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A Biological Distance Analysis of 19th-20th-century Individuals from Myanmar

A dissertation submitted in partial fulfillment of
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by

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ABSTRACT

Myanmar (Burma) is the largest country in mainland Southeast Asia that is an optimal region for studies in human migration patterns in the geographic area. However, owing to a regime under an isolationist military dictatorship for the last half-century, Myanmar is a relatively underrepresented country in the international sphere in many aspects, including anthropological research that explores the biological diversity of the country's human population. As such, the current dissertation study aims to: 1) examine the biological diversity in a sample of individuals belonging to a cranial collection obtained from Burma over a century ago (the Duckworth Burma cranial collection at the University of Cambridge); and 2) explore evolutionary trends in skeletal and dental morphology from this population sample. This research is a holistic and multi-faceted study that incorporates multiple data types (metric and nonmetric data) of the cranium and dentition to compare individuals from the Duckworth Burma collection to diverse global population groups.

Results from the current study indicate that the Duckworth Burma crania exhibit phenotypic diversity that is reflective of their population history. Linear discriminant analysis results of metric suggest that the Duckworth Burma samples were skeletally closest to individuals from Java (Indonesia), South India, and the Philippines. Cluster analyses of craniometric data also showed distinct clusters that formed independent of sexual dimorphism, suggesting phenotypic diversity within the Burma groups analyzed. Further, samples from the Duckworth Burma collection exhibit craniofacial dimensions and traits that are consistent with traits associated with warmer climates. Both craniometric canonical variate plots and macromorphoscopic (MMS) trait frequency analyses of the Duckworth Burma samples indicate closer relationships of this group with other population groups associated with warmer climates. Moreover, raw cranial measurements and MMS trait scores of the Duckworth Burma individuals further support the findings based on climate-related craniofacial morphology. Lastly, the overall results from various data types demonstrate that samples from the Burma groups analyzed in this study are most similar to other Southeast, East, and South Asian population groups, following the isolation-by-distance model.

The current dissertation is the first biological distance (biodistance) study in over 100 years to revisit the Duckworth Burma cranial collection and give it the attention it deserves. Moreover, it is also the first biological anthropological study conducted on Burmese remains by an anthropologist belonging to the Burmese diaspora who is also a descendant community member of the Duckworth Burma individuals. Knowledge produced from the current study can aid in future data collection on additional skeletal samples from Myanmar. Further, it can also serve as a referential baseline for the forensic identification of individuals in Myanmar whose remains have been fully decomposed, skeletonized, or thermally altered due to the atrocities committed by the military junta. As such, this dissertation study strives to serve as a small yet crucial step in bridging an immense gap between biological anthropology and Myanmar.

DEDICATION

To all the brave revolutionaries in Myanmar
risking and sacrificing your precious lives,
fearlessly fighting for our freedom from fear.

Grateful is an understatement
of what I feel toward your heroism.

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Anyone who has gone through graduate school or knows a graduate student would know that a dissertation cannot be completed alone, and my dissertation is no exception. I have been fortunate enough to receive a multitude of support from my community, which I get to take sole credit for in the form of this dissertation. First, I would like to thank my advisor, Dr. Marin Pilloud, for her unwavering support throughout my entire Ph.D. career. She was one of my ultimate sources of hope and guidance when the coup d'état in Myanmar took place in 2021, derailing my plans for doing dissertation research in the country. Marin, thank you for being a role model and for being the type of mentor I would like to be for future generations.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1: INTRODUCTION

OVERVIEW

Myanmar (Burma) is the largest country in mainland Southeast Asia that shares borders with five other countries, making it an optimal region for studies in human migration patterns in the geographic area. Particularly, Myanmar's geographic location as the northwestern-most country in mainland Southeast Asia situates the country as a connection between South Asia (with India and Bangladesh to its east), East Asia (with China to its northeast), and the other regions of Southeast Asia (with Laos and Thailand to its west). Moreover, as home to more than 135 ethnic groups, Myanmar is comprised of a vastly ethnically diverse population. However, owing to a regime under an isolationist military dictatorship for the last half-century, Myanmar is a relatively underrepresented country in the international sphere in many aspects, including anthropological research that explores the biological diversity of the country's human population.

Most anthropological and archaeological research in Myanmar, especially research done by local scholars, has focused on material culture, art history, religious motifs, and metallurgy. As of yet, there has been no focus on the study and analysis of human skeletal remains in these archaeological contexts. Currently, none of the four major universities in Myanmar with anthropology and archaeology departments has a unit dedicated to biological anthropology ("Dagon University, Myanmar | Official Website," 2024; "University of Yangon | Official Website," 2024). As such, local biological anthropological and bioarchaeological research in Myanmar is scarce.

To explore Myanmar’s human population diversity, the current dissertation research asks the following questions: **What is the biological make-up among individuals from an ethnically diverse population in Myanmar (Aim #1),** and **what are the evolutionary trends behind the skeletal variation observed among individuals in Myanmar (Aim #2)?** To address these research questions, multiple skeletal and dental analyses on skeletal remains from colonial-era Burma were conducted and compared to global samples in this study to better understand the population history and diversity of Myanmar through a biocultural lens.

POPULATION BACKGROUND

Throughout this dissertation, specific terminology will be used in the discussion of Myanmar’s population history, archaeology, and anthropology. First, the name “Burma” will be used to refer to the country prior to 1989, especially in relation to the period of British rule, while “Myanmar” will be used to refer to the country post-1989, when the name change occurred. Second, the term “Burmese” will be used mostly to refer to the language predominantly used in the country, but it also refers to the people who speak the language. Additionally, the term “Bamar” will be used to refer to the largest ethnic group in the country. Lastly, while some antiquated texts, such as Tildesley (1921), use the term “Burman” to refer to the “Bamar” people, the latter term will be used more often in this dissertation, unless when referring to the “Tibeto-Burman” language group.

One of the major questions in Myanmar archaeology and population history research revolves around the origins of the Bamar people, the predominant ethnic group in the country. Previous research in adjacent fields, such as linguistics and history have provided evidence that the human groups that migrated into Myanmar in or around 3rd century BCE and later, which include both the ancient Pyu and Burmese people, have origins in the Chinese regions (Aung-Thwin, 2005b; Fan, 1961). Linguistically, both the Pyu and Burmese fall under the Tibeto-Burman family, which also include languages spoken in the Tibeto-Chinese regions (Aung-Thwin, 2005b; Hudson & Lustig, 2008; Than Tun, 2002). In addition, historical accounts have also documented the links between the Pyu and Burmese groups to Chinese groups (Fan, 1961; Than Tun, 2002).

Although the Bamar ethnic group is the largest in Myanmar, different human migration waves throughout history contributed to the current population diversity of the country. Among the over 135 officially recognized ethnic groups in Myanmar, eight are determined as the major ethnic groups (*i.e.*, Kachin, Kayah, Kayin/Karen, Chin, Bamar, Mon, Rakhine, and Shan). Myanmar is geographically divided into 14 geographic territories, known as seven states (for each ethnic group except for Bamar, since Bamar territories are called divisions) and seven Bamar divisions (Figure 1.1). Some additional population groups that are not formally recognized as official ethnic groups by the country but comprise a significant proportion of the population include, but are not limited to, Burmese Indian, Burmese Chinese, Burmese Nepalese, Rohingya, and Anglo-Burmese (Charney, 1993, 2021; Chludzinski, 2019; Maung, 1979). A deeper understanding of a vastly diverse population with complex histories like Myanmar's would be especially beneficial to the understanding of the population history of Southeast Asia on a larger scale.

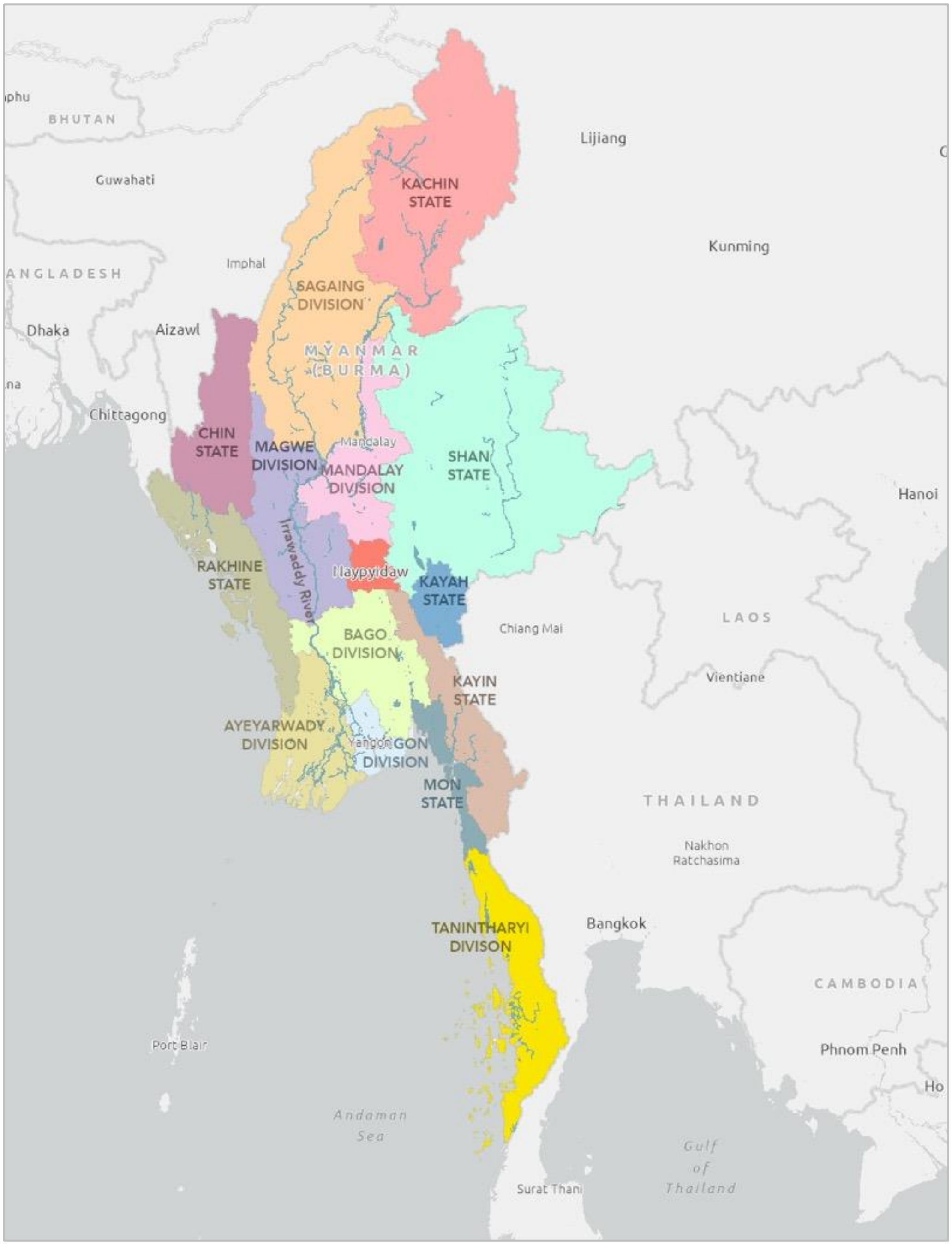

Figure 1.1. Map of the 14 main geographic territories in Myanmar: seven states (Kachin, Kayah, Kayin, Chin, Mon, Rakhine, and Shan) and seven Bamar divisions (Sagaing, Magwe, Mandalay, Bago, Ayeyarwady, Yangon, and Tanintharyi). Naypyidaw, the capital, is not included in the seven Bamar divisions. This map was created using ArcGIS® software by Esri[1]. GIS shapefiles for the territories and waterways were obtained from Myanmar Information Management Unit[2].

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[1] Light Gray Canvas Base, 2024

[2] “GIS Resources | MIMU,” 2024

Population History of Myanmar

Prehistoric Myanmar

Paleolithic Period

Evidence of early human (and hominin) migration into Myanmar has been documented by various archaeologists and geologists throughout the 20th and 21st centuries. Since de Terra and Movius' (1943) expedition to Burma in the 1930s, many Burmese researchers and their foreign collaborators have repeatedly referenced the artifacts and specimens that were collected during this trip. Sites like Letpan-Chebaw and Nwe Gwe Hill in the Chindwin valley of Upper Burma have yielded fossilized *Homo erectus* remains (Ba Maw, Aung, Nyein, & Nyein, 1998), providing a glimpse of what hominin evolution in Myanmar could have looked like. The researchers named the tool culture associated with these remains from the Chindwin valley as the Anyathian culture, as the term "Anyatha" means man/person of Upper Burma (or upper regions of the Irrawaddy River), where the artifacts were found (Aung-Thwin, 2001; Ba Maw et al., 1998). According to de Terra & Movius (1943), the Anyathian tool culture is potentially related to the stone tool technology from Patjitan in Java, which is associated with middle Pleistocene dates (Aung-Thwin, 2001; de Terra & Movius, 1943).

More prehistoric tools and zooarchaeological remains were found in Padah-lin and Gu Myaung caves in Shan State, slightly south of Mandalay and east of Bagan, both of which are in the dry zone of the country where most archaeological research has been conducted (Aung, Marwick, & Conrad, 2015; Schaarschmidt et al., 2019). Aung-Thwin (2001) named the tool culture associated with these sites as "post-Anyathian," which is said to be contemporaneous and even related to the Hoabinhian culture found across the rest of mainland Southeast Asia, including Vietnam and Thailand. While the Anyathian culture is associated with the approximate relative dates of 750,000–25,000 BP (Aung et al., 2015), post-infrared infrared stimulated luminescence (pIRIR) and multi-grain infrared-radiofluorescence (IR-RF) dating of Paleolithic tools from Padah-lin and Gu Myaung revealed that these sites date to approximately 30 ka to 25 ka ago (Schaarschmidt et al., 2019), placing it chronologically after the aforementioned Anyathian sites with associated *Homo erectus* remains. Based on the evidence found at these various sites, this period could be designated as Burma's Stone Age (Aung-Thwin, 2001).

Neolithic Period

Research on the Neolithic Period in Myanmar is relatively scarce, with tremendously scattered notes and reports by various archaeologists (Aung, 2019; Aung Thaw, 1971). However, some patterns of human migration can be deduced via studies on Neolithic and other prehistoric remains found in Myanmar's neighboring Southeast Asian countries. Although not much has been found to date regarding the Neolithic Period in Myanmar, the "two-layer" hypothesis, also known as the immigration hypothesis, provides a glimpse of what the *Homo sapiens* specimens in the region may have been like (Lipson et al., 2018; Matsumura & Hudson, 2005; Matsumura & Oxenham, 2014). Although the two-layer hypothesis is a heavily debated topic based on dental anthropological research, arguments from both sides of the debate provide insights that could help fill in the knowledge gaps regarding the Neolithic period in Myanmar.

First introduced by Jacob (1967), the two-layer model proposes that human settlement into mainland Southeast Asia occurred over two separate migration events by two different groups. While the early indigenous “Australo-Melanesian” groups were the first to occupy mainland Southeast Asia, the East Asian immigrants from southern China arrived later and shared genes with the indigenous groups (Matsumura & Hudson, 2005). Matsumura and colleagues are proponents of the two-layer hypothesis based on dental metric and morphological data collected on prehistoric and modern human remains from various Southeast Asian sites, including Myanmar. Based on their results, metric and nonmetric dental data of early Southeast Asian samples were more similar to recent Australo-Melanesian samples, while modern Southeast Asian samples exhibited dental traits of both Australo-Melanesian and East Asian samples (Matsumura & Hudson, 2005; Matsumura & Oxenham, 2014). Another study using genome-wide ancient DNA data also showed evidence of multiple waves of migration into mainland Southeast Asia (Lipson et al., 2018).

On the other side of the debate, researchers like Scott and Turner, who are proponents of the Sinodont/Sundadont hypothesis, contend that there was no gene flow between Australo-Melanesians and East Asians (Scott & Turner, 1997; Turner, 1987, 1990). The primary argument of this model is that Sundadonty, a dental phenotype mostly observed in modern Southeast Asian populations, was a result of uninterrupted continuity and had no relations with Sinodonty, a suite of traits associated with East Asians (Turner, 1987). Sinodont populations are associated with higher frequencies for traits like first upper incisor shoveling and double shoveling, pegged, reduced, or missing upper molars, and different types of root variation, while Sundadont populations have lower frequencies of the above traits and have higher frequencies of lower second molars with two cusps (Scott, Schmitz, et al., 2018; Turner, 1990). Additionally, the overall craniometric evidence supports the Sinodont/Sundadont model (Hanihara, 1992a, 1992b, 1993; Pietrusewsky, 1984, 2005).

The Metal Ages

Following the gaps in evidence for the Neolithic Period, the next earliest sites that have been extensively studied are associated with the Bronze and Iron (Metal) Ages of Myanmar (Hudson, 2001; Moore, 2003; Moore & Pauk, 2001; Tayles, Domett, & Pauk, 2001). With the discovery of multiple cemetery sites in Upper Myanmar in 1998, archaeologists have gained insights on burial practices, pottery, and metal tools of the inhabitants of the region. The three general site areas with distinct cultures that have been well-represented in the literature are Samon, Chindwin, and Pyu. While the Pyu sites continued to thrive as cities or city-states, the sites in Samon and Chindwin can be classified better as smaller villages (Moore, 2003; Stargardt, 2016).

Of the various Samon and Chindwin sites, one site that stood out was Nyaung-gan village, which is located on a crater rim, in contrast to other cemetery sites in this area that are located in or adjacent to small village mounds (Moore, 2003). At Nyaung-gan, a mixture of multiple cultures was found, indicated by different burial practices, ranging from primary inhumation burials to secondary burials in pottery or urns (Coupey, 2006, 2013; Moore, 2003). Further, bronze grave goods (mostly tools, but no ornaments) were also found in some of the burials, although no evidence of iron usage was found (Moore & Pauk, 2001; Pryce et al., 2015). In 2018, researchers from the French-Myanmar collaboration team obtained the first absolute ^{14}C dates from Nyaung-gan and a neighboring site called Oak-aie, placing the whole local chronology between the 13th to 8th centuries BC (maximum duration). Further, based on charcoal dates obtained at the Nyaung-gan site, a transition period between the 10th and 9th centuries BC could be deduced (Pryce et al., 2015, 2018). Overall, the sites could be assigned to a general period of Late Neolithic to Bronze Age transition (Moore & Pauk, 2001; Pryce et al., 2015, 2018).

Compared to information about Bronze Age sites in Myanmar, Iron Age sites are not as abundant. One of the few sites at which a combination of bronze goods, pottery, and iron weapons were found is Halin, which is a Pyu culture site that has been dated well past the prehistoric period, as Pyu writing systems were already present (Aung-Thwin, 1982; Moore, 2003).

Historic Myanmar

Pyu Millennium (ပျူခေတ်)

The 3rd century BCE marks the beginning of the Pyu Millennium, which is a cultural designation coined by Aung-Thwin (1982). The Pyu Millennium is the earliest recorded evidence of urbanization in Myanmar history (Aung-Thwin, 1982). One of the first documents that included information on the Pyu people—presumably the same group as the ones from the prehistoric period—was a Chinese historical text named

Man Shu (蠻書; which directly translates to the "book of barbarians[3]"), which was written centuries prior but later translated into English by a prominent colonial scholar of Burma, Gordon Luce (Aung-Thwin, 2005b; Fan, 1961; Yian, 2010). Based on the historical accounts in Man Shu, the Pyu people were in fact the P'iao of the Chinese (Aung-Thwin, 2005b; Fan, 1961). Moreover, a genetic study that included ethnic groups in Myanmar (Y.-C. Li et al., 2015) supports the historical accounts through evidence of shared haplogroups and gene flow between population groups in the southwestern Chinese regions and Myanmar groups. The shared haplogroups could be traced back to the Pyu expansion into the Chinese areas in 200 BCE (Y.-C. Li et al., 2015). Lastly, the inference that Pyu people have origins in the Chinese regions is also supported by linguistic data, as the Pyu language is categorized as Tibeto-Burman (Aung-Thwin, 2005b; Hudson & Lustig, 2008).

However, despite the genetic, linguistic, and historical data available, there are some opponents of this hypothesis that the Pyu had Chinese origins. Some Burmese authors, although not trained in history, archaeology, or prehistory, have published literature claiming that the Pyu and the Burmese are more likely to be related to prehistoric populations that existed throughout Upper Myanmar (Win, 2016). Although evidence of prehistoric populations does exist in Myanmar, there is no evidence of connecting them with the Pyu or the Burmese to date (Aung-Thwin, 2005b; Hudson & Lustig, 2008). One possible explanation for claims as such is that these authors may have

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[3] The term "barbarians" was used by scholars of China's Zhou dynasty to describe any population outside of China who were considered uncivilized or uncultured in comparison to the Chinese. The usage of this term is an example of Sinocentrism and cultural othering in Chinese history (W. Li, 2020).

Buddhist- and Burmese-centric nationalistic motivations (Hudson & Lustig, 2008). Despite having nationalistic motivations (or perhaps due to having nationalistic motivations), Win's (2016) perspectives on the population history of the Pyu and the Burmese remain favorable in many amateur archaeologists and historians (T. H. Aung, personal communication).

The city-states of the Pyu civilization flourished in the Upper Burma region for approximately a millennium (3rd century BCE to 9th century AD). As Stargardt (2016) clarifies, the main difference between villages, such as those from the Bronze and Iron Ages, and urbanizing Pyu settlements is "evidence of a considerable economic and social complexity" (Stargardt, 2016, p. 344). The three main Pyu city-states indeed exhibit evidence of urbanizing settlements. The cities were surrounded by brick walls and had 12 gates, which represent each of the zodiac signs to display sacredness (Aung-Thwin, 2005b; Fan, 1961; Myint-U, 2006).

Funerary practices associated with the Pyu were distinct from those found in Bronze-Age sites like Nyaung-gan or Oak-aie. The Pyu practiced the burial of ashes of the dead in urns, which is a pre-Buddhist practice seen during the Southeast Asian preclassical period (Aung-Thwin, 1982). Furthermore, evidence of cultural and linguistic influences from India were also observed in Sri Ksetra, the most recent Pyu city-state. For example, scriptures at this site were written in early South Indian scripts (Aung-Thwin, 1982), and Theravada Buddhist iconography was portrayed throughout the city-state around 4th century AD (Aung-Thwin, 2005b).

After about a millennium of flourishing in the "heartland of precolonial Burma" (Aung-Thwin, 2005b, p. 36), the Pyu people finally met the end of their civilization, owing to the Nanchao invasion in AD 832 (Fan, 1961). According to historical records, the Nanchao looted, sacked, and took over three thousand prisoners from the Pyu cities (Aung-Thwin, 2005b). Currently, there are no available records that document for certain into which regions the Pyu people might have dispersed or information on their descendants. However, studies across multiple disciplines have attempted to make sense of where the Pyu might have gone after the Nanchao invasion. While some wrote that the Pyu were banished into regions near their once-kingdom (Fan, 1961), others report radiocarbon evidence that human activity was detected in Halin for the next few decades (Aung-Thwin, 2005b; Hudson, 2015). In addition, one study by a Burmese historian draws linguistic and cultural parallels and even implies the possibility of continued lineage between the Pyu and current-day Chin ethnic group that lives in western Myanmar (Ngun, 2016).

Bagan Kingdom (ပုဂံခေတ်)

Soon after the fall of the Pyu civilization, the walled city of Bagan was built approximately in the 9th and 11th centuries AD (Aung-Thwin, 2005b; Hudson, Lwin Nyein, & Win Maung (Tanpawady), 2001). The Bagan Kingdom marked the first time Burmese language speakers came to power and the first unification of the territories that would constitute current-day Myanmar. The origins of the Burmese of the Bagan Kingdom are also debated in Myanmar history. While linguistic evidence points to Chinese origins (Than Tun, 2002), historic records—specifically the Glass Palace Chronicles of the Kings of Burma—documented origins in India through the Tagaung Dynasty (Tin & Luce, 1923). Genetically, modern Bamar individuals are shown to have more similar mtDNA data to Chinese groups than Indian groups (Y.-C. Li et al., 2015). However, historical records and evidence of Indian influence in Burma since before the Bagan times (Aung-Thwin, 2005b) makes the latter perspective also valid.

The inhabitants of Bagan primarily spoke Burmese, although King Kyansittha was noted as an admirer of Mon culture, an ethnic group in southern Myanmar. As such, evidence of Mon culture and language during King Kyansittha's rule was prevalent in Bagan (Aung-Thwin, 2005a). One of the most long-standing pieces of evidence for multilingualism in Bagan is the Myazedi (which translates to "the emerald stupa") inscription, which is potentially the oldest surviving stone inscription in the Burmese language. The Myazedi inscription was gifted to King Kyansittha by his son, Prince Yazakumar, to commemorate his love and respect for this father (Blagden, 1911; Krech, 2012; Than Tun, 2002). The significance of this four-sided inscription is that the inscriptions on each side were a different language (*i.e.*, Burmese, Mon, Pyu, and Pali), and the Myazedi inscription was key to deciphering the Pyu language for modern-day scholars (Krech, 2012).

One notable pattern found repeatedly in Bagan archaeology was the lack of cemeteries, unlike the Pyu sites. While burial grounds, including primary burials and secondary urn burials were excavated in Pyu city states like Halin, no burial sites have been identified in Bagan to date (T. H. Aung, personal communication). This disparity in funerary practices between Pyu and Bagan cultures may be attributed to the arrival of Theravada Buddhism into Burma around the 11th century (Than Tun, 1956). In Halin, burial practices are generally thought of as pre-Buddhist, although iconographic influences of Buddhism were found in the younger site of Sri Ksetra (Aung-Thwin, 2005b). Theravada Buddhist funerary practices in Myanmar today involve the cremation of the deceased and at times the dispersal of ashes into bodies of water with no burial. As such, it is a possibility that these Buddhist funerary practices have been followed by the general population in the country since the times of Bagan Kingdom, but until proper evidence is presented, this (personal) conclusion may just be speculation.

After 250 years of power, the Bagan Kingdom finally came to an end following consecutive battles against the Mongol, Shan, and Mon invasions (Lieberman, 2003; Than Tun, 1956, 2002). The Shan, who are one of the current-day ethnic groups of Myanmar much like the Mon, began attacks on the Bagan Kingdom since early 13th century, along with the Mongols led by Kublai Khan (Lieberman, 2003; Than Tun, 1956; Yian, 2010). By the end of the 13th century, Bagan's monarchy had met its end, and the palace was quickly abandoned by Narathihapate, the last king of Bagan.

Toungoo Dynasty and Beyond (တောင်ငူခေတ်)

Following the Mongol attacks that led to the fall of Bagan, an aggregate of smaller kingdoms arose throughout Burma, some of which still exist today as officially recognized ethnic groups of Myanmar, such as the Mon, Shan, and Arakan (present-day Rakhine). Other powerful Burmese/Bamar kingdoms also existed as minor/smaller kingdoms, such as Ava (also known as Inwa), Pegu (also known as Bago), and Prome (also known as Pyay) (Lieberman, 1980; Myint-U, 2006; Phayre, 1883). For the next three centuries, Burma would not have an empire comparable to Bagan, until the rise of the Toungoo dynasty in the 16th century (Fernquest, 2005).

During the Toungoo dynasty, a series of Burmese kings began to engage in expansionary warfare, resulting in constant battles with other kingdoms, especially the Ayutthaya Kingdom of Siam, which is present-day Thailand (Fernquest, 2005; Than Tun, 2002). In this era, Burma and Siam were constantly at war, and slave-gathering was common on both sides. As such, during the Toungoo empire’s rule between the 16th and 18th centuries, forced migrations of Siamese artisans and performers to Burma through the form of slavery took place regularly (Beemer, 2009). As captured and relocated Thai artisans entered Burma, so did their artistic styles (Beemer, 2009) and performing arts (Kyi, 2001). The warfare against Siam persisted beyond the era of the Toungoo empire, continuing through the succeeding dynasty of Konbaung in the 18th century (Lieberman, 2003).

Konbaung Dynasty (ကုန်းဘောင်ခေတ်)

During the era of the Konbaung dynasty from the mid-18th to late-19th centuries, kings of Burma were constantly engaging in wars against multiple groups, including various kingdoms of Siam, the Qing dynasty of China, the Manipur kingdom of India, and the British Empire. The monarchs of the Konbaung dynasty carried on the traditions of warfare from the Toungoo era and continued to create one of the largest empires in Burmese history (Lieberman, 1996). However, after over a century of constant warfare against multiple groups, the Konbaung dynasty met its end and ultimately became the last kingdom of Burma. Perhaps a major contributory factor to Konbaung’s downfall was a series of three Anglo-Burmese wars that the Burmese kings fought against the British

Empire across a span of nearly 60 years (Htin Aung, 1965; Lieberman, 1996; Myint-U, 2006; Phayre, 1883).

Throughout the years leading up to the First Anglo-Burmese War in 1824, multiple European nations had their interests in occupying Burma, including Great Britain and France. Even a century prior, during the Toungoo Period, other European groups such as the Portuguese and the Dutch had economic interest in Burma's richness in precious natural gems such as rubies (Hall, 1944; Lieberman, 1980). By the early 19th century, the British and the French had already been competing to establish trading posts throughout the Irrawaddy Delta (located in the Ayeyarwady[4] division; see Figure 1.1). It is also posited by some scholars that the rivalry between the British and French could have been one of the factors that propelled the British takeover of Burma (Htin Aung, 1965; Shah, 2016; Webster, 2000). Within one year in 1885, the British had already declared and won the Third Anglo-Burmese War, overthrowing King Thibaw, the last king of Burma.

Colonization Period and Historic Migrations

Throughout the British colonization period, a surge of immigrants from various countries were brought into Burma, mostly in connection with official orders of the British empire or for economic opportunities. Two of the most prominent groups of immigrants who came into Burma in this era were Indian and Chinese (Maung, 1979). The majority of the Indian immigrant population in Burma were adult males who primarily immigrated for short-term economic reasons and therefore did not stay longer

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[4] Ayeyarwady is an alternative (Burmanized) spelling for Irrawaddy.

than two or three years in the country. According to Ismael Maung's (1979) report, the Indian immigrants, "…aside from their own contribution to the population … contributed small numbers of births to the 'native-born' population" (Maung, 1979, p. 97). In other words, there was little gene flow between native Bamar groups and Indian groups.

In contrast to the nature of Indian immigration into Burma, the Chinese immigrants came into Burma to settle more permanently. Moreover, the Chinese immigrants assimilated into the Burmese society in a relatively short amount of time and more readily adopted Burmanized versions of their Chinese names (Maung, 1979). Most of the ethnic Chinese that immigrated into Myanmar during the 18th and 19th centuries identified as Hokkien, Hakka, or Cantonese, originating from the south and southeastern regions of China (Yi-Sein, 1966). Chinese migration into Burma has occurred constantly over an extended period of time, although there were different migration waves associated with political events in China, such as fleeing war, famine, or revolution (Mya Than & Khin Maung Kyi, 1997).

Perhaps one of the most well-known immigrant groups associated with Myanmar are the Rohingya, a Muslim ethnic minority primarily centralized in Rakhine (Arakan) state in western Myanmar. While the Rohingya refugee crisis and the Burmese military crackdown in the mid-2010s brought the world's attention to this population group, the Rohingya have been living in Myanmar since the 1940s, even before the country was called Myanmar (Charney, 2021). Neglected by the British colony since the 1940s (Charney, 2021) and more recently facing risks of ethnic cleansing from the Burmese military dictatorship (Albert & Maizland, 2020), the Rohingya have been oppressed for years, but they still are a part of the diverse population in Myanmar. However, mostly due to their restricted geographic movements within refugee camps (Bhatia et al., 2018), the Rohingya may be genetically isolated from the rest of Myanmar. Other population groups that have migrated into Burma around and after British colonial era include the Malay (Christian, 1943) and the Portuguese (Vaz Ezdani, 2018).

A Note on Mawlamyine

The crania in the skeletal collection studied in this dissertation were forcefully obtained by the British during the colonial period from Mawlamyine (previously known as Moulmein), a major city in southern Myanmar (see the Materials and Methods chapter for more details about the collection). Mawlamyine is geographically located in Mon State, where the Mon ethnic majority resides. However, the city is populated with diverse groups of immigrants from various regions (*e.g.*, India, Bangladesh, China, and Thailand) and members of ethnic groups from other regions of Myanmar (*e.g.*, Kayin/Karen), especially after the British had designated the city the capital of British Burma for almost 30 years (1826–1852), soon after the First Anglo-Burmese war ended in 1826 (Gray, 2017). Since then, Mawlamyine has served as an urban center in which individuals of diverse population backgrounds congregate. Therefore, it is inaccurate to view this sample as a homogenous group; rather, the skeletal diversity of this sample was recognized and accounted for in the current study.

The Importance of Myanmar’s Population History

As a country that has experienced many human migration waves and complex historical accounts, Myanmar deserves more attention from biological anthropologists to explore human evolutionary patterns not only in the country but also in the broader

Southeast Asian region. Currently, available information on the population history of Myanmar includes findings from historic, linguistic, and genetic (biological) data. Although relatively sparse, existing literature and recent archaeological projects in Myanmar can provide knowledge on prehistoric (mostly Paleolithic Age), protohistoric (Bronze and Iron Ages), and historic (Pyu kingdom and beyond) periods. Further anthropological research on the Myanmar population through the use of skeletal and dental data can help amplify insights on certain biological trait patterns in modern Southeast Asian populations.

THEORETICAL BACKGROUND

Biological Distance Analysis

One method widely used to study biological relationships and make-up in anthropology is biological distance (biodistance) analysis. The overarching goal of biodistance research is to use patterns of phenotypic similarity and difference to explore underlying genetic relationships among groups and their unique population histories (Stojanowski, 2018). Therefore, biodistance research is a useful avenue for anthropologists to gain insights on evolutionary trends based on phenotypic skeletal traits. However, because human phenotypic expressions can be influenced by various biocultural factors, the relationship between phenotypes and genotypes is far from linear. Therefore, to better understand this relationship, biological anthropologists must appreciate not only the genetics behind phenotypic expressions, but also the evolutionary mechanisms and external factors that affect phenotypes, such as the environment and culture.

Biodistance research has been an integral topic in biological anthropology since the inception of its fundamental theories in the 18th century. Scholars in anthropology and adjacent fields have taken interest in studying the relatedness between and among individuals and/or populations using phenotypic traits as a proxy for genetic information (Hefner, Pilloud, Buikstra, & Vogelsberg, 2016). Although early researchers were focused on eugenicist, typological approaches in the 19th century, a boom in biodistance analyses at the end of the 20th century reflects the discipline's efforts to shift away from early problematic and unscientific values and toward more statistically sound methods of forensic and paleodemographic skeletal analysis (Buikstra, Frankenberg, & Konigsberg, 1990).

The main types of data on which anthropologists rely most often in biodistance research are cranial and dental data. Overall, all four data types have proven to be useful indicators of genotypes due to their tendency to follow a genetically neutral evolutionary model (Herrera, Hanihara, & Godde, 2014; Rathmann et al., 2017; Relethford, 2004a). To test whether certain cranial and dental traits follow the neutral genetic model, anthropologists have studied their rates of heritability as a measure of the amount of phenotypic variation due to additive genetic variation (Konigsberg, 2012; Relethford, 2006). For example, previous studies on the heritability of cranial traits have shown that some cranial features follow the neutral genetic model more closely (*e.g.*, temporal bone) than others (*e.g.*, facial features) (Harvati & Weaver, 2006).

Previous research studies have also identified climate-related trends in the expression of cranial traits, such as the shape of the cranial vault and nasal aperture (Harvati & Weaver, 2006; Hubbe, Hanihara, & Harvati, 2009; Mielke, Konigsberg, &

Relethford, 2011; Plemons, 2022). Particularly, individuals with larger and broader crania are associated with colder climates, while individuals with smaller and narrower crania are associated with hotter climates. The evolutionary rationalization behind this pattern is that larger skulls expel less heat and thus are more well-adapted to colder climates and the opposite for hotter climates (Mielke et al., 2011). Among dental morphology, some traits may be more related to neutral evolutionary forces (Rathmann et al., 2017), while others may be related to climate and diet (Mizoguchi, 2006, 2013). The size of the dentition has also been found to be highly heritable, while also strongly related to hominin evolution (Wolpoff, 1971) and changes in diet (Pinhasi & Meiklejohn, 2011).

Heritability

Studies on relationships between phenotypes and genotypes comprise a substantial portion of the theoretical foundation behind biodistance research. Heritability (h^2) is the measure of the amount of phenotypic variation (V_p) that is due to additive genetic variation (V_a). Mathematically, heritability is defined as:

Equation 1.1. General heritability equation (Konigsberg, 2012; Relethford, 2006).

$$h^2 = \frac{V_a}{V_p}$$

There are two types of heritability, one of which measures the amount of phenotypic variation that is attributed to additive genetic variance and is called narrow-sense heritability. In this case, V_p can be defined as the mathematical sum of V_a and V_e, where V_e refers to environmental effects. Alternatively, the second type of heritability that involves both additive and dominance variation (V_d) on loci is called broad-sense heritability. For this instance, V_p is defined as the mathematical sum of V_a, V_d, and V_e, where V_d refers to the non-additive genetic effects. Unlike additive genetic effects, dominance effects cannot be inherited. Thus, narrow-sense heritability, which only involves additive variation, can provide clearer insights into the amount of phenotypic traits that get passed down across generations (Relethford, 2006). Using the knowledge that V_p is the sum of V_a and V_e for the case of narrow-sense heritability, the initial equation for h^2 shown above can be rewritten as:

Equation 1.2. Narrow-sense heritability equation.

$$h^2 = \frac{V_a}{V_a + V_e}$$

Based on this new equation, it can be concluded that the lower the quantification for environmental factors (V_e), the higher the narrow-sense heritability (h^2) will be.

Biological Relatedness

Biodistance can be analyzed on a variety of scales, ranging from the exploration of broad migration patterns to a level as microscopic as the biological relatedness between two individuals in an intracemetery study (Buikstra et al., 1990; Stojanowski, 2018; Stojanowski & Schillaci, 2006). Large-scale inter-population biodistance studies often aim to estimate genetic component similarities among population-level groups to study evolutionary trends, such as gene flow, migration patterns, or population origins (Buikstra et al., 1990; Stojanowski & Schillaci, 2006). One of the largest assumptions in biodistance research is that the more closely related two individuals or populations are, the more similar their phenotypes will be compared to non-related individuals. Moreover, individuals who share a higher level of phenotypic similarity can be said to originate from populations that exchanged mates with each other and/or share a more recent parent population (Relethford, 2016; Stojanowski, 2018; Stojanowski & Schillaci, 2006).

Model-Bound vs. Model-Free Approaches

While it is important to use the above assumptions in biodistance research, it is equally important to understand the evolutionary processes behind these theories. The correlation made between phenotypic similarity and genetic relation can be attributed to various evolutionary mechanisms. There are two main approaches to biodistance analyses: model-bound and model-free methods. In model-bound analyses, the measure of the phenotypic distance is based on a theoretical model and involves the estimation of specific model parameters (Howells, 1973; Irish, 2010, 2016; Relethford, 2016; Relethford & Lees, 1982). Model-free analyses are associated with indirect methods in which exact parameters are not estimated, although interpretations are still made with regard to certain models of population genetics (Irish, 2010, 2016; Relethford & Lees, 1982).

Relethford (2006) later clarifies that the term “model-free” may be misleading because these analyses still operate indirectly via underlying models. Therefore, Relethford (2006) proposes the terms, “direct” and “indirect” methods (p. 194). For example, anthropologists can test the isolation-by-distance model, in which genetic distances are predicted to increase with increasing geographic distance, by both direct (model-bound) and indirect (model-free) methods, depending on whether parameters are defined or not (Relethford, 2006, 2016). In this dissertation, the original terms model-bound and model-free analyses are used since they appear more often in literature.

R-Matrix Theory

One common model-bound method through which genetic distances can be measured for allele and haplotype frequencies is the R matrix (relationship matrix) (Harpending & Jenkins, 1973; Workman et al., 1973). In an R matrix, there are *g* rows and *g* columns, where *g* is equal to the number of population groups under study. Essentially, the "R matrix is a variance-covariance matrix of standardized allele frequencies" (Relethford, 2016, p. 26) that can give insights into how much genetic similarity exists between and within populations.

One of the most powerful attributes of the R matrix is that it can be applied to concepts beyond allele frequencies, such as migration data, surname frequencies, and biodistance studies based on quantitative traits (Relethford, 2006; Relethford & Blangero, 1990; Relethford & Harpending, 1994). Particularly in biodistance studies with quantitative traits, the R matrix is comprised of weighted Mahalanobis distances (Stojanowski & Schillaci, 2006), which are multivariate squared distances that account for intercorrelations between variables. The main theoretical foundation of this application of R-matrix theory assumes equal contribution by multiple loci to a given phenotype, which is based on the equal-and-additive-effects model (Relethford, 2016).

F_{ST} Estimates

Based on the R-matrix theory, other model parameters such as Wright's F_{ST} can be calculated to further examine quantitative measures of population structure. F_{ST} is a fixation index that measures genetic differentiation among groups relative to the total amount of genetic variation. Values for F_{ST} can range between 0 and 1, where lower values closer to 0 indicate decreased amount of gene frequency differentiation between populations (*i.e.*, there has been little to no genetic drift), while values closer to 1 indicate the opposite. In other words, the higher the F_{ST} value, the greater the genetic distance between two populations. Additionally, F_{ST} can also be calculated for one population to quantify variation present in the same population.

When calculating F_{ST}, it is beneficial to know heritability (h^2) values as well. However, in cases where h^2 is unknown, the F_{ST} value is considered to be the minimum F_{ST} because h^2 is assumed to be 1 by default (Relethford, 2016; Williams-Blangero & Blangero, 1989). One crucial note that researchers must consider when calculating and using F_{ST} is that it is simply a synchronic (as opposed to diachronic) measure of genetic variance. As such, extreme caution must be exercised when studying pooled samples from different time periods, and the assumption that none of the populations under study experienced genetic changes across time (despite the time differences) must be made. Alternatively, different F_{ST} values can also be calculated based on the different time periods (Relethford, 2016).

Evolutionary Mechanisms

In the examination of the relationship between phenotypic and genotypic information in biodistance research, both model-bound and model-free approaches rely on models of population genetics. Through these studies, anthropologists aim to parse out the extrinsic factors that influence how certain phenotypes are expressed, from the genetic components. Further, by separating these two factors, researchers can examine whether observed microevolutionary patterns follow a neutral model (*i.e.*, the phenotype is purely a result of evolutionary processes such as mutation, genetic drift, gene flow, and migration), or whether the patterns can be attributed to factors like the environment, selective pressures, or cultural practices (von Cramon-Taubadel, 2016). While mutation is the only mechanism that can give rise to new alleles, other evolutionary processes such as selection, genetic drift, and migration contribute to changes in allele frequencies. In these situations, the use of known heritability rates for specific phenotypic traits tends to be informative, since higher heritability values indicate less random noise than lower heritability rates would indicate (Buikstra et al., 1990).

One useful approach to understanding how much genetic variation exists in a population is to first assess the correlations between genetic distance and factors such as geographic distance, population size, or population history under neutral conditions without environmental factors. Another approach to assessing genetic variation is by calculating the average amount of heterozygosity in a population based on the allele frequencies, known as the Harpending-Ward method (Harpending & Ward, 1982). This method operates on a comparison of expected and observed heterozygosity. The level of heterozygosity can depend on what kind of evolutionary mechanism is acting. While mutation and gene flow contribute to increases in heterozygosity, genetic drift can do the opposite. When observed heterozygosity levels are higher than expected levels, it can provide information on how much gene flow has entered a population from an external population (Relethford, 2006). Much like the R-matrix theory, this approach was developed based on allele/haplotype data, but it can also be applied to quantitative traits. As demonstrated by the Relethford-Blangero method, researchers can use a known phenotypic co-variance matrix to follow patterns of gene flow in a population (Relethford & Blangero, 1990).

Data Types

The four main data types on which anthropologists rely most in biodistance research are cranial (metric and nonmetric) and dental (metric and nonmetric) data. All four data types are phenotypic traits that are used by anthropologists as a proxy to estimate genetic information and thus can be influenced not only by genetic components, but also by external factors, such as the environment or culture.

Cranial Data

Skeletally, cranial traits are generally preferred over postcranial traits for biodistance studies, largely because traits from postcranial elements, especially the upper limbs, are shown to exhibit inconsistent gene flow patterns and higher susceptibility to selective pressures compared to cranial traits (Mallard & Auerbach, 2020). Therefore, cranial data, especially craniometric data, are used most often in biodistance research. Unlike craniometric data, cranial nonmetric traits were not explored as a proxy for population-related variation until the 1930s (Hefner et al., 2016). However, both cranial data types are widely used in biodistance studies today.

Heritability and Environmental Factors

Although debates exist on whether the cranium should be used in biodistance research due to its potential to exhibit plasticity (Stone, Chew, Ross, & Verano, 2015; Katherine Elizabeth Weisensee, 2008), multiple studies have shown that they mostly follow a genetically neutral evolutionary model (Dudzik & Kolatorowicz, 2016; Harvati

& Weaver, 2006; Relethford & Harpending, 1994; Šešelj, Duren, & Sherwood, 2015; von Cramon-Taubadel, 2016). To explore the neutral model theory of cranial phenotypes, anthropologists have tested the amount of genetic variance that contributes to craniometric traits.

For example, several researchers have calculated narrow-sense heritability values using cranial measurements from a well-known skeletal collection from Hallstatt, Austria, which contains samples that are associated with well-documented records with pedigree information (Carson, 2006; Martínez-Abadías et al., 2009; Sjøvold, 1984). Overall results indicate that craniofacial dimensions exhibit moderate to notable heritability, although Carson (2006) found that craniofacial lengths are more heritable than widths, while Martínez-Abadías et al. (2009) found that not any dimensions are particularly more heritable than others (Dudzik & Kolatorowicz, 2016).

Craniometric traits can reflect adaptations to selective forces experienced over time. Phenotypic changes can occur directly in response to the environment during developmental stages (Fusco & Minelli, 2010; Monaghan, 2008). Phenotypic plasticity, which refers to the ability for a genotype to produce a variety of phenotypes based on the environmental challenges an individual may face, is another important factor that contributes to phenotypic variation (Fusco & Minelli, 2010; Pigliucci, 2001; Wund, 2012). One of the most well-known anthropological studies on cranial developmental plasticity is Boas' (1912) comparative craniometric study on immigrant children and their American-born peers, which has been a heavily debated topic in the field. Although developmental plasticity can lead to phenotypic changes in the cranium, subsequent studies have attested that plastic effects do not inherently erase the underlying trends reflecting population structure (Relethford, 2004a; Sparks & Jantz, 2002).

Fluctuating asymmetry is an example of a plastic response in cranial morphology to environmental stressors on the individual level. Exposure to developmental stressors such as malnutrition or low socioeconomic environments can lead to divergence from "perfect" bilateral symmetry, manifesting in an individual's phenotype as fluctuating asymmetry (Dongen, 2006; Medrano, Spradley, & Weisensee, 2021; Weisensee, 2013). However, it is important to recognize that rather than measure biological distance, fluctuating asymmetry is a better indicator for developmental instability.

Perhaps due to not having been studied as extensively as craniometric traits, the heritability of cranial nonmetric traits and their representation of genetic and environmental components are not as clearly defined. Despite this uncertainty, anthropologists continue to use cranial nonmetric traits as reliable data units in biodistance studies (Pink, Maier, Pilloud, & Hefner, 2016). Outside of anthropology, studies in vertebrate zoology have shown that cranial nonmetric traits exhibit relatively low heritabilities and thus are great tools for studying epigenetic differences among populations (Ansorge, 2001).

One term that has been often incorrectly used interchangeably with cranial nonmetric traits is morphoscopic traits. Although they technically are forms of nonmetric traits, macromorphoscopic traits, as distinguished by Pink et al. (2016), are "morphological, cranial nonmetric variants primarily comprising bony structures in the midfacial skeleton" (p. 92) specifically used for purposes of identification in forensic anthropological contexts. Unlike the cranial traits outlined by Hauser & Stefano (1989), morphoscopic traits involve the assessment of bone and suture shapes, morphology of bony features, presence/absence of cranial features, and degree of bony projection (Gill, 1998; Hefner & Ousley, 2014; Pink et al., 2016; Rhine, 1990).

Because some macromorphoscopic traits are somewhat related to craniometric traits (*e.g.*, nasal aperture shape is based on relative nasal length and width), heritability values from craniometric studies may be more applicable to morphoscopic trait analyses than traditional cranial nonmetric traits. However, as morphoscopic trait heritability studies are still relatively new in biological and forensic anthropology, it is hoped that these studies will further shed light on theoretical foundations of population variation on the cranium.

Studies on cranial nonmetric traits first began as studies on abnormal variants of skeletal features, which included variations due to pathology and cultural practices. Some researchers have gone as far as incorporating pathological conditions for the purpose of identification and population group assignment in forensic settings. For example, Beatrice & Soler (2016) used cribra orbitalia and porotic hyperostosis as signs of physiological stress reflected on the cranium in migrant populations coming into the U.S. to distinguish U.S.-born vs. non-U.S. remains. While it is beneficial to study ways in which environmental and cultural stressors may manifest in the cranium, correlation does not equate to causation. Generalizing presence and absence of cranial pathology as a way to categorize individuals into one population or the other is a grossly oversimplified approach.

Other indirect studies that incorporate biocultural factors have also been conducted by anthropologists. For example, Bocquet-Appel (1984) drew a correlation between the presence of certain sutural bones or foraminal features with raising wheat prices in 19th-century Portugal to show that the population experienced nutritional stress (Saunders & Rainey, 2008). However, because it is often difficult to parse out factors like secular change or non-nutrition-related forces acting on the trait frequencies, correlated data trends may not always indicate causation. Thus, researchers should proceed with extreme caution before making similar conclusions.

Dental Data

Studies on dental traits are based on documented differences in heritable crown and root variation. According to Scott (1973), dental morphological traits display various degrees of trait expression and are generally polygenic traits. However, complex gene interactions and external factors like the environment also play a substantial role on how dental morphological traits are expressed (Pilloud, Edgar, George, & Scott, 2016). Dental morphology is often scored on ordinal scales but occasionally can be scored categorically or in a binary nature (*i.e.*, presence or absence) (Scott & Irish, 2017). Conversely, dental metric (also known as odontometric) data capture the size and shape of the crowns and roots of the teeth. Some measurements may also encompass the relative proportions of dentition compared to the jaw (Altherr, Koroluk, & Phillips, 2007; Harris, 2008; Pilloud & Kenyhercz, 2016).

One of the major advantages of studying dental elements is that they are often more well-preserved than skeletal/cranial elements in the archaeological record, due to the highly inorganic structure of tooth enamel. Another advantage is that dental development has been shown to be more resistant to environmental influences compared to skeletal (cranial) development (Cardoso, 2007). In general, teeth capture environmental stressors from a specific period of time (*i.e.*, mostly in early life developmental period) and are not remodeled during an individual's lifetime after development is complete (Austin et al., 2016).

Heritability and Environmental Factors

Overall, previous research has found that dental morphological traits are heritable, but the complex genetics and environmental influences make it difficult for exact measures of heritability for individual traits to be calculated. The range of h^2 values vary too much, as in the case of Carabelli's cusp, for the values to be considered reliable estimates (Pilloud et al., 2016). Moreover, because heritability is a relative measure, it can reflect differences in population variability. Some phenomena, such as dental trait asymmetry, may be a result of environmental factors, but they could also be attributed by components of research design (*e.g.*, small sample size or discrepancies in data collection methods). Similar to fluctuating asymmetry in the cranium, fluctuating asymmetry studies on tooth size (Matabuena Rodríguez et al., 2017; Perzigian, 1977; Sprowls, Ward, Jamison, & Hartsfield, 2008) and dental morphological traits (Marado, 2017; Marado, Silva, & Irish, 2017) to examine developmental instability have also been conducted. Studies that incorporate biocultural effects like socioeconomic conditions add another layer of complexity to the environmental influences that contribute to phenotypes. Therefore, they need to be approached with perspectives that can capture the nuances in these multifaceted situations.

Due to uncertainties of genetic vs. environmental effects on dental morphology, researchers have developed ways to parse out these factors. Twin studies are a common approach for studying genetic factors of dental trait heritability, although there are some associated limitations (T. Hughes, Dempsey, Richards, & Townsend, 2000). First, the classic twin model, which compares monozygotic vs. dizygotic twins, operates under the assumption that zygosity groups share the same variances (Hughes et al., 2000; Hughes, Townsend, & Bockmann, 2015). Further, the model also assumes that the twin pairs under study have gone through the same environmental conditions, which may not always be the case (Hughes et al., 2015). Despite these limitations, twin studies can offer a glimpse into the genetic components of dental trait variation.

Studies on genetic markers associated with dental morphological traits have increased in recent years. Rathmann and colleagues (2017) examined the genetic neutrality of dental morphological traits on a global scale. Further, researchers have focused on specific genes that play a significant role in dental trait expression. For example, the ectodysplasin A receptor (EDAR) gene, along with its variants, is one of the most widely studied genetic markers in dental anthropology. For example, variants such as EDAR 1540C/EDAR V370A are known to contribute to the shoveling of the upper incisors, a trait that is most often observed in many Asian and Native American populations (Edgar & Ousley, 2016; Hlusko et al., 2018; Kimura, 1984; Park et al., 2012). Through genetic studies focusing on single genetic markers, researchers can find methods to identify certain associated phenotypic traits that are under selective pressure.

Within Asian populations, two categories of morphological complexes have been identified: Sinodonty and Sundadonty. While Sinodonty is found more frequently in

Northeast Asian populations and are associated with “derived, mass additive traits” (Scott, Schmitz, et al., 2018, p. 235), Sundadonty, found most often in Southeast Asian (both mainland and island) and Pacific populations, is associated with retained and less specialized dentition. Because Sundadonty is seen in high frequencies in both mainland and island Southeast Asian populations, some debates exist on when exactly this trait complex would have been shared via gene flow among these populations (Matsumura & Hudson, 2005; Scott, Schmitz, et al., 2018; Turner, 1990). Nonetheless, the study of Sinodont-Sundadont complexes provides a model that can help researchers understand the underlying evolutionary mechanisms operating on dental morphological trait frequencies.

Compared to metric studies of the other parts of the skeleton, dental metrics have not been studied as extensively. Tooth size analysis as a component of biodistance research was first considered toward the end of the 19th century and continues to be an important component of biodistance studies today (Hefner et al., 2016; Pilloud & Kenyhercz, 2016). Similar to the heritability of dental morphological traits, that of dental metric data is not examined as thoroughly compared to cranial trait heritability. Dental metric studies on both deciduous and adult dentition showed that although dental traits exhibit high levels of genetic control overall, some dental metric distances (*e.g.*, intercuspal distance) may be more susceptible to epigenetic changes (Hughes et al., 2000; Pilloud & Kenyhercz, 2016; Townsend, Richards, & Hughes, 2003), similar to the differential heritability rates of different parts of the cranium.

METHODOLOGICAL AND STATISTICAL CONSIDERATIONS

Metric Data Statistics in Biodistance

Craniometric Data

To a large extent, craniometric studies exclusively deal with continuous data, although there are associated minimum and maximum threshold values. Craniometric data are obtained by measuring the distance between standardized landmarks that are shown to capture the overall cranial morphology well. Early craniometric data analyses began with motivations to categorize racial groups, such as the Pearson's coefficient of racial likeness (Pearson, 1926). This method was criticized for not being able to account for factors such as inter-variable correlations or covariation (Hefner et al., 2016).

Today, researchers most often use Linear Discriminant Analysis (LDA, or DFA for Discriminant Function Analysis) for craniometric analysis. The overarching goals of LDA is to maximize differences among groups, to then predict the classes of the observations. LDA uses craniometric values as variables to calculate linear combinations with the biggest variances between groups. For every *n* groups under analysis, there are *n*–1 discriminant functions produced by the linear combination of the most significant variables (Dudzik & Kolatorowicz, 2016; Kassambara, 2018). The unit of measure to assess biological distance in LDA is the Mahalanobis distance (D^2) (Mahalanobis, 1936) of the group centroids, which are the averages of each group's craniometric data. Mahalanobis distance was developed without a reference model and thus is regarded as a model-free approach but is in fact comparable to distances calculated via model-bound methods (Relethford, 2016).

One advantage of using D^2 for craniometric analysis is that it is a multivariate distance and can account for intercorrelations between variables, unlike Euclidean distance. However, one drawback of D^2 is that it cannot be operated with missing data, so the researcher is required to either remove samples or variables with missing data. Imputation methods, which refers to the process of substituting missing values based on values that already exist in a dataset (Heymans & Eekhout, 2019; Hussin, Mokhtar, Naing, Taylor, & Mahmood, 2007; Schork, 2018; Singhal, 2021; van Buuren, 2018), have been proposed to address this problem (Kenyhercz & Passalacqua, 2016). However, one drawback of imputation methods is that they can decrease the general heterogeneity of sample groups (Kenyhercz & Passalacqua, 2016; Wissler, Blevins, & Buikstra, 2022). As a result, using imputation methods with samples that have narrow margins of variance may exaggerate the similarity between the groups.

LDA is considered a supervised analysis because the samples are associated with pre-determined population group labels during analysis. Therefore, samples are often forced into a pre-determined number of groups. Alternatively, anthropologists have also started to use clustering methods, which are considered unsupervised. In cluster analyses, the population group labels on the samples are removed, and the number of groups that would help classify the samples in the most optimal way is determined by the algorithm, not the researcher. One clustering method used often in anthropology is the k-Nearest Neighbor (k-NN) method (Hughes, Tise, Trammell, & Anderson, 2013). An advantage of using clustering methods over LDA is that the former allows the algorithm to build the structure based on the data without pre-determined assumptions.

Odontometric Data

Similar to craniometric data, dental metrics (also used interchangeably with odontometrics throughout this dissertation) are considered continuous data, with most measurements encompassing the diameters on different aspects (*e.g.*, mesiodistal [MD] and buccolingual [BL] diameters) (Pillai, 2018; Pilloud & Kenyhercz, 2016). It is generally recommended by dental anthropologists to perform exploratory analyses to avoid any violations of statistical assumptions and to eliminate any biases (*e.g.*, observer error, sex differences, intervariable correlation, etc.) that may be driving misleading patterns in the data (Harris, 2008; Pilloud & Kenyhercz, 2016). Generally, the analysis of variance (ANOVA) can be used to assess variances in measurements, whether for the detection of observer error (Pilloud & Kenyhercz, 2016) or to explore population-related variances (Pilloud, Hefner, Hanihara, & Hayashi, 2014).

Much like craniometric data analyses, DFA can be used for dental metric data to examine population groups classifications (Pilloud et al., 2014). Moreover, dimension reduction methods like PCA can also be applied to odontometrics to examine which measurements are affecting the majority of the variation in the sample (Harris, 2008; Pilloud & Kenyhercz, 2016).

Nonmetric Data Statistics in Biodistance

Cranial Nonmetric Data

The generally agreed-upon definition for nonmetric trait scores is the presence or absence (or a score on an ordinal scale) of non-pathological conditions that reflect human morphological variation on the cranium. The main types of nonmetric traits according to skeletal data collection standards include extrasutural bone, ossification proliferation or failure, or variations of sutural and foraminal morphology (Hauser & Stefano, 1989). Cranial nonmetric traits are sometimes incorrectly categorized as quasicontinuous traits, but for the most part they are considered discontinuous traits (Hefner et al., 2016; Pink et al., 2016).

The statistical method that is most often used for cranial nonmetric data is Smith's Mean Measure of Divergence (MMD), which is a measure of dissimilarity, much like Mahalanobis' distance. The formula for MMD essentially calculates the distance between numerical values for dichotomous nonmetric trait frequencies between two sample groups, converting the data to become continuous. One of the components in MMD analysis involves the angular transformation of trait frequencies to address the problems of small sample sizes and any extreme trait frequencies, both of which can affect the results (Irish, 2010; Nikita, 2015). Revisions of the MMD formulae show that Anscombe's (1948) and Freeman & Tukey's (1950) methods are the most appropriate angular transformations (Irish, 2010).

Tetrachoric Mahalanobis distance (TMD) is another widely used statistical method for cranial nonmetric analysis (Konigsberg, 1990). The effectiveness of MMD and TMD for nonmetric trait analysis has been assessed by several researchers (Irish, 2010; Nikita, 2015). Konigsberg's (1990) development of the TMD aimed to remove intercorrelated or non-diagnostic variables for MMD. The TMD operates by using the Euclidean distance on binary data to measure biological distance for polygenic traits. Further, the TMD uses the threshold model, which assumes that the underlying variable exhibits normal distribution (Konigsberg, 1990). The TMD does not accommodate for bias correction for smaller sample sizes and missing data. However, modifications of the equation such as the Ordinal Mahalanobis' Distance (OMD), which uses ordinal data before they have been transformed into dichotomized data, have shown to perform better than both the TMD and MMD (Nikita, 2015).

Lastly, although Wright's F_{ST} is not a direct measure of biodistance, it can inform researchers about the amount of inbreeding present in a subpopulation in relation to the overall population. Overall, lower F_{ST} values, which are based on trait frequencies, indicate closer biological distance due to the increased within-group gene flow compared to between-group gene flow (Pink et al., 2016).

Dental Nonmetric Data

Dental morphological traits are scored on ordinal scales to represent the different degrees of trait expression on the dentition. In contrast to binary dichotomies, dental nonmetric traits are considered threshold dichotomies (Pilloud et al., 2016). The main data collection standard in dental morphological trait research is the Arizona State University Dental Anthropology System (ASUDAS), developed by Turner, Nichol, & Scott (1991). Similar to cranial nonmetric trait analyses, dental morphological trait values are often dichotomized before analysis, which can significantly affect the transmissibility estimates due to dominance effects (Edgar & Ousley, 2016; Nichol, 1989). However, alternative methods like TMD or OMD can use raw scores if complete data are presented (Nikita, 2015). Traditionally, Smith's MMD is used in dental nonmetric trait analysis, but the same issues discussed in the above section on cranial data statistics (*e.g.*, intercorrelation of variables, small sample sizes, etc.) still apply to dental morphological trait analysis.

The statistical methods discussed above are most commonly used by biological anthropologists to answer research questions in biodistance studies. However, it is important to note that regardless of the statistical method employed, the most crucial step is to ensure that the approach is appropriate for the data type on hand. Moreover, researchers should also understand the limitations of the methods and the implications of the analytical results. Improper application of analyses and understanding of results not only hinder the research outcomes, but also impact the field negatively.

PREVIOUS RESEARCH ON BIOLOGICAL DATA IN MYANMAR

Within the past decade, some of the first few mitochondrial DNA (mtDNA) analyses focusing on Myanmar have been conducted to understand genetic diversity and prehistoric migration patterns in the region (Y.-C. Li et al., 2015; Summerer et al., 2014). Results from these mtDNA studies support the genetic diversity seen in Myanmar that is consistent with its currently known population history. To date, outside of these few DNA studies, little research has been done to study the biological relationships of the people of Myanmar.

One of the earliest biological anthropological studies on Burmese skeletal remains was a craniometric study conducted by Tildesley (1921) on a collection of remains at the Duckworth Laboratory at the University of Cambridge. This Burmese cranial collection was obtained by a British colonel during colonial-era Burma from Mawlamyine around the 20th century. At the time, “purely Burman skulls” (Tildesley, 1921, p. 176) were requested by early biostatistician Karl Pearson, but the collection was reported to include the remains of individuals from various ethnic backgrounds, which is a more accurate reflection of the ethnic diversity in the country (Tildesley, 1921).

Not only was Tildesley's (1921) study one of the earliest on Burmese crania, but it was one of the first craniometric studies that applied the coefficient of racial likeness (CRL) method in a biological distance context (Hefner et al., 2016). Throughout the study, Tildesley (1921) compared "Burman" (*i.e.*, Bamar) skulls to those of other ethnicities (*e.g.*, Chinese, Indian, and Malay) and found that Bamar craniometrics were most similar to those of Malay and Chinese, while exhibiting the least phenotypic similarity with the Dravidian group of India (Tildesley, 1921, pp. 245–246). These same Burmese crania were also subsequently studied for other topics, such as paleopathology (Hawkins, 1992) and dental metric and morphological variation (Matsumura & Hudson, 2005; Matsumura & Oxenham, 2014).

RESEARCH AIMS AND HYPOTHESES

Now, over a century after Tildesley's (1921) study, the current research revisited the Burmese skull collection housed at the Duckworth Laboratory in the University of Cambridge with a specific focus on understanding the biological make-up of these individuals from 19th- to 20th-century Myanmar. Although Tildesley's (1921) craniometric study, which incorporated methods like the Coefficient of Racial Likeness (CRL), can be considered one of the trailblazing projects in biodistance research, the methodologies employed for the study included techniques that are no longer practiced today in the field (Tildesley, 1921). Further, Tildesley's research was largely based within race science, and this collection deserves to be studied outside this lens of race and racialization. Therefore, the current dissertation is the first biodistance study in over a century to use updated methods and incorporate all four types (cranial and dental metric and nonmetric) of data on the Burmese collection at the Duckworth Laboratory.

Aim #1: Examine Biological Make-up among Individuals from Myanmar

Hypothesis #1: The Duckworth Burma cranial collection will exhibit phenotypic diversity that will reflect the biological diversity observed throughout Myanmar's population history.

The first major aim of the current dissertation asks the research question: What is the biological make-up of individuals from an ethnically diverse population in Myanmar? According to Tildesley (1921), the Burmese skull collection at the Duckworth Laboratory is comprised of individuals belonging to not only the Bamar/Burmese, but also other ethnic groups. Further, Myanmar's complex population history and Mawlamyine's position as an urbanized central city during the British colonial era are good indicators that individuals represented in the collection exhibit phenotypic diversity skeletally.

Aim #2: Explore Evolutionary Trends behind Skeletal Variation in Myanmar

Hypothesis #2: The individuals from the Duckworth Burma collection will exhibit cranial traits of individuals who are more well-adapted to warmer climates.

The second major aim of this research asks: What are the evolutionary trends behind the skeletal variation observed among individuals in Myanmar? Previous research on climate-related patterns in cranial morphology has identified that broader crania are acclimated to colder climates, while smaller and narrower crania are acclimated to wamer climates (Mielke et al., 2011). Moreover, nasal aperture morphology is also shown to exhibit climate-related trends, where narrower and taller nasal apertures are associated with colder climates due to reasons related to cold air inhalation (Maddux, Butaric, Yokley, & Franciscus, 2017; Plemons, 2022; Yokley, 2009). The climate in Myanmar is categorized as tropical to sub-tropical monsoon with mean temperatures around 23ºC (approximately 73ºF) ("World Bank Climate Change Knowledge Portal," n.d.). Therefore, it is expected that the cranial traits of the individuals from the Duckworth Burmese collection will exhibit traits that are better adapted for warmer climates, such as narrower cranial vaults and wider nasal apertures. Additionally, biodistance results on climate-associated craniometrics and facial morphological traits would potentially group the Duckworth Burma samples closer with other samples from similar climates.

Aim #2: Explore Evolutionary Trends behind Skeletal Variation in Myanmar

Hypothesis #3: Both cranially and dentally, the individuals from the Duckworth Burma collection will exhibit traits that are more similar to other Southeast Asian groups and groups from neighboring geographic areas.

Under the same second aim, the current dissertation also explored how skeletally similar the individuals from the Duckworth Burmese cranial collection would be to other global samples. One of the main debates surrounding human migration patterns into Southeast Asia and the Indo-Pacific region revolves around whether gene flow occurred between East Asian and Australo-Melanesian population groups during the Neolithic Period. Although not much has been found to date regarding the Neolithic Period in Myanmar, the debate surrounding the "two-layer" hypothesis provides a glimpse of what

Homo sapiens in the region may have been like (Hanihara, 1992a, 1992b, 1993; Lipson et al., 2018; Matsumura & Hudson, 2005; Matsumura & Oxenham, 2014; Pietrusewsky, 1984, 2005, 2008; Scott & Turner, 1997; Turner, 1987, 1990).

Although the two-layer hypothesis is a heavily debated topic, especially in dental anthropology, arguments from both sides of the debate provide insights that could help fill in the knowledge gaps regarding human migration patterns and biological relationships among individuals in Myanmar. Based on the population history of Myanmar and the dental morphological patterning studied in the overall Southeast Asian region, it is expected that the samples from the Duckworth Burmese collection will exhibit cranial and dental morphological traits that are more similar to other Southeast Asian groups.

Chapter 2: MATERIALS AND METHODS

MATERIALS

Study Samples: The Duckworth Burma Collection

The skeletal samples analyzed in this study include 142 crania from Myanmar, currently housed in the Duckworth Laboratory at the University of Cambridge. An official application, which included a research proposal detailing the goals and methods of the current dissertation was submitted to the Duckworth Laboratory a year prior to data collection. Permission was granted by the laboratory staff, which allowed me to begin the data collection process. Due to the lack of documentation on the identities of the individuals in the Duckworth Burma collection, permission from the direct descendant community was not accessible[5]. All remains were handled with the utmost respect and according to the ethical guidelines outlined in the code of ethics and conduct by the Scientific Working Group for Forensic Anthropology (SWGANTH, 2013) and Passalacqua & Pilloud (2018).

The remains in this collection originated from Mawlamyine (formerly Moulmein), a major city in the southern part of Myanmar (Figure 2.1. Map of Myanmar, with Mawlamyine highlighted, in geographic reference to its neighboring countries.Figure 2.1) during the British colonial period (1824–1948). However, the details of the excavation or provenience of the Myanmar cranial collection at the Duckworth Laboratory are currently not known. Originally, the remains in this collection were obtained by a British colonel in Burma based on a request for “purely Burman skulls” (Tildesley, 1921, p. 176) by early

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[5] Although permission from the direct descendant community was not accessible, it is noteworthy that Mawlamyine is my family’s hometown, and therefore, I am part of the descendant community.

biostatistician Karl Pearson. However, the collection was reported to include the remains of individuals from various ethnic backgrounds, which is a more accurate reflection of the ethnic diversity in the country (Tildesley, 1921).

The crania are in varying levels of preservation. Of the 142 individuals in the collection, 114 individuals are represented by almost complete to fully complete crania, 13 individuals are represented by fragmentary crania, 14 individuals are represented by calvaria, and one individual is represented by a calotte. The calotte was removed from analysis due to the scarce amount of data that could be collected. The preservation states of the cranial elements affected the type and amount of data that could be collected. The total sample sizes that were analyzed for each data type are summarized in Table 2.1.

Figure 2.1. Map of Myanmar, with Mawlamyine highlighted, in geographic reference to its neighboring countries. This map was created using ArcGIS® software by Esri (Charted Territory Map - Overview, 2018).

Table 2.1. Summary of the Duckworth Burma collection total sample sizes organized by data type and sex.

Data Type	Female	Male	Subadult (Sex NA)	Total
Craniometric	32	98	0	130
Dental/Odontometric	25	66	5	96
Cranial Nonmetric	35	98	8	141
Macromorphoscopic Traits	33	89	5	127
Dental Morphological Traits	22	58	3	83

Comparative Samples

All data collected from the Duckworth Burma collection were compared to global samples from multiple reference data sets. Craniometric data were compared to archaeological data in the W. W. Howells craniometric database (Auerbach, 2014; Howells, 1973, 1989, 1995), archaeological data provided by Dr. Michael Pietrusewsky (Pietrusewsky, 2005, 2008; Pietrusewsky, Lauer, Tsang, Li, & Douglas, 2016), modern data from the Forensic Anthropology Data Bank (FDB) provided by Dr. Richard Jantz (Jantz & Moore-Jansen, 1988), and archaeological data provided by Dr. Tsunehiko Hanihara (Hanihara, 1992a, 2000) (Table 2.2). For comparative analyses on odontometric data, reference data in the Dentabase database (Pilloud, Kenessey, Vlemincq-Mendieta, Scott, & Philbin, 2022; Pilloud & Scott, 2017), Pilloud, Hefner, Hanihara, & Hayashi (2014), Hanihara (1992), and Hanihara & Ishida (2005) (Table 2.3) were used.

Cranial nonmetric data from archaeological samples in the Ossenberg Cranial Nonmetric Traits Database (Ossenberg, 2013), Hanihara & Ishida (2001a, 2001d, 2001c, 2001b), and Hanihara, Ishida, & Dodo (2003) were used for comparison (Table 2.4).

Reference data from modern and archaeological samples in the Macromorphoscopic Databank (MaMD) (Hefner, 2018b, 2018a) were used to compare macromorphoscopic (MMS) traits (Table 2.5). Lastly, reference data from modern and archaeological samples in the Dentabase database (Pilloud et al., 2022; Pilloud & Scott, 2017) were used to compare dental morphological traits (Table 2.6).

Table 2.2. Craniometric comparative samples. Institution abbreviations are explained in the footnote. The current table only lists samples from the Howells, Pietrusewsky, and Yukyi (current study) datasets. Additional samples from the Hanihara and FDB datasets are available in Appendix C.

Population Code	**Population**	**Geographic Region**	**Time Period**	**Collection Institute(s)[a]**	**Female**	**Male**	**Total**	**Reference(s)**
AINU	Ainu	South and Southeast Hokkaido, Japan (East Asia)	18th-20th century	UHOK-FM, TKO	38	48	86	Howells (1973, 1989, 1995)
ANDAMAN	Andaman Islands	Andaman Islands (South Asia)	18th-19th century?	BM-NH, UOE, RSM-E, CAM, OXF, MDH, COP, AMNH, PMH, FM	35	35	70	Howells (1973, 1989, 1995)
ANYANG	Anyang	Shang Dynasty, Anyang, Honan Province, China (East Asia)	16th-10th century B.C.	ASNT	0	42	42	Howells (1973, 1989, 1995)
ARIKARA	Arikara	South Dakota (North America)	17th-18th century	SI-NMNH, UKL	27	42	69	Howells (1973, 1989, 1995)
ATAYAL	Atayal	Atayal, Taiwan Aboriginals (East Asia)	20th century	ASNT, NTU	18	29	47	Howells (1973, 1989, 1995)
AUSTRALI	Australia	Lake Alexandrina Tribes (South Australia)	19th-20th century	SAuM-A	49	52	101	Howells (1973, 1989, 1995)
BERG	Berg	Carinthia, Austria (Central Europe)	20th century	AMNH	53	55	108	Howells (1973, 1989, 1995)
BURYAT	Buryat[b]	Southern end of Lake Baikal, Siberia (North Asia)	Not Available	IEL	54	55	109	Howells (1973, 1989, 1995)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference(s)
BUSHMAN	Bushman	Bushman, San (South Africa)	Pre-3rd century	AIV, SAfM-CT, CAP, UWJ-DART, AMNH, MDH, UOE, DHA-OXF	49	41	90	Howells (1973, 1989, 1995)
DOGON	Dogon	Dogon, Mali (West Africa)	18th century	MDH	52	47	99	Howells (1973, 1989, 1995)
DW_Burma	Myanmar	Mawlamyine, Myanmar (Southeast Asia)	19th-20th century	DW-CAM	32	98	130	Yukyi (Current Study)
EASTER_I	Easter Island	Easter Island (Polynesia)	12th-17th century	MDH, BM-NH, NMV, PMH, CANM-C	37	49	86	Howells (1973, 1989, 1995)
EGYPT	Egypt	Gizeh, Egypt, 26th-30th Dynasties (Northeast Africa)	6th-2nd century B.C.	DW-CAM	53	58	111	Howells (1973, 1989, 1995)
GUAM	Guam	Tumon Beach, Guam western shore (Oceania)	12th century	BPB-HON	27	30	57	Howells (1973, 1989, 1995)
HAINAN	Hainan	Haikou City, Hainan, South China (East Asia)	20th century?	ASNT, NTU	38	45	83	Howells (1973, 1989, 1995)
Hong_Kong	Hong Kong	Hong Kong (East Asia)	20th century	HKU	0	50	50	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
INUGSUK	Inugsuk[c]	Inugsuk Inuit, west & southeast Greenland (North America/Europe)	Pre-18th century	KU	55	53	108	Howells (1973, 1989, 1995)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference(s)
Kanto_Japan	Kanto	Kanto District, eastern Honshu, Japan (East Asia)	19th-20th century	CHB	0	50	50	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
Kyushu_Japan	Kyushu	Fukuoka, Yamaguchi, Saga, and Nagasaki Prefectures, Kyushu Island, Japan (East Asia)	20th century	Not Available	0	49	49	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
MOKAPU	Mokapu	Mokapu, Oahu, Hawaii (Polynesia)	15th-18th century	BPB-HON	49	51	100	Howells (1973, 1989, 1995)
MORIORI	Moriori	Moriori, Chatham Islands (Polynesia)	Not Available	BM-NH, OTA, CANM-C, AUC	51	57	108	Howells (1973, 1989, 1995)
N_JAPAN	North Japan	Hokkaido, North Japan (East Asia)	20th century	UHOK	32	55	87	Howells (1973, 1989, 1995)
N_MAORI	North Maori	New Zealand (Oceania)	Not Available	Not Available	0	10	10	Howells (1973, 1989, 1995)
NORSE	Norse	Oslo, Norway (Northern Europe)	10th-11th century	UiO	55	55	110	Howells (1973, 1989, 1995)
PERU	Peru	Yauyos, Peru (South America)	19th century?	PMH	55	55	110	Howells (1973, 1989, 1995)
PHILLIPI	Philippines	Philippine Islands (Southeast Asia)	20th century	UPM	0	50	50	Howells (1973, 1989, 1995)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference(s)
S_JAPAN	South Japan	North Kyushu, South Japan (East Asia)	20th century	KYU	41	50	91	Howells (1973, 1989, 1995)
S_MAORI	South Maori	Murihiku coast, New Zealand (Oceania)	Not Available	Not Available	0	10	10	Howells (1973, 1989, 1995)
SANTA_CR	Santa Cruz Island	Santa Cruz Island, California (North America)	18th century	PMH SI-NMNH	51	51	102	Howells (1973, 1989, 1995)
TASMANIA	Tasmania	Tasmania (Australia)	19th century?	TMH, QVM-L, SAuM-A, DAM, NMM, MDH, BM-NH, OXF, CAM, UOE, RSM-E, AMNH, FM, NMV	42	45	87	Howells (1973, 1989, 1995)
TEITA	Teita	Teita, Kenya (East Africa)	20th century	DW-CAM	50	33	83	Howells (1973, 1989, 1995)
TOLAI	Tolai	Tolai, New Britain (Melanesia)	19th-20th century	AMNH	54	56	110	Howells (1973, 1989, 1995)
Taiwan	Taiwan	Taiwan, origins from Fujian and Guangdong Provinces of China (East Asia)	20th century	Not Available	0	47	47	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
Thailand	Thailand	Bangkok, Thailand (Southeast Asia)	20th century?	SMM-B	0	50	50	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference(s)
Tohoku_Japan	Tohoku	Tohoku District, northern Honshu Island, Japan (East Asia)	20th century	SEN	0	53	53	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
Bachuc_Viet	Vietnam	Bachuc Village, western Angian Province, Vietnam (Southeast Asia)	20th century	Not Available	0	51	51	Pietrusewsky (2005, 2008); Pietrusewsky et al., 2016)
ZALAVAR	Zavalár	Zavalár, Hungary (Central Europe)	9th-11th century	NHM-BUD	45	53	98	Howells (1973, 1989, 1995)
ZULU	Zulu	Zulu (South Africa)	20th century	UWJ-DART	46	55	101	Howells (1973, 1989, 1995)

[a] AIV = Anthropological Institute, Vienna; AMNH = American Museum, New York; ASNT = Academia Sinica, Nankang, Taiwan; AUC = Auckland Museum; BM-NH = British Museum (Natural History); BPB-HON = Bernice P. Bishop Museum, Honolulu; CAM = University of Cambridge; CANM-C = Canterbury Museum, Christchurch; CAP = Department of Anatomy, University of Cape Town; CHB = Department of Anatomy, Chiba University School of Medicine; COP = Copenhagen, Anthropological Institute; DAM = Department of Anatomy, Melbourne; DHA-OXF = Department of Human Anatomy, Oxford; DW-CAM = Duckworth Laboratory, University of Cambridge; FM = Field Museum, Chicago; HKU = University of Hong Kong; IEL = Institute of Ethnography, Academy of Science, Leningrad; KU = Anthropological Laboratory, University of Copenhagen; KYU = Department of Anatomy, Kyushu University, Fukuoka; MDH = Musée de l'Homme, Paris; NHM-BUD = Natural History Museum, Budapest; NMM = National Museum, Melbourne; NMV = Naturhistorisches Museum, Vienna; NTU = National Taiwan University, Taipei, Taiwan; OTA = University of Otago Medical School; OXF = University of Oxford; PMH = Peabody Museum, Harvard University; QVM-L = Queen Victoria Museum, Launceston; RSM-E = Royal Scottish Museum, Edinburgh; SAfM-CT = South African Museum, Cape Town; SAuM-A = South Australian Museum, Adelaide; SEN = Department of Anatomy, Tohoku University School of Medicine, Sendai; SI-NMNH = National Museum of Natural History, Smithsonian Institution; SMM-B = Siriaj Medical Museum, Bangkok; TKO = University Museum, Tokyo University; TMH = Tasmanian Museum, Hobart; UHOK = Hokkaido University, Sapporo, Japan; UHOK-FM = Faculty of Medicine, University of Hokkaido; UiO = Anatomical Institute, University of Oslo; UKL = University of Kansas, Lawrence; UOE = University of Edinburgh; UPM = Medical School, University of the Philippines, Manila; UWJ-DART = R.A. Dart Collection, University of Witwatersrand, Johannesburg

[b] The spelling of Buryat has been updated to reflect the more common spelling today, compared to “Buriat” in the Howells craniometric database (Howells, 1973, 1989, 1995).

[c] The name of the Inugsuk group has been updated from “Eskimo” in the Howells craniometric database (Howells, 1973, 1989, 1995) due to the problematic nature of the latter term.

Table 2.3. Dental metric comparative samples. Institution abbreviations are explained in the footnote. The "_H" at the end of the population code stands for Hanihara, and the "_P" stands for Pilloud.

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Afghanistan_H	Afghanistan	West Asia	Not Available	NHM, AMNH	17	0	0	17	Hanihara & Ishida (2005)
Alaska_Inuit_H	Alaska Inuit	Arctic	Not Available	NHM, AMNH, SI-NMNH	56	69	0	125	Hanihara & Ishida (2005)
Aleut_H	Aleut	Arctic	Not Available	AMNH, NHM	41	17	0	58	Hanihara & Ishida (2005)
Andaman_Isl_H	Andaman Islands	South Asia	Modern	NHM, CAM	37	12	0	49	Hanihara & Ishida (2005)
Australia_ Aboriginal_H	Australia, Aboriginal	Oceania	Modern	AM, AMNH, NHM, NMNH, CAM, MH	207	48	0	255	Hanihara & Ishida (2005); Hanihara (1992)
Austria_H	Austria	Central Europe	16th-17th century	AMNH, NMNH	14	9	0	23	Hanihara & Ishida (2005)
Bismarck_H	Bismarck	Oceania	Not Available	AM, USyd, SAuM, AMNH, SI-NMNH, NHM	9	3	0	12	Hanihara & Ishida (2005)
Borneo_H	Borneo	Southeast Asia	Not Available	NHM, CAM, MDH	54	5	0	59	Hanihara & Ishida (2005)
Burma_NHM_H	Burma, NHM	Southeast Asia	Not Available	NHM	38	2	0	40	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Buryat_H	Buryat	Northeast Asia	Not Available	MDH, NHM, AMNH, SI-NMNH	10	2	0	12	Hanihara & Ishida (2005)
Cameroon_H	Cameroon	Central Africa	Not Available	NHM, AMNH	25	11	0	36	Hanihara & Ishida (2005)
Canada_Indigenous_H	Canada, Indigenous	North America	Not Available	NHM, CAM	63	28	0	91	Hanihara & Ishida (2005)
Canada_Inuit_H	Canada, Inuit	North America	Not Available	NHM, AMNH	6	4	0	10	Hanihara & Ishida (2005)
Celebes_H	Celebes	Southeast Asia	Not Available	NHM, CAM, MDH	19	0	0	19	Hanihara & Ishida (2005)
Chile_H	Chile	South America	Not Available	NHM, AMNH	7	7	0	14	Hanihara & Ishida (2005)
China_North_H	China, North	East Asia	19th century, Modern	TKO, AMNH	48	6	0	54	Hanihara & Ishida (2005); Hanihara (1992)
China_South_H	China, South	East Asia	Not Available	NHM, MDH, AMNH	49	0	0	49	Hanihara & Ishida (2005)
Congo_H	Congo	Central Africa	Not Available	Not Available	11	1	0	12	Hanihara & Ishida (2005)
Cyprus_H	Cyprus	Mediterranean	Hellenismic Period	NHM, AMNH	13	0	0	13	Hanihara & Ishida (2005)
Czech_H	Czechia (Czech Republic)	Central Europe	Not Available	SAuM, NHM	28	2	0	30	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
DW_Burma	Burma, Duckworth	Southeast Asia	19th-20th century	DW-CAM	66	25	5	96	Yukyi (Current Study)
Easter_Isl_H	Easter Islands	Oceania	Not Available	NHM, AMNH, MH	23	7	0	30	Hanihara & Ishida (2005)
Egypt_Badari_H	Egypt, Badari	North Africa	5,000-4,000 B.P.	CAM	24	0	0	24	Hanihara & Ishida (2005)
Egypt_Gizeh_H	Egypt, Gizeh	North Africa	12-29th dynasty	CAM	45	6	0	51	Hanihara & Ishida (2005)
Egypt_Naqada_H	Egypt, Naqada	North Africa	5,000-4,000 B.P.	CAM	31	0	0	31	Hanihara & Ishida (2005)
Egypt_Upper_H	Upper Egypt	North Africa	12-29th dynasty	CAM	17	18	0	35	Hanihara & Ishida (2005)
Finland_H	Finland	Northern Europe	Modern	NHM	14	0	0	14	Hanihara & Ishida (2005)
France_H	France	Western Europe	Not Available	NHM	33	0	0	33	Hanihara & Ishida (2005)
Gabon_H	Gabon	Central Africa	Not Available	NHM	42	1	0	43	Hanihara & Ishida (2005)
Germany_H	Germany	Western Europe	Not Available	NHM, SI-NMNH	61	11	0	72	Hanihara & Ishida (2005)
Ghana_Ashanti_H	Ashanti Region, Ghana	West Africa	Not Available	NHM, CAM	27	10	0	37	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Greece_H	Greece	Southern Europe	Ancient, Modern	NHM	43	28	0	71	Hanihara & Ishida (2005)
Greenland_H	Greenland	North America	Not Available	NHM, AMNH	23	12	0	35	Hanihara & Ishida (2005)
Hawaii_H	Hawaii	Oceania	Prehistoric	NHM, BM-NH	186	135	0	321	Hanihara & Ishida (2005); Hanihara (1992)
Hungary_H	Hungary	Central Europe	11th-12th century	NHM, AMNH	38	22	0	60	Hanihara & Ishida (2005)
India_Bengal_H	India, Bengal	South Asia	Not Available	NHM, AMNH	65	18	0	83	Hanihara & Ishida (2005)
India_Northeast_H	India, Northeast	South Asia	Not Available	NHM, AMNH	39	1	0	40	Hanihara & Ishida (2005)
India_Northwest_H	India, Northwest	South Asia	Not Available	NHM, AMNH	16	0	0	16	Hanihara & Ishida (2005)
India_Pakistan_Punjab_H	India, Pakistan, Punjab	South Asia	Not Available	NHM, AMNH	45	0	0	45	Hanihara & Ishida (2005)
India_South_H	India, South	South Asia	Not Available	NHM, AMNH	74	10	0	84	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Iran_H	Iran	West Asia	Bronze to Achaemenian Period (6th-4th century B.C.)	NHM, TKO	23	11	0	34	Hanihara & Ishida (2005)
Iraq_H	Iraq	West Asia	Not Available	NHM	24	11	0	35	Hanihara & Ishida (2005)
Italy_H	Italy	Southern Europe	Ancient, Modern	NHM	82	0	0	82	Hanihara & Ishida (2005)
Japan_Ainu_H	Japan, Ainu	East Asia	Not Available	NHM, CAM	71	53	0	124	Hanihara & Ishida (2005)
Japan_Chiba_H	Japan, Chiba	East Asia	Modern	NHM	72	16	0	88	Hanihara & Ishida (2005)
Japan_Jomon_H	Japan, Jomon	East Asia	Prehistoric (5,300-2,300 B.P.)	TKO, TKM	77	46	0	123	Hanihara & Ishida (2005)
Japan_Mainland_H	Japan, Mainland	East Asia	Not Available	NHM, AMNH	49	15	0	64	Hanihara & Ishida (2005)
Japan_Okinawa_H	Japan, Okinawa	East Asia	Modern	NHM	37	33	0	70	Hanihara & Ishida (2005); Hanihara (1992)
Japan_P	Japan	East Asia	Not Available	Not Available	71	16	0	87	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Java_H	Java	Southeast Asia	Not Available	NHM, CAM, AMNH, MDH	66	5	0	71	Hanihara & Ishida (2005)
Kenya_H	Kenya	East Africa	Not Available	NHM, CAM, SI-NMNH	64	21	0	85	Hanihara & Ishida (2005)
Kirsten_Black_P	South Africa, Black	South Africa	Modern	KSC	28	7	1	36	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Kirsten_Coloured_P	South Africa, Coloured	South Africa	Modern	KSC	38	27	0	65	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Korea_H	South Korea	East Asia	Modern	NHM, AMNH	12	0	0	12	Hanihara & Ishida (2005); Hanihara (1992)
Laos_H	Laos	Southeast Asia	Not Available	NHM	26	0	0	26	Hanihara & Ishida (2005)
Malay_H	Malay	Southeast Asia	Not Available	NHM, AMNH	14	1	0	15	Hanihara & Ishida (2005)
Marquesas_H	Marquesas	Oceania	Prehistoric (2,000-1,700 B.P.)	BPB-HON, NHM, MDH, AMNH	56	7	0	63	Hanihara & Ishida (2005); Hanihara (
Mel_Fiji_H	Fiji	Oceania	Early 20th century	AM, USyd, SAuM, AMNH, SI-NMNH, NHM, BPB-HON	63	25	0	88	Hanihara & Ishida (2005); Hanihara (1992)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Mel_NewCaledonia_H	New Caledonia	Oceania	Not Available	AM, USyd, SAuM, AMNH, SI-NMNH, NHM, BPB-HON	20	9	0	29	Hanihara & Ishida (2005)
Mel_NewHebrides_H	Hew Hebrides	Oceania	Early 20th century	AM, USyd, SAuM, AMNH, SI-NMNH, NHM, BPB-HON	19	7	0	26	Hanihara & Ishida (2005); Hanihara (1992)
Mel_NewIreland_H	New Ireland	Oceania	Not Available	AM, USyd, SAuM, AMNH, SI-NMNH, NHM	64	31	0	95	Hanihara & Ishida (2005)
Mel_Solomon_H	Solomon Islands	Oceania	Not Available	AM, USyd, SAuM, AMNH, SI-NMNH, NHM, BPB-HON	28	11	0	39	Hanihara & Ishida (2005)
Mel_TorresStrait_H	Torres Strait	Oceania	Not Available	AM, USyd, SAuM, NHM	30	14	0	44	Hanihara & Ishida (2005)
Mexico_H	Mexico	North America	Modern	AMNH, SI-NMNH	32	2	0	34	Hanihara & Ishida (2005)
Mic_Caroline Islands_H	Caroline Islands	Oceania	Not Available	AMNH, TKO	42	12	0	54	Hanihara & Ishida (2005)
Mic_Mariana_H	Mariana Islands	Oceania	Not Available	BPB-HON, MDH	26	7	0	33	Hanihara & Ishida (2005)
Mongol_H	Mongolia	East Asia	Not Available	NHM, AMNH, NMNH	64	37	0	101	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Moriori_H	Moriori	Oceania	Not Available	AM, USyd, SAuM, NHM, CAM, AMNH, SI-NMNH	95	62	0	157	Hanihara & Ishida (2005)
Nepal_H	Nepal	South Asia	Not Available	NHM, AMNH	33	1	0	34	Hanihara & Ishida (2005)
Netherlands_H	Netherlands	Western Europe	Not Available	Not Available	22	2	0	24	Hanihara & Ishida (2005)
NicobarIslands_H	Nicobar Islands	South Asia	Modern	NHM, CAM	19	0	0	19	Hanihara & Ishida (2005)
Nigeria_H	Nigeria	West Africa	Not Available	NHM, AMNH	12	1	0	13	Hanihara & Ishida (2005)
Norway_H	Norway	Northern Europe	Not Available	Not Available	90	16	0	106	Hanihara & Ishida (2005)
Nubia_H	Nubia	North Africa	Not Available	Not Available	15	0	0	15	Hanihara & Ishida (2005)
NZ_Maori_H	Maori, New Zealand	Oceania	Not Available	AM, USyd, SAuM, NHM, CAM, AMNH, SI-NMNH	89	0	0	89	Hanihara & Ishida (2005)
Okhotsk_H	Okhotsk	East Asia	Not Available	Not Available	61	5	0	66	Hanihara & Ishida (2005)
Palestine_H	Palestine	Middle East	Not Available	Not Available	10	3	0	13	Hanihara & Ishida (2005)
Patagonia_H	Patagonia	South America	Not Available	NHM, CAM, AMNH, SI-NMNH	62	1	0	63	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
Peru_H	Peru	South America	Modern	NHM, NMNH	26	3	0	29	Hanihara & Ishida (2005)
Philippines_General_H	Philippines, General	Southeast Asia	Not Available	NHM, CAM, MDH	88	42	0	130	Hanihara & Ishida (2005)
Philippines_Luzon_H	Philippines, Luzon	Southeast Asia	Not Available	NHM, CAM, MDH	80	17	0	97	Hanihara & Ishida (2005)
PNG_H	Papua New Guinea	Oceania	Not Available	AM, USyd, SAuM, NHM	34	10	0	44	Hanihara & Ishida (2005)
Pol_CookIslands_H	Cook Islands	Oceania	Not Available	NHM, KYO	155	81	0	236	Hanihara & Ishida (2005)
Pol_Society_H	Society, Tahiti	Oceania	Not Available	MDH, NHM	36	2	0	38	Hanihara & Ishida (2005)
Pol_Tonga_H	Tonga	Oceania	Not Available	Not Available	35	0	0	35	Hanihara & Ishida (2005)
Pretoria_Black_P	South Africa, Black	South Africa	Modern	PBC	11	6	0	17	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Russia_H	Russia	Eastern Europe	Not Available	NHM, AMNH	91	21	2	114	Hanihara & Ishida (2005)
Sami_H	Sámi[c]	Northern Europe	Not Available	Not Available	37	5	0	42	Hanihara & Ishida (2005)
Somalia_H	Somalia	East Africa	Not Available	CAM	54	3	0	57	Hanihara & Ishida (2005)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
SouthAfrica_H	South Africa	Southern Africa	Not Available	NHM, CAM, AMNH, SI-NMNH	86	4	0	90	Hanihara & Ishida (2005)
SriLanka_H	Sri Lanka	South Asia	Not Available	Not Available	9	2	0	11	Hanihara & Ishida (2005)
Sumatra_H	Sumatra, Indonesia	Southeast Asia	Not Available	NHM, CAM, AMNH, MDH	20	3	0	23	Hanihara & Ishida (2005)
Sweden_H	Sweden	Northern Europe	Not Available	AMNH, NMNH	21	0	0	21	Hanihara & Ishida (2005)
Syria_H	Syria	Middle East	Not Available	Not Available	11	5	0	16	Hanihara & Ishida (2005)
Tanzania_H	Tanzania	East Africa	Not Available	NHM, CAM, AMNH	88	14	0	102	Hanihara & Ishida (2005)
Thailand_H	Thailand	Southeast Asia	3,000-6,000 B.P.	MDH, NHM, AMNH, SI-NMNH	52	19	2	73	Hanihara & Ishida (2005); Hanihara (1992)
Tibet_H	Tibet	East Asia	Not Available	NHM, CAM	36	6	0	42	Hanihara & Ishida (2005)
Turkey_H	Turkey	Middle East	Not Available	NHM	25	8	0	33	Hanihara & Ishida (2005)
TXST_White_P	American White, Texas	North America	Modern	TXST	44	25	1	70	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s) [a]	Female	Male	Unk[b]	Total	Reference
UK_Medieval_H	UK Medieval	Western Europe	Medieval Periods, pre-17th century	NHM	244	50	0	294	Hanihara & Ishida (2005)
UTK_Black_P	American Black, Tennessee	North America	Modern	UTK	18	3	0	21	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
UTK_Hispanic_P	Hispanic, Tennessee	North America	Modern	UTK	10	1	0	11	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
UTK_White_P	American White, Tennessee	North America	Modern	UTK	106	50	0	156	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Vietnam_H	Vietnam	Southeast Asia	Not Available	MDH, NHM, AMNH, SI-NMNH	20	3	0	23	Hanihara & Ishida (2005)
WestAfrica_H	West Africa	West Africa	Not Available	Not Available	26	0	0	26	Hanihara & Ishida (2005)

[a] NHM = Natural History Museum, London, UK; AMNH = American Museum of Natural History, New York; SI-NMNH = National Museum of Natural History, Smithsonian Institution; CAM = University of Cambridge; AM = Australian Museum; MDH = Musée de l'Homme, Paris; USyd = University of Sydney; SAuM = South Australian Museum; TKO = University Museum, Tokyo University; DW-CAM = Duckworth Laboratory, University of Cambridge; TKM = University of Tokyo, University Medical Museum, Tokyo; KSC = Kirsten Skeletal Collection, South Africa; BPB-HOM = Bernice P. Bishop Museum, Honolulu; PBC = Pretoria Bone Collection, South Africa; TXST = Texas State University Donated Skeletal Collection, San Marcos, TX; UTK = William Bass Donated Collection, University of Tennessee, Knoxville, TN; KYO = Kyoto University, Faculty of Science, Laboratory of Physical Anthropology

[b] Unk = Unknown

[c] The name of the Sámi group has been updated from "Lapp" due to the problematic nature of the latter term.

Table 2.4. Cranial nonmetric comparative samples. Institution abbreviations are explained in the footnote. The "_O" at the end of the population code stands for Ossenberg. The current table only lists samples from the Ossenberg and Yukyi (current study) datasets. Additional samples from the Hanihara dataset are available in Appendix C.

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
AfAm_O	African American	United States	19th-mid 20th century	TC-SI	28	34	2	64	Ossenberg (2013)
Aleut_O	Aleutian Islands (Eastern, Central, Western)	Northwest Native America	20th century B.C.-16th century A.D.	SI, FM, UCT, PMH, UAF, UOR	169	183	71	423	Ossenberg (2013)
Armenia_O	Armenia	Eurasia	Antique Age (pre-4000 B.C.) Bronze Age (4000-1300 B.C.) Iron Age (1200-300 B.C.)	IEA	57	68	6	131	Ossenberg (2013)
Athapaskan_O	Athapaskan Territories	Northwest Native America	Not Available	SI, AMNH, CMC, UOR	95	84	25	204	Ossenberg (2013)
Aus_Aborig_O	Australia (Aborigines)	South Pacific	Not Available	AMNH	23	30	2	55	Ossenberg (2013)
DW_Burma	Burma, Duckworth	Mawlamyine, Myanmar (Southeast Asia)	19th-20th century	DW-CAM	32	98	8	138	Yukyi (Current study)
Cen_Arctic_O	Central Arctic	Arctic Native America	Not Available	SI, CMC, PMH	176	169	24	369	Ossenberg (2013)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
Cen_Japan_O	Central Japan	Northeast Asia	17th-19th century	TKM, TKO, NSM, CHB, SEN	112	203	0	315	Ossenberg (2013)
Chile_O	Chile	South America	Not Available	AMNH	8	25	1	34	Ossenberg (2013)
E_Arctic_O	Eastern Arctic	Arctic Native America	Not Available	PAN, SI, AMNH, MUN, PMH, CMC	195	148	15	358	Ossenberg (2013)
Ghana_O	Ghana	West Africa	Not Available	AMNH	14	18	1	33	Ossenberg (2013)
Hungary_O	Hungary	Eurasia	Roman Period (35-9 B.C.) Medieval Period (11th-16th century)	AMNH	21	42	5	68	Ossenberg (2013)
Iceland_O	Iceland	Eurasia	13th-16th century	PMH	21	22	7	50	Ossenberg (2013)
Illinois_O	Illinois	Northeast Native America	Middle Woodland Period (3rd-7th century)	UIN	33	41	3	77	Ossenberg (2013)
India_O	India	Eurasia	Not Available	UAB	55	70	2	127	Ossenberg (2013)
Italy_O	Italy	Eurasia	19th century	SIEN	44	44	0	88	Ossenberg (2013)
Japan_Ainu_O	Japan (Ainu)	Northeast Asia	Not Available	TKM, TKO	62	82	3	147	Ossenberg (2013)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
Japan_Jomon_O	Japan (Jomon)	Hokkaido, North, Central, and West Japan, Northeast Asia	3500-300 B.C. & 300 B.C.-700 A.D.	TKO, NSM, SAP, SEN, KYO	98	88	4	190	Ossenberg (2013)
Kenya_O	Kenya	East Africa	Not Available	SI	17	8	2	27	Ossenberg (2013)
Marquesas_O	Marquesas	South Pacific	Not Available	AMNH	18	38	1	57	Ossenberg (2013)
Mongolia_O	Mongolia	Continental Northeast Asia	Not Available	SI, AMNH	25	35	2	62	Ossenberg (2013)
N_Alaska_O	New Zealand (Maori)	South Pacific	Not Available	AMNH	22	24	2	48	Ossenberg (2013)
N_China_O	Nigeria	West Africa	Not Available	AMNH	14	15	0	29	Ossenberg (2013)
N_Japan_O	North Alaska	Arctic Native America	Not Available	SI, CMC, AMNH, PMH	204	214	14	432	Ossenberg (2013)
N_Miss_Valley_O	North China (Manchuria)	Continental Northeast Asia	Not Available	TKO	14	55	3	72	Ossenberg (2013)
N_N_Japan_O	North Japan	Northeast Asia	18th-19th century	SEN	65	86	0	151	Ossenberg (2013)
N_Pacific_Coast_O	North Pacific Coast	Northwest Native America	Not Available	SI, AMNH, FM, CMC, SFU	177	232	43	452	Ossenberg (2013)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)^a	Female	Male	Unk^b	Total	Reference
Nigeria_O	Northern Mississippi Valley	Northwest Native America	Late Woodland Period (6th-11th century) Middle Missouri, Big Stone Phase	SI, UMN, UMA, ROM, UIN, CMC	108	150	41	299	Ossenberg (2013)
NZ_Maori_O	Northern North Japan	Northeast Asia	18th-19th century	SEN	14	25	1	40	Ossenberg (2013)
Ontario_Brit_O	Ontario (British origin)	Canada, Eurasia	19th century	STT	95	114	28	237	Ossenberg (2013)
Ontario_Native_O	Ontario (Native)	Northeast Native America	Late Woodland Period (6th-11th century)	CMC	30	22	5	57	Ossenberg (2013)
Patagonia_O	Patagonia	South America	Not Available	AMNH	6	19	0	25	Ossenberg (2013)
Pecos_Pueblo_O	Pecos Pueblo	Southwest Native America	Not Available	PMH	84	75	8	167	Ossenberg (2013)
Plains_O	Plains	Northwest Native America	19th century	SI, UAB, FM, WHO, PMH	101	136	49	286	Ossenberg (2013)
Plateau_O	Plateau	Northwest Native America	Not Available	SI, CWU, UOR	101	110	14	225	Ossenberg (2013)
S_Africa_O	Siberia	Continental Northeast Asia	Not Available	SI, AMNH, IESP, SAP	86	93	11	190	Ossenberg (2013)
S_Alaska_O	South Alaska	Arctic Native America	Not Available	SI, NSM, UOR	292	263	60	615	Ossenberg (2013)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
Siberia_O	Southern Africa	Southern Africa	Not Available	SI, AMNH	20	40	0	60	Ossenberg (2013)
St_Lawrence _O	St. Lawrence Island	Siberia (Chukotka), Arctic Native America	Not Available	SI, UG, PMH, IESP, AMNH, LPR	146	152	24	322	Ossenberg (2013)
Sudan_O	Sudan	North Africa	Kerma - Ancient, Middle, and Classical Periods (2500-1500 B.C.)	UG	32	48	6	86	Ossenberg (2013)
Tanzania_O	Tanzania	East Africa	Not Available	AMNH	31	16	0	47	Ossenberg (2013)
W_Japan_O	West Japan	Northeast Asia	18th-19th century & Yayoi (200 B.C.-300 A.D.)	KYO, KYU, SEN	64	119	0	183	Ossenberg (2013)

[a] AMNH = American Museum of Natural History, New York; CHB = Department of Anatomy, Chiba University School of Medicine; CMC = Canadian Museum of Civilization, Gatineau, PQ; CWU = Central Washington State University, Ellensburg; FM = Field Museum, Chicago; IEA = Institute for Ethnography, Armenian Academy of Sciences, Yerevan; IESP = Institute for Ethnography, Russian Academy of Sciences, St. Petersburg; KYO = Kyoto University, Faculty of Science, Laboratory of Physical Anthropology; KYU = Department of Anatomy, Faculty of Medicine, Kyushu, University, Fukuoka; LPR = Laboratory for Plastic Reconstruction, Russian Academy of Sciences, Moscow; MUN = Memorial University of Newfoundland, St. John's NL; NSM = National Science Museum, Tokyo; SI = Smithsonian Institution, Washington, D.C.; TC-SI = Terry Collection, Smithsonian Institution, Washington, D.C.; PAN = Panum Institute, Copenhagen; PMH = Peabody Museum, Harvard University, Cambridge MA; QU = Department of Anatomy, Queen's University, Kingston ON; ROM = Royal Ontario Museum, Toronto ON; SAP = Department of Anatomy, Sapporo Medical University, Sapporo; SEN = Department of Anatomy and Anthropology, Tohoku University School of Medicine, Sendai; SFU = Department of Anthropology, Simon Fraser University, Burnaby BC; SIEN = Department of Anatomy, University of Siena; STT = St. Thomas Church, Belleville ON; TKM = University of Tokyo, University Medical Museum, Tokyo; TKO = University of Tokyo, University Museum, Tokyo; UAB = Department of Anthropology and Dept. of Anatomy, University of Alberta, Edmonton AB; UAF = Department of Anthropology, University of Alaska, Fairbanks AK; UCT = Laboratory of W.S. Laughlin, University of Connecticut, Storrs CT; UG = Department of Anthropology, University of Geneva; UIN = Department of Anthropology, University of Indiana, Bloomington IN; UMA = Department of Anthropology, University of Manitoba, Winnipeg MA; UMN = Department of Anthropology, University of Minnesota, Minneapolis MN; UOR = University of Oregon, Museum of Natural History, Eugene OR; WHO = W.H. Over Museum, Pierre SD.

[b] Unk = Unknown

Table 2.5. Macromorphoscopic trait data comparative samples. Institution abbreviations are explained in the footnote.

Population Code	Population	Geographic Location	Time Period	Collection/Source Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
AmericanBlack	American Black	United States	Modern	UTK	54	47	0	101	Hefner (2018a, 2018b)
AmericanWhite	American White	United States	Modern	UTK	43	66	0	109	Hefner (2018a, 2018b)
Chinese	Chinese	East Asia	Archaeological	Not Available	5	53	0	58	Hefner (2018a, 2018b)
Colombian	Colombia	South America	Modern	UAM-C	25	79	0	104	Hefner (2018a, 2018b)
DW_Burma	Myanmar	Southeast Asia	Archaeological	DW-CAM	30	89	8	127	Yukyi (Current Study)
Guatemalan	Guatemala	Central America	Modern	Not Available	30	70	0	100	Hefner (2018a, 2018b)
Japanese	Japan	East Asia	Archaeological	Not Available	5	8	2	15	Hefner (2018a, 2018b)
Mexico	Mexico	North America	Modern	Not Available	2	21	0	23	Hefner (2018a, 2018b)
PacificAmer-indian	Pacific Amerindian	North America	Archaeological	Not Available	1	4	95	100	Hefner (2018a, 2018b)
Peruvian	Peru	South America	Archaeological	Not Available	0	0	48	48	Hefner (2018a, 2018b)
SWHispanic	Southwest Hispanic	United States	Archaeological & Modern	PCOME, OpID	7	8	85	100	Hefner (2018a, 2018b)

Population Code	Population	Geographic Location	Time Period	Collection/Source Institute(s)[a]	Female	Male	Unk[b]	Total	Reference
Thailand	Thailand	Southeast Asia	Modern	KKU	38	61	2	101	Hefner (2018a, 2018b)

[a] UAM-C = University of Antioquia, Medellin, Colombia; UTK = William Bass Donated Collection, University of Tennessee, Knoxville, TN; KKU = Khon Kaen University Osteological Collection, Khon Kaen University, Thailand; PCOME = Pima County Office of the Medical Examiner Tucson, AZ; OpID = Operation Identification, Forensic Anthropology Center at Texas State, San Marcos TX.

[b] Unk = Unknown

Table 2.6. Dental non-metric data comparative samples. Institution abbreviations are explained in the footnote.

Population Code	Population	Geographic Region	Time Period	Collection/Source Institute(s)[a]	Female	Male	Unk[b]	Total	Reference(s)
Dart_Black_P	South Africa, Black	South Africa	20th century	UWJ-DART	50	45	0	95	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
DW_Burma	Burma	Southeast Asia	19th-20th century	DW-CAM	23	60	0	83	Yukyi (Current Study)
Japan_Chiba_P	Japan	East Asia	Not Available	Not Available	15	71	1	87	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Kirsten_Black_P	South Africa, Black	South Africa	Modern	KSC	7	28	1	36	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)

Population Code	**Population**	**Geographic Region**	**Time Period**	**Collection/Source Institute(s)[a]**	**Female**	**Male**	**Unk[b]**	**Total**	**Reference(s)**
Kirsten_Coloured_P	South Africa, Coloured	South Africa	Modern	KSC	26	37	0	63	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
Pretoria_Black_P	South Africa, Black	South Africa	Modern	PBC	44	141	2	187	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
TXST_White_P	American White, Texas	North America	Modern	TXST	33	56	1	90	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
UTK_Black_P	American Black, Tennessee	North America	Modern	UTK	3	21	0	24	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
UTK_Hispanic_P	Hispanic, Tennessee	North America	Modern	UTK	2	11	0	13	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)
UTK_White_P	American White, Tennessee	North America	Modern	UTK	64	125	0	189	Pilloud et al. (2014, 2022); Pilloud & Scott (2017)

[a] UWJ-DART = R.A. Dart Collection, University of Witwatersrand, Johannesburg; DW-CAM = Duckworth Laboratory, University of Cambridge; KSC = Kirsten Skeletal Collection, South Africa; PBC = Pretoria Bone Collection, South Africa; TXST = Texas State University Donated Skeletal Collection, San Marcos, TX; UTK = William Bass Donated Collection, University of Tennessee, Knoxville, TN

[b] Unk = Unknown

METHODS

Time Period, Age-at-death Categories, and Sex Estimation

Apart from the very general location from which the remains in the Duckworth Burma collection were obtained (Mawlamyine), little is known about the individuals represented by the crania. The time period of recovery for these individuals is estimated to be from the late 19th to early 20th centuries based on the earliest publication date of the first study done on the collection (Tildesley, 1921). Due to limited information available various methods were used to estimate parameters of the biological profile.

