2	body	211111	E	cord	3.12		platter?	see photo
Urup	AIC		692	61	L2	rim	311113	E, R, I	cord, applique	1.54	D, V		see photo
Urup	AIC		693	61	L2	rim	311113	E	cord, applique	1.84	D, V		see photo
Urup	AIC		694	61	L2	rim	311111	E, R, I	cord	1.79	D		see photo
Urup	AIC		695	61	L2	rim	311111	E, R	cord	2.1	D		see photo
Urup	AIC		696	61	L2	rim	311111	E, R	cord	1.57	D		see photo
Urup	AIC		697	61	L2	rim	311111	E,R, I	cord	1.32	D		see photo
Urup	AIC		698	61	L2	rim	111111						see photo
Urup	AIC		701	61	L2	base	311111	E	cord	1.08	D		see photo
Urup	AIC		702	61	L2	base	311111	E	cord	1.41	D		see photo
Urup	AIC		703	61	L2	rim	311111	E	cord	1.09	D	heavy interior carbonization	see photo
Urup	AIC		706	61	L2	body	411111	E	cord (braided)	1.49		three parallel braided cord lines	see photo
Urup	AIC		710	61	L2	body	331111	E	cord, applique	2.01		applique oval piece	see photo
Urup	AIC		715	61	L2	body	311111	E	cord	2.12		possible interior carbonization	see photo
Urup	AIC		716	61	L2	body	311111	E	cord	1.27		interior and exterior carbonization	see photo
Urup	AIC		720	61	L2	body	311111	E	cord	2.93		possible interior carbonization	see photo
Urup	AIC		780	63	L2	rim	311111	E	cord	2.4	D	see photo	
Urup	AIC		807	64	L2	rim	311111	E	cord	1.73	D	see photo	low sand few inclusions
Urup	AIC		808	64	L2	rim	211111	E	cord	1.46	H, <<<	see photo	low sand few inclusions
Urup	AIC		870	A1	L3	rim	311113	E, R	cord, peak	3.04	D	see photo	cord marking on top of the peak, up and over the rim
Urup	AIC		874	A1	L3	rim	411111	E, R	cord, applique	1.91	D	see photo	
Urup	AIC		877	A1	L3	rim	411111	E	cord	3.06	>>>, <<<<	see photo	
Urup	AIC		878	A1	L3	rim	311111	E	cord	1.98	D	see photo	
Urup	AIC		879	A1	L3	rim	311111	E, R	cord	2.53	<<<<	see photo	
Urup	AIC		1105	surface	surface	base	111111						
Urup	AIC		1166	surface	surface	rim	?	E	applie			see photo	
Urup	AIC		1168	surface	surface	rim	111111						
Urup	AIC		1170	surface	surface	rim	111111						
Urup	AIC		1171	surface	surface	rim	111111						
Urup	AIC		1172	surface	surface	rim	?	E	relief			see photo	
Urup	AIC		1174	surface	surface	rim	111111						
Urup	AIC		1176	surface	surface	rim	?	E	applique			see photo	
Urup	AIC		1177	surface	surface	rim	111111						
Urup	AIC		1179	surface	surface	rim	111111						
Urup	AIC		1185	surface	surface	rim	111111						
Urup	AIC		1210	surface	surface	rim	321111	E, R, I	cord, applique	2.33	V, D	small donut protuberances	
Urup	AIC		1215	surface	surface	rim	411111	E	cord	1.87	H	braided cords parallel to each other spaced out on exterior	
Urup	AIC		1219	surface	surface	rim	311111	E, R	cord	2.27	D		exterior carbonization
Urup	AIC		1220	surface	surface	rim	411111	E	cord	1.65	H	3 parallel braided cords across top of rim	
Urup	AIC		1224	surface	surface	rim	311111	E, R	cord	1.85	D		
Urup	AIC	2417	7971-273	65	L1	rim	111111					likely sand temper, few inclusion (at least buried ones, see surface collections more weathered were temper is more evident)	mending hole drilled from outside
Urup	AIC	2417	7971-274	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization
Urup	AIC	2417	7971-275	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-276	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-277	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization
Urup	AIC	2417	7971-278	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-279	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization

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Urup	AIC	2417	7971-280	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-281	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization
Urup	AIC	2417	7971-282	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization
Urup	AIC	2417	7971-283	65	L1	rim	111111					likely sand temper, few inclusions	interior carbonization
Urup	AIC	2417	7971-284	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-285	65	L1	rim	111111					likely sand temper, few inclusions	
Urup	AIC	2417	7971-287	65	L1	base	111111					sand temper few small inclusions	
Urup	AIC	2417	7971-291	65	L1	body	111111					sand temper, few small inclusions	heavy interior carbonization
Urup	AIC	2417	7971-294	65	L1	body	111111					sand temper, few small inclusions	oxidized exterior
Urup	AIC	2417	7971-296	65	L1	body	111111					sand temper few small inclusions	interior carbonization
Urup	AIC	2417	7971-297	65	L1	body	111111					sand temper, few small inclusions	interior carbonization
Urup	AIC	2417	7971-311	65	L1	body	311111	E	cord	1.7	D	Epi-J, sand temper, few small inclusions	
Urup	AIC	2413	7971-442	A1	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-443	A1	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2413	7971-444	A1	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-445	A1	L2	rim	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-446	A1	L2	rim	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2413	7971-447	A1	L2	base	111111					smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2413	7971-448	A1	L2	body	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-449	A1	L2	body	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-450	A1	L2	body	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-451	A1	L2	body	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2413	7971-452	A1	L2	body	111111					smaller amounts of sand temper, few inclusions	
Urup	AIC	2290	7971-454	A1	L2	body	311111	E	cord	2.23		smaller amounts of sand temper, few inclusions	interior carbonization
Urup	AIC	2290	7971-456	A1	L2	rim	111111	E	cord	2.79	H	sets of parallel lines of braided cord, one 20mm from rim, one 40mm from rim	smaller amounts of sand temper
Urup	AIC	2291	7971-459	A1	L2	body	411111	E	cord	1.52		smaller amounts of sand temper, few inclusions	
Urup	AIC	2267	7971-526	A2	L2	base	311111	E	cord	1.38	D	ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-527	A2	L2	base	311111	E	cord	2.11	D	ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-528	A2	L2	body	311111	E	cord	1.48	D	ligh sand temper, few medium to large inclusions	small section of basal inflection present
Urup	AIC	2267	7971-529	A2	L2	body	311111	E	cord	2.26	D	ligh sand temper, few medium to large inclusions	small section of basal inflection present
Urup	AIC	2267	7971-530	A2	L2	body	411111	E	cord	1.68		braided cords parallel to each other spaced out on exterior	
Urup	AIC	2267	7971-531	A2	L2	body	311111	E	cord	2.21		ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-532	A2	L2	body	311111	E	cord	1.8		ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-533	A2	L2	body	311111	E	cord	2.85		ligh sand temper, few medium to large inclusions	interior carbonization
Urup	AIC	2267	7971-534	A2	L2	body	311111	E	cord	2.39		ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-535	A2	L2	body	311111	E	cord	1.96		ligh sand temper, few medium to large inclusions	
Urup	AIC	2267	7971-536	A2	L2	body	311111	E	cord	2.28		ligh sand temper, few medium to large inclusions	
Urup	AIC	2432	7971-61	A3	L1	rim	111111					sand temper, few small inclusions	interior carbonization
Urup	AIC	2432	7971-62	A3	L1	rim	113111	E	depressed relief			depressed horizontal area on exterior only 18mm from bottom of sherd, extending to sherd, 2mm depression	sand temper, few inclusions, interior carbonization
Urup	AIC	2432	7971-63	A3	L1	rim	111111					few inclusions	interior carbonization
Urup	AIC	2432	7971-64	A3	L1	rim	111111					sand temper, one medium inclusions	interior carbonization
Urup	AIC	2432	7971-65	A3	L1	rim	111111					few inclusions	interior carbonization
Urup	AIC	2432	7971-66	A3	L1	rim	111111					few inclusions	interior carbonization
Urup	AIC	2432	7971-67	A3	L1	rim	111111					few inclusions	interior and exterior carbonization
Urup	AIC	2432	7971-68	A3	L1	rim	111111					small amount of temper	
Urup	AIC	2432	7971-69	A3	L1	rim	111111					mending hole, slight depression near base of sherd, probably the start of a shoulder	interior carbonization
Urup	AIC	2432	7971-70	A3	L1	rim	111111					well made sherd	slight interior carbonization
Urup	AIC	2432	7971-71	A3	L1	rim	111111					small amount of temper	
Urup	AIC	2432	7971-72	A3	L1	rim	111111					small amount of temper	interior carbonization

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Urup	AIC	2432	7971-73	A3	L1	rim	111111					small amount of temper	interior carbonization
Kunashir	ALE	135	7863-1	Unknown	Unknown	base	211211	E	cord, stamping	4.08	V,D	very large full base with large portion of body, interior base is slightly concave	stamping on exterior base by small oval in concentric rings, sand tempered with medium inclusions, shows very little carbonization or soot stains, some may not
Kunashir	ALE	175	7863-10	Unknown	Unknown	rim	112111	E	incisions		D	tapered rim section (ovaloid profile, middle is 12.3mm, bottom of sherd is 4.56)	sand tempered with large inclusions, three pointed ovaloids near rim of sherd, approximately 24 mm from rim, set of three running horizontally, an additional set possible above, some sort of relief pattern (see photo)
Kunashir	ALE	136	7863-2	Unknown	Unknown	body	211111	E	cord	3.34	D	diagonal cord marking with 4 cord lines making one half of a ^ design, could also be part of ^ design	highly reduced interior, that may match with large base (1)
Kunashir	ALE	175	7863-3	Unknown	Unknown	body	411111	E	cord	1.93	V,D	exterior has vertical cord marks overlaid by diagonal cord marks that appear to come together in an arrow type pattern	sand tempered with medium inclusions
Kunashir	ALE	175	7863-4	Unknown	Unknown	body	141121	E, I	scraping			exterior has vague scraping marks wnd a small exterior applied ledge with some small incised lines, interior has distinct horizontal scraping marks on a highly reduced interior	
Kunashir	ALE	175	7863-5	Unknown	Unknown	body	141211	E	applique, incisions			small ledge running horizontal across sherd, small crescent impressions under ledge, small rectangles on the exterior of the ledge	
Kunashir	ALE	175	7863-6	Unknown	Unknown	body	112111	E	scraping, grooving			grooved lines, scraping	oxidized exterior
Kunashir	ALE	175	7863-7	Unknown	Unknown	body	113111		scraping, grooving			possible area where applique used to be, looks like diagonal scraping or grooved lines	highly reduced interior
Kunashir	ALE	175	7863-8	Unknown	Unknown	body	113111		applique (grooving)			grooved lines with large gaps between lines then other	very large inclusions
Kunashir	ALE	175	7863-9	Unknown	Unknown	base	311111	E				large inclusions, sand tempered	reduced interior
Shumshu	BAI	915	7928-15	TP2	L2	body	111111						
Shumshu	BAI	915	7928-16	TP2	L2	body	115111	E	depression		V or H	small linear depression running the length of sherd (maybe width)	
Shumshu	BAI	915	7928-18	TP2	L2	body	111111					looks like neck piece indicating probalby okhotsk	
Shumshu	BAI	933	7928-8	Surface	Near TP2	body	111111					crudely made, pebble inclusions	
Shumshu	BAI	933	7928-9	Surface	Near TP2	base	111111						
Iturup	BER	45	125	Surface	Surface	rim	311123	E	cord, peak (scraping?)	1.44		see photo	Late Epi
Iturup	BER	45	126	Surface	Surface	body	311121	E	cord, applique			see photo	Late Epi
Iturup	BER	45	127	Surface	Surface	body	341111	E	cord, applique			see photo	Late Epi
Iturup	BER	45	128	Surface	Surface	body	341121	E	cord (scraping)	2.55		see photo	Late Epi
Iturup	BER	45	143	Surface	Surface	rim	431111	E	cord, applique, relief, dentates	1.98	H, V	see photo	Early Epi
Iturup	BER	45	144	Surface	Surface	rim	441111	E	cord, dentates	2.57	H	see photos, braided cord, some spacing between cord (2.63)	Early Epi, braided
Iturup	BER	45	145	Surface	Surface	rim	441111	E	cord, dentates	1.73	H	see photo	Early Epi
Iturup	BER	45	146	Surface	Surface	rim	441111	E	cord, dentates	1.73	H	see photo	Early Epi
Iturup	BER	45	147	Surface	Surface	rim	411111	E	cord	1.73	H	see photo	Early Epi
Iturup	BER	45	148	Surface	Surface	rim	111111	E	dentates		V	see photo	Early Epi
Iturup	BER	45	149	Surface	Surface	rim	411111	E	cord	2.22	H	see photo	Early Epi
Iturup	BER	45	150	Surface	Surface	body rim?)	111111	none	none			see photo	Early Epi
Iturup	BER	45	151	Surface	Surface	rim	411111	E	cord	2.13	H	see photo	Early Epi
Iturup	BER	45	152	Surface	Surface	body	411111	E	cord	2.37		see photo	Early Epi
Iturup	BER	45	153	Surface	Surface	body	411111	E	cord	3.49		see photo	Early Epi
Iturup	BER	45	154	Surface	Surface	body	311111	E	cord	1.17		see photo	Early Epi
Iturup	BER	45	155	Surface	Surface	body	311111	E	cord	2.98		see photo	Early Epi
Iturup	BER	45	156	Surface	Surface	body	311111	E	cord	2.33		see photo	Early Epi

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Iturup	BER	45	157	Surface	Surface	body	211111	E	cord	3.16		see photo	Early Epi
Iturup	BER	45	158	Surface	Surface	body	311111	E	cord	3.03		see photo	Early Epi
Iturup	BER	45	159	Surface	Surface	body	311111	E	cord	3.19		see photo	Early Epi
Iturup	BER	45	160	Surface	Surface	body	211111	E	cord	3.16		see photo	Early Epi
Iturup	BER	45	161	Surface	Surface	body	311111	E	cord	2.22		see photo	Early Epi
Iturup	BER	45	164	Surface	Surface	base	111111	none	none			see photo	Early Epi
Iturup	BER	47	165	Surface	Surface	rim	114111	E	incisions			finger nail incisions on top or rim see photo	kind of raised protuberance on rim with one in middle (donut) kind of serves as a peaked rim as well
Iturup	BER	47	166	Surface	Surface	rim	114111	E	incisions			see photo	
Iturup	BER	47	167	Surface	Surface	body	112211	E	punctates, applique			see photo and scan	huge sherd some with very large incisions (took small piece for ICP sample)
Iturup	BER	47	168	Surface	Surface	rim	114111	E	incisions			see photos	sand temper with small inclusions, not really shouldered, straight for first 25mm then a convex area (17.61mm wide and 2.296 deep, width at shoulder is 10.85)
Iturup	BER	47	169	Surface	Surface	body	114111	E	incisions			see photos	sand temper with small inclusions
Iturup	BER	47	170	Surface	Surface	body	114111	E	incisions, applique			see photos	sand temper with small inclusions (overall much of the last 10-15 sherds look like relatively high grade material)
Iturup	BER	46	171	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	172	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	173	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	174	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	175	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	176	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	177	Surface	Watch Tower	rim	114111	E	dentates, impressions			pointed ovaloids, see photos	sand temper with smaller inclusions
Iturup	BER	46	178	Surface	Watch Tower	rim	111111	none					
Iturup	BER	46	179	Surface	Watch Tower	rim	111111	none					
Iturup	BER	46	185	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	186	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	187	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	188	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	189	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	190	Surface	Surface	rim	114111	E	impressions, incisions			see photos	sand temper with small inclusions
Iturup	BER	46	191	Surface	Surface	body	111311	E	stamping			see photos	sand temper with small inclusions
Iturup	BER	46	192	Surface	Surface	body	114311	E	stamping, incisions			see photos	sand temper with small inclusions
Iturup	BER	47	204	Surface	Surface	rim	431112	E	Everything			see photo	sand temper with large inclusions
Iturup	BER	47	205	Surface	Surface	rim	511113	E	Geo cord marking, applique			see photo	greyish, sand temper small inclusions
Iturup	BER	226	210	Surface	Surface	rim	331112	E	cord, applique, protuberance	2.18		see photos	sand temper with few small inclusions
Iturup	BER	226	211	Surface	Surface	body	311111	E	cord	2.08		see photos	sand temper, medium to large inclusions
Iturup	BER	226	212	Surface	Surface	body	311111	E	cord	2.5		see photos	sand temper, medium to large inclusions
Iturup	BER	226	213	Surface	Surface	body	311111	E	cord	2.66		see photos	sand temper with few small inclusions
Iturup	BER	226	214	Surface	Surface	base	211111	E	cord	3.41		see photos	sand temper with small to medium inclusions, sooting at base
Iturup	BER	57	216	Profile 2	S5	body	311111	E	cord	2.51		see photos	high sand temper, oxidized exterior

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Iturup	BER	57	217	Profile 2	S5	body	111111	none	none			see photos	high sand temper, oxidized exterior
Iturup	BER	57	218	Profile 2	S5	body	111111	none	none			see photos	high sand temper, no exterior, mending hole
Iturup	BER	54	220	Profile 2	Base of 5	body	411111	E	cord	1.81		see photos	braided cord
Iturup	BER	62	225	Left Bank	Left Bank	rim	311111	E	cord	2.6	D	see photos	reduced I and E
Iturup	BER	62	226	Left Bank	Left Bank	body	331111	E	cord, applique	2.59		see photos	reduced I and E
Iturup	BER	62	227	Left Bank	Left Bank	body	311111	E	cord	2.58		see photos	reduced I and E
Iturup	BER	62	228	Left Bank	Left Bank	body	311111	E	cord	2.04		see photos	reduced I and E
Iturup	BER	62	229	Left Bank	Left Bank	body	311111	E	cord	3.03		see photos	reduced I and E
Iturup	BER	71	230	Profile 1	150cmbd	body	311111	E	applique			see photos	interior carbonization
Iturup	BER	61	231	Right Bank	Right Bank	neck	311111	E	cord	2.2		see photos	
Shumshu	BOL	840	7929-10	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Shumshu	BOL	840	7929-13	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Shumshu	BOL	840	7929-19	Surface	Surface	rim	111111	none	none			sand temper large to medium inclusions	pronounced interior carbonization
Shumshu	BOL	840	7929-4	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Shumshu	BOL	840	7929-5	Surface	Surface	rim	111111	none	none			sand temper, medium to large inclusions	interior carbonization near rim and middle, exterior carbonization, medium to large inclusions, oxidized interior
Shumshu	BOL	840	7929-6	Surface	Surface	base	111111	none	none			sand temper, large to medium inclusions	oily interior
Shumshu	BOL	840	7929-7	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Shumshu	BOL	840	7929-8	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Shumshu	BOL	840	7929-9	Surface	Surface	body	111111	none	none			sand temper, large to medium inclusions	quite possible that all sherds here are part of same vessel
Chirpoi	CHI	4232	8073-10	surface	surface	rim	111111	none	none			curved out rim/lip, flares out forming collar just underneath rim	
Chirpoi	CHI	4232	8073-11	surface	surface	body	111111	none	none			low sand temper, small inclusions	
Chirpoi	CHI	4232	8073-12	surface	surface	body	311111	E	cord	2.31		regular cord pattern	
Chirpoi	CHI	4232	8073-13	surface	surface	rim	111111	none	none			slightly thinning rim, very small collar directly underneath rim, very slight flare to lip	
Chirpoi	CHI	4232	8073-14	surface	surface	body	311111	E	cord	2.11		interior carbonization, probably D cord marking	
Chirpoi	CHI	4232	8073-15	surface	surface	body	311111	E	cord	2.06		<< cord marking pattern	light sand temper, not nearly like Urup ceramics
Chirpoi	CHI	4232	8073-16	surface	surface	body	311111	E	cord	2.52			
Chirpoi	CHI	4232	8073-17	surface	surface	body	311111	E	cord	1.78		very dark interior, small inclusions from sand	
Chirpoi	CHI	4232	8073-18	surface	surface	body	311111	E	cord	1.3		exterior carbonization	
Chirpoi	CHI	4232	8073-19	surface	surface	body	311111	E	cord	2.11		lighter brown, like many other low sand temper few inclusions	
Chirpoi	CHI	4232	8073-2	surface	surface	rim	111111	none	none			slight flare out to rim, slight collar	
Chirpoi	CHI	4232	8073-20	surface	surface	body	311111	E	cord	1.61		cord-marking almost gone on exterior, interior carbonization	
Chirpoi	CHI	4232	8073-21	surface	surface	body	311111	E	cord	2.26			
Chirpoi	CHI	4232	8073-22	surface	surface	body	311111	E	cord	2.43			
Chirpoi	CHI	4232	8073-24	surface	surface	base	311111	E	cord	2.18	D	some cord-marking on exterior base of vessel (bottom)	
Chirpoi	CHI	4232	8073-26	surface	surface	rim	111111	none	none			flared out rim, missing interior façade, gives slight collar directly underneath rim	
Chirpoi	CHI	4232	8073-27	surface	surface	base	311111	E	cord	2.01	D	higher sand temper, still relatively low, diagonal cord marking on walls and on the base of carnie like 24	
Chirpoi	CHI	4232	8073-28	surface	surface	body	311111	E	cord	2.02			
Chirpoi	CHI	4232	8073-29	surface	surface	rim	311111	E	cord	0.94	D, H	exterior lip flare, curving out rim, very thin rim and sherd, has two sets of two parallel cords running horizontally, first set is 21m from rim, second is 35mm from rim, each set of cords is 3mm from each other, background Diag. cords	
Chirpoi	CHI	4232	8073-3	surface	surface	rim	111111	none	none			slightly larger rim, direct rim, some exterior carbonization	
Chirpoi	CHI	4232	8073-30	surface	surface	body	311111	E	cord	1.84			

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Chirpoi	CHI	4232	8073-31	surface	surface	body	311111	E	cord	2.25		very regular cord-marking pattern	light sand temper
Chirpoi	CHI	4232	8073-32	surface	surface	body	311111	E	cord	1.27		part of arrow design, cord is twisted (like other arrow or vertical cords) not knotted like most other cords	
Chirpoi	CHI	4232	8073-33	surface	surface	body	311111	E	cord	1.85			
Chirpoi	CHI	4232	8073-34	surface	surface	rim	111113	R	peak			small peak in rim (2.5mm), grayish exterior with small sand inclusions	
Chirpoi	CHI	4232	8073-4	surface	surface	body	311111	E	cord	2.97		lighter brown exterior,	small inclusions
Chirpoi	CHI	4232	8073-5	surface	surface	body	311111	E	cord	2.26		relatively larger cord, interior carbonization	
Chirpoi	CHI	4232	8073-6	surface	surface	rim	111111	none	none			lighter brown, direct rim, slightly incurse, some interior carbonization	
Chirpoi	CHI	4232	8073-7	surface	surface	body	311111	E	cord	1.87	D	heavy interior carbonization	
Chirpoi	CHI	4232	8073-8	surface	surface	base	311111	E	cord	2.29	D	exterior carbonization near the base	
Chirpoi	CHI	4232	8073-9	surface	surface	body	311111	E	cord	2.21		interior carbonization, probably D cord marking	low sand temper
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	341111	E	cord, applique	1.79	V	rim flare with applique pieces stretching down from the rim 28mm, collar is right below rim	interior and exterior carbonization
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	321111	E	cord, applique	1.15	D	flared out rim, diagonal cords, two applique items, small dash laying vertically around 25mm from rim (6mmL), 47mm from rim is a small donut protuberance 6mm in diameter	heavy interior and exterior carbonization
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	311111	E	cord	1.39	D	diagonal cord pattern, very direct rim with constant wall thickness, interior carbonization with small amount of interior carbonization	
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	341111	E	cord, applique	1.82	V	flared rim with vertical applique extending from rim 29.42mm, collar is directly below rim not a gradual recurve	interior carbonization, small and few inclusions
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	111111	none	none			curled lip, missing exterior façade	interior carbonization, small and few inclusions
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	111111	none	none			small flare to lip, vessel thins bulge to rim	medium inclusions, sand temper
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	111111	none	none			very slight recurve (flare) to rim, walls thin from body to rim	
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	111111	none	none			thick rim, thin collar, thick body, gradual recurve from collar (collar is 29mm long), mending hole, large inclusions	
Chirpoi	CHI	4232	Tray 1	surface	surface	rim	111111	none	none			big chunky piece, gradual recurve measure 80mm collar length, rim bulges slightly at the very top, heavy exterior carbonization	mending hole, large inclusions
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	341111	E	cord	2.42	D	very thin rim piece, sand temper small inclusion	
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	311111	E	cord	2.42	V	flared rim, collar is directly underneath rim	exterior carbonization
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			nearly full profile of vessel, other measurements are for bulge area and diameter just above base, 24mm between rim and bulge (collar length)	
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			very slight recurve, short distance between bulge and rim	many inclusions, medium in size
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			collar is more of a depression than a collar, meaning symmetrical recurve and longer rim section	mending hole, interior and exterior carbonization
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			slightly curled lip, but otherwise direct rim (very slight recurve)	sand temper, medium inclusions
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			very direct rim, many inclusions, but mainly small	interior carbonization
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111111	none	none			very long recurve, making a long collar length, rim angle slopes inward, large and many inclusion, from small vessel as penultimate sherd from tray 1	interior carbonization
Chirpoi	CHI	4232	Tray 2	surface	surface	rim	111113	R	peak	4.28		small peak on rim, slight lip flare leading to small collar or recurve area	interior carbonization, small and few inclusions
Chirpoi	CHI	4232	Tray 3	surface	surface	base	311111	E	cord	1.59	D	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	311111	E	cord	2.49	D	heavy interior carbonization	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	311111	E	cord	1.28	D/H	odd temper, tanish temper with large inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	311111	E	cord	2	V	slight bulge in middle of sherd	
Chirpoi	CHI	4232	Tray 3	surface	surface	base	111111	none	none			slight recurve above base before angle of vessel	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	

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Chirpoi	CHI	4232	Tray 3	surface	surface	body	111111	none	none			sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	145111	E	relief, incision			Kohoku C2-D pottery, Late Epi-Jomon, 3 applique lines running vertically (horizontally) with three dash incision running diagonally from where the applique lines hit a horizontal plane, dashed lines at 50 degree angle, lines are spaced about 7mm from each other	sand temper, medium inclusions
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	1.48	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	1.69	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2.01	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	1.53	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2.02	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2.41	V?	sand temper, medium inclusions, dark exterior color with different cord pattern, spaced more widely or smudged	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2.51	D?	sand temper, medium inclusions	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	2.27	V?	sand temper, medium inclusions, dark exterior color with different cord pattern, spaced more widely or smudged	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	311111	E	cord	1.68	V?	sand temper, medium inclusions, dark exterior color with different cord pattern, spaced more widely or smudged	
Chirpoi	CHI	4232	Tray 4	surface	surface	body	321111	E	cord, applique	2.53	V?	sand temper, medium inclusions, dark exterior color with different cord pattern, spaced more widely or smudged, has two applique pieces, small oval bumps one aimed vertical on a horizontal (25mm below) (roughly bumps measure 13mm x 7mm)	
Chrinkotan	CHR	n/a	8057-1	n/a	n/a	rim	111111	none	none			outward slanted rim, mending hole	
Chrinkotan	CHR	n/a	8057-2	n/a	n/a	body	114111	E	incisions	13.44	H, D	pointed ovaloid incisions in horizontal linear pattern and pointed ovaloid in ^ (chevron)	
Chrinkotan	CHR	n/a	8057-3	n/a	n/a	body	114111	E	incisions		H	very small linear incisions in a horizontal line	
Chrinkotan	CHR	n/a	8057-4	n/a	n/a	body	111111	none	none				
Chrinkotan	CHR	n/a	8057-5	n/a	n/a	body	111111	none	none				
Kunashir	DAN	132	1	TP1	70cmbd	body	311111	e	cord	1.61		sand temper with medium inclusions	early epi
Kunashir	DAN	127	2	TP1	15-20cmbd	rim	111111					sand temper with medium inclusions	
Kunashir	DAN	130	3	TP1	56-60cmbd	body	311111	E	cord	2.96		sand temper with medium to large inclusions	listed as possibly early epi-jomon
Kunashir	DAN	130	4			body	111111					sand temper with medium to large inclusions	listed as possibly early epi-jomon
Kunashir	DAN	130	unknown			body	111111					sand temper with medium to large inclusions	listed as possibly early epi-jomon
Shiashkotan	DRO	1631	7973-10	1	2	base	111111	none	none				
Shiashkotan	DRO	1718	7973-102	1	3	rim	113111	E	ridges, incisions			Three ridges first located 24.36mm, ridges are 12.6 mm wide, 1.455 deep, diagonal incised lines 12.33 mm long located on top of ridged areas, interior and exterior carbonization	
Shiashkotan	DRO	1718	7973-103	1	3	rim	111111	none	none			interior carbonization	
Shiashkotan	DRO	1718	7973-104	1	3	rim	114111	E	incisions			linear pointed ovaloid, 11.8mm long, 3.01mm wide, two are diagonal 13.88mm long, 2.94 mm wide, interior and exterior carbonization	
Shiashkotan	DRO	1718	7973-105	1	3	body	114311	E	stamping, incisions			linear pointed ovaloid, 10.4mm, 2.77 wide, square check stamping, diagonal lines, squares are 2.21mm	
Shiashkotan	DRO	1718	7973-106	1	3	body	114111	E	incisions			diagonal pointed ovaloids on exterior collar bulge, exterior carbonization	
Shiashkotan	DRO	1718	7973-107	1	3	body	114111	E	incisions			diagonal pointed ovaloid, just one	
Shiashkotan	DRO	1718	7973-108	1	3	body	311111	E	cord	1.88	D		
Shiashkotan	DRO	1718	7973-109	1	3	body	311111	E	cord	1.86	D	exterior carbonization	
Shiashkotan	DRO	1718	7973-111	1	3	body	311111	E	cord	1.82	D	exterior carbonization	
Shiashkotan	DRO	1631	7973-12	1	2	body	411111	E	cord	2.38	D (<<<>>)		
Shiashkotan	DRO	1626	7973-126	2	3	body	111111	none	none			mold	
Shiashkotan	DRO	1626	7973-127	2	3	body	111111	none	none			mold	
Shiashkotan	DRO	1626	7973-128	2	3	body	111111	none	none			interior carbonization, mold	
Shiashkotan	DRO	1626	7973-129	2	3	body	111111	none	none			heavy interior carbonization, mold	

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Shiashkotan	DRO	1631	7973-13	1	2	body	111111	none	none				
Shiashkotan	DRO	1626	7973-130	2	3	body	111111	none	none			mold	
Shiashkotan	DRO	1631	7973-14	1	2	body	111111	none	none				
Shiashkotan	DRO	1805	7973-141	1	4	rim	114111	E	incision			linear pointed ovaloid, interior and exterior carbonization	
Shiashkotan	DRO	1805	7973-142	1	4	rim	114111	E	incisions			long linear incision (1mm wide, 13mm long) possible ovaloid	
Shiashkotan	DRO	1805	7973-143	1	4	body (collar)	111111	none	none			interior measurement of collar, interior and exterior carbonization	
Shiashkotan	DRO	1805	7973-144	1	4	body	141111	E	ridges			Diagonal ridge, 11.4mm wide, 0.962	
Shiashkotan	DRO	1805	7973-149	1	4	base	111111	none	none			higher sand temper, coarse inclusions	
Shiashkotan	DRO	1808	7973-150	1	4	body	111111	none	none			possible higher sand temper	
Shiashkotan	DRO	1808	7973-151	1	4	body	111111	none	none			interior carbonization	
Shiashkotan	DRO	1808	7973-164	1	4	body	311111	E	cord	2.01			
Shiashkotan	DRO	1808	7973-165	1	4	body	311111	E	cord	2.07			
Shiashkotan	DRO	1808	7973-168	1	4	body	311111	E	cord	1.48		high sand temper, large inclusions	
Shiashkotan	DRO	1808	7973-169	1	4	body	311111	E	cord	2.19			
Shiashkotan	DRO	1808	7973-170	1	4	body	311111	E	cord	1.47		sand temper	
Shiashkotan	DRO	1704	7973-197	3	5	body	111111	none	none				
Shiashkotan	DRO	1809	7973-3	1	1	body	111111	none	none				
Shiashkotan	DRO	1616	7973-30	2	2	body	111111	none	none			very large inclusions as temper	
Shiashkotan	DRO	1616	7973-31	2	2	body	111111	none	none				
Shiashkotan	DRO	1718	7973-70	1	3	body	111111	none	none			interior carbonization	
Shiashkotan	DRO	1718	7973-71	1	3	body	111111	none	none				
Shiashkotan	DRO	1718	7973-74	1	3	body	111111	none	none			interior carbonization	
Shiashkotan	DRO	1631	7973-9	1	2	rim	111111	none	none			exterior carbonization	
Ekarma	EKA	2945	8075-1	TP2	L2	body	114111	E	incision			sherd has a downward facing chevron (opposite of ^), 14.5mm wide and 6mm deep	
Ekarma	EKA	2950	8075-21	TP2	L3	body	111111	none	noen			reduced exterior, sand temper, minor interior carbonization, sherd from near base probably	
Ekarma	EKA	3098	8076-16	TP2	L3C	body	111111	none	none			exterior carbonization, sand temper, small to medium inclusions	
Ekarma	EKA	2998	8076-28	TP2	L3F	body	111111	none	none			exterior carbonization near base of sherd (probably base of vessel), interior has oil glean to it	
Ekarma	EKA	3006	8076-36	TP2	L3F	body	111111	none	none			exterior carbonization, sand temper, small inclusions	
Ekarma	EKA	3008	8076-38	TP2	L3F	rim	115111	E	incision			horizontal incised line running around the vessel, 20mm from rim), sand temper, exterior surface quite uneven	
Ekarma	EKA	3010	8076-40	TP2	L3F	body	111111	none	none			exterior carbonization, brownish, large inclusions	
Ekarma	EKA	3030	8076-42	TP2	L3G	body	111111	none	none			refits with pieces 3049, exterior carbonization near base of shed, (base of vessel)	
Ekarma	EKA	3049	8076-43	TP2	L4	base	111111	none	none			large section of body attached, shows general bulge area, the constricts towards rim	
Iturup	GLU	592	1	56-80		rim	211111	E, I	cord, grooving	3.35	D, V (on D)	Middle Jomon	sand temper, medium inclusions, interior and exterior carbonization near rim
Iturup	GLU	590	2	Erosion		rim	311111	E	cord	2.86	D	Early Epi-Jomon	sand temper, medium inclusions, interior and exterior carbonization near rim (seems to show some grass tempering, marks of grass in matrix)
Kunashir	GOL	119	unknown	surface	surface	body	211111	E	cord	3.43		possibly middle jomon ceramic, very chunky, sand tempered with medium to large inclusions	
Ururup	KAP	240	8	TP1	L1	rim	111111	none	none			large collar area, sand temper medium to large inclusions	interior carbonization
Ururup	KAP	240	9	TP1	L1	body	111111	none	none			sand temper with medium inclusions	
Ururup	KAP	668	12	TP1	L1	body	111111					sand temper, few inclusions	interior carbonization
Ururup	KAP	668	13	TP1	L1	rim	111111	none	none			very, very slight shoulder maybe inflection at 2mm from rim and 1/2 mm depth	sand temper, few inclusions, probably a very small vessel
Ururup	KAP	242	20	TP1	L1	base	111111	none	none			very large inclusions and many of them, some interior carbonization	roughly made pottery
Ururup	KAP	666	22	TP1	L1	body	111111	none	none			sand temper, medium inclusions	heavy interior carbonization
Ururup	KAP	666	23	TP1	L1	body	311111	E	cord	1.91	D	mending hole, sand temper medium to large inclusions	interior exterior carbonization

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Urup	KAP	666	26	TP1	L1	rim	111111	none	none			small rim fragment	sand temper, one very large inclusion, probably a very small vessel, carbonization on top of rim
Urup	KAP	666	28	TP1	L1	body	111111	none	none			probably sherd from near vessel base	sand temper large inclusions
Urup	KAP	666	29	TP1	L1	body	111111	none	none			sand temper, greyish in color, large inclusions	
Urup	KAP	666	30	TP1	L1	rim	111111	none	none			very small rim sherd	sand temper also greyish in color
Urup	KAP	666	39	TP1	L1	rim	111111	none	none			could be slight lip at rim, sand tempered with medium to large inclusions, interior and exterior carbonization	originally identified as Middle Jomon
Urup	KAP	234	41	TP1	L1	body	111111	none	none			sand temper, few inclusions	interior and exterior carbonization
Urup	KAP	234	42	TP1	L1	body	111111	none	none			sand temper, few inclusions	interior carbonization, reduced exterior
Urup	KAP	234	45	TP1	L1	body	111111	none	none			sand temper, few inclusions	41,42 and 45 likely all part of same vessel
Urup	KAP	233	53	TP1	L2	body	111111	none	none			sand temper with small inclusions	very similar to sherd #9
Urup	KAP	233	54	TP1	L2	body	111111	none	none			sand temper with small inclusions	very similar to sherd #9
Urup	KAP	233	55	TP1	L2	body	111111	none	none			sand temper with small inclusions	very similar to sherd #9
Urup	KAP	263	57	TP4	L1	rim	111111	none	none			very very slight neck, (inflection at 14mm from rim, depth .5mm or so, interior is almost straight, slight convex, parallel to interior)	
Urup	KAP	263	58	TP4	L1	body	111111	none	none			sand temper, medium inclusions	
Kunashir	KAT	n/a	surface	surface		body	314111	E	cord, incision	1.90mmD, 1.25mmV	V, D	vertical cord mark probably running down from rim with small circular incisions (with holes in the middle) 18.13mm apart from each other	interior carbonization
Kunashir	KAT	n/a	surface	surface		rim	311111	E	cord	0.96	H	two parallel lines of cords, 14.55mm from rims, 5.50mm apart from each other	exterior and interior carbonization
Kunashir	KAT	n/a	surface	surface		base	111111	none	none			light sand temper	
Kunashir	KAT	n/a	surface	surface		body	111111	none	none			light sand temper	exterior carbonization
Kunashir	KAT	n/a	surface	surface		body	111111	none	none			light sand temper	exterior carbonization
Kunashir	KAT	n/a	surface	surface		full	111111	none	none			nearly full vessel, with bulge in the middle, and flare out at the rim	
Kunashir	KAT	n/a	surface	surface		rim	111113	R	peak	5.29		heavy exterior carbonization	
Urup	KOM	Tray6	1	Surface	Surface	base	111111	none	none			very large base and body sherd	sand temper with medium inclusions
Urup	KOM	Tray 1	2	Surface	Surface	base	111111	none	none			sand temper, large inclusions	
Urup	KOM	Tray6	3	Surface	Surface	base	111111	none	none				sand temper with medium inclusions
Urup	KOM	Tray6	23	Surface	Surface	rim	411113	E, R	cord, peak	2.75, 6.70	V, H, D	see lab notes	sand temper, medium inclusions
Urup	KOM	Tray6	24	Surface	Surface	rim	441113	E	cord, applique			slight curled lip, slight collar, vertical applique from rim down 33mm, two incision running diagonally from intersection point of applique and rim (35mm)	exterior carbonization, small inclusions
Urup	KOM	Tray6	25	Surface	Surface	rim	111111	none	none			straight rim, slight exterior carbonization	sand temper small inclusions
Urup	KOM	Tray6	26	Surface	Surface	rim	111113	R	peak	6.07		slight lip curl, acute peak on rim, large rim then body thickness, heavy exterior carbonization	sand temper small inclusions
Urup	KOM	Tray6	27	Surface	Surface	rim	111113	R	peak	1.85		small peak on rim, straight rim with exterior carbonization	sand temper small inclusions
Urup	KOM	Tray6	29	Surface	Surface	rim	111111	none	none			exterior carbonization, straight rim	sand temper, small inclusions, very similar to #27
Urup	KOM	Tray6	30	Surface	Surface	rim	111111	none	none			straight rim, slight curl to lip, slight exterior carbonization	sand temper medium inclusions
Urup	KOM	Tray6	32	Surface	Surface	body	115111	E	incisions	11mmLx2mm W	V	vertical dash incisions in parallel verticla lines (59mm apart)	sand temper medium inclusions
Urup	KOM	Tray6	33	Surface	Surface	rim	111111	none	none			straight rim with mending holes	
Urup	KOM	Tray6	44	Surface	Surface	rim	111111	none	none			straight rim, exterior carbonization	sand temper, small inclusions
Urup	KOM	Tray6	46	Surface	Surface	rim	115113	E, R	incisions, peak	11mmLx2mm W	V	small peak on rim, curled lip with vertical dashed incisions running towards the peak	
Urup	KOM	Tray6	49	Surface	Surface	rim	441113	E	cord, peak, applique			straight rim, half of a peak with applique runign vertically from peak (23mm), cord running from end of applique to the end of sherd (32mm)	sand temper with medium inclusions
Urup	KOM	Tray6	69	Surface	Surface	rim	111113	R	peak	5.66		slight flare out to rim with distinct peak (making a slight collar)	
Urup	KOM	Tray6	465	Surface	Surface	body	511111	E	cord	2.43		vertical arrow pattern of cords (intersection point not available)	sand temper, small to medium inclusions
Urup	KOM	Tray 1	566	Surface	Surface	rim	111111	none	none			slight curled rim, very slight collar, some dark discoloring inside	
Urup	KOM	Tray 1	567	Surface	Surface	body	111111	none	none			light sand tempering	
Urup	KOM	Tray 1	573	Surface	Surface	body	111111	none	none			similar to 574, very light carbonization interior	

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Urup	KOM	Tray 1	574	Surface	Surface	rim	111111	none	none			very light sand temper, straight rim, heavy exterior carbonization	
Urup	KOM	Tray 1	583	Surface	Surface	rim	111111	none	none			sand tempered, slight interior carbonization, curled lip	
Urup	KOM	Tray 1	589	Surface	Surface	rim	111111	none	none			exterior carbonization near rim, straight rim, very slight rim curl	
Urup	KOM	Tray 1	589	Surface	Surface	rim	111111	none	none			some post-depositional scarring, heavy interior carbonization (1-2mm thick)	
Urup	KOM	Tray 1	594	Surface	Surface	rim	111111	none	none			small rim flare (3.5mm), rim and body sherd nearly extending to base, some dark discoloration towards bottom of vessel	
Urup	KOM	Tray3	724	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	729	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	738	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	744	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	746	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	762	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	763	Surface	Surface	body	111111	none	none			sand tempered, medium to large inclusions	
Urup	KOM	Tray3	766	Surface	Surface	rim	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	772	Surface	Surface	rim	111111	none	none			sand temper, medium to large inclusions, slight curled lip	
Urup	KOM	Tray3	805	Surface	Surface	body	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	807	Surface	Surface	rim	111111	none	none			rim peak (3.8mm)	
Urup	KOM	Tray3	820	Surface	Surface	body	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	848	Surface	Surface	body	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	855	Surface	Surface	body	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	857	Surface	Surface	body	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray3	860	Surface	Surface	body	111111	none	none			possible sherd from just under rim, medium to large inclusions, sand temper	
Urup	KOM	Tray 2	892	Surface	Surface	body	441111	E	cord, relief	1.6	vertical	just below rim, very large body sherd, shows a vertical cord mark from rim down 35 mm ending in a slight raised area (raised dash) sand temper with some interior and exterior carbonization	
Urup	KOM	Tray 2	912	Surface	Surface	body	111111	none	none			sand temper, interior carbonization	
Urup	KOM	Tray 2	922	Surface	Surface	body	111111	none	none			sand temper, probably located just below rim	
Urup	KOM	Tray 2	934	Surface	Surface	rim	111111	none	none			sand temper, medium to large inclusions	
Urup	KOM	Tray 2	949	Surface	Surface	body	311111	E	cord	1.62	D	small cord lines (9mm) lonh running Diag., sand temper medium inclusions	
Urup	KOM	Tray 2	982	Surface	Surface	body	111111	none	none			sand temper with large inclusions, black exterior	
Urup	KOM	Tray 2	986	Surface	Surface	body	111111	none	none			sand temper	
Urup	KOM	Tray 2	989	Surface	Surface	body	111111	none	none			oxidized exterior, reduced interior, high sand temper with large inclusion	
Urup	KOM	Tray 2	995	Surface	Surface	body	511111	E	cord, geometric	2.64	V	small part of rim, geometric pattern is cords in a arrow pointing towards the rim (arrow sides are at a 50 and 45 angle), straight rim with no collar	
Urup	KOM	Tray 2	998	Surface	Surface	body	111111	none	none			sand temper, but smooth exterior and interior	
Urup	KOM	Tray 2	1001	Surface	Surface	body	111111	none	none			dark exterior, large inclusions, shiny/glassy/sparkly inclusions	
Urup	KOM	Tray4	1065	Surface	Surface	rim	311111	E	cord	2.13	D	sherd had two parallel cord-marks running diagonally (25mm apart), also some possible stamping of 4-5 lines horizontally stacked (lines stamp is around 7mm side and 7mm tall)	sand temper with minor exterior carbonization
Urup	KOM	Tray4	1067	Surface	Surface	rim	111111	none	none				
Urup	KOM	Tray4	1068	Surface	Surface	rim	311112	E	cord	2	D	slight lip flare, small collar	sand temper with medium to large inclusions
Urup	KOM	Tray4	1070	Surface	Surface	rim	111111	none	none			straight rim	sand temper, small to medium inclusions
Urup	KOM	Tray6	1074	Surface	Surface	rim	111111	none	none			nearly full rim, body and sherd ends near base, slight lip curl, very small vessel	sand temper small to medium inclusions
Urup	KOM	Tray4	1076	Surface	Surface	rim	111111	none	none			straight rim	sand temper with medium to large inclusions
Urup	KOM	Tray4	1077	Surface	Surface	rim	111111	none	none			very straight rim	sand temper with medium to large inclusions
Urup	KOM	Tray4	1079	Surface	Surface	base	111111	none	none			flat base, no sidewalls	sand temper, medium to large inclusions
Urup	KOM	Tray4	1080	Surface	Surface	rim	111113	R	peak	3.46		slight peak on rim	sand temper with large inclusion

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Urup	KOM	Tray4	1082	Surface	Surface	rim	111111	none	none			slight bulge in rim from body thickness and very small peak	sand temper with medium to large inclusions
Urup	KOM	Tray4	1085	Surface	Surface	rim	111113	R	peak	4.41		acute peak on rim, curled lip	
Urup	KOM	Tray4	1086	Surface	Surface	base	111111	none	none			soot marks on base	sand temper large inclusions
Urup	KOM	Tray4	1088	Surface	Surface	rim	111111	none	none			straight rim	sand temper with medium to large inclusions
Urup	KOM	Tray4	1089	Surface	Surface	rim	111113	R	peak			very slight rim flare	sand temper with medium to large inclusions
Urup	KOM	Tray4	1090	Surface	Surface	rim	411113	E,R	cord, peak	1.89, 3.89	V	curled lip with peak three cord line running vertically up sherd, mostly parallel but coming together near the rim and the peak on the rim (one set of cords is 25mm apart at base, other is 13mm apart) near top the are (11mm and 8 mm apart)	
Urup	KOM	Tray4	1091	Surface	Surface	rim	411113	E, R	cord, peak	1.70, 3.28	V	rim shows slight peak with a cord running vertically from the peak down to the edge of the sherd	sand temper, small inclusions
Urup	KOM	Tray4	1093	Surface	Surface	base	111111	none	none				sand temper large inclusions
Urup	KOM	Tray4	1094	Surface	Surface	base	111111	none	none			soot marks on base	sand temper large inclusions
Urup	KOM	Tray4	1096	Surface	Surface	rim	111111	none	none				heavy exterior carbonization, underneath rim, slight lip curl
Urup	KOM	Tray4	1097	Surface	Surface	rim	111113	R	peak	4.28		peak on rim, interior carbonization near lip	sand temper but with small inclusions
Urup	KOM	Tray4	1098	Surface	Surface	base	111111	none	none			soot marks on base	sand temper large inclusions
Urup	KOM	Tray4	1099	Surface	Surface	base	111111	none	none				sand temper, medium to large inclusions
Urup	KOM	Tray4	1101	Surface	Surface	rim	111111	none	none			straight rim	sand temper with large inclusions
Urup	KOM	Tray4	1102	Surface	Surface	base	111111	none	none				high sand temper, large inclusions
Urup	KOM	Tray4	1103	Surface	Surface	rim	541113	E,R	cord, peak, protuberance/applique	2.13, 2.75peak, 16.03mmx2.92mm	V	very slight curled lip, has arrow design with cords pointed towards peak on rim, some applique dashes on middle cord of arrow at top and bottom of middle cord	sand temper, medium inclusions
Urup	KOM	Tray4	1104	Surface	Surface	rim	111111	none	none			straight rim	sand temper with large inclusions
Urup	KOM	Tray4	1106	Surface	Surface	rim	111111	none	none			reddish, with oxidized interior and exterior, reduced middle	sand temper with medium to large inclusions
Urup	KOM	Tray4	1107	Surface	Surface	rim	111111	none	none			straight rim, interior carbonization	sand temper
Urup	KOM	Tray4	1109	Surface	Surface	rim	111113	R	peak			half of a rim peak, no collar, slight thinning on interior of collar area	sand temper
Urup	KOM	Tray4	1110	Surface	Surface	rim	111111	none	none			slight curled lip	very thin walled, higher vertical curve
Urup	KOM	Tray4	1111	Surface	Surface	rim	111111	none	none			straight rim with mending hole	sand temper with medium to large inclusions
Urup	KOM	Tray4	1112	Surface	Surface	rim	111111	none	none			slight curled lip	sand temper with medium to large inclusions
Urup	KOM	Tray4	1113	Surface	Surface	rim	111111	none	none			straight rim	sand temper with large inclusions
Urup	KOM	Tray4	1114	Surface	Surface	rim	111113	R	peak			slight curled lip with a small rim peak	sand temper with medium to large inclusions
Urup	KOM	Tray4	1115	Surface	Surface	rim	111111	none	none			slight curled lip	sand temper with medium to large inclusions
Urup	KOM	Tray4	1116	Surface	Surface	rim	111113	R	peak	3.32		curled lip with peak, heavy exterior carbonization, just below rim	
Urup	KOM	Tray4	1117	Surface	Surface	rim	111111	none	none			straight rim, thinning towards rim	sand temper with smaller inclusion
Urup	KOM	Tray4	1118	Surface	Surface	rim	111113	R	peak			straight rim with small peak on rim	sand temper with medium to large inclusions
Urup	KOM	Tray6	1120	Surface	Surface	rim	141113	E	peak, applique			one small peak (2.24mm) on rim, applique running vertically from peak (32mm), incised line continues from applique for 28mm where another small applique (broken at end) is found (9.8mm)	
Urup	KOM	Tray4	1121	Surface	Surface	base	111111	none	none			exterior carbonization near base, and a mending hole 40mm from base	sand temper medium inclusions
Urup	KOM	Tray4	1123	Surface	Surface	base	111111	none	none				sand temper medium inclusions
Urup	KOM	Tray4	1124	Surface	Surface	base	111111	none	none				sand temper large inclusions
Urup	KOM	Tray4	1127	Surface	Surface	base	111111	none	none			interior soot marks	sand temper, small to medium inclusions
Urup	KOM	Tray5	1132	Surface	Surface	rim	111111	none	none			straight rim, interior carbonization	sand temper
Urup	KOM	Tray5	1133	Surface	Surface	rim	111113	R	peak	3.65		exterior carbonization near rim, straight rim, small half of a peak on the rim	
Urup	KOM	Tray5	1134	Surface	Surface	rim	111113	R	peak			straight rim, with very small peak on rim	sand temper, very possible same vessel as 1159
Urup	KOM	Tray5	1135	Surface	Surface	base	111111	none	none				sand temper with medium to large inclusions
Urup	KOM	Tray5	1138	Surface	Surface	rim	341111	E	cord	2.12	D	very faint diagonal cord marking just below collar and possible on top of rim, vessel has slight collar (but more than most from KOMP)	sand temper (using very dark sand) and relatively large inclusions

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Urup	KOM	Tray5	1139	Surface	Surface	rim	111111	none	none			possible start of a peak on rim	sand temper with large inclusions
Urup	KOM	Tray5	1144	Surface	Surface	rim	111111	none	none				sand temper, small to medium inclusions
Urup	KOM	Tray5	1146	Surface	Surface	rim	111111	none	none			curled lip, slight collars	lighter sand temper
Urup	KOM	Tray5	1148	Surface	Surface	base	111111	none	none				sand temper with medium to large inclusions
Urup	KOM	Tray5	1150	Surface	Surface	rim	111111	none	none			slight bulge in rim from body thickness	sand temper
Urup	KOM	Tray5	1153	Surface	Surface	rim	111111	none	none			straight rim	sand temper, large inclusions
Urup	KOM	Tray5	1154	Surface	Surface	rim	111113	R	peak	4.39		peak on rim, slight curled lip	sand temper, medium inclusions
Urup	KOM	Tray5	1156	Surface	Surface	base	111111	none	none				sand temper with medium to large inclusions
Urup	KOM	Tray5	1157	Surface	Surface	base	111111	none	none				sand temper with medium to large inclusions
Urup	KOM	Tray5	1159	Surface	Surface	rim	411113	E, R	cord, peak	1.5, 1.6	V	slight peak on rim	sand temper, medium to large inclusions, similar to 1134
Urup	KOM	Tray5	1160	Surface	Surface	rim	111111	none	none			very small collar causing slight flare in rim, rim thins from body thickness	sand temper, small inclusions
Urup	KOM	Tray5	1162	Surface	Surface	rim	111111	none	none			slight curled lip, exterior carbonization	temper hard to tell, very dark and kind of oil
Urup	KOM	Tray5	1164	Surface	Surface	base	111111	none	none				sand temper with medium to large inclusions
Urup	KOM	Tray5	1167	Surface	Surface	rim	111111	none	none			possible peak on rim	sand temper with medium to large inclusions
Urup	KOM	Tray5	1168	Surface	Surface	rim	111111	none	none			slight lip (higher rim thickness than body thickness),	sand temper with large inclusions
Urup	KOM	Tray5	1171	Surface	Surface	rim	111111	none	none			straight rim	sand temper with medium to large inclusions
Urup	KOM	Tray6	1180	Surface	Surface	full pot	141113	E, R	applique	9.51mmL	V	small applique going vertically down from very small peaks on rim (2 rims and applique on 50% of vessel)	sand temper, medium inclusions, exterior carbonization near base of vessel
Urup	KOM	Tray6	67/73	Surface	Surface	rim	115111	E	incisions	8.18mm	H	straight rim with dash incisions just below rim (4.83mm) dash incisions are also present on top of rim (1mmx4mm dashes) on 5.5 mm rim	sand temper with interior carbonization
Iturup	KUB	3	2	Surface	Surface	rim	311111	E	cord	see photo	see photo	see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	3	3	Surface	Surface	rim	311113	E	cord, peak			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	3	4	Surface	Surface	rim	341113	E	cord, peak			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	3	7	Surface	Surface	rim	311113	E	peak			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	3	8	Surface	Surface	rim	311111	E	cord			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	3	11	Surface	Surface	body	311111	E	cord			see photos	sand temper medium inclusions, unknown (probably late Epi)
Iturup	KUB	3	12	Surface	Surface	rim	311111	E	cord			see photos	sand temper medium inclusions, unknown (probably late Epi)
Iturup	KUB	3	13	Surface	Surface	body	311111	E	cord			see photos	sand temper medium inclusions, unknown (probably late Epi), mending hole
Iturup	KUB	3	18	Surface	Surface	body	311111	E	cord			see photos	sand temper medium inclusions, unknown (probably late Epi)
Iturup	KUB	3	21	Surface	Surface	rim	313211	E	cord, applique, incision			see photos	sand temper medium inclusions, unknown (probably late Epi), mending hole
Iturup	KUB	5	22	Surface	Surface	rim	141211	E	punctates, applique			see photos, circle pattern of punctates, horizontal punctate lines and applique piece next to rim	sand temper with medium to large inclusions (Okhtosk?)
Iturup	KUB	5	23	Surface	Surface	body	111111	none	none			see photos	sand temper with medium to large inclusions
Iturup	KUB	5	26	Surface	Surface	body	111111	none	none			see photos	sand temper with medium to large inclusions
Iturup	KUB	5	28	Surface	Surface	body	114111	E	figernail impression			see photos	sand temper with medium to large inclusions (Okhtosk?)
Iturup	KUB	5	30	Surface	Surface	rim	111111	none	none			see photos	sand temper with medium to large inclusions
Iturup	KUB	5	33	Surface	Surface	base	211111	E	cord	3.13		see photos	sand temper, medium inclusions
Iturup	KUB	5	34	Surface	Surface	base	211111	E	cord	3.52		see photos	sand temper, medium inclusions, two mending holes and interior carbonization (sampled)
Iturup	KUB	5	35	Surface	Surface	base	111111	none	none			see photos	sand temper, medium inclusions
Iturup	KUB	5	36	Surface	Surface	base	111111	none	none			see photos	sand temper, medium inclusions
Iturup	KUB	5	37	Surface	Surface	base	111111	none	none			see photos	sand temper, medium inclusions
Iturup	KUB	5	38	Surface	Surface	rim	311111	E	cord			see photos	sand temper with medium to large inclusions
Iturup	KUB	5	39	Surface	Surface	rim	112211	E	cord grooving, dentates			see photos	sand temper, small inclusions
Iturup	KUB	5	40	Surface	Surface	rim	112211	E	applique, dentates			see photos	sand temper, possible exterior carbonization
Iturup	KUB	5	41	Surface	Surface	rim	112111	E	cord grooving			see photos	sand temper, medium inclusions
Iturup	KUB	5	42	Surface	Surface	rim	111111	E	none	none		see photos	sand temper, medium inclusions, oxidized exterior

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Iturup	KUB	5	45	Surface	Surface	rim	311111	E	cord		V	see photos	sand temper, medium inclusions
Iturup	KUB	5	48	Surface	Surface	body	111111					see photos	sand temper, medium inclusions, oxidized exterior
Iturup	KUB	5	49	Surface	Surface	body	111111					see photos	sand temper, medium inclusions, oxidized exterior
Iturup	KUB	5	51	Surface	Surface	rim	111113	E	punctates, peak			see photos	sand temper, medium inclusions
Iturup	KUB	5	52	Surface	Surface	body	111111					see photos	sand temper, medium inclusions
Iturup	KUB	5	53	Surface	Surface	body	111111					see photos	sand temper, medium inclusions
Iturup	KUB	25	59	Surface	Surface	body	211111	E	cord	3.42		see photos	sand temper, small inclusions
Iturup	KUB	25	60	Surface	Surface	rim	311111	E	cord	2.64		see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	25	62	Surface	Surface	base	111111	none	none			see photos	sand temper, medium to large inclusions, Late Epi, slight convex 30mm from base (parallel point), 3.137 depth
Iturup	KUB	25	63	Surface	Surface	base	111111	none	none			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	25	65	Surface	Surface	body	311111	E	cord			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	unknown	66	Surface	Surface	body	111121	E	incisions			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	67	Surface	Surface	rim	511111	E	geometric cord marking			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	68	Surface	Surface	body	311111	E	cord			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	69	Surface	Surface	rim	311111	E	cord, applique			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	73	Surface	Surface	rim	111111	E	dentates			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	74	Surface	Surface	rim	341111	E	dentates, applique, cord			see photos	sand temper, medium inclusions
Iturup	KUB	4	98	Surface	Surface	rim	341213	E	cord, applique, punctates			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	99	Surface	Surface	rim	341113	E	cord, applique			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	100	Surface	Surface	rim	341113	E	applique, peak			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	101	Surface	Surface	rim	141113	E	applique, peak, cord			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	102	Surface	Surface	rim	341111	E	cord, applique, punctates			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	105	Surface	Surface	rim	111113	E	peak			see photo	sand temper, medium to large inclusions Early epi, mending/hanging hole
Iturup	KUB	4	106	Surface	Surface	rim	111111	E	none			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	107	Surface	Surface	rim	111111	E	none			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	108	Surface	Surface	body	111111					see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	109	Surface	Surface	body	141111	E	applique			see photo	sand temper, small few inclusions, Early Epi
Iturup	KUB	4	113	Surface	Surface	body	312111	E	cord grooving, applique			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	114	Surface	Surface	body	312111	E	cord grooving, punctates			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	119	Surface	Surface	body	111111					see photo	sand temper, small few inclusions, Early Epi, interior carbonization
Iturup	KUB	4	120	Surface	Surface	body	111111					see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	123	Surface	Surface	body	111111					see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	14	127	N deflation zone		body	141111	E	applique, incisions			see photo	oxidized exterior, sand temper, medium inclusions
Iturup	KUB	169	128	Charcoal Exposure	Deflation zone	body	311111	E	cord	2.58		see photo	sand tempered with small inclusions
Iturup	KUB	10	129	East Deflation		base	111111	none				(convex inflection point at 16.56mm from base, 5.560mm depth, parallel point at 25mm, then use 97 angle to top of sherd)	
Iturup	KUB	10	130	East Deflation		base	111111	none				(slight convex just above base for 8mm, depth of about 1mm)	
Iturup	KUB	169	132	Charcoal Exposure	Deflation zone	rim	212111	E	cord grooving	3.86	D, H	see photo, criss cross pattern of cords, almost looks like a black slip, clay looks different on bottom of sherd, interior carbonization	
Iturup	KUB	183	133	N of Creek Deflation		body	511111	E	cord (probably geometric)	1.73	D	see photo, sand temper	possible interior carbonization

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Iturup	KUB	8	136	Eastern deflation zone		rim	311113	E	cord, peak	1.93	many	see photo	sand temper, hanging hole, medium inclusions
Iturup	KUB	22	137	Surface	North of Creek	rim	211211	E, I	cord, punctates	3.91	D	see photo, Middle Jomon, three punctates in horizontal line 30mm from rim, interior cord marking extends to neck inflection point (32mm)	very little sand, some very large inclusions, possible vegetation temper due to large holes in vessel profile (I think holes are from inclusion lost)
Iturup	KUB	22	138	Surface	North of Creek	body	211111	E	cord	3.5		see photo	sand tempered with some very large inclusions
Iturup	KUB	unknown	?	Surface	Surface	body	311111	E	cord			see photos	sand temper, medium inclusions
Iturup	KUB	unknown	?	Surface	Surface	rim	143111	E	applique, grooving			see photos	sand temper, large inclusions, completely oxidized
Iturup	KUB	13	7868-134	Relict Dome	Below Pink Tephra	body	111111	none				some slight depressions in exterior, probably clay coils	oxidized exterior, sand temper, medium inclusions
Iturup	KUB	25	7868-87	Surface	Surface	rim	142112	E	many things			see photo	sand temper, medium to large inclusions, interior carbonization
Iturup	KUB	25	7868-88	Surface	Surface	rim	142112	E	applique			see photo	sand temper, medium to large inclusions, mending/hanging hole, hole in applique piece but does not penetrate, interior carbonization
Iturup	KUB	25	7868-89	Surface	Surface	rim	311113	E	cord			see photo	sand temper, medium to large inclusions, mending/hanging hole
Iturup	KUB	3	n/a	Surface	Surface	rim	341113	E	cord, peak, applique			see photos	sand temper, medium to large inclusions, Late Epi
Iturup	KUB	4	unknown	Surface	Surface	body	312211	E	cord grooving, punctates			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	4	unknown	Surface	Surface	body	111121	E	incisions/grooving			see photo	sand temper, small inclusions
Iturup	KUB	4	unknown	Surface	Surface	rim	142113	E	cord, applique, punctates			see photo	sand temper, medium to large inclusions Early epi
Iturup	KUB	25	unknown	Surface	Surface	body	311111	E	cord			see photos	sand temper, medium to large inclusions, Epi
Iturup	KUB	25	unknown	Surface	Surface	rim	111111	none	none			see photos	sand temper, medium to large inclusions, Late Epi, mending hole
Iturup	OLY	146	3	TP2	Top 25cm	rim	111111	none	none			Early Epi	sand temper, few small inclusions, interior carbonization, nicely constructed piece
Iturup	OLY	146	7	TP2	Top 25cm	body	311111	E	cord	2.66		Early Epi	sand temper, few small inclusions, interior carbonization
Iturup	OLY	138	8	TP2	Erosion Face Cut	rim	151111	E	ribbon applique inlay			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	9	TP2	Erosion Face Cut	rim	111111	none	none			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	10	TP2	Erosion Face Cut	body	151111	E	ribbon applique inlay			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	11	TP2	Erosion Face Cut	body	151111	E	ribbon applique inlay			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	12	TP2	Erosion Face Cut	body	151111	E	ribbon applique inlay			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	13	TP2	Erosion Face Cut	body	155111	E	ribbon applique, incision			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	14	TP2	Erosion Face Cut	body	155111	E	applique, grooving			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	16	TP2	Erosion Face Cut	body	155111	E	ribbon applique, incision			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	138	19	TP2	Erosion Face Cut	neck	111111	none	none			Tobintai (Final Okhotsk)	sand temper, few small inclusions
Iturup	OLY	149	22	TP2	50-80cm	body	211111	E	cord	4.44		probably Epi-Jomon, oxidized exterior	sand temper with some large inclusions (looks kind of Middle Jomonish)
Iturup	OLY	149	23	TP2	50-80cm	body	311111	E	cord	2.41		probably Epi-Jomon, oxidized exterior	much smaller cords than other pieces but sand tempered with some large inclusions
Iturup	OLY	149	24	TP2	50-80cm	body	211111	E	cord	3.61		probably Epi-Jomon, oxidized exterior	sand temper with some large inclusions (looks kind of Middle Jomonish)
Iturup	OLY	151	28	TP3	L5	body	111111	none	none			probably from very near base, sand tempered with medium inclusions and interior carbonization	
Iturup	OLY	150	31	surface	surface	body	111111	none	none			fully reduced piece	sand temper few small inclusions
Rasshua	RAS	3496	8077-106	TP1A	L2	body	111111	none	none				

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Rasshua	RAS	3545	8077-113	TP1A	L2	body	311111	E	cord				
Rasshua	RAS	3545	8077-114	TP1A	L2	rim	111111	none	none				
Rasshua	RAS	3596	8077-129	TP1A	L4	body	311111	E	cord	2.1			
Rasshua	RAS	3732	8077-140	TP1A	L5	body	111111	none					
Rasshua	RAS	3732	8077-141	TP1A	L5	base (partial)	311111	E	cord	1.41	H, D, (= > shape)		
Rasshua	RAS	3732	8077-142	TP1A	L5	body	311111	E	cord	2.98	H		
Rasshua	RAS	3793?	8077-151	TP1A	L6	body	311111	E	cord	1.65	D		
Rasshua	RAS	3793?	8077-157	TP1A	L6	rim	111111	none	none				
Rasshua	RAS	3793?	8077-159	TP1A	L6	base	111111	none	none				
Rasshua	RAS	3864?	8077-175	TP1A	L8	body	311111	E	cord	1.9	H		
Rasshua	RAS	3864?	8077-182	TP1A	L8	body	111111	none	none				
Rasshua	RAS	3864?	8077-184	TP1A	L8	base	111111	none	none				
Rasshua	RAS	3527	8077-293	TP1B	L2	body	311111	E	cord				
Rasshua	RAS	3527	8077-299	TP1B	L2	body	311111	E	cord				
Rasshua	RAS	3527	8077-300	TP1B	L2	body	311111	E	cord				
Rasshua	RAS	3527	8077-303	TP1B	L2	rim	111111	none	none				
Rasshua	RAS	3517	8077-309	TP1B	L2	body	311111	E	cord				
Rasshua	RAS	3525	8077-310	TP1B	L2	base	111111	none	none				
Rasshua	RAS	3621	8077-311	TP1B	L3	base	311111	E	cord	1.7	D		
Rasshua	RAS	3529	8077-314	TP1B	L3	collar (body)	411111	E	cord	1.7	D, H	2 sets of Horizontal parallell cords with background diagonal cords	
Rasshua	RAS	3584?	8077-315	TP1B	L3	body	311111	E	cord	2.26			
Rasshua	RAS	3584?	8077-317	TP1B	L3	body	311111	E	cord	2.75			
Rasshua	RAS	3584?	8077-320	TP1B	L3	body	111111	none	none			Interior Carbon	
Rasshua	RAS	3584?	8077-324	TP1B	L3	body	111111	none	none			Lighter in color	
Rasshua	RAS	3639	8077-326	TP1B	L3B	base	311111	E	cord	1.97	D		
Rasshua	RAS	3629	8077-327	TP1B	L3B	base	311111	E	cord	1.75	D		
Rasshua	RAS	3604	8077-328	TP1B	L3	base	311111	E	cord	1.8	D		
Rasshua	RAS	3632	8077-329	TP1B	L3B	body	311111	E	cord	2.07		Exterior Carbon	
Rasshua	RAS	3630	8077-330	TP1B	L3B	body	311111	E	cord	3.15		Interior Carbon, Reddish Exterior	
Rasshua	RAS	3637	8077-332	TP1B	L3B	body	311111	E	cord	1.68			
Rasshua	RAS	3637	8077-337	TP1B	L3B	body	311111	E	cord	1.8		circular knots	
Rasshua	RAS	3637	8077-340	TP1B	L3B	body	111111	none	none				
Rasshua	RAS	3637	8077-341	TP1B	L3B	body	111111	none	none				
Rasshua	RAS	3637	8077-342	TP1B	L3B	body	111111	none	none				
Rasshua	RAS	3717	8077-343	TP1B	L3D	body	311111	E	cord	2.7	H		
Rasshua	RAS	3717	8077-345	TP1B	L3D	body	111111	none	none				
Rasshua	RAS	3717	8077-346	TP1B	L3D	body	111111	none	none			sand temper, oxidized, large inclusion	
Rasshua	RAS	3716	8077-351	TP1B	L3D	body	311111	E	cord	2	D		
Rasshua	RAS	3716	8077-353	TP1B	L3D	body	111111	none	none				
Rasshua	RAS	3716	8077-354	TP1B	L3D	body	111111	none	none			slight interior carbon	
Rasshua	RAS	3745	8077-359	TP1B	L3E	body	311111	E	cord	1.93	H		
Rasshua	RAS	3745	8077-365	TP1B	L3E	body	311111	E	cord	1.87	H	single cord	
Rasshua	RAS	3775	8077-372	TP1B	L3E	body	311111	E	cord	2.1	H, some D	much thinner and more curved at top of sherd	
Rasshua	RAS	3777	8077-373	TP1B	L3E	body	311111	E	cord	2.11	H	3.3 mm inbetween cords, oxidized firing core	
Rasshua	RAS	3608	8077-378	TP1B	L3	rim	111111	none	none				
Rasshua	RAS	3904	8077-379	TP1B	L3G	body	311111	E	cord	3.39	H		
Rasshua	RAS	3904	8077-388	TP1B	L3G	rim	111111	none	none			partially curled rim, interior carbonization	
Rasshua	RAS	3904	8077-390	TP1B	L3G	body	111111	none	none				
Rasshua	RAS	3904	8077-391	TP1B	L3G	base	311111	E	cord	2.13		slight more reddish	

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Rasshua	RAS	3913	8077-393	TP1B	L3G	body	311111	E	cord	2	D	interior and exterior carbon, black on top red on bottom firing line	
Rasshua	RAS	3914	8077-394	TP1B	L3G	base	311111	E	cord	1.81	H	3 mm inbetween cords	
Rasshua	RAS	3888	8077-396a	TP1B	L3I	base	111111	none	none			Scan with 3D	
Rasshua	RAS	3888	8077-396b	TP1B	L3I	base	111111	none	none			Candidate for ICP	
Rasshua	RAS	3888	8077-396c	TP1B	L3I	base	111111	none	none				
Rasshua	RAS	3888	8077-397	TP1B	L3I	rim	111111	none	none			rim thinner body thicker, mending hole	
Rasshua	RAS	3888	8077-398	TP1B	L3I	body	111111	none	none				
Rasshua	RAS	3888	8077-399	TP1B	L3I	body	111111	none	none				
Rasshua	RAS	3900	8077-402	TP1B	L3I	body	311111	E	cord	1.78	H		
Rasshua	RAS	3900	8077-403	TP1B	L3I	body	111111	none	none			mending hole	
Rasshua	RAS	4142	8077-409	TP1B	L3J	body	311111	E	cord	2.02	H	interior and exterior carbonization	
Rasshua	RAS	4142	8077-412	TP1B	L3J	body	111111	none	none			exterior carbonization	
Rasshua	RAS	4143	8077-415	TP1B	L3J	rim	111111	none	none			interior carbonization	
Rasshua	RAS	4145	8077-416	TP1B	L3J	body	311111	E	cord	2.8	H	much thicker at base of sherd	
Rasshua	RAS	4160	8077-426	TP1B	L5	rim	311111	E	cord	1.78	D	exterior and interior carbonization	
Rasshua	RAS	4172	8077-432	TP1B	L6	rim	111111	none	none			similar to 434, mending hole	
Rasshua	RAS	4172	8077-433	TP1B	L6	body	111111	none	none			exterior carbonization	
Rasshua	RAS	4172	8077-434	TP1B	L6	body	111111	none	none			similar to 432	
Rasshua	RAS	4172	8077-435	TP1B	L6	body	111111	none	none			exterior carbonization	
Rasshua	RAS	3583	8077-486	TP2	L2	rim	111111	none	none			8.796 (Rim Thickness, Bulged Rim)	
Rasshua	RAS	3657?	8077-488/489	TP2	L2	base	111111	none	none			slight convex base leading to concave body	
Rasshua	RAS	3668	8077-490	TP2	L2	base	111111	none	none				
Rasshua	RAS	3660	8077-491	TP2	L2	rim	111111	none	none				
Rasshua	RAS	3660	8077-492	TP2	L2	rim	111111	none	none			exterior carbonization	
Rasshua	RAS	3660	8077-494	TP2	L2	body	111111	none	none			sherd likely located just underneath rim/collar	
Rasshua	RAS	3660	8077-496	TP2	L2	body	111111	none	none				
Rasshua	RAS	3659	8077-525	TP2	L2	body	311111	E	cord	1.95	D		
Rasshua	RAS	3659	8077-526	TP2	L2	body	111111	none	none				
Rasshua	RAS	3663	8077-538	TP2	L3	rim	315111	E	cord, incision	2.08	D	straight horizontal incision 14 mm below rim	
Rasshua	RAS	3663	8077-539	TP2	L3	rim	311111	E	cord	2.25	D	no real collar, more of a convex flare oute	
Rasshua	RAS	3663	8077-540	TP2	L3	body	311111	E	cord, punctation			two wedge-shaped punctates 16.64 mm from each other	
Rasshua	RAS	3663	8077-544	TP2	L3	body	111111	none	none				
Rasshua	RAS	3649	8077-549	TP2	L4	rim	111111	none	none				
Rasshua	RAS	3649	8077-550	TP2	L4	rim	111111	none	none				
Rasshua	RAS	3656	8077-555/556	TP2	L5	rim	111111	none	none			10.088 rim thickness (exterior bulge)	
Rasshua	RAS	3819	8077-557	TP2	L6	body	311111	E	cord	2.12	D	interior carbonization	
Rasshua	RAS	3835	8077-561	TP2	L7A(L7C)	rim	311111	E	cord	2.8	D	interior carbonization	
Rasshua	RAS	3835	8077-562	TP2	L7A(L7C)	rim	111111	none	none			interior carbonization	
Rasshua	RAS	3835	8077-567	TP2	L7A(L7C)	body	311111	E	cord	1.89	D	interior carbonization	
Rasshua	RAS	3835	8077-572	TP2	L7A(L7C)	body	311111	E	cord	1.88	D	interior carbonization	
Rasshua	RAS	3835	8077-575	TP2	L7A(L7C)	body	111111	none	none			exterior carbonization	
Rasshua	RAS	3835	8077-592	TP2	L7A(L7C)	body	111111	none	none			exterior and interior carbonization	
Rasshua	RAS	3835	8077-597	TP2	L7A(L7C)	base	111111	none	none				
Rasshua	RAS	3824	8077-598	TP2	L7A	rim	111111	none	none			heavy interior and exterior carbonization	
Rasshua	RAS	3838	8077-601	TP2	L7B	body	111111	none	none			some possible carbonization	
Rasshua	RAS	3984	8077-604	TP2	L7C	rim	311111	E	cord	1.67	D	presence of cord-marking on top of rim, reddish color, sand temper, sherd has area where something was attached	

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Rasshua	RAS	3981	8077-606-610	TP2	L7C	reconstructed rim and body	311211	E	cord, punctuation		D, H	3D scan (63.26, 5.412, bottom curvature) circular punctates located 18mm from rim spaced 12 mm apart with set (2) of parallel horizontal cord-markings above and below the punctates, parallel lines are 6.4 mm apart	
Rasshua	RAS	3982	8077-611	TP2	L7C	body	311111	E	cord	2.88		interior carbonization	
Rasshua	RAS	3982	8077-612	TP2	L7C	body	311111	E	cord	3.33		reddish-brown, high sand temper	
Rasshua	RAS	3982	8077-615	TP2	L7C	body	311111	E	cord	2.21		interior carbonization	
Rasshua	RAS	3984	8077-624	TP2	L7C	rim	311211	E	cord, punctuation	2.03	D	3 circular punctated located 12.66mm from rim, interior carbonization	
Rasshua	RAS	3984	8077-627	TP2	L7C	body	311111	E	cord	2.88		interior carbonization	
Rasshua	RAS	3984	8077-628	TP2	L7C	body	321111	E	cord, protuberance	2.26	D	bottom section of protuberance, reddish	
Rasshua	RAS	3983	8077-633	TP2	L7D	rim	311111	E	cord	2.01	D	presence of cord-marking on top of rim	
Rasshua	RAS	3990	8077-640	TP2	L8A	rim	311111	E	cord, punctuation	2.15	D	(62.77, 3.850 bottom curvature), small wedge punctate 29.5 mm from rim, interior carbonization	
Rasshua	RAS	3990	8077-641	TP2	L8A	rim	321113	E	cord, protuberance	2.5	D	(44.01, 2.112 bottom), ring protub 42mm from rim, 12.88 mm in diameter, interior carbonizat	
Rasshua	RAS	3990	8077-642	TP2	L8A	rim	211111	E	cord	3.11	D	interior carbonization, cord-marking on top or rim	
Rasshua	RAS	3990	8077-643	TP2	L8A	rim	311111	E	cord	1.89	D	exterior carbonization	
Rasshua	RAS	3990	8077-644	TP2	L8A	rim	311111	E	cord	2.24	D	curled lip, decorated on top of rim	
Rasshua	RAS	3990	8077-645	TP2	L8A	rim	311111	E	cord	2.07	D	slight rim bulge, interior and exterior carbonization	
Rasshua	RAS	3990	8077-646	TP2	L8A	rim	311111	E (slight I)	cord	2.09	D	curled lip, decorated on top of rim	
Rasshua	RAS	3990	8077-649	TP2	L8A	body	211111	E	cord	3.82	D		
Rasshua	RAS	3990	8077-650	TP2	L8A	body	111111	none	none			sand temper, oxidized, large inclusion	
Rasshua	RAS	3990	8077-654	TP2	L8A	body	111111	none	none			interior carbonization	
Rasshua	RAS	3990	8077-656	TP2	L8A	body	311111	E	cord	1.89	D (<<<>>>)	(alternating arrow pattern), interior carbonization	
Rasshua	RAS	3990	8077-661	TP2	L8A	body	311111	E	cord	2.3	H	interior and exterior carbonization	
Rasshua	RAS	3990	8077-688	TP2	L8A	base	311111	E	cord	1.07	D	wall get much thinner towards base, cords run in parallel diagonal lines 5mm apart, exterior carbonization on base	
Rasshua	RAS	3990	8077-689	TP2	L8A	base	311111	E	cord	2.1	D	wall of shallow bowl, with rim, body and base, sand temper, reddish, large inclusions	
Rasshua	RAS	3990	8077-690	TP2	L8A	base	311111	E	cord	1.79	D		
Rasshua	RAS	3998	8077-691	TP2	L8A	rim	311111	E	cord	1.7	D	cord-marking on top of rim, interior carbonization	
Rasshua	RAS	3998	8077-693	TP2	L8A	rim	311111	E	cord	1.22	D	<<< cord pattern	
Rasshua	RAS	3998	8077-695	TP2	L8A	rim	311111	E	cord	1.61	D	cord-marking on top of rim, interior and exterior carbonization	
Rasshua	RAS	3998	8077-697	TP2	L8A	body	311111	E	cord	2.49	D	interior carbonization	
Rasshua	RAS	3998	8077-698	TP2	L8A	body	311111	E	cord	1.9	D, H	interior and exterior carbonization	
Rasshua	RAS	3998	8077-700	TP2	L8A	body	311111	E	cord	1.79	D	exterior carbonization, interior is reddish with sand temper and large inclusions	
Rasshua	RAS	3998	8077-701	TP2	L8A	body	311111	E	cord	1.86	D	exterior carbonization	
Rasshua	RAS	3998	8077-711	TP2	L8A	body	314111	E	cord, incision	2.2		geometric triangle shape (little triangle inside larger triangle), triangle is 3.80 mm apart) smaller triangle base is 13.63mm long, 18.79mm tall)	
Rasshua	RAS	3998	8077-714	TP2	L8A	body	311111	E	cord	2.66		2.5 mm spacing between cords	
Rasshua	RAS	3998	8077-722	TP2	L8A	base	311111	E	cord	1.98	D	wall of shallow bowl, with rim, body and base, interior is reddish	
Rasshua	RAS	3989	8077-725	TP2	L8A	rim	211111	E	cord	3.31	D	3D scan (91.46, 11.272, bottom curvature) interior carbonization	
Rasshua	RAS	3993	8077-726	TP2	L8B	rim	111111	none	none			exterior and interior carbonization	
Rasshua	RAS	3997	8077-727	TP2	L8B	body	311111	E	cord	1.66	D (<<<>>>)	just below rim, cord pattern (>>>), then <<< below), interior carbonization	
Rasshua	RAS	3997	8077-728	TP2	L8B	body (collar)	315111	E	cord, incised lines	1.66, 1.40	D, parallel lines	3 parallel incised lines, 11.5 mm from each other	
Iturup	RIK	Unknown	1	n/a	n/a	rim	111111					sherd widens at rim, with slight flare out, inside stays flat, flat lip, slight recurve under rim (listed here as collar but not a collar)	
Iturup	RIK	Unknown	3	n/a	n/a	body	211111	E	cord	2.53		sand temper, small inclusions, shiny temper (sparkly)	

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Iturup	RIK	Unknown	4	n/a	n/a	body	211111	E	cord	3.17		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	5	n/a	n/a	body	211111	E	cord	3.04		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	7	n/a	n/a	body	211111	E	cord	2.91		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	9	n/a	n/a	body	211111	E	cord	3.54		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	11	n/a	n/a	body	111111					sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	13	n/a	n/a	body	111111					sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	16	n/a	n/a	body	?	E	applique	10.47		sand temper, small inclusions, shiny temper (sparkly), sherd is near top of vessel extending through the bulge and ending probably very near the base, small vessel height wise	
Iturup	RIK	Unknown	17	n/a	n/a	body	111111					sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	22	n/a	n/a	body	211111	E	cord	2.86		may belong to same vessel	sand temper, shiny inclusions, also has some very large inclusions, pebble size
Iturup	RIK	Unknown	23	n/a	n/a	body	211111	E	cord	3.15		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	24	n/a	n/a	body	211111	E	cord	3.01		sand temper, small inclusions, shiny	
Iturup	RIK	Unknown	25	n/a	n/a	body	211111	E	cord	3.03		may belong to same vessel	sand temper, shiny inclusions, also has some very large inclusions, pebble size
Iturup	RIK	Unknown	29	n/a	n/a	body	211111	E	cord	3.12		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	30	n/a	n/a	body	211111	E	cord	3.12		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	34	n/a	n/a	body	111111					sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	35	n/a	n/a	body	211111	E	cord	3.87		sand temper, small inclusions, shiny temper (sparkly)	
Iturup	RIK	Unknown	36	n/a	n/a	base	211111	E	cord	3.21	D	may belong to same vessel, 90 degree angle on base for first 10 mm, then 114 base angle	sand temper, shiny inclusions, also has some very large inclusions, pebble size
Iturup	RIK	Unknown	37	n/a	n/a	rim	211111	E	cord	2.44	D	Early Epi-Jomon bag, flare out of rim, rim thins a bit towards to top	
Iturup	RIK	Unknown	38	n/a	n/a	rim	111111					Early Epi-Jomon	small sherd, slight flare to rim
Iturup	RIK	Unknown	39	n/a	n/a	rim	111111					Early Epi-Jomon	small sherd, slight flare to rim
Iturup	RIK	Unknown	40	n/a	n/a	rim	111111	E				sherd widens at rim with slight flare out, interior stays vertical mostly, rounded lip	
Iturup	RIK	Unknown	41	n/a	n/a	rim	111111					Early Epi-Jomon	small sherd, slight flare to rim
Iturup	RIK	Unknown	42	n/a	n/a	body	111111					Early Epi-Jomon	section of body very near rim, probably is only missing top lip
Iturup	RIK	Unknown	44	n/a	n/a	body	211111	E	cord			Early Epi-Jomon	
Iturup	RIK	Unknown	45	n/a	n/a	body	211111	E	cord			Early Epi-Jomon	possible root discoloration of surface
Iturup	RIK	Unknown	46	n/a	n/a	body	111111					Early Epi-Jomon	
Iturup	RIK	Unknown	50	n/a	n/a	body	111111					Early Epi-Jomon	probably collar area or area just above bulge
Iturup	RIK	Unknown	57	n/a	n/a	body	111111					Early Epi-Jomon	possible root discoloration of surface
Iturup	RIK	Unknown	58	n/a	n/a	body	111111					Early Epi-Jomon	
Iturup	RIK	Unknown	59	n/a	n/a	body	411111	E	cord			Early Epi-Jomon	see photo for description, one cord running horizontal with three sets of <<< and >>> lines of cords running horizontally, cord is braided and not knotted
Ryponkicha	RYP	1858	n/a	Unit 1	L2	body	111111	none	none			interior carbonization	
Ryponkicha	RYP	1858	n/a	Unit 1	L2	body	111111	none	none			interior carbonization	

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Ryponkicha	RYP	1862		Unit 1	L3	body	115111	E	incisions	1.4	H,D	series of incised lines forming a rough geometric pattern, one incised line running horizontal, then stopping and running Diagonally towards rim (and possibly another line running diagonally down) 52 degree angle __ with small marks (little dashes) at this angle	exterior carbonization at angle intersection
Ryponkicha	RYP	1862		Unit 1	L3	body	111111	none	none				
Ryponkicha	RYP	1867		Unit 1	L3B	body	111111	none	none				
Ryponkicha	RYP	1867		Unit 1	L3B	body	111111	none	none				
Ryponkicha	RYP	1872		Unit 1	L4	base	111111	none	none			roughed up piece, sand temper but limited inclusions	
Ryponkicha	RYP	1872		Unit 1	L4	body	111111	none	none			"ledge" on rim, Ledge thickness is 14.84mm, interior carbonization above ledge, possibly below ledge	
Ryponkicha	RYP	1872		Unit 1	L4	body	111111	none	none			sand temper, relatively large inclusions	
Ryponkicha	RYP	1872		Unit 1	L4	body	111111	none	none				
Ryponkicha	RYP	1872		Unit 1	L4	body	111111	none	none			interior carbonization	
Ryponkicha	RYP	1872		Unit 1	L4	body	111111	none	none				
Ryponkicha	RYP	1872		Unit 1	L4	rim	111111	none	none			straight rim (direct)	
Ryponkicha	RYP	1872		Unit 1	L4	rim	111111	none	none			straight rim (direct)	slight interior carbonization
Ryponkicha	RYP	1872		Unit 1	L4	rim	111111	none	none			straight rim (direct)	
Ryponkicha	RYP	1873		Unit 1	L4	base	111111	none	none			roughed up piece, missing exterior façade	
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	body	111111	none	none			missing exterior façade, sheen on the interior (oily)	
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	body	111111	none	none			brownish exterior	
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	body	111111	none	none			brownish exterior, larger inclusions	
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	body	111111	none	none			interior and exterior carbonization	
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	body	111111	none	none				
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	rim	111111	none	none			exterior and interior carbonization	straight/direct rim
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	rim	111111	none	none			slight interior carbonization	elongated flare, widening rim 44.87mm from bulge to rim
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	rim	111111	none	none			exterior and interior carbonization	mending hole, 24mm from bulge to rim (not really a bulge more like a small lip)
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	rim	111111	none	none			almost seems like a slip or waterproofing on the sherd, the matrix is very red with sand inclusion on the interior and exterior, maybe just carbonization on all parts of the sherd	mending hole underneath partial exterior ledge/bulge/lip, thins greatly from bulge to rim, direct rim
Ryponkicha	RYP	1882		Unit 1	L4 (Below)	rim	111111	none	none			again, almost like a carbon slip on the exterior of this sherd, no red interior rather grayish, but significant exterior carbonization	direct rim
Kunahsir	SER	99	1	TP1	L2	rim	341111	E	applique, cord			1 and 8 fit together	pointed rim slightly slanting inward
Kunahsir	SER	unknown	2	unknown	unknown	rim	411111	E	cord	4	H	bradided cords running across body underneath rim	sand temper, highly oxidized, medium to large inclusions
Kunahsir	SER	unknown	4	unknown	unknown	body	411111	E	cord	3.41	V, D	bradided cord, see photo	
Kunahsir	SER	unknown	5	unknown	unknown	body	331111	E	cord	3.45	V,D	braided cord, see photo	
Kunahsir	SER	99	8	TP1	L2	rim	341111	E	cord, applique			fits with 1, exterior carbonization near rim,	sand temper with some large inclusions
Kunahsir	SER	unknown	9	unknown	unknown	rim	411111	E	cord, dentate	3.52	H, D	six braided cords running horizontally extending from rim, with small dent in middle, and diagonal braided cords, possible fingernail impressions also overlain on cord	
Kunahsir	SER	unknown	14	unknown	unknown	rim	111211	E	punctuation		H	relatively deep dentates in middle of neck, 15.78mm from rim, spaced about 13mm from each other, deep enough to small small bulge on interior, relatively deep neck with rim that curves out then back in towards center line	sand temper, few inclusions, possible exterior carbonization
Kunahsir	SER	unknown	15	unknown	unknown	rim	411111	E	cord?	1.6	H	set of 4 parallel cord, running horizontally from rim, spaced 6.64mm from each other	exterior carbonization
Kunahsir	SER	unknown	16	unknown	unknown	body	511111	E	cord, applique	2.24	V, H	braided cord parallel lines running horizontal, vertical applique (8.25mmx44mm) with protuberance at end with hole in middle of protuberance	heavy exterior carbonization

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Kunahsir	SER	unknown	19	unknown	unknown	rim	441111	E	applique, cord, punctate		H, V	set of two cord running horizontal parallel to rim, then an applique line 9.5mm from rim, with punctate in middle of applique, cord running vertically from applique line	
Kunahsir	SER	99	20	TP1	L2	body	411211	E	cord, incisions, punctation			circular punctations across top of sherds, parallel horizontal rows with cord running inbetween them and cord lines running from circles vertically down sherd	
Kunahsir	SER	99	21	TP1	L2	rim	411111	E	cord	variable	H, V, D	interior curvature is very near diameter of vessel,	see photo, cord marking running horizontal around rim, 6 parallel lines, cords also running vertically and diagonally, sand temper with medium inclusions
	SER	99	22	TP1	L2	rim	411111	E	cord			bradied cords running horizontal across neck and upper part of shoulder	
Kunahsir	SER	unknown	24	unknown	unknown	body	511111	E	cord. Dents	4.05	all	braided cord with some knotted cord and some dents, cord pattern is variable, with some braided cords radiating out from smudge areas	
Kunahsir	SER	unknown	29	unknown	unknown	base	311111	E, B	cord	2.12	D	knotted cord marking found on body as well as on bottom of base	sand temper with some large inclusions
Kunahsir	SER	unknown	30	unknown	unknown	body	411111	E	cord, dentate	2.8	all	see photo for decoration description	interior carbonization
Kunahsir	SER	unknown	31	unknown	unknown	body	411111	E	cord	3.45, 2.01		braided cord on top of sherd with diagonally knotted cord on bottom of sherd	sand temper medium inclusions
Kunahsir	SER	unknown	32	unknown	unknown	rim	341111	E, R	cord, applique	3.11	D	diagonally cord marking with diagonal applique in middle of sherd, see photo	interior carbonization
Kunahsir	SER	unknown	33	unknown	unknown	body	411111	E	cord	3.52, 1.86	H, D	braided cord on top of sherd with diagonally knotted cord on bottom of sherd	sand temper medium inclusions
Kunahsir	SER	unknown	34	unknown	unknown	body	411111	E	cord	3.4, 2.07		braided cord on top of sherd with diagonally knotted cord on bottom of sherd	sand temper medium inclusions
Kunahsir	SER	unknown	35	unknown	unknown	body	411111	E	cord	2.45		braided cord on top of sherd with diagonally knotted cord on bottom of sherd	sand temper medium inclusions
Kunahsir	SER	unknown	36	unknown	unknown	body	411111	E	cord	1.73		wide spacing inbetween cords,	
Kunahsir	SER	unknown	39	unknown	unknown	body	411111	E	cord	3.09		braided cord on top of sherd with diagonally knotted cord on bottom of sherd	sand temper medium inclusions
Kunahsir	SER	98	52	TP1	L1	body	311111	E	cord	3.41	V	likely also part of same vessel	sand temper small inclusion some sparkly
Kunahsir	SER	98	55	TP1	L1	body	311111	E	cord	2.83	V	likely also part of same vessel	sand temper small inclusion some sparkly
Kunahsir	SER	unknown	?	unknown	unknown	body	411111	E	cord	3.7	V, D	braided, sand tempered, medium inclusions	similar to 4 and 5
Kunahsir	SER	unknown	3, 23	unknown	unknown	body	411111	E	cord. Dents	4.05	all	braided cord with some knotted cord and some dents, cord pattern is variable, with some braided cords radiating out from smudge areas	
Kunahsir	SER	98	43, 51	TP1	L1	body	311111	E	cord	3.39	V	likely also part of same vessel	sand temper small inclusion some sparkly
Kunahsir	SER	98	47, 48, 56	TP1	L1	body/base	311111	E	cord	2.96	V	collection of 15 sherds refit, part of base and mostly body, length is vessel height from base to the middle, cord has very large knots running vertically, has slight recurve just above base, slight interior bulge at around 100mm from base	diameter measurement taken at top of vessel, middle of vessel and just above base, diameter should get wider as they go up, to fragile to scan, but will probably want to draw, interior kind of goes concave, convex, concave, while exterior is very slight concave near base and then convex all the up
Kunahsir	SER	98	49,60	TP1	L1	base	311111	E	cord	2.83	V	collection of 6 sherds forming part of base, likely also part of vessel from previous ones, slight recurve of base (8mm)	sand temper small inclusion some sparkly
Kunahsir	SER	98	53,54	TP1	L1	body	311111	E	cord	2.55	V	collection of 8 sherds refit, very similar to 47,48,56 refit, wider spacing between cords (3mm), should have similar diameter has other refits	sand temper small inclusion some sparkly
Iturup	TIK	33	3	TP2	Below 80	base	111111	none	none			interior carbonization 30mm from base	sand temper few inclusions
Iturup	TIK	35	6	TP2		body	111111	none	none				sand temper few inclusions
Iturup	TIK	35	7	TP2		body	111111	none	none				sand temper few inclusions
Iturup	TIK	35	9	TP2		body	111111	none	none				sand temper few inclusions
Iturup	TIK	35	Unknown	TP2		body	111111	none	none				sand temper few inclusions
Urup	TOK	414	1	TP1	L1	body	111111					mending hole light temper with few inclusions	, piece taken for previous sampling
Urup	TOK	414	2	TP1	L1	base	111111					sand temper with medium to large inclusions, shiny sand temper	
Urup	TOK	414	3	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	
Urup	TOK	414	4	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	mending hole

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Ururup	TOK	414	5	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	
Ururup	TOK	414	6	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	
Ururup	TOK	414	8	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	
Ururup	TOK	414	11	TP1	L1	body	111111					sand temper with medium to large inclusions, shiny sand temper	
Ururup	TOK	414	12	TP1	L1	rim	111111					sand temper with medium to large inclusions, shiny sand temper	possible part of rim, missing exterior part of rim, unshouldered, quite rounded, (V depth 1.483, V chord 33.83)
Ururup	TOK	414	13	TP1	L1	body	111111					sand temper with smaller inclusion and oil interior and exterior	
Ururup	TOK	414	15	TP1	L1	neck	111111					sand temper with smaller inclusion and oil interior and exterior	it rim thickness but neck thickness
Ururup	TOK	414	16	TP1	L1	body	111111					sand temper with smaller inclusion and oil interior and exterior	mending hole
Ururup	TOK	414	27	TP1	L1	body	115111	E	incisions	11.7mmx3mm	D	pointed ovaloids in a diagonal pattern running horizontally	
Ururup	TOK	414	28	TP1	L1	rim	111111					small shouldered rim sherd, very similar to piece #30, refit with piece #30	sand temper, small inclusions
Ururup	TOK	418	29	TP1	L2	body	111111					oily interior and exterior, sand temper few inclusions	interior carbonization
Ururup	TOK	418	30	TP1	L2	body	131111	E	applique	16mmx7mm	V	measurement at vessel bulge, small applique oval placed on bulge just before neck inflection	interior carbonization
Ururup	TOK	418	31	TP1	L2	base	111111					extremely thick inflection point from base to wall (29mm)	
Ururup	TOK	418	32	TP1	L2	body	111111					sand temper, medium to large inclusions	interior carbonization
Ururup	TOK	418	33	TP1	L2	body	111111					oily interior and exterior, sand temper few inclusions with two mending holes	exterior carbonization
Ururup	TOK	418	34	TP1	L2	body	111111					oily interior and exterior, sand temper few inclusions with mending hole	
Ururup	TOK	418	35	TP1	L2	body	111111					sand temper, medium to large inclusions	
Ururup	TOK	418	36	TP1	L2	neck	111111					sand temper, medium to large inclusions	interior carbonization
Ururup	TOK	418	37	TP1	L2	body	141111	E	applique		H	small ledge running horizontal, sand temper few inclusions	exterior carbonization
Simushir	VOD	1306	7672-79	Unit 3	L2	rim	111111	none	none			slight widening 10 mm from top of rim	
Simushir	VOD	1306	7672-86	Unit 3	L2	body	115111	E	incision			incised line running horizontal on body sherd, very thick, similar to 7972-78	
Simushir	VOD	1306	7672-87	Unit 3	L2	body	111111	none	none			probably from just underneath rim	
Simushir	VOD	494	7918-160 (1)	TP3	L3	base	111111	none	none			reconstructed vessel, first measurement from right at shoulder/bulge	exterior carbonization, sand temper few small inclusions
Simushir	VOD	494	7918-160 (2)	TP3	L3	rim	111111	none	none			reconstructed vessel, first measurement from just below shoulder/bulge	Exterior and Interior carbonization (especially in shoulder area), sand temper small to medium inclusions
Simushir	VOD	494	7918-160 (3)	TP3	L3	rim	111111	none	none			don't think this piece is same vessel, different collars and rim (V1)	exterior carbonization, sand temper, small to medium inclusions
Simushir	VOD	494	7918-205	TP3	L3	base	111111	none	none			higher sand temper, medium inclusions	
Simushir	VOD	497	7918-208	TP3	L4	base	111111	none	noe			sand temper, medium inclusions, brownish interior, small raised area in the middle of interior possibly edges worn away from stirring	
Simushir	VOD	497	7918-209	TP3	L4	rim	111111	none	none			sand temper, few inclusions	
Simushir	VOD	497	7918-211	TP3	L4	rim	111111	none	none			sand temper, few inclusions	exterior and interior carbonization
Simushir	VOD	497	7918-212	TP3	L4	body	111111	none	none			sand temper, few inclusions	small amount of interior carbonization
Simushir	VOD	579	7918-222	TP3	L3	rim	111111	none	none			sand temper, low small inclusions	carbonization interior and exterior near rim
Simushir	VOD	486	7918-51	TP3	?	rim	115211	E	incisions, punctate		H, D	see photos	interior carbonization, sand temper, few inclusions
Simushir	VOD	497?	7918-52	TP3	L4?	rim	111111	none	none			see photos	
Simushir	VOD	497?	7918-53	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-54	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-55	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-56	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-57	TP3	L4?	rim	141111	E	applique			see photos	
Simushir	VOD	497?	7918-58	TP3	L4?	rim	111111					see photos	

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Simushir	VOD	497?	7918-59	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-61	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-62	TP3	L4?	rim	111111					see photos	
Simushir	VOD	497?	7918-63	TP3	L4?	body	111111					see photos	
Simushir	VOD	497?	7918-64	TP3	L4?	body	111111					see photos	
Simushir	VOD	497?	7918-66	TP3	L4?	body	111111					shoulder of vessel	
Simushir	VOD	497?	7918-71	TP3	L4?	body	111111						
Simushir	VOD	1382	7972-103	Unit 2	L4	rim	111111	none	none			(Collar 92.01, 10.482) (Width of exterior collar 90.74), sand tempered, medium inclusions, some exterior carbonization, mending hole in collar with worn area of mending rope	
Simushir	VOD	1380	7972-104	Unit 1	L4C	body	131111	E	Incisions, ridges			just below rim, small dash incisions running along top of bulge, with 2 ridges (first ridge starting 40.05mm, 6.39mm width, 11.90 spacing inbetween), small dashes below ridges, diagonal pointed ovaloids above ridges	
Simushir	VOD	1380	7972-105	Unit 1	L4C	rim	111111	none	none			large inclusions, sand temper	
Simushir	VOD	1380	7972-106	Unit 1	L4C	rim	111111	none	none			sand temper, possible slip?, large inclusions	
Simushir	VOD	1380	7972-107	Unit 1	L4C	body	111111	E	protuberance (applique)			round protuberance (18mm), located underneath vessel bulge, very thick at base of sherd and thin at top of sherd, large inclusions	
Simushir	VOD	1380	7972-108	Unit 1	L4C	body	111111	none	none			base curvature, sherd located just above the base, large inclusions	
Simushir	VOD	1935	7972-109	Unit 2	L4	rim	111111	none	none			curled lip, thinning walls to rim, medium inclusions	
Simushir	VOD	1935	7972-110	Unit 2	L4	body	111111	none	none				
Simushir	VOD	1935	7972-111	Unit 2	L4	body	111111	none	none			collar piece, beige exterior, black interior	
Simushir	VOD	1935	7972-113	Unit 2	L4	body	111111	none	none			beige exterior and black interior, similar to piece 111	
Simushir	VOD	1411	7972-115	Unit 1	L4C	body	111111	none	none			shell temper, from near base of vessel	
Simushir	VOD	1403	7972-117	Unit 1	L4A	base	111111	none	none			coarse inclusion, flat base, full base fragment	
Simushir	VOD	1403	7972-118	Unit 1	L4A	base	111111	none	none			dark, with sand temper	
Simushir	VOD	1403	7972-119	Unit 1	L4A	body	111111	none	none			heavy interior carbonization, very coarse inclusion, sand temper, carbonization just below bulge of vessel	
Simushir	VOD	1403	7972-120	Unit 1	L4A	body	111111	none	none				
Simushir	VOD	1403	7972-121	Unit 1	L4A	body	111111	none	none				
Simushir	VOD	1403	7972-122	Unit 1	L4A	body	115111	E	Incisions			small dash incisions with incised line running in the middle, sandy temper, large inclusions	
Simushir	VOD	1403	7972-123	Unit 1	L4A	body	111111	none	none	4.5mm L, 1mm W	V, D		
Simushir	VOD	1236	7972-26	Unit 2	L2	rim	114111	E	incisions, bulge	7.04Lx 1mmW	D	slight bulge decoration in rim (12.76), 49.53mm from rim to bulge, series of figernail type impression in lineat line around bulge	
Simushir	VOD	1235	7972-27	Unit 2	L2	rim	111111	none	none			(Bottom curvature, 41.17(y), 5.172(x), 75.05mm from rim), mending hole, slight exterior and interior carbonization, some sand temper some large inclusions	
Simushir	VOD	1235	7972-28	Unit 2	L2	rim	111111	none	none			small collar curvature, sand temper, medium size inclusions	
Simushir	VOD	1235	7972-29	Unit 2	L2	rim	111111	none	none			very slight collar, small inclusions, light sand temper?	
Simushir	VOD	1444	7972-298	Unit 1	L5	base	111111	none	none			extremely thick base, sand temper, large inclusions, oxidized core, reduced interior and exterior	
Simushir	VOD	1444	7972-299	Unit 1	L5	body	111111	none	none			large inclusions, sand temper	
Simushir	VOD	1273	7972-3	Unit 1	L2	rim	143111	none	none			slight outward flare to the rim (thus the larger rim thickness than body thickness), sparkly temper sand	
Simushir	VOD	1235	7972-30	Unit 2	L2	rim	111111	none	none			flared rim (deep collar depth), some medium inclusions, sand temper	
Simushir	VOD	1444	7972-300	Unit 1	L5	body	111111	none	none			large inclusions, sand temper	
Simushir	VOD	1444	7972-301	Unit 1	L5	body	111111	none	none			collar sherd, sand temper, reduced exterior and oxidized interior, interior carbonization	
Simushir	VOD	1445	7972-302	Unit 1	L5	rim	111111	none	none			slight curled lip, narrowing rim, sparkly temper (sand), exterior carbonization	

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Simushir	VOD	1445	7972-304	Unit 1	L5	body	111111	none	none			very thick corner of sherd (19.240mm) probably located near base, heavy interior carbonization, sand temper, large inclusions, sparkly temper on interior, very large inclusions (nearly small pebble size)	
Simushir	VOD	1235	7972-31	Unit 2	L2	body	114111	E	incisions	6.6mm x 2.20mm	D	small slightly point ovaloids, 4 of them pointed diagonally	
Simushir	VOD	1552	7972-319	Unit 2	L5	rim	111111	none	none			curled lip,	
Simushir	VOD	1552	7972-320	Unit 2	L5	body	111111	none	none			probably bulge of vessel, thin walls on bottom of sherd, thicker walls towards top (or vice versa)	
Simushir	VOD	1553	7972-321	Unit 2	L5	body	111111	none	none			sandy exterior, thicker base, thinner walls towards top or sherd, oxidized exterior reduced interior	
Simushir	VOD	1553	7972-322	Unit 2	L5	body	111111	none	none				
Simushir	VOD	1553	7972-323	Unit 2	L5	body	111111	none	none			interior carbonization (similar to 324 sherd)	
Simushir	VOD	1553	7972-324	Unit 2	L5	body	115111	E	incision	3.72Lx 1Wmm	H	small dash incision, interior carbonization	
Simushir	VOD	1553	7972-327	Unit 2	L5	body	111111	none	none				
Simushir	VOD	1927	7972-329	Unit 2	L5	rim	111111	none	none			slight curled lip, interior carbonization, small amount of exterior carbonization	
Simushir	VOD	1235	7972-33	Unit 2	L2	body	111111	none	none			part of collar for large vessel, very large inclusions, (nearly pebble size), sand temper, brownish	
Simushir	VOD	1461	7972-333	Unit 3	L2	rim	111111	none	none			half reconstructed vessel, curled lip with a mending hole, interior and exterior carbonization, sand temper	
Simushir	VOD	1461	7972-336	Unit 3	L5	base	111111	none	none			base to the reconstructed rim piece (possibly) , sand temper with medium to large inclusions	
Simushir	VOD	1461	7972-337	Unit 3	L5	body	111111	none	none			exterior carbonization, possible incised line vertically on sherd, 11Lx2Wmm	
Simushir	VOD	1461	7972-338	Unit 3	L5	body	111111	none	none			likely from same vessel (337,338,339,340)	
Simushir	VOD	1461	7972-339	Unit 3	L5	body	111111	none	none			likely from same vessel (337,338,339,340)	
Simushir	VOD	1461	7972-340	Unit 3	L5	body	111111	none	none			likely from same vessel (337,338,339,340)	
Simushir	VOD	1461	7972-342	Unit 3	L5	base	111111	none	none			very thick base with sand temper and large inclusions	
Simushir	VOD	1461	7972-343	Unit 3	L5	body	111111	none	none			slight interior carbonization	
Simushir	VOD	1461	7972-344	Unit 3	L5	body	111111	none	none			sand tempered, reddish exterior, medium to large inclusions, interior carbonization	
Simushir	VOD	1564	7972-353	Unit 4	L5	body	111111	none	none			large inclusions of angular origin, sparkly temper, sand?	
Simushir	VOD	1564	7972-354	Unit 4	L5	body	111111	none	none			large inclusions of angular origin, sparkly temper, sand?	
Simushir	VOD	1543	7972-356	Unit 1	L6	rim	111111	none	none			slightly larger lip, slight flare out, interior carbonization, mending hole, sand temper, sparkly temper inclusions	
Simushir	VOD	1543	7972-357	Unit 1	L6	rim	111111	none	none			curled lip, thinning walls to rim, interior and exterior carbonization, some sparkly temper	
Simushir	VOD	1543	7972-359	Unit 1	L6	body	111111	none	none				
Simushir	VOD	1917	7972-36	Unit 2	L2	body	115111	E	incisions			one incised line running horizontal, with a two small diagonal lines connecting to center line, possible incised chevron above line	
Simushir	VOD	1543	7972-360	Unit 1	L6	body	111111	none	none				
Simushir	VOD	1264	7972-37	Unit 2	L2	body	111111	none	none			mending hole, located just underneath rim,	
Simushir	VOD	1350	7972-38	Unit 2	L2	rim	111111	none	none			fewer inclusions, higher vertical depth (56.94mm, 3.289)	
Simushir	VOD	1350	7972-39	Unit 2	L2	rim	111111	none	none			fewer inclusions, slight collar	
Simushir	VOD	1350	7972-40	Unit 2	L2	rim	111111	none	none			small piece, sand temper	
Simushir	VOD	1316	7972-405	Unit 4	L1	rim	111111	none	none			slight interior carbonization	
Simushir	VOD	1316	7972-407	Unit 4	L1	body	111111	none	none				
Simushir	VOD	1326	7972-410	Unit 4	L2	body	114111	E	incisions	4.35mm W, 8.55mm L	D, chevron	wider pointed ovaloids with incised line below, ovaloids are arranged in ^ and reverse ^ pattern, pattern is located on bulge of vessel, exterior is slightly reddish, high sand temper, large inclusions	
Simushir	VOD	1319	7972-411	Unit 4	L2	body	111111	none	none				
Simushir	VOD	1319	7972-412	Unit 4	L2	body	111111	none	none			broke during measurements, interior or sherd is completely reduced, light temper, sand, carbonization interior and exterior	
Simushir	VOD	1320	7972-414	Unit 4	L2	rim	111111	none	none				
Simushir	VOD	1320	7972-415	Unit 4	L2	body	111111	none	none			bulge area, thickness measurements are from body and bulge area	

Island Name	Site	FS #	SM #	Unit	Level	PART	Type	Surface Treatment		Width	Direction	notes	additional notes
Simushir	VOD	1320	7972-417	Unit 4	L2	body	111111	none	none				
Simushir	VOD	1320	7972-418	Unit 4	L2	body	115111	E	Incisions	5.28	diagonal	small dash on bulge of body sherd, sherd is from near top of vessel, just under rim and includes bulge	
Simushir	VOD	1320	7972-419	Unit 4	L2	body	111111	none	none				
Simushir	VOD	1350	7972-42	Unit 2	L2	body	111111	none	none			thick body sherds, coarse inclusions, reduced exterior	
Simushir	VOD	1344	7972-427	Unit 4	L4	rim	111111	none	none			slight curved out lip, collar thickness is 9.90mm	
Simushir	VOD	1350	7972-43	Unit 2	L2	body	111111	none	none			near a base sherd, much thicker bottom than top of sherd	
Simushir	VOD	1344	7972-430	Unit 4	L4	body	111111	none	none			heavy interior carbonization	
Simushir	VOD	1340	7972-432	TP3	L4	rim	11311	E	Geometric relief	44.35	Towards Rim	heavy interior and some exterior carbonization, one large set of relief (^) one underneath the other, one much smaller set (27.73), depressed area running linear at base of large chevrons	
Simushir	VOD	1343	7972-433	Unit 4	L3	body	115111	E	Incisions			incised line running around pot, diagonal line running a 45 degree angle from the incised line, heavy exterior carbonization	
Simushir	VOD	1334	7972-434	TP3	L6	body	114111	E	Incisions	10mm, 1mm	Linear, slanted	heavy exterior carbonization, some interior carbonization, pointed ovaloid impressions (fingernail impression), linear around bulge, slanted	Interior Bulge
Simushir	VOD	1235	7972-44	Unit 2	L2	rim	111111	none	none			very flat interior curve, sandy texture, reddish in color, slight exterior collar curve	
Simushir	VOD	1235	7972-45	Unit 2	L2	rim	111111	none	none			slight rim flare out, flat interior rim curve, but more curve just underneath lip	
Simushir	VOD	1235	7972-48	Unit 2	L2	body	111111	none	none			large sand inclusions, interior carbonization,	
Simushir	VOD	1235	7972-50	Unit 2	L2	body	111111	none	none			interior carbonization,	
Simushir	VOD	1235	7972-51	Unit 2	L2	body	111111	none	none				
Simushir	VOD	1235	7972-52	Unit 2	L2	body	111111	none	none			interior carbonization, sandy temper with large inclusions	
Simushir	VOD	1235	7972-53	Unit 2	L2	body	111111	none	none				
Simushir	VOD	1235	7972-54	Unit 2	L2	body	111111	none	none			interior carbonization, sandy temper with large inclusions	
Simushir	VOD	1235	7972-55	Unit 2	L2	body	111111	none	none			interior carbonization, sandy temper with large inclusions	
Simushir	VOD	1273	7972-6	Unit 1	L2	body	111111	none	none			sparkly temper	
Simushir	VOD	1273	7972-7	Unit 1	L2	body	111111	none	none				
Simushir	VOD	1298	7972-76	Unit 3	L2	rim	111111	none	none			exterior and interior carbonization, no collar but slight bulge (50.75, 5.136)	
Simushir	VOD	1298	7972-77	Unit 3	L2	body	111111	none	none			small to medium inclusions	
Simushir	VOD	1304	7972-78	Unit 3	L2	rim	111111	E	incision			linear incision (line) running horizontal near bulge, 44.34 mm from rim, high sand temper, very large inclusions	
Simushir	VOD	1273	7972-8	Unit 1	L2	body	111111	none	none			interior carbonization	
Simushir	VOD	1304	7972-80	Unit 3	L2	body	111111	none	none				
Simushir	VOD	1304	7972-81	Unit 3	L2	body	111111	none	none				
Simushir	VOD	1304	7972-82	Unit 3	L2	body	111111	none	none			very sandy texture, high sand temper content	
Simushir	VOD	1304	7972-83	Unit 3	L2	body	111111	none	none				
Simushir	VOD	1304	7972-84	Unit 3	L2	body	111111	none	none				
Simushir	VOD	1304	7972-85	Unit 3	L2	rim	111111	none	none				
Simushir	VOD	1344	7973-431	Unit 4	L4	body	111111	none	none			collar section	

Appendix B: Pottery Samples with Affiliated Radiocarbon Dates

Archived at: <https://core.tdar.org/dataset/393045>

FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
2290	7971-454	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2291	7971-459	Urup	Ainu Creek	AIC	411111	Epi-Jomon	Early Epi-Jomon	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2290	7971-456	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-447	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-448	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-449	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-450	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-451	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-452	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-442	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-443	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-444	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-445	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
2413	7971-446	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A1	L2	2305, 2377	55, 49	2181-2355, 2330-2464	2181-2464
n/a	878	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	A1	L3	2319; 2443; 2577; 2597; 2633	48, 88, 87, 76, 80	2182-2359, 2341-2683, 2366-2729, 2487-2738, 2495-2748	2182-2748
n/a	879	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	A1	L3	2319; 2443; 2577; 2597; 2633	48, 88, 87, 76, 80	2182-2359, 2341-2683, 2366-2729, 2487-2738, 2495-2748	2182-2748
n/a	870	Urup	Ainu Creek	AIC	311113	Epi-Jomon	Early Epi-Jomon	A1	L3	2319; 2443; 2577; 2597; 2633	48, 88, 87, 76, 80	2182-2359, 2341-2683, 2366-2729, 2487-2738, 2495-2748	2182-2748
n/a	877	Urup	Ainu Creek	AIC	411111	Epi-Jomon	Early Epi-Jomon	A1	L3	2319; 2443; 2577; 2597; 2633	48, 88, 87, 76, 80	2182-2359, 2341-2683, 2366-2729, 2487-2738, 2495-2748	2182-2748
n/a	874	Urup	Ainu Creek	AIC	411111	Epi-Jomon	Early Epi-Jomon	A1	L3	2319; 2443; 2577; 2597; 2633	48, 88, 87, 76, 80	2182-2359, 2341-2683, 2366-2729, 2487-2738, 2495-2748	2182-2748
2430	587	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	A3	L2	2500	107	2357-2697	2357-2697
2430	588	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	A3	L2	2500	107	2357-2697	2357-2697
2430	586	Urup	Ainu Creek	AIC	431111	Epi-Jomon	Early Epi-Jomon	A3	L2	2500	107	2357-2697	2357-2697
2430	569	Urup	Ainu Creek	AIC	113111	Okhotsk	Middle Okhotsk	A3	L2	2500	107	2357-2697	2357-2697
2430	580	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	582	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	583	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	570	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	571	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	572	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	573	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	574	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	577	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
2430	579	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	A3	L2	2500	107	2357-2697	2357-2697
	701	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	702	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	715	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	716	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353

FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
	720	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	703	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	689	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	695	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	696	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	694	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	697	Urup	Ainu Creek	AIC	311111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	693	Urup	Ainu Creek	AIC	311113	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	688	Urup	Ainu Creek	AIC	311113	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	692	Urup	Ainu Creek	AIC	311113	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	710	Urup	Ainu Creek	AIC	331111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	706	Urup	Ainu Creek	AIC	411111	Epi-Jomon	Early Epi-Jomon	61	L2	2290	59	2180-2353	2180-2353
	691	Urup	Ainu Creek	AIC	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	61	L2	2290	59	2180-2353	2180-2353
2429	671	Urup	Ainu Creek	AIC	114111	Okhotsk	Middle Okhotsk	61	L2	2290	59	2180-2353	2180-2353
2429	678	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	673	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	682	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	684	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	669	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	670	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	672	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	676	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
	698	Urup	Ainu Creek	AIC	111111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
2429	679	Urup	Ainu Creek	AIC	141111	Unknown	Unknown	61	L2	2290	59	2180-2353	2180-2353
915	7928-16	Shumshu	Baikova	BAI	115111	Okhotsk	Late Okhotsk	TP2	L2	157	84	1-284	1-284
915	7928-15	Shumshu	Baikova	BAI	111111	Unknown	Unknown	TP2	L2	157	84	1-284	1-284
915	7928-18	Shumshu	Baikova	BAI	111111	Unknown	Unknown	TP2	L2	157	84	1-284	1-284
71	230	Iturup	Berezovka	BER	311111	Epi-Jomon	Early Epi-Jomon	Profile 1	150cmbd	3516	34	3451-3576	3451-3576
54	220	Iturup	Berezovka	BER	411111	Epi-Jomon	Early Epi-Jomon	Profile 2	Base of 5	2053	52	1950-2145	1950-2146
57	216	Iturup	Berezovka	BER	311111	Epi-Jomon	Early Epi-Jomon	Profile 2	S5	1985	45	1898-2106	1898-2106
57	217	Iturup	Berezovka	BER	111111	Unknown	Unknown	Profile 2	S5	1985	45	1898-2106	1898-2106
57	218	Iturup	Berezovka	BER	111111	Unknown	Unknown	Profile 2	S5	1985	45	1898-2106	1898-2106
1631	7973-12	Shiashkotan	Drobnye	DRO	411111	Epi-Jomon	Early Epi-Jomon	1	2	1229	36	1175-1288	1175-1288
1631	7973-10	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	2	1229	36	1175-1288	1175-1288
1631	7973-13	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	2	1229	36	1175-1288	1175-1288
1631	7973-14	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	2	1229	36	1175-1288	1175-1288
1631	7973-9	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	2	1229	36	1175-1288	1175-1288
1718	7973-108	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	3	1453	42	1521-1384	1521-1384
1718	7973-109	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	3	1453	42	1521-1384	1521-1384
1718	7973-111	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	3	1453	42	1521-1384	1521-1384
1718	7973-102	Shiashkotan	Drobnye	DRO	113111	Okhotsk	Middle Okhotsk	1	3	1453	42	1521-1384	1521-1384
1718	7973-106	Shiashkotan	Drobnye	DRO	114111	Okhotsk	Middle Okhotsk	1	3	1453	42	1521-1384	1521-1384
1718	7973-107	Shiashkotan	Drobnye	DRO	114111	Okhotsk	Middle Okhotsk	1	3	1453	42	1521-1384	1521-1384
1718	7973-104	Shiashkotan	Drobnye	DRO	114111	Okhotsk	Middle Okhotsk	1	3	1453	42	1521-1384	1521-1384
1718	7973-105	Shiashkotan	Drobnye	DRO	114311	Okhotsk	Middle Okhotsk	1	3	1453	42	1521-1384	1521-1384
1718	7973-70	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	3	1453	42	1521-1384	1521-1384
1718	7973-71	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	3	1453	42	1521-1384	1521-1384
1718	7973-74	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	3	1453	42	1521-1384	1521-1384
1718	7973-103	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	3	1453	42	1521-1384	1521-1384

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1808	7973-164	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	4	1565	39	1517-1689	1517-1689
1808	7973-165	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	4	1565	39	1517-1689	1517-1689
1808	7973-168	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	4	1565	39	1517-1689	1517-1689
1808	7973-169	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	4	1565	39	1517-1689	1517-1689
1808	7973-170	Shiashkotan	Drobnye	DRO	311111	Epi-Jomon	Early Epi-Jomon	1	4	1565	39	1517-1689	1517-1689
1805	7973-141	Shiashkotan	Drobnye	DRO	114111	Okhotsk	Middle Okhotsk	1	4	1565	39	1517-1689	1517-1689
1805	7973-142	Shiashkotan	Drobnye	DRO	114111	Okhotsk	Middle Okhotsk	1	4	1565	39	1517-1689	1517-1689
1805	7973-149	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	4	1565	39	1517-1689	1517-1689
1808	7973-150	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	4	1565	39	1517-1689	1517-1689
1808	7973-151	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	4	1565	39	1517-1689	1517-1689
1805	7973-143	Shiashkotan	Drobnye	DRO	111111	Unknown	Unknown	1	4	1565	39	1517-1689	1517-1689
1805	7973-144	Shiashkotan	Drobnye	DRO	141111	Unknown	Unknown	1	4	1565	39	1517-1689	1517-1689
2945	8075-1	Ekarma	Ekarma	EKA	114111	Okhotsk	Middle Okhotsk	TP2	L2	753	33	691-794	691-795
2950	8075-21	Ekarma	Ekarma	EKA	111111	Unknown	Unknown	TP2	L3	854, 1106	41, 43	790-926, 1009-1175	790-1175
3049	8076-43	Ekarma	Ekarma	EKA	111111	Unknown	Unknown	TP2	L4	852; 859; 933; 979	39, 41, 23, 35	790-920, 795-928, 910-965, 931-1053	790-1053
592	1	Iturup	Glush	GLU	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	56-80		3958	49	3875-4079	3875-4080
666	23	Urup	Kapsul	KAP	311111	Epi-Jomon	Early Epi-Jomon	TP1	L1	1126	48	1013-1239	1013-1239
242	20	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	28	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	29	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	22	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
234	41	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
234	42	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
234	45	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
240	9	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
668	13	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	39	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	26	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
666	30	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
240	8	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
668	12	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP1	L1	1126	48	1013-1239	1013-1239
263	58	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP4	L1	722	24	683-773	683-773
263	57	Urup	Kapsul	KAP	111111	Unknown	Unknown	TP4	L1	722	24	683-773	683-773
149	23	Iturup	Olya	OLY	311111	Epi-Jomon	Early Epi-Jomon	TP2	50-80cm	4211	53	4096-4351	4096-4351
149	22	Iturup	Olya	OLY	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	TP2	50-80cm	4211	53	4096-4351	4096-4351
149	24	Iturup	Olya	OLY	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	TP2	50-80cm	4211	53	4096-4351	4096-4351
3545	8077-113	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1A	L2	837	48	743-911	743-911
3496	8077-106	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1A	L2	837	48	743-911	743-911
3545	8077-114	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1A	L2	837	48	743-911	743-911
3596	8077-129	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1A	L4	853	39	792-921	792-922
3864?	8077-175	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1A	L8	3509	45	3406-3610	3406-3610
3864?	8077-184	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1A	L8	3509	45	3406-3610	3406-3610
3864?	8077-182	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1A	L8	3509	45	3406-3610	3406-3610
3621	8077-311	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3	842	46	745-920	745-920
3604	8077-328	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3	842	46	745-920	745-920
3584?	8077-315	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3	842	46	745-920	745-920

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3584?	8077-317	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3	842	46	745-920	745-920
3529	8077-314	Rasshua	Rasshua	RAS	411111	Epi-Jomon	Early Epi-Jomon	TP1B	L3	842	46	745-920	745-920
3584?	8077-320	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3	842	46	745-920	745-920
3584?	8077-324	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3	842	46	745-920	745-920
3608	8077-378	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3	842	46	745-920	745-920
3629	8077-327	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3639	8077-326	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3630	8077-330	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3632	8077-329	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3637	8077-332	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3637	8077-337	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3B	858	39	796-926	796-926
3637	8077-340	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3B	858	39	796-926	796-926
3637	8077-341	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3B	858	39	796-926	796-926
3637	8077-342	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3B	858	39	796-926	796-926
3904	8077-391	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3G	384	47	302-467	302-467
3914	8077-394	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3G	384	47	302-467	302-467
3904	8077-379	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3G	384	47	302-467	302-467
3913	8077-393	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3G	384	47	302-467	302-467
3904	8077-390	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3G	384	47	302-467	302-467
3904	8077-388	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3G	384	47	302-467	302-467
3900	8077-402	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3I	184	97	0-305	0-305
3888	8077-396b	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3888	8077-396a	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3888	8077-396c	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3888	8077-398	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3888	8077-399	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3900	8077-403	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
3888	8077-397	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3I	184	97	0-305	0-305
4142	8077-409	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3J	2237	53	2153-2336	2153-2336
4145	8077-416	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP1B	L3J	2237	53	2153-2336	2153-2336
4142	8077-412	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3J	2237	53	2153-2336	2153-2336
4143	8077-415	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP1B	L3J	2237	53	2153-2336	2153-2336
3659	8077-525	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L2	1795	44	1720-1870	1720-1870
3668	8077-490	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3657?	8077-488/489	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3659	8077-526	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3660	8077-494	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3660	8077-496	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3583	8077-486	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3660	8077-491	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3660	8077-492	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L2	1795	44	1720-1870	1720-1870
3663	8077-540	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L3	1866	37	1745-1948	1745-1948
3663	8077-539	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L3	1866	37	1745-1948	1745-1948
3663	8077-538	Rasshua	Rasshua	RAS	315111	Epi-Jomon	Early Epi-Jomon	TP2	L3	1866	37	1745-1948	1745-1948
3663	8077-544	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L3	1866	37	1745-1948	1745-1948
3649	8077-549	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L4	2248	57	2158-2340	2158-2340
3649	8077-550	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L4	2248	57	2158-2340	2158-2340
3656	8077-555/556	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L5	1959	38	1885-2041	1885-2042
3819	8077-557	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L6	1971	42	1891-2057	1891-2058
3824	8077-598	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7A	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-567	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112

FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
3835	8077-572	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-561	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-597	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-575	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-592	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3835	8077-562	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7A(L7C)	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3838	8077-601	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L7B	2186	80	2044-2310	2044-2310
3982	8077-611	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3982	8077-612	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3982	8077-615	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3984	8077-627	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3984	8077-604	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3981	8077-606-610	Rasshua	Rasshua	RAS	311211	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3984	8077-624	Rasshua	Rasshua	RAS	311211	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3984	8077-628	Rasshua	Rasshua	RAS	321111	Epi-Jomon	Early Epi-Jomon	TP2	L7C	1998; 2000	43, 48	1926-2110, 1904-2112	1926-2112
3998	8077-722	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-689	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-688	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-690	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-656	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-661	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-697	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-698	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-700	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-701	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-714	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-640	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-643	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-644	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-645	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-691	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-693	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-695	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-646	Rasshua	Rasshua	RAS	311111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3998	8077-711	Rasshua	Rasshua	RAS	314111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-641	Rasshua	Rasshua	RAS	321111	Epi-Jomon	Early Epi-Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-649	Rasshua	Rasshua	RAS	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3989	8077-725	Rasshua	Rasshua	RAS	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-642	Rasshua	Rasshua	RAS	211111	Epi-Jomon / Jomon	Epi-Jomon / Jomon	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-650	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L8A	2762	20	2727-2758	2727-2758
3990	8077-654	Rasshua	Rasshua	RAS	111111	Unknown	Unknown	TP2	L8A	2762	20	2727-2758	2727-2758
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1873	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935

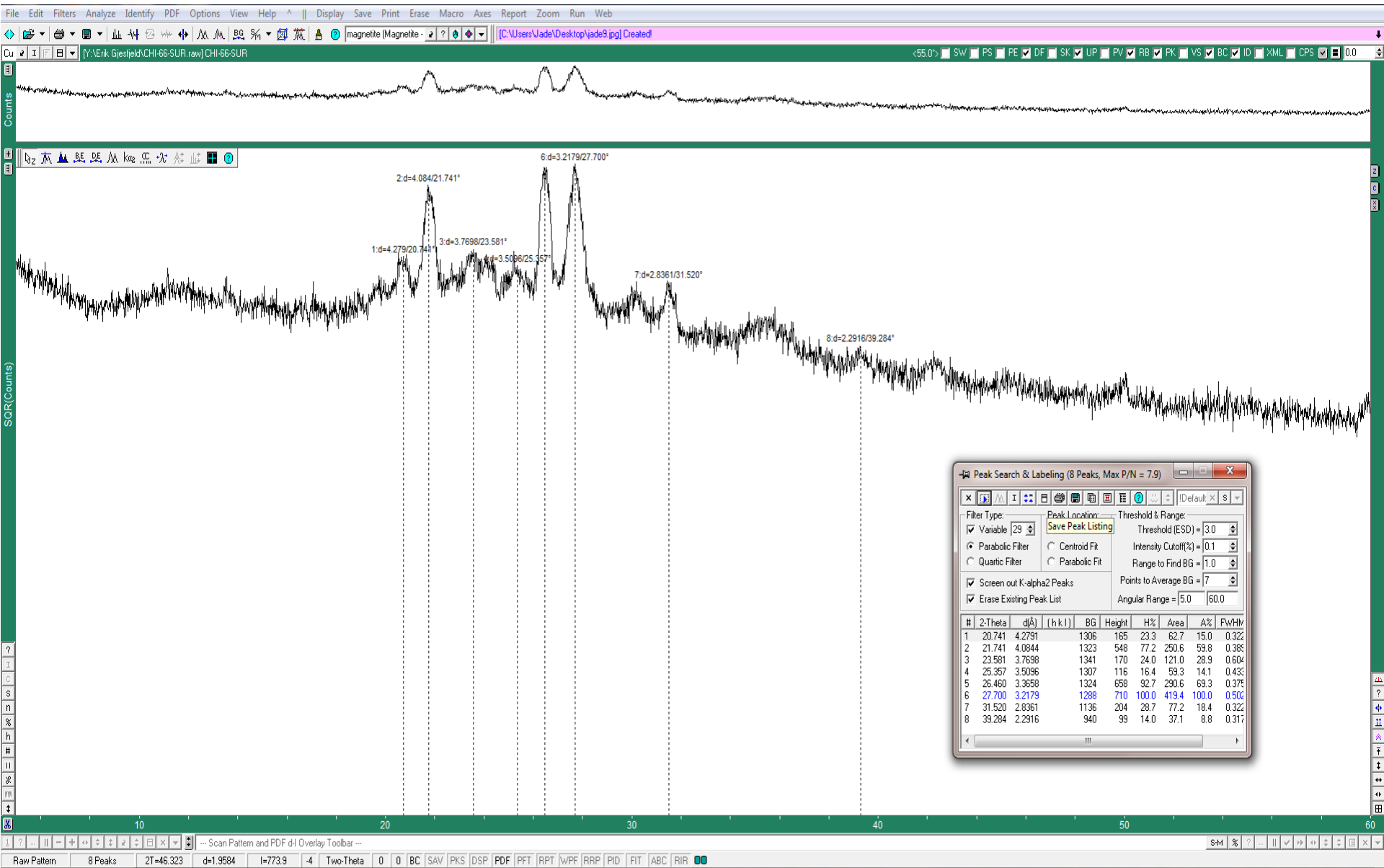
FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1872	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
1882	n/a	Ryponkicha	Ryponkicha	RYP	111111	Unknown	Unknown	Unit 1	L4 (Below)	873	45	796-935	796-935
33	3	Iturup	Tikhaya	TIK	111111	Unknown	Unknown	TP2	Below 80	1094	47	998-1174	998-1174
35	6	Iturup	Tikhaya	TIK	111111	Unknown	Unknown	TP2		1094	47	998-1174	998-1174
35	7	Iturup	Tikhaya	TIK	111111	Unknown	Unknown	TP2		1094	47	998-1174	998-1174
35	9	Iturup	Tikhaya	TIK	111111	Unknown	Unknown	TP2		1094	47	998-1174	998-1174
35	Unknown	Iturup	Tikhaya	TIK	111111	Unknown	Unknown	TP2		1094	47	998-1174	998-1174
414	27	Urup	Tokotan	TOK	115111	Okhotsk	Late Okhotsk	TP1	L1	1252	35	1181-1298	1181-1298
414	2	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	1	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	3	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	4	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	5	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	6	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	8	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	11	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	13	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	16	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	15	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	12	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
414	28	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L1	1252	35	1181-1298	1181-1298
418	31	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	29	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	32	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	33	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	34	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	35	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	36	Urup	Tokotan	TOK	111111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	30	Urup	Tokotan	TOK	131111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
418	37	Urup	Tokotan	TOK	141111	Unknown	Unknown	TP1	L2	1202	51	1082-1283	1082-1283
494	7918-160 (1)	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L3	1235; 1289	36, 11	1175-1288, 1270-1307	1175-1307
494	7918-205	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L3	1235; 1289	36, 11	1175-1288, 1270-1307	1175-1307
494	7918-160 (2)	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L3	1235; 1289	36, 11	1175-1288, 1270-1307	1175-1307
494	7918-160 (3)	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L3	1235; 1289	36, 11	1175-1288, 1270-1307	1175-1307
579	7918-222	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L3	1235; 1289	36, 11	1175-1288, 1270-1307	1175-1307
1340	7972-432	Simushir	Vodopodnaya	VOD	113111	Okhotsk	Middle Okhotsk	TP3	L4	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497	7918-208	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300

FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
497	7918-212	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497	7918-209	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497	7918-211	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-52	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-63	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-64	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-66	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-71	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-53	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-54	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-55	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-56	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-58	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-59	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-61	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-62	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
497?	7918-57	Simushir	Vodopodnaya	VOD	141111	Unknown	Unknown	TP3	L4?	1244; 1648; 2141	35, 43, 74	1179-1293, 1561-1717, 2009-2300	1179-2300
1334	7972-434	Simushir	Vodopodnaya	VOD	114111	Okhotsk	Middle Okhotsk	TP3	L6	1551	41	1421-1686	1421-1687
1273	7972-6	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L2	1241	36	1178-1295	1178-1295
1273	7972-7	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L2	1241	36	1178-1295	1178-1295
1273	7972-8	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L2	1241	36	1178-1295	1178-1295
1273	7972-3	Simushir	Vodopodnaya	VOD	143111	Unknown	Unknown	Unit 1	L2	1241	36	1178-1295	1178-1295
1380	7972-107	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1380	7972-108	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1411	7972-115	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1380	7972-105	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1380	7972-106	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1380	7972-104	Simushir	Vodopodnaya	VOD	131111	Unknown	Unknown	Unit 1	L4C	1648	73	1561-1717	1561-1717
1917	7972-36	Simushir	Vodopodnaya	VOD	115111	Okhotsk	Late Okhotsk	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-31	Simushir	Vodopodnaya	VOD	114111	Okhotsk	Middle Okhotsk	Unit 2	L2	967	31	928-1052	928-1052
1236	7972-26	Simushir	Vodopodnaya	VOD	114111	Okhotsk	Middle Okhotsk	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-48	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-50	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052

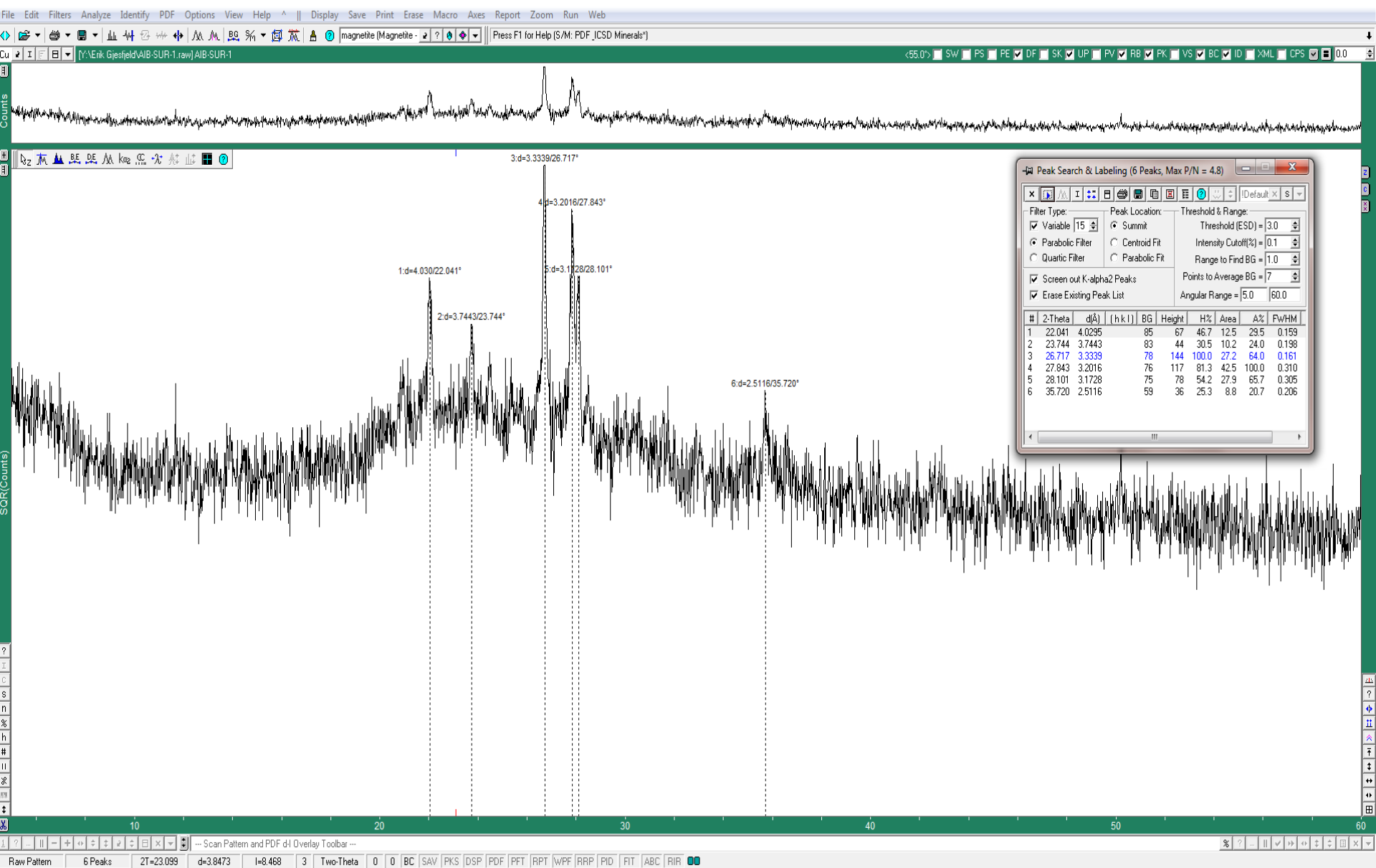
FS #	SM #	Island	Site	Site Abbr.	PCC	Cultural Occupation	Culture Phase	Unit	Level	Calibrated Date (Cal BP) (Weighted Mean)	Weighted SD	Calibrated Age Ranges for RC Dates (Cal BP) (2 σ)	Calibrated Age Range for Sherd
1235	7972-51	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-52	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-53	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-54	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-55	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-33	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1350	7972-42	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1350	7972-43	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1264	7972-37	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-44	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-45	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-27	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-28	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-29	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1235	7972-30	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1350	7972-38	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1350	7972-39	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1350	7972-40	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 2	L2	967	31	928-1052	928-1052
1306	7672-86	Simushir	Vodopodnaya	VOD	115111	Okhotsk	Late Okhotsk	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-78	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1298	7972-77	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-80	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-81	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-82	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-83	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-84	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1306	7672-87	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1298	7972-76	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1304	7972-85	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1306	7672-79	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1461	7972-333	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L2	1014	36	937-1071	937-1071
1461	7972-336	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-342	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-343	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-344	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-337	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-338	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-339	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1461	7972-340	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 3	L5	1761	39	1698-1824	1698-1824
1564	7972-353	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 4	L5	1017	42	933-1122	933-1122
1564	7972-354	Simushir	Vodopodnaya	VOD	111111	Unknown	Unknown	Unit 4	L5	1017	42	933-1122	933-1122

Appendix C: XRD Spectra of Pottery Sherds and Raw Clay Samples

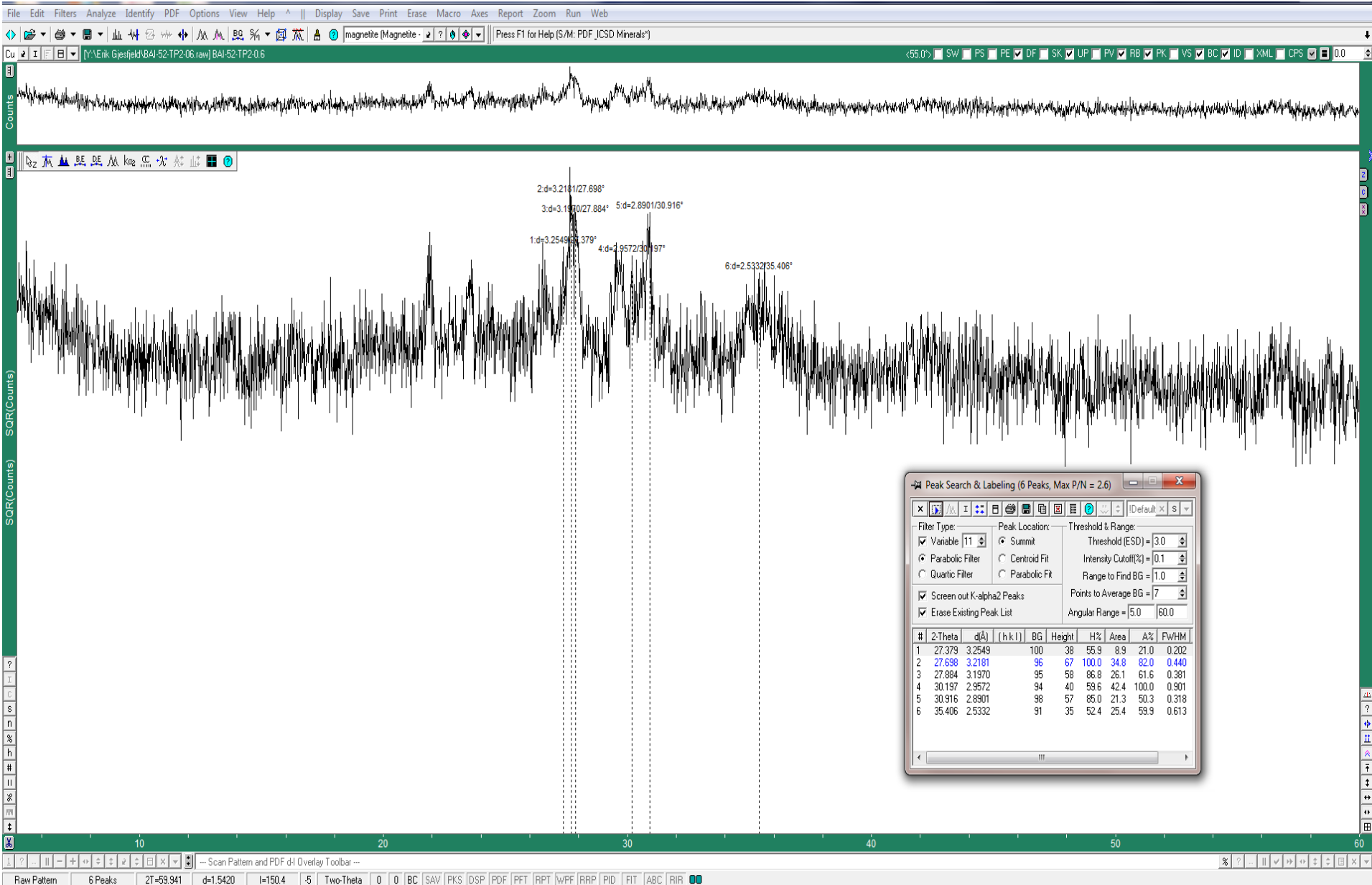
Chirpoi FS#4849 - Surface



Ainu Bay FS#2091 - Surface



Chirpoi FS#905-1 – TP2 Wall



Peak Search & Labeling (6 Peaks, Max P/N = 2.6)

Filter Type: Variable [1] Parabolic Filter Quartic Filter

Peak Location: Summit Centroid Fit Parabolic Fit

Threshold & Range: Threshold (ESD) = 3.0, Intensity Cutoff(%) = 0.1, Range to Find BG = 1.0, Points to Average BG = 7, Angular Range = 5.0 | 60.0

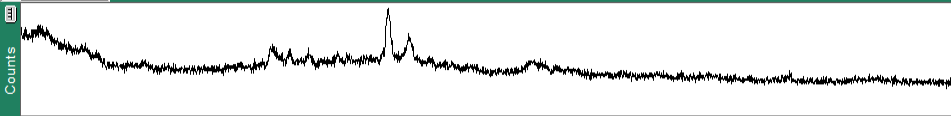
#	2-Theta	d(Å)	(h k l)	BG	Height	H%	Area	A%	FwHM
1	27.379	3.2549		100	38	55.9	8.9	21.0	0.202
2	27.698	3.2181		96	67	100.0	34.8	82.0	0.440
3	27.884	3.1970		95	58	86.8	26.1	61.6	0.381
4	30.197	2.9572		94	40	59.6	42.4	100.0	0.901
5	30.916	2.8901		98	57	85.0	21.3	50.3	0.318
6	35.406	2.5332		91	35	52.4	25.4	59.9	0.613

Bolshoy FS#827 - Surface

File Edit Filters Analyze Identify PDF Options View Help ^ || Display Save Print Erase Macro Axes Report Zoom Run Web

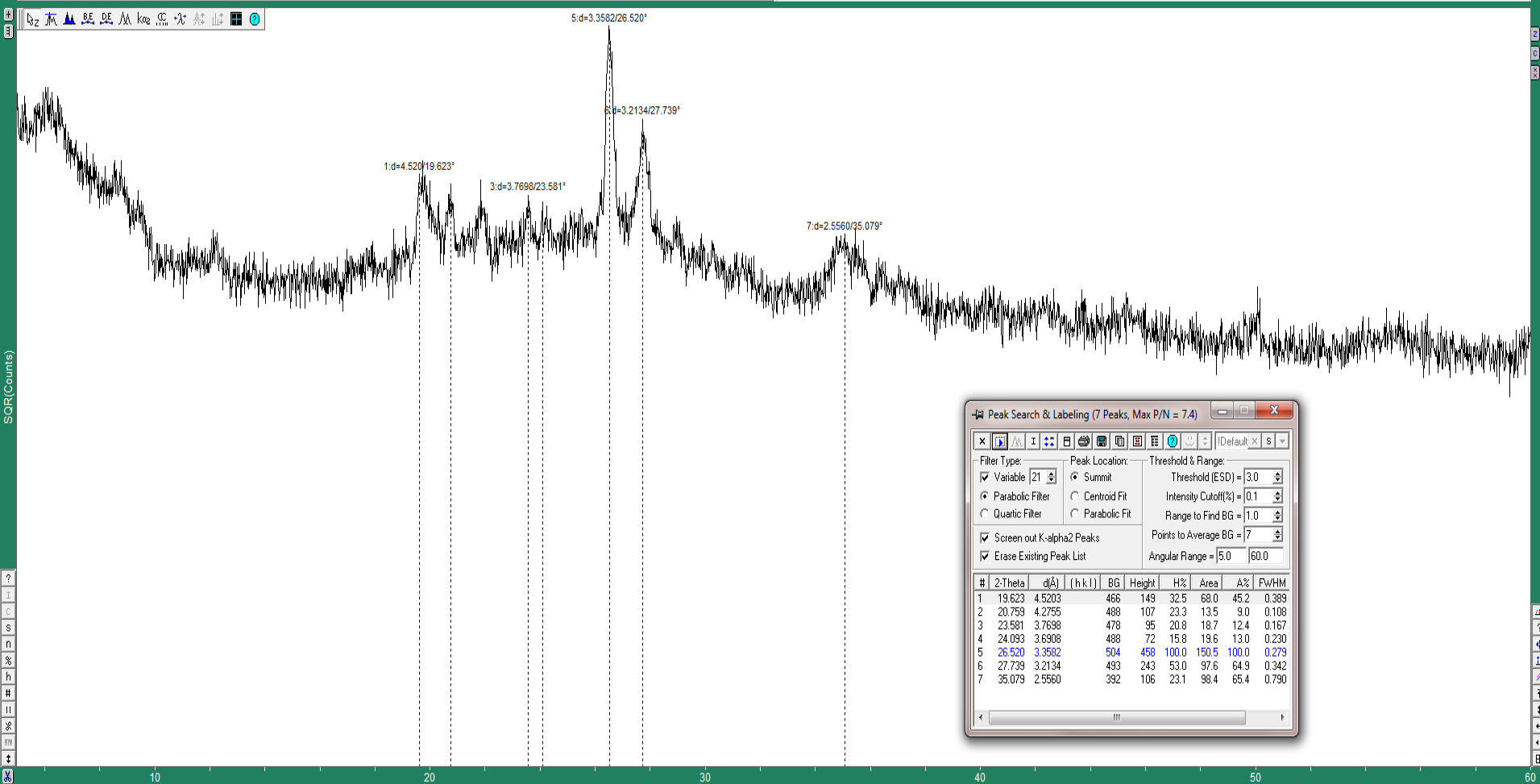
Y:\Enk_Gjesfjeld\BOL-55-SUR.raw BOL-55-SUR

<65.0> SW PS PE DF SK UP PV RB PK VS BC ID *XML CPS 0.0



6 Hits Sorted on Figure-Of-Merit

Chemical Formula	FOM	J	D	PDF#	Hits	#d/l	I%	2T(0)	RIR	Space Group	a	b	c	Z
Calcium, Alpha	Ca	99.9	C	98-000-0142	0	5	<1	0.000	7.30	Fm-3m (225)	5.576	5.576	5.576	4
Calcium, beta	Ca	99.9	C	98-000-0143	0	8	<1	0.000	4.82	P63/mmc (194)	3.980	3.980	6.520	4
Calcium, gamma	Ca	99.9	C	98-000-0144	0	4	<1	0.000	10.09	Im-3m (229)	4.486	4.486	4.486	2
Line	CaO	99.9	C	98-000-0284	0	3	<1	0.000	5.08	Fm-3m (225)	4.811	4.811	4.811	4
Pyrochlore	Ca2Nb2O7	99.9	C	98-000-0364	0	12	<1	0.000	7.03	Fd-3m (227)	10.445	10.445	10.445	8



Peak Search & Labeling (7 Peaks, Max P/N = 7.4)

Filter Type: Variable [2] Parabolic Filter Quartic Filter

Peak Location: Summit Centroid Fit Parabolic Fit

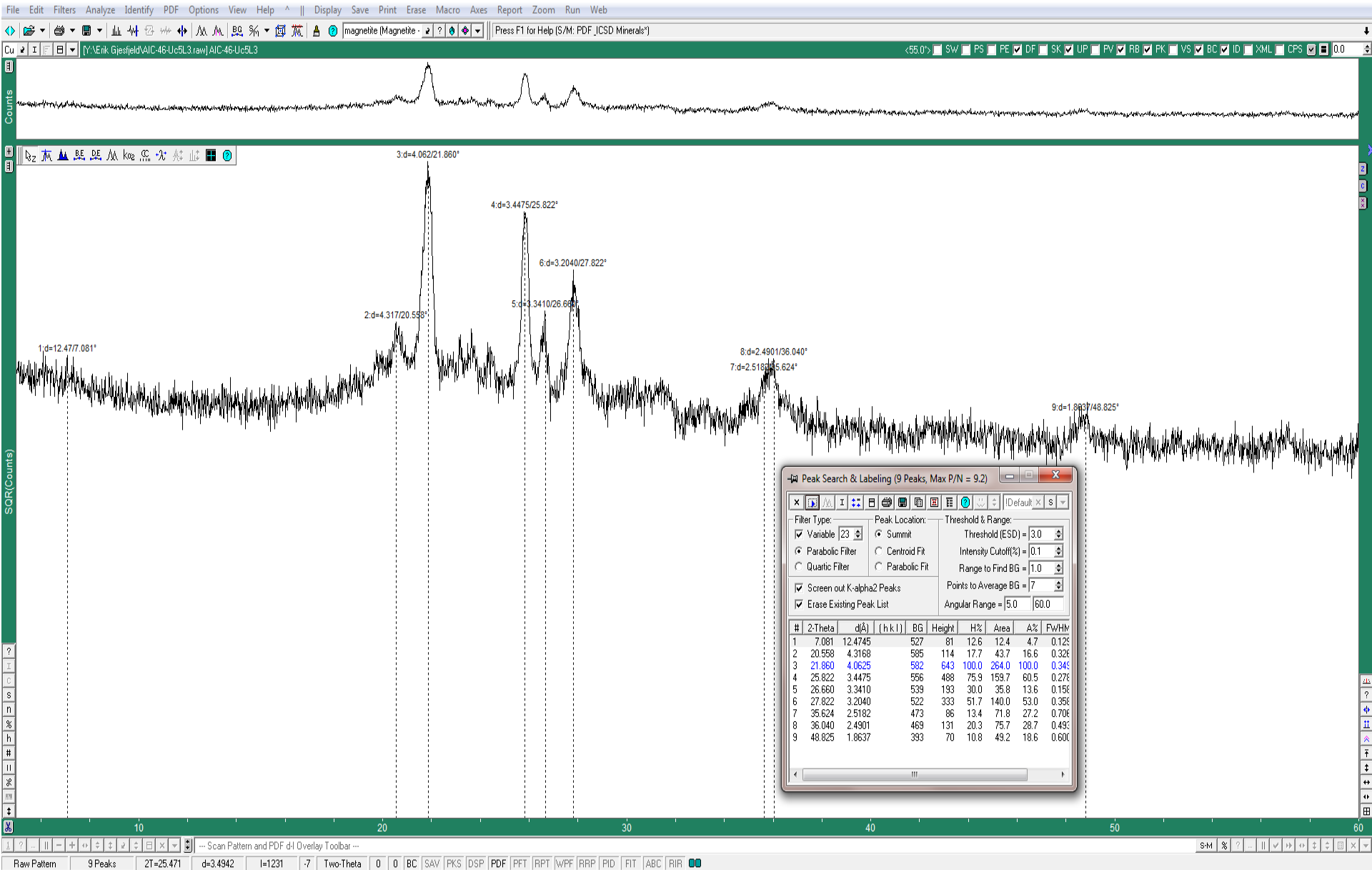
Threshold & Range: Threshold (ESD) = 3.0 Intensity Cutoff(%) = 0.1 Range to Find BG = 1.0 Points to Average BG = 7 Angular Range = 5.0 | 60.0

Screen out K-alpha2 Peaks Erase Existing Peak List

#	2-Theta	d(Å)	(h k l)	BG	Height	H%	Area	A%	FWHM
1	19.623	4.5203	466	149	32.5	68.0	45.2	0.389	
2	20.759	4.2755	488	107	23.3	13.5	9.0	0.108	
3	23.581	3.7698	478	95	20.8	18.7	12.4	0.167	
4	24.093	3.6908	488	72	15.8	19.6	13.0	0.230	
5	26.520	3.3582	504	458	100.0	150.5	100.0	0.279	
6	27.739	3.2134	493	243	53.0	97.6	64.9	0.342	
7	35.079	2.5560	392	106	23.1	98.4	65.4	0.790	

Raw Pattern 7 Peaks 2T=59.883 d=1.5433 l=743.1 -5 Two-Theta 0 0 BC SAV PKS DSP PDF PFT RPT WPF RRP PID FIT ABC RIR

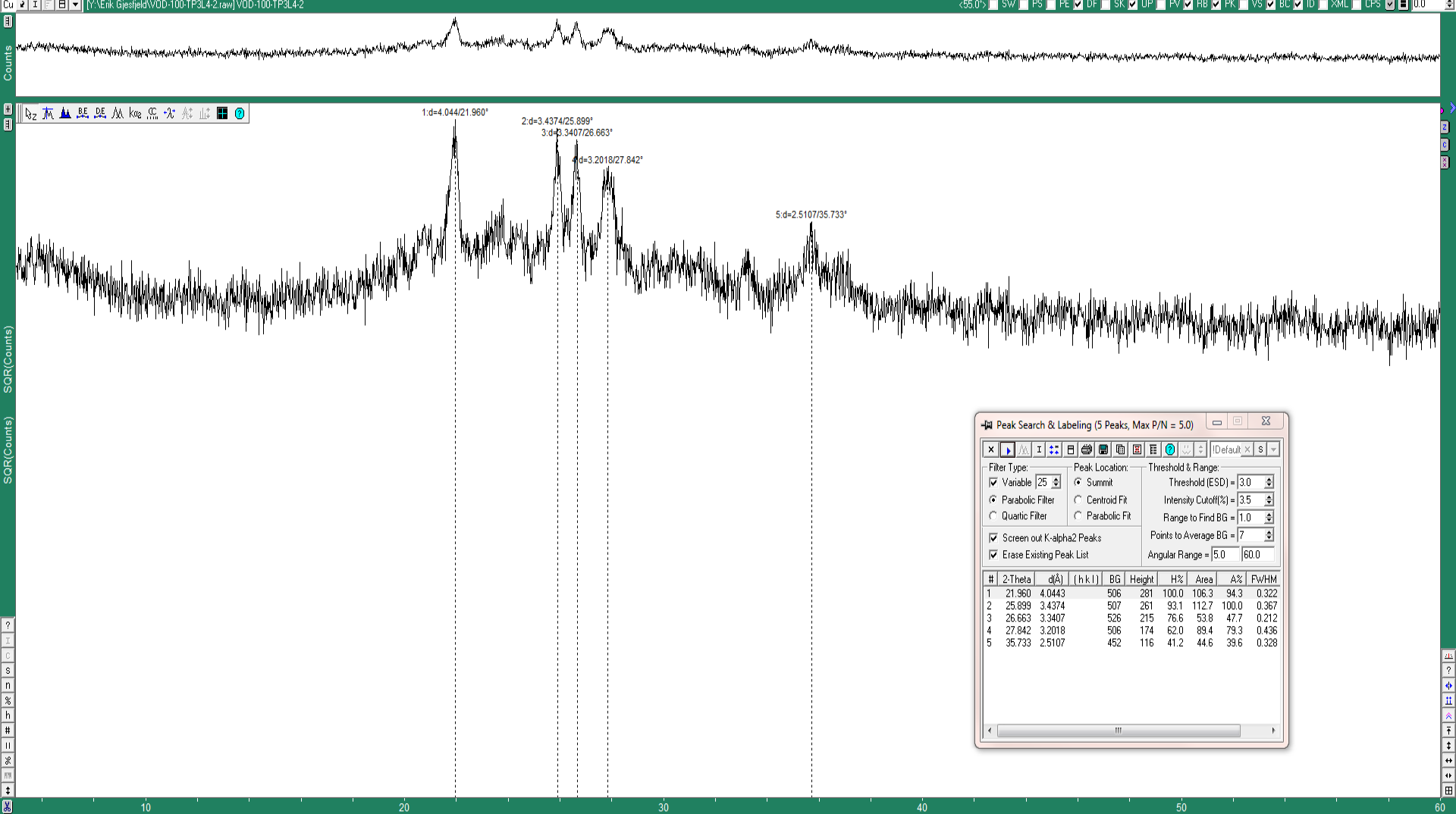
Ainu Creek FS#2263-6 – UC5 L3



Vodopodnaya FS#1024-1 – TP3 L4

File Edit Filters Analyze Identify PDF Options View Help ^ | Display Save Print Erase Macro Axes Report Zoom Run Web

Cu [Y:\Enk. Gjesfjeld\VOD-100-TP3L4-2.raw] VOD-100-TP3L4-2 <55.0°> SW PS PE DF SK UP PV RB PK VS BC ID XML CPS 0.0



Peak Search & Labeling (5 Peaks, Max P/N = 5.0)

Filter Type: Variable [25] Parabolic Filter Quartic Filter

Peak Location: Summit Centroid Fit Parabolic Fit

Threshold & Range: Threshold (ESD) = 3.0 Intensity Cutoff(%) = 3.5 Range to Find BG = 1.0 Points to Average BG = 7 Angular Range = 5.0 60.0

#	2-Theta	d(Å)	(h k l)	BG	Height	H%	Area	A%	FwHM
1	21.960	4.0443		506	281	100.0	106.3	94.3	0.322
2	25.899	3.4374		507	261	93.1	112.7	100.0	0.367
3	26.663	3.3407		526	215	76.6	53.8	47.7	0.212
4	27.842	3.2018		506	174	62.0	89.4	79.3	0.436
5	35.733	2.5107		452	116	41.2	44.6	39.6	0.328

Raw Pattern 5 Peaks 2T=57.716 d=1.5960 I=693.6 -4 Two-Theta 0 0 BC SAV PKS DSP PDF PFT RPT WPF RRP PID FIT ABC RIR