Age-at-death categories were first generally assigned as adult or subadult based on the varying developmental stages of different skeletal and dental elements. Of the 141 individuals, not including the calotte, 12 individuals were estimated to be subadults, and 129 were estimated to be adults based on the overall size and shape of the crania, cranial suture stages (Bassed, Briggs, & Drummer, 2010; Hisham, Flavel, Abdullah, Noor, & Franklin, 2018; Konie, 1964; Powell & Brodie, 1963; Schaefer, Black, & Scheuer, 2009; Shirley & Jantz, 2011), and dental development (AlQahtani, Hector, & Liversidge, 2010; Chaitanya, Reddy, Suhasini, Chandrika, & Praveen, 2018; Hussin et al., 2007; So, 1990).

The subadults were further differentiated as either children or adolescents based on age-at-death categories outlined in the Dentabase user manual (Pilloud et al., 2022), summarized in Table 2.7. According to these analyses, eight individuals were estimated to be children, and three were estimated to be adolescents. Of the eight children in the collection, the ages of three individuals were estimated following AlQahtani et al. (2010), which uses dental developmental stages for age estimation. Although radiographs of the dentition could not be taken, the dental root developmental stages of the three individuals were visible for assessment due to missing bone at the alveolus. The ages for these individuals were estimated as 9.5 to 10.5 years for BU 101, 6.5 to 7.5 years for BU 127, and 10.5 to 11.5 years for BU 134 (AlQahtani et al., 2010).

Table 2.7. Table of age categories in the Dentabase user manual (Pilloud et al., 2022).

Age Category	**Age (years)**
Neonate	0
Infant	0-3
Child	3-12
Adolescent	12-20
Young Adult	20-35
Middle Adult	35-50
Old Adult	50+
Adult	20+

Based on the spheno-occipital synchondrosis fusion and dental development stages (*i.e.*, presence of fully erupted permanent second and/or third molars), three individuals (BU 12, BU 18, and BU 41) were estimated to be adolescents due to their completely open synchondroses. According to literature on the time of spheno-occipital synchondrosis closure across various populations (Bassed et al., 2010; Hisham et al., 2018; Konie, 1964; Powell & Brodie, 1963; Schaefer et al., 2009; Shirley & Jantz, 2011), the upper age limit for open spheno-occipital synchondroses is 18 years. Although children also technically exhibit open spheno-occipital synchondroses, the three adolescents exhibit fully erupted permanent second molars, which was helpful in distinguishing them from the eight children in the collection. According to dental eruption charts based on studies done on different population groups (AlQahtani et al., 2010; Chaitanya et al., 2018; Hussin et al., 2007; So, 1990), individuals 12 years and older exhibit erupted second molars. As such, the individuals in this collection who exhibit open spheno-occipital synchondroses and fully erupted permanent second molars were categorized as adolescents (see Table 2.7).

Sex estimations for the crania were made following Walker (2008). Due to the lack of mandibles, the mental eminence could not be scored; only the nuchal crest, mastoid process, supra-orbital margin, and glabella were scored. Of the 130 adults, excluding the individual represented by a calotte, 32 were scored as female (F) or probable female (F?), and 98 were scored as male (M) or probable male (M?). Individuals with sex estimates as probable female and male were collapsed into the male and female categories in Table 2.1 and in the final analyses. Besides the individual represented by the calotte, there were no other individuals with indeterminate sex. Sex estimates were not made for the eight subadults in the collection and therefore marked as NAs in Table 2.1.

Data Collection Methods

Craniometric Data

Craniometric data were collected using traditional sliding and spreading calipers and a Microscribe G2X 3D digitizer using the program 3Skull (Ousley, 2004). While the digitizer recorded the cranial landmarks, 3Skull provided the interlandmark distance calculations and the XYZ coordinate data. Although all the crania in the collection were measured by traditional calipers, only 21 crania (approximately 15%) were re-measured by the digitizer for the intraobserver test. Despite the difference in craniometric data collection methods, previous literature has shown that data collected by both instruments are highly comparable (Hildebolt & Vannier, 1988). Measurement descriptions from Howells (1973), Langley, Jantz, Ousley, Jantz, & Milner (2016), and Martin & Knussmann (1988) were referenced. A total of 28 cranial interlandmark distances were collected in the study (Table 2.8).

Table 2.8. Cranial measurements collected in this study with their definitions and references.

Measurement Abbrev.	**Measurement Name**	**Measurement Definition**	**References**
GOL	Glabello-Occipital Length (or) Maximum Cranial Length	Direct distance from glabella to opisthocranion in the mid-sagittal plane	Howells (1973: 170); Langley et al. (2016: 65)
NOL	Nasio-Occipital Length	Maximum cranial length from nasion in the mid-sagittal plane	Howells (1973: 171); Langley et al. (2016: 65)
XCB	Maximum Cranial Breadth	Maximum cranial breadth, taken perpendicular to the mid-sagittal plane above the supramastoid crests, except at or around the inferior temporal lines	Howells (1973: 172); Langley et al. (2016: 65)
ZYB	Bizygomatic Breadth	Maximum breadth the zygomatic arches, wherever found, perpendicular to the mid-sagittal plane	Howells (1973: 173); Langley et al. (2016: 66)
BBH	Basion-Bregma Height	Direct distance from basion to bregma	Howells (1973: 172); Langley et al. (2016: 66)
BNL	Basion-Nasion Length	Direct distance from nasion to basion	Howells (1973: 171); Langley et al. (2016: 66)
BPL	Basion-Prosthion Length	Facial length from basion to prosthion	Howells (1973: 174); Langley et al. (2016: 66)
MAB	Palate Breadth, External (or) Maxillo-Alveolar Breadth	Maximum breadth across the maxillary alveolar borders, perpendicular to the meridian plane, taken on the lateral surfaces	Howells (1973: 176); Langley et al. (2016: 66)

Measurement Abbrev.	Measurement Name	Measurement Definition	References
		at the location of the second maxillary molars	
MAL	Maxillo-Alveolar Length	Distance from prosthion to alveolon	Martin & Knussmann (1988: 182); Langley et al. (2016: 66)
AUB	Biauricular Breadth	Minimum exterior breadth across the roots of the zygomatic processes, wherever found	Howells (1973: 173); Langley et al. (2016: 66)
NPH	Nasion-Prosthion Height (or) Upper Facial Height	Distance from nasion to prosthion	Howells (1973: 174); Langley et al. (2016: 66–67)
WFB	Minimum Frontal Breadth	Direct distance between the left and right frontotemporale	Martin & Knussmann (1988: 170); Langley et al. (2016: 67)
UFBR	Upper Facial Breadth	Distance between the left and right frontomalare temporale, taken at the external points on the frontomalar suture	Martin & Knussmann (1988: 179); Langley et al. (2016: 67)
NLH	Nasal Height	Average height from nasion to the lowest point on the border of the nasal aperture on either side	Howells (1973: 175); Langley et al. (2016: 67)
NLB	Nasal Breadth	Maximum breadth of the nasal aperture, taken at the anterior edges of the aperture	Howells (1973: 176); Langley et al. (2016: 68)
OBB	Orbital Breadth	Distance from dacryon to ectoconchion, approximating the longitudinal axis, bisecting the orbit into equal upper and lower halves	Howells (1973: 175); Langley et al. (2016: 68)
OBH	Orbital Height	Distance between the superior and inferior orbital margins, perpendicular to orbital breadth, bisecting the orbit into equal medial and lateral halves	Howells (1973: 175); Langley et al. (2016: 68)
EKB	Biorbital Breadth	Direct distance between left and right ectoconchion, across the orbits	Howells (1973: 178); Langley et al. (2016: 68)
DKB	Interorbital Breadth	Direct distance between left and right dacryon, across the nasal space	Howells (1973: 178); Langley et al. (2016: 69)

Measurement Abbrev.	Measurement Name	Measurement Definition	References
FRC	Frontal Chord (or) Nasion-Bregma Chord	Direct distance from nasion to bregma, taken in the mid-sagittal plane on the external surface	Howells (1973: 181); Langley et al. (2016: 69)
PAC	Parietal Chord (or) Bregma-Lambda Chord	Direct distance from bregma to lambda, taken in the mid-sagittal plane on the external surface	Howells (1973: 182); Langley et al. (2016: 69)
OCC	Occipital Chord (or) Lambda-Opisthion Chord	Direct distance from lambda to opisthion, taken in the mid-sagittal plane on the external surface	Howells (1973: 182); Langley et al. (2016: 69)
FOL	Foramen Magnum Length	Direct mid-sagittal distance from basion to opisthion	Howells (1973: 182); Langley et al. (2016: 69)
FOB	Foramen Magnum Breadth	Distance between the lateral margins of the foramen magnum at the point of greatest lateral curvature	Martin & Knussmann (1988: 171); Langley et al. (2016: 69)
MDH	Mastoid Height	Direct distance between porion and mastoidale, length of the vertical projection of the mastoid process	Howells (1973: 176); Langley et al. (2016: 69–70)
ASB	Biasterionic Breadth	Direct distance from the left to right asterion	Howells (1973: 174); Langley et al. (2016: 70)
ZMB	Bimaxillary Breadth	Breadth across the maxillae, from the left to right zygomaxillare anterior	Howells (1973: 177); Langley et al. (2016: 70)
ZOB	Zygoorbitale Breadth	Direct distance from the left to right zygoorbitale	Langley et al. (2016: 70)

Dental Metric Data

Dental metric data were collected using Paleo-Tech needlepoint sliding dental calipers following standard procedures outlined in Hillson (1996), Hillson, FitzGerald, & Flinn (2005), and Moorrees, Fanning, & Hunt (1963). For each left tooth (or the right, if the left was unobservable), four measurements were taken: 1) maximum mesiodistal crown diameter; 2) maximum buccolingual crown diameter; 3) mesiodistal cervical diameter; and 4) buccolingual cervical diameter. Data were collected only on maxillary dentition due to the absence of mandibles. All dental measurements collected in this study and their abbreviations are summarized in Table 2.9.

Table 2.9. Maxillary dental measurements collected in this study with their respective tooth categories.

Measurement Abbrev.	**Measurement**	**Tooth Category**
UI1_crn_md	Crown Mesiodistal Diameter	Upper Incisor 1 (UI1)
UI1_crn_bl	Crown Buccolingual Diameter	Upper Incisor 1 (UI1)
UI1_crx_md	Cervical Mesiodistal Diameter	Upper Incisor 1 (UI1)
UI1_crx_bl	Cervical Buccolingual Diameter	Upper Incisor 1 (UI1)
UI2_crn_md	Crown Mesiodistal Diameter	Upper Incisor 2 (UI2)
UI2_crn_bl	Crown Buccolingual Diameter	Upper Incisor 2 (UI2)
UI2_crx_md	Cervical Mesiodistal Diameter	Upper Incisor 2 (UI2)
UI2_crx_bl	Cervical Buccolingual Diameter	Upper Incisor 2 (UI2)
UC_crn_md	Crown Mesiodistal Diameter	Upper Canine (UC)
UC_crn_bl	Crown Buccolingual Diameter	Upper Canine (UC)
UC_crx_md	Cervical Mesiodistal Diameter	Upper Canine (UC)
UC_crx_bl	Cervical Buccolingual Diameter	Upper Canine (UC)
UP3_crn_md	Crown Mesiodistal Diameter	Upper Premolar 3 (UP3)
UP3_crn_bl	Crown Buccolingual Diameter	Upper Premolar 3 (UP3)
UP3_crx_md	Cervical Mesiodistal Diameter	Upper Premolar 3 (UP3)
UP3_crx_bl	Cervical Buccolingual Diameter	Upper Premolar 3 (UP3)
UP4_crn_md	Crown Mesiodistal Diameter	Upper Premolar 4 (UP4)
UP4_crn_bl	Crown Buccolingual Diameter	Upper Premolar 4 (UP4)

Measurement Abbrev.	Measurement	Tooth Category
UP4_crx_md	Cervical Mesiodistal Diameter	Upper Premolar 4 (UP4)
UP4_crx_bl	Cervical Buccolingual Diameter	Upper Premolar 4 (UP4)
UM1_crn_md	Crown Mesiodistal Diameter	Upper Molar 1 (UM1)
UM1_crn_bl	Crown Buccolingual Diameter	Upper Molar 1 (UM1)
UM1_crx_md	Cervical Mesiodistal Diameter	Upper Molar 1 (UM1)
UM1_crx_bl	Cervical Buccolingual Diameter	Upper Molar 1 (UM1)
UM2_crn_md	Crown Mesiodistal Diameter	Upper Molar 2 (UM2)
UM2_crn_bl	Crown Buccolingual Diameter	Upper Molar 2 (UM2)
UM2_crx_md	Cervical Mesiodistal Diameter	Upper Molar 2 (UM2)
UM2_crx_bl	Cervical Buccolingual Diameter	Upper Molar 2 (UM2)
UM3_crn_md	Crown Mesiodistal Diameter	Upper Molar 3 (UM3)
UM3_crn_bl	Crown Buccolingual Diameter	Upper Molar 3 (UM3)
UM3_crx_md	Cervical Mesiodistal Diameter	Upper Molar 3 (UM3)
UM3_crx_bl	Cervical Buccolingual Diameter	Upper Molar 3 (UM3)

Cranial Nonmetric & Macromorphoscopic Trait Data

Cranial nonmetric trait data were collected according to trait descriptions in El-Najjar & McWilliams (1978) and Hauser & Stefano (1989) (Table 2.10). Cranial MMS trait data were collected following trait descriptions in Hefner (2009) and Hefner, Plemons, Kamnikar, Ousley, & Linde (n.d.) in the MMS program (Ousley & Hefner, 2015) (Table 2.11). In total, 27 cranial nonmetric traits and 17 MMS traits were collected. Of the 27 cranial nonmetric traits collected, 20 traits are paired, and therefore collected on both the left and right sides, totaling 48 observations recorded for each cranium. Conversely, MMS traits were only scored on the side on which the trait is more prominent, even if the feature is a paired trait (Hefner et al., n.d.; Ousley & Hefner, 2015). Of the 27 cranial nonmetric traits scored, 16 were included in the Ossenberg (2013a) comparative dataset. To match the dichotomized scores in the comparative database, the 16 trait scores from the current study were dichotomized according to guidelines outlined in Ossenberg (2013b). Of the 17 MMS traits collected, six were dichotomized using guidelines from Hefner & Ousley (2014).

Table 2.10. Cranial nonmetric traits collected in this study, their score ranges, and breakpoints based on two different datasets.

Ossenberg Abbrev.	Hanihara Abbrev.	Cranial Nonmetric Trait	Midline or Paired	Score Range	Breakpoint (Ossenberg 2013)	Breakpoint (Hanihara & Ishida, 2001a,b, c,d; Hanhara et al., 1998)
METO	MET	Metopic Suture	Midline	0-2	2+	2+
NA	NA	Supraorbital Notch	Paired	0-4	NA	NA
SOFL/R	SOF_L/R	Supraorbital Foramen	Paired	0-2	1+	1+
CONL/R	NA	Infraorbital Suture	Paired	0-2	1+	NA
NA	AIOF_L/R	Multiple Infraorbital Foramina	Paired	0-3	NA	2+
NA	NA	Zygomatico-Facial Foramina	Paired	0-6	NA	NA
NA	NA	Parietal (Obelionic) Foramen	Paired	0-2	NA	NA
NA	NA	Epipteric Bone	Paired	0-1	NA	NA
NA	NA	Coronal Ossicle	Paired	0-1	NA	NA
NA	NA	Bregmatic Bone	Midline	0-1	NA	NA
NA	NA	Sagittal Ossicle	Midline	0-1	NA	NA
APIC	OL	Apical Bone	Midline	0-1	1+	1+
NA	NA	Lambdoid Ossicle	Paired	0-1	1+	NA
ASTL/R	ASB_L/R	Asterionic Bone	Paired	0-1	1+	1+

Ossenberg Abbrev.	Hanihara Abbrev.	Cranial Nonmetric Trait	Midline or Paired	Score Range	Breakpoint (Ossenberg 2013)	Breakpoint (Hanihara & Ishida, 2001a,b, c,d; Hanhara et al., 1998)
OMBL/R	OMB_L/R	Ossicle in Occipito-Mastoid Suture	Paired	0-1	1+	1+
PNBL/R	PNB_L/R	Parietal Notch Bone	Paired	0-1	1+	1+
INCA	IP	Inca Bone	Midline	0-4	1+	NA
POSL/R	CCA_L/R	Condylar Canal	Paired	0-1	1+	1+
HYPL/R	HGCB_L/R	Divided Hypoglossal Canal	Paired	0-4	3+	3+
NA	NA	Direction of Flexure for Superior Sagittal Sulcus	Midline	1-3	NA	NA
FSPL/R	NA	Foramen Ovale Incomplete	Paired	0-2	1+	NA
FSPL/R	NA	Foramen Spinosum Incomplete	Paired	0-2	1+	NA
CIVL/R	NA	Pterygo-Spinous Bridge or Spur	Paired	0-3	3+	NA
NA	NA	Pterygo-Alar Bridge or Spur	Paired	0-3	NA	NA
TYML/R	TD_L/R	Tympanic Dehiscence	Paired	0-2	1+	1+
NA	AEX_L/R	Auditory Exostosis (Torus)	Paired	0-3	NA	1+
TZSL/R[a]	TZS_L/R	Transversozygomatic Suture	Paired	0-2	1+	1+

[a] The original abbreviation in Ossenberg (2013) for this trait is "JAPL/R" (for "Os japonicum"), but TZSL/R is used in the current study instead to capture partial trace expressions of this trait and to reflect that this trait is also seen in populations outside of Japan in similar frequencies (Hanihara, Ishida, & Dodo, 1998).

Table 2.11. Macromorphoscopic traits collected in this study, their score ranges, and breakpoints.

Trait Abbrev.	Macromorphoscopic Trait Name	Score Range	Breakpoint
ANS	Anterior Nasal Spine	1-3	2+
INA	Inferior Nasal Aperture	1-5	4+
IOB	Interorbital Breadth	1-3	1-2
MT	Malar Tubercle	0-3	NA
NAS	Nasal Aperture Shape	1-3	NA
NAW	Nasal Aperture Width	1-3	1-2
NBC	Nasal Bone Contour	0-4	NA
NBS	Nasal Bone Shape	1-4	2+
NO	Nasal Overgrowth	0-1	NA
NFS	Nasofrontal Suture	1-4	NA
OBS	Orbital Shape	1-3	NA
PBD	Postbregmatic Depression	0-1	0
PZT	Posterior Zygomatic Tubercle	0-3	NA
SPS	Supranasal Suture	0-2	NA
TPS	Transverse Palatine Suture	1-4	NA
PS	Palate Shape	1-4	NA
ZS	Zygomaticomaxillary Suture	0-2	NA

Dental Nonmetric Data

Most dental nonmetric/morphological data were collected according to descriptions and guidelines outlined in the Dentabase manual (Pilloud et al., 2022), based on the Arizona State University Dental Anthropology System (ASUDAS) (Scott & Irish, 2017; Turner et al., 1991). Additional traits (*e.g.*, molar crenulation and potato tooth) following Pilloud, Maier, Scott, & Edgar (2018) and Perash et al. (2018) were also collected. Dental morphological expressions on all teeth from both sides of the dental arcade were recorded. However, only the key teeth described by Scott & Irish (2017) and the side with the maximum expression were included in statistical analyses, following the tooth count method (Scott, 1977; Turner, 1967). Table 2.12 presents a summary of dental morphological traits that were collected on the maxillary dentition. The grades of expression were dichotomized using the breakpoints provided in Scott & Turner (1997), Scott et al. (2018), and the Dentabase manual (Pilloud et al., 2022).

Table 2.12. Maxillary dental morphological traits collected in this study, respective teeth observed, grades of expression, and their breakpoints.

Morphological Trait Name	**Key Tooth**	**Grades of Expression**	**Breakpoint**
Winging	UI1	0-3	1+
Labial Convexity	UI1	0-5	2+
Shoveling	UI1	0-7	3+
Double Shoveling	UI1	0-6	2+
Interruption Grooves	UI2	0, M, D, MD, Med	Presence
Tuberculum Dentale	UI2	0-7	2+
Mesial Ridge	UC	0-3	1+
Distal Accessory Ridge	UC	0-5	2+
Diastema	UI, UC	0-2	1+
Dental Crowding	UI1-UI2, UC-UP4	0-3	1+
Accessory Cusps	UP3	0-3	1+
Uto-Aztecan premolar (or) Distosagittal Ridge	UP3	0-1	1

Morphological Trait Name	**Key Tooth**	**Grades of Expression**	**Breakpoint**
Metacone	UM3	0-6	3+
Hypocone	UM2	0-6	2+
Metaconule	UM1	0-5	1+
Carabelli's Trait	UM1	0-7	5+
Parastyle	UM1	0-6	2+
Molar Crenulation	UM2	0-2	1+
Enamel Extensions	UM1	0-3	2+
Root Number	UP3	1-3	2+
Potato Tooth	UM2, UM3	0-2	1+
Peg-shape	UM3	0-2	1+
Odontome	UP3, UP4	0-1	1
Congenital Absence	UM3	0-1	1

Exploratory Data Analysis and Data Wrangling

Before any statistical analyses were employed, various exploratory analyses were conducted. Exploratory data analysis (EDA) is a crucial first step to identify and understand data patterns, check for statistical assumptions that the data may violate, and pinpoint any anomalies in any dataset (Datar, 2019; G. R. Santos, 2023; US EPA, 2015). Results from EDA can then enable the selection of appropriate statistical analyses for the datasets in hand. Additionally, data preprocessing through transforming or restructuring raw data into certain desirable formats, a process known as data wrangling or data munging, is an equally important step before any statistical analysis or machine learning process can be run (Santos, 2023). All data analyses were conducted using the R statistical computing language and environment (R Core Team, 2023) and R Markdown (Allaire et al., 2014/2023; Xie, Allaire, & Grolemund, 2023; Xie, Dervieux, & Riederer, 2024). All tables were created using the *flextable* package (Gohel et al., 2024) in R and Microsoft Excel (*Microsoft® Excel for Mac*, 2024).

Missing Data

Missing data were visualized using the *vismiss* function in the R package *naniar* (Tierney & Cook, 2023). A visualization of missing data for each data type is represented in Figure 2.2 throughFigure 2.6. Overall, the Duckworth Burma collection exhibits 12.5% missing craniometric data (see Figure 2.2), 59.2% missing dental metric data (see Figure 2.3), 7% missing cranial nonmetric data (see Figure 2.4), 14% missing MMS data (see Figure 2.5), and 69.6% missing dental nonmetric data (see Figure 2.6).

Variables with more than 50% missing values were omitted in the final statistical analyses since variables with too many missing values can introduce bias in the analyses. Different individuals were omitted from each dataset, depending on the missing data pattern. All subadults were omitted in the craniometric dataset to remove any age- and size- related variances. No individuals were omitted for the cranial nonmetric dataset. All individuals represented by calvaria were omitted from the MMS dataset due to the lack of facial skeleton present, which precluded most MMS traits from being scored for these individuals.

Due to the high proportion of individuals in the collection exhibiting incomplete dentition, most variables in both dental datasets were missing, especially in the anterior dentition. Incisor and canine measurements were omitted from the dental metric dataset because of the high percentage (>60%) of missing variables. Lastly, all variables with more than 80% missing data, which included all incisor and canine traits and some premolar traits, were omitted from the dental nonmetric dataset.

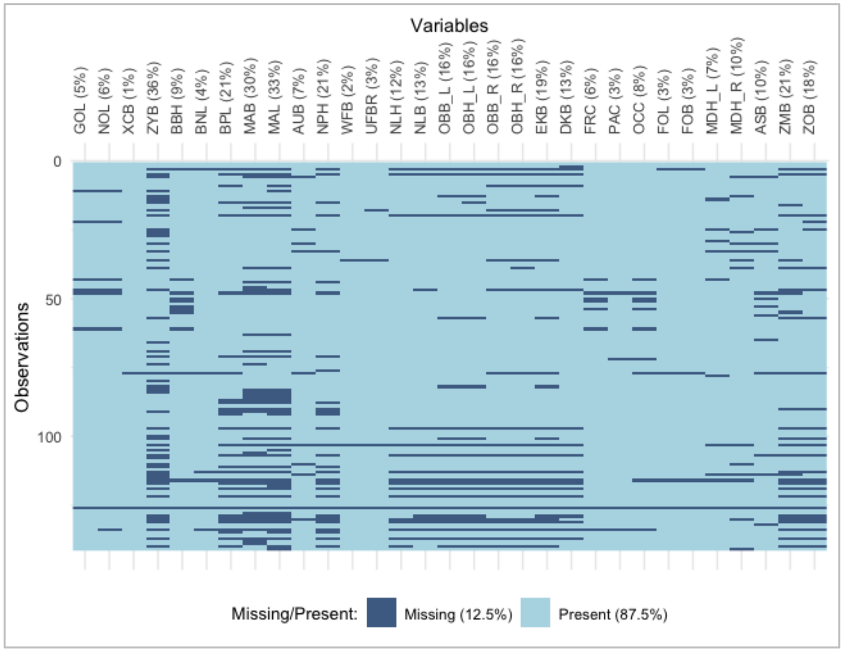

Figure 2.2. Visualization of missing craniometric data in the Duckworth Burma cranial collection. The percentage of missing data for each variable is indicated on top.

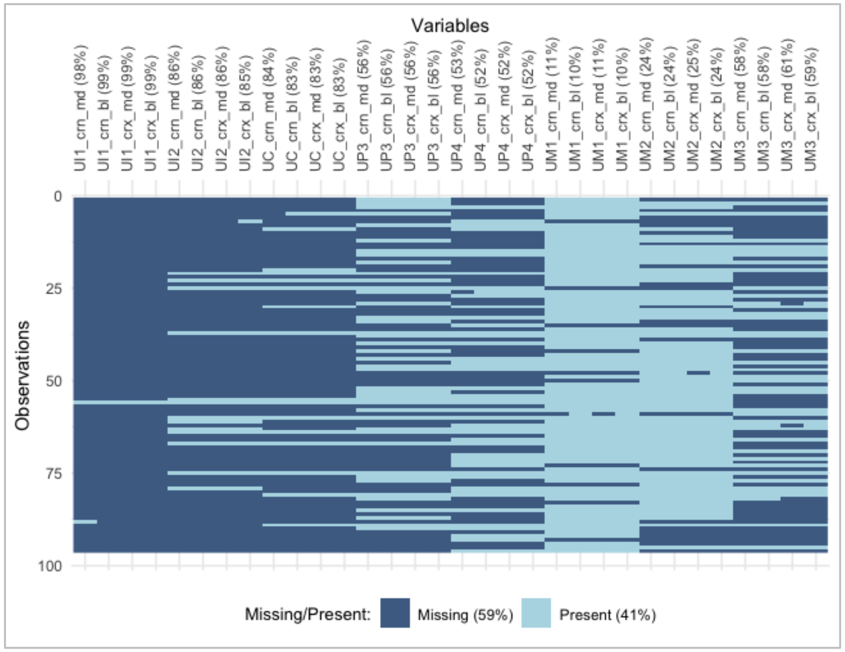

Figure 2.3. Visualization of missing dental metric data in the Duckworth Burma cranial collection. The percentage of missing data for each variable is indicated on top.

Figure 2.4. Visualization of missing cranial nonmetric data (not including MMS data) in the Duckworth Burma cranial collection. The percentage of missing data for each variable is indicated on top.

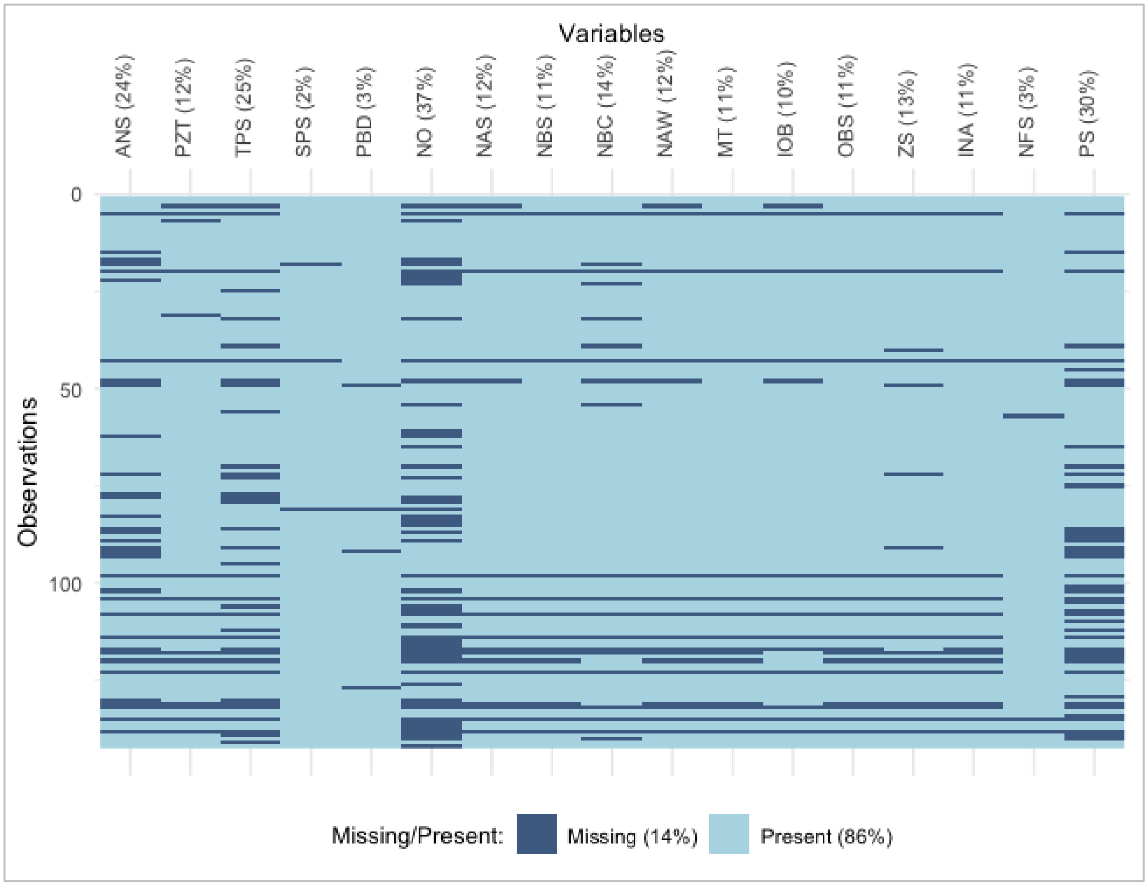

Figure 2.5. Visualization of missing MMS data in the Duckworth Burma cranial collection. The percentage of missing data for each variable is indicated on top.

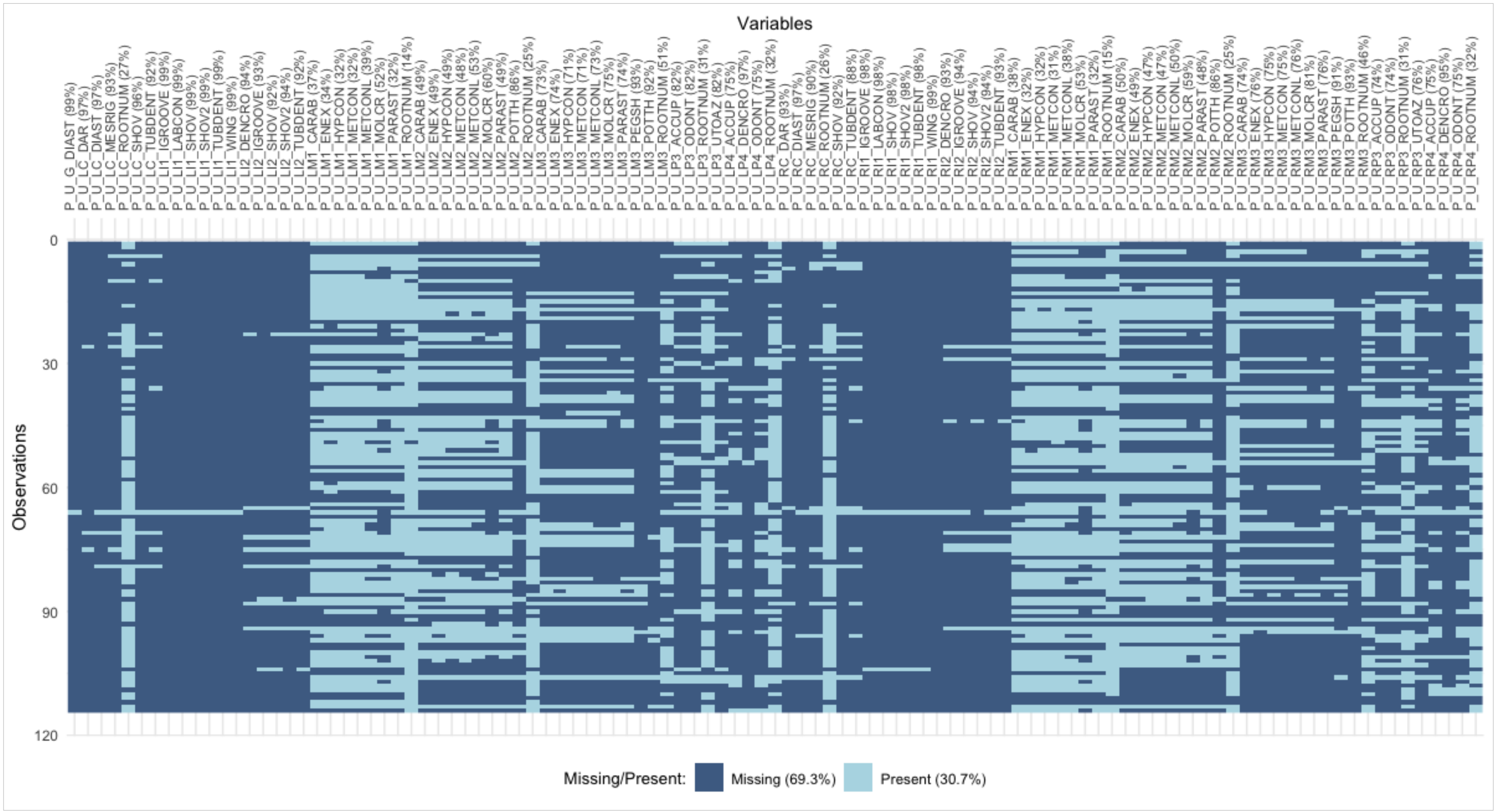

Figure 2.6. Visualization of missing dental nonmetric data in the Duckworth Burma cranial collection. The percentage of missing data for each variable is indicated on top.

Imputation Methods

Missing data were then imputed, rather than omitting every individual or variable with absent values. Implementing imputation methods can help make data analysis more robust than working with a reduced sample size as a result of sample omission, which can introduce bias. While there are numerous data imputation methods, it is important to select the most appropriate one depending on the type of data being analyzed (*e.g.*, continuous, nominal, ordinal) and the proportion of missing data. Therefore, craniometric and dental metric data (continuous data) were subjected to different imputation methods from cranial nonmetric, MMS, and dental nonmetric data, which are comprised of a mix of nominal and ordinal data. Although nominal and ordinal data types are both considered categorical, ordinal data are ordered in specific ranks, while order does not matter for nominal data. In the case of cranial and dental ordinal variables studied in this dissertation, the scores are based on the prominence of the trait being observed (*e.g.*, interorbital breadth [MMS trait], metopic suture [cranial nonmetric trait], first molar hypocone [dental nonmetric trait]).

Metric Data Imputation

For cranial and dental metric data, two different imputation methods were implemented and compared: k-Nearest Neighbor (k-NN) and Predictive Mean Matching (PMM). Based on previous literature on imputation methods on osteometric data, these two imputation methods have been shown to perform well in their ability to replicate missing data as closely as possible to complete datasets (Kenyhercz & Passalacqua, 2016; Pang & Liu, 2023).

One difference between the k-NN and PMM imputation methods is that the former is a single imputation method, while the latter is a multiple imputation method. In single imputation methods, missing data in a dataset are replaced once, while multiple imputation methods fill in the missing data multiple times based on different plausible values (P. Li, Stuart, & Allison, 2015; Schork, 2019; van Buuren, 2018). Specifically, k-NN imputation replaces missing values by using a certain number (*k*) of values with the closest Euclidean distances (hence, nearest neighbor) (Coxen, 2023; Htoon, 2020; Jadhav, Pramod, & Ramanathan, 2019). Using the *kNN* function in the *VIM* package (Kowarik & Templ, 2016), which uses *k*=5 (*i.e.*, five nearest neighbors) by default, the missing values in the Duckworth Burma metric datasets were imputed.

The PMM imputation randomly borrows from a chosen set of value donors from the complete cases with the closest predictive mean to replace the missing values (T. P. Morris, White, & Royston, 2014; van Buuren, 2018). As a multiple imputation method, PMM goes through multiple iterations to generate plausible values for the missing data (T. P. Morris et al., 2014; Schork, 2019; van Buuren, 2018). Using the *mice* function from the *mice* package (van Buuren & Groothuis-Oudshoorn, 2011), of which the default method is PMM with five iterations, a second imputed dataset for each Duckworth Burma metric dataset was created.

To determine which imputed dataset to use in the final analyses, the generated datasets were combined with comparative craniometric data and were subjected to LDA to analyze which dataset performed better in terms of accuracy rates for population classification. Overall, both k-NN- and PMM-imputed datasets performed similarly well to each other, with LDA classification accuracy rates of 0.2981 for the k-NN-imputed craniometric dataset and 0.2991 for the PMM-imputed craniometric dataset when testing the classification of 116 population groups with the sexes pooled (Table 4.1, see Chapter 4 Results). The population classification accuracy rates for the k-NN-imputed and PMM-imputed odontometric datasets are 0.1506 and 0.1532, respectively, for 105 population groups with the sexes pooled (Table 4.2, see Chapter 4 results), which also showed similar LDA classification performance to each other. However, because k-NN has been tested and recommended to be the best imputation option for biodistance studies (Kenyhercz & Passalacqua, 2016), the k-NN-imputed Duckworth Burma metric datasets were chosen for the final statistical analyses.

Nonmetric Data Imputation

Based on findings and recommendations by Memon, Wamala, & Kabano (2023) and Kenyhercz & Passalacqua (2016), k-NN was used to impute missing data in the Duckworth Burma cranial nonmetric (excluding MMS) and dental nonmetric datasets. Using the *kNN* function and *k*=5 in the *VIM* package (Kowarik & Templ, 2016), k-NN imputation was implemented for variables with less than 50% missing data in these two datasets.

For missing MMS data, the Iterative Robust Model-based Imputation (IRMI) algorithm was implemented following the recommendations by Kenyhercz, Passalacqua, & Hefner, (2019). The IRMI algorithm (Templ, Kowarik, & Filzmoser, 2011) is a robust, regression-based multiple imputation method that uses chained equations based on the methods of the Imputation and Variance Estimation Software (IVEware) (Raghunathan, Lepkowski, Hoewyk, & Solenberger, 2001). Essentially, the IRMI algorithm uses every missing variable as a response variable, while all the other variables act as the regressors (Templ et al., 2011). Further, the IRMI algorithm can handle outliers as well as mixed data types (*e.g.*, binary, categorical, continuous, etc.) robustly (Templ et al., 2011, 2011). Therefore, the *irmi* function in the *VIM* package (Kowarik & Templ, 2016) was used to impute missing variables in the Duckworth Burma MMS dataset.

Intraobserver Error Tests

To assess the reliability and reproducibility of the measurements used in the analyses, intraobserver error tests were conducted on approximately 15% of data collected on the Duckworth Burma cranial collection. Two iterations of measurements or scores were taken on the crania about three weeks apart (for cranial nonmetric, MMS, and dental metric and nonmetric data) to eight months apart (for craniometric data) between each iteration.

Metric Data Intraobserver Error

To quantify intraobserver measurement error for craniometric and odontometric data, absolute Technical Error Measurements (TEM) were calculated for each variable, following the recommendations of Fancourt & Stephan (2018), Jamison & Ward (1993), Perini, de Oliveira, dos Santos Ornellas, & de Oliveira, 2005), and Skipper (2022). The TEM is a common assessment of interobserver (between/among different observers) or intraobserver (multiple iterations for one observer) measurement error in anthropometry (Carsley et al., 2019; Perini et al., 2005). Further, absolute mean differences (d_i) were also calculated, which were a part of the absolute TEM equation, where d_i represents the absolute difference between measurements from the first and second rounds of data collection, and *n* represents the number of pairs included in the intraobserver error test:

Equation 2.1. Absolute TEM equation.

$$Absolute\ TEM = \sqrt{\frac{\Sigma\, d_i^2}{2n}}$$

The absolute TEM equation was written into a custom function in base R (RStudio Team, 2020) to calculate the absolute TEM values for each variable. Since TEM is a measure of difference or disagreement between observations, the higher the TEM, the less precise a measurement is. Based on previous literature assessing TEM in anthropometry, the suggested threshold for acceptable TEM values is 5%, since values above this threshold would be considered imprecise (Jamaiyah et al., 2010; Weinberg, Scott, Neiswanger, & Marazita, 2005).

Nonmetric Data Intraobserver Error

To quantify intraobserver measurement error for cranial nonmetric, MMS, and dental nonmetric data, unweighted and weighted Cohen's kappa scores were calculated based on recommendations by Hefner (2009) and Skipper (2022), using the *kappa2* function in the *irr* package (Gamer, Lemon, & Singh, 2019). Unweighted kappa scores were calculated for nominal data (Cohen, 1960), since any disagreements between observations for nominal data can be treated equally. Conversely, weighted kappa scores were calculated for ordinal data (Cohen, 1968), because weighted kappa scores can account for the different levels of weights that ordinal data portray. Unweighted Cohen's kappa is calculated as:

Equation 2.2. Unweighted Cohen's kappa equation.

$$K = \frac{P_o - P_e}{1 - P_e}$$

where K is the unweighted kappa, P_o (P *observed*) represents the proportion of observation agreements, and P_e (P expected by chance) represents the proportion of agreements that is expected to happen by chance. Weighted (linear) Cohen's kappa is calculated as:

Equation 2.3. Weighted (linear) Cohen's kappa equation.

$$K_w = \frac{P_o' - P_e'}{1 - P_e'}$$

where K_w is the weighted kappa, P_o' and P_e' are modified versions of P_o and P_e that account for the weights that reflect agreement between the observations. In general, the higher the kappa scores, which range from -1 to 1, are (*i.e.*, closer to 1), the higher the agreement is between the observations that are being compared. In addition to the kappa scores, a p-value for each nonmetric variable was also reported. A significant p-value of the Cohen's kappa test rejects the null hypothesis that the agreement seen between the observations is by chance.

Weighted and unweighted Cohen's kappa scores for all nonmetric variables in the current study were calculated using the *kappa2* function in the *irr* package (Gamer et al., 2019). Following recommended interpretations of Cohen's kappa scores by Landis & Koch (1977), variables with kappa scores below 0.61 (which are considered "moderate" or lower strengths of agreement) were excluded from the study.

Data Dichotomization

Nonmetric data were subjected to dichotomization according to appropriate breakpoints for two main purposes: to match the data format in the comparative datasets and to prepare the data for statistical analyses that require binary data. Cranial nonmetric variables matching those in comparative datasets were dichotomized following guidelines in Ossenberg (2013). Select MMS data were dichotomized following Hefner & Ousley's (2014) guidelines. Dental nonmetric data were dichotomized or trichotomized according to the breakpoints outlined in the Dentabase manual (Pilloud et al., 2022) and Scott & Irish (2017).

Normality Tests

Tests of normality were conducted on the comparative global craniometric and odontometric datasets, which include the k-NN-imputed Duckworth Burma metric datasets combined with the global samples listed in Table 2.2 and Table 2.3. A multivariate test of normality, Mardia’s test, was run on the metric datasets using the *mvn* function in the *MVN* package (Korkmaz, Goksuluk, & Zararsiz, 2014). The Mardia’s test reports both skewness and kurtosis, which showed that the global comparative data for craniometric variables do not show normal distribution. With this function, Anderson-Darling test, a univariate test of normality for large samples (n > 5000), was also implemented for each variable in the metric datasets. Similarly, the Anderson-Darling statistics for all variables showed that the metric data were not normally distributed (see Results section for full test statistics).

Because formal normality tests like Mardia and Anderson-Darling tests are sensitive to slight deviations from normality, especially at the tail ends of the data for large datasets (Royston, 1983), visual assessments for normality are often helpful in determining if a dataset exhibits normal distribution. Quantile-Quantile (Q-Q) plots and histograms for each craniometric and odontometric variable were also created. The Q-Q plots for most metric variables exhibited close to normal distribution, but most deviated at the tail ends (Figure A.1-Figure A.5 for craniometric variables, Figure A.6-Figure A.8 for odontometric variables, Appendix A). The histograms for most of the metric variables in this study exhibited slight to moderate skewness to normal distribution patterns (Figure A.9-Figure A.13 for craniometric variables, Figure A.14-Figure A.16 for odontometric variables, Appendix A). Overall, metric data in this study were treated as exhibiting non-normal distribution.

Descriptive Statistics (Craniometric Data)

Descriptive statistics for craniometric data, which included the minimum, mean, and maximum values of cranial interlandmark dimensions for all population groups were reported, with particular attention given to dimensions that have been shown to follow climate patterns (Roseman, 2004). Climate-associated measurements included in this study were BNL, BPL, MDH, FOL, ASB, XCB, AUB, FRC, and NLH. A summary of these statistics was included in Table B.7. Descriptive statistics outlining the minimum, mean, and maximum craniometric values for each population. BNL.Table B.7 of Appendix B.

Frequency Distributions (Nonmetric Data)

All nonmetric trait counts and frequencies were calculated, and the data distributions for each data type's variables were visually assessed. In base R (RStudio Team, 2020), the *table* and *prop.table* functions were used to calculate the score counts and relative frequencies by population. Frequency tables for cranial nonmetric data in the Ossenberg and Hanihara datasets (Table B.3-Table B.4), MMS data (Table B.5), and dental nonmetric data (Table B.6) were created[6]. Visualizations of trait frequencies were also created using the *ggplot* function (with *geom_bar* specified) in the *ggplot2* package (Wickham, 2016). Stacked bar charts showing the frequencies of the scores by trait are summarized for cranial nonmetric data (Figure 2.7), MMS data (Figure 2.8), and dental nonmetric data (Figure 2.9). Stacked bar charts showing the frequencies of each trait for the Duckworth Burma samples were included in Figure 4.17 in Chapter 4 (Statistical Results section).

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[6] Frequency table formatting follows tables in Vlemincq-Mendieta (2023).

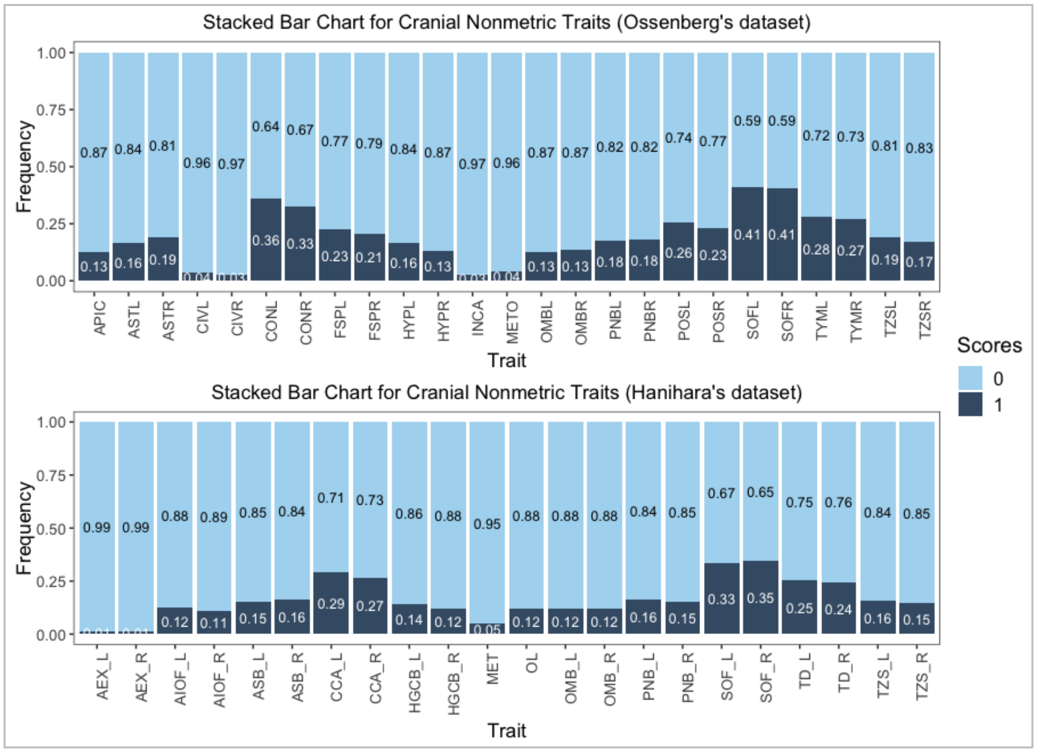

Figure 2.7. Stacked bar charts showing the relative frequencies of cranial nonmetric traits in the Ossenberg (top) and Hanihara (bottom) global comparative datasets.

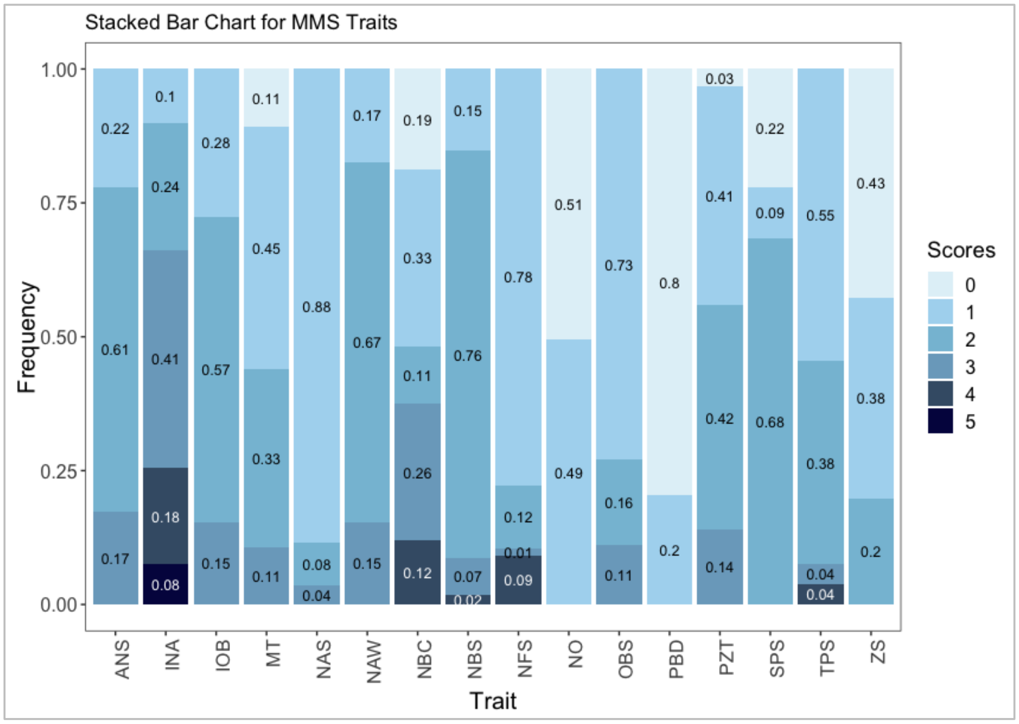

Figure 2.8. Stacked bar chart showing the relative frequencies of MMS traits in the global comparative dataset.

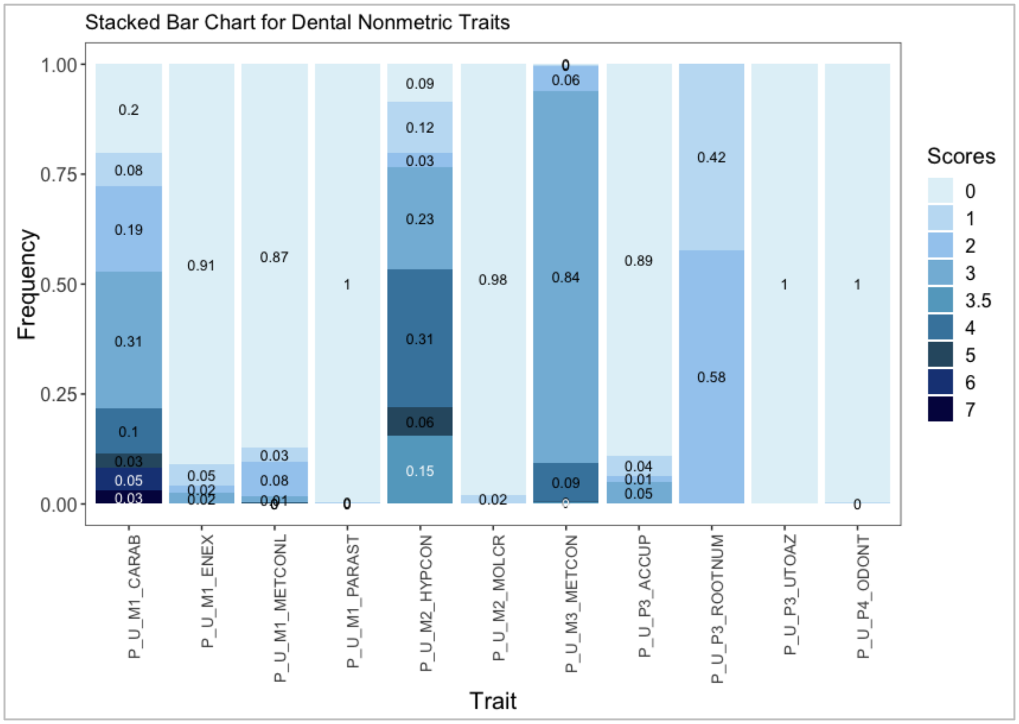

Figure 2.9. Stacked bar chart showing the relative frequencies of dental nonmetric traits (raw scores) in the global comparative dataset.

Normalization (Feature Scaling)

To set all craniometric data on a similar scale, a data preprocessing technique called feature scaling was implemented on metric data. In general, feature scaling enables all variables or features to have the same amount of contribution to the model, thereby ensuring that larger values in the raw dataset do not dominate over smaller values (Bhandari, 2020; Nwanganga & Chapple, 2020; Soni, 2023; Tricks, 2020). For example, cranial vault measurements such as maximum cranial breadth (XCB) are much larger than measurements in the facial region such as nasal breadth (NLB). To avoid a model in which XCB contributes more heavily to the model than NLB, feature scaling modifies all the values in the dataset to be in a similar range.

Two most commonly used feature scaling methods are normalization and standardization. Standardization, which is a method recommended for normally distributed data, sets a variable or feature’s mean to zero, with a standard deviation of one. Normalization, the alternative feature scaling method, sets the variables or features on a scale between zero and one and is recommended for data that exhibit non-normal distribution (Soni, 2023; Tricks, 2020). Since the comparative global craniometric and odontometric datasets in the current study exhibit non-normal distribution overall, normalization was implemented using the *preProcess* function with the method set as “range” in the *caret* package (Kuhn, 2008).

Outlier Detection

Multivariate outliers in the metric datasets were detected through a Principal Components Analysis (PCA), which reduced the dimensions of the variables overall and replaced many of the correlated variables with fewer uncorrelated variables. PCA was conducted on craniometric and odontometric data using the function *princomp* in the base R *stats* package (R Core Team, 2023) and plotted using the *fviz_pca_var* function in the *factoextra* package (Kassambara, 2017b) to visualize which variables might be contributing heavily to outliers (Figure 2.10 and Figure 2.11), which allowed a visual assessment of multivariate outliers in the metric datasets. In addition to plotting quantiles to identify normal distribution, Q-Q plots are also useful for detecting outliers. A visual assessment of Q-Q plots (see Figure A.1-Figure A.8, Appendix A) was used as a method to detect univariate metric outliers.

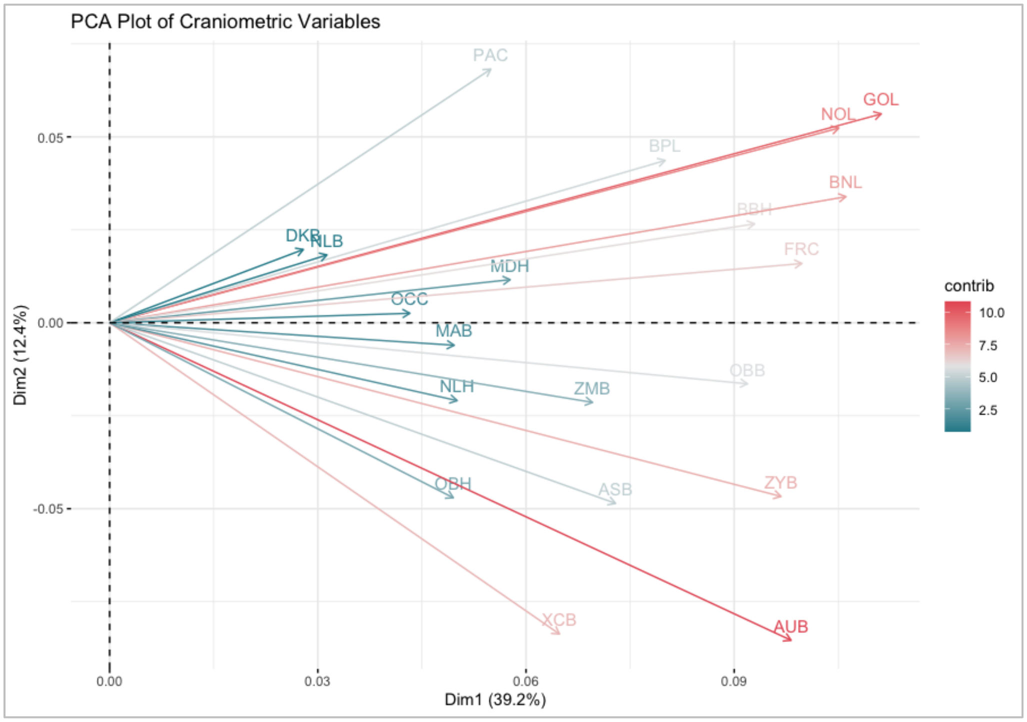

Figure 2.10. PCA plot of craniometric variables contributing to the outliers. Red, gray, and blue hues indicate high, intermediate, and low contribution, respectively.

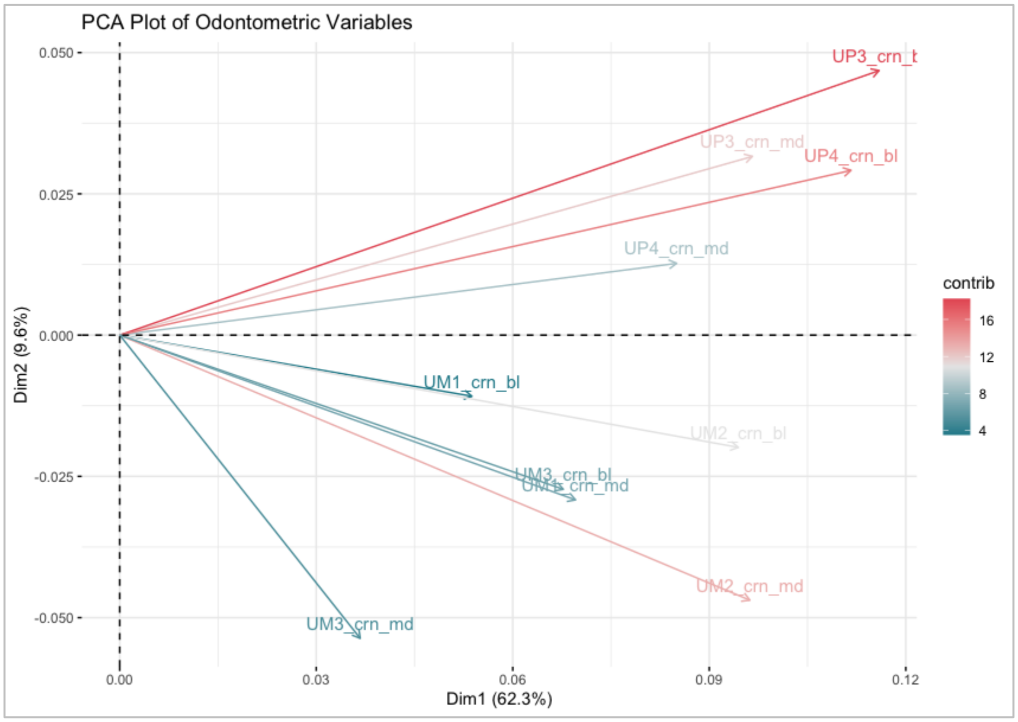

Figure 2.11. PCA plot of odontometric variables contributing to the outliers. Red, gray, and blue hues indicate high, intermediate, and low contribution, respectively.

Multicollinearity and Variable Selection

Metric Data Multicollinearity

Multicollinearity, which refers to the case in which a linear relationship exists between two independent variables, can cause issues for some statistical analyses, such as lower precision or distortion of relationships between independent and dependent variables (Belsley, 1976; Daoud, 2017). To avoid these issues, multicollinear variables in the craniometric and odontometric datasets were identified by calculating Spearman's rank correlation coefficients between the variables. A correlation matrix was created for each metric data type (Table A.1-Table A.2, Appendix A) using the *corr.test* function in the *pscyh* package (Revelle, 2024) and visualized (Figure 2.12 and Figure 2.13) using the *cor* and *corrplot* function in the *corrplot* package (Wei & Simko, 2021).

Metric Variable Selection

Metric variables with correlation coefficients over 0.80 in the correlation matrices, which were considered to show fairly high correlation, were removed. Additionally, two more methods were specifically used to select a list of craniometric variables to be included in the final statistical analyses. Using the *train* function in the *caret* package (Kuhn, 2008), a Random Forest (RF) model was built to select the variables with the highest importance in the dataset. Further, additional variables were manually omitted due to discrepancies observed between different comparative craniometric datasets. In sum, a total of 15 craniometric variables were selected to be used in the final craniometric statistical analyses: NOL, BNL, BBH, XCB, ASB, BPL, NLH, NLB, MAB, MDH, OBH, ZMB, FRC, PAC, and OCC.

The variable selection process for odontometric data depended vastly on the proportion of data that were present. As mentioned in the “Missing Data” section above, incisor and canine measurements were removed from the Duckworth Burma odontometric dataset due to the high percentage of missing data from these two tooth types. The Duckworth Burma and global comparative datasets were merged together based on crown measurements, which were the only common measurements across all datasets. As such, all cervical measurements were further removed, leaving 10 final crown measurements to be analyzed. Lastly, after removing odontometric variables with correlation coefficients over 0.80, nine odontometric variables remained, which included all crown measurements except for the buccolingual diameter of the upper fourth premolar (UP4_crn_bl).

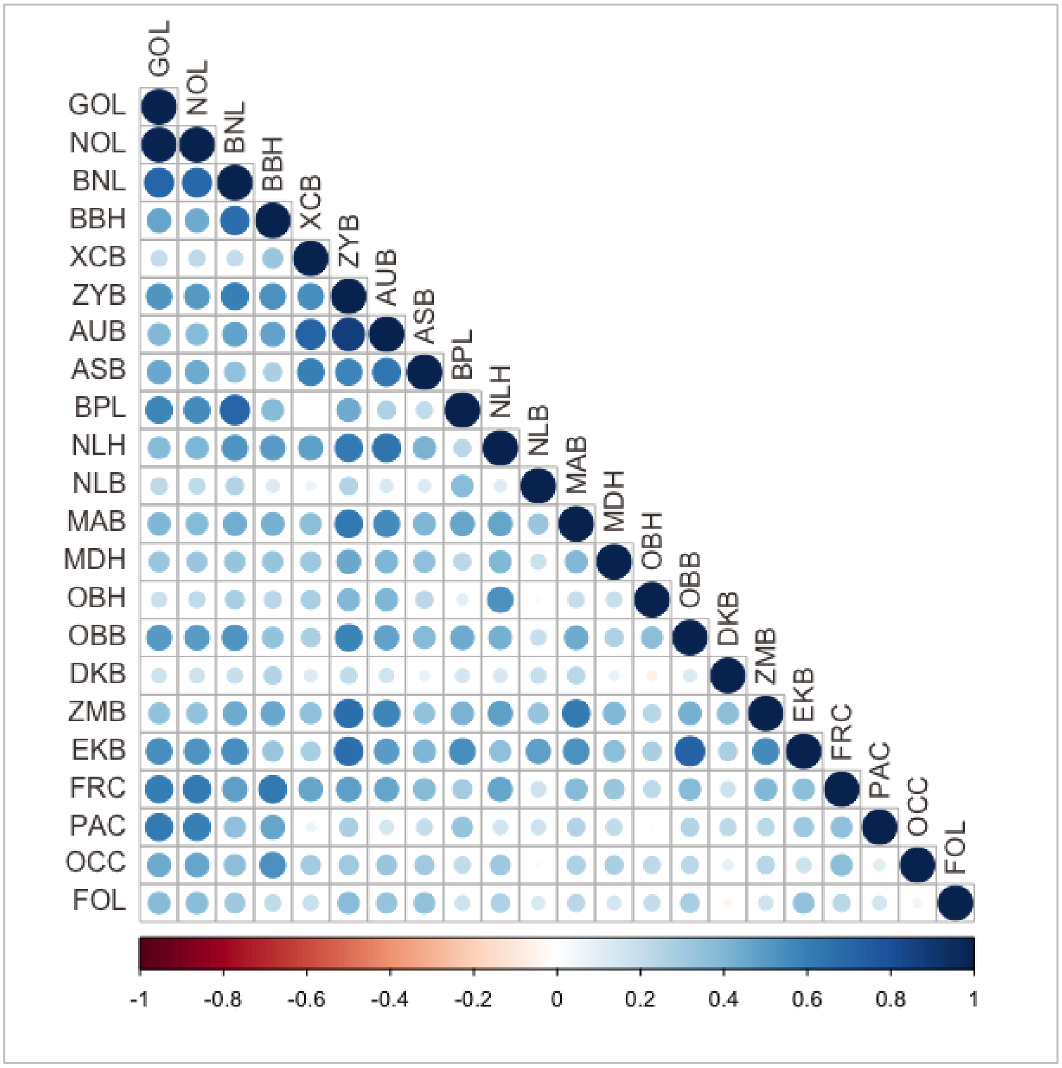

Figure 2.12. Correlation plot of variables for the comparative global craniometric dataset.

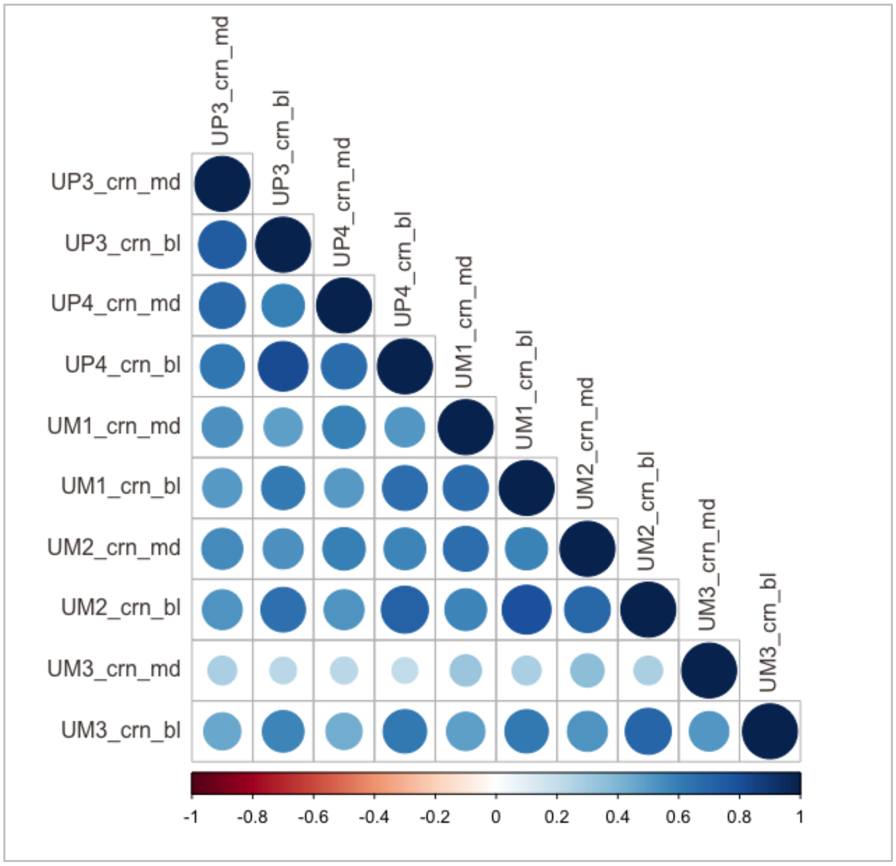

Figure 2.13. Correlation plot of variables for the comparative global odontometric dataset.

Nonmetric Data Multicollinearity

To test for multicollinearity between nonmetric variables, Cramér’s V scores were calculated. The Cramér’s V statistic measures how strongly two nominal variables are associated, and the scores range from 0 and 1. A correlation matrix for each nonmetric data type in the global comparative nonmetric datasets was created (Table A.3-Table A.6, Appendix A) using the *PairApply* function in the *DescTools* package (Signorell et al., 2024) and visualized (Figure 2.14 through Figure 2.17) using the *cor* and *corrplot* function in the *corrplot* package (Wei & Simko, 2021).

Nonmetric Variable Selection

The correlation plots for cranial nonmetric data (see Figure 2.14 andFigure 2.15) showed correlations between bilateral or paired variables. Therefore, cranial nonmetric variables observed from the right side were removed for the final analysis with the Ossenberg data and those from the left were removed for the Hanihara analysis. After removing bilateral variables, the following 13 cranial nonmetric variables remained to be included in the final analysis with Ossenberg's comparative data: METO, SOFL, TZSL, CONL, APIC, ASTL, OMBL, PNBL, INCA, HYPL, CIVL, FSPL, TYML (see Table 2.10 for trait names). For the final analysis with Hanihara's comparative data, the following 12 variables remained: MET, SOF_R, AIOF_R, OL, ASB_R, OMB_R, PNB_R, CCA_R, HGCB_R, TD_R, AEX_R, and TZS_R (see Table 2.10 for trait names).

No MMS variables were removed following the correlation matrix and plot based on the fairly low correlation coefficients between variables. However, due to a large proportion of missing data (>90% missing), palate shape (PS) was removed when the Duckworth Burma dataset and the comparative dataset were merged. Additionally, results from the intraobserver error test for MMS traits further helped with variable selection, leaving the following 12 MMS traits to be included in the final statistical analyses: ANS, INA, IOB, MT, NAW, NFS, NO, OBS, PZT, SPS, TPS, and ZS, four of which have dichotomized OSSA scores associated (ANS, INA, IOB, and NAW).

No dental nonmetric variables were removed based on results from the correlation matrix and plot, since the traits exhibited low correlation coefficients, similar to MMS traits. An array of dental nonmetric traits was removed prior to the calculation of correlation coefficients due to the large proportions of missing data. Further, variables scored on tooth types that were not key teeth (see above “Dental Nonmetric Data” section under “Data Collection Methods”) were removed as well. Results from the intraobserver error test for dental nonmetric traits further helped with variable selection. Lastly, P4 distosagittal ridge (Uto-Aztecan premolar) was removed due to the lack of variance of this trait in all samples, leaving the following 10 dental nonmetric traits to be included in the final statistical analyses: P3 accessory cusp, P3 root number, P4 odontomes, M1 Carabelli’s trait, M1 enamel extension, M1 parastyle, M1 metaconule, M2 hypocone, M2 molar crenulation, and M3 metacone.

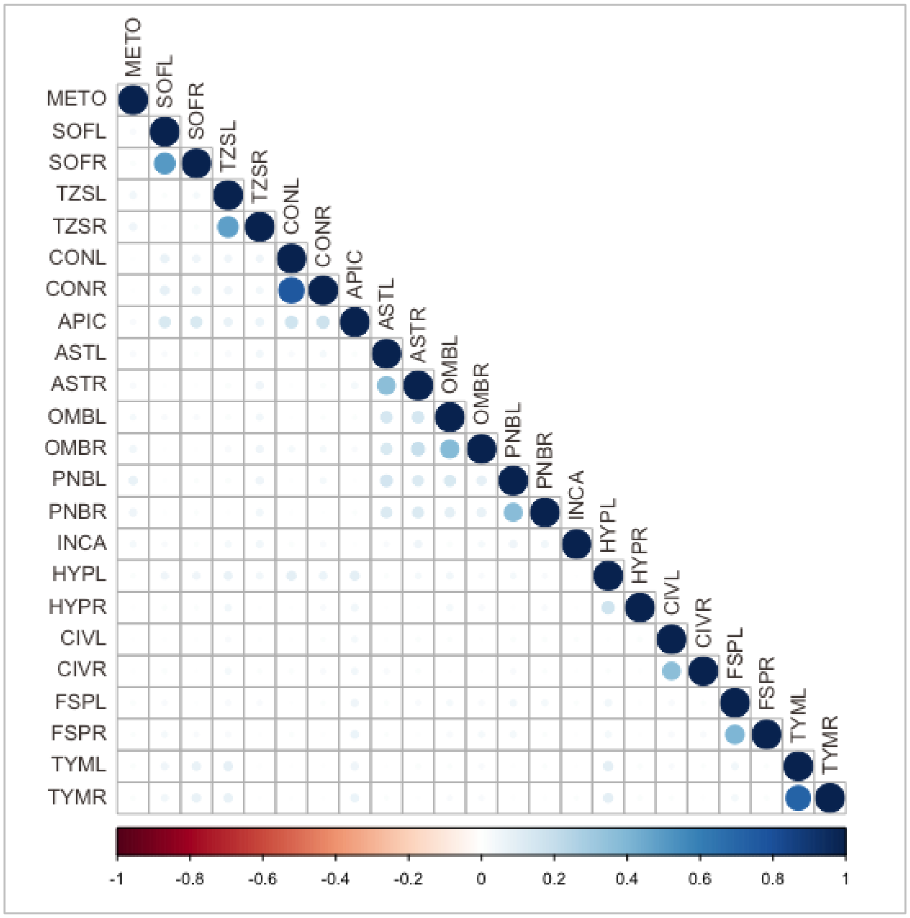

Figure 2.14. Correlation plot of variables for the Ossenberg comparative global cranial nonmetric dataset.

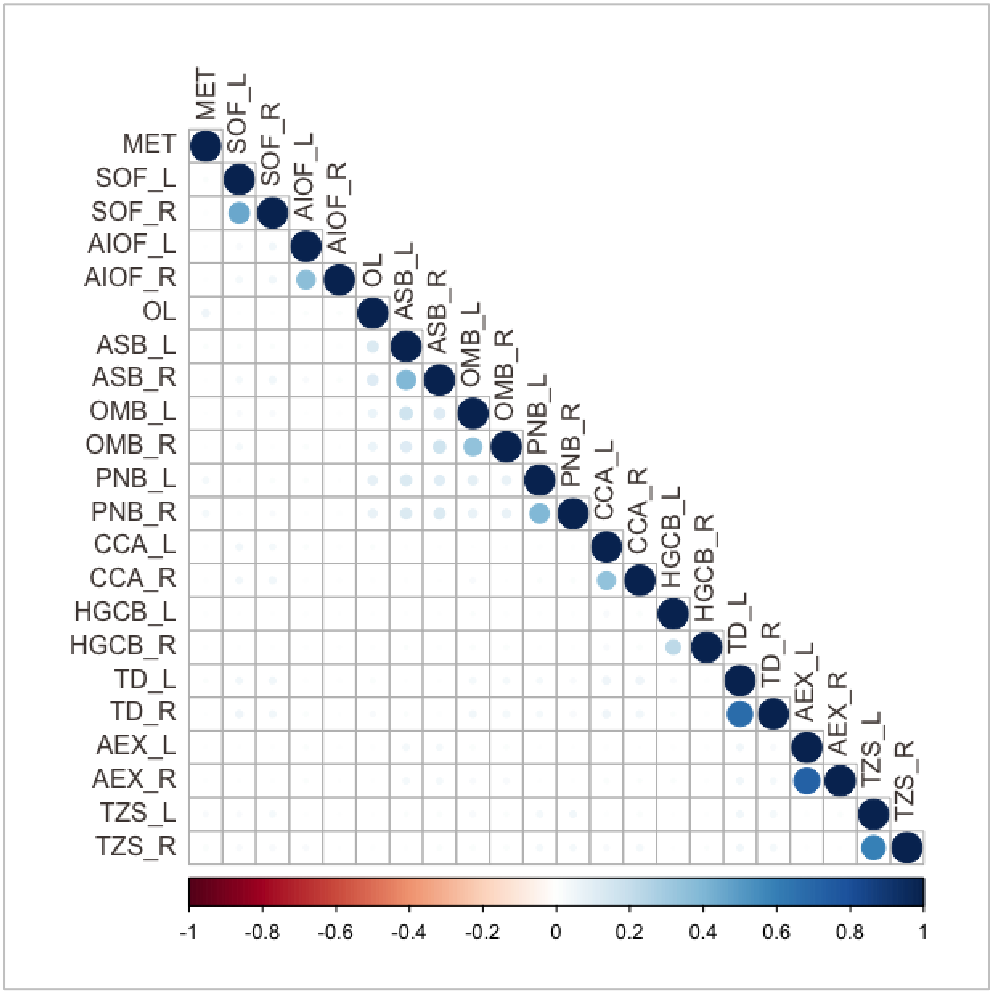

Figure 2.15. Correlation plot of variables for the Hanihara comparative global cranial nonmetric dataset

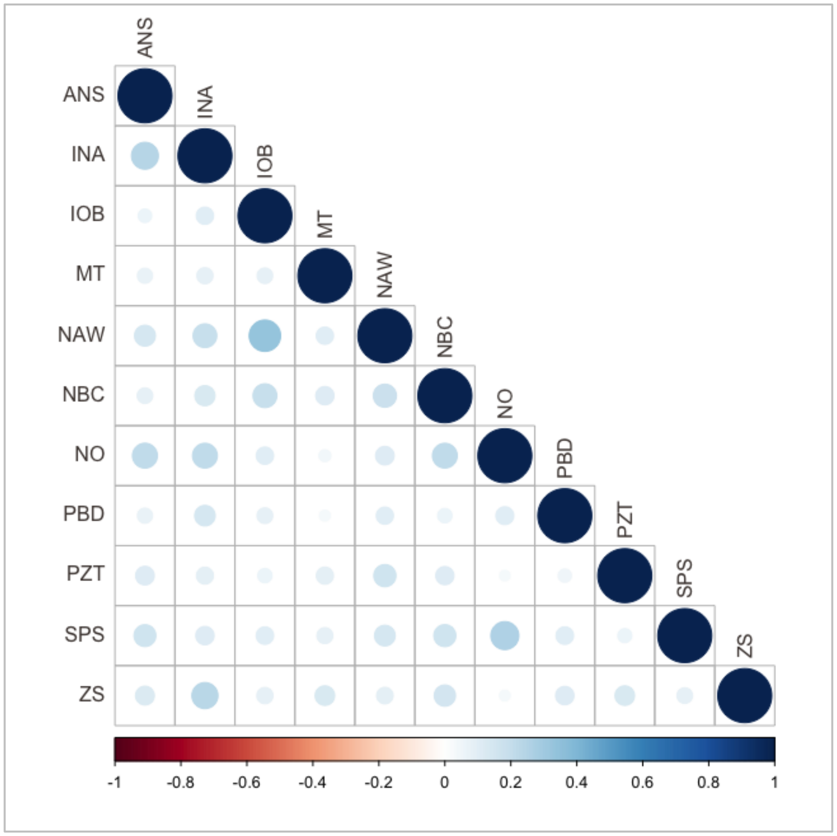

Figure 2.16. Correlation plot of variables for the comparative global MMS dataset.

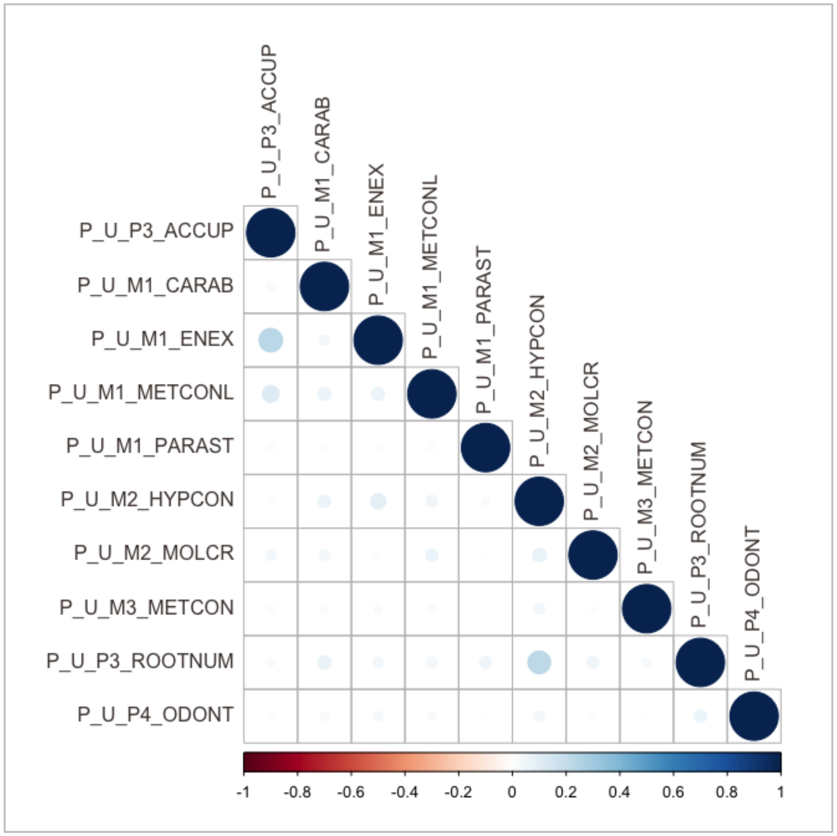

Figure 2.17. Correlation plot of variables for the comparative global dental nonmetric dataset.

Sexual Dimorphism

Potential effects that sexual dimorphism can have on statistical analyses and corresponding results were considered. To test for sexual dimorphism in the metric datasets, a Fligner-Killeen test of homogeneity of variances was implemented on each metric variable. The Fligner-Killeen test is most appropriate for non-normally distributed data and can account for problems related to outliers in datasets (Conover, Johnson, & Johnson, 1981; Fligner & Killeen, 1976). Using the function *fligner.test* in the *stats* package in base R (RStudio Team, 2020), variance between females and males in craniometric and odontometric data were tested.

Sexual dimorphism in the nonmetric datasets were tested through a Pearson's Chi-squared test using the *chisq.test* function for cranial nonmetric data and a Fisher's exact test using the *fisher.test* function for MMS and dental nonmetric data. Both functions are included in the base R package *stats* (RStudio Team, 2020). The decision between a Pearson's Chi-squared test and a Fisher's exact test for the datasets depended on whether any of the cells in the frequency count tables included values less than five. Any dataset containing at least one cell with a value less than five (*i.e.*, $n < 5$) was subjected to a Fisher's exact test, while datasets with expected number of observations greater than five were subjected to a Pearson's Chi-squared test. To ensure that sexual dimorphism would not have profound effects that could skew the results and interpretations, all statistical analyses were performed on pooled samples as well as separate female and male subsets.

Statistical Analysis

Metric Data

Supervised Learning: Discriminant Function Analysis

Discriminant Function Analysis (DFA) is one of the most common statistical analyses used to examine osteological metric data, especially craniometric data, to answer questions in biodistance in both forensic anthropological and bioarchaeological contexts. The goal of DFA is to predict the probability of group membership by maximizing differences among groups. Specifically, a type of DFA called LDA was implemented to analyze metric data in this study. The main objective of LDA is to predict the classes of observations based on combinations of predictors using group-specific means and a within-group variance-covariance matrix (Kassambara, 2018; Ousley, 2016). In this study, craniometric and odontometric measurements served as predictors used to calculate multivariate distances among population groups.

Prior to performing LDA on the entire comparative global craniometric and odontometric datasets, the data were parsed out into training (80% of each dataset) and test (the remaining 20%) subsets. The purpose of this partitioning is to train a portion of the data to build a model and use the test subset for an external validation independent from the comparative global sample. Using the function *lda* in the *MASS* package (Venables & Ripley, 2002), LDA was performed on the metric data. Following LDA, the performance of the analysis was examined by calculating the classification accuracy using the *predict* function in the *stats* package (R Core Team, 2023).

Another term used synonymously with LDA throughout this research is Canonical Variates Analysis (CVA). Despite the difference in names, both analyses perform the same task (Magwene, 2023). After implementing LDA on metric data and testing for model performance, canonical variates (CV) scores, which are group centroids, for all the population groups were calculated using the *candisc* function in the *candisc* package (Friendly & Fox, 2021). The calculated CV scores were then used to visualize the LDA results using functions from the *ggplot2* (Wickham, 2016) and *ggrepel* (Slowikowski et al., 2024) packages.

LDA Model excluding the Duckworth Burma Samples

To examine classification patterns of the Duckworth Burma samples against global samples, separate LDA models were built with metric data (one model for each data type) of all comparative global samples excluding the Duckworth Burma group. The Duckworth Burma samples were then tested against the LDA model for each data type through the *predict* function in the *stats* package (RStudio Team, 2020) after setting the “newdata” as the Duckworth Burma subset. The “class” column in the results listed out the groups into which the Duckworth Burma samples classified, indicating the group means with which each Duckworth Burma sample was closest. By assessing the diversity of these global sample groups into which the Duckworth Burma samples classified, the skeletal phenotypic diversity of the Duckworth Burma samples could be inferred.

Unsupervised Learning: Cluster Analysis

While DFA is considered a type of supervised learning because of the pre-labeling of the groups that are being analyzed, approaches such as cluster analysis are considered unsupervised learning. Supervised and unsupervised learning are the two main methods of training models in machine learning. The main difference between these two approaches is that supervised learning models use labeled data in the training process, while unsupervised learning models use unlabeled data and essentially let the structure of the data define its own model (Berry, Mohamed, & Yap, 2020; Sharma, Sharma, & Khanna, 2020).

Cluster analysis is an unsupervised approach that has been proposed as an alternative to supervised methods such as DFA (Dudzik & Kolatorowicz, 2016; Kenyhercz, 2021). The goal of cluster analysis is to examine relationships between any number of observations without being given predefined classes (Alonso-Betanzos & Bolón-Canedo, 2018; Kassambara, 2017a). Specifically, a type of cluster analysis called k-means clustering was implemented to explore data patterns in the craniometric and odontometric datasets. K-means clustering was used to assess the optimal number of subgroups that are necessary for exploring inter-population differences among the comparative global sample groups. Unlike the data preparation process for LDA, the observations on each individual in the datasets were not labeled by population or sex.

To calculate the optimal number of clusters, the elbow and average silhouette methods were implemented. The elbow method is useful for analyzing the within-cluster-sum-of-square (WCSS) values as a function the number of necessary clusters. The average silhouette method calculates the average silhouette to choose how well each observation lies within its cluster. K-means clustering analysis was conducted on the Duckworth Burma and the Hanihara Burma (British National History Museum) metric data using the *kmeans* function in the *stats* package (RStudio Team, 2020) and visualized using the *fviz_cluster* function in the *factoextra* package (Kassambara & Mundt, 2020).

The purpose of this analysis is to examine clustering patterns within the Burma population group.

Nonmetric Data

Mean Measure of Divergence (MMD)

A common statistical method to analyze nonmetric data in biodistance research is the Smith's MMD (de Souza & Houghton, 1977; Pink et al., 2016). This distance statistic, which is a measure of dissimilarity between groups, quantifies the distance between numerical values calculated from dichotomous nonmetric trait frequencies between sample groups. The MMD provides unbiased estimations of population distances, but one drawback is that under the assumptions of the MMD computation, intercorrelated/multicollinear traits cannot be included (Irish, 2010; Nikita, 2015). Therefore, all intercorrelated traits (*e.g.*, all cranial nonmetric observations on the left side) were removed prior to analysis.

In this study, MMD analyses were conducted on comparative global cranial (including MMS) and dental nonmetric data using functions in the *AnthropMMD* package (Santos, 2018). Two separate analyses were run for the two comparative cranial nonmetric datasets, Ossenberg (2013) and Hanihara (Hanihara & Ishida, 2001e; Hanihara et al., 2003) (hereafter referred to as the Ossenberg and Hanihara datasets), due to differences in comparable traits with the Duckworth Burma dataset. Moreover, based on findings by Hefner & Pilloud (2015), cranial nonmetric traits have been shown to follow geographic patterns. Following the general groupings from Hefner & Pilloud (2015), the population groups in the Ossenberg and Hanihara datasets in this study were assigned geographic regions from which the population groups originate. Consolidating the population samples in geographic regions provided a more organized approach, since both comparative datasets consist of over 100 groups per dataset.

A table with relative trait frequencies in the geographic regions was created from dichotomized scores for each comparative dataset using the *binary_to_table* function. Then, the MMD was computed for each group using the *mmd* function on the symmetrical matrix of the MMD values ($MMDSym). The MMD computation was implemented with the Anscombe's (1948) angular transformation applied to account for problems related to small sample sizes and extreme trait frequencies (Irish, 2010; Nikita, 2015). Although both Anscombe's (1948) and Freeman & Tukey (1950) provide the same outputs, Anscombe's transformation is less complicated than Freeman & Tukey's and has been graphically shown to perform marginally better in the asymptotical stabilization of sampling variance (Green & Suchey, 1976; Harris & Sjøvold, 2004). The transformed MMD formula is defined as:

Equation 2.4. Smith's MMD equation with transformed thetas.

$$MMD = \frac{\sum_{k=1}^{r}(\theta_{ik} - \theta_{jk})^2 - (\frac{1}{n_{ik} + 0.5} + \frac{1}{n_{jk} + 0.5})}{r}$$

where r represents the number of nonmetric traits observed in the study, n_{ik} and n_{jk} represent the sample sizes of samples i and j, and θ_{ik} and θ_{jk} represent the transformed frequencies (either Anscombe's or Freeman & Tukey's) of each trait in each sample.

Following the MMD computation, the MMD symmetrical matrix was used to plot a dendrogram using the *agnes* function in the *cluster* package (Maechler et al., 2023). The *agnes* function, which stands for agglomerative nesting, was used to compute the agglomerative hierarchical clustering of the three nonmetric comparative datasets. The agglomerative hierarchical clustering method, which is an unsupervised machine learning approach, first divides the data into clusters, which are then further clustered or aggregated as the distance between the groups decreases (Benhur, 2023). The computed hierarchical clustering was then plotted using the *plot* function from base R (RStudio Team, 2020), yielding a dendrogram of population groups for each nonmetric data type.

Diversity and Evenness Indices

Trait frequencies for the three nonmetric datasets were used calculate measures of diversity in the data to compare skeletal and dental phenotypes across the population groups assessed in this study. Based on the methods outlined in Marion, Fordyce, & Fitzpatrick (2015) and Philbin & Pilloud (2018), various diversity indices were calculated to quantify the complexity, which has been used as a proxy for diversity, in different populations. Originally developed for study species diversity in ecology, these measures of diversity have been applied to anthropology to answer biodistance research questions (Adams, 2020; Dern, 2023; Philbin & Pilloud, 2018). Based on the recommendations of Morris et al. (2014), multiple diversity indices were calculated and reported. In this dissertation, the following diversity indices were calculated for each nonmetric dataset: Shannon’s diversity index, Simpson’s diversity index, and Pielou’s evenness index.

Shannon’s diversity index (Shannon’s H) is a measure of entropy, which was developed from a theoretical background in information theory (Shannon, 1948) but has been applied to ecology to quantify species richness and evenness in an ecological community (E. K. Morris et al., 2014). While species richness refers to the sheer number of species that are present, evenness refers to the degree of distribution of individuals in each species (Adams, 2020; E. K. Morris et al., 2014). In the application of this concept to biodstance research, species richness is equated to the number of nonmetric traits observed, and evenness is represented by the distribution of nonmetric traits across the samples (Dern, 2023). Mathematically, Shannon's H diversity index is defined as:

Equation 2.5. Equation for Shannon's diversity index (H).

$$H' = -\sum_i p_i log_b p_i$$

where p_i represents the proportion of individuals that belong to a species i, and b represents the base of the logarithm, for which the natural log (ln) is most commonly used (E. K. Morris et al., 2014; Oksanen et al., 2022). The fundamental idea of this index is that the higher diversity a system exhibits, the higher the uncertainty in predictions that an individual belongs to a species (*i.e.,* higher entropy) will be (E. K. Morris et al., 2014). As such, the higher the Shannon's H index, which often ranges from 1.5 to 3.5, the greater the diversity. Although Shannon's H technically is boundless, it rarely exceeds 4.5 (Ortiz-Burgos, 2016). Shannon's H values were calculated for population groups surrounding Myanmar using the *diversity* function in the *vegan* package (Oksanen et al., 2022), in which "shannon" is the default index.

Similar to Shannon's H, Simpson's diversity index (D_1) is also a measure of entropy that captures both species richness and evenness. The equation for Simpson's diversity index is:

Equation 2.6. Equation for Simpson's diversity index (D_1)

$$D_1 = 1 - \sum {p_i}^2$$

where p_i represents the proportion of abundance in species i, just like in Shannon's H index. Simpson's diversity index represents the probability of two randomly chosen individuals belonging to two different species and therefore its values range between 0 and 1. Much like Shannon's H, the closer the index is to 1, the higher the diversity. In comparison to Shannon's H, Simpson's D_1 is more heavily dependent on evenness and therefore places more importance on the species (or trait frequencies in the context of biodistance research) that are most abundant (Dern, 2023; Magurran, 2013). Simpson's diversity index for each population group in the geographic regions around Myanmar was calculated using the diversity function in the *vegan* package (Oksanen et al., 2022) with the "simpson" index specified.

Lastly, Pielou's evenness index is a measure of evenness of individual distribution within a species. Mathematically, Pielou's evenness index is defined as:

Equation 2.7. Equation for Pielou's evenness index (J).

$$J = H/\log(S)$$

where H is Shannon's H diversity index and S is the number of species present (Oksanen et al., 2022; Pielou, 1966). As seen in the equation, the value for Pielou's evenness is dependent on the value for Shannon's H. However, unlike Shannon's H and Simpson's D_1, Pielou's index does not account for entropy and is strictly a measure of evenness. The values for Pielou's evenness index range from 0 to 1, with values closer to 1 indicating greater evenness of species or trait frequencies (*i.e.*, the distribution is more equal). Pielou's evenness index for each population group was calculated by dividing the Shannon's H value by the logarithm of the numbers of species, which was obtained by using the *specnumber* function in the *vegan* package (Oksanen et al., 2022).

R Matrix and F_{ST} Calculations

To examine quantitative measures of population structure, Wright's F_{ST} estimates were calculated in this study. Wright's F_{ST} estimates for cranial and dental metric data were calculated using RMET 5.0, kindly made available by Dr. John Relethford. RMET 5.0 is a software that uses quantitative phenotypic traits (*i.e.*, craniometric and odontometric data) to perform population genetics via Relethford & Blangero's (1990). Complete metric datasets, which included k-NN-imputed data, were used for the RMET analysis, since the software required that no missing data should be present. Further, because the maximum population group threshold for RMET 5.0 is 62, several population groups in the metric datasets were consolidated by combining the same population groups collected by different observers or removing population groups with low sample sizes. A summary of the population groups included in the final analyses are shown in Table 4.11 and Table 4.12 in Chapter 4 (Statistical Results). The R matrices were calculated using 15 measurements for craniometric data (NOL, BNL, BBH, XCB, ASB, BPL, NLH, NLB, MAB, MDH, OBH, ZMB, FRC, PAC, and OCC) and 9 measurements for odontometric data (all crown measurements except UP4_crn_bl).

The R workspace (Konigsberg, 1990) made available by Dr. Lyle Konigsberg at http://faculty.las.illinois.edu/lylek/ was used to calculate Wright's F_{ST} estimates for nonmetric data. A summary of the groups included in the final analyses are shown in Table 4.14-Table 4.17 in Chapter 4 (Statistical Results). The following traits were used in the calculation of the R matrices for the four nonmetric datasets: 1) METO, SOFL, CONL, APIC, ASTL, OMBL, PNBL, INCA, HYPL, CIVL, TYML, TZSL, and FSPL for the analysis with Ossenberg's comparative cranial nonmetric data; 2) MET, SOF_R,

AIOF_R, OL, OMB_R, PNB_R, CCA_R, HGCB_R, TD_R, AEX_R, TZS_R, and OSC_R for the analysis with Hanihara's comparative cranial nonmetric data; 3) ANS, INA, IOB, NAW, NBS, and PBD for MMS data; and 4) UP3 accessory cusp, UP3 distosagittal ridge, UM1 Carabelli's trait, UM1 enamel extension, UM1 metaconule, UM1 parastyle, UM2 hypocone, UM2 molar crenulation, UM3 metacone, UP3 root number, and UP4 odontome for dental nonmetric data.

Through the R workspace, several calculations were generated, including tetrachoric Mahalanobis distances (TMD) and their associated F_{ST} values, R matrices, and trait frequencies. Both RMET 5.0 and Konigsberg's (1990) R workspace generated D^2 matrices for each data type, which were used to quantify distances between every pair of population groups in the analyses. The TMD is a measure of dissimilarity between groups and is useful in quantifying the distance between the Duckworth Burma samples and the comparative samples. The F_{ST} values associated with the TMD matrices indicate the amount of variation that exists among populations.

Lastly, both RMET 5.0 and Konigsberg's (1990) R workspace reported eigenvectors, also known as principal coordinate (PCo) scores, which were used to quantify Euclidean distances between population groups in the principal coordinate analysis (PCoA). PCoA is a distance-based method used to represent dissimilarity between objects and therefore was used to examine similarities/dissimilarities between population groups analyzed in this study. The first two eigenvectors, or PCo scores, from the tests on all data types were plotted together using functions in *ggplot2* to visualize the spatial relationships between population groups.

FLEXDIST Analysis

Up until the previous section, all data types have been analyzed separately, with different statistical and machine learning methods implemented on metric and nonmetric data, which is the most common approach in biodistance research. In addition to these traditional approaches, this dissertation aims to include a more holistic approach that incorporates multiple data types in one analysis. As such, FLEXDIST was used to examine the relationships among population groups in this study using a mix of various data types collected.

FLEXDIST is a relatively novel R-based software tool developed by Rathmann, Lismann, Francken, & Spatzier (2023) that computes inter-individual Mahalanobis-type distances that can accommodate multiple variable types (metric and nonmetric). In this dissertation, the Duckworth Burma data was merged with a subset of comparative samples using selected data types collected. The comparative data subset included selected individuals from the Hanihara datasets that had craniometric, odontometric, and cranial nonmetric data associated. In total, 36 variables containing a mix of continuous and nominal data were used in this analysis. R code made available by Dr. Hannes Rathman at https://zenodo.org/doi/10.5281/zenodo.7869074 (Rathmann, 2024) was used for this analysis.

A main advantage of FLEXDIST is that it can handle missing data. One of the first steps of FLEXDIST involved imputing missing data by drawing randomly generated values from predictive kernel density estimates based on the distribution of existing data. Then, FLEXDIST gave the option of scaling continuous data, which was performed on the metric data in this study. After data imputation and standardization, the data were entered into a mixed data PCA to generate uncorrelated PCs, which was then followed by a conventional PCA. The uncorrelated PCs were then re-standardized, and the products of this standardization (new PC scores) were used as variables to create a pairwise Euclidean distance matrix across individuals. Then, three summary matrices, which included the median of the pairwise distance value distribution and the upper and lower bounds of a 95% confidence interval for each pairwise comparison, were calculated. Lastly, the results were visualized using a two-dimensional PCA plot based on a dataset in which the missing values were replaced by the median values (Rathmann et al., 2023).

Chapter 3: EXPLORATORY DATA ANALYSIS RESULTS

INTRAOBSERVER ERROR TEST RESULTS

The TEM values from the intraobserver error tests on craniometric and odontometric data are organized in Table 3.1Table 3.2, respectively. Following the recommended threshold of 5% for an acceptable TEM value in anthropometry research (Jamaiyah et al., 2010; Weinberg et al., 2005), any relative TEM values above 5% in this study were removed.

Weighted and unweighted Cohen's kappa scores from the intraobserver error tests on cranial nonmetric, MMS, and dental nonmetric data are summarized in Table 3.3Table 3.5. Based on recommendations by Landis & Koch (1977), variables lower than 0.60 were removed from final analyses and are highlighted in red in the tables.

Table 3.1. TEM results from the craniometric intraobserver error test. Variables highlighted in red were removed from final analyses.

Measure ment	Subjects (n pairs)	Obser-vations	Absolute Mean Difference	Absolute TEM	Relative TEM (%)
ASB	21	2	1.33	1.53	1.45
AUB	21	2	0.619	0.556	0.462
BBH	21	2	0.667	0.617	0.46
BNL	21	2	0.619	0.598	0.618
BPL	21	2	1.48	1.21	1.3
DKB	21	2	0.476	0.535	2.68
EKB	21	2	0.571	0.655	0.687
FOB	21	2	0.952	0.845	2.88
FOL	21	2	0.429	0.556	1.61
FRC	21	2	0.571	0.535	0.488

Measure ment	Subjects (n pairs)	Obser-vations	Absolute Mean Difference	Absolute TEM	Relative TEM (%)
GOL	21	2	1.52	1.18	0.699
MAB	21	2	0.952	0.873	1.37
MAL	21	2	1.33	1.2	2.35
MDH	21	2	3.76	2.79	9.41
MOW	21	2	0.81	0.886	1.62
NLB	21	2	0.524	0.636	2.47
NLH	21	2	0.81	0.886	1.74
NOL	21	2	1.9	1.46	0.881
NPH	21	2	2.62	1.98	2.92
OBB	21	2	0.429	0.512	1.33
OBH	21	2	0.762	0.724	2.13
OCC	21	2	0.714	0.707	0.758
PAC	21	2	0.81	0.707	0.661
UFBR	21	2	1.95	1.6	1.58
WFB	21	2	1.81	1.46	1.61
XCB	21	2	0.714	0.707	0.514
ZMB	21	2	0.476	0.577	0.601
ZYB	21	2	0.381	0.436	0.343

Table 3.2. TEM results from the odontometric intraobserver error test. Variables highlighted in red were removed from final analyses.

Measurement	Subjects (n pairs)	Obser-vations	Absolute Mean Difference	Absolute TEM	Relative TEM (%)
UI1_crn_bl	16	2	0.085	0.113	2.457
UI1_crn_md	16	2	0.082	0.111	5.869
UI1_crx_bl	16	2	0.058	0.0713	3.860

Measurement	Subjects (n pairs)	Obser-vations	Absolute Mean Difference	Absolute TEM	Relative TEM (%)
UI1_crx_md	16	2	0.128	0.161	15.249
UI2_crn_bl	16	2	0.278	0.272	21.502
UI2_crn_md	16	2	0.088	0.1	7.958
UI2_crx_bl	16	2	0.156	0.183	21.794
UI2_crx_md	16	2	0.144	0.198	5.121
UC_crn_bl	16	2	0.140	0.178	17.967
UC_crn_md	16	2	0.181	0.198	9.385
UC_crx_bl	16	2	0.198	0.271	1.381
UC_crx_md	16	2	0.102	0.142	2.999
UP3_crn_bl	16	2	0.103	0.179	1.315
UP3_crn_md	16	2	0.203	0.276	2.326
UP3_crx_bl	16	2	0.151	0.199	2.453
UP3_crx_md	16	2	0.081	0.124	3.769
UP4_crn_bl	16	2	0.054	0.111	2.277
UP4_crn_md	16	2	0.183	0.289	2.730
UP4_crx_bl	16	2	0.016	0.029	5.642
UP4_crx_md	16	2	0.043	0.0823	3.382
UM1_crn_bl	16	2	0.106	0.191	2.450
UM1_crn_md	16	2	0.093	0.147	4.954
UM1_crx_bl	16	2	0.079	0.154	11.311
UM1_crx_md	16	2	0.084	0.135	2.790
UM2_crn_bl	16	2	0.022	0.0553	2.077
UM2_crn_md	16	2	0.197	0.46	2.131
UM2_crx_bl	16	2	0.008	0.0144	2.728
UM2_crx_md	16	2	0.018	0.0413	7.645

Measurement	Subjects (n pairs)	Obser-vations	Absolute Mean Difference	Absolute TEM	Relative TEM (%)
UM3_crn_bl	16	2	0.040	0.0758	1.916
UM3_crn_md	16	2	0.037	0.0666	3.145
UM3_crx_bl	16	2	0.056	0.0842	3.798
UM3_crx_md	16	2	0.069	0.0784	4.630

Table 3.3. Cohen's Kappa results from the cranial nonmetric intraobserver error test. Variables highlighted in red were removed from final analyses.

Cranial Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
Apical_SB	23	2	0.813	4.450e-06	Unweighted
Asterionic_SB_L	23	2	0.681	5.080e-06	Unweighted
Asterionic_SB_R	23	2	0.681	5.080e-06	Unweighted
Audit_Exos_L	23	2	0.736	4.110e-08	Unweighted
Audit_Exos_R	23	2	0.736	4.110e-08	Unweighted
Bregmatic_SB	23	2	0.736	4.110e-08	Unweighted
Condyl_Canal_L	23	2	0.758	7.670e-06	Unweighted
Condyl_Canal_R	23	2	0.922	1.350e-07	Unweighted
Coronal_SB_L	23	2	0.817	9.600e-09	Unweighted
Coronal_SB_R	23	2	0.736	4.110e-08	Unweighted
Div_Hypogloss_Canal_L	23	2	0.776	6.400e-05	Weighted, Linear
Div_Hypogloss_Canal_R	23	2	0.953	4.440e-06	Weighted, Linear
Epipteric_SB_L	23	2	0.736	4.110e-08	Unweighted
Epipteric_SB_R	23	2	0.742	9.560e-07	Unweighted
FlexDir_SupSagSulc	23	2	0.587	2.580e-05	Unweighted
Foram_Ovale_L	23	2	0.656	1.640e-03	Weighted, Linear

Cranial Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
Foram_Ovale_R	23	2	0.742	1.560e-04	Weighted, Linear
Foram_Spinos_L	23	2	0.648	8.980e-04	Weighted, Linear
Foram_Spinos_R	23	2	0.777	3.990e-05	Weighted, Linear
Inca_Bone	23	2	0.574	1.620e-06	Unweighted
Infraorb_Sut_L	23	2	0.878	2.500e-05	Weighted, Linear
Infraorb_Sut_R	23	2	0.733	3.860e-04	Weighted, Linear
Lambdoid_SB_L	23	2	0.677	6.390e-05	Unweighted
Lambdoid_SB_R	23	2	0.817	1.500e-06	Unweighted
Metop_Sut	23	2	0.913	1.120e-05	Weighted, Linear
Mult_Infraorb_Foram_L	23	2	0.706	3.130e-04	Weighted, Linear
Mult_Infraorb_Foram_R	23	2	0.860	2.680e-05	Weighted, Linear
Occipitomast_SB_L	23	2	0.579	1.620e-05	Unweighted
Occipitomast_SB_R	23	2	0.778	9.850e-07	Unweighted
Pariet_Foram_L	23	2	0.858	6.540e-09	Unweighted
Pariet_Foram_R	23	2	0.921	1.300e-07	Unweighted
ParNotch_SB_L	23	2	0.778	9.850e-07	Unweighted
ParNotch_SB_R	23	2	0.646	1.260e-05	Unweighted
Pterygoalar_Bridge_Spur_L	23	2	0.764	1.970e-04	Weighted, Linear
Pterygoalar_Bridge_Spur_R	23	2	0.928	8.130e-06	Weighted, Linear
Pterygospin_Bridge_Spur_L	23	2	0.841	5.260e-05	Weighted, Linear
Pterygospin_Bridge_Spur_R	23	2	0.871	2.830e-05	Weighted, Linear
Sagittal_SB	23	2	0.574	1.620e-06	Unweighted
Supraorb_Foram_L	23	2	0.882	2.120e-05	Weighted, Linear

Cranial Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
Supraorb_Foram_R	23	2	0.961	3.660e-06	Weighted, Linear
Supraorb_Notch_L	23	2	0.796	2.430e-09	Unweighted
Supraorb_Notch_R	23	2	0.723	2.970e-09	Unweighted
Tymp_Dihisc_L	23	2	0.859	5.710e-10	Weighted, Linear
Tymp_Dihisc_R	23	2	0.857	1.860e-08	Weighted, Linear
Zygomat-facial_Foram_L	23	2	0.641	7.110e-15	Unweighted
Zygomat-facial_Foram_R	23	2	0.792	0.000e+00	Unweighted

Table 3.4. Cohen’s Kappa results from the MMS intraobserver error test. Variables highlighted in red were removed from final analyses.

MMS Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight	OSSA
ANS	21	2	0.759	3.910e-04	Weighted, Linear	Yes
INA	21	2	0.879	4.530e-05	Weighted, Linear	Yes
IOB	21	2	0.417	3.900e-02	Weighted, Linear	Yes
MT	21	2	0.786	2.410e-08	Unweighted	No
NAS	21	2	0.263	9.190e-02	Unweighted	No
NAW	21	2	0.800	1.620e-04	Weighted, Linear	Yes
NBC	21	2	0.554	9.420e-03	Weighted, Linear	No
NBS	21	2	0.429	1.130e-02	Unweighted	Yes
NFS	21	2	0.780	1.810e-08	Unweighted	No
NO	21	2	0.855	7.230e-08	Unweighted	No
OBS	21	2	0.634	2.430e-05	Unweighted	No

MMS Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight	OSSA
PBD	21	2	0.571	4.590e-06	Unweighted	Yes
PS	21	2	0.677	1.330e-08	Unweighted	No
PZT	21	2	0.729	7.120e-04	Weighted, Linear	No
SPS	21	2	0.693	8.350e-07	Unweighted	No
TPS	21	2	0.847	1.030e-07	Unweighted	No
ZS	21	2	0.636	1.030e-04	Unweighted	No

Table 3.5. Cohen's Kappa results from the dental nonmetric intraobserver error test. The variable highlighted in red was removed from final analyses.