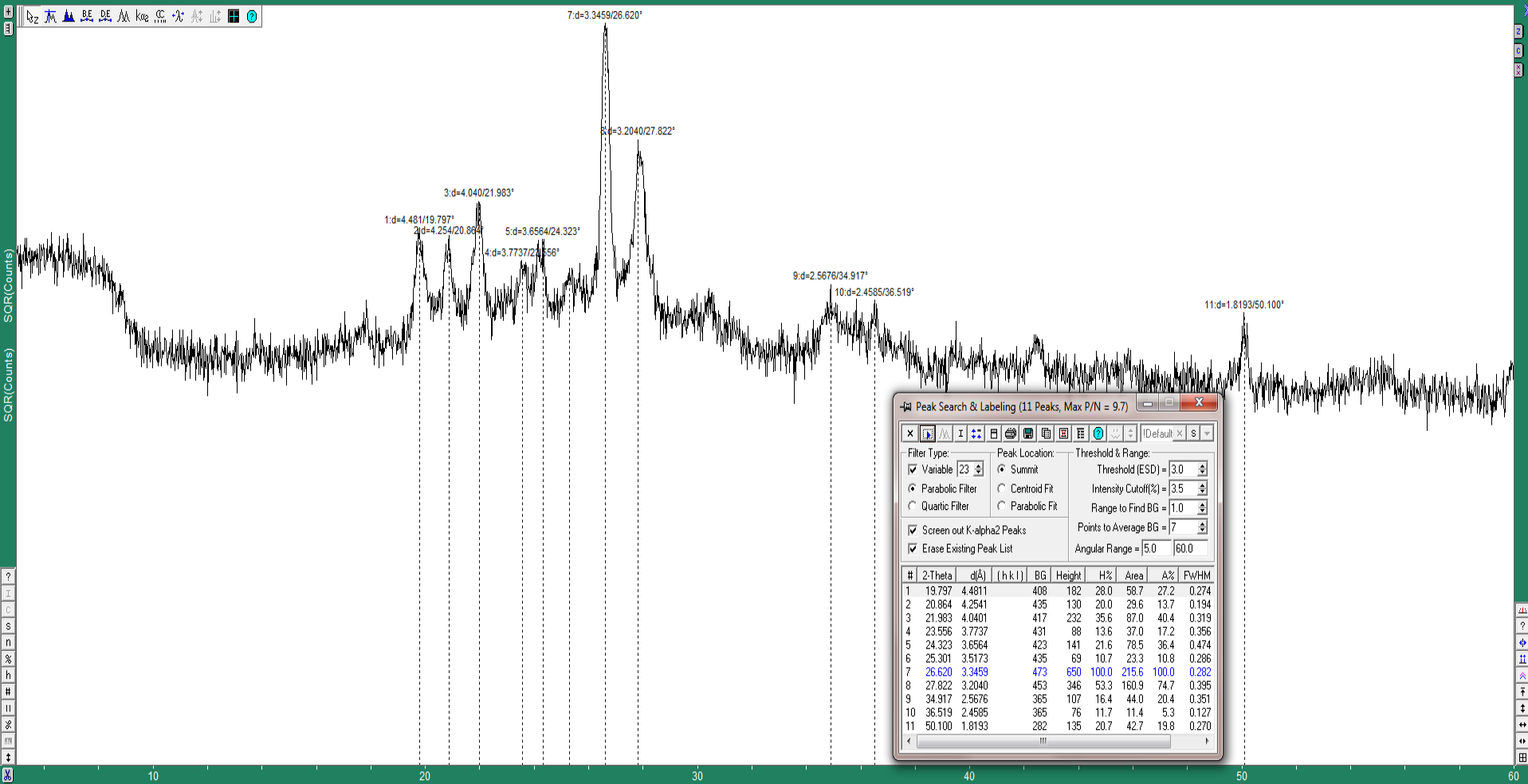
Ainu Creek FS#2594-1 – UB1 L2

File Edit Filters Analyze Identify PDF Options View Help ^ || Display Save Print Erase Macro Axes Report Zoom Run Web

Y:\Enk_Gjesfeld\AIC-24-Ub1L2-2.raw) AIC-24-Ub1L2-2 magnetite (Magnetite) ? Press F1 for Help (S/M: PDF: JCSJ Minerals)

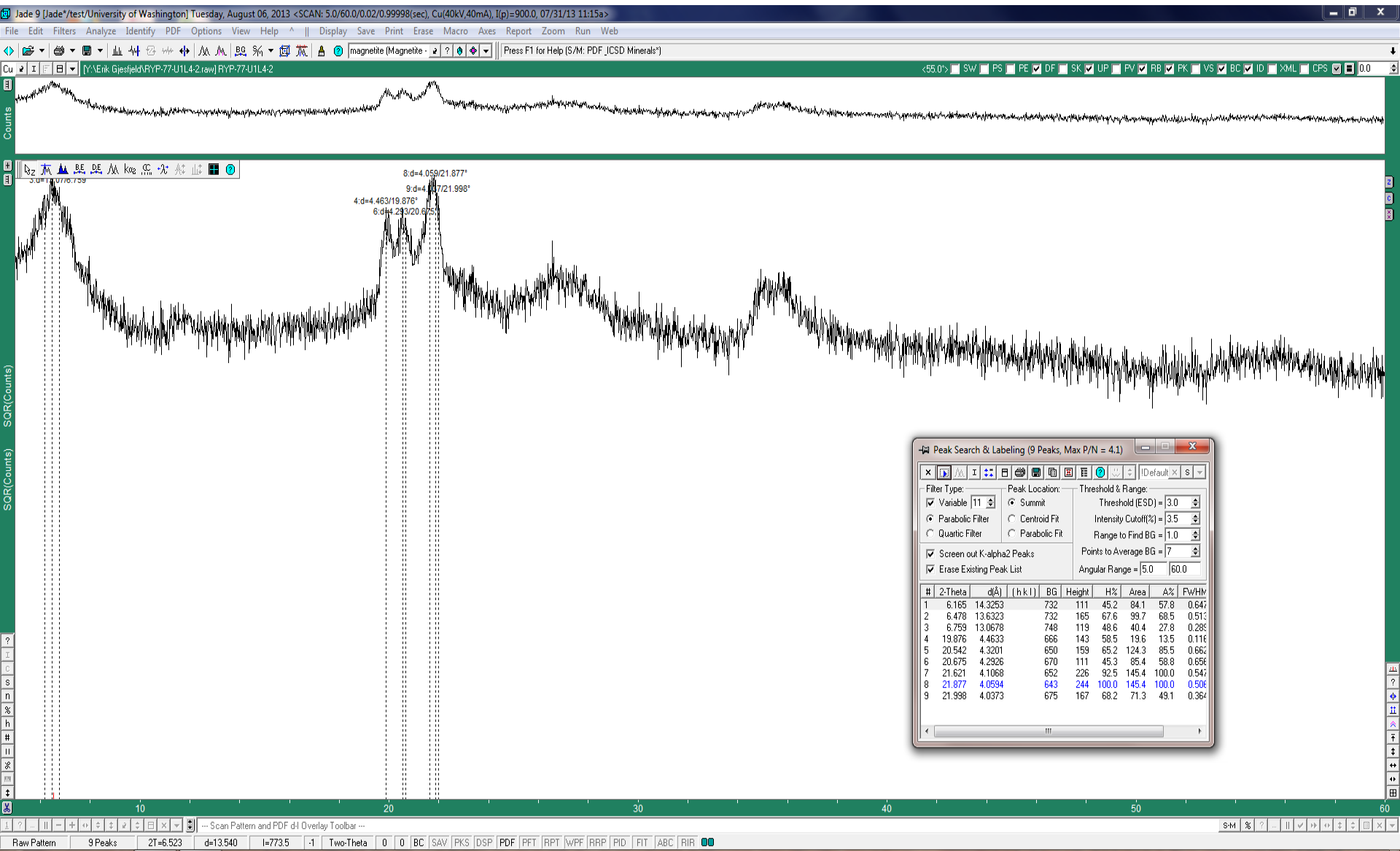
5 Hits Sorted on Figure-Of-Merit

Chemical Formula	FOM	J	D	PDF#	Hits	#d/l	I%	2θ(°)	RIR	Space Group	a	b	c	Z
Calcium, Alpha	99.9	C	C	98-000-0142	0	5	<1	0.000	7.30	Fm-3m (225)	5.576	5.576	5.576	4
Calcium, beta	99.9	C	C	98-000-0143	0	8	<1	0.000	4.82	P63/mmc (194)	3.980	3.980	6.520	4
Calcium, gamma	99.9	C	C	98-000-0144	0	4	<1	0.000	10.09	Im-3m (229)	4.486	4.486	4.486	2
Line	99.9	C	C	98-000-0284	0	3	<1	0.000	5.08	Fm-3m (225)	4.811	4.811	4.811	4
Pyrochlore	99.9	C	C	98-000-0364	0	12	<1	0.000	7.03	Fd-3m (227)	10.445	10.445	10.445	8

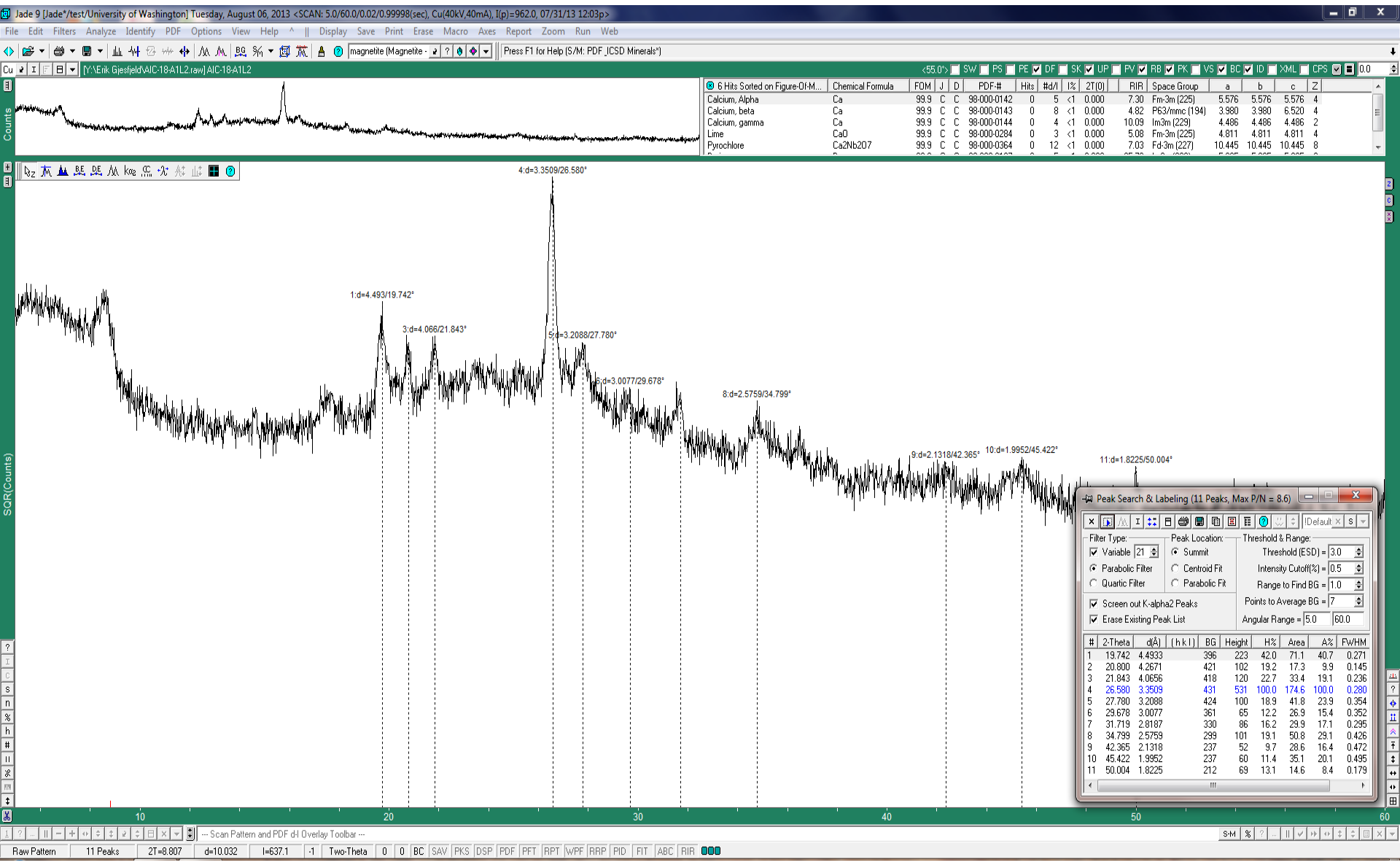


Raw Pattern 11 Peaks 2θ=59.912 d=1.5426 I=491.3 -5 Two-Theta 0 0 BC [SAV] [PKS] [DSP] [PDF] [PFT] [RPT] [WPF] [RRP] [PID] [FIT] [ABC] [RIR] [00]

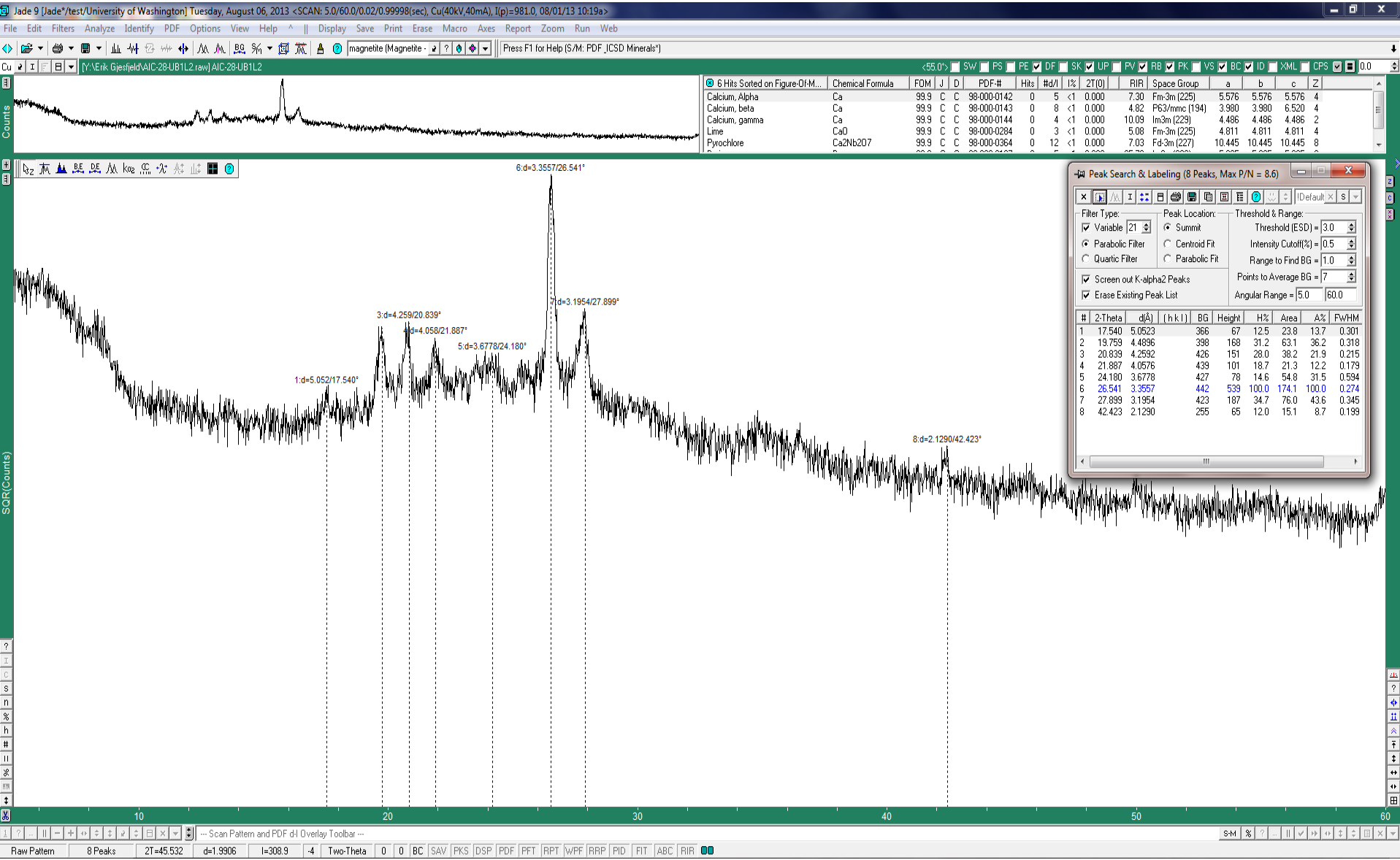
Ryponkicha FS#1874 – U1 L4



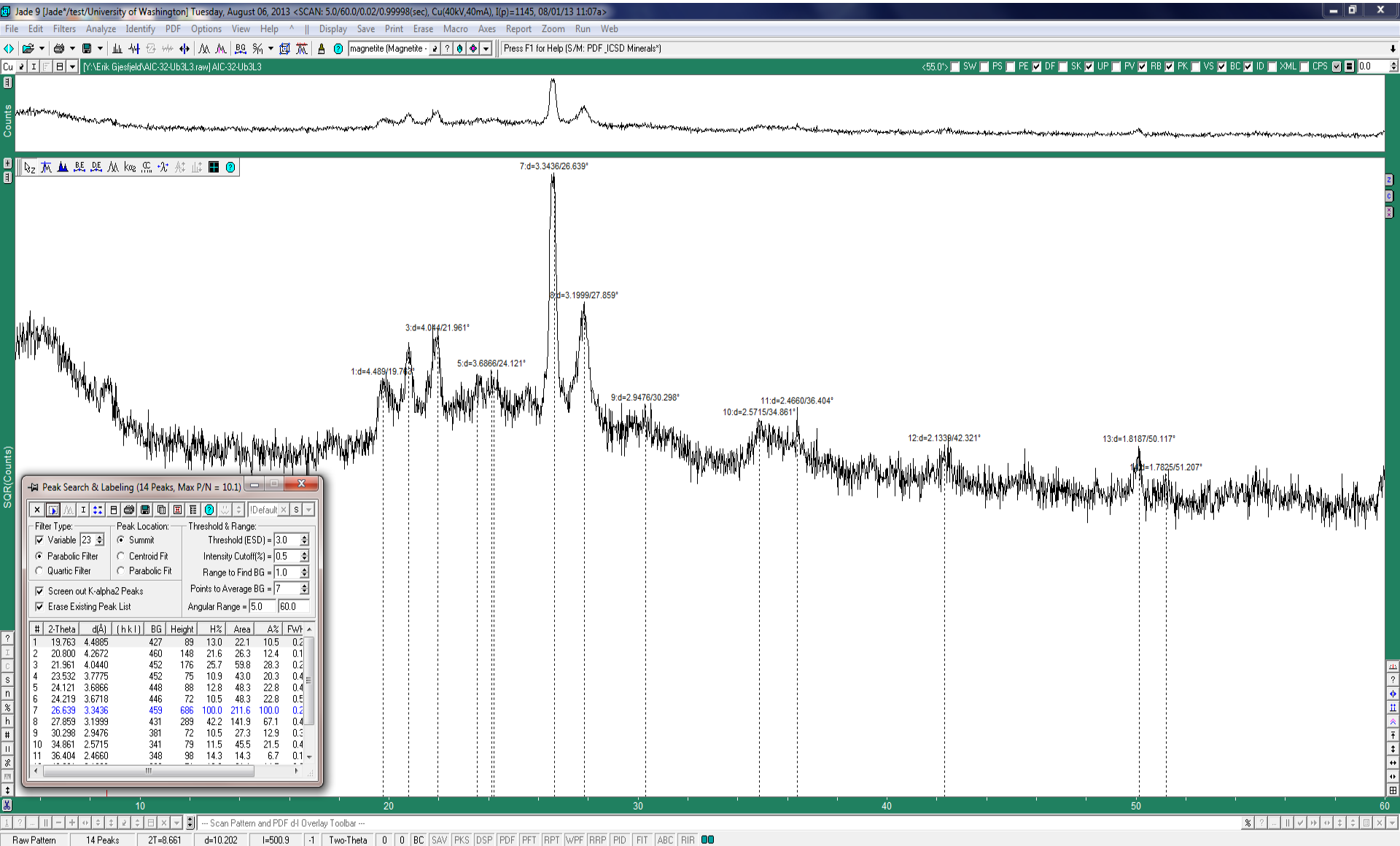
Ainu Creek FS#1288.01-1 – UA1 L2



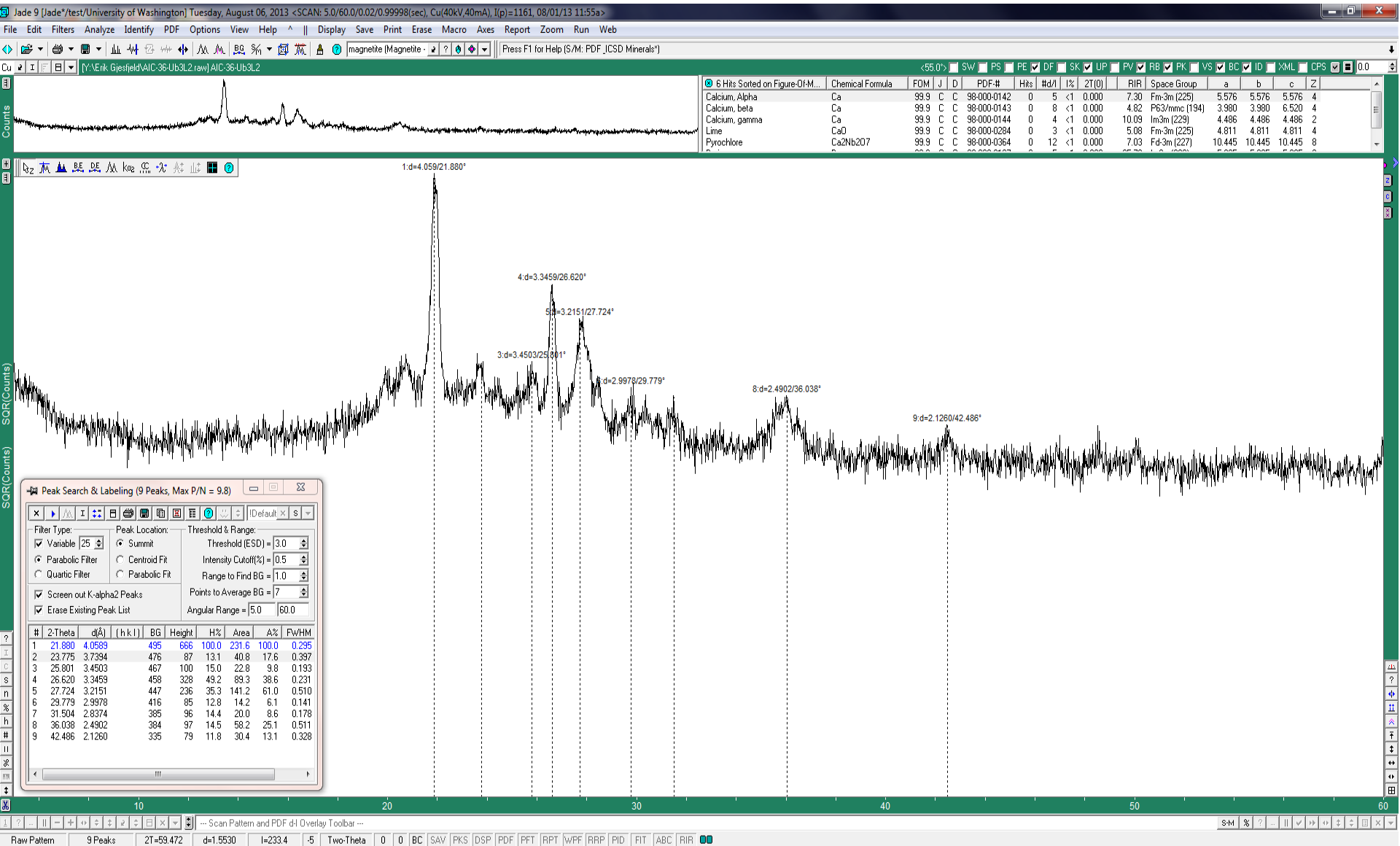
Vodopodnaya FS#1024-1 – TP3 L4



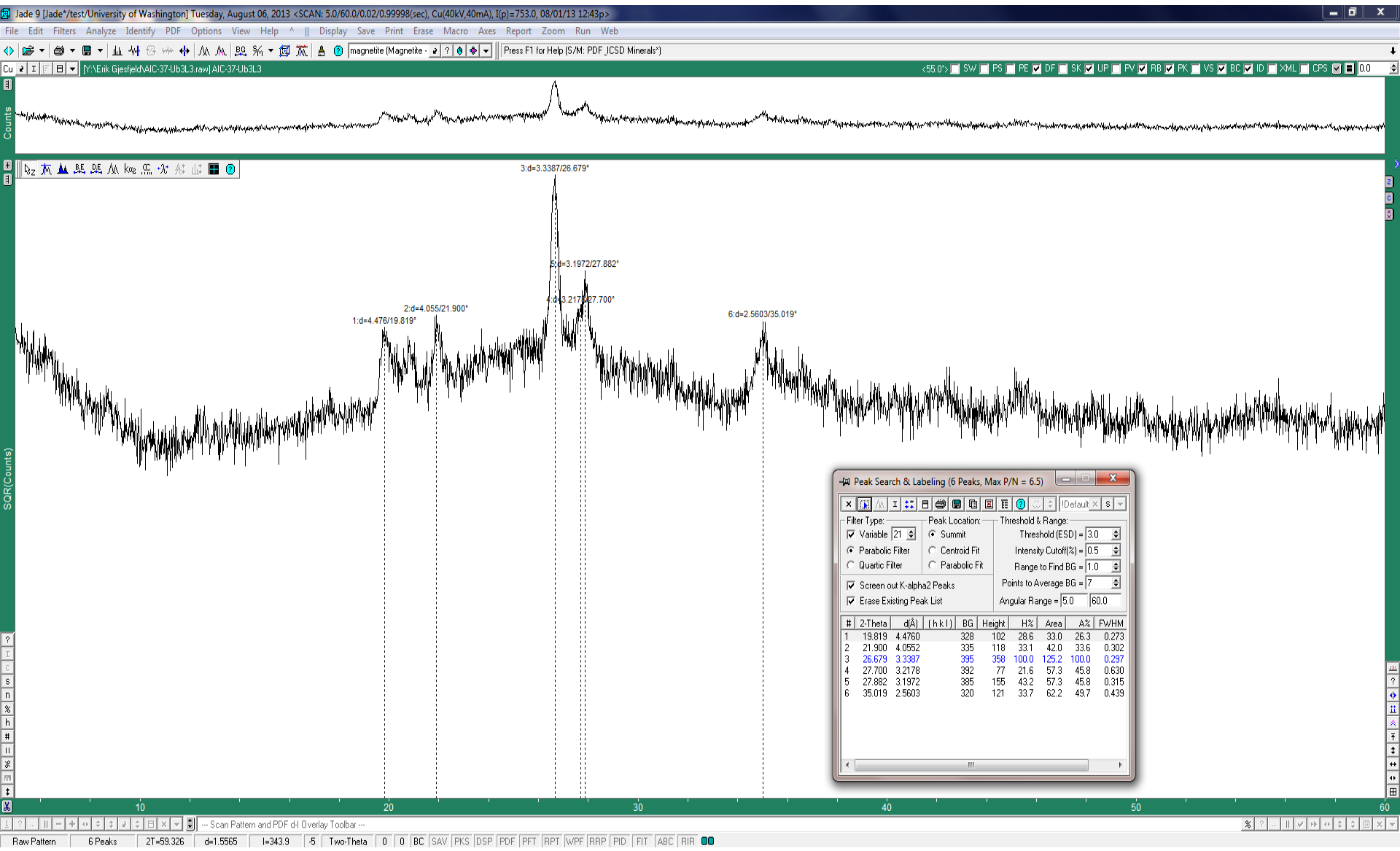
Ainu Creek FS#2569-1 – Ub2 L3



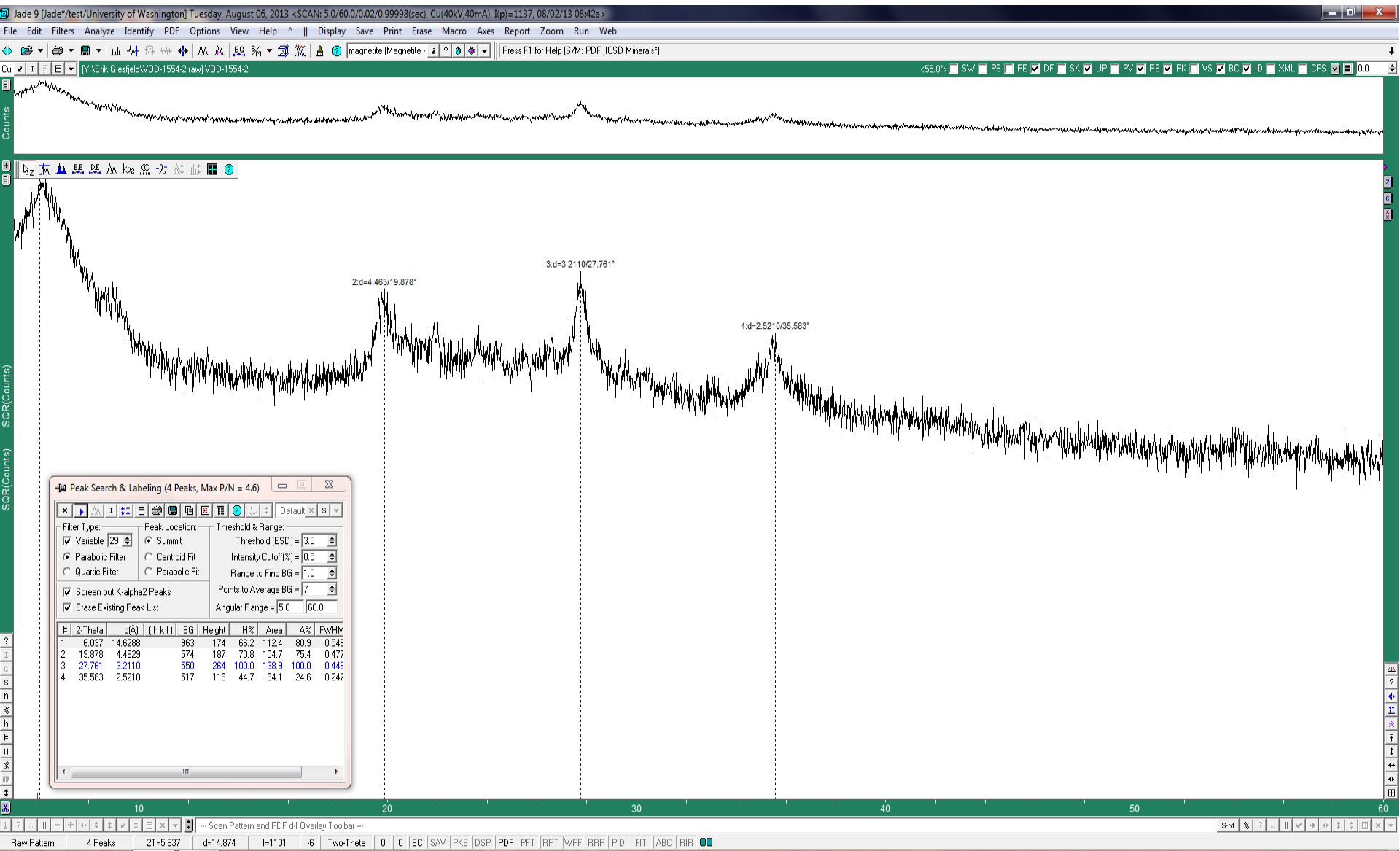
Ainu Creek FS#2567-1 – Ub3 L2



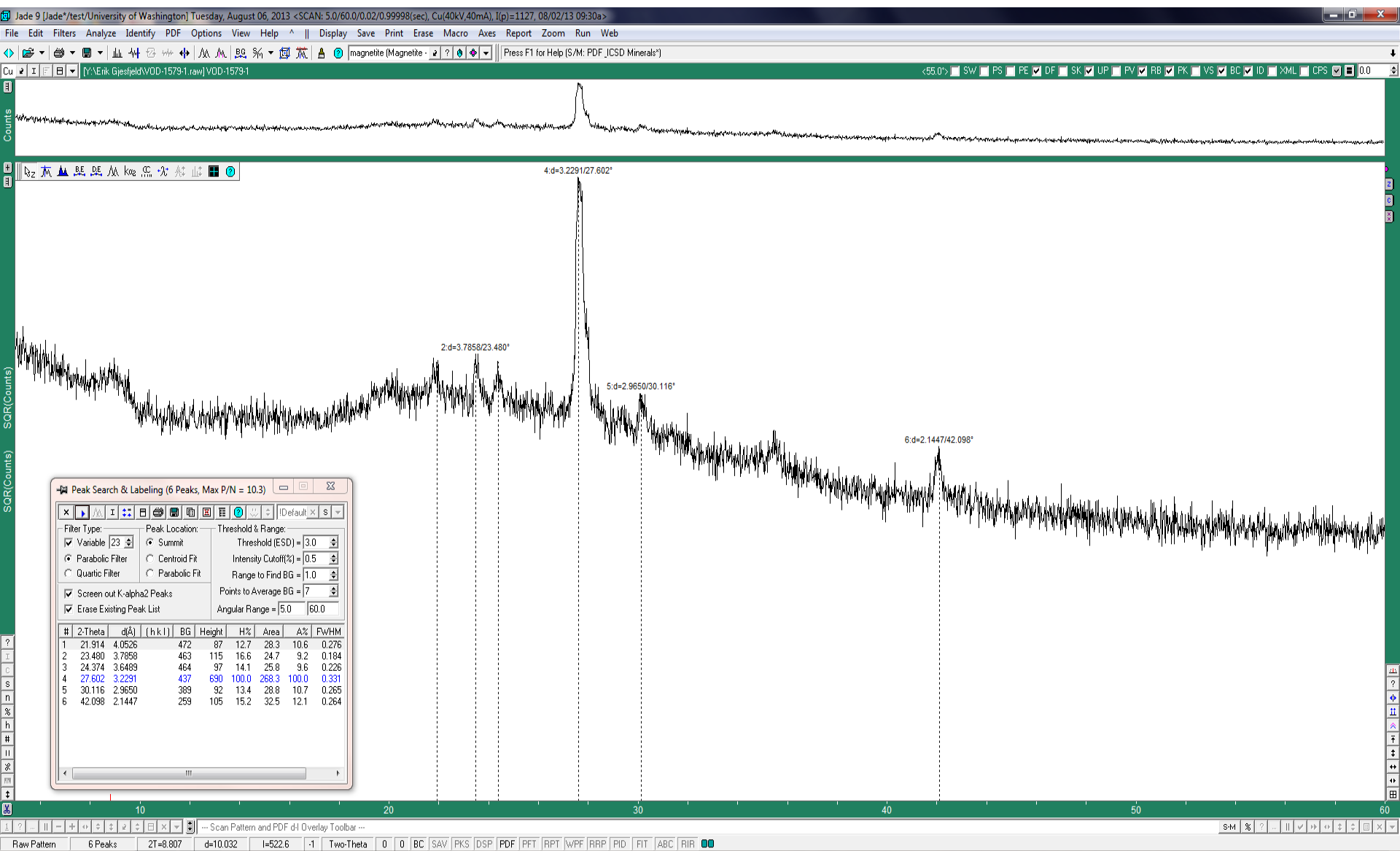
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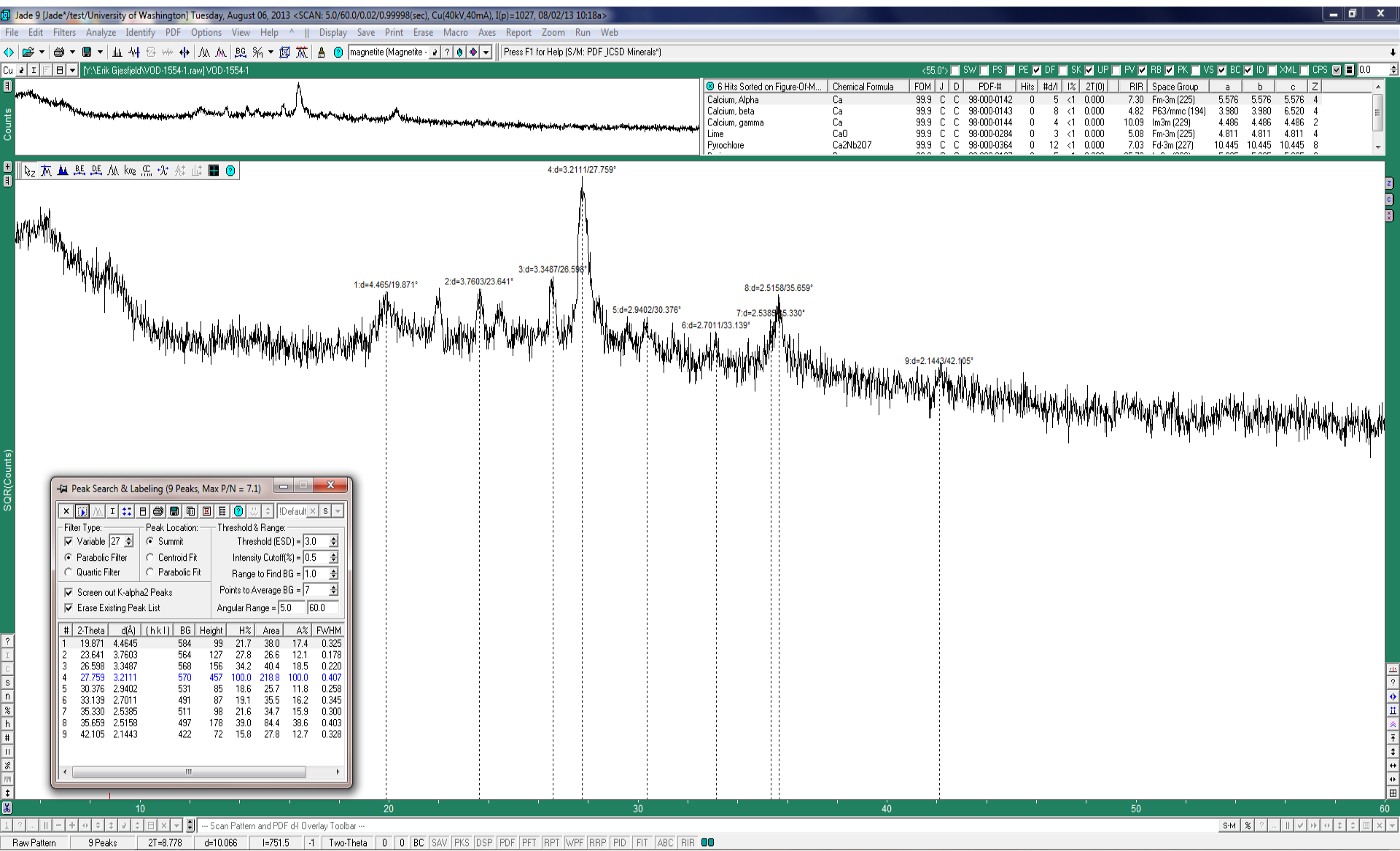
Vodopodnaya FS#1554-2 – U2 L5



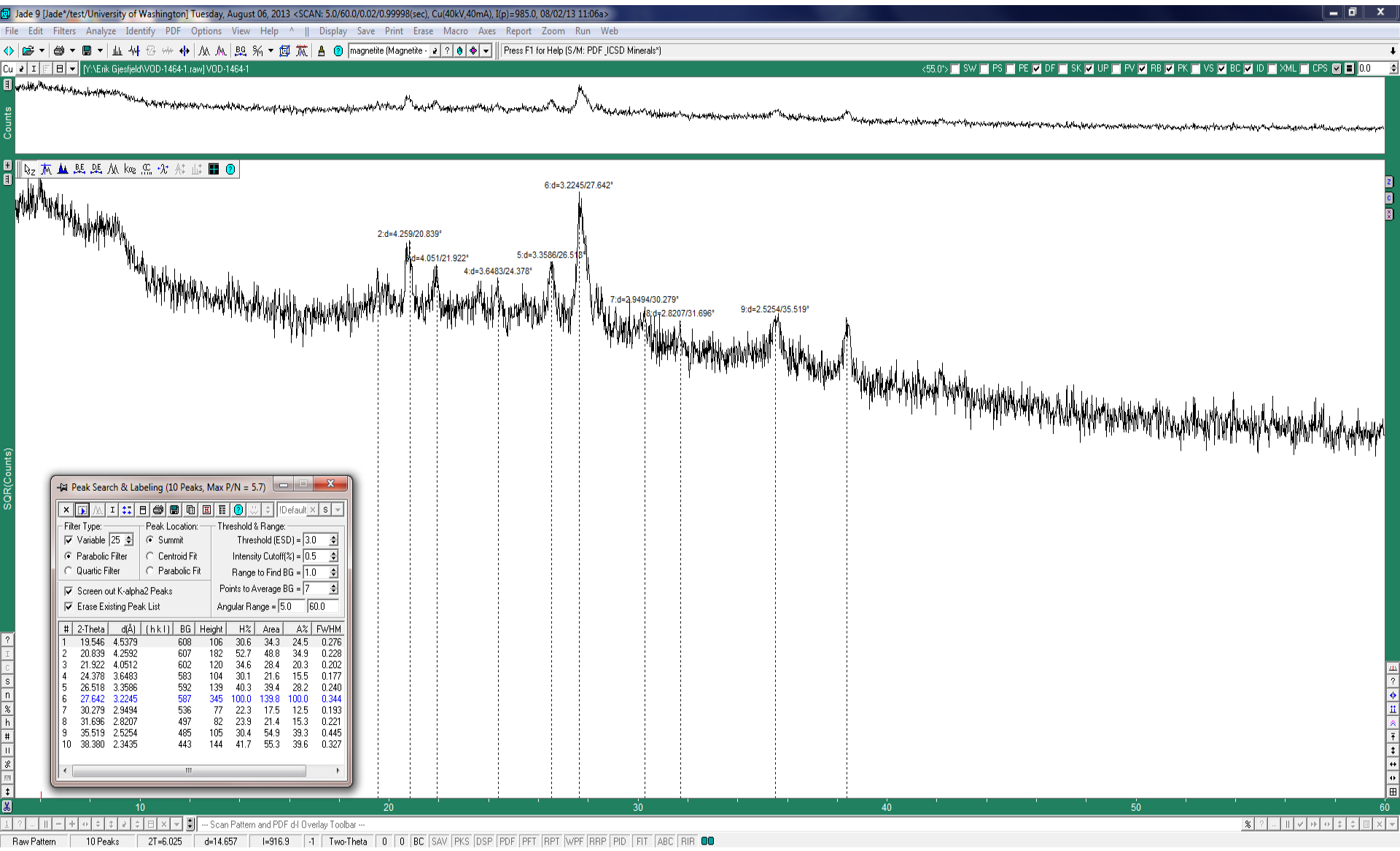
Vodopodnaya FS#1579-1 – U2 L5



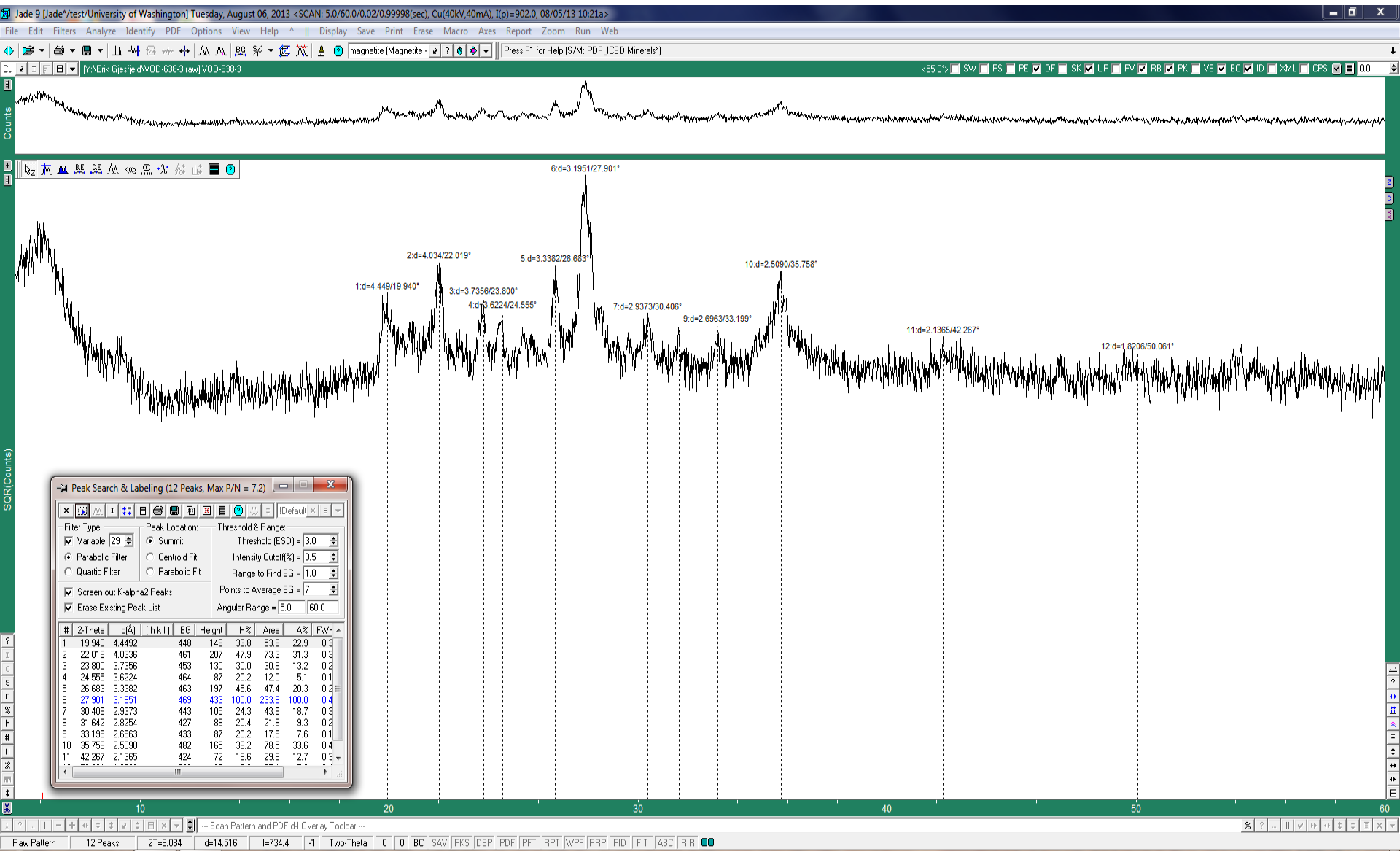
Vodopodnaya FS#1554-1 – U2 L5



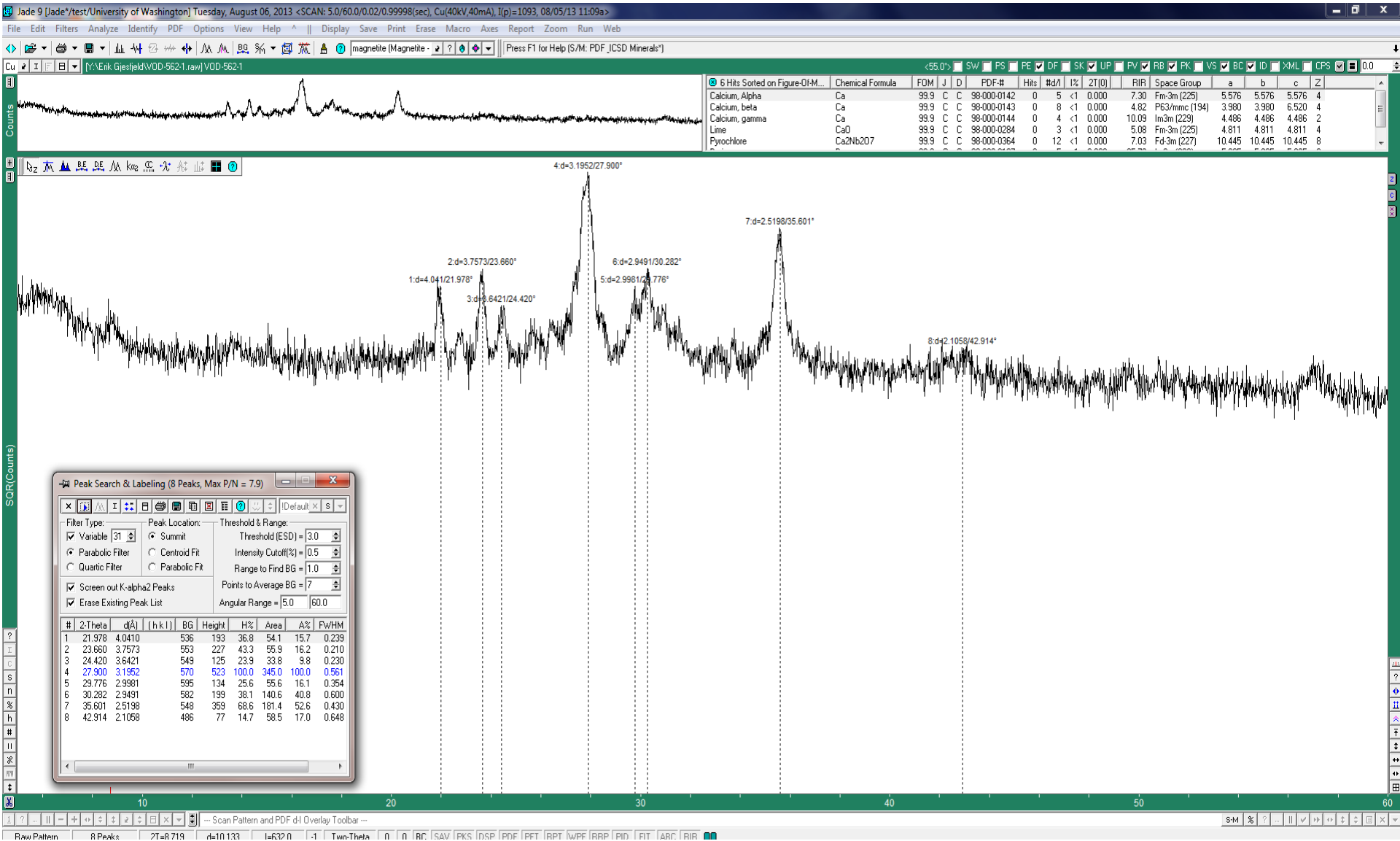
Vodopodnaya FS#1464-1 – U3 L5



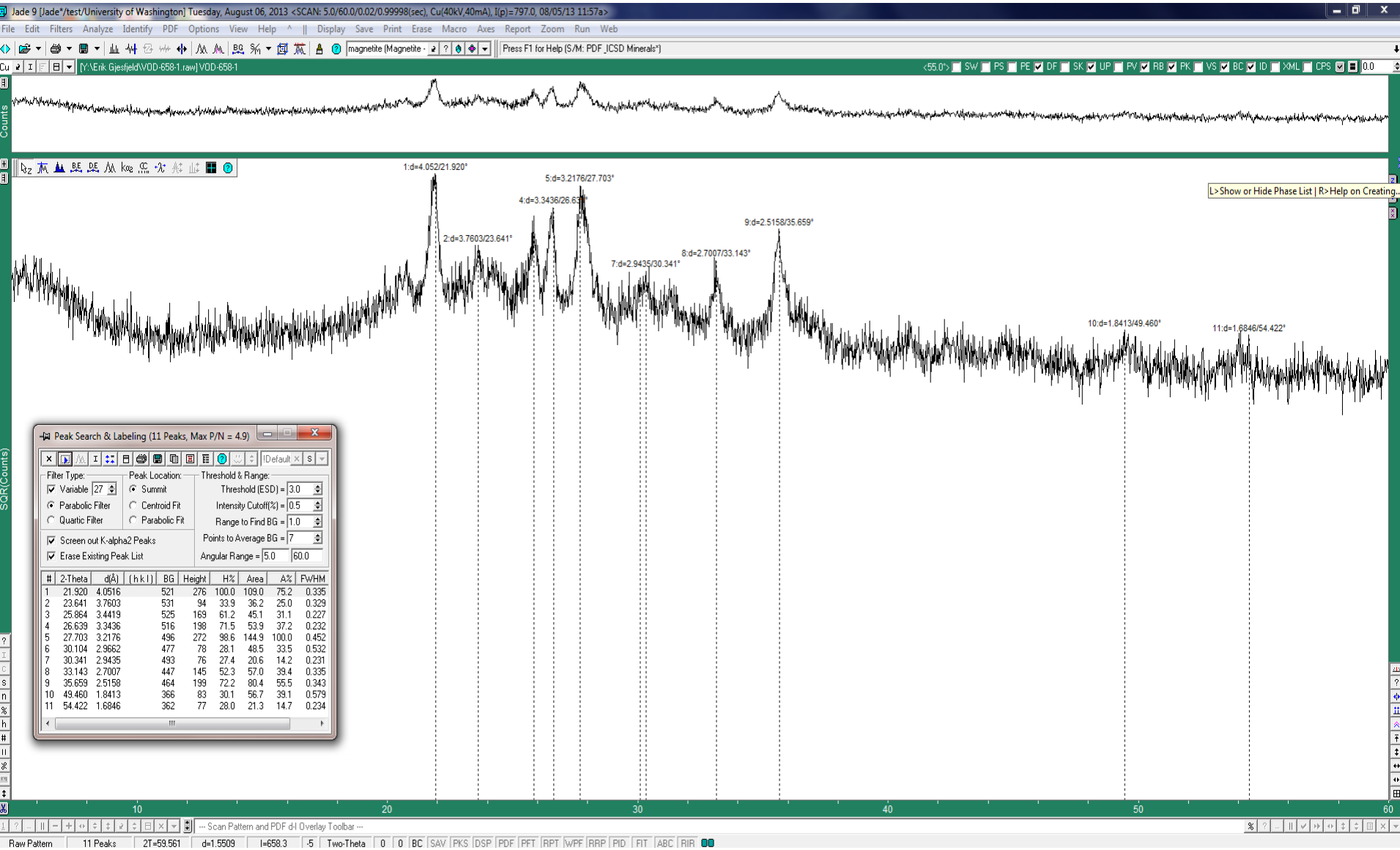
Vodopodnaya FS#638-3 – TP3 L3



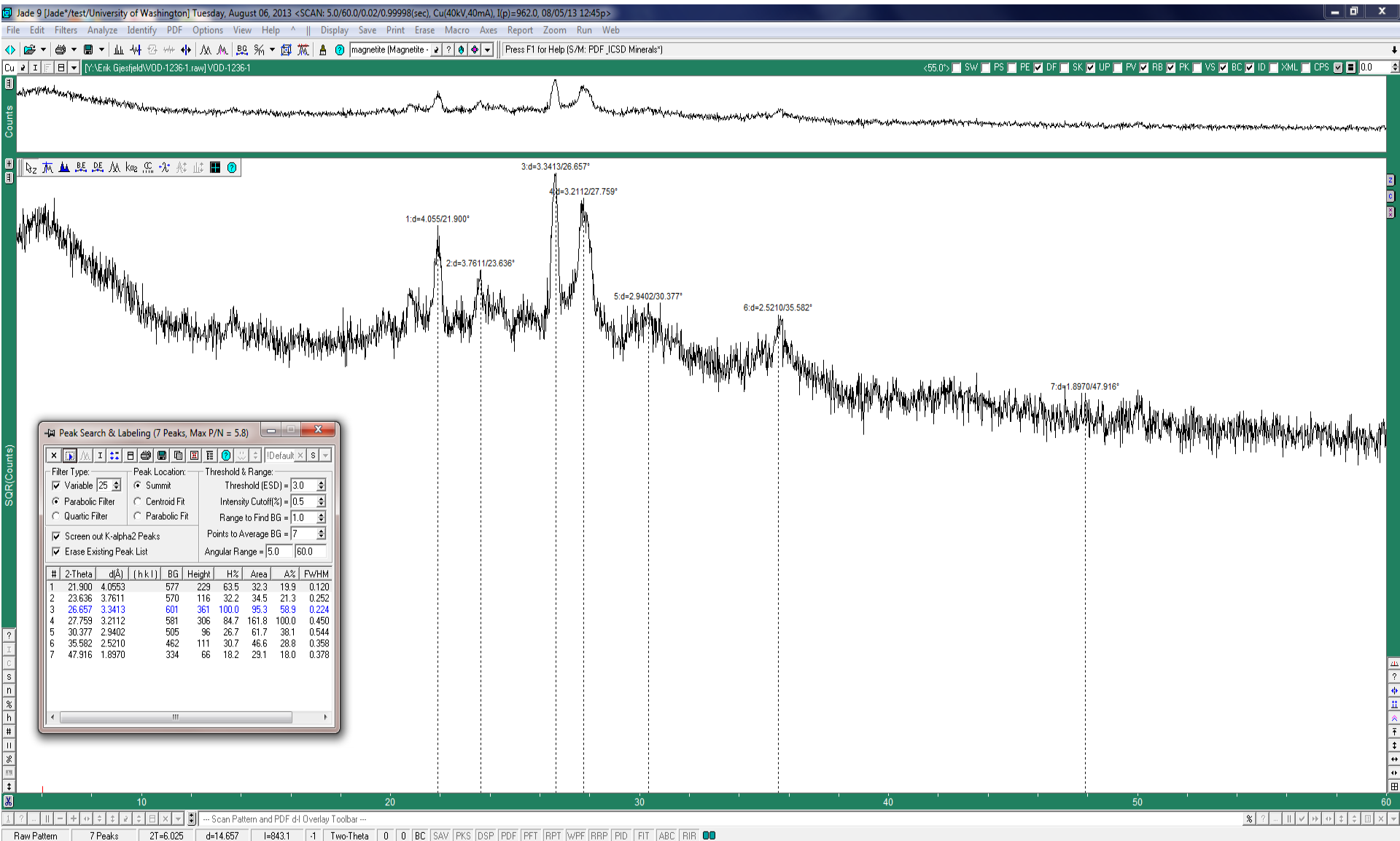
Vodopodnaya FS#562-1 – TP1 L3



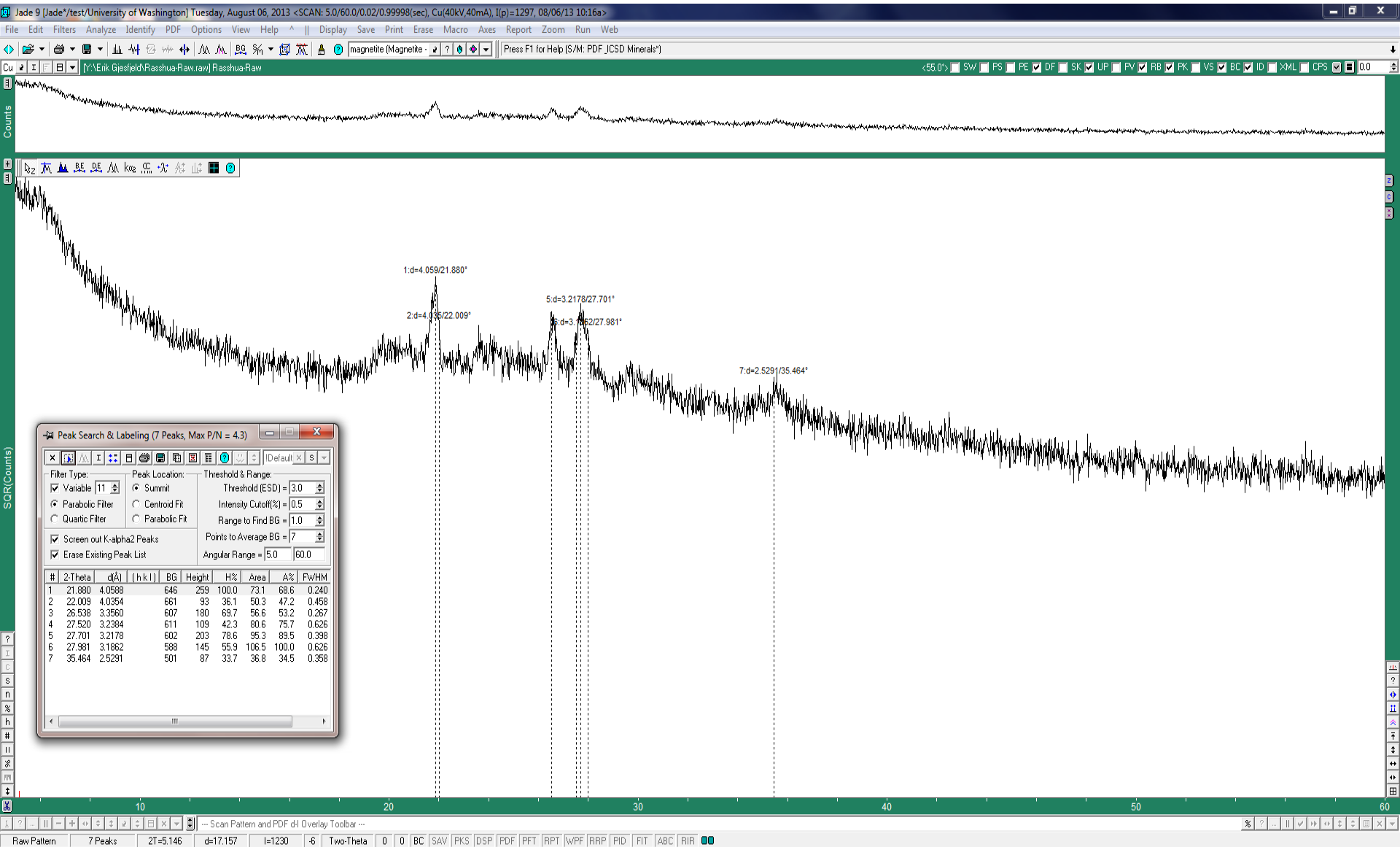
Vodopodnaya FS#658-1 – TP3 L4



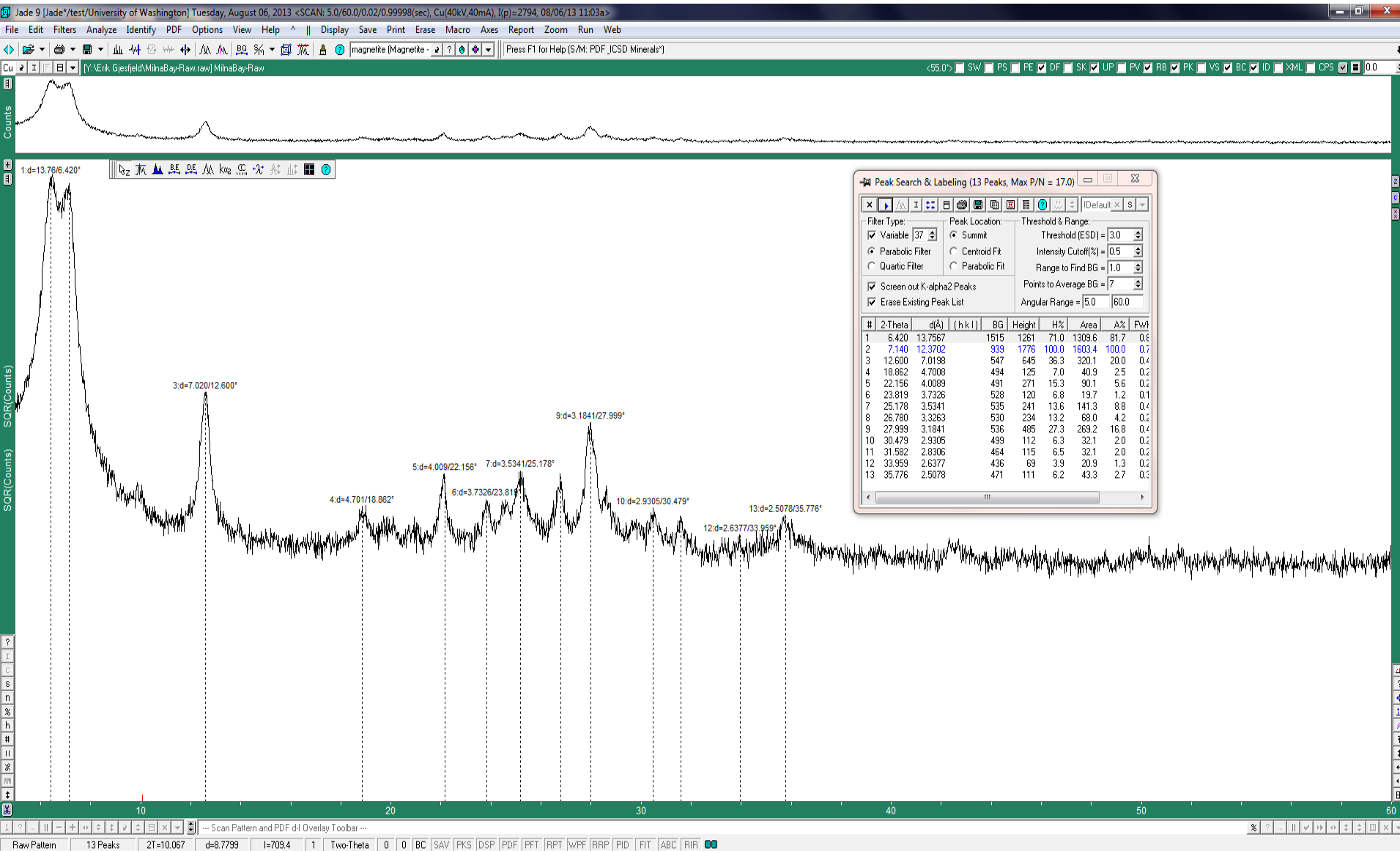
Vodopodnaya FS#1236-1 – U2 L2



Rasshua Raw Clay



Milna Bay Raw



Appendix D: Elemental Compositional Data from ICP-MS

Archived at: <https://core.tdar.org/dataset/393046>

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	
1	AIB 7921-3	18.6	30.3	81	166	20.19	139	13.2	57	1.43	0.8	14.4	0.6	7.31	167	4.53	10.8	1.45	6.46	1.70	0.58	1.97	0.33	
2	AIB 7922-3	11.34	25.5	42	187	11.8	176	15.4	58.1	1.17	0.83	16.5	0.5	2.59	174	4.77	13.4	1.70	8.45	2.34	0.63	2.61	0.37	
3	AIB 7921-5	10.71	33	82	162	22.1	190	11.5	82.3	1.88	1.0	15.4	0.1	5.69	181	6.35	14.18	1.87	8.30	2.12	0.60	2.23	0.33	
4	AIB 7921-6	10.4	13.0	10	1995	36.0	20	9.5	47.9	1.40	1.05	17.2	0.5	4.58	223	7.57	19.1	2.10	9.09	2.06	0.40	1.86	0.23	
5	AIB 7922-8a	7.89	28.0	53	189	11.96	173	16.4	45	1.63	1.1	15.8	0.8	3.95	226	5.30	14.1	1.84	9.05	2.40	0.77	2.71	0.47	
6	AIB 7921-86	11.56	39	96	174	21.9	163	11.7	114.8	1.63	1.3	15.1	0.1	5.58	159	5.22	12.44	1.75	7.59	2.14	0.61	2.11	0.33	
7	AIB 7922-1	9.8	37.1	74	121	11.47	263	19.0	96	1.82	1.0	16.1	0.9	2.85	226	6.26	14.9	2.04	9.8	2.70	0.83	2.96	0.50	
8	AIB 7922-12	9.6	19.3	37	83	15.4	248	11.5	42.0	1.47	0.74	16.1	0.5	2.15	275	7.83	17.4	2.17	9.42	2.22	0.67	2.25	0.30	
9	AIC 7971-A	18.46	27	53	268	7.7	356	15.2	78.7	1.40	1.7	13.9	1.2	1.05	263	3.65	9.32	1.34	6.30	1.97	0.58	2.26	0.35	
10	AIC 7971-B	13.74	34	59	175	6.8	423	18.3	66.7	1.27	1.3	16.1	0.1	0.97	209	3.60	9.93	1.50	7.56	2.51	0.75	2.82	0.45	
11	a	AIC 7971-C	8.9	37.2	72	465	11.2	944	18.5	82.4	1.01	1.60	19.4	2.9	1.79	457	4.31	11.7	1.60	8.71	2.39	0.76	3.08	0.42
11	b	AIC 7971-C	11.65	29.8	61	142	7.9	596	16.0	54.9	0.85	1.29	16.9	0.5	1.94	286	3.02	8.7	1.17	6.41	2.01	0.54	2.28	0.35
12	a	AIC 7971-D	5.43	29.4	39	102	11.3	355	16.9	76.4	1.25	2.70	17.5	1.0	1.12	198	5.65	15.2	2.17	11.04	3.00	0.73	2.83	0.37
12	b	AIC 7971-D	9.77	27.9	60	75	9.5	341	14.3	67.9	1.23	2.42	17.1	1.2	1.17	191	5.16	13.5	1.87	9.24	2.53	0.60	2.45	0.33
13	AIC 7971-E	12.85	30	51	125	10.2	298	14.1	79.8	1.45	1.6	16.5	0.1	1.26	166	3.41	9.26	1.38	6.52	1.99	0.58	2.34	0.36	
14	AIC 7971-F	12.19	33	44	172	13.6	339	15.4	82.3	1.38	1.4	14.8	0.1	1.39	284	3.14	8.47	1.35	6.43	1.96	0.60	2.34	0.37	
15	AIC 7971-G	11.46	22	139	222	23.3	590	22.6	60.1	2.09	1.5	14.4	0.1	2.10	740	6.94	15.22	2.55	12.88	3.89	1.00	4.47	0.72	
16	AIC 7971-H	7.48	21.8	10	83	20.2	232	18.4	75.7	1.97	0.67	14.8	0.5	1.14	259	7.49	22.0	2.52	11.73	3.13	0.87	3.36	0.52	
17	AIC 7971-I	15.55	26	64	318	26.7	341	16.5	57.2	2.16	1.8	15.4	0.1	2.38	328	6.97	17.91	2.42	11.23	2.94	0.81	3.12	0.46	
18	AIC 7971-J	5.35	31.8	10	257	8.6	340	18.7	60.7	0.72	0.26	16.1	0.5	0.58	184	3.05	9.0	1.25	7.09	2.39	0.72	2.91	0.46	
19	AIC 7971-K	3.52	42	32	439	9.5	299	19.2	100.3	1.31	0.7	15.3	0.1	0.56	202	3.04	8.43	1.31	6.97	2.44	0.81	3.03	0.48	
20	AIC 7971-L	9.61	29.0	46	93	7.3	268	17.2	59.4	0.86	1.32	18.1	0.5	1.30	157	3.37	9.7	1.36	7.46	2.34	0.60	2.75	0.39	
21	AIC 7971-M	13.29	25	34	223	14.3	573	16.5	85.3	1.62	1.2	12.8	0.1	1.30	244	4.12	11.22	1.47	6.58	2.15	0.60	2.37	0.38	
22	AIC 7971-N	17.97	24	11	139	6.2	252	14.0	58.7	1.04	0.4	12.6	0.1	0.39	166	2.24	6.78	1.10	5.85	2.07	0.72	2.44	0.39	
23	AIC 7971-O	9.3	23.6	39	144	13.4	300	13.8	66.6	0.75	1.49	15.2	0.5	1.74	169	3.13	8.6	1.19	6.38	1.89	0.42	2.08	0.29	
24	AIC 7971-P	8.92	33	57	150	11.7	470	17.9	97.2	1.36	1.7	14.9	0.1	1.73	342	3.64	9.81	1.49	7.26	2.19	0.69	2.57	0.40	
25	AIC 7971-Q	13.05	24.8	27	141	13.9	295	16.3	60.9	1.05	0.71	16.0	0.5	2.77	199	3.90	11.9	1.44	7.48	2.20	0.61	2.74	0.40	
26	AIC 7971-R	7.66	31.8	58	117	7.35	276	18.2	65	1.25	1.2	17.6	1.4	1.36	247	3.47	9.6	1.47	7.6	2.29	0.76	2.67	0.47	
27	AIC 7971-S	10.7	28.0	41	122	8.46	556	14.4	55	1.29	0.8	14.5	3.2	0.83	392	3.68	9.7	1.41	7.09	2.01	0.68	2.19	0.38	
28	AIC 7971-T	18.57	26.5	46	86	11.23	292	17.3	66	1.19	1.3	13.3	1.0	1.59	278	3.85	10.3	1.48	7.47	2.16	0.67	2.39	0.42	
29	AIC 7971-U	13.89	28.2	29	110	9.0	399	13.7	73	1.22	0.54	12.6	1.2	0.71	374	3.38	8.5	1.26	6.71	2.20	0.63	2.23	0.37	
30	AIC 7971-V	11.33	18.6	143	186	22.20	252	22.8	60	1.72	1.6	13.0	0.9	2.03	456	5.15	12.0	2.23	11.4	3.81	0.81	4.08	0.65	
31	AIC 7971-W	15.59	24.6	147	431	22.16	211	34.0	52	1.70	2.5	15.5	1.4	2.08	734	7.92	21.3	3.35	17.7	6.08	1.51	6.36	1.12	
32	AIC 7971-X	11.77	24.9	41	165	12.4	346	16.7	53	1.48	0.80	13.3	1.3	1.70	424	4.42	11.1	1.63	8.48	2.58	0.63	2.59	0.46	
33	AIC 7971-Y	8.93	22.3	15	193	17.01	270	21.7	58	1.59	0.6	13.0	1.7	1.06	236	6.29	16.0	2.15	10.2	2.92	0.95	3.23	0.56	
34	AIC 7971-Z	11.79	27	58	206	27.0	373	18.8	72.8	2.73	1.8	18.5	1.5	2.64	410	8.93	20.9	2.93	12.91	3.39	0.90	3.11	0.52	
35	AIC 7971-AA	12.35	26	37	200	66.7	530	33.5	83.7	3.49	1.3	18.6	1.4	5.17	680	15.57	30.0	5.10	22.01	5.76	1.56	5.07	0.90	
36	AIC 7971-BB	12.17	34	60	101	11.1	448	14.8	74.5	1.43	1.9	15.0	1.0	2.35	235	3.39	9.0	1.33	7.09	2.18	0.61	2.35	0.38	
37	AIC 7971-CC	9.61	19.9	53	98	27.07	563	14.4	88	4.06	1.7	14.8	1.5	1.42	564	16.2	35.3	4.60	19.6	4.23	1.17	3.42	0.49	
38	AIC 7971-DD	10.57	30.5	45	136	6.09	284	18.2	49	1.10	1.1	14.6	1.0	0.95	185	3.11	8.87	1.37	6.94	2.21	0.74	2.51	0.45	
39	ALE 7509-1	8.35	36.6	27	170	7.21	242	12.3	56	1.19	0.4	17.5	1.7	0.53	147	1.95	5.5	0.84	4.50	1.48	0.64	1.77	0.33	
40	ALE 7509-10	11.09	28	14	79	17.9	115	27.6	110.2	2.44	1.2	18.5	1.4	3.45	207	6.72	14.4	2.31	11.17	3.33	0.94	3.41	0.69	
41	ALE 7509-11	13.18	26.5	28	70	27.42	113	13.3	71	2.76	0.8	19.2	1.8	7.83	345	5.78	13.0	1.68	7.37	1.98	0.70	2.08	0.39	
42	ALE 7509-13	17.23	32.5	16	94	12.96	118	18.0	93	2.60	1.0	17.7	1.2	1.17	277	6.53	17.5	2.17	10.3	2.80	0.91	2.97	0.51	

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
43	ALE 7509-15	10.81	26	19	111	18.0	183	26.9	98.1	2.20	1.0	17.4	1.6	2.71	451	7.41	17.1	2.72	12.50	3.93	1.21	3.77	0.78
44	ALE 7509-21	10.9	23.3	26	51	29.41	203	11.9	113	5.49	0.8	18.7	1.7	2.81	345	9.5	21.3	2.42	10.2	2.29	0.82	2.18	0.38
45	ALE 7863-4	13.15	28	19	82	26.2	160	17.2	111.9	3.04	1.3	17.3	1.6	3.06	397	7.33	21.7	2.17	9.43	2.64	0.81	2.76	0.48
46	ALE 7863-6	9.08	33.0	38	77	42.89	186	10.4	106	4.32	0.7	19.0	2.6	2.89	489	8.20	23.8	2.05	8.17	1.91	0.66	1.88	0.31
47	ALE 7863-7	11.02	22	17	80	17.3	157	41.4	72.3	1.82	0.8	15.3	1.7	4.08	249	6.79	11.3	2.72	13.51	4.28	1.29	4.29	0.97
48	ALE 7863-8	10.26	26	17	89	23.4	157	37.5	89.0	2.47	1.1	17.9	1.8	4.98	309	9.54	17.2	3.39	15.78	4.60	1.37	4.61	1.01
49	BAI 5244-36	14.56	22	82	44	9.6	328	14.2	59.6	1.75	1.3	14.9	1.0	0.72	201	7.15	17.3	2.51	11.48	2.91	0.85	2.65	0.41
50	BAI 5249-37	12.59	25	72	76	26.7	286	16.5	81.2	2.80	1.2	16.3	1.6	2.26	331	11.65	25.3	3.37	14.94	3.66	1.04	3.25	0.52
51	BAI 5249-40	19.8	22.0	81	15	9.1	312	9.6	79	1.61	0.74	13.4	1.4	0.65	187	6.59	16.0	2.22	10.61	2.54	0.68	2.32	0.33
52	BAI 5249-41	13	25.8	75	87	27.4	335	21.3	84.5	1.91	0.40	13.9	0.6	2.62	254	5.57	16.02	2.14	11.05	3.15	0.90	3.38	0.57
53	BAI 7928-8	15.6	72.0	227	202	107.1	692	45.3	164.1	2.89	1.04	33.5	4.8	11.83	865	13.47	33.36	5.15	25.44	7.08	2.14	7.19	1.16
54	BAI 7928-15	14.3	69.1	198	278	42.3	844	59.9	241.0	3.50	1.26	34.6	2.7	3.07	643	14.67	38.39	5.66	28.67	8.34	2.67	8.81	1.52
55	BAI 7928-16	5.9	27.7	59	94	17.7	358	26.3	86.1	2.02	0.55	14.9	0.6	1.38	267	6.33	16.66	2.46	12.40	3.68	1.06	3.87	0.68
56	BAI 7928-18	15.1	24.5	42	300	17.1	374	20.8	84.4	1.99	0.56	13.5	2.0	1.21	360	6.42	16.22	2.23	11.07	3.03	0.90	3.20	0.55
57	BER 7867-147	21	27.5	11	102	22.4	113	14.5	101.8	2.64	0.84	16.2	1.2	2.33	272	5.60	15.17	1.68	7.87	2.12	0.62	2.32	0.39
58	BER 7867-148	12.8	29.8	19	82	25.0	158	19.7	80.1	3.60	0.93	16.0	1.4	1.83	256	12.01	29.37	3.52	15.38	3.89	1.01	3.76	0.62
59	BER 7867-157	16.1	22.8	21	71	30.7	115	17.5	61.7	2.75	1.69	16.1	1.4	3.88	230	8.26	19.60	2.39	10.98	2.88	0.73	2.91	0.48
60	BER 7867-161	11.28	24	33	87	6.0	149	16.9	55.0	1.29	2.4	15.4	1.0	1.44	140	3.60	9.4	1.45	7.44	2.24	0.59	2.45	0.41
61	BER 7867-165	14.8	26.4	39	86	33.2	107	19.6	73.6	2.96	0.98	16.0	1.7	2.96	253	8.69	20.76	2.59	12.10	3.26	0.83	3.31	0.56
62	BER 7867-180	9.58	24	18	98	19.1	167	42.5	81.7	1.84	0.8	16.4	1.8	3.80	222	7.13	14.7	2.77	13.97	4.49	1.33	4.53	1.02
63	BER 7867-189	13.7	23.2	23	98	19.6	173	26.8	84.4	2.52	0.68	15.6	1.1	1.94	263	9.42	21.36	3.01	14.17	3.92	1.11	4.12	0.72
64	BER 7867-199	17.5	25.5	39	77	22.8	160	18.6	83.6	3.30	0.63	16.7	1.0	1.95	254	10.78	30.45	3.10	13.89	3.48	0.97	3.45	0.56
65	BER 7867-A	14.7	18.9	3	64	19.7	173	16.6	89.1	1.69	0.80	12.5	0.5	2.15	221	4.79	14.82	1.57	7.55	2.15	0.60	2.27	0.42
66	BER 7867-B	8.95	23	19	107	19.1	173	41.2	78.5	1.82	0.7	15.9	1.2	3.81	224	7.09	15.2	2.72	13.90	4.46	1.33	4.43	1.02
67	BER 7867-C	14.9	23.1	28	15	35.9	115	14.7	47	2.82	1.86	17.0	2.3	5.96	239	10.29	24.0	2.84	12.70	2.88	0.78	2.89	0.45
68	BER 7867-D	10.7	6.1	9	84	12.2	107	13.7	63.9	1.98	0.27	11.9	1.5	2.78	203	8.16	22.71	3.44	16.97	4.82	0.61	3.91	0.57
69	BER 7867-E	14.4	19.2	14	83	21.3	189	16.4	87.9	1.65	0.84	12.6	0.8	2.10	231	4.88	13.95	1.60	7.71	2.16	0.61	2.23	0.41
70	BER 7867-F	12.17	28.6	43	84	21.49	188	18.7	90	3.13	0.7	16.7	1.5	1.55	235	8.8	23.7	2.82	13.1	3.46	1.04	3.51	0.60
71	BER 7867-G	16.23	30	51	101	12.0	175	27.9	55.3	1.55	0.8	15.2	0.9	1.28	176	6.61	14.4	2.30	11.50	3.36	1.03	3.48	0.70
72	BER 7867-H	16.9	26.4	29	59	13.0	154	18.2	73	1.64	0.33	15.4	1.5	1.31	187	5.73	14.2	2.03	9.84	2.81	0.78	2.90	0.51
73	BER 7867-I	14.97	24	71	92	17.3	171	29.8	82.1	2.49	5.3	16.1	1.4	1.90	282	9.03	20.3	2.96	13.33	3.76	1.17	3.72	0.76
74	BOL 7929-7	12.8	25.3	94	68	24.4	213	25.4	78	2.18	2.31	15.0	2.2	1.71	296	9.49	26.0	3.39	15.65	4.08	1.03	3.95	0.71
75	BOL 7929-8	8.7	29.1	81	62	25.3	179	24.6	96	2.26	2.82	15.0	1.6	1.79	286	9.36	26.9	3.26	15.48	4.16	1.01	3.86	0.71
76	BOL 7029-11	9.54	36	105	58	26.5	209	26.8	154.7	2.05	4.1	15.8	1.4	1.78	304	10.03	26.7	3.58	16.39	4.34	1.08	4.57	0.75
77	BOL 7029-12	3.91	31	60	115	27.3	200	26.3	85.1	2.23	5.0	16.4	1.3	1.92	292	10.62	28.7	3.50	16.87	4.38	1.10	4.52	0.76
78	BOL 7029-13	8.98	27	92	58	25.2	207	24.9	87.0	2.25	3.0	15.9	1.5	1.77	285	9.55	25.9	3.41	15.90	4.16	1.04	4.25	0.73
79	BOL 7924-A	13.33	29.7	74	109	20.0	269	21.1	96.4	1.33	0.65	15.2	1.2	4.44	236	5.94	15.4	2.14	10.82	3.04	0.85	3.48	0.49
80	BOL 7924-B	16.48	39	72	105	63.6	304	24.4	107.3	2.25	1.2	21.1	0.9	6.63	392	17.13	42.0	5.03	20.43	4.82	1.26	4.68	0.76
81	BOL 7924-C	13.2	25.6	61	103	21.4	272	20.0	55.0	1.23	0.38	15.5	0.5	5.22	221	5.29	13.6	2.00	9.73	2.83	0.82	3.26	0.48
82	BOL 7924-D	7.54	30.5	82	85	27.5	372	23.3	82.5	1.54	0.32	17.4	1.3	2.32	278	5.76	17.3	2.35	11.21	3.38	0.95	3.75	0.55
83	BOL 7924-E	15.75	26.1	72	99	20.0	278	21.0	52.0	1.20	0.41	15.6	0.5	4.82	221	5.89	15.5	2.15	10.59	3.00	0.85	3.50	0.51
84	STA 679-A	1.13	18	22	63	130.8	60	14.8	53.7	12.48	8.9	18.6	3.3	7.32	336	37.13	65.9	8.50	32.41	6.06	1.13	4.50	0.66
85	CHI 7065-493	10.87	34	91	121	6.0	339	12.8	49.7	1.38	1.4	15.3	0.7	0.37	99	3.79	9.0	1.29	6.56	1.80	0.49	1.91	0.28
86	CHI 7065-498	12.74	37.3	57	96	7.8	209	15.4	77.8	1.38	0.96	15.6	1.3	0.42	116	4.89	12.7	1.69	8.13	2.27	0.61	2.49	0.36
87	CHI 7065-544	10.25	33.0	95	80	10.6	186	21.9	84.1	1.93	0.63	16.1	1.7	0.49	187	6.68	17.3	2.33	11.13	3.15	0.76	3.53	0.51
88	CHI 7065-545	9.03	28.0	44	100	13.5	411	14.7	113.8	3.21	0.48	17.0	3.7	0.57	352	12.28	28.4	3.42	14.24	3.13	0.97	2.81	0.37
89	CHI 7065-546	12.89	38	42	185	9.8	150	18.7	114.3	1.66	1.9	15.8	0.8	1.04	130	9.07	23.1	3.63	16.90	4.41	0.97	4.03	0.62

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
90	CHI 7065-550	20.09	28	142	52	6.9	255	11.1	71.4	1.98	1.6	15.3	1.1	0.51	183	6.06	14.0	2.03	9.95	2.74	0.68	2.40	0.31
91	CHI 7065-557	10.46	34	30	77	23.4	301	24.6	100.8	2.94	1.2	17.4	1.2	1.78	270	10.78	24.1	3.18	14.04	3.68	1.11	3.86	0.68
92	CHI 7065-564	8.98	33	38	60	15.8	188	14.0	79.2	2.09	0.6	16.1	0.9	1.21	212	5.99	16.1	1.73	8.21	2.08	0.62	2.21	0.35
93	CHI 7065-A	9.95	38	30	311	31.8	285	19.0	104.7	3.06	0.7	15.0	0.4	1.92	239	8.67	20.94	2.63	11.43	3.06	0.88	3.28	0.50
94	CHI 7065-B	9.15	39	109	59	6.9	326	13.6	107.3	1.66	1.0	16.1	0.6	0.54	129	4.09	9.7	1.40	6.79	2.00	0.55	2.09	0.33
95	CHI 7065-C	17.21	38	88	63	9.7	198	16.2	58.2	1.68	1.1	14.6	0.9	0.47	127	4.95	12.3	1.74	8.71	2.52	0.75	2.76	0.47
96	CHI 7065-D	14.07	29	99	151	9.8	176	11.2	73.4	1.93	1.1	15.0	1.0	0.73	95	3.78	9.0	1.21	5.87	1.69	0.43	1.78	0.25
97	CHI 7065-E	11.98	30.9	77	97	8.7	179	14.2	60.5	1.61	1.02	14.8	1.4	0.69	101	3.72	9.4	1.24	6.60	2.05	0.53	2.26	0.31
98	CHR 8026-3	15.79	34	74	67	26.9	155	10.8	45.1	1.25	1.1	15.1	0.7	4.15	142	4.22	10.5	1.46	7.04	1.96	0.52	1.94	0.26
99	b CHR 8026-5	11.28	29.3	69	50	7.3	266	14.3	39.7	0.87	1.42	14.9	0.5	1.10	149	3.93	10.7	1.50	7.65	2.13	0.56	2.48	0.31
99	a CHR 8026-5	5.02	34.6	87	61	9.2	312	17.2	48.8	1.10	1.42	17.6	0.5	1.38	182	5.10	13.6	1.84	9.26	2.55	0.71	2.77	0.39
100	DRO 7973-109	15.17	32.8	101	125	9.6	211	21.2	69.4	1.53	0.69	17.4	1.1	1.09	179	5.45	15.1	1.94	9.55	2.83	0.78	3.39	0.51
101	DRO 7973-167	9.5	31.5	94	117	10.4	246	18.3	86	2.21	0.6	18.1	0.6	1.18	209	4.74	13.4	1.68	8.47	2.54	0.77	2.78	0.44
102	DRO 7973-170	11.1	33.2	57	104	10.1	233	16.1	61	2.05	0.8	17.2	0.7	1.09	195	4.61	12.1	1.56	7.57	2.24	0.75	2.45	0.39
103	DRO 7973-A	12.75	37	112	92	12.3	249	19.1	107.3	1.80	0.7	18.2	0.7	1.22	200	5.35	14.3	1.90	9.18	2.76	0.77	2.86	0.50
104	DRO 7973-B	9.42	33.3	77	97	7.4	245	22.0	78.2	1.54	0.75	19.5	1.4	0.65	200	5.51	15.8	2.01	10.21	3.04	0.83	3.65	0.54
105	DRO 7973-C	13.3	28.7	72	103	15.3	156	21.1	92	1.98	1.2	15.5	1.1	1.69	228	4.85	12.6	1.65	8.39	2.48	0.68	2.81	0.49
106	DRO 7973-D	9.8	30.8	106	120	13.4	235	18.5	73	2.28	0.7	18.3	0.4	1.44	206	4.93	13.7	1.74	8.58	2.53	0.79	2.81	0.47
107	DRO 7973-E	10.9	33.7	114	152	12.1	208	20.3	73.6	1.44	0.57	20.1	0.5	1.47	173	4.24	13.5	1.63	8.20	2.57	0.72	3.14	0.47
108	DRO 7973-F	8.3	23	72	70	10.2	193	16.0	44.0	0.99	1.2	12.8	1.0	1.29	180	3.51	9.5	1.39	6.56	2.06	0.71	2.00	0.44
109	DRO 7973-G	5.7	29.2	62	88	15.2	318	15.9	94.1	1.82	2.06	15.4	1.5	1.66	263	5.71	14.59	1.90	9.52	2.60	0.76	2.66	0.44
110	DRO 7973-H	7.2	26.4	51	128	9.3	209	16.4	46	1.48	1.0	14.0	0.2	0.93	154	3.03	8.1	1.07	5.38	1.67	0.64	1.96	0.33
111	DRO 7973-I	18.66	29	42	84	12.0	145	24.2	52.1	1.50	0.7	14.5	1.0	1.37	152	5.16	12.7	1.92	9.71	2.99	0.87	3.09	0.63
112	DRO 7973-J	8.1	29.2	38	83	11.7	177	9.4	64.6	1.64	3.06	16.1	1.3	1.91	200	3.39	8.54	1.10	5.52	1.57	0.41	1.48	0.25
113	DRO 7973-K	12.06	29	61	36	9.6	137	8.2	55.6	1.35	2.9	15.9	0.7	1.97	197	4.10	10.2	1.42	6.94	1.79	0.47	1.40	0.19
114	DRO 7973-L	10.77	24.4	80	126	13.0	429	18.3	71.0	1.89	1.05	17.6	2.4	2.52	371	9.24	22.7	2.87	13.17	3.43	1.06	3.27	0.45
115	DRO 7973-M	16.4	29.5	89	173	7.1	216	17.8	68.0	1.23	0.80	18.5	1.8	1.22	276	4.77	13.5	1.86	9.03	2.59	0.71	3.16	0.46
116	DRO 7973-N	13.81	29	68	25	9.6	159	7.6	62.8	1.29	2.7	16.1	1.1	1.58	217	3.75	9.4	1.35	6.43	1.77	0.41	1.37	0.16
117	DRO 7973-O	2.9	34.1	45	99	12.4	270	22.6	100	1.91	0.6	15.2	0.3	0.80	299	4.58	11.2	1.72	8.86	2.77	0.88	3.08	0.50
118	DRO 7973-P	13.4	28.0	60	54	7.9	86	10.4	66	1.67	2.6	16.5	0.7	1.60	111	2.91	8.5	1.11	5.84	1.75	0.47	1.58	0.22
119	DRO 7973-Q	5.15	45	140	225	16.7	441	21.6	88.0	2.00	0.9	20.3	0.4	2.23	294	7.68	23.9	2.81	13.00	3.68	1.04	3.75	0.67
120	DRO 7973-R	11.78	28	187	510	23.9	875	25.3	106.4	2.31	0.8	17.8	0.4	3.50	773	21.33	44.0	6.04	26.75	6.16	1.69	5.25	0.88
121	DRO 7973-S	8.9	27.6	78	177	12.0	489	17.0	79	2.42	1.0	17.3	1.0	1.91	431	8.52	21.7	2.62	12.09	3.20	0.94	2.97	0.45
122	DRO 7973-T	9.91	36	121	127	16.0	409	14.2	82.2	1.84	1.0	17.5	1.1	1.66	296	5.09	16.5	1.63	7.54	2.16	0.62	2.18	0.37
123	DRO 7973-U	9.67	39	135	146	19.0	427	14.5	88.2	2.04	0.8	19.1	1.3	2.03	315	5.21	17.2	1.72	7.78	2.21	0.65	2.38	0.38
124	DRO 7973-V	20.18	23.6	31	78	11.5	145	18.0	87.0	2.19	0.58	15.7	1.3	0.80	168	6.61	16.1	2.28	10.53	2.78	0.70	2.98	0.44
125	STA Ored-A	0.6	18.1	10	90	173.3	72	15.3	76.7	13.70	11.25	22.6	3.9	10.37	611	38.09	87.1	9.33	34.57	6.41	1.17	4.70	0.57
126	EKA2 8075-1	5.4	36	29	190	30.1	292	19.2	81.7	3.10	0.7	15.2	0.7	2.04	253	8.73	21.08	2.71	11.97	3.08	0.91	3.40	0.54
127	EKA2 8075-21	10.56	41.1	124	100	18.16	335	14.1	110	2.24	1.1	18.8	1.4	2.44	327	4.88	15.9	1.66	7.80	2.11	0.70	2.28	0.42
128	EKA1/3 8076-36	15.8	31.2	63	112	11.7	223	12.0	51.0	0.97	0.41	14.9	0.5	1.83	137	3.53	9.6	1.28	6.46	1.88	0.52	2.07	0.31
129	EKA1/3 8076-40	22.52	23.9	72	55	5.0	242	8.1	49.8	0.78	2.32	12.7	0.5	1.77	225	5.57	14.9	2.23	10.72	2.71	0.54	2.25	0.26
130	EKA1/3 8076-42	16.91	16.6	10	36	17.6	174	12.6	69.2	1.27	1.81	14.2	0.5	1.91	290	4.37	11.3	1.47	7.12	1.91	0.51	1.95	0.28
131	KOM 7172-24	12.14	30	28	36	23.7	241	19.9	90.5	3.00	0.9	17.5	1.0	1.50	198	9.58	25.1	2.94	13.32	3.63	1.09	3.30	0.62
132	KOM 7172-41	9.37	31.0	30	67	21.12	221	20.2	101	3.25	0.9	16.9	1.1	1.45	251	9.6	25.4	2.95	13.5	3.54	1.08	3.48	0.60
133	KOM 7172-44	13.41	26.9	26	60	23.2	197	15.7	77.7	2.66	0.90	17.3	1.4	1.61	170	7.76	24.7	2.52	11.11	3.05	0.83	3.07	0.47
134	KOM 7172-48	8.11	31	39	63	21.4	316	21.2	84.3	3.09	1.0	17.7	1.2	1.50	238	10.08	23.5	3.04	13.46	3.63	1.10	3.51	0.63
135	KOM 7172-50	15.16	24.4	25	86	15.0	220	19.1	67.5	2.21	0.65	16.4	0.5	1.21	162	8.19	22.1	2.69	12.40	3.27	0.99	3.58	0.53

Sample number		Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
136		KOM 7172-56	12	23	24	61	23.4	198	25.3	101.8	2.95	2.3	16.8	1.2	1.81	187	9.05	20.9	2.78	12.48	3.40	0.96	3.63	0.59
137		KOM 7172-56		34.8	24	82	23.56	306	23.5	116	3.76	0.8	20.3	2.2	1.64	298	10.1	23.9	3.00	13.7	3.55	1.09	3.65	0.64
138	a	KOM 7172-61	7.84	34.2	51	200	37.1	260	18.9	101.3	3.20	0.93	22.2	1.9	2.58	284	9.45	22.2	2.77	12.28	3.19	1.02	3.25	0.48
138	b	KOM 7172-61	9.46	31.6	43	67	34.9	239	21.2	93.6	3.29	0.74	21.4	1.3	2.35	251	10.60	25.3	3.16	14.12	3.65	1.08	3.92	0.56
139		KOM 7172-62	13.26	27	70	80	14.6	178	18.6	61.8	2.42	1.2	15.9	0.8	2.66	181	9.34	21.5	2.93	13.47	3.36	0.93	3.38	0.52
140		KOM 7172-68	7.32	27.6	21	67	19.0	256	16.5	82.9	2.65	0.63	17.6	0.5	1.35	213	7.61	22.6	2.47	11.19	3.02	0.91	3.09	0.46
141		KOM 7172-70	4.7	28.9	40	87	8.7	249	17.5	46	1.48	0.9	14.4	1.9	0.88	204	3.85	10.2	1.35	6.72	2.08	0.72	2.33	0.38
142		KOM 7172-74	9.25	31	45	53	22.5	246	18.1	100.1	3.44	0.8	18.5	2.2	1.66	215	9.26	23.2	2.86	12.99	3.43	1.00	3.20	0.55
143		KOM 7172-81	8.94	28.4	20	79	16.9	247	16.2	81.0	2.48	0.72	17.8	0.5	1.02	205	7.82	21.6	2.52	11.19	2.92	0.95	3.05	0.47
144		KOM 7172-87	9.92	34	37	63	17.5	237	16.1	86.2	2.90	0.8	17.8	1.2	1.21	179	7.36	20.1	2.17	10.24	2.72	0.89	2.56	0.47
145		KOM 7172-92	8.1	31	40	37	22.4	233	16.7	95.2	3.22	2.6	18.4	1.2	1.50	192	9.03	25.2	2.76	12.20	3.27	0.99	3.04	0.53
146		KOM 7172-93	10.33	30	35	52	22.9	252	16.9	93.4	3.20	0.7	18.2	1.6	1.66	240	8.60	22.7	2.68	12.02	3.12	0.99	3.00	0.53
147	a	KOM 7172-96	9.86	34.1	25	119	11.6	321	19.1	112.0	2.09	0.74	21.3	1.2	0.95	313	5.55	14.2	1.82	8.89	2.39	0.67	2.83	0.44
147	b	KOM 7172-96	11.23	30.6	36	84	8.4	203	17.8	85.8	1.92	0.52	19.7	1.2	0.67	177	5.01	13.6	1.60	7.99	2.15	0.61	2.54	0.39
148	a	KOM 7172-47	10.47	31.4	21	123	32.5	263	14.5	118.4	3.31	1.72	22.2	1.5	2.16	251	6.88	20.5	1.97	8.73	2.28	0.80	2.33	0.35
148	b	KOM 7172-47	8.88	28.0	30	77	31.5	262	15.9	100.9	3.47	0.77	21.2	1.7	2.11	232	8.05	24.2	2.41	10.43	2.67	0.89	2.68	0.39
149		KOM 7172-49	7.46	32.9	32	81	21.33	271	19.7	123	3.34	1.1	18.9	1.7	1.36	274	9.03	23.5	2.76	12.2	3.16	1.05	3.24	0.54
150		KOM 7172-114	7.87	27	51	113	10.3	259	23.8	78.5	2.23	0.6	16.9	0.9	1.70	164	9.06	20.6	2.86	13.08	3.36	0.99	3.50	0.64
151		KUB 7424-33	16.42	40	47	57	9.5	62	20.5	52.3	1.51	0.4	13.9	0.1	0.65	44	5.08	14.44	2.28	11.57	3.53	1.10	3.82	0.58
152		KUB 7424-59	8.77	51	28	157	33.3	193	23.6	136.7	3.79	1.0	17.1	1.2	2.58	294	14.20	27.9	4.16	18.11	4.63	1.31	4.37	0.81
153		KUB 7424-60	6.5	30	27	87	34.0	249	23.4	112.5	3.78	1.2	17.0	0.7	2.33	302	13.81	30.52	3.74	16.33	4.08	1.16	4.12	0.66
154		KUB 7424-63	8.2	32	18	41	33.1	281	23.1	106.7	3.44	1.0	17.2	1.2	2.46	298	13.47	29.6	3.78	16.39	3.82	1.12	4.07	0.62
155		KUB 7273-68	11.3	25	43	160	39.4	118	9.6	45.2	2.79	1.5	16.8	0.3	5.69	382	7.28	17.85	2.06	8.80	2.09	0.52	1.87	0.29
156		KUB 7424-84	9.51	34	43	87	11.6	309	23.1	119.5	2.60	0.4	15.4	0.1	2.62	187	9.73	22.12	2.98	13.73	3.56	1.00	3.83	0.59
157	a	KUB 7424-89	9.84	29.1	24	60	35.0	203	16.7	94.4	4.33	1.42	22.1	1.8	2.75	313	10.99	26.1	3.23	13.58	3.31	0.91	3.25	0.47
157	b	KUB 7424-89	13.41	28.3	23	38	33.2	194	20.7	82.7	3.95	1.29	21.1	1.4	2.50	301	13.76	33.9	4.03	16.76	4.09	1.13	3.97	0.59
158	a	KUB 7424-90	6.09	35.2	10	89	29.8	254	31.2	124.1	4.13	0.72	23.2	1.8	2.66	341	16.51	34.7	4.52	19.30	4.81	1.35	5.22	0.75
158	b	KUB 7424-90	13.69	31.2	32	90	25.7	240	31.0	102.4	4.10	0.30	22.2	1.6	2.44	325	17.09	37.5	4.66	19.66	4.82	1.41	5.24	0.77
159		KUB 7424-92	16.85	30	20	33	27.1	157	15.3	94.3	3.64	0.9	18.2	1.2	2.35	251	11.38	28.3	3.02	12.72	3.07	0.84	2.93	0.46
160		KUB 7424-93	9.4	31	12	25	35.1	197	17.8	75.8	2.97	1.7	17.0	1.3	4.26	277	11.72	25.1	3.11	13.08	2.95	0.81	2.72	0.43
161		KUB 7424-96	5.04	28	17	62	30.2	268	24.7	85.3	3.49	0.7	17.4	1.3	2.43	329	13.26	28.2	3.67	16.04	4.02	1.10	4.13	0.67
162		KUB 7424-97	8.56	22	14	32	33.2	203	11.9	82.6	4.56	1.9	18.7	1.4	2.83	343	10.69	25.8	2.56	10.93	2.46	0.75	2.20	0.33
163		KUB 7424-99	1.78	14	4	30	14.1	171	21.2	104.9	1.79	0.5	14.9	0.1	1.68	191	6.12	16.75	2.47	12.05	3.50	1.07	3.86	0.60
164		KUB 7424-104	10.72	22	27	107	36.6	146	13.6	61.8	3.71	1.8	17.8	0.6	4.84	311	11.01	24.10	2.83	11.64	2.71	0.79	2.62	0.37
165		KUB 7424-115	2.9	29	23	49	27.1	222	17.2	92.9	3.73	1.1	20.4	1.3	2.20	334	12.27	34.4	3.28	13.75	3.35	1.03	2.98	0.50
166		KUB 7424-A	14.23	14	8	64	51.2	230	17.5	106.7	1.69	0.2	12.9	0.6	1.94	607	6.51	17.61	2.32	10.97	3.19	0.94	3.39	0.50
167		KUB 7424-B	7.33	27	32	73	30.2	226	23.5	84.0	3.98	0.7	16.8	0.4	2.37	306	13.56	29.43	3.63	15.66	3.83	1.14	4.15	0.66
168		LAL(KHA) 7924-3	19.06	26	52	25	6.8	201	11.6	43.5	1.03	2.5	12.7	0.7	1.18	126	3.51	9.3	1.31	7.05	2.05	0.53	1.91	0.28
169		LAL(KHA) 7924-4	3.8	24	40	25	10.6	237	13.6	48.9	1.08	2.0	14.3	0.9	3.00	178	3.76	9.7	1.45	7.27	2.12	0.58	1.87	0.28
170		LAL(KHA) 7924-6	17.63	24	90	25	6.9	195	15.0	40.8	1.02	1.1	12.6	1.0	1.09	121	3.61	9.6	1.38	7.04	2.12	0.56	2.31	0.35
171		LAL(KHA) 7924-7	18.04	27	30	42	8.7	147	12.5	50.3	1.10	1.1	14.9	0.5	1.92	118	3.38	9.0	1.26	6.58	2.04	0.52	1.93	0.27
172		LAL(KHA) 7924-8	17.87	25	77	75	15.1	92	9.8	38.0	1.51	1.6	15.9	0.1	2.05	135	4.19	10.57	1.39	6.22	1.69	0.40	1.85	0.26
173		LAL(KHA) 7924-9	5.19	22	58	87	9.8	187	13.8	54.7	1.30	1.5	13.1	0.1	2.95	167	3.48	9.37	1.33	6.37	1.90	0.56	1.92	0.32
174		LAL(KHA) 7924-13	4.51	26	42	30	14.2	164	14.2	72.3	1.50	1.3	13.5	0.1	1.29	199	4.54	11.63	1.60	7.16	2.04	0.58	2.11	0.35
175		LAL(KHA) 7924-15	4.2	27	54	25	14.0	187	16.8	74.5	1.38	1.4	15.2	0.9	1.25	223	4.79	12.1	1.69	8.56	2.42	0.60	2.55	0.38
176		LAL(KHA) 7924-41	16.15	32.1	64	64	7.85	132	14.9	73	1.26	1.8	17.9	1.0	2.17	159	3.29	9.1	1.33	6.72	1.93	0.62	2.25	0.39
177		LAL(KHA) 7924-43	4	23.4	44	90	10.9	218	12.5	53	1.37	1.9	14.1	1.2	3.05	190	3.68	10.2	1.50	7.53	2.00	0.60	1.80	0.30

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
178	OLY 7870-6	11	26.0	23	73	27.2	224	17.7	116	3.84	0.5	19.1	1.0	2.83	270	9.42	24.5	2.83	12.34	3.08	0.98	3.13	0.50
179	OLY 7870-13	7.6	34.3	19	188	8.4	386	14.9	109.2	2.46	0.53	13.8	0.9	0.48	263	9.03	19.65	2.52	11.80	2.88	0.82	2.70	0.43
180	OLY 7870-14	9.4	29.8	33	186	7.6	333	16.4	53	2.32	0.1	13.7	0.4	0.50	207	8.38	19.9	2.45	11.25	2.86	0.83	2.90	0.39
181	OLY 7870-23	8.4	27.6	27	42	27.7	235	18.5	109	3.74	0.61	19.0	1.7	2.65	337	9.41	20.4	2.73	12.22	3.16	1.04	3.07	0.53
182	OLY 7870-24	13.3	25.2	29	80	29.27	212	16.0	136	4.67	1.0	22.1	2.1	3.07	485	10.1	24.3	2.81	12.2	3.00	1.00	2.86	0.50
183	OLY 7870-00A	13.5	28.2	23	44	28.0	240	17.6	129	4.10	0.29	20.6	1.9	2.58	315	9.86	21.1	2.97	12.63	3.26	1.05	3.11	0.56
184	OLY 7870-B	8.3	31.1	45	230	8.1	402	17.9	71	2.33	0.1	15.0	0.6	0.97	390	7.39	19.3	2.37	10.99	3.00	0.94	3.01	0.45
185	OLY 7870-C	5.4	29.8	46	174	9.9	367	13.6	60	2.49	0.1	14.7	0.3	0.60	305	8.23	18.9	2.38	10.74	2.68	0.81	2.54	0.35
186	OLY 7870-D	12.8	21.4	24	79	28.0	206	12.4	108	4.28	0.8	19.2	0.9	2.55	293	7.51	22.3	2.14	9.55	2.39	0.80	2.20	0.35
187	OLY 7870-E	4.9	32.3	46	273	8.6	405	14.7	65	2.39	0.10	14.6	1.3	0.48	330	8.46	18.9	2.50	11.15	2.90	0.84	2.74	0.42
188	OLY 7870-F	15.3	22.8	23	30	25.8	160	12.4	120	3.87	2.44	19.3	1.8	2.90	233	6.98	17.6	1.99	9.00	2.23	0.67	2.28	0.36
189	OLY 7870-G	11.6	27.1	24	36	28.7	215	17.2	113	3.67	0.36	20.2	1.7	2.91	222	8.97	23.5	2.75	12.01	3.22	1.06	3.08	0.55
190	OLY 7870-H	12.3	20.2	19	174	8.7	379	17.1	84	2.90	0.10	15.7	3.1	0.87	362	11.31	25.4	3.27	14.18	3.41	1.08	3.31	0.51
191	OLY 7870-08(I)	11.3	26.8	23	36	26.8	225	18.7	104	4.10	0.44	19.4	1.6	2.74	260	9.78	22.7	3.00	13.10	3.42	1.12	3.26	0.56
192	OLY 7870-(F)	13.7	25.0	18	98	17.7	273	17.7	111	4.72	0.6	22.0	1.3	1.59	307	10.34	19.4	2.89	12.54	3.04	0.97	3.08	0.48
193	STA 985-A	0.8	20.3	51	103	163.1	196	13.8	94	21.1	14.7	36.2	5.0	17.18	708	70.17	122.2	11.90	38.54	6.25	1.04	4.49	0.44
194	RAS 8077-A	11	29.6	37	99	3.1	316	17.1	56	1.63	0.10	15.2	0.9	0.31	146	5.36	11.9	1.74	8.58	2.65	0.75	2.70	0.48
195	RAS 8077-B	15.3	29.7	45	89	12.0	265	12.0	55	1.90	0.42	17.1	0.9	1.29	285	4.45	12.1	1.43	6.67	1.83	0.52	1.96	0.33
196	RAS 8077-C	14.1	37.7	48	90	12.8	194	12.6	95.8	2.00	0.86	16.5	1.2	1.00	165	3.86	10.02	1.31	6.54	1.92	0.58	2.02	0.37
197	RAS 8077-D	13.6	30.5	62	197	9.8	184	15.3	54	1.69	0.4	14.4	0.1	2.24	152	4.17	11.4	1.45	7.14	2.11	0.64	2.22	0.38
198	RAS 8077-E	11.1	31.9	70	176	12.6	254	13.9	60	1.87	0.5	15.2	2.9	3.11	250	4.50	11.9	1.42	6.72	1.96	0.61	1.99	0.33
199	RAS 8077-F(577)	11.5	32.3	73	157	14.4	248	12.6	65.0	1.76	0.47	14.6	0.7	3.11	230	4.27	11.75	1.40	6.91	2.00	0.57	1.92	0.37
200	RAS 8077-G	3.7	33.8	55	117	8.4	279	15.0	53	1.74	0.10	16.5	1.2	1.07	203	4.21	11.5	1.49	7.67	2.22	0.65	2.40	0.42
201	RAS 8077-H	10.69	39	86	309	13.5	252	12.7	57.7	1.51	1.3	15.6	0.4	2.27	194	4.51	11.5	1.49	7.24	2.10	0.60	2.06	0.35
202	RAS 8077-I	8.8	36.8	61	173	11.9	270	14.1	116.3	1.72	0.76	14.5	1.1	1.51	187	3.96	10.29	1.34	6.79	2.07	0.60	2.25	0.41
203	RAS 8077-J	11.9	40.5	57	178	10.0	272	13.4	98	1.69	0.23	15.4	0.9	1.60	229	4.52	11.9	1.57	7.74	2.26	0.65	2.45	0.44
204	RAS 8077-K	17.37	40	34	187	6.3	334	17.8	92.3	1.63	2.0	16.8	0.4	0.26	497	5.78	13.3	1.89	8.99	2.61	0.85	2.80	0.47
205	RAS 8077-L	11.81	32	49	189	10.0	264	17.2	54.2	1.66	0.7	15.1	0.9	1.69	206	4.59	11.2	1.61	7.95	2.35	0.69	2.58	0.45
206	RAS 8077-M	9.6	33.1	58	166	11.3	234	12.6	63.2	1.81	0.69	14.6	1.3	1.57	192	3.97	11.28	1.36	6.51	1.91	0.58	2.01	0.36
207	RAS 8077-N	13.61	34	47	102	15.7	158	16.1	93.1	1.93	1.1	15.5	1.0	1.68	145	6.92	17.0	2.34	11.19	2.86	0.78	2.66	0.43
208	RAS 8077-O	11.83	35	46	234	10.5	245	12.3	55.9	1.51	0.3	15.9	0.4	1.64	164	3.82	10.0	1.27	6.15	1.76	0.55	1.71	0.33
209	RAS 8077-P	12.64	37	64	119	12.6	298	19.4	62.1	1.88	0.5	16.4	0.7	1.20	244	6.08	14.3	1.99	9.43	2.71	0.82	2.78	0.50
210	RAS 8077-Q	9.5	36.2	49	113	14.9	326	12.8	75.5	2.04	0.59	16.2	1.0	1.53	218	4.67	12.76	1.55	7.54	2.19	0.61	2.28	0.39
211	RAS 8077-R	12.9	33.3	40	206	18.9	418	14.6	60.6	1.68	0.55	14.4	0.7	1.98	213	3.92	10.96	1.46	7.69	2.39	0.67	2.44	0.44
212	RAS 8077-S	13.3	40	55	165	9.0	343	14.7	62.0	1.49	0.6	16.5	0.4	0.85	215	4.95	12.5	1.69	8.37	2.44	0.74	2.38	0.42
213	RAS 8077-T	15.8	35.0	55	173	12.6	366	12.5	56	1.60	0.18	14.5	1.2	1.67	190	4.37	11.7	1.56	7.54	2.26	0.60	2.32	0.40
214	RAS 8077-U	10.09	32	46	189	9.8	188	14.9	54.5	1.45	0.2	15.9	0.4	1.41	150	4.23	11.2	1.40	7.00	2.00	0.58	2.19	0.37
215	RAS 8077-V	14.9	34.9	54	119	14.5	361	11.4	64	1.61	0.67	15.2	0.9	1.44	199	3.30	10.1	1.23	6.05	1.81	0.50	1.95	0.34
216	RAS 8077-W	10.9	34.4	38	147	16.0	331	14.4	68.4	1.76	0.58	15.3	0.9	1.38	165	4.19	10.71	1.42	7.18	2.25	0.65	2.33	0.41
217	RAS 8077-X (443)	15.45	31	41	97	9.0	359	11.8	50.2	1.34	0.5	14.8	0.4	1.20	122	3.29	8.7	1.17	5.74	1.79	0.55	1.77	0.31
218	RAS 8077-Y	13.98	34	46	115	11.1	355	17.4	53.9	1.45	1.1	15.2	0.4	1.53	149	4.28	11.1	1.43	7.29	2.06	0.61	2.45	0.41
219	RIK 7862-A	12.38	30	52	62	31.4	207	20.6	102.1	5.24	1.1	22.1	1.3	3.81	429	13.98	31.4	3.61	15.91	3.72	1.14	3.62	0.65
220	RIK 7862-B	13.93	24	23	137	21.4	106	15.0	74.0	2.36	2.3	17.2	1.2	2.04	261	6.92	18.8	2.18	10.08	2.74	0.79	2.49	0.44
221	RIK 7862-C	14.92	25	27	41	29.3	217	10.0	89.4	4.53	1.7	20.0	0.9	3.41	363	6.95	15.9	1.77	7.42	1.69	0.66	1.48	0.23
222	RIK 7862-D	14.06	30	47	43	31.1	220	22.6	106.9	4.99	1.0	22.5	1.9	3.52	469	14.50	32.6	3.98	16.58	4.00	1.19	3.98	0.66
223	RIK 7862-E	14.57	29	42	67	32.1	216	22.7	102.2	5.00	1.0	20.9	2.5	3.61	423	14.60	31.4	3.85	16.57	3.99	1.18	3.94	0.67
224	RIK 7862-F	11.6	24.7	8	139	24.6	111	14.5	77.3	2.50	0.81	15.6	1.1	2.36	268	6.28	17.07	2.12	9.79	2.67	0.77	2.82	0.46

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
225	RIK 7862-G	13.26	24	16	148	23.6	100	15.3	72.9	2.31	1.1	17.3	0.7	2.52	252	6.63	18.0	2.10	9.69	2.52	0.76	2.39	0.43
226	RIK 7862-H	16	27.9	32	63	28.7	195	20.8	99	4.57	0.83	20.0	1.7	3.45	416	12.77	29.3	3.63	15.47	3.65	1.10	3.57	0.62
227	RIK 7862-I	11.4	30.0	21	137	25.4	100	15.1	97	2.61	0.45	17.9	1.7	2.61	271	6.48	17.0	2.23	10.34	2.83	0.82	2.75	0.48
228	RIK 7862-J	10.3	26.5	14	118	25.9	98	14.8	78	2.56	0.26	16.7	2.3	2.55	278	6.79	17.2	2.29	10.47	2.87	0.77	2.75	0.47
229	RIK 7862-K	18	22.3	12	50	14.4	91	16.7	98	3.07	0.94	18.1	1.6	2.47	223	6.34	18.2	2.13	9.62	2.75	0.70	2.77	0.49
230	RIK 7862-L	11.8	28.6	18	119	25.7	95	15.6	97	2.91	0.51	17.3	1.4	2.61	250	7.08	19.5	2.45	11.18	3.01	0.85	2.95	0.51
231	RIK 7862-M	13.5	24.2	14	162	26.6	75	12.3	70	2.35	0.54	15.7	1.3	2.64	241	5.82	16.6	1.95	8.90	2.40	0.61	2.37	0.40
232	RIK 7862-N	16.5	27.2	39	58	29.4	191	20.3	99	4.68	0.85	19.7	1.7	3.50	410	12.80	29.6	3.61	15.10	3.62	1.13	3.59	0.60
233	RIK 7862-O	14	29.3	34	65	27.5	195	21.1	103	4.81	0.89	20.7	1.7	3.55	400	12.96	30.2	3.69	15.52	3.84	1.21	3.71	0.63
234	RYP 7920-1	15.8	26.1	79	15	6.0	219	14.3	37	1.27	0.58	13.6	0.9	0.78	179	3.40	9.0	1.24	6.36	2.06	0.57	2.08	0.36
235	RYP 7920-6	14.4	9.3	26	46	22.9	367	13.9	75	1.73	1.28	10.8	1.1	7.11	360	5.93	13.6	1.85	8.43	2.20	0.63	2.28	0.36
236	RYP 7920-8	20.6	29.2	45	68	3.2	166	7.9	45	1.56	1.58	19.0	1.2	0.61	146	3.54	9.3	1.25	6.34	1.69	0.25	1.67	0.23
237	RYP 7920-9	12.9	39.3	50	53	43.9	240	16.2	60	1.93	2.23	15.7	1.4	5.07	243	7.29	19.5	3.02	15.41	3.37	0.84	2.80	0.46
238	RYP 7920-13	20.9	33.0	38	15	4.5	106	7.6	43	1.56	0.96	16.6	1.1	0.69	152	3.66	9.7	1.36	6.66	1.74	0.24	1.68	0.22
239	RYP 7920-14	20	31.9	45	15	4.8	93	6.1	40	1.49	0.86	15.8	0.8	0.79	127	3.45	8.7	1.13	5.69	1.46	0.18	1.42	0.19
240	RYP 7920-22	15.6	26.0	50	63	39.1	216	14.1	48	2.32	0.59	15.7	0.9	2.94	338	7.70	16.7	2.18	10.30	2.43	0.59	2.38	0.37
241	RYP 7861-12	11.8	35.5	20	79	5.8	174	15.0	41	1.12	0.66	15.4	0.8	1.03	135	3.15	7.3	1.33	7.08	2.34	0.69	2.37	0.47
242	SER 7861-13	13.8	24.4	23	80	21.5	98	9.3	107	2.07	0.25	18.5	1.4	4.30	215	3.37	10.0	0.94	4.48	1.31	0.36	1.56	0.22
243	SER 7861-15	18.5	28.8	26	37	5.4	166	15.1	58	1.30	0.10	15.9	0.9	1.56	187	4.56	11.6	1.71	8.90	2.65	0.86	2.63	0.47
244	SER 7861-16	13.5	27.5	21	45	6.4	175	13.2	61	1.33	0.10	15.8	0.9	1.26	191	4.05	10.6	1.45	7.44	2.33	0.77	2.34	0.41
245	SER 7861-31	13.9	27.3	25	50	24.3	176	22.5	97	3.08	0.58	19.2	1.5	2.62	301	9.77	23.2	3.20	14.33	3.81	1.24	3.63	0.67
246	SER 7861-35	16.8	28.6	25	49	6.5	181	14.1	65	1.30	0.07	15.5	1.0	1.33	198	3.90	10.9	1.40	7.51	2.20	0.76	2.35	0.41
247	SER 7861-39	21.3	26.2	23	80	24.5	109	20.4	105	3.42	0.96	19.7	2.5	2.93	320	8.23	19.0	2.40	10.43	2.79	0.78	2.87	0.51
248	SER 7861-41	17.7	28.0	29	62	9.5	171	13.6	60	1.24	0.10	15.3	0.9	1.76	215	3.51	9.2	1.25	6.69	2.09	0.71	2.19	0.38
249	SER 7861-A	10.8	26.6	31	72	14.8	260	13.4	121	1.99	0.28	18.9	1.4	2.20	444	4.06	14.6	1.31	6.24	1.81	0.68	2.02	0.37
250	SER 7861-B	7.4	24.9	24	71	9.2	218	11.2	62	1.36	0.10	15.9	1.0	2.06	273	3.85	10.7	1.21	6.08	1.64	0.59	1.92	0.31
251	SER 7861-C	18.6	29.2	26	99	20.87	191	25.3	105	2.72	0.7	18.0	2.5	2.05	346	9.8	22.1	3.06	14.1	3.82	1.16	3.97	0.68
252	SER 7861-D	5.08	36.7	35	138	3.24	142	15.1	45	0.86	0.5	16.3	1.5	0.13	122	1.17	4.1	0.67	3.70	1.44	0.64	1.96	0.37
252	b SER 7861-D	5.08	32.2	29	119	2.4	151	15.4	46	0.61	0.3	15.8	0.6	0.21	92	1.20	4.30	0.66	4.08	1.60	0.63	2.06	0.37
253	SER 7861-E	17.5	26.2	23	81	11.9	168	14.7	48	1.18	0.10	14.1	0.8	1.80	192	3.70	9.9	1.29	6.66	2.05	0.68	2.22	0.40
254	SER 7861-F	17.5	28.2	24	79	12.0	163	18.3	53	1.19	0.10	14.6	0.9	1.58	192	4.05	10.8	1.49	7.81	2.46	0.75	2.59	0.49
255	SER 7861-G	12.2	27.0	23	59	18.6	167	21.4	97	3.05	1.24	19.3	1.7	1.87	301	9.14	21.8	3.02	13.49	3.77	1.17	3.53	0.67
256	SER 7912-5	8	30.6	45	112	15.9	98	21.9	57	1.53	0.97	17.7	1.5	2.58	148	4.23	11.5	1.69	9.18	3.10	0.84	3.09	0.60
257	SER 7912-9	10.3	20.2	13	53	17.2	210	17.9	48	1.75	0.38	12.2	0.9	0.91	140	5.49	14.1	1.78	9.29	2.85	0.78	2.75	0.49
258	SER 7912-12	9.02	26.6	15	117	15.70	241	19.9	71	1.68	0.7	15.2	1.3	0.75	172	5.74	15.4	1.99	9.8	2.81	0.92	3.07	0.54
259	SER 7912-16	13.3	20.9	13	58	17.9	228	17.2	54	1.67	0.41	13.2	0.9	0.77	150	5.55	14.5	1.87	9.16	2.66	0.83	2.68	0.48
260	SER 7912-17	7.8	26.5	54	116	15.83	226	19.1	68	1.59	0.8	14.4	1.5	0.76	172	7.61	22.0	2.50	12.5	3.30	0.99	3.49	0.57
261	SER 7912-34	14.6	26.1	38	146	36.74	114	16.9	96	2.97	1.0	17.2	1.7	4.18	340	10.5	28.7	3.09	13.8	3.16	0.84	2.95	0.51
262	SER 7912-35	14.1	21.8	12	122	18.23	182	11.6	52	0.98	0.2	14.4	1.3	0.85	112	2.55	7.3	0.97	4.84	1.46	0.62	1.70	0.33
262	b SER 7912-35	14.1	20.5	9	103	18.2	190	11.7	51	0.74	0.1	13.7	0.4	0.89	113	2.58	7.34	0.99	5.05	1.57	0.61	1.83	0.31
263	SER 7912-36	19	20.2	18	93	14.8	223	19.3	54	1.62	0.44	13.0	0.9	0.77	146	6.45	15.9	2.10	10.41	2.85	0.91	2.86	0.55
264	SER 7912-38	7.1	23.9	61	172	14.21	280	19.5	52	1.67	0.5	14.2	1.5	0.78	253	7.78	21.9	2.53	12.5	3.39	1.04	3.54	0.59
265	SER 7912-39	11.73	20.9	48	110	18.05	214	19.8	59	1.66	0.7	13.4	1.2	1.08	159	6.61	16.8	2.22	10.7	2.95	0.98	3.13	0.53
266	VOD 7972-A	7.6	25.6	32	43	8.4	291	6.9	68	2.28	0.62	17.8	1.2	0.93	127	8.88	22.8	3.25	15.24	3.34	0.75	2.60	0.31
267	VOD 7972-B	17.2	27.0	45	261	3.36	436	16.3	97	3.47	0.5	16.3	1.1	0.58	324	8.4	22.0	2.74	12.3	3.07	0.93	2.86	0.47
268	VOD 7972-C	9.9	27.1	51	241	33.89	292	11.4	46	2.45	2.0	17.6	1.5	2.02	453	9.2	20.2	2.72	12.2	2.56	0.73	2.18	0.33
269	VOD 7972-D	8.2	27.0	43	138	36.3	296	10.9	42	2.61	1.65	17.6	1.4	2.30	447	9.57	21.0	2.98	12.69	2.82	0.69	2.54	0.33

Sample number	Sample name	Loss of ignition, %	Sc	Cu	Zn	Rb	Sr	Y	Zr	Nb	Mo	Ga	Sn	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	
270	VOD 7972-E	6.7	27.0	57	163	13.1	361	18.4	76	2.15	0.10	15.0	1.1	0.78	297	8.30	19.8	2.66	12.48	3.11	0.89	3.03	0.52	
271	VOD 7972-F	9.6	25.3	45	233	33.2	273	9.6	39	2.45	1.62	17.3	1.2	2.10	422	8.60	19.0	2.70	11.39	2.55	0.64	2.31	0.30	
272	VOD 7972-G	8.2	25.7	65	79	17.4	386	13.8	77	2.39	1.16	15.3	1.8	1.35	292	9.39	23.3	3.34	15.56	3.76	0.95	3.24	0.46	
273	VOD 7972-H	11.2	29.6	45	279	6.58	356	10.6	59	1.89	0.6	17.8	0.8	0.55	105	4.40	12.0	1.45	6.82	1.88	0.67	1.98	0.34	
274	VOD 7972-I	3.1	28.2	50	42	16.3	389	16.2	83	2.56	0.53	16.1	1.1	0.92	297	8.64	19.9	2.70	12.66	3.17	0.85	3.05	0.49	
275	VOD 7972-J	5.6	29.9	38	25	21.9	149	10.1	46	2.51	1.46	18.8	1.8	2.40	295	7.09	15.4	2.29	10.53	2.44	0.63	2.35	0.32	
276	VOD 7972-K	11.4	30	64	573	9.1	163	8.8	57.5	1.17	1.8	16.9	1.2	1.23	377	4.91	11.7	1.70	7.96	2.16	0.58	1.70	0.29	
277	VOD 7972-L	11.32	35	60	185	21.4	286	19.6	82.4	2.30	0.6	17.3	0.1	2.37	218	8.27	20.05	2.79	13.30	3.17	0.96	3.48	0.48	
278	VOD 7972-M	11.9	32.6	31	309	16.9	271	4.8	49.7	2.38	1.04	20.7	4.9	2.18	297	2.92	6.75	0.83	3.85	1.03	0.21	0.80	0.14	
279	VOD 7972-N	11.91	30	52	220	6.8	262	14.0	54.8	1.61	0.4	14.2	0.1	1.20	137	4.26	10.95	1.47	6.50	2.03	0.65	2.28	0.32	
280	VOD 7972-O	14.18	24.4	34	230	7.2	296	12.8	79.6	2.88	0.44	15.6	1.1	1.72	151	6.94	18.3	2.28	10.10	2.61	0.71	2.45	0.34	
281	a	VOD 7972-P	12.47	35.7	32	204	2.0	507	20.5	108.7	3.97	0.75	22.7	1.0	0.41	272	10.26	26.3	3.38	15.39	3.88	1.12	3.82	0.53
281	b	VOD 7972-P	15.87	32.8	50	225	2.5	415	18.3	101.3	3.48	0.47	19.6	1.1	0.75	213	9.34	24.5	3.13	14.07	3.50	0.99	3.52	0.48
282	VOD 7972-Q	16.4	31.1	57	305	6.6	235	10.0	50.9	1.85	0.30	20.6	0.5	1.36	115	4.22	10.1	1.31	6.15	1.61	0.49	1.78	0.23	
283	VOD 7972-R	13	33.1	60	94	17.9	268	15.9	78.7	2.23	0.62	17.2	0.8	1.82	289	6.40	15.96	2.24	10.96	2.88	0.76	2.73	0.47	
284	VOD 7972-S	9.2	22	16	60	6.5	225	13.8	53.2	0.82	0.5	14.7	0.6	0.61	148	3.02	8.4	1.29	6.49	2.18	0.84	2.00	0.44	
285	VOD 7972-T	11.14	26.7	35	157	11.4	284	18.3	75.3	1.71	0.50	16.4	1.2	0.56	282	7.44	18.2	2.44	11.16	2.94	0.79	3.10	0.45	
286	VOD 7972-U	11.9	30.3	23	160	23.6	190	4.5	39.1	2.17	1.25	17.4	1.2	2.25	499	3.07	6.60	0.78	3.84	0.93	0.23	0.81	0.13	
287	VOD 7972-V	11.57	32.8	72	168	4.5	107	14.7	48.1	1.31	1.57	18.5	1.2	1.04	111	2.91	8.1	1.07	5.54	1.62	0.41	2.07	0.30	
288	VOD 7972-W	10.9	27.6	41	266	4.9	563	17.7	104.0	3.66	0.59	17.4	1.2	1.06	232	9.31	21.10	2.99	14.10	3.50	1.03	3.29	0.53	
289	VOD 7972-X	14.4	28.5	46	238	4.4	403	17.3	61.3	2.13	0.35	16.6	1.3	0.70	158	6.07	14.63	2.02	10.08	2.74	0.85	2.89	0.47	
290	VOD 7972-Y	15	23.9	46	214	6.8	261	7.8	89.3	3.35	0.80	14.4	0.7	1.77	157	5.21	14.84	1.63	7.57	1.82	0.56	1.65	0.28	
291	ZAP 5160-102	12.74	26.5	55	115	18.0	213	20.8	68.6	1.79	0.88	16.3	2.9	2.22	206	7.96	21.0	2.63	12.39	3.23	0.89	3.50	0.50	
292	ZAP 5160-103	6.6	28.8	40	95	7.2	346	19.4	71.5	2.12	0.39	14.6	4.4	0.57	164	6.08	15.13	2.16	10.58	3.06	0.81	3.08	0.52	
293	ZAP 5160-139	5.29	30.5	38	111	7.1	349	20.2	70.1	1.76	0.16	16.9	1.2	0.50	134	6.34	15.7	2.24	10.99	3.03	0.82	3.37	0.48	
294	ZAP 5160-00(A)	2.48	31	44	114	10.1	325	24.9	63.0	1.84	0.5	15.8	0.1	1.57	105	5.12	12.07	1.81	8.79	2.88	1.00	3.49	0.59	
295	ZAP 5160-01(B)	12.47	31	41	99	9.2	270	17.7	74.1	2.36	0.9	16.3	0.1	1.56	182	5.58	15.32	1.86	8.56	2.42	0.81	2.82	0.46	
296	ZAP 5160-02(C)	9.33	30.7	32	118	8.4	253	17.0	61.0	1.44	0.38	16.4	1.4	3.40	141	3.83	11.0	1.48	7.77	2.23	0.71	2.75	0.40	
297	ZAP 5160-03(D)	5.17	32.8	55	243	10.75	284	19.9	75	2.05	0.5	18.3	0.9	2.02	155	4.78	12.7	1.74	8.68	2.49	0.94	2.86	0.51	
298	ZAP 5160-04(E)	3.5	29.6	65	123	8.1	329	19.8	59.0	1.82	0.32	17.0	0.8	1.81	91	4.52	11.43	1.53	8.17	2.49	0.78	2.83	0.51	
299	ZAP 5160-05(F)	13.4	28.6	37	100	20.4	150	21.9	102.6	2.18	0.81	15.6	1.4	2.09	221	6.04	16.57	2.19	10.70	3.22	0.86	3.46	0.60	
300	ZAP 5160-06(A)	9.4	34	43	85	7.1	301	17.9	64.5	1.37	0.6	16.2	1.1	2.17	143	4.37	10.9	1.70	7.81	2.28	0.84	2.13	0.48	

Appendix D: Elemental Compositional Data from ICP-MS (Continued)

Sample number	Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
1	AIB 7921-3	2.31	0.52	1.69	0.25	1.60	0.27	1.81	0.13	0.31	132.56	0.52	0.42	3776	38	12	10	243	0.4	780	10029	1.69	57852
2	AIB 7922-3	2.75	0.59	1.62	0.23	1.55	0.21	1.65	0.15	0.18	28.0	0.87	0.15	5349	56	24	24.4	334	0.55	3221	7120	1.43	80576
3	AIB 7921-5	2.35	0.48	1.43	0.21	1.34	0.21	2.20	0.17	0.6	139.3	0.81	0.49	3924	48	13	8	267	0.6	695	9713	2.06	60351
4	AIB 7921-6	1.71	0.43	0.90	0.15	1.05	0.17	1.37	0.18	1.49	380.2	1.41	0.60	2705	15	12	10.6	131	0.75	12884	17588	4.95	56377
5	AIB 7922-8a	3.01	0.66	1.74	0.26	1.69	0.29	1.34	0.06	0.01	26.67	0.52	0.27	6938	47	40	28	433	0.6	3696	7293	1.07	97305
6	AIB 7921-86	2.36	0.49	1.45	0.21	1.51	0.22	2.87	0.16	0.5	133.5	0.94	0.55	4154	45	14	9	272	0.6	722	9906	2.18	65113
7	AIB 7922-1	3.22	0.70	1.95	0.31	1.93	0.31	2.53	0.09	0.01	24.77	0.82	0.44	4990	69	28	44	305	0.6	1580	7079	0.50	74349
8	AIB 7922-12	2.06	0.50	1.15	0.18	1.20	0.17	1.41	0.18	0.48	9.6	1.44	0.34	3135	37	12	13.0	164	0.64	1264	8174	0.52	44231
9	AIC 7971-A	2.49	0.55	1.68	0.24	1.69	0.24	2.30	0.14	0.6	158.4	0.89	0.33	4169	37	14	32	200	0.5	685	3468	0.35	80635
10	AIC 7971-B	3.04	0.70	2.00	0.30	1.92	0.29	1.94	0.13	0.5	8.2	0.82	0.29	4877	38	17	16	254	0.5	725	3774	0.14	74391
11	a AIC 7971-C	3.09	0.67	2.01	0.25	1.98	0.28	2.51	0.17	0.47	12.3	0.91	0.15	5388	52	27	28.9	249	0.49	1153	9325	0.24	80472
11	b AIC 7971-C	2.57	0.59	1.62	0.24	1.70	0.24	1.78	0.13	0.31	7.1	0.77	0.15	4732	52	19	13.7	248	0.41	722	4781	0.11	74542
12	a AIC 7971-D	2.79	0.60	1.74	0.24	1.78	0.25	2.53	0.18	0.36	8.6	0.90	0.15	4902	11	18	1.0	174	0.52	507	10872	0.10	68695
12	b AIC 7971-D	2.42	0.55	1.57	0.22	1.65	0.23	2.21	0.16	0.39	8.8	0.79	0.15	4733	12	15	2.7	172	0.54	405	7557	0.09	73983
13	AIC 7971-E	2.47	0.54	1.55	0.24	1.56	0.22	2.23	0.15	0.6	8.9	0.82	0.27	4488	49	16	17	258	0.5	689	5332	0.16	74921
14	AIC 7971-F	2.60	0.57	1.63	0.25	1.71	0.25	2.27	0.15	0.6	17.5	0.87	0.50	4316	27	17	16	229	0.6	834	4955	0.17	70286
15	AIC 7971-G	4.38	0.91	2.41	0.37	2.18	0.34	1.72	0.21	0.5	27.5	1.42	0.65	2728	7.9	26	6.4	95	0.6	626	10573	1.69	51932
16	AIC 7971-H	3.67	0.75	2.22	0.32	2.48	0.31	2.42	0.21	0.29	9.9	2.08	0.56	3888	19	11	8.3	151	0.67	559	9340	0.40	49040
17	AIC 7971-I	2.92	0.64	1.85	0.27	1.82	0.26	1.65	0.20	0.7	28.2	1.82	0.78	3663	12	14	9	129	0.7	1341	9230	0.47	55325
18	AIC 7971-J	3.37	0.71	2.03	0.28	2.10	0.27	2.00	0.12	0.09	4.3	0.40	0.15	3892	24	18	10.6	192	0.42	722	5027	0.16	64837
19	AIC 7971-K	3.37	0.73	2.08	0.31	2.00	0.28	2.49	0.13	0.3	4.7	0.48	0.53	4363	26	22	24	219	0.6	856	5894	0.15	70716
20	AIC 7971-L	3.07	0.65	1.80	0.25	1.89	0.26	1.99	0.12	0.39	7.5	0.77	0.15	4445	41	13	10.9	256	0.38	781	4242	0.15	74488
21	AIC 7971-M	2.71	0.61	1.87	0.28	1.83	0.28	2.39	0.16	0.5	16.1	0.98	0.77	3544	18	18	10	144	0.5	985	6421	0.20	54924
22	AIC 7971-N	2.65	0.57	1.60	0.25	1.54	0.22	1.75	0.11	0.4	6.0	0.37	0.18	3325	0.7	7.3	3.7	94	0.5	882	4914	0.35	37132
23	AIC 7971-O	2.35	0.54	1.35	0.21	1.43	0.21	2.21	0.12	0.41	10.4	0.73	1.62	4171	29	10	9.8	252	1.32	741	11396	0.16	63233
24	AIC 7971-P	2.84	0.64	1.92	0.28	1.83	0.28	2.61	0.14	0.6	11.3	0.95	0.40	4672	36	17	17	231	0.6	868	5445	0.23	66262
25	AIC 7971-Q	3.23	0.65	1.90	0.28	2.02	0.27	2.05	0.14	0.24	7.4	0.88	0.24	3599	11	10	3.7	134	0.45	806	6223	0.27	40948
26	AIC 7971-R	3.14	0.69	1.93	0.30	1.96	0.32	2.16	0.04	0.20	8.53	0.44	0.18	5081	40	18	21	272	0.4	960	4037	0.02	82738
27	AIC 7971-S	2.32	0.55	1.43	0.25	1.55	0.27	1.75	0.04	0.01	6.83	0.14	0.31	4402	10	20	11	160	0.5	815	4876	0.53	58668
28	AIC 7971-T	2.76	0.62	1.80	0.29	1.79	0.29	2.11	0.18	0.27	9.80	0.56	0.24	3754	29	16	17	183	0.4	739	6915	0.46	50585
29	AIC 7971-U	2.61	0.55	1.55	0.23	1.44	0.24	1.95	0.07	0.11	9.6	0.33	0.11	3585	11	12	6.6	163	0.50	673	4279	0.37	50663
30	AIC 7971-V	4.29	0.85	2.56	0.39	2.49	0.37	2.04	0.09	0.17	22.34	1.09	0.56	2462	6.2	20	7.4	88	0.5	525	10413	0.89	41427
31	AIC 7971-W	7.26	1.33	4.05	0.56	3.18	0.43	1.72	0.08	0.12	71.12	1.15	0.64	2767	10	15	11	131	0.6	1048	12028	2.23	51407
32	AIC 7971-X	3.04	0.64	1.87	0.30	1.92	0.28	1.73	0.09	0.28	15.0	0.75	0.33	3909	14	16	8	160	0.53	789	6929	0.12	49639
33	AIC 7971-Y	3.78	0.80	2.35	0.36	2.26	0.35	1.85	0.05	2.06	4.75	0.67	0.29	4359	5.6	22	10	168	0.5	1267	7881	0.01	77487
34	AIC 7971-Z	3.25	0.67	1.94	0.27	1.81	0.27	2.11	0.21	0.6	32.2	2.35	0.86	4206	18	14	11	140	0.9	932	10160	0.56	56931
35	AIC 7971-AA	5.64	1.14	3.61	0.49	3.27	0.46	2.45	0.27	0.6	18.6	4.64	1.25	3640	17	13	10	116	1.1	839	16695	1.03	46901
36	AIC 7971-BB	2.73	0.55	1.63	0.24	1.65	0.23	2.15	0.08	0.4	9.1	0.63	0.19	4532	43	17	16	232	0.5	720	6334	0.25	68421
37	AIC 7971-CC	2.79	0.57	1.41	0.23	1.53	0.28	2.46	0.25	0.11	14.95	3.50	0.97	4109	52	15	33	181	0.8	419	12698	0.62	47098
38	AIC 7971-DD	2.89	0.66	1.78	0.29	1.87	0.30	1.66	0.02	0.08	6.67	0.18	0.13	4410	36	18	17	221	0.4	1370	3119	0.01	69231
39	ALE 7509-1	2.15	0.51	1.22	0.20	1.33	0.24	1.68	0.05	0.38	5.88	0.03	0.17	5638	27	22	15	249	0.5	731	2192	0.01	74702
40	ALE 7509-10	4.86	1.02	3.12	0.45	3.23	0.46	3.57	0.19	0.8	14.9	2.33	0.74	4356	14	9	8.3	101	0.8	702	6449	0.41	48457
41	ALE 7509-11	2.48	0.55	1.50	0.26	1.65	0.28	2.16	0.17	1.83	11.05	3.20	0.99	5484	18	19	12	153	0.7	405	9424	0.46	37026
42	ALE 7509-13	3.39	0.71	2.10	0.31	2.05	0.32	2.89	0.17	0.37	11.08	1.96	0.64	5726	15	16	10	179	0.6	938	5063	0.19	56099

Sample number	Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
43	ALE 7509-15	5.49	1.12	3.49	0.49	3.51	0.48	2.88	0.16	0.6	19.6	1.87	0.57	4412	10	13	8.3	99	0.8	717	7600	0.55	47051
44	ALE 7509-21	2.30	0.51	1.34	0.25	1.54	0.26	3.42	0.40	0.82	17.91	4.95	1.23	6123	22	16	12	132	0.8	337	7995	0.48	37943
45	ALE 7863-4	3.26	0.67	2.00	0.28	1.96	0.28	3.36	0.23	0.6	14.6	3.12	0.94	4820	16	14	10	118	0.9	756	7679	0.57	50733
46	ALE 7863-6	1.88	0.44	1.04	0.18	1.26	0.23	2.84	0.26	0.48	13.69	3.81	1.17	6254	45	15	15	195	1.0	647	13416	0.16	53963
47	ALE 7863-7	6.86	1.45	4.66	0.65	4.60	0.67	2.34	0.12	0.5	11.7	1.28	0.37	3237	10	2.7	6.9	78	0.8	210	5475	0.39	26719
48	ALE 7863-8	7.00	1.43	4.48	0.62	4.33	0.59	2.82	0.18	0.6	14.2	2.19	0.67	4128	12	8.5	8.3	99	0.9	514	5576	0.48	46297
49	BAI 5244-36	2.51	0.53	1.51	0.22	1.51	0.22	1.75	0.09	0.1	5.3	0.68	0.15	4499	0.7	13	5.8	213	0.7	380	4739	0.15	56367
50	BAI 5249-37	3.18	0.64	1.88	0.27	1.87	0.27	2.16	0.17	0.3	9.1	3.94	1.15	4218	42	20	23	225	0.9	559	9838	0.60	55316
51	BAI 5249-40	1.92	0.40	1.04	0.15	0.90	0.16	2.13	0.09	0.09	6.5	0.64	0.18	4036	5	11	5.1	198	0.56	307	4441	0.12	51862
52	BAI 5249-41	3.89	0.80	2.39	0.35	2.32	0.33	2.31	0.06	0.6	6.3	1.00	0.37	4893	5	18	9	212	0.7	1094	8733	0.17	57863
53	BAI 7928-8	8.25	1.73	4.75	0.72	4.55	0.68	4.60	0.16	1.0	17.8	2.30	1.59	10475	48	85	30	557	1.2	1855	27630	1.83	160768
54	BAI 7928-15	10.96	2.39	6.90	1.04	6.57	0.96	6.81	0.22	0.5	20.0	2.60	1.44	11485	52	82	28	480	1.2	2520	15876	0.57	145184
55	BAI 7928-16	4.98	0.99	3.00	0.43	2.96	0.43	2.47	0.06	0.1	6.9	1.03	0.59	5102	10	20	14	210	0.7	1094	7101	0.13	64735
56	BAI 7928-18	3.66	0.75	2.35	0.34	2.24	0.34	2.27	0.07	0.0	8.7	1.19	0.45	4472	11	16	12	212	0.7	946	7138	0.45	59570
57	BER 7867-147	2.76	0.57	1.79	0.25	1.77	0.26	2.97	0.16	0.5	12.8	2.69	0.79	5016	12	12	10	148	0.7	641	4588	0.14	53728
58	BER 7867-148	4.16	0.80	2.33	0.35	2.40	0.33	2.33	0.21	0.4	11.5	3.67	1.04	5658	22	19	13	243	0.9	1070	7461	0.19	66318
59	BER 7867-157	3.36	0.66	1.86	0.27	1.79	0.25	1.83	0.14	0.4	15.4	2.79	0.76	4166	11	11	10	186	0.8	488	7722	0.35	56065
60	BER 7867-161	2.86	0.59	1.77	0.26	1.84	0.26	1.68	0.07	0.7	11.3	0.29	-0.02	4449	6.5	8.2	6.8	301	0.5	450	2705	0.10	39071
61	BER 7867-165	3.74	0.76	2.20	0.32	2.15	0.30	2.13	0.18	0.5	14.1	2.98	0.81	4717	14	14	13	180	0.8	652	7601	0.17	58344
62	BER 7867-180	6.93	1.49	4.73	0.67	4.79	0.68	2.64	0.13	0.5	12.1	1.43	0.43	3622	7.3	9	6.9	84	0.8	751	6989	0.45	42233
63	BER 7867-189	5.19	1.01	3.06	0.43	3.00	0.45	2.55	0.13	0.4	14.7	2.62	1.41	4999	12	14	12	161	0.8	424	5961	0.41	50475
64	BER 7867-199	3.69	0.72	2.08	0.30	2.02	0.27	2.49	0.20	0.3	11.2	3.57	1.38	5233	17	16	16	204	0.9	1002	5633	0.20	61651
65	BER 7867-A	2.84	0.61	1.88	0.29	1.98	0.27	2.87	0.05	0.5	14.3	1.50	0.96	3351	7	10	6	89	0.6	948	5312	0.22	38552
66	BER 7867-B	6.96	1.49	4.69	0.67	4.59	0.68	2.59	0.13	0.5	12.7	1.41	0.43	3574	6.6	10	7.4	79	0.8	786	8255	0.50	40245
67	BER 7867-C	2.88	0.59	1.70	0.23	1.48	0.23	1.39	0.20	0.50	17.2	3.07	0.67	3717	18	10	9	186	0.84	398	8923	0.81	45519
68	BER 7867-D	2.96	0.54	1.31	0.19	1.22	0.19	2.85	0.08	0.1	26.8	2.52	1.09	676	2	2	4	8	0.8	254	5825	0.21	14939
69	BER 7867-E	2.86	0.61	1.83	0.28	1.90	0.27	2.72	0.05	0.5	16.4	1.48	0.96	3352	7	8	7	86	0.7	801	5428	0.14	38581
70	BER 7867-F	3.93	0.82	2.39	0.35	2.39	0.37	2.69	0.21	0.25	9.91	2.40	0.78	5032	31	16	20	207	0.7	696	6580	0.11	61580
71	BER 7867-G	4.85	1.03	3.16	0.44	3.09	0.44	1.74	0.10	0.3	5.7	1.17	0.47	4912	16	24	13	200	0.6	823	3823	0.12	68146
72	BER 7867-H	3.55	0.69	2.04	0.31	1.94	0.31	2.22	0.11	0.25	5.6	1.10	0.30	4022	15	14	10	169	0.57	629	3265	0.12	73170
73	BER 7867-I	5.14	1.09	3.47	0.51	3.35	0.48	2.49	0.17	0.9	12.1	2.52	0.72	5124	37	21	25	154	0.8	451	6340	0.39	51646
74	BOL 7929-7	4.56	0.93	2.84	0.38	2.58	0.37	2.26	0.15	0.45	13.7	2.44	0.92	4010	12	45	11	212	0.73	966	10497	1.09	52298
75	BOL 7929-8	4.58	0.93	2.74	0.39	2.48	0.36	2.71	0.15	0.44	11.8	2.46	1.00	4136	11	50	10	221	0.73	1051	10100	1.25	52563
76	BOL 7029-11	4.74	0.96	2.84	0.39	2.67	0.34	4.05	0.09	0.4	14.7	2.45	0.97	4114	8.4	50	6.3	230	0.9	1019	12159	1.20	57111
77	BOL 7029-12	4.87	1.01	2.95	0.41	2.79	0.38	2.51	0.10	0.5	11.8	2.67	0.99	4633	10	52	6.2	247	0.9	1101	14871	0.88	57050
78	BOL 7029-13	4.57	0.93	2.79	0.38	2.53	0.34	2.41	0.12	0.3	11.9	2.56	1.05	4638	10	49	7.8	253	0.9	1072	10728	1.05	59376
79	BOL 7924-A	3.66	0.73	2.24	0.31	2.18	0.29	2.83	0.15	0.20	17.6	0.99	0.20	4136	11	17	7.1	226	0.51	1418	8579	0.32	60965
80	BOL 7924-B	4.42	0.90	2.70	0.39	2.58	0.34	2.89	0.14	0.2	18.7	4.78	0.87	4457	31	26	15	243	1.3	1768	11525	0.47	88088
81	BOL 7924-C	3.57	0.72	2.06	0.29	2.14	0.28	1.72	0.14	0.16	16.6	0.89	0.15	4304	12	18	8.6	227	0.52	1263	7882	0.33	61810
82	BOL 7924-D	4.04	0.83	2.54	0.34	2.59	0.34	2.38	0.19	0.43	4.7	1.17	0.15	5549	6	18	4.7	266	0.60	1394	8644	0.21	67424
83	BOL 7924-E	3.69	0.74	2.25	0.31	2.23	0.29	1.71	0.14	0.12	15.8	0.95	0.15	4270	10	19	7.1	232	0.56	1434	7961	0.36	61854
84	STA 679-A	3.16	0.56	1.53	0.19	1.43	0.19	1.51	0.90	1.2	19.9	9.26	1.48	4423	68	22	44	156	2.2	1296	22294	0.79	66445
85	CHI 7065-493	2.32	0.48	1.38	0.19	1.35	0.20	1.36	0.03	0.1	4.4	0.43	0.36	4403	53	24	41	486	0.6	704	3413	0.03	74584
86	CHI 7065-498	2.71	0.60	1.65	0.23	1.72	0.25	2.30	0.16	0.10	4.4	1.02	0.15	4318	42	20	18.6	265	0.36	740	4974	0.06	68333
87	CHI 7065-544	3.75	0.76	2.39	0.32	2.32	0.31	2.73	0.20	0.16	5.5	1.74	0.31	5049	25	18	13.5	208	0.48	907	5833	0.18	67291
88	CHI 7065-545	2.60	0.57	1.52	0.22	1.62	0.22	3.29	0.30	0.20	11.0	3.81	0.63	4127	69	14	26.8	137	0.70	888	8624	0.10	49468

Sample number		Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
89		CHI 7065-546	3.72	0.72	2.00	0.28	2.15	0.26	2.91	0.06	0.3	7.1	1.40	0.66	4165	10	27	6.4	247	0.7	322	4431	0.25	61988
90		CHI 7065-550	2.53	0.46	1.27	0.18	1.27	0.20	1.99	0.09	0.1	8.2	1.12	0.43	5230	32	18	16	304	0.7	308	4169	0.55	67379
91		CHI 7065-557	4.43	0.94	2.72	0.45	2.74	0.38	2.81	0.16	0.3	8.2	2.66	0.84	5129	29	20	15	205	0.9	661	7085	0.34	63546
92		CHI 7065-564	2.63	0.54	1.62	0.25	1.67	0.24	2.35	0.09	0.1	7.0	1.42	0.68	5316	32	25	16	233	0.8	973	11785	0.81	67595
93		CHI 7065-A	3.44	0.76	2.16	0.32	2.16	0.31	2.79	0.25	0.5	11.6	2.53	0.84	5469	36	27	18	226	0.8	1025	10878	0.46	70105
94		CHI 7065-B	2.52	0.52	1.55	0.22	1.54	0.22	2.78	0.05	0.1	6.5	0.80	0.36	4757	18	25	15	232	0.6	576	4134	0.07	70949
95		CHI 7065-C	3.07	0.65	1.95	0.26	1.74	0.23	1.63	0.06	0.1	4.0	0.88	0.43	4416	37	19	26	253	0.7	476	5281	0.07	80830
96		CHI 7065-D	2.07	0.43	1.24	0.17	1.26	0.20	2.06	0.07	0.1	7.0	1.01	0.37	4709	29	22	17	217	0.6	533	3718	0.50	63812
97		CHI 7065-E	2.40	0.54	1.43	0.21	1.51	0.23	1.82	0.17	0.12	8.0	1.19	0.15	4373	39	26	29.4	232	0.42	676	3168	0.20	64379
98		CHR 8026-3	2.06	0.41	1.30	0.19	1.17	0.17	1.24	0.03	0.2	23.8	0.22	0.35	4773	18	9	3.5	280	0.6	236	10443	0.59	58555
99	b	CHR 8026-5	2.39	0.55	1.38	0.21	1.39	0.22	1.30	0.13	0.34	5.1	0.58	0.15	5338	3	20	1.0	303	0.41	742	3805	0.16	72427
99	a	CHR 8026-5	2.83	0.63	1.70	0.24	1.78	0.24	1.60	0.16	0.48	6.2	0.98	0.15	6145	4	29	10.3	324	0.49	929	4378	0.21	87223
100		DRO 7973-109	3.79	0.76	2.34	0.32	2.32	0.31	2.31	0.17	0.28	6.4	1.65	0.24	5504	14	23	7.9	269	0.52	1404	3726	0.07	81106
101		DRO 7973-167	3.30	0.69	2.11	0.30	1.94	0.28	2.65	0.11	0.18	9.63	1.55	0.31	6036	14	25	10	212	0.653	1196	4124	0.00	86532
102		DRO 7973-170	2.92	0.62	1.89	0.28	1.85	0.27	1.99	0.07	0.24	8.97	1.30	0.39	6345	17	24	11	335	0.649	1102	3795	0.07	88223
103		DRO 7973-A	3.46	0.73	2.14	0.30	2.10	0.29	2.90	0.07	0.2	8.8	1.57	0.42	5718	7.9	27	10	259	0.7	1094	4343	0.08	88776
104		DRO 7973-B	4.08	0.81	2.48	0.35	2.49	0.34	2.53	0.18	0.35	7.4	1.61	0.24	6746	13	23	7.6	354	0.50	1696	3458	0.03	94258
105		DRO 7973-C	3.65	0.73	2.34	0.33	2.35	0.33	2.91	0.08	0.57	9.65	1.42	0.51	4424	10	18	6.8	211	0.630	553	5833	0.10	69366
106		DRO 7973-D	3.48	0.72	2.10	0.31	2.06	0.30	2.35	0.08	0.23	9.32	1.49	0.39	6072	14	26	11	239	0.684	1087	4598	0.03	86081
107		DRO 7973-E	3.54	0.73	2.23	0.31	2.12	0.28	2.47	0.17	0.28	8.1	1.54	0.24	6147	12	27	6.4	272	0.51	1195	3767	0.08	88783
108		DRO 7973-F	2.99	0.62	1.98	0.28	2.01	0.29	1.48	0.08	0.6	8.3	0.92	1.10	4103	10	15	3.8	194	0.4	729	4930	0.14	59816
109		DRO 7973-G	2.85	0.62	1.78	0.26	1.77	0.26	2.52	0.08	0.4	14.7	1.32	0.39	4279	8	17	9	240	0.7	825	6254	0.08	66427
110		DRO 7973-H	2.74	0.56	1.82	0.27	1.79	0.26	1.56	0.06	0.28	6.87	0.65	0.06	4656	2	13	2.3	229	0.561	888	4684	0.03	66305
111		DRO 7973-I	4.21	0.89	2.73	0.39	2.73	0.39	1.66	0.09	0.2	5.9	1.03	0.39	4664	15	21	13	192	0.6	729	3796	0.15	63877
112		DRO 7973-J	1.48	0.33	0.99	0.16	1.05	0.15	1.90	0.09	0.5	12.8	0.75	0.26	4691	11	8	7	235	0.6	557	3977	0.17	43074
113		DRO 7973-K	1.51	0.31	0.77	0.12	0.97	0.14	1.60	0.05	0.6	11.0	0.62	0.29	4845	0.3	11	2.4	244	0.6	281	4245	0.30	44220
114		DRO 7973-L	3.05	0.65	1.81	0.26	1.91	0.26	2.21	0.17	0.32	18.9	3.02	0.75	4568	9	16	8.7	262	0.65	1150	7705	0.16	59572
115		DRO 7973-M	3.49	0.69	1.92	0.27	1.96	0.26	2.27	0.15	0.29	9.9	1.33	0.18	5394	8	16	4.9	246	0.45	1681	2432	0.14	82122
116		DRO 7973-N	1.61	0.27	0.74	0.10	1.02	0.12	1.74	0.04	0.6	12.2	0.64	0.30	4511	3.4	12	2.3	263	0.6	281	4594	0.37	64688
117		DRO 7973-O	3.86	0.82	2.55	0.37	2.55	0.38	2.97	0.06	0.12	5.85	1.32	0.31	4525	10	24	6.9	240	0.638	1575	9160	0.03	68895
118		DRO 7973-P	1.88	0.40	1.19	0.18	1.12	0.19	2.09	0.05	0.49	12.50	0.95	0.21	5119	9	9	4.7	263	0.498	391	3786	0.31	50448
119		DRO 7973-Q	4.53	0.91	2.73	0.39	2.70	0.36	2.49	0.09	0.3	7.6	1.75	0.52	6994	10	35	8.2	304	0.8	1946	5056	0.17	105127
120		DRO 7973-R	4.41	0.92	2.61	0.37	2.65	0.38	2.92	0.10	0.4	15.7	5.16	1.63	3058	5.1	23	14	184	1.2	1352	10654	0.34	56727
121		DRO 7973-S	2.95	0.62	1.85	0.27	1.80	0.28	2.34	0.11	0.22	31.76	2.34	0.70	5466	10	26	12	265	0.730	1397	6052	0.15	73278
122		DRO 7973-T	2.72	0.56	1.69	0.22	1.70	0.24	2.40	0.09	0.3	9.0	1.62	0.55	6079	17	32	9	257	0.7	1506	5038	0.10	91356
123		DRO 7973-U	2.74	0.60	1.66	0.23	1.73	0.24	2.54	0.10	0.2	9.2	1.86	0.69	6404	16	35	10	279	0.7	1661	5439	0.19	98246
124		DRO 7973-V	3.31	0.66	2.00	0.28	2.09	0.28	2.81	0.21	0.17	9.4	1.55	0.26	4557	20	9	11.2	193	0.46	669	4953	0.15	48563
125		STA Ored-A	2.87	0.61	1.43	0.22	1.40	0.21	2.38	1.08	2.20	11.9	13.21	1.81	4412	76	18	71.2	186	2.54	247	33772	0.79	49533
126		EKA2 8075-1	3.68	0.76	2.19	0.34	2.08	0.34	2.17	0.26	0.5	9.5	2.45	0.81	5674	37	30	18	241	0.9	1069	10785	0.47	74586
127		EKA2 8075-21	2.81	0.61	1.65	0.28	1.77	0.29	3.16	0.13	0.23	9.54	1.76	0.70	6186	14	23	14	256	0.5	1019	6253	0.19	90963
128		EKA1/3 8076-36	2.42	0.53	1.40	0.22	1.52	0.20	1.59	0.13	0.16	7.8	0.74	0.15	4050	28	15	5.6	273	0.42	656	4358	0.34	65642
129		EKA1/3 8076-40	1.64	0.38	0.89	0.14	0.87	0.13	1.62	0.11	0.35	6.2	1.20	0.15	2506	15	5	2.7	212	0.29	322	2347	0.14	83656
130		EKA1/3 8076-42	2.26	0.52	1.41	0.22	1.50	0.22	2.31	0.15	0.46	8.6	1.26	0.38	3108	3	3	1.0	115	0.36	279	7202	0.27	31343
131		KOM 7172-24	3.98	0.81	2.41	0.35	2.47	0.33	2.61	0.17	0.2	8.0	2.47	0.87	5266	32	19	14	207	1.0	700	6895	0.22	60871
132		KOM 7172-41	3.98	0.81	2.42	0.35	2.43	0.37	3.02	0.20	0.16	10.03	2.38	0.82	5247	29	16	19	204	0.8	652	6602	0.13	60248
133		KOM 7172-44	3.36	0.68	2.01	0.28	2.14	0.29	2.51	0.28	0.31	7.4	2.79	0.74	4848	32	16	15.3	200	0.70	601	6036	0.32	57164