Dental Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
P_U_G_DIAST	20	2	0.844	2.450e-05	Weighted, Linear
P_U_LC_DAR	20	2	0.915	2.450e-05	Weighted, Linear
P_U_LC_DIAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LC_MESRIG	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LC_ROOTNUM	20	2	0.881	6.910e-05	Weighted, Linear
P_U_LC_SHOV	20	2	0.981	1.120e-05	Weighted, Linear
P_U_LC_TUBDENT	20	2	0.784	2.830e-04	Weighted, Linear
P_U_LI1_IGROOVE	20	2	0.733	3.000e-07	Unweighted
P_U_LI1_LABCON	20	2	0.955	1.670e-05	Weighted, Linear
P_U_LI1_SHOV	20	2	0.867	2.940e-05	Weighted, Linear
P_U_LI1_SHOV2	20	2	0.758	1.320e-04	Weighted, Linear
P_U_LI1_TUBDENT	20	2	0.773	1.350e-04	Weighted, Linear
P_U_LI1_WING	20	2	0.758	1.320e-04	Weighted, Linear
P_U_LI2_DENCRO	20	2	0.733	3.000e-07	Unweighted
P_U_LI2_IGROOVE	20	2	0.733	3.000e-07	Unweighted

Dental Nonmetric Trait	**Subjects (n pairs)**	**Obser-vations**	**Cohen's Kappa**	**p-value**	**Weight**
P_U_LI2_SHOV	20	2	0.908	3.690e-05	Weighted, Linear
P_U_LI2_SHOV2	20	2	0.758	1.320e-04	Weighted, Linear
P_U_LI2_TUBDENT	20	2	0.758	1.320e-04	Weighted, Linear
P_U_LM1_CARAB	20	2	0.896	5.140e-05	Weighted, Linear
P_U_LM1_ENEX	20	2	0.961	1.720e-05	Weighted, Linear
P_U_LM1_HYPCON	20	2	0.988	9.810e-06	Weighted, Linear
P_U_LM1_METCON	20	2	0.990	9.270e-06	Weighted, Linear
P_U_LM1_METCONL	20	2	0.562	1.160e-02	Weighted, Linear
P_U_LM1_MOLCR	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LM1_PARAST	20	2	0.907	4.630e-05	Weighted, Linear
P_U_LM1_ROOTNUM	20	2	0.976	1.120e-05	Weighted, Linear
P_U_LM2_CARAB	20	2	0.782	1.840e-04	Weighted, Linear
P_U_LM2_ENEX	20	2	0.874	8.050e-05	Weighted, Linear
P_U_LM2_HYPCON	20	2	0.981	1.050e-05	Weighted, Linear
P_U_LM2_METCON	20	2	0.979	1.180e-05	Weighted, Linear
P_U_LM2_METCONL	20	2	0.932	1.840e-05	Weighted, Linear
P_U_LM2_MOLCR	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LM2_PARAST	20	2	0.907	4.630e-05	Weighted, Linear
P_U_LM2_POTTH	20	2	0.926	3.280e-05	Weighted, Linear
P_U_LM2_ROOTNUM	20	2	0.904	2.520e-05	Weighted, Linear
P_U_LM3_CARAB	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LM3_ENEX	20	2	0.972	1.300e-05	Weighted, Linear
P_U_LM3_HYPCON	20	2	0.961	1.510e-05	Weighted, Linear
P_U_LM3_METCON	20	2	0.976	1.210e-05	Weighted, Linear
P_U_LM3_METCONL	20	2	0.979	1.150e-05	Weighted, Linear
P_U_LM3_MOLCR	20	2	0.952	1.700e-05	Weighted, Linear

Dental Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
P_U_LM3_PARAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LM3_PEGSH	20	2	0.733	3.000e-07	Unweighted
P_U_LM3_POTTH	20	2	0.969	1.370e-05	Weighted, Linear
P_U_LM3_ROOTNUM	20	2	0.970	1.340e-05	Weighted, Linear
P_U_LP3_ACCUP	20	2	0.983	1.080e-05	Weighted, Linear
P_U_LP3_ODONT	20	2	0.733	3.000e-07	Unweighted
P_U_LP3_ROOTNUM	20	2	0.662	2.610e-03	Weighted, Linear
P_U_LP3_UTOAZ	20	2	0.952	1.700e-05	Weighted, Linear
P_U_LP4_ACCUP	20	2	0.908	3.500e-05	Weighted, Linear
P_U_LP4_DENCRO	20	2	0.733	3.000e-07	Unweighted
P_U_LP4_ODONT	20	2	0.733	3.000e-07	Unweighted
P_U_LP4_ROOTNUM	20	2	0.922	3.470e-05	Weighted, Linear
P_U_RC_DAR	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RC_DIAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RC_MESRIG	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RC_ROOTNUM	20	2	0.881	6.910e-05	Weighted, Linear
P_U_RC_SHOV	20	2	0.870	9.390e-05	Weighted, Linear
P_U_RC_TUBDENT	20	2	0.963	1.490e-05	Weighted, Linear
P_U_RI1_IGROOVE	20	2	0.733	3.000e-07	Unweighted
P_U_RI1_LABCON	20	2	0.918	4.030e-05	Weighted, Linear
P_U_RI1_SHOV	20	2	0.954	1.460e-05	Weighted, Linear
P_U_RI1_SHOV2	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RI1_TUBDENT	20	2	0.954	1.940e-05	Weighted, Linear
P_U_RI1_WING	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RI2_DENCRO	20	2	0.733	3.000e-07	Unweighted
P_U_RI2_IGROOVE	20	2	0.733	3.000e-07	Unweighted

Dental Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
P_U_RI2_SHOV	20	2	0.955	1.670e-05	Weighted, Linear
P_U_RI2_SHOV2	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RI2_TUBDENT	20	2	0.907	3.520e-05	Weighted, Linear
P_U_RM1_CARAB	20	2	0.919	3.040e-05	Weighted, Linear
P_U_RM1_ENEX	20	2	0.941	2.190e-05	Weighted, Linear
P_U_RM1_HYPCON	20	2	0.982	1.110e-05	Weighted, Linear
P_U_RM1_METCON	20	2	0.981	1.110e-05	Weighted, Linear
P_U_RM1_METCONL	20	2	0.963	1.670e-05	Weighted, Linear
P_U_RM1_MOLCR	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RM1_PARAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RM1_ROOTNUM	20	2	0.857	2.010e-05	Weighted, Linear
P_U_RM2_CARAB	20	2	0.672	9.850e-04	Weighted, Linear
P_U_RM2_ENEX	20	2	0.917	3.930e-05	Weighted, Linear
P_U_RM2_HYPCON	20	2	0.974	1.270e-05	Weighted, Linear
P_U_RM2_METCON	20	2	0.992	9.170e-06	Weighted, Linear
P_U_RM2_METCONL	20	2	0.844	1.180e-04	Weighted, Linear
P_U_RM2_MOLCR	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RM2_PARAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RM2_POTTH	20	2	0.963	1.490e-05	Weighted, Linear
P_U_RM2_ROOTNUM	20	2	0.922	2.860e-05	Weighted, Linear
P_U_RM3_CARAB	20	2	0.907	3.520e-05	Weighted, Linear
P_U_RM3_ENEX	20	2	0.982	1.100e-05	Weighted, Linear
P_U_RM3_HYPCON	20	2	0.939	2.310e-05	Weighted, Linear
P_U_RM3_METCON	20	2	0.961	1.420e-05	Weighted, Linear
P_U_RM3_METCONL	20	2	0.952	1.660e-05	Weighted, Linear
P_U_RM3_MOLCR	20	2	0.955	1.670e-05	Weighted, Linear

Dental Nonmetric Trait	Subjects (n pairs)	Obser-vations	Cohen's Kappa	p-value	Weight
P_U_RM3_PARAST	20	2	0.952	1.700e-05	Weighted, Linear
P_U_RM3_PEGSH	20	2	0.733	3.000e-07	Unweighted
P_U_RM3_POTTH	20	2	0.800	1.970e-04	Weighted, Linear
P_U_RM3_ROOTNUM	20	2	0.689	1.800e-03	Weighted, Linear
P_U_RP3_ACCUP	20	2	0.881	4.750e-05	Weighted, Linear
P_U_RP3_ODONT	20	2	0.733	3.000e-07	Unweighted
P_U_RP3_ROOTNUM	20	2	0.890	6.200e-05	Weighted, Linear
P_U_RP3_UTOAZ	20	2	0.758	1.320e-04	Weighted, Linear
P_U_RP4_ACCUP	20	2	0.872	5.920e-05	Weighted, Linear
P_U_RP4_DENCRO	20	2	0.733	3.000e-07	Unweighted
P_U_RP4_ODONT	20	2	0.733	3.000e-07	Unweighted
P_U_RP4_ROOTNUM	20	2	0.858	1.080e-04	Weighted, Linear

NORMALITY TEST RESULTS (METRIC DATA)

Tests of normality conducted on metric data in this study, which included the Duckworth Burma data and all comparative data listed in Table 2.2 to Table 2.3, showed that the data did not exhibit normal distribution. Results from Mardia’s multivariate normality tests on both craniometric and odontometric datasets are summarized in Table 3.6. Additionally, an Anderson-Darling univariate test of normality was also run on each metric variable. The results are summarized in Table 3.7 for craniometric data and Table 3.8 for odontometric data. Results from all normality tests indicated that metric data from both datasets were not distributed normally. As such, non-parametric tests were used for metric data analyses throughout this study.

Table 3.6. Results from Mardia's multivariate normality tests on craniometric and odontometric data.

Mardia's Test on Craniometric Data

Test	Mardia Statistic	p-value	Normality
Skewness	11283.846	0	No
Kurtosis	35.292	0	No

Mardia's Test on Odontometric Data

Test	Mardia Statistic	p-value	Normality
Skewness	12731.548	0	No
Kurtosis	335.616	0	No

Table 3.7. Results from Anderson-Darling univariate normality tests on craniometric data.

Craniometric Variable	Anderson-Darling Statistic	p-value	Normality
GOL	6.229	<0.001	No
NOL	6.897	<0.001	No
BNL	14.489	<0.001	No
BBH	9.239	<0.001	No
XCB	10.472	<0.001	No
ZYB	7.724	<0.001	No
AUB	8.833	<0.001	No
ASB	14.303	<0.001	No
BPL	10.751	<0.001	No
NLH	24.975	<0.001	No
NLB	68.264	<0.001	No
MAB	22.393	<0.001	No
MDH	30.791	<0.001	No

Craniometric Variable	Anderson-Darling Statistic	p-value	Normality
OBH	68.781	<0.001	No
OBB	61.458	<0.001	No
DKB	87.419	<0.001	No
ZMB	4.372	<0.001	No
FRC	13.588	<0.001	No
PAC	8.733	<0.001	No
OCC	18.608	<0.001	No

Table 3.8. Results from Anderson-Darling univariate normality tests on odontometric data.

Odontometric Variable	Anderson-Darling Statistic	p-value	Normality
UP3_crn_md	2.659	<0.001	No
UP3_crn_bl	1.7191	2.00E-04	No
UP4_crn_md	1.9117	1.00E-04	No
UP4_crn_bl	2.119	<0.001	No
UM1_crn_md	4.896	<0.001	No
UM1_crn_bl	10.4786	<0.001	No
UM2_crn_md	3.6014	<0.001	No
UM2_crn_bl	6.8132	<0.001	No
UM3_crn_md	28.7877	<0.001	No
UM3_crn_bl	12.9938	<0.001	No

SEXUAL DIMORPHISM TEST RESULTS

All datasets were tested for sexual dimorphism. Metric data were analyzed using the Fligner-Killeen test of homogeneity of variances, and nonmetric data were analyzed using Pearson’s Chi-squared test or Fisher’s exact test. Results from the Fligner-Killeen tests for craniometric and odontometric data are summarized in Table 3.9 and Table 3.10, respectively. Pearson’s Chi-squared test results for cranial nonmetric data, run separately for the Ossenberg and the Hanihara datasets, are summarized in Table 3.11 Table 3.12, respectively. Fisher’s exact tests results for MMS and dental nonmetric data are summarized in

Table 3.14 and Table 3.14, respectively. Results from tests on sexual dimorphism for all datasets except the dental nonmetric dataset showed that there was at least one variable that exhibited variance between females and males.

Table 3.9. Results from the Fligner-Killeen test of homogeneity between sexes on comparative craniometric data.

Craniometric Variable	Median Chi-squared	df	p-value	Variance between Sexes
GOL	18.680	1	1.55E-05	Yes
NOL	14.979	1	0.0001087	Yes
BNL	3.547	1	0.05965	No
BBH	7.365	1	0.006651	Yes
XCB	29.991	1	4.34E-08	Yes
ZYB	41.688	1	1.07E-10	Yes
AUB	14.098	1	0.0001735	Yes
ASB	19.370	1	1.08E-05	Yes
BPL	0.813	1	0.3673	No

Craniometric Variable	Median Chi-squared	df	p-value	Variance between Sexes
NLH	4.773	1	0.02891	Yes
NLB	19.304	1	1.12E-05	Yes
MAB	26.011	1	3.40E-07	Yes
MDH	1.494	1	0.2216	No
OBH	0.009	1	0.9263	No
OBB	2.100	1	0.1473	No
DKB	36.243	1	1.74E-09	Yes
ZMB	26.620	1	2.48E-07	Yes
FRC	2.735	1	0.0982	No
PAC	1.332	1	0.2484	No
OCC	12.089	1	0.0005071	Yes

Table 3.10. Results from the Fligner-Killeen test of homogeneity between sexes on comparative odontometric data.

Odontometric Variable	Median Chi-squared	df	p-value	Variance between Sexes
UP3_crn_md	0.665	1	0.4147	No
UP3_crn_bl	0.531	1	0.4662	No
UP4_crn_md	2.079	1	0.1493	No
UP4_crn_bl	0.42	1	0.5167	No
UM1_crn_md	0.964	1	0.3262	No
UM1_crn_bl	0.785	1	0.3755	No
UM2_crn_md	2.868	1	0.09037	No
UM2_crn_bl	1.835	1	0.1755	No
UM3_crn_md	4.463	1	0.03463	Yes
UM3_crn_bl	1.697	1	0.1927	No

Table 3.11. Results from Pearson's Chi-squared test with Yates' continuity correction on comparative cranial nonmetric data from the Ossenberg dataset.

Cranial Nonmetric Trait	**Chi-squared**	**df**	**p-value**	**Variance between Sexes**
METO	3.0661	1	0.07994	No
SOFL	18.139	1	2.05E-05	Yes
SOFR	19.873	1	8.28E-06	Yes
CONL	0.73257	1	0.3921	No
CONR	0.31257	1	0.5761	No
APIC	2.6367	1	0.1044	No
ASTL	31.774	1	1.73E-08	Yes
ASTR	46.721	1	8.19E-12	Yes
OMBL	0.078678	1	0.7791	No
OMBR	0.53623	1	0.464	No
PNBL	3.5981	1	0.05785	No
PNBR	15.241	1	9.46E-05	Yes
INCA	3.3011	1	0.06924	No
POSL	4.7107	1	0.02998	Yes
POSR	6.4306	1	0.01122	Yes
HYPL	72.151	1	< 2.2e-16	Yes
HYPR	0.049611	1	0.8237	No
CIVL	16.338	1	5.30E-05	Yes
CIVR	33.433	1	7.38E-09	Yes
TYML	178.88	1	< 2.2e-16	Yes
TYMR	176.53	1	< 2.2e-16	Yes
TZSL	88.653	1	< 2.2e-16	Yes
TZSR	21.23	1	4.07E-06	Yes

Cranial Nonmetric Trait	Chi-squared	df	p-value	Variance between Sexes
FSPL	53.429	1	2.68E-13	Yes
FSPR	51.841	1	6.02E-13	Yes

Table 3.12. Results from Pearson's Chi-squared test with Yates' continuity correction on comparative cranial nonmetric data from the Hanihara dataset.

Cranial Nonmetric Trait	Chi-squared	df	p-value	Variance between Sexes
MET	1.8632	1	0.1723	No
SOF_L	45.596	1	1.45E-11	Yes
SOF_R	40.069	1	2.45E-10	Yes
AIOF_L	13.179	1	0.0002831	Yes
AIOF_R	20.081	1	7.42E-06	Yes
OL	0.046344	1	0.8296	No
ASB_L	66.408	1	3.67E-16	Yes
ASB_R	157.07	1	< 2.2e-16	Yes
OMB_L	3.72E-28	1	1	No
OMB_R	1.472	1	0.225	No
PNB_L	3.9962	1	0.0456	Yes
PNB_R	2.5932	1	0.1073	No
CCA_L	20.035	1	7.61E-06	Yes
CCA_R	53.132	1	3.12E-13	Yes
HGCB_L	0.33503	1	0.5627	No
HGCB_R	0.47292	1	0.4916	No
TD_L	184.24	1	< 2.2e-16	Yes
TD_R	151.6	1	< 2.2e-16	Yes
AEX_L	45.673	1	1.40E-11	Yes

Cranial Nonmetric Trait	Chi-squared	df	p-value	Variance between Sexes
AEX_R	38.791	1	4.72E-10	Yes
TZS_L	45.283	1	1.71E-11	Yes
TZS_R	61.842	1	3.72E-15	Yes
OSC_L	14.621	1	0.0001314	Yes
OSC_R	4.9308	1	0.02638	Yes

Table 3.13. Results from Fisher's exact test on comparative MMS data.

MMS Trait	p-value	Variance between Sexes
ANS	0.0070	Yes
INA	0.0370	Yes
IOB	0.8543	No
MT	3.27E-07	Yes
NAW	8.36E-05	Yes
NFS	0.0002	Yes
NO	0.0239	Yes
OBS	0.8271	No
PZT	0.0001	Yes
SPS	< 2.2E-16	Yes
TPS	0.8598	No
ZS	0.8512	No

Table 3.14. Results from Fisher's exact test for comparative dental nonmetric data.

Dental Nonmetric Trait	p-value	Variance between Sexes
P_U_P3_ACCUP	0.7394	No
P_U_P3_UTOAZ	NA	NA

Dental Nonmetric Trait	**p-value**	**Variance between Sexes**
P_U_M1_CARAB	1	No
P_U_M1_ENEX	0.09571	No
P_U_M1_METCONL	0.7476	No
P_U_M1_PARAST	1	No
P_U_M2_HYPCON	0.3662	No
P_U_M2_MOLCR	0.106	No
P_U_M3_METCON	1	No
P_U_P3_ROOTNUM	0.42	No
P_U_P4_ODONT	1	No

Chapter 4: STATISTICAL ANALYSIS RESULTS

In this chapter, statistical analysis results are organized according to the corresponding aims and hypotheses of this study. The two major aims of this research are to examine within-group variation and diversity and to explore the evolutionary trends behind skeletal and dental variation in the Burma samples.

AIM #1: EXAMINE BIOLOGICAL MAKE-UP OF INDIVIDUALS FROM MYANMAR

Hypothesis #1: The Duckworth Burma crania will exhibit phenotypic diversity.

LDA Results

To demonstrate the phenotypic diversity observed in the Duckworth Burma collection, results from various statistical analyses were presented. First, two different LDA models were built based on craniometric and odontometric data from global comparative population groups. One model included the Duckworth Burma samples in the model and another excluded the Duckworth Burma samples. The purpose of the second model was to test into which global comparative samples the Duckworth Burma samples would classify, which was used as a proxy for phenotypic similarity. The first LDA models for the classification of all 116 population groups (see Appendix B for the complete list of population groups analyzed) for craniometric data and all 105 groups (see Appendix B) for odontometric data were conducted four separate times per dataset with the following specifications: 1) PMM-imputed dataset with pooled sexes; 2) k-NN-imputed dataset with pooled sexes; 3) k-NN-imputed dataset with females only; and 4) k-NN-imputed dataset with males only.

First, to determine if the LDA models were significant, the accuracy rates and associated statistics were reported (Table 4.1 and Table 4.2). The accuracy rate refers to the proportion of individuals or cases that were correctly classified within the LDA model, and the 95% CI is the confidence interval. The no information rate (NIR) is a baseline naïve classifier accuracy rate that could be calculated by always predicting the majority group or class. Ideally, for a model to be considered significant, the accuracy rate should be higher than the NIR, which is the case for craniometric data but not for odontometric data. The significance or non-significance of the accuracy of the model compared to the NIR is represented by the p-value. Lastly, the kappa represents the Cohen's kappa value that shows the agreement between predictions and true values. The kappa value, which falls between -1 and 1 indicates how well the model performs when compared to random chance. The closer the value is to 1, the better the agreement is; a kappa value of 0 indicates that the prediction is no better than random chance (Lee, 2023).

According to the statistical results on model significance, only the craniometric LDA model was significant, in that the p-values were significant for the accuracy being higher than the NIR. The accuracy rates for the craniometric model ranged from 0.296 to 0.407. Conversely, the odontometric LDA model exhibited non-significant p-values for the accuracy being higher than the NIR. The accuracy rates were also low, ranging from 0.1489 to 0.2209. As such, odontometric LDA results were not considered heavily in the conclusions of this study.

Confusion matrices for 116 population groups based on craniometric data (pooled sexes) and 105 groups for odontometric data (pooled sexes) are available in Table B.1

and Table B.2 of Appendix B, respectively. All analyzed population groups and the classifications of individuals based in the LDA were reported in the confusion matrices for both metric data types.

Table 4.1. LDA population classification accuracy rates and associated statistics on k-NN- and PMM-imputed craniometric datasets from 116 population groups[7]. The k-NN dataset was parsed into subsets by sex in addition to the model with pooled sexes.

	PMM (Pooled Sexes)	k-NN (Pooled Sexes)	k-NN (Females Only)	k-NN (Males Only)
Accuracy	0.2991	0.2981	0.407	0.296
95% CI	(0.2902, 0.3082)	(0.2892, 0.3072)	(0.3896, 0.4247)	(0.2853, 0.3068)
No Information Rate	0.0685	0.0684	0.075	0.069
P-Value [Acc > NIR]	< 2.2e-16	< 2.2e-16	< 2.2e-16	< 2.2e-16
Kappa	0.2878	0.2868	0.3943	0.2853

Table 4.2. LDA Population classification accuracy rates and associated statistics on k-NN- and PMM-imputed odontometric datasets from 105 population groups[8]. The k-NN dataset was parsed into subsets by sex in addition to the model with pooled sexes.

	PMM (Pooled Sexes)	k-NN (Pooled Sexes)	k-NN (Females Only)	k-NN (Males Only)
Accuracy	0.1532	0.1506	0.2209	0.1484
95% CI	(0.1444, 0.1624)	(0.1418, 0.1597)	(0.1996, 0.2433)	(0.1385, 0.1588)
No Information Rate	0.2176	0.2165	0.2861	0.2472
P-Value [Acc > NIR]	1	1	1	1
Kappa	0.1219	0.1197	0.1778	0.1204

---

[7] All 116 population groups analyzed in this craniometric LDA are listed in Table 2.2 (Howells, Pietrusewsky, FDB, and Yukyi DW Burma datasets) in Chapter 2 and Table C.1 (Hanihara dataset) in Appendix C.

[8] All 105 population groups analyzed in this odontometric LDA are listed in Table 2.3 in Chapter 2.

<u>Duckworth Burma Classifications in a Global LDA Model</u>

To assess the skeletal and dental phenotypic diversity of the Duckworth Burma samples, LDA models based on all comparative global data excluding the Duckworth Burma metric data were built. Then, the Duckworth Burma samples were tested against this model to examine the groups into which they would classify (i.e., the groups to which they would be most similar). Visualizations of the groups into which the Duckworth Burma samples classified are presented in Figure 4.1-Figure 4.3 for craniometric data and Figure 4.4-Figure 4.6 for odontometric data.

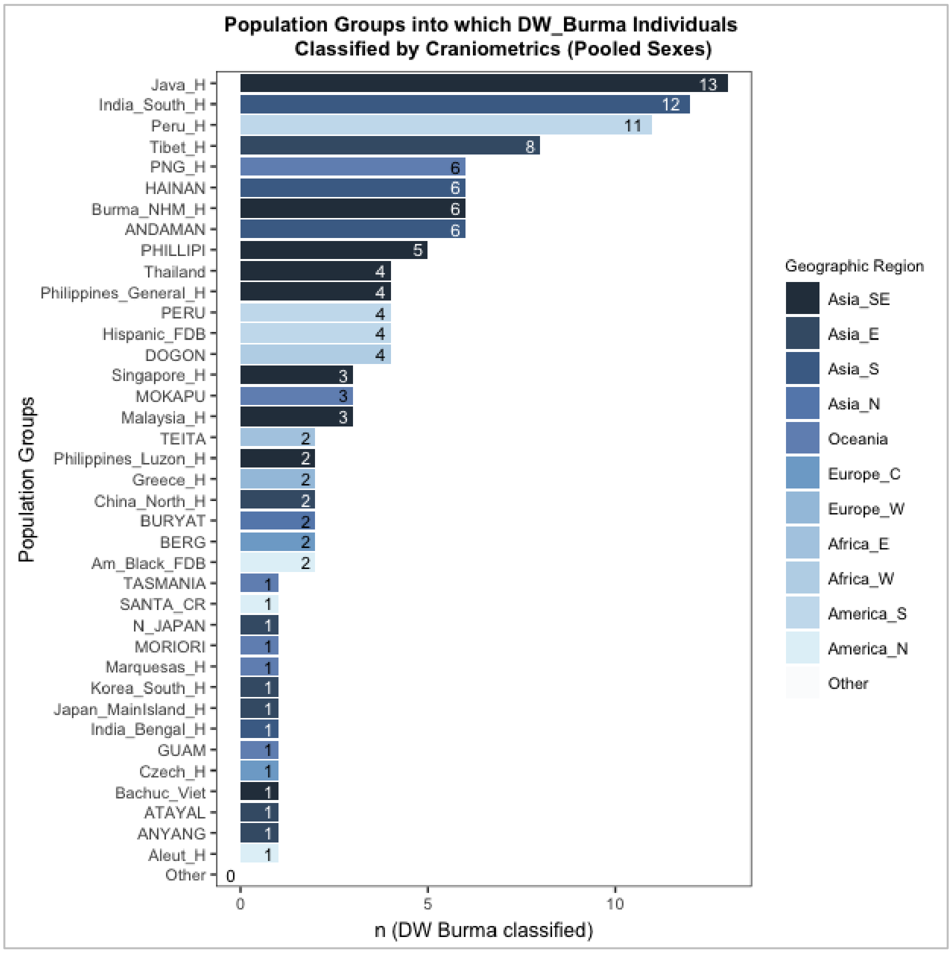

Figure 4.1. Bar chart of population groups into which the Duckworth Burma samples (pooled sexes) classified by craniometrics. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

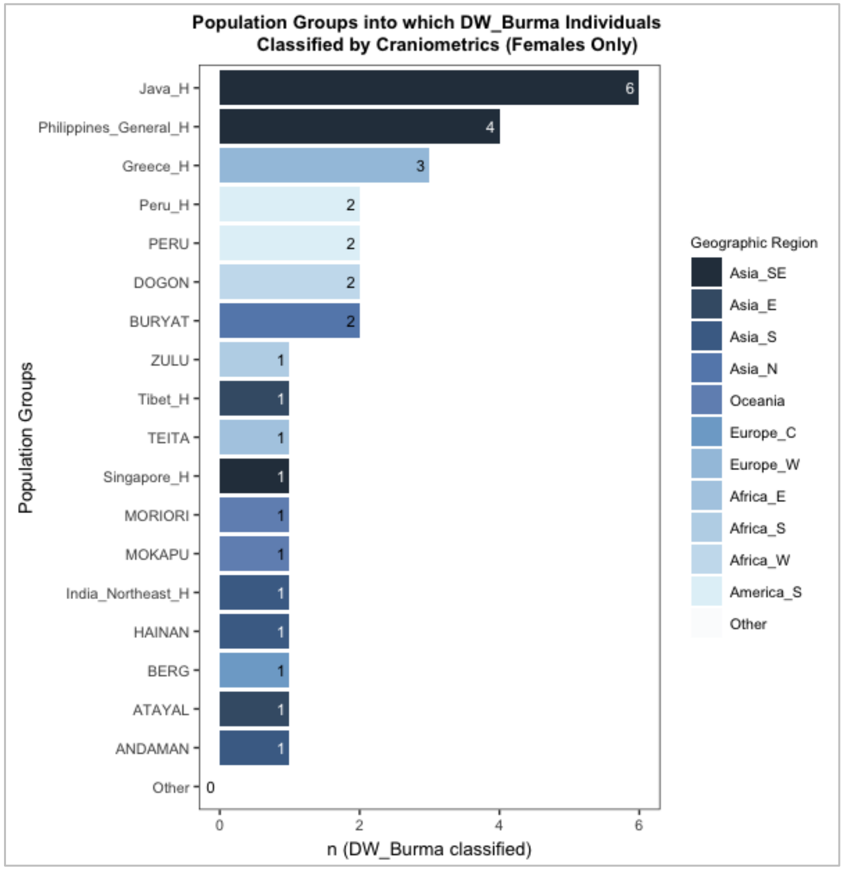

Figure 4.2. Bar chart of population groups into which the Duckworth Burma samples (females only) classified by craniometric data. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

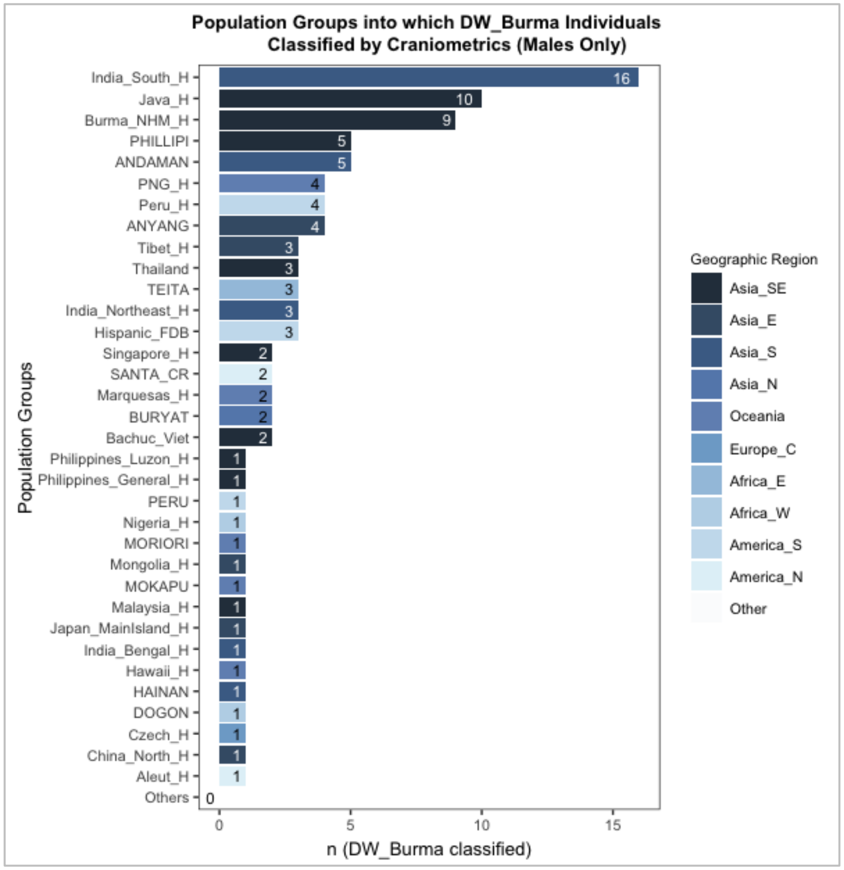

Figure 4.3. Bar chart of population groups into which the Duckworth Burma samples (males only) classified by craniometric data. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

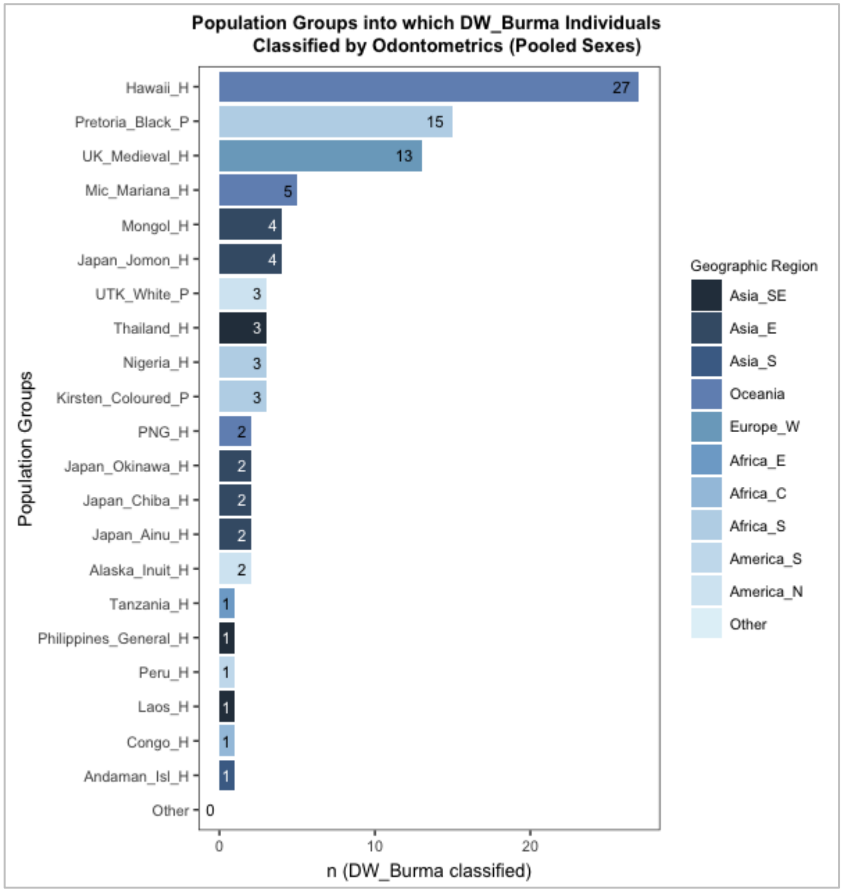

Figure 4.4. Bar chart of population groups into which the Duckworth Burma samples (pooled sexes) classified by odontometric data. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

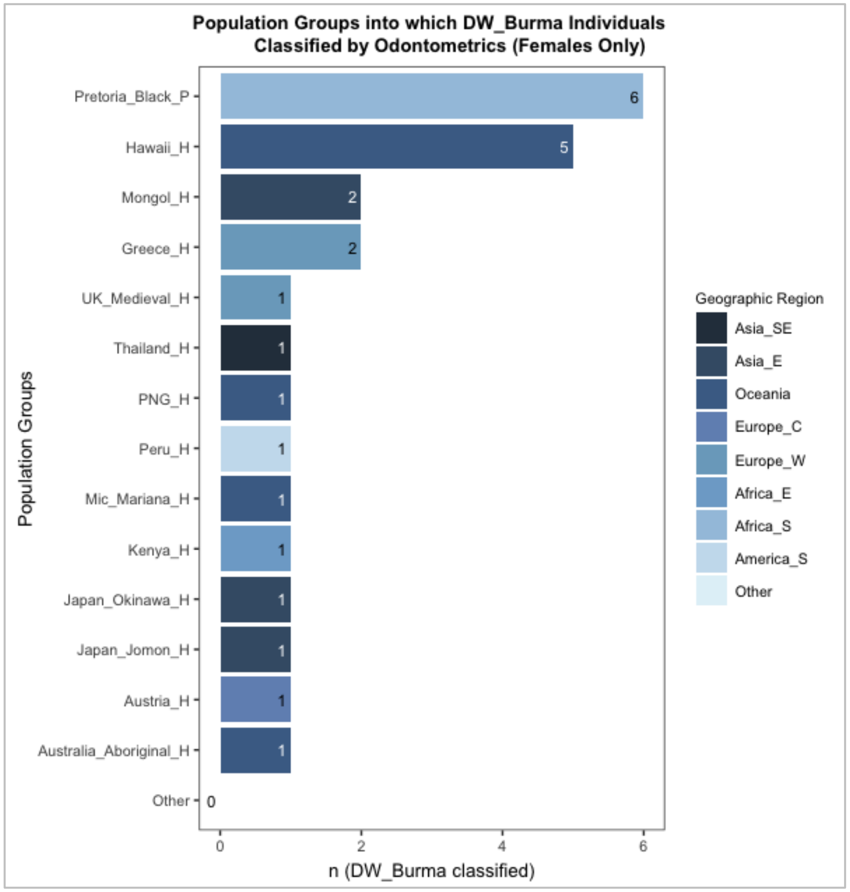

Figure 4.5. Bar chart of population groups into which the Duckworth Burma samples (females only) classified by odontometric data. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

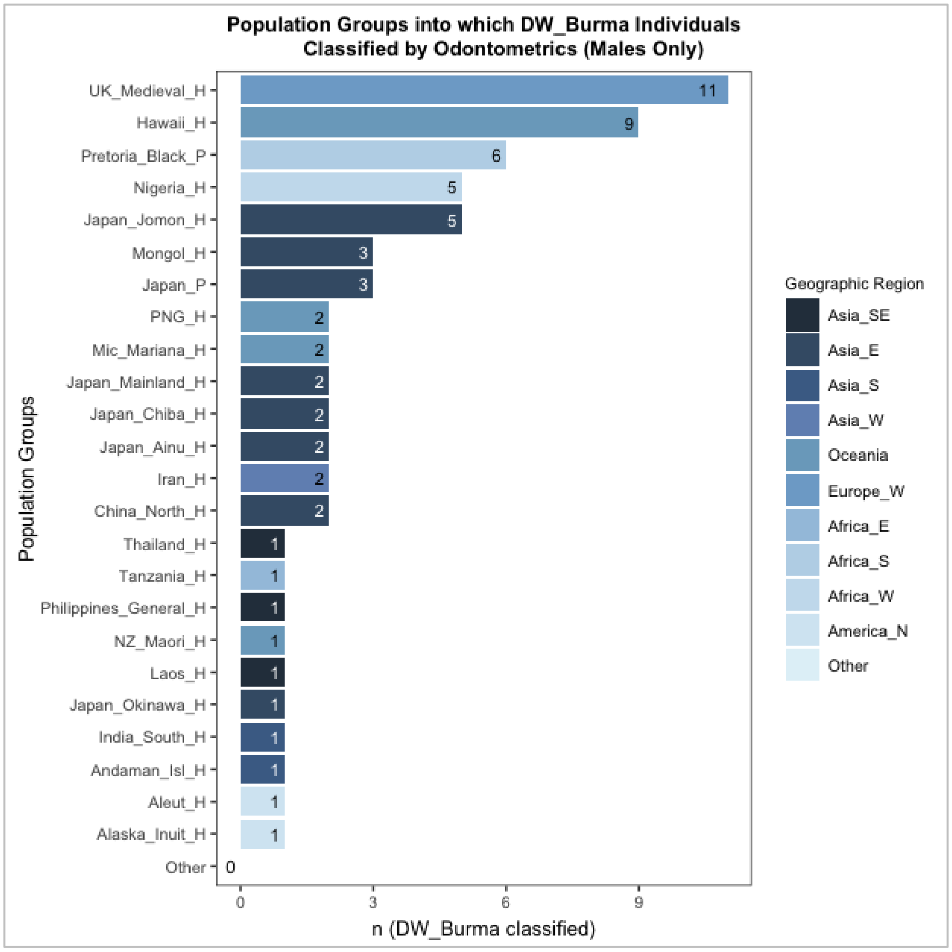

Figure 4.6. Bar chart of population groups into which the Duckworth Burma samples (males only) classified by odontometric data. Shades of blue in the legend are organized by geographic proximity to Myanmar (Southeast Asia).

Craniometrically, the Duckworth Burma samples were most similar to Java (Indonesia) in all three LDA models. Besides Java, the Duckworth Burma samples also classified mostly into other Southeast Asian groups, such the Philippines, and Burma (samples from the British National History Museum [NHM]) and South Asian groups, such as South India and Andaman Island in the pooled sexes and males only LDA models. Craniometric measurements for female samples in the Duckworth Burma group were most similar to Java (classified n=6), followed by the Philippines (n=4) and Greece (n=3). In the analysis with pooled sexes, other groups into which the Duckworth Burma samples classified prominently besides Java (n=13) include South India (n=12), Peru (n=11), and Tibet (n=8). In the analysis with only males, most Duckworth Burma samples classified into South India (n=16), followed by Java (n=10), and the other Burma group (n=9). One group into which the Duckworth Burma samples consistently classified in the craniometric LDA was Peru (from both the Howells and Hanihara craniometric datasets).

In reviewing odontometric data, the Duckworth Burma samples classified into very different groups for all three specifications. In the odontometric LDA with pooled sexes, the Duckworth Burma individuals mostly classified into the native Hawaii group (n=27), followed by Pretoria Black (n=15), and Medieval UK (n=13). Results from the female only LDA yielded most classifications for the Duckworth Burma samples in the Pretoria Black group (n=6), followed by Hawaii (n=5). Lastly, most male individuals in the Duckworth Burma sample exhibited most similar odontometric measurements to the Medieval UK group (n=11), followed by Hawaii (n=9), Pretoria Black (n=6), Nigeria (n=5), and Jomon Japan (n=5).

However, it is important to note the low population classification accuracy rates for the odontometric LDA models and the non-significance of the model (see Table 4.2). One possible reason for the low accuracy rates could be attributed to the difficulty of collecting consistent odontometric measurements on elements as small as teeth, which require a small window of error. As such, obtaining a good degree of precision in odontometric measurements has been shown to exhibit high interobserver discrepancies, especially in the mesiodistal measurements (Kieser, Groeneveld, McKee, & Cameron, 1990). Since the odontometric data used in this analysis were taken by multiple observers, it is possible that interobserver error played a role in the low classification accuracy rates. Further, the same factor most likely contributed to the results of the odontometric k-means cluster analysis (see the *Odontometric Cluster Analysis Results* section below). Moreover, only the crown measurements of maxillary dentition were used in this study, which also limits comparative results.

Cluster Analysis Results

Craniometric Cluster Analysis Results

K-means cluster analyses of craniometric data for the Duckworth Burma samples and the Hanihara Burma samples from the British NHM were run three separate times with pooled sexes, females only, and males only. The k-means clustering pattern in the analysis with pooled sexes showed that the optimal number of clusters is two, as shown in Figure 4.7. To ensure that the clustering was not determined by interobserver differences, a contingency table showing the proportions of individuals that classified into each cluster was created (Table 4.3).

In addition to the k-means cluster analysis with both the sexes pooled, the analysis was performed two more times, one for each sex. The k-means cluster analysis for females only showed that the optimal number of clusters is two, as shown in Table 4.22. The proportions of female samples that classified into the two clusters are summarized in Table 4.4. However, the sample size available for females in the NHM Burma dataset is extremely small (n=3), possibly precluding any meaningful inferences based on this dataset. Lastly, the k-means cluster analysis with only the male samples showed that the optimal number of clusters is two (Figure 4.9), and the proportions of classified individuals are summarized in Table 4.5.

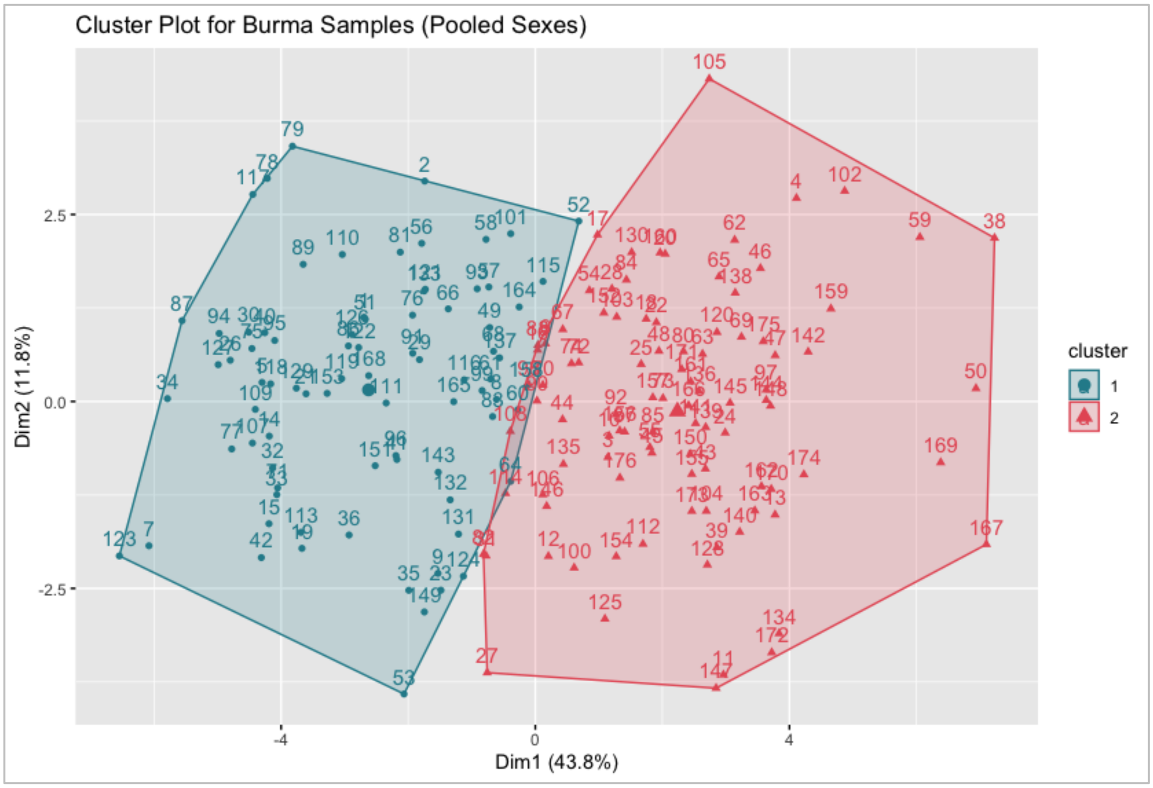

Figure 4.7. Cluster plot based on craniometric data from Burma samples (pooled sexes).

Table 4.3. Proportions of individuals from the two Burma craniometric datasets (pooled sexes) that grouped into the two clusters.

	Cluster 1	**Cluster 2**
Burma_NHM_H	12	34
DW_Burma	78	52

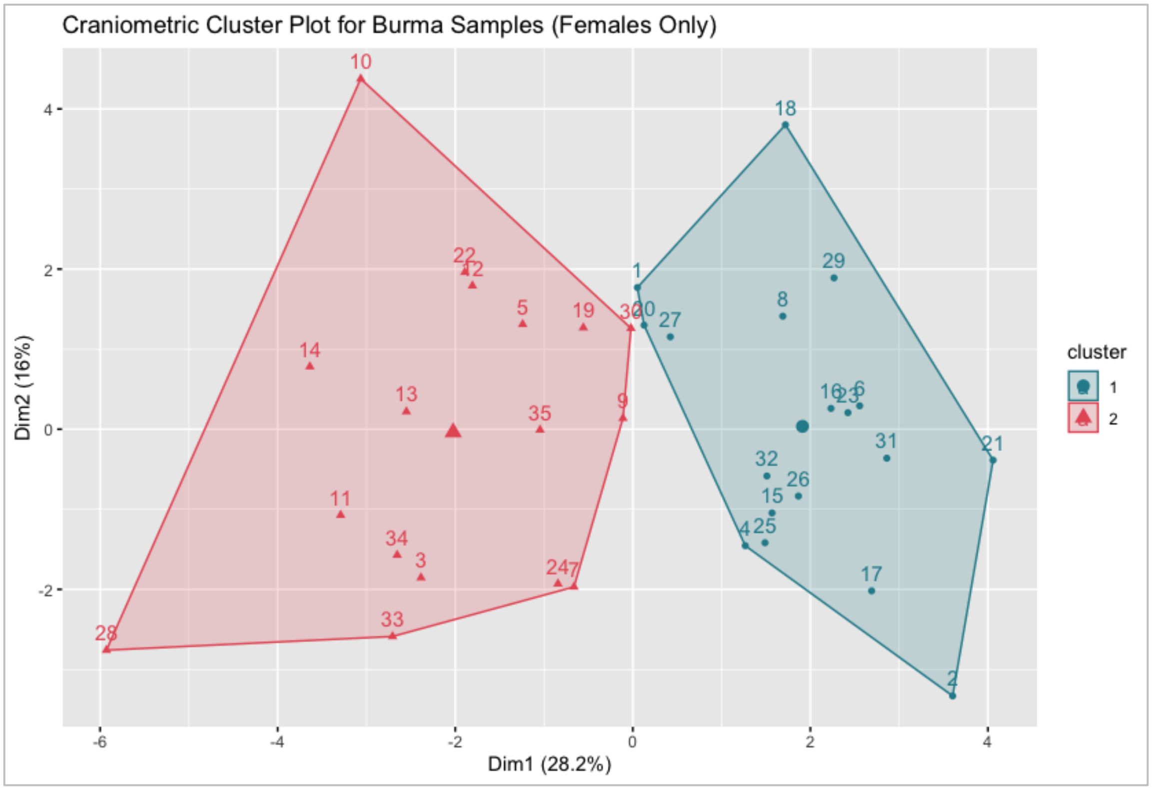

Figure 4.8. Cluster plot based on craniometric data from Burma samples (females only).

Table 4.4. Proportions of individuals from the two Burma craniometric datasets (females only) that grouped into the three clusters.

	Cluster 1	**Cluster 2**
Burma_NHM_H	3	0
DW_Burma	14	18

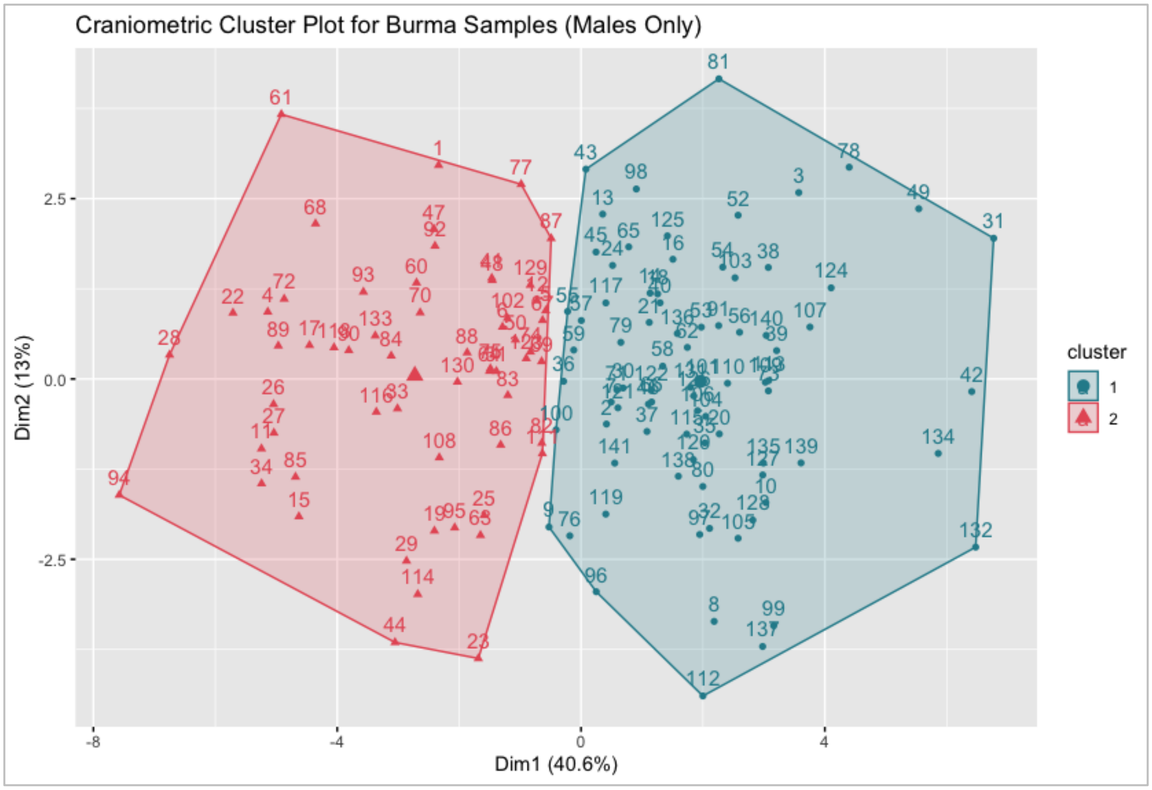

Figure 4.9. Cluster plot based on craniometric data from Burma samples (males only).

Table 4.5. Proportions of individuals from the two Burma craniometric datasets (males only) that grouped into the two clusters.

	Cluster 1	**Cluster 2**
Burma_NHM_H	33	10
DW_Burma	49	49

Apart from the overall Burma group comprised of both the Duckworth and NHM samples, k-means cluster analysis was also performed on the Duckworth Burma samples alone to explore clustering patterns within this collection. Figure 4.10 shows the clustering pattern based on the two optimal clusters for the Duckworth Burma only samples. To ensure that the two clusters were not based on sexual dimorphism, the proportions of individuals from both sexes that classified into each cluster is summarized in Table 4.6.

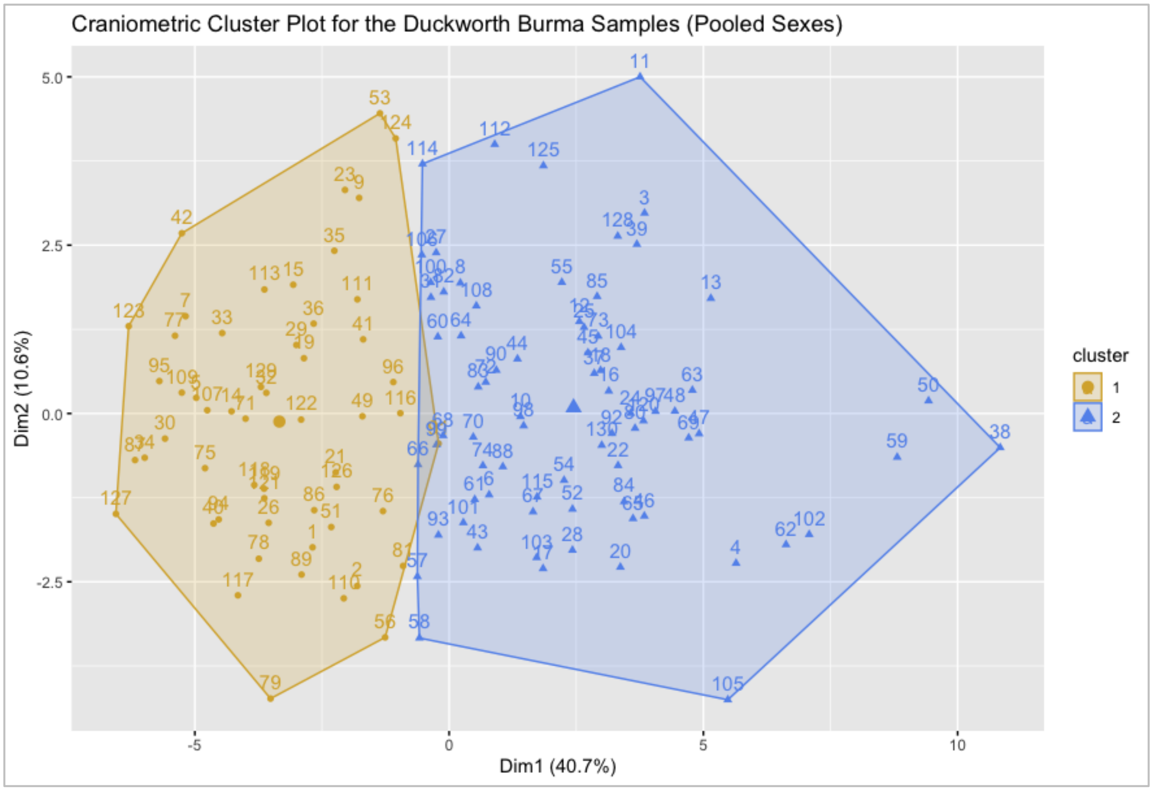

Figure 4.10. Cluster plot based on craniometric data from the Duckworth Burma samples.

Table 4.6. Proportions of individuals from the Duckworth Burma collection (organized by sex) that grouped into the two clusters.

	Cluster 1	**Cluster 2**
DW_Burma Females	25	7
DW_Burma Males	30	68

Odontometric Cluster Analysis Results

K-means clustering analysis was also performed on odontometric data for the Duckworth Burma and NHM Burma groups using the same methods from the craniometric cluster analysis. However, results showed that odontometric data for the two Burma groups were divided by interobserver differences. All individuals from one dataset clustered with those from the same collection and did not exhibit clear demarcations between the clusters. Therefore, odontometric k-means cluster analysis results were not considered meaningful.

Diversity and Evenness Indices

Diversity and evenness indices calculated based on nonmetric data for the geographic areas near Myanmar (*i.e.*, Southeast Asian, East Asian, and South Asian population groups) are summarized in Table 4.7 throughTable 4.10. Each table reports the sample size, Shannon's H diversity index, Simpson's D_1 diversity index, and Pielou's evenness index for each population group represented. Several groups, including the Duckworth Burma sample group, in the analysis with Hanihara's comparative cranial nonmetric dataset were merged with data from the same population group. For example, the Duckworth Burma group was merged with the NHM Burma group to constitute an overall "Burma" group (denoted as "Burma_YH" for Burma, Yukyi-Hanihara). Population groups in the analysis with Ossenberg's dataset were not organized similarly due to the uneven proportions of the represented population groups.

Table 4.7. Diversity and evenness indices for population Southeast, East, and South Asian groups represented in Ossenberg's cranial nonmetric dataset.

Population	**n**	**Shannon's H Diversity Index**	**Simpson's D_1 Diversity Index**	**Pielou's Evenness Index**
Cen_Japan_O	320	2.389435	0.7394107	0.8618064
DW_Burma	**141**	**2.125032**	**0.7530667**	**0.7664432**
India_O	129	2.387422	0.7167215	0.8610804
Japan_Ainu_O	148	2.320354	0.7374472	0.8568355
Japan_Jomon_O	267	2.395269	0.7438469	0.8639106
Mongolia_O	62	2.394157	0.7849271	0.8840888

Population	n	Shannon's H Diversity Index	Simpson's D_1 Diversity Index	Pielou's Evenness Index
N_China_O	72	2.442285	0.7733154	0.8808680
N_Japan_O	153	2.417894	0.7296979	0.8720708
N_N_Japan_O	54	2.334373	0.7162753	0.8419471
W_Japan_O	183	2.367298	0.7528171	0.8538223

Table 4.8. Diversity and evenness indices for Southeast, East, and South Asian population groups represented in Hanihara's cranial nonmetric dataset.

Population	n	Shannon's H Diversity Index	Simpson's D_1 Diversity Index	Pielou's Evenness Index
Andaman_Isl_H	91	2.141526	0.6572095	0.8618136
Bangladesh_H	31	2.159055	0.6158082	0.8688675
Burma_YH	**324**	**2.115342**	**0.6461324**	**0.8247110**
Cambodia_H	12	1.841390	0.6168600	0.8380529
China_H	197	2.188223	0.6703538	0.8806056
India_H	611	2.161629	0.6394725	0.8427569
Indonesia_H	144	2.180481	0.6444657	0.8501067
Japan_H	471	2.121268	0.6173627	0.8270214
Korea_H	11	1.803719	0.6561795	0.8209081
Laos_H	46	2.197262	0.6523078	0.8842433
Malaysia_H	184	2.233445	0.6707509	0.8707559
Mongolia_H	287	2.135512	0.6429422	0.8593934
Nepal_H	52	2.154840	0.6779451	0.8671714
NicobarIslands_H	29	2.038843	0.5599803	0.8204906
Philippines_H	324	2.227887	0.6845257	0.8685891
Singapore_H	91	2.127622	0.6701809	0.8562182
SriLanka_H	52	2.105086	0.6775774	0.8778889
Thailand_H	77	2.124405	0.6708409	0.8549235

Population	n	Shannon's H Diversity Index	Simpson's D_1 Diversity Index	Pielou's Evenness Index
Tibet_H	81	2.139082	0.6846625	0.8608299
Vietnam_H	46	2.151915	0.6199032	0.8659941

Compared to the comparative samples in the Ossenberg database, the Duckworth Burma group exhibited a lower Shannon's H diversity index (2.125032) than all other groups but a relatively high Simpson's D_1 diversity index (0.7530667). In terms of evenness in the Ossenberg comparison, the Duckworth Burma group had the lowest Pielou's index, indicating that the trait frequencies for this sample groups exhibited less evenness compared to the other groups. The general Burma group, represented by the Duckworth and NHM Burma groups combined, exhibited a relatively high Shannon's H diversity index (2.115342) and Simpson's D_1 diversity index (0.6461324) compared to the other Hanihara groups. However, the Pielou evenness index was one of the lowest among the groups compared (0.8247110).

Diversity and evenness indices were calculated for the Chinese, Duckworth Burma, Japanese, and Thai groups in the comparative MMS dataset (Table 4.9). The Duckworth Burma group exhibited the second highest diversity (Shannon's H = 1.1475257 and Simpson's D_1 = 0.7063123) and evenness (Pielou's index = 0.6404463), following the Thai group.

Table 4.9. Diversity and evenness indices for Southeast and East Asian population groups represented in the comparative MMS dataset.

Population	n	Shannon's H Diversity Index	Simpson's D_1 Diversity Index	Pielou's Evenness Index
Chinese	57	0.7969414	0.6761674	0.4951676
DW_Burma	**127**	**1.1475257**	**0.7063123**	**0.6404463**
Japanese	15	1.0032972	0.7050362	0.5599508
Thailand	96	1.1825179	0.7229845	0.6599758

Lastly, diversity and evenness indices calculated for the two Asian groups (Chiba, Japan, and Duckworth Burma) represented in the comparative dental nonmetric dataset are presented in Table 4.10. However, because there were no other population groups from neighboring geographic regions to Myanmar represented in this dataset, the diversity and evenness indices might not provide a complete picture of dental morphological diversity patterns. In sum, the Duckworth Burma group exhibited higher diversity indices (Shannon’s H = 1.891479 and Simpson’s D_1 = 0.8280397) but a lower evenness index (Pielou’s index = 0.7888080) than the Chiba Japan group.

Table 4.10. Diversity and evenness indices for Southeast and East Asian population groups represented in the comparative MMS dataset.

Population	n	Shannon's H Diversity Index	Simpson's D_1 Diversity Index	Pielou's Evenness Index
DW_Burma	**83**	**1.891479**	**0.8280397**	**0.7888080**
Japan_Chiba_P	87	1.806237	0.8129837	0.8220537

The overall diversity and evenness indices for the Burma samples compared to those from nearby geographic regions showed that a relatively high amount of diversity is present in the area. Therefore, these indices serve as further evidence to the Burma population group’s relatively high phenotypic diversity.

R Matrix and F_{ST} Calculations

Metric Data R Matrix and F_{ST} Results

R matrix results from the RMET analysis for craniometric and odontometric data are shown in Table 4.11 andTable 4.12, respectively. The populations in the tables were ordered based on decreasing r_{ii} values, which are the diagonal elements of the R matrix on which the estimated F_{ST} calculations are based. Essentially, the r_{ii} values indicate the genetic distance of a certain population to a regional centroid (Relethford, 1994). Therefore, higher r_{ii} values indicate higher degrees of genetic drift. RMET 5.0 generated both biased and unbiased r_{ii} values with their standard errors.

The Burma group, comprised of the Duckworth Burma and NHM Burma groups, was bolded in all tables to show the group's degree of genetic drift in comparison to other groups. Of the 62 population groups analyzed in the craniometric dataset, the Burma group exhibited intermediate r_{ii} values (27th highest; biased r_{ii} = 0.134961; unbiased r_{ii} = 0.132120; standard error = 0.009400; see Table 4.11). The Burma group also exhibited intermediate r_{ii} values (32nd highest; biased r_{ii} = 0.134961; unbiased r_{ii} = 0.132120; standard error = 0.009400; see Table 4.12) in relation to the other 61 population groups analyzed in the odontometric dataset.

Table 4.11. R Matrix results for population groups represented in the comparative craniometric dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	**n**	**Biased r_{ii}**	**Unbiased r_{ii}**	**Standard Error**
Aleut_H	237	0.364773	0.362663	0.013317
BURYAT	109	0.351540	0.346953	0.019277
Greenland_H	128	0.278229	0.274323	0.015826

Population	**n**	**Biased r_{ii}**	**Unbiased r_{ii}**	**Standard Error**
TASMANIA	87	0.272300	0.266553	0.018990
EasterIsl_HH	158	0.249595	0.246431	0.013491
TOLAI	110	0.245336	0.240790	0.016031
Switzerland_H	56	0.225233	0.216304	0.021527
Australia_HH	311	0.215597	0.213989	0.008937
Mongolia_H	212	0.210386	0.208027	0.010693
TEITA	83	0.211825	0.205801	0.017148
Czech_H	111	0.209579	0.205075	0.014750
Alaska_H	466	0.201540	0.200467	0.007059
ANDAMAN	70	0.197118	0.189975	0.018013
Germany_H	140	0.189908	0.186337	0.012502
SriLanka_H	20	0.202702	0.177702	0.034173
BERG	109	0.181563	0.176976	0.013854
UKMedieval_H	304	0.169782	0.168137	0.008022
ZULU	101	0.171674	0.166724	0.013995
Ghana_H	83	0.166570	0.160546	0.015207
Moriori_HH	181	0.159040	0.156277	0.010062
Austria_H	130	0.158664	0.154818	0.011859
Tanzania_H	94	0.157412	0.152093	0.013891
Taiwan	47	0.161840	0.151202	0.019919
Melanesia_H	167	0.148512	0.145518	0.010123
Canada_H	95	0.141304	0.136040	0.013091
Hawaii_H	64	0.140646	0.132833	0.015913
Burma_YH	**176**	**0.134961**	**0.132120**	**0.009400**
Kenya_H	81	0.136226	0.130053	0.013921
NORSE	110	0.133429	0.128884	0.011822
Singapore_H	58	0.133210	0.124589	0.016268

Population	n	Biased r_{ii}	Unbiased r_{ii}	Standard Error
Vietnam_PH	71	0.129159	0.122117	0.014478
PNG_H	340	0.119003	0.117533	0.006351
Nigeria_H	98	0.117859	0.112757	0.011772
SAfrica_H	110	0.112634	0.108089	0.010862
Japan_P	154	0.096165	0.092918	0.008482
Thailand_PH	89	0.094275	0.088657	0.011048
Hungary_H	135	0.091787	0.088083	0.008851
Peru_HH	460	0.084538	0.083451	0.004602
GUAM	57	0.091979	0.083207	0.013636
Greece_H	117	0.086923	0.082650	0.009252
Korea_South_H	19	0.107419	0.081103	0.025523
CHINA_How	125	0.081490	0.077490	0.008667
ZALAVAR	98	0.078862	0.073760	0.009629
Indonesia_H	89	0.077390	0.071772	0.010010
India_H	342	0.073229	0.071767	0.004967
China_H	170	0.073161	0.070220	0.007042
Maori_H	122	0.071976	0.067878	0.008245
Bangladesh_H	19	0.091751	0.065435	0.023588
Nepal_H	29	0.082669	0.065427	0.018123
Egypt_HH	488	0.063414	0.062389	0.003869
HongKong	50	0.071919	0.061919	0.012874
Russia_H	48	0.072025	0.061608	0.013149
Ainu_HH	205	0.061185	0.058746	0.005864
Mexico_H	92	0.057996	0.052561	0.008523
Nubia_H	156	0.055100	0.051895	0.006379
Philip_HH	206	0.052680	0.050253	0.005428
Tibet_H	61	0.058335	0.050139	0.010497

Population	n	Biased r_{ii}	Unbiased r_{ii}	Standard Error
Palestine_H	61	0.054061	0.045864	0.010105
Japan_H	175	0.042355	0.039498	0.005281
JAPAN_How	178	0.042135	0.039326	0.005223
Malaysia_H	98	0.042798	0.037696	0.007094
Laos_H	16	0.064393	0.033143	0.021534

Table 4.12. R Matrix results for population groups represented in the comparative odontometric dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	n	Biased r_{ii}	Unbiased r_{ii}	Standard Error
Iran_H	35	0.340992	0.326706	0.044958
Australia_H	257	0.217829	0.215883	0.013260
KirstenBl_P	36	0.155934	0.142045	0.029977
Cameroon_H	36	0.138422	0.124533	0.028244
PretorBl_P	114	0.122454	0.118068	0.014928
Mexico_H	54	0.111847	0.102588	0.020729
UKMedievl_H	294	0.095921	0.094220	0.008227
KirstenCol_P	65	0.099757	0.092065	0.017844
Aleut_H	58	0.100308	0.091687	0.018942
CanadaNat_H	91	0.090925	0.085431	0.014398
Ghana_H	37	0.097866	0.084352	0.023425
Iraq_H	35	0.096595	0.082309	0.023928
Tanzania_H	102	0.084647	0.079745	0.013121
Peru_H	130	0.082045	0.078199	0.011443
Andaman_Isl_H	49	0.084356	0.074152	0.018899
Gabon_H	43	0.083438	0.071810	0.020064
Micronesia_H	134	0.075531	0.071800	0.010814

Population	**n**	**Biased r_{ii}**	**Unbiased r_{ii}**	**Standard Error**
Alaska_H	125	0.075428	0.071428	0.011189
Nicobar_H	13	0.108896	0.070435	0.041687
UTK_Wh_P	159	0.070003	0.066858	0.009557
Italy_H	82	0.070037	0.063939	0.013311
Greece_H	71	0.070057	0.063014	0.014307
Hungary_H	60	0.068524	0.060191	0.015393
PNG_H	236	0.061961	0.059842	0.007380
Germany_H	72	0.065586	0.058642	0.013747
Turkey_H	33	0.071849	0.056698	0.021253
UTK_Bl_P	21	0.077216	0.053406	0.027619
SAfrica_H	90	0.058234	0.052679	0.011586
Laos_H	26	0.071716	0.052485	0.023922
Burma_YH	**136**	**0.054864**	**0.051188**	**0.009148**
Melanesia_H	267	0.051270	0.049397	0.006312
Polynesia_H	411	0.046996	0.045779	0.004871
Nigeria_H	106	0.049953	0.045236	0.009888
Palestine_H	63	0.050827	0.042890	0.012937
Kenya_H	85	0.048201	0.042319	0.010846
TXSTWh_P	70	0.046246	0.039104	0.011707
France_H	33	0.053857	0.038706	0.018401
WAfrica_H	26	0.056463	0.037232	0.021226
NZMaori_H	66	0.042874	0.035298	0.011609
Japan_PH	558	0.035244	0.034348	0.003620
Malaysia_H	60	0.040628	0.032294	0.011852
Russia_H	42	0.040009	0.028104	0.014058
Mongol_H	157	0.031017	0.027832	0.006402
Marquesas_H	88	0.028610	0.022928	0.008213

Population	n	Biased r_{ii}	Unbiased r_{ii}	Standard Error
Thailand_H	73	0.027988	0.021138	0.008918
EasterIsl_H	30	0.037017	0.020350	0.016000
Greenland_H	35	0.034197	0.019911	0.014237
India_H	268	0.020378	0.018513	0.003972
Philipp_H	141	0.020759	0.017213	0.005527
Indonesia_H	94	0.021823	0.016504	0.006940
Egypt_H	141	0.019548	0.016002	0.005363
Tibet_H	42	0.026726	0.014821	0.011490
Moriori_H	34	0.028515	0.013809	0.013191
Malay_H	63	0.021193	0.013256	0.008354
Nubia_H	89	0.014837	0.009219	0.005881
China_H	103	0.013709	0.008855	0.005255
Vietnam_H	23	0.030341	0.008602	0.016543
Somalia_H	57	0.016631	0.007860	0.007780
Nepal_H	24	0.023846	0.003012	0.014357
Korea_H	12	0.042029	0.000363	0.026956
Cambodia_H	5	0.077070	0.000000	0.056549
SriLanka_H	30	0.016456	0.000000	0.010668

Calculated F_{ST} values based on R matrix results for metric data were summarized in Table 4.13Table 4.13. The F_{ST} for the craniometric dataset is 0.135825, indicating that approximately 13.6% of the variation seen in this dataset existed among the population groups, and approximately 86.4% of the variation was within the groups. Overall, the average within-group phenotypic variance for craniometric data is 0.755. The average within-group variation was part of the Relethford-Blangero analysis (Relethford & Blangero, 1990), which compared the expected and observed variation values based on the distance between population groups to the centroid (Relethford, 2003). The odontometric dataset exhibited a much lower F_{ST} value of 0.066427, indicating that approximately 6.6% of the variation is among the groups, while 93.4% was within-group. The average within-group phenotypic variance for odontometric data was 0.783.

Table 4.13. F_{ST} values for metric data calculated from biased and unbiased R matrix results, associated standard errors, and mean within-group phenotypic variance.

Data Type	F_{ST}	**Unbiased** F_{ST}	**Standard Error**	**Mean Within-group Phenotypic Variance**
Craniometric	0.135825	0.129477	0.001496	0.755
Odontometric	0.066427	0.055602	0.002144	0.783

Nonmetric Data R Matrix and F_{ST} Results

R matrix results calculated in the Konigsberg (1990) R workspace for nonmetric data are shown in Table 4.14 through Table 4.17. The first two tables report results from cranial nonmetric analyses based on the Ossenberg and Hanihara comparative datasets. As with the case for R matrices for metric data, higher r_{ii} values indicate larger genetic distance between a given population group to a regional centroid. The Konigsberg (1990) R workspace generated one r_{ii} value with an associated standard error for each population group analyzed. Population groups from the same geographic origin from different collections collected by different observers were not consolidated as they were for metric data since there was no threshold set on population groups in the R workspace.

Similar to the above R matrix tables for metric data, the tables in this section are also organized in descending order for r_{ii} values. The Duckworth Burma group in all tables were also bolded to show the group's degree of genetic drift in comparison to other groups. Of the 45 population groups analyzed in the Ossenberg cranial nonmetric dataset, the Duckworth Burma group exhibited an intermediate r_{ii} value (18th highest; r_{ii} = 0.05981578; standard error = 0.007804298; see Table 4.14). Compared to the 97 other population groups represented in the Hanihara cranial nonmetric dataset, the Duckworth Burma samples exhibited a relatively high r_{ii} value (16th highest; r_{ii} = 0.10393668; standard error = 0.010741804; see Table 4.15).

Table 4.14. R Matrix results for population groups in the Ossenberg comparative cranial nonmetric dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	**n**	r_{ii}	**Standard Error**
Italy_O	88	0.24324215	0.019921112
Japan_Ainu_O	148	0.17258774	0.012939265
Patagonia_O	26	0.14464218	0.028261571
Aus_Aborig_O	55	0.11797347	0.017548756
Moriori_O	22	0.11740444	0.027680022
Japan_Jomon_O	267	0.11718973	0.007938248
Chile_O	34	0.11256435	0.021802007
Ghana_O	33	0.10373727	0.021244472
AfAm_O	64	0.09366708	0.014495694
Pecos_Pueblo_O	168	0.09126023	0.008831239
Ontario_Brit_O	280	0.08627631	0.006651234
Mongolia_O	62	0.08555112	0.014075133
Marquesas_O	78	0.07501858	0.011750940
Iceland_O	51	0.07109366	0.014147048
Kenya_O	27	0.07065905	0.019383738
W_Africa_O	12	0.06999867	0.028939416
N_China_O	461	0.06421486	0.011315846
DW_Burma	**141**	**0.05981578**	**0.007804298**
Tanzania_O	47	0.05727485	0.013227219

Population	n	r_{ii}	Standard Error
Ontario_Native_O	75	0.05697041	0.010443102
Plateau_O	240	0.05630893	0.005803881
Illinois_O	100	0.05479702	0.008869803
Cen_Arctic_O	417	0.05288004	0.004266909
N_N_Japan_O	546	0.05285465	0.011854418
Aleut_O	541	0.04955290	0.003626364
N_Japan_O	72	0.04749110	0.006675686
S_Alaska_O	670	0.04733753	0.003184937
Nigeria_O	41	0.04579561	0.015057346
N_Pacific_Coast_O	54	0.04463836	0.003464328
Hungary_O	68	0.04355144	0.009589199
NZ_Maori_O	29	0.04094766	0.011066987
Newfoundland_O	534	0.03966633	0.011785678
St_Lawrence_O	423	0.03806319	0.003594330
E_Arctic_O	397	0.03796220	0.003705237
Siberia_O	201	0.03739135	0.005168006
Armenia_O	136	0.03736644	0.006280684
Cen_Japan_O	320	0.03427880	0.003921691
S_Africa_O	65	0.03383172	0.008644519
N_Miss_Valley_O	153	0.03368101	0.002975992
N_Alaska_O	48	0.03286890	0.003199467
Athapaskan_O	212	0.03016364	0.004519699
India_O	129	0.02996663	0.005775101
Plains_O	296	0.02744341	0.003648452
Sudan_O	86	0.02687057	0.006697685
W_Japan_O	183	0.01821778	0.003780573

Table 4.15. R Matrix results for population groups in the Hanihara comparative cranial nonmetric dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	n	rii	Standard Error
Easter_Isl_H	163	0.20701152	0.014049481
Japan_Jomon_H	147	0.17211475	0.013489852
Colombia_H	25	0.15070978	0.030609591
Switzerland_H	63	0.13336789	0.018138952
Siberia_H	38	0.13266481	0.023293936
Bolivia_H	73	0.12742167	0.016470889
Marquesas_H	172	0.12234085	0.010514251
Chukchi_H	30	0.12168053	0.025107689
Peru_H	128	0.12075691	0.006195243
Bismarck_H	40	0.11534534	0.021170293
Cambodia_H	12	0.11509593	0.038609678
Patagonia_H	23	0.11239006	0.011681962
Moriori_H	133	0.11126340	0.011402686
Chile_H	64	0.10951451	0.016308073
Greenland_H	227	0.10939000	0.008654315
DW_Burma	**140**	**0.10393668**	**0.010741804**
Spain_H	23	0.10120302	0.026151081
Okhotsk_H	82	0.09822944	0.013644912
Finland_H	26	0.09766457	0.024162322
Canada_Inuit_H	64	0.09716095	0.015360761
Palestine_H	727	0.09645109	0.025529745
Aleut_H	374	0.09559812	0.006302977
Mexico_H	366	0.09456863	0.006337089
Turkey_H	150	0.09312100	0.009822794
Bulgaria_H	21	0.09284366	0.026213397

Population	n	rii	Standard Error
UK_Medieval_H	697	0.09017209	0.004484113
Hawaii_H	157	0.08710670	0.009286087
Gabon_H	135	0.08484948	0.009883586
Korea_H	11	0.08260093	0.034162759
Ecuador_H	30	0.08191678	0.020600731
Italy_H	201	0.08097883	0.007913061
Nigeria_H	29	0.08016616	0.007344232
Netherlands_H	52	0.07960474	0.016768722
Japan_Ainu_H	135	0.07874089	0.009521165
Canada_Indigenous_H	236	0.07614017	0.007081214
Australia_Aboriginal_H	442	0.07585694	0.005164679
Molucca_H	27	0.07432389	0.020684221
Yugoslavia_H	59	0.07249214	0.013818989
Morocco_H	47	0.07012115	0.015227633
Alaska_Inuit_H	763	0.06656176	0.003682196
NZ_Maori_H	450	0.06623848	0.006856302
Pol_Society_H	88	0.06211050	0.010473649
Germany_H	170	0.06137448	0.007490767
Thailand_H	77	0.06124504	0.011118519
Buryat_H	48	0.06102360	0.014056757
Syria_H	46	0.06083303	0.014336648
Mongol_H	287	0.06014324	0.005707018
France_H	111	0.05982039	0.009152083
Afghanistan_H	48	0.05974957	0.013909246
Sumatra_H	43	0.05970284	0.014689943
Malawi_H	34	0.05876522	0.016389947
Bedouin_H	25	0.05653681	0.018747893

Population	n	rii	Standard Error
China_South_H	100	0.05621951	0.009347605
NicobarIslands_H	44	0.05585461	0.017301643
India_Northwest_H	36	0.05512965	0.015427593
India_Pakistan_ Punjab_H	107	0.05414374	0.008868273
Russia_H	57	0.05354602	0.012083229
SouthAfrica_H	192	0.05277407	0.006536067
Greece_H	67	0.05245300	0.011030738
Kenya_H	190	0.05159946	0.006496847
Congo_H	27	0.05055720	0.017059507
SriLanka_H	25	0.05047587	0.017714492
Austria_H	251	0.04989485	0.005558375
Cameroon_H	51	0.04795908	0.012089467
Japan_Mainland_H	189	0.04771734	0.006264177
Micronesia_H	87	0.04680821	0.009144463
Sweden_H	35	0.04673218	0.014405582
Celebes_H	27	0.04631210	0.016327593
Laos_H	46	0.04601177	0.012468448
PNG_H	324	0.04558415	0.003121739
Singapore_H	91	0.04379149	0.008648305
Ghana_Ashanti_H	110	0.04150135	0.007657581
Israel_H	109	0.03956078	0.007510623
Cyprus_H	41	0.03808031	0.012014761
Java_H	101	0.03772597	0.007619322
Borneo_H	147	0.03627303	0.006192843
Sami_H	42	0.03558539	0.011475405
Philippines_H	489	0.03537817	0.004119571
India_South_H	200	0.03488193	0.005206454

Population	n	rii	Standard Error
Tibet_H	81	0.03422754	0.008104051
Burma_NHM_H	184	0.03345953	0.005316280
Iraq_H	41	0.03288654	0.011165392
China_North_H	97	0.03266542	0.007234609
India_Bengal_H	117	0.03211893	0.006531973
Bangladesh_H	31	0.03143503	0.012554022
Tanzania_H	163	0.03108546	0.005444295
Nepal_H	219	0.02948541	0.009387690
Czech_H	142	0.02936926	0.005669688
Hungary_H	201	0.02923422	0.004754497
Andaman_Isl_H	91	0.02890511	0.007026247
Malay_H	37	0.02781678	0.010809594
Somalia_H	80	0.02548133	0.007035951
Egypt_H	738	0.02350897	0.002225079
India_Northeast_H	151	0.02243466	0.004805384
Melanesia_H	600	0.02097723	0.002331070
Ukraine_H	34	0.02012900	0.009592426
Nubia_H	231	0.01688847	0.002415159
Vietnam_H	46	0.01594109	0.007338999

When compared to dichotomized MMS scores from 11 population groups in the comparative dataset, the Duckworth Burma sample exhibited the fifth highest r_{ii} value (0.15147789 with a standard error of 0.01827528; see Table 4.16) in the R matrix. Lastly, the Duckworth Burma had the highest r_{ii} value (0.24394263 with a standard error of 0.021998189; see Table 4.17) out of 11 population groups compared in the R matrix for the comparative dental nonmetric dataset.

Table 4.16. R Matrix results for population groups in the comparative MMS dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	**n**	r_{ii}	**Standard Error**
Chinese	57	0.48347826	0.04873514
Thailand	96	0.21246645	0.02489435
Colombian	103	0.18685726	0.02253863
AmericanBlack	100	0.15759324	0.02100680
DW_Burma	**127**	**0.15147789**	**0.01827528**
PacificAmerindian	93	0.14865103	0.02115601
Japanese	15	0.12953264	0.04917396
Mexico	23	0.12025793	0.03826345
Guatemalan	94	0.10102159	0.01734740
AmericanWhite	109	0.09177946	0.01535503
Peruvian	16	0.09088836	0.03988277
SWHispanic	98	0.04543085	0.01139341

Table 4.17. R Matrix results for population groups in the comparative dental nonmetric dataset, their sample sizes, and standard errors for r_{ii} values. Population groups are organized in decreasing r_{ii} value order.

Population	**n**	**rii**	**Standard Error**
DW_Burma	**95**	**0.24394263**	**0.021998189**
Japan_Chiba_P	87	0.14467204	0.016546830
UTK_Hispanic_P	13	0.12248669	0.039387180
UTK_Black_P	24	0.09704850	0.025803042
Pretoria_White_P	12	0.08226823	0.033597546
Kirsten_Black_P	36	0.08118928	0.019269934
UTK_White_P	189	0.07113072	0.007871904
Dart_Black_P	83	0.06667873	0.010750136

Population	n	rii	Standard Error
Pretoria_Black_P	187	0.06056878	0.007302738
TXST_White_P	90	0.03585896	0.008099528
Kirsten_Coloured_P	63	0.03277340	0.009254918

Based on the R matrices, F_{ST} calculations were also calculated and summarized in Table 4.18. The F_{ST} calculated from the Ossenberg cranial nonmetric dataset indicated that approximately 6.7% of the variation seen in this analysis can be attributed to among-group variation, while 93.3% was within-group variation. Calculations from the Hanihara cranial nonmetric dataset also yielded a similar value (~6.7% among-group variation). The R matrix that yielded the highest F_{ST} value in this study was based on the MMS dataset, with approximately 16% of the variation attributed to among-group variation. The R matrix for the dental nonmetric dataset yielded a relatively higher F_{ST} value (~9.4% among-group variation) than the two cranial nonmetric datasets but was lower than the MMS dataset. Generally, the patterns observed in R matrix results for both metric and nonmetric data demonstrated that the Burma group showed an intermediate amount of genetic drift compared to global populations.

Table 4.18. F_{ST} values for nonmetric data calculated from R matrix results and associated standard errors.

Data Type	F_{ST}	Standard Error
Cranial Nonmetric (Ossenberg)	0.06677931	0.001764694
Cranial Nonmetric (Hanihara)	0.0660688	0.001315205
MMS (dichotomized)	0.15995290	0.007296882
Dental Nonmetric	0.09441982	0.005737506

<u>AIM #2</u>: EXPLORE EVOLUTIONARY TRENDS BEHIND SKELETAL VARIATION IN MYANMAR

<u>Hypothesis #2</u>: The individuals from the Duckworth Burma collection will exhibit cranial traits associated with warmer climates.

<u>Descriptive Statistics (Craniometric Dimensions)</u>

Craniometric dimensions analyzed in the current study that have been shown to be positively correlated with colder climate include BNL, BPL, MDH, ASB, XCB, AUB, FRC, and NLH. In other words, individuals from geographic regions with colder climates are expected to exhibit higher values for these measurements. The evolutionary rationalization behind this finding is related to thermoregulation purposes (Mielke et al., 2011; Roseman, 2004). As such, a table of summary statistics including the minimum, mean, and maximum values for these measurements per population group was reported in Table B.7 in Appendix B. Based on the craniometric dimension means in the descriptive statistics results, the combined Burma group mostly exhibited values below or near the average, with the exception of MDH (Table 4.19). Overall, this pattern of lower values for these cranial measurements is consistent with what would be expected of individuals from geographic areas with warmer climates.

Table 4.19. Comparison of means for the combined Burma group compared to the overall dataset's minimum, mean, and maximum of means for each craniometric measurement that is being tested for correlation with climate.

Craniometric Measurement	Combined Burma Group (DW + NHM)	Min of Global Comparative Groups	Mean of Global Comparative Groups	Max of Global Comparative Groups
BNL_Mean	96.73	91.64	99.48	108.11
BPL_Mean	95.49	90.64	97.50	104.34

Craniometric Measurement	Combined Burma Group (DW + NHM)	Min of Global Comparative Groups	Mean of Global Comparative Groups	Max of Global Comparative Groups
MDH_Mean	30.76	23.60	26.96	30.76
ASB_Mean	105.83	98.00	107.30	114.78
AUB_Mean	120.21	110.93	121.21	132.78
XCB_Mean	138.83	126.55	137.67	151.66
FRC_Mean	109.86	104.11	110.60	116.11
NLH_Mean	50.57	45.29	50.82	55.14

CVA Coefficients and Data Visualization

Craniometric CVA

Data visualizations of CV scores from the first and second canonical dimensions are presented Figure 4.11 throughFigure 4.13 for comparative craniometric data and Figure 4.19 through Figure 4.21 for comparative odontometric data. The three figures represent CV plots for CVA models with the following specifications: pooled sexes, females only, and males only. The dataset with the pooled sexes were initially analyzed without craniometric variables that exhibited variance between the sexes, but the removal of these variables yielded results with much lower accuracy rates and skewed data based on interobserver differences. Therefore, the 15 craniometric variables outlined in the Methods section were used for this CVA iteration with pooled sexes. Sources from which the data originated are coded in different colors in the figures, and each group centroid is labeled with population group names within the scatterplot. The percentage that each canonical dimension contributes to the variation seen in the model is denoted on the x- and y-axes following the corresponding CV dimensions (labeled Can1 and Can2 in the figures). Standardized canonical coefficients for each metric variable were also calculated, with each coefficient indicating the loadings that the variables contributed to the model in the classification of population groups. Tables summarizing the standardized coefficients for craniometric data (Table 4.20) and odontometric data (Table 4.22) were included below.

In the craniometric CVA with pooled sexes, NLB and BPL contributed most to the first canonical dimension/Can1 (*i.e.*, the x-axis division in Figure 4.11), while BNL contributed most to the second canonical dimension/Can2 (i.e., the y-axis division in Figure 4.11). This pattern indicates that population groups on the left and right sides of the x-axis in Figure 4.11 were divided by variables such as NLB and BPL (*i.e.*, nasal breadths and prosthion prognathism) compared to the groups on the right side of the x-axis. Likewise, those on the top part of the y-axis in Figure 4.11 were divided from those on the bottom by BNL (distance from the cranial base to the top of the nasal region) and XCB (maximum cranial breadth), which contributed most to Can2. For the females only craniometric CVA, XCB contributed most to Can1, while BNL and NLB contributed most to Can2. Lastly, the canonical coefficients in the males only craniometric CVA showed that NLB had the highest loading for Can1, while BPL had the highest for Can2.

Table 4.20. Standardized canonical coefficients for comparative craniometric data. Metric variables with the highest loadings are bolded.

	Pooled Sexes		**Females Only**		**Males Only**	
Variable	**Can1**	**Can2**	**Can1**	**Can2**	**Can1**	**Can2**
NOL	0.144186365	0.026270344	-0.169094758	-0.313620557	0.02851018	-0.15970084
BNL	-0.215120815	**0.534435238**	0.074136951	**0.367267190**	-0.22114315	-0.40058382
BBH	0.178817786	-0.454509600	-0.129135745	-0.453211462	0.11245141	**0.46047660**

	Pooled Sexes		**Females Only**		**Males Only**	
Variable	**Can1**	**Can2**	**Can1**	**Can2**	**Can1**	**Can2**
XCB	-0.672625381	**0.363630934**	**0.566656327**	0.325169667	-0.66211818	-0.30908011
ASB	-0.298456375	0.008475595	0.318249530	-0.010736391	-0.25304732	-0.05434844
BPL	**0.376574935**	-0.680328546	-0.252425993	-0.695438085	0.34879150	**0.54876935**
NLH	-0.372898271	-0.141507197	0.349497223	-0.076523069	-0.35251057	0.20842545
NLB	**0.422545350**	0.327554772	-0.388066329	**0.346949266**	**0.42025690**	-0.27728704
MAB	0.103986714	-0.085874193	0.002453334	-0.013274428	0.12852658	0.09747978
MDH	0.317379571	0.312039385	-0.227310954	0.226556318	0.24585052	-0.11108119
OBH	0.015235438	-0.493300280	0.061083453	-0.458106309	0.03484215	0.44582856
ZMB	-0.198651904	-0.535208038	0.253331138	-0.363816248	-0.17666310	**0.49450402**
FRC	0.082375275	0.032310336	-0.017010979	0.075670859	0.12786255	-0.01790886
PAC	0.177338004	0.339440137	-0.241877645	0.340285913	0.16009756	-0.25498935
OCC	-0.002687682	-0.142428676	-0.013620762	0.006288889	0.01973415	0.20798815

Based on these results, it is clear that most of the variables contributing most to group separation in the craniometric CVA were associated with facial and nasal dimensions, as well as cranial breadth. These measurements have previously been shown to be related to climate patterns (Hubbe et al., 2009; Roseman, 2004). In Figure 4.11 throughFigure 4.13, a distinct grouping of populations from colder and drier climates, such as Alaska Inuit, Canada Indigenous, Greenland, Patagonia, and Okhotsk, formed in the same plot quadrants. Further, these groups have also been shown to fall on the same sides of the plots in similar magnitudes as most European populations in areas with cold weather, such as Switzerland, Czech, Austria, Germany, France, and the UK. Further, populations associated with geographic regions with warmer climates, including the

Duckworth Burma group, were shown to be closer together compared to groups from colder climate regions.

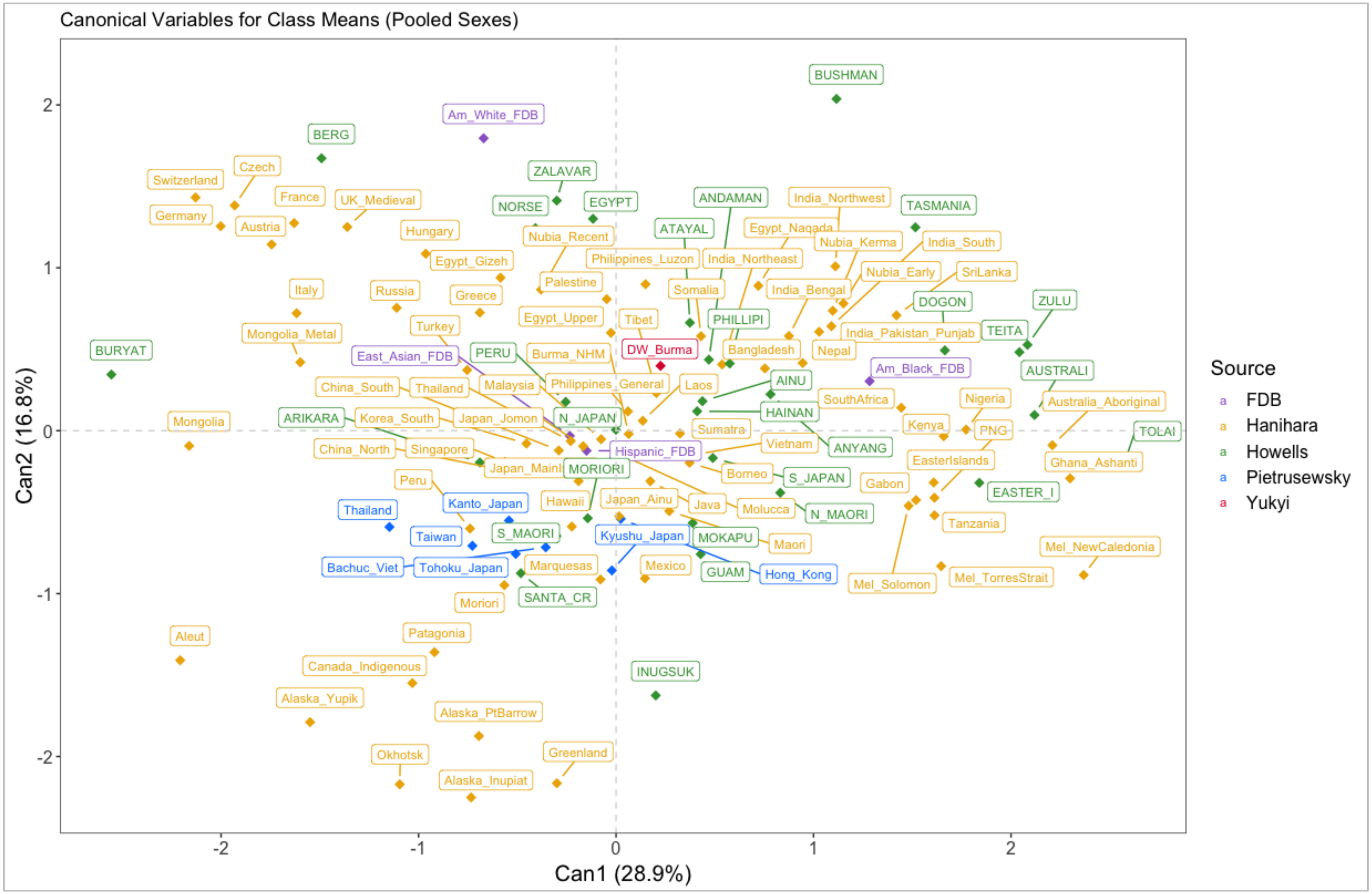

Figure 4.11. Canonical Variates (CV) plot of comparative global craniometric data (pooled sexes).

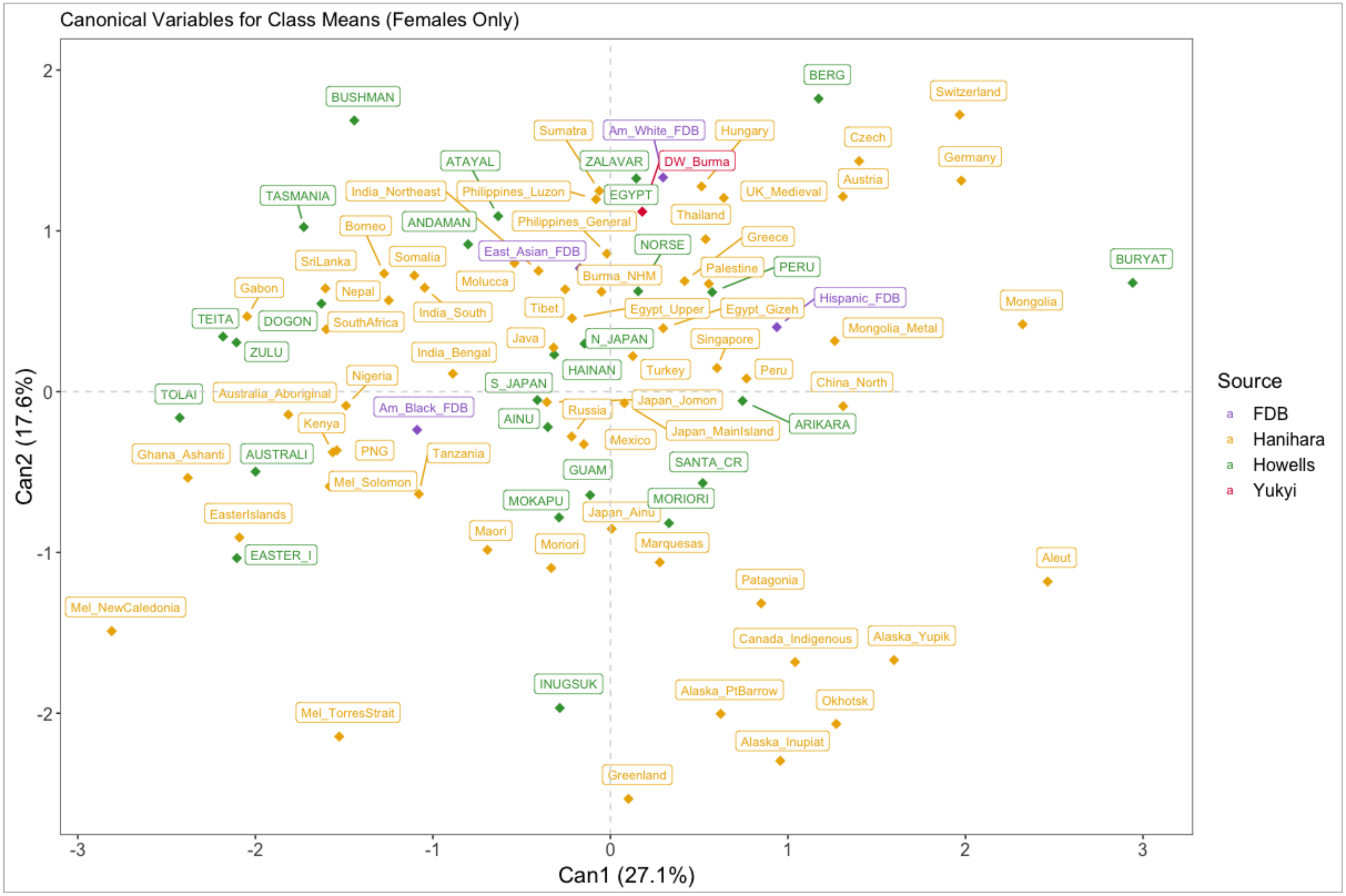

Figure 4.12. Canonical Variates (CV) plot of comparative global craniometric data (females only).

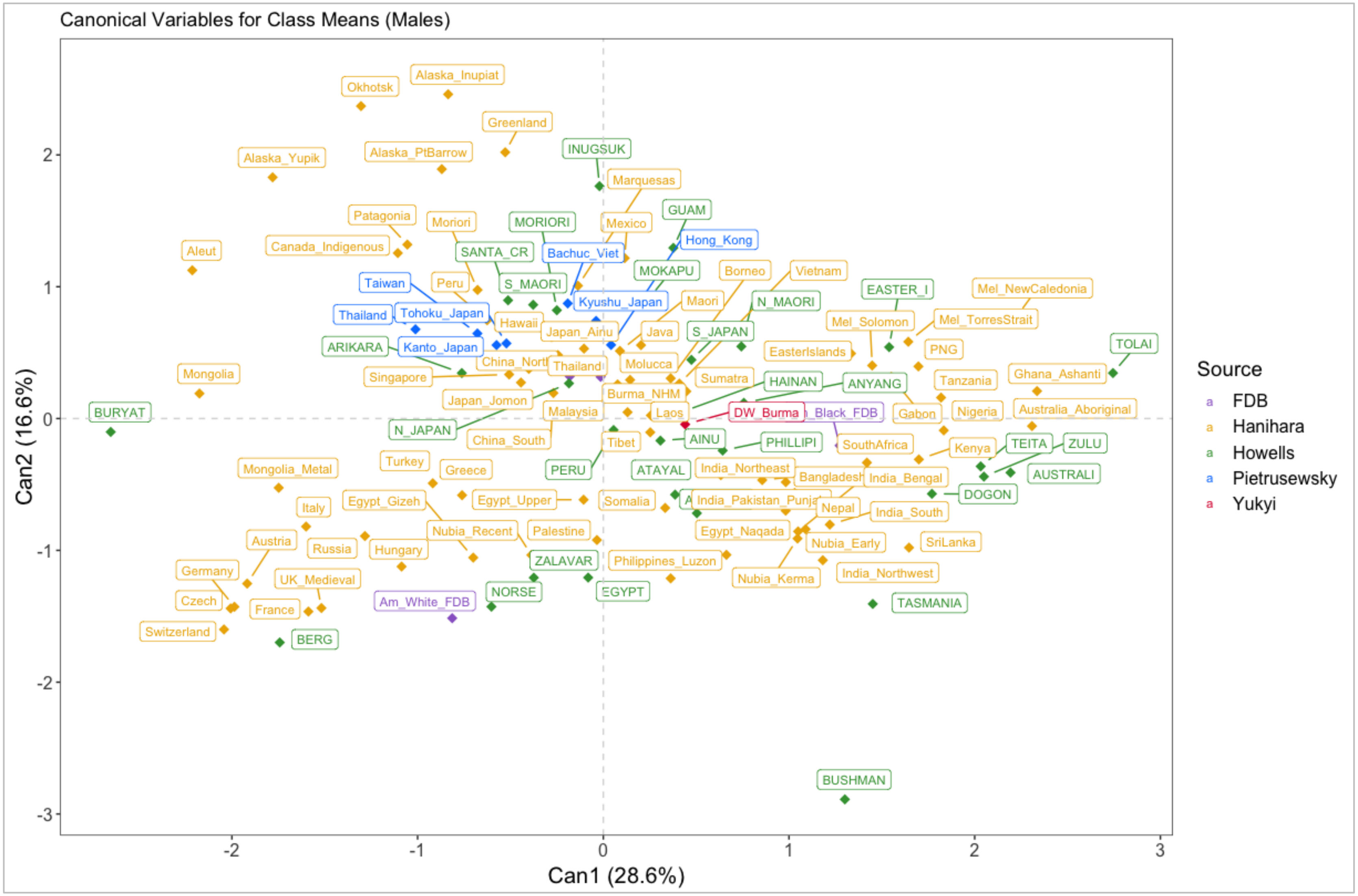

Figure 4.13. Canonical Variates (CV) plot of comparative global craniometric data (males only).

MMS Trait Frequencies

Based on previous findings that most cranial morphology associated with climate are often related to the dimensions and proportions of the facial and nasal region (Hubbe et al., 2009; Plemons, 2022; Roseman, 2004), MMS trait frequencies for all analyzed population groups were calculated. In the current study, MMS trait frequencies of the Duckworth Burma samples were calculated and visualized in Figure 4.14. Based on these results, most of the Duckworth Burma samples exhibited low to intermediate ANS scores and IOB scores (mostly 1s and 2s), which are trait scores expected to be associated with moderate to warmer climates (Plemons, 2022). Further, NAW, a trait that contributes to the overall nasal morphology, was also assessed for Duckworth Burma samples, who showed that an intermediate score of 2 was seen in the highest frequencies. NBC scores, although marked as a climate-associated trait, might not provide much insight into climate patterns from the Duckworth Burma data, since the trait exhibited low reliability in the intraobserver error test (see Table 3.4). As such, the Duckworth Burma NBC scores were not considered heavily in the final conclusions.

Lastly, although ZS was not listed as one of the traits with high climate correlations in previous literature, it was considered a noteworthy factor in the conclusions for the current study. According to Plemons (2022), ZS is a trait with one of the highest heritability measures (*i.e.*, it is not influenced by environmental factors), and yet it demonstrated the highest positive temperature effect in her study. Interestingly, the trait score with the highest frequency for ZS in the Duckworth Burma sample group was the lowest score on the scale (1), which indicates the lowest complexity of the zygomaticomaxillary suture course. This pattern is consistent with Plemons' (2022) observation that higher expressions of this trait are correlated with colder climates, while the opposite is true for more temperate climates. Generally, the individuals represented in the Duckworth collection exhibited MMS scores that are consistent with those expected in individuals associated with warmer/moderate climates.

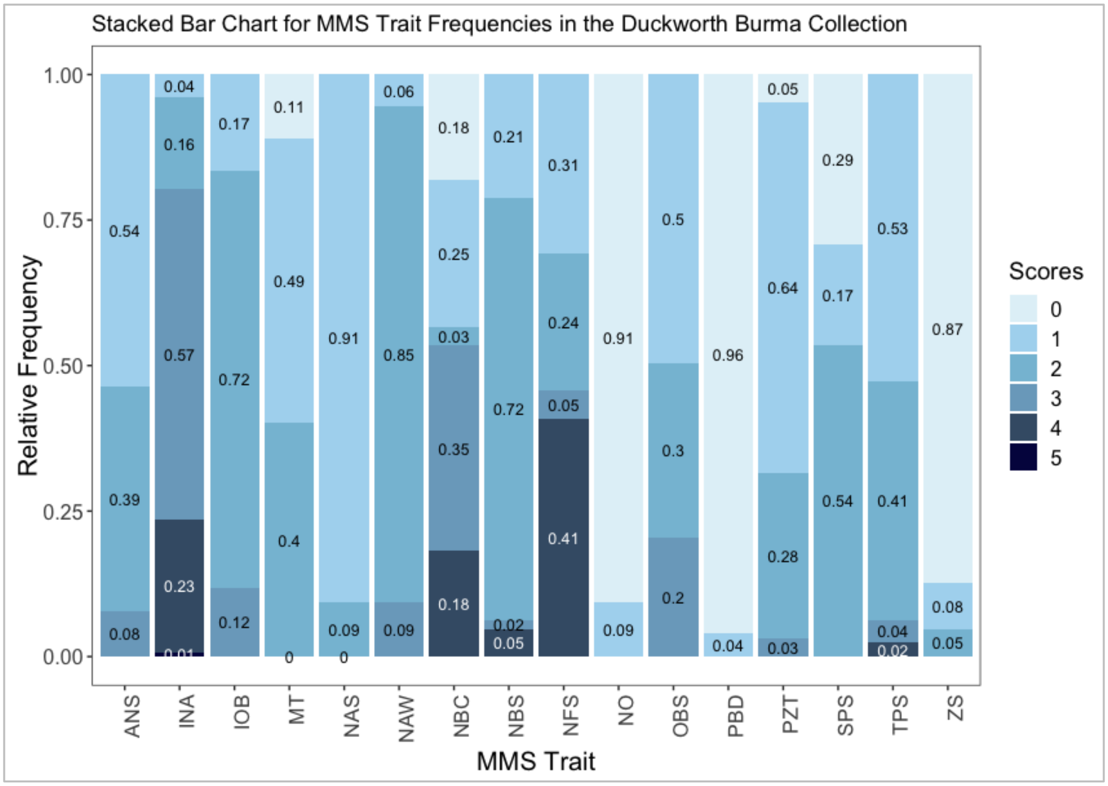

Figure 4.14. Stacked bar chart showing relative trait frequencies of MMS traits within the Duckworth Burma sample group.

Bar charts summarizing MMS trait frequencies for all analyzed population groups were reported in Figure 4.15 and Figure 4.16. In reviewing similarities for climate-related MMS trait frequencies between the Duckworth Burma group and global comparative samples, the Duckworth Burma was most similar to Mexico based on ANS and to Pacific Amerindian based on IOB. Lastly, based on NAW trait frequencies, the Duckworth Burma group was most similar to the Chinese group.