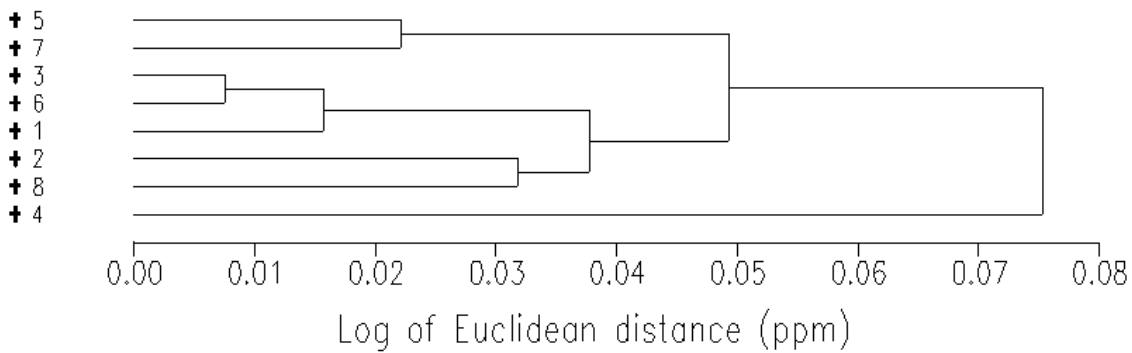
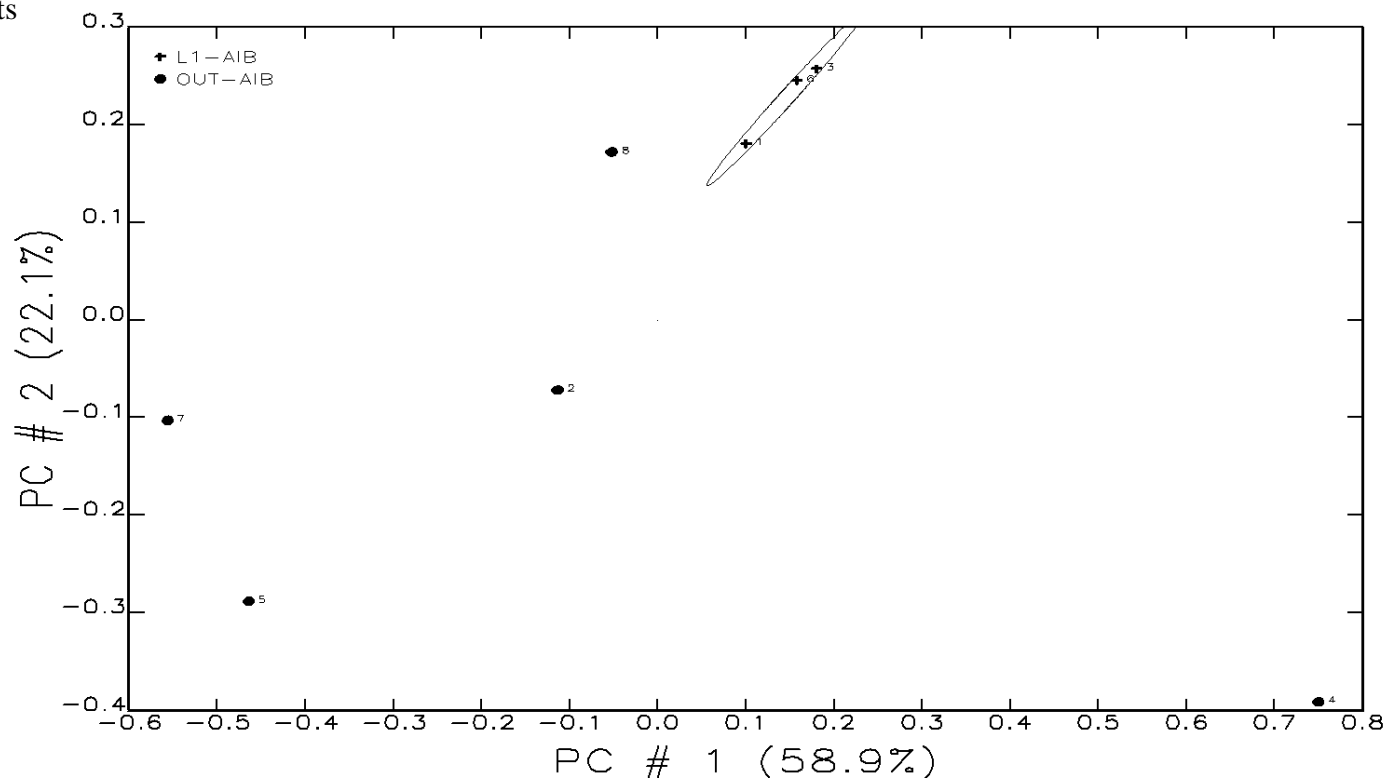
Sample number		Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
134		KOM 7172-48	4.19	0.88	2.59	0.36	2.60	0.35	2.52	0.17	0.3	9.2	2.65	0.95	5618	35	18	18	233	0.9	659	6886	0.38	67467
135		KOM 7172-50	3.66	0.74	2.22	0.31	2.24	0.29	2.27	0.21	0.22	5.4	1.95	0.44	4671	24	17	13.3	214	0.70	951	5543	0.23	61598
136		KOM 7172-54	4.00	0.86	2.54	0.38	2.61	0.37	2.93	0.17	0.3	9.0	2.51	1.37	4844	24	16	14	190	0.9	911	7596	0.27	65174
137		KOM 7172-56	4.17	0.87	2.58	0.37	2.52	0.39	3.16	0.23	0.14	10.42	2.53	0.73	6345	39	16	21	186	0.8	821	7483	0.03	71798
138	a	KOM 7172-61	3.54	0.72	2.11	0.29	2.16	0.29	3.08	0.32	0.41	11.8	3.07	0.59	6173	40	24	17.9	227	0.91	741	8606	0.44	74708
138	b	KOM 7172-61	3.99	0.78	2.40	0.32	2.43	0.32	2.91	0.31	0.35	8.8	3.11	0.65	6270	38	26	15.3	226	0.91	684	7303	0.26	73514
139		KOM 7172-62	3.32	0.69	1.98	0.26	1.99	0.25	1.67	0.12	0.2	8.5	1.46	0.48	4792	23	26	11	259	0.8	1394	6509	0.18	68034
140		KOM 7172-68	3.36	0.70	1.99	0.29	2.08	0.28	2.69	0.25	0.22	6.8	2.64	0.65	5158	33	14	12.2	192	0.72	723	5034	0.16	61767
141		KOM 7172-70	2.97	0.62	1.95	0.29	2.03	0.29	1.52	0.06	0.21	6.56	0.66	0.09	4768	2	13	1.9	220	0.625	1044	4709	0.03	68718
142		KOM 7172-74	3.84	0.74	2.27	0.32	2.22	0.30	2.94	0.20	0.2	9.4	2.99	0.90	5905	34	18	19	215	1.0	693	6728	0.20	70144
143		KOM 7172-81	3.37	0.71	1.91	0.29	1.98	0.27	2.59	0.24	0.27	7.0	2.57	0.66	5176	30	15	11.9	221	0.75	780	4942	0.31	62571
144		KOM 7172-87	3.26	0.65	1.97	0.29	2.01	0.29	2.51	0.15	0.2	8.1	2.39	0.84	6264	46	22	20	262	0.8	902	6002	0.16	72336
145		KOM 7172-92	3.53	0.72	2.12	0.29	2.18	0.30	2.69	0.19	0.3	9.1	2.83	0.92	5782	33	18	15	244	1.0	666	6597	0.30	71632
146		KOM 7172-93	3.56	0.72	2.13	0.29	2.15	0.30	2.72	0.18	0.2	11.1	2.92	0.90	5654	30	17	17	197	1.0	641	6799	0.13	65420
147	a	KOM 7172-96	3.25	0.72	1.97	0.29	2.01	0.27	3.44	0.24	0.22	5.5	1.59	0.44	6225	13	21	5.6	147	0.68	573	8486	0.15	54023
147	b	KOM 7172-96	3.09	0.65	1.93	0.26	1.99	0.26	2.84	0.22	0.20	4.3	1.46	0.35	5951	12	16	6.1	155	0.60	445	5080	0.03	49513
148	a	KOM 7172-47	2.54	0.57	1.51	0.24	1.66	0.22	3.59	0.33	0.30	12.2	3.25	0.69	6167	51	22	21.4	259	0.88	1052	11098	0.41	73492
148	b	KOM 7172-47	2.92	0.63	1.70	0.24	1.73	0.24	3.04	0.31	0.33	8.3	3.20	0.57	6164	43	20	15.6	199	0.92	875	9147	0.20	69369
149		KOM 7172-49	3.58	0.76	2.22	0.33	2.17	0.33	3.38	0.19	0.23	9.84	2.44	0.73	5873	35	17	20	234	0.8	682	7669	0.12	65409
150		KOM 7172-114	3.90	0.83	2.35	0.35	2.27	0.32	2.07	0.09	0.1	6.2	1.11	0.48	4908	10	26	12	257	0.9	1940	5468	0.04	73258
151		KUB 7424-33	3.67	0.76	2.16	0.32	2.03	0.31	1.43	0.14	0.2	2.5	0.78	0.28	4483	34	25	13	296	0.6	141	2609	0.14	46714
152		KUB 7424-59	4.84	0.98	2.84	0.41	2.79	0.37	3.74	0.24	0.6	10.9	4.21	1.33	6082	203	29	42	302	1.0	1134	7576	0.22	77714
153		KUB 7424-60	4.05	0.87	2.57	0.39	2.59	0.40	3.03	0.33	0.7	13.3	3.18	1.01	5315	27	20	16	207	0.9	1160	7340	0.41	66901
154		KUB 7424-63	3.88	0.82	2.44	0.33	2.45	0.33	2.87	0.19	0.4	11.3	3.89	1.10	5001	26	19	11	184	1.0	1060	8918	0.26	62183
155		KUB 7273-68	1.78	0.37	1.05	0.15	1.00	0.14	1.12	0.24	0.4	53.4	2.79	0.75	3978	103	16	33	238	0.9	952	10844	0.64	61244
156		KUB 7424-84	3.90	0.85	2.40	0.37	2.24	0.37	3.00	0.22	0.4	7.2	1.78	0.51	5008	55	21	28	238	0.7	825	3690	0.09	67121
157	a	KUB 7424-89	3.23	0.67	1.86	0.27	1.97	0.26	2.81	0.39	0.68	12.3	5.12	0.88	6042	26	21	9.2	221	1.12	626	8445	0.23	69745
157	b	KUB 7424-89	4.33	0.78	2.33	0.32	2.40	0.31	2.49	0.36	0.60	11.4	4.83	1.03	5579	24	19	6.8	230	1.11	709	8143	0.26	63937
158	a	KUB 7424-90	5.09	1.00	3.11	0.41	3.14	0.41	3.74	0.37	0.50	11.9	5.53	1.21	6559	27	27	11.8	265	1.26	1318	11950	0.23	72826
158	b	KUB 7424-90	5.22	0.96	3.03	0.40	3.07	0.40	3.11	0.36	0.42	11.7	5.32	1.14	6278	24	23	11.3	208	1.18	1026	7340	0.25	67731
159		KUB 7424-92	2.95	0.59	1.76	0.24	1.64	0.22	2.57	0.21	0.5	12.5	4.33	1.03	5413	23	24	10	203	0.9	1447	6264	0.21	72132
160		KUB 7424-93	2.87	0.61	1.73	0.24	1.67	0.23	2.02	0.17	0.4	13.4	3.14	0.81	4456	20	16	5.7	204	0.9	866	9976	0.56	57694
161		KUB 7424-96	4.26	0.85	2.59	0.37	2.54	0.36	2.25	0.21	0.5	11.3	4.03	0.97	5322	30	21	11	207	1.0	1168	7228	0.19	71436
162		KUB 7424-97	2.33	0.48	1.35	0.19	1.43	0.20	2.39	0.30	0.7	13.3	5.16	1.17	5743	19	14	5.8	157	1.0	396	9298	0.27	47244
163		KUB 7424-99	3.86	0.81	2.27	0.34	2.16	0.32	3.49	0.17	0.6	9.9	0.94	0.31	2867	3.7	4.2	2.9	36	0.8	469	12231	0.25	26293
164		KUB 7424-104	2.46	0.54	1.46	0.23	1.43	0.21	1.71	0.30	0.6	12.4	2.43	0.67	4524	16	13	9	200	0.9	769	7548	0.60	52111
165		KUB 7424-115	3.20	0.67	1.87	0.25	1.75	0.25	2.59	0.22	0.4	9.4	4.66	1.12	6636	27	29	11	248	1.0	1876	6425	0.16	81958
166		KUB 7424-A	3.17	0.63	1.80	0.28	1.95	0.29	3.13	0.16	0.4	80.3	0.97	0.23	2653	4.9	7.2	5.6	55	0.7	317	9703	0.23	29572
167		KUB 7424-B	4.14	0.88	2.61	0.40	2.49	0.40	2.53	0.35	0.7	11.8	2.81	1.02	5222	27	18	15	194	0.9	1184	6601	0.30	62873
168		LAL(KHA) 7924-3	2.05	0.44	1.22	0.18	1.26	0.19	1.28	0.03	0.8	5.6	0.45	0.12	4831	2.0	9	0.5	262	0.5	479	4117	0.06	50334
169		LAL(KHA) 7924-4	2.21	0.48	1.34	0.18	1.38	0.22	1.44	0.01	0.6	10.9	0.33	0.27	4596	8.0	10	2.3	220	0.6	537	5743	0.35	49266
170		LAL(KHA) 7924-6	2.51	0.56	1.59	0.22	1.50	0.21	1.24	0.01	0.3	6.7	0.43	0.23	4510	2.5	18	2.3	247	0.5	537	3979	0.10	71283
171		LAL(KHA) 7924-7	2.13	0.45	1.35	0.20	1.40	0.21	1.49	0.02	0.3	5.3	0.64	0.37	5437	2.5	6.4	0.9	266	0.5	512	6503	0.04	36211
172		LAL(KHA) 7924-8	1.99	0.37	1.13	0.20	0.96	0.14	1.17	0.14	0.5	11.6	0.59	0.29	4111	9	5.8	5.1	209	0.4	454	7584	0.18	35616
173		LAL(KHA) 7924-9	2.16	0.47	1.39	0.21	1.38	0.22	1.60	0.13	0.7	12.4	0.40	0.16	4066	7.6	8.9	6.6	182	0.5	422	4281	0.41	45482
174		LAL(KHA) 7924-13	2.30	0.53	1.55	0.23	1.56	0.23	2.13	0.14	0.5	10.0	0.73	0.39	3400	4.9	17	5.1	220	0.6	485	6122	0.62	62031

Sample number	Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
175	LAL(KHA) 7924-15	2.80	0.66	1.85	0.29	1.90	0.28	2.17	0.04	0.4	10.4	1.14	0.62	4014	2.5	29	2.7	258	0.7	570	7647	0.37	66302
176	LAL(KHA) 7924-41	2.51	0.58	1.76	0.27	1.66	0.29	2.20	0.06	0.33	9.64	0.72	0.30	4880	51	15	18	284	0.4	461	4335	0.16	88292
177	LAL(KHA) 7924-43	2.20	0.46	1.29	0.22	1.37	0.23	1.75	0.05	0.52	17.51	0.69	0.12	4330	6	12	2.8	210	0.576	506	6372	0.33	50327
178	OLY 7870-6	3.49	0.70	2.14	0.31	2.10	0.30	3.54	0.25	0.48	12.69	3.76	0.72	5824	27	11	8.2	125	0.805	620	5348	0.27	55002
179	OLY 7870-13	2.64	0.57	1.59	0.24	1.55	0.23	2.69	0.13	0.2	9.2	2.49	0.39	4292	84	25	53	214	0.7	848	3065	0.08	68442
180	OLY 7870-14	2.73	0.57	1.72	0.25	1.55	0.24	1.63	0.07	0.09	7.65	1.92	0.23	4321	111	29	58	225	0.672	793	3041	0.03	70763
181	OLY 7870-23	3.74	0.76	2.27	0.33	2.28	0.33	3.37	0.26	0.49	13.1	3.77	0.88	5857	34	13	13	163	0.81	733	7510	0.27	60075
182	OLY 7870-24	3.30	0.67	1.96	0.29	1.94	0.30	4.22	0.33	0.54	14.57	4.34	0.90	6616	31	11	17	146	0.7	526	5896	0.34	62708
183	OLY 7870-00A	3.72	0.73	2.17	0.32	2.07	0.30	3.99	0.32	0.56	16.1	4.16	1.09	5992	28	9	12	116	0.84	517	6346	0.31	51129
184	OLY 7870-B	3.31	0.66	2.09	0.30	1.92	0.29	2.24	0.07	0.12	6.82	1.67	0.29	5295	40	22	16	241	0.664	1134	4081	0.03	69088
185	OLY 7870-C	2.49	0.51	1.46	0.22	1.33	0.21	1.83	0.07	0.17	12.42	2.20	0.37	4565	122	28	55	226	0.734	748	4077	0.03	69436
186	OLY 7870-D	2.59	0.50	1.51	0.24	1.53	0.23	3.21	0.28	0.46	21.81	3.72	0.78	6135	41	15	15	158	0.763	722	5211	0.18	58629
187	OLY 7870-E	2.73	0.58	1.60	0.23	1.48	0.23	1.79	0.14	0.20	4.4	2.31	0.29	4452	117	27	54	229	0.63	871	3617	0.12	71614
188	OLY 7870-F	2.49	0.53	1.51	0.23	1.50	0.23	3.67	0.29	0.67	13.3	3.91	1.04	5437	27	12	12	198	0.73	632	5564	0.28	57946
189	OLY 7870-G	3.73	0.75	2.23	0.32	2.21	0.31	3.55	0.27	0.60	14.8	3.59	0.92	5895	28	11	10	137	0.75	700	5148	0.26	59326
190	OLY 7870-H	3.27	0.67	1.86	0.26	1.70	0.26	2.37	0.18	0.15	5.4	2.46	0.67	4608	8	19	9	194	0.77	1486	4724	0.12	62710
191	OLY 7870-08(I)	3.81	0.77	2.26	0.33	2.24	0.33	3.20	0.30	0.63	12.6	4.07	0.99	5817	56	13	18	169	0.82	677	5483	0.28	57419
192	OLY 7870-(F)	3.50	0.70	2.13	0.31	2.09	0.29	3.61	0.34	0.63	21.15	4.34	0.89	6345	32	14	14	150	1.087	530	5031	0.21	66918
193	STA 985-A	2.32	0.50	1.62	0.25	1.55	0.25	3.03	1.63	2.47	54.24	21.91	3.84	7840	106	16	64	179	2.381	124	29552	1.37	13283
194	RAS 8077-A	3.25	0.66	1.93	0.27	1.71	0.27	1.68	0.10	0.11	10.2	1.03	0.34	4339	167	27	82	257	0.59	1008	2565	0.12	70989
195	RAS 8077-B	2.29	0.50	1.40	0.21	1.34	0.21	1.69	0.13	0.29	18.3	1.25	0.54	4742	36	17	11	170	0.64	475	5604	0.24	55767
196	RAS 8077-C	2.47	0.54	1.50	0.24	1.58	0.22	2.62	0.11	0.2	14.9	1.09	0.51	5136	28	17	13	298	0.6	869	5294	0.75	77627
197	RAS 8077-D	2.94	0.58	1.84	0.27	1.86	0.28	1.72	0.07	0.11	15.60	0.93	0.34	4342	28	20	9	266	0.619	737	4180	0.42	70209
198	RAS 8077-E	2.52	0.54	1.65	0.25	1.74	0.26	1.91	0.05	0.17	17.90	1.09	0.52	4465	29	18	10	230	0.671	579	6133	0.63	70714
199	RAS 8077-F(577)	2.42	0.53	1.51	0.24	1.54	0.21	1.81	0.07	0.1	14.3	0.90	0.39	4218	25	16	13	221	0.7	580	6799	0.75	67639
200	RAS 8077-G	3.02	0.62	1.78	0.26	1.79	0.27	1.61	0.11	0.28	12.7	0.81	0.43	4808	33	19	13	252	0.60	785	4513	0.56	68905
201	RAS 8077-H	2.70	0.53	1.55	0.20	1.52	0.21	1.63	0.05	0.2	9.8	0.74	0.46	4855	30	19	11	272	0.6	638	6052	0.64	68980
202	RAS 8077-I	2.77	0.59	1.75	0.26	1.67	0.23	2.89	0.16	0.1	17.6	0.73	0.35	4368	26	17	13	238	0.6	699	4610	0.34	67514
203	RAS 8077-J	2.83	0.59	1.68	0.25	1.70	0.25	2.67	0.11	0.25	13.2	0.90	0.36	4637	34	18	12	278	0.54	572	4685	0.37	70117
204	RAS 8077-K	3.44	0.70	2.07	0.30	2.17	0.29	2.53	0.07	0.1	3.2	0.90	0.57	5427	29	22	9	164	0.6	1069	7476	0.01	82662
205	RAS 8077-L	3.18	0.67	1.93	0.30	1.98	0.29	1.66	0.11	0.2	9.5	0.88	0.41	4448	30	20	12	247	0.6	756	4029	0.57	70351
206	RAS 8077-M	2.46	0.55	1.50	0.24	1.56	0.23	1.80	0.09	0.2	19.1	0.85	0.32	4449	26	17	13	234	0.7	760	4536	0.18	67803
207	RAS 8077-N	2.99	0.59	1.73	0.23	1.75	0.23	2.55	0.08	0.4	8.6	1.36	0.52	4379	43	20	19	208	0.7	584	5946	0.12	61787
208	RAS 8077-O	2.43	0.50	1.48	0.20	1.48	0.20	1.60	0.04	0.1	9.5	0.67	0.41	4774	25	18	10	264	0.6	564	4345	0.65	71974
209	RAS 8077-P	3.36	0.74	2.13	0.29	2.12	0.29	1.85	0.08	0.3	10.3	1.17	0.52	4791	22	22	9	271	0.8	1202	5049	0.46	79605
210	RAS 8077-Q	2.63	0.56	1.53	0.24	1.58	0.22	2.12	0.13	0.1	25.5	0.99	0.71	4520	25	16	13	230	0.7	474	5240	0.29	53907
211	RAS 8077-R	3.14	0.64	1.91	0.29	1.96	0.27	1.72	0.08	0.1	10.6	0.74	0.52	4287	24	17	12	259	0.6	816	4574	0.64	71867
212	RAS 8077-S	3.00	0.62	1.70	0.24	1.70	0.24	1.76	0.06	0.2	8.5	0.68	0.45	5157	26	20	7.8	307	0.6	1359	4941	0.80	80939
213	RAS 8077-T	2.69	0.58	1.59	0.24	1.61	0.23	1.69	0.10	0.23	10.5	0.87	0.41	4208	32	16	11	249	0.50	722	4289	0.47	66230
214	RAS 8077-U	2.85	0.60	1.78	0.27	1.76	0.24	1.52	0.04	0.2	8.0	0.62	0.39	4814	25	25	9	297	0.6	897	3953	0.43	79253
215	RAS 8077-V	2.36	0.51	1.44	0.22	1.51	0.22	1.89	0.12	0.22	12.8	0.76	0.44	4185	34	16	11	230	0.54	449	4799	0.37	59751
216	RAS 8077-W	2.79	0.60	1.68	0.26	1.77	0.27	1.98	0.09	0.1	13.6	0.82	0.39	4436	24	15	12	252	0.6	613	4259	0.67	71983
217	RAS 8077-X (443)	2.24	0.48	1.45	0.20	1.50	0.20	1.41	0.03	0.2	8.7	0.57	0.47	4467	24	17	6.5	255	0.6	566	3473	0.43	68628
218	RAS 8077-Y	3.08	0.63	1.98	0.28	1.94	0.27	1.54	0.04	0.2	6.3	0.71	0.51	4608	23	20	8.2	271	0.6	814	3655	0.43	72511
219	RIK 7862-A	4.08	0.81	2.45	0.34	2.43	0.33	2.98	0.35	1.2	14.4	5.37	1.33	7073	24	11	11	210	1.1	407	8678	0.29	37143
220	RIK 7862-B	3.28	0.65	1.88	0.25	1.91	0.26	2.31	0.12	0.7	15.2	2.32	0.71	5606	14	16	5.4	171	0.8	1280	6968	0.25	59377

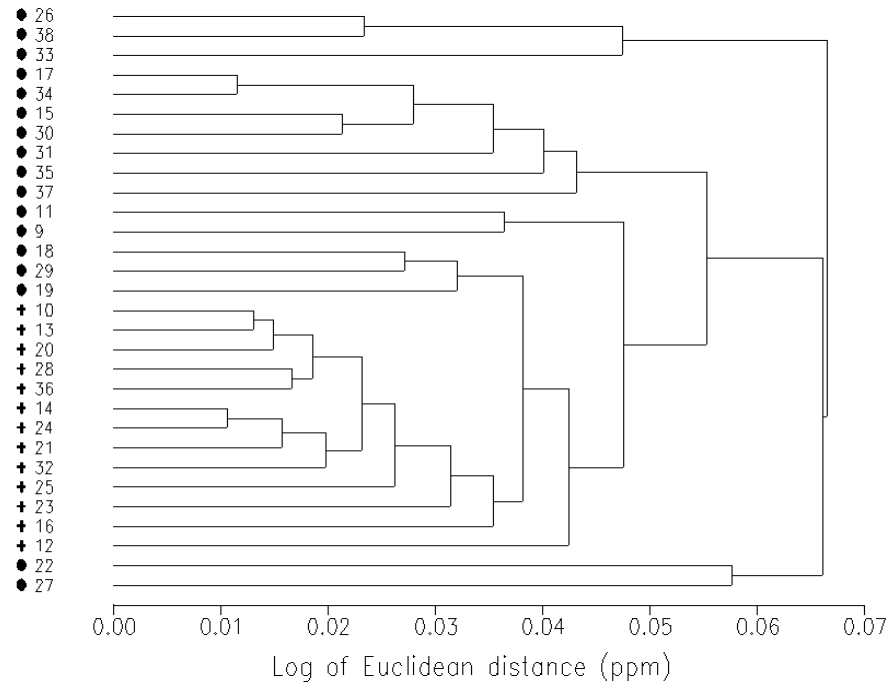
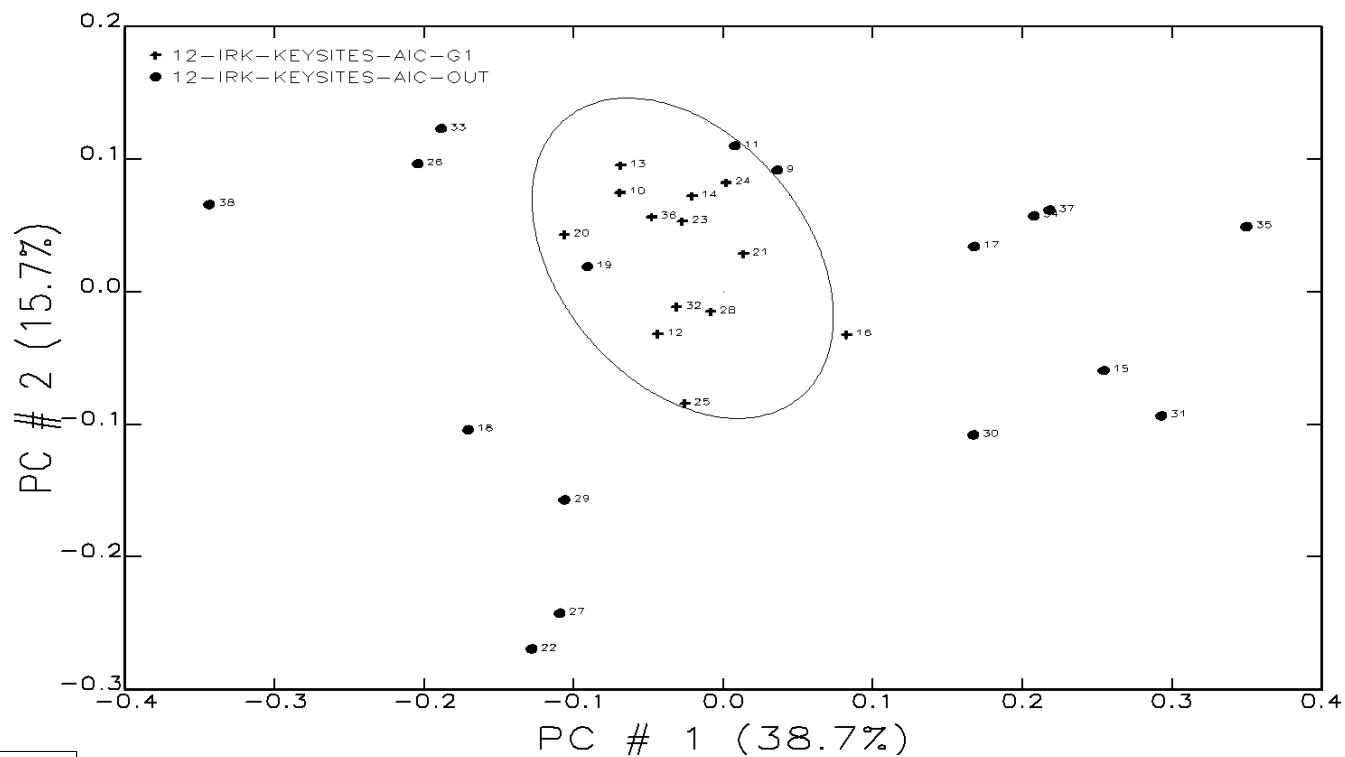
Sample number	Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe
221	RIK 7862-C	1.86	0.39	1.11	0.15	1.17	0.17	2.41	0.28	0.7	10.7	3.60	0.87	6160	25	13	8.3	183	0.9	602	7651	0.29	46801
222	RIK 7862-D	4.19	0.85	2.51	0.35	2.55	0.33	3.07	0.36	0.8	13.8	5.41	1.36	6880	24	10	8.5	220	1.1	490	8132	0.31	37638
223	RIK 7862-E	4.24	0.85	2.49	0.37	2.61	0.34	2.99	0.35	0.8	14.2	5.09	1.43	6473	22	11	17	212	1.1	417	8160	0.38	35416
224	RIK 7862-F	3.01	0.62	1.79	0.28	1.85	0.26	2.35	0.17	0.6	18.3	2.09	0.60	5250	14	13	9	157	0.8	917	6085	0.22	53935
225	RIK 7862-G	3.09	0.63	1.95	0.26	1.98	0.27	2.14	0.12	0.6	12.3	2.24	0.66	5539	15	15	5.5	172	0.8	1103	6193	0.22	59538
226	RIK 7862-H	3.93	0.80	2.41	0.34	2.39	0.36	2.90	0.36	0.84	14.3	4.96	1.31	6114	28	9	12	196	0.92	423	7582	0.25	32822
227	RIK 7862-I	3.21	0.67	1.93	0.29	1.82	0.28	2.85	0.19	0.73	14.2	2.36	0.55	5702	19	14	11	171	0.69	930	7249	0.12	62802
228	RIK 7862-J	3.15	0.66	1.88	0.29	1.92	0.28	2.49	0.19	0.66	14.2	2.33	0.58	5395	18	13	8.2	156	0.70	962	6689	0.12	57361
229	RIK 7862-K	3.28	0.70	2.05	0.31	2.06	0.31	3.09	0.24	0.81	14.8	3.46	0.79	4830	20	5.9	6.0	136	0.69	573	3481	0.27	38606
230	RIK 7862-L	3.45	0.70	2.07	0.30	2.02	0.32	2.88	0.22	0.80	14.9	2.71	0.65	5365	18	13	8.2	153	0.73	1028	6725	0.12	56495
231	RIK 7862-M	2.68	0.56	1.60	0.24	1.56	0.24	2.22	0.17	0.73	13.8	2.00	0.49	5219	24	13	7.6	171	0.65	837	6794	0.24	54872
232	RIK 7862-N	3.90	0.79	2.35	0.34	2.23	0.34	3.05	0.46	0.90	14.5	4.86	1.34	6100	30	9	12	193	0.92	367	7531	0.25	31484
233	RIK 7862-O	4.00	0.83	2.49	0.36	2.35	0.37	3.21	0.42	1.08	15.2	4.93	1.31	6274	32	8.5	12	194	1.01	424	7253	0.22	33024
234	RYP 7920-1	2.56	0.55	1.59	0.23	1.54	0.24	1.23	0.08	0.35	8.3	0.58	0.10	4887	6	13	4.5	244	0.46	525	3272	0.12	67725
235	RYP 7920-6	2.41	0.53	1.50	0.24	1.72	0.29	2.16	0.12	0.44	27.7	0.99	0.42	2227	9	6.4	4.6	58	0.60	820	8973	0.49	28791
236	RYP 7920-8	1.51	0.32	0.85	0.13	0.82	0.14	1.45	0.11	0.44	13.5	0.87	0.28	4526	14	3.7	3.6	262	0.37	406	1368	0.12	53856
237	RYP 7920-9	2.91	0.62	1.80	0.27	1.73	0.26	1.84	0.12	0.25	38.5	1.28	0.27	4991	125	16	47	236	0.59	616	13254	0.73	53434
238	RYP 7920-13	1.44	0.32	0.88	0.13	0.82	0.13	1.38	0.11	0.32	10.9	0.80	0.22	4878	14	0.9	3.0	244	0.33	76	1724	0.12	53862
239	RYP 7920-14	1.18	0.28	0.73	0.09	0.65	0.11	1.40	0.10	0.33	9.9	0.70	0.21	4607	11	1.3	2.4	237	0.34	97	1979	0.12	56671
240	RYP 7920-22	2.33	0.51	1.38	0.19	1.29	0.21	1.45	0.15	0.30	8.3	1.25	0.43	4277	157	14	45	191	0.64	483	14189	0.76	62161
241	RYP 7861-12	3.21	0.66	1.90	0.27	1.79	0.27	1.38	0.06	0.27	9.2	0.59	0.27	5149	31	24	12	305	0.48	868	1313	0.12	75902
242	SER 7861-13	1.67	0.38	1.06	0.16	1.11	0.18	3.38	0.15	0.59	16.1	1.85	0.53	4278	14	9	16	118	0.66	592	5690	0.30	51596
243	SER 7861-15	3.08	0.62	1.75	0.26	1.65	0.26	1.87	0.08	0.52	9.8	0.97	0.38	4525	23	14	10	221	0.55	336	1685	0.21	65271
244	SER 7861-16	2.77	0.56	1.52	0.22	1.34	0.21	1.91	0.09	0.51	7.9	0.96	0.40	4377	21	14	9	199	0.63	364	2533	0.32	62369
245	SER 7861-31	4.62	0.91	2.76	0.42	2.74	0.41	3.04	0.23	0.61	16.1	3.58	1.06	5708	19	12	12	170	0.95	559	7346	0.40	57210
246	SER 7861-35	2.77	0.57	1.58	0.23	1.51	0.22	2.00	0.08	0.47	8.5	0.93	0.42	4367	23	15	9	209	0.56	401	2007	0.56	63516
247	SER 7861-39	3.54	0.75	2.31	0.33	2.37	0.34	3.34	0.27	0.70	93.3	3.99	0.96	5094	22	9	22	150	0.86	583	5705	0.55	57762
248	SER 7861-41	2.64	0.56	1.57	0.22	1.41	0.21	1.86	0.12	0.46	8.3	0.79	0.51	4491	23	18	10	233	0.56	408	1573	0.13	61933
249	SER 7861-A	2.77	0.60	1.82	0.31	2.16	0.31	3.85	0.14	0.76	16.4	2.26	0.83	5478	14	13	9	144	0.67	1574	3518	0.12	58890
250	SER 7861-B	2.18	0.46	1.28	0.18	1.22	0.18	2.03	0.08	0.43	8.5	1.04	0.18	4073	19	17	7.9	181	0.59	449	1641	0.12	55449
251	SER 7861-C	4.65	0.93	2.77	0.41	2.57	0.37	3.06	0.16	0.33	13.38	2.44	0.81	5458	17	14	12	167	0.7	549	5078	0.17	53152
252	SER 7861-D	2.55	0.57	1.51	0.23	1.47	0.25	1.46	0.05	0.10	3.37	0.01	0.07	6221	31	27	17	360	0.4	1124	1850	0.01	77349
252	b SER 7861-D	2.70	0.55	1.75	0.24	1.55	0.20	1.55	0.02	0.36	3.23	0.17	0.22	6164	32	28	11	363	0.31	1084	1454	0.00	73467
253	SER 7861-E	2.72	0.58	1.61	0.23	1.44	0.23	1.63	0.09	0.43	7.0	0.82	0.38	4054	22	18	9	202	0.58	442	1769	0.30	55726
254	SER 7861-F	3.34	0.69	1.98	0.29	1.77	0.27	1.70	0.08	0.42	7.1	0.78	0.33	4408	22	19	10	216	0.53	503	2115	0.12	59506
255	SER 7861-G	4.42	0.89	2.69	0.39	2.64	0.38	2.96	0.23	0.65	16.0	3.25	0.98	5793	22	11	11	176	0.92	613	6359	0.44	59473
256	SER 7912-5	4.29	0.85	2.45	0.36	2.29	0.34	1.83	0.10	0.52	9.4	0.71	0.21	5207	26	16	12	297	1.09	432	5328	0.12	87330
257	SER 7912-9	3.41	0.70	2.10	0.31	1.98	0.31	1.48	0.09	10.78	4.9	0.74	0.21	4702	11	30	12	178	0.64	1047	7341	0.12	104992
258	SER 7912-12	3.51	0.75	2.10	0.32	2.10	0.32	2.12	0.06	2.37	5.27	0.61	0.27	5069	7.7	23	13	199	0.6	1036	8690	0.01	94741
259	SER 7912-16	3.18	0.68	2.02	0.29	1.96	0.30	1.67	0.10	7.52	5.0	0.90	0.25	4506	10	28	11	181	0.64	985	7318	0.12	107340
260	SER 7912-17	3.72	0.76	2.03	0.32	2.01	0.33	1.91	0.04	4.26	7.04	0.51	0.20	5260	11	40	20	259	0.6	1104	6591	0.01	152703
261	SER 7912-34	2.95	0.64	1.70	0.27	1.68	0.27	2.82	0.18	0.32	11.19	3.35	0.95	5440	19	17	15	201	0.6	692	11925	0.19	66601
262	SER 7912-35	2.00	0.46	1.13	0.18	1.23	0.22	1.75	0.01	0.16	5.46	0.01	0.10	3736	4.2	19	5.8	105	0.5	750	6485	0.01	40492
262	b SER 7912-35	2.21	0.44	1.31	0.17	1.24	0.16	1.79	0.03	0.40	5.05	0.43	0.20	3730	5	10	0.6	105	0.39	709	6184	0.13	39194
263	SER 7912-36	3.51	0.73	2.19	0.31	2.09	0.31	1.66	0.09	3.50	5.0	0.85	0.22	4343	11	25	13	167	0.63	854	6851	0.12	91617
264	SER 7912-38	3.81	0.77	2.13	0.32	2.08	0.32	1.59	0.05	2.10	9.35	0.58	0.23	5077	22	38	21	235	0.6	1459	6205	0.01	139792

Sample number	Sample name	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Pb	Th	U	Ti	Cr	Co	Ni	V	Be	Mn	K	Tl	Fe	
265	SER 7912-39	3.48	0.73	2.05	0.30	1.89	0.31	1.74	0.05	2.78	6.31	0.61	0.27	4383	6.4	25	13	167	0.6	885	8543	0.01	98275	
266	VOD 7972-A	1.63	0.34	0.80	0.11	0.70	0.11	2.13	0.15	0.28	8.3	1.08	0.22	5532	13	2.2	4.5	173	0.55	140	2410	0.12	44481	
267	VOD 7972-B	3.01	0.61	1.67	0.27	1.64	0.26	2.59	0.17	0.12	4.11	1.90	0.55	5367	101	30	85	210	0.5	1323	2168	0.01	77452	
268	VOD 7972-C	1.93	0.44	0.97	0.16	1.08	0.20	1.35	0.10	0.01	5.69	1.02	0.47	4869	91	21	23	244	0.6	368	12056	0.35	60319	
269	VOD 7972-D	2.11	0.42	1.10	0.16	0.91	0.14	1.26	0.16	0.23	6.0	1.32	0.40	4799	101	9	19	254	0.66	296	11555	0.49	60688	
270	VOD 7972-E	3.36	0.70	2.08	0.30	2.08	0.31	2.25	0.13	0.21	6.6	1.96	0.51	4680	57	21	45	146	0.67	1125	7375	0.12	58791	
271	VOD 7972-F	1.83	0.37	0.98	0.12	0.78	0.12	1.18	0.15	0.20	7.1	1.16	0.42	4564	103	8.4	19	246	0.64	283	10309	0.49	59347	
272	VOD 7972-G	2.66	0.54	1.52	0.21	1.45	0.23	2.35	0.16	0.26	10.1	1.86	0.63	4763	127	13	38	180	0.65	518	6773	0.51	50858	
273	VOD 7972-H	1.98	0.47	1.10	0.17	1.17	0.21	1.69	0.07	0.01	3.93	0.94	0.29	5288	42	29	23	234	0.5	1369	2131	0.01	77362	
274	VOD 7972-I	3.12	0.65	1.84	0.27	1.91	0.28	2.51	0.16	0.21	7.7	2.15	0.66	5300	76	20	33	199	0.71	946	10395	0.12	63702	
275	VOD 7972-J	2.09	0.42	1.09	0.15	0.85	0.14	1.39	0.15	0.12	14.7	0.80	0.30	5379	134	10	18	254	0.50	251	9942	1.04	83453	
276	VOD 7972-K	1.81	0.36	1.13	0.16	1.12	0.16	1.91	0.12	0.5	54.0	1.06	0.84	4612	17	9	4.5	241	0.3	511	6270	0.24	55433	
277	VOD 7972-L	3.29	0.71	2.15	0.31	2.02	0.32	2.34	0.20	0.3	25.2	1.08	0.38	5592	110	18	44	220	0.6	911	8166	0.27	70973	
278	VOD 7972-M	0.84	0.18	0.53	0.09	0.59	0.09	1.32	0.10	0.0	10.9	0.72	0.34	5781	84	3	13	231	0.6	416	8066	0.08	47020	
279	VOD 7972-N	2.41	0.51	1.58	0.24	1.44	0.22	1.48	0.15	0.2	4.6	0.65	0.26	3964	42	23	27	208	0.5	813	3045	0.16	62047	
280	VOD 7972-O	2.37	0.52	1.32	0.20	1.32	0.18	2.35	0.23	0.23	2.2	2.12	0.32	4623	95	24	84.5	201	0.52	1215	2090	0.03	72459	
281	a	VOD 7972-P	3.73	0.73	2.08	0.29	2.14	0.28	3.15	0.32	0.29	4.3	2.77	0.43	6784	140	35	116.2	237	0.72	1932	2653	0.08	103679
281	b	VOD 7972-P	3.28	0.66	1.89	0.27	1.90	0.26	2.91	0.29	0.29	4.2	2.61	0.41	5797	115	31	100.7	235	0.59	1737	2375	0.03	88911
282	VOD 7972-Q	1.73	0.43	0.97	0.16	0.92	0.13	1.58	0.18	0.04	3.4	1.15	0.15	5687	59	27	23.0	257	0.48	691	2064	0.06	70264	
283	VOD 7972-R	2.93	0.60	1.73	0.26	1.73	0.25	2.29	0.11	0.1	26.0	1.67	0.49	5505	86	14	48	186	0.7	623	7885	0.25	70643	
284	VOD 7972-S	2.85	0.56	1.79	0.25	1.69	0.25	1.86	0.06	0.4	5.8	0.60	0.28	4110	3.2	11	2.1	136	0.4	706	3620	0.41	48787	
285	VOD 7972-T	3.20	0.69	1.99	0.28	2.00	0.26	2.50	0.18	0.18	5.9	2.13	0.30	4754	61	16	39.9	165	0.53	882	6526	0.03	61884	
286	VOD 7972-U	0.63	0.15	0.50	0.07	0.46	0.07	1.07	0.10	0.0	12.3	0.55	0.27	5086	88	3	10	274	0.6	95	7013	0.31	62145	
287	VOD 7972-V	2.48	0.56	1.59	0.21	1.37	0.20	1.55	0.15	0.11	4.7	0.57	0.15	4361	20	11	15.0	233	0.47	226	647	0.03	67869	
288	VOD 7972-W	3.48	0.68	1.95	0.29	1.90	0.25	2.76	0.22	0.2	5.3	2.50	0.57	5629	96	26	89	219	0.8	890	3264	0.08	67239	
289	VOD 7972-X	3.27	0.66	1.93	0.28	1.80	0.25	1.79	0.10	0.0	5.0	1.42	0.43	5090	46	25	26	214	0.6	837	2369	0.08	74362	
290	VOD 7972-Y	1.63	0.33	0.86	0.13	0.88	0.13	2.37	0.19	0.2	4.2	2.08	0.43	4696	98	39	89	200	0.7	2597	2680	0.08	73669	
291	ZAP 5160-102	3.60	0.72	2.12	0.32	2.18	0.29	2.24	0.18	0.26	5.5	1.85	0.59	4548	44	17	18.8	204	0.52	1020	6451	0.13	57906	
292	ZAP 5160-103	3.47	0.76	2.15	0.32	2.15	0.30	2.00	0.08	0.1	6.1	1.12	0.58	4423	6	26	13	243	0.7	1638	3766	0.08	68322	
293	ZAP 5160-139	3.69	0.75	2.08	0.30	2.13	0.28	2.10	0.20	0.02	2.4	1.39	0.15	4875	7	30	7.8	279	0.46	1594	4293	0.03	73507	
294	ZAP 5160-00(A)	4.00	0.92	2.75	0.41	2.67	0.43	1.72	0.17	0.2	3.8	0.36	0.15	4666	20	21	16	193	0.6	1421	6817	0.05	64616	
295	ZAP 5160-01(B)	3.06	0.66	1.96	0.31	1.91	0.29	2.09	0.20	0.3	6.4	0.83	0.35	5024	49	20	27	206	0.6	810	3589	0.22	65290	
296	ZAP 5160-02(C)	3.16	0.67	1.92	0.28	2.04	0.28	1.97	0.16	0.09	19.5	0.75	0.15	4952	14	17	7.8	208	0.50	1120	3789	0.82	65215	
297	ZAP 5160-03(D)	3.39	0.73	2.08	0.33	2.13	0.34	2.07	0.09	0.01	5.50	0.49	0.26	5634	26	20	18	222	0.6	1218	4282	0.01	72006	
298	ZAP 5160-04(E)	3.38	0.74	2.23	0.35	2.24	0.32	1.60	0.07	0.0	7.4	0.59	0.08	4733	26	23	26	169	0.7	1291	3286	0.08	66607	
299	ZAP 5160-05(F)	4.10	0.85	2.55	0.38	2.62	0.37	2.84	0.09	0.3	10.5	1.69	0.75	4884	17	19	15	205	0.7	1011	7559	0.35	69126	
300	ZAP 5160-06(A)	3.26	0.69	2.29	0.31	2.32	0.30	1.99	0.10	0.1	12.8	0.96	0.44	4762	30	23	20	227	0.5	1284	4065	0.20	70631	

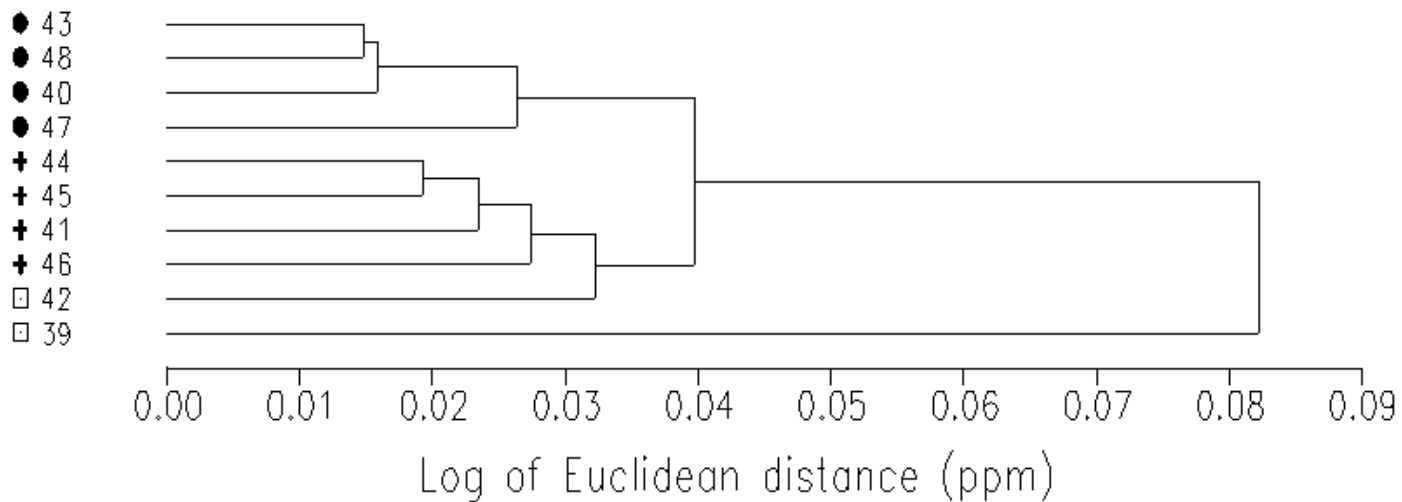
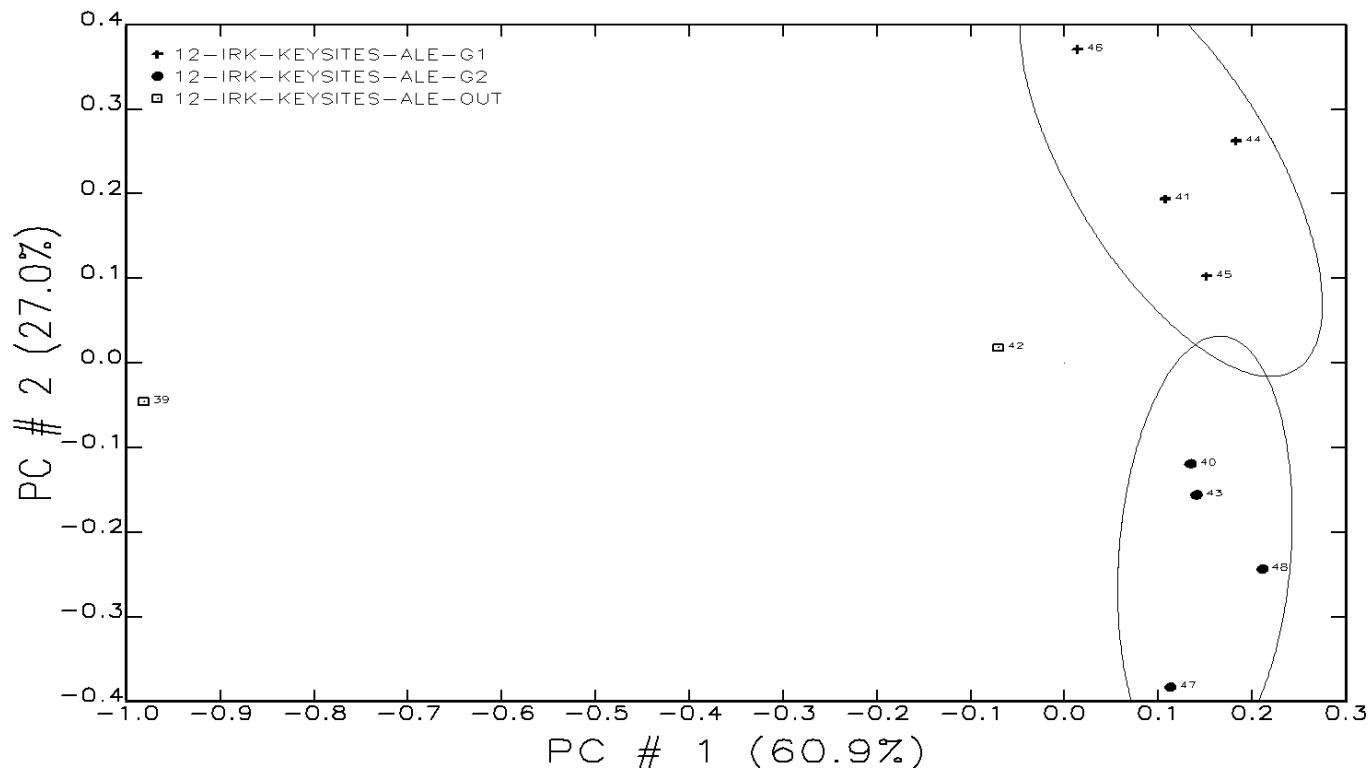
Ainu Bay 1



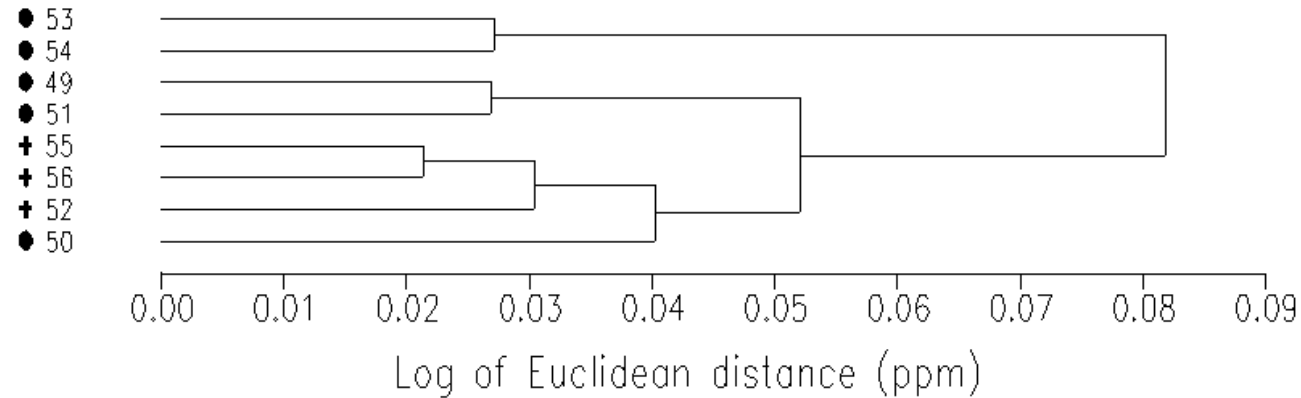
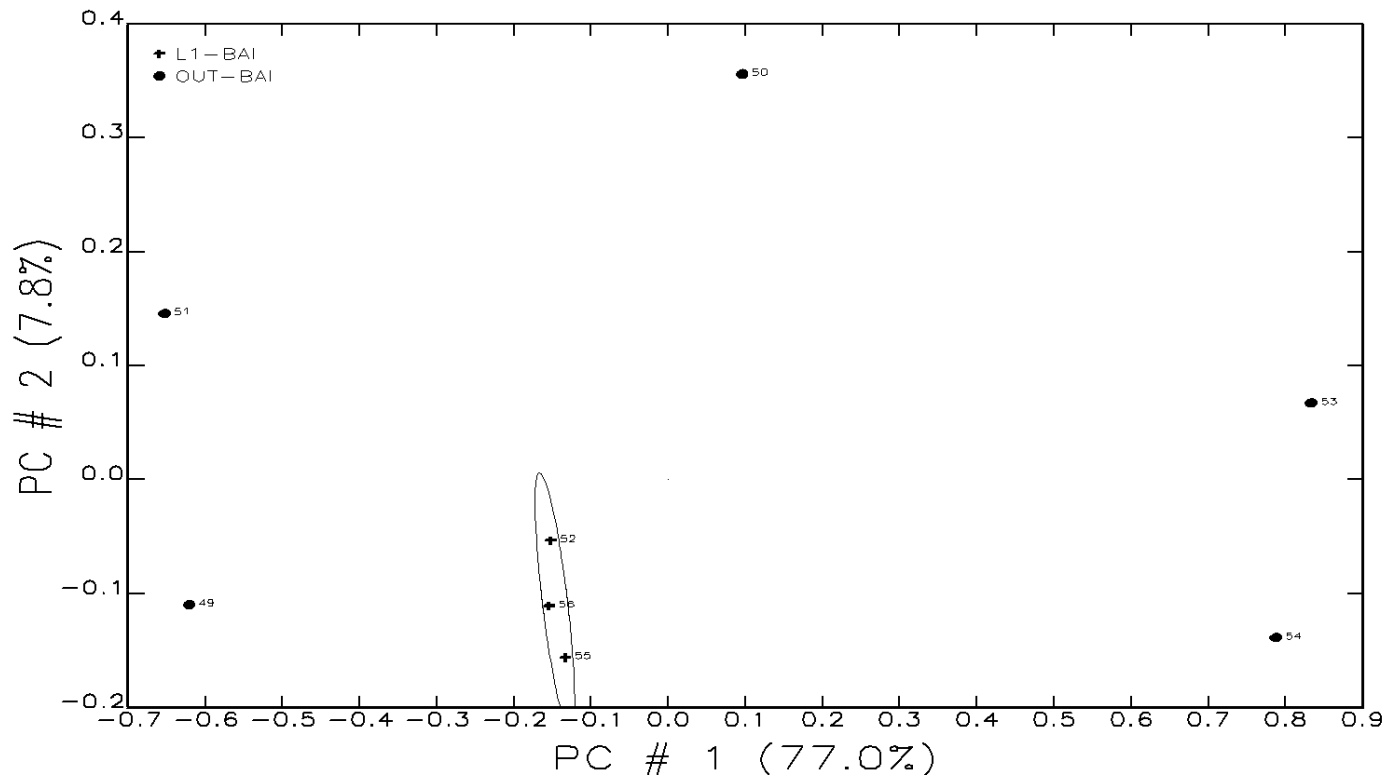
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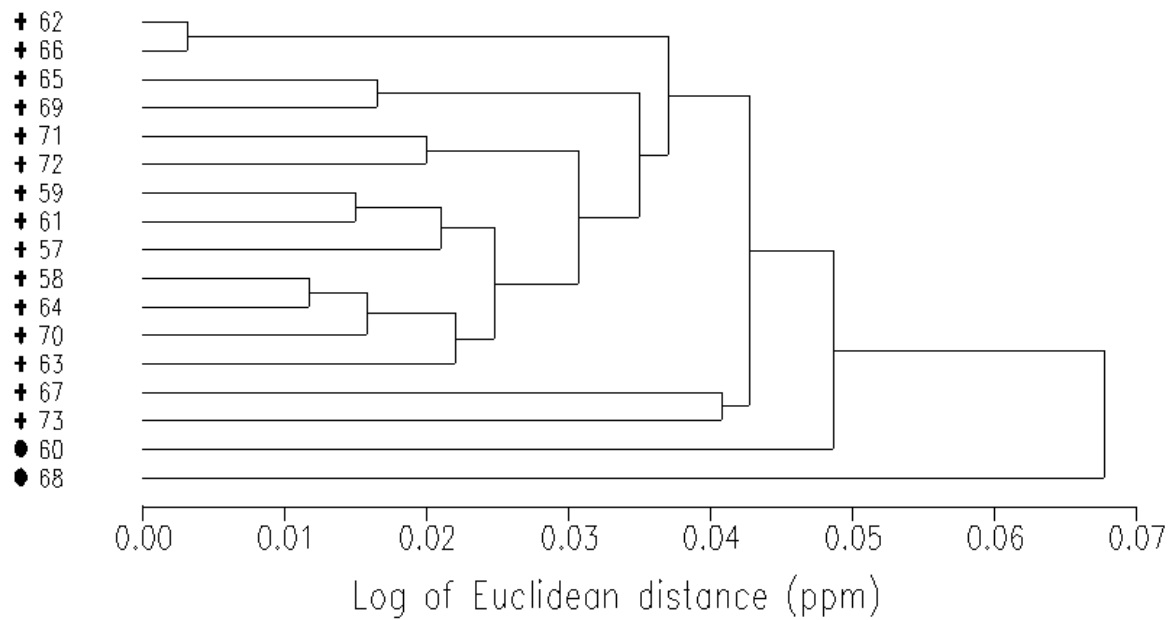
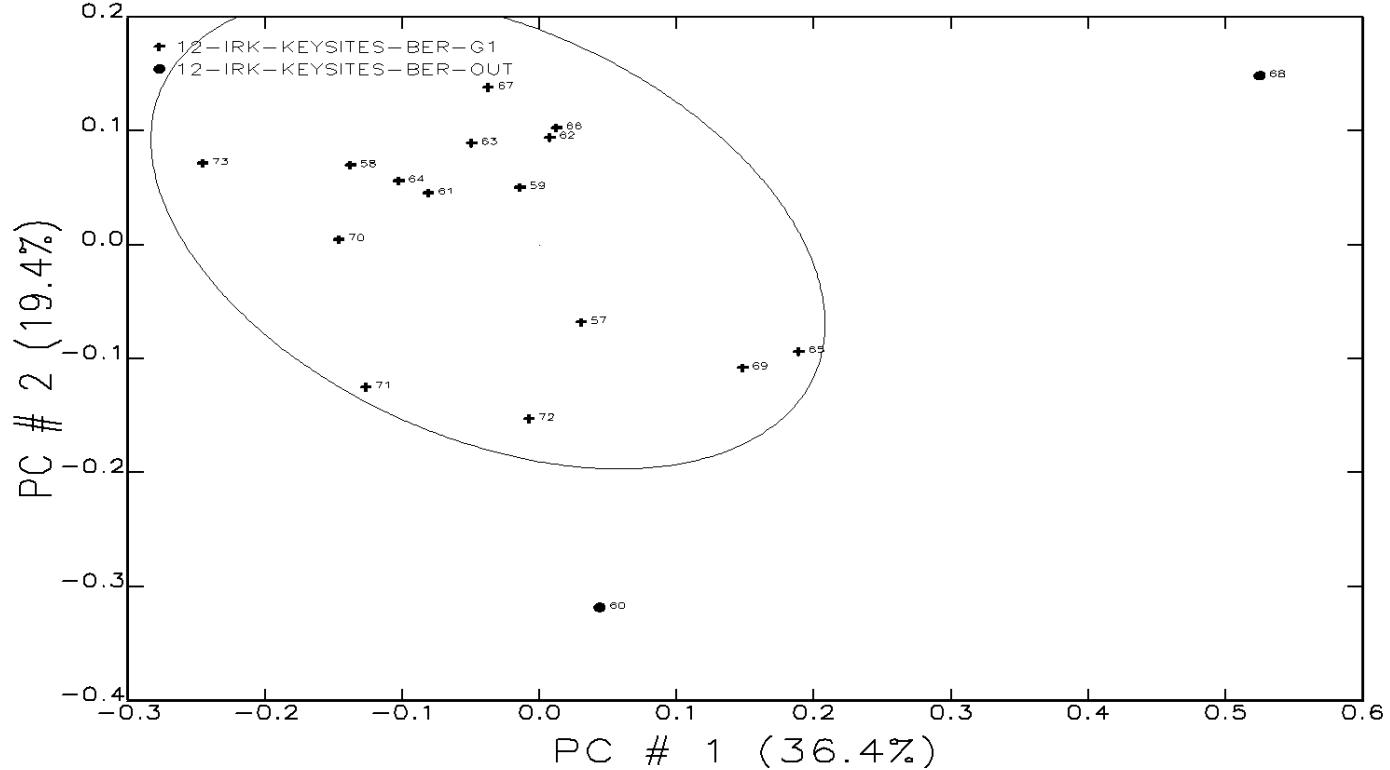
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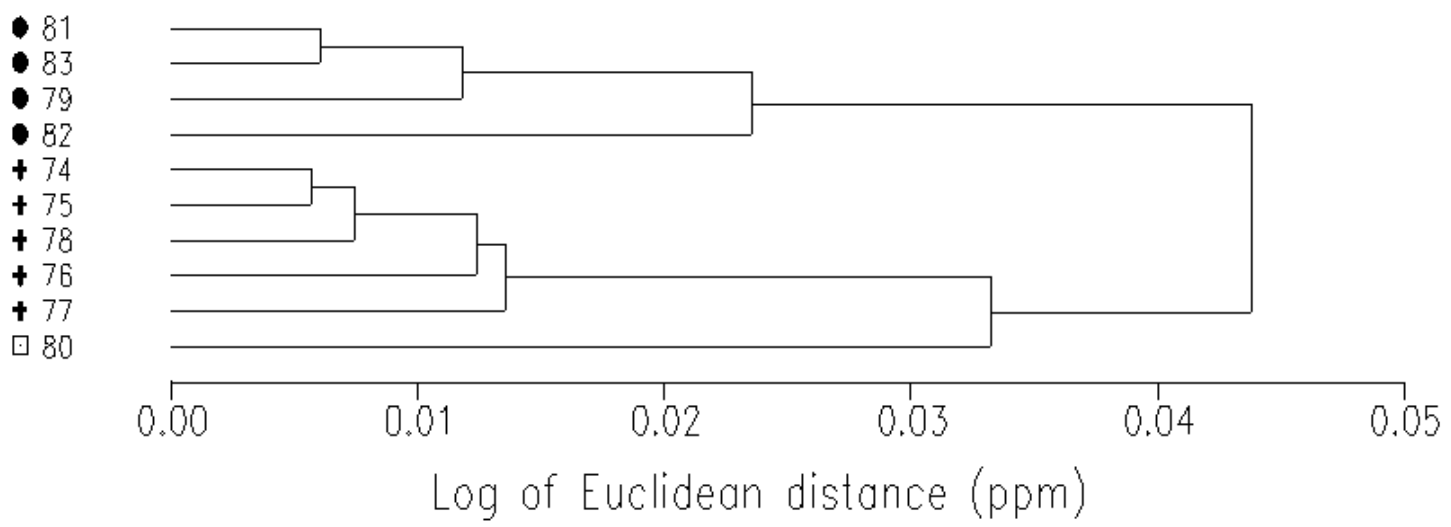
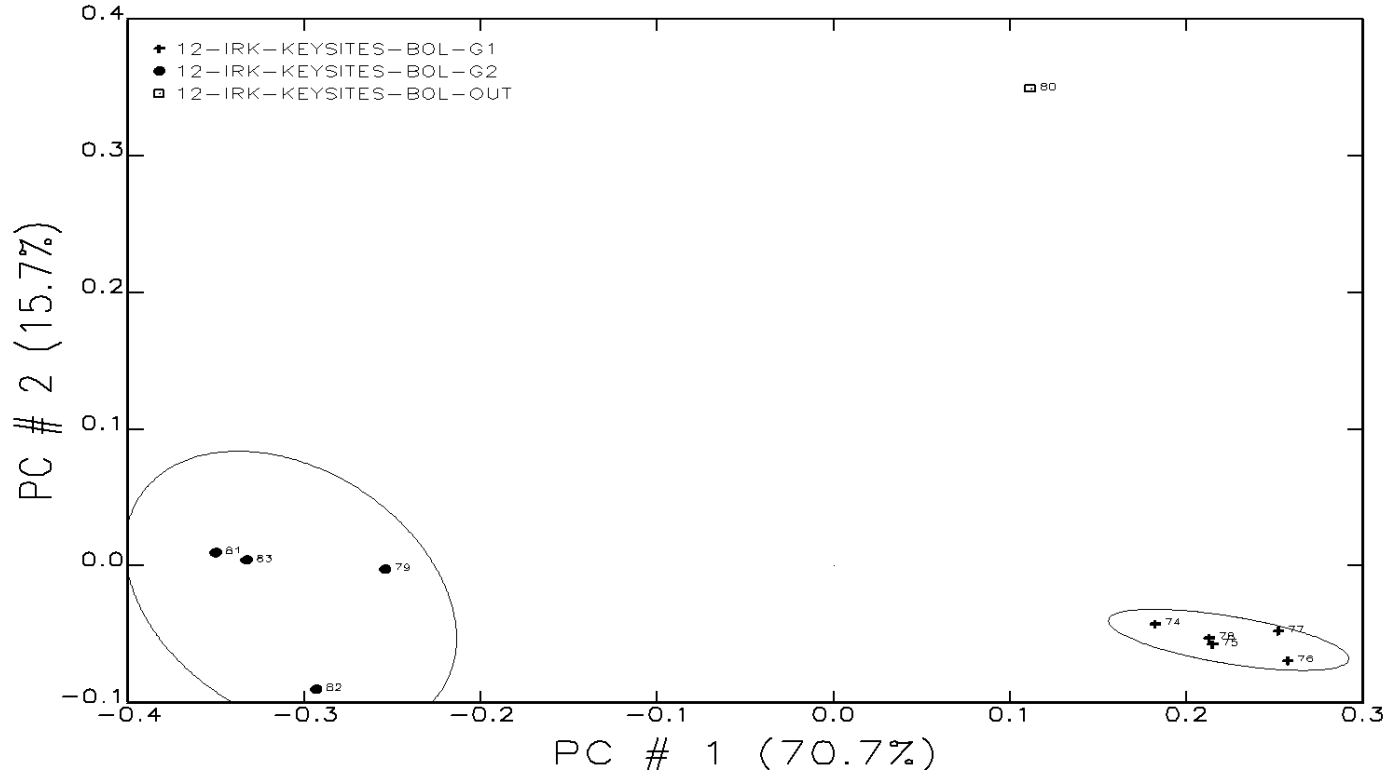
Baikova 1



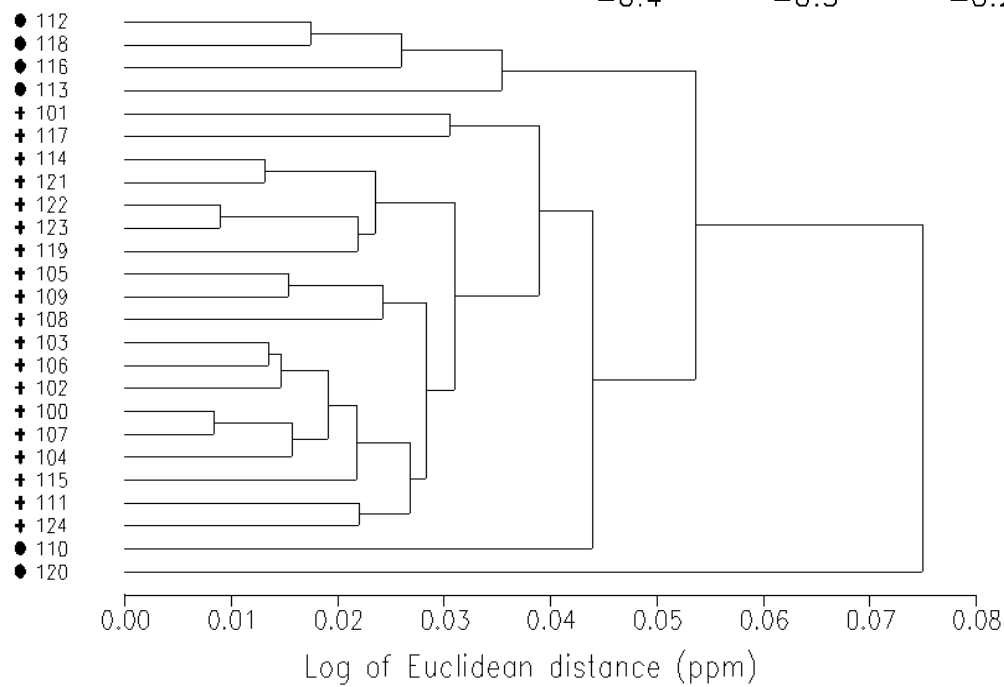
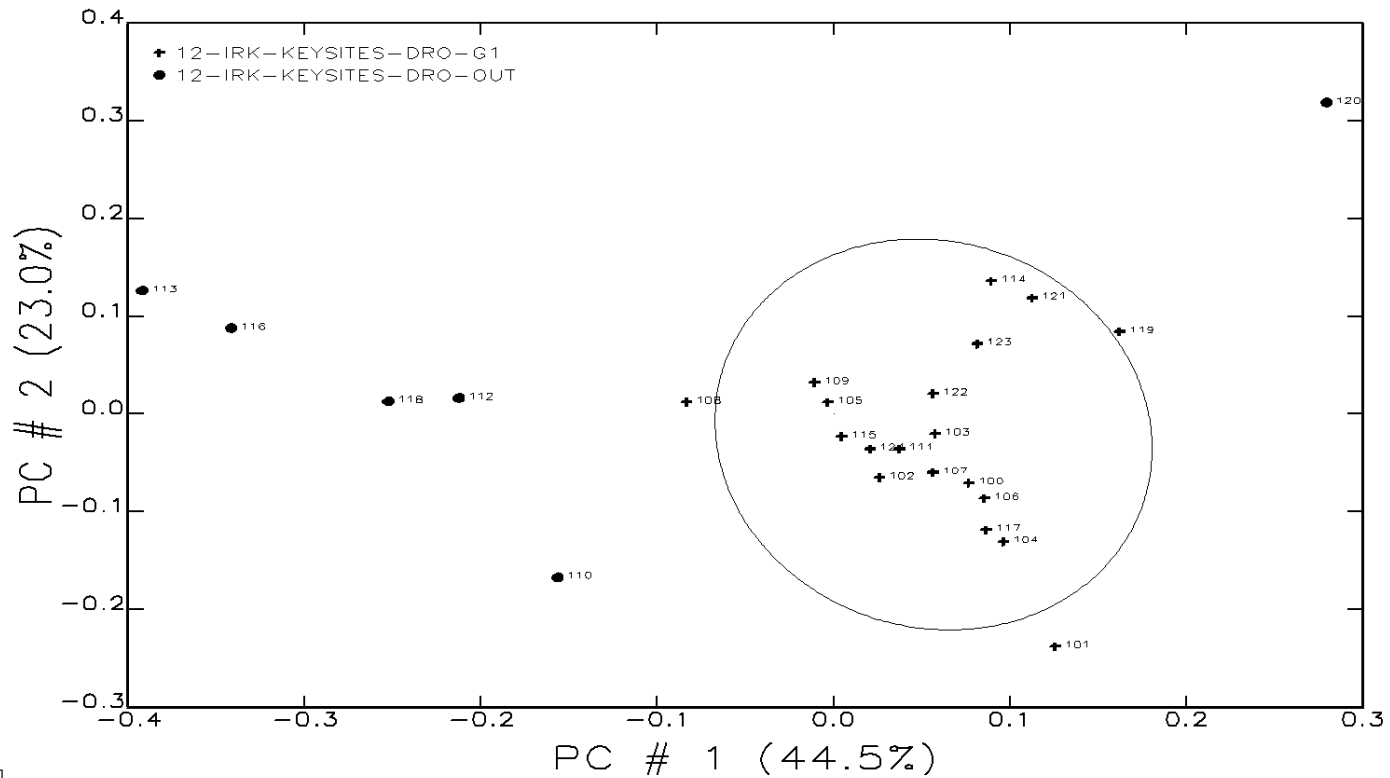
Berezovka 1