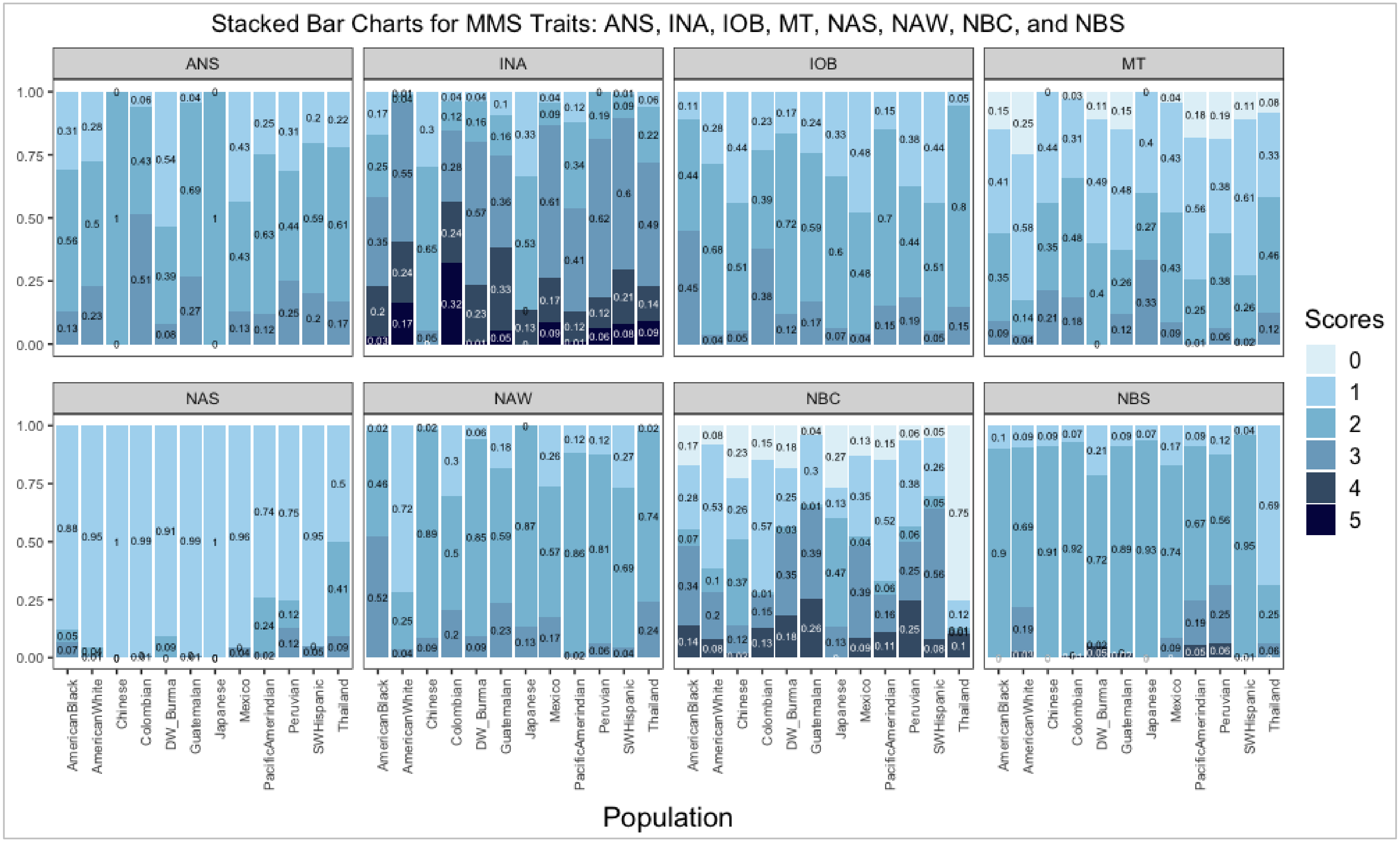

Figure 4.15. Stacked bar charts showing relative frequencies of MMS traits across all analyzed population groups. MMS traits in this figure include ANS, INA, IOB, MT, NAS, NAW, NBC, and NBS.

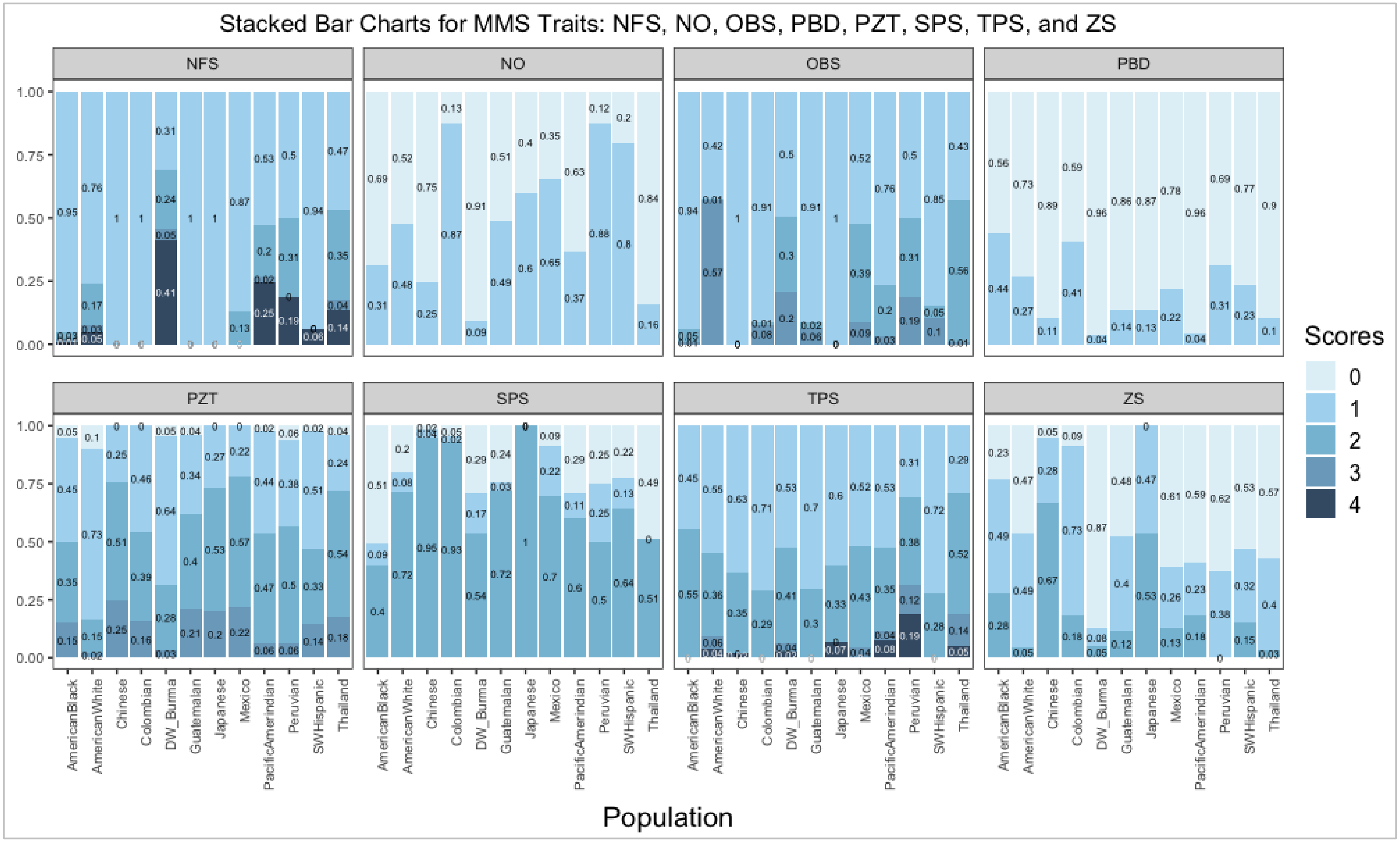

Figure 4.16. Stacked bar charts showing relative frequencies of MMS traits across all analyzed population groups. MMS traits in this figure include NFS, NO, OBS, PBD, PZT, SPS, TPS, and ZS.

MMS MMD Results

Lastly, MMD results for MMS data were assessed to compare the population groups with which the Duckworth Burma group was similar or dissimilar. Based on four MMS traits (ANS, INA, IOB, and NAW), the Duckworth Burma samples were most similar to samples from Mexico. Based on the MMD distances for MMS data, a dendrogram showing the hierarchical clustering of groups (Figure 4.17) and a heatmap showing the similarities and dissimilarities between groups (Figure 4.18). In the heatmap, a red hue indicates a larger distance between two groups and therefore indicates dissimilarity, while a blue hue indicates the opposite. Based on the MMD distance analysis for MMS data, a summary of the overall measures of distance (MD) of dichotomized MMS traits in the MMD model, similar to loadings in CVA, was also reported (Table 4.21). According to the overall MD values, ANS had the highest MD, indicating that it had the highest contribution to the MMS MMD model.

The overall clustering pattern showed relatively closer relationships among population groups that are associated with warmer climates. However, the non-grouping of Duckworth Burma with Thailand, as well as the dissimilarity of trait frequencies between these two groups assessed in the previous section, was somewhat surprising, especially given that Myanmar and Thailand share very similar climates. An important distinction to make is that while the Duckworth Burma samples are archaeological, the Thailand samples are modern. Therefore, another factor besides climate, such as microevolutionary forces (*e.g.*, genetic drift or gene flow creating temporal differences) might be influencing clustering patterns. However, Thailand was one of the groups that the Duckworth Burma group was similar to, according to the heatmap (see Figure 4.18).

Other groups similar to the Duckworth Burma samples (indicated by a blue hue) included Peru, Mexico, Pacific Amerindian, American White, and Southwest Hispanic. Out of this list, American White stood out, which might indicate that there might be other factors such as interobserver differences influencing the results as well.

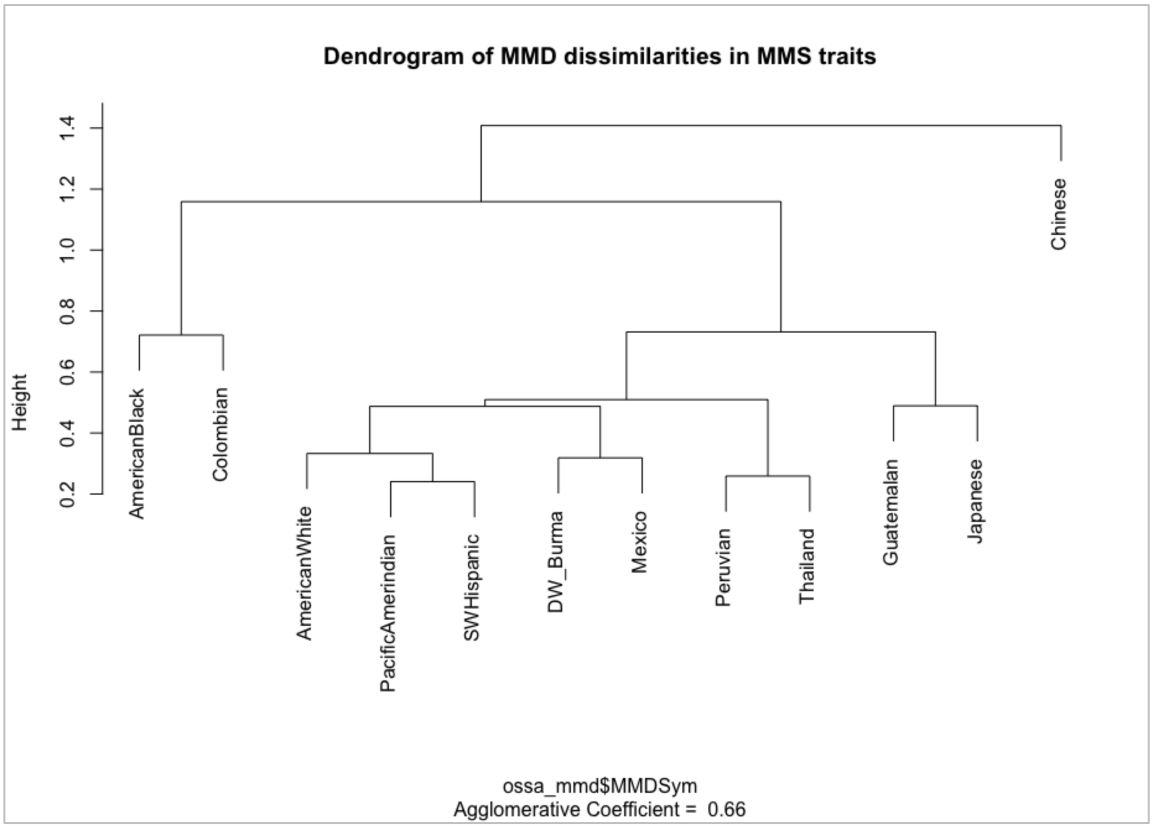

Figure 4.17. Dendrogram representing the agglomerative clustering of populations from comparative global MMS data using trait frequencies from MMS scores (pooled sexes).

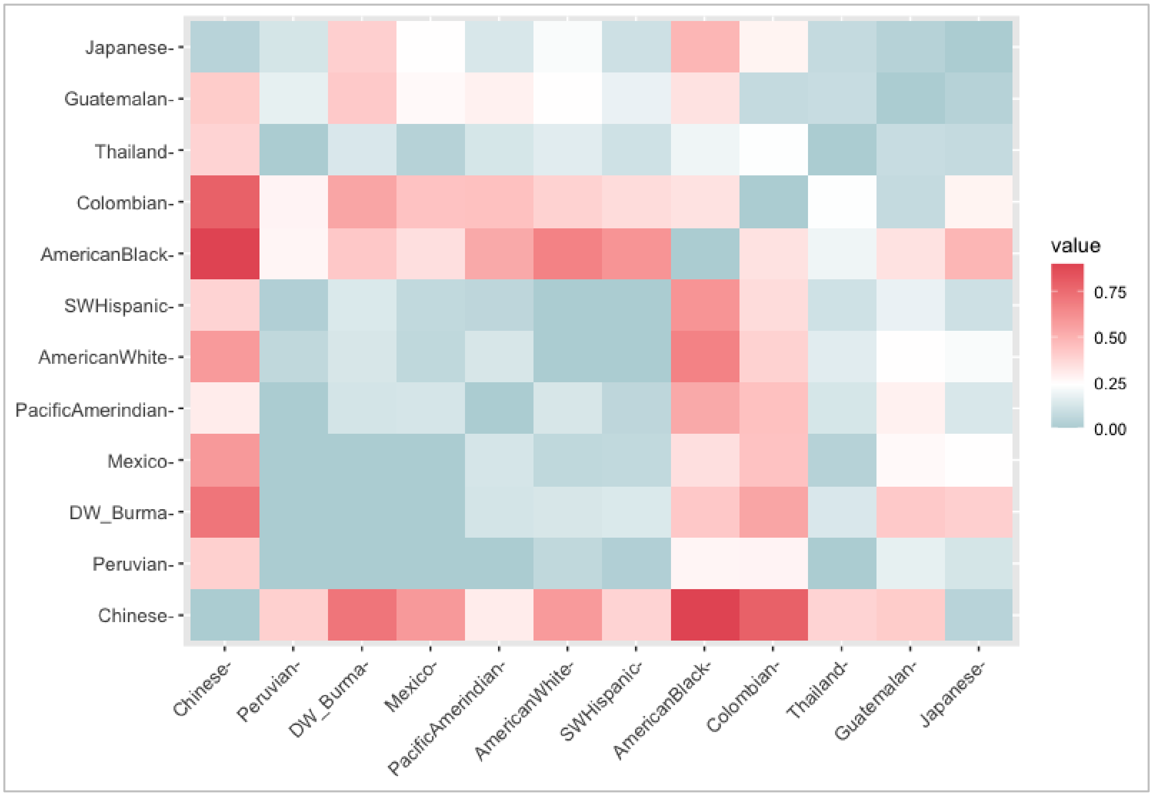

Figure 4.18. Heatmap showing the MMD distance matrix for the global MMS dataset (pooled sexes). A red hue indicates larger distance between two groups, while a blue hue indicates smaller distance.

Table 4.21. Summary of overall MDs of dichotomized MMS traits in the MMD model.

MMS Trait (dichotomized)	Overall MD
ANS	25.42915
INA	16.05980
NAW	14.04256
IOB	12.15775

AIM #2: EXPLORE EVOLUTIONARY TRENDS BEHIND SKELETAL VARIATION IN MYANMAR

Hypothesis #3: The Burma sample groups will be similar to other Southeast Asian groups and groups from neighboring geographic areas.

CVA Models and Data Visualization

Craniometric CVA

As discussed in the above section for Hypothesis #2, craniometric CVA results were helpful in identifying which population groups exhibited closest distances to the Duckworth Burma sample group. Figure 4.11 through Figure 4.13 showed that the Duckworth Burma group placed spatially closest to multiple East and Southeast Asian groups, such as Tibet, Hainan (southern China), Laos, the Philippines, Sumatra, and the NHM Burma sample. The CVA model with only females included showed a few different grouping patterns from the other two iterations with pooled sexes and males only. However, it is important to note that the females only model was built with a much smaller sample size (with some population groups being represented by samples as small as n = 3). Therefore, although the accuracy rate for this model was higher than the other models (see Table 4.1), caution was exercised when interpreting results from this analysis. Overall, the grouping patterns based on craniometric CV scores support the third hypothesis that the Duckworth Burma (and the Burma group in general, which included the NHM Burma group), will be more similar to groups from neighboring geographic areas.

Odontometric CVA

In reviewing odontometric data, the buccolingual crown measurement of the upper third premolar contributed relatively heavily to both Can1 and Can2 for the CVA with pooled sexes (Table 4.22). Additionally, the buccolingual crown measurement of the upper second molar had the highest loading for Can2. For the females only odontometric CVA model, the buccolingual crown measurement of the upper first molar contributed most to both Can1 and Can2, although the loading for Can1 was much higher. Lastly, the males only odontometric CVA model did not have high loadings in Can1, except for a relatively high loading from the buccolingual crown measurement of the upper second molar compared to other variables, while the mesiodistal crown measurement of the upper fourth molar had the highest loading for Can2.

Table 4.22. Standardized canonical coefficients for comparative odontometric data. Metric variables with the highest loadings are bolded.

	Pooled Sexes		**Females Only**		**Males Only**	
Variable	**Can1**	**Can2**	**Can1**	**Can2**	**Can1**	**Can2**
UP3_crn_md	0.155324097	-0.30013195	0.26728098	-0.14655186	-0.10612051	0.23667482
UP3_crn_bl	**0.380169878**	**0.68003751**	-0.53344030	-0.64577495	-0.40549549	-0.65179493
UP4_crn_md	0.292567435	-0.49407626	0.19602734	-0.27155566	-0.26907178	**0.51694455**
UM1_crn_md	0.159208337	-0.38362110	-0.58636129	-0.43001583	-0.16925365	0.45473341
UM1_crn_bl	0.138025130	-0.26532509	**1.21276764**	**0.36197326**	-0.11462707	0.04489656
UM2_crn_md	0.282970613	-0.18005614	-0.06092771	-0.12929938	-0.30361431	0.24747375
UM2_crn_bl	-0.17578127	**0.77462695**	0.16277271	0.20283062	0.13656554	-0.70538969
UM3_crn_md	0.098683537	-0.03534102	0.15170705	-0.13960447	-0.09242375	0.04248283
UM3_crn_bl	0.005459388	0.30376609	-0.04875372	0.03173329	-0.02524124	-0.23785251

Visualizations of the CVA results for odontometric data were presented in Figure 4.19 through Figure 4.21. The grouping patterns according to odontometric CVA were not as clear as patterns seen in craniometric CVA results. Overall, the Duckworth Burma group exhibited closeness to groups from neighboring geographic regions, such as Northeast India, Mongolia, China, and Japan. However, the centroid for the Duckworth Burma group also placed them close to European groups like France, Sweden, and Austria. Considering the low accuracy rates and non-significant models based on LDA for odontometric data, the same issues of interobserver difference might apply to CVA results as well.

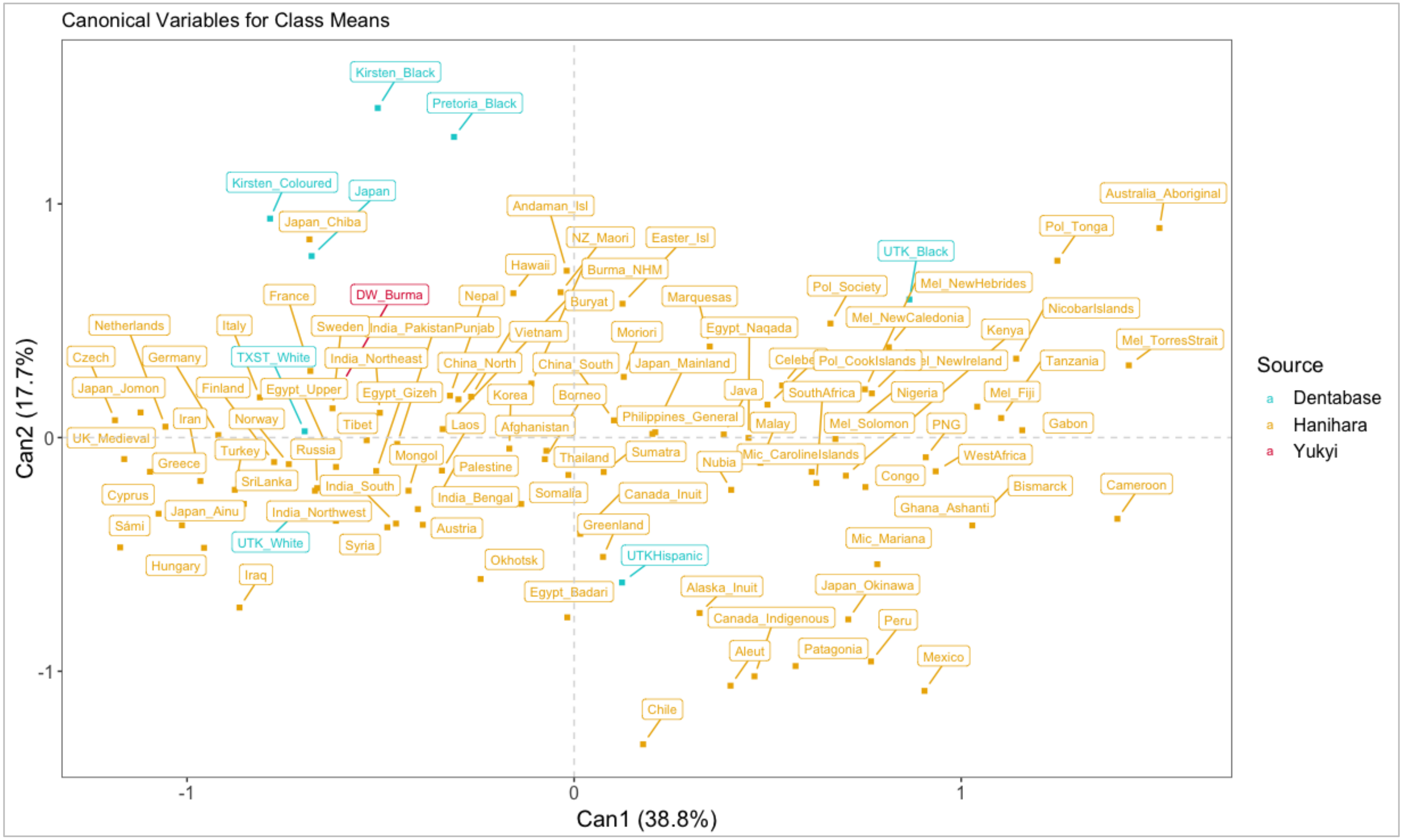

Figure 4.19. Canonical Variates (CV) plot of comparative global odontometric data (pooled sexes).

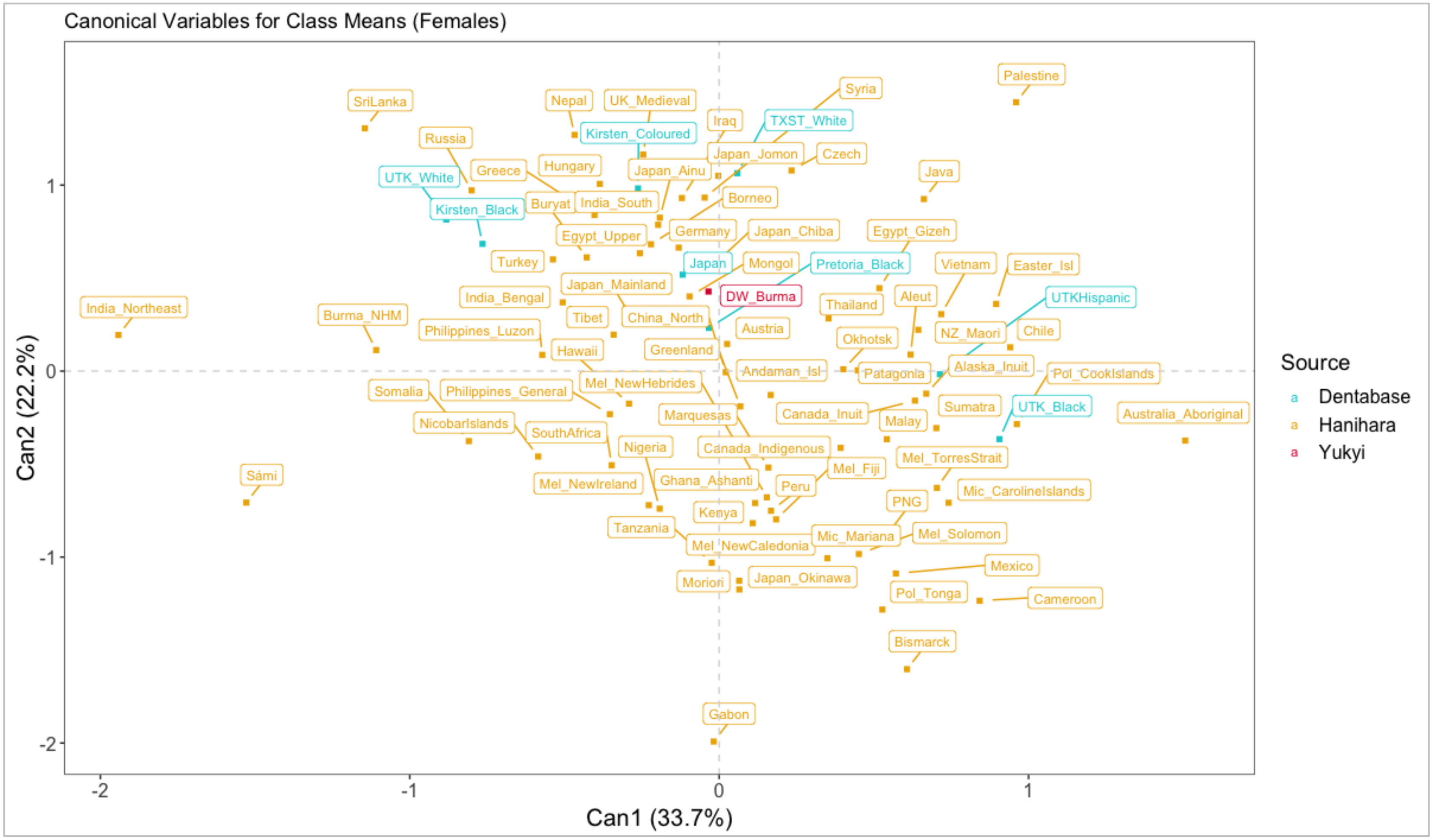

Figure 4.20. Canonical Variates (CV) plot of comparative global odontometric data (females only).

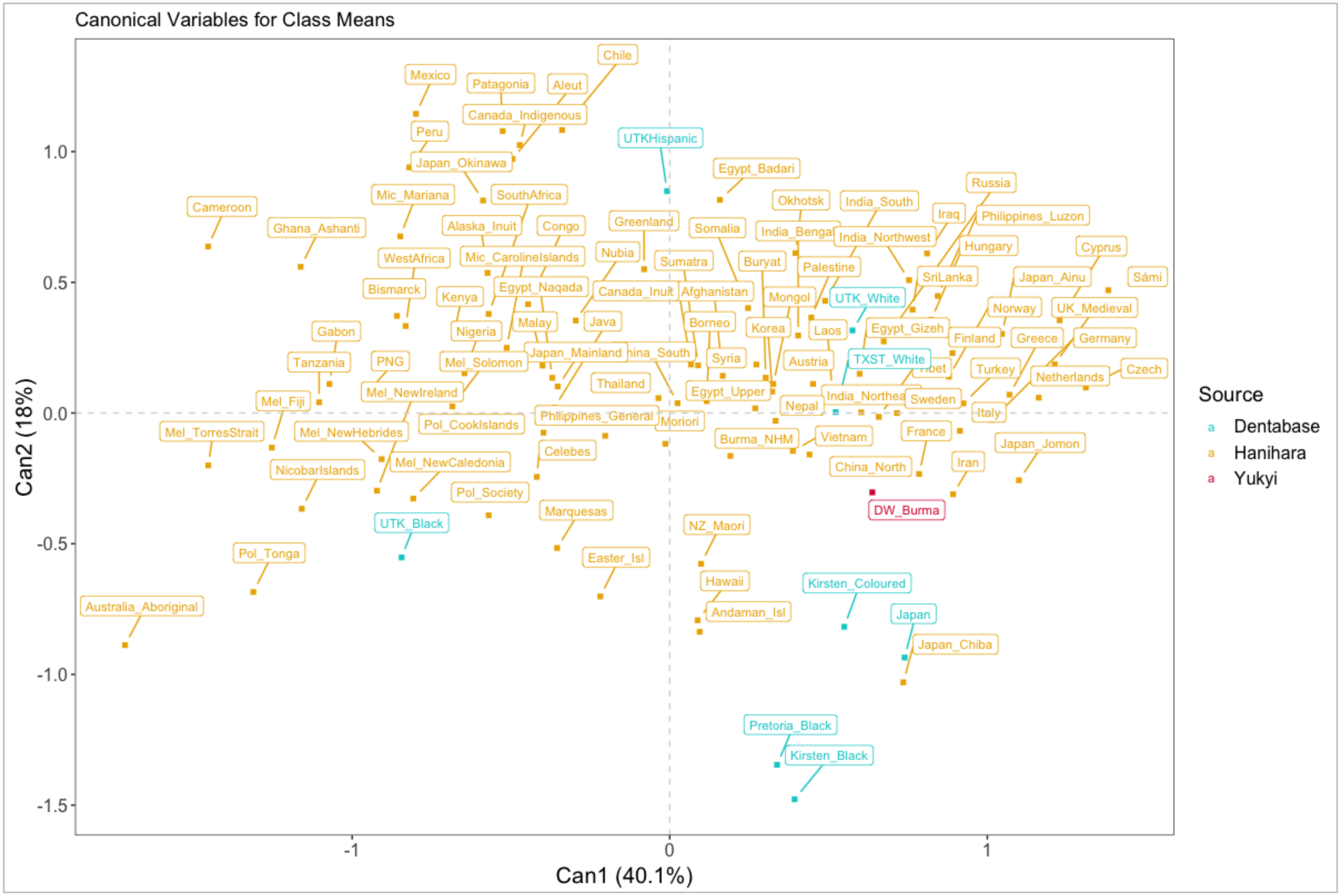

Figure 4.21. Canonical Variates (CV) plot of comparative global odontometric data (males only).

Cranial Nonmetric and Dental Nonmetric MMD Results

MMD distance analyses were performed on dichotomized cranial nonmetric and dental nonmetric datasets as well. Distance matrices from the MMD analyses were used to generate data visualizations for the datasets. Dendrograms representing the agglomerative hierarchical clustering of cranial nonmetric data (Figure 4.22 and

Figure 4.23) and dental nonmetric data (Figure 4.24 and Figure 4.24) were generated. In addition, tables summarizing the overall MD of each trait to the MMD distances were also generated for the two cranial nonmetric datasets (Table 4.23 and Table 4.24) and the dental nonmetric dataset (Table 4.25). The dendrogram based on the Ossenberg cranial nonmetric data (pooled sexes) showed that the Duckworth Burma group was mostly isolated from other groups in its own clade and leaf. Similar to metric analyses, datasets with pooled sexes were initially treated for sexual dimorphism by removing variables exhibiting difference between sexes, but doing so limited the comparisons, so traits selected in the Methods section were used.

The closest group that was also isolated in its own clade was South America. The dendrogram produced from the Hanihara cranial nonmetric data analysis showed that the Duckworth Burma group was also isolated from the geographic region clusters but were relatively close to the clade with South America, North America, and Arctic, with North America and Arctic splitting off in their own clade. Lastly, the dendrogram built from dental nonmetric data showed that the Duckworth Burma group was dissimilar to all comparative groups but had the closest relative distances to the Chiba (Japan) and UTK (University of Tennessee, Knoxville collection) Hispanic groups.

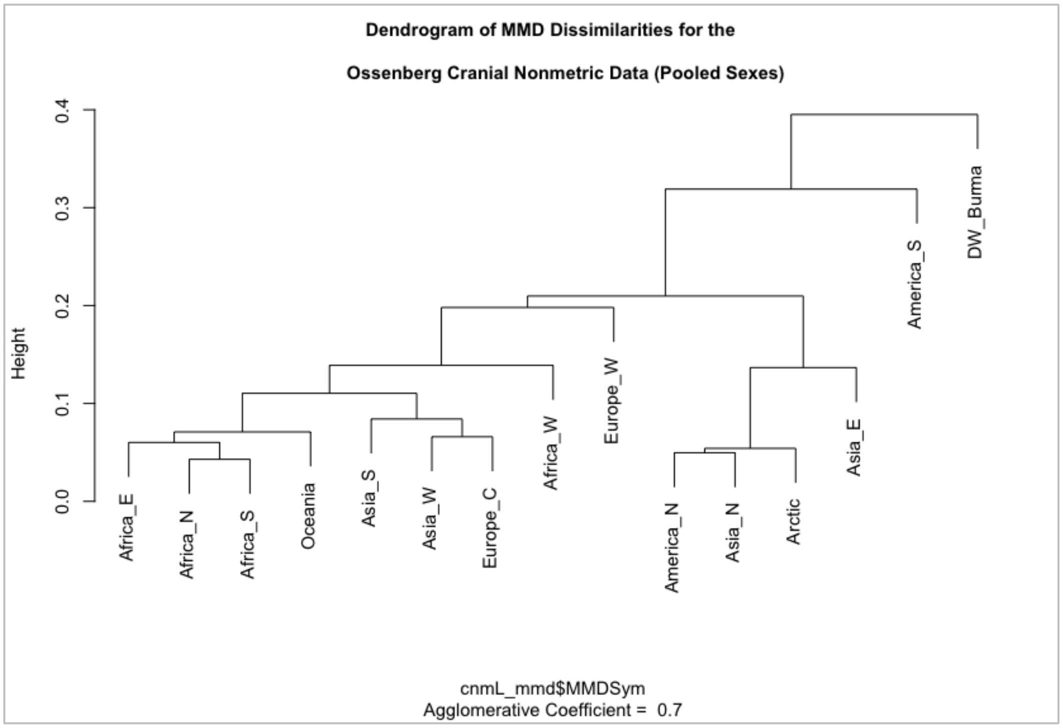

Figure 4.22. Dendrogram representing the agglomerative clustering based on DW_Burma and Ossenberg's comparative global cranial nonmetric data (pooled sexes).

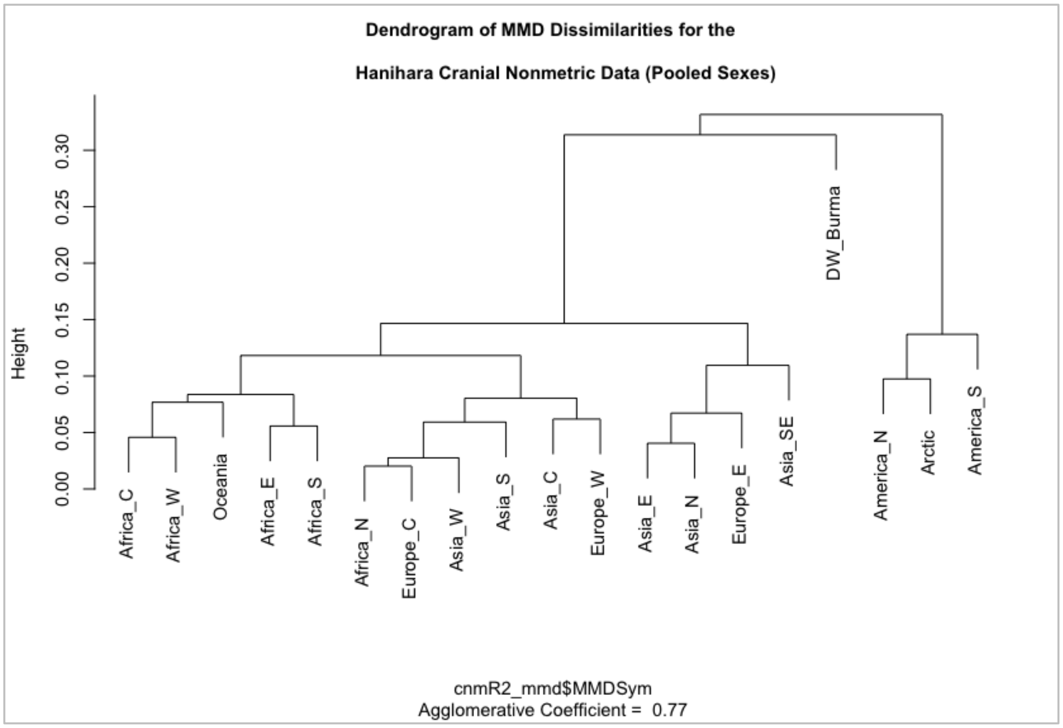

Figure 4.23. Dendrogram representing the agglomerative clustering based on DW_Burma and Hanihara's comparative global cranial nonmetric data (pooled sexes).

Table 4.23. Summary of overall MDs of cranial nonmetric traits in the MMD model in the Ossenberg dataset.

Trait (Ossenberg)	Overall MD
CONL	23.2161629
SOFL	13.9735790
TYML	7.4753462
TZSL	6.2324832
HYPL	5.2922430
OMBL	5.2159967
FSPL	5.0768142
APIC	4.7913258
METO	3.3692464
ASTL	2.4104763
PNBL	1.1924026
CIVL	1.1442168
INCA	0.3183278

Table 4.24. Summary of overall MDs of cranial nonmetric traits to the MMD model in the Hanihara dataset.

Trait (Hanihara)	Overall MD
TD_R	15.813113
SOF_R	14.708399
CCA_R	12.687004
TZS_R	8.987257
HGCB_R	8.023881
OMB_R	7.538209
MET	6.924000
AIOF_R	4.995691
OL	2.811951
AEX_R	2.521576
OSC_R	2.000722
PNB_R	1.944752

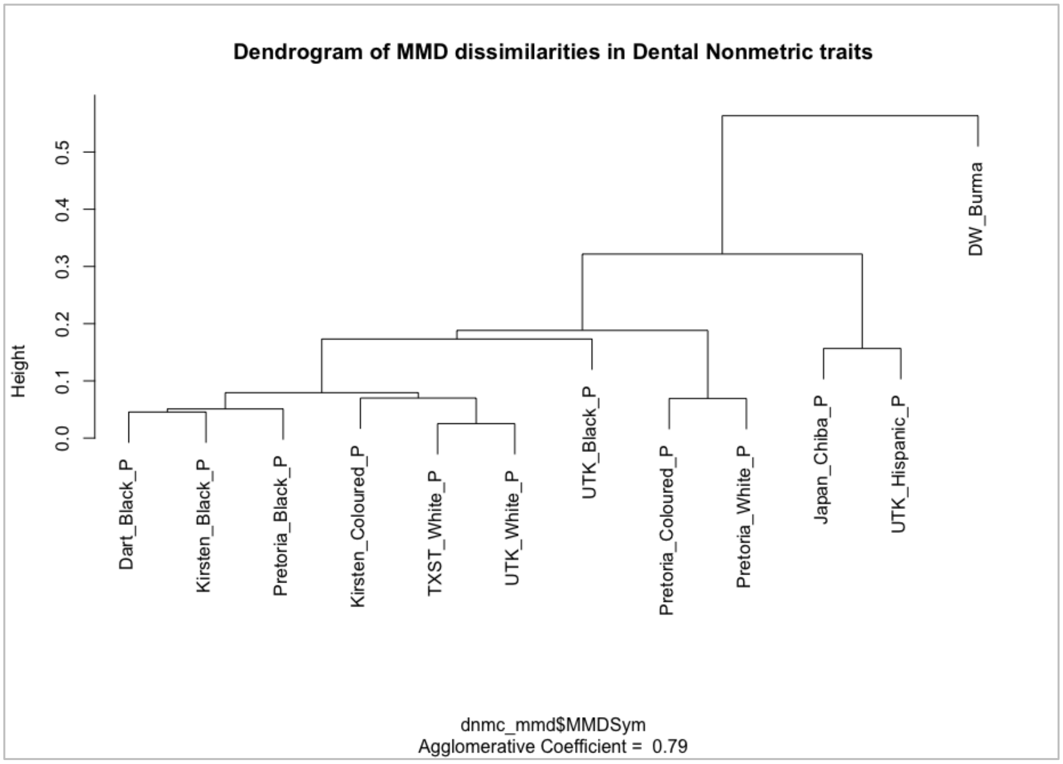

Figure 4.24. Dendrogram representing the agglomerative clustering of populations based on comparative global dental nonmetric data (pooled sexes).

Table 4.25. Summary of overall MDs of dental nonmetric traits in the MMD model.

Dental Nonmetric Trait	Overall MD
P_U_M1_ENEX	20.1747750
P_U_P3_ACCUP	12.2641446
P_U_M2_HYPCON	9.2362205
P_U_P3_ROOTNUM	2.2648889
P_U_M1_METCONL	1.4078352
P_U_M3_METCON	-0.2512619
P_U_M2_MOLCR	-0.3863112
P_U_M1_CARAB	-1.2430706
P_U_P3_UTOAZ	-2.0281374
P_U_M1_PARAST	-2.1151244

Dental Nonmetric Trait	Overall MD
P_U_P4_ODONT	-2.1451571

The isolation of Duckworth Burma seen in all three dendrograms could be attributed to a few reasons. First, interobserver differences could be influencing this pattern. Cranial nonmetric data on the Duckworth Burma samples were collected using different standards from both the Ossenberg and Hanihara datasets, and the scores were later dichotomized according to the different standards laid out by authors of the two comparative samples (Hanihara & Ishida, 2001a, 2001a, 2001b, 2001c, 2001d; Hanihara et al., 2003; Ossenberg, 2013b). As such, errors attributed to dichotomization and/or interobserver differences could very well have contributed to the isolation of the Duckworth Burma group in the dendrograms for cranial nonmetric data.

Second, a temporal difference due to secular change could be present in the dendrogram based on dental morphological MMD results. In this analysis, the Duckworth Burma sample group was compared to modern samples, which might have contributed to the pattern in which Duckworth Burma was farthest from all the comparative groups. However, another possibility for this pattern is observer difference in the scoring of enamel extensions. According to the overall MD for dental nonmetric MMD, M1 enamel extension was the trait that contributed to the model. Because of the paucity of complete dental elements in the Duckworth Burma collection, a majority of dental elements were not scored from teeth with all parts of the enamel present. The enamel extension is one such trait that might be affected by the lack of enamel on the teeth. Further, some trait scores were estimated due to heavy occlusal wear of the dentition, affecting traits like

P3 accessory cusp and M2 hypocone, which had the second and third highest MDs, respectively. Therefore, temporal and interobserver differences could be influencing the final MMD results for both cranial nonmetric and dental nonmetric data.

Additionally, the MMD distance matrices for nonmetric data were used to generate heatmaps showing the relationships between population groups analyzed for cranial nonmetric data (Figure 4.25 and Figure 4.26) and dental nonmetric data (Figure 4.27). Similar to heatmaps in MMS data (see previous section on Hypothesis #2), a red hue indicates greater distance from each other, indicating dissimilarity, and a blue hue indicates closer distance, indicating similarity between two groups. Since the heatmaps were built from the same MMD model used for dendrograms, the similarity/dissimilarity patterns were also reflected in these figures.

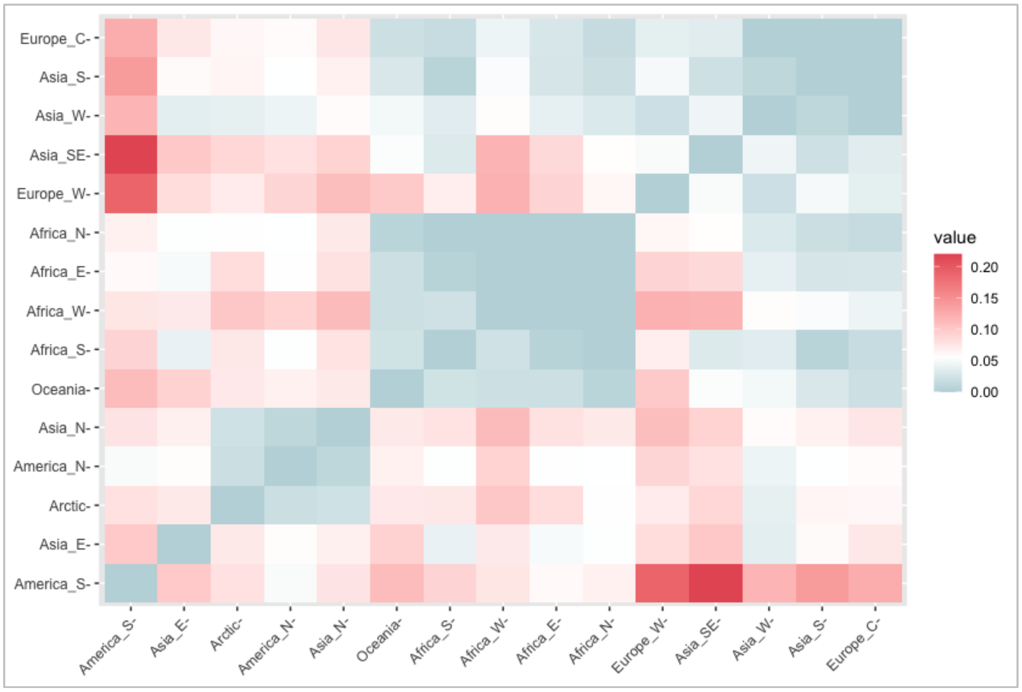

Figure 4.25. Heatmap showing the MMD distance matrix for the Ossenberg global cranial nonmetric dataset (pooled sexes), organized by geographic region.

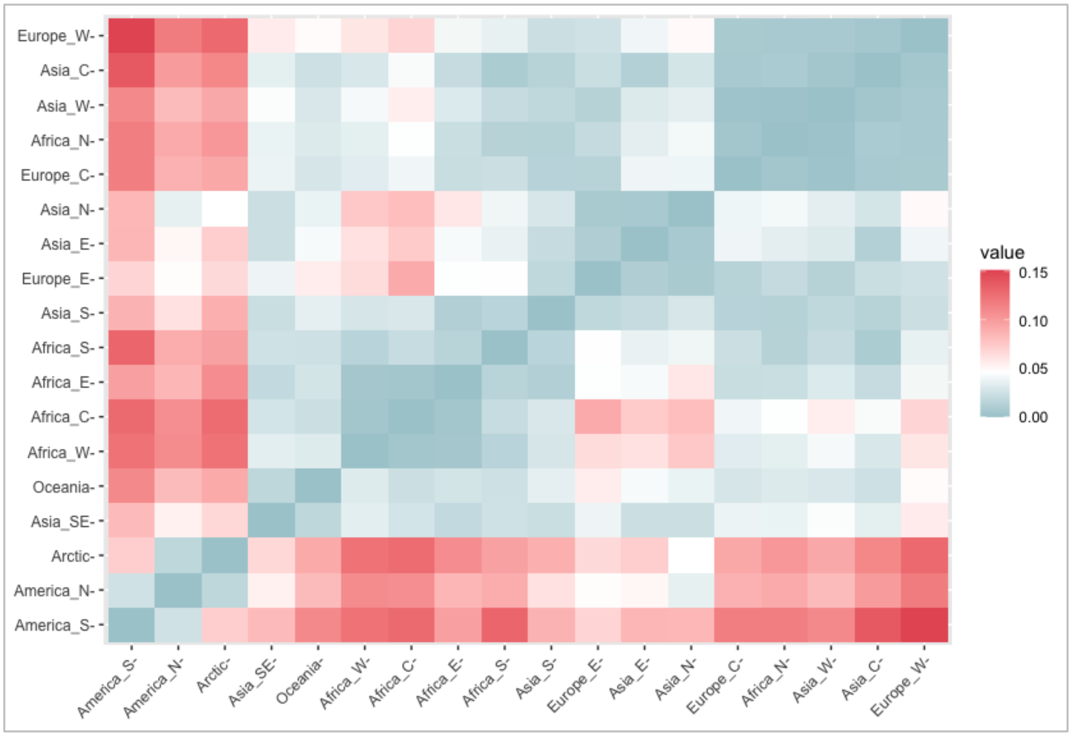

Figure 4.26. Heatmap showing the MMD distance matrix for the Hanihara global cranial nonmetric dataset (pooled sexes), organized by geographic region.

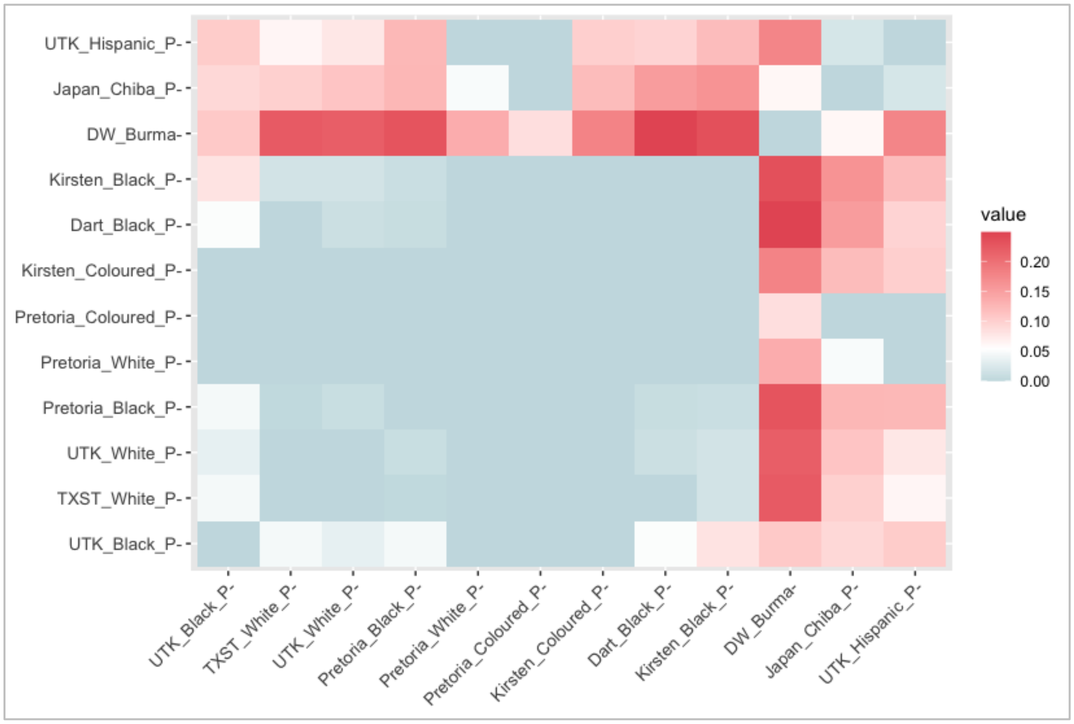

Figure 4.27. Heatmap showing the MMD distance matrix for the global dental nonmetric dataset (pooled sexes).

D^2 Matrices Results (Metric and Nonmetric Data)

In addition to R matrix and FST calculations discussed in the first section for Hypothesis #1, both RMET 5.0 and Konigsberg's (1990) R workspace generated D^2 matrices. The matrices for each data type are summarized in Table B.8-Table B.13 of Appendix B. Based on the distances represented in the D^2 matrix for craniometric data, the Duckworth Burma group had the smallest distances with Southeast Asian countries including Laos, Indonesia, Malaysia, and the Philippines, as well as similarly close distances to South Korea, Tibet, and China.

Upon reviewing the odontometric D^2 matrix, the population groups with the closest distances to the Burma group included Southeast Asian groups such as Thailand, Cambodia, Laos, Indonesia, Malaysia, and the Philippines, East Asian groups such as China, Japan, South Korea, Tibet, and South Asian groups such as Nepal, India, and Sri Lanka. These population groups had calculated distances of under 0.070 with the Burma group and thus exhibited the closest relative distances. However, there were other groups whose distances with the Burma group were relatively low (between 0.070 and 0.085), such as Pretoria Black, Kirsten Colored, Texas State White, and France. Based on previous observations with LDA and k-means cluster analyses on odontometric data, results for D^2 matrix were considered with caution. However, the overall distance patterns based on both craniometric and odontometric D^2 matrices showed similar trends.

Conversely, results from the cranial nonmetric and MMS D^2 matrices were more difficult to comprehend and did not follow clear geographic patterns. D^2 values calculated based on cranial nonmetric data with Ossenberg's comparative data showed that India (D^2=1.446), Plains (Native America; D^2=1.449), and South Africa (D^2=1.597) were closest to Duckworth Burma. The next most similar groups were West Japan (D^2=1.749), Siberia (D^2=2.153), and Maori (New Zealand; D^2=2.173) (see Table B.10 in Appendix B).

Similarly unclear in exhibiting patterns, cranial nonmetric D^2 values in the analysis comparing the Duckworth Burma group to Hanihara's cranial nonmetric data showed that African groups such as Somalia (D^2=1.056), South Africa (D^2=1.334), and Ashanti (Ghana; D^2=1.418) were groups with the three lowest D^2 values with Duckworth Burma. Following these three groups in small D^2 values were NHM Burma (D^2=1.716), Nubia (D^2=1.737), Northeast India (D^2=1.765), and Nepal (D^2=1.766) (see Table B.11 in Appendix B). Further, the D^2 matrix based on comparative MMS data showed that the Duckworth Burma group was closest to Mexico (D^2=2.148), Pacific Amerindian (D^2=2.157), and American White (D^2=2.282), followed by Southwest Hispanic (D^2=2.658), Peruvian (D^2=2.704), and Thailand (D^2=3.315) (see Table B.12 in Appendix B).

Lastly, the dental morphological D^2 matrix results showed that Duckworth Burma was closest to the Chiba (Japan) group. Other comparative groups were similarly far from Duckworth Burma. Overall, this pattern is consistent with the hypothesis that Duckworth Burma would be more similar to population groups that exhibit closer geographic distance. However, the D^2 value between Duckworth Burma and Chiba Japan was 4.556, which was small, relative to other groups with values ranging from 7.570 (UTK Black) to 10.909 (Kirsten Black), but still far compared to previous analyses. Further, because the Chiba group was the only Asian group compared in this analysis, with most other groups being Black, White, or Hispanic, a further analysis with more population groups is warranted.

PCoA Results

In addition to r_{ii}, F_{ST}, and D^2 values, RMET 5.0 also provided the first two scaled eigenvectors (which are synonymous with PCo scores) for the two metric datasets were also calculated. The eigenvectors, which were obtained by taking the square root of the respective eigenvalues (Harpending & Jenkins, 1973; Relethford, 2003), were then plotted to provide a visualization of relationships among groups (Figure 4.28 and Figure 4.29). The x- and y-axis labels in the figures indicate the first and second PCA eigenvectors, respectively, followed by the percentage of the variation for which each eigenvalue accounts. The eigenvectors were calculated based on the unbiased R matrix.

PCo scores were also generated in the Konigsberg (1990) R workspace, of which the first two were selected for data visualization. Figure 4.28 through Figure 4.33 represent data visualizations with labeled scatterplots for the first (x-axis) and second (y-axis) PCo scores from the R matrix calculated for nonmetric data in this study. The PCoA plot for Ossenberg’s comparative cranial nonmetric data (see Figure 4.30) showed that Duckworth Burma was relatively closer to Mongolia, Jomon (Japan), and Armenia. Results from the Hanihara cranial nonmetric PCoA plot showed Duckworth Burma being far away from most groups, but overall, the plot showed some trends, with North and South American groups generally grouping in the top left quadrant and most Oceania groups in the bottom left quadrant (see Figure 4.31). Apart from these two observations, a clear geographic pattern based on the general spatial placements of the population groups in the plot was difficult.

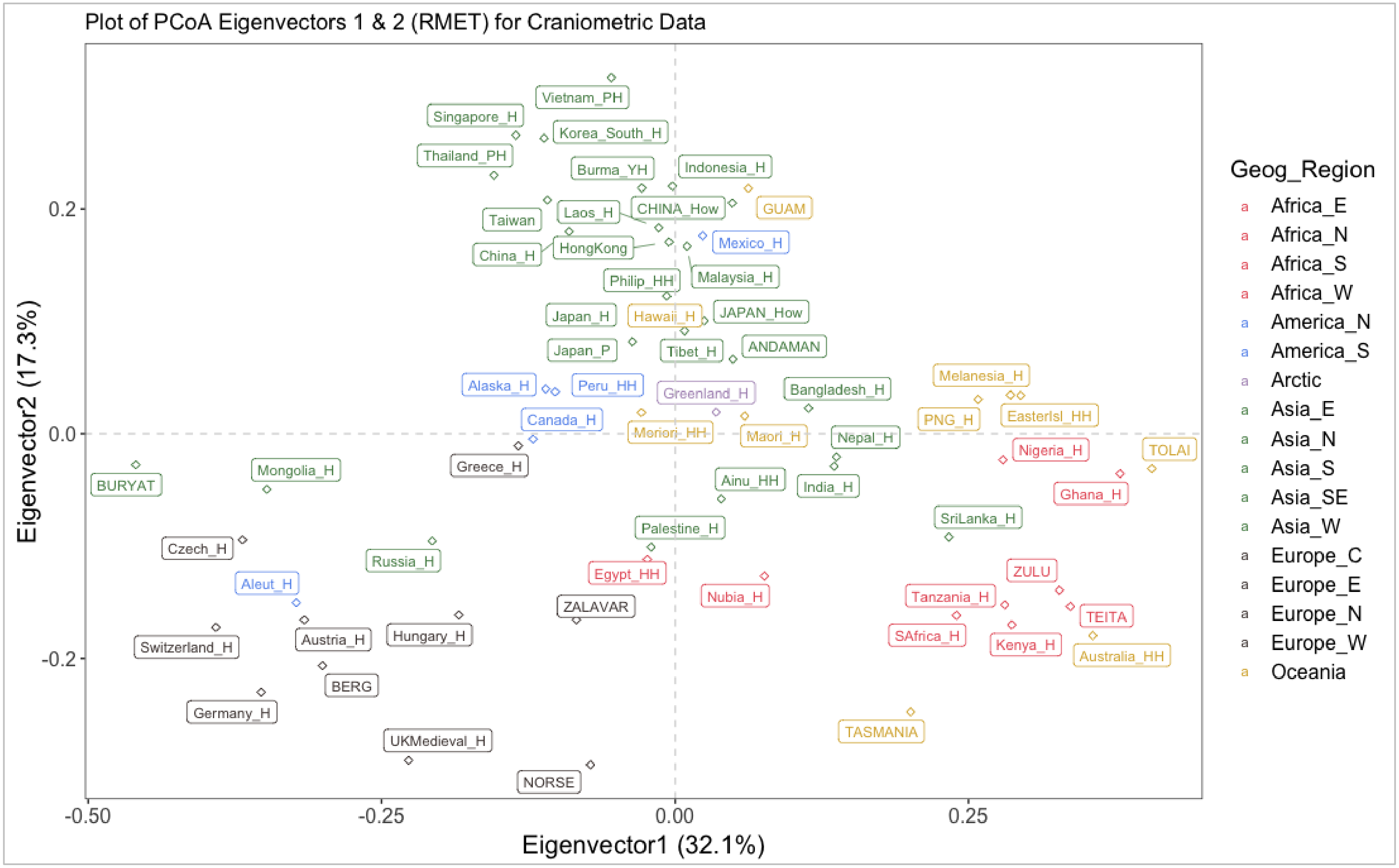

Figure 4.28. Plot of PCoA eigenvector values 1 and 2 for comparative craniometric data from 62 population groups. Labels are color-coded by geographic region.

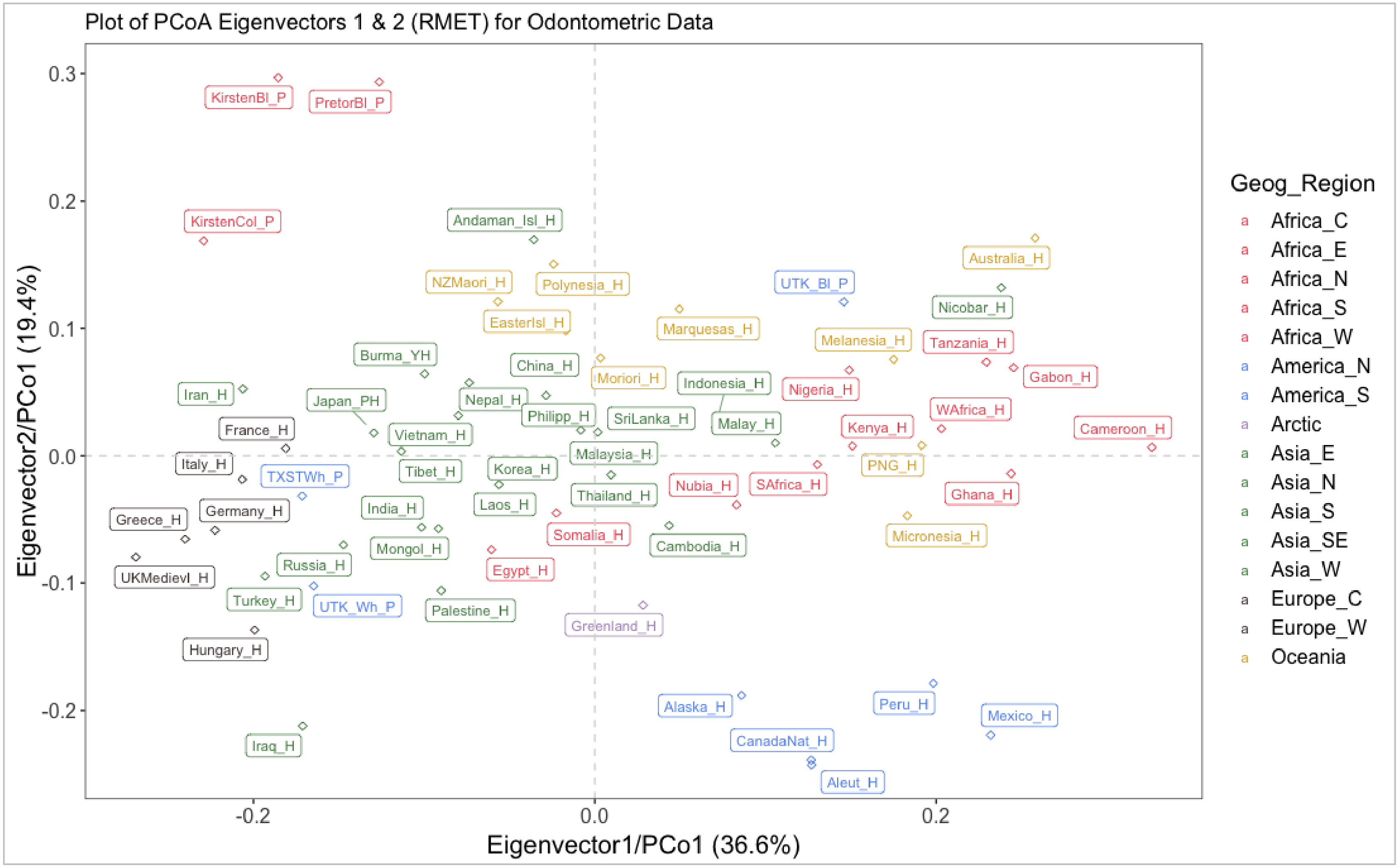

Figure 4.29. Plot of PCoA eigenvector values 1 and 2 for comparative odontometric data from 62 population groups. Labels are color-coded by geographic region.

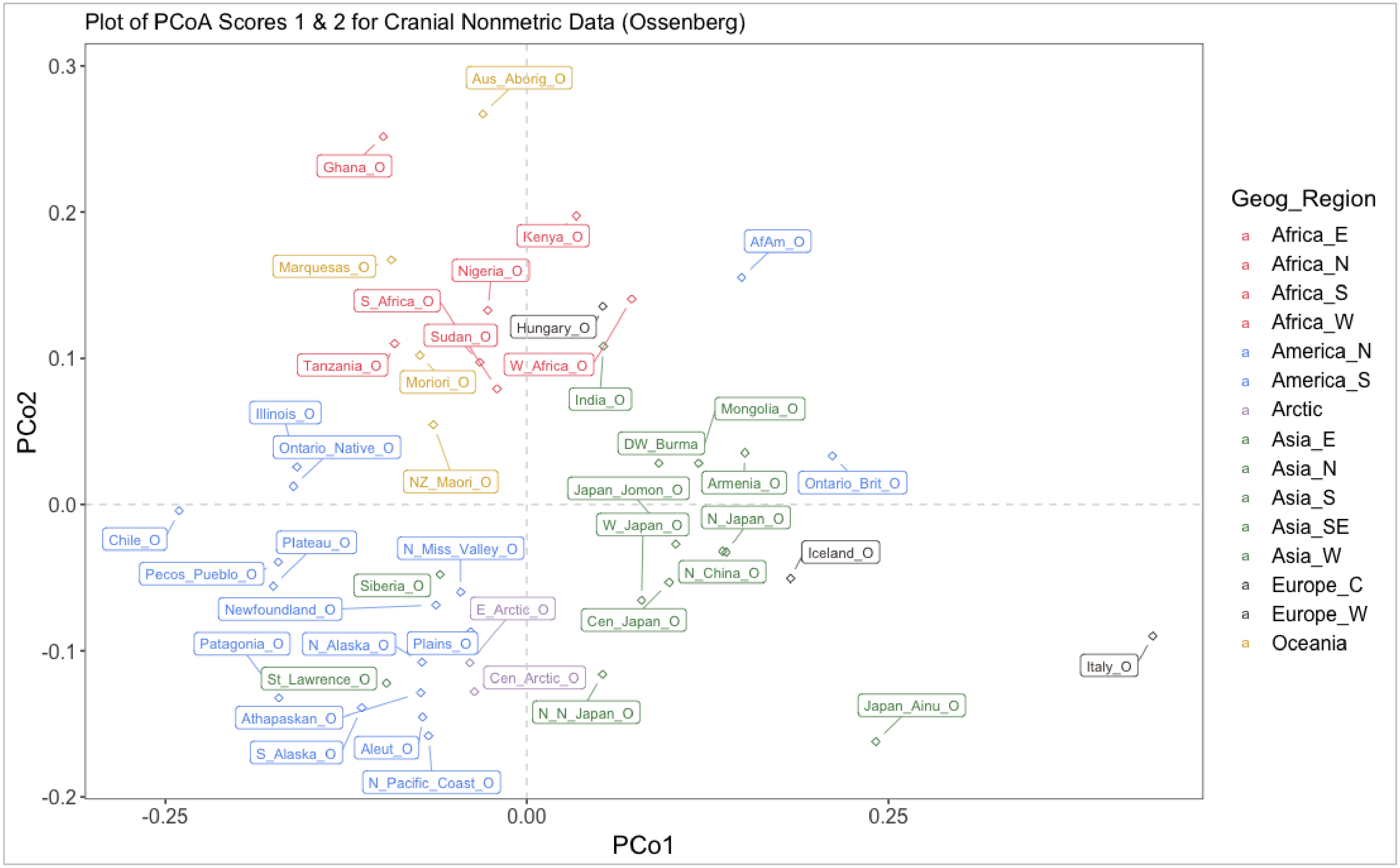

Figure 4.30. Plot of PCo scores 1 and 2 for the Ossenberg comparative cranial nonmetric data from 45 population groups. Labels are color-coded by geographic region.

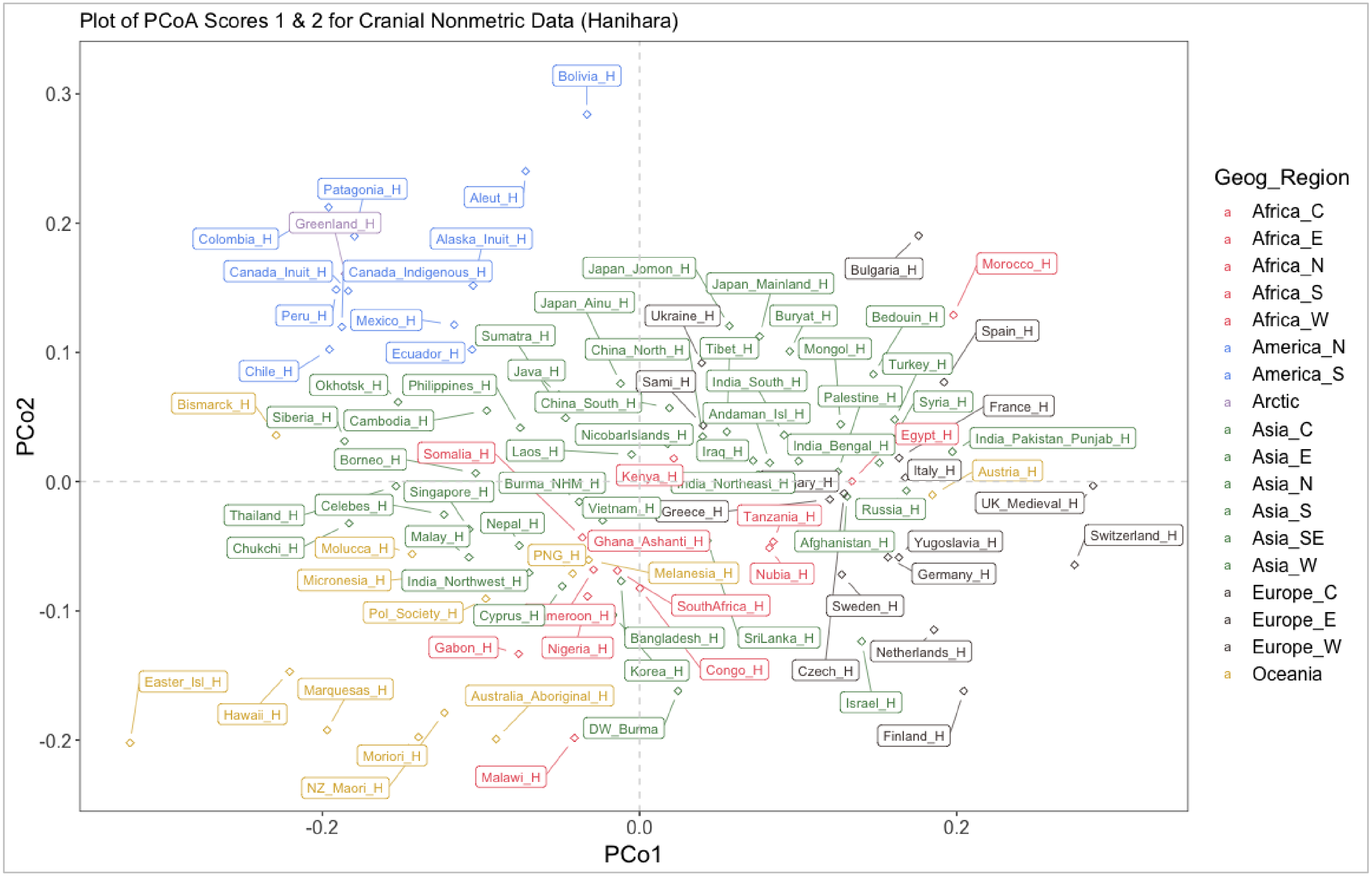

Figure 4.31. Plot of PCo scores 1 and 2 for the Hanihara comparative cranial nonmetric data from 98 population groups. Labels are color-coded by geographic region.

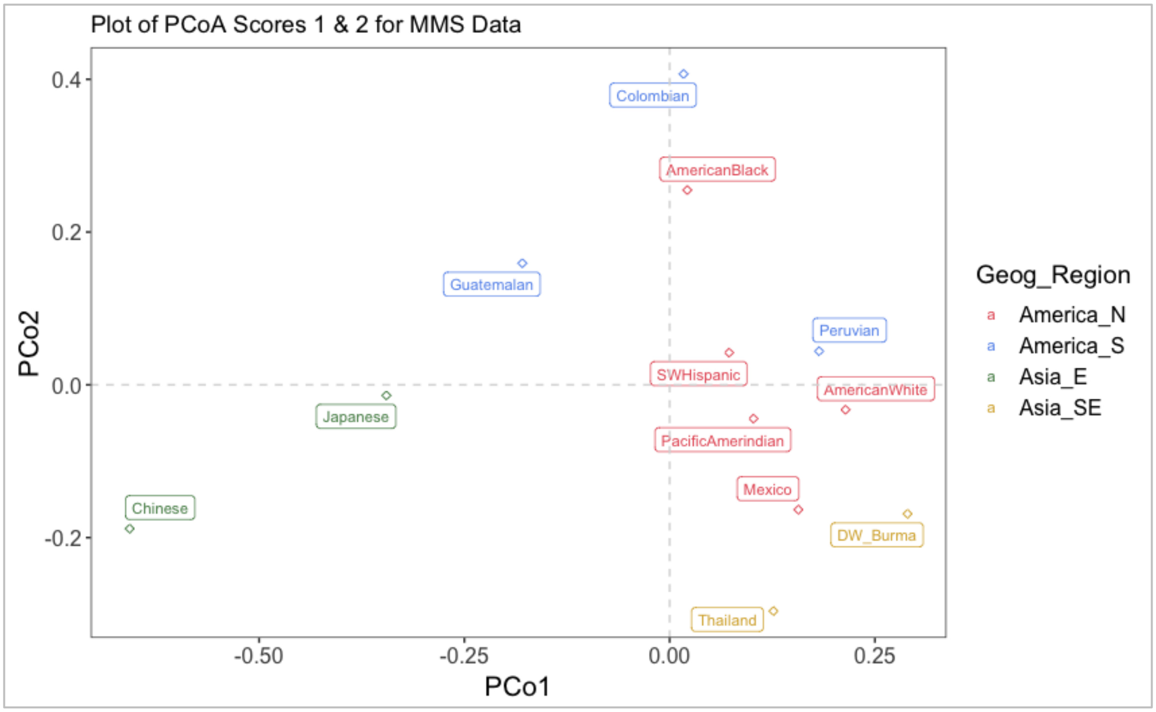

Figure 4.32. Plot of PCo scores 1 and 2 for MMS data from 12 population groups. Labels are color-coded by geographic region.

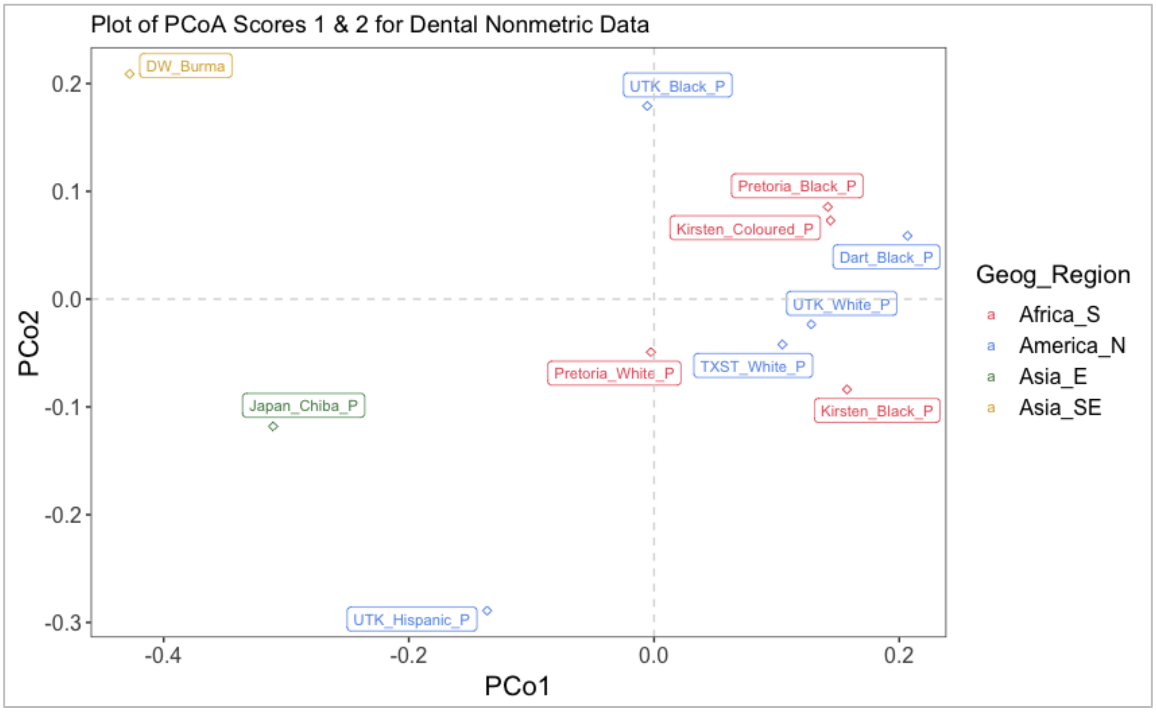

Figure 4.33. Plot of PCo scores 1 and 2 comparative dental nonmetric data from 11 population groups. Labels are color-coded by geographic region.

Results from MMS PCoA generally reflected results from previous analyses, including MMD and D^2 matrix, with Mexico grouping closest to Duckworth Burma (see Figure 4.32). Thailand was relatively close to Duckworth Burma as well, although not as close as Mexico. Lastly, visualization for the dental nonmetric PCoA showed that the Duckworth Burma group was farthest away from all other comparative groups. The overall patterns or lack thereof in these PCoA results in nonmetric datasets could be attributed to temporal differences and/or discrepancies due to issues relating to dichotomization and data collection standards or possibly high interobserver error rates.

FLEXDIST Results

Finally, results from the FLEXDIST analysis yielded PC (principal components, not to be confused with PCo, principal coordinates) scores based on a mix of three different datasets (craniometric, odontometric, and Hanihara's cranial nonmetric data) and 40 population groups. Data visualization of the PC scores along with their ellipses and group centroids are presented in Figure 4.34. The first and second PCs contributed to 16.5% and 6.6% of the variation in this analysis, as noted on the x- and y-axes. Color coding is based on geographic regions from which the population groups originate. Overall, the Duckworth Burma group exhibited spatial closeness to most other Southeast Asian groups, such as Java, Thailand, and Sumatra. The first and second PC values for the population groups represented are summarized in Table 4.26.

Table 4.26. PC1 and PC2 scores for population groups in the FLEXDIST analysis with their associated geographic regions.

Population	Geographic Region	PC1	PC2
Aleut_H	America_N	-0.24229744	-1.67973494
Australia_Aboriginal_H	Oceania	3.92956378	0.23656527
Borneo_H	Asia_SE	-0.51604713	0.58118505
Burma_NHM_H	Asia_SE	-1.50761111	1.81047810
Canada_Indigenous_H	America_N	0.11637253	0.02267155
China_North_H	Asia_E	-0.63519060	0.56830502
China_South_H	Asia_E	-1.00090584	0.33409971
Czech_H	Europe_C	-1.30667030	-1.21045878
DW_Burma	Asia_SE	0.16755729	1.30425606
France_H	Europe_W	-0.82911067	-1.28740117
Gabon_H	Africa_C	4.03506405	0.47700072
Germany_H	Europe_W	-2.49737943	-2.11739159
Ghana_Ashanti_H	Africa_W	1.44366122	0.32784973
Greece_H	Europe_W	-2.01284787	-0.21531557
Greenland_H	Arctic	-1.88536697	-1.35170985
Hungary_H	Europe_C	-0.75776269	-0.42743871
India_Bengal_H	Asia_S	1.15645550	-0.48806458
India_Northeast_H	Asia_S	-1.10418799	0.04782291
India_Pakistan_ Punjab_H	Asia_S	-1.71783085	-0.73811096
India_South_H	Asia_S	0.39276101	0.03793264
Italy_H	Europe_W	-1.20636944	-1.06133961
Japan_Ainu_H	Asia_E	0.11101489	0.16198619
Java_H	Asia_SE	0.55338827	1.51757486
Kenya_H	Africa_E	1.99369266	-0.69961536

Population	Geographic Region	PC1	PC2
Laos_H	Asia_SE	-1.91920630	1.39593535
Marquesas_H	Oceania	-0.02273331	-0.08729970
Mexico_H	America_N	1.37548334	0.12723858
Molucca_H	Oceania	0.61251027	1.37855239
Moriori_H	Oceania	-1.71280705	-0.01802764
Nigeria_H	Africa_W	0.76883194	0.85042244
Patagonia_H	America_S	-0.98038954	-0.90579188
Peru_H	America_S	2.07339166	-1.11254463
PNG_H	Oceania	2.18945575	-0.12101487
Russia_H	Asia_N	-2.41413906	-1.07568627
SouthAfrica_H	Africa_S	2.42854427	1.26824840
Sumatra_H	Asia_SE	0.72230243	0.97908661
Thailand_H	Asia_SE	-0.20013704	1.53955548
Tibet_H	Asia_E	-0.42409806	1.08842576
UK_Medieval_H	Europe_W	-2.50685015	-1.24320512
Vietnam_H	Asia_SE	-0.81422305	1.35232899

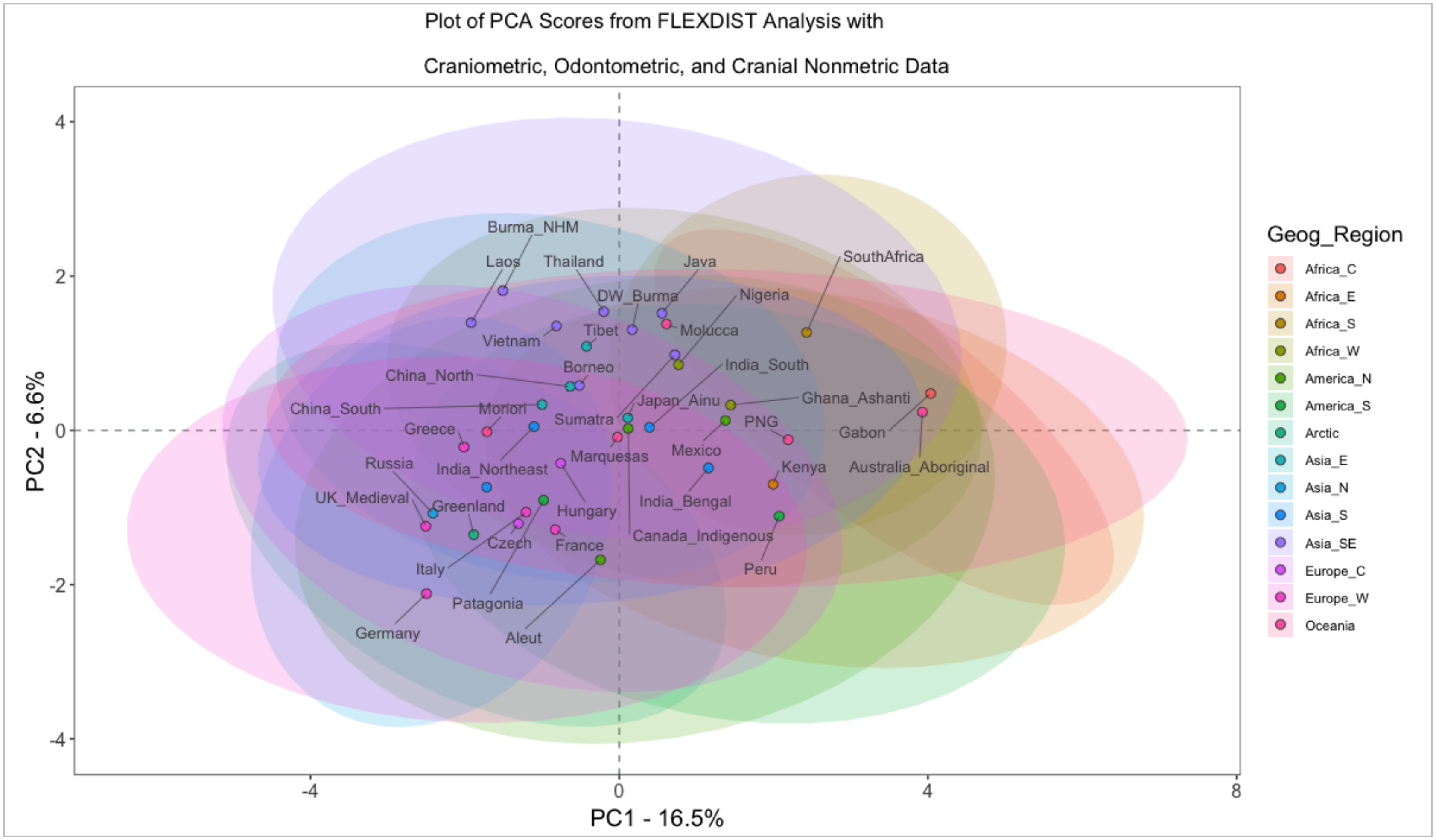

Figure 4.34. Plot of PC scores calculated via FLEXDIST using a mix of 36 variables (craniometric, odontometric, and cranial nonmetric data). Comparative samples in the analysis included individuals from the Duckworth Burma dataset and select individuals from the Hanihara datasets who had mostly complete data for all three data types. Dots represent population group centroids, and ellipses indicate the PC score distributions for each population group. Colors indicate geographic region.

Chapter 5: DISCUSSION AND CONCLUSIONS

The current dissertation is the first biodistance study in over a century since Tildesley's (1921) pioneering craniometric study to revisit the Duckworth Burma cranial collection and give it the attention it deserves. The main objectives of the current research are to examine the biological relationships of the individuals within the collection and compare them to global population groups to better understand evolutionary trends within Myanmar. This study holistically incorporated multiple data types commonly used in biodistance research (cranial and dental metric and nonmetric data) to explore research hypotheses.

RESEARCH AIMS AND HYPOTHESES

Aim #1: Examine Biological Make-up of Individuals from Myanmar

Hypothesis #1: The Duckworth Burma crania will exhibit phenotypic diversity that is reflective of their population history.

When the crania in the Duckworth Burma collection were first excavated from British-colonized Burma and described in the Tildesley (1921) paper, the objective was to collect skulls from “purely Burman” individuals. Biodistance research in the early 20th century was racially motivated, with researchers like Karl Pearson, a supporter of eugenics, promoting their racist agendas thinly veiled as scientific research (Delzell & Poliak, 2013). However, one of the main findings from Tildesley's (1921) craniometric study was that the Duckworth Burma cranial collection was comprised of individuals exhibiting diverse cranial phenotypic variation. This finding is not entirely surprising as not all individuals in the collection are “purely Burman” and given the unique population history of Myanmar. Moreover, this research is crucial evidence that the human population in Burma and present-day Myanmar, much like many other geographical regions, is not homogeneous. As Myanmar is home to more than 135 ethnic groups, researchers should expect phenotypic diversity in a given sample of the country's population, especially from an urban center like Mawlamyine, from which the remains in the Duckworth collection were taken.

To examine biological relationships among individuals from Myanmar, an array of biodistance methods incorporating multiple data types was used. Based on the overall results, the Duckworth Burma sample group indeed exhibited phenotypic diversity. First, in the LDA iterations, Duckworth Burma samples exhibited similar craniometric dimensions with a range of different population groups from nearby geographic regions, including groups like Java (Indonesia), South India, the Philippines, and the NHM Burma sample group. Additionally, not only did supervised analyses such as LDA and CVA on craniometric data show phenotypic diversity in the Duckworth Burma sample, but unsupervised approaches such as cluster analysis also produced similar results that pointed toward diversity. Both k-means cluster analyses—once conducted with the Duckworth and NHM Burma groups combined and another time with only the Duckworth Burma samples—showed that phenotypic diversity was present. In all k-means cluster analysis iterations, the Burma groups consistently exhibited two distinct clusters that formed based on detectable phenotypic diversity attributable to neither interobserver error nor sexual dimorphism.

Moreover, diversity and evenness indices calculated from nonmetric data for Duckworth Burma and other groups from close geographic proximity to Myanmar showed intermediate to relatively high levels of diversity for the Duckworth Burma group. Finally, R matrix results based on both metric and nonmetric data also exhibited intermediate to high r_{ii} values for Duckworth Burma, indicating intermediate to higher levels of genetic drift experienced by this group compared to other population groups. As the biggest mainland Southeast Asian country that shares borders with many other geographic areas, it would make sense that population groups in Myanmar experienced higher levels of gene flow between population groups nearby. Based on this nature of Myanmar's geography, we could expect lower levels of genetic drift in the population. However, other factors such as assortative mating and/or socio-cultural barriers experienced by certain population groups in Myanmar could contribute to higher levels of genetic drift as well. As such, results from r_{ii} calculations based on R matrices showed that there is a certain level of genetic or phenotypic diversity observed in the Duckworth Burma group, albeit in intermediate levels. Overall, results pointed to the Duckworth Burma sample exhibiting phenotypic diversity.

Aim #2: Explore Evolutionary Trends behind Skeletal Variation in Myanmar

Hypothesis #2: The individuals from the Duckworth Burma collection will exhibit cranial traits associated with warmer climates.

Previous research on evolutionary trends behind skeletal phenotypes have identified certain measurements and traits, especially of the cranium, that are correlated with environmental factors such as climate. For example, craniometric dimensions relating to the cranial breadth, vault size and shape, and nasal morphology have been shown to be significantly correlated to cold climate (Harvati & Weaver, 2006; Hubbe et al., 2009; Mielke et al., 2011; Relethford, 1994; Roseman, 2004; von Cramon-Taubadel, 2016). Further, correlations between MMS traits and environmental factors have also been studied more recently (Plemons, 2022). Based on current knowledge about microevolutionary patterns in cranial phenotypic variation and the climate in Myanmar being tropical to sub-tropical monsoon (“World Bank Climate Change Knowledge Portal,” n.d.), it is expected that the individuals from Myanmar in this study will exhibit cranial traits correlated to warmer climates.

First, descriptive statistics on craniometric measurements shown to exhibit positive correlations with cold climates were summarized for all population groups analyzed in this study. These measurements included BNL, BPL, MDH, ASB, XCB, AUB, FRC, and NLH. The means for each of these craniometric measurement observed in the overall Burma group (Duckworth and NHM Burma groups combined) were compared to the minimum, mean, and maximum of means observed in the global comparative groups. The general trend for this comparison showed that the mean measurements for Burma fell on the lower side compared to the mean values of comparative samples. As such, this trend is consistent with cranial traits associated with warmer climates.

Furthermore, craniometric CVA results, which included canonical coefficients (variable loadings) and plotted CV scores, were assessed to examine if Duckworth Burma would be placed closer to other population groups from regions with warmer climates. The canonical coefficients, which indicated the variables that contributed most heavily to the CVA model, showed that group divisions seen in the CVA plots were contributed mostly by climate-associated craniometric variables, such as BNL, BPL, and XCB.

Although NLH was not one of the variables with high canonical loadings, NLB was. In most literature on climate-related cranial morphology, NLH and other measurements related to the tallness of the nasal region have been mostly discussed (Katz, Grote, & Weaver, 2016; Roseman, 2004). Conversely, although NLB has been shown to be not as significantly affected by cold climates, it still plays a role in nasal surface-to-volume ratios (Plemons, 2022; Roseman, 2004). In the craniometric CVA, NLB served as a variable with one of the highest loadings and thus contributed heavily to the model.

Lastly, the CVA plot also showed that there were distinct groupings potentially based on climate effects. For example, populations from colder and drier climates, such as Alaska Inuit, Canada Indigenous, Greenland, Patagonia, and Okhotsk consistently grouped together in the same quadrants. Additionally, these groups have also been shown to consistently fall on the same side of the plots as most European populations in areas with cold weather. In relation to these groups, the Duckworth Burma group fell much farther and more closely to other groups from geographic regions with warmer climates.

MMS trait frequencies were also assessed to explore patterns in cranial morphology in the facial and nasal region, which have been shown to be associated with climate (Hubbe et al., 2009; Katz et al., 2016; Plemons, 2022; Roseman, 2004). The Duckworth Burma samples generally exhibited lower expressions of MMS traits like ANS and IOB, indicating a pattern consistent with traits seen in areas with warmer/moderate climates. Other MMS traits that were explored but not weighed heavily as ANS and IOB for the final conclusions were NAW and ZS.

When compared to global comparative samples by each trait’s frequencies, Duckworth Burma was closest to Mexico (ANS), Pacific Amerindian (IOB), and Chinese

(NAW). Moreover, MMD results based on four dichotomized MMS scores (ANS, INA, IOB, and NAW) showed that Duckworth Burma was most similar to Mexico. As most MMS traits contributing to this MMD model have been shown to have climate-related effects, this clustering made sense. In addition, Myanmar and Mexico have somewhat comparable climate patterns, with both countries being associated with hot/warmer temperatures and both having a mix of both tropical and dry areas ("World Bank Climate Change Knowledge Portal," n.d.). The similarities in climate patterns therefore can further explain the similarity in MMS traits observed between these two groups. As such, the general patterns observed in MMS trait frequencies for Duckworth Burma support the second hypothesis.

Aim #2: Explore Evolutionary Trends behind Skeletal Variation in Myanmar

Hypothesis #3: The Burma sample groups will be similar to other Southeast Asian groups and groups from neighboring geographical areas.

The final hypothesis of the current study is built upon one of the most foundational components of biodistance research: exploring patterns of population biological variation based on between-population differences. A major assumption of biodistance research is that closer relationships between two individuals or populations correlate to higher phenotypic similarity due to the individuals or populations sharing a more recent parent population and/or gene flow. Furthermore, this hypothesis is also largely based on the isolation-by-distance model, which predicts lower degrees of genetic similarity between populations with larger geographic distances (Relethford, 2004b; Wright, 1943). Therefore, it is expected that the Burma samples will be more cranially and dentally similar to other Southeast Asian groups and groups from neighboring geographical regions.

Similarities to East, Southeast, and South Asian Groups

Statistical analyses on craniometric data showed the most consistent geographic trends. One group that Duckworth Burma samples exhibited most phenotypic similarity in the global comparative LDA (including Duckworth Burma) and CVA iterations was Java (Indonesia). Further adding to this line of evidence were results from LDA models excluding the Duckworth Burma samples, which showed that most groups into which they classified consistently were those from East, Southeast, and South Asia, with Java as the top group. Other groups on this list included South India and the Philippines.

Another line of evidence pointing to the phenotypic closeness between samples from Burma groups and other Southeast Asian groups and population groups from neighboring countries is based on distances presented in the D^2 matrices. According to the D^2 matrix based on craniometric and odontometric data, the overall Burma group exhibited the closest distance to most Southeast Asian countries in the analysis (*e.g.*, Laos, Indonesia, Malaysia, and the Philippines and somewhat close distances to some East Asian groups (*e.g.*, China, Tibet, Japan, and South Korea), supporting the final hypothesis. Lastly, data visualization based on PCoA for metric data and Ossenberg's cranial nonmetric data, as well as FLEXDIST results showed that the Burma group generally grouped closer together with most East, Southeast, and South Asian groups.

The Two-Layer Hypothesis Debate

Based on perspectives from both sides of the debate surrounding the two-layer model (or the immigration hypothesis), patterns found in this study were considered. According to the two-layer hypothesis, we would expect to find phenotypic similarities between Australo-Melanesian groups and Southeast Asian groups and dental patterns of both Australo-Melanesian and East Asian groups in modern Southeast Asian samples (Matsumura & Hudson, 2005; Matsumura & Oxenham, 2014). Conversely, according to the hypothesis that there was no gene flow between Australo-Melanesian groups and East Asians, we would expect to observe distinct Sinodont and Sundadont patterns between East Asian groups and Southeast Asian groups, respectively (Scott, Schmitz, et al., 2018; Turner, 1987, 1990). Unfortunately, results in this study did not clearly indicate to one or the other hypothesis, but some meaningful observations were made.

First, PCoA plots for all data types were assessed for any spatial closeness between Southeast Asian groups and Australo-Melanesian groups. Based on craniometric PCoA plots, there seemed to be closer affinities between Southeast Asian groups (including Malaysia, Philippines, Indonesia, and Laos) and Polynesian and Western Micronesian groups (including Hawaii, Guam, Moriori, and Maori) than Melanesian groups. This observation is consistent with the findings of Hanihara (1992). Based on odontometric PCoA results, the general Polynesia group, Maori (New Zealand), and Easter Island were closely grouped together and exhibited more relative closeness to some Southeast Asian groups, but the general Micronesia group was placed quite far from this general cluster. In relative distance, the general Micronesia group was closer to the Papua New Guinea and the general Melanesia groups. However, cranial nonmetric

PCoA based on Hanihara’s comparative data exhibited the opposite pattern, with Melanesian groups showing closer affinities to Southeast Asian groups than Polynesian and Micronesian groups.

Unfortunately, trait frequencies associated with Sinodonty, such as first upper incisor shoveling and double shoveling, pegged, reduced, or upper molars, and root variation, could not be examined to the fullest extent due to the large proportion of missing teeth in the Duckworth Burma cranial collection. However, this study could be considered a start to further research on dental morphological variation in modern Myanmar populations.

Duckworth Burma and Peru

One population group into which the Duckworth Burma samples classified consistently, albeit in lower numbers than the Asian groups, was Peru (both Howells’ and Hanihara’s comparative craniometric groups). This pattern is of note because despite the large geographical distance between Southeast Asia and South America, cranial phenotypic similarities between population groups from these geographical origins have been acknowledged in previous research (Dudzik, 2019; Dudzik & Jantz, 2016; Go, Jones, Algee-Hewitt, Dudzik, & Hughes, 2019; Yukyi, 2017).

One possible explanation of the constant grouping of Duckworth Burma samples as Peru samples could be the large waves of East and Southeast Asian migrations (whether in the form of slavery or voluntary immigration) into South America since as early as the 16th century and throughout the 19th-20th centuries (Binder, 1993; Homburger et al., 2015; Yang, 2018). Moreover, a genomic study on South America’s demographic history by Homburger and colleagues (2015) noted that multiple Peruvian individuals in their study exhibited more than a quarter proportion of East Asian ancestry, which further suggests gene flow between population groups from Peru and Asia (specifically China). As discussed in the Introduction, Myanmar has experienced extensive connections with Chinese groups throughout its population history (Aung-Thwin, 2005b; Fan, 1961; Y.-C. Li et al., 2015). Furthermore, based on the similarities in craniometric data observed between Duckworth Burma and Chinese groups such as Hainan, the phenotypic similarity between Duckworth Burma and Peru might be explained through the possibility of these two groups sharing a common ancestor.

However, craniometric variation is not only a result of just genetics and migration; rather, other environmental factors might play substantial roles in shaping cranial morphology as well. Therefore, other possible explanations of the phenotypic similarity between Peru and Duckworth Burma were explored, to include climate and diet. As mentioned in the previous section for Hypothesis #2, climate-related craniometric dimensions and MMS traits can exhibit similar patterns in population groups with similar climates. However, climate patterns in Myanmar and Peru are rather different. Although Myanmar does have regions of aridity, it is generally categorized as a tropical monsoon climate with heavy rainfall. Conversely, Peru only experiences this type of tropical climate in the jungle regions, while the other parts are categorized as semi-arid and desert-like (“World Bank Climate Change Knowledge Portal,” n.d.). As such, climate might not be a plausible explanation to the similarities in craniometric dimensions between Burma and Peru.

As an alternative, diet was also explored as a possible explanation for the craniometric similarity between these two groups. However, diet patterns between Myanmar and Peru are also very different, with the former relying on rice-based food types and the latter relying on maize-based food types. Further, results from PCoA iterations for odontometric and Hanihara's cranial nonmetric data showed that Peru and Duckworth Burma placed very far apart from each other. Therefore, based on these factors, the craniometric similarity between Duckworth Burma and Peru could be attributed to genetics and migration.

"Hispanic" and "Asian" groups

Findings from the pooled sexes craniometric CVA plot, which showed the FDB Hispanic group's spatial closeness to various Japanese and other Asian groups, also confirm the trend of phenotypic similarity between certain Asian and South American population groups. One of the complications that this phenotypic similarity can introduce is the difficulty of distinguishing population affinity in building biological profiles for unidentified individuals in forensic anthropology.

Perhaps one factor that might be contributing to this complication is that biological and forensic anthropologists still continue to lump diverse Central and South American population groups into the general "Hispanic" group. Although the term "Hispanic" was originally a political term that refers to a unified group encompassing Spanish-speaking groups (Celis Carbajal, 2020; Gershon, 2020), it has been adopted in forensic anthropology for the identification of population groups from all of Latin America. Doing so is an oversimplification of the nuances and complex population histories of each population group included in this general “Hispanic” group. Likewise, lumping Asian groups into a general “Asian” group while there is phenotypic variation (Skipper, 2022) among these groups would only make the identification process more difficult. As such, recognizing patterns in phenotypic similarities between specific population groups like Peru and Burma and incorporating the knowledge of their complex population histories could be a more productive approach than generalization.

RESEARCH IMPACT

The major aims of the current dissertation are two-fold: 1) to examine the biological diversity in a sample of Myanmar individuals from over a century ago; and 2) to explore evolutionary trends in skeletal and dental morphology from this population sample. This research strives to be a small yet crucial step in bridging an immense gap between biological anthropology and Myanmar.

Currently, biological anthropological research in Myanmar is extremely underrepresented, which is one of the countless legacies of being under a half-century-long regime by an isolationist military dictatorship. Unfortunately, the most recent coup d’état in 2021 by the Myanmar military, which has banned or halted any and all international research projects in the country, has only exacerbated the underrepresentation. As such, a small window of opportunity for anthropologists to learn more about human migration patterns and biological relationships of individuals in Myanmar has been shut as long as the country is under the military regime. The current study thus serves as the first step toward better understanding population groups in Myanmar from biological anthropological and evolutionary perspectives.

As discussed in previous chapters, the earliest and only anthropological research examining the biological relationships among individuals belonging to diverse population groups in Burma was Tildesley's (1921) study on the Duckworth Burma collection. In the 100+ years since this publication, the collection had been largely forgotten and had neither been seen as a valuable resource for research projects nor considered for repatriation until recently (personal communication, T. Biers). Unfortunately, instances as such are common legacies of colonialism, with precious items and human remains from colonized nations ending up in a corner of a museum or laboratory in colonizer countries for decades or centuries.

Furthermore, the motivations behind the obtainment of the Duckworth cranial collection were largely related to race science, as were most biodistance studies in the 19th and 20th centuries. Clever (2022) identified an array of issues that came with race science during this era, including racism, sexism, and nationalism, as the field was mostly dominated by white male anthropologists and/or race scientists. The sentiments behind scientists conducting race science were not far off from those of European colonizers who claimed that “superior races have a right over lower races [and] the duty to civilize inferior races” (Ferry, 1893). However, the very production of the current dissertation research conducted by a descendant community member of the Duckworth Burma collection would be more than enough to dispel such claims of racial hierarchies that are supposedly (but wrongly) based on biology.

Moreover, the data collected in this study on individuals from 19th-20th-century Burma could serve as a baseline for future data collection on additional skeletal samples from Myanmar. To take even further steps, the data and findings from results could also be applied to identifying individuals in Myanmar whose remains have been fully decomposed, skeletonized, or thermally altered. Amidst the ongoing political and social unrest in Myanmar, news of the military taking civilian lives by burning villages all across the country is not uncommon (Lone & Mcpherson, 2022; Mirza & Moriarty, n.d.; Pierson & Hlaing, 2021). However, the identification process for burned remains in Myanmar is extremely difficult due to the lack of access to forensic anthropological experts who are trained to analyze skeletal remains or to avenues of conducting DNA analysis. Moreover, as Myanmar is extremely underrepresented in biological (and forensic) anthropology, there are currently no appropriate reference samples to study Burmese skeletal remains. Therefore, insights on evolutionary patterns and biological variation among the Duckworth Burma cranial collection would be a considerable step toward answering forensic-related questions in Myanmar.

RESEARCH LIMITATIONS

One of the limitations of this research is the sample size on Myanmar individuals that is currently available. Although the Duckworth Burma samples serve as a glimpse into select population demographics of lower Burma in the 19th-20th centuries, they do not represent the full population diversity that exists in the country. Moreover, human migration patterns into Myanmar from neighboring countries may have changed in the past century, suggesting that the Duckworth Burmese collection may not represent the diversity of modern Myanmar as accurately as a modern 21st-century skeletal collection in Myanmar would.

Another major limitation in the current research is the amount of interobserver error observed in a number of analyses. Analyses on craniometric and MMS data were mostly relied on for final conclusions, limiting the depth of interpretations that could have been made with a variety of data types and large comparative datasets. Therefore, improved standardization and training on data collection methods, as well as dichotomization standards, would be extremely helpful in ensuring that all comparative data would be analyzed on the same scale and parameters.

CONCLUSIONS AND FUTURE DIRECTIONS

The Duckworth Burma cranial collection serves as an invaluable resource for biodistance research, especially in understanding the biological diversity of populations in Myanmar and exploring evolutionary patterns associated with skeletal phenotypic traits in the East, Southeast, and South Asian regions. Overall, results from this dissertation research showed that Myanmar is not a homogeneous population group, evidenced by the amount of phenotypic diversity observed in the Duckworth Burma samples. Moreover, individuals in the Duckworth Burma group generally exhibited craniometric dimensions and MMS traits that are associated with warmer climate patterns. Lastly, the Burma samples analyzed in the current research showed close affinities to population groups from Southeast Asia and other geographic regions around Myanmar, following the isolation-by-distance model.

In addition to exhibiting phenotypic similarities to population groups in the vicinity of Myanmar, the Duckworth Burma group was also shown to be similar to South and Central American groups such as Mexico and Peru based on craniometric and MMS data. Exploring evolutionary patterns based on these types of similarities between these groups and the Duckworth Burma group would provide further insights into methods that help differentiate “Hispanic” and “Asian” groups in forensic anthropological contexts.

Lastly, the current study of crania in the Duckworth Burma collection brought up issues related to colonialism and illegal obtainment of human remains from previously colonized nations like Myanmar. Further context of the racist and problematic history of biological anthropology provided foundations for how to move away from race science in the current research. As a descendant community member of the Duckworth Burma collection remains and the first biological anthropologist belonging to the Burmese diaspora, I strive to apply the knowledge gained from this dissertation in ways that would benefit not only the biological anthropology community, but also the general public in Myanmar.

One of the first problems that was identified regarding the Duckworth Burma collection was the lack of documentation on who these individuals were. As such, as one of the future directions of this research, destructive analysis methods such as isotopic or ancient DNA (aDNA) analysis could be helpful in investigating the identities of these nameless individuals in the collection. Alternatively, tracking down historical records of cemeteries in Mawlamyine from which British officials excavated and took human remains could be another option that would not involve the destruction of human remains.

Additionally, 3D scans of the crania could also be collected to not only preserve the integrity of the remains but also as a means for capacity building. For example, anthropologists and archaeologists in Myanmar who are participating in the Civil

Disobedience Movement (CDM) in protest against the military dictatorship are unable to travel overseas for research. Instead of finding ways for them to travel at the risk of their safety, resources such as 3D scans of the crania from the Duckworth collection could be used to disseminate knowledge that could be gained from studying this collection. Lastly, only after we find avenues to identify and learn about the individuals represented in the Duckworth Burma collection, and after the civil war has ended in Myanmar, repatriation efforts can begin.

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Appendix A: Results from Exploratory Data Analyses and Data Wrangling

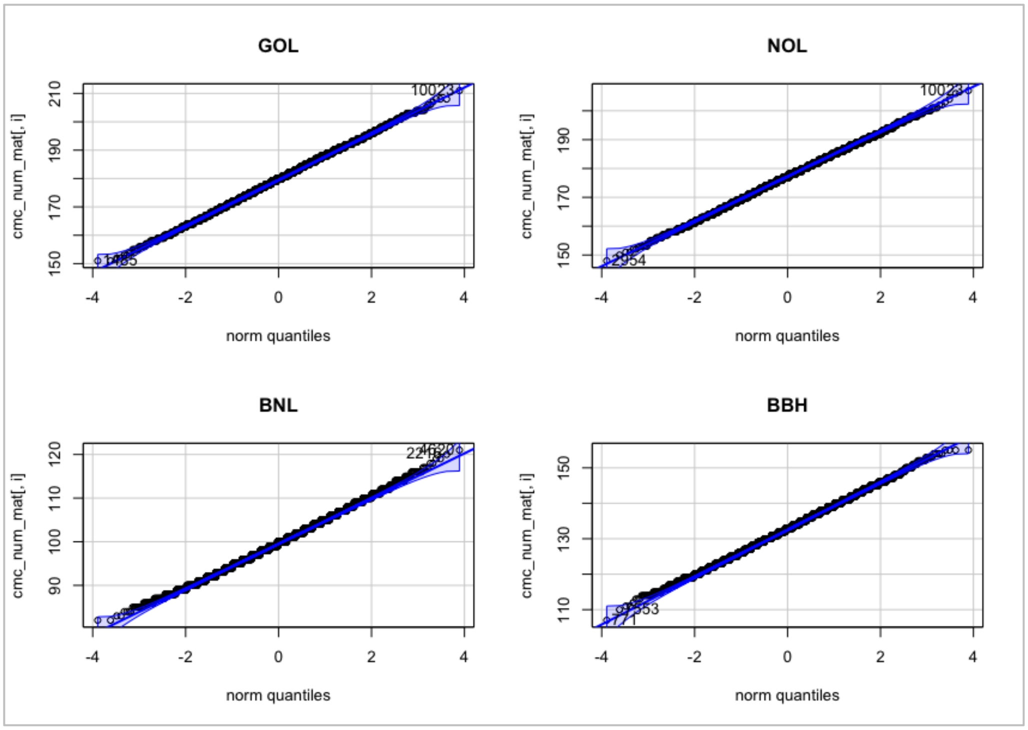

Figure A.1. Q-Q plots for craniometric variables: GOL, NOL, BNL, and BBH.

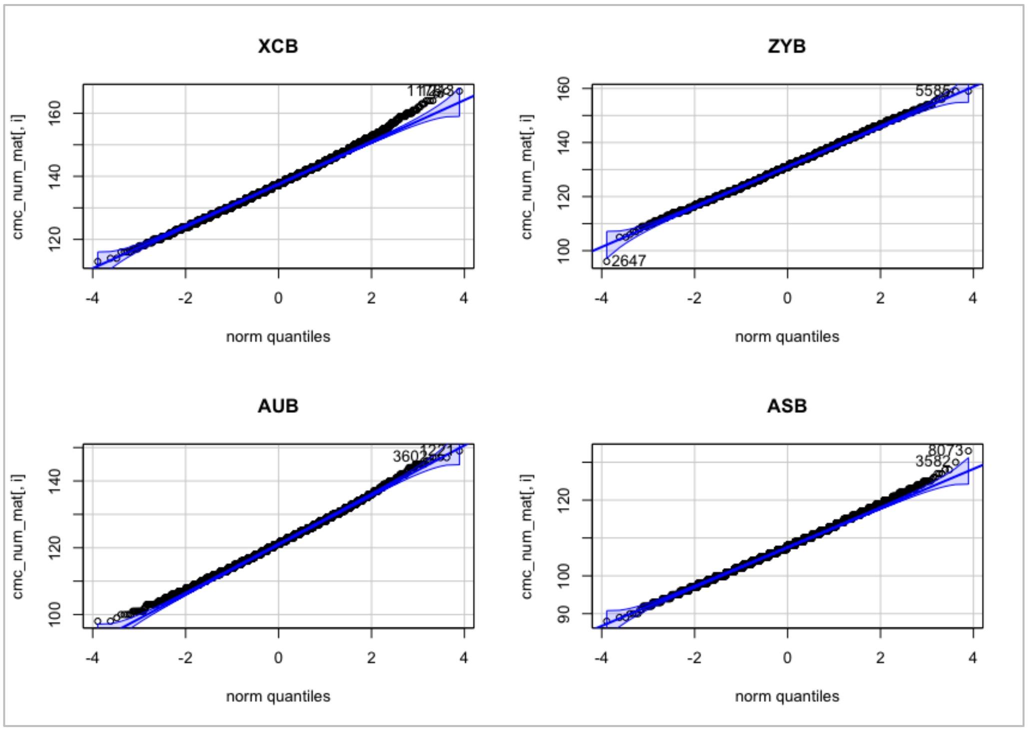

Figure A.2. Q-Q plots for craniometric variables: XCB, ZYB, AUB, and ASB.

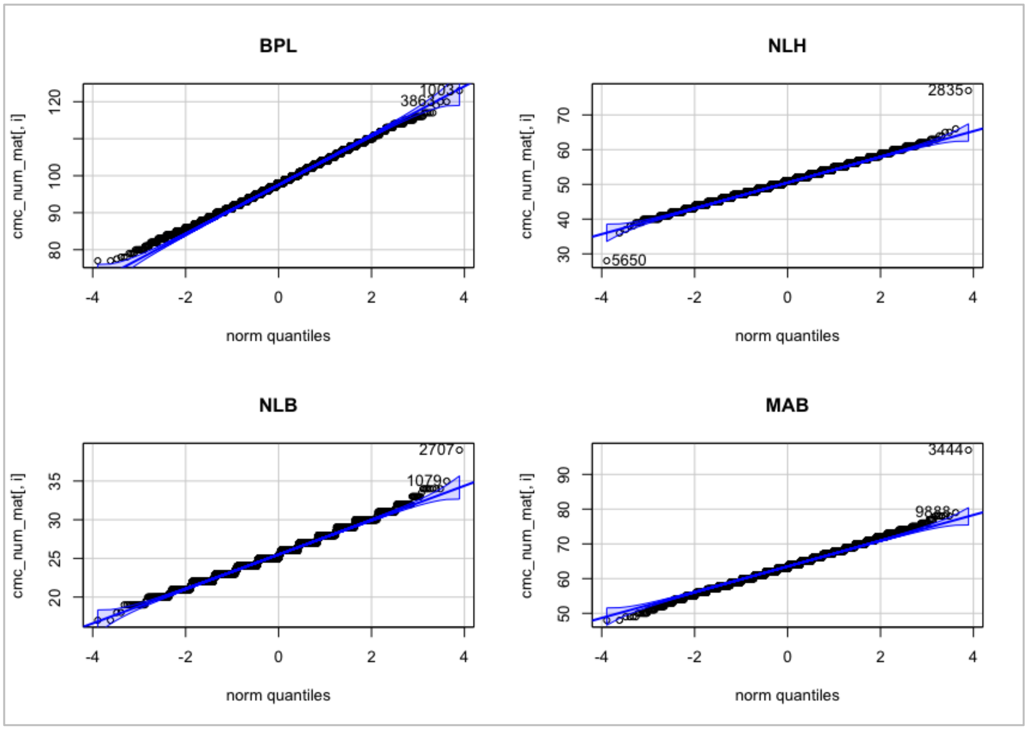

Figure A.3. Q-Q plots for craniometric variables: BPL, NLH, NLB, and MAB.

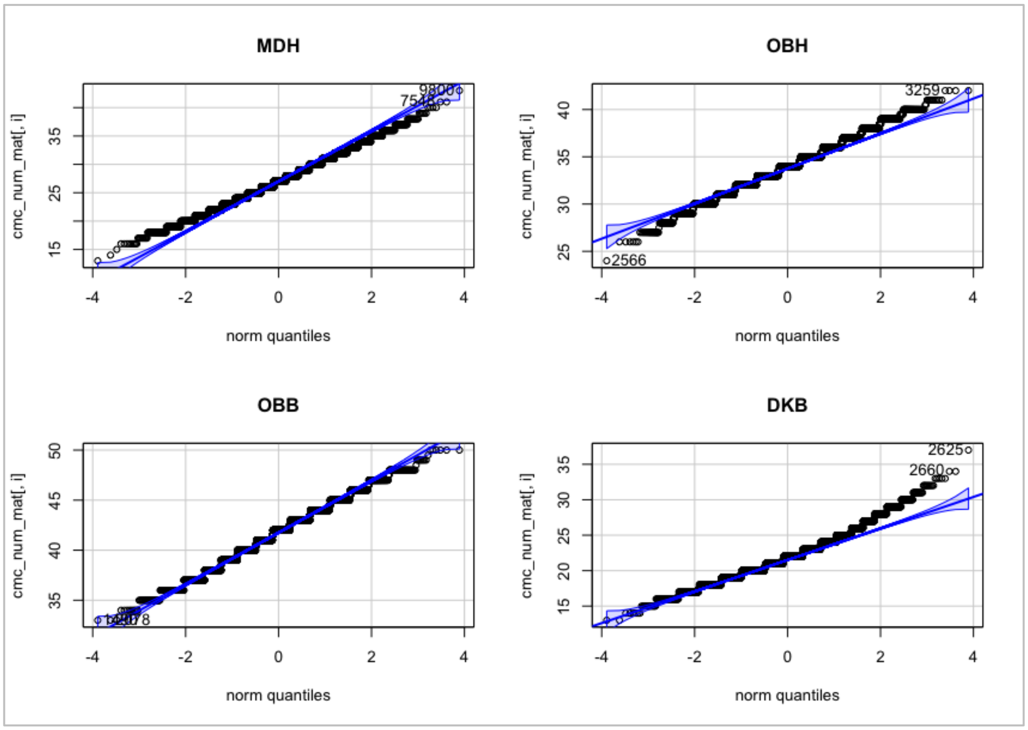

Figure A.4. Q-Q plots for craniometric variables: MDH, OBH, OBB, and DKB.

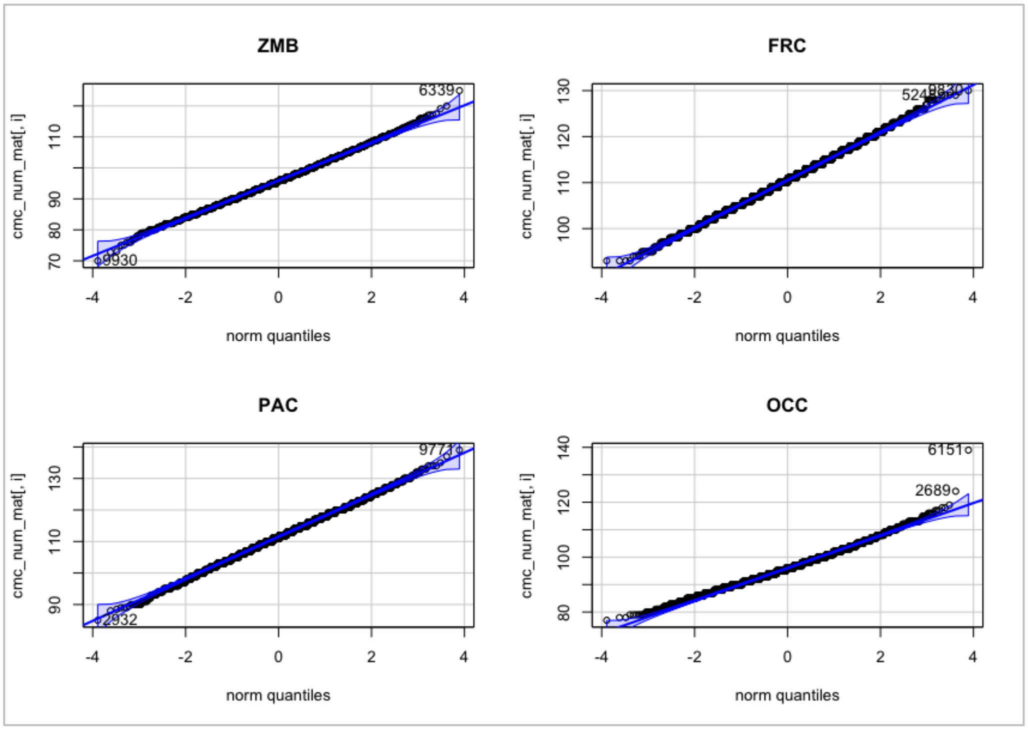

Figure A.5. Q-Q plots for craniometric variables: ZMB, FRC, PAC, and OCC.

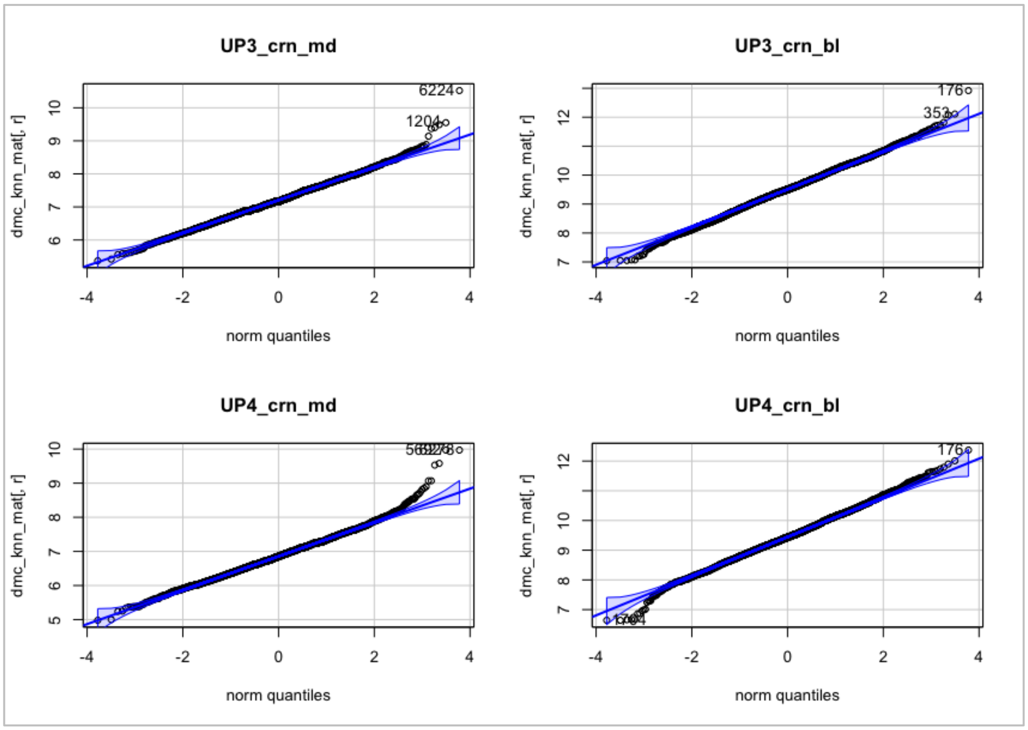

Figure A.6. Q-Q plots for odontometric variables: UP3 and UP4 mesiodistal and buccolingual crown diameters.

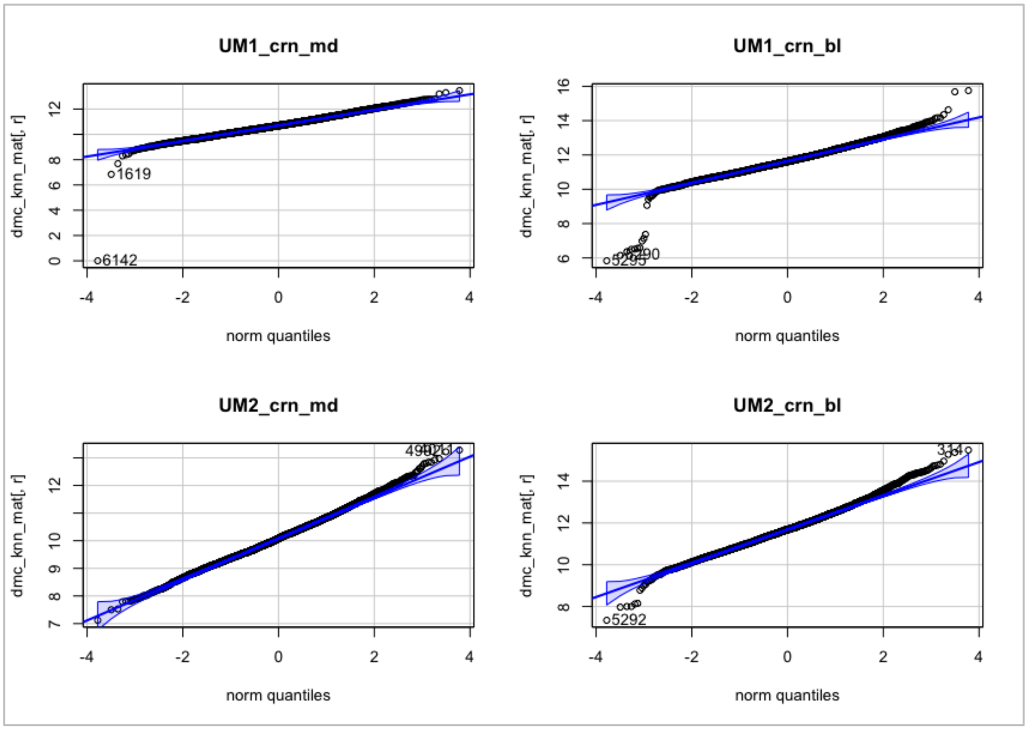

Figure A.7. Q-Q plots for odontometric variables: UM1 and UM2 mesiodistal and buccolingual crown diameters.

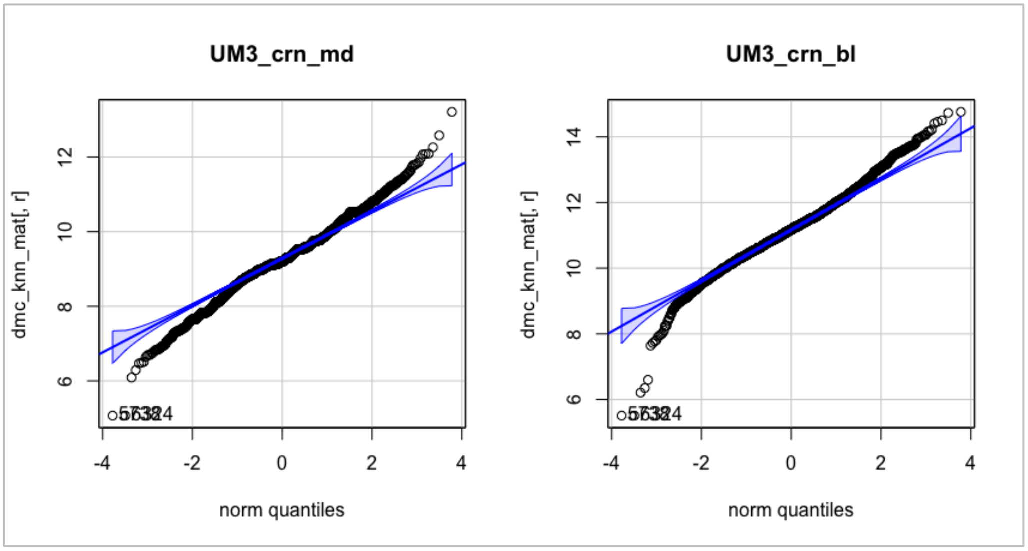

Figure A.8. Q-Q plots for odontometric variables: UM3 mesiodistal and buccolingual crown diameters.

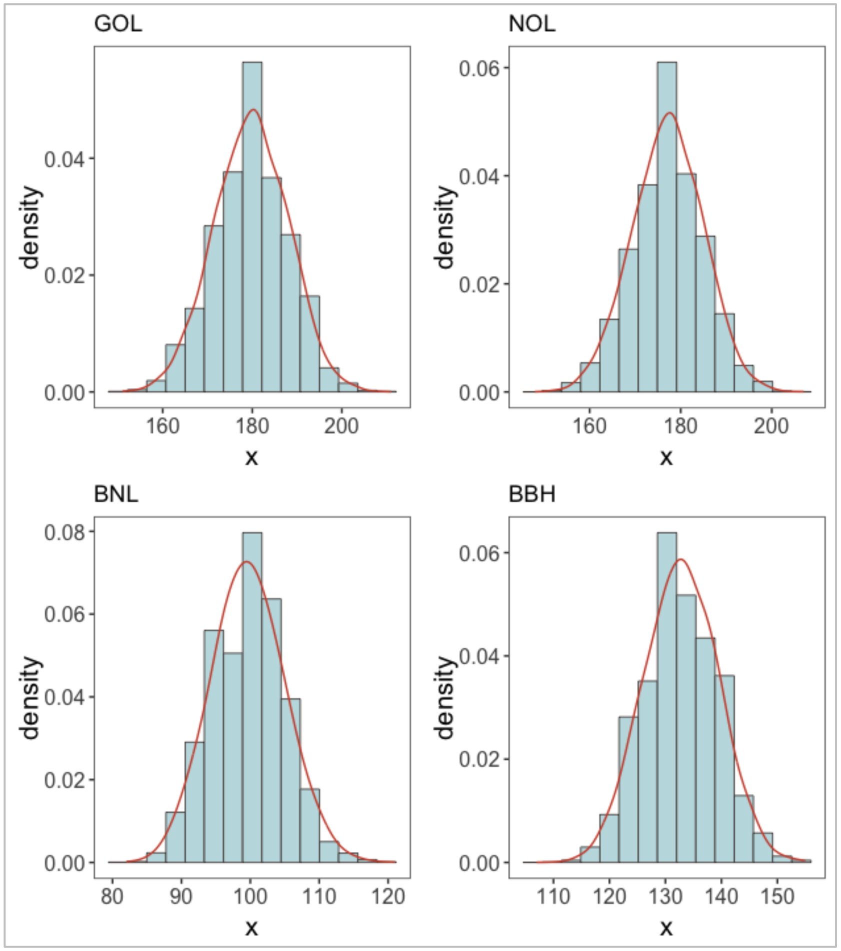

Figure A.9. Histograms for craniometric variables: MDH, OBH, OBB, and DKB.

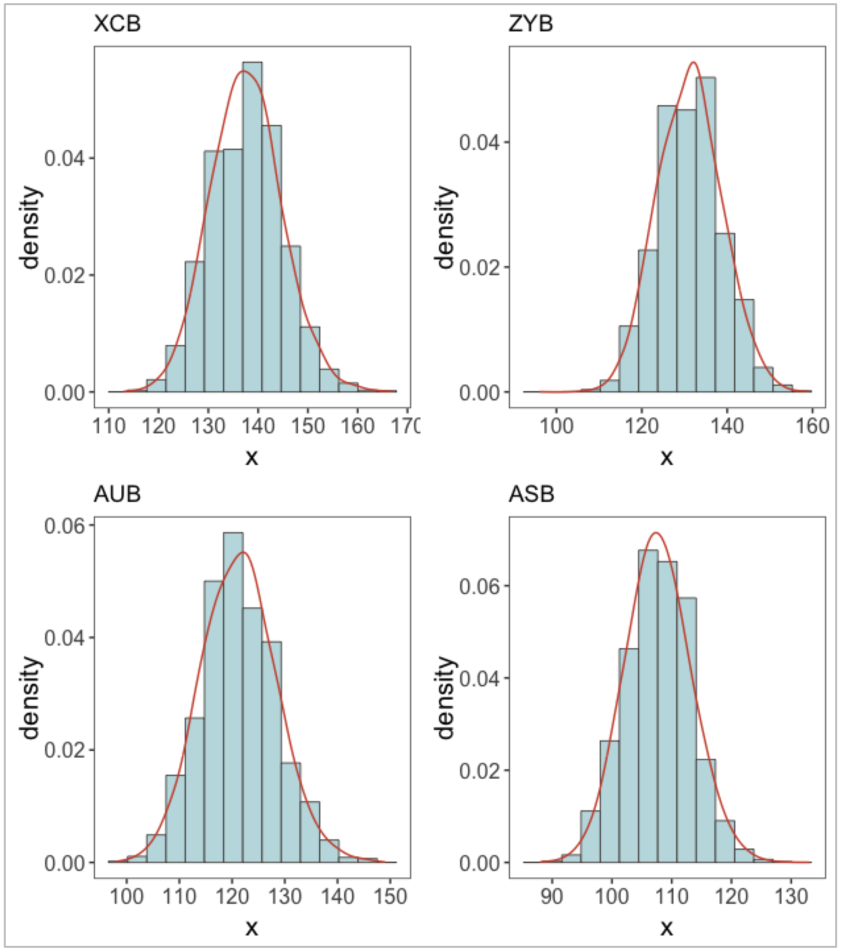

Figure A.10. Histograms for craniometric variables: XCB, ZYB, AUB, and ASB.

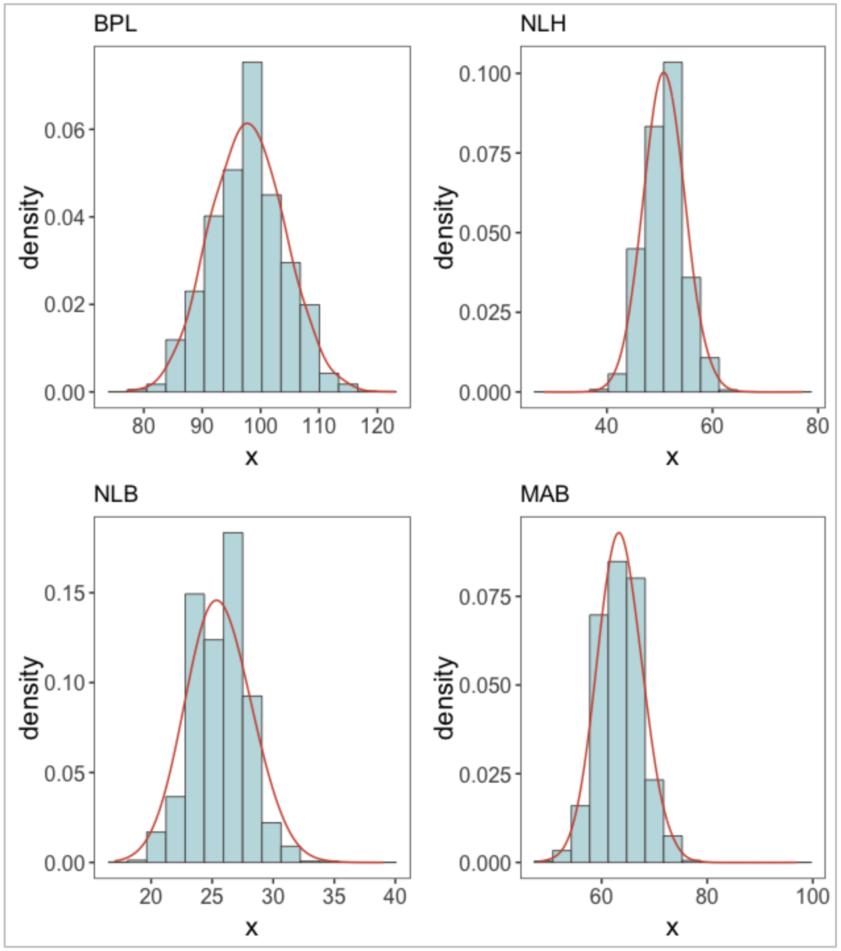

Figure A.11. Histograms for craniometric variables: BPL, NLH, NLB, and MAB.

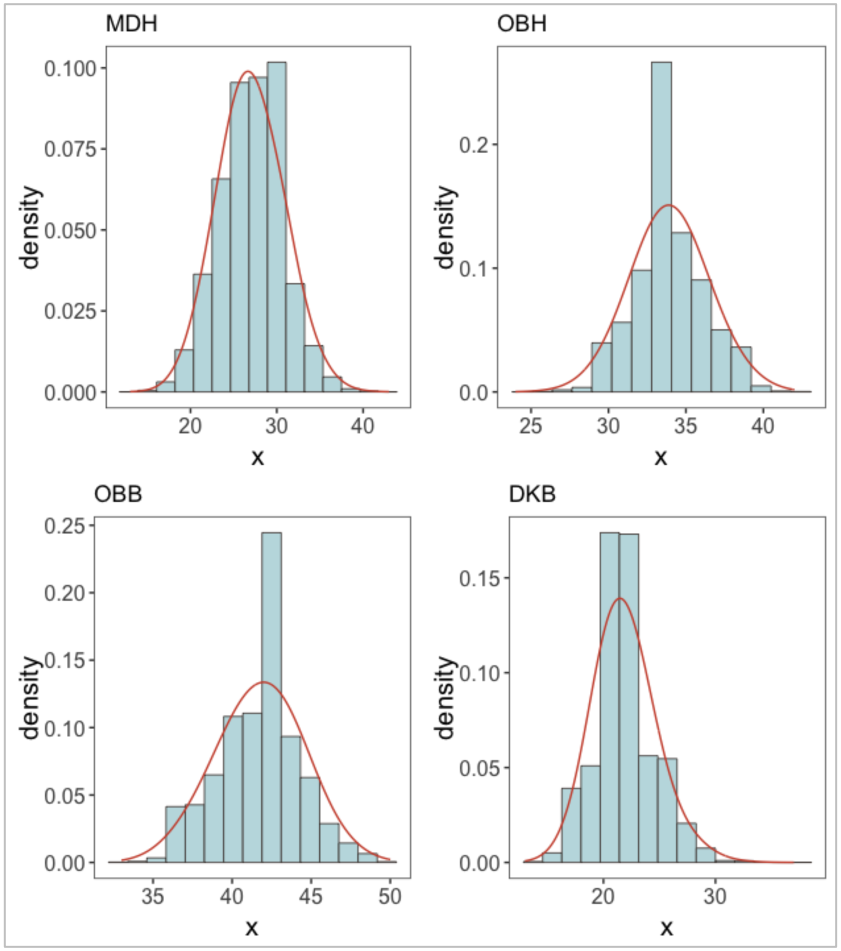

Figure A.12. Histograms for craniometric variables: MDH, OBH, OBB, and DKB.

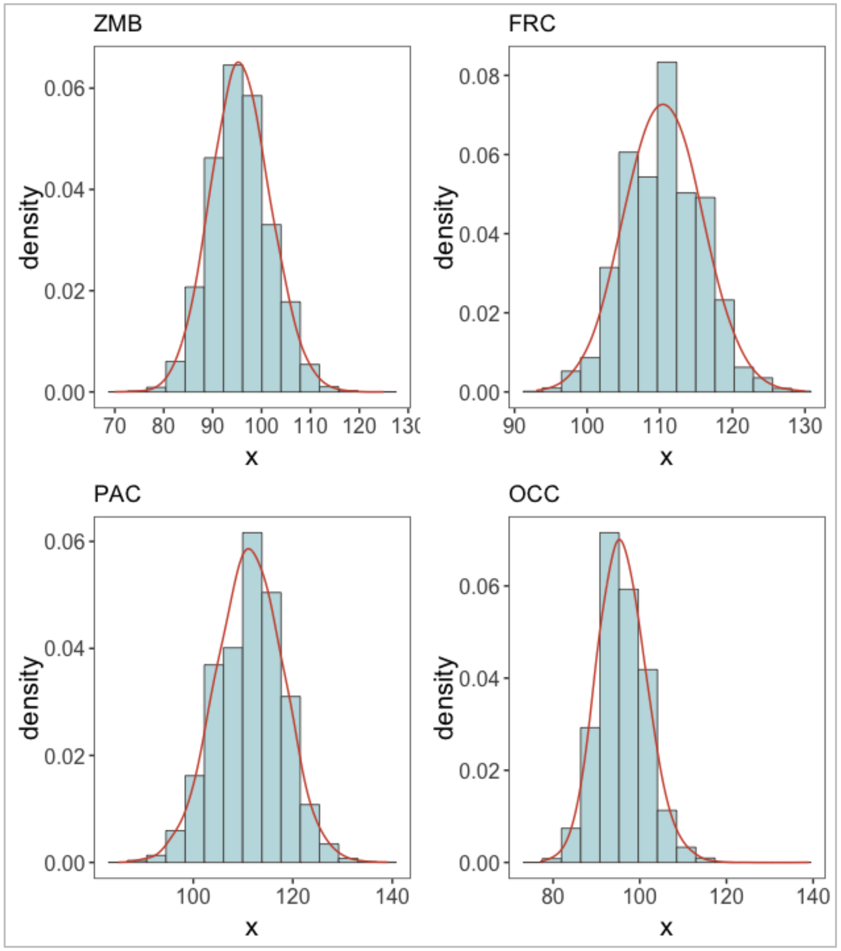

Figure A.13. Histograms for craniometric variables: ZMB, FRC, PAC, and OCC.

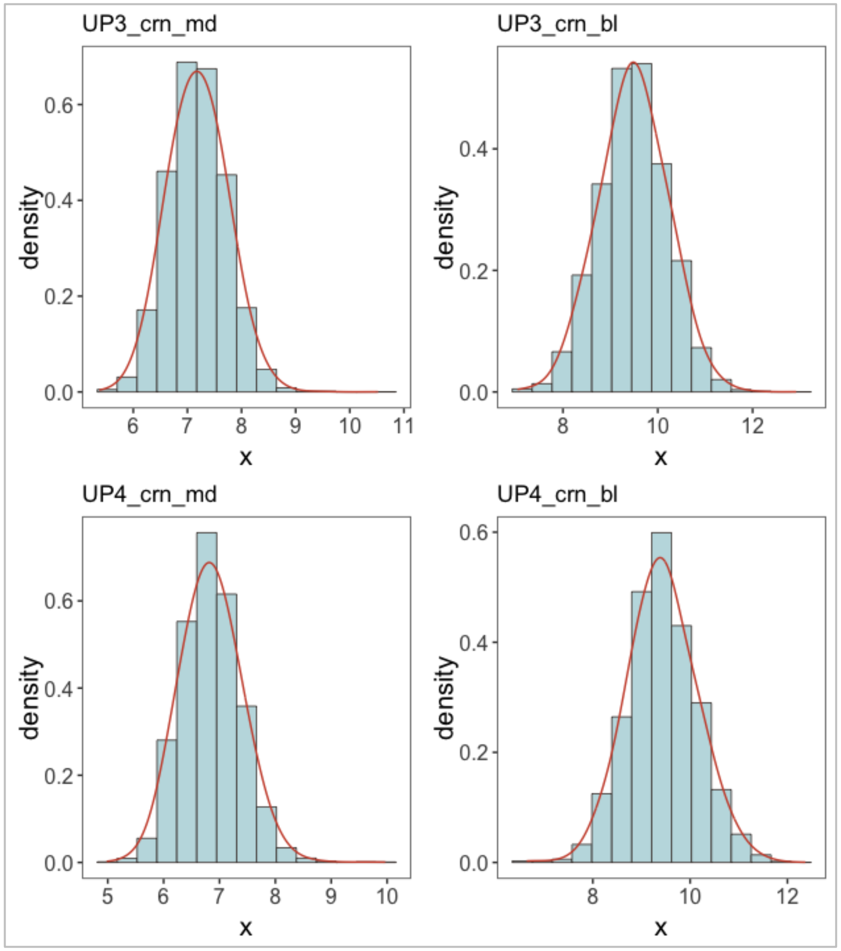

Figure A.14. Histograms for odontometric variables: UP3 and UP4 mesiodistal and buccolingual crown diameters.

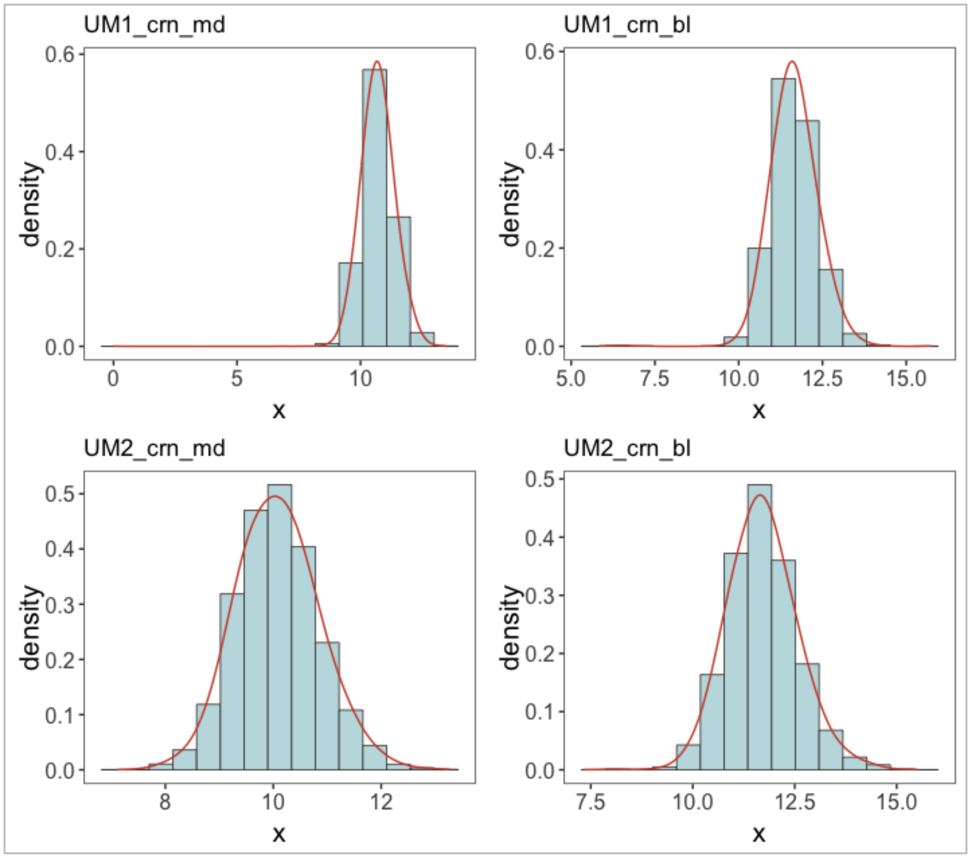

Figure A.15. Histograms for odontometric variables: UM1 and UM2 mesiodistal and buccolingual crown diameters.

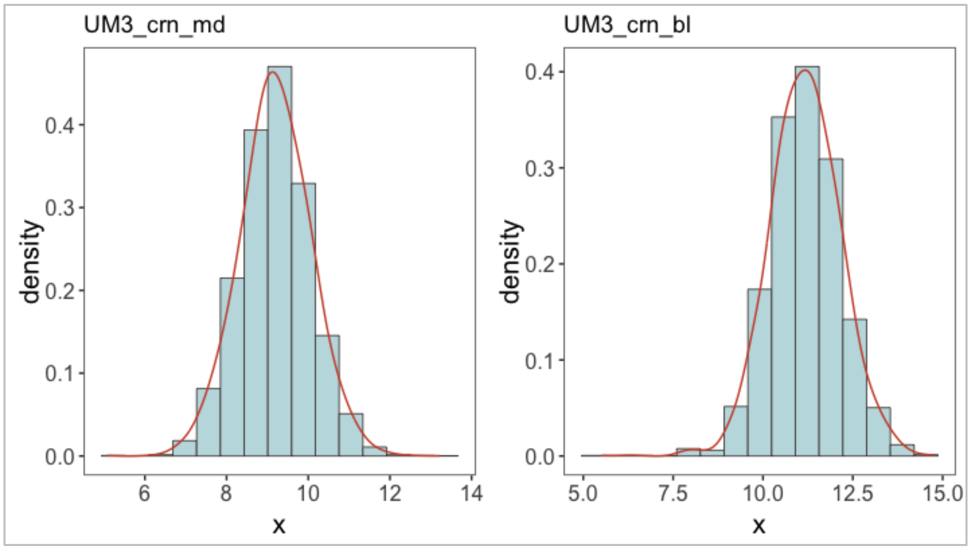

Figure A.16. Histograms for plots for odontometric variables: UM3 mesiodistal and buccolingual crown diameters.

Table A.1. Correlation matrix for 22 craniometric variables.

	GOL	NOL	BNL	BBH	XCB	ZYB	AUB	ASB	BPL	NLH	NLB	MAB	MDH	OBH	OBB	DKB	ZMB	EKB	FRC	PAC	OCC	FOL
GOL	1	0.98	0.7	0.46	0.21	0.53	0.39	0.46	0.58	0.39	0.23	0.41	0.33	0.18	0.51	0.17	0.35	0.54	0.61	0.61	0.44	0.38
NOL	0.98	1	0.7	0.45	0.22	0.5	0.38	0.45	0.55	0.41	0.22	0.39	0.32	0.21	0.49	0.18	0.34	0.52	0.62	0.6	0.47	0.38
BNL	0.7	0.7	1	0.67	0.2	0.6	0.48	0.35	0.7	0.53	0.25	0.44	0.34	0.28	0.52	0.19	0.45	0.54	0.49	0.36	0.37	0.32
BBH	0.46	0.45	0.67	1	0.32	0.53	0.48	0.28	0.38	0.49	0.13	0.42	0.34	0.24	0.35	0.25	0.46	0.32	0.63	0.46	0.54	0.21
XCB	0.21	0.22	0.2	0.32	1	0.54	0.72	0.59	0.01	0.48	0.06	0.37	0.32	0.28	0.28	0.12	0.35	0.29	0.46	0.06	0.3	0.18
ZYB	0.53	0.5	0.6	0.53	0.54	1	0.87	0.57	0.45	0.62	0.25	0.62	0.46	0.39	0.59	0.21	0.67	0.66	0.49	0.27	0.31	0.37
AUB	0.39	0.38	0.48	0.48	0.72	0.87	1	0.64	0.26	0.65	0.13	0.56	0.4	0.4	0.48	0.17	0.57	0.49	0.47	0.15	0.33	0.33
ASB	0.46	0.45	0.35	0.28	0.59	0.57	0.64	1	0.21	0.41	0.13	0.4	0.36	0.24	0.39	0.08	0.34	0.41	0.39	0.21	0.3	0.34
BPL	0.58	0.55	0.7	0.38	0.01	0.45	0.26	0.21	1	0.23	0.38	0.47	0.24	0.09	0.44	0.15	0.42	0.54	0.3	0.33	0.21	0.17
NLH	0.39	0.41	0.53	0.49	0.48	0.62	0.65	0.41	0.23	1	0.11	0.47	0.39	0.54	0.43	0.15	0.48	0.35	0.47	0.17	0.32	0.27
NLB	0.23	0.22	0.25	0.13	0.06	0.25	0.13	0.13	0.38	0.11	1	0.32	0.19	-0.03	0.2	0.2	0.33	0.48	0.18	0.17	0.02	0.14
MAB	0.41	0.39	0.44	0.42	0.37	0.62	0.56	0.4	0.47	0.47	0.32	1	0.4	0.21	0.45	0.24	0.62	0.54	0.39	0.25	0.28	0.24
MDH	0.33	0.32	0.34	0.34	0.32	0.46	0.4	0.36	0.24	0.39	0.19	0.4	1	0.19	0.26	0.07	0.39	0.37	0.33	0.21	0.27	0.15
OBH	0.18	0.21	0.28	0.24	0.28	0.39	0.4	0.24	0.09	0.54	-0.03	0.21	0.19	1	0.36	-0.07	0.25	0.28	0.23	-0.02	0.23	0.2
OBB	0.51	0.49	0.52	0.35	0.28	0.59	0.48	0.39	0.44	0.43	0.2	0.45	0.26	0.36	1	0.13	0.42	0.72	0.38	0.26	0.23	0.28
DKB	0.17	0.18	0.19	0.25	0.12	0.21	0.17	0.08	0.15	0.15	0.2	0.24	0.07	-0.07	0.13	1	0.37	0.27	0.18	0.23	0.09	-0.05
ZMB	0.35	0.34	0.45	0.46	0.35	0.67	0.57	0.34	0.42	0.48	0.33	0.62	0.39	0.25	0.42	0.37	1	0.56	0.4	0.23	0.25	0.16
EKB	0.54	0.52	0.54	0.32	0.29	0.66	0.49	0.41	0.54	0.35	0.48	0.54	0.37	0.28	0.72	0.27	0.56	1	0.37	0.31	0.18	0.34
FRC	0.61	0.62	0.49	0.63	0.46	0.49	0.47	0.39	0.3	0.47	0.18	0.39	0.33	0.23	0.38	0.18	0.4	0.37	1	0.36	0.37	0.24
PAC	0.61	0.6	0.36	0.46	0.06	0.27	0.15	0.21	0.33	0.17	0.17	0.25	0.21	-0.02	0.26	0.23	0.23	0.31	0.36	1	0.1	0.15
OCC	0.44	0.47	0.37	0.54	0.3	0.31	0.33	0.3	0.21	0.32	0.02	0.28	0.27	0.23	0.23	0.09	0.25	0.18	0.37	0.1	1	0.06
FOL	0.38	0.38	0.32	0.21	0.18	0.37	0.33	0.34	0.17	0.27	0.14	0.24	0.15	0.2	0.28	-0.05	0.16	0.34	0.24	0.15	0.06	1

Table A.2. Correlation matrix for 10 odontometric variables.

	UP3_crn_md	UP3_crn_bl	UP4_crn_md	UP4_crn_bl	UM1_crn_md	UM1_crn_bl	UM2_crn_md	UM2_crn_bl	UM3_crn_md	UM3_crn_bl
UP3_crn_md	1	0.735	0.696	0.636	0.535	0.510	0.555	0.515	0.271	0.453
UP3_crn_bl	0.735	1	0.598	0.814	0.482	0.619	0.526	0.651	0.230	0.578
UP4_crn_md	0.696	0.598	1	0.677	0.611	0.515	0.603	0.526	0.227	0.436
UP4_crn_bl	0.636	0.814	0.677	1	0.514	0.653	0.570	0.718	0.208	0.629
UM1_crn_md	0.535	0.482	0.611	0.514	1	0.692	0.661	0.573	0.315	0.488
UM1_crn_bl	0.510	0.619	0.515	0.653	0.692	1	0.586	0.777	0.264	0.620
UM2_crn_md	0.555	0.526	0.603	0.570	0.661	0.586	1	0.681	0.359	0.523
UM2_crn_bl	0.515	0.651	0.526	0.718	0.573	0.777	0.681	1	0.256	0.707
UM3_crn_md	0.271	0.230	0.227	0.208	0.315	0.264	0.359	0.256	1	0.464
UM3_crn_bl	0.453	0.578	0.436	0.629	0.488	0.620	0.523	0.707	0.464	1

Table A.3. Correlation matrix for 23 cranial nonmetric traits in the Ossenberg dataset.

	METO	SOFL	SOFR	TZSL	TZSR	CONL	CONR	APIC	ASTL	ASTR	OMBL	OMBR	PNBL	PNBR	INCA	HYPL	HYPR
METO	1	0.028	0.017	0.048	0.058	0.009	0.004	0.026	0.026	0.028	0.033	0.049	0.076	0.058	0.033	0.015	0.006
SOFL	0.028	1	0.503	0.014	0.008	0.072	0.081	0.135	0.021	0.003	0.026	0.002	0.006	0.007	0.022	0.051	0.017
SOFR	0.017	0.503	1	0.032	0.013	0.058	0.070	0.136	0.015	0.004	0.026	0.000	0.014	0.014	0.016	0.052	0.015
TZSL	0.048	0.014	0.032	1	0.488	0.054	0.060	0.075	0.028	0.019	0.019	0.029	0.018	0.005	0.035	0.070	0.041
TZSR	0.058	0.008	0.013	0.488	1	0.051	0.044	0.069	0.046	0.058	0.047	0.052	0.059	0.047	0.048	0.044	0.004
CONL	0.009	0.072	0.058	0.054	0.051	1	0.770	0.164	0.026	0.007	0.003	0.033	0.005	0.008	0.020	0.090	0.004
CONR	0.004	0.081	0.070	0.060	0.044	0.770	1	0.171	0.036	0.017	0.012	0.031	0.035	0.002	0.026	0.065	0.022
APIC	0.026	0.135	0.136	0.075	0.069	0.164	0.171	1	0.018	0.040	0.017	0.021	0.002	0.012	0.005	0.091	0.048
ASTL	0.026	0.021	0.015	0.028	0.046	0.026	0.036	0.018	1	0.364	0.143	0.130	0.154	0.121	0.023	0.016	0.004
ASTR	0.028	0.003	0.004	0.019	0.058	0.007	0.017	0.040	0.364	1	0.147	0.191	0.120	0.126	0.056	0.031	0.001
OMBL	0.033	0.026	0.026	0.019	0.047	0.003	0.012	0.017	0.143	0.147	1	0.383	0.136	0.099	0.020	0.043	0.035
OMBR	0.049	0.002	0.000	0.029	0.052	0.033	0.031	0.021	0.130	0.191	0.383	1	0.087	0.080	0.031	0.022	0.026
PNBL	0.076	0.006	0.014	0.018	0.059	0.005	0.035	0.002	0.154	0.120	0.136	0.087	1	0.376	0.060	0.031	0.007
PNBR	0.058	0.007	0.014	0.005	0.047	0.008	0.002	0.012	0.121	0.126	0.099	0.080	0.376	1	0.045	0.021	0.022
INCA	0.033	0.022	0.016	0.035	0.048	0.020	0.026	0.005	0.023	0.056	0.020	0.031	0.060	0.045	1	0.001	0.004
HYPL	0.015	0.051	0.052	0.070	0.044	0.090	0.065	0.091	0.016	0.031	0.043	0.022	0.031	0.021	0.001	1	0.167
HYPR	0.006	0.017	0.015	0.041	0.004	0.004	0.022	0.048	0.004	0.001	0.035	0.026	0.007	0.022	0.004	0.167	1
CIVL	0.003	0.008	0.007	0.024	0.007	0.001	0.010	0.034	0.007	0.017	0.013	0.001	0.017	0.016	0.013	0.006	0.016
CIVR	0.007	0.020	0.003	0.036	0.015	0.019	0.024	0.041	0.028	0.015	0.000	0.001	0.024	0.012	0.003	0.013	0.009
FSPL	0.017	0.021	0.005	0.030	0.022	0.003	0.012	0.054	0.017	0.021	0.030	0.025	0.041	0.036	0.010	0.048	0.009
FSPR	0.013	0.033	0.024	0.027	0.003	0.015	0.007	0.064	0.011	0.009	0.029	0.033	0.039	0.013	0.005	0.040	0.001
TYML	0.015	0.050	0.072	0.083	0.009	0.004	0.004	0.058	0.003	0.018	0.014	0.024	0.005	0.013	0.002	0.091	0.017
TYMR	0.014	0.045	0.076	0.080	0.004	0.005	0.004	0.066	0.016	0.006	0.021	0.023	0.008	0.007	0.011	0.092	0.019

Table A.3. (continued).

	CIVL	CIVR	FSPL	FSPR	TYML	TYMR
METO	0.003	0.007	0.017	0.013	0.015	0.014
SOFL	0.008	0.020	0.021	0.033	0.050	0.045
SOFR	0.007	0.003	0.005	0.024	0.072	0.076
TZSL	0.024	0.036	0.030	0.027	0.083	0.080
TZSR	0.007	0.015	0.022	0.003	0.009	0.004
CONL	0.001	0.019	0.003	0.015	0.004	0.005
CONR	0.010	0.024	0.012	0.007	0.004	0.004
APIC	0.034	0.041	0.054	0.064	0.058	0.066
ASTL	0.007	0.028	0.017	0.011	0.003	0.016
ASTR	0.017	0.015	0.021	0.009	0.018	0.006
OMBL	0.013	0.000	0.030	0.029	0.014	0.021
OMBR	0.001	0.001	0.025	0.033	0.024	0.023
PNBL	0.017	0.024	0.041	0.039	0.005	0.008
PNBR	0.016	0.012	0.036	0.013	0.013	0.007
INCA	0.013	0.003	0.010	0.005	0.002	0.011
HYPL	0.006	0.013	0.048	0.040	0.091	0.092
HYPR	0.016	0.009	0.009	0.001	0.017	0.019
CIVL	1	0.363	0.026	0.026	0.021	0.012
CIVR	0.363	1	0.011	0.027	0.011	0.006
FSPL	0.026	0.011	1	0.409	0.046	0.039
FSPR	0.026	0.027	0.409	1	0.012	0.018
TYML	0.021	0.011	0.046	0.012	1	0.718
TYMR	0.012	0.006	0.039	0.018	0.718	1

Table A.4. Correlation matrix for 22 cranial nonmetric traits in the Hanihara dataset.

	MET	SOF_L	SOF_R	AIOF_L	AIOF_R	OL	ASB_L	ASB_R	OMB_L	OMB_R	PNB_L	PNB_R	CCA_L	CCA_R
MET	1	0.014	0.009	0.003	0.005	0.052	0.011	0.002	0.002	0.001	0.034	0.034	0.005	0.007
SOF_L	0.014	1	0.458	0.029	0.039	0.006	0.013	0.034	0.022	0.037	0.002	0.008	0.043	0.041
SOF_R	0.009	0.458	1	0.042	0.044	0.003	0.012	0.044	0.023	0.007	0.014	0.020	0.032	0.047
AIOF_L	0.003	0.029	0.042	1	0.369	0.012	0.003	0.020	0.003	0.017	0.013	0.005	0.014	0.010
AIOF_R	0.005	0.039	0.044	0.369	1	0.011	0.010	0.012	0.005	0.001	0.001	0.008	0.009	0.010
OL	0.052	0.006	0.003	0.012	0.011	1	0.130	0.117	0.068	0.068	0.087	0.075	0.011	0.010
ASB_L	0.011	0.013	0.012	0.003	0.010	0.130	1	0.390	0.161	0.114	0.123	0.120	0.005	0.007
ASB_R	0.002	0.034	0.044	0.020	0.012	0.117	0.390	1	0.119	0.161	0.103	0.124	0.003	0.000
OMB_L	0.002	0.022	0.023	0.003	0.005	0.068	0.161	0.119	1	0.341	0.090	0.075	0.001	0.023
OMB_R	0.001	0.037	0.007	0.017	0.001	0.068	0.114	0.161	0.341	1	0.080	0.075	0.003	0.001
PNB_L	0.034	0.002	0.014	0.013	0.001	0.087	0.123	0.103	0.090	0.080	1	0.392	0.009	0.013
PNB_R	0.034	0.008	0.020	0.005	0.008	0.075	0.120	0.124	0.075	0.075	0.392	1	0.006	0.018
CCA_L	0.005	0.043	0.032	0.014	0.009	0.011	0.005	0.003	0.001	0.003	0.009	0.006	1	0.342
CCA_R	0.007	0.041	0.047	0.010	0.010	0.010	0.007	0.000	0.023	0.001	0.013	0.018	0.342	1
HGCB_L	0.009	0.001	0.003	0.009	0.002	0.003	0.005	0.002	0.010	0.008	0.008	0.008	0.025	0.016
HGCB_R	0.007	0.002	0.006	0.009	0.004	0.008	0.010	0.009	0.015	0.017	0.002	0.007	0.023	0.017
TD_L	0.012	0.041	0.044	0.008	0.008	0.019	0.001	0.002	0.037	0.037	0.031	0.027	0.060	0.055
TD_R	0.000	0.050	0.043	0.015	0.002	0.022	0.011	0.010	0.041	0.040	0.033	0.030	0.053	0.042
AEX_L	0.004	0.004	0.007	0.013	0.004	0.008	0.039	0.031	0.017	0.013	0.003	0.002	0.008	0.000
AEX_R	0.007	0.005	0.007	0.013	0.002	0.001	0.039	0.035	0.022	0.029	0.003	0.005	0.019	0.010
TZS_L	0.021	0.021	0.033	0.007	0.003	0.000	0.014	0.015	0.029	0.016	0.037	0.041	0.010	0.018
TZS_R	0.020	0.025	0.029	0.023	0.002	0.008	0.009	0.018	0.018	0.017	0.036	0.034	0.024	0.034

Table A.4. (continued).

	HGCB_L	HGCB_R	TD_L	TD_R	AEX_L	AEX_R	TZS_L	TZS_R
MET	0.009	0.007	0.012	0.000	0.004	0.007	0.021	0.020
SOF_L	0.001	0.002	0.041	0.050	0.004	0.005	0.021	0.025
SOF_R	0.003	0.006	0.044	0.043	0.007	0.007	0.033	0.029
AIOF_L	0.009	0.009	0.008	0.015	0.013	0.013	0.007	0.023
AIOF_R	0.002	0.004	0.008	0.002	0.004	0.002	0.003	0.002
OL	0.003	0.008	0.019	0.022	0.008	0.001	0.000	0.008
ASB_L	0.005	0.010	0.001	0.011	0.039	0.039	0.014	0.009
ASB_R	0.002	0.009	0.002	0.010	0.031	0.035	0.015	0.018
OMB_L	0.010	0.015	0.037	0.041	0.017	0.022	0.029	0.018
OMB_R	0.008	0.017	0.037	0.040	0.013	0.029	0.016	0.017
PNB_L	0.008	0.002	0.031	0.033	0.003	0.003	0.037	0.036
PNB_R	0.008	0.007	0.027	0.030	0.002	0.005	0.041	0.034
CCA_L	0.025	0.023	0.060	0.053	0.008	0.019	0.010	0.024
CCA_R	0.016	0.017	0.055	0.042	0.000	0.010	0.018	0.034
HGCB_L	1	0.225	0.023	0.011	0.009	0.015	0.002	0.002
HGCB_R	0.225	1	0.009	0.010	0.009	0.010	0.006	0.010
TD_L	0.023	0.009	1	0.676	0.042	0.044	0.042	0.042
TD_R	0.011	0.010	0.676	1	0.023	0.030	0.040	0.038
AEX_L	0.009	0.009	0.042	0.023	1	0.726	0.010	0.008
AEX_R	0.015	0.010	0.044	0.030	0.726	1	0.015	0.004
TZS_L	0.002	0.006	0.042	0.040	0.010	0.015	1	0.600
TZS_R	0.002	0.010	0.042	0.038	0.008	0.004	0.600	1

Table A.5. Correlation matrix for 11 MMS traits.

	ANS	INA	IOB	MT	NAW	NBC	NO	PBD	PZT	SPS	ZS
ANS	1	0.247	0.061	0.077	0.149	0.082	0.213	0.077	0.118	0.164	0.121
INA	0.247	1	0.102	0.089	0.193	0.138	0.211	0.144	0.097	0.114	0.233
IOB	0.061	0.102	1	0.082	0.338	0.194	0.102	0.084	0.068	0.104	0.089
MT	0.077	0.089	0.082	1	0.101	0.113	0.047	0.039	0.100	0.086	0.130
NAW	0.149	0.193	0.338	0.101	1	0.183	0.117	0.100	0.168	0.146	0.093
NBC	0.082	0.138	0.194	0.113	0.183	1	0.210	0.070	0.113	0.166	0.154
NO	0.213	0.211	0.102	0.047	0.117	0.210	1	0.109	0.036	0.268	0.038
PBD	0.077	0.144	0.084	0.039	0.100	0.070	0.109	1	0.060	0.105	0.115
PZT	0.118	0.097	0.068	0.100	0.168	0.113	0.036	0.060	1	0.066	0.130
SPS	0.164	0.114	0.104	0.086	0.146	0.166	0.268	0.105	0.066	1	0.082
ZS	0.121	0.233	0.089	0.130	0.093	0.154	0.038	0.115	0.130	0.082	1

Table A.6. Correlation matrix for 10 dental nonmetric variables.

	P_U_P3_ACCUP	P_U_M1_CARAB	P_U_M1_ENEX	P_U_M1_METCONL	P_U_M1_PARAST	P_U_M2_HYPCON	P_U_M2_MOLCR	P_U_M3_METCON	P_U_P3_ROOTNUM	P_U_P4_ODONT
P_U_P3_ACCUP	1	0.045	0.227	0.101	0.017	0.005	0.054	0.018	0.008	0.018
P_U_M1_CARAB	0.045	1	0.037	0.002	0.016	0.084	0.045	0.025	0.113	0.024
P_U_M1_ENEX	0.227	0.037	1	0.083	0.013	0.107	0.005	0.021	0.007	0.037
P_U_M1_METCONL	0.101	0.002	0.083	1	0.018	0.061	0.073	0.029	0.101	0.029
P_U_M1_PARAST	0.017	0.016	0.013	0.018	1	0.024	0.006	0.004	0.056	0.004
P_U_M2_HYPCON	0.005	0.084	0.107	0.061	0.024	1	0.038	0.038	0.045	0.038
P_U_M2_MOLCR	0.054	0.045	0.005	0.073	0.006	0.038	1	0.010	0.029	0.010
P_U_M3_METCON	0.018	0.025	0.021	0.029	0.004	0.038	0.010	1	0.058	0.006
P_U_P3_ROOTNUM	0.008	0.113	0.007	0.101	0.056	0.045	0.029	0.058	1	0.027
P_U_P4_ODONT	0.018	0.024	0.037	0.029	0.004	0.038	0.010	0.006	0.027	1

Appendix B: Supplemental Results

Table B.1. Confusion matrix for craniometric LDA results. AINU to BERG. Cells with diagonal values representing correct classifications are colored gray.

	AINU	Alaska_Inupiat_H	Alaska_PtBarrow_H	Alaska_Yupik_H	Aleut_H	Am_Black_FDB	Am_White_FDB	ANDAMAN	ANYANG	ARIKARA	ATAYAL	AUSTRALI	Australia_Aboriginal_H	Austria_H	Bachuc_Viet	Bangladesh_H	BERG
AINU	33	0	0	1	0	2	0	0	0	2	0	0	0	0	0	0	2
Alaska_Inupiat_H	0	77	9	34	4	1	0	0	0	0	0	0	0	0	0	0	0
Alaska_PtBarrow_H	0	14	11	19	0	0	0	0	0	0	0	0	0	0	0	0	0
Alaska_Yupik_H	0	34	4	97	12	0	0	0	0	2	0	0	0	0	1	0	0
Aleut_H	0	2	1	12	169	1	0	0	0	1	0	0	0	0	0	0	0
Am_Black_FDB	0	1	0	0	0	76	3	0	0	0	0	1	13	0	0	0	0
Am_White_FDB	1	0	0	0	0	1	98	0	0	0	0	0	0	1	0	0	1
ANDAMAN	0	0	0	0	0	0	0	46	0	0	1	0	0	0	0	0	0
ANYANG	0	0	0	0	0	0	0	0	14	1	0	0	2	0	0	0	0
ARIKARA	2	0	0	2	2	0	0	1	0	17	0	0	0	0	0	0	0
ATAYAL	0	0	0	0	0	0	1	2	1	0	11	0	0	0	0	0	3
AUSTRALI	0	0	0	0	0	3	0	0	0	0	0	39	29	0	0	0	0
Australia_Aboriginal_H	0	0	0	0	0	13	0	0	0	0	0	19	98	0	0	0	0
Austria_H	0	0	0	1	4	0	3	0	0	0	1	0	0	27	0	0	3
Bachuc_Viet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0
Bangladesh_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
BERG	1	0	0	0	1	1	0	3	0	1	0	0	0	4	0	0	26
Borneo_H	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2	0	0
Burma_NHM_H	0	0	0	1	0	0	1	0	0	1	0	0	0	0	5	0	0
BURYAT	1	0	0	1	6	0	0	0	0	2	0	0	0	0	0	0	2
BUSHMAN	0	0	0	0	0	0	0	2	0	0	0	2	0	1	0	0	1
Canada_Indigenous_H	3	9	1	20	7	0	0	0	0	0	0	0	0	2	0	0	0
China_North_H	0	0	0	0	0	2	0	0	3	0	0	0	0	0	3	0	1
China_South_H	0	0	0	0	0	0	2	0	3	2	0	0	0	1	0	0	0
Czech_H	1	0	0	0	2	0	0	0	0	0	0	0	0	11	0	0	13
DOGON	5	0	0	0	0	1	0	4	0	0	0	0	4	0	0	0	0
DW_Burma	0	0	0	0	1	2	0	2	0	0	0	0	0	0	1	0	0
East_Asian_FDB	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
EASTER_I	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
EasterIslands_H	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0
EGYPT	0	0	0	0	0	2	8	0	0	1	0	0	0	0	0	0	3
Egypt_Gizeh_H	1	0	0	0	0	1	5	1	0	1	0	0	0	0	0	0	0
Egypt_Naqada_H	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Egypt_Upper_H	0	1	2	1	0	2	3	1	0	0	0	0	1	1	0	0	0
France_H	0	0	0	0	1	0	3	0	0	0	0	0	0	2	0	0	2
Gabon_H	1	0	0	0	0	2	0	0	0	0	1	0	3	0	0	0	0
Germany_H	0	0	0	1	1	0	5	0	0	0	0	0	0	8	0	0	6
Ghana_Ashanti_H	0	1	0	0	0	2	0	0	0	0	1	0	6	0	0	0	0

Greece_H	1	0	1	3	0	0	12	1	0	0	0	0	0	3	0	0	3
Greenland_H	1	18	7	8	1	0	0	0	0	0	0	0	0	0	0	0	0
GUAM	2	0	0	1	0	0	1	0	3	1	1	0	0	0	0	0	0
HAINAN	0	0	0	0	0	0	0	2	1	0	1	0	1	0	1	0	0
Hawaii_H	1	0	1	0	0	0	1	0	0	1	0	0	0	0	2	0	0
Hispanic_FDB	0	2	0	1	0	4	6	0	0	0	1	0	0	0	1	0	0
Hong_Kong	1	0	1	2	0	1	0	0	0	1	0	0	0	0	2	0	0
Hungary_H	0	0	0	1	1	0	0	0	0	0	1	0	0	9	1	0	3
India_Bengal_H	0	0	1	0	0	1	0	2	0	0	2	0	0	0	0	1	0
India_Northeast_H	0	0	0	0	0	2	2	0	2	0	0	1	1	0	0	0	0
India_Northwest_H	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Pakistan_Punjab_H	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0
India_South_H	1	0	0	0	0	1	0	2	0	0	0	1	3	0	0	0	0
INUGSUK	0	10	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0
Italy_H	0	0	0	0	1	0	3	0	0	2	1	0	0	6	0	0	2
Japan_Ainu_H	8	2	3	2	3	3	0	0	2	1	0	0	0	0	0	0	0
Japan_Jomon_H	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_MainIsland_H	2	5	0	2	1	4	1	2	1	1	0	0	0	1	2	0	0
Java_H	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
Kanto_Japan	0	2	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0
Kenya_H	0	0	1	0	0	4	0	1	0	0	0	1	11	0	0	0	0
Korea_South_H	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Kyushu_Japan	0	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Laos_H	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Malaysia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0
Maori_H	3	1	0	2	0	0	2	0	1	2	0	0	2	0	0	0	0
Marquesas_H	1	2	1	1	0	1	0	0	0	1	0	0	0	0	0	0	1
Mel_NewCaledonia_H	0	0	0	0	0	1	0	0	0	0	0	1	3	0	0	0	0
Mel_Solomon_H	0	1	0	0	1	5	0	0	0	0	1	0	6	0	1	0	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0
Mexico_H	0	3	0	4	0	0	0	2	1	1	0	0	0	0	2	0	0
MOKAPU	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
Molucca_H	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2	0	0
Mongolia_H	0	0	1	3	15	0	0	0	0	3	0	0	0	2	0	0	3
Mongolia_Metal_H	0	0	0	1	1	0	1	0	0	1	0	0	0	1	0	0	0
MORIORI	3	0	1	0	1	3	0	0	0	1	0	0	0	0	0	0	0
Moriori_H	1	3	1	1	0	1	1	0	0	1	0	0	1	0	0	0	0
N_JAPAN	0	1	0	0	0	8	0	1	1	2	1	0	0	0	0	0	1
N_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	0	0	2	0	0	0	0	1	0	3	0	0	0	0
Nigeria_H	1	1	0	0	1	1	0	0	3	0	1	1	10	0	0	0	0
NORSE	4	0	0	0	0	1	3	1	0	0	0	1	1	0	0	0	0
Nubia_Early_H	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
Nubia_Kerma_H	0	0	0	0	0	1	0	0	1	0	0	0	2	0	0	0	0
Nubia_Recent_H	2	0	0	1	1	2	2	0	0	0	0	0	1	0	0	0	2
Okhotsk_H	0	0	1	7	1	0	0	0	0	0	0	0	0	0	1	0	0
Palestine_H	0	1	0	0	0	2	2	0	0	1	1	0	0	0	0	0	1
Patagonia_H	1	5	0	8	0	0	0	0	0	1	0	0	0	0	0	0	0
PERU	0	0	0	2	1	3	0	2	0	0	0	0	1	0	0	0	2

Peru_H	1	10	0	7	6	1	1	1	0	1	2	0	1	2	1	0	1
Philippines_General_H	1	1	0	0	0	0	0	3	0	0	2	0	1	1	2	0	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHILLIPI	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0
PNG_H	0	1	0	2	3	8	1	4	0	0	0	2	22	0	0	0	0
Russia_H	1	0	0	0	0	0	4	0	0	2	0	0	0	3	0	0	2
S_JAPAN	2	0	0	1	0	1	1	1	0	0	2	0	2	0	0	0	0
S_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SANTA_CR	0	3	0	3	5	1	0	3	0	0	0	0	1	0	0	0	0
Singapore_H	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0
Somalia_H	0	1	1	1	0	0	3	0	0	0	0	0	0	0	0	0	0
SouthAfrica_H	1	1	0	0	0	1	1	1	0	0	2	4	7	0	0	0	0
SriLanka_H	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Switzerland_H	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	7
Taiwan	0	2	0	3	0	0	0	0	0	0	0	0	0	0	2	0	0
Tanzania_H	1	1	0	0	1	1	0	0	0	1	0	4	8	0	0	0	0
TASMANIA	0	0	0	0	0	4	0	0	0	0	0	2	2	0	0	0	1
TEITA	0	0	0	0	0	3	0	0	0	0	2	6	2	0	0	0	0
Thailand	0	0	0	1	0	1	0	0	0	0	0	0	0	0	5	0	0
Thailand_H	0	0	0	1	0	0	0	1	1	1	0	0	0	1	1	0	0
Tibet_H	0	0	0	0	0	1	2	0	0	1	1	0	0	1	1	0	1
Tohoku_Japan	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
TOLAI	1	0	0	0	0	1	0	0	0	0	0	1	13	0	0	0	0
Turkey_H	1	0	0	1	0	1	2	0	0	0	2	0	0	0	0	1	1
UK_Medieval_H	3	1	1	6	1	1	12	2	0	0	0	0	0	3	0	0	8
Vietnam_H	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
ZALAVAR	1	0	0	0	0	2	5	0	0	0	1	0	0	3	0	0	1
ZULU	3	0	0	0	0	2	0	0	1	0	0	5	10	0	0	0	0

Table B.1. (continued) Borneo_H to Egypt_Upper_H. Cells with diagonal values representing correct classifications are colored gray.

	Borneo_H	Burma_NHM_H	BURYAT	BUSHMAN	Canada_Indigenous_H	China_North_H	China_South_H	Czech_H	DOGON	DW_Burma	East_Asian_FDB	EASTER_I	EasterIslands_H	EGYPT	Egypt_Gizeh_H	Egypt_Naqada_H	Egypt_Upper_H
AINU	0	0	0	2	0	0	0	0	3	0	0	1	0	0	0	0	0
Alaska_Inupiat_H	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0
Alaska_PtBarrow_H	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1
Alaska_Yupik_H	0	0	0	0	5	1	0	1	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Am_Black_FDB	1	0	0	0	0	0	0	0	1	1	0	0	2	1	0	0	4
Am_White_FDB	0	0	0	0	0	1	1	3	0	0	0	0	0	2	3	1	4
ANDAMAN	0	0	0	0	1	0	0	0	5	2	0	0	0	0	0	0	0
ANYANG	2	1	0	0	0	3	0	1	0	1	0	0	0	0	0	0	0
ARIKARA	0	0	3	0	1	1	0	0	1	2	0	0	0	0	0	0	0
ATAYAL	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
AUSTRALI	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Australia_Aboriginal_H	0	0	0	2	0	0	0	0	1	0	0	0	1	0	0	1	0
Austria_H	0	0	1	0	1	0	0	19	0	1	0	0	0	0	1	0	4
Bachuc_Viet	0	0	2	0	0	3	0	0	1	3	0	0	0	0	0	0	1
Bangladesh_H	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1
BERG	0	0	9	0	0	0	0	13	1	1	0	0	0	0	0	0	0
Borneo_H	3	1	1	0	0	1	1	0	0	5	0	1	0	1	0	0	3
Burma_NHM_H	0	2	0	0	0	2	0	0	1	8	0	1	1	2	0	0	0
BURYAT	0	0	53	0	0	1	0	2	0	3	0	0	0	0	0	0	0
BUSHMAN	0	0	0	64	0	0	0	0	1	0	0	0	0	0	0	0	2
Canada_Indigenous_H	0	0	1	0	9	2	0	0	0	0	0	1	0	0	0	0	0
China_North_H	0	1	0	0	0	32	1	1	1	4	0	0	0	0	1	0	8
China_South_H	0	0	0	0	1	8	1	0	0	2	0	0	1	2	0	0	3
Czech_H	0	0	2	1	0	1	1	37	0	1	0	1	0	0	0	1	2
DOGON	1	0	0	1	0	0	0	0	43	5	0	1	0	0	0	0	0
DW_Burma	0	2	1	0	0	1	0	0	2	71	0	0	0	0	0	0	0
East_Asian_FDB	0	0	0	0	0	2	1	0	0	1	0	0	0	0	0	0	0
EASTER_I	0	0	0	0	0	0	0	0	0	0	0	50	12	0	1	0	1
EasterIslands_H	1	0	0	0	0	0	0	0	1	0	0	19	26	0	0	0	0
EGYPT	0	0	0	1	1	0	0	0	0	0	0	0	0	21	7	1	14
Egypt_Gizeh_H	0	0	0	1	0	3	0	0	0	0	0	1	0	5	35	0	14
Egypt_Naqada_H	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	1	5
Egypt_Upper_H	1	0	0	0	0	2	0	1	1	0	0	0	0	5	14	1	50
France_H	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0
Gabon_H	0	0	0	0	0	1	0	0	8	1	0	0	1	0	0	0	0
Germany_H	0	0	1	0	0	0	0	9	0	1	0	0	0	1	1	0	2
Ghana_Ashanti_H	0	0	0	0	0	0	0	0	6	0	0	4	1	0	0	0	0
Greece_H	0	0	1	0	0	2	0	3	0	0	0	0	0	2	3	0	9
Greenland_H	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1

GUAM	0	0	0	0	0	4	0	0	0	2	0	1	0	0	0	0	0
HAINAN	1	1	0	0	0	6	0	1	4	7	0	0	0	1	0	0	3
Hawaii_H	0	0	0	0	0	2	0	0	0	1	0	1	3	0	1	1	1
Hispanic_FDB	0	0	0	0	0	2	0	1	0	3	0	0	0	2	0	0	0
Hong_Kong	1	0	0	0	0	4	1	0	0	2	0	1	0	0	0	0	2
Hungary_H	0	0	0	3	1	0	1	13	0	0	0	0	0	0	3	1	6
India_Bengal_H	1	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	5
India_Northeast_H	0	1	0	0	0	5	0	0	1	1	0	0	1	1	0	0	3
India_Northwest_H	0	0	0	0	0	0	0	0	0	3	0	0	0	1	1	0	1
India_Pakistan_Punjab_H	0	0	0	1	0	0	0	0	0	0	0	1	2	1	1	0	0
India_South_H	0	0	0	1	0	1	0	0	1	5	0	1	0	4	1	1	2
INUGSUK	0	0	0	0	2	1	0	0	0	0	0	1	4	0	0	0	4
Italy_H	0	0	1	0	0	0	0	8	0	0	0	0	1	2	1	0	2
Japan_Ainu_H	0	0	0	0	0	0	0	0	2	0	0	0	1	0	1	0	4
Japan_Jomon_H	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Japan_MainIsland_H	1	0	0	0	1	9	0	0	2	3	0	0	0	0	3	1	5
Java_H	0	1	0	0	0	1	1	1	2	13	0	0	0	0	0	0	0
Kanto_Japan	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1
Kenya_H	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0
Korea_South_H	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Kyushu_Japan	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	3
Laos_H	0	0	0	0	0	1	0	0	1	4	0	0	0	0	0	0	0
Malaysia_H	0	0	0	0	0	0	0	0	0	6	0	0	0	1	0	0	0
Maori_H	0	1	0	0	0	1	0	0	1	2	0	2	0	0	4	0	7
Marquesas_H	0	0	0	0	4	0	0	0	0	2	0	0	1	0	0	0	3
Mel_NewCaledonia_H	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Mel_Solomon_H	0	0	0	0	0	2	0	0	0	2	0	0	1	0	0	0	1
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Mexico_H	1	0	0	0	1	2	0	0	2	0	0	0	0	0	0	0	2
MOKAPU	0	1	0	0	0	1	0	0	0	2	0	4	2	0	1	0	1
Molucca_H	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1
Mongolia_H	0	0	23	0	1	1	0	3	0	2	0	0	0	0	0	0	0
Mongolia_Metal_H	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0
MORIORI	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0
Moriori_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N_JAPAN	0	0	0	0	0	3	0	1	1	1	0	0	0	2	0	0	3
N_MAORI	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0
Nepal_H	0	0	0	1	0	0	0	0	0	2	0	0	1	1	0	1	0
Nigeria_H	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	1
NORSE	0	0	0	2	0	0	0	0	0	0	0	0	0	5	6	0	3
Nubia_Early_H	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	2
Nubia_Kerma_H	0	0	0	1	0	0	0	0	2	0	0	1	2	1	2	2	9
Nubia_Recent_H	0	0	0	0	0	1	0	1	1	0	0	0	0	2	4	3	5
Okhotsk_H	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Palestine_H	1	0	0	0	0	2	0	0	0	0	0	1	0	1	4	1	7
Patagonia_H	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	1
PERU	0	0	0	1	0	1	0	1	1	4	0	0	0	0	0	0	2
Peru_H	0	0	1	1	0	3	0	2	0	7	0	0	0	1	0	0	4
Philippines_General_H	0	0	0	1	0	2	0	0	6	4	0	1	0	0	0	0	4
Philippines_Luzon_H	0	0	0	2	0	0	0	0	2	2	0	0	0	1	0	0	1

PHILLIPI	0	0	0	0	0	1	0	0	4	9	0	0	0	1	0	0	0
PNG_H	1	0	0	0	0	2	0	0	0	4	0	1	1	0	0	1	5
Russia_H	1	0	1	0	0	3	0	3	0	0	0	0	0	1	0	0	1
S_JAPAN	0	0	0	0	0	3	0	0	2	3	0	0	0	1	0	0	3
S_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SANTA_CR	0	0	0	1	2	1	0	0	1	0	0	0	0	0	0	0	0
Singapore_H	0	1	0	0	0	7	1	2	0	3	0	0	0	0	0	0	1
Somalia_H	0	0	0	0	0	0	0	0	1	0	0	1	0	3	1	0	5
SouthAfrica_H	0	0	0	7	0	1	0	0	4	0	0	2	2	0	0	0	0
SriLanka_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Sumatra_H	0	0	0	0	0	1	0	0	1	3	0	1	0	0	0	0	1
Switzerland_H	0	0	3	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Taiwan	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	1
Tanzania_H	0	0	0	2	0	0	0	0	1	0	0	3	0	0	0	0	0
TASMANIA	0	0	0	3	0	0	0	0	1	0	0	0	0	1	1	0	0
TEITA	0	0	0	4	0	0	0	0	4	0	0	1	0	0	0	0	3
Thailand	0	0	0	0	0	1	0	2	0	3	0	0	0	0	0	0	0
Thailand_H	1	0	0	0	0	2	0	1	0	4	0	0	0	1	0	0	0
Tibet_H	0	0	2	1	0	1	1	0	1	4	0	0	0	0	2	0	1
Tohoku_Japan	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	2	2
TOLAI	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Turkey_H	0	0	0	0	0	0	0	5	0	2	0	0	0	0	1	0	8
UK_Medieval_H	0	0	0	0	0	0	0	7	0	1	0	0	0	4	14	1	2
Vietnam_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ZALAVAR	0	0	0	0	0	1	0	0	0	3	0	2	0	6	1	1	7
ZULU	0	0	0	4	0	0	0	0	4	0	0	5	1	1	0	0	2

Table B.1. (continued) France_H to India_South_H. Cells with diagonal values representing correct classifications are colored gray.

	France_H	Gabon_H	Germany_H	Ghana_Ashanti_H	Greece_H	Greenland_H	GUAM	HAINAN	Hawaii_H	Hispanic_FDB	Hong_Kong	Hungary_H	India_Bengal_H	India_Northeast_H	India_Northwest_H	India_Pakistan_Punjab_H	India_South_H
AINU	0	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0
Alaska_Inupiat_H	0	0	1	0	0	21	0	0	0	0	0	0	0	0	0	0	0
Alaska_PtBarrow_H	0	0	0	0	2	16	0	0	0	0	0	0	0	0	0	0	0
Alaska_Yupik_H	0	0	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	1	0	0	3	0	0	0	1	0	1	0	0	0	0	0
Am_Black_FDB	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
Am_White_FDB	0	0	3	0	4	0	0	0	0	2	0	1	0	0	0	0	1
ANDAMAN	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
ANYANG	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	1	0
ARIKARA	0	0	0	0	0	0	0	1	0	0	0	1	2	0	0	1	0
ATAYAL	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	1	1
AUSTRALI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Australia_Aboriginal_H	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	2
Austria_H	0	0	8	0	7	0	0	0	1	0	0	12	0	0	0	0	0
Bachuc_Viet	0	0	0	0	1	0	1	1	2	0	1	0	0	0	0	0	0
Bangladesh_H	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1
BERG	0	0	4	0	1	0	0	0	0	0	0	3	0	0	0	1	0
Borneo_H	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0
Burma_NHM_H	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0
BURYAT	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
BUSHMAN	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Canada_Indigenous_H	0	0	0	0	0	1	0	0	2	0	0	2	0	0	0	0	0
China_North_H	0	0	0	0	1	0	0	2	0	0	5	0	0	0	0	1	0
China_South_H	0	0	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0
Czech_H	0	0	4	0	2	0	0	0	0	1	0	4	0	0	0	0	2
DOGON	0	1	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0
DW_Burma	0	0	0	0	1	0	1	2	0	2	0	0	1	0	0	0	10
East_Asian_FDB	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
EASTER_I	0	1	0	2	0	0	2	1	0	0	0	0	0	0	0	1	0
EasterIslands_H	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	2
EGYPT	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	1	2
Egypt_Gizeh_H	0	0	0	0	1	0	0	0	0	0	0	3	3	0	0	2	0
Egypt_Naqada_H	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	5
Egypt_Upper_H	0	0	1	0	6	2	0	1	1	1	2	5	1	0	0	2	3
France_H	0	0	8	0	0	0	0	0	0	1	0	1	1	0	0	0	0
Gabon_H	0	4	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Germany_H	0	0	33	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Ghana_Ashanti_H	0	1	0	13	0	0	0	0	0	0	0	0	2	0	0	0	0
Greece_H	0	0	1	0	23	1	0	0	0	3	0	1	3	0	0	3	2
Greenland_H	0	0	0	0	0	58	0	0	0	0	0	0	1	0	0	0	0

GUAM	0	2	0	0	1	1	9	3	4	0	0	0	0	0	0	0	0
HAINAN	0	1	0	0	2	0	2	9	0	0	1	1	0	1	0	0	3
Hawaii_H	0	0	0	0	2	1	2	0	11	1	0	0	0	0	0	0	0
Hispanic_FDB	0	0	0	0	4	0	0	0	0	7	0	0	0	0	0	1	1
Hong_Kong	0	0	0	1	0	1	1	0	1	0	3	0	0	0	0	0	0
Hungary_H	0	0	5	0	2	0	0	0	1	0	0	29	0	0	0	0	2
India_Bengal_H	0	0	0	0	1	0	0	0	1	0	0	2	20	1	0	2	10
India_Northeast_H	0	0	0	0	2	0	0	2	0	0	0	1	6	2	0	1	9
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	3
India_Pakistan_Punjab_H	0	0	0	0	0	1	0	0	0	0	0	1	7	0	0	19	4
India_South_H	0	0	0	0	2	0	0	0	0	0	0	2	11	0	0	2	31
INUGSUK	0	0	0	0	0	22	0	0	0	1	0	1	0	0	0	2	0
Italy_H	0	0	7	0	1	0	0	0	0	1	0	0	1	0	0	0	0
Japan_Ainu_H	0	1	0	0	2	2	0	0	2	0	0	1	0	0	0	1	0
Japan_Jomon_H	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Japan_MainIsland_H	0	0	0	0	7	0	2	1	1	1	1	0	0	1	0	0	1
Java_H	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Kanto_Japan	0	0	0	0	1	2	0	0	0	0	0	1	0	0	0	1	0
Kenya_H	0	0	0	4	0	0	0	0	0	0	0	2	0	0	0	1	1
Korea_South_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Kyushu_Japan	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	1	1
Laos_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maori_H	0	0	1	2	1	1	5	0	4	0	0	0	0	0	0	1	0
Marquesas_H	0	0	0	0	0	1	0	0	1	3	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	1
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	1	0	0	2	1	0	0	0	1	0	1	0	0	0	0	4
MOKAPU	0	0	0	0	0	0	2	0	6	0	0	0	0	0	0	0	1
Molucca_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mongolia_H	0	0	4	0	0	0	1	1	1	0	0	1	0	0	0	1	0
Mongolia_Metal_H	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0
MORIORI	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Moriori_H	0	0	0	0	1	0	0	0	2	0	1	0	0	0	0	0	0
N_JAPAN	0	0	0	0	3	2	0	1	0	3	1	0	0	0	0	0	0
N_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	3
Nigeria_H	0	2	0	2	0	0	0	0	0	0	0	0	1	0	0	0	1
NORSE	0	0	2	0	1	0	0	0	0	0	0	3	0	0	0	0	0
Nubia_Early_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Nubia_Kerma_H	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	4	3
Nubia_Recent_H	0	0	2	0	1	0	0	0	1	0	0	0	0	0	0	1	1
Okhotsk_H	0	0	0	1	0	1	0	0	3	0	0	0	0	0	0	0	0
Palestine_H	0	0	0	0	1	1	1	0	0	0	0	1	1	1	0	0	2
Patagonia_H	0	0	0	0	0	5	0	0	2	0	2	0	0	0	0	0	0
PERU	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Peru_H	0	0	0	0	2	2	1	0	0	2	0	3	0	2	0	0	1
Philippines_General_H	0	1	1	0	3	0	2	1	3	0	0	0	2	0	0	0	2
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

PHILLIPI	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
PNG_H	0	0	0	5	1	1	0	1	0	0	1	1	1	1	0	0	5
Russia_H	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
S_JAPAN	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	3
S_MAORI	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
SANTA_CR	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Singapore_H	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Somalia_H	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0
SouthAfrica_H	0	1	0	4	0	0	1	0	0	0	0	0	4	1	0	0	1
SriLanka_H	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	4
Sumatra_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Switzerland_H	0	0	11	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Taiwan	0	0	0	0	2	0	0	0	1	0	1	2	0	0	0	0	0
Tanzania_H	0	0	0	1	1	0	0	0	0	0	0	0	3	0	0	0	0
TASMANIA	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
TEITA	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	1
Thailand	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	1
Thailand_H	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Tibet_H	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	2	3
Tohoku_Japan	0	0	0	0	1	4	1	0	0	0	0	0	0	1	0	0	1
TOLAI	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey_H	0	0	3	0	1	0	0	0	0	0	0	0	1	0	0	0	2
UK_Medieval_H	0	0	8	0	6	2	0	0	1	0	0	6	0	0	0	1	0
Vietnam_H	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0
ZALAVAR	0	0	1	0	2	0	0	0	0	0	0	7	0	0	0	0	2
ZULU	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1

Table B.1. (continued) INUGSUK to Mel_TorresStrait_H. Cells with diagonal values representing correct classifications are colored gray.

	INUGSUK	Italy_H	Japan_Ainu_H	Japan_Jomon_H	Japan_MainIsland_H	Java_H	Kanto_Japan	Kenya_H	Korea_South_H	Kyushu_Japan	Laos_H	Malaysia_H	Maori_H	Marquesas_H	Mel_NewCaledonia_H	Mel_Solomon_H	Mel_TorresStrait_H
AINU	0	0	8	0	2	0	0	1	0	1	0	0	2	0	0	0	0
Alaska_Inupiat_H	5	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Alaska_PtBarrow_H	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Alaska_Yupik_H	1	1	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0
Aleut_H	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Am_Black_FDB	3	0	0	0	0	0	0	1	0	0	0	0	3	1	0	0	1
Am_White_FDB	2	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0
ANDAMAN	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ANYANG	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0
ARIKARA	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
ATAYAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUSTRALI	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Australia_Aboriginal_H	1	0	0	0	0	0	0	3	0	0	0	0	1	1	0	1	3
Austria_H	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bachuc_Viet	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Bangladesh_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
BERG	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Borneo_H	1	0	1	1	3	1	0	0	0	0	0	0	0	0	0	0	1
Burma_NHM_H	0	0	1	0	1	4	0	0	0	0	0	0	1	0	0	0	0
BURYAT	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
BUSHMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada_Indigenous_H	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
China_North_H	0	0	0	0	6	0	1	0	0	1	0	0	3	0	0	0	0
China_South_H	0	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0
Czech_H	0	2	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
DOGON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DW_Burma	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0
East_Asian_FDB	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
EASTER_I	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0
EasterIslands_H	0	0	2	0	0	1	0	1	0	0	0	0	1	0	0	0	1
EGYPT	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0
Egypt_Gizeh_H	1	0	2	0	2	0	1	0	0	1	0	0	3	0	0	0	0
Egypt_Naqada_H	0	0	2	0	0	0	0	0	0	1	0	0	2	0	1	0	0
Egypt_Upper_H	1	2	3	0	5	0	0	0	0	2	0	0	1	0	0	0	0
France_H	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gabon_H	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Germany_H	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ghana_Ashanti_H	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
Greece_H	1	2	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0

Greenland_H	18	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
GUAM	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	0
HAINAN	0	0	0	0	4	0	0	0	0	1	0	0	1	0	0	0	0
Hawaii_H	2	0	4	0	0	0	0	0	0	0	0	0	3	1	0	0	0
Hispanic_FDB	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	1	0
Hong_Kong	0	0	1	0	4	0	0	0	0	0	0	0	1	0	0	0	0
Hungary_H	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
India_Bengal_H	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
India_Northeast_H	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
India_Pakistan_Punjab_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_South_H	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
INUGSUK	23	0	1	0	1	0	0	1	0	4	0	0	2	1	0	0	0
Italy_H	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	1	0	29	0	2	0	1	0	0	0	0	0	3	3	0	0	0
Japan_Jomon_H	0	0	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_MainIsland_H	1	1	4	0	25	1	1	0	0	1	0	0	2	1	0	0	0
Java_H	0	0	0	0	2	7	1	0	0	0	0	0	0	0	0	0	0
Kanto_Japan	3	1	2	0	5	0	4	0	0	1	0	0	0	0	0	1	0
Kenya_H	0	0	1	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Korea_South_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Kyushu_Japan	3	0	1	0	4	0	1	0	0	7	0	0	0	0	0	0	1
Laos_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia_H	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Maori_H	3	0	2	0	2	0	1	0	0	0	0	0	18	4	1	0	0
Marquesas_H	0	0	4	0	1	0	0	0	0	0	0	0	9	14	1	0	1
Mel_NewCaledonia_H	0	0	1	0	0	0	0	1	0	0	0	0	0	0	6	1	0
Mel_Solomon_H	2	0	1	0	0	1	0	0	0	0	0	0	0	2	2	3	1
Mel_TorresStrait_H	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	12
Mexico_H	0	0	1	0	0	0	1	0	0	0	0	0	2	1	0	0	0
MOKAPU	1	0	2	0	1	1	0	0	0	0	0	0	2	2	0	0	0
Molucca_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Mongolia_H	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mongolia_Metal_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
MORIORI	0	1	2	0	3	0	0	0	0	0	0	0	7	3	0	0	0
Moriori_H	2	0	0	0	0	0	0	0	0	0	0	0	6	5	0	0	0
N_JAPAN	0	1	0	2	10	0	1	0	0	0	0	0	0	0	0	0	0
N_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Nepal_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Nigeria_H	0	0	2	0	0	0	0	0	0	0	0	0	3	0	1	0	0
NORSE	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Nubia_Early_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nubia_Kerma_H	0	0	3	1	0	0	0	1	0	0	0	0	0	1	0	0	0
Nubia_Recent_H	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Okhotsk_H	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
Palestine_H	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Patagonia_H	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0
PERU	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Peru_H	0	0	1	0	4	0	1	0	0	0	0	0	2	3	0	0	0
Philippines_General_H	0	0	1	1	3	6	0	0	0	0	0	0	1	0	0	0	0

Philippines_Luzon_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
PHILLIPI	0	0	0	0	1	2	0	0	0	0	0	0	0	2	0	0	0
PNG_H	4	0	2	0	3	0	0	0	0	0	0	0	3	0	5	1	4
Russia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S_JAPAN	0	0	2	0	8	0	0	0	0	1	0	0	3	0	0	1	0
S_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
SANTA_CR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Singapore_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Somalia_H	1	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0
SouthAfrica_H	1	0	6	0	1	0	0	2	0	0	0	0	2	1	0	0	1
SriLanka_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Switzerland_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taiwan	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Tanzania_H	0	0	1	0	0	0	0	4	0	0	0	0	1	1	1	0	1
TASMANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
TEITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thailand	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Thailand_H	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0
Tibet_H	0	1	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0
Tohoku_Japan	2	0	1	1	2	0	3	0	0	5	0	0	0	0	0	0	0
TOLAI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Turkey_H	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
UK_Medieval_H	0	2	1	0	1	0	1	0	0	0	0	0	2	0	0	0	0
Vietnam_H	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
ZALAVAR	0	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ZULU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.1. (continued) Mexico_H to Palestine_H. Cells with diagonal values representing correct classifications are colored gray.

	Mexico_H	MOKAPU	Molucca_H	Mongolia_H	Mongolia_Metal_H	MORIORI	Moriori_H	N_JAPAN	N_MAORI	Nepal_H	Nigeria_H	NORSE	Nubia_Early_H	Nubia_Kerma_H	Nubia_Recent_H	Okhotsk_H	Palestine_H
AINU	0	1	0	0	0	0	0	2	0	0	3	1	0	0	1	0	0
Alaska_Inupiat_H	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0
Alaska_PtBarrow_H	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Alaska_Yupik_H	0	0	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	0	7	1	1	0	0	0	0	1	0	0	0	0	1	0
Am_Black_FDB	0	2	0	0	0	2	0	1	0	1	0	1	0	0	0	0	0
Am_White_FDB	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	1
ANDAMAN	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
ANYANG	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
ARIKARA	1	0	0	3	0	2	1	1	0	0	0	2	0	1	0	0	0
ATAYAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUSTRALI	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Australia_Aboriginal_H	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0
Austria_H	0	0	0	7	0	1	0	0	0	0	0	0	0	0	2	0	0
Bachuc_Viet	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Bangladesh_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
BERG	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0
Borneo_H	1	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0
Burma_NHM_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
BURYAT	0	0	0	26	2	0	0	1	0	0	0	0	0	0	0	1	0
BUSHMAN	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Canada_Indigenous_H	1	0	0	3	0	2	0	0	0	0	1	0	0	0	0	3	0
China_North_H	0	0	0	2	0	2	1	2	0	0	1	0	0	0	0	0	0
China_South_H	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	1	0
Czech_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DOGON	0	0	0	0	0	1	0	1	0	0	5	0	0	0	1	0	0
DW_Burma	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
East_Asian_FDB	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
EASTER_I	0	3	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
EasterIslands_H	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
EGYPT	0	0	0	0	0	3	0	0	0	0	0	2	0	2	0	0	0
Egypt_Gizeh_H	0	0	0	1	0	1	0	0	0	0	0	5	0	0	2	0	0
Egypt_Naqada_H	0	1	0	1	0	1	0	0	0	0	1	1	0	5	1	0	0
Egypt_Upper_H	0	0	0	2	0	1	0	1	0	0	0	1	0	3	2	0	0
France_H	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
Gabon_H	0	3	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0
Germany_H	0	0	0	4	3	0	0	0	0	0	0	1	0	0	0	0	0
Ghana_Ashanti_H	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0
Greece_H	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Greenland_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

GUAM	0	5	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
HAINAN	1	1	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0
Hawaii_H	0	15	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Hispanic_FDB	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0
Hong_Kong	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Hungary_H	0	1	0	4	0	0	0	0	0	0	0	0	1	1	0	0	0
India_Bengal_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
India_Northeast_H	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
India_Pakistan_Punjab_H	0	0	0	1	0	2	0	0	0	0	0	2	0	0	0	0	0
India_South_H	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0
INUGSUK	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
Italy_H	0	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0
Japan_Ainu_H	0	7	0	3	0	1	0	0	0	0	0	0	0	0	1	1	0
Japan_Jomon_H	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_MainIsland_H	1	2	0	1	0	2	1	4	1	0	0	2	0	0	0	0	0
Java_H	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Kanto_Japan	0	0	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
Kenya_H	0	0	0	0	0	0	0	0	0	0	1	1	1	3	0	0	0
Korea_South_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Kyushu_Japan	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laos_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia_H	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Maori_H	0	4	0	0	0	12	3	0	0	0	1	1	0	0	0	1	0
Marquesas_H	1	6	0	1	0	5	4	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Mexico_H	9	1	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0
MOKAPU	0	53	0	0	0	4	2	0	0	0	0	0	0	0	0	1	0
Molucca_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mongolia_H	0	0	0	77	3	0	0	0	0	0	0	1	0	0	0	1	0
Mongolia_Metal_H	0	2	0	17	5	0	0	0	0	0	0	0	0	0	0	0	0
MORIORI	0	5	0	1	1	46	11	1	0	0	0	1	0	0	0	0	0
Moriori_H	0	0	0	1	0	17	20	0	0	0	0	0	0	0	0	1	0
N_JAPAN	4	4	0	0	0	0	0	6	0	0	0	1	0	0	1	0	0
N_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Nigeria_H	1	1	0	0	0	0	0	0	0	0	10	1	0	1	0	0	0
NORSE	0	0	0	0	0	1	0	0	0	0	0	25	0	1	0	0	0
Nubia_Early_H	0	0	0	0	0	0	0	0	0	0	1	0	2	3	0	0	0
Nubia_Kerma_H	0	0	0	0	0	1	0	0	0	0	0	2	0	7	0	0	0
Nubia_Recent_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7	0	0
Okhotsk_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0
Palestine_H	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Patagonia_H	1	1	0	4	1	1	1	0	0	0	0	0	0	0	0	3	0
PERU	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Peru_H	4	0	0	2	0	1	1	0	0	0	0	1	0	0	0	0	0
Philippines_General_H	2	1	0	3	0	0	0	1	0	0	0	0	0	2	0	1	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PHILLIPI	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
PNG_H	0	1	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0
Russia_H	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S_JAPAN	1	3	0	2	0	1	0	2	0	0	3	0	0	0	0	1	0
S_MAORI	0	1	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0
SANTA_CR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Singapore_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Somalia_H	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0
SouthAfrica_H	0	2	0	0	0	0	0	1	1	0	4	1	0	1	0	1	0
SriLanka_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0
Switzerland_H	0	0	0	6	1	1	0	0	0	0	0	0	0	0	0	0	0
Taiwan	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Tanzania_H	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
TASMANIA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
TEITA	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0
Thailand	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Thailand_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Tibet_H	0	0	0	4	0	0	1	1	0	1	2	0	0	0	2	0	0
Tohoku_Japan	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOLAI	0	0	0	0	0	1	0	0	0	0	3	0	0	1	0	0	0
Turkey_H	0	1	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0
UK_Medieval_H	0	1	0	3	1	0	0	0	0	0	0	6	0	1	1	0	0
Vietnam_H	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ZALAVAR	0	0	0	2	0	1	0	1	0	0	0	5	0	0	0	0	1
ZULU	0	1	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0

Table B.1. (continued) Patagonia_H to Switzerland_H. Cells with diagonal values representing correct classifications are colored gray.

	Patagonia_H	PERU	Peru_H	Philippines_General_H	Philippines_Luzon_H	PHILLIPI	PNG_H	Russia_H	S_JAPAN	S_MAORI	SANTA_CR	Singapore_H	Somalia_H	SouthAfrica_H	SriLanka_H	Sumatra_H	Switzerland_H
AINU	0	0	6	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Alaska_Inupiat_H	1	0	8	0	0	0	3	0	0	0	2	0	0	0	0	0	0
Alaska_PtBarrow_H	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alaska_Yupik_H	2	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	18	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Am_Black_FDB	0	2	0	0	0	0	8	0	0	0	4	0	0	1	0	0	0
Am_White_FDB	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
ANDAMAN	0	0	4	1	0	0	1	0	1	0	0	0	0	0	0	0	0
ANYANG	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0
ARIKARA	0	2	10	2	1	0	2	0	0	0	1	0	0	0	0	0	0
ATAYAL	0	0	6	2	0	1	6	0	0	0	2	0	0	1	0	0	0
AUSTRALI	0	0	0	0	0	0	4	0	0	0	1	0	0	3	0	0	0
Australia_Aboriginal_H	0	0	0	0	0	0	27	0	0	0	3	0	0	2	0	0	0
Austria_H	0	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Bachuc_Viet	1	0	2	5	0	0	3	0	0	0	0	1	0	0	0	0	0
Bangladesh_H	0	1	1	2	0	0	1	0	1	1	0	0	0	0	0	0	0
BERG	0	5	6	0	0	1	0	0	0	0	1	0	0	0	0	0	3
Borneo_H	1	0	6	4	0	0	12	0	0	0	0	1	0	2	0	0	0
Burma_NHM_H	0	0	2	4	0	0	1	0	0	0	0	1	0	0	0	0	0
BURYAT	0	0	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0
BUSHMAN	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Canada_Indigenous_H	1	0	8	0	0	0	1	0	1	0	4	0	0	0	0	0	0
China_North_H	0	1	10	2	0	0	3	0	0	0	0	1	0	0	0	0	0
China_South_H	1	0	5	1	0	0	3	0	2	0	0	0	0	0	0	0	0
Czech_H	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4
DOGON	0	2	1	2	0	0	6	0	0	0	0	0	0	0	0	0	0
DW_Burma	0	2	4	0	1	3	4	0	0	0	1	0	0	0	0	0	0
East_Asian_FDB	0	0	1	0	0	0	2	0	0	0	0	2	0	0	0	0	0
EASTER_I	0	0	0	0	0	0	4	0	0	0	0	0	0	1	0	0	0
EasterIslands_H	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
EGYPT	0	0	5	1	0	0	3	0	0	0	0	0	0	0	0	0	0
Egypt_Gizeh_H	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Naqada_H	0	0	2	0	0	0	5	0	0	0	0	0	0	2	0	0	0
Egypt_Upper_H	0	2	11	3	0	0	9	0	1	0	1	0	1	0	0	0	0
France_H	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gabon_H	0	0	2	2	0	0	14	0	1	0	0	0	0	2	0	0	0
Germany_H	0	1	8	1	0	0	1	0	0	0	2	0	0	0	0	0	7
Ghana_Ashanti_H	0	0	1	1	0	0	20	0	0	0	0	0	0	1	0	0	0
Greece_H	0	0	3	5	0	0	5	0	0	0	1	1	0	0	0	0	1

Greenland_H	0	0	1	0	0	0	7	0	1	0	0	0	0	0	0	0	0
GUAM	1	0	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0
HAINAN	0	1	2	7	1	1	5	0	1	0	0	0	0	0	0	0	0
Hawaii_H	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Hispanic_FDB	0	0	6	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Hong_Kong	0	0	3	0	0	0	4	0	0	0	0	1	0	2	0	0	0
Hungary_H	1	0	6	2	0	0	2	0	0	0	0	0	1	1	0	0	1
India_Bengal_H	0	0	2	1	0	0	6	0	1	0	0	0	0	0	0	0	0
India_Northeast_H	0	2	6	1	0	0	5	0	0	0	0	0	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0
India_Pakistan_Punjab_H	0	0	1	0	0	0	3	0	0	0	0	0	0	1	0	0	0
India_South_H	1	3	5	1	1	0	13	0	0	0	0	0	0	2	0	0	0
INUGSUK	0	0	3	0	0	0	7	0	0	0	2	0	1	0	0	0	0
Italy_H	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	1	1	14	0	0	1	2	0	0	0	0	0	0	0	0	0	0
Japan_Jomon_H	0	0	2	1	0	0	1	0	0	0	0	0	0	2	0	0	0
Japan_MainIsland_H	0	2	17	2	0	0	3	0	2	0	2	1	0	1	0	0	0
Java_H	0	1	3	8	0	2	3	0	0	0	0	1	0	1	0	0	0
Kanto_Japan	0	0	3	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Kenya_H	0	0	1	1	0	0	9	0	0	0	1	0	0	8	0	0	0
Korea_South_H	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
Kyushu_Japan	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Laos_H	0	0	2	3	0	0	0	0	0	0	0	1	0	0	0	0	0
Malaysia_H	0	0	2	1	0	1	4	0	0	0	1	0	0	0	0	0	0
Maori_H	0	0	5	1	0	0	6	0	0	1	0	0	0	1	0	0	0
Marquesas_H	0	0	5	2	0	0	2	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	1	1	0	0	18	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	3	0	0	0	29	0	0	0	0	0	0	0	0	0	0
Mel_TorresStrait_H	0	0	6	0	0	0	12	0	0	0	0	0	0	1	0	0	0
Mexico_H	0	1	22	4	0	0	11	0	1	0	1	0	0	0	0	0	1
MOKAPU	0	0	2	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Molucca_H	0	0	5	0	0	0	2	0	0	0	0	1	0	0	0	0	0
Mongolia_H	0	0	5	5	0	1	0	0	0	0	1	1	0	0	0	0	2
Mongolia_Metal_H	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
MORIORI	0	1	2	0	0	0	2	0	1	0	2	0	0	0	0	0	0
Moriori_H	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N_JAPAN	0	7	5	1	0	0	1	0	2	0	1	0	0	0	0	0	0
N_MAORI	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Nigeria_H	0	0	3	3	0	0	9	0	1	0	1	0	0	3	0	0	0
NORSE	0	3	2	0	0	0	2	0	0	0	0	0	0	1	0	0	0
Nubia_Early_H	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0
Nubia_Kerma_H	0	0	1	1	0	0	4	0	0	0	0	0	0	5	0	0	0
Nubia_Recent_H	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Okhotsk_H	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palestine_H	0	1	2	0	0	0	3	0	0	0	0	0	2	1	0	0	0
Patagonia_H	1	0	7	0	0	0	0	0	0	1	1	0	0	2	0	0	0
PERU	0	33	27	0	1	0	2	0	1	0	11	0	0	0	0	0	0
Peru_H	1	12	200	1	0	1	13	0	0	0	11	3	1	0	0	0	0

Philippines_General_H	0	1	9	22	1	5	5	1	1	0	0	9	0	1	0	0	0
Philippines_Luzon_H	0	0	0	5	6	0	2	0	0	0	0	2	0	0	1	0	0
PHILLIPI	0	0	1	5	0	3	4	0	0	0	0	1	0	0	0	0	0
PNG_H	0	0	17	3	0	1	189	0	1	0	0	0	0	0	0	0	0
Russia_H	0	0	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0
S_JAPAN	0	3	9	2	0	0	10	0	4	0	0	1	0	1	0	0	0
S_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SANTA_CR	0	3	26	0	0	0	1	0	0	0	47	0	0	0	0	0	0
Singapore_H	0	0	6	5	1	0	4	0	0	0	0	14	0	0	0	0	0
Somalia_H	0	0	2	0	0	0	1	0	1	0	0	0	1	1	0	0	0
SouthAfrica_H	0	1	1	0	0	0	5	0	1	0	0	0	0	10	0	0	0
SriLanka_H	0	0	1	0	0	0	1	0	0	0	0	0	0	1	2	0	0
Sumatra_H	0	1	2	3	0	0	4	0	0	0	0	0	1	0	0	0	0
Switzerland_H	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	8
Taiwan	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Tanzania_H	0	0	0	0	0	0	5	0	0	0	1	1	1	8	0	0	0
TASMANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TEITA	0	0	0	0	0	0	5	0	0	0	0	0	0	1	1	0	0
Thailand	0	0	8	2	0	0	0	0	0	0	0	7	0	0	0	0	0
Thailand_H	0	0	5	4	0	1	3	0	1	0	0	2	0	0	0	0	0
Tibet_H	0	0	3	1	0	0	5	0	0	0	1	0	0	0	0	0	0
Tohoku_Japan	1	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0
TOLAI	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0
Turkey_H	0	1	4	1	0	0	1	0	0	0	0	1	0	0	0	0	1
UK_Medieval_H	0	0	8	2	0	0	2	0	1	0	1	0	0	0	0	0	0
Vietnam_H	0	0	1	4	1	0	0	0	0	0	0	1	0	0	0	0	0
ZALAVAR	0	2	2	2	0	0	2	1	0	0	0	0	0	0	0	0	0
ZULU	0	0	0	0	0	0	6	0	0	0	0	0	0	6	0	0	0

Table B.1. (continued) Taiwan to ZULU. Cells with diagonal values representing correct classifications are colored gray.

	Taiwan	Tanzania_H	TASMANIA	TEITA	Thailand	Thailand_H	Tibet_H	Tohoku_Japan	TOLAI	Turkey_H	UK_Medieval_H	Vietnam_H	ZALAVAR	ZULU
AINU	0	1	0	0	0	0	0	0	0	0	3	0	0	1
Alaska_Inupiat_H	0	1	0	0	0	0	0	1	0	0	1	0	0	0
Alaska_PtBarrow_H	0	0	0	0	0	0	0	2	0	0	3	0	0	0
Alaska_Yupik_H	0	0	0	0	1	0	0	0	0	0	4	0	0	0
Aleut_H	0	1	0	0	0	0	0	0	0	0	2	0	0	0
Am_Black_FDB	0	1	1	0	0	0	0	0	2	0	2	0	2	3
Am_White_FDB	0	0	0	0	0	0	0	0	0	0	9	0	1	0
ANDAMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ANYANG	0	0	0	0	0	0	1	0	0	0	0	0	0	0
ARIKARA	0	0	0	1	0	0	0	0	0	0	0	0	0	0
ATAYAL	0	0	1	0	0	0	0	0	1	0	0	0	1	0
AUSTRALI	0	4	2	5	0	0	0	0	2	0	0	0	0	1
Australia_Aboriginal_H	0	1	9	1	0	0	0	0	7	0	0	0	0	5
Austria_H	0	0	0	0	1	0	0	0	0	0	13	0	0	0
Bachuc_Viet	2	0	0	0	2	0	0	0	0	0	0	0	0	0
Bangladesh_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BERG	0	0	0	0	0	0	0	0	0	0	13	0	2	0
Borneo_H	1	0	0	1	2	0	0	0	0	0	0	0	0	0
Burma_NHM_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0
BURYAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUSHMAN	0	2	3	4	0	0	0	0	0	0	2	0	0	2
Canada_Indigenous_H	0	0	0	0	0	0	0	0	0	1	4	0	1	0
China_North_H	3	0	0	0	4	0	0	0	0	0	1	0	0	0
China_South_H	2	1	0	0	1	0	0	0	0	0	3	0	0	0
Czech_H	0	0	0	0	6	0	0	0	0	0	7	0	0	0
DOGON	0	2	0	3	0	0	0	0	1	0	0	0	0	3
DW_Burma	0	0	1	2	1	0	2	0	0	0	0	0	0	0
East_Asian_FDB	0	0	0	0	1	0	0	0	0	0	0	0	0	0
EASTER_I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EasterIslands_H	0	0	0	1	0	0	0	0	1	0	0	0	0	0
EGYPT	0	0	0	2	0	0	0	1	0	0	19	0	3	0
Egypt_Gizeh_H	1	0	0	0	0	0	0	0	0	0	31	0	0	0
Egypt_Naqada_H	0	0	1	1	0	0	0	2	0	0	5	0	2	0
Egypt_Upper_H	1	1	1	0	0	0	1	0	0	1	12	0	1	0
France_H	0	0	0	0	0	0	0	0	0	0	15	0	1	0
Gabon_H	0	3	0	1	0	0	0	0	1	0	0	0	0	2
Germany_H	0	0	0	0	0	0	0	0	0	0	37	0	2	0
Ghana_Ashanti_H	0	4	1	4	0	0	0	0	4	0	0	0	0	3
Greece_H	2	0	0	0	0	0	2	0	0	0	8	0	2	0
Greenland_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0

GUAM	1	0	0	0	1	0	0	0	0	0	0	0	0	0
HAINAN	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hawaii_H	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Hispanic_FDB	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Hong_Kong	4	0	0	0	0	0	0	0	1	0	1	0	0	0
Hungary_H	0	0	2	0	1	0	0	0	0	0	21	0	3	0
India_Bengal_H	0	0	2	3	1	0	0	1	0	0	0	0	0	1
India_Northeast_H	0	0	0	0	1	0	2	1	0	0	1	0	1	0
India_Northwest_H	0	0	0	2	0	0	0	1	0	0	0	0	1	0
India_Pakistan_Punjab_H	1	0	0	2	0	0	0	0	1	0	1	0	0	0
India_South_H	1	1	0	0	0	0	1	0	0	0	1	0	0	1
INUGSUK	1	0	0	0	0	0	0	2	0	0	2	0	0	0
Italy_H	0	0	0	0	2	0	0	1	0	1	18	0	1	0
Japan_Ainu_H	0	1	0	0	0	0	0	2	0	0	3	0	1	0
Japan_Jomon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_MainIsland_H	2	0	2	0	0	0	0	0	0	1	6	1	0	0
Java_H	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Kanto_Japan	2	0	0	0	1	0	0	2	0	0	2	0	0	0
Kenya_H	0	4	0	9	0	0	0	0	1	0	0	0	0	3
Korea_South_H	1	0	0	0	2	0	0	0	0	0	0	0	1	0
Kyushu_Japan	4	0	0	0	0	0	0	3	0	1	0	0	0	0
Laos_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Malaysia_H	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Maori_H	2	1	0	0	0	0	0	0	0	1	4	0	1	0
Marquesas_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Mel_Solomon_H	1	0	1	0	0	0	0	0	5	0	1	0	1	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0
MOKAPU	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Molucca_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mongolia_H	0	0	0	0	2	0	0	0	0	0	4	0	0	0
Mongolia_Metal_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MORIORI	0	0	0	0	0	0	0	0	0	0	2	0	1	2
Moriori_H	1	0	0	0	0	0	0	0	0	0	1	0	0	1
N_JAPAN	0	1	0	0	0	0	1	0	0	0	0	0	2	0
N_MAORI	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Nigeria_H	0	1	0	4	0	0	1	0	3	0	1	0	0	9
NORSE	0	0	1	1	0	0	0	1	0	0	33	0	3	0
Nubia_Early_H	0	0	1	1	0	0	0	0	2	0	1	0	1	1
Nubia_Kerma_H	0	0	2	2	0	0	0	0	0	0	2	0	0	3
Nubia_Recent_H	1	0	0	2	0	0	0	1	0	0	8	0	0	0
Okhotsk_H	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Palestine_H	0	0	1	0	0	0	0	0	0	0	10	0	2	0
Patagonia_H	2	0	0	0	0	0	0	0	0	0	0	0	0	0
PERU	0	0	0	1	0	0	0	0	0	0	2	0	3	1
Peru_H	1	1	1	2	3	0	0	1	0	0	10	0	0	0
Philippines_General_H	0	0	0	1	2	0	1	1	1	0	1	0	0	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	2	0	0	0

PHILLIPI	0	0	1	2	1	0	0	0	0	0	0	0	0	1
PNG_H	0	0	2	2	0	0	0	0	21	1	1	0	0	0
Russia_H	1	0	0	0	1	0	0	0	0	0	13	0	0	0
S_JAPAN	1	0	0	0	1	0	1	0	0	0	1	0	0	1
S_MAORI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SANTA_CR	0	2	0	0	0	0	0	0	0	0	1	0	0	0
Singapore_H	1	0	1	0	4	0	0	0	0	0	0	0	0	0
Somalia_H	1	0	1	0	0	0	0	0	0	0	6	0	1	0
SouthAfrica_H	0	5	4	5	0	0	0	0	0	0	6	0	0	1
SriLanka_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Switzerland_H	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Taiwan	15	0	0	0	1	0	0	1	0	0	1	1	0	0
Tanzania_H	0	20	4	4	0	0	0	0	5	1	0	0	1	4
TASMANIA	0	0	56	0	0	0	0	0	10	0	0	0	0	2
TEITA	0	2	0	35	0	0	1	0	2	0	0	0	0	2
Thailand	3	0	0	0	9	0	0	0	0	0	0	0	0	0
Thailand_H	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Tibet_H	1	0	0	1	0	0	3	0	0	0	0	0	0	0
Tohoku_Japan	1	0	0	0	0	0	0	4	0	0	4	0	0	0
TOLAI	0	1	2	2	0	0	0	0	39	0	0	0	0	2
Turkey_H	0	0	0	0	0	0	0	0	0	3	6	0	0	0
UK_Medieval_H	1	0	1	0	1	0	0	1	0	1	172	0	2	0
Vietnam_H	0	0	1	1	0	0	0	1	0	0	0	1	0	0
ZALAVAR	0	0	2	0	0	0	0	0	0	0	14	0	11	0
ZULU	0	3	6	3	0	0	0	0	4	0	0	0	0	22

Table B.2. Confusion matrix for odontometric LDA results. Afghanistan_H to Chile_H. Cells with diagonal values representing correct classifications are colored gray.