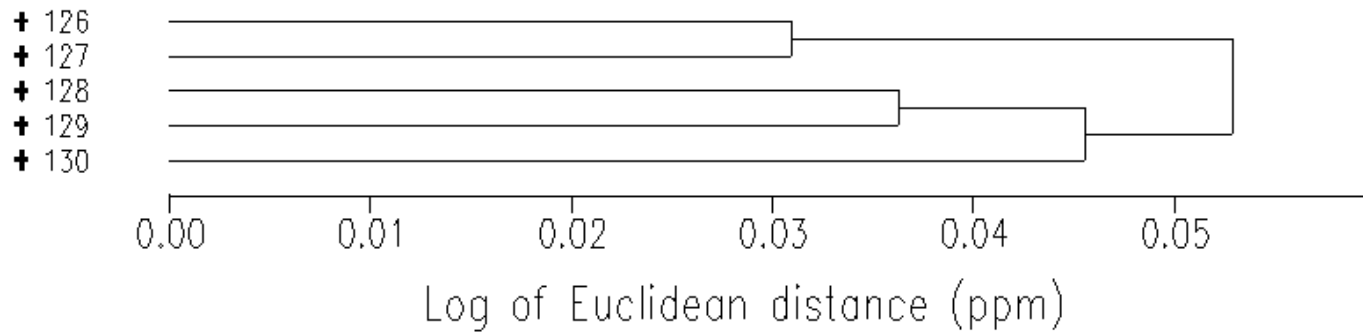
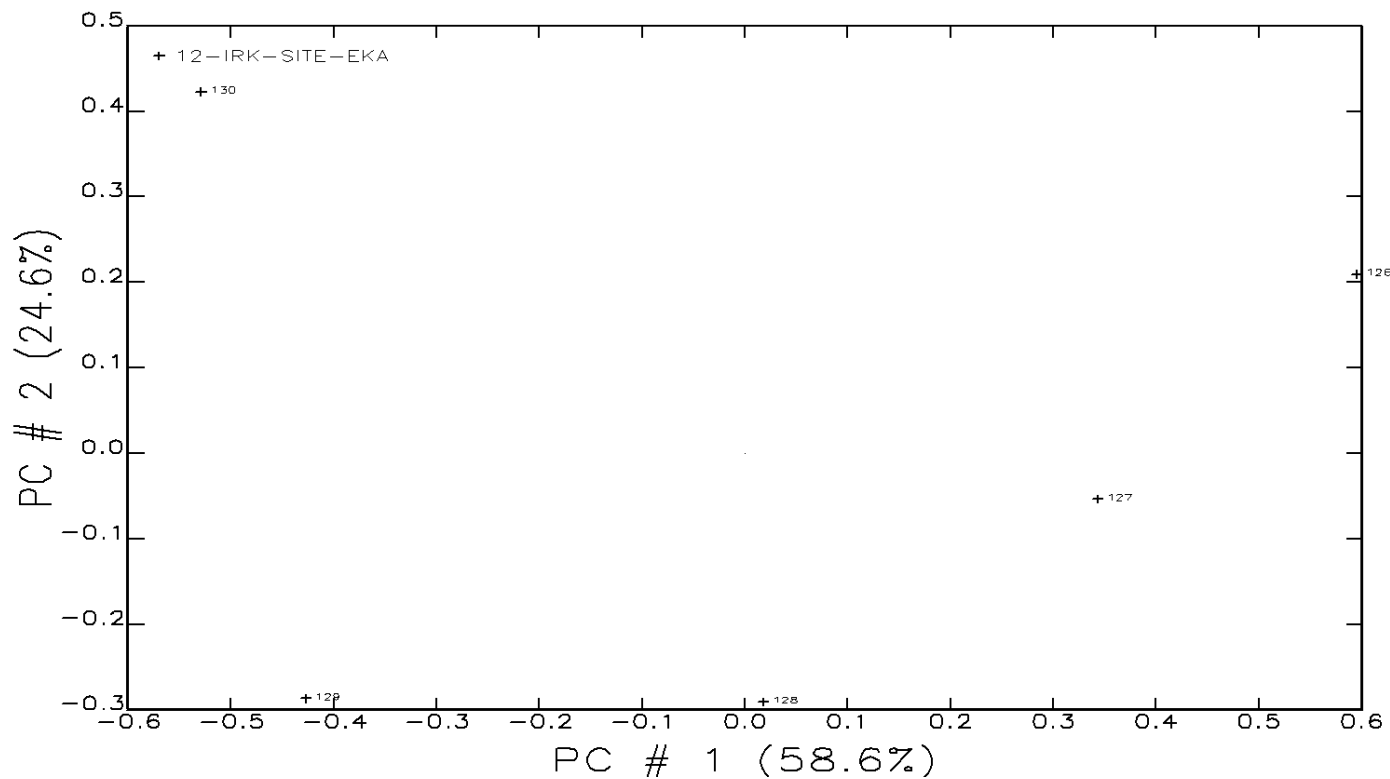
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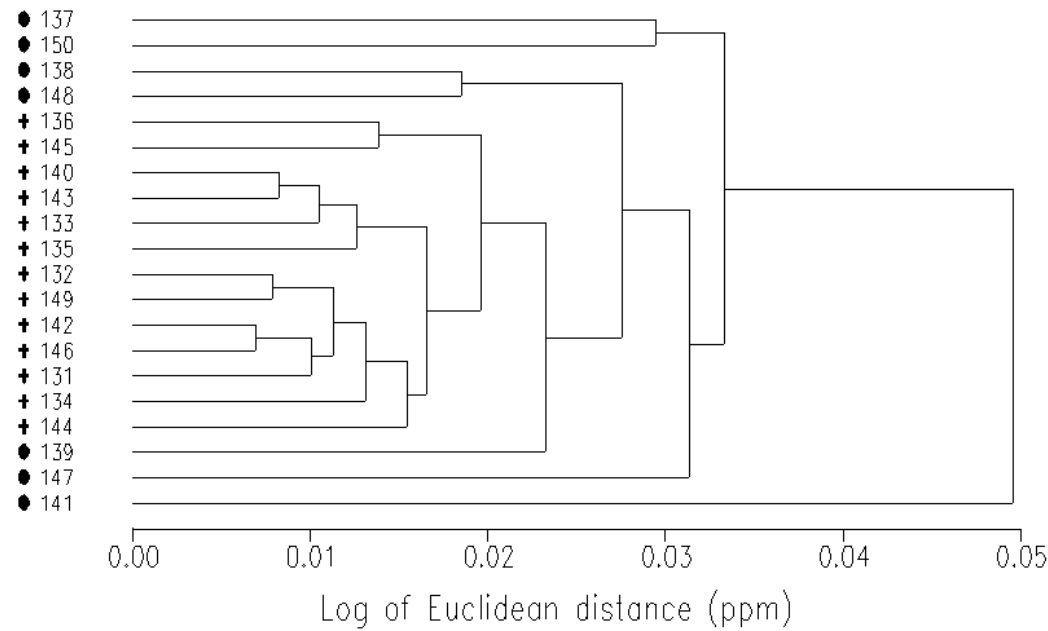
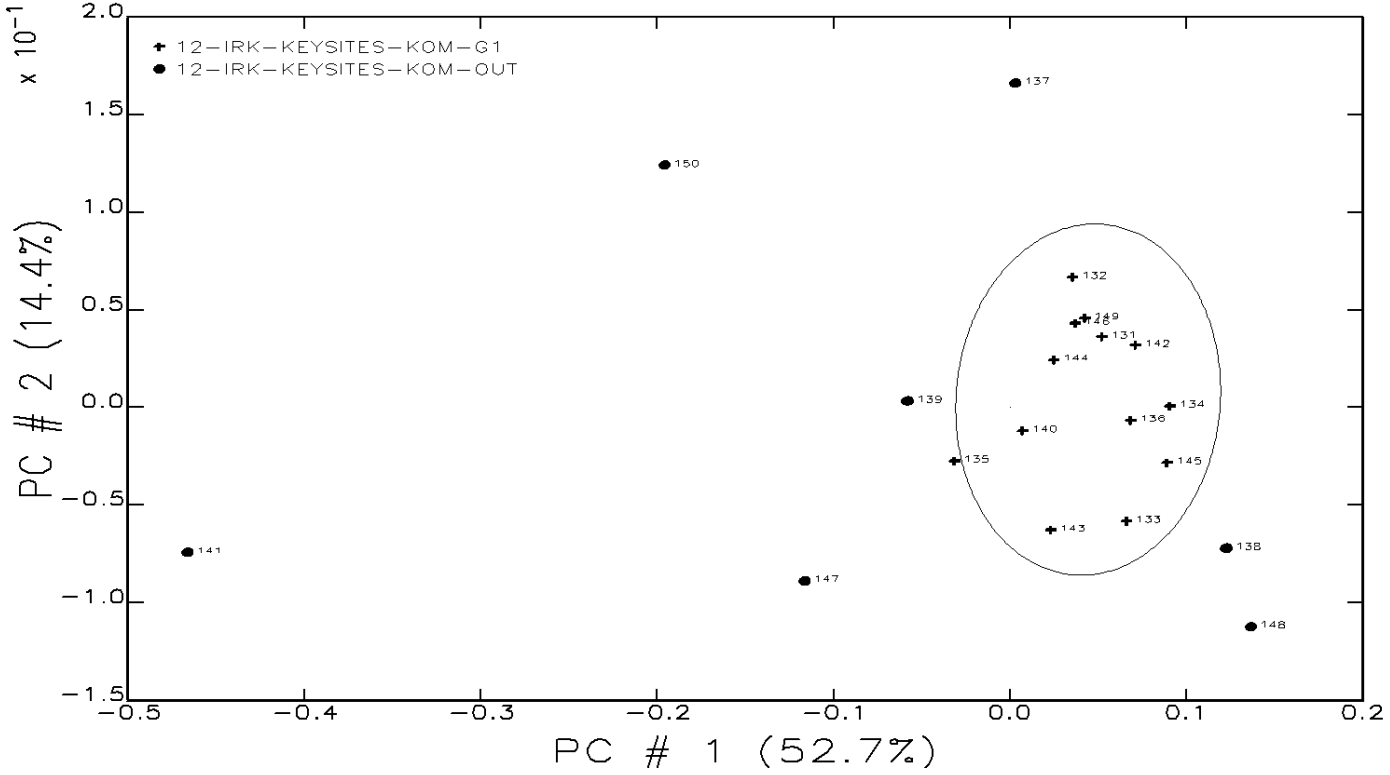
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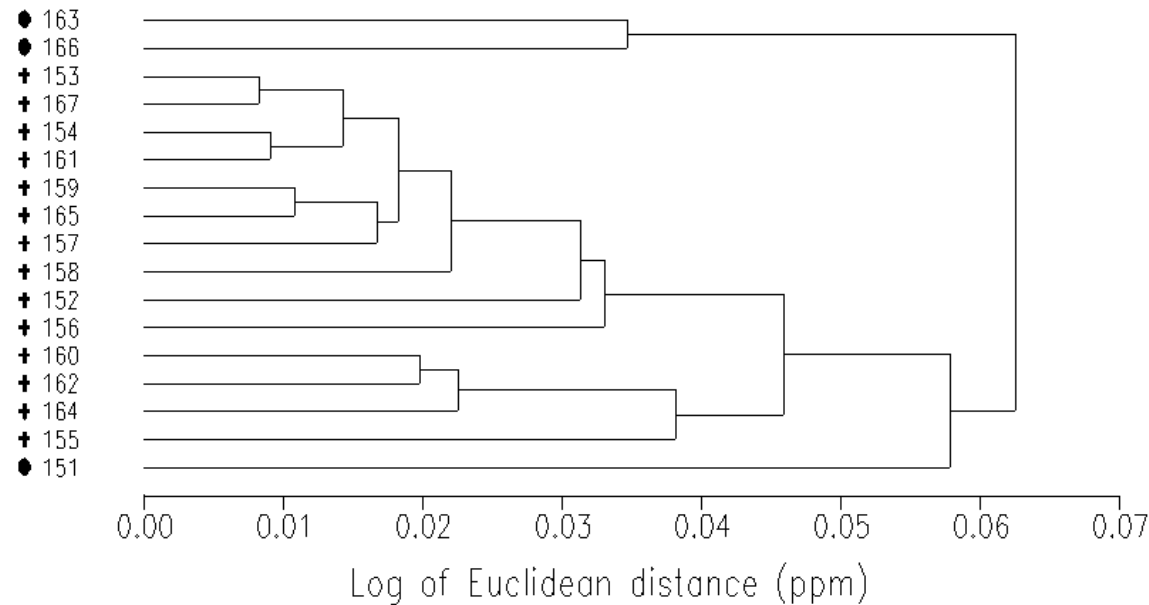
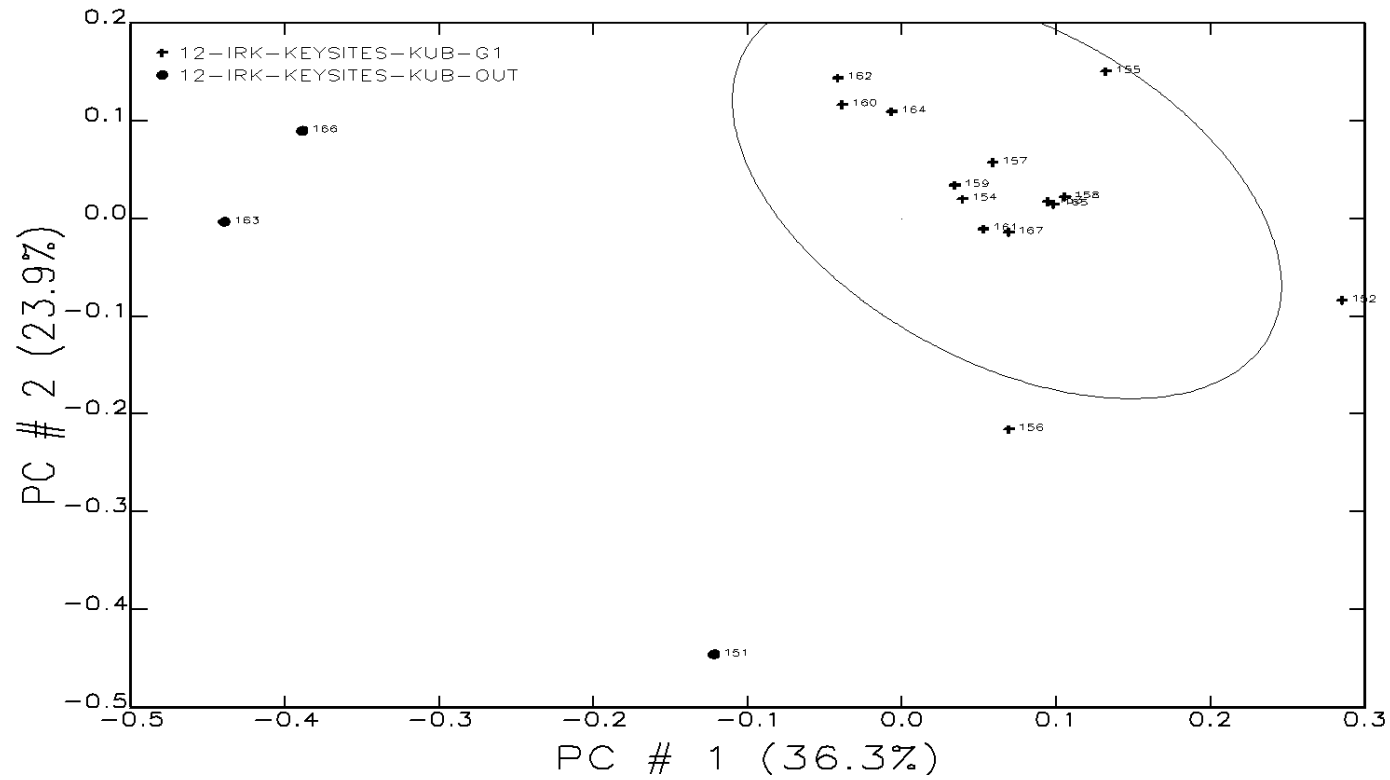
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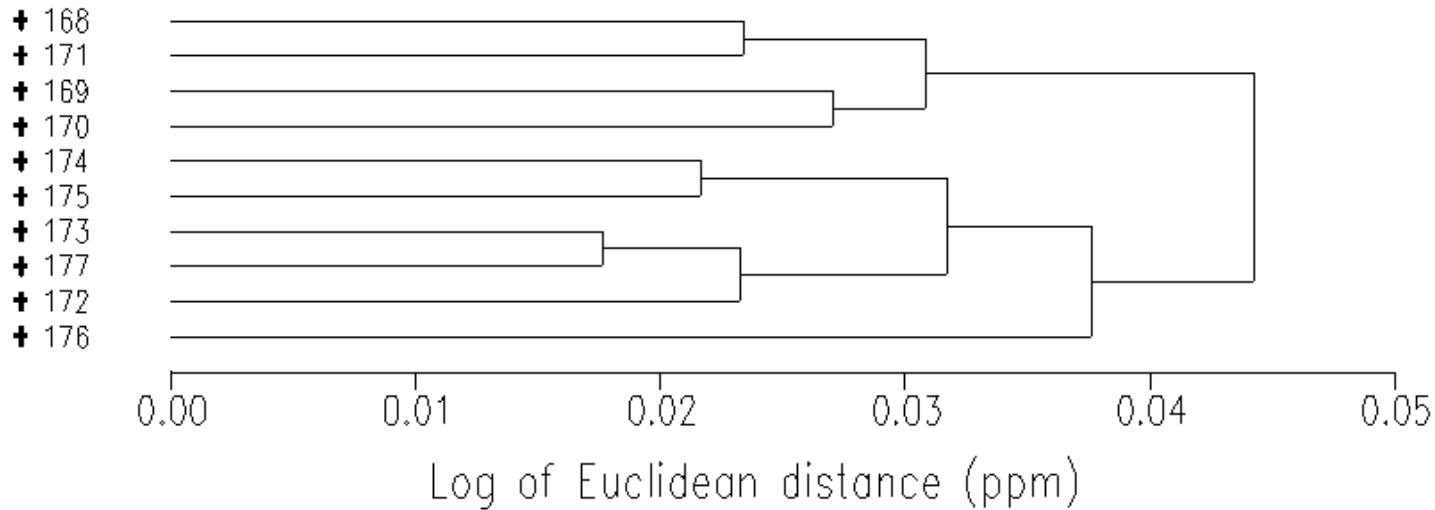
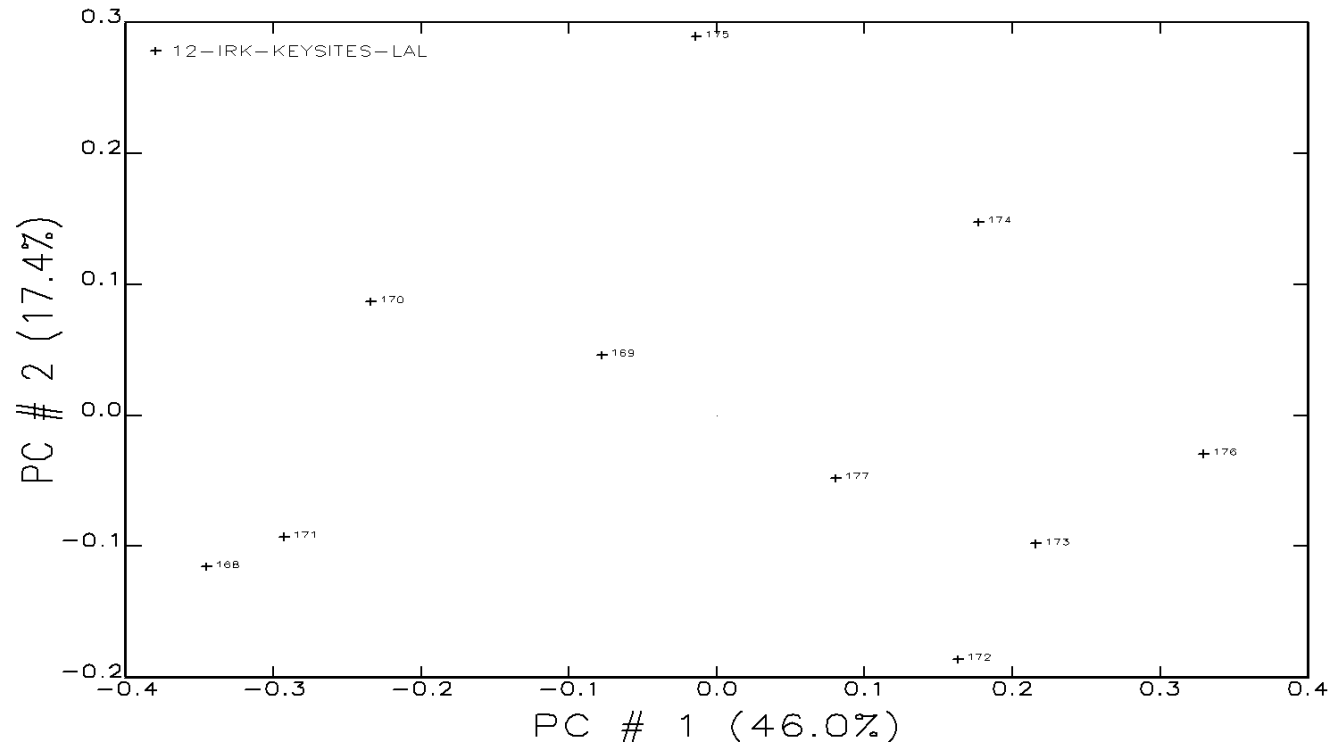
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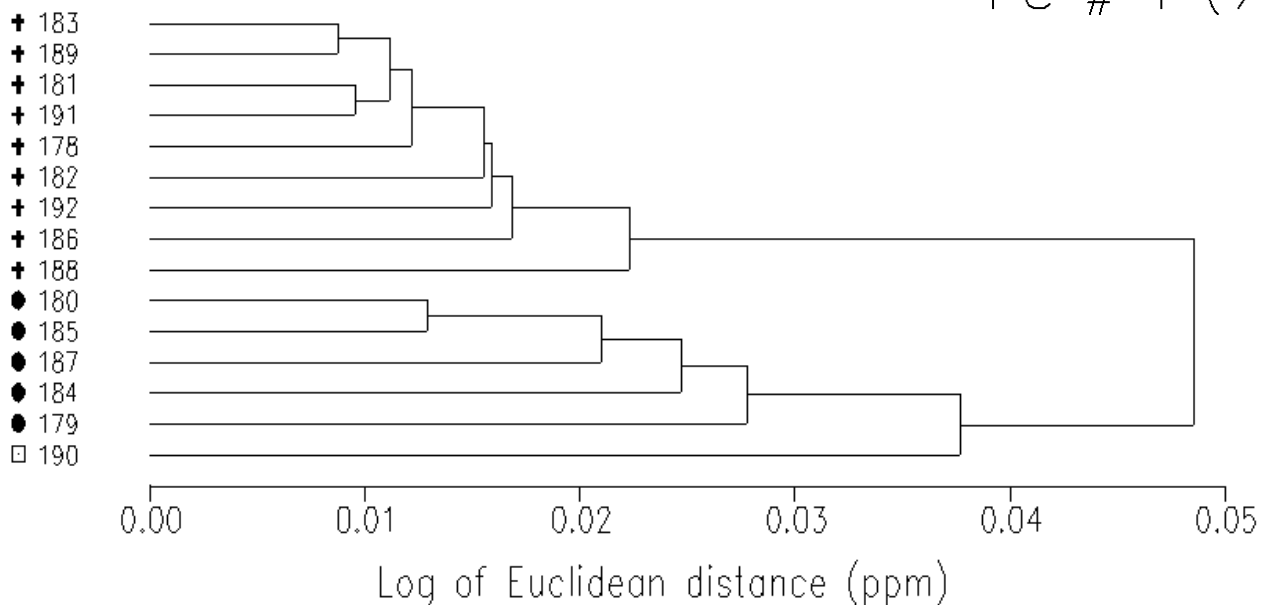
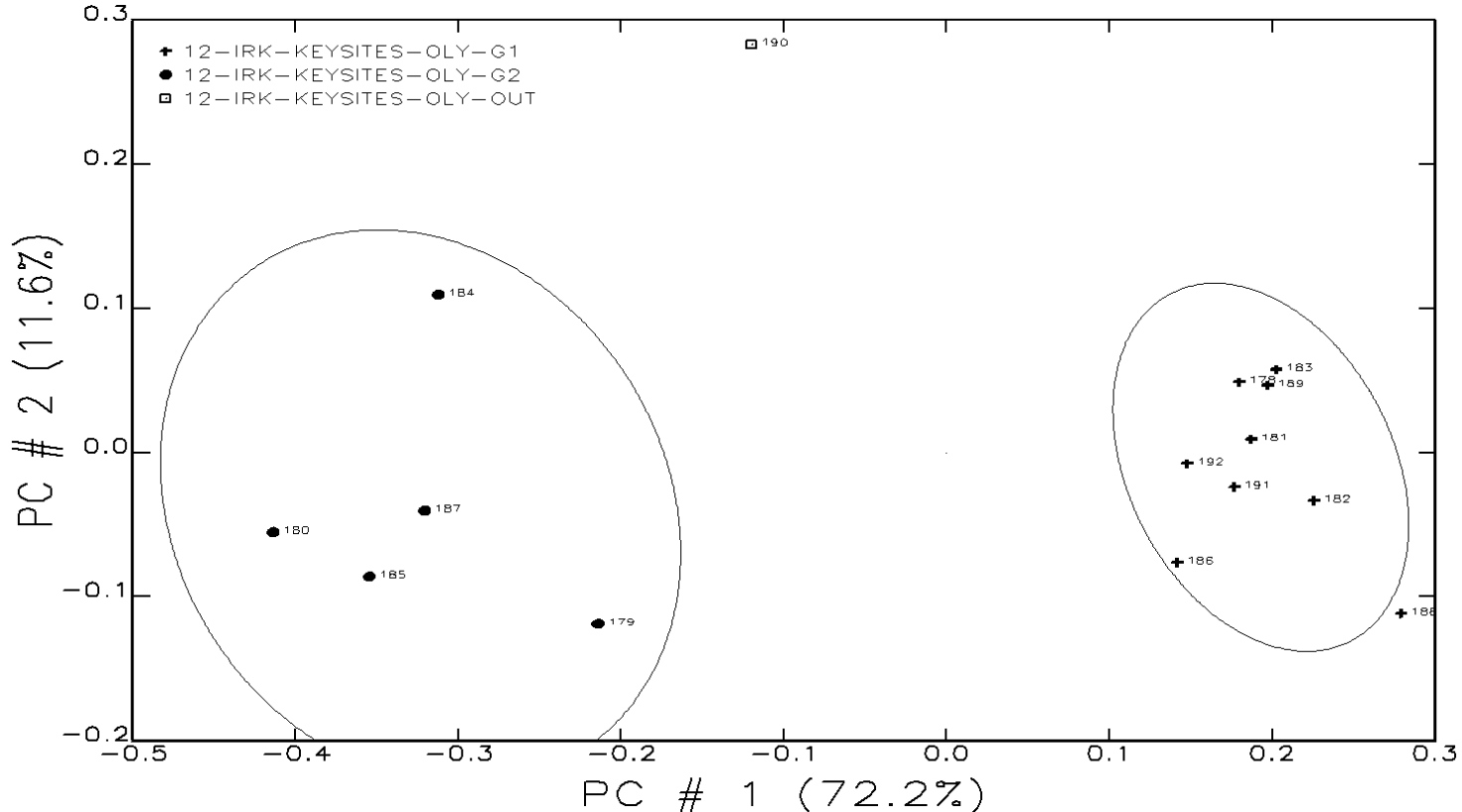
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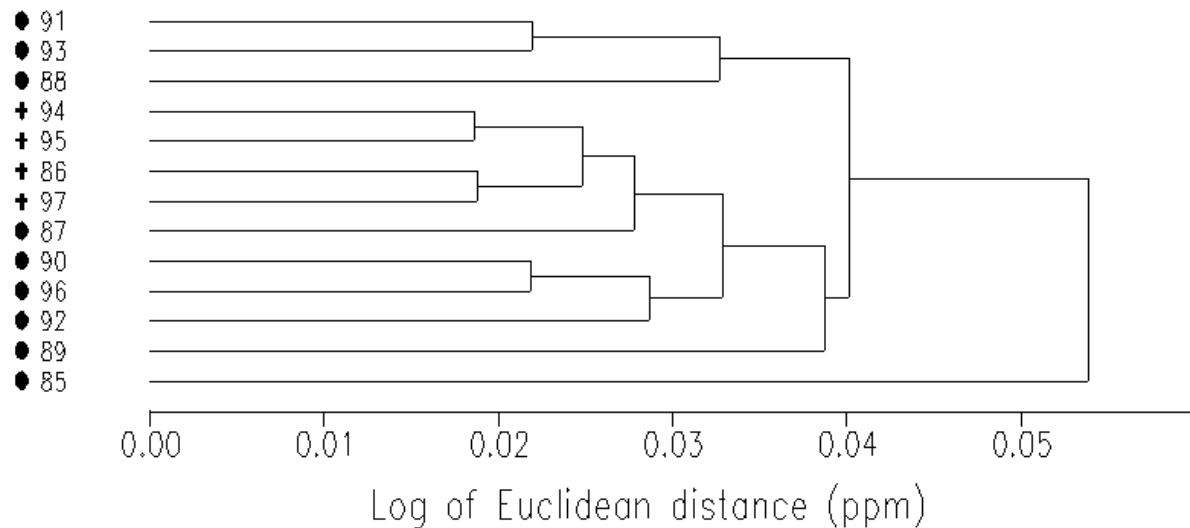
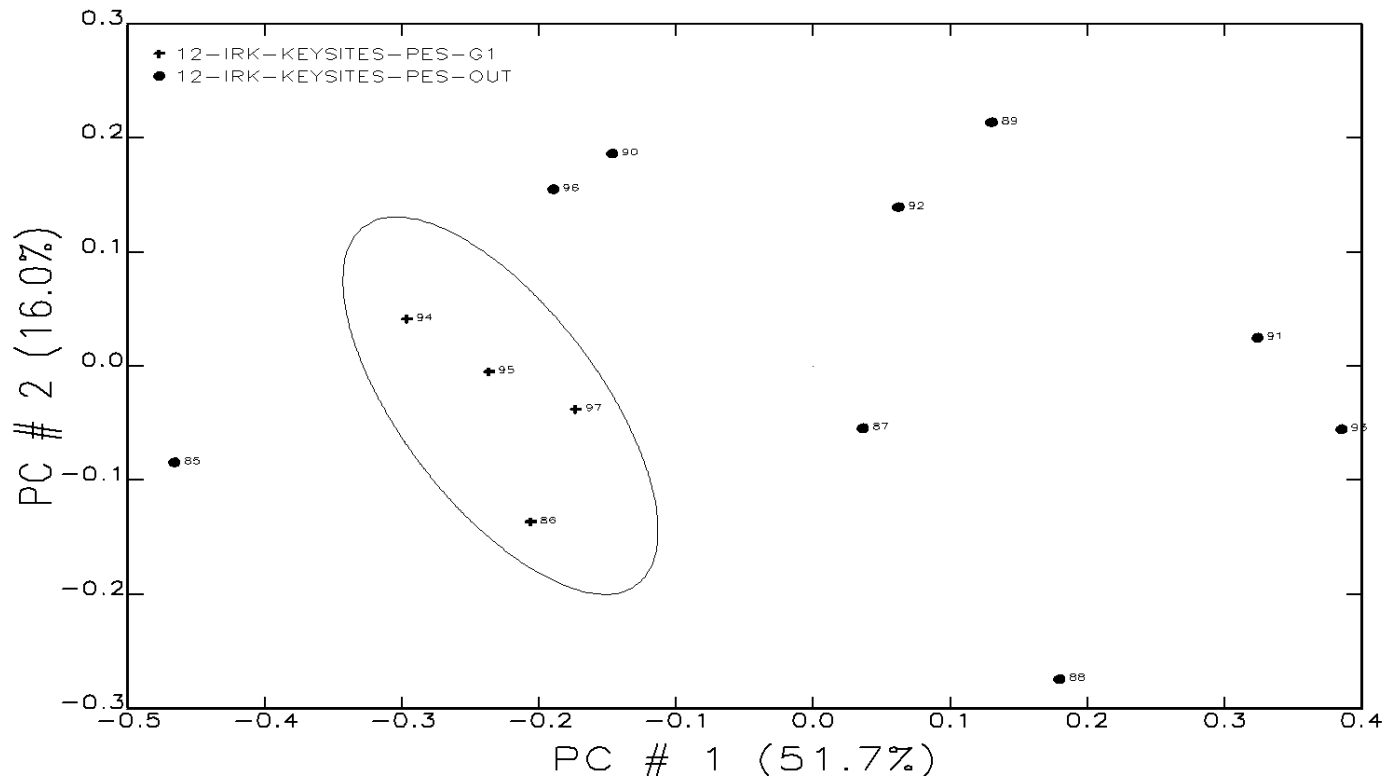
Lake Lazournye 1



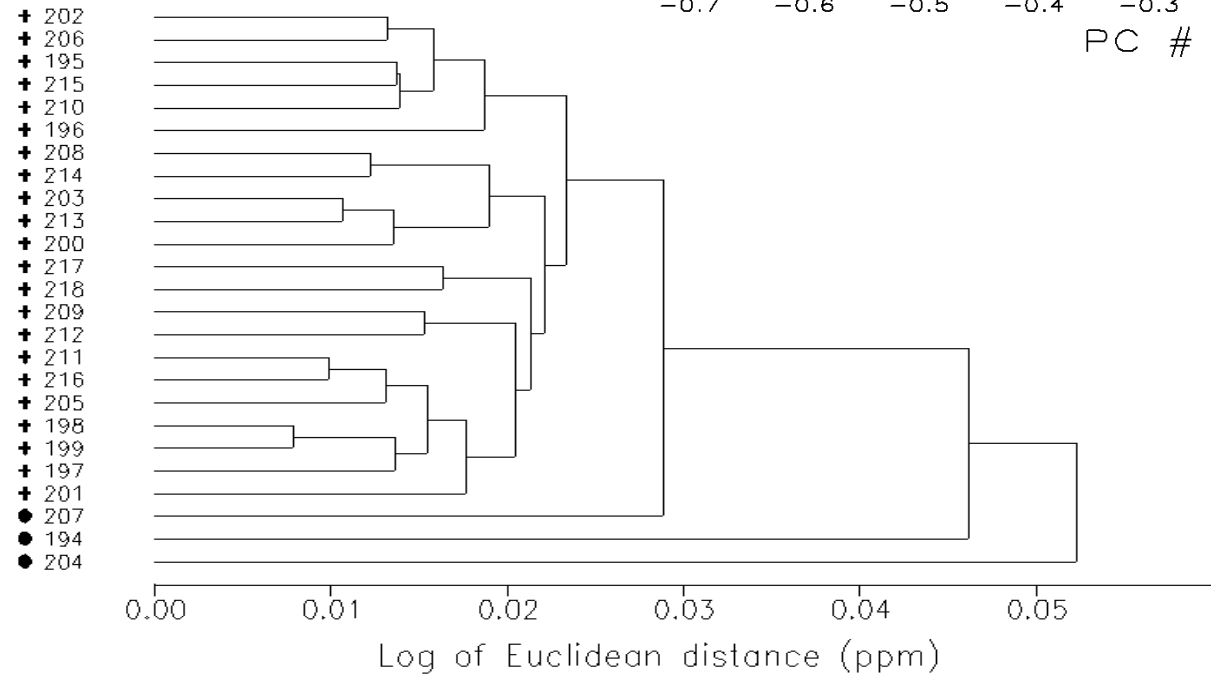
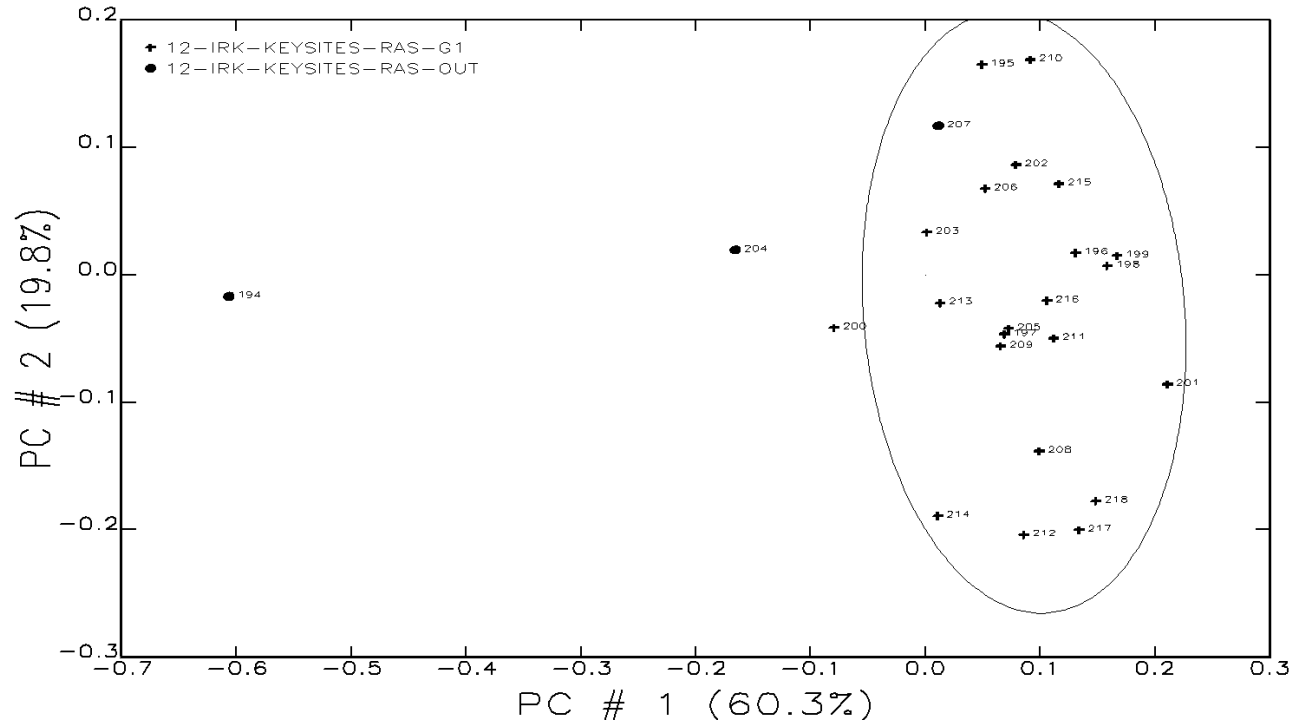
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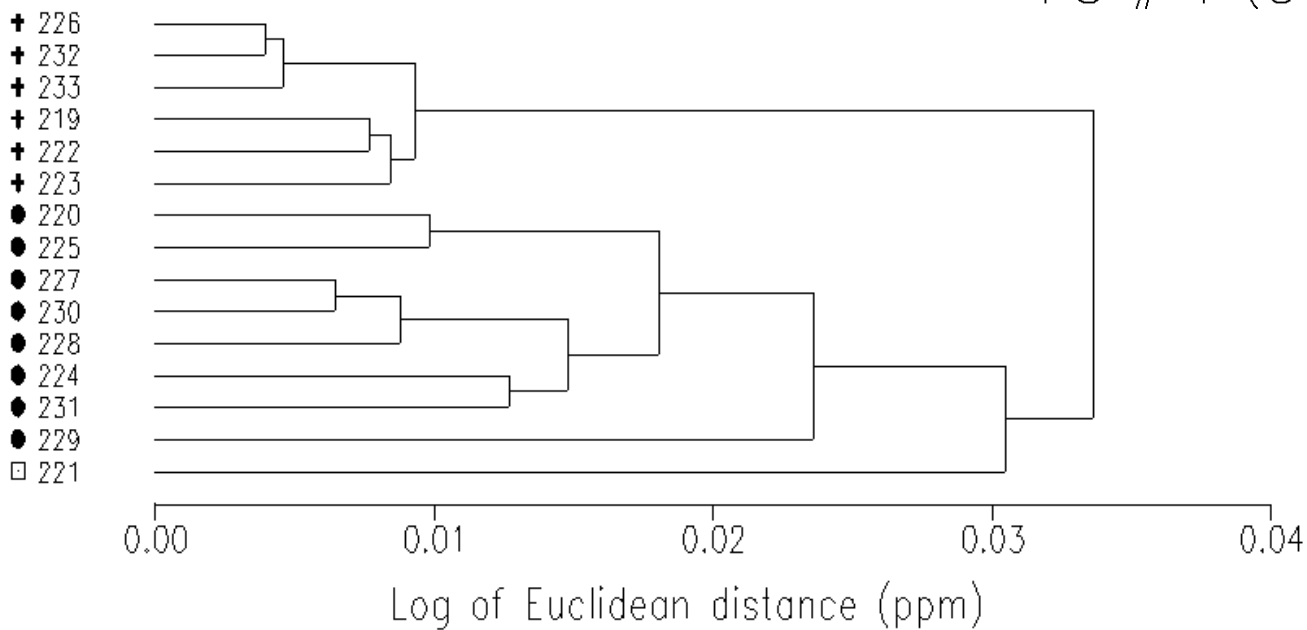
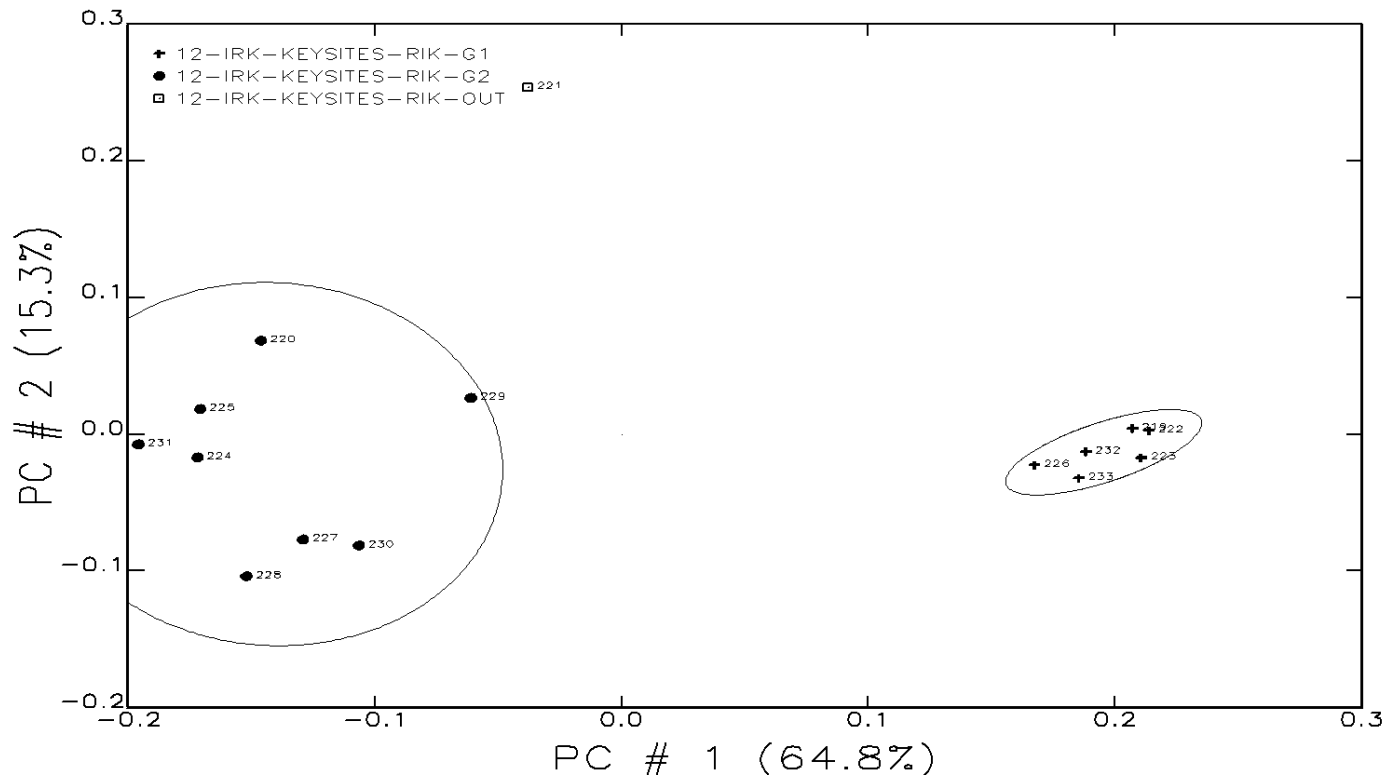
Peschnaya Bay 1 (Chirpoi)



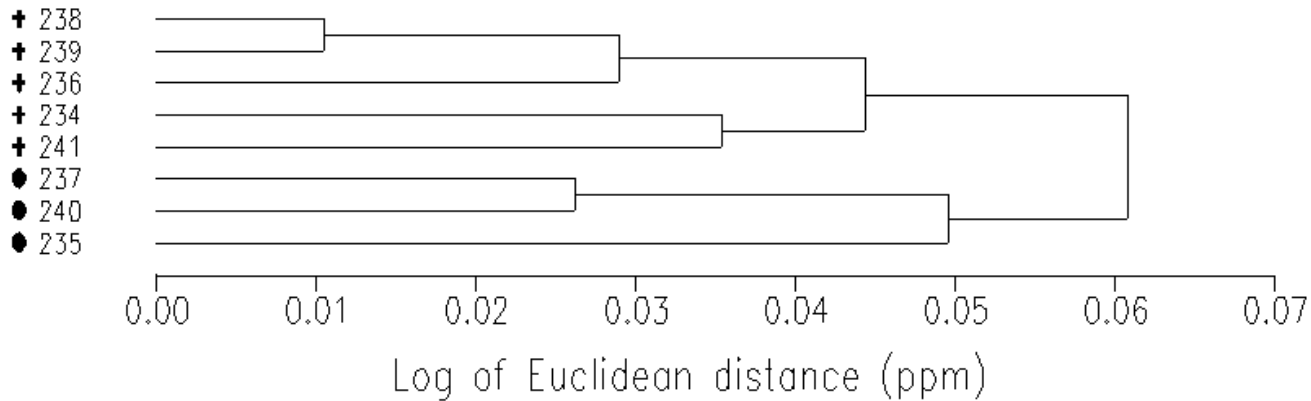
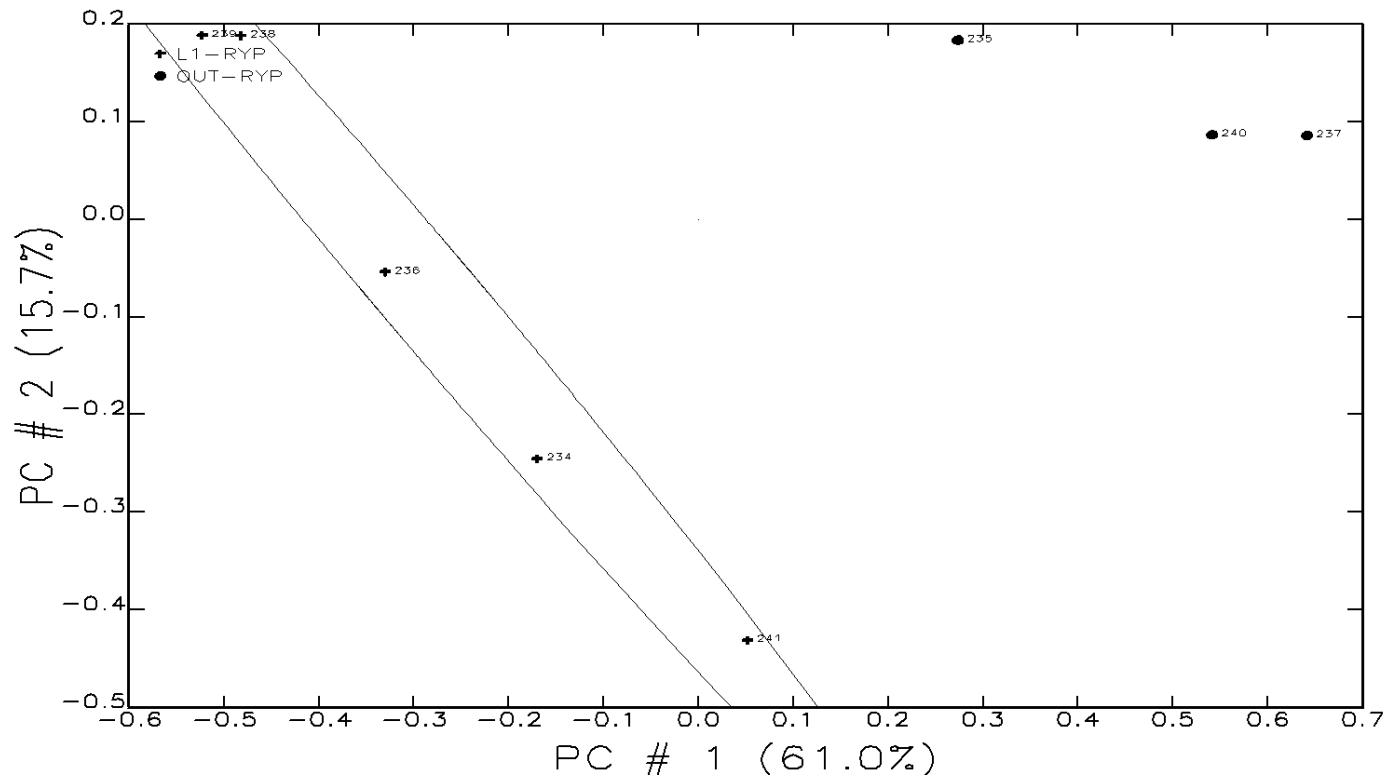
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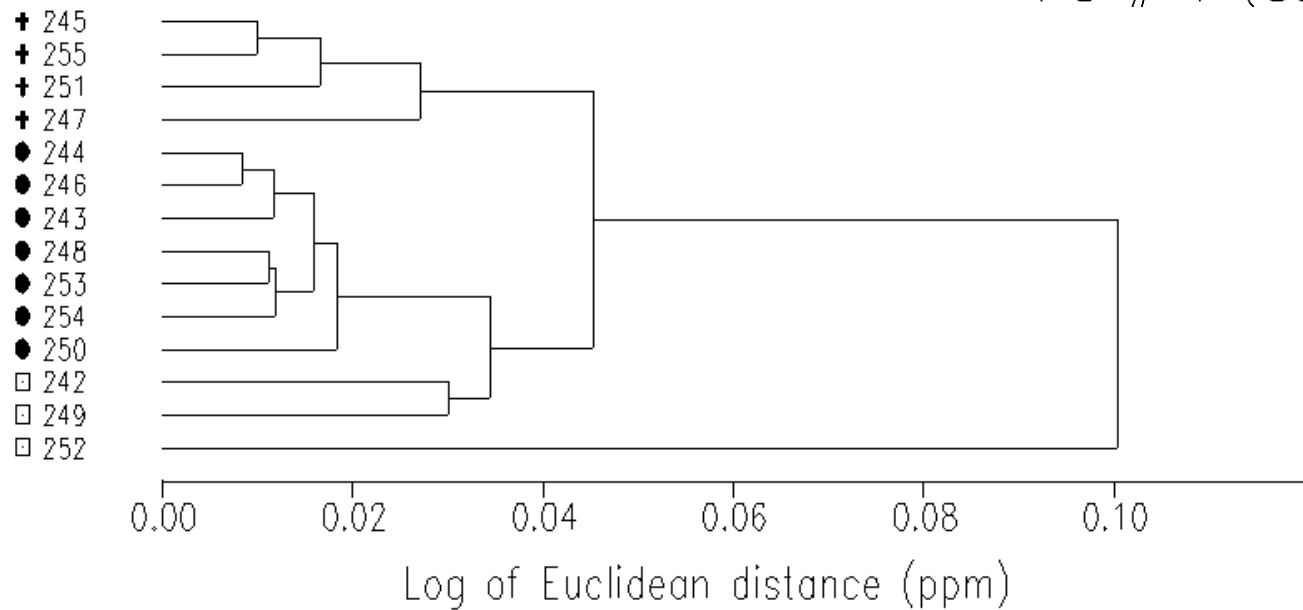
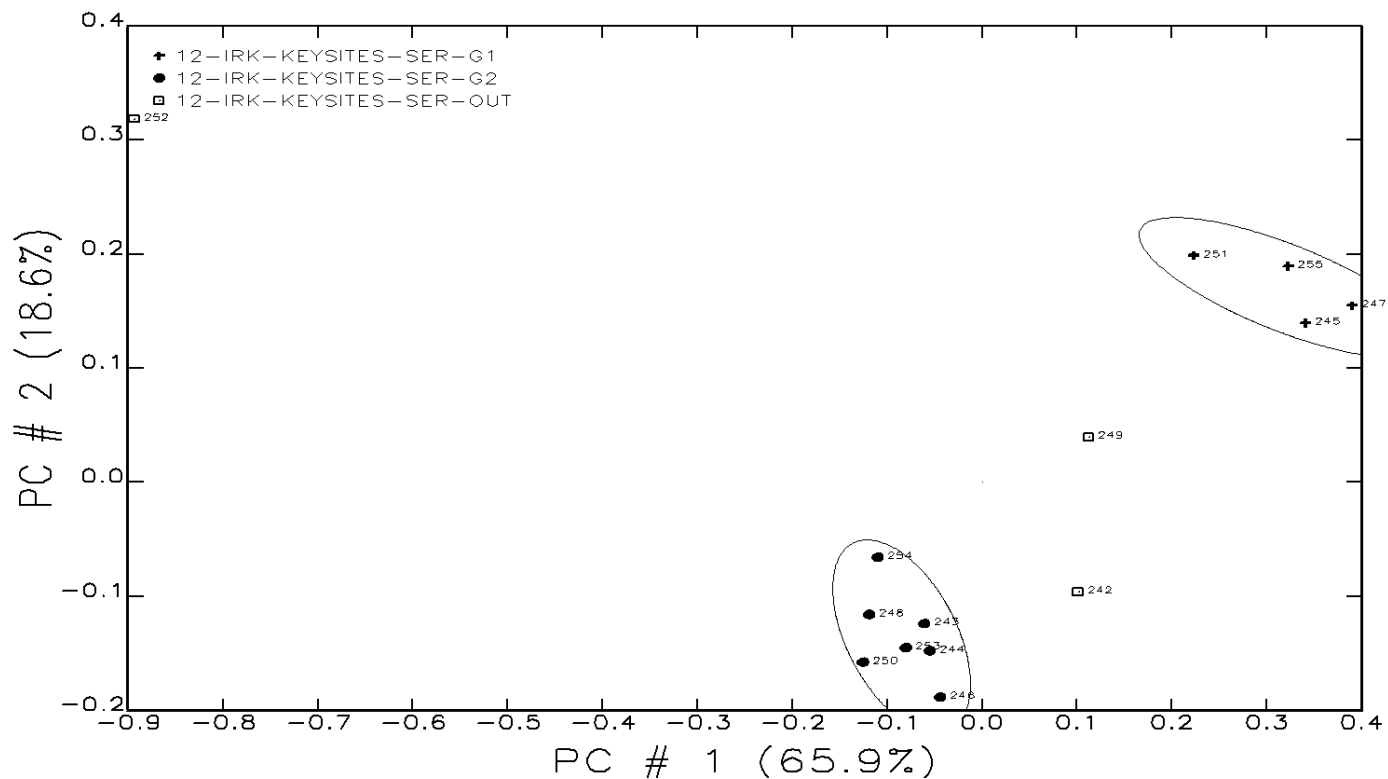
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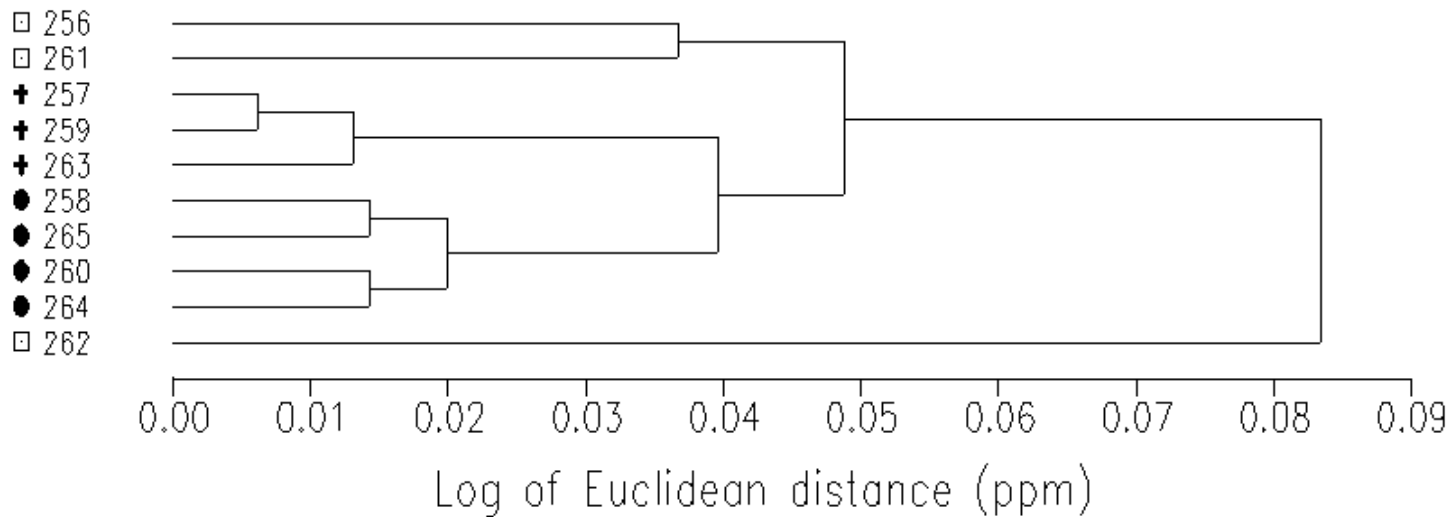
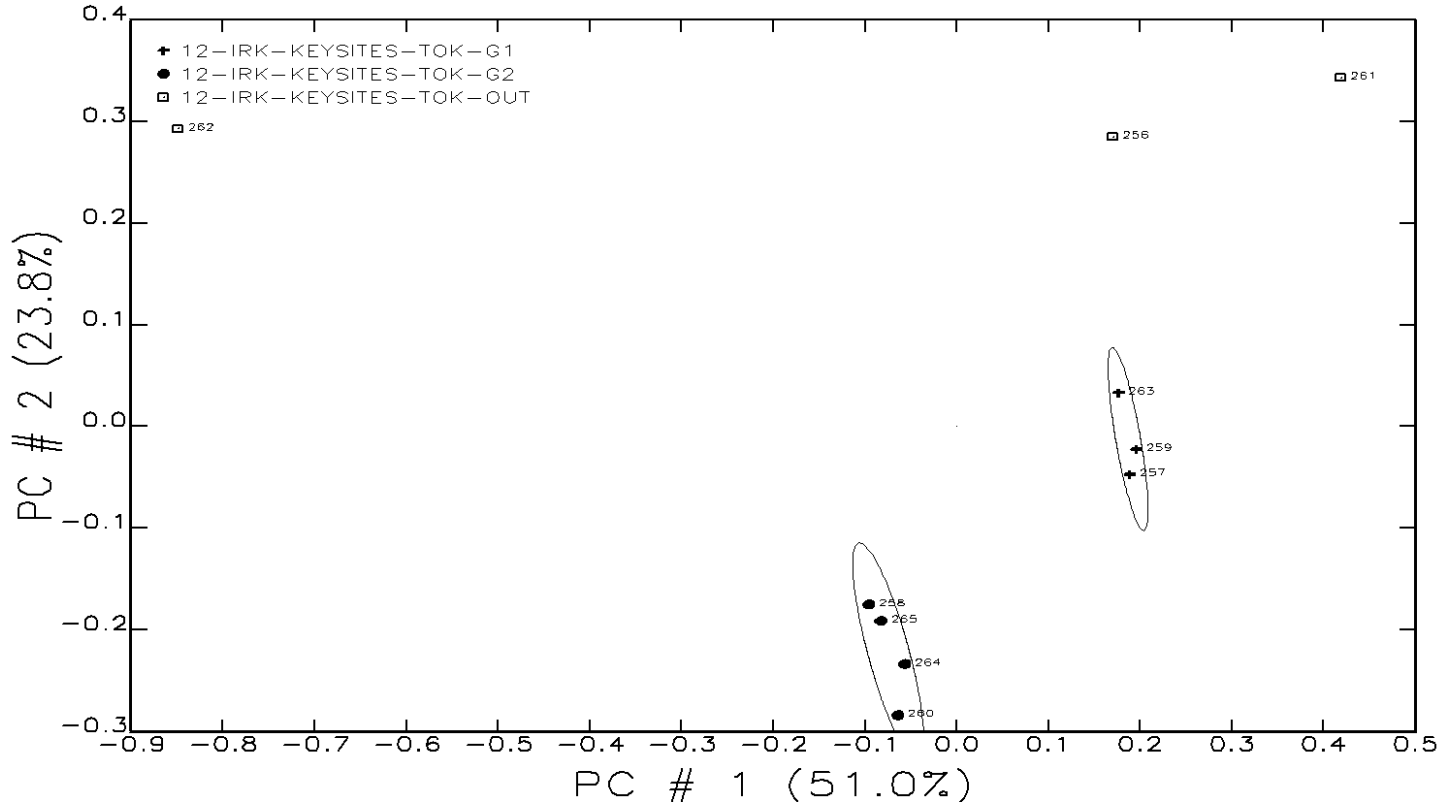
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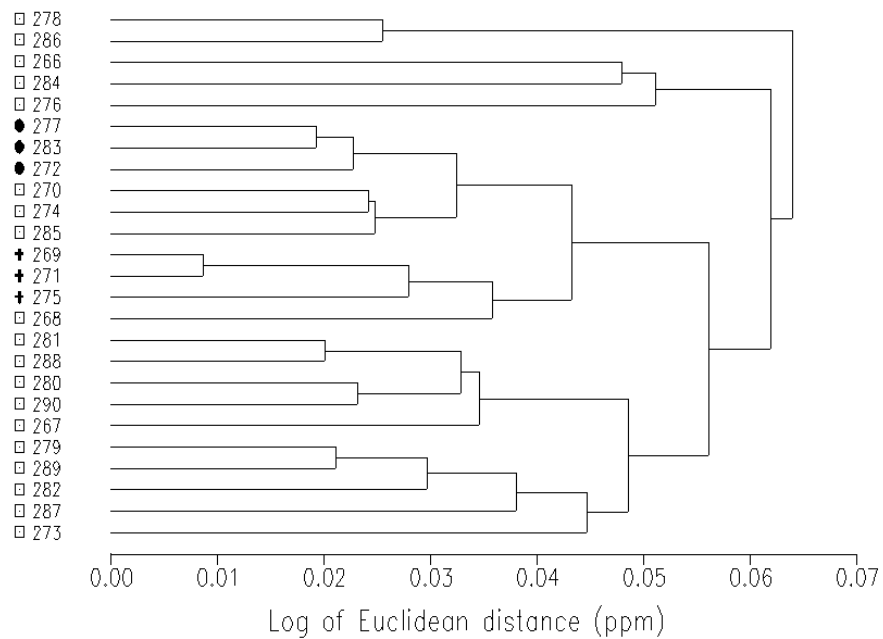
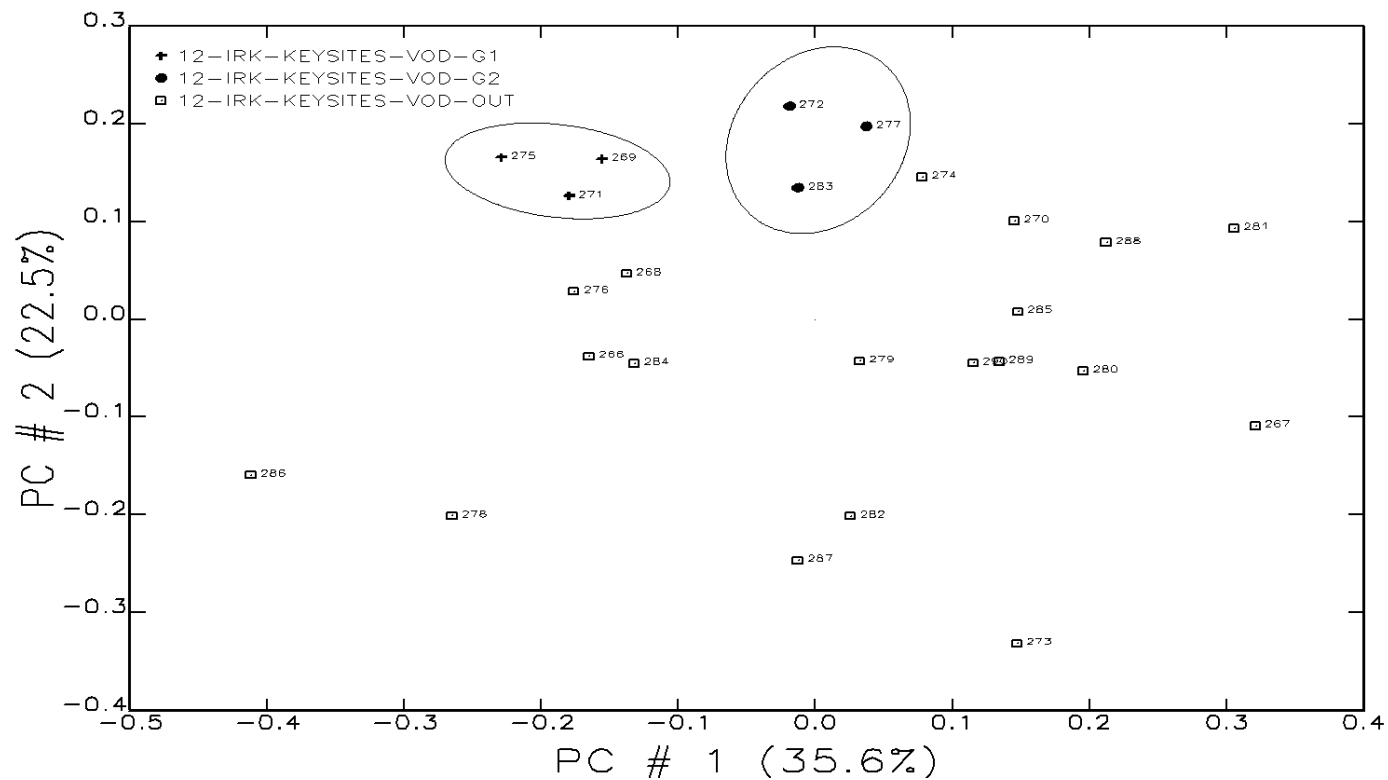
Sernovodskoe 1



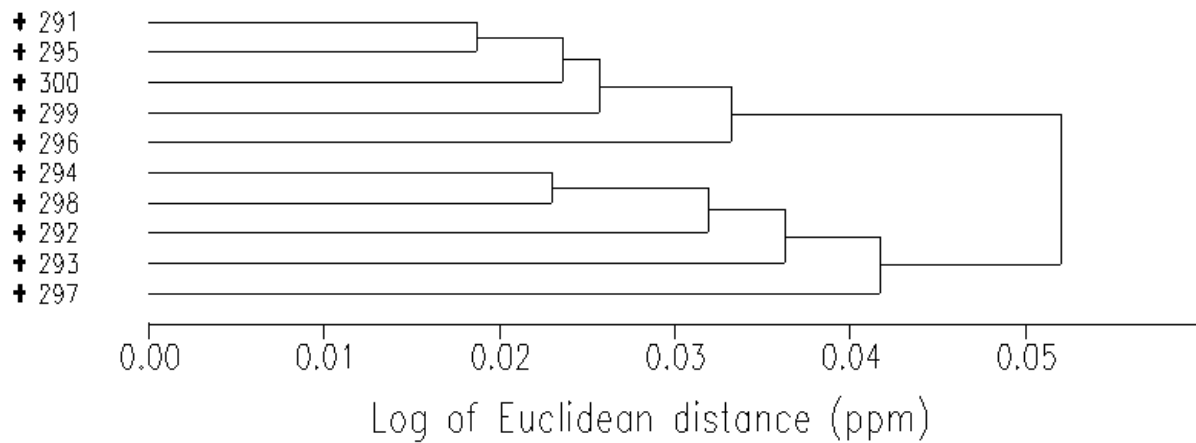
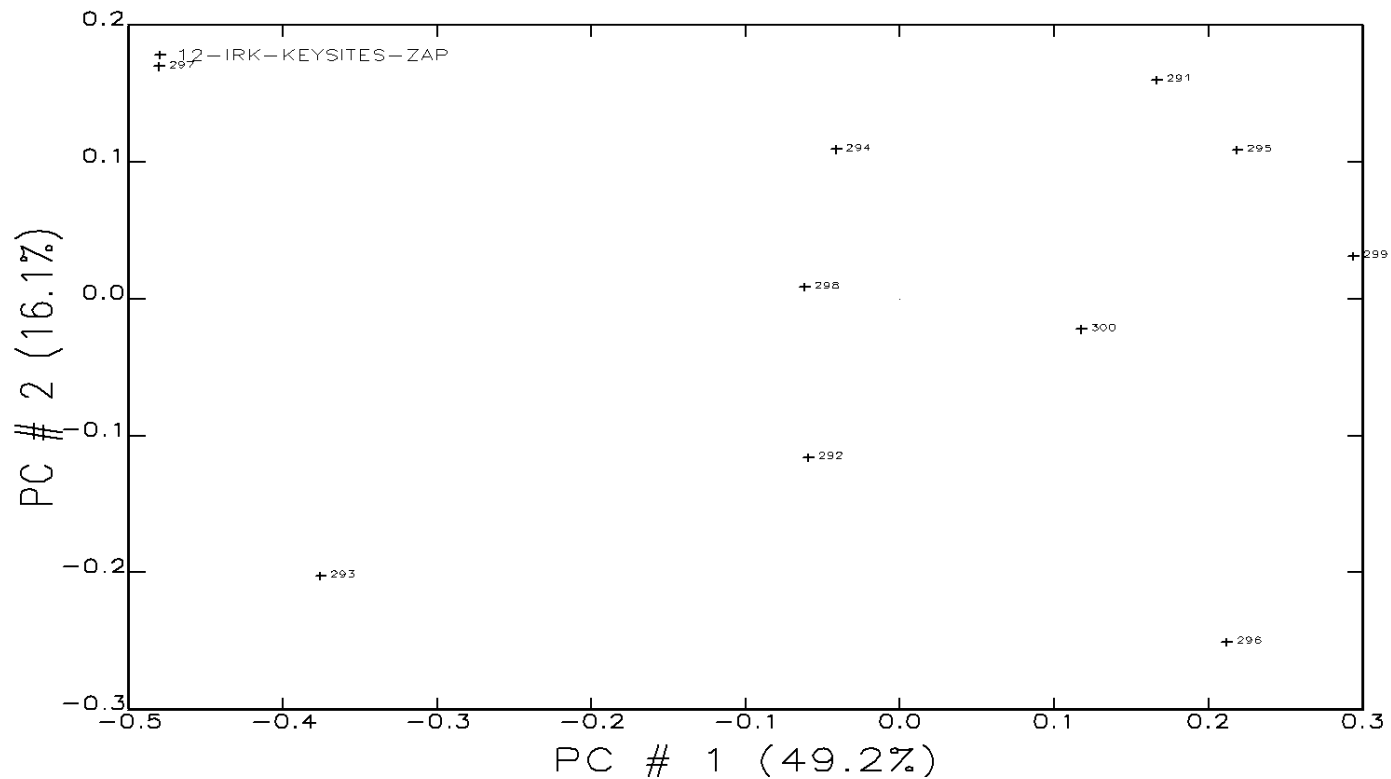
Tokotan 1



Vodopodnaya 1



Zapadnaya
Klechnya 1



Appendix F: Mahalanobis Distance Probabilities for Non-Local Samples

Non-Local		Reference Local Source Groups (Epi-Jomon)								Best Group
Sample #	Site	Drobyne 1	Kompaniski 1	Kubyshevskaya 1	Olya 1	Rasshua 1	Rikorda 1	Rikorda 2	Sernovodskoe 2	
2	AIB	0.968	3.717	2.956	0.248	12.346	0.032	2.803	0.139	RAS-L1
5	AIB	1.838	3.149	2.696	0.064	0.395	0.014	0.157	0.132	KOM-L1
7	AIB	0.219	1.069	2.895	0.067	0.004	0.011	0.226	0.029	KUB-L1
8	AIB	1.519	0.249	1.932	0.497	3.412	0.022	7.569	0.258	RIK-L2
17	AIC	0.115	0.113	2.927	14.611	0.017	0.086	5.639	0.032	OLY-L1
18	AIC	0.236	0.023	0.913	0.015	0.095	0.003	0.004	4.467	SER-L2
19	AIC	57.358	0.271	1.648	0.029	0.154	0.006	0.022	0.713	DRO-L1
20	AIC	0.883	0.081	1.101	0.035	17.316	0.005	0.017	59.137	SER-L2
27	AIC	0.077	0.008	0.676	0.016	0.167	0.002	0.003	0.716	SER-L2
28	AIC	12.864	0.201	1.455	0.115	60.285	0.01	0.21	2.656	RAS-L1
29	AIC	0.079	0.005	0.604	0.027	0.185	0.002	0.005	0.671	SER-L2
30	AIC	0.511	0.024	1.481	3.171	0.022	0.018	34.988	0.132	RIK-L2
31	AIC	0.034	0.08	5.092	2.151	0.001	0.563	0.161	0.009	KUB-L1
32	AIC	5.31	0.15	1.304	0.076	76.179	0.008	0.082	9.561	RAS-L1
35	AIC	0.006	0.012	6.304	0.097	0	0.893	0.003	0.001	KUB-L1
43	ALE	0.062	0.063	3.281	5.497	0.003	0.144	0.675	0.018	OLY-L1
44	ALE	0.035	0.049	4.215	1.535	0.001	0.357	0.141	0.01	KUB-L1
45	ALE	0.053	0.048	3.277	3.157	0.002	0.156	0.386	0.015	KUB-L1
46	ALE	0.053	7.692	13.335	14.929	0.026	0.477	2.863	0.013	OLY-L1
47	ALE	0.286	0.012	1.407	4.387	0.004	0.018	8.322	0.081	RIK-L2
48	ALE	0.034	0.056	4.499	1.616	0.001	0.426	0.139	0.009	KUB-L1
57	BER	0.846	0.192	2.005	0.872	1.036	0.026	26.814	0.171	RIK-L2
58	BER	0.03	13.696	42.603	30.364	0.004	0.592	0.613	0.007	KUB-L1
59	BER	0.167	0.022	1.811	6.051	0.005	0.032	4.522	0.047	OLY-L1
60	BER	0.05	0.001	0.467	0.036	0.007	0.001	0.006	0.201	KUB-L1
61	BER	0.082	0.953	5.577	19.269	0.043	0.237	6.076	0.021	OLY-L1
70	BER	0.063	53.707	8.658	0.466	0.012	0.056	3.377	0.013	KOM-L1
71	BER	1.916	5.516	2.831	0.09	2.777	0.018	0.302	0.158	KOM-L1
72	BER	15.366	0.356	1.522	0.06	68.361	0.009	0.066	3.67	RAS-L1
73	BER	0.026	2.69	39.762	47.421	0.002	2.651	0.265	0.006	OLY-L1
85	PES	0.094	0.001	0.648	0.006	0	0.001	0.001	0.308	KUB-L1
86	PES	1.221	0.028	1.111	0.014	0.006	0.003	0.005	1.691	SER-L2
87	PES	1.359	4.041	2.848	0.07	0.38	0.015	0.197	0.113	KOM-L1
88	PES	0.049	1.399	3.743	0.173	0.001	0.015	0.767	0.009	KUB-L1
91	PES	0.032	23.932	33.302	11.118	0.005	0.362	0.895	0.007	KUB-L1
93	PES	0.027	17.71	38.638	15.743	0.003	0.338	0.523	0.006	KUB-L1
94	PES	0.228	0.019	0.902	0.013	0.031	0.003	0.003	3.194	SER-L2
101	DRO	1.756	0.01	1.017	0.011	0	0.002	0.003	0.547	DRO-L1
105	DRO	10.581	0.197	1.531	0.167	29.088	0.012	0.478	1.335	RAS-L1
136	KOM	0.046	6.46	15.867	29.123	0.016	0.648	1.712	0.011	OLY-L1
137	KOM	0.046	0.944	3.453	0.165	0	0.014	0.667	0.008	KUB-L1
138	KOM	0.023	10.719	52.189	35.667	0.002	0.469	0.329	0.005	KUB-L1
139	KOM	0.363	23.253	4.353	0.248	1.795	0.043	3.688	0.061	KOM-L1
141	KOM	0.027	0.001	0.448	0.016	0.006	0.001	0.002	0.076	KUB-L1
145	KOM	0.053	11.123	14.35	10.581	0.028	0.43	3.132	0.013	KUB-L1
147	KOM	4.308	1.6	2.26	0.146	42.356	0.019	0.622	0.351	RAS-L1
148	KOM	0.037	19.689	28.435	13.61	0.009	0.469	1.21	0.009	KUB-L1
150	KOM	3.195	0.833	2.237	0.042	0.059	0.009	0.064	0.146	DRO-L1
151	KUB	3.244	0.165	1.345	0.028	1.751	0.005	0.016	5.611	SER-L2
152	KUB	0.006	0.029	1.779	1.999	0	0.007	0.016	0.001	OLY-L1
155	KUB	0.047	0.76	8.357	46.427	0.009	0.732	0.894	0.012	OLY-L1
156	KUB	0.066	2.16	3.903	0.149	0.001	0.016	0.807	0.012	KUB-L1
157	KUB	0.025	0.713	20.023	8.24	0.001	6.728	0.16	0.006	KUB-L1
158	KUB	0.008	0.339	10.099	1.659	0	0.144	0.018	0.002	KUB-L1
159	KUB	0.047	2.41	11.788	65.265	0.014	0.761	1.357	0.012	OLY-L1
160	KUB	0.062	0.018	2.312	1.718	0.001	0.069	0.335	0.018	KUB-L1
162	KUB	0.065	0.017	2.221	1.747	0.001	0.062	0.364	0.019	KUB-L1
163	KUB	0.922	0.001	0.602	0.915	0	0.003	1.311	0.736	RIK-L2
164	KUB	0.069	0.028	2.493	2.995	0.001	0.078	0.568	0.02	OLY-L1
165	KUB	0.028	19.449	38.104	14.734	0.003	0.358	0.615	0.007	KUB-L1
166	KUB	1.104	0.003	0.849	1.691	0.001	0.006	5.926	0.364	RIK-L2
188	OLY	0.09	0.09	3.054	12.861	0.008	0.104	2.34	0.025	OLY-L1
190	OLY	0.489	9.713	3.569	0.098	0.202	0.02	0.469	0.061	KOM-L1
204	RAS	2.871	0.012	1.063	0.012	0	0.002	0.004	0.451	DRO-L1
207	RAS	1.166	8.58	3.131	0.12	3.894	0.023	0.601	0.126	KOM-L1
221	RIK	0.212	0.033	1.874	7.023	0.011	0.033	11.8	0.058	RIK-L2
229	RIK	0.217	0.026	1.763	6.437	0.008	0.029	9.88	0.06	RIK-L2
245	SER	0.027	0.368	12.292	5.108	0.001	4.134	0.158	0.007	KUB-L1
247	SER	0.027	0.046	4.859	1	0	0.614	0.081	0.008	KUB-L1
255	SER	0.034	0.333	8.721	8.326	0.002	1.462	0.278	0.009	KUB-L1
279	VOD	3.098	0.088	1.3	0.02	0.082	0.004	0.009	2.342	DRO-L1

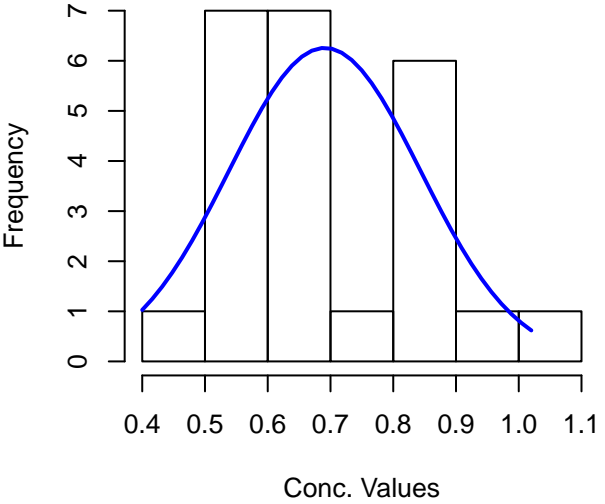
Non-Local		Reference Local Source Groups (Epi-Jomon)								
Sample #	Site	Drobyne 1	Kompaniski 1	Kubyshevskaya 1	Olya 1	Rasshua 1	Rikorda 1	Rikorda 2	Sernovodskoe 2	Best Group
280	VOD	0.429	0.004	1.02	0.016	0	0.002	0.011	0.028	KUB-L1
281	VOD	0.03	0.001	0.729	0.027	0	0.001	0.032	0.004	KUB-L1
282	VOD	0.265	0.004	0.803	0.008	0	0.002	0.001	0.699	KUB-L1
287	VOD	0.034	0.002	0.564	0.008	0.002	0.001	0.001	0.131	KUB-L1
288	VOD	0.045	0.008	1.153	0.04	0	0.002	0.07	0.006	KUB-L1
289	VOD	5.602	0.018	1.252	0.016	0	0.003	0.009	0.125	DRO-L1
294	ZAP	10.423	0.106	1.414	0.021	0.038	0.005	0.012	1.03	DRO-L1
295	ZAP	1.271	5.85	2.98	0.082	0.801	0.017	0.274	0.116	KOM-L1
296	ZAP	2.698	0.049	1.097	0.111	10.811	0.007	0.129	13.913	SER-L2
297	ZAP	0.444	0.001	0.658	0.006	0	0.001	0.001	0.194	KUB-L1
298	ZAP	0.922	0.016	1.034	0.012	0.002	0.003	0.004	1.265	SER-L2
299	ZAP	0.158	6.304	5.326	1.396	0.491	0.109	46.615	0.036	RIK-L2
300	ZAP	40.442	1.066	2.01	0.048	2.19	0.01	0.064	0.505	DRO-L1

Non-Local		Reference Local Source Groups (Okhotsk)						
Sample #	Site	Ainu Creek 1	Bolshoy 1	Drobyne 1	Olya 2	Tokotan 1	Vodopodnaya 1	Best Group
9	AIC	47.694	0.019	60.852	4.881	35.034	24.407	DRO-L1
11	AIC	7.758	0.037	34.77	12.944	4.277	8.293	DRO-L1
12	AIC	4.359	0.005	8.558	2.767	12.495	4.32	TOK-L1
15	AIC	2.029	0.686	3.647	2.391	0.659	1.182	DRO-L1
16	AIC	7.548	0.118	26.211	3.87	2.237	23.714	DRO-L1
21	AIC	51.224	0.019	64.672	5.024	33.971	23.266	DRO-L1
22	AIC	0.408	0.001	0.965	1.384	0.122	0.453	OLY-L2
23	AIC	26.514	0.01	31.009	4.072	71.125	8.883	TOK-L1
25	AIC	5.756	0.006	10.595	2.919	22.692	6.586	TOK-L1
26	AIC	5.152	0.004	2.882	9.472	21.125	0.14	TOK-L1
33	AIC	20.118	0.006	10.272	8.308	64.261	0.461	TOK-L1
34	AIC	2.083	12.973	7.014	2.952	0.302	1.624	BOL-L1
37	AIC	0.834	0.221	8.704	4.152	0.061	2.474	DRO-L1
38	AIC	1.017	0.001	0.52	4.844	0.736	0.025	OLY-L2
39	ALE	0.543	0.001	0.356	2.502	0.079	0.014	OLY-L2
40	ALE	2.608	0.501	5.436	2.648	0.808	1.998	DRO-L1
41	ALE	2.273	0.179	3.522	2.323	1.433	1.708	DRO-L1
42	ALE	16.309	0.057	66.807	4.995	4.769	81.766	VOD-L1
49	BAI	1.616	0.002	3.742	2.257	1.057	0.772	DRO-L1
50	BAI	1.303	1.074	11.625	3.952	0.111	2.716	DRO-L1
51	BAI	1.883	0.002	4.084	2.464	0.953	0.474	DRO-L1
52	BAI	29.387	0.019	43.253	4.261	33.819	34.593	DRO-L1
53	BAI	0.129	0.004	0.592	1.578	0.003	0.069	OLY-L2
54	BAI	0.101	0.003	0.543	1.843	0.003	0.184	OLY-L2
55	BAI	12.76	0.032	48.806	10.896	6.847	9.065	DRO-L1
56	BAI	28.206	0.031	91.066	7.477	10.195	20.785	DRO-L1
62	BER	3.506	0.262	7.982	2.896	1.205	3.811	DRO-L1
63	BER	2.676	3.129	13.255	3.534	0.367	3.789	DRO-L1
64	BER	2.375	1.385	25.832	4.841	0.274	11.678	DRO-L1
65	BER	2.967	0.011	4.775	2.329	27.74	18.177	TOK-L1
66	BER	3.212	0.29	6.97	2.801	1.123	3.141	DRO-L1
67	BER	1.373	0.212	1.702	1.916	1.026	0.681	OLY-L2
68	BER	0.958	0.008	1.31	1.631	10.529	5.034	TOK-L1
69	BER	4.381	0.01	7.421	2.608	34.861	22.219	TOK-L1
89	PES	33.882	0.026	62.791	4.808	18.615	45.423	DRO-L1
90	PES	83.829	0.009	37.223	6.249	96.957	2.359	TOK-L1
92	PES	26.719	0.036	99.302	6.55	8.298	38.915	DRO-L1
98	PES	0.827	0.003	1.744	1.684	1.081	2.955	VOD-L1
99	PES	12.631	0.006	17.922	3.662	30.622	3.006	TOK-L1
108	DRO	4.77	0.005	9.241	2.85	12.719	3.811	TOK-L1
110	DRO	0.748	0.001	1.599	1.919	0.139	0.127	OLY-L2
111	DRO	86.269	0.014	56.904	7.007	57.756	4.756	AIC-L1
112	DRO	1.335	0.003	3.073	2.033	1.362	1.658	DRO-L1
113	DRO	0.141	0.001	0.241	0.854	0.045	0.857	VOD-L1
115	DRO	35.473	0.007	26.939	4.787	60.526	2.119	TOK-L1
116	DRO	0.271	0.001	0.538	1.131	0.122	1.107	OLY-L2
117	DRO	19.766	0.008	12.804	10.916	89.803	0.705	TOK-L1
118	DRO	0.747	0.002	1.696	1.667	0.577	1.494	DRO-L1
120	DRO	0.625	0.1	4.893	3.247	0.037	0.819	DRO-L1
124	DRO	81.114	0.016	70.821	6.507	42.149	8.35	AIC-L1
126	EKA	1.412	0.85	16.724	4.817	0.132	6.756	DRO-L1
127	EKA	24.4	0.04	98.918	6.342	7.258	48.231	DRO-L1
128	EKA	7.552	0.004	11.119	3.574	8.376	0.929	DRO-L1
129	EKA	1.18	0.002	2.816	2.02	0.716	0.804	DRO-L1
130	EKA	0.336	0.002	0.521	1.169	0.588	3.405	VOD-L1
133	KOM	4.401	0.393	43.098	5.123	0.666	31.846	DRO-L1
168	LAL	0.181	0.001	0.402	1.001	0.027	0.203	OLY-L2

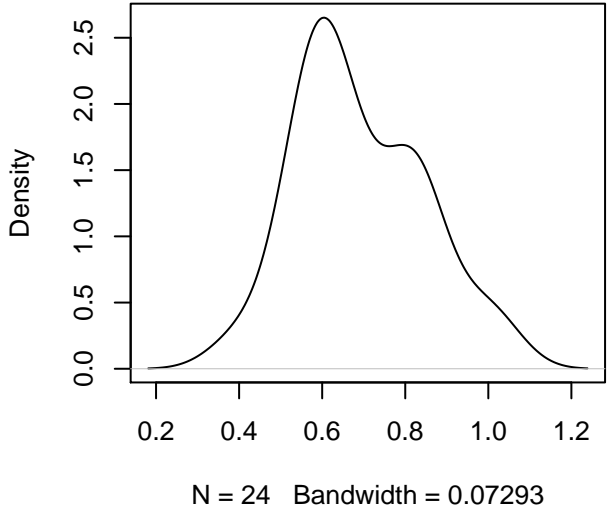
Non-Local		Reference Local Source Groups (Okhotsk)						
Sample #	Site	Ainu Creek 1	Bolshoy 1	Drobnye 1	Olya 2	Tokotan 1	Vodopodnaya 1	Best Group
169	LAL	0.408	0.002	0.873	1.333	0.222	1.213	OLY-L2
170	LAL	0.429	0.001	1.039	1.464	0.085	0.206	OLY-L2
171	LAL	0.332	0.001	0.791	1.295	0.071	0.278	OLY-L2
172	LAL	0.978	0.002	2.183	1.809	1.065	2.133	DRO-L1
173	LAL	1.031	0.003	2.216	1.816	1.483	3.038	VOD-L1
174	LAL	1.378	0.005	2.468	1.901	7.016	9.924	VOD-L1
175	LAL	1.283	0.005	2.339	1.867	5.621	8.947	VOD-L1
176	LAL	41.199	0.007	25.454	5.238	62.897	1.569	TOK-L1
177	LAL	0.738	0.002	1.537	1.617	0.921	2.916	VOD-L1
179	LAL	1.167	0.036	3.402	45.727	0.924	1.608	OLY-L2
183	OLY	1.656	6.766	9.858	3.443	0.164	2	DRO-L1
186	OLY	3.506	0.779	30.69	4.632	0.481	15.317	DRO-L1
217	RAS	4.308	0.003	7.815	3.082	3.807	0.795	DRO-L1
234	RYP	1.024	0.002	2.372	2.044	0.323	0.29	DRO-L1
235	RYP	1.173	0.012	1.52	1.729	13.644	4.017	TOK-L1
236	RYP	0.687	0.001	1.662	1.748	0.188	0.283	OLY-L2
237	RYP	2.453	2.282	20.89	4.29	0.284	7.133	DRO-L1
238	RYP	0.316	0.001	0.747	1.266	0.067	0.284	OLY-L2
239	RYP	0.219	0.001	0.503	1.094	0.033	0.188	OLY-L2
240	RYP	4.314	0.302	52.626	5.939	0.673	57.65	VOD-L1
241	RYP	10.929	0.004	7.955	5.208	10.513	0.326	AIC-L1
256	TOK	86.955	0.013	59.497	5.594	65.184	7.744	AIC-L1
261	TOK	2.495	2.375	20.369	4.223	0.293	6.809	DRO-L1
262	TOK	0.187	0	0.232	1.186	0.009	0.01	OLY-L2
266	VOD	2.537	0.003	5.551	2.491	3.202	1.666	DRO-L1
267	VOD	0.268	0.011	0.293	19.062	0.625	0.104	OLY-L2
268	VOD	6.533	0.039	30.649	13.745	3.568	8.172	DRO-L1
270	VOD	1.139	0.055	4.733	28.259	0.525	4.048	OLY-L2
273	VOD	0.55	0.002	0.266	7.621	3.968	0.021	OLY-L2
274	VOD	1.722	0.115	14.159	13.981	0.437	27.668	VOD-L1
276	VOD	4.701	0.007	8.541	2.708	27.928	12.804	TOK-L1
278	VOD	3.501	0.002	4.215	3.577	1.449	0.185	DRO-L1
284	VOD	0.656	0.002	1.55	1.626	0.338	0.855	OLY-L2
285	VOD	1.453	0.024	3.215	59.396	2.09	0.906	OLY-L2
286	VOD	1.337	0.002	2.985	2.242	0.49	0.327	DRO-L1
290	VOD	1.543	0.019	2.771	67.205	3.519	0.599	OLY-L2
291	ZAP	4.583	0.087	43.102	10.611	1.276	39.162	DRO-L1
292	ZAP	24.022	0.009	15.175	10.368	90.606	0.83	TOK-L1
293	ZAP	2.595	0.004	1.621	15.028	33.875	0.108	TOK-L1