	Afghanistan_H	Alaska_Inuit_H	Aleut_H	Andaman_Isl_H	Australia_Aboriginal_H	Austria_H	Bismarck_H	Borneo_H	Burma_NHM_H	Buryat_H	Cameroon_H	Canada_Indigenous_H	Canada_Inuit_H	Celebes_H	Chile_H
Afghanistan_H	0	2	0	0	1	0	0	0	0	0	0	1	0	0	0
Alaska_Inuit_H	0	32	0	0	12	0	0	0	0	0	0	3	0	0	0
Aleut_H	0	11	5	0	1	0	0	0	0	0	0	1	0	0	0
Andaman_Isl_H	0	1	0	2	7	0	0	0	0	0	0	0	0	0	0
Australia_Aboriginal_H	0	3	0	0	176	0	0	0	0	0	1	0	0	0	0
Austria_H	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Bismarck_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Borneo_H	0	2	0	0	4	0	0	2	0	0	0	0	0	0	0
Burma_NHM_H	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0
Buryat_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cameroon_H	0	0	0	0	6	0	0	0	0	0	1	1	0	0	0
Canada_Indigenous_H	0	25	2	0	8	0	0	0	0	0	0	3	0	0	0
Canada_Inuit_H	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
Celebes_H	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0
Chile_H	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0
China_North_H	0	2	0	0	3	0	0	1	0	0	0	0	0	0	0
China_South_H	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Congo_H	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cyprus_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DW_Burma	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Easter_Isl_H	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Egypt_Badari_H	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Egypt_Gizeh_H	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Egypt_Naqada_H	0	2	0	0	8	0	0	0	0	0	0	0	0	0	0
Egypt_Upper_H	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0
Finland_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
France_H	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Gabon_H	0	1	0	0	5	0	0	0	0	0	0	0	0	0	0
Germany_H	0	3	1	0	2	0	0	0	0	0	0	0	0	0	0

Ghana_Ashanti_H	0	3	0	0	3	0	0	0	0	0	1	0	0	0	0
Greece_H	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Greenland_H	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0
Hawaii_H	0	6	0	0	10	0	0	0	0	0	0	1	0	0	0
Hungary_H	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Bengal_H	0	3	0	0	3	0	0	0	0	0	1	1	0	0	0
India_Northeast_H	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
India_Pakistan_Punjab_H	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
India_South_H	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0
Iran_H	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Iraq_H	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
Italy_H	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Chiba_H	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Japan_Jomon_H	0	2	1	3	1	0	0	0	0	0	0	0	0	0	0
Japan_Mainland_H	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
Japan_Okinawa_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_P	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Java_H	0	2	0	0	4	0	0	0	0	0	2	0	0	0	0
Kenya_H	0	4	0	0	10	0	0	0	0	0	0	0	0	0	0
Kirsten_Black_P	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Kirsten_Coloured_P	0	0	0	0	6	0	0	0	0	0	0	1	0	0	0
Korea_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laos_H	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0
Lapp_H	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Malay_H	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0
Marquesas_H	0	2	0	0	10	0	0	0	0	0	0	0	0	0	0
Mel_Fiji_H	0	0	0	0	5	0	0	0	0	0	0	1	0	0	0
Mel_NewCaledonia_H	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Mel_NewHebrides_H	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
Mel_NewIreland_H	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	0	0	4	0	0	0	0	0	1	1	0	0	0
Mel_TorresStrait_H	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	3	2	0	8	0	0	0	0	0	0	0	0	0	0
Mic_CarolineIslands_H	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Mic_Mariana_H	0	3	2	4	2	0	0	0	0	0	0	0	0	0	0
Mongol_H	0	6	0	1	2	0	0	0	0	0	0	0	0	0	0

Moriori_H	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
NicobarIslands_H	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Nigeria_H	0	1	0	0	6	0	0	0	0	0	3	0	0	0	0
Norway_H	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Nubia_H	0	2	0	0	11	0	0	0	0	0	0	3	0	0	0
NZ_Maori_H	0	1	0	0	4	0	0	0	0	0	0	0	0	0	0
Okhotsk_H	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Palestine_H	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0
Patagonia_H	0	3	0	0	1	0	0	0	0	0	1	2	0	0	0
Peru_H	0	12	0	0	6	0	0	1	0	0	1	1	0	0	0
Philippines_General_H	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PNG_H	0	9	0	3	35	0	0	0	0	0	3	2	0	0	0
Pol_CookIslands_H	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0
Pol_Society_H	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
Pol_Tonga_H	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0
Pretoria_Black_P	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
Russia_H	0	1	0	0	2	0	0	0	0	0	0	1	0	0	0
Somalia_H	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0
SouthAfrica_H	0	6	0	0	9	0	0	0	0	0	0	0	0	0	0
SriLanka_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden_H	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Syria_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Tanzania_H	0	4	0	0	19	0	0	0	0	0	0	1	0	0	0
Thailand_H	0	1	0	0	5	0	0	0	0	0	0	0	0	0	0
Tibet_H	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TXST_White_P	0	3	1	0	2	0	0	0	0	0	0	0	0	0	0
UK_Medieval_H	0	5	0	0	9	0	0	0	0	0	0	0	0	0	0
UTK_Black_P	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0
UTK_Hispanic_P	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
UTK_White_P	0	2	1	0	8	0	0	0	0	0	0	4	0	0	0
Vietnam_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
WestAfrica_H	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0

Table B.2. (continued). China_North_H to Germany_H. Cells with diagonal values representing correct classifications are colored gray.

	China_North_H	China_South_H	Congo_H	Cyprus_H	Czech_H	DW_Burma	Easter_Isl_H	Egypt_Badari_H	Egypt_Gizeh_H	Egypt_Naqada_H	Egypt_Upper_H	Finland_H	France_H	Gabon_H	Germany_H
Afghanistan_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alaska_Inuit_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Andaman_Isl_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Australia_Aboriginal_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Austria_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Bismarck_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Borneo_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Burma_NHM_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Buryat_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cameroon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada_Indigenous_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Canada_Inuit_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Celebes_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chile_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China_North_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
China_South_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Congo_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Czech_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DW_Burma	0	0	1	0	0	24	0	0	0	0	0	0	0	0	0
Easter_Isl_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Badari_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Gizeh_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Egypt_Naqada_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Upper_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Finland_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
France_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Gabon_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Germany_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Ghana_Ashanti_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Greece_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greenland_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hawaii_H	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Hungary_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Bengal_H	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
India_Northeast_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Pakistan_Punjab_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
India_South_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Iran_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Iraq_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Japan_Chiba_H	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Japan_Jomon_H	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Japan_Mainland_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Japan_Okinawa_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_P	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Java_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Kenya_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Kirsten_Black_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kirsten_Coloured_P	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Korea_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Laos_H	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Lapp_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Malay_H	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Marquesas_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Fiji_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewHebrides_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewIreland_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Mic_CarolineIslands_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Mic_Mariana_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Mongol_H	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0

Moriori_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Netherlands_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NicobarIslands_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Nigeria_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Norway_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nubia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NZ_Maori_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Okhotsk_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palestine_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Patagonia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peru_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philippines_General_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PNG_H	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Pol_CookIslands_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pol_Society_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pol_Tonga_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pretoria_Black_P	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Russia_H	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Somalia_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
SouthAfrica_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SriLanka_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Sweden_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syria_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanzania_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Thailand_H	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Tibet_H	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Turkey_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TXST_White_P	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
UK_Medieval_H	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
UTK_Black_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UTK_Hispanic_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UTK_White_P	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Vietnam_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WestAfrica_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B.2. (continued). Ghana_Ashanti_H to Japan_Chiba_H. Cells with diagonal values representing correct classifications are colored gray.

	Ghana_Ashanti_H	Greece_H	Greenland_H	Hawaii_H	Hungary_H	India_Bengal_H	India_Northeast_H	India_Northwest_H	India_Pakistan_Punjab_H	India_South_H	Iran_H	Iraq_H	Italy_H	Japan_Ainu_H	Japan_Chiba_H
Afghanistan_H	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0
Alaska_Inuit_H	0	0	0	12	0	0	0	0	0	0	0	0	0	3	0
Aleut_H	0	0	0	7	0	0	0	0	0	0	0	0	0	2	0
Andaman_Isl_H	0	0	0	19	0	0	0	0	0	0	1	0	0	1	2
Australia_Aboriginal_H	0	0	0	19	0	0	0	0	0	0	0	0	0	0	1
Austria_H	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0
Bismarck_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Borneo_H	0	0	0	17	0	0	0	0	0	0	0	0	0	2	0
Burma_NHM_H	0	0	0	13	0	0	0	0	0	0	0	0	0	0	1
Buryat_H	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Cameroon_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Canada_Indigenous_H	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0
Canada_Inuit_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Celebes_H	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1
Chile_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
China_North_H	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0
China_South_H	0	0	0	20	0	0	0	0	0	0	0	0	0	0	1
Congo_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Cyprus_H	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Czech_H	0	0	0	5	0	0	0	0	0	0	1	0	0	0	1
DW_Burma	0	0	0	23	0	0	0	0	0	0	0	0	0	1	1
Easter_Isl_H	0	0	0	8	0	0	0	0	0	0	0	0	0	1	1
Egypt_Badari_H	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0
Egypt_Gizeh_H	0	0	0	6	0	0	0	0	0	0	0	0	0	1	0
Egypt_Naqada_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Egypt_Upper_H	1	0	0	7	0	0	0	0	0	0	0	0	0	1	1
Finland_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
France_H	0	0	0	8	0	0	0	0	0	0	0	0	0	1	0
Gabon_H	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Germany_H	0	0	0	11	0	0	0	0	0	0	0	0	0	0	1

Ghana_Ashanti_H	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Greece_H	0	0	0	17	0	0	0	0	0	0	0	0	0	5	0
Greenland_H	0	0	0	8	0	0	0	0	0	0	0	0	0	2	0
Hawaii_H	0	0	0	195	0	0	0	0	0	0	1	0	0	4	3
Hungary_H	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
India_Bengal_H	0	0	0	20	0	0	0	0	0	0	1	0	0	5	0
India_Northeast_H	0	0	0	13	0	0	0	0	0	0	1	0	0	1	0
India_Northwest_H	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0
India_Pakistan_Punjab_H	0	0	0	8	0	0	0	0	0	0	1	0	0	0	0
India_South_H	0	0	0	14	0	0	0	0	0	0	1	0	0	4	0
Iran_H	0	0	0	8	0	0	0	0	0	0	9	0	0	1	0
Iraq_H	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Italy_H	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	0	0	0	30	0	0	0	0	0	0	2	0	0	14	3
Japan_Chiba_H	0	0	0	27	0	0	0	0	0	0	0	0	0	0	6
Japan_Jomon_H	0	0	0	25	0	0	0	0	0	0	0	0	0	9	2
Japan_Mainland_H	0	0	0	29	0	0	0	0	0	0	0	0	0	1	2
Japan_Okinawa_H	0	0	0	17	0	0	0	0	0	0	0	0	0	1	0
Japan_P	0	0	0	26	0	0	0	0	0	0	0	0	0	0	5
Java_H	0	0	0	20	0	0	0	0	0	0	0	0	0	0	1
Kenya_H	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
Kirsten_Black_P	0	0	0	10	0	0	0	0	0	0	1	0	0	0	0
Kirsten_Coloured_P	0	0	0	14	0	0	0	0	0	0	0	0	0	0	2
Korea_H	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Laos_H	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0
Lapp_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Malay_H	0	0	0	16	0	0	0	0	0	0	0	0	0	3	0
Marquesas_H	0	0	0	33	0	0	0	0	0	0	0	1	0	1	0
Mel_Fiji_H	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
Mel_NewHebrides_H	0	0	0	17	0	0	0	0	0	0	0	0	0	1	0
Mel_NewIreland_H	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Mel_TorresStrait_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Mic_CarolineIslands_H	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
Mic_Mariana_H	0	0	0	14	0	0	0	0	0	0	0	0	0	0	1
Mongol_H	0	0	0	44	0	0	0	0	0	0	0	0	0	9	1

Moriori_H	0	0	0	11	0	0	0	0	0	0	0	0	0	1	0
Nepal_H	0	0	0	6	0	0	0	0	0	0	0	0	0	1	0
Netherlands_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
NicobarIslands_H	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Nigeria_H	1	0	0	18	0	0	0	0	0	0	0	0	0	0	2
Norway_H	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0
Nubia_H	0	0	0	21	0	0	0	0	0	0	1	0	0	0	0
NZ_Maori_H	0	0	0	31	0	0	0	0	0	0	0	0	0	0	2
Okhotsk_H	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0
Palestine_H	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
Patagonia_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Peru_H	0	0	0	15	0	0	0	0	0	0	0	0	0	2	0
Philippines_General_H	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0
Philippines_Luzon_H	0	0	0	20	0	0	0	0	0	0	0	0	0	2	2
PNG_H	3	0	0	36	0	0	0	0	0	0	0	0	0	0	0
Pol_CookIslands_H	0	0	0	9	0	0	0	0	0	0	0	0	0	0	1
Pol_Society_H	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
Pol_Tonga_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Pretoria_Black_P	0	0	0	31	0	0	0	0	0	0	0	0	0	2	1
Russia_H	0	0	0	4	0	0	0	0	0	0	0	0	0	1	1
Somalia_H	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
SouthAfrica_H	0	0	0	10	0	0	0	0	0	0	0	0	0	1	0
SriLanka_H	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0
Sumatra_H	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Sweden_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Syria_H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Tanzania_H	1	0	0	14	0	0	0	0	0	0	0	0	0	0	0
Thailand_H	0	0	0	19	0	0	0	0	0	0	0	0	0	4	0
Tibet_H	0	0	0	13	0	0	0	0	0	0	0	1	0	2	2
Turkey_H	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1
TXST_White_P	0	0	0	12	0	0	0	0	0	0	0	0	0	1	0
UK_Medieval_H	0	0	0	39	0	0	0	0	0	0	1	0	0	5	1
UTK_Black_P	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
UTK_Hispanic_P	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
UTK_White_P	0	0	0	9	0	0	0	0	0	0	1	0	0	0	0
Vietnam_H	0	0	0	6	0	0	0	0	0	0	0	0	0	0	1
WestAfrica_H	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

Table B.2. (continued). Japan_Jomon_H to Mel_NewCaledonia_H. Cells with diagonal values representing correct classifications are colored gray.

	Japan_Jomon_H	Japan_Mainland_H	Japan_Okinawa_H	Japan_P	Java_H	Kenya_H	Kirsten_Black_P	Kirsten_Coloured_P	Korea_H	Laos_H	Lapp_H	Malay_H	Marquesas_H	Mel_Fiji_H	Mel_NewCaledonia_H
Afghanistan_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alaska_Inuit_H	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Aleut_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Andaman_Isl_H	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australia_Aboriginal_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austria_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bismarck_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Borneo_H	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Burma_NHM_H	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Buryat_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cameroon_H	2	0	3	0	0	1	0	0	0	0	0	0	0	0	0
Canada_Indigenous_H	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
Canada_Inuit_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Celebes_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Chile_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China_North_H	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China_South_H	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Congo_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
DW_Burma	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Easter_Isl_H	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Egypt_Badari_H	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Gizeh_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Naqada_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Egypt_Upper_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gabon_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Germany_H	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Ghana_Ashanti_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Greece_H	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Greenland_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Hawaii_H	9	1	8	2	0	0	0	0	0	0	0	0	1	0	0
Hungary_H	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Bengal_H	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
India_Northeast_H	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
India_Northwest_H	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
India_Pakistan_Punjab_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_South_H	2	0	2	0	0	1	0	1	0	0	0	0	0	0	0
Iran_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Iraq_H	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Italy_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Ainu_H	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Chiba_H	3	0	1	2	0	0	2	0	0	0	0	0	0	0	0
Japan_Jomon_H	20	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Japan_Mainland_H	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Japan_Okinawa_H	0	0	17	0	0	1	0	0	0	0	0	0	0	0	0
Japan_P	4	0	1	1	0	0	2	1	0	0	0	0	0	0	0
Java_H	2	0	1	1	0	0	0	1	0	0	0	0	0	0	0
Kenya_H	1	0	3	1	0	3	0	0	0	0	0	0	0	0	0
Kirsten_Black_P	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Kirsten_Coloured_P	3	1	0	0	0	0	1	1	0	0	0	0	0	0	0
Korea_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laos_H	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lapp_H	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malay_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Marquesas_H	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Fiji_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewHebrides_H	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Mel_NewIreland_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_Solomon_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Mic_CarolineIslands_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mic_Mariana_H	2	0	9	0	0	0	0	0	0	0	0	0	0	0	0

Mongol_H	9	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Moriori_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal_H	3	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Netherlands_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NicobarIslands_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Nigeria_H	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Norway_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nubia_H	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
NZ_Maori_H	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Okhotsk_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Palestine_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Patagonia_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peru_H	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Philippines_General_H	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Philippines_Luzon_H	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
PNG_H	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Pol_CookIslands_H	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pol_Society_H	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pol_Tonga_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pretoria_Black_P	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0
Russia_H	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Somalia_H	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0
SouthAfrica_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
SriLanka_H	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden_H	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Syria_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanzania_H	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0
Thailand_H	5	0	2	1	0	0	0	0	0	0	0	0	0	0	0
Tibet_H	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Turkey_H	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TXST_White_P	2	0	1	1	0	1	0	0	0	0	0	0	0	0	0
UK_Medieval_H	2	0	4	1	0	0	0	0	0	0	0	0	0	0	0
UTK_Black_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UTK_Hispanic_P	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UTK_White_P	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Vietnam_H	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
WestAfrica_H	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0

Table B.2. (continued). Mel_NewHebrides_H to Nubia_H. Cells with diagonal values representing correct classifications are colored gray.

	Mel_NewHebrides_H	Mel_NewIreland_H	Mel_Solomon_H	Mel_TorresStrait_H	Mexico_H	Mic_CarolineIslands_H	Mic_Mariana_H	Mongol_H	Moriori_H	Nepal_H	Netherlands_H	NicobarIslands_H	Nigeria_H	Norway_H	Nubia_H
Afghanistan_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Alaska_Inuit_H	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
Aleut_H	0	0	0	0	1	0	0	4	0	0	0	0	0	0	0
Andaman_Isl_H	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0
Australia_Aboriginal_H	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0
Austria_H	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Bismarck_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Borneo_H	0	0	0	0	0	0	4	5	0	0	0	0	0	0	0
Burma_NHM_H	0	0	0	0	0	0	2	2	0	0	0	0	2	0	0
Buryat_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Cameroon_H	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0
Canada_Indigenous_H	0	0	0	0	1	0	1	5	0	0	0	0	1	0	0
Canada_Inuit_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Celebes_H	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Chile_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China_North_H	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0
China_South_H	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
Congo_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Cyprus_H	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Czech_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DW_Burma	0	0	0	0	0	0	5	2	0	0	0	0	2	0	0
Easter_Isl_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Egypt_Badari_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Egypt_Gizeh_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Egypt_Naqada_H	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0
Egypt_Upper_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Finland_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Gabon_H	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Germany_H	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0

Ghana_Ashanti_H	1	0	0	0	0	0	2	1	0	0	0	0	1	0	0
Greece_H	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0
Greenland_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Hawaii_H	0	0	0	0	0	0	2	4	0	0	0	0	5	0	0
Hungary_H	0	0	0	0	0	0	1	3	0	0	0	0	1	0	0
India_Bengal_H	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0
India_Northeast_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
India_Pakistan_Punjab_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_South_H	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1
Iran_H	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
Iraq_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Italy_H	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Japan_Ainu_H	0	0	0	0	0	0	3	9	0	0	0	0	0	0	0
Japan_Chiba_H	0	0	0	0	0	0	4	4	0	0	0	0	1	0	0
Japan_Jomon_H	0	0	0	0	0	0	1	6	0	0	0	0	0	0	0
Japan_Mainland_H	0	0	0	0	0	0	3	3	0	0	0	0	1	0	0
Japan_Okinawa_H	0	0	0	0	0	0	6	3	0	0	0	0	2	0	0
Japan_P	0	0	0	0	0	0	2	3	0	0	0	0	0	1	0
Java_H	0	0	0	0	0	0	6	3	0	0	0	0	1	0	0
Kenya_H	0	0	0	0	0	0	3	1	0	0	0	0	6	0	0
Kirsten_Black_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kirsten_Coloured_P	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0
Korea_H	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Laos_H	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
Lapp_H	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Malay_H	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0
Marquesas_H	0	0	0	0	0	0	4	3	0	0	0	0	3	0	0
Mel_Fiji_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Mel_NewHebrides_H	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0
Mel_NewIreland_H	0	0	0	1	0	0	2	2	0	0	0	0	2	0	0
Mel_Solomon_H	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0
Mel_TorresStrait_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mexico_H	0	0	0	0	1	0	4	3	0	0	0	0	0	0	0
Mic_CarolineIslands_H	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0
Mic_Mariana_H	0	0	0	0	2	0	15	1	0	0	0	0	4	0	0
Mongol_H	0	0	0	0	0	0	1	14	0	0	0	0	1	0	0

Moriori_H	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Nepal_H	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
Netherlands_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
NicobarIslands_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Nigeria_H	0	0	0	0	0	0	4	5	0	0	0	0	15	0	0
Norway_H	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Nubia_H	0	0	0	1	0	0	3	3	0	0	0	0	4	0	0
NZ_Maori_H	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
Okhotsk_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Palestine_H	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Patagonia_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Peru_H	1	0	0	0	2	0	2	2	0	0	0	0	5	0	0
Philippines_General_H	0	0	0	0	0	0	6	3	0	0	0	0	4	0	0
Philippines_Luzon_H	0	0	0	0	0	0	1	3	0	0	0	0	2	0	0
PNG_H	0	0	0	0	0	0	12	3	0	0	0	0	2	0	0
Pol_CookIslands_H	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0
Pol_Society_H	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0
Pol_Tonga_H	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Pretoria_Black_P	0	0	0	0	0	0	1	0	0	0	0	0	4	0	0
Russia_H	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Somalia_H	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
SouthAfrica_H	0	0	0	1	0	0	0	2	0	0	0	0	6	0	0
SriLanka_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Sweden_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syria_H	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Tanzania_H	1	0	0	0	0	0	5	1	0	0	0	0	6	0	0
Thailand_H	0	0	0	0	0	0	5	2	0	0	0	0	4	0	0
Tibet_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Turkey_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
TXST_White_P	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
UK_Medieval_H	0	0	0	0	0	0	1	5	0	0	0	0	3	0	0
UTK_Black_P	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
UTK_Hispanic_P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UTK_White_P	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0
Vietnam_H	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0
WestAfrica_H	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

Table B.2. (continued). NZ_Maori_H to SouthAfrica_H. Cells with diagonal values representing correct classifications are colored gray.

	NZ_Maori_H	Okhotsk_H	Palestine_H	Patagonia_H	Peru_H	Philippines_General_H	Philippines_Luzon_H	PNG_H	Pol_CookIslands_H	Pol_Society_H	Pol_Tonga_H	Pretoria_Black_P	Russia_H	Somalia_H	SouthAfrica_H
Afghanistan_H	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Alaska_Inuit_H	0	0	0	0	6	0	0	21	0	0	0	1	0	0	2
Aleut_H	0	0	0	0	5	0	0	11	1	0	0	0	0	0	1
Andaman_Isl_H	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0
Australia_Aboriginal_H	0	0	0	0	3	0	0	24	0	0	1	1	0	0	1
Austria_H	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Bismarck_H	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0
Borneo_H	0	0	0	0	0	0	0	4	1	0	0	2	0	0	0
Burma_NHM_H	0	0	0	0	1	0	0	4	0	0	0	1	0	0	0
Buryat_H	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0
Cameroon_H	0	0	0	0	3	0	0	8	0	0	0	0	0	0	0
Canada_Indigenous_H	0	0	0	0	11	0	0	10	0	0	0	0	0	0	1
Canada_Inuit_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Celebes_H	0	0	0	0	0	1	0	4	1	0	0	0	0	0	0
Chile_H	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0
China_North_H	0	0	0	0	1	1	0	5	1	0	0	4	0	0	0
China_South_H	0	0	0	0	3	0	0	5	1	0	0	0	0	0	0
Congo_H	0	0	0	0	1	0	0	3	0	0	0	0	0	0	1
Cyprus_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech_H	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
DW_Burma	0	0	0	0	1	0	0	2	0	0	0	10	0	0	0
Easter_Isl_H	0	0	0	0	1	0	0	3	0	0	0	1	0	0	0
Egypt_Badari_H	0	0	0	0	1	0	0	6	0	0	0	0	0	0	1
Egypt_Gizeh_H	0	0	0	0	1	2	0	3	0	0	0	2	0	0	0
Egypt_Naqada_H	0	0	0	0	2	0	0	6	0	0	0	1	0	0	1
Egypt_Upper_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Finland_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
France_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Gabon_H	0	0	0	1	4	0	0	11	0	0	0	3	0	0	1
Germany_H	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0

Ghana_Ashanti_H	0	0	0	0	3	0	0	6	0	0	0	1	0	0	2
Greece_H	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0
Greenland_H	0	0	0	0	3	0	0	5	0	0	0	0	0	0	0
Hawaii_H	0	0	1	0	3	0	0	17	3	0	0	15	0	0	1
Hungary_H	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
India_Bengal_H	0	0	0	0	4	0	0	9	0	0	0	2	0	0	1
India_Northeast_H	0	0	0	0	2	0	0	2	0	0	0	3	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India_Pakistan_Punjab_H	1	0	0	0	2	0	0	5	0	0	0	1	0	0	0
India_South_H	0	0	0	0	2	0	0	7	0	0	0	2	0	0	1
Iran_H	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0
Iraq_H	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Italy_H	1	0	0	0	0	0	0	3	0	0	0	5	0	0	0
Japan_Ainu_H	0	0	0	0	1	0	0	4	0	0	0	0	0	0	0
Japan_Chiba_H	0	0	0	0	0	0	0	3	2	0	0	9	0	0	0
Japan_Jomon_H	0	0	0	0	1	0	0	4	0	0	0	3	0	0	0
Japan_Mainland_H	0	0	0	0	4	0	0	2	0	0	0	1	0	0	1
Japan_Okinawa_H	0	0	0	0	14	0	0	7	0	0	0	0	0	0	0
Japan_P	0	0	0	0	1	0	0	5	1	0	0	6	0	0	0
Java_H	0	0	0	0	1	0	0	17	0	0	0	0	0	0	0
Kenya_H	0	0	0	0	7	0	0	12	0	0	0	2	0	0	7
Kirsten_Black_P	0	0	0	0	0	0	0	1	0	0	0	8	0	0	0
Kirsten_Coloured_P	0	0	0	0	0	0	0	1	0	0	0	8	0	0	1
Korea_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laos_H	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Lapp_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malay_H	0	0	0	0	4	0	0	12	1	0	0	2	0	0	1
Marquesas_H	0	0	0	0	2	0	0	15	0	0	0	4	0	0	0
Mel_Fiji_H	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0
Mel_NewCaledonia_H	0	0	0	0	4	0	0	3	0	0	0	1	0	0	0
Mel_NewHebrides_H	0	0	0	0	1	1	0	37	0	0	0	1	0	0	2
Mel_NewIreland_H	0	0	0	0	2	0	0	12	0	0	0	1	0	0	0
Mel_Solomon_H	0	0	0	0	1	2	0	15	1	1	0	1	0	0	0
Mel_TorresStrait_H	0	0	0	0	2	0	0	7	0	0	0	0	0	0	2
Mexico_H	0	0	0	0	11	0	0	7	0	0	0	0	0	0	1
Mic_CarolineIslands_H	0	0	0	0	3	0	0	8	0	1	0	2	0	0	0
Mic_Mariana_H	0	0	0	0	12	0	0	19	2	0	0	0	0	0	0
Mongol_H	0	0	0	0	5	1	0	16	1	0	0	3	0	0	1

Moriori_H	0	0	0	0	2	0	0	4	0	0	0	1	0	0	2
Nepal_H	0	0	0	0	1	0	0	4	0	0	0	1	0	0	0
Netherlands_H	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
NicobarIslands_H	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Nigeria_H	0	0	0	0	9	0	0	11	1	0	0	5	0	0	4
Norway_H	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Nubia_H	0	0	0	0	8	1	0	14	0	0	0	4	0	0	1
NZ_Maori_H	0	0	0	0	2	0	0	4	1	0	0	3	0	0	0
Okhotsk_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Palestine_H	0	0	0	0	1	0	0	6	0	0	0	0	0	0	0
Patagonia_H	0	0	0	0	5	0	0	4	0	0	0	0	0	0	2
Peru_H	0	0	0	0	29	2	0	30	0	0	0	0	0	0	5
Philippines_General_H	0	0	0	0	0	0	0	20	0	0	0	3	0	0	1
Philippines_Luzon_H	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
PNG_H	0	0	0	0	10	0	0	81	5	0	0	5	0	0	3
Pol_CookIslands_H	0	0	0	0	1	0	0	6	2	0	0	0	0	0	0
Pol_Society_H	0	0	0	0	0	0	0	5	1	1	0	1	0	0	0
Pol_Tonga_H	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0
Pretoria_Black_P	0	0	1	0	0	0	0	5	0	0	0	32	0	0	1
Russia_H	0	0	0	0	0	0	0	2	0	0	0	1	0	0	2
Somalia_H	0	0	1	0	5	0	0	4	1	0	0	2	0	0	3
SouthAfrica_H	0	0	0	0	3	0	0	11	0	0	0	4	0	1	9
SriLanka_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumatra_H	0	0	0	0	1	0	0	7	0	0	0	0	0	0	0
Sweden_H	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Syria_H	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0
Tanzania_H	0	0	1	0	5	0	0	10	0	0	0	2	0	0	3
Thailand_H	0	0	0	0	4	0	0	6	0	0	0	0	0	0	0
Tibet_H	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Turkey_H	0	0	0	0	0	1	0	5	0	0	0	2	0	0	0
TXST_White_P	0	0	0	0	2	0	0	4	0	0	0	2	0	0	2
UK_Medieval_H	0	0	0	0	1	0	0	12	0	0	0	6	0	0	0
UTK_Black_P	0	0	0	0	0	0	0	7	0	0	0	2	0	0	0
UTK_Hispanic_P	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1
UTK_White_P	0	0	1	0	3	0	0	9	1	0	0	3	0	0	5
Vietnam_H	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
WestAfrica_H	0	0	0	0	1	0	0	6	1	0	0	1	0	0	1

Table B.2. (continued). SriLanka_H to WestAfrica_H. Cells with diagonal values representing correct classifications are colored gray.

	SriLanka_H	Sumatra_H	Sweden_H	Syria_H	Tanzania_H	Thailand_H	Tibet_H	Turkey_H	TXST_White_P	UK_Medieval_H	UTK_Black_P	UTK_Hispanic_P	UTK_White_P	Vietnam_H	WestAfrica_H
Afghanistan_H	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Alaska_Inuit_H	0	0	0	0	0	0	0	0	0	19	0	0	4	0	0
Aleut_H	0	0	0	0	0	1	0	0	0	5	0	0	0	0	0
Andaman_Isl_H	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Australia_Aboriginal_H	0	0	0	0	4	0	0	0	0	12	0	0	1	0	0
Austria_H	0	0	0	0	0	0	0	0	0	8	0	0	1	0	0
Bismarck_H	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Borneo_H	0	0	0	0	3	0	0	0	0	5	0	0	2	0	0
Burma_NHM_H	0	0	0	0	1	0	0	0	0	5	0	0	1	0	0
Buryat_H	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0
Cameroon_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Canada_Indigenous_H	0	0	0	0	0	0	0	0	0	8	0	0	2	0	0
Canada_Inuit_H	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Celebes_H	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Chile_H	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0
China_North_H	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
China_South_H	0	0	0	0	0	1	0	0	0	6	0	0	0	0	0
Congo_H	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Cyprus_H	0	0	0	0	0	0	0	0	0	5	0	0	3	0	0
Czech_H	0	0	0	0	0	0	0	0	0	19	0	0	1	0	0
DW_Burma	0	0	0	0	1	0	0	0	0	13	0	0	3	0	0
Easter_Isl_H	0	0	0	0	0	0	0	0	0	4	0	0	2	0	0
Egypt_Badari_H	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Egypt_Gizeh_H	0	0	0	0	1	1	0	0	0	22	0	0	3	0	0
Egypt_Naqada_H	0	0	0	0	1	0	0	0	0	3	0	0	2	0	0
Egypt_Upper_H	0	0	0	0	0	0	0	0	0	15	0	0	1	0	0
Finland_H	0	0	0	0	0	0	0	0	0	5	0	0	1	0	0
France_H	0	0	0	0	0	0	0	0	0	14	0	0	2	0	0
Gabon_H	0	0	0	0	6	0	0	0	0	1	0	0	0	0	0

Germany_H	0	0	0	0	2	0	0	0	0	36	0	0	2	0	0
Ghana_Ashanti_H	0	0	0	0	5	0	0	0	0	0	0	0	1	0	0
Greece_H	0	0	0	0	0	0	0	0	0	36	0	0	1	0	0
Greenland_H	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Hawaii_H	0	0	0	0	2	0	0	0	0	23	0	0	1	0	0
Hungary_H	0	0	0	0	0	0	0	0	0	34	0	0	2	0	0
India_Bengal_H	0	0	0	0	0	0	0	0	0	14	0	0	6	0	0
India_Northeast_H	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
India_Northwest_H	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
India_Pakistan_Punjab_H	0	0	0	0	1	0	0	0	0	17	0	0	5	0	0
India_South_H	0	0	0	0	1	0	0	0	0	32	0	0	2	0	0
Iran_H	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Iraq_H	0	0	0	0	0	1	0	0	0	20	0	0	2	0	0
Italy_H	0	0	0	0	3	0	0	0	1	46	0	0	6	0	0
Japan_Ainu_H	0	0	0	0	0	0	0	0	0	42	0	0	4	0	0
Japan_Chiba_H	0	0	0	0	0	0	0	0	0	15	0	0	1	0	0
Japan_Jomon_H	0	0	0	0	0	0	0	0	0	40	0	0	1	0	0
Japan_Mainland_H	0	0	0	0	2	0	0	0	0	4	0	0	0	0	0
Japan_Okinawa_H	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Japan_P	0	0	0	0	0	0	0	0	0	17	0	0	2	0	0
Java_H	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0
Kenya_H	0	0	0	0	7	0	0	0	0	3	0	0	4	0	0
Kirsten_Black_P	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
Kirsten_Coloured_P	0	0	0	0	0	0	0	0	0	21	0	0	1	0	0
Korea_H	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0
Laos_H	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Lapp_H	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
Malay_H	0	0	0	0	2	0	0	0	0	4	0	0	2	0	0
Marquesas_H	0	0	0	0	2	0	0	0	0	3	0	0	2	0	0
Mel_Fiji_H	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Mel_NewCaledonia_H	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0
Mel_NewHebrides_H	0	0	0	0	1	0	0	0	0	11	0	0	5	0	0
Mel_NewIreland_H	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0
Mel_Solomon_H	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0
Mel_TorresStrait_H	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0
Mexico_H	0	0	0	0	1	0	0	0	0	5	0	0	1	0	0
Mic_CarolineIslands_H	0	0	0	0	1	0	0	0	0	2	0	0	1	0	0
Mic_Mariana_H	0	0	0	0	1	0	0	0	0	3	0	0	1	0	0

Mongol_H	0	0	0	0	1	0	0	0	0	33	0	0	0	0	0
Moriori_H	0	0	0	0	1	0	0	0	0	5	0	0	1	0	0
Nepal_H	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
Netherlands_H	0	0	0	0	0	0	0	0	0	13	0	0	2	0	0
NicobarIslands_H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nigeria_H	0	0	0	0	11	0	0	0	0	3	0	0	4	0	0
Norway_H	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Nubia_H	0	0	0	0	2	0	0	0	0	6	0	0	2	0	0
NZ_Maori_H	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0
Okhotsk_H	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0
Palestine_H	0	0	0	0	0	1	0	0	0	28	0	0	3	0	0
Patagonia_H	0	0	0	0	2	0	0	0	0	5	0	0	2	0	0
Peru_H	0	0	0	0	1	1	0	0	0	4	0	0	2	0	0
Philippines_General_H	0	0	0	0	1	0	0	0	0	10	0	0	6	0	0
Philippines_Luzon_H	0	0	0	0	0	0	0	0	0	9	0	0	1	0	0
PNG_H	0	0	0	0	0	0	0	0	0	9	0	0	5	0	0
Pol_CookIslands_H	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Pol_Society_H	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0
Pol_Tonga_H	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pretoria_Black_P	0	0	0	0	1	0	0	0	0	15	0	0	4	0	0
Russia_H	0	0	0	0	0	0	0	0	0	18	0	0	2	0	0
Somalia_H	0	0	0	0	2	0	0	0	0	9	0	0	4	0	0
SouthAfrica_H	0	0	0	0	9	0	0	0	0	12	0	0	4	0	0
SriLanka_H	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Sumatra_H	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
Sweden_H	0	0	0	0	0	0	0	0	0	9	0	0	2	0	0
Syria_H	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Tanzania_H	0	0	0	0	17	0	0	0	0	5	0	0	2	0	0
Thailand_H	0	0	0	0	1	0	0	0	0	7	0	0	1	0	0
Tibet_H	0	0	0	0	1	0	0	0	0	8	0	0	1	0	0
Turkey_H	0	0	0	0	0	0	0	0	0	17	0	0	2	0	0
TXST_White_P	0	0	0	0	0	0	0	0	0	25	0	0	7	0	0
UK_Medieval_H	0	0	0	0	1	0	0	0	0	188	0	0	8	0	0
UTK_Black_P	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
UTK_Hispanic_P	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
UTK_White_P	0	0	0	0	1	0	0	0	0	68	0	0	29	0	0
Vietnam_H	0	0	0	0	0	0	0	0	0	5	0	0	1	0	0
WestAfrica_H	0	0	0	0	4	0	0	0	0	2	0	0	0	0	0

Table B.3. Frequency table for cranial nonmetric traits in the Ossenberg dataset. AfAm_O to Cen_Japan_O.

Trait Abbrev.	Trait Name		AfAm_O	Aleut_O	Armenia_O	Athapaskan_O	Aus_Aborig_O	Cen_Arctic_O	Cen_Japan_O
APIC	Apical Bone	%	0.094	0.226	0.125	0.113	0.218	0.113	0.053
		n	6	122	17	24	12	47	17
ASTL	Asterionic Bone	%	0.125	0.107	0.110	0.085	0.200	0.070	0.156
		n	8	58	15	18	11	29	50
CIVL	Pterygo-Alar Bridge or Spur	%	0.016	0.035	0.044	0.066	0.000	0.120	0.019
		n	1	19	6	14	0	50	6
CONL	Infraorbital Suture	%	0.438	0.434	0.456	0.349	0.400	0.446	0.338
		n	28	235	62	74	22	186	108
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.125	0.185	0.243	0.179	0.382	0.240	0.144
		n	8	100	33	38	21	100	46
HYPL	Divided Hypoglossal Canal	%	0.172	0.283	0.184	0.198	0.018	0.216	0.097
		n	11	153	25	42	1	90	31
INCA	Inca Bone	%	0.063	0.018	0.022	0.033	0.000	0.034	0.028
		n	4	10	3	7	0	14	9
METO	Metopic Suture	%	0.031	0.041	0.096	0.019	0.036	0.012	0.056
		n	2	22	13	4	2	5	18
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.016	0.161	0.037	0.151	0.218	0.082	0.125
		n	1	87	5	32	12	34	40
PNBL	Parietal Notch Bone	%	0.109	0.137	0.140	0.203	0.109	0.204	0.250
		n	7	74	19	43	6	85	80
POSL	Condylar Canal	%	0.391	0.165	0.353	0.165	0.382	0.158	0.303
		n	25	89	48	35	21	66	97
SOFL	Supraorbital Foramen	%	0.125	0.634	0.346	0.557	0.182	0.597	0.388
		n	8	343	47	118	10	249	124
TYML	Tympanic Dehiscence	%	0.172	0.588	0.243	0.415	0.164	0.348	0.278
		n	11	318	33	88	9	145	89
TZSL	Transversozygomatic Suture	%	0.125	0.281	0.206	0.184	0.091	0.185	0.328
		n	8	152	28	39	5	77	105

Table B.3. (continued). Chile_O to Illinois_O.

Trait Abbrev.	Trait Name		Chile_O	DW_Burma	E_Arctic_O	Ghana_O	Hungary_O	Iceland_O	Illinois_O
APIC	Apical Bone	%	0.176	0.092	0.068	0.152	0.176	0.039	0.290
		n	6	13	27	5	12	2	29
ASTL	Asterionic Bone	%	0.235	0.128	0.086	0.364	0.162	0.039	0.250
		n	8	18	34	12	11	2	25
CIVL	Pterygo-Alar Bridge or Spur	%	0.059	0.035	0.045	0.000	0.029	0.059	0.040
		n	2	5	18	0	2	3	4
CONL	Infraorbital Suture	%	0.059	0.674	0.348	0.152	0.471	0.471	0.240
		n	2	95	138	5	32	24	24
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.265	0.121	0.312	0.364	0.279	0.275	0.130
		n	9	17	124	12	19	14	13
HYPL	Divided Hypoglossal Canal	%	0.206	0.085	0.222	0.091	0.250	0.196	0.260
		n	7	12	88	3	17	10	26
INCA	Inca Bone	%	0.059	0.007	0.018	0.091	0.029	0.000	0.010
		n	2	1	7	3	2	0	1
METO	Metopic Suture	%	0.059	0.014	0.008	0.000	0.044	0.078	0.020
		n	2	2	3	0	3	4	2
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.324	0.106	0.088	0.061	0.059	0.078	0.150
		n	11	15	35	2	4	4	15
PNBL	Parietal Notch Bone	%	0.353	0.113	0.191	0.182	0.088	0.196	0.180
		n	12	16	76	6	6	10	18
POSL	Condylar Canal	%	0.235	0.709	0.171	0.303	0.368	0.490	0.120
		n	8	100	68	10	25	25	12
SOFL	Supraorbital Foramen	%	0.471	0.326	0.574	0.212	0.265	0.294	0.470
		n	16	46	228	7	18	15	47
TYML	Tympanic Dehiscence	%	0.382	0.149	0.317	0.182	0.162	0.216	0.250
		n	13	21	126	6	11	11	25
TZSL	Transversozygomatic Suture	%	0.088	0.113	0.179	0.091	0.118	0.118	0.100
		n	3	16	71	3	8	6	10

Table B.3. (continued). India_O to Mongolia_O.

Trait Abbrev.	Trait Name		India_O	Italy_O	Japan_Ainu_O	Japan_Jomon_O	Kenya_O	Marquesas_O	Mongolia_O
APIC	Apical Bone	%	0.202	0.000	0.000	0.071	0.148	0.256	0.194
		n	26	0	0	19	4	20	12
ASTL	Asterionic Bone	%	0.171	0.159	0.176	0.228	0.259	0.192	0.177
		n	22	14	26	61	7	15	11
CIVL	Pterygo-Alar Bridge or Spur	%	0.031	0.034	0.034	0.026	0.000	0.026	0.048
		n	4	3	5	7	0	2	3
CONL	Infraorbital Suture	%	0.512	0.682	0.311	0.172	0.519	0.474	0.435
		n	66	60	46	46	14	37	27
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.186	0.250	0.196	0.150	0.444	0.282	0.355
		n	24	22	29	40	12	22	22
HYPL	Divided Hypoglossal Canal	%	0.163	0.261	0.264	0.172	0.111	0.064	0.065
		n	21	23	39	46	3	5	4
INCA	Inca Bone	%	0.023	0.000	0.020	0.060	0.074	0.038	0.000
		n	3	0	3	16	2	3	0
METO	Metopic Suture	%	0.031	0.125	0.047	0.116	0.037	0.013	0.161
		n	4	11	7	31	1	1	10
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.062	0.011	0.149	0.142	0.074	0.141	0.097
		n	8	1	22	38	2	11	6
PNBL	Parietal Notch Bone	%	0.209	0.182	0.169	0.210	0.296	0.128	0.210
		n	27	16	25	56	8	10	13
POSL	Condylar Canal	%	0.140	0.148	0.155	0.146	0.407	0.192	0.355
		n	18	13	23	39	11	15	22
SOFL	Supraorbital Foramen	%	0.287	0.307	0.203	0.195	0.296	0.526	0.532
		n	37	27	30	52	8	41	33
TYML	Tympanic Dehiscence	%	0.155	0.284	0.203	0.311	0.185	0.077	0.258
		n	20	25	30	83	5	6	16
TZSL	Transversozygomatic Suture	%	0.155	0.136	0.581	0.663	0.074	0.103	0.339
		n	20	12	86	177	2	8	21

Table B.3. (continued). Moriori_O to N_Pacific_Coast_O.

Trait Abbrev.	Trait Name		Moriori_O	N_Alaska_O	N_China_O	N_Japan_O	N_Miss_Valley_O	N_N_Japan_O	N_Pacific_Coast_O
APIC	Apical Bone	%	0.045	0.087	0.153	0.052	0.170	0.037	0.112
		n	1	40	11	8	93	2	60
ASTL	Asterionic Bone	%	0.318	0.178	0.167	0.092	0.075	0.167	0.176
		n	7	82	12	14	41	9	94
CIVL	Pterygo-Alar Bridge or Spur	%	0.000	0.065	0.097	0.020	0.035	0.056	0.077
		n	0	30	7	3	19	3	41
CONL	Infraorbital Suture	%	0.091	0.349	0.583	0.301	0.328	0.296	0.418
		n	2	161	42	46	179	16	223
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.636	0.195	0.125	0.229	0.123	0.074	0.142
		n	14	90	9	35	67	4	76
HYPL	Divided Hypoglossal Canal	%	0.136	0.152	0.097	0.124	0.227	0.074	0.238
		n	3	70	7	19	124	4	127
INCA	Inca Bone	%	0.000	0.013	0.056	0.046	0.013	0.019	0.043
		n	0	6	4	7	7	1	23
METO	Metopic Suture	%	0.045	0.011	0.167	0.092	0.022	0.019	0.024
		n	1	5	12	14	12	1	13
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.273	0.184	0.111	0.085	0.060	0.111	0.163
		n	6	85	8	13	33	6	87
PNBL	Parietal Notch Bone	%	0.136	0.245	0.236	0.235	0.082	0.148	0.176
		n	3	113	17	36	45	8	94
POSL	Condylar Canal	%	0.409	0.165	0.278	0.209	0.077	0.259	0.159
		n	9	76	20	32	42	14	85
SOFL	Supraorbital Foramen	%	0.318	0.586	0.500	0.333	0.458	0.407	0.655
		n	7	270	36	51	250	22	350
TYML	Tympanic Dehiscence	%	0.182	0.275	0.264	0.294	0.454	0.296	0.455
		n	4	127	19	45	248	16	243
TZSL	Transversozygomatic Suture	%	0.182	0.182	0.264	0.359	0.119	0.315	0.204
		n	4	84	19	55	65	17	109

Table B.3. (continued). Newfoundland_O to Pecos_Pueblo_O.

Trait Abbrev.	**Trait Name**		**Newfoundland_O**	**Nigeria_O**	**NZ_Maori_O**	**Ontario_Brit_O**	**Ontario_Native_O**	**Patagonia_O**	**Pecos_Pueblo_O**
APIC	Apical Bone	%	0.146	0.069	0.083	0.071	0.213	0.077	0.220
		n	6	2	4	20	16	2	37
ASTL	Asterionic Bone	%	0.073	0.241	0.167	0.061	0.133	0.038	0.304
		n	3	7	8	17	10	1	51
CIVL	Pterygo-Alar Bridge or Spur	%	0.000	0.000	0.063	0.054	0.000	0.000	0.048
		n	0	0	3	15	0	0	8
CONL	Infraorbital Suture	%	0.293	0.172	0.396	0.482	0.253	0.038	0.321
		n	12	5	19	135	19	1	54
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.146	0.414	0.333	0.193	0.173	0.154	0.119
		n	6	12	16	54	13	4	20
HYPL	Divided Hypoglossal Canal	%	0.195	0.069	0.146	0.214	0.147	0.346	0.143
		n	8	2	7	60	11	9	24
INCA	Inca Bone	%	0.000	0.069	0.042	0.007	0.027	0.000	0.000
		n	0	2	2	2	2	0	0
METO	Metopic Suture	%	0.000	0.034	0.000	0.061	0.013	0.000	0.012
		n	0	1	0	17	1	0	2
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.049	0.103	0.125	0.014	0.120	0.115	0.345
		n	2	3	6	4	9	3	58
PNBL	Parietal Notch Bone	%	0.073	0.172	0.104	0.100	0.200	0.038	0.119
		n	3	5	5	28	15	1	20
POSL	Condylar Canal	%	0.024	0.207	0.438	0.343	0.107	0.077	0.167
		n	1	6	21	96	8	2	28
SOFL	Supraorbital Foramen	%	0.634	0.345	0.375	0.275	0.560	0.500	0.393
		n	26	10	18	77	42	13	66
TYML	Tympanic Dehiscence	%	0.390	0.207	0.229	0.168	0.427	0.462	0.399
		n	16	6	11	47	32	12	67
TZSL	Transversozygomatic Suture	%	0.146	0.138	0.063	0.089	0.080	0.154	0.173
		n	6	4	3	25	6	4	29

Table B.3. (continued). Plains_O to St_Lawrence_O.

Trait Abbrev.	Trait Name		Plains_O	Plateau_O	S_Africa_O	S_Alaska_O	Siberia_O	St_Lawrence_O
APIC	Apical Bone	%	0.098	0.158	0.092	0.143	0.124	0.175
		n	29	38	6	96	25	74
ASTL	Asterionic Bone	%	0.111	0.204	0.215	0.200	0.174	0.132
		n	33	49	14	134	35	56
CIVL	Pterygo-Alar Bridge or Spur	%	0.078	0.121	0.015	0.042	0.015	0.045
		n	23	29	1	28	3	19
CONL	Infraorbital Suture	%	0.446	0.229	0.338	0.375	0.433	0.440
		n	132	55	22	251	87	186
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.135	0.133	0.154	0.175	0.154	0.215
		n	40	32	10	117	31	91
HYPL	Divided Hypoglossal Canal	%	0.186	0.192	0.123	0.216	0.114	0.279
		n	55	46	8	145	23	118
INCA	Inca Bone	%	0.020	0.029	0.015	0.022	0.025	0.028
		n	6	7	1	15	5	12
METO	Metopic Suture	%	0.014	0.013	0.000	0.015	0.010	0.021
		n	4	3	0	10	2	9
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.139	0.200	0.123	0.233	0.184	0.191
		n	41	48	8	156	37	81
PNBL	Parietal Notch Bone	%	0.105	0.104	0.185	0.310	0.154	0.210
		n	31	25	12	208	31	89
POSL	Condylar Canal	%	0.152	0.133	0.369	0.190	0.338	0.123
		n	45	32	24	127	68	52
SOFL	Supraorbital Foramen	%	0.453	0.550	0.215	0.642	0.577	0.681
		n	134	132	14	430	116	288
TYML	Tympanic Dehiscence	%	0.331	0.258	0.169	0.407	0.244	0.371
		n	98	62	11	273	49	157
TZSL	Transversozygomatic Suture	%	0.135	0.125	0.154	0.249	0.299	0.213
		n	40	30	10	167	60	90

Table B.3. (continued). Sudan_O to W_Japan_O.

Trait Abbrev.	Trait Name		Sudan_O	Tanzania_O	W_Africa_O	W_Japan_O
APIC	Apical Bone	%	0.081	0.191	0.250	0.071
		n	7	9	3	13
ASTL	Asterionic Bone	%	0.174	0.213	0.167	0.115
		n	15	10	2	21
CIVL	Pterygo-Alar Bridge or Spur	%	0.012	0.000	0.000	0.027
		n	1	0	0	5
CONL	Infraorbital Suture	%	0.291	0.170	0.417	0.432
		n	25	8	5	79
FSPL	Foramen Ovale/Spinosum Incomplete	%	0.302	0.213	0.333	0.186
		n	26	10	4	34
HYPL	Divided Hypoglossal Canal	%	0.128	0.106	0.000	0.126
		n	11	5	0	23
INCA	Inca Bone	%	0.023	0.021	0.000	0.022
		n	2	1	0	4
METO	Metopic Suture	%	0.012	0.043	0.167	0.038
		n	1	2	2	7
OMBL	Ossicle in Occipito-Mastoid Suture	%	0.116	0.191	0.083	0.115
		n	10	9	1	21
PNBL	Parietal Notch Bone	%	0.209	0.191	0.250	0.230
		n	18	9	3	42
POSL	Condylar Canal	%	0.407	0.383	0.250	0.355
		n	35	18	3	65
SOFL	Supraorbital Foramen	%	0.291	0.191	0.417	0.415
		n	25	9	5	76
TYML	Tympanic Dehiscence	%	0.174	0.383	0.250	0.306
		n	15	18	3	56
TZSL	Transversozygomatic Suture	%	0.105	0.170	0.167	0.284
		n	9	8	2	52

Table B.4. Frequency table for cranial nonmetric traits in the Hanihara dataset. Afghanistan_H to Australia_Aboriginal_H.

Trait Abbrev.	Trait Name		Afghanistan_H	Alaska_Inuit_H	Aleut_H	Andaman_Isl_H	Australia_Aboriginal_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.003	0.003	0.000	0.031
		n	0	2	1	0	14
AIOF_R	Multiple Infraorbital Foramina	%	0.104	0.086	0.152	0.055	0.107
		n	5	66	57	5	49
ASB_R	Asterionic Bone	%	0.042	0.111	0.080	0.176	0.279
		n	2	85	30	16	128
CCA_R	Condylar Canal	%	0.333	0.133	0.158	0.363	0.367
		n	16	102	59	33	168
HGCB_R	Divided Hypoglossal Canal	%	0.042	0.158	0.182	0.110	0.033
		n	2	121	68	10	15
MET	Metopic Suture	%	0.042	0.014	0.032	0.066	0.009
		n	2	11	12	6	4
OL	Apical Bone	%	0.167	0.069	0.048	0.110	0.098
		n	8	53	18	10	45
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.021	0.136	0.096	0.099	0.131
		n	1	104	36	9	60
PNB_R	Parietal Notch Bone	%	0.083	0.214	0.115	0.187	0.096
		n	4	164	43	17	44
SOF_R	Supraorbital Foramen	%	0.250	0.593	0.618	0.363	0.155
		n	12	454	231	33	71
TD_R	Tympanic Dihiscence	%	0.167	0.370	0.588	0.275	0.144
		n	8	283	220	25	66
TZS_R	Transversozygomatic Suture	%	0.208	0.220	0.225	0.231	0.074
		n	10	168	84	21	34

Table B.4. (continued). Austria_H to Borneo_H.

Trait Abbrev.	Trait Name		Austria_H	Bangladesh_H	Bedouin_H	Bismarck_H	Bolivia_H	Borneo_H
AEX_R	Auditory Exostosis (Torus)	%	0.004	0.000	0.000	0.000	0.000	0.027
		n	1	0	0	0	0	4
AIOF_R	Multiple Infraorbital Foramina	%	0.108	0.065	0.080	0.125	0.178	0.203
		n	27	2	2	5	13	30
ASB_R	Asterionic Bone	%	0.239	0.258	0.040	0.350	0.082	0.264
		n	60	8	1	14	6	39
CCA_R	Condylar Canal	%	0.283	0.258	0.240	0.075	0.123	0.149
		n	71	8	6	3	9	22
HGCB_R	Divided Hypoglossal Canal	%	0.171	0.097	0.120	0.100	0.151	0.115
		n	43	3	3	4	11	17
MET	Metopic Suture	%	0.088	0.032	0.120	0.000	0.082	0.041
		n	22	1	3	0	6	6
OL	Apical Bone	%	0.239	0.129	0.200	0.000	0.096	0.088
		n	60	4	5	0	7	13
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.060	0.129	0.040	0.225	0.137	0.209
		n	15	4	1	9	10	31
PNB_R	Parietal Notch Bone	%	0.131	0.129	0.120	0.150	0.123	0.291
		n	33	4	3	6	9	43
SOF_R	Supraorbital Foramen	%	0.291	0.516	0.200	0.300	0.370	0.311
		n	73	16	5	12	27	46
TD_R	Tympanic Dihiscence	%	0.175	0.097	0.360	0.300	0.726	0.189
		n	44	3	9	12	53	28
TZS_R	Transversozygomatic Suture	%	0.100	0.226	0.080	0.150	0.260	0.169
		n	25	7	2	6	19	25

Table B.4. (continued). Bulgaria_H to Canada_Indigenous_H.

Trait Abbrev.	**Trait Name**		**Bulgaria_H**	**Burma_NHM_H**	**Buryat_H**	**Cambodia_H**	**Cameroon_H**	**Canada_Indigenous_H**
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.000	0.000	0.059
		n	0	0	0	0	0	14
AIOF_R	Multiple Infraorbital Foramina	%	0.143	0.082	0.063	0.083	0.039	0.169
		n	3	15	3	1	2	40
ASB_R	Asterionic Bone	%	0.000	0.179	0.125	0.000	0.157	0.191
		n	0	33	6	0	8	45
CCA_R	Condylar Canal	%	0.143	0.304	0.313	0.167	0.314	0.097
		n	3	56	15	2	16	23
HGCB_R	Divided Hypoglossal Canal	%	0.381	0.076	0.167	0.000	0.059	0.165
		n	8	14	8	0	3	39
MET	Metopic Suture	%	0.143	0.022	0.125	0.000	0.020	0.021
		n	3	4	6	0	1	5
OL	Apical Bone	%	0.143	0.076	0.125	0.083	0.098	0.136
		n	3	14	6	1	5	32
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.048	0.196	0.104	0.167	0.137	0.157
		n	1	36	5	2	7	37
PNB_R	Parietal Notch Bone	%	0.143	0.212	0.146	0.000	0.333	0.169
		n	3	39	7	0	17	40
SOF_R	Supraorbital Foramen	%	0.238	0.321	0.563	0.417	0.176	0.530
		n	5	59	27	5	9	125
TD_R	Tympanic Dihiscence	%	0.143	0.250	0.292	0.250	0.235	0.411
		n	3	46	14	3	12	97
TZS_R	Transversozygomatic Suture	%	0.333	0.174	0.375	0.333	0.118	0.161
		n	7	32	18	4	6	38

Table B.4. (continued). Canada_Inuit_H to Chukchi_H.

Trait Abbrev.	Trait Name		Canada_Inuit_H	Celebes_H	Chile_H	China_North_H	China_South_H	Chukchi_H
AEX_R	Auditory Exostosis (Torus)	%	0.047	0.000	0.172	0.000	0.000	0.000
		n	3	0	11	0	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.172	0.222	0.156	0.144	0.250	0.267
		n	11	6	10	14	25	8
ASB_R	Asterionic Bone	%	0.016	0.185	0.047	0.175	0.210	0.067
		n	1	5	3	17	21	2
CCA_R	Condylar Canal	%	0.125	0.222	0.141	0.299	0.200	0.300
		n	8	6	9	29	20	9
HGCB_R	Divided Hypoglossal Canal	%	0.094	0.037	0.156	0.113	0.090	0.100
		n	6	1	10	11	9	3
MET	Metopic Suture	%	0.000	0.000	0.031	0.082	0.090	0.000
		n	0	0	2	8	9	0
OL	Apical Bone	%	0.047	0.111	0.141	0.103	0.230	0.033
		n	3	3	9	10	23	1
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.031	0.148	0.156	0.124	0.210	0.167
		n	2	4	10	12	21	5
PNB_R	Parietal Notch Bone	%	0.234	0.296	0.172	0.196	0.270	0.300
		n	15	8	11	19	27	9
SOF_R	Supraorbital Foramen	%	0.531	0.333	0.438	0.443	0.440	0.767
		n	34	9	28	43	44	23
TD_R	Tympanic Dihiscence	%	0.313	0.222	0.422	0.309	0.270	0.100
		n	20	6	27	30	27	3
TZS_R	Transversozygomatic Suture	%	0.188	0.185	0.078	0.113	0.160	0.100
		n	12	5	5	11	16	3

Table B.4. (continued). Colombia_H to DW_Burma.

Trait Abbrev.	Trait Name		Colombia_H	Congo_H	Cyprus_H	Czech_H	DW_Burma
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.049	0.000	0.007
		n	0	0	2	0	1
AIOF_R	Multiple Infraorbital Foramina	%	0.160	0.111	0.122	0.104	0.071
		n	4	3	5	15	10
ASB_R	Asterionic Bone	%	0.240	0.111	0.268	0.118	0.086
		n	6	3	11	17	12
CCA_R	Condylar Canal	%	0.000	0.370	0.293	0.250	0.671
		n	0	10	12	36	94
HGCB_R	Divided Hypoglossal Canal	%	0.160	0.000	0.171	0.139	0.064
		n	4	0	7	20	9
MET	Metopic Suture	%	0.040	0.037	0.049	0.049	0.014
		n	1	1	2	7	2
OL	Apical Bone	%	0.120	0.185	0.049	0.132	0.093
		n	3	5	2	19	13
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.240	0.074	0.146	0.063	0.129
		n	6	2	6	9	18
PNB_R	Parietal Notch Bone	%	0.120	0.148	0.098	0.090	0.121
		n	3	4	4	13	17
SOF_R	Supraorbital Foramen	%	0.360	0.296	0.293	0.222	0.293
		n	9	8	12	32	41
TD_R	Tympanic Dihiscence	%	0.680	0.296	0.171	0.153	0.136
		n	17	8	7	22	19
TZS_R	Transversozygomatic Suture	%	0.040	0.074	0.073	0.090	0.114
		n	1	2	3	13	16

Table B.4. (continued). Easter_Isl_H to France_H.

Trait Abbrev.	Trait Name		Easter_Isl_H	Ecuador_H	Egypt_H	Finland_H	France_H
AEX_R	Auditory Exostosis (Torus)	%	0.147	0.000	0.005	0.000	0.000
		n	24	0	4	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.129	0.100	0.081	0.154	0.126
		n	21	3	60	4	14
ASB_R	Asterionic Bone	%	0.209	0.200	0.126	0.231	0.135
		n	34	6	93	6	15
CCA_R	Condylar Canal	%	0.239	0.100	0.324	0.462	0.252
		n	39	3	239	12	28
HGCB_R	Divided Hypoglossal Canal	%	0.025	0.233	0.182	0.192	0.126
		n	4	7	134	5	14
MET	Metopic Suture	%	0.000	0.000	0.061	0.077	0.099
		n	0	0	45	2	11
OL	Apical Bone	%	0.098	0.133	0.128	0.192	0.162
		n	16	4	94	5	18
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.221	0.133	0.076	0.038	0.045
		n	36	4	56	1	5
PNB_R	Parietal Notch Bone	%	0.080	0.100	0.119	0.077	0.090
		n	13	3	88	2	10
SOF_R	Supraorbital Foramen	%	0.546	0.300	0.242	0.269	0.351
		n	89	9	178	7	39
TD_R	Tympanic Dihiscence	%	0.117	0.500	0.179	0.038	0.189
		n	19	15	132	1	21
TZS_R	Transversozygomatic Suture	%	0.061	0.033	0.126	0.077	0.099
		n	10	1	93	2	11

Table B.4. (continued). Gabon_H to Greenland_H.

Trait Abbrev.	**Trait Name**		**Gabon_H**	**Germany_H**	**Ghana_Ashanti_H**	**Greece_H**	**Greenland_H**
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.015	0.000
		n	0	0	0	1	0
AIOF_R	Multiple Infraorbital Foramina	%	0.030	0.135	0.045	0.088	0.163
		n	4	23	5	6	37
ASB_R	Asterionic Bone	%	0.215	0.200	0.136	0.206	0.062
		n	29	34	15	14	14
CCA_R	Condylar Canal	%	0.363	0.335	0.336	0.235	0.101
		n	49	57	37	16	23
HGCB_R	Divided Hypoglossal Canal	%	0.044	0.118	0.091	0.191	0.163
		n	6	20	10	13	37
MET	Metopic Suture	%	0.007	0.076	0.009	0.132	0.000
		n	1	13	1	9	0
OL	Apical Bone	%	0.133	0.094	0.109	0.132	0.040
		n	18	16	12	9	9
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.207	0.053	0.091	0.118	0.070
		n	28	9	10	8	16
PNB_R	Parietal Notch Bone	%	0.207	0.112	0.182	0.103	0.185
		n	28	19	20	7	42
SOF_R	Supraorbital Foramen	%	0.267	0.194	0.200	0.338	0.586
		n	36	33	22	23	133
TD_R	Tympanic Dihiscence	%	0.259	0.176	0.264	0.132	0.335
		n	35	30	29	9	76
TZS_R	Transversozygomatic Suture	%	0.044	0.047	0.082	0.132	0.141
		n	6	8	9	9	32

Table B.4. (continued). Hawaii_H to India_Northwest_H.

Trait Abbrev.	Trait Name		Hawaii_H	Hungary_H	India_Bengal_H	India_Northeast_H	India_Northwest_H
AEX_R	Auditory Exostosis (Torus)	%	0.057	0.005	0.000	0.007	0.000
		n	9	1	0	1	0
AIOF_R	Multiple Infraorbital Foramina	%	0.121	0.095	0.051	0.066	0.083
		n	19	19	6	10	3
ASB_R	Asterionic Bone	%	0.197	0.179	0.111	0.185	0.194
		n	31	36	13	28	7
CCA_R	Condylar Canal	%	0.248	0.279	0.291	0.358	0.222
		n	39	56	34	54	8
HGCB_R	Divided Hypoglossal Canal	%	0.064	0.149	0.137	0.126	0.000
		n	10	30	16	19	0
MET	Metopic Suture	%	0.006	0.050	0.051	0.060	0.028
		n	1	10	6	9	1
OL	Apical Bone	%	0.083	0.189	0.197	0.179	0.139
		n	13	38	23	27	5
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.223	0.045	0.103	0.146	0.139
		n	35	9	12	22	5
PNB_R	Parietal Notch Bone	%	0.127	0.159	0.214	0.205	0.083
		n	20	32	25	31	3
SOF_R	Supraorbital Foramen	%	0.497	0.333	0.299	0.311	0.333
		n	78	67	35	47	12
TD_R	Tympanic Dihiscence	%	0.096	0.219	0.231	0.265	0.278
		n	15	44	27	40	10
TZS_R	Transversozygomatic Suture	%	0.089	0.070	0.120	0.205	0.139
		n	14	14	14	31	5

Table B.4. (continued). India_Pakistan_Punjab_H to Italy_H.

Trait Abbrev.	Trait Name		India_Pakistan_Punjab_H	India_South_H	Iraq_H	Israel_H	Italy_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.000	0.015
		n	0	0	0	0	3
AIOF_R	Multiple Infraorbital Foramina	%	0.047	0.065	0.049	0.064	0.119
		n	5	13	2	7	24
ASB_R	Asterionic Bone	%	0.159	0.130	0.049	0.248	0.164
		n	17	26	2	27	33
CCA_R	Condylar Canal	%	0.327	0.250	0.195	0.294	0.308
		n	35	50	8	32	62
HGCB_R	Divided Hypoglossal Canal	%	0.196	0.155	0.098	0.064	0.179
		n	21	31	4	7	36
MET	Metopic Suture	%	0.093	0.030	0.073	0.073	0.100
		n	10	6	3	8	20
OL	Apical Bone	%	0.168	0.265	0.122	0.119	0.189
		n	18	53	5	13	38
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.047	0.110	0.122	0.073	0.045
		n	5	22	5	8	9
PNB_R	Parietal Notch Bone	%	0.140	0.150	0.073	0.138	0.144
		n	15	30	3	15	29
SOF_R	Supraorbital Foramen	%	0.262	0.295	0.293	0.220	0.264
		n	28	59	12	24	53
TD_R	Tympanic Dihiscence	%	0.243	0.245	0.146	0.092	0.164
		n	26	49	6	10	33
TZS_R	Transversozygomatic Suture	%	0.121	0.130	0.171	0.092	0.154
		n	13	26	7	10	31

Table B.4. (continued). Japan_Ainu_H to Korea_H.

Trait Abbrev.	Trait Name		Japan_Ainu_H	Japan_Jomon_H	Japan_Mainland_H	Java_H	Kenya_H	Korea_H
AEX_R	Auditory Exostosis (Torus)	%	0.015	0.066	0.000	0.000	0.000	0.000
		n	2	10	0	0	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.074	0.059	0.153	0.158	0.042	0.091
		n	10	9	29	16	8	1
ASB_R	Asterionic Bone	%	0.089	0.092	0.079	0.198	0.138	0.182
		n	12	14	15	20	26	2
CCA_R	Condylar Canal	%	0.156	0.112	0.259	0.178	0.254	0.455
		n	21	17	49	18	48	5
HGCB_R	Divided Hypoglossal Canal	%	0.141	0.105	0.090	0.089	0.106	0.000
		n	19	16	17	9	20	0
MET	Metopic Suture	%	0.022	0.118	0.069	0.059	0.021	0.000
		n	3	18	13	6	4	0
OL	Apical Bone	%	0.022	0.033	0.079	0.059	0.143	0.000
		n	3	5	15	6	27	0
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.052	0.039	0.063	0.218	0.153	0.000
		n	7	6	12	22	29	0
PNB_R	Parietal Notch Bone	%	0.111	0.099	0.212	0.178	0.159	0.273
		n	15	15	40	18	30	3
SOF_R	Supraorbital Foramen	%	0.185	0.112	0.402	0.356	0.164	0.364
		n	25	17	76	36	31	4
TD_R	Tympanic Dihiscence	%	0.170	0.263	0.280	0.327	0.365	0.182
		n	23	40	53	33	69	2
TZS_R	Transversozygomatic Suture	%	0.400	0.487	0.317	0.188	0.090	0.182
		n	54	74	60	19	17	2

Table B.4. (continued). Laos_H to Melanesia_H.

Trait Abbrev.	Trait Name		Laos_H	Malawi_H	Malay_H	Marquesas_H	Melanesia_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.064	0.020
		n	0	0	0	11	12
AIOF_R	Multiple Infraorbital Foramina	%	0.174	0.059	0.162	0.064	0.166
		n	8	2	6	11	102
ASB_R	Asterionic Bone	%	0.174	0.353	0.405	0.180	0.207
		n	8	12	15	31	127
CCA_R	Condylar Canal	%	0.217	0.441	0.297	0.291	0.274
		n	10	15	11	50	168
HGCB_R	Divided Hypoglossal Canal	%	0.152	0.118	0.081	0.064	0.060
		n	7	4	3	11	37
MET	Metopic Suture	%	0.065	0.000	0.000	0.012	0.052
		n	3	0	0	2	32
OL	Apical Bone	%	0.196	0.088	0.108	0.017	0.108
		n	9	3	4	3	66
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.283	0.147	0.135	0.203	0.145
		n	13	5	5	35	89
PNB_R	Parietal Notch Bone	%	0.065	0.176	0.216	0.087	0.142
		n	3	6	8	15	87
SOF_R	Supraorbital Foramen	%	0.391	0.235	0.378	0.448	0.318
		n	18	8	14	77	195
TD_R	Tympanic Dihiscence	%	0.239	0.176	0.297	0.058	0.227
		n	11	6	11	10	139
TZS_R	Transversozygomatic Suture	%	0.109	0.000	0.108	0.099	0.078
		n	5	0	4	17	48

Table B.4. (continued). Mexico_H to Moriori_H.

Trait Abbrev.	**Trait Name**		**Mexico_H**	**Micronesia_H**	**Molucca_H**	**Mongol_H**	**Moriori_H**
AEX_R	Auditory Exostosis (Torus)	%	0.011	0.011	0.000	0.000	0.098
		n	4	1	0	0	13
AIOF_R	Multiple Infraorbital Foramina	%	0.079	0.207	0.111	0.146	0.045
		n	29	18	3	42	6
ASB_R	Asterionic Bone	%	0.169	0.172	0.148	0.105	0.188
		n	62	15	4	30	25
CCA_R	Condylar Canal	%	0.077	0.241	0.407	0.352	0.361
		n	28	21	11	101	48
HGCB_R	Divided Hypoglossal Canal	%	0.134	0.034	0.074	0.111	0.060
		n	49	3	2	32	8
MET	Metopic Suture	%	0.014	0.011	0.000	0.073	0.023
		n	5	1	0	21	3
OL	Apical Bone	%	0.216	0.126	0.037	0.153	0.113
		n	79	11	1	44	15
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.175	0.184	0.222	0.101	0.346
		n	64	16	6	29	46
PNB_R	Parietal Notch Bone	%	0.101	0.184	0.111	0.108	0.105
		n	37	16	3	31	14
SOF_R	Supraorbital Foramen	%	0.437	0.287	0.259	0.481	0.331
		n	160	25	7	138	44
TD_R	Tympanic Dihiscence	%	0.413	0.230	0.444	0.181	0.083
		n	151	20	12	52	11
TZS_R	Transversozygomatic Suture	%	0.148	0.069	0.037	0.282	0.135
		n	54	6	1	81	18

Table B.4. (continued). Morocco_H to Nigeria_H.

Trait Abbrev.	Trait Name		**Morocco_H**	**Nepal_H**	**Netherlands_H**	**NicobarIslands_H**	**Nigeria_H**
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.000	0.009
		n	0	0	0	0	2
AIOF_R	Multiple Infraorbital Foramina	%	0.149	0.096	0.159	0.069	0.022
		n	7	5	7	2	5
ASB_R	Asterionic Bone	%	0.085	0.231	0.159	0.034	0.195
		n	4	12	7	1	45
CCA_R	Condylar Canal	%	0.362	0.308	0.455	0.207	0.264
		n	17	16	20	6	61
HGCB_R	Divided Hypoglossal Canal	%	0.255	0.058	0.091	0.138	0.056
		n	12	3	4	4	13
MET	Metopic Suture	%	0.149	0.019	0.182	0.034	0.013
		n	7	1	8	1	3
OL	Apical Bone	%	0.191	0.154	0.136	0.034	0.126
		n	9	8	6	1	29
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.043	0.192	0.068	0.034	0.139
		n	2	10	3	1	32
PNB_R	Parietal Notch Bone	%	0.234	0.308	0.114	0.276	0.173
		n	11	16	5	8	40
SOF_R	Supraorbital Foramen	%	0.277	0.365	0.341	0.345	0.186
		n	13	19	15	10	43
TD_R	Tympanic Dihiscence	%	0.340	0.250	0.114	0.103	0.238
		n	16	13	5	3	55
TZS_R	Transversozygomatic Suture	%	0.213	0.154	0.045	0.172	0.091
		n	10	8	2	5	21

Table B.4. (continued). Nubia_H to Patagonia_H.

Trait Abbrev.	Trait Name		Nubia_H	NZ_Maori_H	Okhotsk_H	Palestine_H	Patagonia_H
AEX_R	Auditory Exostosis (Torus)	%	0.007	0.037	0.048	0.000	0.008
		n	3	8	4	0	1
AIOF_R	Multiple Infraorbital Foramina	%	0.056	0.110	0.120	0.087	0.109
		n	25	24	10	2	14
ASB_R	Asterionic Bone	%	0.160	0.205	0.084	0.087	0.086
		n	72	45	7	2	11
CCA_R	Condylar Canal	%	0.307	0.297	0.169	0.435	0.039
		n	138	65	14	10	5
HGCB_R	Divided Hypoglossal Canal	%	0.140	0.064	0.145	0.304	0.219
		n	63	14	12	7	28
MET	Metopic Suture	%	0.033	0.018	0.012	0.043	0.008
		n	15	4	1	1	1
OL	Apical Bone	%	0.120	0.064	0.024	0.087	0.070
		n	54	14	2	2	9
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.069	0.174	0.108	0.000	0.125
		n	31	38	9	0	16
PNB_R	Parietal Notch Bone	%	0.109	0.132	0.108	0.000	0.086
		n	49	29	9	0	11
SOF_R	Supraorbital Foramen	%	0.278	0.502	0.373	0.478	0.461
		n	125	110	31	11	59
TD_R	Tympanic Dihiscence	%	0.164	0.059	0.157	0.174	0.453
		n	74	13	13	4	58
TZS_R	Transversozygomatic Suture	%	0.084	0.073	0.434	0.130	0.063
		n	38	16	36	3	8

Table B.4. (continued). Peru_H to Russia_H.

Trait Abbrev.	Trait Name		Peru_H	Philippines_H	PNG_H	Pol_Society_H	Russia_H
AEX_R	Auditory Exostosis (Torus)	%	0.080	0.006	0.003	0.000	0.000
		n	39	2	2	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.084	0.191	0.143	0.148	0.193
		n	41	62	107	13	11
ASB_R	Asterionic Bone	%	0.233	0.194	0.189	0.182	0.123
		n	114	63	141	16	7
CCA_R	Condylar Canal	%	0.125	0.290	0.301	0.239	0.281
		n	61	94	225	21	16
HGCB_R	Divided Hypoglossal Canal	%	0.198	0.130	0.031	0.114	0.123
		n	97	42	23	10	7
MET	Metopic Suture	%	0.018	0.022	0.024	0.011	0.105
		n	9	7	18	1	6
OL	Apical Bone	%	0.176	0.108	0.072	0.057	0.246
		n	86	35	54	5	14
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.194	0.213	0.156	0.205	0.070
		n	95	69	117	18	4
PNB_R	Parietal Notch Bone	%	0.184	0.210	0.130	0.091	0.088
		n	90	68	97	8	5
SOF_R	Supraorbital Foramen	%	0.397	0.346	0.281	0.466	0.263
		n	194	112	210	41	15
TD_R	Tympanic Dihiscence	%	0.613	0.346	0.261	0.080	0.140
		n	300	112	195	7	8
TZS_R	Transversozygomatic Suture	%	0.207	0.157	0.071	0.091	0.123
		n	101	51	53	8	7

Table B.4. (continued). Sami_H to Spain_H.

Trait Abbrev.	Trait Name		Sami_H	Siberia_H	Singapore_H	Somalia_H	SouthAfrica_H	Spain_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.000	0.000	0.000
		n	0	0	0	0	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.143	0.158	0.165	0.100	0.042	0.130
		n	6	6	15	8	8	3
ASB_R	Asterionic Bone	%	0.262	0.263	0.187	0.113	0.172	0.000
		n	11	10	17	9	33	0
CCA_R	Condylar Canal	%	0.262	0.079	0.330	0.350	0.359	0.348
		n	11	3	30	28	69	8
HGCB_R	Divided Hypoglossal Canal	%	0.119	0.132	0.077	0.050	0.109	0.304
		n	5	5	7	4	21	7
MET	Metopic Suture	%	0.048	0.000	0.022	0.013	0.005	0.043
		n	2	0	2	1	1	1
OL	Apical Bone	%	0.190	0.158	0.099	0.175	0.104	0.174
		n	8	6	9	14	20	4
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.071	0.132	0.297	0.138	0.115	0.000
		n	3	5	27	11	22	0
PNB_R	Parietal Notch Bone	%	0.214	0.263	0.198	0.138	0.125	0.087
		n	9	10	18	11	24	2
SOF_R	Supraorbital Foramen	%	0.429	0.763	0.429	0.338	0.286	0.130
		n	18	29	39	27	55	3
TD_R	Tympanic Dihiscence	%	0.262	0.263	0.275	0.238	0.167	0.130
		n	11	10	25	19	32	3
TZS_R	Transversozygomatic Suture	%	0.286	0.026	0.088	0.150	0.161	0.261
		n	12	1	8	12	31	6

Table B.4. (continued). SriLanka_H to Syria_H.

Trait Abbrev.	Trait Name		SriLanka_H	Sumatra_H	Sweden_H	Switzerland_H	Syria_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.023	0.000	0.000	0.000
		n	0	1	0	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.040	0.186	0.086	0.016	0.087
		n	1	8	3	1	4
ASB_R	Asterionic Bone	%	0.320	0.116	0.343	0.159	0.196
		n	8	5	12	10	9
CCA_R	Condylar Canal	%	0.320	0.302	0.257	0.381	0.239
		n	8	13	9	24	11
HGCB_R	Divided Hypoglossal Canal	%	0.080	0.116	0.143	0.190	0.239
		n	2	5	5	12	11
MET	Metopic Suture	%	0.080	0.047	0.057	0.175	0.087
		n	2	2	2	11	4
OL	Apical Bone	%	0.200	0.023	0.114	0.175	0.304
		n	5	1	4	11	14
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.120	0.047	0.057	0.032	0.087
		n	3	2	2	2	4
PNB_R	Parietal Notch Bone	%	0.400	0.209	0.114	0.079	0.109
		n	10	9	4	5	5
SOF_R	Supraorbital Foramen	%	0.400	0.372	0.171	0.286	0.304
		n	10	16	6	18	14
TD_R	Tympanic Dihiscence	%	0.240	0.349	0.086	0.190	0.196
		n	6	15	3	12	9
TZS_R	Transversozygomatic Suture	%	0.200	0.116	0.257	0.032	0.087
		n	5	5	9	2	4

Table B.4. (continued). Austria_H to Borneo_H.

Trait Abbrev.	Trait Name		Tanzania_H	Thailand_H	Tibet_H	Turkey_H	UK_Medieval_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000	0.020	0.001
		n	0	0	0	3	1
AIOF_R	Multiple Infraorbital Foramina	%	0.067	0.195	0.073	0.053	0.077
		n	11	15	6	8	54
ASB_R	Asterionic Bone	%	0.209	0.117	0.134	0.067	0.109
		n	34	9	11	10	76
CCA_R	Condylar Canal	%	0.350	0.338	0.329	0.233	0.390
		n	57	26	27	35	272
HGCB_R	Divided Hypoglossal Canal	%	0.061	0.039	0.073	0.160	0.140
		n	10	3	6	24	98
MET	Metopic Suture	%	0.055	0.000	0.098	0.067	0.133
		n	9	0	8	10	93
OL	Apical Bone	%	0.141	0.078	0.171	0.087	0.158
		n	23	6	14	13	110
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.117	0.169	0.195	0.007	0.027
		n	19	13	16	1	19
PNB_R	Parietal Notch Bone	%	0.196	0.195	0.256	0.060	0.125
		n	32	15	21	9	87
SOF_R	Supraorbital Foramen	%	0.215	0.364	0.354	0.327	0.269
		n	35	28	29	49	188
TD_R	Tympanic Dihiscence	%	0.282	0.338	0.341	0.200	0.153
		n	46	26	28	30	107
TZS_R	Transversozygomatic Suture	%	0.098	0.182	0.220	0.133	0.119
		n	16	14	18	20	83

Table B.4. (continued). Ukraine_H to Yugoslavia_H.

Trait Abbrev.	Trait Name		Ukraine_H	Vietnam_H	Yugoslavia_H
AEX_R	Auditory Exostosis (Torus)	%	0.000	0.000	0.000
		n	0	0	0
AIOF_R	Multiple Infraorbital Foramina	%	0.118	0.174	0.086
		n	4	8	5
ASB_R	Asterionic Bone	%	0.118	0.174	0.138
		n	4	8	8
CCA_R	Condylar Canal	%	0.147	0.261	0.259
		n	5	12	15
HGCB_R	Divided Hypoglossal Canal	%	0.176	0.043	0.155
		n	6	2	9
MET	Metopic Suture	%	0.059	0.043	0.138
		n	2	2	8
OL	Apical Bone	%	0.176	0.087	0.172
		n	6	4	10
OMB_R	Ossicle in Occipito-Mastoid Suture	%	0.088	0.109	0.103
		n	3	5	6
PNB_R	Parietal Notch Bone	%	0.118	0.174	0.138
		n	4	8	8
SOF_R	Supraorbital Foramen	%	0.353	0.326	0.241
		n	12	15	14
TD_R	Tympanic Dihiscence	%	0.265	0.217	0.121
		n	9	10	7
TZS_R	Transversozygomatic Suture	%	0.147	0.152	0.034
		n	5	7	2

Table B.5. Frequency table for MMS traits.

Trait Abbrev.	Trait Name		AmericanBlack	AmericanWhite	Chinese	Colombian	DW_Burma	Guatemalan	Japanese	Mexico	PacificAmerindian	Peruvian	SWHispanic	Thailand
ANS	Anterior Nasal Spine	%	0.690	0.725	1.000	0.942	0.465	0.957	1.000	0.565	0.753	0.688	0.796	0.781
		n	69	79	57	97	59	90	15	13	70	11	78	75
INA	Inferior Nasal Aperture	%	0.230	0.404	0.000	0.563	0.236	0.383	0.133	0.261	0.129	0.188	0.296	0.229
		n	23	44	0	58	30	36	2	6	12	3	29	22
IOB	Interorbital Width	%	0.450	0.037	0.053	0.379	0.118	0.170	0.067	0.043	0.151	0.188	0.051	0.146
		n	45	4	3	39	15	16	1	1	14	3	5	14
NAW	Nasal Aperture Width	%	0.480	0.963	0.912	0.796	0.906	0.766	0.867	0.826	0.978	0.938	0.959	0.760
		n	48	105	52	82	115	72	13	19	91	15	94	73
NBS	Nasal Bone Shape	%	0.900	0.908	0.912	0.932	0.787	0.915	0.933	0.826	0.914	0.875	0.959	0.313
		n	90	99	52	96	100	86	14	19	85	14	94	30
PBD	Post-bregmatic Depression	%	0.560	0.734	0.895	0.592	0.961	0.862	0.867	0.783	0.957	0.688	0.765	0.896
		n	56	80	51	61	122	81	13	18	89	11	75	86

Table B.6. Frequency table for dental nonmetric traits. Dart_Black_P to Japan_Chiba_P.

Trait Abbrev.	Trait Name	Key Tooth		Dart_Black_P	Dart_Coloured_P	DW_Burma	Japan_Chiba_P
P_U_M1_CARAB	Carabelli's Trait	UM1	%	0.042	0.250	0.024	0.092
			n	4	1	2	8
P_U_M1_ENEX	Enamel Extension	UM1	%	0.000	0.000	0.325	0.356
			n	0	0	27	31
P_U_M1_METCONL	Metaconule	UM1	%	0.126	0.000	0.289	0.080
			n	12	0	24	7
P_U_M1_PARAST	Parastyle	UM1	%	0.000	0.000	0.000	0.000
			n	0	0	0	0
P_U_M2_HYPCON	Hypocone	UM2	%	0.768	0.750	1.000	0.816
			n	73	3	83	71
P_U_M2_MOLCR	Molar Crenulation	UM2	%	0.053	0.000	0.012	0.000
			n	5	0	1	0
P_U_M3_METCON	Metacone	UM3	%	1.000	1.000	0.988	0.977
			n	95	4	82	85
P_U_P3_ACCUP	Accessory Cusp	UP3	%	0.042	0.000	0.410	0.218
			n	4	0	34	19
P_U_P3_ROOTNUM	Root Number	UP3	%	0.537	0.500	0.639	0.483
			n	51	2	53	42
P_U_P4_ODONT	Odontome	UP4	%	0.021	0.000	0.012	0.000
			n	2	0	1	0

Table B.6. (continued). Kirsten_Black_P to Pretoria_Black_P.

Trait Abbrev.	Trait Name	Key Tooth		Kirsten_Black_P	Kirsten_Coloured_P	Kirsten_White_P	Pretoria_Black_P
P_U_M1_CARAB	Carabelli's Trait	UM1	%	0.056	0.111	0.000	0.128
			n	2	7	0	24
P_U_M1_ENEX	Enamel Extension	UM1	%	0.000	0.000	0.000	0.000
			n	0	0	0	0
P_U_M1_METCONL	Metaconule	UM1	%	0.250	0.175	0.000	0.075
			n	9	11	0	14
P_U_M1_PARAST	Parastyle	UM1	%	0.000	0.000	0.000	0.000
			n	0	0	0	0
P_U_M2_HYPCON	Hypocone	UM2	%	0.806	0.841	0.333	0.840
			n	29	53	1	157
P_U_M2_MOLCR	Molar Crenulation	UM2	%	0.028	0.032	0.000	0.016
			n	1	2	0	3
P_U_M3_METCON	Metacone	UM3	%	1.000	1.000	1.000	0.995
			n	36	63	3	186
P_U_P3_ACCUP	Accessory Cusp	UP3	%	0.000	0.111	0.000	0.043
			n	0	7	0	8
P_U_P3_ROOTNUM	Root Number	UP3	%	0.556	0.635	0.667	0.578
			n	20	40	2	108
P_U_P4_ODONT	Odontome	UP4	%	0.000	0.000	0.000	0.000
			n	0	0	0	0

Table B.6. (continued). Pretoria_White_P to TXST_White_P.

Trait Abbrev.	**Trait Name**	**Key Tooth**		**Pretoria_White_P**	**TXST_Black_P**	**TXST_Hispanic_P**	**TXST_White_P**
P_U_M1_CARAB	Carabelli's Trait	UM1	%	0.167	0.000	0.000	0.133
			n	2	0	0	12
P_U_M1_ENEX	Enamel Extension	UM1	%	0.000	0.000	0.000	0.011
			n	0	0	0	1
P_U_M1_METCONL	Metaconule	UM1	%	0.083	0.250	0.000	0.056
			n	1	1	0	5
P_U_M1_PARAST	Parastyle	UM1	%	0.000	0.000	0.000	0.000
			n	0	0	0	0
P_U_M2_HYPCON	Hypocone	UM2	%	0.833	1.000	0.333	0.756
			n	10	4	1	68
P_U_M2_MOLCR	Molar Crenulation	UM2	%	0.000	0.250	0.000	0.000
			n	0	1	0	0
P_U_M3_METCON	Metacone	UM3	%	1.000	1.000	1.000	1.000
			n	12	4	3	90
P_U_P3_ACCUP	Accessory Cusp	UP3	%	0.000	0.000	0.000	0.067
			n	0	0	0	6
P_U_P3_ROOTNUM	Root Number	UP3	%	0.500	0.500	0.333	0.589
			n	6	2	1	53
P_U_P4_ODONT	Odontome	UP4	%	0.000	0.000	0.000	0.011
			n	0	0	0	1

Table B.6. (continued). UTK_Black_P.

Trait Abbrev.	Trait Name	Key Tooth		UTK_Black_P
P_U_M1_CARAB	Carabelli's Trait	UM1	%	0.083
			n	2
P_U_M1_ENEX	Enamel Extension	UM1	%	0.000
			n	0
P_U_M1_METCONL	Metaconule	UM1	%	0.083
			n	2
P_U_M1_PARAST	Parastyle	UM1	%	0.000
			n	0
P_U_M2_HYPCON	Hypocone	UM2	%	0.875
			n	21
P_U_M2_MOLCR	Molar Crenulation	UM2	%	0.083
			n	2
P_U_M3_METCON	Metacone	UM3	%	1.000
			n	24
P_U_P3_ACCUP	Accessory Cusp	UP3	%	0.375
			n	9
P_U_P3_ROOTNUM	Root Number	UP3	%	0.667
			n	16
P_U_P4_ODONT	Odontome	UP4	%	0.000
			n	0

Table B.7. Descriptive statistics outlining the minimum, mean, and maximum craniometric values for each population. BNL.

Population	**BNL_Min**	**BNL_Mean**	**BNL_Max**
ANDAMAN	85.00	91.64	102.00
Ainu_HH	92.00	103.60	114.00
Alaska_H	90.00	102.47	116.00
Aleut_H	87.50	98.60	110.00
Australia_HH	89.00	99.86	111.00
Austria_H	88.00	98.66	112.00
BERG	84.00	95.83	110.00
BURYAT	89.00	99.30	113.00
Bangladesh_H	89.00	98.79	103.00
Burma_YH	**82.00**	**96.73**	**110.00**
CHINA_How	87.00	98.64	107.00
Canada_Indigenous_H	92.00	101.31	114.00
China_H	85.00	99.09	111.00
Czech_H	87.00	98.01	112.00
Easter_Isl_HH	97.00	108.11	121.00
Egypt_HH	88.00	99.96	115.00
GUAM	95.00	102.63	112.00
Germany_H	87.00	97.49	110.00
Ghana_Ashanti_H	92.00	100.10	114.00
Greece_H	87.00	99.41	110.00
Greenland_H	90.00	104.58	117.00
Hawaii_H	95.00	105.25	116.00
Hong_Kong	87.00	99.36	108.00
Hungary_H	87.50	98.53	111.00
India_H	86.00	99.07	113.00
Indonesia_H	90.00	99.19	109.00
JAPAN_How	85.00	99.21	110.00
Japan_H	87.00	100.20	114.00
Japan_P	90.00	101.84	113.00
Kenya_H	88.50	99.69	110.00
Korea_South_H	92.00	99.76	109.00
Laos_H	94.00	98.44	104.00
Malaysia_H	89.00	98.76	107.00
Maori_H	89.00	103.67	112.00
Melanesia_H	90.00	99.96	112.00
Mexico_H	88.00	98.77	112.00
Mongolia_H	83.00	98.79	113.00
Moriori_HH	93.00	103.95	118.00
NORSE	88.00	99.55	112.00
Nepal_H	90.00	97.43	108.00
Nigeria_H	91.00	99.99	111.00
Nubia_H	92.00	101.37	114.00
PNG_H	88.00	98.35	109.00
Palestine_H	92.00	100.57	110.00

Peru_HH	83.00	95.23	108.00
Philippines_HH	88.00	97.96	115.00
Russia_H	93.00	100.77	109.00
Singapore_H	90.00	97.60	107.00
SouthAfrica_H	92.00	101.62	118.00
SriLanka_H	87.00	97.23	106.00
Switzerland_H	88.00	95.25	105.00
TASMANIA	88.00	97.34	108.00
TEITA	90.00	98.72	111.00
TOLAI	86.00	98.60	110.00
Taiwan	87.00	98.98	105.00
Tanzania_H	88.00	99.88	107.00
Thailand_PH	87.00	98.21	110.00
Tibet_H	90.00	97.15	109.00
UK_Medieval_H	87.00	99.22	112.00
Vietnam_PH	88.00	98.30	109.00
ZALAVAR	90.00	99.09	109.00
ZULU	88.00	99.85	114.00

Table B.7. (continued). BPL.

Population	**BPL_Min**	**BPL_Mean**	**BPL_Max**
ANDAMAN	82.00	91.84	100.00
Ainu_HH	87.00	101.77	116.00
Alaska_H	86.00	100.05	114.00
Aleut_H	86.00	101.33	116.00
Australia_HH	92.00	103.44	120.00
Austria_H	77.50	94.00	108.00
BERG	81.00	91.88	108.00
BURYAT	82.00	96.75	112.00
Bangladesh_H	87.00	94.00	100.00
Burma_YH	**77.00**	**95.49**	**110.00**
CHINA_How	84.00	95.92	109.00
Canada_Indigenous_H	88.00	100.06	112.00
China_H	82.00	95.65	106.00
Czech_H	80.00	92.94	106.00
Easter_Isl_HH	91.00	104.24	116.00
Egypt_HH	82.00	94.97	108.00
GUAM	91.00	99.11	115.00
Germany_H	80.00	92.88	106.00
Ghana_Ashanti_H	91.00	102.16	114.00
Greece_H	80.00	93.55	105.00
Greenland_H	92.00	102.67	113.00
Hawaii_H	93.00	101.89	113.00
Hong_Kong	86.00	97.46	110.00
Hungary_H	79.00	94.30	109.00
India_H	81.00	95.29	110.00
Indonesia_H	88.00	98.56	109.00
JAPAN_How	81.00	96.76	110.00
Japan_H	84.00	96.75	113.00
Japan_P	84.00	98.57	111.00
Kenya_H	89.00	100.99	113.00
Korea_South_H	89.00	95.42	107.00
Laos_H	91.00	95.69	100.00
Malaysia_H	88.00	97.47	111.00
Maori_H	90.00	100.59	113.00
Melanesia_H	90.00	103.39	119.00
Mexico_H	85.00	97.78	109.00
Mongolia_H	83.00	96.24	109.00
Moriori_HH	92.00	101.26	114.00
NORSE	86.00	95.49	114.00
Nepal_H	84.00	94.83	105.00
Nigeria_H	88.00	100.68	114.00
Nubia_H	78.00	97.56	113.00
PNG_H	89.00	101.42	115.00
Palestine_H	86.00	95.95	107.00
Peru_HH	80.00	94.17	112.00

Philippines_HH	83.00	96.21	112.00
Russia_H	87.00	96.68	105.00
Singapore_H	83.00	95.32	103.00
SouthAfrica_H	86.00	101.89	115.00
SriLanka_H	86.00	92.80	103.00
Switzerland_H	78.00	90.64	101.00
TASMANIA	87.00	100.82	115.00
TEITA	86.00	98.73	114.00
TOLAI	92.00	104.34	123.00
Taiwan	85.00	94.77	102.00
Tanzania_H	89.00	103.01	117.00
Thailand_PH	85.00	96.24	108.00
Tibet_H	84.00	94.64	112.00
UK_Medieval_H	79.00	93.64	109.00
Vietnam_PH	89.00	96.58	111.00
ZALAVAR	83.00	94.80	110.00
ZULU	88.00	100.71	116.00

Table B.7. (continued). MDH.

Population	**MDH_Min**	**MDH_Mean**	**MDH_Max**
ANDAMAN	17.00	24.17	30.00
Ainu_HH	18.00	27.45	37.00
Alaska_H	17.00	25.05	35.00
Aleut_H	17.00	24.01	33.00
Australia_HH	19.00	28.36	37.00
Austria_H	16.00	24.48	32.00
BERG	18.00	27.00	36.00
BURYAT	18.00	27.74	35.00
Bangladesh_H	23.00	27.79	36.00
Burma_YH	**23.00**	**30.76**	**39.00**
CHINA_How	20.00	28.57	35.00
Canada_Indigenous_H	16.00	25.02	36.00
China_H	21.00	28.37	35.00
Czech_H	17.00	25.55	34.00
Easter_Isl_HH	18.00	28.18	38.00
Egypt_HH	18.00	26.54	38.00
GUAM	22.00	29.11	39.00
Germany_H	19.50	25.75	35.00
Ghana_Ashanti_H	18.00	25.79	34.00
Greece_H	18.00	26.00	32.00
Greenland_H	15.00	24.93	34.00
Hawaii_H	21.00	27.45	35.00
Hong_Kong	20.00	27.30	35.00
Hungary_H	18.00	24.38	33.00
India_H	16.00	27.16	35.00
Indonesia_H	20.00	29.13	36.00
JAPAN_How	20.00	28.53	39.00
Japan_H	20.00	28.17	37.00
Japan_P	20.00	27.06	34.00
Kenya_H	20.00	25.94	34.00
Korea_South_H	20.00	29.89	34.00
Laos_H	24.00	28.13	32.00
Malaysia_H	21.00	27.99	37.00
Maori_H	20.00	28.70	36.00
Melanesia_H	20.00	28.92	39.00
Mexico_H	18.00	26.76	33.00
Mongolia_H	18.00	26.32	34.00
Moriori_HH	21.00	29.61	37.00
NORSE	19.00	27.78	37.00
Nepal_H	19.00	27.97	34.00
Nigeria_H	22.00	27.56	41.00
Nubia_H	20.00	27.11	33.00
PNG_H	18.00	27.12	40.00
Palestine_H	19.00	27.03	34.00
Peru_HH	17.00	26.32	38.00
Philippines_HH	18.00	26.98	37.00
Russia_H	21.00	27.76	35.00

Singapore_H	21.00	26.22	32.00
SouthAfrica_H	16.00	26.64	35.00
SriLanka_H	19.00	23.60	30.00
Switzerland_H	17.00	24.87	32.00
TASMANIA	18.00	24.60	36.00
TEITA	17.00	26.19	35.00
TOLAI	19.00	27.45	36.00
Taiwan	19.00	24.94	30.00
Tanzania_H	17.00	25.37	35.00
Thailand_PH	20.50	26.84	36.00
Tibet_H	21.00	28.90	37.00
UK_Medieval_H	18.00	25.86	34.00
Vietnam_PH	13.00	27.03	34.00
ZALAVAR	21.00	28.04	35.00
ZULU	19.00	27.14	34.00

Table B.7. (continued). ASB.

Population	ASB_Min	ASB_Mean	ASB_Max
ANDAMAN	88.00	98.00	112.00
Ainu_HH	95.00	108.97	122.00
Alaska_H	95.00	109.33	125.00
Aleut_H	103.00	114.78	130.00
Australia_HH	95.00	107.20	123.00
Austria_H	96.00	110.46	123.00
BERG	98.00	110.97	127.00
BURYAT	101.00	114.59	128.00
Bangladesh_H	96.00	102.79	107.00
Burma_YH	**92.00**	**105.83**	**117.00**
CHINA_How	93.00	105.41	119.00
Canada_Indigenous_H	98.00	109.60	119.00
China_H	97.00	108.15	122.00
Czech_H	95.00	110.93	122.00
Easter_Isl_HH	94.00	106.08	118.00
Egypt_HH	92.00	106.24	119.00
GUAM	100.00	107.82	118.00
Germany_H	100.00	112.00	125.00
Ghana_Ashanti_H	90.00	103.46	114.00
Greece_H	93.00	107.51	118.50
Greenland_H	99.00	108.73	121.00
Hawaii_H	101.00	107.36	113.00
Hong_Kong	96.00	108.22	117.00
Hungary_H	98.00	109.14	121.00
India_H	92.00	103.88	118.00
Indonesia_H	98.00	106.20	120.00
JAPAN_How	96.00	106.80	119.00
Japan_H	94.00	107.99	120.00
Japan_P	98.00	107.60	120.00
Kenya_H	93.00	104.62	114.50
Korea_South_H	99.00	108.32	114.00
Laos_H	95.00	105.63	116.00
Malaysia_H	97.00	107.27	119.00
Maori_H	95.00	108.54	119.00
Melanesia_H	94.50	106.79	119.00
Mexico_H	97.00	106.27	117.00
Mongolia_H	99.00	112.55	123.00
Moriori_HH	90.00	107.99	119.00
NORSE	96.00	109.30	123.00
Nepal_H	98.00	105.28	114.00
Nigeria_H	96.00	104.66	118.00
Nubia_H	97.00	106.46	117.00
PNG_H	93.00	105.15	119.00
Palestine_H	96.00	108.30	119.00
Peru_HH	96.00	108.04	133.00

Philippines_HH	93.00	105.75	120.00
Russia_H	100.00	111.35	122.00
Singapore_H	96.00	106.94	116.50
SouthAfrica_H	92.00	107.05	119.00
SriLanka_H	92.00	98.80	105.00
Switzerland_H	99.00	110.97	123.00
TASMANIA	100.00	107.21	119.00
TEITA	91.00	102.33	115.00
TOLAI	97.00	104.60	116.00
Taiwan	97.00	106.11	116.00
Tanzania_H	97.00	106.66	119.00
Thailand_PH	97.00	107.76	119.00
Tibet_H	97.00	105.79	118.00
UK_Medieval_H	94.00	110.97	125.00
Vietnam_PH	93.00	104.89	116.00
ZALAVAR	97.00	109.51	122.00
ZULU	94.00	104.40	115.00

Table B.7. (continued). AUB.

Population	**AUB_Min**	**AUB_Mean**	**AUB_Max**
ANDAMAN	100.00	110.93	126.00
Ainu_HH	110.00	122.82	139.00
Alaska_H	107.00	126.00	142.00
Aleut_H	116.00	132.00	147.00
Australia_HH	103.00	117.20	132.00
Austria_H	110.50	122.37	137.00
BERG	110.00	124.02	140.00
BURYAT	120.00	132.78	149.00
Bangladesh_H	106.00	115.16	123.00
Burma_YH	**103.00**	**120.21**	**135.00**
CHINA_How	110.00	122.44	135.00
Canada_Indigenous_H	113.00	127.99	144.00
China_H	114.00	124.02	134.00
Czech_H	105.00	122.54	137.00
Easter_Isl_HH	105.00	120.74	132.00
Egypt_HH	100.00	116.38	130.00
GUAM	116.00	126.68	141.00
Germany_H	109.00	123.09	138.00
Ghana_Ashanti_H	101.00	112.12	125.00
Greece_H	104.00	118.22	133.00
Greenland_H	111.00	125.70	142.00
Hawaii_H	114.00	125.25	140.00
Hong_Kong	115.00	124.12	134.00
Hungary_H	106.00	121.34	135.00
India_H	99.00	116.01	132.00
Indonesia_H	109.00	122.02	134.00
JAPAN_How	109.00	120.96	136.00
Japan_H	110.00	122.31	140.00
Japan_P	110.00	123.99	137.00
Kenya_H	100.00	116.56	128.00
Korea_South_H	113.00	125.00	134.00
Laos_H	113.00	123.06	135.00
Malaysia_H	106.00	121.88	133.50
Maori_H	109.00	125.43	136.00
Melanesia_H	103.00	118.27	133.00
Mexico_H	109.00	121.97	135.00
Mongolia_H	117.00	130.46	146.00
Moriori_HH	114.00	126.57	145.00
NORSE	108.00	121.16	134.00
Nepal_H	107.00	116.97	130.00
Nigeria_H	107.00	116.48	130.00
Nubia_H	107.00	117.51	132.00
PNG_H	101.00	115.76	132.00
Palestine_H	110.00	119.43	130.00
Peru_HH	106.00	121.88	137.50

Philippines_HH	103.00	121.85	135.00
Russia_H	103.50	124.01	140.00
Singapore_H	112.00	123.20	134.00
SouthAfrica_H	103.50	116.91	130.00
SriLanka_H	101.00	111.10	120.00
Switzerland_H	111.00	122.44	138.00
TASMANIA	103.00	120.15	132.00
TEITA	105.00	114.41	124.00
TOLAI	106.00	117.55	128.00
Taiwan	113.00	123.15	136.00
Tanzania_H	106.00	117.21	132.50
Thailand_PH	109.00	123.97	135.00
Tibet_H	101.00	120.92	135.00
UK_Medieval_H	101.00	121.58	137.00
Vietnam_PH	113.00	122.99	133.00
ZALAVAR	110.00	121.39	133.00
ZULU	107.00	114.68	124.00

Table B.7. (continued). XCB.

Population	**XCB_Min**	**XCB_Mean**	**XCB_Max**
ANDAMAN	118.00	133.37	146.00
Ainu_HH	130.00	139.93	156.00
Alaska_H	116.00	137.30	159.00
Aleut_H	130.00	145.99	162.00
Australia_HH	117.00	130.29	148.00
Austria_H	126.00	143.32	159.00
BERG	131.00	144.08	161.00
BURYAT	138.00	151.66	167.00
Bangladesh_H	123.00	132.26	140.00
Burma_YH	**124.00**	**138.83**	**153.00**
CHINA_How	125.00	137.50	151.00
Canada_Indigenous_H	130.00	140.35	154.00
China_H	126.00	140.37	155.00
Czech_H	126.00	145.13	160.00
Easter_Isl_HH	120.00	132.69	146.00
Egypt_HH	119.00	137.18	153.00
GUAM	129.00	138.70	151.00
Germany_H	124.00	144.93	163.00
Ghana_Ashanti_H	114.00	129.77	141.00
Greece_H	124.00	137.52	153.00
Greenland_H	122.00	134.97	148.00
Hawaii_H	130.00	142.42	153.00
Hong_Kong	128.00	139.28	151.00
Hungary_H	128.00	140.05	156.00
India_H	118.00	131.43	149.00
Indonesia_H	125.00	139.57	153.00
JAPAN_How	124.00	137.40	152.00
Japan_H	126.00	138.92	154.00
Japan_P	128.00	138.21	156.00
Kenya_H	120.00	131.22	144.00
Korea_South_H	129.00	140.47	149.00
Laos_H	129.00	138.38	144.00
Malaysia_H	123.00	138.11	153.00
Maori_H	118.00	137.81	151.00
Melanesia_H	116.00	131.24	150.00
Mexico_H	126.00	135.92	148.00
Mongolia_H	132.00	146.88	164.00
Moriori_HH	127.00	140.86	155.00
NORSE	127.00	139.08	152.00
Nepal_H	124.00	132.14	145.00
Nigeria_H	126.00	134.34	146.00
Nubia_H	124.00	136.83	148.00
PNG_H	113.00	130.32	148.00
Palestine_H	127.00	137.54	151.00
Peru_HH	123.00	137.10	153.00

Philippines_HH	116.00	138.77	154.00
Russia_H	129.00	143.08	156.00
Singapore_H	129.00	140.52	153.00
SouthAfrica_H	123.00	134.94	149.00
SriLanka_H	117.00	126.55	135.00
Switzerland_H	129.00	144.17	159.00
TASMANIA	118.00	135.68	149.00
TEITA	116.00	127.80	139.00
TOLAI	120.00	129.24	139.00
Taiwan	120.00	137.62	148.00
Tanzania_H	122.00	132.76	147.00
Thailand_PH	130.00	141.54	157.00
Tibet_H	121.00	136.93	152.00
UK_Medieval_H	124.00	142.23	160.00
Vietnam_PH	128.00	139.72	153.00
ZALAVAR	127.00	139.33	149.00
ZULU	120.00	133.02	149.00

Table B.7. (continued). FRC.