Appendix G: Elemental Summary Plots and Location Regression

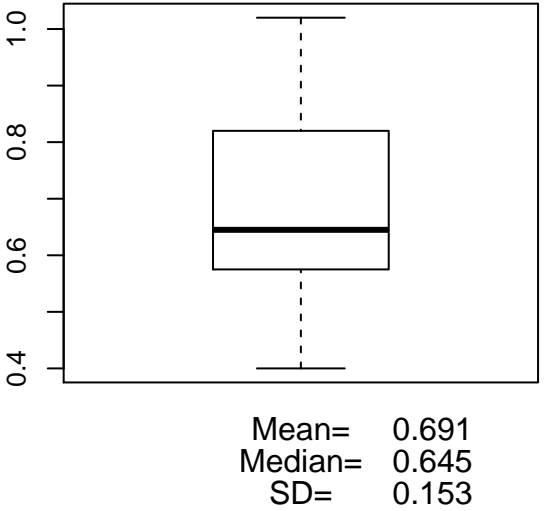
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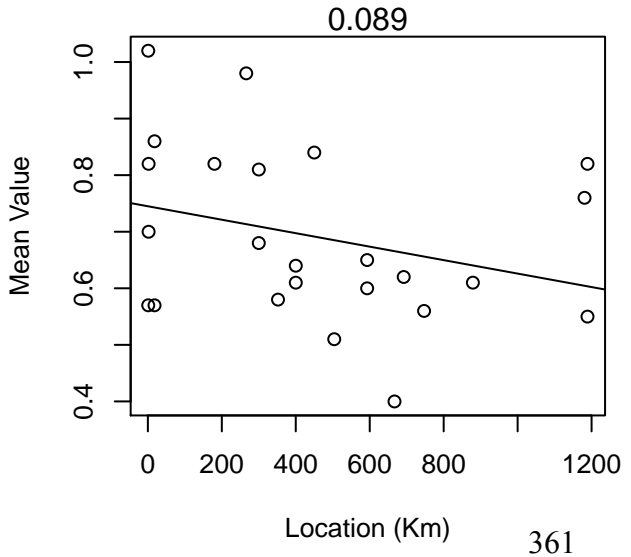
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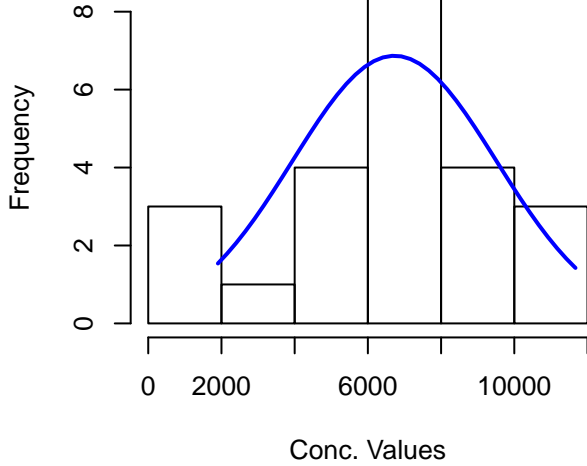
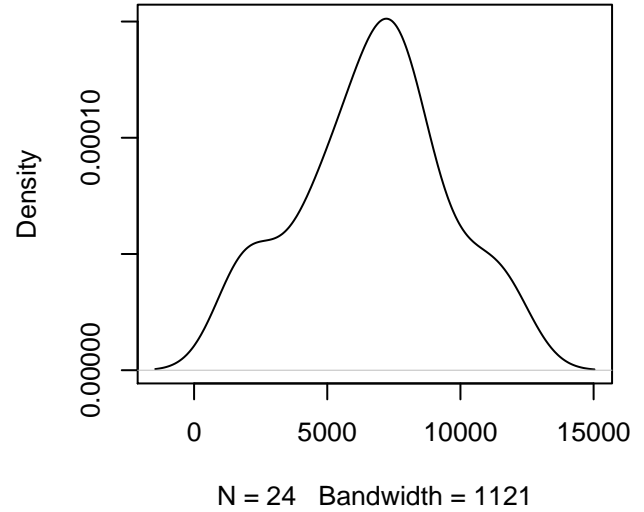
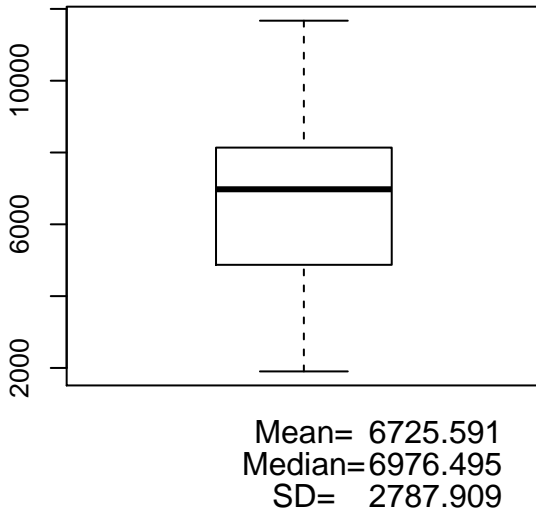
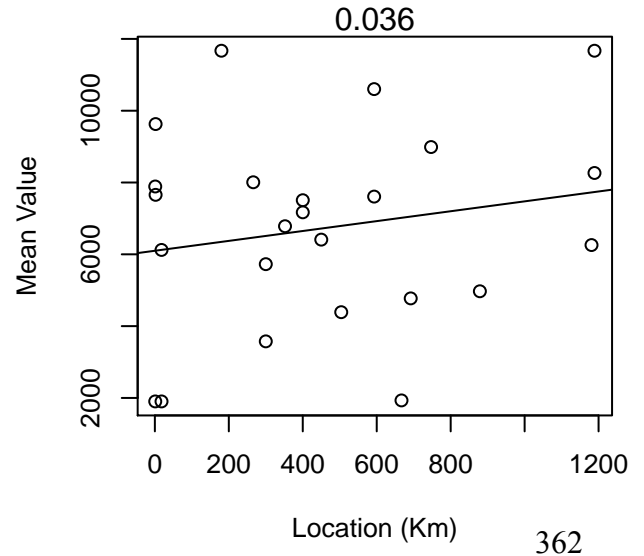


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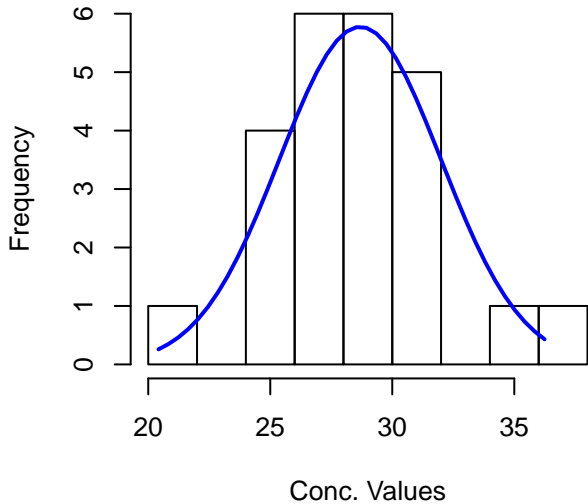


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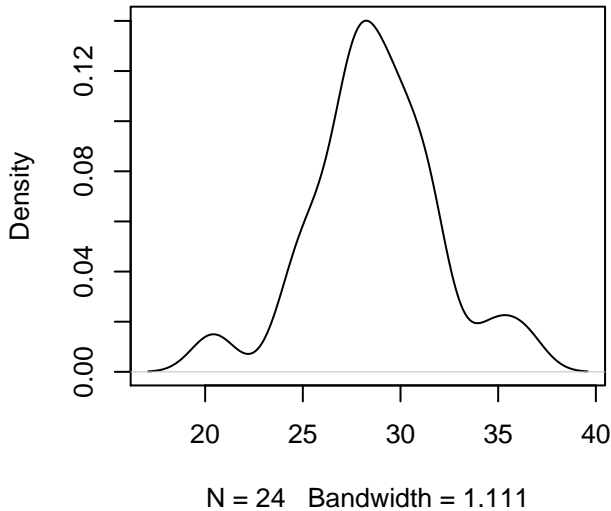


K**K****K****K**

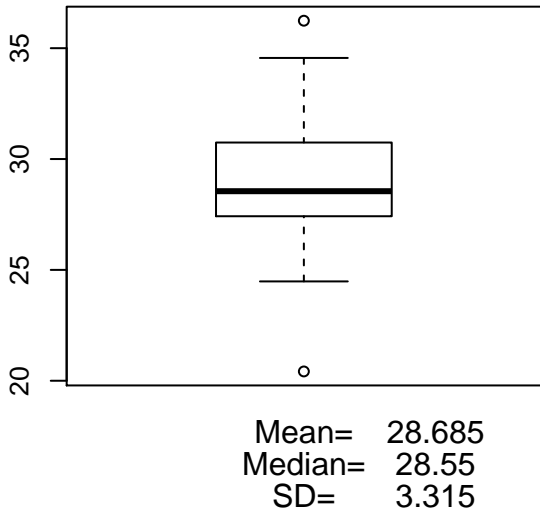
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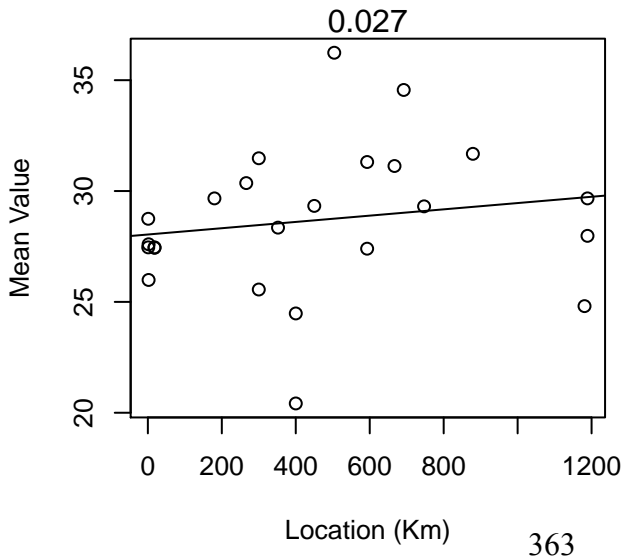
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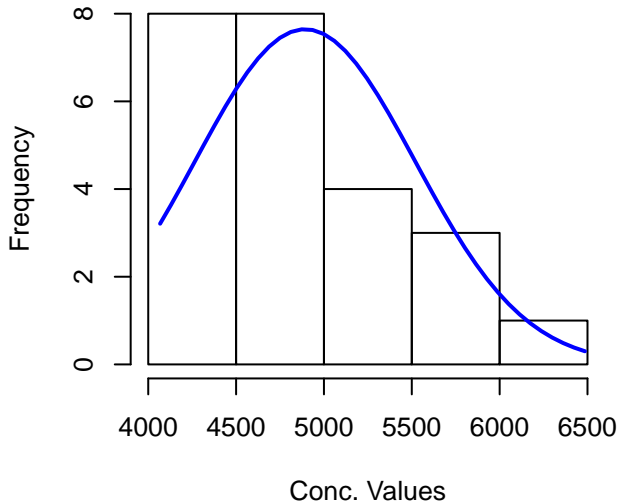
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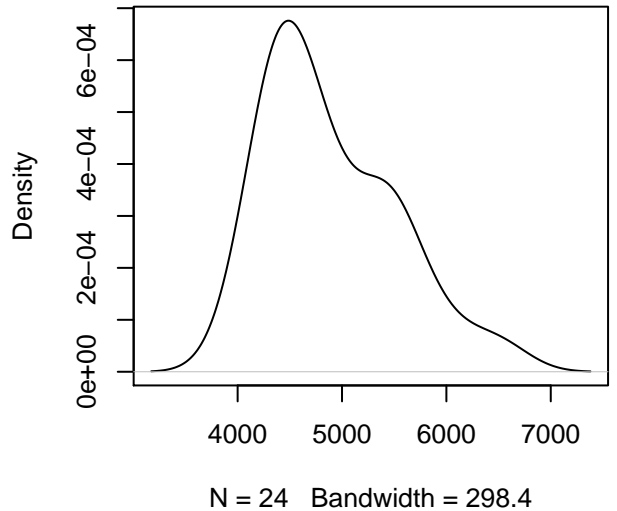
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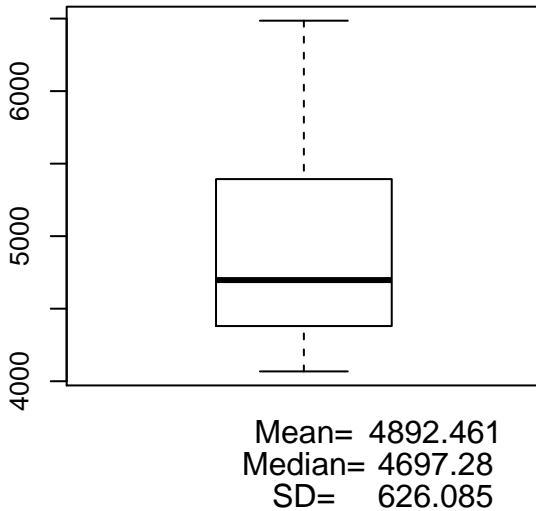
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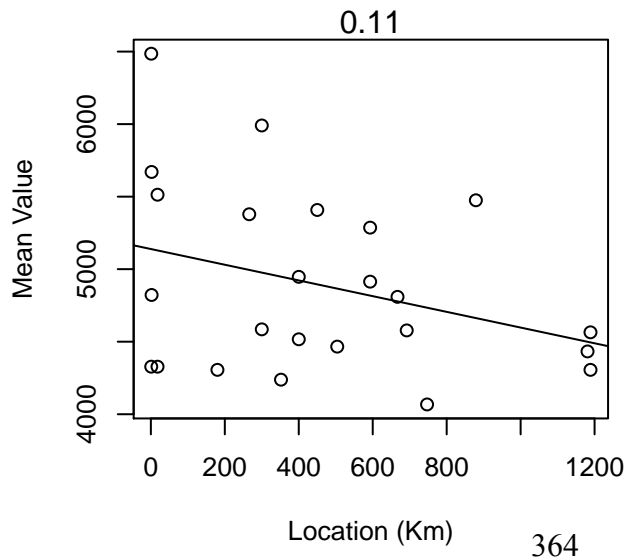
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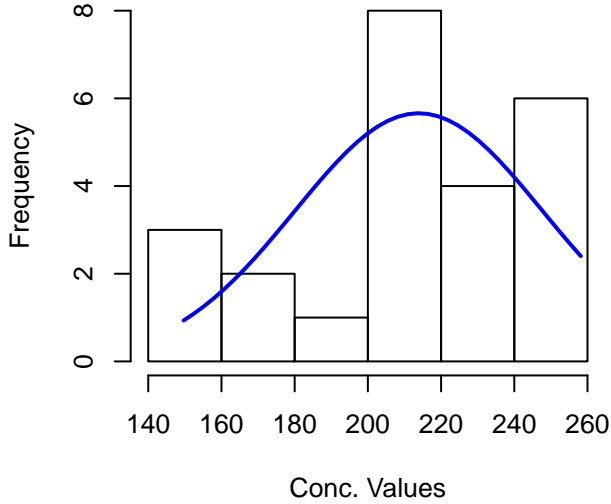
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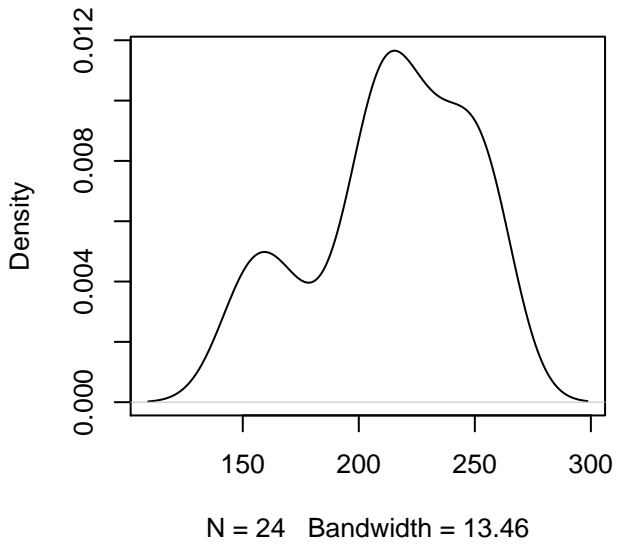
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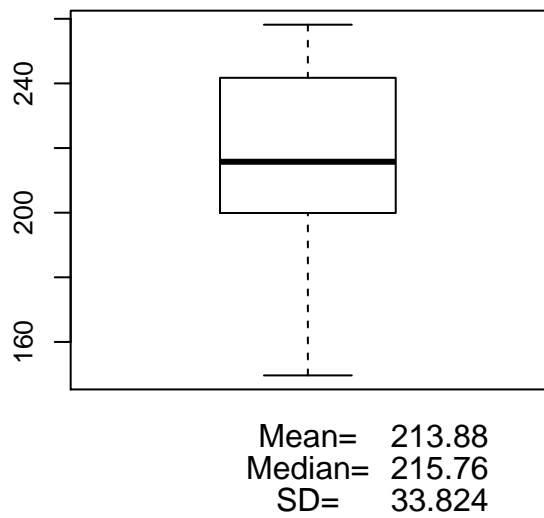
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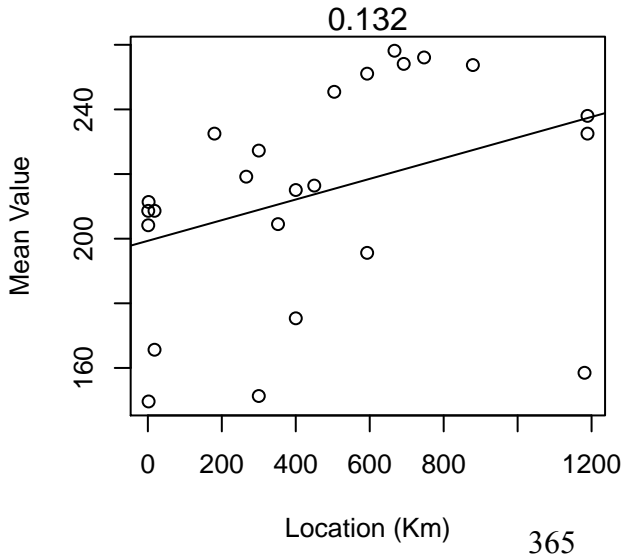
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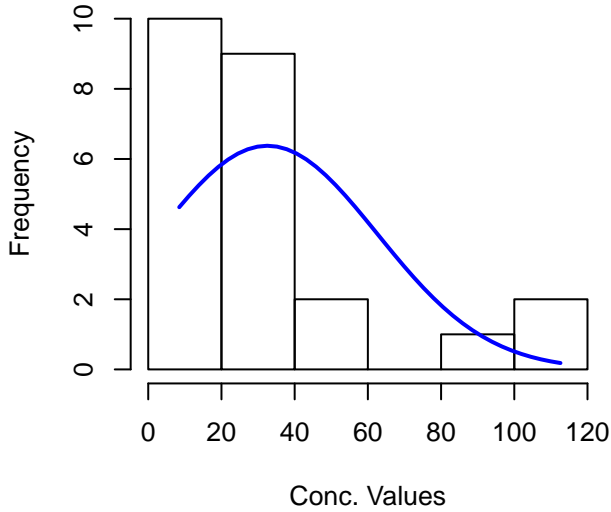
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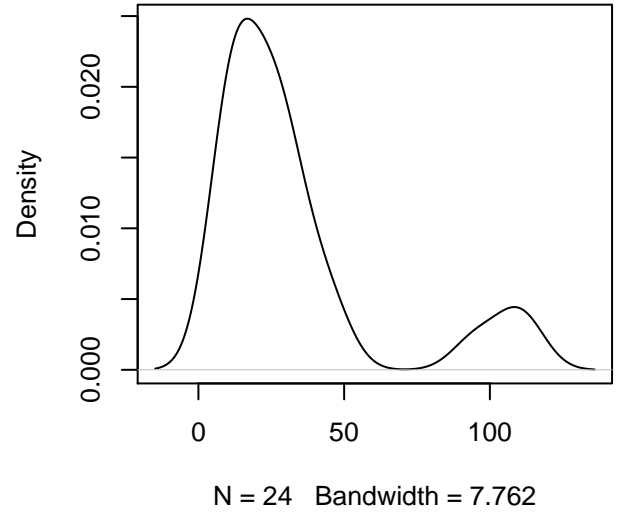
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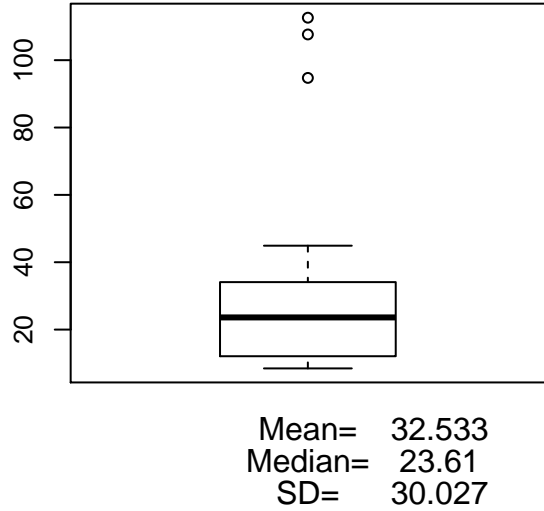
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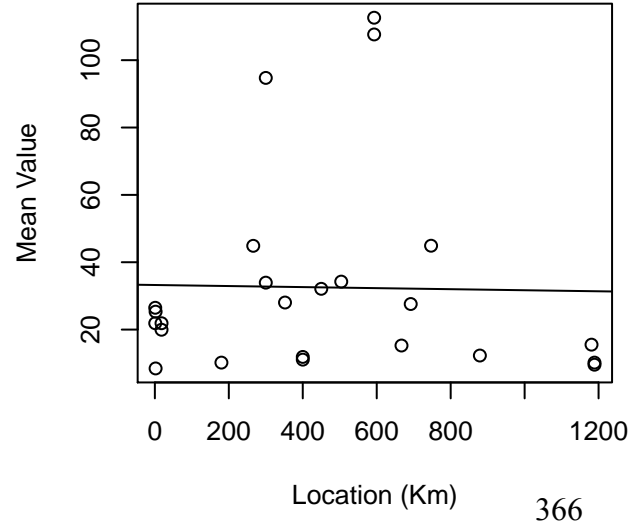
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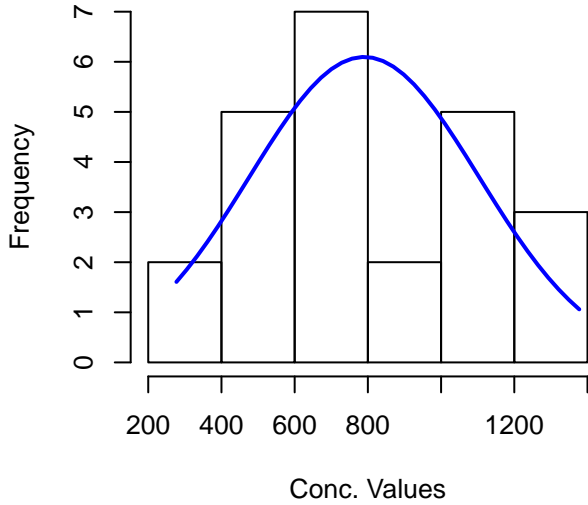
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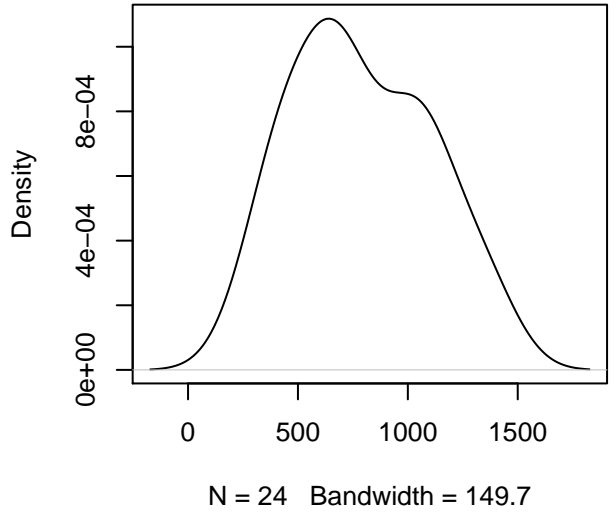
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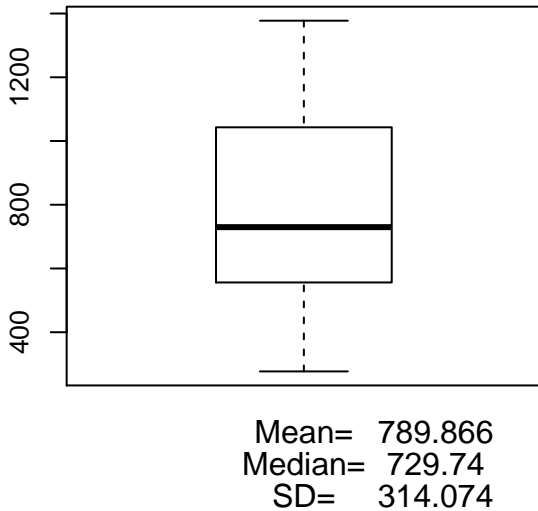
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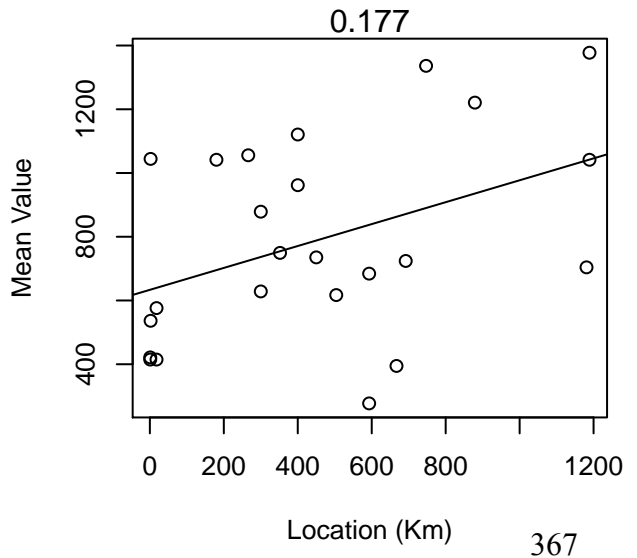
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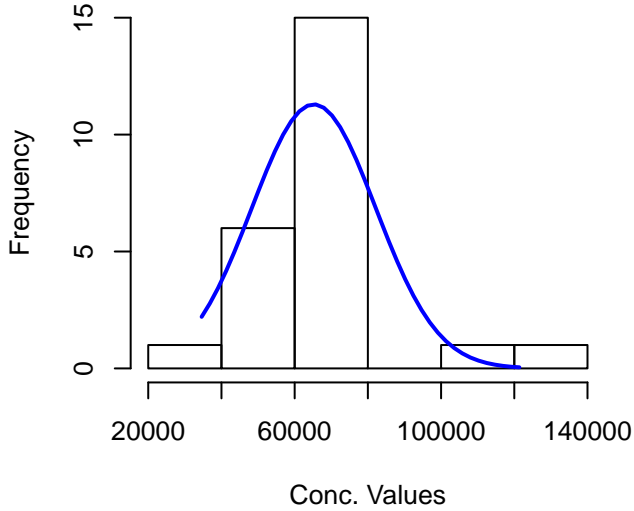
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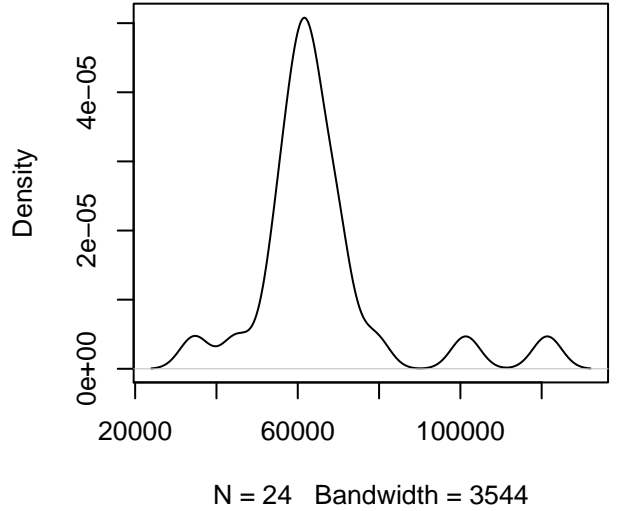
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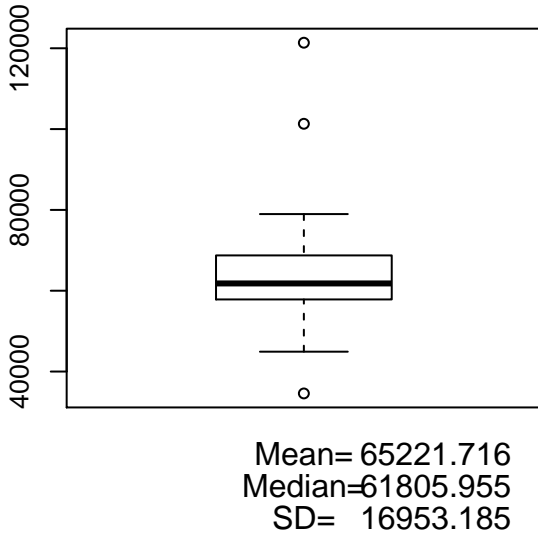
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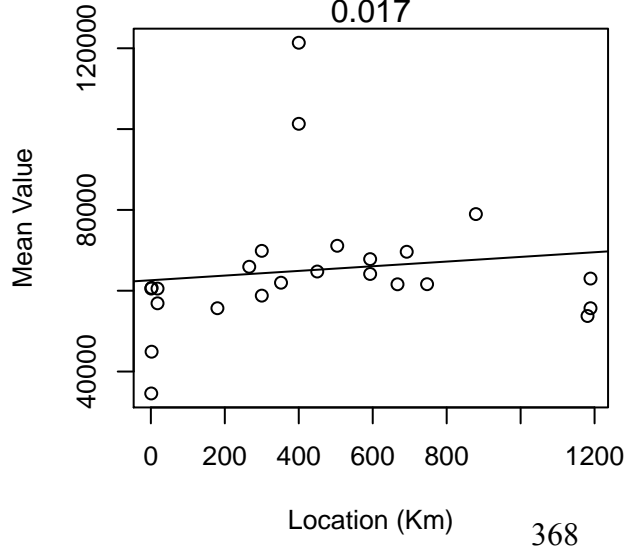
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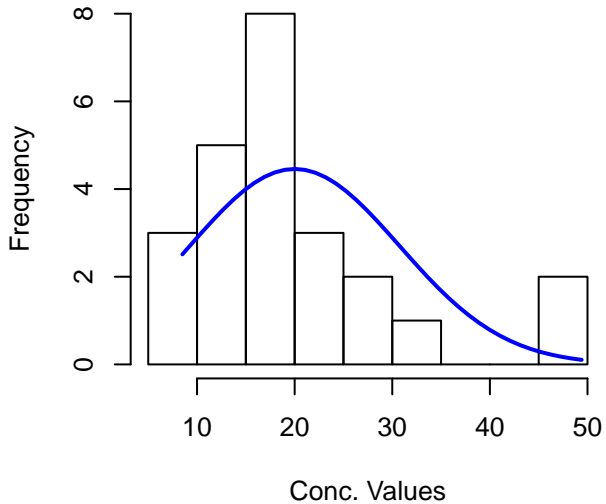
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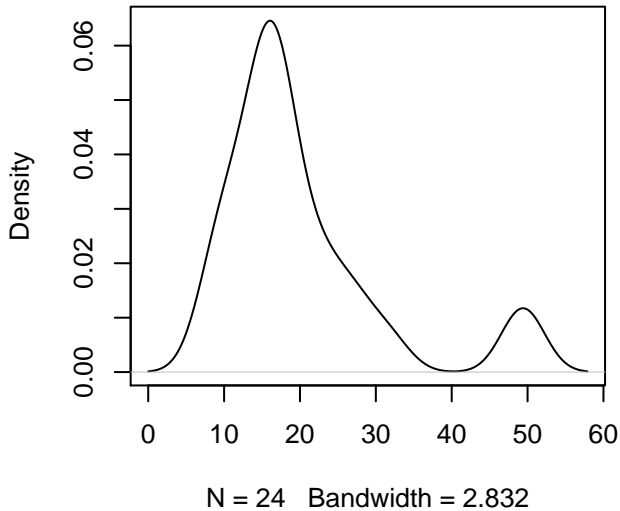
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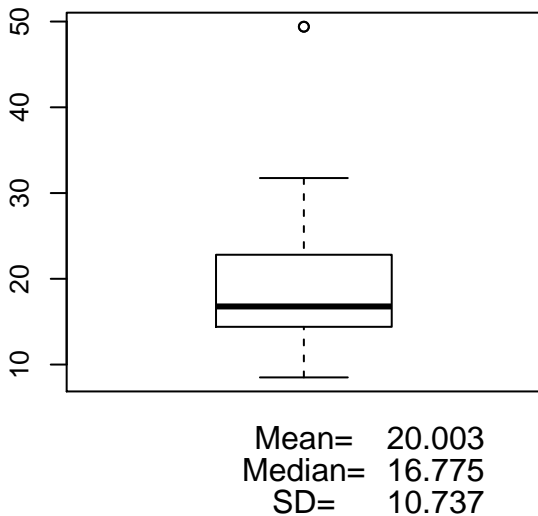
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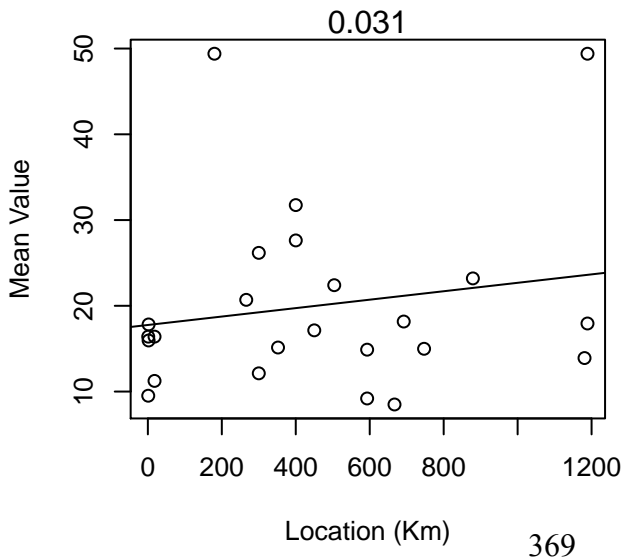
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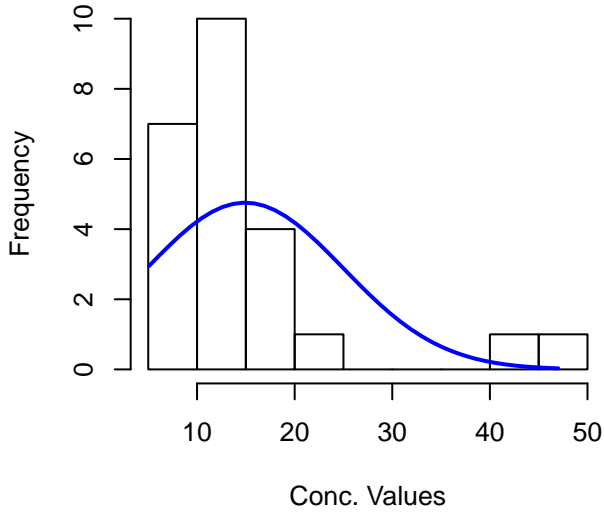
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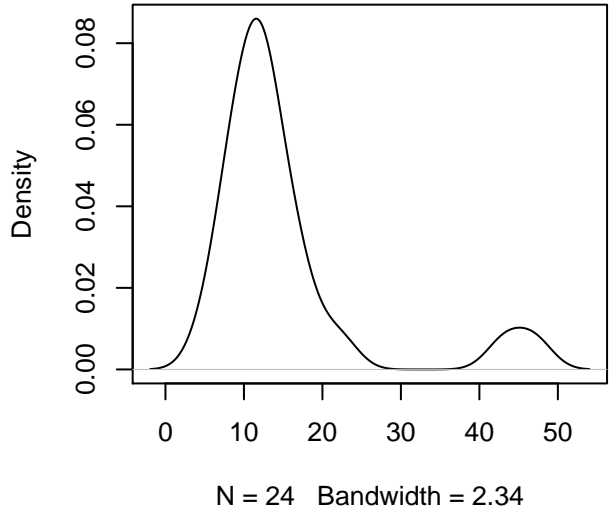
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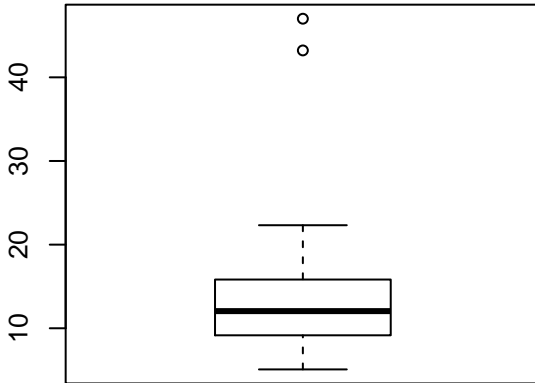
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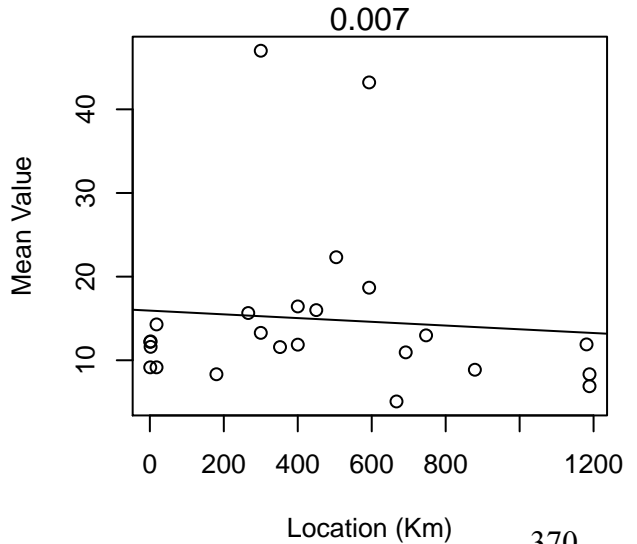


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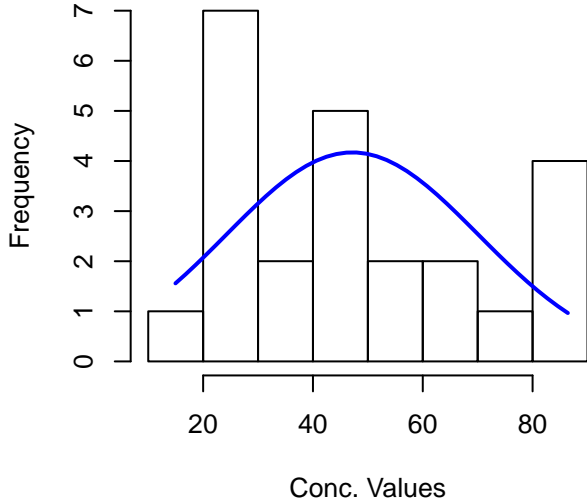


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SD= 10.07

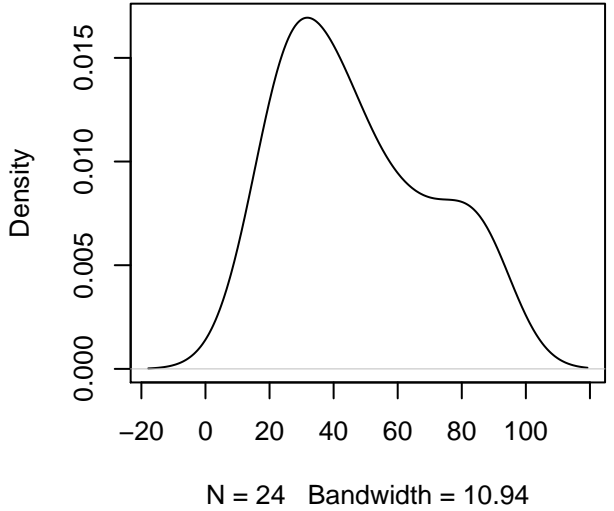
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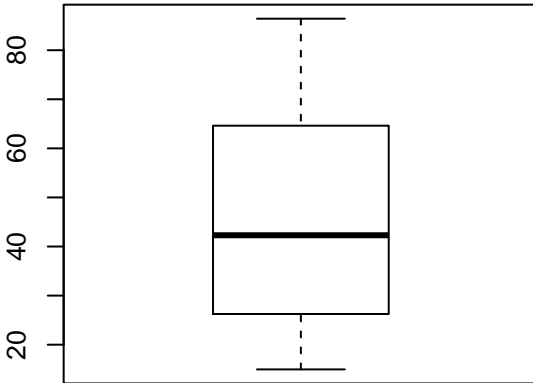
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Cu

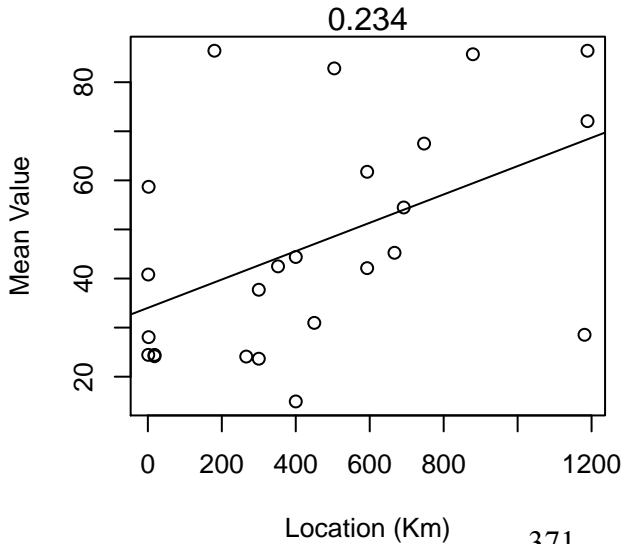


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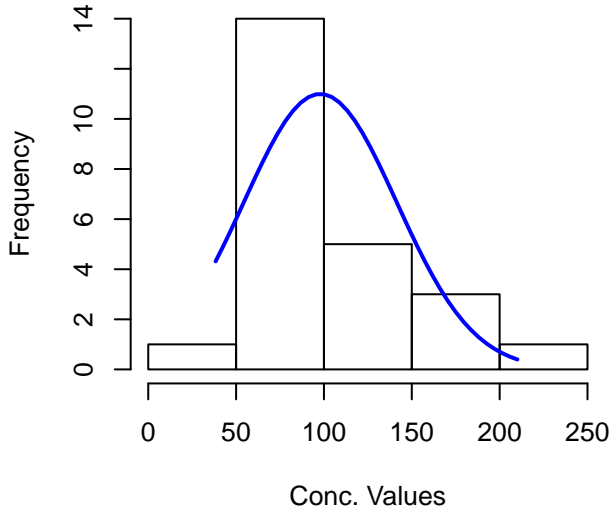


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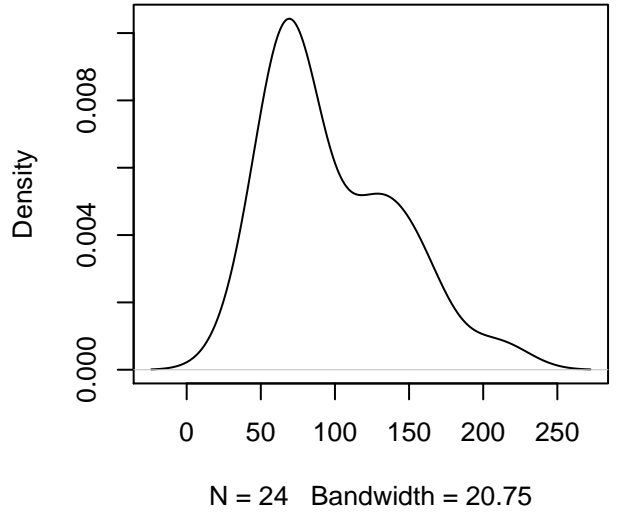
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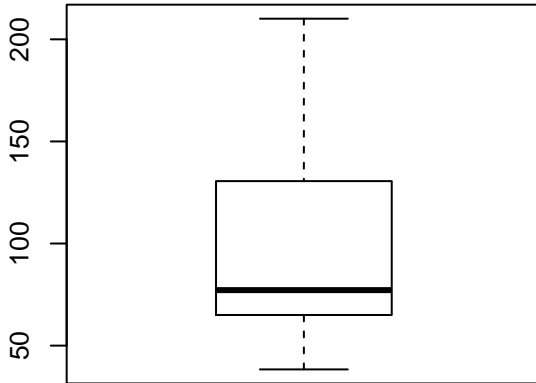
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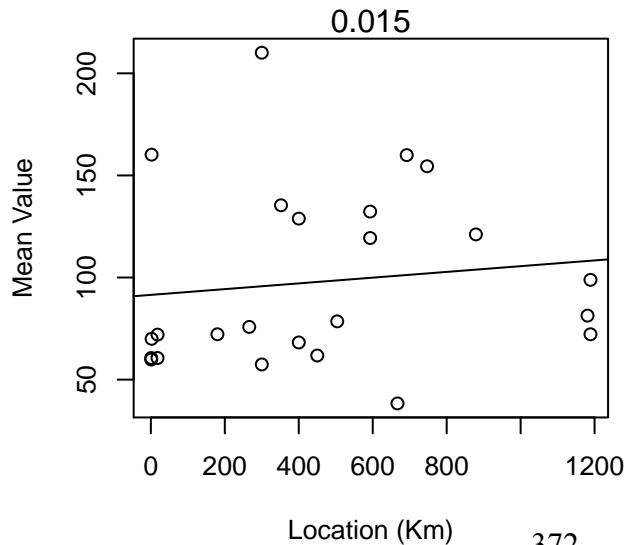


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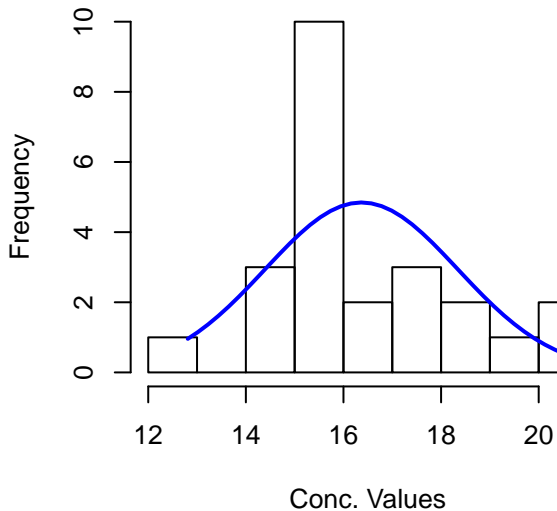


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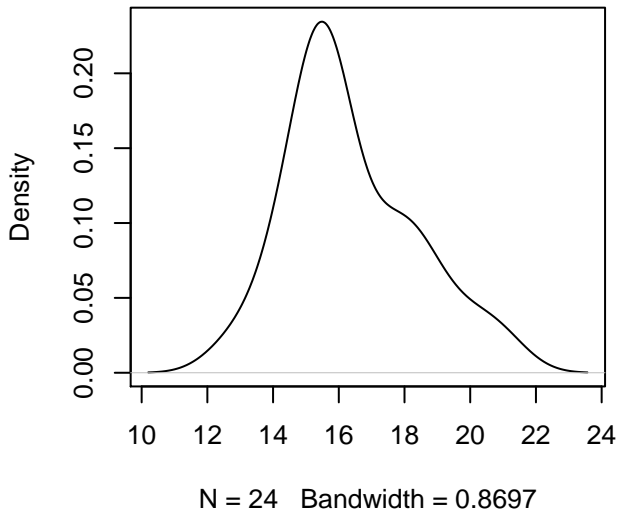
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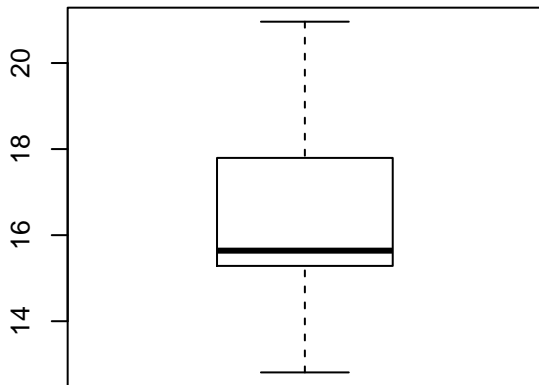
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Ga



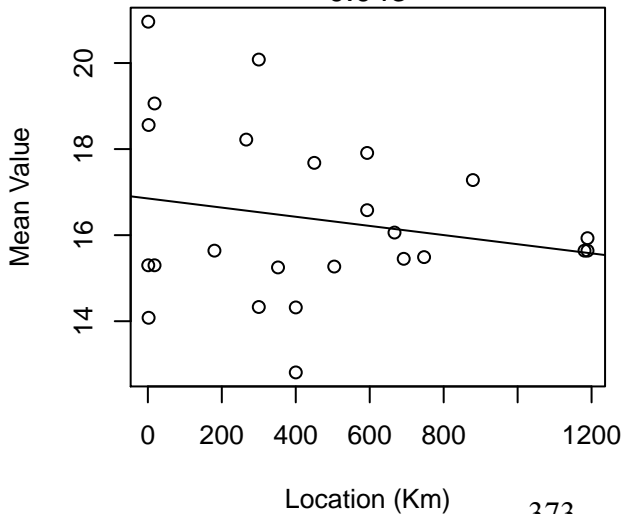
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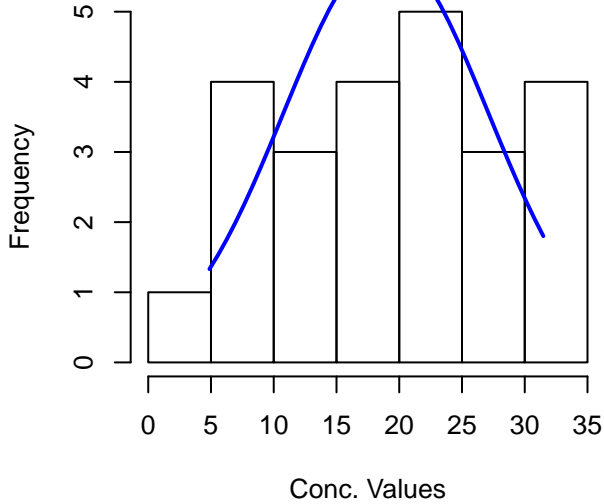
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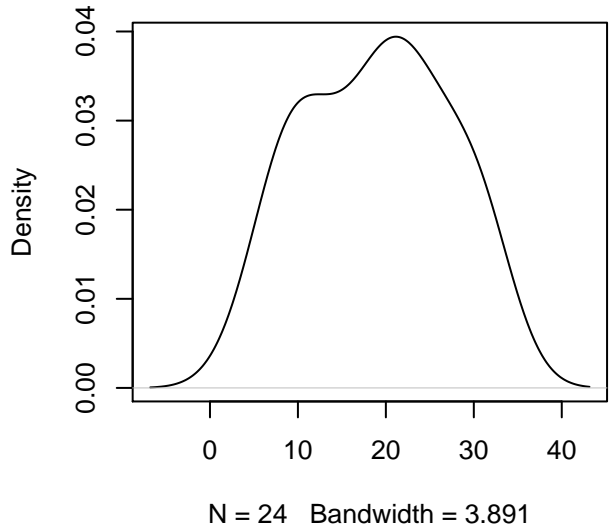
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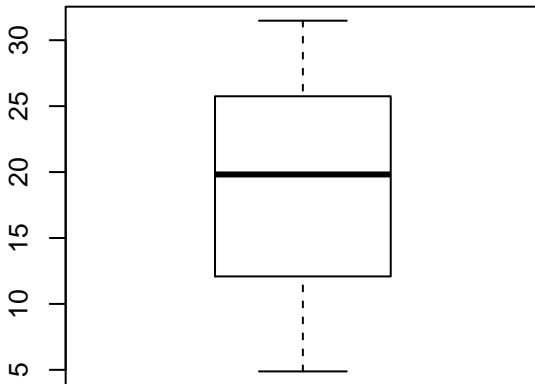
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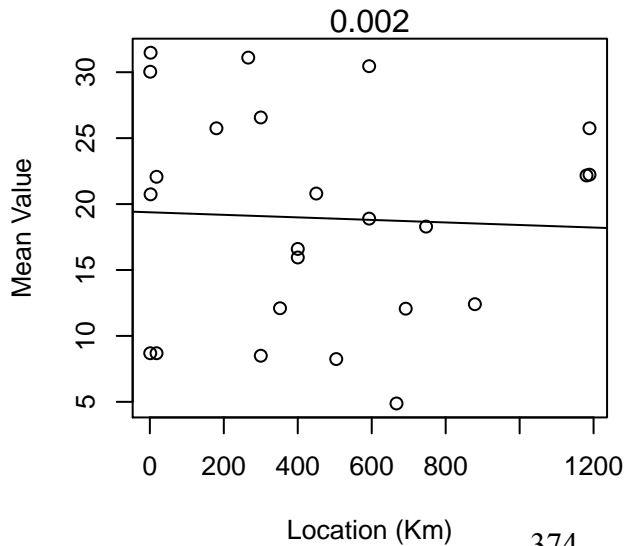


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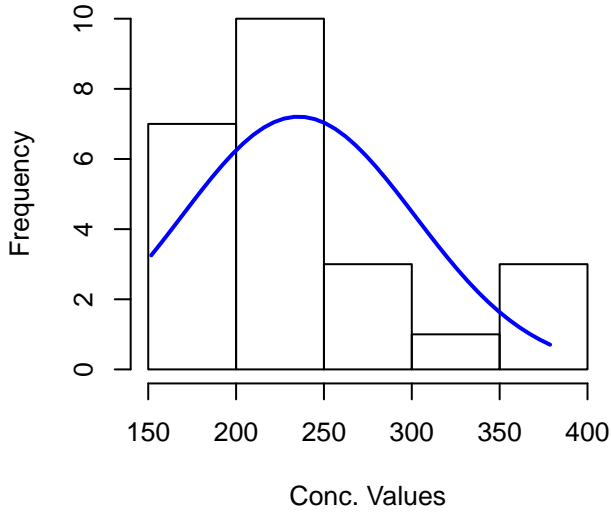


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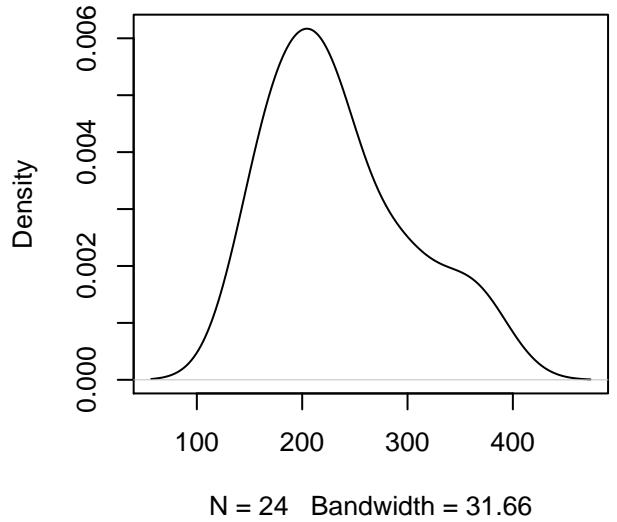
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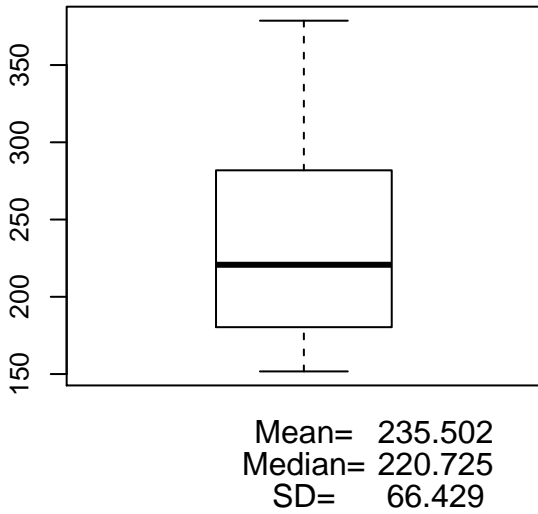
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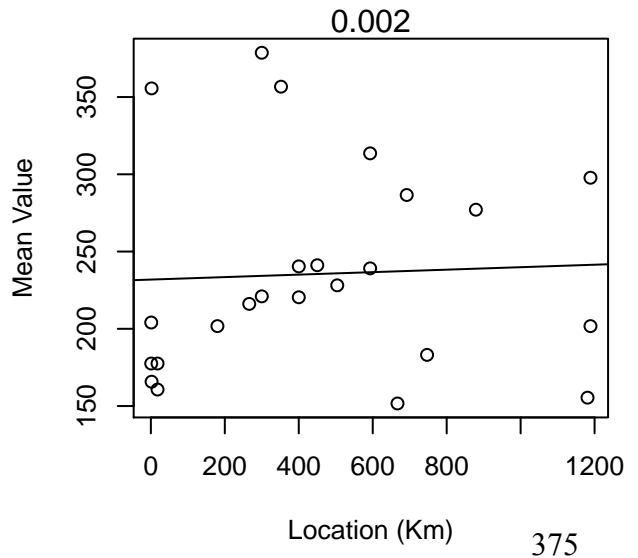
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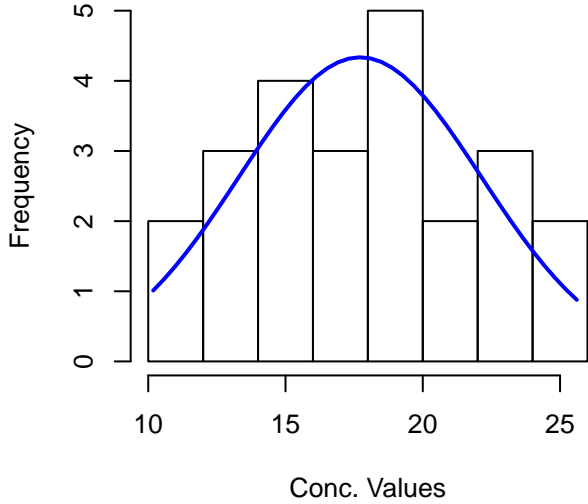
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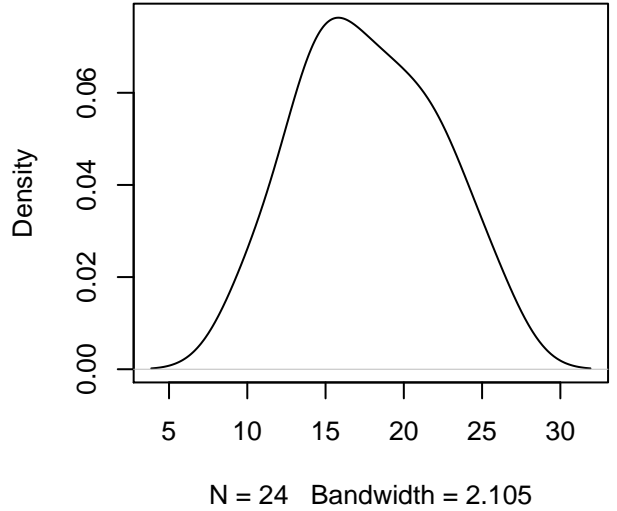
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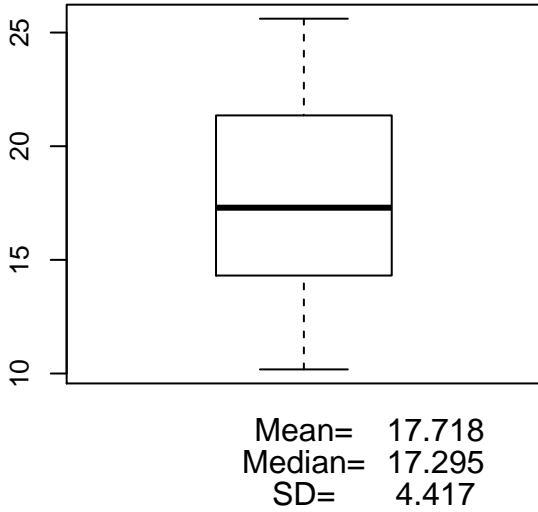
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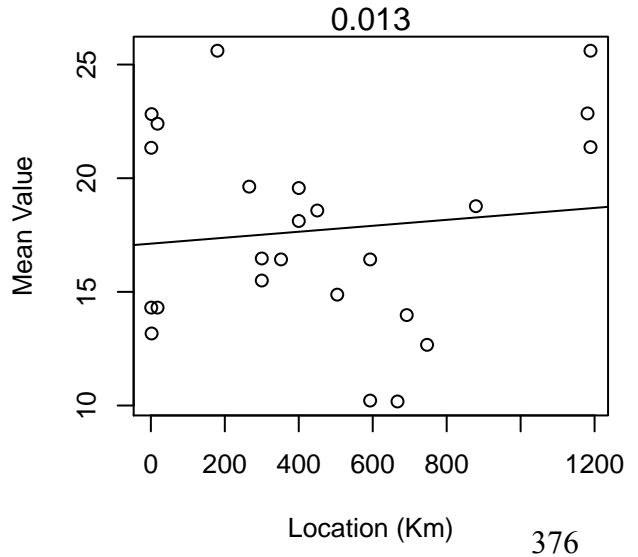
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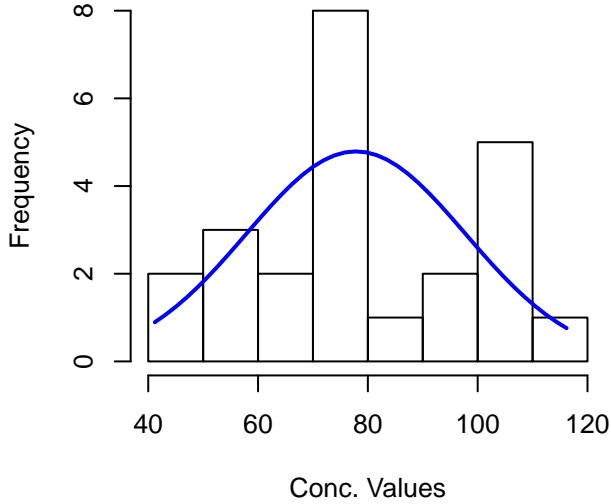
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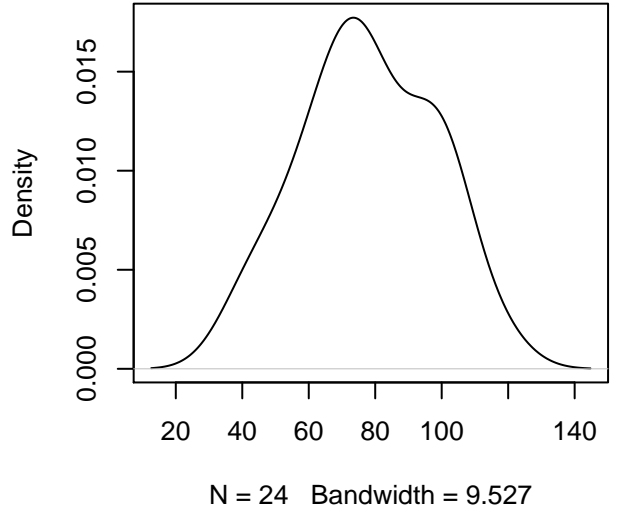
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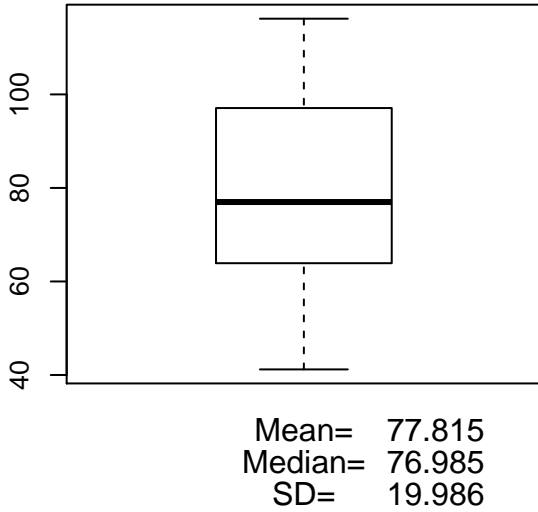
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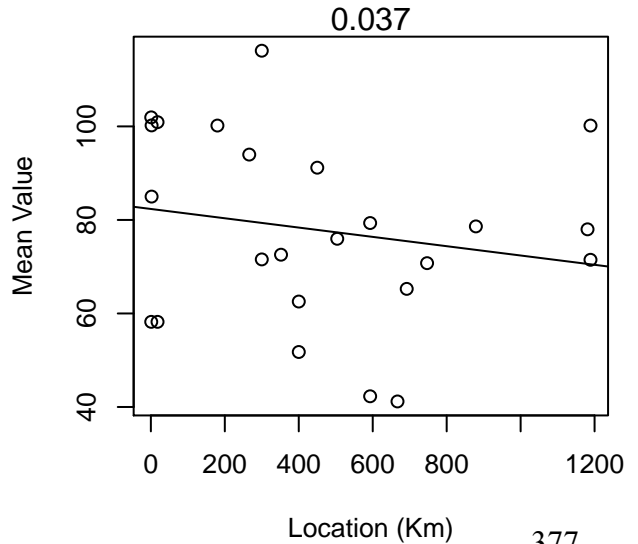
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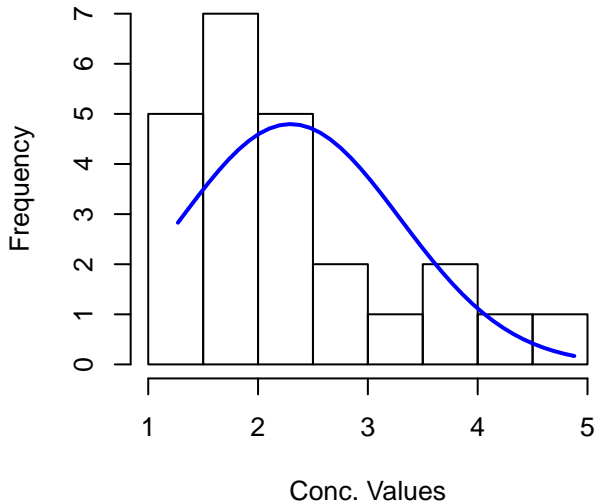
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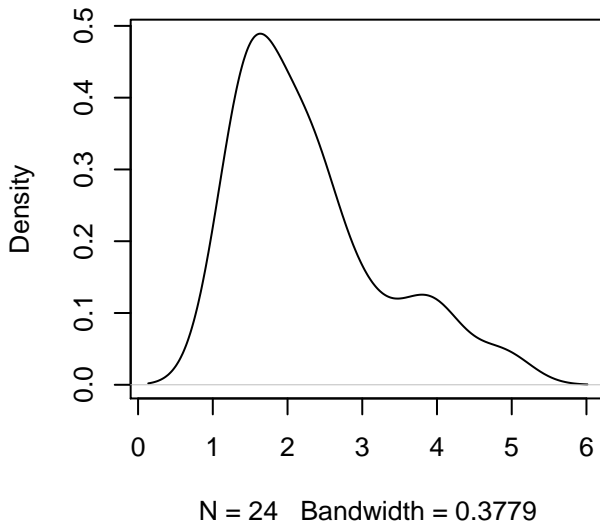
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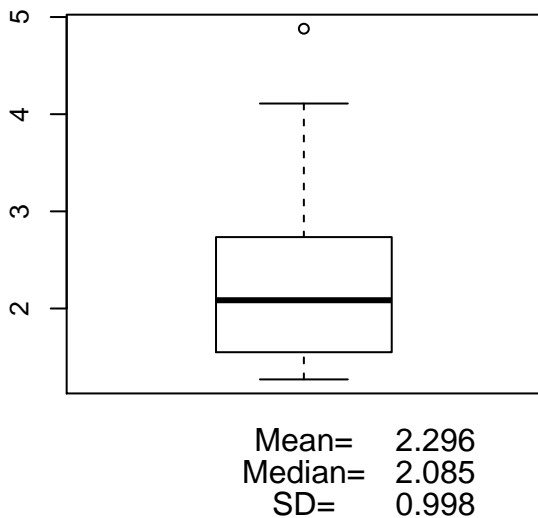
Nb



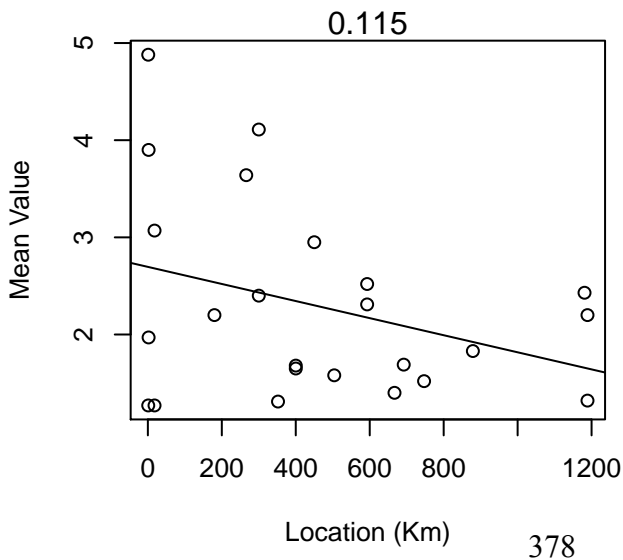
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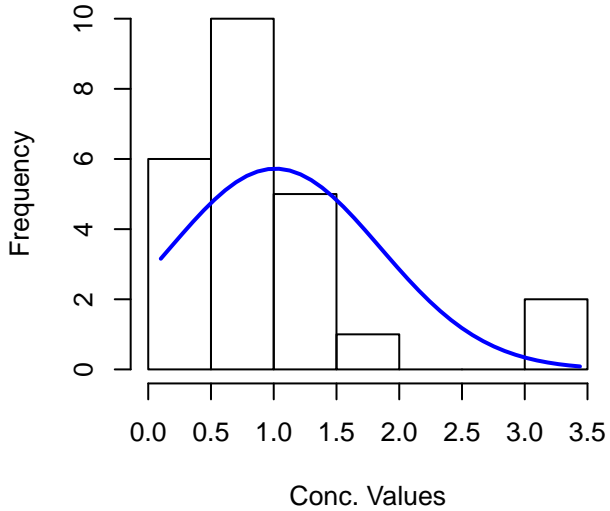
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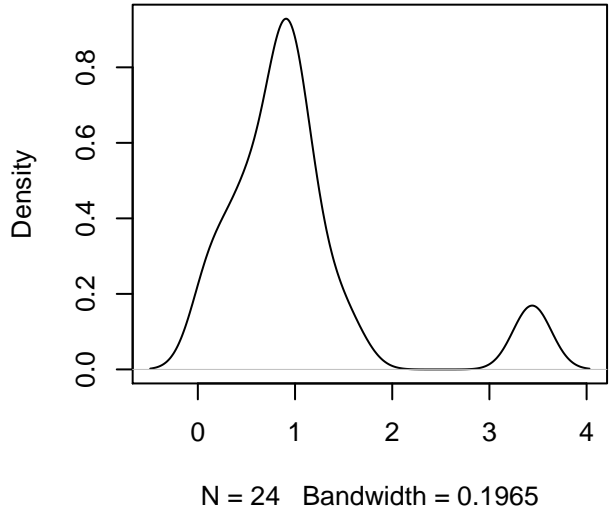
Nb



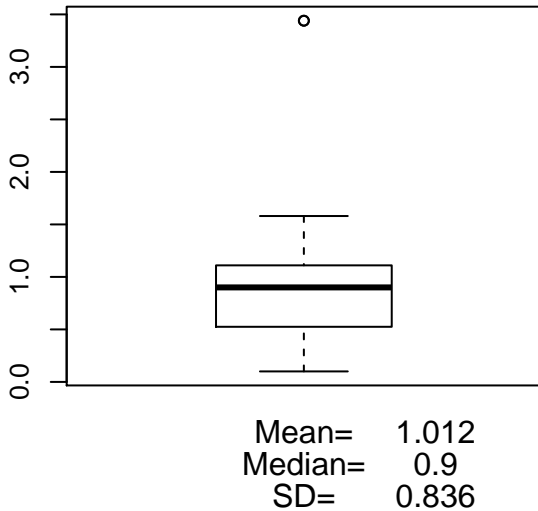
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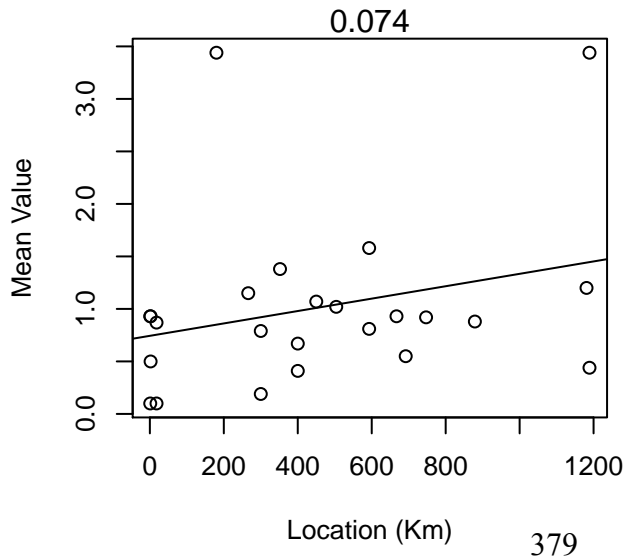
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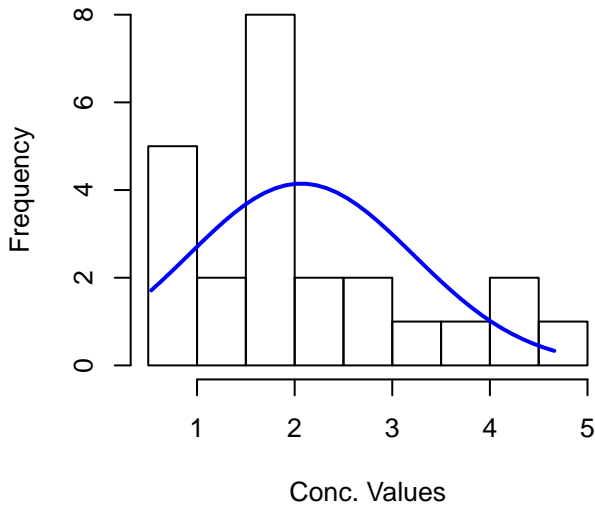
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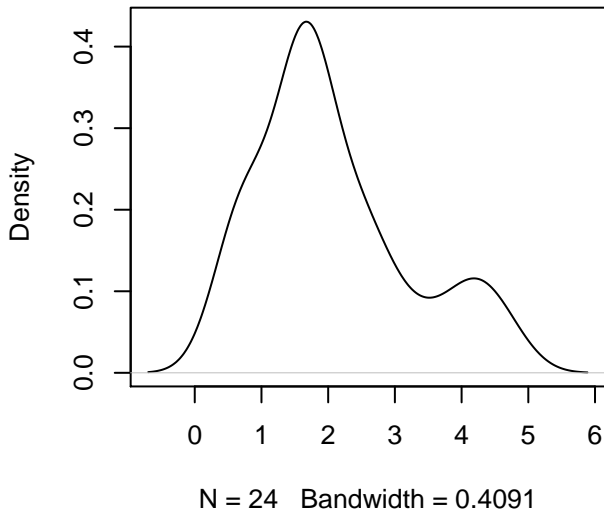
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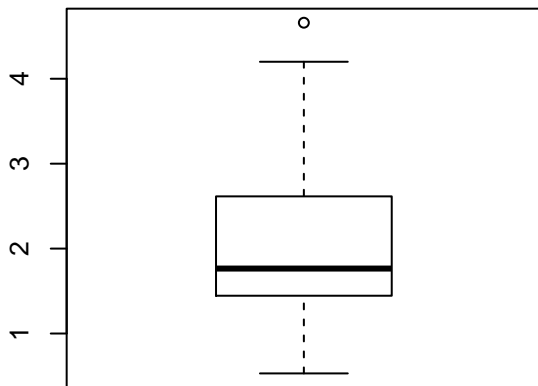
Cs



Cs



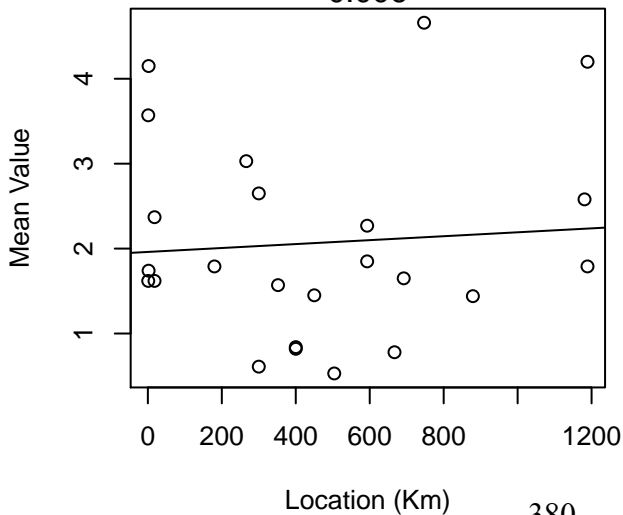
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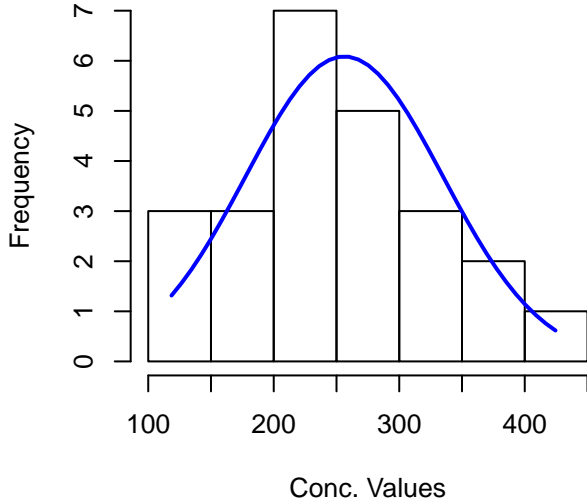
Mean= 2.066
Median= 1.765
SD= 1.154

Cs

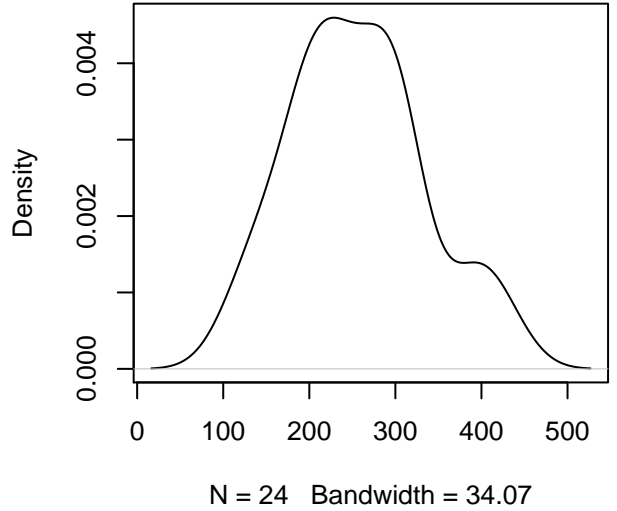
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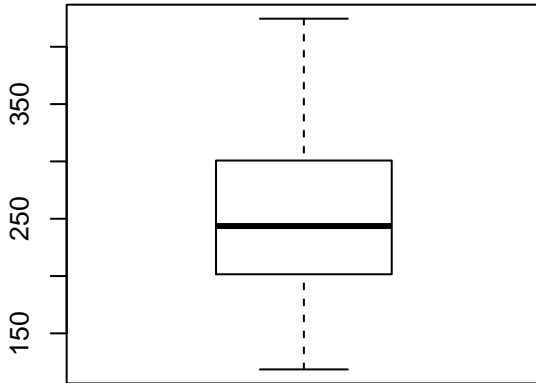
Ba



Ba

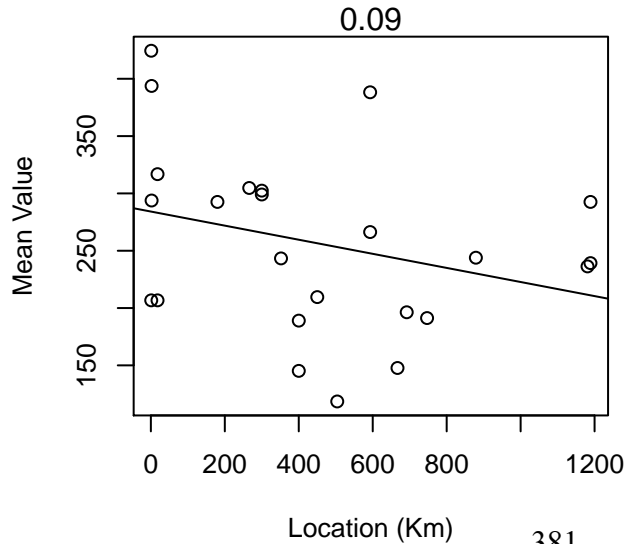


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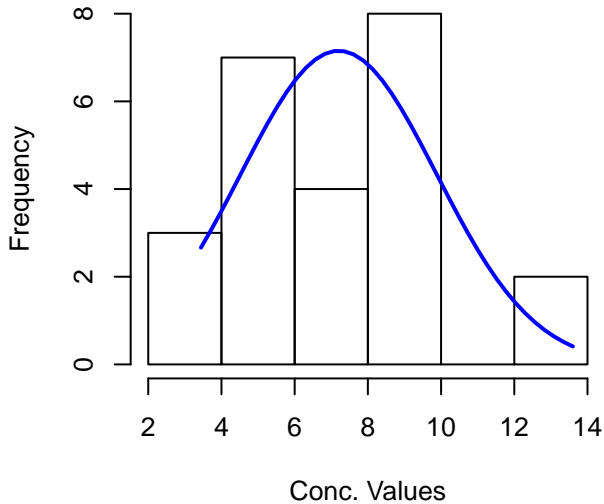


Mean= 256.21
Median= 243.62
SD= 78.645

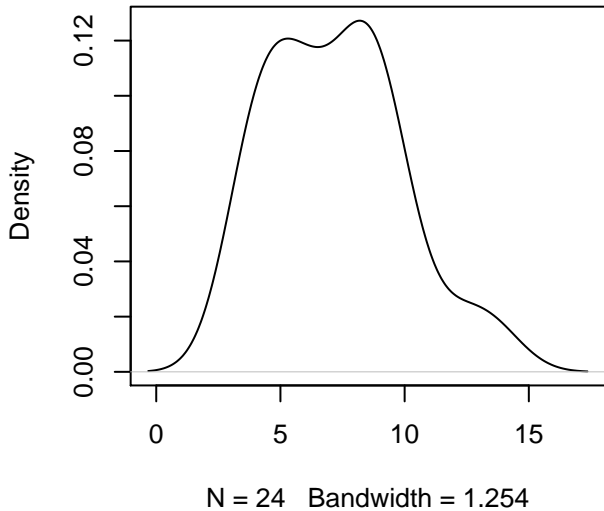
Ba



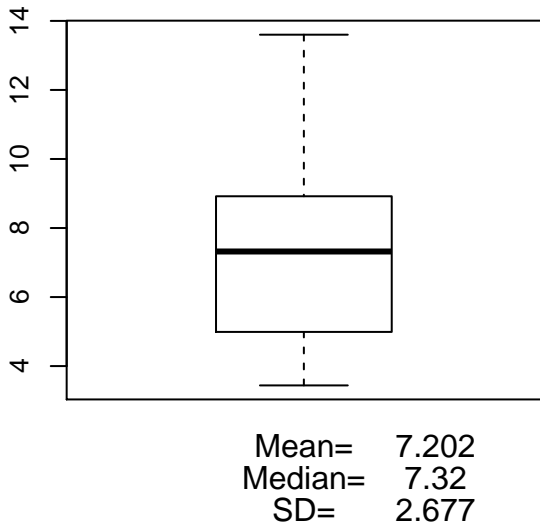
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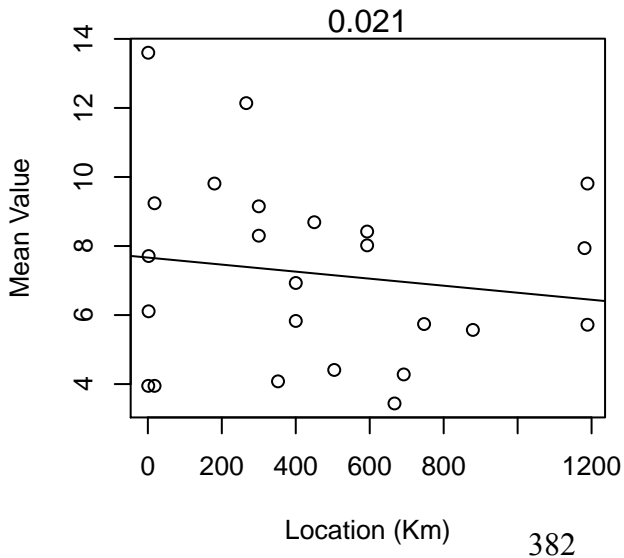
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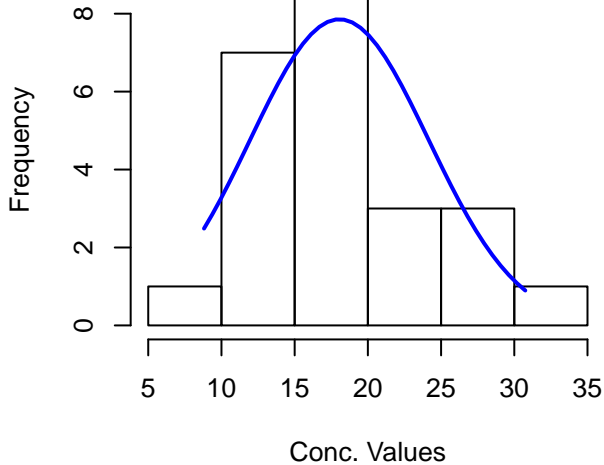
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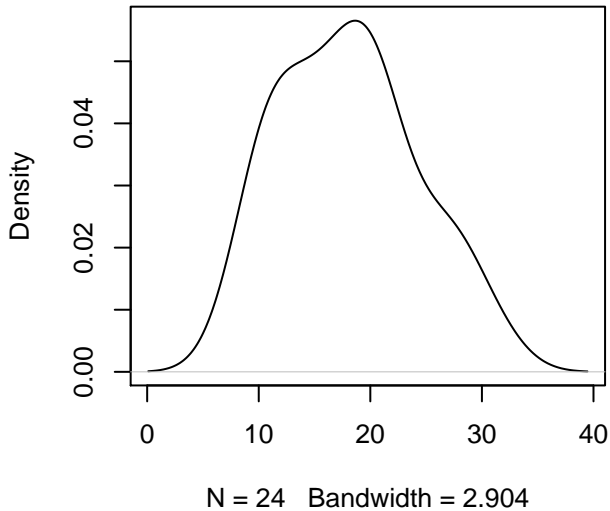
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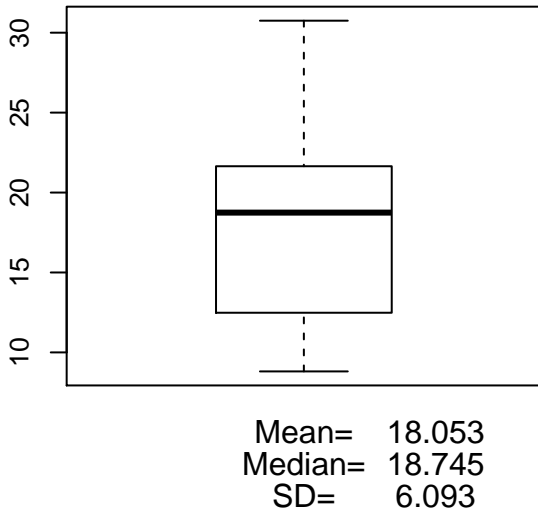
Ce



Ce

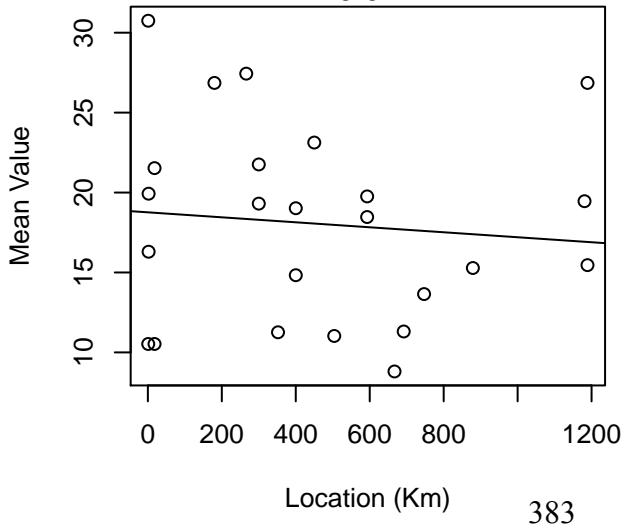


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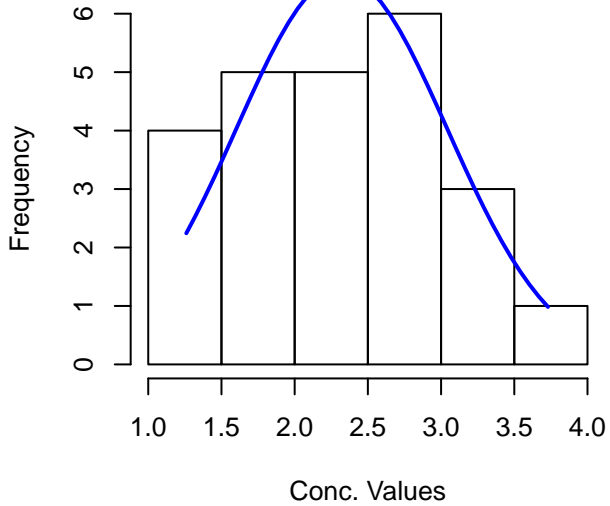


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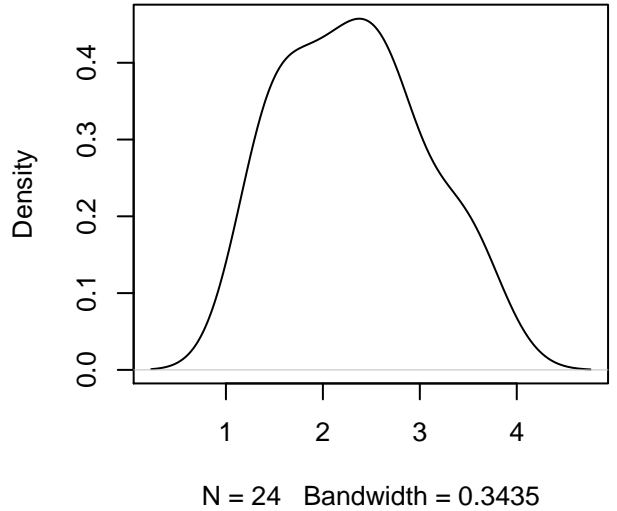
0.01



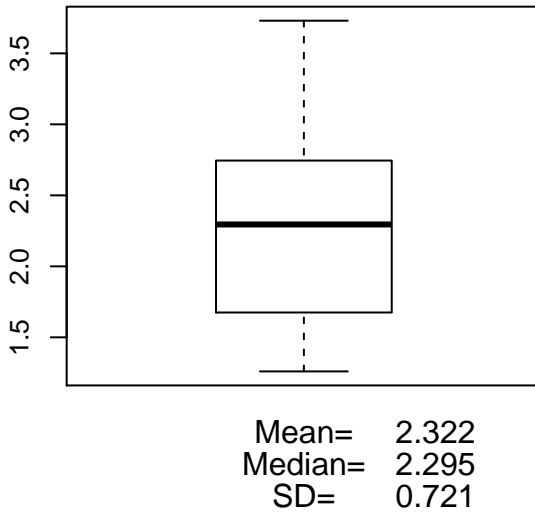
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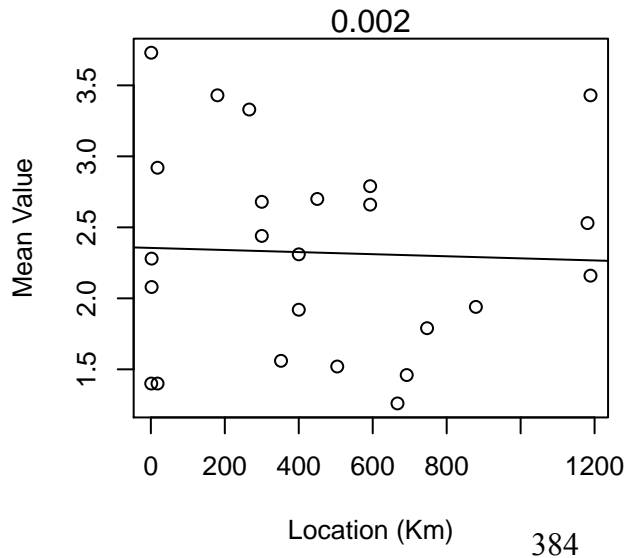
Pr



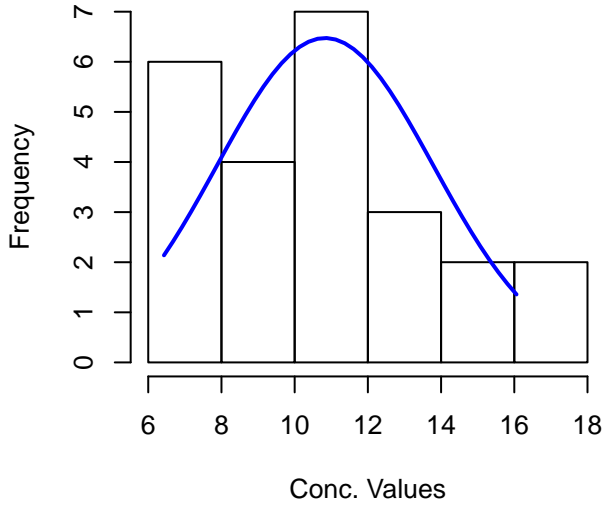
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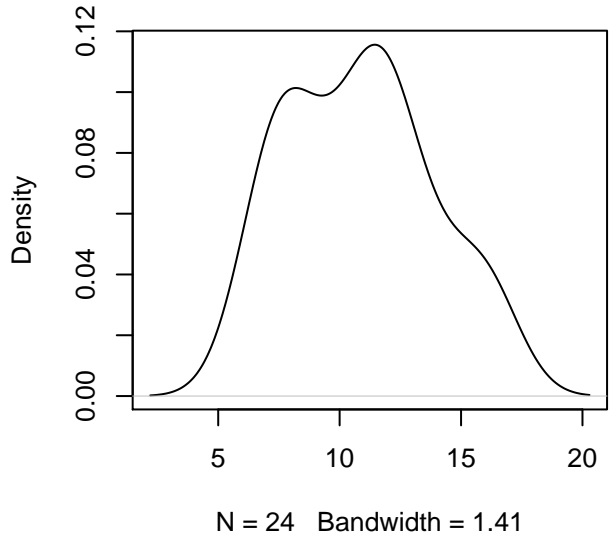
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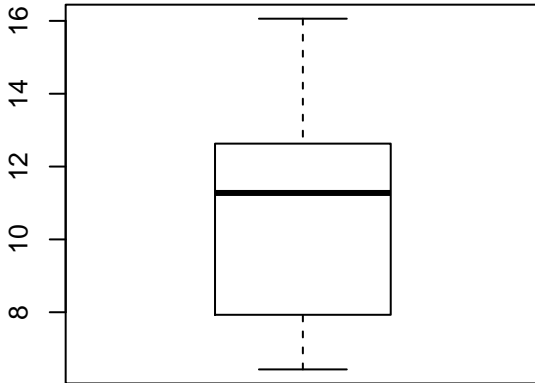
Nd



Nd

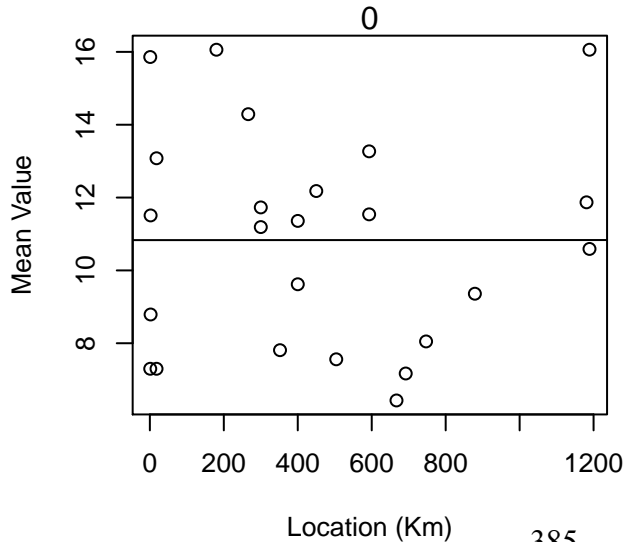


Nd

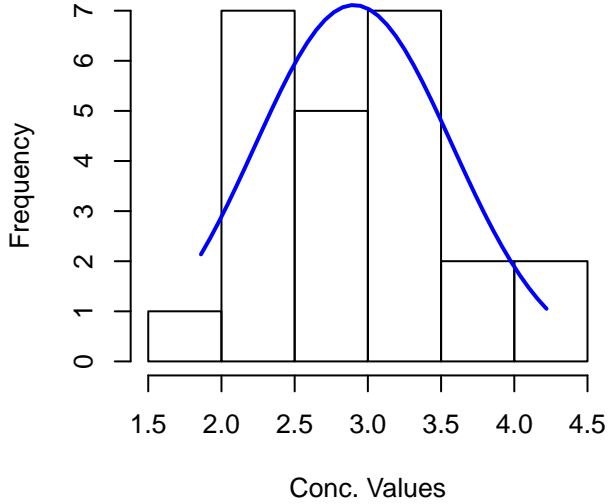


Mean= 10.832
Median= 11.275
SD= 2.957

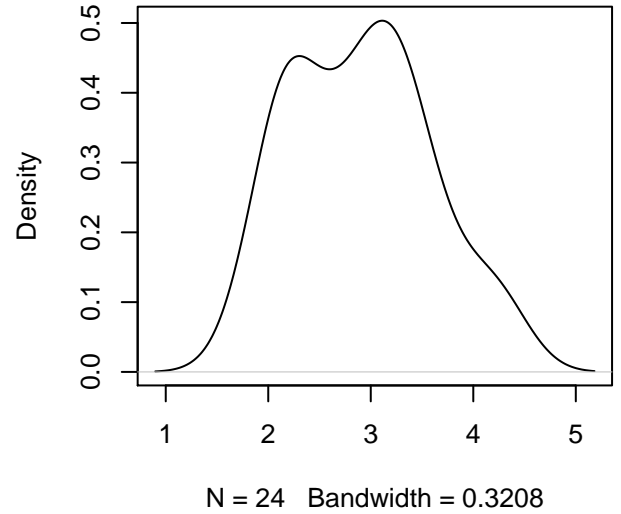
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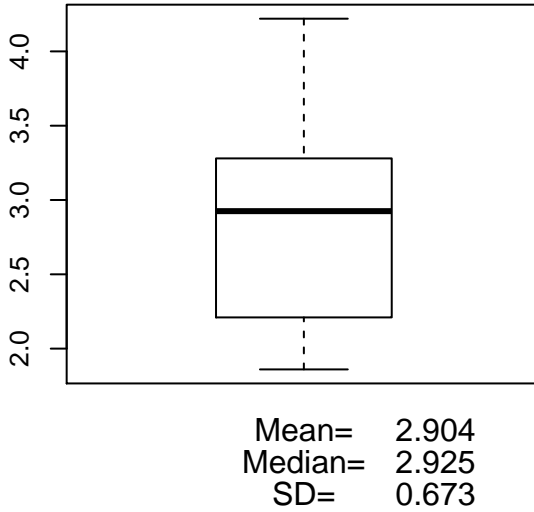
Sm



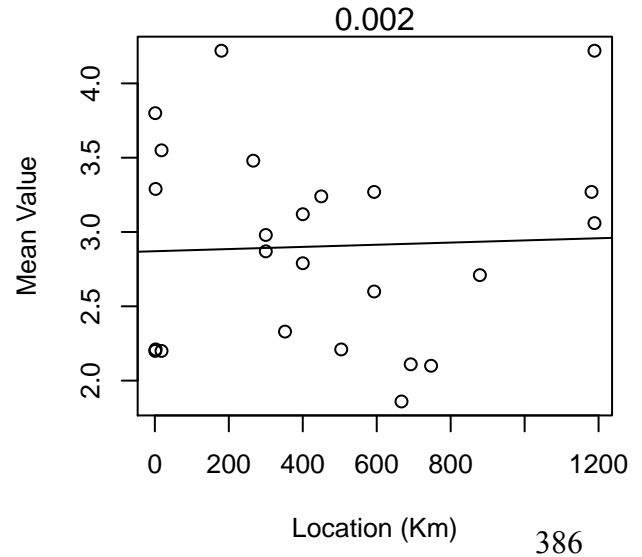
Sm



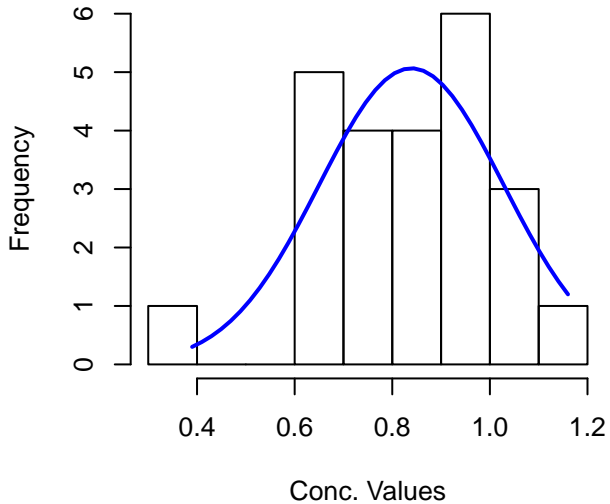
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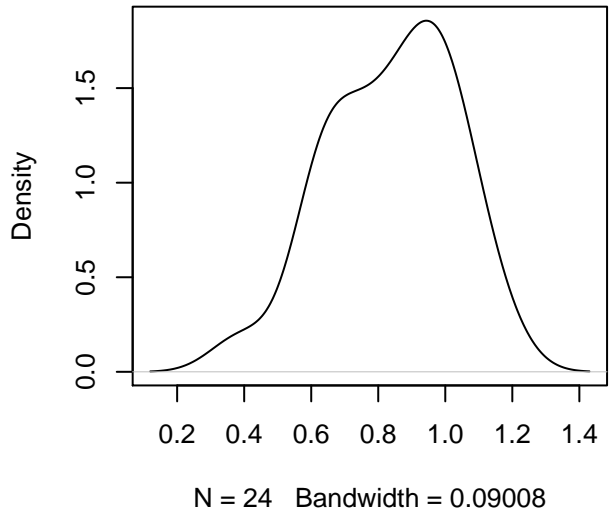
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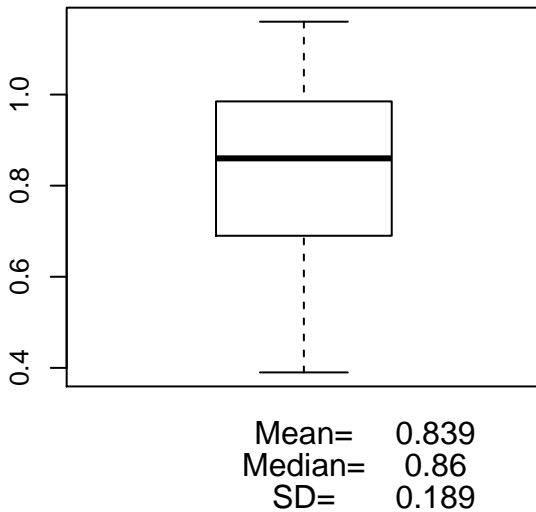
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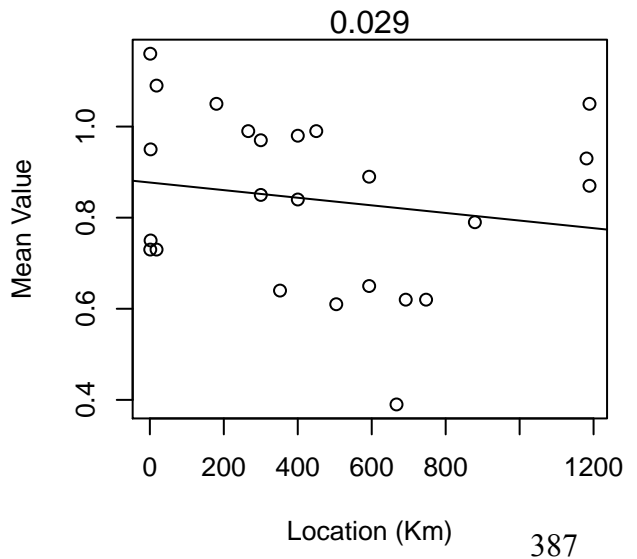
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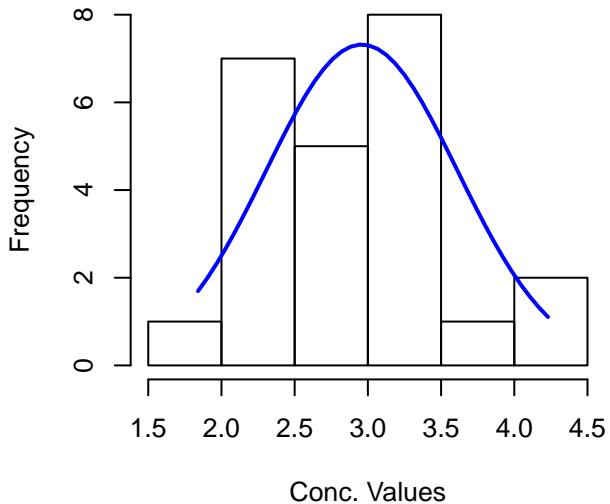
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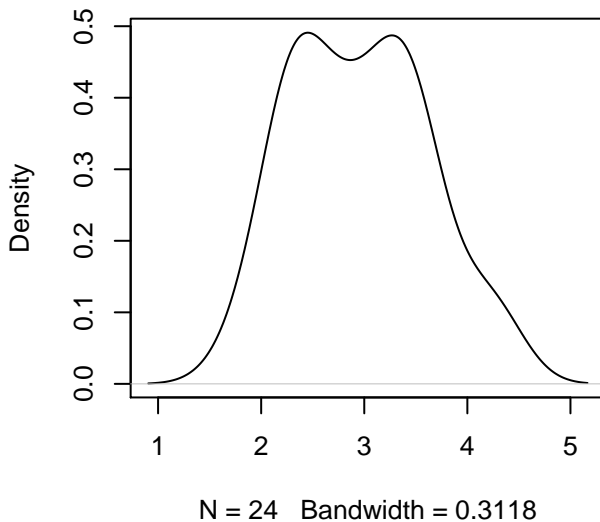
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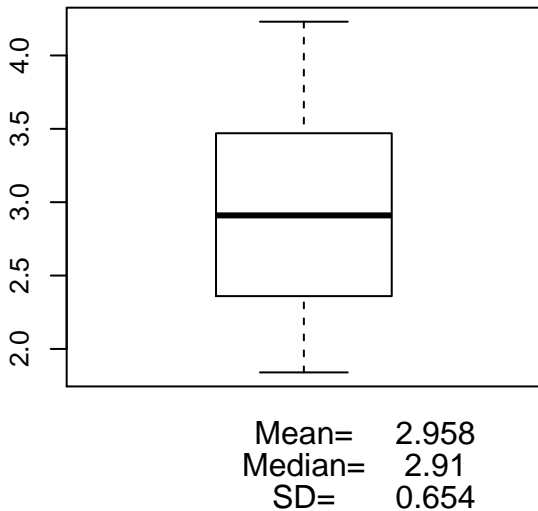
Gd



Gd

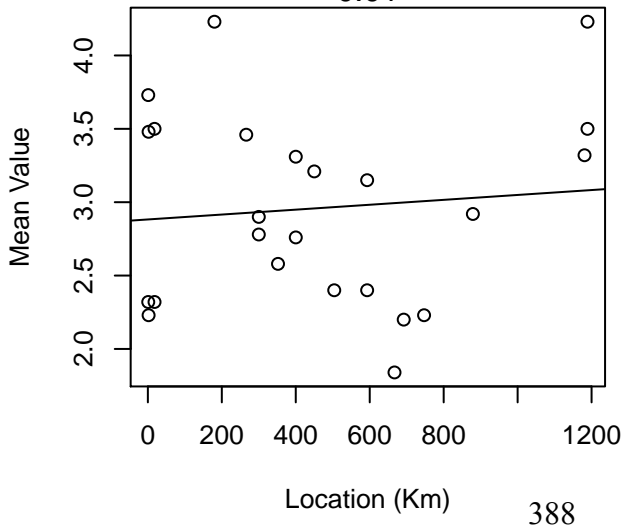


Gd

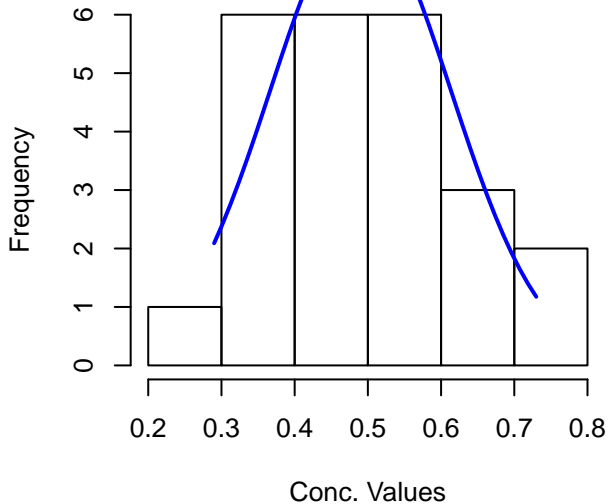


Gd

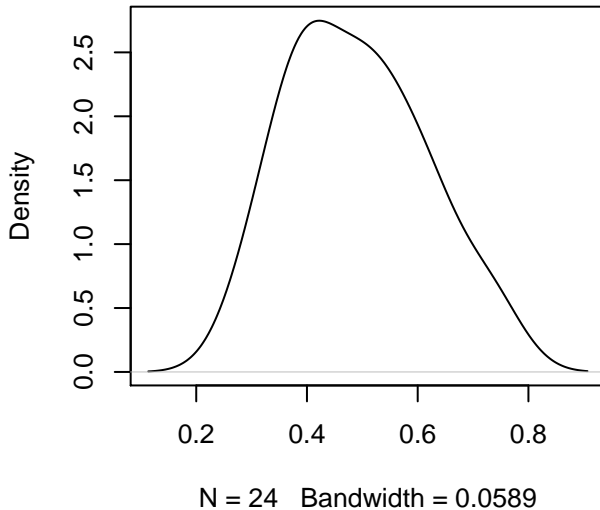
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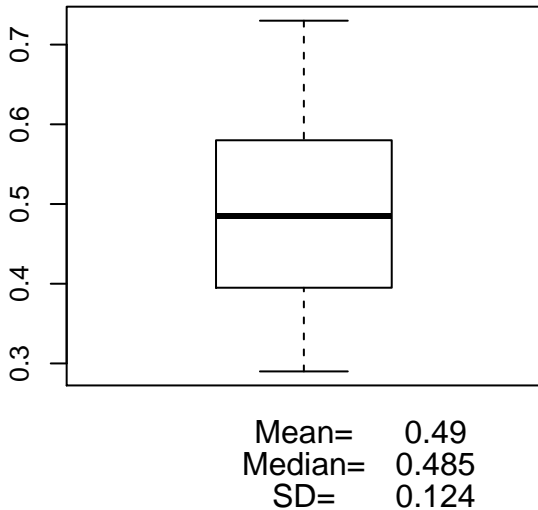
Tb



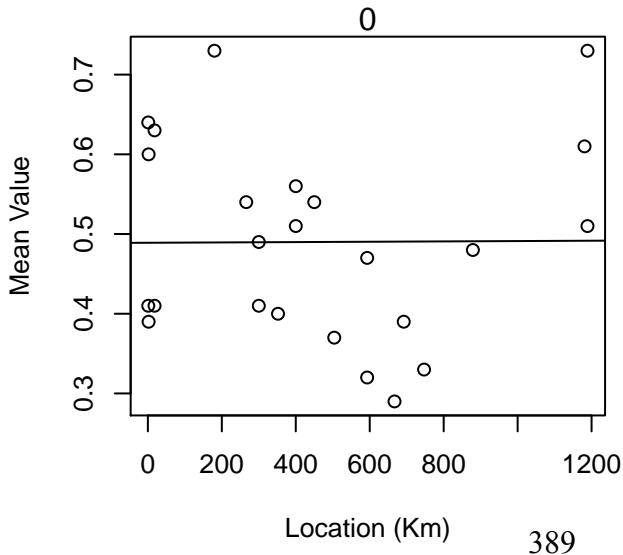
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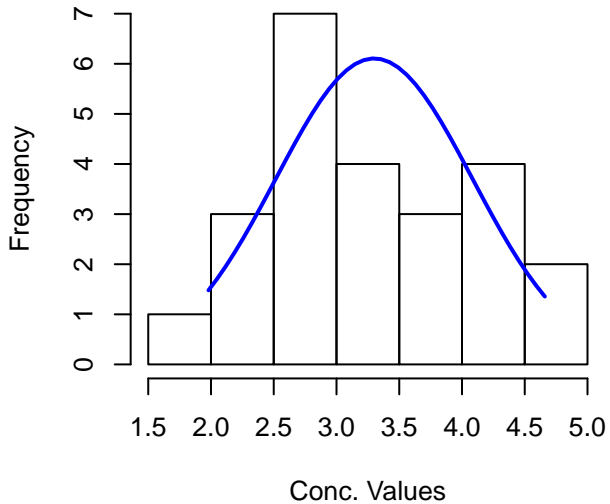
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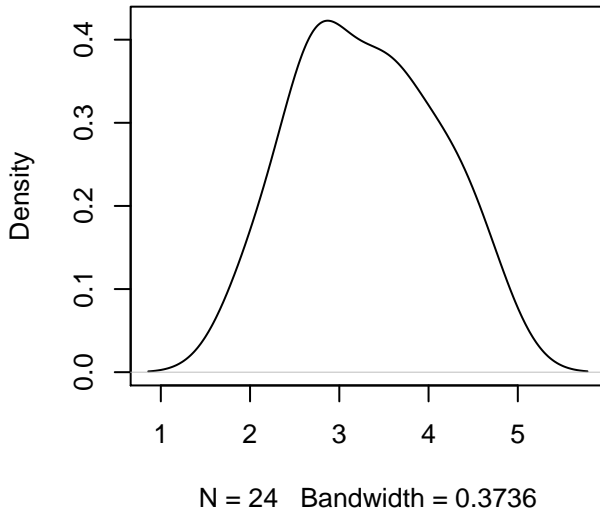
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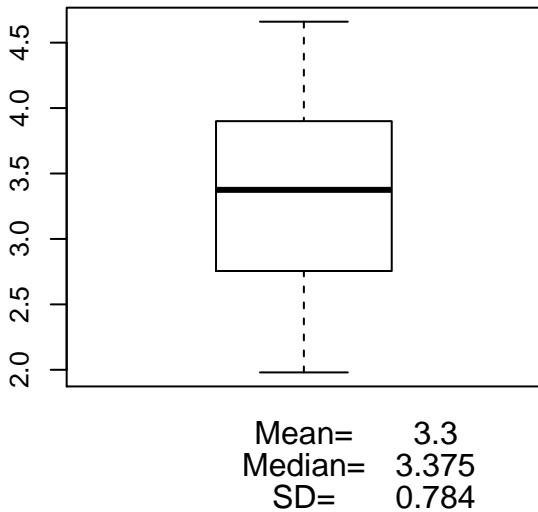
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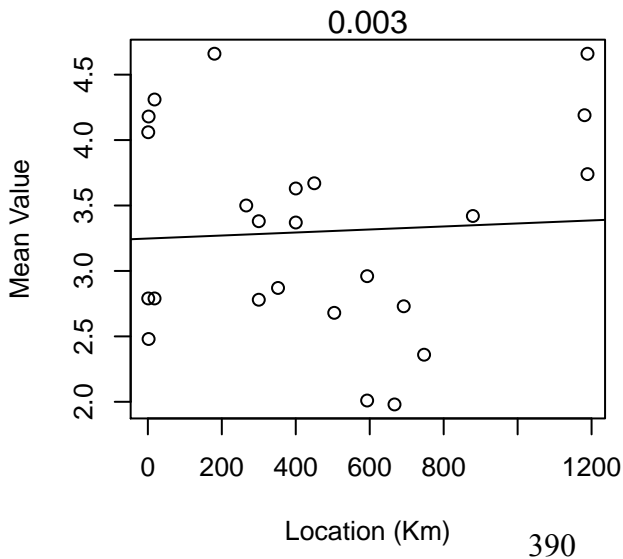
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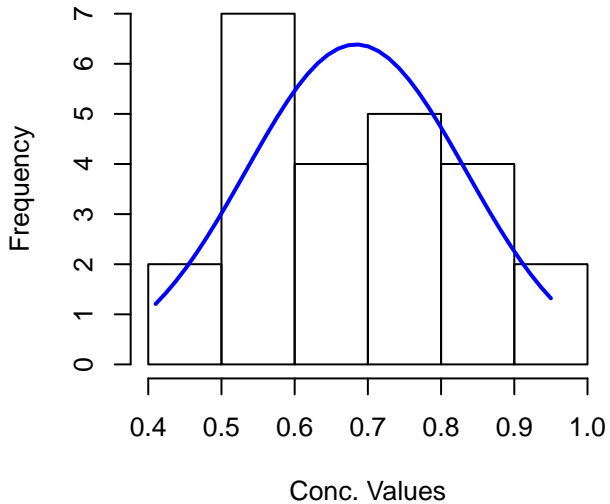
Dy



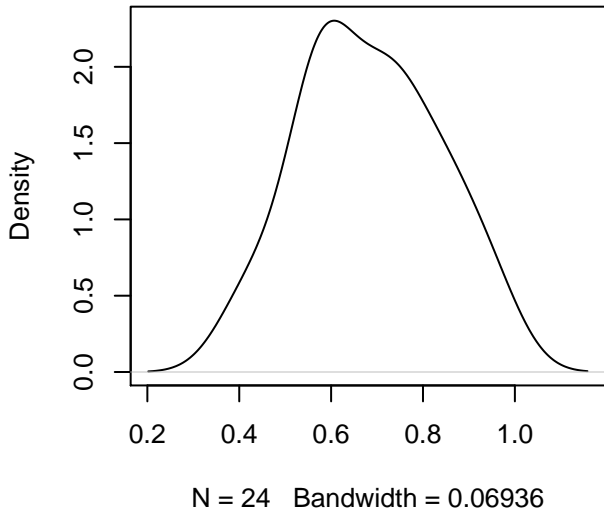
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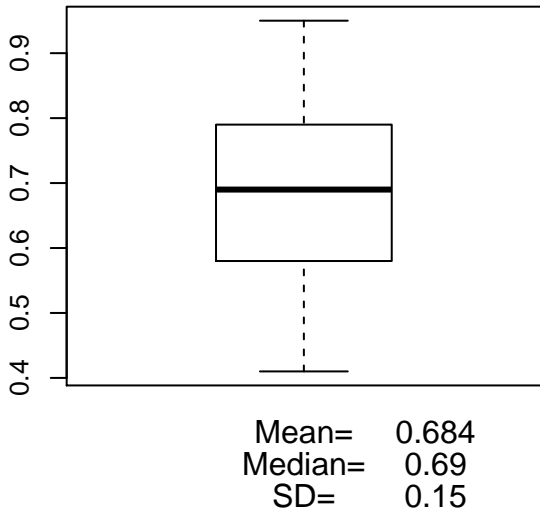
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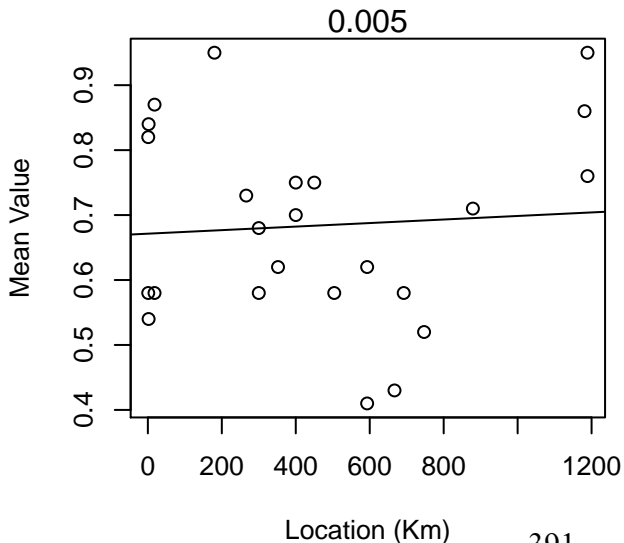
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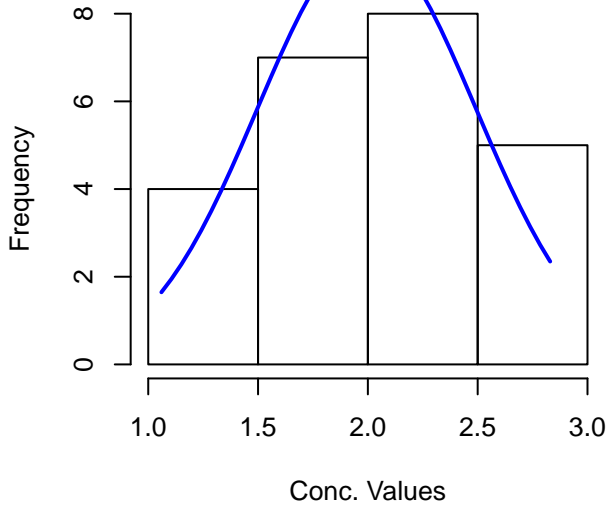
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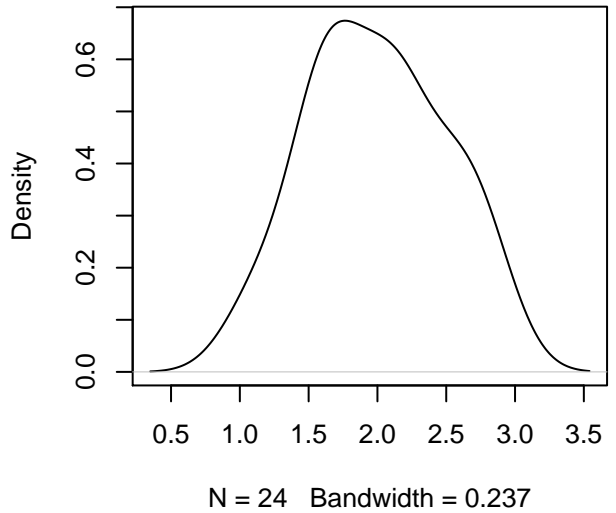
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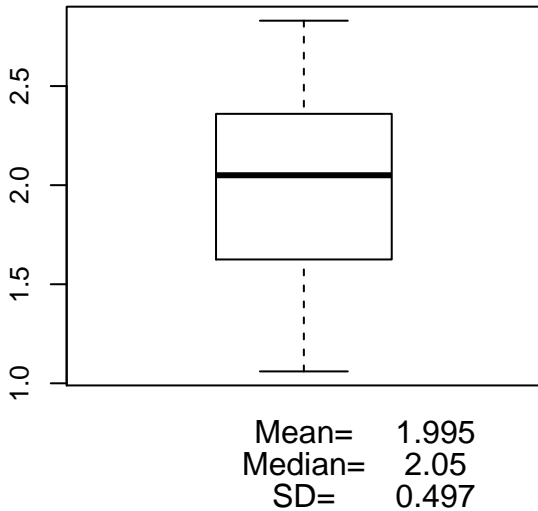
Er



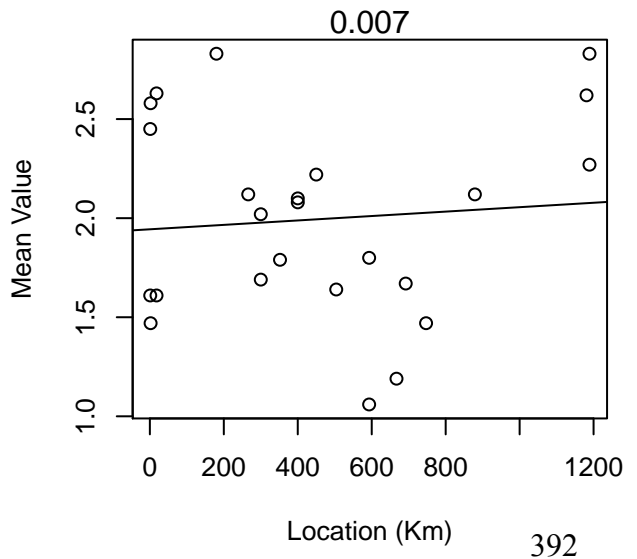
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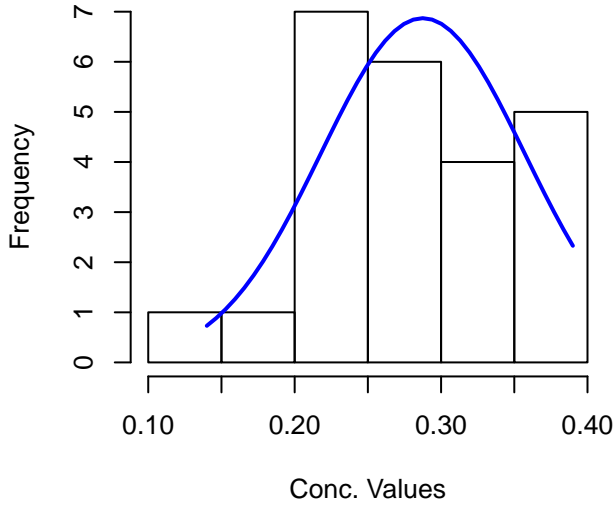
Er



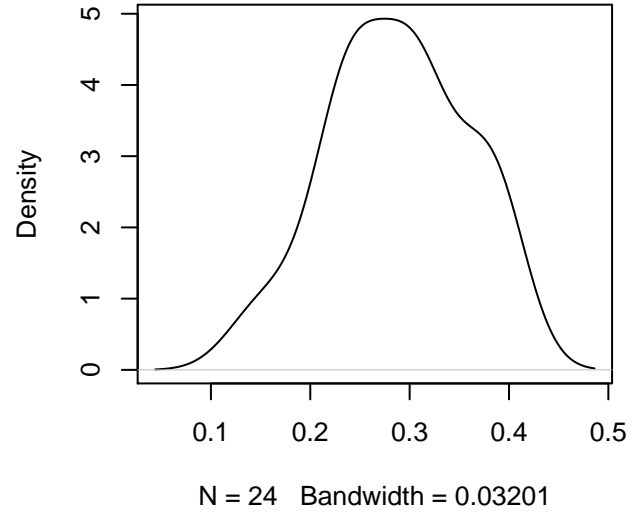
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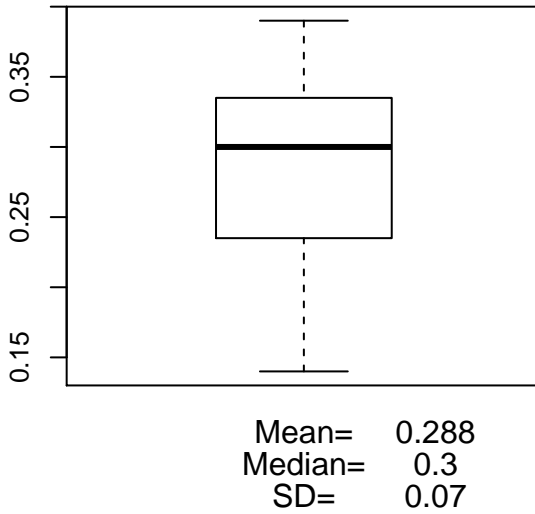
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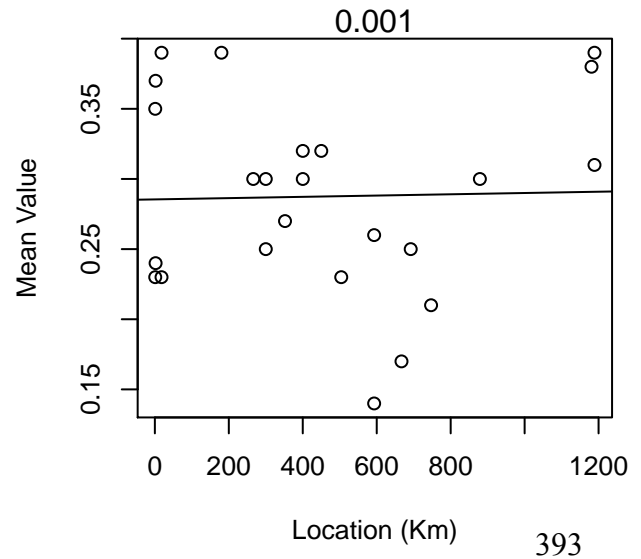
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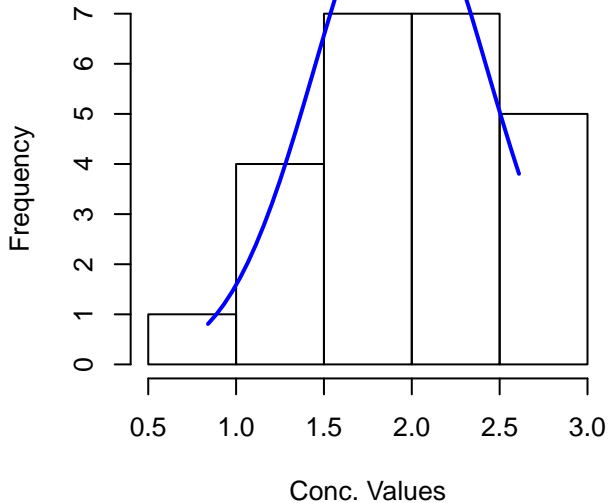
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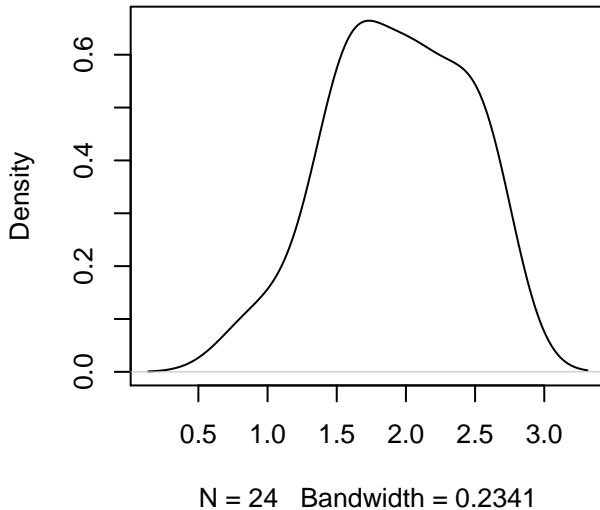
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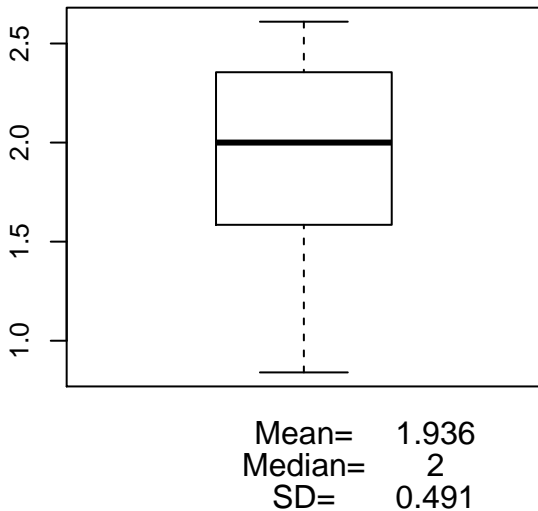
Yb



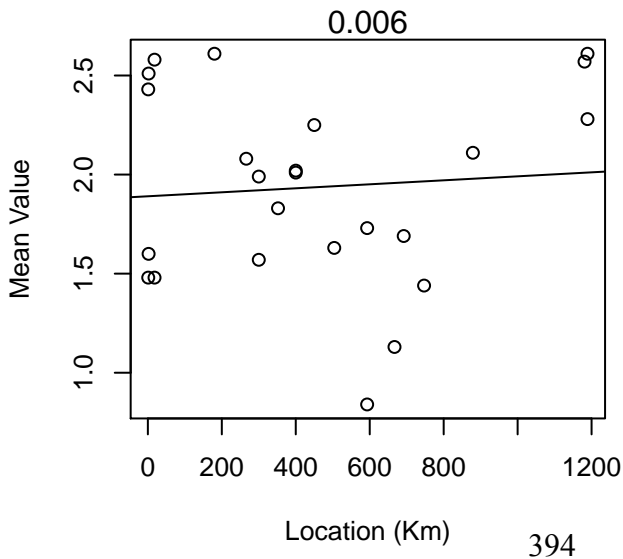
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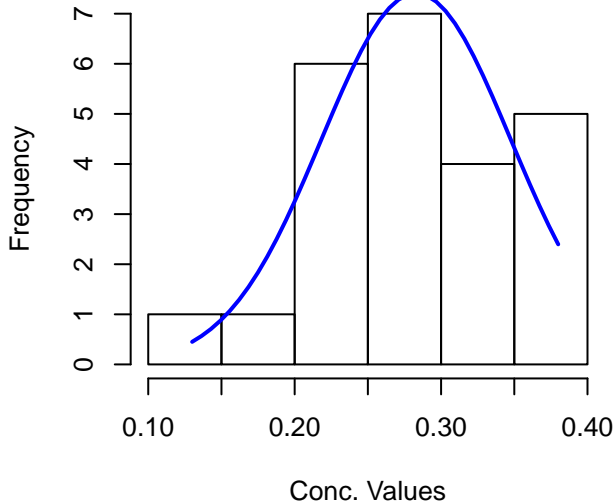
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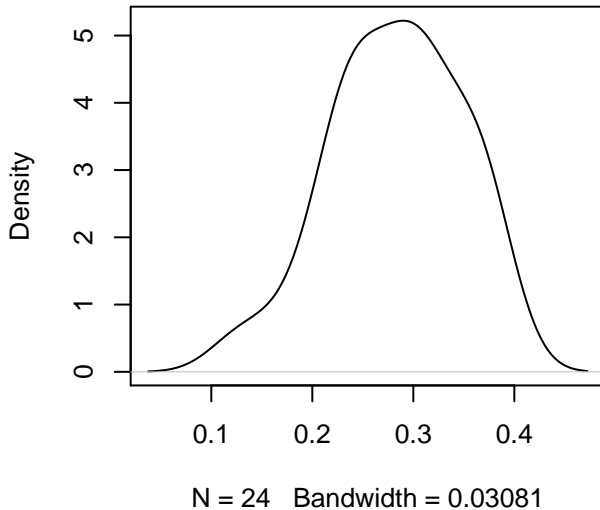
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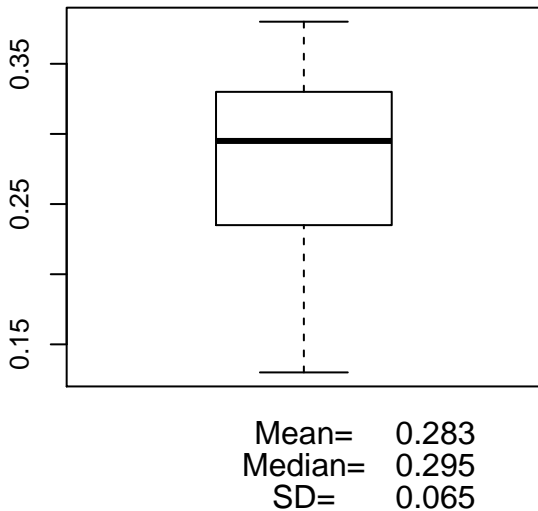
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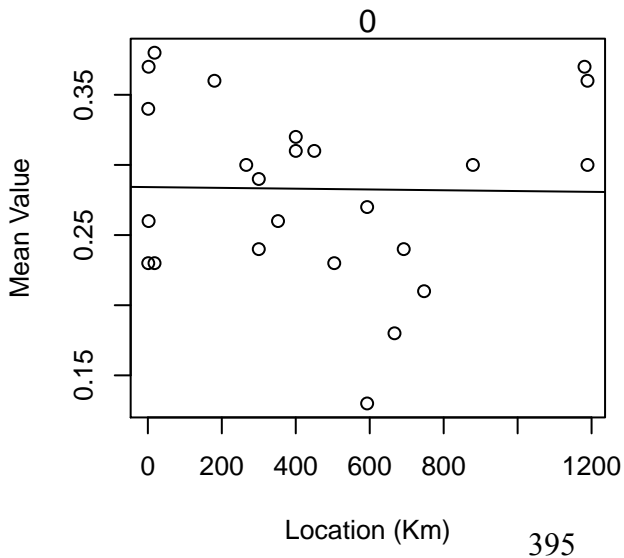
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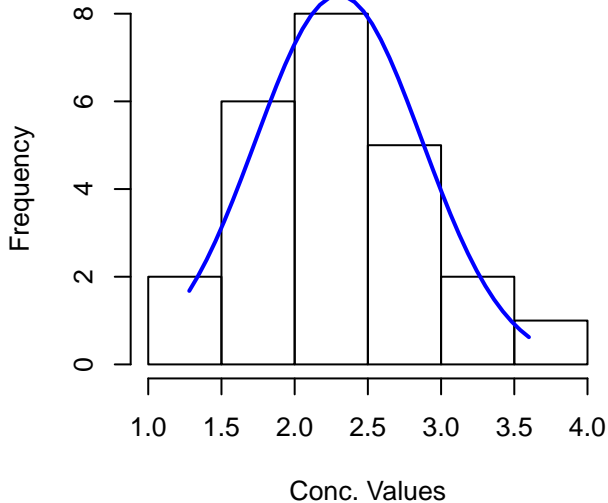
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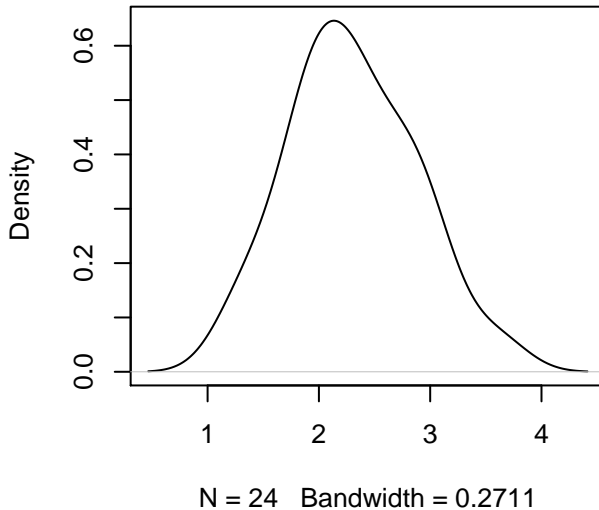
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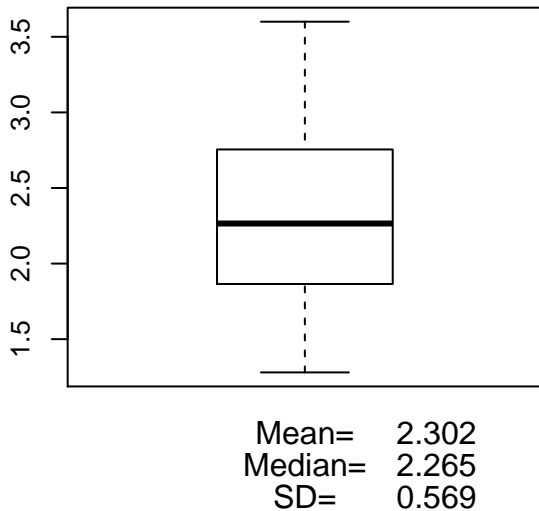
Hf



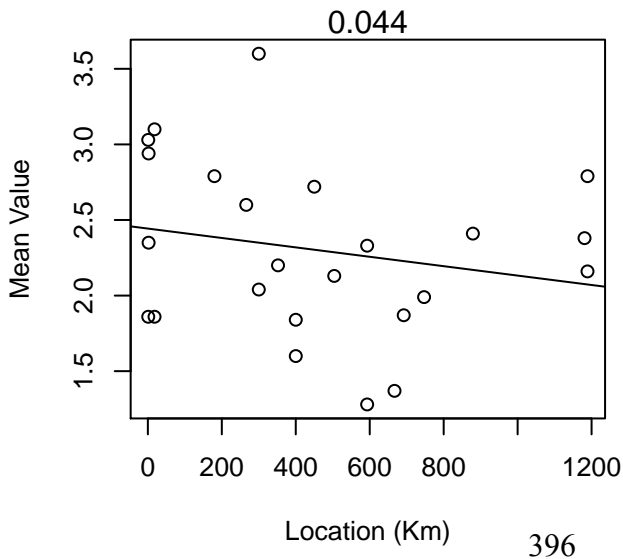
Hf



Hf

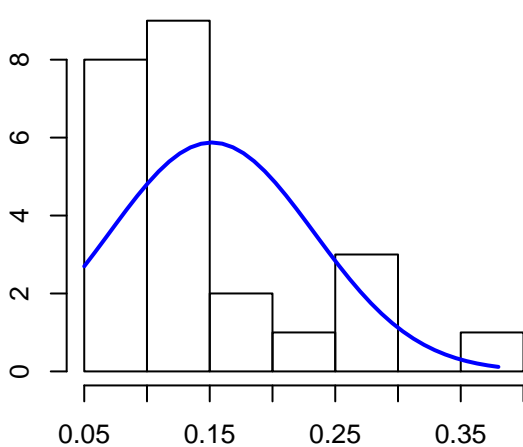


Hf



Ta

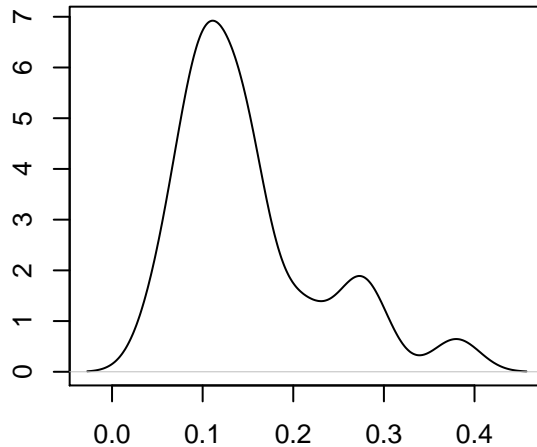
Frequency



Conc. Values

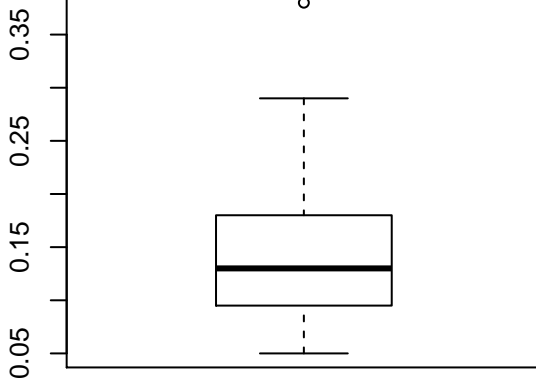
Ta

Density



N = 24 Bandwidth = 0.02579

Ta

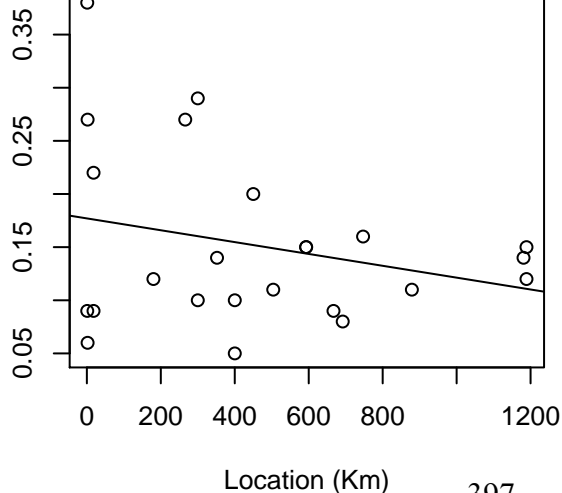


Mean= 0.152
Median= 0.13
SD= 0.081

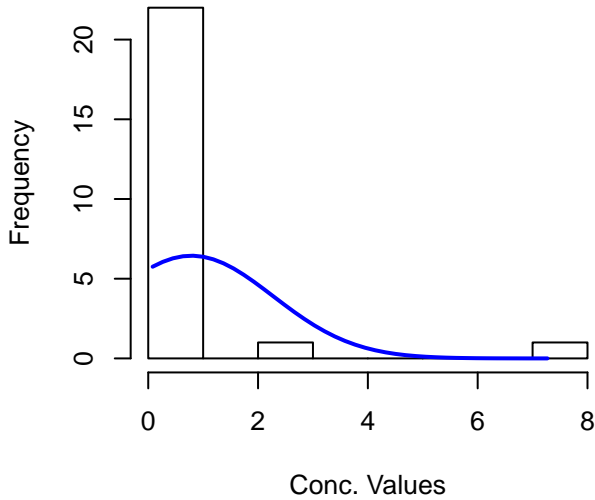
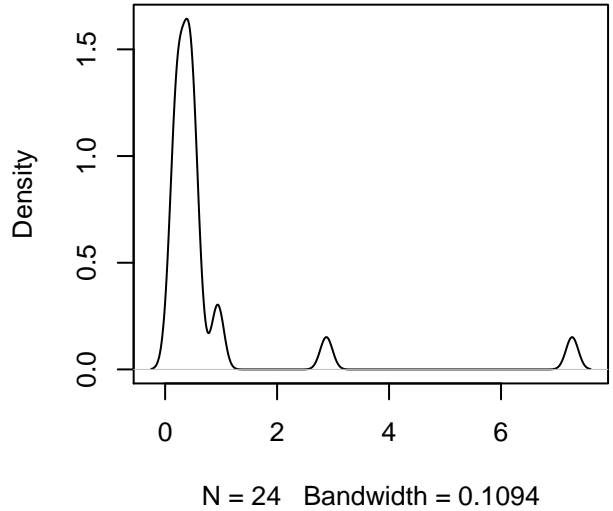
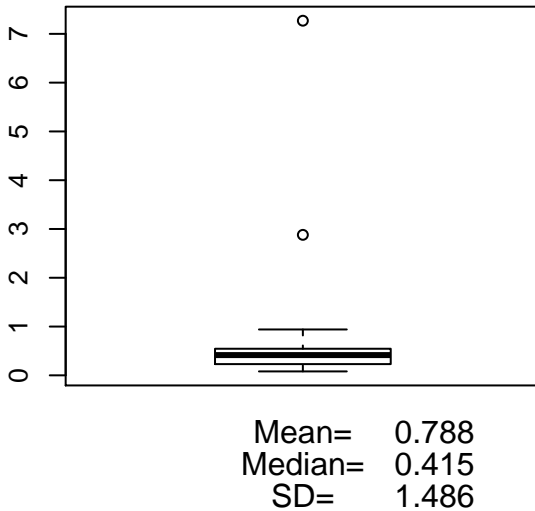
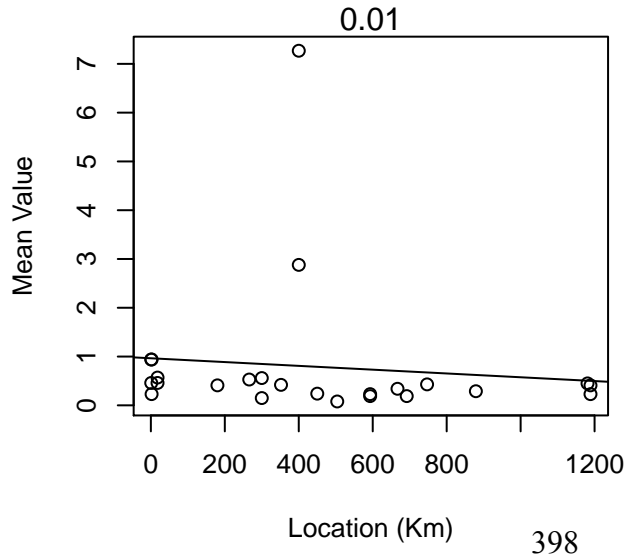
Ta

0.069

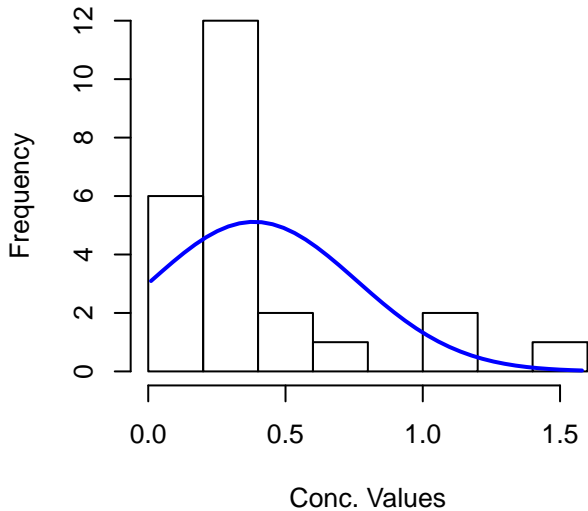
Mean Value



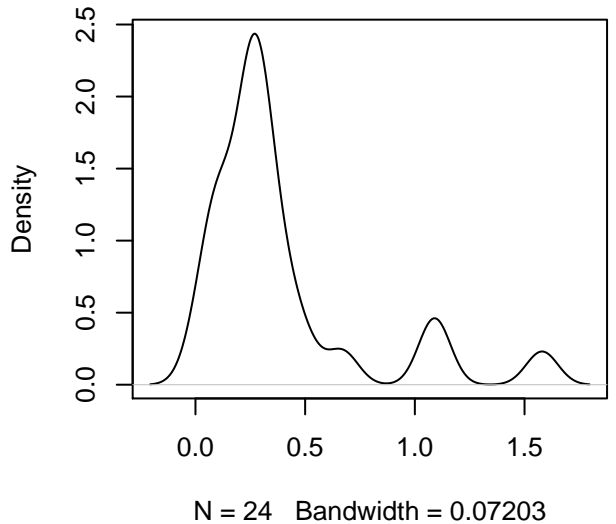
397

W**W****W****W**

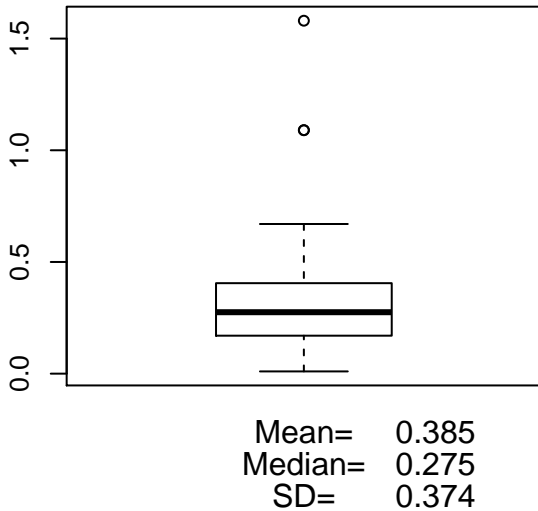
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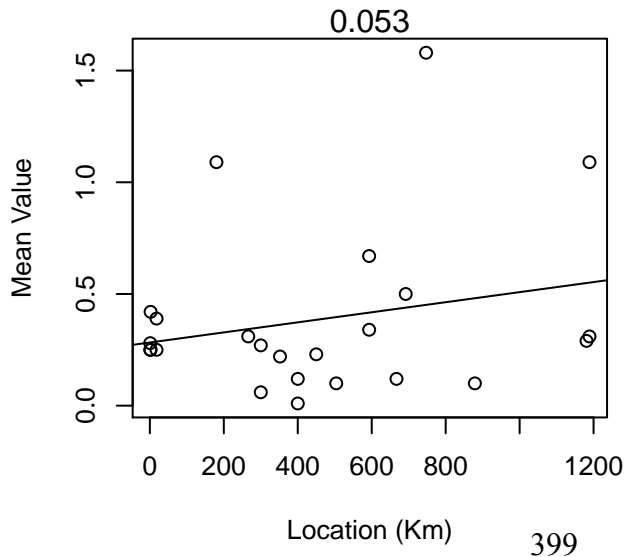
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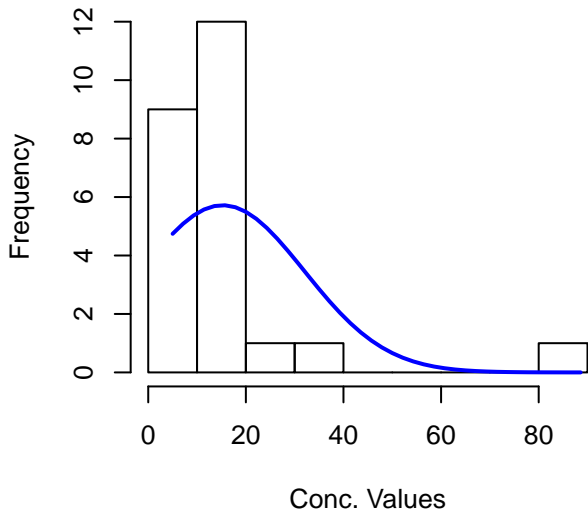
TI



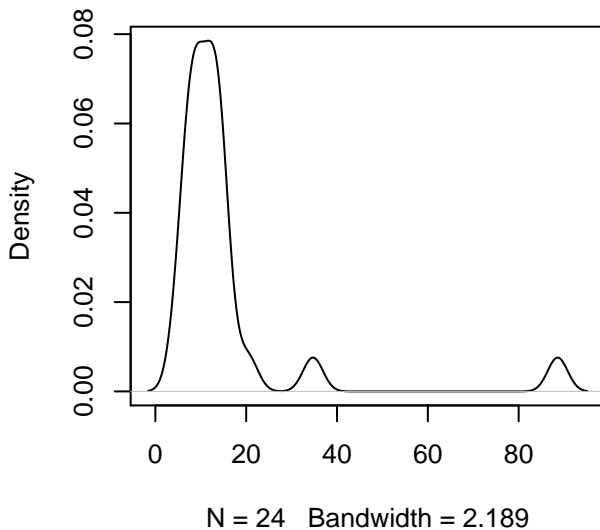
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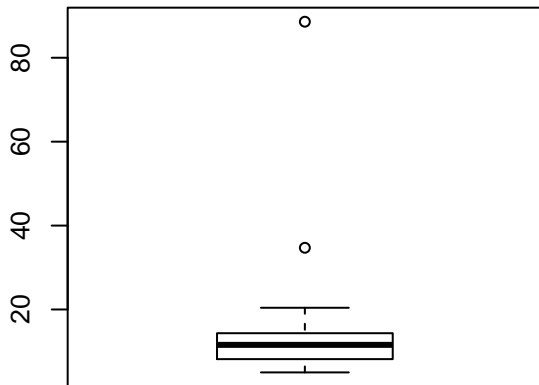
Pb



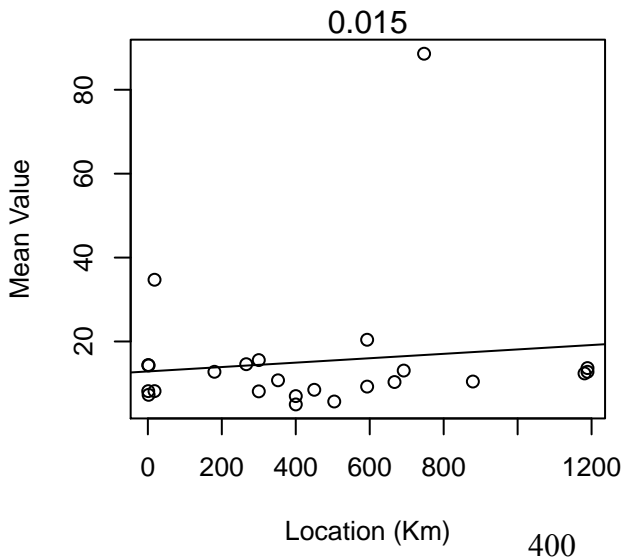
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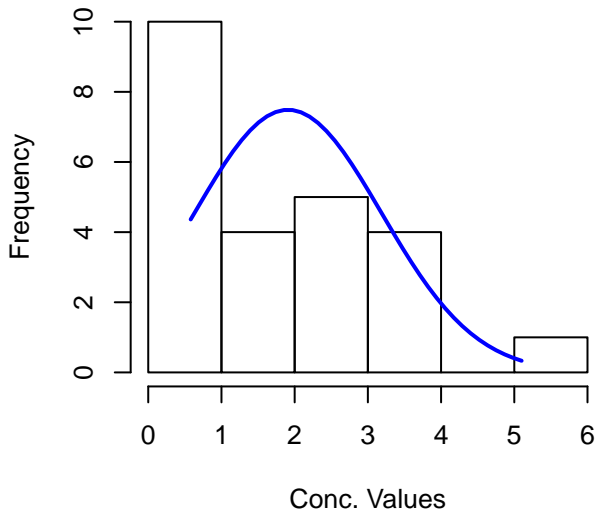
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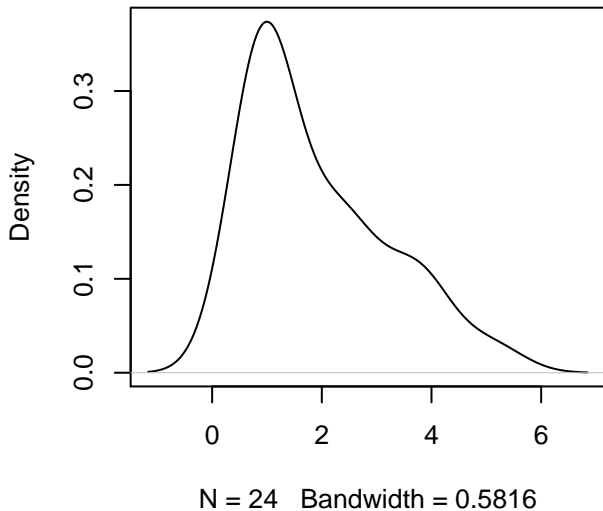
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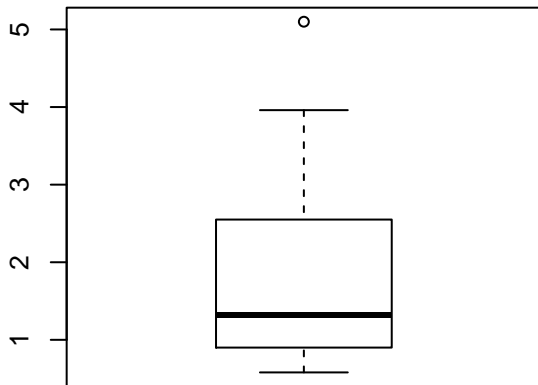
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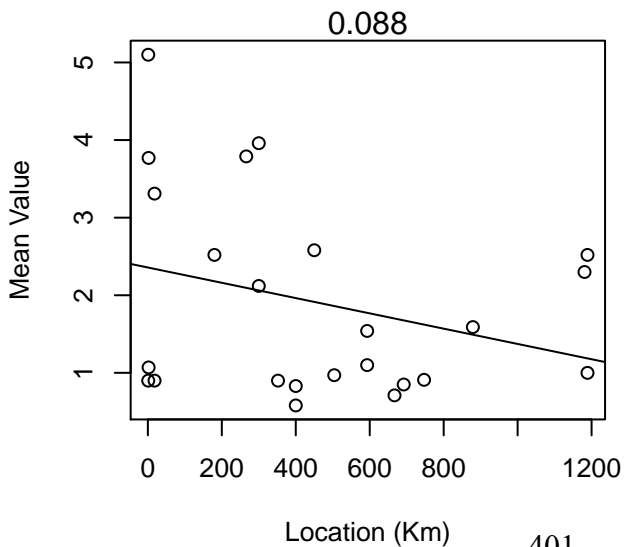


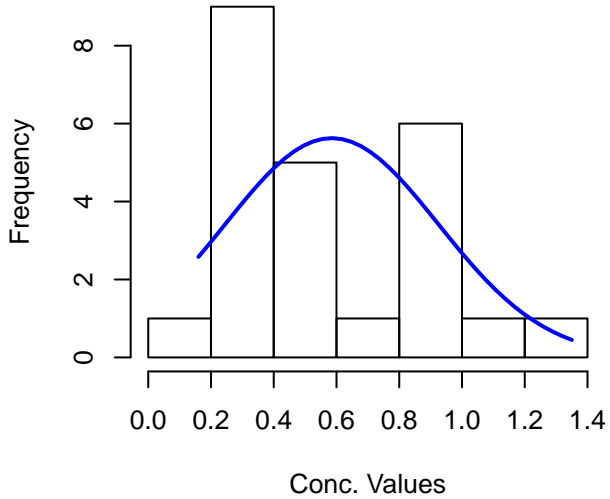
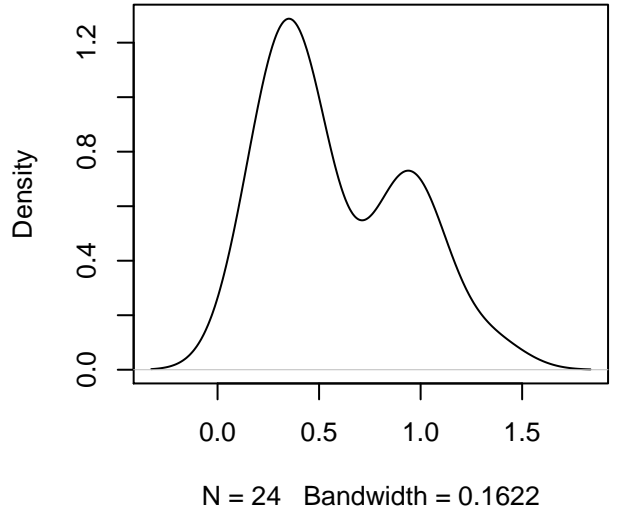
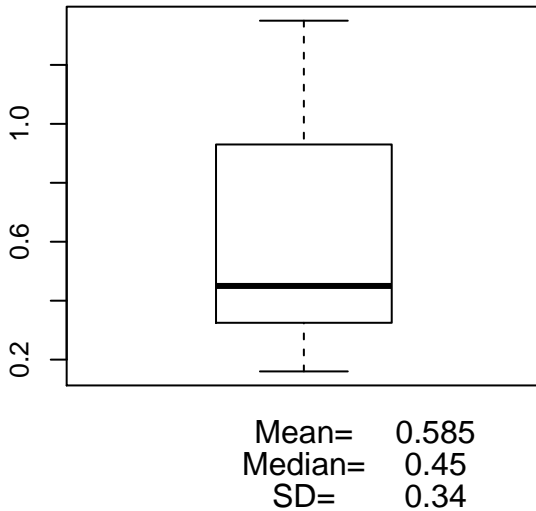
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Mean= 1.909
Median= 1.32
SD= 1.278

Th



U**U****U****U**