Population	FRC_Min	FRC_Mean	FRC_Max
ANDAMAN	95.00	104.11	119.00
Ainu_HH	100.00	111.28	126.00
Alaska_H	99.00	111.46	125.00
Aleut_H	99.00	110.31	122.00
Australia_HH	95.00	110.57	124.00
Austria_H	96.50	109.01	123.00
BERG	96.00	108.71	122.00
BURYAT	101.00	111.72	125.00
Bangladesh_H	99.00	110.84	123.00
Burma_YH	**99.00**	**109.86**	**124.00**
CHINA_How	99.00	110.46	124.00
Canada_Indigenous_H	98.00	112.57	126.00
China_H	100.00	111.92	127.00
Czech_H	97.00	109.26	122.00
Easter_Isl_HH	101.00	113.69	126.00
Egypt_HH	98.00	111.15	128.00
GUAM	103.00	113.65	126.00
Germany_H	100.50	111.35	129.00
Ghana_Ashanti_H	98.50	108.98	120.50
Greece_H	98.00	109.56	123.00
Greenland_H	100.00	112.82	126.00
Hawaii_H	108.00	116.11	128.00
Hong_Kong	104.00	112.30	122.00
Hungary_H	96.00	109.20	119.00
India_H	93.00	109.65	121.00
Indonesia_H	100.00	110.47	125.00
JAPAN_How	94.00	108.99	121.00
Japan_H	98.00	109.89	120.00
Japan_P	102.00	111.00	121.00
Kenya_H	96.00	111.02	122.00
Korea_South_H	104.00	111.11	119.00
Laos_H	105.00	109.75	116.00
Malaysia_H	102.00	111.29	123.00
Maori_H	101.00	114.34	129.00
Melanesia_H	96.00	110.57	124.00
Mexico_H	98.00	108.65	121.00
Mongolia_H	98.00	111.60	125.00
Moriori_HH	99.00	112.38	126.00
NORSE	99.00	110.55	123.00
Nepal_H	102.00	109.38	121.00
Nigeria_H	101.00	111.64	124.00
Nubia_H	98.00	111.89	123.00
PNG_H	94.00	108.16	122.00
Palestine_H	102.00	112.51	124.00
Peru_HH	96.00	107.31	124.00

Philippines_HH	97.00	109.89	121.00
Russia_H	99.00	111.96	124.00
Singapore_H	102.00	110.91	122.00
SouthAfrica_H	99.00	113.20	128.00
SriLanka_H	95.00	108.40	117.00
Switzerland_H	98.50	110.29	121.00
TASMANIA	94.00	108.15	120.00
TEITA	93.00	106.96	118.00
TOLAI	95.00	105.87	118.00
Taiwan	104.00	112.47	125.00
Tanzania_H	100.50	110.60	123.00
Thailand_PH	101.00	111.66	122.00
Tibet_H	99.00	109.34	120.00
UK_Medieval_H	99.00	111.26	124.00
Vietnam_PH	102.00	112.03	123.00
ZALAVAR	98.00	110.30	120.00
ZULU	100.00	110.64	122.00

Table B.7. (continued). NLH.

Population	NLH_Min	NLH_Mean	NLH_Max
ANDAMAN	40.00	45.29	51.00
Ainu_HH	42.00	50.48	58.00
Alaska_H	45.00	53.58	64.00
Aleut_H	45.00	52.41	60.00
Australia_HH	40.00	49.28	56.00
Austria_H	44.00	49.98	58.50
BERG	42.00	50.02	58.00
BURYAT	47.00	55.14	62.00
Bangladesh_H	45.00	50.11	56.00
Burma_YH	**41.00**	**50.57**	**62.00**
CHINA_How	42.00	51.47	58.00
Canada_Indigenous_H	46.50	53.18	62.00
China_H	44.00	54.02	66.00
Czech_H	42.00	49.82	59.00
Easter_Isl_HH	42.00	51.68	60.00
Egypt_HH	43.00	50.97	59.00
GUAM	47.00	52.77	60.00
Germany_H	44.00	51.41	59.00
Ghana_Ashanti_H	41.00	47.78	54.00
Greece_H	43.50	50.55	58.00
Greenland_H	42.00	53.54	64.00
Hawaii_H	46.00	52.97	58.00
Hong_Kong	47.00	52.42	57.00
Hungary_H	28.00	49.51	57.00
India_H	40.00	49.19	61.00
Indonesia_H	45.00	51.69	58.00
JAPAN_How	44.00	51.26	60.00
Japan_H	42.00	51.34	59.00
Japan_P	44.00	51.66	77.00
Kenya_H	40.00	48.85	58.50
Korea_South_H	49.00	53.63	58.00
Laos_H	46.00	50.84	54.00
Malaysia_H	44.00	51.20	59.00
Maori_H	45.00	53.07	61.00
Melanesia_H	43.00	49.78	58.00
Mexico_H	43.00	50.52	60.50
Mongolia_H	47.00	54.98	65.00
Moriori_HH	46.00	54.91	65.00
NORSE	44.00	50.56	59.00
Nepal_H	44.00	49.19	54.00
Nigeria_H	43.00	49.42	59.00
Nubia_H	43.00	50.55	58.00
PNG_H	42.00	49.47	58.00
Palestine_H	43.00	51.22	58.00
Peru_HH	42.00	49.27	57.50

Philippines_HH	43.00	50.43	56.00
Russia_H	44.00	51.75	57.00
Singapore_H	46.00	51.71	58.50
SouthAfrica_H	41.50	49.21	58.00
SriLanka_H	40.00	46.55	51.00
Switzerland_H	44.00	50.26	58.00
TASMANIA	40.00	47.10	56.00
TEITA	40.00	47.93	58.00
TOLAI	41.00	47.55	55.00
Taiwan	46.00	53.30	60.00
Tanzania_H	37.00	48.26	56.00
Thailand_PH	44.00	51.85	60.00
Tibet_H	40.00	51.05	57.00
UK_Medieval_H	40.00	50.72	60.00
Vietnam_PH	46.00	52.62	59.00
ZALAVAR	42.00	50.08	57.00
ZULU	41.00	48.77	57.00

Table B.8. D^2 matrix for craniometric data. Ainu_HH to China_H.

	Ainu_HH	Alaska_H	Aleut_H	ANDAMAN	Australia_HH	Austria_H	Bangladesh_H	BERG	**Burma_YH**	BURYAT	Canada_H	China_H
Ainu_HH	0	0.227	0.356	0.303	0.265	0.227	0.177	0.275	**0.263**	0.417	0.146	0.173
Alaska_H	0.227	0	0.247	0.487	0.488	0.339	0.300	0.469	**0.461**	0.517	0.046	0.259
Aleut_H	0.356	0.247	0	0.639	0.658	0.328	0.652	0.366	**0.610**	0.254	0.144	0.475
ANDAMAN	0.303	0.487	0.639	0	0.460	0.349	0.190	0.345	**0.196**	0.628	0.403	0.313
Australia_HH	0.265	0.488	0.658	0.460	0	0.563	0.226	0.504	**0.399**	0.787	0.402	0.412
Austria_H	0.227	0.339	0.328	0.349	0.563	0	0.302	0.069	**0.339**	0.250	0.273	0.256
Bangladesh_H	0.177	0.300	0.652	0.190	0.226	0.302	0	0.306	**0.148**	0.583	0.272	0.151
BERG	0.275	0.469	0.366	0.345	0.504	0.069	0.306	0	**0.280**	0.183	0.330	0.274
Burma_YH	**0.263**	**0.461**	**0.610**	**0.196**	**0.399**	**0.339**	**0.148**	**0.280**	**0**	**0.395**	**0.375**	**0.148**
BURYAT	0.417	0.517	0.254	0.628	0.787	0.250	0.583	0.183	**0.395**	0	0.327	0.356
Canada_H	0.146	0.046	0.144	0.403	0.402	0.273	0.272	0.330	**0.375**	0.327	0	0.211
China_H	0.173	0.259	0.475	0.313	0.412	0.256	0.151	0.274	**0.148**	0.356	0.211	0
CHINA_Howells	0.173	0.392	0.633	0.208	0.343	0.332	0.124	0.311	**0.087**	0.444	0.306	0.065
Czech_H	0.294	0.435	0.421	0.364	0.679	0.020	0.377	0.078	**0.312**	0.258	0.366	0.279
EasterIsl_HH	0.189	0.462	0.900	0.565	0.343	0.576	0.271	0.679	**0.454**	0.923	0.439	0.365
Egypt_HH	0.119	0.296	0.529	0.286	0.319	0.158	0.075	0.203	**0.276**	0.487	0.253	0.127
Germany_H	0.270	0.362	0.300	0.442	0.568	0.040	0.329	0.049	**0.383**	0.228	0.271	0.260
Ghana_H	0.167	0.452	0.698	0.297	0.097	0.526	0.181	0.557	**0.345**	0.833	0.373	0.328
Greece_H	0.168	0.278	0.507	0.278	0.452	0.099	0.134	0.186	**0.218**	0.448	0.268	0.135
Greenland_H	0.271	0.068	0.449	0.630	0.475	0.485	0.359	0.674	**0.634**	0.822	0.159	0.325
GUAM	0.112	0.258	0.549	0.320	0.338	0.377	0.146	0.393	**0.145**	0.468	0.197	0.080
Hawaii_H	0.106	0.266	0.496	0.393	0.464	0.302	0.246	0.391	**0.280**	0.458	0.182	0.184
HongKong	0.139	0.230	0.462	0.285	0.340	0.282	0.171	0.327	**0.183**	0.438	0.191	0.022
Hungary_H	0.164	0.304	0.367	0.280	0.404	0.018	0.201	0.077	**0.294**	0.310	0.236	0.200
India_H	0.177	0.327	0.666	0.212	0.198	0.270	0.000	0.305	**0.190**	0.635	0.317	0.184
Indonesia_H	0.158	0.349	0.498	0.201	0.337	0.294	0.137	0.293	**0.033**	0.341	0.256	0.079
Japan_H	0.077	0.204	0.422	0.243	0.339	0.216	0.106	0.249	**0.147**	0.407	0.164	0.049
JAPAN_Howells	0.101	0.267	0.480	0.218	0.264	0.257	0.092	0.240	**0.119**	0.419	0.198	0.059
Japan_P	0.121	0.136	0.449	0.325	0.397	0.247	0.168	0.354	**0.299**	0.553	0.156	0.112
Kenya_H	0.150	0.358	0.546	0.304	0.070	0.433	0.131	0.434	**0.360**	0.689	0.280	0.319
Korea_South_H	0.198	0.309	0.549	0.294	0.459	0.256	0.141	0.267	**0.054**	0.338	0.266	0.009
Laos_H	0.126	0.308	0.488	0.133	0.328	0.230	0.066	0.230	**0.017**	0.319	0.229	0.051
Malaysia_H	0.132	0.282	0.468	0.208	0.291	0.244	0.100	0.278	**0.071**	0.389	0.226	0.046
Maori_H	0.066	0.193	0.455	0.386	0.259	0.311	0.123	0.340	**0.247**	0.493	0.140	0.124
Melanesia_H	0.205	0.348	0.624	0.363	0.100	0.493	0.186	0.528	**0.264**	0.797	0.341	0.252
Mexico_H	0.123	0.173	0.387	0.177	0.298	0.278	0.118	0.321	**0.119**	0.427	0.137	0.096
Mongolia_H	0.287	0.312	0.178	0.498	0.592	0.182	0.388	0.166	**0.345**	0.054	0.186	0.210
Moriori_HH	0.129	0.250	0.419	0.461	0.401	0.382	0.234	0.368	**0.308**	0.416	0.162	0.187
Nepal_H	0.186	0.323	0.604	0.214	0.140	0.297	0.000	0.278	**0.162**	0.586	0.292	0.160
Nigeria_H	0.124	0.438	0.613	0.262	0.114	0.464	0.140	0.419	**0.242**	0.605	0.307	0.241
NORSE	0.153	0.356	0.445	0.394	0.307	0.173	0.177	0.132	**0.377**	0.438	0.273	0.254
Nubia_H	0.076	0.326	0.540	0.288	0.216	0.210	0.062	0.239	**0.263**	0.498	0.257	0.151
Palestine_H	0.111	0.271	0.509	0.316	0.276	0.143	0.088	0.190	**0.256**	0.470	0.238	0.109

Peru_HH	0.171	0.183	0.275	0.191	0.358	0.201	0.160	0.206	**0.174**	0.376	0.144	0.146
Philip_HH	0.132	0.366	0.475	0.158	0.323	0.226	0.116	0.225	**0.072**	0.318	0.250	0.090
PNG_H	0.205	0.354	0.595	0.282	0.104	0.426	0.156	0.466	**0.234**	0.722	0.330	0.223
Russia_H	0.116	0.251	0.329	0.337	0.388	0.038	0.184	0.073	**0.213**	0.245	0.192	0.124
Singapore_H	0.261	0.361	0.489	0.249	0.520	0.244	0.219	0.304	**0.103**	0.314	0.281	0.101
SAfrica_H	0.098	0.366	0.530	0.341	0.089	0.376	0.156	0.380	**0.348**	0.613	0.264	0.281
SriLanka_H	0.285	0.426	0.853	0.195	0.281	0.393	0.043	0.460	**0.372**	0.907	0.420	0.356
Switzerland_H	0.349	0.429	0.336	0.391	0.640	0.034	0.340	0.047	**0.332**	0.207	0.332	0.299
Taiwan	0.272	0.202	0.546	0.358	0.576	0.294	0.227	0.437	**0.319**	0.566	0.236	0.081
Tanzania_H	0.143	0.351	0.450	0.335	0.068	0.454	0.225	0.454	**0.385**	0.649	0.246	0.359
TASMANIA	0.313	0.720	0.679	0.418	0.196	0.424	0.420	0.371	**0.488**	0.645	0.528	0.471
TEITA	0.239	0.515	0.748	0.303	0.154	0.525	0.154	0.510	**0.382**	0.812	0.453	0.400
Thailand_PH	0.202	0.268	0.408	0.231	0.485	0.198	0.208	0.257	**0.099**	0.294	0.205	0.070
Tibet_H	0.162	0.309	0.495	0.178	0.270	0.259	0.037	0.226	**0.067**	0.381	0.251	0.069
TOLAI	0.271	0.588	0.768	0.362	0.099	0.616	0.320	0.610	**0.369**	0.906	0.514	0.403
UKMedieval_H	0.196	0.333	0.384	0.444	0.490	0.092	0.279	0.110	**0.455**	0.388	0.268	0.264
Vietnam_PH	0.251	0.340	0.569	0.246	0.486	0.334	0.195	0.388	**0.120**	0.420	0.269	0.065
ZALAVAR	0.142	0.369	0.499	0.308	0.300	0.105	0.139	0.089	**0.240**	0.396	0.300	0.162
ZULU	0.166	0.554	0.706	0.335	0.097	0.508	0.190	0.438	**0.352**	0.702	0.396	0.333

Table B.8. (continued). CHINA_How to Hungary_H.

	CHINA_How	Czech_H	EasterIsl_HH	Egypt_HH	Germany_H	Ghana_H	Greece_H	Greenland_H	GUAM	Hawaii_H	HongKong	Hungary_H
Ainu_HH	0.173	0.294	0.189	0.119	0.270	0.167	0.168	0.271	0.112	0.106	0.139	0.164
Alaska_H	0.392	0.435	0.462	0.296	0.362	0.452	0.278	0.068	0.258	0.266	0.230	0.304
Aleut_H	0.633	0.421	0.900	0.529	0.300	0.698	0.507	0.449	0.549	0.496	0.462	0.367
ANDAMAN	0.208	0.364	0.565	0.286	0.442	0.297	0.278	0.630	0.320	0.393	0.285	0.280
Australia_HH	0.343	0.679	0.343	0.319	0.568	0.097	0.452	0.475	0.338	0.464	0.340	0.404
Austria_H	0.332	0.020	0.576	0.158	0.040	0.526	0.099	0.485	0.377	0.302	0.282	0.018
Bangladesh_H	0.124	0.377	0.271	0.075	0.329	0.181	0.134	0.359	0.146	0.246	0.171	0.201
BERG	0.311	0.078	0.679	0.203	0.049	0.557	0.186	0.674	0.393	0.391	0.327	0.077
Burma_YH	**0.087**	**0.312**	**0.454**	**0.276**	**0.383**	**0.345**	**0.218**	**0.634**	**0.145**	**0.280**	**0.183**	**0.294**
BURYAT	0.444	0.258	0.923	0.487	0.228	0.833	0.448	0.822	0.468	0.458	0.438	0.310
Canada_H	0.306	0.366	0.439	0.253	0.271	0.373	0.268	0.159	0.197	0.182	0.191	0.236
China_H	0.065	0.279	0.365	0.127	0.260	0.328	0.135	0.325	0.080	0.184	0.022	0.200
CHINA_Howells	0	0.326	0.295	0.179	0.398	0.233	0.190	0.491	0.053	0.201	0.058	0.230
Czech_H	0.326	0	0.633	0.233	0.080	0.629	0.123	0.616	0.388	0.327	0.303	0.058
EasterIsl_HH	0.295	0.633	0	0.280	0.652	0.188	0.298	0.404	0.181	0.169	0.316	0.441
Egypt_HH	0.179	0.233	0.280	0	0.160	0.259	0.068	0.318	0.209	0.200	0.156	0.092
Germany_H	0.398	0.080	0.652	0.160	0	0.598	0.139	0.508	0.422	0.340	0.320	0.072
Ghana_H	0.233	0.629	0.188	0.259	0.598	0	0.345	0.409	0.216	0.311	0.238	0.370
Greece_H	0.190	0.123	0.298	0.068	0.139	0.345	0	0.350	0.199	0.180	0.171	0.075
Greenland_H	0.491	0.616	0.404	0.318	0.508	0.409	0.350	0	0.322	0.313	0.259	0.416
GUAM	0.053	0.388	0.181	0.209	0.422	0.216	0.199	0.322	0	0.093	0.052	0.286
Hawaii_H	0.201	0.327	0.169	0.200	0.340	0.311	0.180	0.313	0.093	0	0.175	0.258
HongKong	0.058	0.303	0.316	0.156	0.320	0.238	0.171	0.259	0.052	0.175	0	0.201
Hungary_H	0.230	0.058	0.441	0.092	0.072	0.370	0.075	0.416	0.286	0.258	0.201	0
India_H	0.146	0.337	0.248	0.080	0.326	0.160	0.120	0.360	0.184	0.275	0.177	0.165
Indonesia_H	0.038	0.302	0.343	0.213	0.360	0.242	0.190	0.473	0.073	0.171	0.091	0.237
Japan_H	0.089	0.260	0.292	0.100	0.250	0.232	0.101	0.256	0.068	0.151	0.052	0.160
JAPAN_Howells	0.062	0.298	0.284	0.116	0.285	0.188	0.131	0.324	0.068	0.170	0.067	0.178
Japan_P	0.180	0.306	0.327	0.124	0.304	0.306	0.150	0.133	0.146	0.179	0.080	0.181
Kenya_H	0.259	0.552	0.253	0.185	0.453	0.065	0.328	0.371	0.257	0.329	0.255	0.291
Korea_South_H	0.029	0.241	0.358	0.174	0.300	0.367	0.116	0.424	0.055	0.178	0.052	0.211
Laos_H	0.000	0.237	0.320	0.151	0.304	0.218	0.134	0.447	0.043	0.175	0.056	0.167
Malaysia_H	0.035	0.265	0.304	0.144	0.303	0.200	0.132	0.365	0.065	0.180	0.035	0.175
Maori_H	0.163	0.377	0.130	0.105	0.296	0.202	0.141	0.217	0.074	0.070	0.131	0.229
Melanesia_H	0.230	0.565	0.247	0.255	0.531	0.094	0.295	0.305	0.210	0.319	0.186	0.365
Mexico_H	0.073	0.316	0.324	0.198	0.360	0.197	0.170	0.273	0.067	0.191	0.064	0.201
Mongolia_H	0.335	0.236	0.733	0.295	0.149	0.619	0.308	0.534	0.351	0.369	0.273	0.207
Moriori_HH	0.273	0.463	0.284	0.198	0.328	0.346	0.247	0.316	0.169	0.125	0.251	0.342
Nepal_H	0.137	0.372	0.339	0.110	0.325	0.145	0.171	0.358	0.173	0.332	0.145	0.188
Nigeria_H	0.141	0.535	0.209	0.218	0.494	0.047	0.332	0.471	0.134	0.243	0.180	0.323
NORSE	0.318	0.261	0.426	0.062	0.119	0.363	0.170	0.419	0.342	0.321	0.293	0.119
Nubia_H	0.161	0.295	0.212	0.020	0.223	0.161	0.122	0.338	0.173	0.188	0.152	0.124
Palestine_H	0.151	0.196	0.242	0.009	0.151	0.247	0.057	0.291	0.169	0.183	0.112	0.070

Peru_HH	0.186	0.252	0.518	0.187	0.225	0.317	0.159	0.318	0.203	0.313	0.145	0.160
Philip_HH	0.035	0.245	0.327	0.157	0.292	0.206	0.151	0.499	0.092	0.181	0.094	0.161
PNG_H	0.193	0.505	0.263	0.223	0.483	0.068	0.250	0.337	0.212	0.323	0.173	0.305
Russia_H	0.199	0.061	0.374	0.075	0.045	0.383	0.052	0.351	0.200	0.165	0.150	0.033
Singapore_H	0.085	0.236	0.475	0.267	0.340	0.382	0.180	0.521	0.140	0.228	0.111	0.207
SAfrica_H	0.219	0.472	0.212	0.167	0.404	0.074	0.304	0.368	0.198	0.252	0.201	0.241
SriLanka_H	0.270	0.485	0.294	0.149	0.475	0.176	0.213	0.432	0.319	0.373	0.317	0.252
Switzerland_H	0.397	0.051	0.745	0.226	0.022	0.653	0.148	0.638	0.461	0.403	0.365	0.078
Taiwan	0.167	0.321	0.416	0.179	0.352	0.434	0.159	0.238	0.181	0.238	0.070	0.231
Tanzania_H	0.290	0.570	0.295	0.281	0.492	0.054	0.392	0.373	0.252	0.334	0.258	0.319
TASMANIA	0.340	0.491	0.511	0.363	0.496	0.214	0.477	0.760	0.453	0.510	0.378	0.284
TEITA	0.283	0.635	0.302	0.244	0.579	0.117	0.379	0.562	0.343	0.479	0.360	0.371
Thailand_PH	0.078	0.183	0.428	0.223	0.273	0.370	0.142	0.409	0.103	0.163	0.067	0.169
Tibet_H	0.074	0.304	0.395	0.121	0.274	0.229	0.157	0.413	0.120	0.273	0.094	0.195
TOLAI	0.290	0.694	0.319	0.381	0.699	0.053	0.453	0.547	0.329	0.469	0.307	0.458
UKMedieval_H	0.381	0.157	0.520	0.090	0.047	0.502	0.141	0.408	0.391	0.325	0.295	0.079
Vietnam_PH	0.055	0.335	0.417	0.249	0.414	0.339	0.215	0.439	0.097	0.182	0.067	0.269
ZALAVAR	0.181	0.139	0.368	0.047	0.109	0.320	0.088	0.439	0.242	0.266	0.179	0.049
ZULU	0.223	0.603	0.235	0.229	0.522	0.054	0.381	0.558	0.239	0.319	0.280	0.348

Table B.8. (continued). India_H to Mexico_H.

	India_H	Indonesia_H	Japan_H	JAPAN_How	Japan_P	Kenya_H	Korea_South_H	Laos_H	Malaysia_H	Maori_H	Melanesia_H	Mexico_H
Ainu_HH	0.177	0.158	0.077	0.101	0.121	0.150	0.198	0.126	0.132	0.066	0.205	0.123
Alaska_H	0.327	0.349	0.204	0.267	0.136	0.358	0.309	0.308	0.282	0.193	0.348	0.173
Aleut_H	0.666	0.498	0.422	0.480	0.449	0.546	0.549	0.488	0.468	0.455	0.624	0.387
ANDAMAN	0.212	0.201	0.243	0.218	0.325	0.304	0.294	0.133	0.208	0.386	0.363	0.177
Australia_HH	0.198	0.337	0.339	0.264	0.397	0.070	0.459	0.328	0.291	0.259	0.100	0.298
Austria_H	0.270	0.294	0.216	0.257	0.247	0.433	0.256	0.230	0.244	0.311	0.493	0.278
Bangladesh_H	0.000	0.137	0.106	0.092	0.168	0.131	0.141	0.066	0.100	0.123	0.186	0.118
BERG	0.305	0.293	0.249	0.240	0.354	0.434	0.267	0.230	0.278	0.340	0.528	0.321
Burma_YH	**0.190**	**0.033**	**0.147**	**0.119**	**0.299**	**0.360**	**0.054**	**0.017**	**0.071**	**0.247**	**0.264**	**0.119**
BURYAT	0.635	0.341	0.407	0.419	0.553	0.689	0.338	0.319	0.389	0.493	0.797	0.427
Canada_H	0.317	0.256	0.164	0.198	0.156	0.280	0.266	0.229	0.226	0.140	0.341	0.137
China_H	0.184	0.079	0.049	0.059	0.112	0.319	0.009	0.051	0.046	0.124	0.252	0.096
CHINA_Howells	0.146	0.038	0.089	0.062	0.180	0.259	0.029	0.000	0.035	0.163	0.230	0.073
Czech_H	0.337	0.302	0.260	0.298	0.306	0.552	0.241	0.237	0.265	0.377	0.565	0.316
EasterIsl_HH	0.248	0.343	0.292	0.284	0.327	0.253	0.358	0.320	0.304	0.130	0.247	0.324
Egypt_HH	0.080	0.213	0.100	0.116	0.124	0.185	0.174	0.151	0.144	0.105	0.255	0.198
Germany_H	0.326	0.360	0.250	0.285	0.304	0.453	0.300	0.304	0.303	0.296	0.531	0.360
Ghana_H	0.160	0.242	0.232	0.188	0.306	0.065	0.367	0.218	0.200	0.202	0.094	0.197
Greece_H	0.120	0.190	0.101	0.131	0.150	0.328	0.116	0.134	0.132	0.141	0.295	0.170
Greenland_H	0.360	0.473	0.256	0.324	0.133	0.371	0.424	0.447	0.365	0.217	0.305	0.273
GUAM	0.184	0.073	0.068	0.068	0.146	0.257	0.055	0.043	0.065	0.074	0.210	0.067
Hawaii_H	0.275	0.171	0.151	0.170	0.179	0.329	0.178	0.175	0.180	0.070	0.319	0.191
HongKong	0.177	0.091	0.052	0.067	0.080	0.255	0.052	0.056	0.035	0.131	0.186	0.064
Hungary_H	0.165	0.237	0.160	0.178	0.181	0.291	0.211	0.167	0.175	0.229	0.365	0.201
India_H	0	0.170	0.130	0.117	0.168	0.125	0.175	0.101	0.110	0.151	0.149	0.137
Indonesia_H	0.170	0	0.080	0.062	0.194	0.279	0.023	0.000	0.019	0.164	0.206	0.053
Japan_H	0.130	0.080	0	0.015	0.054	0.255	0.045	0.046	0.053	0.085	0.194	0.047
JAPAN_Howells	0.117	0.062	0.015	0	0.096	0.228	0.048	0.041	0.058	0.092	0.166	0.051
Japan_P	0.168	0.194	0.054	0.096	0	0.294	0.138	0.159	0.132	0.124	0.219	0.096
Kenya_H	0.125	0.279	0.255	0.228	0.294	0	0.393	0.226	0.213	0.173	0.134	0.221
Korea_South_H	0.175	0.023	0.045	0.048	0.138	0.393	0	0.000	0.023	0.147	0.267	0.069
Laos_H	0.101	0.000	0.046	0.041	0.159	0.226	0.000	0	0.000	0.151	0.219	0.020
Malaysia_H	0.110	0.019	0.053	0.058	0.132	0.213	0.023	0.000	0	0.133	0.150	0.038
Maori_H	0.151	0.164	0.085	0.092	0.124	0.173	0.147	0.151	0.133	0	0.168	0.139
Melanesia_H	0.149	0.206	0.194	0.166	0.219	0.134	0.267	0.219	0.150	0.168	0	0.163
Mexico_H	0.137	0.053	0.047	0.051	0.096	0.221	0.069	0.020	0.038	0.139	0.163	0
Mongolia_H	0.434	0.268	0.267	0.297	0.362	0.459	0.250	0.224	0.256	0.331	0.580	0.291
Moriori_HH	0.306	0.220	0.146	0.143	0.227	0.311	0.216	0.233	0.250	0.063	0.325	0.232
Nepal_H	0.013	0.150	0.103	0.076	0.166	0.122	0.161	0.088	0.095	0.169	0.123	0.110
Nigeria_H	0.157	0.165	0.196	0.148	0.301	0.052	0.277	0.128	0.148	0.153	0.154	0.173
NORSE	0.179	0.340	0.189	0.192	0.224	0.217	0.317	0.280	0.279	0.167	0.342	0.312
Nubia_H	0.066	0.187	0.108	0.113	0.154	0.101	0.199	0.129	0.127	0.091	0.202	0.187
Palestine_H	0.070	0.198	0.097	0.113	0.107	0.172	0.147	0.138	0.114	0.088	0.207	0.176

Peru_HH	0.181	0.150	0.076	0.097	0.135	0.275	0.144	0.102	0.110	0.201	0.242	0.059
Philip_HH	0.140	0.021	0.088	0.074	0.213	0.218	0.060	0.000	0.025	0.166	0.242	0.069
PNG_H	0.120	0.169	0.179	0.140	0.229	0.119	0.238	0.171	0.121	0.185	0.018	0.134
Russia_H	0.170	0.174	0.100	0.127	0.137	0.304	0.124	0.136	0.132	0.134	0.303	0.181
Singapore_H	0.241	0.045	0.139	0.147	0.237	0.414	0.039	0.018	0.045	0.268	0.346	0.086
SAfrica_H	0.141	0.250	0.217	0.197	0.250	0.018	0.347	0.202	0.187	0.144	0.150	0.212
SriLanka_H	0.043	0.340	0.270	0.248	0.273	0.143	0.377	0.236	0.259	0.263	0.264	0.248
Switzerland_H	0.339	0.342	0.298	0.330	0.384	0.513	0.296	0.274	0.295	0.386	0.589	0.357
Taiwan	0.232	0.217	0.144	0.198	0.096	0.396	0.117	0.161	0.125	0.211	0.332	0.146
Tanzania_H	0.209	0.282	0.266	0.235	0.319	0.026	0.426	0.247	0.231	0.209	0.141	0.203
TASMANIA	0.340	0.380	0.425	0.335	0.493	0.221	0.520	0.356	0.349	0.438	0.335	0.389
TEITA	0.144	0.332	0.333	0.298	0.415	0.042	0.443	0.248	0.271	0.283	0.221	0.288
Thailand_PH	0.223	0.045	0.097	0.114	0.156	0.381	0.025	0.024	0.038	0.202	0.296	0.062
Tibet_H	0.083	0.056	0.060	0.053	0.171	0.197	0.059	0.005	0.038	0.162	0.196	0.077
TOLAI	0.255	0.286	0.320	0.247	0.396	0.153	0.424	0.297	0.258	0.325	0.079	0.262
UKMedieval_H	0.266	0.407	0.219	0.261	0.228	0.347	0.339	0.329	0.318	0.231	0.470	0.357
Vietnam_PH	0.232	0.040	0.115	0.110	0.174	0.388	0.030	0.031	0.046	0.219	0.293	0.076
ZALAVAR	0.113	0.217	0.124	0.121	0.164	0.238	0.173	0.158	0.158	0.164	0.273	0.216
ZULU	0.193	0.264	0.268	0.196	0.376	0.062	0.388	0.233	0.246	0.196	0.195	0.275

Table B.8. (continued). Mongolia_H to Singapore_H.

	Mongolia_H	Moriori_HH	Nepal_H	Nigeria_H	NORSE	Nubia_H	Palestine_H	Peru_HH	Philip_HH	PNG_H	Russia_H	Singapore_H
Ainu_HH	0.287	0.129	0.186	0.124	0.153	0.076	0.111	0.171	0.132	0.205	0.116	0.261
Alaska_H	0.312	0.250	0.323	0.438	0.356	0.326	0.271	0.183	0.366	0.354	0.251	0.361
Aleut_H	0.178	0.419	0.604	0.613	0.445	0.540	0.509	0.275	0.475	0.595	0.329	0.489
ANDAMAN	0.498	0.461	0.214	0.262	0.394	0.288	0.316	0.191	0.158	0.282	0.337	0.249
Australia_HH	0.592	0.401	0.140	0.114	0.307	0.216	0.276	0.358	0.323	0.104	0.388	0.520
Austria_H	0.182	0.382	0.297	0.464	0.173	0.210	0.143	0.201	0.226	0.426	0.038	0.244
Bangladesh_H	0.388	0.234	0.000	0.140	0.177	0.062	0.088	0.160	0.116	0.156	0.184	0.219
BERG	0.166	0.368	0.278	0.419	0.132	0.239	0.190	0.206	0.225	0.466	0.073	0.304
Burma_YH	**0.345**	**0.308**	**0.162**	**0.242**	**0.377**	**0.263**	**0.256**	**0.174**	**0.072**	**0.234**	**0.213**	**0.103**
BURYAT	0.054	0.416	0.586	0.605	0.438	0.498	0.470	0.376	0.318	0.722	0.245	0.314
Canada_H	0.186	0.162	0.292	0.307	0.273	0.257	0.238	0.144	0.250	0.330	0.192	0.281
China_H	0.210	0.187	0.160	0.241	0.254	0.151	0.109	0.146	0.090	0.223	0.124	0.101
CHINA_Howells	0.335	0.273	0.137	0.141	0.318	0.161	0.151	0.186	0.035	0.193	0.199	0.085
Czech_H	0.236	0.463	0.372	0.535	0.261	0.295	0.196	0.252	0.245	0.505	0.061	0.236
EasterIsl_HH	0.733	0.284	0.339	0.209	0.426	0.212	0.242	0.518	0.327	0.263	0.374	0.475
Egypt_HH	0.295	0.198	0.110	0.218	0.062	0.020	0.009	0.187	0.157	0.223	0.075	0.267
Germany_H	0.149	0.328	0.325	0.494	0.119	0.223	0.151	0.225	0.292	0.483	0.045	0.340
Ghana_H	0.619	0.346	0.145	0.047	0.363	0.161	0.247	0.317	0.206	0.068	0.383	0.382
Greece_H	0.308	0.247	0.171	0.332	0.170	0.122	0.057	0.159	0.151	0.250	0.052	0.180
Greenland_H	0.534	0.316	0.358	0.471	0.419	0.338	0.291	0.318	0.499	0.337	0.351	0.521
GUAM	0.351	0.169	0.173	0.134	0.342	0.173	0.169	0.203	0.092	0.212	0.200	0.140
Hawaii_H	0.369	0.125	0.332	0.243	0.321	0.188	0.183	0.313	0.181	0.323	0.165	0.228
HongKong	0.273	0.251	0.145	0.180	0.293	0.152	0.112	0.145	0.094	0.173	0.150	0.111
Hungary_H	0.207	0.342	0.188	0.323	0.119	0.124	0.070	0.160	0.161	0.305	0.033	0.207
India_H	0.434	0.306	0.013	0.157	0.179	0.066	0.070	0.181	0.140	0.120	0.170	0.241
Indonesia_H	0.268	0.220	0.150	0.165	0.340	0.187	0.198	0.150	0.021	0.169	0.174	0.045
Japan_H	0.267	0.146	0.103	0.196	0.189	0.108	0.097	0.076	0.088	0.179	0.100	0.139
JAPAN_Howells	0.297	0.143	0.076	0.148	0.192	0.113	0.113	0.097	0.074	0.140	0.127	0.147
Japan_P	0.362	0.227	0.166	0.301	0.224	0.154	0.107	0.135	0.213	0.229	0.137	0.237
Kenya_H	0.459	0.311	0.122	0.052	0.217	0.101	0.172	0.275	0.218	0.119	0.304	0.414
Korea_South_H	0.250	0.216	0.161	0.277	0.317	0.199	0.147	0.144	0.060	0.238	0.124	0.039
Laos_H	0.224	0.233	0.088	0.128	0.280	0.129	0.138	0.102	0.000	0.171	0.136	0.018
Malaysia_H	0.256	0.250	0.095	0.148	0.279	0.127	0.114	0.110	0.025	0.121	0.132	0.045
Maori_H	0.331	0.063	0.169	0.153	0.167	0.091	0.088	0.201	0.166	0.185	0.134	0.268
Melanesia_H	0.580	0.325	0.123	0.154	0.342	0.202	0.207	0.242	0.242	0.018	0.303	0.346
Mexico_H	0.291	0.232	0.110	0.173	0.312	0.187	0.176	0.059	0.069	0.134	0.181	0.086
Mongolia_H	0	0.298	0.395	0.446	0.285	0.312	0.287	0.237	0.229	0.512	0.160	0.243
Moriori_HH	0.298	0	0.305	0.260	0.219	0.193	0.227	0.270	0.246	0.325	0.205	0.369
Nepal_H	0.395	0.305	0	0.132	0.176	0.085	0.097	0.127	0.134	0.099	0.181	0.238
Nigeria_H	0.446	0.260	0.132	0	0.284	0.116	0.202	0.285	0.125	0.134	0.304	0.310
NORSE	0.285	0.219	0.176	0.284	0	0.078	0.072	0.218	0.274	0.329	0.091	0.447
Nubia_H	0.312	0.193	0.085	0.116	0.078	0	0.024	0.215	0.130	0.178	0.105	0.277
Palestine_H	0.287	0.227	0.097	0.202	0.072	0.024	0	0.181	0.149	0.193	0.046	0.239

Peru_HH	0.237	0.270	0.127	0.285	0.218	0.215	0.181	0	0.141	0.212	0.146	0.172
Philip_HH	0.229	0.246	0.134	0.125	0.274	0.130	0.149	0.141	0	0.181	0.149	0.048
PNG_H	0.512	0.325	0.099	0.134	0.329	0.178	0.193	0.212	0.181	0	0.284	0.277
Russia_H	0.160	0.205	0.181	0.304	0.091	0.105	0.046	0.146	0.149	0.284	0	0.194
Singapore_H	0.243	0.369	0.238	0.310	0.447	0.277	0.239	0.172	0.048	0.277	0.194	0
SAfrica_H	0.424	0.296	0.133	0.038	0.196	0.076	0.135	0.286	0.191	0.151	0.242	0.374
SriLanka_H	0.651	0.456	0.093	0.213	0.277	0.137	0.161	0.301	0.259	0.211	0.333	0.395
Switzerland_H	0.158	0.441	0.345	0.544	0.215	0.294	0.213	0.223	0.266	0.514	0.082	0.270
Taiwan	0.343	0.360	0.267	0.398	0.379	0.242	0.146	0.210	0.208	0.304	0.209	0.153
Tanzania_H	0.460	0.339	0.171	0.056	0.296	0.175	0.251	0.268	0.231	0.128	0.336	0.410
TASMANIA	0.550	0.593	0.303	0.198	0.355	0.274	0.318	0.449	0.291	0.271	0.375	0.466
TEITA	0.569	0.424	0.165	0.105	0.293	0.156	0.247	0.351	0.250	0.177	0.412	0.478
Thailand_PH	0.219	0.298	0.220	0.292	0.370	0.244	0.184	0.129	0.060	0.255	0.130	0.007
Tibet_H	0.236	0.222	0.037	0.150	0.204	0.107	0.124	0.095	0.055	0.158	0.146	0.130
TOLAI	0.717	0.467	0.218	0.132	0.453	0.283	0.346	0.375	0.285	0.058	0.459	0.461
UKMedieval_H	0.244	0.296	0.280	0.417	0.041	0.140	0.087	0.237	0.320	0.447	0.062	0.435
Vietnam_PH	0.315	0.309	0.223	0.270	0.449	0.260	0.228	0.199	0.069	0.245	0.231	0.021
ZALAVAR	0.277	0.274	0.115	0.252	0.043	0.066	0.024	0.173	0.167	0.252	0.032	0.275
ZULU	0.537	0.299	0.169	0.019	0.257	0.126	0.226	0.366	0.202	0.167	0.353	0.436

Table B.8. (continued). SAfrica_H to Vietnam_PH.

	SAfrica_H	SriLanka_H	Switzerland_H	Taiwan	Tanzania_H	TASMANIA	TEITA	Thailand_PH	Tibet_H	TOLAI	UKMedieval_H	Vietnam_PH
Ainu_HH	0.098	0.285	0.349	0.272	0.143	0.313	0.239	0.202	0.162	0.271	0.196	0.251
Alaska_H	0.366	0.426	0.429	0.202	0.351	0.720	0.515	0.268	0.309	0.588	0.333	0.340
Aleut_H	0.530	0.853	0.336	0.546	0.450	0.679	0.748	0.408	0.495	0.768	0.384	0.569
ANDAMAN	0.341	0.195	0.391	0.358	0.335	0.418	0.303	0.231	0.178	0.362	0.444	0.246
Australia_HH	0.089	0.281	0.640	0.576	0.068	0.196	0.154	0.485	0.270	0.099	0.490	0.486
Austria_H	0.376	0.393	0.034	0.294	0.454	0.424	0.525	0.198	0.259	0.616	0.092	0.334
Bangladesh_H	0.156	0.043	0.340	0.227	0.225	0.420	0.154	0.208	0.037	0.320	0.279	0.195
BERG	0.380	0.460	0.047	0.437	0.454	0.371	0.510	0.257	0.226	0.610	0.110	0.388
Burma_YH	**0.348**	**0.372**	**0.332**	**0.319**	**0.385**	**0.488**	**0.382**	**0.099**	**0.067**	**0.369**	**0.455**	**0.120**
BURYAT	0.613	0.907	0.207	0.566	0.649	0.645	0.812	0.294	0.381	0.906	0.388	0.420
Canada_H	0.264	0.420	0.332	0.236	0.246	0.528	0.453	0.205	0.251	0.514	0.268	0.269
China_H	0.281	0.356	0.299	0.081	0.359	0.471	0.400	0.070	0.069	0.403	0.264	0.065
CHINA_Howells	0.219	0.270	0.397	0.167	0.290	0.340	0.283	0.078	0.074	0.290	0.381	0.055
Czech_H	0.472	0.485	0.051	0.321	0.570	0.491	0.635	0.183	0.304	0.694	0.157	0.335
EasterIsl_HH	0.212	0.294	0.745	0.416	0.295	0.511	0.302	0.428	0.395	0.319	0.520	0.417
Egypt_HH	0.167	0.149	0.226	0.179	0.281	0.363	0.244	0.223	0.121	0.381	0.090	0.249
Germany_H	0.404	0.475	0.022	0.352	0.492	0.496	0.579	0.273	0.274	0.699	0.047	0.414
Ghana_H	0.074	0.176	0.653	0.434	0.054	0.214	0.117	0.370	0.229	0.053	0.502	0.339
Greece_H	0.304	0.213	0.148	0.159	0.392	0.477	0.379	0.142	0.157	0.453	0.141	0.215
Greenland_H	0.368	0.432	0.638	0.238	0.373	0.760	0.562	0.409	0.413	0.547	0.408	0.439
GUAM	0.198	0.319	0.461	0.181	0.252	0.453	0.343	0.103	0.120	0.329	0.391	0.097
Hawaii_H	0.252	0.373	0.403	0.238	0.334	0.510	0.479	0.163	0.273	0.469	0.325	0.182
HongKong	0.201	0.317	0.365	0.070	0.258	0.378	0.360	0.067	0.094	0.307	0.295	0.067
Hungary_H	0.241	0.252	0.078	0.231	0.319	0.284	0.371	0.169	0.195	0.458	0.079	0.269
India_H	0.141	0.043	0.339	0.232	0.209	0.340	0.144	0.223	0.083	0.255	0.266	0.232
Indonesia_H	0.250	0.340	0.342	0.217	0.282	0.380	0.332	0.045	0.056	0.286	0.407	0.040
Japan_H	0.217	0.270	0.298	0.144	0.266	0.425	0.333	0.097	0.060	0.320	0.219	0.115
JAPAN_Howells	0.197	0.248	0.330	0.198	0.235	0.335	0.298	0.114	0.053	0.247	0.261	0.110
Japan_P	0.250	0.273	0.384	0.096	0.319	0.493	0.415	0.156	0.171	0.396	0.228	0.174
Kenya_H	0.018	0.143	0.513	0.396	0.026	0.221	0.042	0.381	0.197	0.153	0.347	0.388
Korea_South_H	0.347	0.377	0.296	0.117	0.426	0.520	0.443	0.025	0.059	0.424	0.339	0.030
Laos_H	0.202	0.236	0.274	0.161	0.247	0.356	0.248	0.024	0.005	0.297	0.329	0.031
Malaysia_H	0.187	0.259	0.295	0.125	0.231	0.349	0.271	0.038	0.038	0.258	0.318	0.046
Maori_H	0.144	0.263	0.386	0.211	0.209	0.438	0.283	0.202	0.162	0.325	0.231	0.219
Melanesia_H	0.150	0.264	0.589	0.332	0.141	0.335	0.221	0.296	0.196	0.079	0.470	0.293
Mexico_H	0.212	0.248	0.357	0.146	0.203	0.389	0.288	0.062	0.077	0.262	0.357	0.076
Mongolia_H	0.424	0.651	0.158	0.343	0.460	0.550	0.569	0.219	0.236	0.717	0.244	0.315
Moriori_HH	0.296	0.456	0.441	0.360	0.339	0.593	0.424	0.298	0.222	0.467	0.296	0.309
Nepal_H	0.133	0.093	0.345	0.267	0.171	0.303	0.165	0.220	0.037	0.218	0.280	0.223
Nigeria_H	0.038	0.213	0.544	0.398	0.056	0.198	0.105	0.292	0.150	0.132	0.417	0.270
NORSE	0.196	0.277	0.215	0.379	0.296	0.355	0.293	0.370	0.204	0.453	0.041	0.449
Nubia_H	0.076	0.137	0.294	0.242	0.175	0.274	0.156	0.244	0.107	0.283	0.140	0.260
Palestine_H	0.135	0.161	0.213	0.146	0.251	0.318	0.247	0.184	0.124	0.346	0.087	0.228

Peru_HH	0.286	0.301	0.223	0.210	0.268	0.449	0.351	0.129	0.095	0.375	0.237	0.199
Philip_HH	0.191	0.259	0.266	0.208	0.231	0.291	0.250	0.060	0.055	0.285	0.320	0.069
PNG_H	0.151	0.211	0.514	0.304	0.128	0.271	0.177	0.255	0.158	0.058	0.447	0.245
Russia_H	0.242	0.333	0.082	0.209	0.336	0.375	0.412	0.130	0.146	0.459	0.062	0.231
Singapore_H	0.374	0.395	0.270	0.153	0.410	0.466	0.478	0.007	0.130	0.461	0.435	0.021
SAfrica_H	0	0.187	0.478	0.374	0.031	0.166	0.106	0.332	0.202	0.170	0.298	0.348
SriLanka_H	0.187	0	0.481	0.322	0.246	0.392	0.147	0.379	0.226	0.331	0.365	0.367
Switzerland_H	0.478	0.481	0	0.375	0.549	0.529	0.609	0.237	0.278	0.751	0.131	0.390
Taiwan	0.374	0.322	0.375	0	0.463	0.625	0.489	0.108	0.211	0.548	0.325	0.110
Tanzania_H	0.031	0.246	0.549	0.463	0	0.179	0.120	0.376	0.245	0.124	0.413	0.399
TASMANIA	0.166	0.392	0.529	0.625	0.179	0	0.301	0.457	0.394	0.194	0.455	0.478
TEITA	0.106	0.147	0.609	0.489	0.120	0.301	0	0.477	0.224	0.187	0.454	0.477
Thailand_PH	0.332	0.379	0.237	0.108	0.376	0.457	0.477	0	0.121	0.439	0.345	0.023
Tibet_H	0.202	0.226	0.278	0.211	0.245	0.394	0.224	0.121	0	0.299	0.279	0.128
TOLAI	0.170	0.331	0.751	0.548	0.124	0.194	0.187	0.439	0.299	0	0.621	0.417
UKMedieval_H	0.298	0.365	0.131	0.325	0.413	0.455	0.454	0.345	0.279	0.621	0	0.465
Vietnam_PH	0.348	0.367	0.390	0.110	0.399	0.478	0.477	0.023	0.128	0.417	0.465	0
ZALAVAR	0.188	0.234	0.160	0.265	0.301	0.273	0.301	0.218	0.138	0.374	0.067	0.291
ZULU	0.049	0.223	0.597	0.518	0.074	0.145	0.111	0.419	0.231	0.129	0.418	0.389

Table B.8. (continued). ZAVALAR to ZULU.

	ZALAVAR	ZULU
Ainu_HH	0.142	0.166
Alaska_H	0.369	0.554
Aleut_H	0.499	0.706
ANDAMAN	0.308	0.335
Australia_HH	0.300	0.097
Austria_H	0.105	0.508
Bangladesh_H	0.139	0.190
BERG	0.089	0.438
Burma_YH	**0.240**	**0.352**
BURYAT	0.396	0.702
Canada_H	0.300	0.396
China_H	0.162	0.333
CHINA_Howells	0.181	0.223
Czech_H	0.139	0.603
EasterIsl_HH	0.368	0.235
Egypt_HH	0.047	0.229
Germany_H	0.109	0.522
Ghana_H	0.320	0.054
Greece_H	0.088	0.381
Greenland_H	0.439	0.558
GUAM	0.242	0.239
Hawaii_H	0.266	0.319
HongKong	0.179	0.280
Hungary_H	0.049	0.348
India_H	0.113	0.193
Indonesia_H	0.217	0.264
Japan_H	0.124	0.268
JAPAN_Howells	0.121	0.196
Japan_P	0.164	0.376
Kenya_H	0.238	0.062
Korea_South_H	0.173	0.388
Laos_H	0.158	0.233
Malaysia_H	0.158	0.246
Maori_H	0.164	0.196
Melanesia_H	0.273	0.195
Mexico_H	0.216	0.275
Mongolia_H	0.277	0.537
Moriori_HH	0.274	0.299
Nepal_H	0.115	0.169
Nigeria_H	0.252	0.019
NORSE	0.043	0.257
Nubia_H	0.066	0.126
Palestine_H	0.024	0.226

Peru_HH	0.173	0.366
Philip_HH	0.167	0.202
PNG_H	0.252	0.167
Russia_H	0.032	0.353
Singapore_H	0.275	0.436
SAfrica_H	0.188	0.049
SriLanka_H	0.234	0.223
Switzerland_H	0.160	0.597
Taiwan	0.265	0.518
Tanzania_H	0.301	0.074
TASMANIA	0.273	0.145
TEITA	0.301	0.111
Thailand_PH	0.218	0.419
Tibet_H	0.138	0.231
TOLAI	0.374	0.129
UKMedieval_H	0.067	0.418
Vietnam_PH	0.291	0.389
ZALAVAR	0	0.255
ZULU	0.255	0

Table B.9. D^2 matrix for odontometric data. Alaska_H to France_H.

	Alaska_H	Aleut_H	Andaman_Isl_H	Australia_H	**Burma_YH**	Cambodia_H	Cameroon_H	CanadaNat_H	China_H	EasterIsl_H	Egypt_H	France_H
Alaska_H	0	0.009	0.201	0.248	**0.172**	0.000	0.172	0.005	0.117	0.096	0.070	0.122
Aleut_H	0.009	0	0.221	0.312	**0.169**	0.021	0.146	0.013	0.126	0.147	0.101	0.176
Andaman_Isl_H	0.201	0.221	0	0.273	**0.091**	0.096	0.222	0.259	0.050	0.038	0.120	0.099
Australia_H	0.248	0.312	0.273	0	**0.369**	0.210	0.222	0.271	0.277	0.114	0.236	0.254
Burma_YH	**0.172**	**0.169**	**0.091**	**0.369**	**0**	**0.037**	**0.220**	**0.209**	**0.019**	**0.088**	**0.096**	**0.085**
Cambodia_H	0.000	0.021	0.096	0.210	**0.037**	0	0.129	0.010	0.004	0.036	0.030	0.059
Cameroon_H	0.172	0.146	0.222	0.222	**0.220**	0.129	0	0.167	0.150	0.188	0.187	0.304
CanadaNat_H	0.005	0.013	0.259	0.271	**0.209**	0.010	0.167	0	0.133	0.134	0.079	0.158
China_H	0.117	0.126	0.050	0.277	**0.019**	0.004	0.150	0.133	0	0.039	0.045	0.059
EasterIsl_H	0.096	0.147	0.038	0.114	**0.088**	0.036	0.188	0.134	0.039	0	0.028	0.009
Egypt_H	0.070	0.101	0.120	0.236	**0.096**	0.030	0.187	0.079	0.045	0.028	0	0.009
France_H	0.122	0.176	0.099	0.254	**0.085**	0.059	0.304	0.158	0.059	0.009	0.009	0
Gabon_H	0.150	0.169	0.161	0.141	**0.192**	0.082	0.012	0.143	0.101	0.097	0.112	0.196
Germany_H	0.134	0.179	0.149	0.343	**0.093**	0.069	0.333	0.164	0.076	0.065	0.027	0.000
Ghana_H	0.141	0.138	0.241	0.217	**0.170**	0.070	0.011	0.123	0.113	0.150	0.123	0.222
Greece_H	0.159	0.184	0.144	0.447	**0.057**	0.059	0.359	0.178	0.052	0.095	0.046	0.020
Greenland_H	0.020	0.040	0.155	0.248	**0.088**	0.000	0.160	0.017	0.041	0.056	0.021	0.061
Hungary_H	0.126	0.147	0.158	0.427	**0.106**	0.099	0.302	0.144	0.079	0.096	0.021	0.021
India_H	0.089	0.123	0.129	0.315	**0.065**	0.013	0.220	0.096	0.029	0.053	0.012	0.022
Indonesia_H	0.090	0.079	0.046	0.228	**0.049**	0.028	0.087	0.108	0.010	0.038	0.058	0.094
Iran_H	0.547	0.605	0.459	0.889	**0.336**	0.324	0.548	0.519	0.280	0.471	0.363	0.398
Iraq_H	0.136	0.133	0.218	0.432	**0.134**	0.098	0.310	0.131	0.102	0.138	0.032	0.051
Italy_H	0.168	0.217	0.156	0.306	**0.113**	0.121	0.320	0.195	0.090	0.054	0.022	0.000
Japan_PH	0.128	0.142	0.050	0.363	**0.026**	0.023	0.251	0.161	0.012	0.055	0.059	0.046
Kenya_H	0.113	0.129	0.175	0.190	**0.134**	0.062	0.038	0.104	0.067	0.093	0.076	0.150
KirstenBl_P	0.320	0.415	0.125	0.295	**0.138**	0.210	0.381	0.399	0.141	0.073	0.169	0.088
KirstenCol_P	0.237	0.306	0.109	0.314	**0.078**	0.134	0.371	0.298	0.085	0.054	0.105	0.033
Korea_H	0.071	0.059	0.052	0.278	**0.000**	0.000	0.117	0.106	0.000	0.043	0.039	0.052
Laos_H	0.131	0.104	0.044	0.380	**0.031**	0.034	0.213	0.163	0.024	0.078	0.081	0.088
Malay_H	0.077	0.078	0.077	0.209	**0.070**	0.001	0.080	0.076	0.010	0.046	0.057	0.108
Malaysia_H	0.106	0.098	0.032	0.331	**0.050**	0.029	0.155	0.133	0.012	0.067	0.077	0.101
Marquesas_H	0.147	0.177	0.051	0.186	**0.092**	0.051	0.126	0.153	0.018	0.024	0.060	0.084
Melanesia_H	0.120	0.145	0.092	0.123	**0.159**	0.055	0.066	0.127	0.073	0.040	0.079	0.129
Mexico_H	0.038	0.018	0.286	0.263	**0.223**	0.056	0.085	0.011	0.147	0.174	0.121	0.232
Micronesia_H	0.135	0.099	0.116	0.279	**0.154**	0.091	0.065	0.120	0.070	0.124	0.115	0.203
Mongol_H	0.077	0.093	0.084	0.345	**0.054**	0.008	0.240	0.094	0.020	0.055	0.042	0.048
Moriori_H	0.109	0.163	0.089	0.203	**0.085**	0.012	0.168	0.114	0.020	0.017	0.036	0.050
Nepal_H	0.106	0.127	0.024	0.293	**0.006**	0.000	0.164	0.144	0.000	0.021	0.031	0.028
Nicobar_H	0.162	0.150	0.069	0.148	**0.120**	0.059	0.040	0.174	0.061	0.067	0.142	0.197
Nigeria_H	0.152	0.160	0.143	0.228	**0.107**	0.073	0.035	0.148	0.051	0.099	0.097	0.166
Nubia_H	0.049	0.074	0.124	0.172	**0.106**	0.003	0.091	0.044	0.035	0.035	0.022	0.072
NZMaori_H	0.146	0.207	0.075	0.183	**0.093**	0.032	0.239	0.164	0.035	0.009	0.055	0.037
Palestine_H	0.074	0.115	0.195	0.241	**0.122**	0.059	0.231	0.087	0.088	0.053	0.007	0.014

Peru_H	0.042	0.033	0.225	0.275	**0.205**	0.052	0.082	0.019	0.114	0.145	0.099	0.203
Philipp_H	0.123	0.122	0.061	0.312	**0.033**	0.006	0.142	0.130	0.000	0.063	0.055	0.084
PNG_H	0.099	0.116	0.110	0.138	**0.191**	0.065	0.073	0.100	0.092	0.053	0.078	0.141
Polynesia_H	0.170	0.212	0.044	0.256	**0.076**	0.037	0.222	0.192	0.023	0.034	0.091	0.084
PretorBl_P	0.315	0.376	0.123	0.290	**0.077**	0.160	0.304	0.377	0.097	0.085	0.166	0.108
Russia_H	0.121	0.145	0.159	0.337	**0.059**	0.061	0.238	0.127	0.040	0.070	0.010	0.015
Somalia_H	0.102	0.104	0.108	0.295	**0.054**	0.046	0.122	0.101	0.012	0.063	0.019	0.059
SAfrica_H	0.092	0.138	0.204	0.187	**0.169**	0.062	0.078	0.091	0.097	0.087	0.070	0.134
SriLanka_H	0.071	0.080	0.020	0.238	**0.032**	0.000	0.124	0.096	0.000	0.019	0.033	0.051
Tanzania_H	0.163	0.182	0.207	0.145	**0.178**	0.094	0.025	0.153	0.107	0.115	0.127	0.206
Thailand_H	0.097	0.081	0.081	0.296	**0.021**	0.010	0.142	0.108	0.005	0.059	0.056	0.083
Tibet_H	0.108	0.118	0.052	0.346	**0.007**	0.015	0.201	0.142	0.001	0.045	0.034	0.030
Turkey_H	0.157	0.169	0.145	0.375	**0.091**	0.099	0.283	0.173	0.070	0.087	0.019	0.013
TXSTWh_P	0.118	0.162	0.138	0.307	**0.078**	0.078	0.264	0.149	0.061	0.050	0.019	0.003
UKMedievl_H	0.189	0.234	0.188	0.421	**0.135**	0.143	0.389	0.216	0.116	0.101	0.040	0.008
UTK_Bl_P	0.127	0.153	0.121	0.049	**0.112**	0.022	0.100	0.143	0.068	0.028	0.096	0.116
UTK_Wh_P	0.133	0.177	0.197	0.354	**0.142**	0.121	0.274	0.152	0.107	0.093	0.023	0.027
Vietnam_H	0.079	0.120	0.026	0.250	**0.065**	0.034	0.203	0.114	0.014	0.000	0.023	0.016
WAfrica_H	0.110	0.116	0.157	0.160	**0.130**	0.037	0.006	0.095	0.056	0.086	0.080	0.164

Table B.9. (continued). Gabon_H to Japan_PH.

	Gabon_H	Germany_H	Ghana_H	Greece_H	Greenland_H	Hungary_H	India_H	Indonesia_H	Iran_H	Iraq_H	Italy_H	Japan_PH
Alaska_H	0.150	0.134	0.141	0.159	0.020	0.126	0.089	0.090	0.547	0.136	0.168	0.128
Aleut_H	0.169	0.179	0.138	0.184	0.040	0.147	0.123	0.079	0.605	0.133	0.217	0.142
Andaman_Isl_H	0.161	0.149	0.241	0.144	0.155	0.158	0.129	0.046	0.459	0.218	0.156	0.050
Australia_H	0.141	0.343	0.217	0.447	0.248	0.427	0.315	0.228	0.889	0.432	0.306	0.363
Burma_YH	**0.192**	**0.093**	**0.170**	**0.057**	**0.088**	**0.106**	**0.065**	**0.049**	**0.336**	**0.134**	**0.113**	**0.026**
Cambodia_H	0.082	0.069	0.070	0.059	0.000	0.099	0.013	0.028	0.324	0.098	0.121	0.023
Cameroon_H	0.012	0.333	0.011	0.359	0.160	0.302	0.220	0.087	0.548	0.310	0.320	0.251
CanadaNat_H	0.143	0.164	0.123	0.178	0.017	0.144	0.096	0.108	0.519	0.131	0.195	0.161
China_H	0.101	0.076	0.113	0.052	0.041	0.079	0.029	0.010	0.280	0.102	0.090	0.012
EasterIsl_H	0.097	0.065	0.150	0.095	0.056	0.096	0.053	0.038	0.471	0.138	0.054	0.055
Egypt_H	0.112	0.027	0.123	0.046	0.021	0.021	0.012	0.058	0.363	0.032	0.022	0.059
France_H	0.196	0.000	0.222	0.020	0.061	0.021	0.022	0.094	0.398	0.051	0.000	0.046
Gabon_H	0	0.246	0.005	0.270	0.102	0.232	0.139	0.069	0.429	0.257	0.219	0.192
Germany_H	0.246	0	0.259	0.019	0.082	0.016	0.031	0.125	0.350	0.026	0.003	0.056
Ghana_H	0.005	0.259	0	0.258	0.081	0.228	0.135	0.085	0.428	0.239	0.235	0.208
Greece_H	0.270	0.019	0.258	0	0.065	0.016	0.019	0.111	0.278	0.036	0.039	0.026
Greenland_H	0.102	0.082	0.081	0.065	0	0.071	0.016	0.049	0.364	0.079	0.101	0.062
Hungary_H	0.232	0.016	0.228	0.016	0.071	0	0.024	0.109	0.329	0.008	0.021	0.057
India_H	0.139	0.031	0.135	0.019	0.016	0.024	0	0.064	0.253	0.050	0.040	0.035
Indonesia_H	0.069	0.125	0.085	0.111	0.049	0.109	0.064	0	0.412	0.134	0.131	0.042
Iran_H	0.429	0.350	0.428	0.278	0.364	0.329	0.253	0.412	0	0.388	0.385	0.304
Iraq_H	0.257	0.026	0.239	0.036	0.079	0.008	0.050	0.134	0.388	0	0.041	0.094
Italy_H	0.219	0.003	0.235	0.039	0.101	0.021	0.040	0.131	0.385	0.041	0	0.084
Japan_PH	0.192	0.056	0.208	0.026	0.062	0.057	0.035	0.042	0.304	0.094	0.084	0
Kenya_H	0.016	0.159	0.022	0.193	0.075	0.163	0.087	0.057	0.343	0.173	0.153	0.142
KirstenBl_P	0.259	0.137	0.319	0.175	0.243	0.203	0.155	0.188	0.424	0.311	0.114	0.141
KirstenCol_P	0.268	0.049	0.307	0.080	0.168	0.116	0.089	0.141	0.375	0.177	0.053	0.072
Korea_H	0.112	0.055	0.091	0.041	0.021	0.065	0.029	0.000	0.358	0.074	0.083	0.000
Laos_H	0.189	0.118	0.188	0.060	0.068	0.083	0.075	0.020	0.438	0.106	0.138	0.016
Malay_H	0.047	0.133	0.063	0.119	0.029	0.127	0.055	0.000	0.351	0.141	0.146	0.054
Malaysia_H	0.136	0.107	0.167	0.089	0.075	0.095	0.067	0.009	0.346	0.123	0.140	0.017
Marquesas_H	0.050	0.121	0.104	0.123	0.075	0.132	0.062	0.027	0.308	0.163	0.116	0.063
Melanesia_H	0.008	0.194	0.052	0.208	0.074	0.183	0.109	0.043	0.465	0.216	0.171	0.135
Mexico_H	0.104	0.234	0.075	0.251	0.056	0.206	0.143	0.098	0.557	0.181	0.257	0.206
Micronesia_H	0.066	0.226	0.092	0.210	0.101	0.183	0.136	0.028	0.455	0.176	0.232	0.126
Mongol_H	0.180	0.056	0.190	0.028	0.028	0.048	0.022	0.041	0.315	0.077	0.088	0.009
Moriori_H	0.065	0.091	0.095	0.080	0.027	0.100	0.019	0.046	0.254	0.149	0.087	0.053
Nepal_H	0.107	0.056	0.119	0.031	0.036	0.046	0.014	0.010	0.280	0.101	0.064	0.000
Nicobar_H	0.018	0.277	0.045	0.248	0.100	0.260	0.160	0.014	0.541	0.290	0.258	0.134
Nigeria_H	0.013	0.189	0.018	0.192	0.089	0.177	0.094	0.042	0.310	0.206	0.177	0.126
Nubia_H	0.039	0.093	0.053	0.111	0.012	0.093	0.033	0.031	0.349	0.105	0.096	0.080
NZMaori_H	0.127	0.066	0.184	0.086	0.074	0.122	0.050	0.073	0.319	0.150	0.076	0.056
Palestine_H	0.161	0.018	0.154	0.064	0.042	0.033	0.029	0.106	0.420	0.037	0.014	0.100

Peru_H	0.080	0.211	0.075	0.217	0.048	0.169	0.113	0.074	0.461	0.170	0.230	0.164
Philipp_H	0.098	0.098	0.108	0.062	0.043	0.086	0.036	0.013	0.262	0.105	0.116	0.020
PNG_H	0.021	0.204	0.066	0.218	0.070	0.178	0.118	0.049	0.514	0.202	0.184	0.149
Polynesia_H	0.124	0.130	0.175	0.100	0.082	0.148	0.067	0.051	0.297	0.202	0.139	0.042
PretorBl_P	0.215	0.149	0.242	0.161	0.211	0.215	0.144	0.145	0.388	0.288	0.131	0.121
Russia_H	0.170	0.006	0.155	0.012	0.046	0.008	0.004	0.080	0.274	0.014	0.008	0.048
Somalia_H	0.086	0.057	0.085	0.056	0.041	0.040	0.018	0.024	0.267	0.049	0.060	0.043
SAfrica_H	0.029	0.158	0.033	0.195	0.061	0.154	0.078	0.090	0.351	0.194	0.145	0.161
SriLanka_H	0.084	0.068	0.112	0.063	0.027	0.073	0.032	0.000	0.334	0.094	0.093	0.006
Tanzania_H	0.002	0.235	0.012	0.274	0.116	0.249	0.145	0.087	0.425	0.259	0.215	0.205
Thailand_H	0.116	0.108	0.099	0.065	0.028	0.088	0.044	0.004	0.374	0.104	0.119	0.027
Tibet_H	0.153	0.043	0.152	0.016	0.042	0.030	0.016	0.024	0.293	0.072	0.059	0.000
Turkey_H	0.219	0.001	0.223	0.023	0.092	0.000	0.038	0.105	0.357	0.000	0.004	0.063
TXSTWh_P	0.191	0.000	0.199	0.034	0.074	0.017	0.022	0.096	0.334	0.046	0.002	0.056
UKMedievl_H	0.286	0.010	0.292	0.027	0.117	0.007	0.049	0.166	0.365	0.030	0.004	0.091
UTK_Bl_P	0.054	0.158	0.083	0.205	0.085	0.228	0.125	0.058	0.542	0.217	0.155	0.137
UTK_Wh_P	0.198	0.021	0.201	0.062	0.091	0.011	0.038	0.137	0.343	0.038	0.013	0.105
Vietnam_H	0.128	0.037	0.178	0.048	0.049	0.042	0.020	0.025	0.323	0.098	0.052	0.007
WAfrica_H	0.000	0.186	0.000	0.205	0.061	0.184	0.093	0.039	0.361	0.187	0.178	0.141

Table B.9. (continued). Kenya_H to Mongol_H.

	Kenya_H	KirstenBl_P	KirstenCol_P	Korea_H	Laos_H	Malay_H	Malaysia_H	Marquesas_H	Melanesia_H	Mexico_H	Micronesia_H	Mongol_H
Alaska_H	0.113	0.320	0.237	0.071	0.131	0.077	0.106	0.147	0.120	0.038	0.135	0.077
Aleut_H	0.129	0.415	0.306	0.059	0.104	0.078	0.098	0.177	0.145	0.018	0.099	0.093
Andaman_Isl_H	0.175	0.125	0.109	0.052	0.044	0.077	0.032	0.051	0.092	0.286	0.116	0.084
Australia_H	0.190	0.295	0.314	0.278	0.380	0.209	0.331	0.186	0.123	0.263	0.279	0.345
Burma_YH	**0.134**	**0.138**	**0.078**	**0.000**	**0.031**	**0.070**	**0.050**	**0.092**	**0.159**	**0.223**	**0.154**	**0.054**
Cambodia_H	0.062	0.210	0.134	0.000	0.034	0.001	0.029	0.051	0.055	0.056	0.091	0.008
Cameroon_H	0.038	0.381	0.371	0.117	0.213	0.080	0.155	0.126	0.066	0.085	0.065	0.240
CanadaNat_H	0.104	0.399	0.298	0.106	0.163	0.076	0.133	0.153	0.127	0.011	0.120	0.094
China_H	0.067	0.141	0.085	0.000	0.024	0.010	0.012	0.018	0.073	0.147	0.070	0.020
EasterIsl_H	0.093	0.073	0.054	0.043	0.078	0.046	0.067	0.024	0.040	0.174	0.124	0.055
Egypt_H	0.076	0.169	0.105	0.039	0.081	0.057	0.077	0.060	0.079	0.121	0.115	0.042
France_H	0.150	0.088	0.033	0.052	0.088	0.108	0.101	0.084	0.129	0.232	0.203	0.048
Gabon_H	0.016	0.259	0.268	0.112	0.189	0.047	0.136	0.050	0.008	0.104	0.066	0.180
Germany_H	0.159	0.137	0.049	0.055	0.118	0.133	0.107	0.121	0.194	0.234	0.226	0.056
Ghana_H	0.022	0.319	0.307	0.091	0.188	0.063	0.167	0.104	0.052	0.075	0.092	0.190
Greece_H	0.193	0.175	0.080	0.041	0.060	0.119	0.089	0.123	0.208	0.251	0.210	0.028
Greenland_H	0.075	0.243	0.168	0.021	0.068	0.029	0.075	0.075	0.074	0.056	0.101	0.028
Hungary_H	0.163	0.203	0.116	0.065	0.083	0.127	0.095	0.132	0.183	0.206	0.183	0.048
India_H	0.087	0.155	0.089	0.029	0.075	0.055	0.067	0.062	0.109	0.143	0.136	0.022
Indonesia_H	0.057	0.188	0.141	0.000	0.020	0.000	0.009	0.027	0.043	0.098	0.028	0.041
Iran_H	0.343	0.424	0.375	0.358	0.438	0.351	0.346	0.308	0.465	0.557	0.455	0.315
Iraq_H	0.173	0.311	0.177	0.074	0.106	0.141	0.123	0.163	0.216	0.181	0.176	0.077
Italy_H	0.153	0.114	0.053	0.083	0.138	0.146	0.140	0.116	0.171	0.257	0.232	0.088
Japan_PH	0.142	0.141	0.072	0.000	0.016	0.054	0.017	0.063	0.135	0.206	0.126	0.009
Kenya_H	0	0.221	0.190	0.067	0.175	0.032	0.099	0.046	0.052	0.068	0.073	0.123
KirstenBl_P	0.221	0	0.012	0.150	0.236	0.212	0.200	0.136	0.212	0.450	0.361	0.185
KirstenCol_P	0.190	0.012	0	0.080	0.159	0.158	0.130	0.111	0.212	0.355	0.294	0.101
Korea_H	0.067	0.150	0.080	0	0.000	0.014	0.000	0.055	0.087	0.114	0.076	0.016
Laos_H	0.175	0.236	0.159	0.000	0	0.054	0.016	0.091	0.123	0.190	0.082	0.031
Malay_H	0.032	0.212	0.158	0.014	0.054	0	0.020	0.011	0.033	0.067	0.022	0.039
Malaysia_H	0.099	0.200	0.130	0.000	0.016	0.020	0	0.044	0.098	0.141	0.049	0.020
Marquesas_H	0.046	0.136	0.111	0.055	0.091	0.011	0.044	0	0.030	0.156	0.059	0.063
Melanesia_H	0.052	0.212	0.212	0.087	0.123	0.033	0.098	0.030	0	0.121	0.060	0.125
Mexico_H	0.068	0.450	0.355	0.114	0.190	0.067	0.141	0.156	0.121	0	0.081	0.141
Micronesia_H	0.073	0.361	0.294	0.076	0.082	0.022	0.049	0.059	0.060	0.081	0	0.107
Mongol_H	0.123	0.185	0.101	0.016	0.031	0.039	0.020	0.063	0.125	0.141	0.107	0
Moriori_H	0.052	0.109	0.088	0.057	0.102	0.020	0.068	0.004	0.041	0.146	0.108	0.040
Nepal_H	0.086	0.090	0.057	0.000	0.003	0.027	0.009	0.029	0.068	0.176	0.096	0.012
Nicobar_H	0.081	0.254	0.255	0.057	0.072	0.017	0.081	0.039	0.002	0.138	0.031	0.141
Nigeria_H	0.002	0.204	0.191	0.056	0.143	0.026	0.085	0.036	0.046	0.106	0.063	0.123
Nubia_H	0.014	0.196	0.145	0.041	0.106	0.008	0.061	0.025	0.034	0.050	0.060	0.051
NZMaori_H	0.095	0.087	0.048	0.066	0.124	0.051	0.077	0.017	0.085	0.208	0.150	0.055
Palestine_H	0.092	0.172	0.098	0.064	0.147	0.104	0.132	0.113	0.135	0.130	0.187	0.076

Peru_H	0.056	0.395	0.317	0.108	0.159	0.044	0.100	0.111	0.090	0.000	0.054	0.106
Philipp_H	0.073	0.187	0.126	0.000	0.021	0.010	0.011	0.025	0.074	0.140	0.054	0.025
PNG_H	0.068	0.270	0.254	0.106	0.124	0.040	0.102	0.049	0.003	0.097	0.049	0.126
Polynesia_H	0.119	0.115	0.093	0.058	0.075	0.038	0.052	0.017	0.077	0.227	0.120	0.050
PretorBl_P	0.177	0.011	0.032	0.087	0.185	0.164	0.170	0.112	0.188	0.397	0.299	0.172
Russia_H	0.088	0.153	0.070	0.029	0.094	0.080	0.086	0.083	0.148	0.162	0.157	0.041
Somalia_H	0.032	0.181	0.113	0.010	0.063	0.021	0.033	0.033	0.081	0.100	0.059	0.035
SAfrica_H	0.009	0.199	0.190	0.103	0.210	0.061	0.139	0.071	0.057	0.081	0.128	0.131
SriLanka_H	0.065	0.154	0.097	0.000	0.008	0.001	0.000	0.015	0.048	0.117	0.047	0.011
Tanzania_H	0.003	0.246	0.241	0.107	0.228	0.058	0.156	0.067	0.049	0.101	0.100	0.192
Thailand_H	0.087	0.205	0.137	0.000	0.002	0.013	0.024	0.052	0.083	0.113	0.060	0.025
Tibet_H	0.108	0.123	0.065	0.000	0.004	0.044	0.014	0.057	0.110	0.177	0.112	0.008
Turkey_H	0.148	0.194	0.098	0.044	0.086	0.126	0.096	0.119	0.178	0.221	0.173	0.070
TXSTWh_P	0.108	0.100	0.037	0.044	0.118	0.106	0.092	0.095	0.157	0.197	0.197	0.053
UKMedievl_H	0.212	0.167	0.090	0.107	0.138	0.186	0.158	0.164	0.227	0.297	0.269	0.093
UTK_Bl_P	0.051	0.170	0.140	0.045	0.151	0.042	0.117	0.046	0.046	0.129	0.115	0.136
UTK_Wh_P	0.124	0.167	0.104	0.095	0.162	0.146	0.140	0.135	0.175	0.202	0.217	0.093
Vietnam_H	0.086	0.088	0.043	0.027	0.051	0.030	0.008	0.019	0.075	0.156	0.098	0.001
WAfrica_H	0.000	0.247	0.219	0.057	0.151	0.010	0.091	0.030	0.020	0.052	0.039	0.124

Table B.9. (continued). Moriori_H to PretorBl_P.

	Moriori_H	Nepal_H	Nicobar_H	Nigeria_H	Nubia_H	NZMaori_H	Palestine_H	Peru_H	Philipp_H	PNG_H	Polynesia_H	PretorBl_P
Alaska_H	0.109	0.106	0.162	0.152	0.049	0.146	0.074	0.042	0.123	0.099	0.170	0.315
Aleut_H	0.163	0.127	0.150	0.160	0.074	0.207	0.115	0.033	0.122	0.116	0.212	0.376
Andaman_Isl_H	0.089	0.024	0.069	0.143	0.124	0.075	0.195	0.225	0.061	0.110	0.044	0.123
Australia_H	0.203	0.293	0.148	0.228	0.172	0.183	0.241	0.275	0.312	0.138	0.256	0.290
Burma_YH	**0.085**	**0.006**	**0.120**	**0.107**	**0.106**	**0.093**	**0.122**	**0.205**	**0.033**	**0.191**	**0.076**	**0.077**
Cambodia_H	0.012	0.000	0.059	0.073	0.003	0.032	0.059	0.052	0.006	0.065	0.037	0.160
Cameroon_H	0.168	0.164	0.040	0.035	0.091	0.239	0.231	0.082	0.142	0.073	0.222	0.304
CanadaNat_H	0.114	0.144	0.174	0.148	0.044	0.164	0.087	0.019	0.130	0.100	0.192	0.377
China_H	0.020	0.000	0.061	0.051	0.035	0.035	0.088	0.114	0.000	0.092	0.023	0.097
EasterIsl_H	0.017	0.021	0.067	0.099	0.035	0.009	0.053	0.145	0.063	0.053	0.034	0.085
Egypt_H	0.036	0.031	0.142	0.097	0.022	0.055	0.007	0.099	0.055	0.078	0.091	0.166
France_H	0.050	0.028	0.197	0.166	0.072	0.037	0.014	0.203	0.084	0.141	0.084	0.108
Gabon_H	0.065	0.107	0.018	0.013	0.039	0.127	0.161	0.080	0.098	0.021	0.124	0.215
Germany_H	0.091	0.056	0.277	0.189	0.093	0.066	0.018	0.211	0.098	0.204	0.130	0.149
Ghana_H	0.095	0.119	0.045	0.018	0.053	0.184	0.154	0.075	0.108	0.066	0.175	0.242
Greece_H	0.080	0.031	0.248	0.192	0.111	0.086	0.064	0.217	0.062	0.218	0.100	0.161
Greenland_H	0.027	0.036	0.100	0.089	0.012	0.074	0.042	0.048	0.043	0.070	0.082	0.211
Hungary_H	0.100	0.046	0.260	0.177	0.093	0.122	0.033	0.169	0.086	0.178	0.148	0.215
India_H	0.019	0.014	0.160	0.094	0.033	0.050	0.029	0.113	0.036	0.118	0.067	0.144
Indonesia_H	0.046	0.010	0.014	0.042	0.031	0.073	0.106	0.074	0.013	0.049	0.051	0.145
Iran_H	0.254	0.280	0.541	0.310	0.349	0.319	0.420	0.461	0.262	0.514	0.297	0.388
Iraq_H	0.149	0.101	0.290	0.206	0.105	0.150	0.037	0.170	0.105	0.202	0.202	0.288
Italy_H	0.087	0.064	0.258	0.177	0.096	0.076	0.014	0.230	0.116	0.184	0.139	0.131
Japan_PH	0.053	0.000	0.134	0.126	0.080	0.056	0.100	0.164	0.020	0.149	0.042	0.121
Kenya_H	0.052	0.086	0.081	0.002	0.014	0.095	0.092	0.056	0.073	0.068	0.119	0.177
KirstenBl_P	0.109	0.090	0.254	0.204	0.196	0.087	0.172	0.395	0.187	0.270	0.115	0.011
KirstenCol_P	0.088	0.057	0.255	0.191	0.145	0.048	0.098	0.317	0.126	0.254	0.093	0.032
Korea_H	0.057	0.000	0.057	0.056	0.041	0.066	0.064	0.108	0.000	0.106	0.058	0.087
Laos_H	0.102	0.003	0.072	0.143	0.106	0.124	0.147	0.159	0.021	0.124	0.075	0.185
Malay_H	0.020	0.027	0.017	0.026	0.008	0.051	0.104	0.044	0.010	0.040	0.038	0.164
Malaysia_H	0.068	0.009	0.081	0.085	0.061	0.077	0.132	0.100	0.011	0.102	0.052	0.170
Marquesas_H	0.004	0.029	0.039	0.036	0.025	0.017	0.113	0.111	0.025	0.049	0.017	0.112
Melanesia_H	0.041	0.068	0.002	0.046	0.034	0.085	0.135	0.090	0.074	0.003	0.077	0.188
Mexico_H	0.146	0.176	0.138	0.106	0.050	0.208	0.130	0.000	0.140	0.097	0.227	0.397
Micronesia_H	0.108	0.096	0.031	0.063	0.060	0.150	0.187	0.054	0.054	0.049	0.120	0.299
Mongol_H	0.040	0.012	0.141	0.123	0.051	0.055	0.076	0.106	0.025	0.126	0.050	0.172
Moriori_H	0	0.015	0.072	0.046	0.012	0.005	0.073	0.103	0.029	0.061	0.008	0.100
Nepal_H	0.015	0	0.067	0.062	0.044	0.042	0.075	0.133	0.000	0.088	0.019	0.069
Nicobar_H	0.072	0.067	0	0.043	0.071	0.122	0.222	0.115	0.059	0.016	0.068	0.181
Nigeria_H	0.046	0.062	0.043	0	0.032	0.102	0.133	0.081	0.052	0.069	0.093	0.148
Nubia_H	0.012	0.044	0.071	0.032	0	0.045	0.043	0.033	0.041	0.036	0.068	0.174
NZMaori_H	0.005	0.042	0.122	0.102	0.045	0	0.081	0.170	0.056	0.110	0.020	0.085
Palestine_H	0.073	0.075	0.222	0.133	0.043	0.081	0	0.128	0.110	0.137	0.151	0.177

Peru_H	0.103	0.133	0.115	0.081	0.033	0.170	0.128	0	0.104	0.067	0.172	0.361
Philipp_H	0.029	0.000	0.059	0.052	0.041	0.056	0.110	0.104	0	0.089	0.032	0.136
PNG_H	0.061	0.088	0.016	0.069	0.036	0.110	0.137	0.067	0.089	0	0.103	0.252
Polynesia_H	0.008	0.019	0.068	0.093	0.068	0.020	0.151	0.172	0.032	0.103	0	0.099
PretorBl_P	0.100	0.069	0.181	0.148	0.174	0.085	0.177	0.361	0.136	0.252	0.099	0
Russia_H	0.053	0.033	0.207	0.105	0.049	0.066	0.007	0.144	0.054	0.160	0.108	0.133
Somalia_H	0.036	0.017	0.108	0.036	0.017	0.064	0.044	0.074	0.015	0.089	0.076	0.146
SAfrica_H	0.040	0.091	0.117	0.029	0.018	0.102	0.076	0.063	0.106	0.070	0.129	0.188
SriLanka_H	0.025	0.000	0.044	0.058	0.023	0.033	0.081	0.085	0.000	0.057	0.024	0.124
Tanzania_H	0.079	0.129	0.060	0.011	0.044	0.126	0.146	0.095	0.115	0.072	0.147	0.189
Thailand_H	0.049	0.004	0.045	0.068	0.046	0.083	0.098	0.097	0.007	0.092	0.056	0.144
Tibet_H	0.042	0.000	0.113	0.091	0.060	0.063	0.069	0.141	0.009	0.125	0.048	0.099
Turkey_H	0.115	0.054	0.246	0.168	0.095	0.104	0.027	0.198	0.081	0.180	0.153	0.183
TXSTWh_P	0.066	0.038	0.235	0.132	0.065	0.062	0.007	0.172	0.085	0.171	0.116	0.114
UKMedievl_H	0.123	0.079	0.323	0.232	0.136	0.122	0.040	0.261	0.135	0.232	0.173	0.191
UTK_Bl_P	0.064	0.094	0.032	0.066	0.043	0.047	0.108	0.139	0.092	0.072	0.089	0.114
UTK_Wh_P	0.098	0.075	0.283	0.156	0.082	0.116	0.012	0.174	0.124	0.178	0.175	0.192
Vietnam_H	0.010	0.000	0.115	0.089	0.029	0.013	0.055	0.106	0.027	0.082	0.021	0.110
WAfrica_H	0.043	0.080	0.026	0.000	0.007	0.092	0.112	0.042	0.056	0.035	0.101	0.185

Table B.9. (continued). Russia_H to UTK_Wh_P.

	Russia_H	Somalia_H	SAfrica_H	SriLanka_H	Tanzania_H	Thailand_H	Tibet_H	Turkey_H	TXSTWh_P	UKMedievl_H	UTK_Bl_P	UTK_Wh_P
Alaska_H	0.121	0.102	0.092	0.071	0.163	0.097	0.108	0.157	0.118	0.189	0.127	0.133
Aleut_H	0.145	0.104	0.138	0.080	0.182	0.081	0.118	0.169	0.162	0.234	0.153	0.177
Andaman_Isl_H	0.159	0.108	0.204	0.020	0.207	0.081	0.052	0.145	0.138	0.188	0.121	0.197
Australia_H	0.337	0.295	0.187	0.238	0.145	0.296	0.346	0.375	0.307	0.421	0.049	0.354
Burma_YH	**0.059**	**0.054**	**0.169**	**0.032**	**0.178**	**0.021**	**0.007**	**0.091**	**0.078**	**0.135**	**0.112**	**0.142**
Cambodia_H	0.061	0.046	0.062	0.000	0.094	0.010	0.015	0.099	0.078	0.143	0.022	0.121
Cameroon_H	0.238	0.122	0.078	0.124	0.025	0.142	0.201	0.283	0.264	0.389	0.100	0.274
CanadaNat_H	0.127	0.101	0.091	0.096	0.153	0.108	0.142	0.173	0.149	0.216	0.143	0.152
China_H	0.040	0.012	0.097	0.000	0.107	0.005	0.001	0.070	0.061	0.116	0.068	0.107
EasterIsl_H	0.070	0.063	0.087	0.019	0.115	0.059	0.045	0.087	0.050	0.101	0.028	0.093
Egypt_H	0.010	0.019	0.070	0.033	0.127	0.056	0.034	0.019	0.019	0.040	0.096	0.023
France_H	0.015	0.059	0.134	0.051	0.206	0.083	0.030	0.013	0.003	0.008	0.116	0.027
Gabon_H	0.170	0.086	0.029	0.084	0.002	0.116	0.153	0.219	0.191	0.286	0.054	0.198
Germany_H	0.006	0.057	0.158	0.068	0.235	0.108	0.043	0.001	0.000	0.010	0.158	0.021
Ghana_H	0.155	0.085	0.033	0.112	0.012	0.099	0.152	0.223	0.199	0.292	0.083	0.201
Greece_H	0.012	0.056	0.195	0.063	0.274	0.065	0.016	0.023	0.034	0.027	0.205	0.062
Greenland_H	0.046	0.041	0.061	0.027	0.116	0.028	0.042	0.092	0.074	0.117	0.085	0.091
Hungary_H	0.008	0.040	0.154	0.073	0.249	0.088	0.030	0.000	0.017	0.007	0.228	0.011
India_H	0.004	0.018	0.078	0.032	0.145	0.044	0.016	0.038	0.022	0.049	0.125	0.038
Indonesia_H	0.080	0.024	0.090	0.000	0.087	0.004	0.024	0.105	0.096	0.166	0.058	0.137
Iran_H	0.274	0.267	0.351	0.334	0.425	0.374	0.293	0.357	0.334	0.365	0.542	0.343
Iraq_H	0.014	0.049	0.194	0.094	0.259	0.104	0.072	0.000	0.046	0.030	0.217	0.038
Italy_H	0.008	0.060	0.145	0.093	0.215	0.119	0.059	0.004	0.002	0.004	0.155	0.013
Japan_PH	0.048	0.043	0.161	0.006	0.205	0.027	0.000	0.063	0.056	0.091	0.137	0.105
Kenya_H	0.088	0.032	0.009	0.065	0.003	0.087	0.108	0.148	0.108	0.212	0.051	0.124
KirstenBl_P	0.153	0.181	0.199	0.154	0.246	0.205	0.123	0.194	0.100	0.167	0.170	0.167
KirstenCol_P	0.070	0.113	0.190	0.097	0.241	0.137	0.065	0.098	0.037	0.090	0.140	0.104
Korea_H	0.029	0.010	0.103	0.000	0.107	0.000	0.000	0.044	0.044	0.107	0.045	0.095
Laos_H	0.094	0.063	0.210	0.008	0.228	0.002	0.004	0.086	0.118	0.138	0.151	0.162
Malay_H	0.080	0.021	0.061	0.001	0.058	0.013	0.044	0.126	0.106	0.186	0.042	0.146
Malaysia_H	0.086	0.033	0.139	0.000	0.156	0.024	0.014	0.096	0.092	0.158	0.117	0.140
Marquesas_H	0.083	0.033	0.071	0.015	0.067	0.052	0.057	0.119	0.095	0.164	0.046	0.135
Melanesia_H	0.148	0.081	0.057	0.048	0.049	0.083	0.110	0.178	0.157	0.227	0.046	0.175
Mexico_H	0.162	0.100	0.081	0.117	0.101	0.113	0.177	0.221	0.197	0.297	0.129	0.202
Micronesia_H	0.157	0.059	0.128	0.047	0.100	0.060	0.112	0.173	0.197	0.269	0.115	0.217
Mongol_H	0.041	0.035	0.131	0.011	0.192	0.025	0.008	0.070	0.053	0.093	0.136	0.093
Moriori_H	0.053	0.036	0.040	0.025	0.079	0.049	0.042	0.115	0.066	0.123	0.064	0.098
Nepal_H	0.033	0.017	0.091	0.000	0.129	0.004	0.000	0.054	0.038	0.079	0.094	0.075
Nicobar_H	0.207	0.108	0.117	0.044	0.060	0.045	0.113	0.246	0.235	0.323	0.032	0.283
Nigeria_H	0.105	0.036	0.029	0.058	0.011	0.068	0.091	0.168	0.132	0.232	0.066	0.156
Nubia_H	0.049	0.017	0.018	0.023	0.044	0.046	0.060	0.095	0.065	0.136	0.043	0.082
NZMaori_H	0.066	0.064	0.102	0.033	0.126	0.083	0.063	0.104	0.062	0.122	0.047	0.116
Palestine_H	0.007	0.044	0.076	0.081	0.146	0.098	0.069	0.027	0.007	0.040	0.108	0.012

Peru_H	0.144	0.074	0.063	0.085	0.095	0.097	0.141	0.198	0.172	0.261	0.139	0.174
Philipp_H	0.054	0.015	0.106	0.000	0.115	0.007	0.009	0.081	0.085	0.135	0.092	0.124
PNG_H	0.160	0.089	0.070	0.057	0.072	0.092	0.125	0.180	0.171	0.232	0.072	0.178
Polynesia_H	0.108	0.076	0.129	0.024	0.147	0.056	0.048	0.153	0.116	0.173	0.089	0.175
PretorBl_P	0.133	0.146	0.188	0.124	0.189	0.144	0.099	0.183	0.114	0.191	0.114	0.192
Russia_H	0	0.006	0.096	0.054	0.153	0.056	0.022	0.000	0.000	0.021	0.131	0.012
Somalia_H	0.006	0	0.060	0.017	0.083	0.025	0.017	0.032	0.033	0.083	0.095	0.049
SAfrica_H	0.096	0.060	0	0.090	0.026	0.117	0.120	0.169	0.102	0.197	0.084	0.105
SriLanka_H	0.054	0.017	0.090	0	0.106	0.007	0.000	0.064	0.061	0.117	0.054	0.102
Tanzania_H	0.153	0.083	0.026	0.106	0	0.125	0.166	0.222	0.175	0.293	0.037	0.197
Thailand_H	0.056	0.025	0.117	0.007	0.125	0	0.008	0.090	0.090	0.141	0.083	0.133
Tibet_H	0.022	0.017	0.120	0.000	0.166	0.008	0	0.038	0.031	0.065	0.123	0.068
Turkey_H	0.000	0.032	0.169	0.064	0.222	0.090	0.038	0	0.012	0.005	0.173	0.016
TXSTWh_P	0.000	0.033	0.102	0.061	0.175	0.090	0.031	0.012	0	0.020	0.135	0.006
UKMedievl_H	0.021	0.083	0.197	0.117	0.293	0.141	0.065	0.005	0.020	0	0.240	0.019
UTK_Bl_P	0.131	0.095	0.084	0.054	0.037	0.083	0.123	0.173	0.135	0.240	0	0.198
UTK_Wh_P	0.012	0.049	0.105	0.102	0.197	0.133	0.068	0.016	0.006	0.019	0.198	0
Vietnam_H	0.039	0.023	0.084	0.000	0.145	0.043	0.004	0.059	0.020	0.073	0.099	0.058
WAfrica_H	0.107	0.036	0.011	0.050	0.000	0.068	0.109	0.165	0.138	0.240	0.026	0.157

Table B.9. (continued). Vietnam_H to WAfrica_H.

	Vietnam_H	WAfrica_H
Alaska_H	0.079	0.110
Aleut_H	0.120	0.116
Andaman_Isl_H	0.026	0.157
Australia_H	0.250	0.160
Burma_YH	**0.065**	**0.130**
Cambodia_H	0.034	0.037
Cameroon_H	0.203	0.006
CanadaNat_H	0.114	0.095
China_H	0.014	0.056
EasterIsl_H	0.000	0.086
Egypt_H	0.023	0.080
France_H	0.016	0.164
Gabon_H	0.128	0.000
Germany_H	0.037	0.186
Ghana_H	0.178	0.000
Greece_H	0.048	0.205
Greenland_H	0.049	0.061
Hungary_H	0.042	0.184
India_H	0.020	0.093
Indonesia_H	0.025	0.039
Iran_H	0.323	0.361
Iraq_H	0.098	0.187
Italy_H	0.052	0.178
Japan_PH	0.007	0.141
Kenya_H	0.086	0.000
KirstenBl_P	0.088	0.247
KirstenCol_P	0.043	0.219
Korea_H	0.027	0.057
Laos_H	0.051	0.151
Malay_H	0.030	0.010
Malaysia_H	0.008	0.091
Marquesas_H	0.019	0.030
Melanesia_H	0.075	0.020
Mexico_H	0.156	0.052
Micronesia_H	0.098	0.039
Mongol_H	0.001	0.124
Moriori_H	0.010	0.043
Nepal_H	0.000	0.080
Nicobar_H	0.115	0.026
Nigeria_H	0.089	0.000
Nubia_H	0.029	0.007
NZMaori_H	0.013	0.092
Palestine_H	0.055	0.112

Peru_H	0.106	0.042
Philipp_H	0.027	0.056
PNG_H	0.082	0.035
Polynesia_H	0.021	0.101
PretorBl_P	0.110	0.185
Russia_H	0.039	0.107
Somalia_H	0.023	0.036
SAfrica_H	0.084	0.011
SriLanka_H	0.000	0.050
Tanzania_H	0.145	0.000
Thailand_H	0.043	0.068
Tibet_H	0.004	0.109
Turkey_H	0.059	0.165
TXSTWh_P	0.020	0.138
UKMedievl_H	0.073	0.240
UTK_Bl_P	0.099	0.026
UTK_Wh_P	0.058	0.157
Vietnam_H	0	0.096
WAfrica_H	0.096	0

Table B.10. D^2 matrix for cranial nonmetric data in Ossenberg's dataset.

	AfAm_O	Aleut_O	Armenia_O	Athapaskan_O	Aus_Aborig_O	Cen_Arctic_O	Cen_Japan_O	Chile_O	**DW_Burma**	E_Arctic_O	Ghana_O
AfAm_O	0	6.041	2.075	4.935	5.142	5.299	3.348	8.302	**3.101**	5.093	3.177
Aleut_O	6.041	0	2.759	0.843	6.280	1.791	2.540	3.708	**3.881**	1.748	6.501
Armenia_O	2.075	2.759	0	2.713	4.401	2.815	1.787	5.823	**2.447**	2.738	4.433
Athapaskan_O	4.935	0.843	2.713	0	6.097	0.498	1.977	2.985	**2.942**	0.626	5.164
Aus_Aborig_O	5.142	6.280	4.401	6.097	0	7.373	4.832	6.944	**3.377**	6.467	3.824
Cen_Arctic_O	5.299	1.791	2.815	0.498	7.373	0	3.079	4.599	**3.190**	0.515	5.782
Cen_Japan_O	3.348	2.540	1.787	1.977	4.832	3.079	0	5.136	**2.509**	2.402	4.948
Chile_O	8.302	3.708	5.823	2.985	6.944	4.599	5.136	0	**8.121**	4.044	4.332
DW_Burma	**3.101**	**3.881**	**2.447**	**2.942**	**3.377**	**3.190**	**2.509**	**8.121**	**0**	**3.150**	**5.819**
E_Arctic_O	5.093	1.748	2.738	0.626	6.467	0.515	2.402	4.044	**3.150**	0	4.871
Ghana_O	3.177	6.501	4.433	5.164	3.824	5.782	4.948	4.332	**5.819**	4.871	0
Hungary_O	1.601	3.513	1.024	3.280	3.143	3.499	3.235	5.327	**2.336**	3.144	2.610
Iceland_O	3.955	3.704	1.296	2.848	5.933	2.982	2.479	6.697	**2.652**	2.703	7.507
Illinois_O	5.164	2.345	3.355	2.255	4.511	3.196	3.938	2.076	**3.827**	2.813	3.493
India_O	1.559	3.215	1.040	2.502	2.989	2.636	2.147	5.171	**1.446**	2.554	2.701
Italy_O	6.703	9.108	4.321	8.924	12.725	8.549	5.919	15.381	**6.351**	7.804	13.024
Japan_Ainu_O	7.067	7.009	5.193	6.226	10.792	7.080	2.917	10.657	**6.402**	5.584	10.276
Japan_Jomon_O	5.122	4.904	3.606	5.032	7.227	6.579	1.929	6.347	**6.720**	5.735	6.048
Kenya_O	2.428	5.002	2.505	3.826	3.356	3.827	3.625	5.651	**3.173**	3.427	1.844
Marquesas_O	4.413	4.719	3.792	3.530	2.549	3.661	4.206	5.540	**2.603**	3.442	2.673
Mongolia_O	6.273	3.522	1.591	4.210	4.241	4.504	2.631	6.541	**4.139**	4.266	6.635
Moriori_O	7.719	5.735	4.937	5.348	4.668	6.469	4.748	3.726	**7.249**	4.442	3.777
N_Alaska_O	5.781	1.667	3.148	0.622	5.544	0.948	1.987	3.415	**2.430**	0.633	5.012
N_China_O	3.943	2.920	1.383	2.649	5.587	2.999	1.673	6.497	**2.505**	3.856	6.499
N_Japan_O	3.088	2.973	1.353	2.465	5.409	3.367	0.442	5.357	**3.689**	2.706	5.044
N_Miss_Valley_O	3.424	1.012	1.863	1.070	5.053	1.846	2.606	3.750	**2.685**	1.810	4.672
N_N_Japan_O	4.345	2.930	2.979	1.902	6.015	2.724	0.890	5.998	**2.322**	2.510	5.849
N_Pacific_Coast_O	5.536	0.886	3.182	0.446	7.227	0.973	2.297	3.753	**3.215**	1.219	5.746
Newfoundland_O	4.067	1.243	2.454	1.272	5.512	2.060	2.384	4.198	**3.191**	1.431	4.565
Nigeria_O	3.198	4.138	2.584	3.029	3.135	3.803	2.231	3.410	**4.132**	2.734	1.109
NZ_Maori_O	3.458	3.125	2.855	1.719	3.842	1.782	3.527	4.173	**2.173**	1.602	2.677
Ontario_Brit_O	2.411	4.800	0.788	4.238	5.999	3.932	3.560	8.245	**2.648**	3.838	6.391
Ontario_Native_O	4.691	2.005	4.000	1.674	4.665	3.034	3.126	2.621	**4.117**	2.316	3.364
Patagonia_O	8.129	3.668	6.120	3.698	9.477	5.547	5.586	3.366	**8.808**	4.318	7.248
Pecos_Pueblo_O	7.753	2.604	5.314	3.014	4.205	4.494	4.404	4.142	**3.599**	4.045	6.160
Plains_O	3.897	1.380	2.408	0.570	4.990	0.985	2.252	4.312	**1.449**	1.192	4.979
Plateau_O	5.947	2.258	4.039	1.354	5.678	1.937	3.874	2.509	**3.658**	2.113	4.193
S_Africa_O	2.330	3.605	2.757	2.441	2.814	3.296	1.856	4.632	**1.597**	2.406	2.372
S_Alaska_O	6.548	1.079	3.896	0.597	6.553	1.327	2.199	3.031	**3.584**	1.035	5.537
Siberia_O	4.649	1.970	3.390	1.403	4.389	2.264	1.398	4.895	**2.153**	1.628	4.366
St_Lawrence_O	5.850	0.666	3.035	0.403	6.266	0.885	2.464	3.123	**3.286**	0.763	5.419
Sudan_O	2.579	3.379	2.422	2.133	2.755	2.835	1.985	3.584	**2.306**	1.686	1.757

Tanzania_O	3.886	3.095	3.222	3.183	2.320	5.076	2.626	2.588	**4.306**	4.111	2.536
W_Africa_O	3.921	3.900	1.402	3.799	2.821	4.230	2.724	5.267	**3.680**	4.456	3.971
W_Japan_O	3.205	1.678	1.323	1.099	4.506	1.753	0.277	4.873	**1.749**	1.341	4.875

Table B.10. (continued). Hungary_O to Moriori_O.

	Hungary_O	Iceland_O	Illinois_O	India_O	Italy_O	Japan_Ainu_O	Japan_Jomon_O	Kenya_O	Marquesas_O	Mongolia_O	Moriori_O
AfAm_O	1.601	3.955	5.164	1.559	6.703	7.067	5.122	2.428	4.413	6.273	7.719
Aleut_O	3.513	3.704	2.345	3.215	9.108	7.009	4.904	5.002	4.719	3.522	5.735
Armenia_O	1.024	1.296	3.355	1.040	4.321	5.193	3.606	2.505	3.792	1.591	4.937
Athapaskan_O	3.280	2.848	2.255	2.502	8.924	6.226	5.032	3.826	3.530	4.210	5.348
Aus_Aborig_O	3.143	5.933	4.511	2.989	12.725	10.792	7.227	3.356	2.549	4.241	4.668
Cen_Arctic_O	3.499	2.982	3.196	2.636	8.549	7.080	6.579	3.827	3.661	4.504	6.469
Cen_Japan_O	3.235	2.479	3.938	2.147	5.919	2.917	1.929	3.625	4.206	2.631	4.748
Chile_O	5.327	6.697	2.076	5.171	15.381	10.657	6.347	5.651	5.540	6.541	3.726
DW_Burma	**2.336**	**2.652**	**3.827**	**1.446**	**6.351**	**6.402**	**6.720**	**3.173**	**2.603**	**4.139**	**7.249**
E_Arctic_O	3.144	2.703	2.813	2.554	7.804	5.584	5.735	3.427	3.442	4.266	4.442
Ghana_O	2.610	7.507	3.493	2.701	13.024	10.276	6.048	1.844	2.673	6.635	3.777
Hungary_O	0	2.688	2.411	0.694	6.992	6.897	5.001	1.527	2.230	3.551	4.038
Iceland_O	2.688	0	4.943	2.545	3.767	4.670	5.615	4.131	5.738	3.255	5.996
Illinois_O	2.411	4.943	0	2.039	11.588	9.394	6.046	3.936	2.933	4.482	4.435
India_O	0.694	2.545	2.039	0	7.088	6.710	4.525	1.247	1.789	2.931	5.186
Italy_O	6.992	3.767	11.588	7.088	0	5.859	9.723	8.136	12.504	7.008	11.914
Japan_Ainu_O	6.897	4.670	9.394	6.710	5.859	0	2.849	8.922	10.311	6.897	6.376
Japan_Jomon_O	5.001	5.615	6.046	4.525	9.723	2.849	0	6.843	7.650	4.323	4.865
Kenya_O	1.527	4.131	3.936	1.247	8.136	8.922	6.843	0	1.931	4.596	4.955
Marquesas_O	2.230	5.738	2.933	1.789	12.504	10.311	7.650	1.931	0	4.624	4.925
Mongolia_O	3.551	3.255	4.482	2.931	7.008	6.897	4.323	4.596	4.624	0	4.849
Moriori_O	4.038	5.996	4.435	5.186	11.914	6.376	4.865	4.955	4.925	4.849	0
N_Alaska_O	3.535	3.324	1.927	2.410	8.693	5.693	5.332	3.811	2.924	3.703	4.443
N_China_O	3.084	2.718	4.498	2.147	5.976	6.161	4.226	3.705	4.105	1.997	7.393
N_Japan_O	3.031	2.002	4.870	2.437	5.716	2.957	1.638	3.638	5.007	2.585	4.539
N_Miss_Valley_O	2.130	2.810	1.594	2.036	7.970	7.549	5.383	3.991	3.917	4.019	5.874
N_N_Japan_O	4.368	3.744	4.070	3.076	7.245	3.547	3.109	5.368	4.690	3.961	6.088
N_Pacific_Coast_O	3.714	3.967	2.586	3.118	8.492	6.298	5.426	4.314	3.966	4.613	5.976
Newfoundland_O	2.761	3.671	2.122	2.586	8.479	7.408	5.606	4.119	3.448	4.200	5.469
Nigeria_O	2.122	4.406	3.338	2.252	9.324	6.340	3.857	1.624	2.190	3.776	1.931
NZ_Maori_O	1.592	3.542	2.533	1.875	8.937	7.562	6.906	1.769	1.671	5.214	3.920
Ontario_Brit_O	1.779	1.104	4.646	1.955	3.309	6.521	6.490	3.884	5.487	3.475	7.211
Ontario_Native_O	3.463	5.227	1.774	2.803	11.628	9.962	6.699	3.190	3.059	5.653	5.578
Patagonia_O	6.080	6.546	4.166	7.163	14.164	8.722	6.287	9.325	8.271	8.451	5.244
Pecos_Pueblo_O	4.561	6.366	1.584	3.919	13.078	8.910	6.501	6.446	4.466	5.194	5.338
Plains_O	2.349	2.683	2.105	1.956	7.870	6.000	5.530	3.608	2.923	4.397	5.556
Plateau_O	3.255	5.268	1.201	3.081	12.242	8.323	6.176	4.761	2.748	5.317	4.530
S_Africa_O	1.851	3.726	2.073	1.013	8.829	5.437	4.074	2.263	2.178	4.733	4.154
S_Alaska_O	4.295	4.419	2.061	3.025	10.113	6.446	5.198	4.311	3.737	4.431	5.246
Siberia_O	3.300	4.568	2.835	2.280	9.829	5.409	4.237	3.518	2.056	4.103	4.804
St_Lawrence_O	3.179	3.566	1.938	2.594	9.419	6.746	5.579	3.739	3.099	4.049	4.979
Sudan_O	1.517	3.113	2.137	1.131	8.486	5.913	4.630	1.317	1.771	4.318	2.872

Tanzania_O	2.664	4.839	1.952	2.366	11.599	7.638	3.320	3.504	3.861	4.174	3.361
W_Africa_O	2.426	3.461	3.963	1.829	8.289	9.046	4.957	2.260	2.961	1.186	5.307
W_Japan_O	2.526	1.683	3.270	1.528	5.610	3.424	2.796	2.955	3.479	2.364	4.744

Table B.10. (continued). N_Alaska_O to Ontario_Native_O.

	N_Alaska_O	N_China_O	N_Japan_O	N_Miss_Valley_O	N_N_Japan_O	N_Pacific_Coast_O	Newfoundland_O	Nigeria_O	NZ_Maori_O	Ontario_Brit_O	Ontario_Native_O
AfAm_O	5.781	3.943	3.088	3.424	4.345	5.536	4.067	3.198	3.458	2.411	4.691
Aleut_O	1.667	2.920	2.973	1.012	2.930	0.886	1.243	4.138	3.125	4.800	2.005
Armenia_O	3.148	1.383	1.353	1.863	2.979	3.182	2.454	2.584	2.855	0.788	4.000
Athapaskan_O	0.622	2.649	2.465	1.070	1.902	0.446	1.272	3.029	1.719	4.238	1.674
Aus_Aborig_O	5.544	5.587	5.409	5.053	6.015	7.227	5.512	3.135	3.842	5.999	4.665
Cen_Arctic_O	0.948	2.999	3.367	1.846	2.724	0.973	2.060	3.803	1.782	3.932	3.034
Cen_Japan_O	1.987	1.673	0.442	2.606	0.890	2.297	2.384	2.231	3.527	3.560	3.126
Chile_O	3.415	6.497	5.357	3.750	5.998	3.753	4.198	3.410	4.173	8.245	2.621
DW_Burma	**2.430**	**2.505**	**3.689**	**2.685**	**2.322**	**3.215**	**3.191**	**4.132**	**2.173**	**2.648**	**4.117**
E_Arctic_O	0.633	3.856	2.706	1.810	2.510	1.219	1.431	2.734	1.602	3.838	2.316
Ghana_O	5.012	6.499	5.044	4.672	5.849	5.746	4.565	1.109	2.677	6.391	3.364
Hungary_O	3.535	3.084	3.031	2.130	4.368	3.714	2.761	2.122	1.592	1.779	3.463
Iceland_O	3.324	2.718	2.002	2.810	3.744	3.967	3.671	4.406	3.542	1.104	5.227
Illinois_O	1.927	4.498	4.870	1.594	4.070	2.586	2.122	3.338	2.533	4.646	1.774
India_O	2.410	2.147	2.437	2.036	3.076	3.118	2.586	2.252	1.875	1.955	2.803
Italy_O	8.693	5.976	5.716	7.970	7.245	8.492	8.479	9.324	8.937	3.309	11.628
Japan_Ainu_O	5.693	6.161	2.957	7.549	3.547	6.298	7.408	6.340	7.562	6.521	9.962
Japan_Jomon_O	5.332	4.226	1.638	5.383	3.109	5.426	5.606	3.857	6.906	6.490	6.699
Kenya_O	3.811	3.705	3.638	3.991	5.368	4.314	4.119	1.624	1.769	3.884	3.190
Marquesas_O	2.924	4.105	5.007	3.917	4.690	3.966	3.448	2.190	1.671	5.487	3.059
Mongolia_O	3.703	1.997	2.585	4.019	3.961	4.613	4.200	3.776	5.214	3.475	5.653
Moriori_O	4.443	7.393	4.539	5.874	6.088	5.976	5.469	1.931	3.920	7.211	5.578
N_Alaska_O	0	3.049	3.093	1.978	1.608	0.825	1.857	2.928	1.750	4.576	2.286
N_China_O	3.049	0	2.014	3.027	2.326	2.447	3.721	3.902	3.810	3.035	4.790
N_Japan_O	3.093	2.014	0	2.950	2.005	3.209	2.834	2.188	4.027	3.120	3.847
N_Miss_Valley_O	1.978	3.027	2.950	0	2.548	1.512	0.561	3.324	2.090	2.616	1.453
N_N_Japan_O	1.608	2.326	2.005	2.548	0	1.868	2.550	3.333	3.360	4.390	3.929
N_Pacific_Coast_O	0.825	2.447	3.209	1.512	1.868	0	1.602	3.547	1.991	4.988	2.246
Newfoundland_O	1.857	3.721	2.834	0.561	2.550	1.602	0	2.823	2.417	3.543	1.040
Nigeria_O	2.928	3.902	2.188	3.324	3.333	3.547	2.823	0	1.792	4.625	2.552
NZ_Maori_O	1.750	3.810	4.027	2.090	3.360	1.991	2.417	1.792	0	3.782	2.520
Ontario_Brit_O	4.576	3.035	3.120	2.616	4.390	4.988	3.543	4.625	3.782	0	5.717
Ontario_Native_O	2.286	4.790	3.847	1.453	3.929	2.246	1.040	2.552	2.520	5.717	0
Patagonia_O	5.075	8.539	5.261	2.911	5.724	4.631	2.697	5.153	5.607	7.476	3.760
Pecos_Pueblo_O	2.218	5.430	6.177	2.712	3.499	3.049	3.549	5.133	3.562	7.040	3.419
Plains_O	0.852	2.448	3.113	0.890	1.562	0.689	1.457	3.215	1.006	3.299	2.301
Plateau_O	1.214	4.026	4.938	1.838	2.767	1.308	2.248	3.198	1.518	5.594	2.583
S_Africa_O	1.894	3.923	2.775	2.388	2.125	3.094	2.548	1.906	1.743	3.846	2.310
S_Alaska_O	0.404	3.442	3.303	2.153	2.259	0.639	1.942	3.533	2.621	6.050	1.823
Siberia_O	1.042	3.060	2.543	2.454	1.496	1.450	1.667	2.405	2.221	5.564	1.995
St_Lawrence_O	0.642	2.996	3.117	1.581	2.812	0.487	1.412	3.305	1.969	4.927	1.725
Sudan_O	1.824	4.087	2.372	2.345	2.987	3.000	2.127	0.945	1.212	3.588	1.667

Tanzania_O	3.513	4.620	2.929	2.357	3.754	4.151	2.960	2.024	3.380	5.309	1.976
W_Africa_O	4.095	1.556	2.488	3.410	4.355	4.446	3.881	2.355	3.745	3.298	3.954
W_Japan_O	1.227	1.460	0.648	1.787	1.001	1.555	1.769	2.289	2.484	2.794	2.603

Table B.10. (continued). Patagonia_O to W_Africa_O.

	Patagonia_O	Pecos_Pueblo_O	Plains_O	Plateau_O	S_Africa_O	S_Alaska_O	Siberia_O	St_Lawrence_O	Sudan_O	Tanzania_O	W_Africa_O
AfAm_O	8.129	7.753	3.897	5.947	2.330	6.548	4.649	5.850	2.579	3.886	3.921
Aleut_O	3.668	2.604	1.380	2.258	3.605	1.079	1.970	0.666	3.379	3.095	3.900
Armenia_O	6.120	5.314	2.408	4.039	2.757	3.896	3.390	3.035	2.422	3.222	1.402
Athapaskan_O	3.698	3.014	0.570	1.354	2.441	0.597	1.403	0.403	2.133	3.183	3.799
Aus_Aborig_O	9.477	4.205	4.990	5.678	2.814	6.553	4.389	6.266	2.755	2.320	2.821
Cen_Arctic_O	5.547	4.494	0.985	1.937	3.296	1.327	2.264	0.885	2.835	5.076	4.230
Cen_Japan_O	5.586	4.404	2.252	3.874	1.856	2.199	1.398	2.464	1.985	2.626	2.724
Chile_O	3.366	4.142	4.312	2.509	4.632	3.031	4.895	3.123	3.584	2.588	5.267
DW_Burma	**8.808**	**3.599**	**1.449**	**3.658**	**1.597**	**3.584**	**2.153**	**3.286**	**2.306**	**4.306**	**3.680**
E_Arctic_O	4.318	4.045	1.192	2.113	2.406	1.035	1.628	0.763	1.686	4.111	4.456
Ghana_O	7.248	6.160	4.979	4.193	2.372	5.537	4.366	5.419	1.757	2.536	3.971
Hungary_O	6.080	4.561	2.349	3.255	1.851	4.295	3.300	3.179	1.517	2.664	2.426
Iceland_O	6.546	6.366	2.683	5.268	3.726	4.419	4.568	3.566	3.113	4.839	3.461
Illinois_O	4.166	1.584	2.105	1.201	2.073	2.061	2.835	1.938	2.137	1.952	3.963
India_O	7.163	3.919	1.956	3.081	1.013	3.025	2.280	2.594	1.131	2.366	1.829
Italy_O	14.164	13.078	7.870	12.242	8.829	10.113	9.829	9.419	8.486	11.599	8.289
Japan_Ainu_O	8.722	8.910	6.000	8.323	5.437	6.446	5.409	6.746	5.913	7.638	9.046
Japan_Jomon_O	6.287	6.501	5.530	6.176	4.074	5.198	4.237	5.579	4.630	3.320	4.957
Kenya_O	9.325	6.446	3.608	4.761	2.263	4.311	3.518	3.739	1.317	3.504	2.260
Marquesas_O	8.271	4.466	2.923	2.748	2.178	3.737	2.056	3.099	1.771	3.861	2.961
Mongolia_O	8.451	5.194	4.397	5.317	4.733	4.431	4.103	4.049	4.318	4.174	1.186
Moriori_O	5.244	5.338	5.556	4.530	4.154	5.246	4.804	4.979	2.872	3.361	5.307
N_Alaska_O	5.075	2.218	0.852	1.214	1.894	0.404	1.042	0.642	1.824	3.513	4.095
N_China_O	8.539	5.430	2.448	4.026	3.923	3.442	3.060	2.996	4.087	4.620	1.556
N_Japan_O	5.261	6.177	3.113	4.938	2.775	3.303	2.543	3.117	2.372	2.929	2.488
N_Miss_Valley_O	2.911	2.712	0.890	1.838	2.388	2.153	2.454	1.581	2.345	2.357	3.410
N_N_Japan_O	5.724	3.499	1.562	2.767	2.125	2.259	1.496	2.812	2.987	3.754	4.355
N_Pacific_Coast_O	4.631	3.049	0.689	1.308	3.094	0.639	1.450	0.487	3.000	4.151	4.446
Newfoundland_O	2.697	3.549	1.457	2.248	2.548	1.942	1.667	1.412	2.127	2.960	3.881
Nigeria_O	5.153	5.133	3.215	3.198	1.906	3.533	2.405	3.305	0.945	2.024	2.355
NZ_Maori_O	5.607	3.562	1.006	1.518	1.743	2.621	2.221	1.969	1.212	3.380	3.745
Ontario_Brit_O	7.476	7.040	3.299	5.594	3.846	6.050	5.564	4.927	3.588	5.309	3.298
Ontario_Native_O	3.760	3.419	2.301	2.583	2.310	1.823	1.995	1.725	1.667	1.976	3.954
Patagonia_O	0	5.771	4.510	3.852	5.899	4.969	5.497	4.318	5.086	4.191	8.394
Pecos_Pueblo_O	5.771	0	2.217	1.837	2.671	2.399	2.817	2.875	3.644	2.536	5.744
Plains_O	4.510	2.217	0	1.029	1.783	1.352	1.422	1.005	2.030	3.278	3.968
Plateau_O	3.852	1.837	1.029	0	2.609	1.674	2.160	1.466	2.735	3.348	4.803
S_Africa_O	5.899	2.671	1.783	2.609	0	2.493	1.411	2.765	0.493	1.625	3.815
S_Alaska_O	4.969	2.399	1.352	1.674	2.493	0	1.054	0.343	2.387	3.411	4.654
Siberia_O	5.497	2.817	1.422	2.160	1.411	1.054	0	1.189	1.604	3.020	4.000
St_Lawrence_O	4.318	2.875	1.005	1.466	2.765	0.343	1.189	0	2.280	3.609	4.072
Sudan_O	5.086	3.644	2.030	2.735	0.493	2.387	1.604	2.280	0	1.664	3.137

Tanzania_O	4.191	2.536	3.278	3.348	1.625	3.411	3.020	3.609	1.664	0	2.987
W_Africa_O	8.394	5.744	3.968	4.803	3.815	4.654	4.000	4.072	3.137	2.987	0
W_Japan_O	5.355	3.743	1.316	3.113	1.584	1.496	1.084	1.498	1.572	2.659	2.467

Table B.10. (continued). W_Japan_O

	W_Japan_O
AfAm_O	3.205
Aleut_O	1.678
Armenia_O	1.323
Athapaskan_O	1.099
Aus_Aborig_O	4.506
Cen_Arctic_O	1.753
Cen_Japan_O	0.277
Chile_O	4.873
DW_Burma	**1.749**
E_Arctic_O	1.341
Ghana_O	4.875
Hungary_O	2.526
Iceland_O	1.683
Illinois_O	3.270
India_O	1.528
Italy_O	5.610
Japan_Ainu_O	3.424
Japan_Jomon_O	2.796
Kenya_O	2.955
Marquesas_O	3.479
Mongolia_O	2.364
Moriori_O	4.744
N_Alaska_O	1.227
N_China_O	1.460
N_Japan_O	0.648
N_Miss_Valley_O	1.787
N_N_Japan_O	1.001
N_Pacific_Coast_O	1.555
Newfoundland_O	1.769
Nigeria_O	2.289
NZ_Maori_O	2.484
Ontario_Brit_O	2.794
Ontario_Native_O	2.603
Patagonia_O	5.355
Pecos_Pueblo_O	3.743
Plains_O	1.316
Plateau_O	3.113
S_Africa_O	1.584
S_Alaska_O	1.496
Siberia_O	1.084
St_Lawrence_O	1.498
Sudan_O	1.572

Tanzania_O	2.659
W_Africa_O	2.467
W_Japan_O	0

Table B.11. D^2 matrix for cranial nonmetric data in the Hanihara dataset. Afghanistan_H to Bismarck_H.

	Afghanistan_H	Alaska_Inuit_H	Aleut_H	Andaman_Isl_H	Australia_Aboriginal_H	Austria_H	Bangladesh_H	Bedouin_H	Bismarck_H	Bolivia_H
Afghanistan_H	0.000	4.966	5.453	2.304	3.338	2.547	3.065	1.639	8.049	5.081
Alaska_Inuit_H	4.966	0.000	0.812	1.896	5.582	3.789	2.468	5.216	3.011	2.315
Aleut_H	5.453	0.812	0.000	2.532	7.064	4.353	4.065	5.042	3.845	1.010
Andaman_Isl_H	2.304	1.896	2.532	0.000	3.465	1.313	1.265	2.784	4.332	3.001
Australia_Aboriginal_H	3.338	5.582	7.064	3.465	0.000	3.946	2.603	4.731	3.999	7.029
Austria_H	2.547	3.789	4.353	1.313	3.946	0.000	2.134	2.443	6.257	4.523
Bangladesh_H	3.065	2.468	4.065	1.265	2.603	2.134	0.000	4.682	3.801	5.402
Bedouin_H	1.639	5.216	5.042	2.784	4.731	2.443	4.682	0.000	8.083	3.567
Bismarck_H	8.049	3.011	3.845	4.332	3.999	6.257	3.801	8.083	0.000	4.579
Bolivia_H	5.081	2.315	1.010	3.001	7.029	4.523	5.402	3.567	4.579	0.000
Borneo_H	4.167	2.216	3.503	2.136	2.459	2.999	1.792	4.234	1.846	3.596
Bulgaria_H	3.312	5.242	5.536	3.889	7.996	3.802	4.986	2.585	8.785	4.729
Burma_NHM_H	3.381	1.287	2.493	0.788	2.691	2.398	1.632	4.183	2.792	3.235
Buryat_H	3.145	2.163	2.288	0.686	5.862	2.316	1.644	3.517	5.697	2.888
Cambodia_H	2.917	4.068	4.384	3.552	4.011	5.767	2.939	3.905	5.137	3.880
Cameroon_H	2.945	2.984	4.866	1.527	2.022	3.144	2.566	3.143	4.042	4.826
Canada_Indigenous_H	5.057	2.080	2.570	3.492	3.857	4.545	2.742	4.408	2.851	2.776
Canada_Inuit_H	4.310	3.679	4.423	5.548	6.054	7.744	5.491	4.826	6.357	5.128
Celebes_H	2.907	2.473	3.815	2.296	1.892	3.605	2.166	4.202	3.153	3.978
Chile_H	5.661	5.292	5.704	6.178	5.193	7.371	5.774	3.758	6.494	4.911
China_North_H	3.017	1.658	1.852	0.655	3.641	1.202	1.824	2.684	3.780	2.356
China_South_H	3.661	2.174	2.806	1.727	4.447	1.733	2.443	3.627	4.743	2.790
Chukchi_H	6.552	3.183	4.702	4.849	6.007	6.676	3.743	7.755	5.613	7.294
Colombia_H	9.387	4.577	4.153	6.790	7.114	6.752	7.187	6.078	3.669	3.100
Congo_H	1.369	4.552	5.184	2.363	1.717	2.889	2.993	1.920	6.247	4.667
Cyprus_H	4.336	3.980	4.567	2.423	1.792	2.821	1.849	3.848	2.529	4.933
Czech_H	1.661	3.155	3.785	1.286	2.878	0.525	2.050	1.754	5.029	3.886
DW_Burma	**2.496**	**4.320**	**5.656**	**2.014**	**2.274**	**3.403**	**2.562**	**4.216**	**6.796**	**6.660**
Easter_Isl_H	7.384	7.553	9.512	7.911	2.796	9.289	4.496	8.995	6.061	10.575

Ecuador_H	5.799	3.052	3.213	3.925	3.907	3.592	4.298	3.557	3.355	3.012
Egypt_H	1.796	2.799	3.424	0.695	3.087	0.545	1.748	1.728	5.006	3.584
Finland_H	3.051	7.151	8.136	3.331	3.661	1.430	2.691	4.035	8.538	8.804
France_H	1.746	3.418	3.509	1.262	3.891	0.321	2.082	1.703	5.894	3.673
Gabon_H	4.358	3.236	5.186	2.351	1.949	3.456	2.796	4.617	4.469	5.880
Germany_H	2.816	4.453	4.705	1.760	3.154	0.682	3.031	2.534	5.305	4.822
Ghana_Ashanti_H	2.478	2.476	3.877	1.398	1.793	2.248	2.389	2.788	4.163	4.287
Greece_H	2.959	3.494	4.084	1.238	3.620	0.845	1.303	2.514	4.601	4.201
Greenland_H	5.935	0.887	1.761	4.177	6.113	5.722	4.292	6.668	3.673	3.825
Hawaii_H	5.060	4.025	6.045	4.303	1.718	5.534	1.910	6.397	3.599	7.377
Hungary_H	2.099	2.885	3.546	1.137	3.234	0.313	1.988	1.863	5.503	4.011
India_Bengal_H	2.005	2.211	3.357	0.693	3.563	0.978	1.943	1.687	5.576	3.497
India_Northeast_H	2.277	2.015	2.918	0.206	3.091	1.083	1.343	2.490	4.632	3.026
India_Northwest_H	2.316	3.628	4.379	2.195	1.411	3.243	1.885	3.469	3.828	4.086
India_Pakistan_Punjab_H	2.289	3.497	3.913	0.791	4.334	0.458	2.382	1.728	6.318	3.968
India_South_H	2.292	2.164	3.240	1.143	3.700	0.913	2.106	2.295	5.755	3.421
Iraq_H	1.694	3.411	4.266	1.779	3.608	2.418	2.011	1.679	5.502	3.910
Israel_H	2.364	4.443	5.717	1.345	2.478	0.884	1.640	3.060	5.083	5.983
Italy_H	1.514	3.877	4.356	1.132	3.390	0.469	1.886	1.552	6.078	4.192
Japan_Ainu_H	3.120	3.161	3.950	2.364	3.894	4.362	2.742	4.410	3.104	4.131
Japan_Jomon_H	4.215	6.899	6.864	4.381	6.048	6.367	5.290	4.344	5.771	5.200
Japan_Mainland_H	2.156	1.695	1.887	0.859	5.095	2.225	2.514	3.142	4.950	2.313
Java_H	4.103	1.362	1.681	1.263	3.582	2.589	2.128	4.037	1.872	1.836
Kenya_H	3.072	2.409	3.375	1.404	2.812	2.053	3.022	2.423	4.182	3.011
Korea_H	2.774	4.455	5.462	1.988	2.469	3.971	2.258	4.098	4.867	6.138
Laos_H	3.863	2.876	3.158	2.272	3.448	1.966	2.107	3.348	4.284	3.033
Malawi_H	5.569	5.090	6.661	3.254	1.710	3.144	3.162	5.022	4.463	7.580
Malay_H	4.420	2.436	3.408	1.988	1.725	2.713	1.811	5.210	2.423	4.299
Marquesas_H	6.225	5.391	7.304	4.803	2.503	6.858	2.436	7.619	3.421	8.930
Melanesia_H	2.471	2.970	3.560	1.548	1.316	1.822	1.593	2.483	3.077	3.486
Mexico_H	4.356	1.593	2.341	2.849	3.880	3.367	2.526	3.875	3.389	2.401
Micronesia_H	3.229	3.060	4.310	2.922	1.269	3.434	2.699	3.953	3.439	4.413
Molucca_H	5.135	3.783	3.923	3.190	2.124	4.785	4.122	4.200	3.117	3.961
Mongol_H	2.401	2.441	2.757	1.040	5.197	1.512	1.923	3.823	6.383	3.590
Moriori_H	5.061	5.978	8.142	4.280	2.005	5.997	2.311	5.954	5.271	8.382
Morocco_H	2.387	3.875	3.638	1.559	6.068	1.553	3.970	1.563	7.863	3.075
Nepal_H	3.126	1.777	3.404	1.193	2.003	2.572	1.454	3.956	3.454	3.945
Netherlands_H	2.830	6.033	6.252	2.415	3.989	1.325	3.073	2.584	7.658	6.380

NicobarIslands_H	2.677	3.225	4.728	2.562	4.691	4.078	2.999	3.143	5.430	5.615
Nigeria_H	2.948	3.158	4.950	1.669	1.437	2.783	2.062	3.155	3.782	4.963
Nubia_H	1.912	2.714	3.706	0.844	2.119	0.734	1.244	2.054	4.352	4.274
NZ_Maori_H	4.323	4.018	5.931	3.266	1.765	4.093	1.232	5.602	3.727	7.478
Okhotsk_H	4.370	3.060	4.065	3.554	4.011	6.223	2.582	6.078	3.031	4.854
Palestine_H	3.085	4.926	4.534	2.843	4.899	2.598	2.756	3.545	7.456	5.759
Patagonia_H	6.515	1.931	2.228	4.807	5.700	5.286	4.713	4.961	3.046	2.815
Peru_H	6.239	3.077	3.440	4.046	4.593	5.768	4.101	4.919	3.752	2.900
Philippines_H	3.851	1.252	1.883	1.430	2.893	2.500	2.245	4.066	2.798	2.323
PNG_H	3.122	2.720	3.386	1.747	1.785	2.420	2.431	3.814	3.082	3.729
Pol_Society_H	4.591	2.376	3.898	2.697	2.591	3.152	1.343	5.893	2.839	5.698
Russia_H	1.463	4.533	4.833	1.975	3.586	0.665	2.490	1.693	6.957	4.354
Sami_H	2.362	1.998	2.654	0.781	3.348	1.336	1.146	3.427	4.333	3.135
Siberia_H	7.695	2.878	4.250	5.212	5.814	4.954	3.794	6.914	4.692	6.194
Singapore_H	4.451	1.774	2.756	1.936	2.713	3.073	2.243	4.695	3.143	3.562
Somalia_H	1.729	2.233	3.418	1.429	1.808	2.405	1.706	3.052	4.762	3.809
SouthAfrica_H	3.040	2.102	3.819	1.330	2.249	2.434	1.464	4.656	4.087	5.129
Spain_H	1.899	6.496	6.955	4.049	5.900	3.682	5.218	2.373	10.144	6.257
SriLanka_H	3.442	3.095	4.689	0.895	3.544	2.169	1.481	3.642	5.124	4.989
Sumatra_H	3.422	2.707	2.546	2.016	3.413	3.509	3.162	3.195	3.133	3.080
Sweden_H	2.899	4.826	5.972	1.761	2.785	1.527	1.533	4.255	4.600	6.101
Switzerland_H	4.340	7.288	7.578	3.138	6.262	1.930	4.479	2.665	9.720	7.610
Syria_H	2.734	3.852	4.465	1.765	3.965	0.385	2.195	1.837	6.460	4.284
Tanzania_H	2.372	2.960	3.770	0.683	2.474	1.096	2.230	2.379	4.541	3.606
Thailand_H	3.471	2.024	2.905	2.493	2.469	4.514	3.003	5.055	3.589	3.544
Tibet_H	2.613	2.131	2.812	0.535	4.025	2.002	2.156	2.486	5.082	2.506
Turkey_H	1.712	5.088	5.008	2.591	4.757	2.393	3.234	1.758	7.248	5.220
UK_Medieval_H	2.269	5.002	5.265	1.604	5.786	0.732	3.490	2.470	8.631	5.524
Ukraine_H	2.006	1.993	2.381	1.335	3.336	1.191	1.692	1.427	4.117	2.171
Vietnam_H	1.880	2.323	3.000	1.097	1.680	1.939	1.418	2.802	2.978	3.133
Yugoslavia_H	3.174	5.059	5.902	2.406	4.036	1.065	3.093	1.804	6.684	5.613

Table B.11. (continued). Borneo_H to Chile_H.

	Borneo_H	Bulgaria_H	Burma_NHM_H	Buryat_H	Cambodia_H	Cameroon_H	Canada_Indigenous_H	Canada_Inuit_H	Celebes_H	Chile_H
Afghanistan_H	4.167	3.312	3.381	3.145	2.917	2.945	5.057	4.310	2.907	5.661
Alaska_Inuit_H	2.216	5.242	1.287	2.163	4.068	2.984	2.080	3.679	2.473	5.292
Aleut_H	3.503	5.536	2.493	2.288	4.384	4.866	2.570	4.423	3.815	5.704
Andaman_Isl_H	2.136	3.889	0.788	0.686	3.552	1.527	3.492	5.548	2.296	6.178
Australia_Aboriginal_H	2.459	7.996	2.691	5.862	4.011	2.022	3.857	6.054	1.892	5.193
Austria_H	2.999	3.802	2.398	2.316	5.767	3.144	4.545	7.744	3.605	7.371
Bangladesh_H	1.792	4.986	1.632	1.644	2.939	2.566	2.742	5.491	2.166	5.774
Bedouin_H	4.234	2.585	4.183	3.517	3.905	3.143	4.408	4.826	4.202	3.758
Bismarck_H	1.846	8.785	2.792	5.697	5.137	4.042	2.851	6.357	3.153	6.494
Bolivia_H	3.596	4.729	3.235	2.888	3.880	4.826	2.776	5.128	3.978	4.911
Borneo_H	0.000	4.444	1.380	3.181	3.505	1.827	1.559	3.999	0.741	3.744
Bulgaria_H	4.444	0.000	5.365	3.249	4.589	5.451	5.422	5.268	5.607	5.702
Burma_NHM_H	1.380	5.365	0.000	2.180	3.665	1.029	3.216	5.198	1.317	6.020
Buryat_H	3.181	3.249	2.180	0.000	3.158	3.632	3.615	5.788	3.723	6.328
Cambodia_H	3.505	4.589	3.665	3.158	0.000	4.216	2.994	3.788	3.191	3.429
Cameroon_H	1.827	5.451	1.029	3.632	4.216	0.000	3.737	4.488	1.467	4.878
Canada_Indigenous_H	1.559	5.422	3.216	3.615	2.994	3.737	0.000	2.675	2.071	1.705
Canada_Inuit_H	3.999	5.268	5.198	5.788	3.788	4.488	2.675	0.000	3.030	2.198
Celebes_H	0.741	5.607	1.317	3.723	3.191	1.467	2.071	3.030	0.000	3.884
Chile_H	3.744	5.702	6.020	6.328	3.429	4.878	1.705	2.198	3.884	0.000
China_North_H	1.538	4.229	0.902	1.391	4.042	2.115	2.776	5.187	1.896	5.218
China_South_H	1.480	4.498	1.442	2.365	4.509	2.946	3.003	5.909	1.651	5.713
Chukchi_H	3.037	7.450	3.550	5.190	5.641	4.835	4.047	3.577	2.847	5.234
Colombia_H	4.171	9.014	5.885	7.558	6.512	6.705	2.450	7.203	5.649	4.368
Congo_H	3.018	6.107	2.554	3.969	3.174	1.807	3.604	4.300	1.661	3.923
Cyprus_H	1.428	5.259	2.516	3.476	3.721	2.747	2.415	5.595	2.681	3.942
Czech_H	2.369	2.918	1.680	2.507	4.053	2.204	4.018	5.867	2.750	5.927
DW_Burma	**3.716**	**6.272**	**1.716**	**3.662**	**4.290**	**1.849**	**5.577**	**5.923**	**2.696**	**6.470**
Easter_Isl_H	4.782	12.071	6.548	9.114	4.513	6.021	3.774	5.584	4.045	4.007
Ecuador_H	2.811	6.355	3.491	5.174	5.205	3.724	1.553	5.228	3.807	3.127

Egypt_H	2.218	2.539	1.385	1.666	3.930	1.845	3.813	5.717	2.754	5.684
Finland_H	4.372	4.777	4.691	4.398	6.824	4.882	6.503	8.969	4.992	8.329
France_H	2.893	3.134	2.372	1.903	4.308	3.234	4.071	6.284	3.278	6.265
Gabon_H	2.971	8.483	1.245	4.806	5.250	0.962	4.230	6.454	2.396	5.984
Germany_H	2.938	4.772	2.266	3.525	6.100	2.778	5.301	7.743	3.468	7.549
Ghana_Ashanti_H	2.299	5.360	0.951	3.496	4.329	0.517	3.404	4.532	1.848	4.965
Greece_H	2.049	2.879	2.263	1.552	3.675	3.064	3.549	6.850	3.416	5.713
Greenland_H	3.211	6.679	2.749	4.937	5.512	4.258	2.573	2.647	2.946	5.320
Hawaii_H	2.037	7.852	3.090	5.404	3.208	3.197	2.265	4.104	1.941	3.393
Hungary_H	2.523	3.875	1.942	2.352	5.186	2.198	3.463	5.620	2.734	5.652
India_Bengal_H	2.330	3.104	1.145	1.740	4.051	1.220	3.602	5.136	2.434	5.181
India_Northeast_H	1.832	3.616	0.693	1.060	3.566	1.273	3.211	5.627	1.987	5.557
India_Northwest_H	2.402	6.910	1.956	3.449	1.910	2.218	2.859	5.201	1.585	4.722
India_Pakistan_Punjab_H	3.421	3.185	2.285	1.664	5.251	2.490	4.679	6.991	4.052	6.870
India_South_H	2.698	3.573	1.347	2.195	4.329	1.952	3.534	5.803	2.716	5.769
Iraq_H	2.780	2.274	2.311	2.037	1.513	2.472	3.759	4.814	3.169	4.312
Israel_H	2.588	4.903	1.926	2.952	4.928	2.071	5.320	7.779	2.989	7.817
Italy_H	2.436	2.288	2.530	1.814	4.324	2.616	3.784	5.728	2.926	5.569
Japan_Ainu_H	2.429	3.190	2.582	2.978	2.795	2.794	3.762	3.974	2.960	5.941
Japan_Jomon_H	4.665	3.820	5.932	4.450	3.417	5.112	5.617	6.161	5.553	6.669
Japan_Mainland_H	2.366	3.062	1.302	1.197	3.656	2.600	3.932	4.344	2.097	6.567
Java_H	0.950	4.793	0.660	2.037	3.223	2.255	2.465	5.278	1.572	5.414
Kenya_H	2.506	4.952	0.971	3.248	4.235	0.991	3.619	5.823	2.529	5.361
Korea_H	2.493	6.051	2.733	3.188	4.172	1.925	3.955	4.017	1.969	5.200
Laos_H	2.012	4.366	1.999	2.624	2.962	3.685	2.543	6.572	2.826	4.536
Malawi_H	3.017	8.809	2.697	5.865	7.156	2.157	4.536	7.750	3.495	6.128
Malay_H	1.281	7.586	1.384	3.679	5.069	2.094	2.019	5.309	1.197	5.306
Marquesas_H	3.042	8.589	3.913	5.809	3.581	3.965	4.128	5.657	3.604	5.193
Melanesia_H	0.945	4.904	1.337	2.830	2.848	1.657	2.126	4.550	1.042	3.604
Mexico_H	2.327	5.415	2.403	3.318	2.927	3.309	1.004	4.330	2.640	3.416
Micronesia_H	1.314	6.682	1.475	4.876	3.576	1.658	2.439	4.032	0.561	3.792
Molucca_H	2.624	8.001	2.138	5.073	4.173	2.272	3.101	5.247	2.611	3.714
Mongol_H	3.250	3.646	1.621	1.107	3.966	3.726	4.813	6.652	3.134	7.920
Moriori_H	3.112	7.488	3.740	5.211	2.666	3.171	4.002	6.328	3.344	4.192
Morocco_H	3.597	1.892	3.209	1.851	5.560	3.428	4.664	5.649	3.930	5.980
Nepal_H	1.085	5.849	0.511	2.681	3.711	0.758	2.363	4.290	0.601	4.609
Netherlands_H	3.776	4.865	3.579	3.407	5.768	3.964	6.068	8.209	4.199	7.188
NicobarIslands_H	2.623	2.624	2.921	3.245	3.929	2.137	4.139	2.327	2.789	4.472

Nigeria_H	2.331	6.162	1.294	3.722	3.671	0.497	3.439	5.394	2.121	4.982
Nubia_H	2.122	3.740	1.337	2.124	3.814	1.481	3.295	5.355	2.487	5.218
NZ_Maori_H	1.852	6.922	2.586	4.345	3.508	2.852	3.087	4.913	2.082	4.479
Okhotsk_H	2.273	4.392	3.223	3.544	2.010	3.804	2.520	2.774	2.631	4.243
Palestine_H	5.169	4.124	4.694	2.660	4.601	5.615	4.518	6.293	5.770	6.149
Patagonia_H	3.207	6.198	3.767	5.379	4.517	4.788	1.528	3.819	4.079	3.346
Peru_H	2.860	6.686	4.055	4.361	3.855	3.975	0.686	4.010	3.377	2.248
Philippines_H	1.034	5.094	0.535	2.599	3.940	1.818	2.039	4.523	1.085	4.629
PNG_H	1.819	6.803	0.753	3.684	3.915	1.671	3.662	5.823	1.365	6.002
Pol_Society_H	1.661	6.147	1.444	3.760	3.897	3.096	3.166	5.638	2.173	5.878
Russia_H	2.897	2.662	2.866	2.651	4.050	3.511	4.422	6.554	3.097	5.954
Sami_H	1.646	4.020	1.550	1.272	3.906	2.439	2.305	4.759	1.605	5.601
Siberia_H	3.218	9.148	4.354	5.987	7.209	5.302	2.170	5.200	3.716	4.739
Singapore_H	1.378	6.560	0.628	3.272	4.001	1.952	2.663	5.217	1.295	4.830
Somalia_H	2.093	5.142	0.881	2.760	2.671	1.305	2.834	4.029	1.069	4.465
SouthAfrica_H	2.613	5.829	0.787	2.962	4.258	1.413	3.845	5.625	2.287	6.722
Spain_H	5.409	1.319	5.406	4.482	5.103	4.732	6.305	5.332	5.362	6.098
SriLanka_H	2.138	5.464	1.826	1.845	4.857	1.430	3.495	5.930	2.275	5.912
Sumatra_H	1.770	4.706	2.276	2.971	4.142	2.421	2.493	2.859	1.932	3.815
Sweden_H	2.514	4.197	2.766	2.864	4.905	3.073	4.796	7.821	3.385	8.150
Switzerland_H	6.685	5.804	5.518	4.056	7.735	5.010	7.725	10.587	7.795	8.899
Syria_H	2.981	3.116	2.906	2.400	4.899	3.300	3.592	7.030	3.887	5.489
Tanzania_H	2.218	5.148	0.827	2.459	4.554	1.039	4.233	6.581	2.090	6.477
Thailand_H	1.943	6.911	1.062	4.009	3.417	1.910	2.731	3.398	0.698	4.687
Tibet_H	2.108	3.989	0.869	1.185	3.231	1.491	3.576	5.515	2.013	5.419
Turkey_H	4.759	3.116	4.765	2.895	4.295	4.235	4.593	4.895	5.027	5.635
UK_Medieval_H	4.895	3.645	3.241	2.507	6.663	3.871	7.220	8.655	5.147	9.524
Ukraine_H	1.541	2.146	1.913	1.647	2.538	2.419	1.603	3.786	2.135	3.221
Vietnam_H	0.868	4.501	0.860	2.292	2.610	1.403	2.418	3.936	0.556	4.452
Yugoslavia_H	3.133	3.632	3.124	3.580	5.467	3.033	5.199	7.650	4.182	6.016

Table B.11. (continued). China_North_H to Ecuador_H.

	China_North_H	China_South_H	Chukchi_H	Colombia_H	Congo_H	Cyprus_H	Czech_H	**DW_Burma**	Easter_Isl_H	Ecuador_H
Afghanistan_H	3.017	3.661	6.552	9.387	1.369	4.336	1.661	**2.496**	7.384	5.799
Alaska_Inuit_H	1.658	2.174	3.183	4.577	4.552	3.980	3.155	**4.320**	7.553	3.052
Aleut_H	1.852	2.806	4.702	4.153	5.184	4.567	3.785	**5.656**	9.512	3.213
Andaman_Isl_H	0.655	1.727	4.849	6.790	2.363	2.423	1.286	**2.014**	7.911	3.925
Australia_Aboriginal_H	3.641	4.447	6.007	7.114	1.717	1.792	2.878	**2.274**	2.796	3.907
Austria_H	1.202	1.733	6.676	6.752	2.889	2.821	0.525	**3.403**	9.289	3.592
Bangladesh_H	1.824	2.443	3.743	7.187	2.993	1.849	2.050	**2.562**	4.496	4.298
Bedouin_H	2.684	3.627	7.755	6.078	1.920	3.848	1.754	**4.216**	8.995	3.557
Bismarck_H	3.780	4.743	5.613	3.669	6.247	2.529	5.029	**6.796**	6.061	3.355
Bolivia_H	2.356	2.790	7.294	3.100	4.667	4.933	3.886	**6.660**	10.575	3.012
Borneo_H	1.538	1.480	3.037	4.171	3.018	1.428	2.369	**3.716**	4.782	2.811
Bulgaria_H	4.229	4.498	7.450	9.014	6.107	5.259	2.918	**6.272**	12.071	6.355
Burma_NHM_H	0.902	1.442	3.550	5.885	2.554	2.516	1.680	**1.716**	6.548	3.491
Buryat_H	1.391	2.365	5.190	7.558	3.969	3.476	2.507	**3.662**	9.114	5.174
Cambodia_H	4.042	4.509	5.641	6.512	3.174	3.721	4.053	**4.290**	4.513	5.205
Cameroon_H	2.115	2.946	4.835	6.705	1.807	2.747	2.204	**1.849**	6.021	3.724
Canada_Indigenous_H	2.776	3.003	4.047	2.450	3.604	2.415	4.018	**5.577**	3.774	1.553
Canada_Inuit_H	5.187	5.909	3.577	7.203	4.300	5.595	5.867	**5.923**	5.584	5.228
Celebes_H	1.896	1.651	2.847	5.649	1.661	2.681	2.750	**2.696**	4.045	3.807
Chile_H	5.218	5.713	5.234	4.368	3.923	3.942	5.927	**6.470**	4.007	3.127
China_North_H	0.000	0.711	3.472	4.859	2.185	2.009	1.159	**2.578**	7.399	2.856
China_South_H	0.711	0.000	3.880	5.009	2.780	3.471	1.844	**3.761**	7.906	3.708
Chukchi_H	3.472	3.880	0.000	9.044	5.304	4.413	5.487	**4.154**	5.263	6.693
Colombia_H	4.859	5.009	9.044	0.000	6.566	4.905	6.064	**10.552**	8.349	1.292
Congo_H	2.185	2.780	5.304	6.566	0.000	3.102	2.203	**2.067**	4.569	3.891
Cyprus_H	2.009	3.471	4.413	4.905	3.102	0.000	2.195	**3.234**	4.136	2.474
Czech_H	1.159	1.844	5.487	6.064	2.203	2.195	0.000	**2.362**	7.804	2.992
DW_Burma	**2.578**	**3.761**	**4.154**	**10.552**	**2.067**	**3.234**	**2.362**	**0.000**	**5.833**	**5.871**
Easter_Isl_H	7.399	7.906	5.263	8.349	4.569	4.136	7.804	**5.833**	0.000	6.080
Ecuador_H	2.856	3.708	6.693	1.292	3.891	2.474	2.992	**5.871**	6.080	0.000

Egypt_H	0.905	1.841	5.222	6.475	2.357	1.948	0.201	**1.954**	8.026	3.151
Finland_H	3.368	4.296	7.017	10.876	3.919	2.762	1.705	**3.414**	8.147	6.192
France_H	0.929	1.668	5.722	6.197	2.271	2.557	0.372	**3.216**	8.490	3.480
Gabon_H	2.475	3.327	5.212	6.347	2.089	3.218	2.683	**1.827**	5.201	3.235
Germany_H	1.219	2.353	6.350	6.691	2.597	2.200	0.524	**2.994**	9.067	3.624
Ghana_Ashanti_H	1.799	2.849	5.008	6.043	1.668	2.543	1.369	**1.418**	5.950	2.552
Greece_H	1.185	2.007	5.394	5.929	3.231	1.371	0.852	**3.416**	7.442	3.465
Greenland_H	3.374	3.872	3.017	5.250	5.548	5.201	4.393	**5.413**	7.240	3.441
Hawaii_H	3.924	4.386	2.629	6.608	3.218	1.991	4.312	**3.151**	0.899	4.051
Hungary_H	0.902	1.738	5.289	5.804	1.964	2.388	0.506	**2.733**	7.696	2.596
India_Bengal_H	0.947	1.516	4.881	6.221	1.994	2.935	0.713	**1.986**	7.937	3.133
India_Northeast_H	0.691	1.248	4.856	6.337	2.102	2.419	1.055	**1.765**	7.482	3.434
India_Northwest_H	2.293	2.702	5.663	5.198	0.949	2.612	2.466	**2.885**	3.662	3.547
India_Pakistan_Punjab_H	1.284	2.572	7.065	7.051	2.901	2.850	0.711	**3.087**	9.943	3.629
India_South_H	1.329	1.491	5.668	5.873	2.452	3.486	0.734	**2.427**	8.117	2.805
Iraq_H	2.190	2.824	5.347	6.421	2.441	2.685	1.233	**2.768**	6.577	4.040
Israel_H	1.614	2.497	6.188	7.806	2.340	2.196	0.756	**2.614**	7.649	4.665
Italy_H	1.347	2.090	5.923	7.100	2.313	2.169	0.620	**2.910**	8.122	3.781
Japan_Ainu_H	3.513	4.761	6.065	7.525	4.684	2.947	2.859	**4.285**	7.703	5.057
Japan_Jomon_H	5.878	7.320	10.645	8.660	5.962	4.570	5.072	**7.760**	10.243	7.165
Japan_Mainland_H	0.975	1.429	4.175	7.294	3.047	3.998	1.755	**3.111**	9.563	5.115
Java_H	0.681	1.020	3.835	3.873	3.174	2.142	1.948	**3.548**	7.088	2.948
Kenya_H	1.615	2.318	6.353	4.717	2.225	3.015	1.249	**2.400**	7.684	2.147
Korea_H	2.589	4.255	4.155	9.132	2.090	2.256	3.493	**2.549**	5.187	5.824
Laos_H	1.390	1.284	4.756	4.018	3.051	2.063	1.535	**3.378**	5.954	2.412
Malawi_H	2.811	4.409	5.577	6.611	3.023	1.585	2.795	**2.679**	5.076	2.951
Malay_H	1.574	2.179	4.084	4.863	2.467	1.773	2.709	**3.034**	4.445	2.517
Marquesas_H	4.912	6.484	3.612	8.572	4.799	1.826	5.218	**3.822**	2.106	5.859
Melanesia_H	0.852	1.393	3.602	4.314	1.029	0.919	1.263	**2.198**	4.066	2.348
Mexico_H	2.553	2.507	5.704	2.292	3.379	3.332	2.816	**5.044**	5.241	1.191
Micronesia_H	2.027	1.878	3.355	4.769	1.291	2.463	2.334	**2.340**	3.433	2.787
Molucca_H	2.375	3.932	4.657	4.389	2.417	1.750	3.422	**2.673**	4.567	2.327
Mongol_H	1.145	1.342	4.677	8.503	3.465	4.133	1.435	**2.608**	9.506	5.656
Moriori_H	4.852	5.553	5.087	8.552	3.546	2.291	4.712	**2.967**	2.110	5.623
Morocco_H	1.656	2.389	6.643	7.838	3.456	4.119	1.740	**3.948**	11.560	4.744
Nepal_H	1.224	1.367	3.206	5.767	1.649	2.507	2.186	**1.766**	4.760	3.280
Netherlands_H	1.688	2.734	5.732	8.706	2.496	2.539	1.415	**3.055**	8.471	5.485
NicobarIslands_H	2.959	4.231	3.296	8.616	3.655	3.358	2.684	**3.405**	7.322	5.459

Nigeria_H	2.408	3.404	6.012	5.749	1.726	2.386	1.922	**2.080**	5.049	2.793
Nubia_H	1.092	2.275	4.899	5.988	1.873	1.469	0.362	**1.737**	6.214	2.543
NZ_Maori_H	2.872	3.682	2.274	7.340	2.896	1.361	3.166	**2.514**	2.056	4.490
Okhotsk_H	4.307	5.202	4.112	7.533	5.189	2.951	4.533	**4.510**	4.882	5.340
Palestine_H	3.226	5.355	6.589	8.831	4.399	2.683	2.396	**3.730**	7.720	4.567
Patagonia_H	3.608	4.187	5.433	1.523	5.358	3.906	3.978	**7.000**	6.477	0.943
Peru_H	4.059	4.618	6.935	2.815	4.476	3.466	5.368	**6.519**	5.207	1.784
Philippines_H	0.859	1.008	3.260	4.466	2.686	2.324	1.952	**2.378**	6.155	2.430
PNG_H	1.080	1.630	4.163	5.192	1.539	2.303	1.548	**2.016**	5.639	3.183
Pol_Society_H	2.032	2.463	2.317	6.260	3.822	1.835	2.136	**2.490**	4.245	3.674
Russia_H	1.613	1.656	6.090	7.072	2.195	2.904	0.534	**3.060**	8.146	4.182
Sami_H	1.080	1.363	4.695	6.207	2.480	2.667	1.742	**3.163**	6.892	3.642
Siberia_H	3.371	3.513	3.423	3.810	5.068	4.219	5.018	**7.012**	5.156	2.677
Singapore_H	1.022	1.200	2.483	4.932	2.480	2.355	2.351	**2.007**	5.088	2.963
Somalia_H	1.588	1.770	3.832	6.399	1.075	2.967	1.575	**1.056**	4.645	3.380
SouthAfrica_H	2.166	3.058	4.782	7.595	2.938	2.916	1.700	**1.334**	6.045	3.714
Spain_H	4.944	5.630	8.370	11.115	4.700	5.337	2.586	**4.177**	10.781	6.568
SriLanka_H	1.624	2.351	5.284	7.330	2.472	2.900	2.715	**3.183**	7.024	4.603
Sumatra_H	1.457	3.130	3.345	5.428	2.637	1.709	2.701	**3.456**	6.336	3.276
Sweden_H	2.742	3.588	7.530	8.478	3.943	2.140	1.578	**3.823**	7.994	5.125
Switzerland_H	3.531	5.764	10.256	9.320	4.493	4.106	2.418	**5.256**	11.679	5.468
Syria_H	1.615	2.059	6.727	5.647	2.912	2.502	0.740	**3.676**	8.161	2.650
Tanzania_H	0.794	1.554	5.762	6.065	1.508	2.548	0.891	**1.933**	7.814	3.353
Thailand_H	2.175	2.328	3.048	6.239	2.144	3.609	3.273	**2.041**	4.771	3.976
Tibet_H	0.751	1.063	4.739	6.223	2.044	3.305	1.781	**2.315**	8.114	4.168
Turkey_H	3.263	5.277	7.675	8.004	3.240	3.247	2.012	**4.686**	8.545	4.518
UK_Medieval_H	1.897	3.005	7.724	9.926	3.637	4.510	0.978	**3.529**	12.404	6.134
Ukraine_H	1.074	1.423	4.694	3.733	2.183	1.918	0.809	**3.438**	6.280	1.757
Vietnam_H	0.769	1.165	3.313	5.287	1.125	1.651	1.286	**2.047**	4.896	3.291
Yugoslavia_H	1.761	2.493	6.140	6.534	2.864	2.406	0.830	**3.544**	8.577	3.736

Table B.11. (continued). Egypt_H to Hungary_H.

	Egypt_H	Finland_H	France_H	Gabon_H	Germany_H	Ghana_Ashanti_H	Greece_H	Greenland_H	Hawaii_H	Hungary_H
Afghanistan_H	1.796	3.051	1.746	4.358	2.816	2.478	2.959	5.935	5.060	2.099
Alaska_Inuit_H	2.799	7.151	3.418	3.236	4.453	2.476	3.494	0.887	4.025	2.885
Aleut_H	3.424	8.136	3.509	5.186	4.705	3.877	4.084	1.761	6.045	3.546
Andaman_Isl_H	0.695	3.331	1.262	2.351	1.760	1.398	1.238	4.177	4.303	1.137
Australia_Aboriginal_H	3.087	3.661	3.891	1.949	3.154	1.793	3.620	6.113	1.718	3.234
Austria_H	0.545	1.430	0.321	3.456	0.682	2.248	0.845	5.722	5.534	0.313
Bangladesh_H	1.748	2.691	2.082	2.796	3.031	2.389	1.303	4.292	1.910	1.988
Bedouin_H	1.728	4.035	1.703	4.617	2.534	2.788	2.514	6.668	6.397	1.863
Bismarck_H	5.006	8.538	5.894	4.469	5.305	4.163	4.601	3.673	3.599	5.503
Bolivia_H	3.584	8.804	3.673	5.880	4.822	4.287	4.201	3.825	7.377	4.011
Borneo_H	2.218	4.372	2.893	2.971	2.938	2.299	2.049	3.211	2.037	2.523
Bulgaria_H	2.539	4.777	3.134	8.483	4.772	5.360	2.879	6.679	7.852	3.875
Burma_NHM_H	1.385	4.691	2.372	1.245	2.266	0.951	2.263	2.749	3.090	1.942
Buryat_H	1.666	4.398	1.903	4.806	3.525	3.496	1.552	4.937	5.404	2.352
Cambodia_H	3.930	6.824	4.308	5.250	6.100	4.329	3.675	5.512	3.208	5.186
Cameroon_H	1.845	4.882	3.234	0.962	2.778	0.517	3.064	4.258	3.197	2.198
Canada_Indigenous_H	3.813	6.503	4.071	4.230	5.301	3.404	3.549	2.573	2.265	3.463
Canada_Inuit_H	5.717	8.969	6.284	6.454	7.743	4.532	6.850	2.647	4.104	5.620
Celebes_H	2.754	4.992	3.278	2.396	3.468	1.848	3.416	2.946	1.941	2.734
Chile_H	5.684	8.329	6.265	5.984	7.549	4.965	5.713	5.320	3.393	5.652
China_North_H	0.905	3.368	0.929	2.475	1.219	1.799	1.185	3.374	3.924	0.902
China_South_H	1.841	4.296	1.668	3.327	2.353	2.849	2.007	3.872	4.386	1.738
Chukchi_H	5.222	7.017	5.722	5.212	6.350	5.008	5.394	3.017	2.629	5.289
Colombia_H	6.475	10.876	6.197	6.347	6.691	6.043	5.929	5.250	6.608	5.804
Congo_H	2.357	3.919	2.271	2.089	2.597	1.668	3.231	5.548	3.218	1.964
Cyprus_H	1.948	2.762	2.557	3.218	2.200	2.543	1.371	5.201	1.991	2.388
Czech_H	0.201	1.705	0.372	2.683	0.524	1.369	0.852	4.393	4.312	0.506
DW_Burma	**1.954**	**3.414**	**3.216**	**1.827**	**2.994**	**1.418**	**3.416**	**5.413**	**3.151**	**2.733**
Easter_Isl_H	8.026	8.147	8.490	5.201	9.067	5.950	7.442	7.240	0.899	7.696
Ecuador_H	3.151	6.192	3.480	3.235	3.624	2.552	3.465	3.441	4.051	2.596

Egypt_H	0.000	1.756	0.517	2.607	0.736	1.230	0.645	4.455	4.309	0.521
Finland_H	1.756	0.000	1.649	5.424	1.746	3.971	1.659	8.584	5.096	1.815
France_H	0.517	1.649	0.000	3.726	0.654	2.372	0.708	5.086	5.091	0.422
Gabon_H	2.607	5.424	3.726	0.000	3.118	0.654	3.812	4.374	2.864	2.456
Germany_H	0.736	1.746	0.654	3.118	0.000	2.005	1.282	5.852	5.451	0.720
Ghana_Ashanti_H	1.230	3.971	2.372	0.654	2.005	0.000	2.778	3.232	3.151	1.321
Greece_H	0.645	1.659	0.708	3.812	1.282	2.778	0.000	5.818	4.021	1.173
Greenland_H	4.455	8.584	5.086	4.374	5.852	3.232	5.818	0.000	4.215	4.171
Hawaii_H	4.309	5.096	5.091	2.864	5.451	3.151	4.021	4.215	0.000	4.409
Hungary_H	0.521	1.815	0.422	2.456	0.720	1.321	1.173	4.171	4.409	0.000
India_Bengal_H	0.437	3.037	1.045	1.798	1.549	0.898	1.352	3.984	4.300	0.632
India_Northeast_H	0.540	3.083	1.260	1.906	1.729	1.105	1.189	4.212	3.935	0.979
India_Northwest_H	2.716	4.773	2.617	2.056	3.172	2.087	2.826	5.073	2.434	2.696
India_Pakistan_Punjab_H	0.365	2.186	0.606	3.306	0.998	1.818	0.961	5.710	6.040	0.490
India_South_H	0.666	3.234	1.163	1.983	1.846	1.073	1.725	3.682	4.529	0.738
Iraq_H	1.178	3.515	1.623	3.453	2.732	2.387	1.234	5.275	3.739	2.250
Israel_H	0.873	1.602	0.948	2.581	0.701	1.931	0.950	6.466	4.339	1.057
Italy_H	0.415	1.167	0.465	3.920	1.042	2.153	0.700	5.619	4.755	0.552
Japan_Ainu_H	2.502	5.450	3.724	5.167	4.159	2.934	3.060	4.088	4.508	3.901
Japan_Jomon_H	4.596	7.433	5.352	8.706	6.225	5.961	4.342	8.896	7.696	6.182
Japan_Mainland_H	1.435	4.675	1.643	4.161	2.504	2.514	2.342	3.216	5.540	1.965
Java_H	1.786	5.270	2.186	2.837	2.330	2.295	1.862	3.001	3.685	2.370
Kenya_H	1.153	4.838	2.189	1.038	1.969	0.471	2.486	3.823	4.435	1.513
Korea_H	2.886	3.956	3.471	3.635	3.467	2.590	3.252	5.705	3.150	2.971
Laos_H	1.614	3.554	1.698	3.217	2.442	2.889	1.294	4.566	3.194	2.114
Malawi_H	2.687	3.479	3.612	1.330	2.267	1.627	3.175	5.986	2.862	2.288
Malay_H	2.563	4.230	2.985	1.866	2.671	1.651	2.988	3.214	2.250	1.997
Marquesas_H	4.987	5.722	6.082	4.145	5.992	4.335	4.209	6.100	0.934	5.850
Melanesia_H	1.341	2.776	1.423	1.915	1.392	1.542	1.342	4.152	1.958	1.348
Mexico_H	2.916	6.355	3.159	2.926	4.464	2.423	3.124	2.520	3.179	2.672
Micronesia_H	2.687	4.730	3.120	1.477	2.894	1.455	3.490	3.224	1.681	2.510
Molucca_H	3.219	6.240	4.221	1.878	3.340	1.916	3.966	4.446	2.831	3.573
Mongol_H	1.212	3.324	1.197	4.186	2.336	3.020	1.761	4.436	5.437	1.811
Moriori_H	4.319	5.180	5.651	3.310	6.031	3.725	3.728	7.604	1.115	5.366
Morocco_H	1.154	3.427	1.428	5.416	2.236	3.063	2.124	5.734	7.384	1.458
Nepal_H	1.888	4.462	2.709	0.990	2.845	0.915	2.664	3.035	2.131	1.838
Netherlands_H	1.458	1.270	0.936	4.418	0.919	3.608	1.253	8.030	5.352	1.471
NicobarIslands_H	2.315	4.626	3.258	4.508	3.821	2.638	3.060	3.756	4.023	2.965

Nigeria_H	1.789	4.490	2.913	0.574	2.672	0.439	2.683	4.559	2.770	1.986
Nubia_H	0.273	1.700	0.736	1.711	0.841	0.777	0.815	4.091	3.154	0.409
NZ_Maori_H	3.150	3.385	3.638	2.717	3.776	2.922	2.611	4.757	0.461	3.312
Okhotsk_H	4.034	6.635	5.343	5.742	6.341	4.016	4.134	3.513	2.663	5.388
Palestine_H	2.028	2.196	2.041	5.976	3.150	3.954	2.154	6.065	5.099	2.329
Patagonia_H	4.287	8.434	4.577	4.470	5.432	3.613	4.631	1.689	4.221	4.010
Peru_H	4.778	8.461	5.641	4.560	6.766	3.700	4.887	4.099	3.832	4.604
Philippines_H	1.693	4.798	2.509	1.980	2.533	1.392	2.565	2.178	2.977	1.968
PNG_H	1.819	4.282	2.059	1.291	1.529	1.296	2.565	3.705	3.041	1.903
Pol_Society_H	2.298	3.639	2.881	2.492	2.925	2.444	2.270	2.933	1.460	2.754
Russia_H	0.762	1.363	0.421	4.243	1.138	2.786	1.009	6.106	4.955	0.988
Sami_H	1.378	3.088	1.453	3.374	2.390	2.092	1.721	3.608	3.820	1.163
Siberia_H	5.290	7.123	4.764	4.211	5.599	4.554	4.897	2.912	3.254	3.609
Singapore_H	2.221	5.033	2.910	1.404	2.784	1.673	2.800	2.804	2.276	2.431
Somalia_H	1.547	3.906	2.188	1.205	2.693	0.789	2.738	3.115	2.326	1.723
SouthAfrica_H	1.466	3.851	2.721	1.167	2.729	0.620	2.767	3.084	2.917	1.891
Spain_H	2.318	3.559	3.296	7.185	4.312	3.963	3.825	7.121	7.305	3.463
SriLanka_H	1.992	3.968	2.518	2.479	3.038	2.068	2.077	5.655	4.025	1.756
Sumatra_H	2.319	4.698	2.700	3.946	2.568	2.416	2.863	3.218	3.711	2.383
Sweden_H	1.404	1.747	1.868	4.449	1.931	2.857	1.279	6.778	4.667	1.980
Switzerland_H	2.170	2.805	1.917	5.246	2.180	4.192	2.071	10.092	8.276	1.987
Syria_H	0.691	1.674	0.638	3.527	1.401	2.357	0.744	5.763	4.874	0.562
Tanzania_H	0.768	3.252	1.206	1.318	0.894	0.845	1.644	4.901	4.478	0.874
Thailand_H	3.177	6.452	4.064	2.051	4.149	1.646	4.626	2.195	2.554	3.414
Tibet_H	1.255	4.663	1.810	2.322	2.475	1.788	1.836	4.617	4.608	1.795
Turkey_H	1.902	2.807	1.620	5.815	2.693	3.403	2.216	6.247	5.991	1.849
UK_Medieval_H	0.878	2.104	0.667	4.819	1.026	3.118	1.660	7.211	7.936	1.072
Ukraine_H	0.779	2.955	0.836	3.221	1.899	1.840	0.906	3.280	3.418	0.892
Vietnam_H	1.320	3.236	1.456	2.157	1.605	1.457	1.668	3.442	2.398	1.474
Yugoslavia_H	0.966	1.859	0.938	3.493	0.930	2.714	0.869	6.971	5.116	1.131

Table B.11. (continued). India_Bengal_H to Japan_Jomon_H.

	India_Bengal_H	India_Northeast_H	India_Northwest_H	India_Pakistan_Punjab_H	India_South_H	Iraq_H	Israel_H	Italy_H	Japan_Ainu_H	Japan_Jomon_H
Afghanistan_H	2.005	2.277	2.316	2.289	2.292	1.694	2.364	1.514	3.120	4.215
Alaska_Inuit_H	2.211	2.015	3.628	3.497	2.164	3.411	4.443	3.877	3.161	6.899
Aleut_H	3.357	2.918	4.379	3.913	3.240	4.266	5.717	4.356	3.950	6.864
Andaman_Isl_H	0.693	0.206	2.195	0.791	1.143	1.779	1.345	1.132	2.364	4.381
Australia_Aboriginal_H	3.563	3.091	1.411	4.334	3.700	3.608	2.478	3.390	3.894	6.048
Austria_H	0.978	1.083	3.243	0.458	0.913	2.418	0.884	0.469	4.362	6.367
Bangladesh_H	1.943	1.343	1.885	2.382	2.106	2.011	1.640	1.886	2.742	5.290
Bedouin_H	1.687	2.490	3.469	1.728	2.295	1.679	3.060	1.552	4.410	4.344
Bismarck_H	5.576	4.632	3.828	6.318	5.755	5.502	5.083	6.078	3.104	5.771
Bolivia_H	3.497	3.026	4.086	3.968	3.421	3.910	5.983	4.192	4.131	5.200
Borneo_H	2.330	1.832	2.402	3.421	2.698	2.780	2.588	2.436	2.429	4.665
Bulgaria_H	3.104	3.616	6.910	3.185	3.573	2.274	4.903	2.288	3.190	3.820
Burma_NHM_H	1.145	0.693	1.956	2.285	1.347	2.311	1.926	2.530	2.582	5.932
Buryat_H	1.740	1.060	3.449	1.664	2.195	2.037	2.952	1.814	2.978	4.450
Cambodia_H	4.051	3.566	1.910	5.251	4.329	1.513	4.928	4.324	2.795	3.417
Cameroon_H	1.220	1.273	2.218	2.490	1.952	2.472	2.071	2.616	2.794	5.112
Canada_Indigenous_H	3.602	3.211	2.859	4.679	3.534	3.759	5.320	3.784	3.762	5.617
Canada_Inuit_H	5.136	5.627	5.201	6.991	5.803	4.814	7.779	5.728	3.974	6.161
Celebes_H	2.434	1.987	1.585	4.052	2.716	3.169	2.989	2.926	2.960	5.553
Chile_H	5.181	5.557	4.722	6.870	5.769	4.312	7.817	5.569	5.941	6.669
China_North_H	0.947	0.691	2.293	1.284	1.329	2.190	1.614	1.347	3.513	5.878
China_South_H	1.516	1.248	2.702	2.572	1.491	2.824	2.497	2.090	4.761	7.320
Chukchi_H	4.881	4.856	5.663	7.065	5.668	5.347	6.188	5.923	6.065	10.645
Colombia_H	6.221	6.337	5.198	7.051	5.873	6.421	7.806	7.100	7.525	8.660
Congo_H	1.994	2.102	0.949	2.901	2.452	2.441	2.340	2.313	4.684	5.962
Cyprus_H	2.935	2.419	2.612	2.850	3.486	2.685	2.196	2.169	2.947	4.570
Czech_H	0.713	1.055	2.466	0.711	0.734	1.233	0.756	0.620	2.859	5.072
DW_Burma	**1.986**	**1.765**	**2.885**	**3.087**	**2.427**	**2.768**	**2.614**	**2.910**	**4.285**	**7.760**
Easter_Isl_H	7.937	7.482	3.662	9.943	8.117	6.577	7.649	8.122	7.703	10.243
Ecuador_H	3.133	3.434	3.547	3.629	2.805	4.040	4.665	3.781	5.057	7.165

Egypt_H	0.437	0.540	2.716	0.365	0.666	1.178	0.873	0.415	2.502	4.596
Finland_H	3.037	3.083	4.773	2.186	3.234	3.515	1.602	1.167	5.450	7.433
France_H	1.045	1.260	2.617	0.606	1.163	1.623	0.948	0.465	3.724	5.352
Gabon_H	1.798	1.906	2.056	3.306	1.983	3.453	2.581	3.920	5.167	8.706
Germany_H	1.549	1.729	3.172	0.998	1.846	2.732	0.701	1.042	4.159	6.225
Ghana_Ashanti_H	0.898	1.105	2.087	1.818	1.073	2.387	1.931	2.153	2.934	5.961
Greece_H	1.352	1.189	2.826	0.961	1.725	1.234	0.950	0.700	3.060	4.342
Greenland_H	3.984	4.212	5.073	5.710	3.682	5.275	6.466	5.619	4.088	8.896
Hawaii_H	4.300	3.935	2.434	6.040	4.529	3.739	4.339	4.755	4.508	7.696
Hungary_H	0.632	0.979	2.696	0.490	0.738	2.250	1.057	0.552	3.901	6.182
India_Bengal_H	0.000	0.363	2.596	0.648	0.297	1.288	1.368	0.993	3.316	5.644
India_Northeast_H	0.363	0.000	2.122	0.822	0.604	1.598	1.375	1.006	2.801	4.986
India_Northwest_H	2.596	2.122	0.000	3.467	2.669	2.152	2.222	3.010	3.640	4.996
India_Pakistan_Punjab_H	0.648	0.822	3.467	0.000	0.983	1.950	1.132	0.505	3.482	4.985
India_South_H	0.297	0.604	2.669	0.983	0.000	1.712	1.824	1.306	3.777	6.615
Iraq_H	1.288	1.598	2.152	1.950	1.712	0.000	1.934	1.723	2.450	3.562
Israel_H	1.368	1.375	2.222	1.132	1.824	1.934	0.000	1.066	3.463	5.248
Italy_H	0.993	1.006	3.010	0.505	1.306	1.723	1.066	0.000	2.942	4.162
Japan_Ainu_H	3.316	2.801	3.640	3.482	3.777	2.450	3.463	2.942	0.000	1.524
Japan_Jomon_H	5.644	4.986	4.996	4.985	6.615	3.562	5.248	4.162	1.524	0.000
Japan_Mainland_H	1.449	1.135	3.120	1.942	1.832	2.294	2.548	1.802	2.289	4.570
Java_H	1.934	1.295	2.099	2.702	2.159	2.388	2.408	2.634	2.561	4.911
Kenya_H	0.749	0.955	2.231	1.619	0.748	2.031	2.111	2.322	3.349	5.850
Korea_H	3.120	2.507	2.696	3.335	4.390	3.676	2.658	2.536	2.839	4.171
Laos_H	1.942	1.655	2.266	2.668	1.591	1.747	2.644	2.250	4.497	6.774
Malawi_H	2.888	2.917	3.447	3.285	3.337	4.622	2.393	3.421	5.857	8.990
Malay_H	2.654	1.866	1.965	3.258	2.607	4.459	2.678	2.819	3.888	7.005
Marquesas_H	5.599	5.014	3.490	6.718	6.453	4.029	4.507	5.703	4.003	6.617
Melanesia_H	1.607	1.334	0.978	2.210	1.971	1.855	1.367	1.537	3.236	5.006
Mexico_H	2.413	2.370	2.157	3.555	1.787	2.739	4.279	3.514	3.925	6.284
Micronesia_H	2.410	2.329	1.316	4.138	2.406	3.096	2.857	3.290	4.209	7.235
Molucca_H	3.364	3.011	2.477	4.378	3.872	3.849	4.094	4.416	4.658	7.070
Mongol_H	1.447	1.050	3.227	1.785	1.357	2.119	2.200	1.682	3.734	6.613
Moriori_H	4.363	3.802	2.676	5.870	4.977	2.895	4.187	4.837	4.701	6.456
Morocco_H	1.359	1.438	4.974	1.037	1.855	2.828	3.044	0.864	3.877	4.999
Nepal_H	1.246	0.851	1.553	2.700	1.491	2.743	2.218	2.451	3.380	6.420
Netherlands_H	2.213	2.376	3.589	1.738	2.968	2.633	1.177	1.252	5.798	7.120
NicobarIslands_H	2.271	2.839	4.511	3.135	3.461	2.190	3.243	2.570	1.877	3.940

Nigeria_H	1.333	1.393	1.432	2.282	1.638	2.106	1.778	2.647	3.040	5.239
Nubia_H	0.578	0.747	2.027	0.599	0.788	1.340	0.687	0.708	2.647	4.971
NZ_Maori_H	3.423	3.161	2.341	4.577	3.984	2.949	2.667	3.513	4.147	7.125
Okhotsk_H	4.650	3.819	3.860	5.634	5.027	3.250	5.389	4.418	0.962	3.077
Palestine_H	3.313	3.172	4.700	2.218	3.383	3.077	3.579	1.881	4.071	5.908
Patagonia_H	4.042	4.535	4.347	5.246	3.607	4.170	6.242	5.345	4.639	7.577
Peru_H	4.315	3.676	3.675	5.249	4.210	4.864	6.756	4.878	4.437	5.645
Philippines_H	1.594	1.050	2.416	2.769	1.489	3.042	2.986	2.538	3.205	6.583
PNG_H	1.888	1.621	1.172	2.832	2.015	2.697	1.651	2.780	3.815	6.746
Pol_Society_H	2.735	2.478	2.731	3.912	2.629	2.761	2.533	3.355	3.635	7.851
Russia_H	1.361	1.537	2.780	1.290	1.322	1.540	1.330	0.534	4.107	5.558
Sami_H	1.458	0.795	2.254	1.572	1.449	2.831	2.050	1.065	2.705	4.805
Siberia_H	4.505	4.924	4.749	5.902	4.416	6.163	5.760	5.537	7.858	11.686
Singapore_H	1.908	1.513	2.160	3.511	1.990	3.054	2.942	3.355	4.474	8.202
Somalia_H	1.134	0.994	1.159	2.541	1.021	1.899	2.291	2.228	3.333	6.386
SouthAfrica_H	1.380	1.142	2.420	2.273	1.181	2.632	2.124	2.575	2.727	6.676
Spain_H	3.056	3.586	6.327	3.071	3.218	2.820	4.650	2.079	3.457	4.747
SriLanka_H	1.383	0.934	2.599	1.779	2.186	3.039	1.866	1.817	3.846	5.334
Sumatra_H	2.814	2.487	3.218	2.952	3.752	3.520	3.285	2.423	2.421	4.164
Sweden_H	2.525	1.868	3.160	1.729	2.674	2.785	1.051	1.112	2.103	3.497
Switzerland_H	2.647	3.326	5.466	1.238	3.414	3.407	2.212	2.135	6.919	7.412
Syria_H	0.970	1.265	3.289	0.693	0.844	1.865	1.562	0.598	4.535	6.140
Tanzania_H	0.639	0.533	1.736	0.984	0.978	2.102	0.821	1.383	3.555	5.640
Thailand_H	2.784	2.225	1.999	4.663	2.759	3.798	4.188	4.108	3.533	7.189
Tibet_H	0.696	0.363	2.127	1.597	1.208	1.651	2.071	1.836	3.472	5.220
Turkey_H	2.698	3.114	3.928	1.598	3.268	2.397	2.678	1.332	2.972	3.347
UK_Medieval_H	1.383	1.744	4.632	0.590	1.783	2.644	1.280	0.957	4.770	6.535
Ukraine_H	0.911	1.057	2.107	1.228	0.908	1.060	1.997	0.833	2.476	3.978
Vietnam_H	1.496	1.088	0.942	2.214	1.869	1.858	1.346	1.529	2.323	4.338
Yugoslavia_H	1.299	2.002	3.681	1.266	1.866	1.690	1.087	1.195	5.120	6.540

Table B.11. (continued). Japan_Mainland_H to Mexico_H.

	Japan_Mainland_H	Java_H	Kenya_H	Korea_H	Laos_H	Malawi_H	Malay_H	Marquesas_H	Melanesia_H	Mexico_H
Afghanistan_H	2.156	4.103	3.072	2.774	3.863	5.569	4.420	6.225	2.471	4.356
Alaska_Inuit_H	1.695	1.362	2.409	4.455	2.876	5.090	2.436	5.391	2.970	1.593
Aleut_H	1.887	1.681	3.375	5.462	3.158	6.661	3.408	7.304	3.560	2.341
Andaman_Isl_H	0.859	1.263	1.404	1.988	2.272	3.254	1.988	4.803	1.548	2.849
Australia_Aboriginal_H	5.095	3.582	2.812	2.469	3.448	1.710	1.725	2.503	1.316	3.880
Austria_H	2.225	2.589	2.053	3.971	1.966	3.144	2.713	6.858	1.822	3.367
Bangladesh_H	2.514	2.128	3.022	2.258	2.107	3.162	1.811	2.436	1.593	2.526
Bedouin_H	3.142	4.037	2.423	4.098	3.348	5.022	5.210	7.619	2.483	3.875
Bismarck_H	4.950	1.872	4.182	4.867	4.284	4.463	2.423	3.421	3.077	3.389
Bolivia_H	2.313	1.836	3.011	6.138	3.033	7.580	4.299	8.930	3.486	2.401
Borneo_H	2.366	0.950	2.506	2.493	2.012	3.017	1.281	3.042	0.945	2.327
Bulgaria_H	3.062	4.793	4.952	6.051	4.366	8.809	7.586	8.589	4.904	5.415
Burma_NHM_H	1.302	0.660	0.971	2.733	1.999	2.697	1.384	3.913	1.337	2.403
Buryat_H	1.197	2.037	3.248	3.188	2.624	5.865	3.679	5.809	2.830	3.318
Cambodia_H	3.656	3.223	4.235	4.172	2.962	7.156	5.069	3.581	2.848	2.927
Cameroon_H	2.600	2.255	0.991	1.925	3.685	2.157	2.094	3.965	1.657	3.309
Canada_Indigenous_H	3.932	2.465	3.619	3.955	2.543	4.536	2.019	4.128	2.126	1.004
Canada_Inuit_H	4.344	5.278	5.823	4.017	6.572	7.750	5.309	5.657	4.550	4.330
Celebes_H	2.097	1.572	2.529	1.969	2.826	3.495	1.197	3.604	1.042	2.640
Chile_H	6.567	5.414	5.361	5.200	4.536	6.128	5.306	5.193	3.604	3.416
China_North_H	0.975	0.681	1.615	2.589	1.390	2.811	1.574	4.912	0.852	2.553
China_South_H	1.429	1.020	2.318	4.255	1.284	4.409	2.179	6.484	1.393	2.507
Chukchi_H	4.175	3.835	6.353	4.155	4.756	5.577	4.084	3.612	3.602	5.704
Colombia_H	7.294	3.873	4.717	9.132	4.018	6.611	4.863	8.572	4.314	2.292
Congo_H	3.047	3.174	2.225	2.090	3.051	3.023	2.467	4.799	1.029	3.379
Cyprus_H	3.998	2.142	3.015	2.256	2.063	1.585	1.773	1.826	0.919	3.332
Czech_H	1.755	1.948	1.249	3.493	1.535	2.795	2.709	5.218	1.263	2.816
DW_Burma	**3.111**	**3.548**	**2.400**	**2.549**	**3.378**	**2.679**	**3.034**	**3.822**	**2.198**	**5.044**
Easter_Isl_H	9.563	7.088	7.684	5.187	5.954	5.076	4.445	2.106	4.066	5.241
Ecuador_H	5.115	2.948	2.147	5.824	2.412	2.951	2.517	5.859	2.348	1.191

Egypt_H	1.435	1.786	1.153	2.886	1.614	2.687	2.563	4.987	1.341	2.916
Finland_H	4.675	5.270	4.838	3.956	3.554	3.479	4.230	5.722	2.776	6.355
France_H	1.643	2.186	2.189	3.471	1.698	3.612	2.985	6.082	1.423	3.159
Gabon_H	4.161	2.837	1.038	3.635	3.217	1.330	1.866	4.145	1.915	2.926
Germany_H	2.504	2.330	1.969	3.467	2.442	2.267	2.671	5.992	1.392	4.464
Ghana_Ashanti_H	2.514	2.295	0.471	2.590	2.889	1.627	1.651	4.335	1.542	2.423
Greece_H	2.342	1.862	2.486	3.252	1.294	3.175	2.988	4.209	1.342	3.124
Greenland_H	3.216	3.001	3.823	5.705	4.566	5.986	3.214	6.100	4.152	2.520
Hawaii_H	5.540	3.685	4.435	3.150	3.194	2.862	2.250	0.934	1.958	3.179
Hungary_H	1.965	2.370	1.513	2.971	2.114	2.288	1.997	5.850	1.348	2.672
India_Bengal_H	1.449	1.934	0.749	3.120	1.942	2.888	2.654	5.599	1.607	2.413
India_Northeast_H	1.135	1.295	0.955	2.507	1.655	2.917	1.866	5.014	1.334	2.370
India_Northwest_H	3.120	2.099	2.231	2.696	2.266	3.447	1.965	3.490	0.978	2.157
India_Pakistan_Punjab_H	1.942	2.702	1.619	3.335	2.668	3.285	3.258	6.718	2.210	3.555
India_South_H	1.832	2.159	0.748	4.390	1.591	3.337	2.607	6.453	1.971	1.787
Iraq_H	2.294	2.388	2.031	3.676	1.747	4.622	4.459	4.029	1.855	2.739
Israel_H	2.548	2.408	2.111	2.658	2.644	2.393	2.678	4.507	1.367	4.279
Italy_H	1.802	2.634	2.322	2.536	2.250	3.421	2.819	5.703	1.537	3.514
Japan_Ainu_H	2.289	2.561	3.349	2.839	4.497	5.857	3.888	4.003	3.236	3.925
Japan_Jomon_H	4.570	4.911	5.850	4.171	6.774	8.990	7.005	6.617	5.006	6.284
Japan_Mainland_H	0.000	1.257	2.438	2.874	2.954	5.726	3.076	6.450	2.281	3.534
Java_H	1.257	0.000	1.754	3.355	1.447	3.780	1.717	4.335	1.144	2.179
Kenya_H	2.438	1.754	0.000	4.084	2.139	2.475	2.363	5.724	1.748	1.954
Korea_H	2.874	3.355	4.084	0.000	5.171	3.291	2.320	3.033	1.906	5.452
Laos_H	2.954	1.447	2.139	5.171	0.000	3.614	2.657	4.657	1.209	1.700
Malawi_H	5.726	3.780	2.475	3.291	3.614	0.000	1.741	3.477	1.779	4.471
Malay_H	3.076	1.717	2.363	2.320	2.657	1.741	0.000	3.747	1.113	2.368
Marquesas_H	6.450	4.335	5.724	3.033	4.657	3.477	3.747	0.000	2.899	5.362
Melanesia_H	2.281	1.144	1.748	1.906	1.209	1.779	1.113	2.899	0.000	2.314
Mexico_H	3.534	2.179	1.954	5.452	1.700	4.471	2.368	5.362	2.314	0.000
Micronesia_H	3.171	1.881	1.919	3.100	2.097	2.365	1.271	3.573	0.756	2.333
Molucca_H	4.449	2.276	2.122	3.340	2.827	1.838	2.083	3.351	1.412	3.457
Mongol_H	0.790	1.854	2.781	4.181	1.902	5.573	3.462	6.591	2.467	3.638
Moriori_H	6.447	4.552	4.526	3.507	3.523	3.529	4.016	1.188	2.590	4.467
Morocco_H	1.453	3.152	2.834	3.711	3.434	5.572	4.304	8.736	2.978	4.566
Nepal_H	1.955	1.371	1.366	2.069	2.287	2.290	0.850	3.715	1.051	2.128
Netherlands_H	3.292	3.493	3.785	3.307	2.664	3.209	4.003	5.724	1.626	5.940
NicobarIslands_H	2.273	3.472	3.637	2.078	4.995	4.934	4.500	3.967	3.024	4.871

Nigeria_H	3.428	2.505	0.728	2.655	3.013	1.710	1.968	3.543	1.569	2.310
Nubia_H	2.094	2.012	1.065	2.396	1.767	1.647	1.877	3.806	1.043	2.436
NZ_Maori_H	4.537	3.095	4.141	2.318	2.812	2.194	2.203	0.726	1.398	3.867
Okhotsk_H	3.449	3.119	4.880	3.103	4.439	6.440	3.831	2.570	3.495	3.686
Palestine_H	4.038	4.885	4.676	4.018	3.452	4.699	4.458	5.330	3.417	4.586
Patagonia_H	4.852	2.996	3.194	7.053	3.075	5.307	3.766	5.942	3.532	1.081
Peru_H	5.274	3.600	3.634	4.914	3.831	5.253	2.836	5.754	3.420	1.404
Philippines_H	1.603	0.692	1.344	3.319	1.458	2.893	0.980	4.639	1.192	1.847
PNG_H	2.179	1.022	1.337	2.986	1.863	2.171	1.339	4.010	0.682	2.856
Pol_Society_H	3.286	1.798	2.963	3.965	1.616	2.619	1.953	2.112	1.571	2.840
Russia_H	2.157	2.742	2.564	4.033	1.484	4.211	3.556	6.400	1.515	3.569
Sami_H	1.174	1.689	2.436	2.184	2.370	3.928	1.282	5.384	1.586	2.265
Siberia_H	5.840	4.079	5.129	6.025	3.954	4.109	2.744	5.649	3.333	2.642
Singapore_H	2.420	0.958	1.703	3.557	1.368	2.380	1.286	3.725	1.041	2.367
Somalia_H	1.918	1.939	1.183	2.751	1.833	2.923	1.659	4.115	1.183	1.935
SouthAfrica_H	2.517	2.367	1.210	3.216	2.769	2.423	1.743	3.915	2.219	2.518
Spain_H	3.778	6.111	4.381	5.306	5.051	7.381	6.916	8.481	4.810	5.982
SriLanka_H	2.409	2.521	2.486	1.633	3.666	3.086	2.012	4.912	1.965	3.526
Sumatra_H	1.982	1.861	3.168	1.283	3.772	3.330	1.983	3.924	1.489	3.978
Sweden_H	2.977	2.993	3.255	2.797	3.388	3.737	2.760	4.713	2.318	4.385
Switzerland_H	5.485	5.912	3.998	5.327	4.766	4.064	6.232	8.153	4.058	6.438
Syria_H	3.002	2.978	2.001	4.495	1.441	3.164	3.137	6.417	1.860	2.531
Tanzania_H	1.672	1.434	0.662	2.628	2.160	2.141	1.814	5.419	1.049	3.054
Thailand_H	2.241	1.771	2.243	3.016	3.024	3.904	1.521	4.327	1.794	2.719
Tibet_H	1.000	1.144	1.297	2.883	1.941	4.067	2.678	5.698	1.554	2.788
Turkey_H	3.289	4.777	4.028	2.972	4.666	5.162	4.829	6.106	3.208	4.546
UK_Medieval_H	2.040	3.710	2.952	4.360	3.690	4.904	4.892	8.522	3.181	5.764
Ukraine_H	1.657	1.536	1.562	3.314	1.064	3.620	2.354	4.819	1.134	1.169
Vietnam_H	1.204	0.821	1.782	1.498	1.765	2.747	1.137	3.305	0.316	2.504
Yugoslavia_H	3.476	3.095	2.360	4.345	2.034	2.770	4.170	5.735	1.688	4.344

Table B.11. (continued). Micronesia_H to Nubia_H.

	Micronesia_H	Molucca_H	Mongol_H	Moriori_H	Morocco_H	Nepal_H	Netherlands_H	NicobarIslands_H	Nigeria_H	Nubia_H
Afghanistan_H	3.229	5.135	2.401	5.061	2.387	3.126	2.830	2.677	2.948	1.912
Alaska_Inuit_H	3.060	3.783	2.441	5.978	3.875	1.777	6.033	3.225	3.158	2.714
Aleut_H	4.310	3.923	2.757	8.142	3.638	3.404	6.252	4.728	4.950	3.706
Andaman_Isl_H	2.922	3.190	1.040	4.280	1.559	1.193	2.415	2.562	1.669	0.844
Australia_Aboriginal_H	1.269	2.124	5.197	2.005	6.068	2.003	3.989	4.691	1.437	2.119
Austria_H	3.434	4.785	1.512	5.997	1.553	2.572	1.325	4.078	2.783	0.734
Bangladesh_H	2.699	4.122	1.923	2.311	3.970	1.454	3.073	2.999	2.062	1.244
Bedouin_H	3.953	4.200	3.823	5.954	1.563	3.956	2.584	3.143	3.155	2.054
Bismarck_H	3.439	3.117	6.383	5.271	7.863	3.454	7.658	5.430	3.782	4.352
Bolivia_H	4.413	3.961	3.590	8.382	3.075	3.945	6.380	5.615	4.963	4.274
Borneo_H	1.314	2.624	3.250	3.112	3.597	1.085	3.776	2.623	2.331	2.122
Bulgaria_H	6.682	8.001	3.646	7.488	1.892	5.849	4.865	2.624	6.162	3.740
Burma_NHM_H	1.475	2.138	1.621	3.740	3.209	0.511	3.579	2.921	1.294	1.337
Buryat_H	4.876	5.073	1.107	5.211	1.851	2.681	3.407	3.245	3.722	2.124
Cambodia_H	3.576	4.173	3.966	2.666	5.560	3.711	5.768	3.929	3.671	3.814
Cameroon_H	1.658	2.272	3.726	3.171	3.428	0.758	3.964	2.137	0.497	1.481
Canada_Indigenous_H	2.439	3.101	4.813	4.002	4.664	2.363	6.068	4.139	3.439	3.295
Canada_Inuit_H	4.032	5.247	6.652	6.328	5.649	4.290	8.209	2.327	5.394	5.355
Celebes_H	0.561	2.611	3.134	3.344	3.930	0.601	4.199	2.789	2.121	2.487
Chile_H	3.792	3.714	7.920	4.192	5.980	4.609	7.188	4.472	4.982	5.218
China_North_H	2.027	2.375	1.145	4.852	1.656	1.224	1.688	2.959	2.408	1.092
China_South_H	1.878	3.932	1.342	5.553	2.389	1.367	2.734	4.231	3.404	2.275
Chukchi_H	3.355	4.657	4.677	5.087	6.643	3.206	5.732	3.296	6.012	4.899
Colombia_H	4.769	4.389	8.503	8.552	7.838	5.767	8.706	8.616	5.749	5.988
Congo_H	1.291	2.417	3.465	3.546	3.456	1.649	2.496	3.655	1.726	1.873
Cyprus_H	2.463	1.750	4.133	2.291	4.119	2.507	2.539	3.358	2.386	1.469
Czech_H	2.334	3.422	1.435	4.712	1.740	2.186	1.415	2.684	1.922	0.362
DW_Burma	**2.340**	**2.673**	**2.608**	**2.967**	**3.948**	**1.766**	**3.055**	**3.405**	**2.080**	**1.737**
Easter_Isl_H	3.433	4.567	9.506	2.110	11.560	4.760	8.471	7.322	5.049	6.214
Ecuador_H	2.787	2.327	5.656	5.623	4.744	3.280	5.485	5.459	2.793	2.543

Egypt_H	2.687	3.219	1.212	4.319	1.154	1.888	1.458	2.315	1.789	0.273
Finland_H	4.730	6.240	3.324	5.180	3.427	4.462	1.270	4.626	4.490	1.700
France_H	3.120	4.221	1.197	5.651	1.428	2.709	0.936	3.258	2.913	0.736
Gabon_H	1.477	1.878	4.186	3.310	5.416	0.990	4.418	4.508	0.574	1.711
Germany_H	2.894	3.340	2.336	6.031	2.236	2.845	0.919	3.821	2.672	0.841
Ghana_Ashanti_H	1.455	1.916	3.020	3.725	3.063	0.915	3.608	2.638	0.439	0.777
Greece_H	3.490	3.966	1.761	3.728	2.124	2.664	1.253	3.060	2.683	0.815
Greenland_H	3.224	4.446	4.436	7.604	5.734	3.035	8.030	3.756	4.559	4.091
Hawaii_H	1.681	2.831	5.437	1.115	7.384	2.131	5.352	4.023	2.770	3.154
Hungary_H	2.510	3.573	1.811	5.366	1.458	1.838	1.471	2.965	1.986	0.409
India_Bengal_H	2.410	3.364	1.447	4.363	1.359	1.246	2.213	2.271	1.333	0.578
India_Northeast_H	2.329	3.011	1.050	3.802	1.438	0.851	2.376	2.839	1.393	0.747
India_Northwest_H	1.316	2.477	3.227	2.676	4.974	1.553	3.589	4.511	1.432	2.027
India_Pakistan_Punjab_H	4.138	4.378	1.785	5.870	1.037	2.700	1.738	3.135	2.282	0.599
India_South_H	2.406	3.872	1.357	4.977	1.855	1.491	2.968	3.461	1.638	0.788
Iraq_H	3.096	3.849	2.119	2.895	2.828	2.743	2.633	2.190	2.106	1.340
Israel_H	2.857	4.094	2.200	4.187	3.044	2.218	1.177	3.243	1.778	0.687
Italy_H	3.290	4.416	1.682	4.837	0.864	2.451	1.252	2.570	2.647	0.708
Japan_Ainu_H	4.209	4.658	3.734	4.701	3.877	3.380	5.798	1.877	3.040	2.647
Japan_Jomon_H	7.235	7.070	6.613	6.456	4.999	6.420	7.120	3.940	5.239	4.971
Japan_Mainland_H	3.171	4.449	0.790	6.447	1.453	1.955	3.292	2.273	3.428	2.094
Java_H	1.881	2.276	1.854	4.552	3.152	1.371	3.493	3.472	2.505	2.012
Kenya_H	1.919	2.122	2.781	4.526	2.834	1.366	3.785	3.637	0.728	1.065
Korea_H	3.100	3.340	4.181	3.507	3.711	2.069	3.307	2.078	2.655	2.396
Laos_H	2.097	2.827	1.902	3.523	3.434	2.287	2.664	4.995	3.013	1.767
Malawi_H	2.365	1.838	5.573	3.529	5.572	2.290	3.209	4.934	1.710	1.647
Malay_H	1.271	2.083	3.462	4.016	4.304	0.850	4.003	4.500	1.968	1.877
Marquesas_H	3.573	3.351	6.591	1.188	8.736	3.715	5.724	3.967	3.543	3.806
Melanesia_H	0.756	1.412	2.467	2.590	2.978	1.051	1.626	3.024	1.569	1.043
Mexico_H	2.333	3.457	3.638	4.467	4.566	2.128	5.940	4.871	2.310	2.436
Micronesia_H	0.000	1.648	3.586	3.100	4.724	0.871	3.759	3.842	1.732	2.169
Molucca_H	1.648	0.000	5.170	3.425	5.286	2.241	4.314	4.752	2.167	2.660
Mongol_H	3.586	5.170	0.000	5.958	2.001	2.378	2.550	3.824	3.861	1.842
Moriori_H	3.100	3.425	5.958	0.000	7.535	2.975	5.260	4.647	2.589	3.432
Morocco_H	4.724	5.286	2.001	7.535	0.000	3.358	2.592	3.033	4.258	2.099
Nepal_H	0.871	2.241	2.378	2.975	3.358	0.000	3.656	2.975	1.084	1.526
Netherlands_H	3.759	4.314	2.550	5.260	2.592	3.656	0.000	4.119	4.018	1.623
NicobarIslands_H	3.842	4.752	3.824	4.647	3.033	2.975	4.119	0.000	3.174	2.334

Nigeria_H	1.732	2.167	3.861	2.589	4.258	1.084	4.018	3.174	0.000	1.048
Nubia_H	2.169	2.660	1.842	3.432	2.099	1.526	1.623	2.334	1.048	0.000
NZ_Maori_H	1.893	2.894	4.214	1.266	6.192	2.023	3.305	3.144	2.588	2.197
Okhotsk_H	3.954	4.527	4.634	3.340	5.587	3.410	7.186	2.501	4.045	3.881
Palestine_H	5.693	5.107	3.160	5.528	3.134	5.026	3.046	4.199	4.737	1.894
Patagonia_H	3.422	3.560	5.732	6.592	6.050	4.005	7.492	4.988	4.020	3.756
Peru_H	3.786	3.465	6.457	4.757	5.333	3.117	8.095	5.711	3.473	4.228
Philippines_H	1.136	1.827	1.944	4.304	2.818	0.694	3.870	3.632	2.174	1.798
PNG_H	0.752	1.479	2.357	4.050	4.069	1.088	2.636	4.027	1.583	1.513
Pol_Society_H	1.703	2.874	2.590	2.869	5.465	1.850	3.588	3.617	2.740	1.820
Russia_H	2.864	4.692	1.413	5.095	1.585	2.909	1.073	3.716	3.327	1.213
Sami_H	2.567	4.222	1.386	4.879	1.771	1.209	3.112	3.200	2.547	1.419
Siberia_H	3.281	4.844	6.045	6.550	7.076	3.310	6.197	5.813	4.883	4.169
Singapore_H	0.857	1.457	2.340	3.458	4.132	0.720	3.500	4.075	2.166	2.035
Somalia_H	0.841	2.340	1.788	2.978	3.191	0.590	3.384	3.174	1.188	1.276
SouthAfrica_H	2.140	3.068	2.236	3.559	3.953	1.100	4.350	3.295	1.027	1.010
Spain_H	5.855	7.195	4.013	6.915	2.105	5.495	4.752	3.096	5.160	3.138
SriLanka_H	3.256	4.215	2.940	3.933	2.694	1.125	3.190	3.046	1.757	1.694
Sumatra_H	2.605	2.005	3.675	5.157	2.636	2.326	3.291	1.958	3.221	2.236
Sweden_H	4.081	5.439	2.822	4.492	3.206	3.012	2.916	3.674	2.702	1.374
Switzerland_H	7.104	6.271	4.720	7.261	3.465	5.844	1.975	5.471	4.109	1.984
Syria_H	3.475	4.518	2.139	4.975	1.696	2.796	1.742	4.065	2.658	0.798
Tanzania_H	1.871	2.443	1.836	4.530	2.158	1.076	1.912	3.437	1.064	0.752
Thailand_H	0.822	1.996	3.026	4.152	4.583	0.876	5.384	3.830	2.397	2.936
Tibet_H	2.470	3.106	1.277	4.283	1.762	1.059	2.751	3.093	1.946	1.649
Turkey_H	5.454	5.640	3.817	6.259	2.415	4.800	2.959	2.594	3.742	1.732
UK_Medieval_H	5.231	6.222	1.553	7.866	1.414	3.996	1.372	3.846	3.970	1.455
Ukraine_H	2.216	3.239	1.790	4.048	1.548	1.869	2.501	2.442	2.123	0.890
Vietnam_H	0.842	2.075	1.757	3.249	2.649	0.769	2.120	2.400	1.665	1.208
Yugoslavia_H	3.435	4.081	2.941	4.818	2.471	3.321	0.789	3.453	2.861	1.105

Table B.11. (continued). NZ_Maori_H to Sami_H.

	NZ_Maori_H	Okhotsk_H	Palestine_H	Patagonia_H	Peru_H	Philippines_H	PNG_H	Pol_Society_H	Russia_H	Sami_H
Afghanistan_H	4.323	4.370	3.085	6.515	6.239	3.851	3.122	4.591	1.463	2.362
Alaska_Inuit_H	4.018	3.060	4.926	1.931	3.077	1.252	2.720	2.376	4.533	1.998
Aleut_H	5.931	4.065	4.534	2.228	3.440	1.883	3.386	3.898	4.833	2.654
Andaman_Isl_H	3.266	3.554	2.843	4.807	4.046	1.430	1.747	2.697	1.975	0.781
Australia_Aboriginal_H	1.765	4.011	4.899	5.700	4.593	2.893	1.785	2.591	3.586	3.348
Austria_H	4.093	6.223	2.598	5.286	5.768	2.500	2.420	3.152	0.665	1.336
Bangladesh_H	1.232	2.582	2.756	4.713	4.101	2.245	2.431	1.343	2.490	1.146
Bedouin_H	5.602	6.078	3.545	4.961	4.919	4.066	3.814	5.893	1.693	3.427
Bismarck_H	3.727	3.031	7.456	3.046	3.752	2.798	3.082	2.839	6.957	4.333
Bolivia_H	7.478	4.854	5.759	2.815	2.900	2.323	3.729	5.698	4.354	3.135
Borneo_H	1.852	2.273	5.169	3.207	2.860	1.034	1.819	1.661	2.897	1.646
Bulgaria_H	6.922	4.392	4.124	6.198	6.686	5.094	6.803	6.147	2.662	4.020
Burma_NHM_H	2.586	3.223	4.694	3.767	4.055	0.535	0.753	1.444	2.866	1.550
Buryat_H	4.345	3.544	2.660	5.379	4.361	2.599	3.684	3.760	2.651	1.272
Cambodia_H	3.508	2.010	4.601	4.517	3.855	3.940	3.915	3.897	4.050	3.906
Cameroon_H	2.852	3.804	5.615	4.788	3.975	1.818	1.671	3.096	3.511	2.439
Canada_Indigenous_H	3.087	2.520	4.518	1.528	0.686	2.039	3.662	3.166	4.422	2.305
Canada_Inuit_H	4.913	2.774	6.293	3.819	4.010	4.523	5.823	5.638	6.554	4.759
Celebes_H	2.082	2.631	5.770	4.079	3.377	1.085	1.365	2.173	3.097	1.605
Chile_H	4.479	4.243	6.149	3.346	2.248	4.629	6.002	5.878	5.954	5.601
China_North_H	2.872	4.307	3.226	3.608	4.059	0.859	1.080	2.032	1.613	1.080
China_South_H	3.682	5.202	5.355	4.187	4.618	1.008	1.630	2.463	1.656	1.363
Chukchi_H	2.274	4.112	6.589	5.433	6.935	3.260	4.163	2.317	6.090	4.695
Colombia_H	7.340	7.533	8.831	1.523	2.815	4.466	5.192	6.260	7.072	6.207
Congo_H	2.896	5.189	4.399	5.358	4.476	2.686	1.539	3.822	2.195	2.480
Cyprus_H	1.361	2.951	2.683	3.906	3.466	2.324	2.303	1.835	2.904	2.667
Czech_H	3.166	4.533	2.396	3.978	5.368	1.952	1.548	2.136	0.534	1.742
DW_Burma	**2.514**	**4.510**	**3.730**	**7.000**	**6.519**	**2.378**	**2.016**	**2.490**	**3.060**	**3.163**
Easter_Isl_H	2.056	4.882	7.720	6.477	5.207	6.155	5.639	4.245	8.146	6.892
Ecuador_H	4.490	5.340	4.567	0.943	1.784	2.430	3.183	3.674	4.182	3.642

Egypt_H	3.150	4.034	2.028	4.287	4.778	1.693	1.819	2.298	0.762	1.378
Finland_H	3.385	6.635	2.196	8.434	8.461	4.798	4.282	3.639	1.363	3.088
France_H	3.638	5.343	2.041	4.577	5.641	2.509	2.059	2.881	0.421	1.453
Gabon_H	2.717	5.742	5.976	4.470	4.560	1.980	1.291	2.492	4.243	3.374
Germany_H	3.776	6.341	3.150	5.432	6.766	2.533	1.529	2.925	1.138	2.390
Ghana_Ashanti_H	2.922	4.016	3.954	3.613	3.700	1.392	1.296	2.444	2.786	2.092
Greece_H	2.611	4.134	2.154	4.631	4.887	2.565	2.565	2.270	1.009	1.721
Greenland_H	4.757	3.513	6.065	1.689	4.099	2.178	3.705	2.933	6.106	3.608
Hawaii_H	0.461	2.663	5.099	4.221	3.832	2.977	3.041	1.460	4.955	3.820
Hungary_H	3.312	5.388	2.329	4.010	4.604	1.968	1.903	2.754	0.988	1.163
India_Bengal_H	3.423	4.650	3.313	4.042	4.315	1.594	1.888	2.735	1.361	1.458
India_Northeast_H	3.161	3.819	3.172	4.535	3.676	1.050	1.621	2.478	1.537	0.795
India_Northwest_H	2.341	3.860	4.700	4.347	3.675	2.416	1.172	2.731	2.780	2.254
India_Pakistan_Punjab_H	4.577	5.634	2.218	5.246	5.249	2.769	2.832	3.912	1.290	1.572
India_South_H	3.984	5.027	3.383	3.607	4.210	1.489	2.015	2.629	1.322	1.449
Iraq_H	2.949	3.250	3.077	4.170	4.864	3.042	2.697	2.761	1.540	2.831
Israel_H	2.667	5.389	3.579	6.242	6.756	2.986	1.651	2.533	1.330	2.050
Italy_H	3.513	4.418	1.881	5.345	4.878	2.538	2.780	3.355	0.534	1.065
Japan_Ainu_H	4.147	0.962	4.071	4.639	4.437	3.205	3.815	3.635	4.107	2.705
Japan_Jomon_H	7.125	3.077	5.908	7.577	5.645	6.583	6.746	7.851	5.558	4.805
Japan_Mainland_H	4.537	3.449	4.038	4.852	5.274	1.603	2.179	3.286	2.157	1.174
Java_H	3.095	3.119	4.885	2.996	3.600	0.692	1.022	1.798	2.742	1.689
Kenya_H	4.141	4.880	4.676	3.194	3.634	1.344	1.337	2.963	2.564	2.436
Korea_H	2.318	3.103	4.018	7.053	4.914	3.319	2.986	3.965	4.033	2.184
Laos_H	2.812	4.439	3.452	3.075	3.831	1.458	1.863	1.616	1.484	2.370
Malawi_H	2.194	6.440	4.699	5.307	5.253	2.893	2.171	2.619	4.211	3.928
Malay_H	2.203	3.831	4.458	3.766	2.836	0.980	1.339	1.953	3.556	1.282
Marquesas_H	0.726	2.570	5.330	5.942	5.754	4.639	4.010	2.112	6.400	5.384
Melanesia_H	1.398	3.495	3.417	3.532	3.420	1.192	0.682	1.571	1.515	1.586
Mexico_H	3.867	3.686	4.586	1.081	1.404	1.847	2.856	2.840	3.569	2.265
Micronesia_H	1.893	3.954	5.693	3.422	3.786	1.136	0.752	1.703	2.864	2.567
Molucca_H	2.894	4.527	5.107	3.560	3.465	1.827	1.479	2.874	4.692	4.222
Mongol_H	4.214	4.634	3.160	5.732	6.457	1.944	2.357	2.590	1.413	1.386
Moriori_H	1.266	3.340	5.528	6.592	4.757	4.304	4.050	2.869	5.095	4.879
Morocco_H	6.192	5.587	3.134	6.050	5.333	2.818	4.069	5.465	1.585	1.771
Nepal_H	2.023	3.410	5.026	4.005	3.117	0.694	1.088	1.850	2.909	1.209
Netherlands_H	3.305	7.186	3.046	7.492	8.095	3.870	2.636	3.588	1.073	3.112
NicobarIslands_H	3.144	2.501	4.199	4.988	5.711	3.632	4.027	3.617	3.716	3.200

Nigeria_H	2.588	4.045	4.737	4.020	3.473	2.174	1.583	2.740	3.327	2.547
Nubia_H	2.197	3.881	1.894	3.756	4.228	1.798	1.513	1.820	1.213	1.419
NZ_Maori_H	0.000	3.064	4.114	4.933	5.107	2.950	2.417	0.984	3.760	3.287
Okhotsk_H	3.064	0.000	4.498	4.319	3.498	3.249	4.614	3.100	5.421	3.268
Palestine_H	4.114	4.498	0.000	5.606	5.649	4.475	4.951	3.967	2.640	2.970
Patagonia_H	4.933	4.319	5.606	0.000	2.424	2.866	3.959	3.455	5.495	4.477
Peru_H	5.107	3.498	5.649	2.424	0.000	2.880	4.979	5.297	6.064	3.190
Philippines_H	2.950	3.249	4.475	2.866	2.880	0.000	1.068	1.610	2.694	1.367
PNG_H	2.417	4.614	4.951	3.959	4.979	1.068	0.000	1.585	2.440	2.315
Pol_Society_H	0.984	3.100	3.967	3.455	5.297	1.610	1.585	0.000	3.111	2.826
Russia_H	3.760	5.421	2.640	5.495	6.064	2.694	2.440	3.111	0.000	1.838
Sami_H	3.287	3.268	2.970	4.477	3.190	1.367	2.315	2.826	1.838	0.000
Siberia_H	3.355	6.696	6.587	2.506	4.168	3.498	4.196	3.174	5.869	4.021
Singapore_H	2.077	4.111	5.179	3.350	3.933	0.423	0.735	1.102	3.118	2.323
Somalia_H	2.344	3.434	3.865	3.895	3.684	1.024	1.045	1.852	2.060	1.547
SouthAfrica_H	2.667	3.383	3.599	4.226	4.418	1.469	1.718	1.621	3.144	1.865
Spain_H	6.738	4.804	3.221	7.368	7.095	5.113	6.303	6.282	2.444	4.061
SriLanka_H	3.133	4.653	4.676	6.115	3.877	2.513	2.878	3.887	3.178	1.143
Sumatra_H	3.071	2.808	3.446	3.836	3.628	1.947	2.291	3.301	3.564	2.158
Sweden_H	3.450	3.751	3.062	6.692	5.750	3.384	3.261	3.236	2.016	1.582
Switzerland_H	6.083	9.512	3.049	8.018	8.391	6.483	5.282	6.449	2.966	4.704
Syria_H	3.877	5.827	2.237	4.316	4.509	2.686	3.072	3.249	0.735	1.744
Tanzania_H	3.430	5.309	4.178	4.906	4.839	1.437	0.794	2.803	1.662	1.569
Thailand_H	3.015	3.029	5.823	3.886	3.676	0.789	1.241	2.254	4.085	2.340
Tibet_H	3.809	4.392	4.623	4.910	4.120	1.324	1.680	3.226	2.079	1.450
Turkey_H	4.801	4.597	1.371	5.498	5.557	5.139	4.771	5.354	2.423	2.764
UK_Medieval_H	5.768	7.478	3.076	7.595	8.638	4.022	3.397	4.758	1.209	2.549
Ukraine_H	3.003	3.107	2.308	2.248	2.589	1.556	2.228	2.403	1.011	1.120
Vietnam_H	1.795	2.798	3.765	3.912	3.814	0.989	0.591	1.666	1.621	1.057
Yugoslavia_H	3.444	6.804	3.578	5.407	6.774	3.474	2.679	3.245	1.042	3.338

Table B.11. (continued). Siberia_H to Syria_H.

	Siberia_H	Singapore_H	Somalia_H	SouthAfrica_H	Spain_H	SriLanka_H	Sumatra_H	Sweden_H	Switzerland_H	Syria_H
Afghanistan_H	7.695	4.451	1.729	3.040	1.899	3.442	3.422	2.899	4.340	2.734
Alaska_Inuit_H	2.878	1.774	2.233	2.102	6.496	3.095	2.707	4.826	7.288	3.852
Aleut_H	4.250	2.756	3.418	3.819	6.955	4.689	2.546	5.972	7.578	4.465
Andaman_Isl_H	5.212	1.936	1.429	1.330	4.049	0.895	2.016	1.761	3.138	1.765
Australia_Aboriginal_H	5.814	2.713	1.808	2.249	5.900	3.544	3.413	2.785	6.262	3.965
Austria_H	4.954	3.073	2.405	2.434	3.682	2.169	3.509	1.527	1.930	0.385
Bangladesh_H	3.794	2.243	1.706	1.464	5.218	1.481	3.162	1.533	4.479	2.195
Bedouin_H	6.914	4.695	3.052	4.656	2.373	3.642	3.195	4.255	2.665	1.837
Bismarck_H	4.692	3.143	4.762	4.087	10.144	5.124	3.133	4.600	9.720	6.460
Bolivia_H	6.194	3.562	3.809	5.129	6.257	4.989	3.080	6.101	7.610	4.284
Borneo_H	3.218	1.378	2.093	2.613	5.409	2.138	1.770	2.514	6.685	2.981
Bulgaria_H	9.148	6.560	5.142	5.829	1.319	5.464	4.706	4.197	5.804	3.116
Burma_NHM_H	4.354	0.628	0.881	0.787	5.406	1.826	2.276	2.766	5.518	2.906
Buryat_H	5.987	3.272	2.760	2.962	4.482	1.845	2.971	2.864	4.056	2.400
Cambodia_H	7.209	4.001	2.671	4.258	5.103	4.857	4.142	4.905	7.735	4.899
Cameroon_H	5.302	1.952	1.305	1.413	4.732	1.430	2.421	3.073	5.010	3.300
Canada_Indigenous_H	2.170	2.663	2.834	3.845	6.305	3.495	2.493	4.796	7.725	3.592
Canada_Inuit_H	5.200	5.217	4.029	5.625	5.332	5.930	2.859	7.821	10.587	7.030
Celebes_H	3.716	1.295	1.069	2.287	5.362	2.275	1.932	3.385	7.795	3.887
Chile_H	4.739	4.830	4.465	6.722	6.098	5.912	3.815	8.150	8.899	5.489
China_North_H	3.371	1.022	1.588	2.166	4.944	1.624	1.457	2.742	3.531	1.615
China_South_H	3.513	1.200	1.770	3.058	5.630	2.351	3.130	3.588	5.764	2.059
Chukchi_H	3.423	2.483	3.832	4.782	8.370	5.284	3.345	7.530	10.256	6.727
Colombia_H	3.810	4.932	6.399	7.595	11.115	7.330	5.428	8.478	9.320	5.647
Congo_H	5.068	2.480	1.075	2.938	4.700	2.472	2.637	3.943	4.493	2.912
Cyprus_H	4.219	2.355	2.967	2.916	5.337	2.900	1.709	2.140	4.106	2.502
Czech_H	5.018	2.351	1.575	1.700	2.586	2.715	2.701	1.578	2.418	0.740
DW_Burma	**7.012**	**2.007**	**1.056**	**1.334**	**4.177**	**3.183**	**3.456**	**3.823**	**5.256**	**3.676**
Easter_Isl_H	5.156	5.088	4.645	6.045	10.781	7.024	6.336	7.994	11.679	8.161
Ecuador_H	2.677	2.963	3.380	3.714	6.568	4.603	3.276	5.125	5.468	2.650

Egypt_H	5.290	2.221	1.547	1.466	2.318	1.992	2.319	1.404	2.170	0.691
Finland_H	7.123	5.033	3.906	3.851	3.559	3.968	4.698	1.747	2.805	1.674
France_H	4.764	2.910	2.188	2.721	3.296	2.518	2.700	1.868	1.917	0.638
Gabon_H	4.211	1.404	1.205	1.167	7.185	2.479	3.946	4.449	5.246	3.527
Germany_H	5.599	2.784	2.693	2.729	4.312	3.038	2.568	1.931	2.180	1.401
Ghana_Ashanti_H	4.554	1.673	0.789	0.620	3.963	2.068	2.416	2.857	4.192	2.357
Greece_H	4.897	2.800	2.738	2.767	3.825	2.077	2.863	1.279	2.071	0.744
Greenland_H	2.912	2.804	3.115	3.084	7.121	5.655	3.218	6.778	10.092	5.763
Hawaii_H	3.254	2.276	2.326	2.917	7.305	4.025	3.711	4.667	8.276	4.874
Hungary_H	3.609	2.431	1.723	1.891	3.463	1.756	2.383	1.980	1.987	0.562
India_Bengal_H	4.505	1.908	1.134	1.380	3.056	1.383	2.814	2.525	2.647	0.970
India_Northeast_H	4.924	1.513	0.994	1.142	3.586	0.934	2.487	1.868	3.326	1.265
India_Northwest_H	4.749	2.160	1.159	2.420	6.327	2.599	3.218	3.160	5.466	3.289
India_Pakistan_Punjab_H	5.902	3.511	2.541	2.273	3.071	1.779	2.952	1.729	1.238	0.693
India_South_H	4.416	1.990	1.021	1.181	3.218	2.186	3.752	2.674	3.414	0.844
Iraq_H	6.163	3.054	1.899	2.632	2.820	3.039	3.520	2.785	3.407	1.865
Israel_H	5.760	2.942	2.291	2.124	4.650	1.866	3.285	1.051	2.212	1.562
Italy_H	5.537	3.355	2.228	2.575	2.079	1.817	2.423	1.112	2.135	0.598
Japan_Ainu_H	7.858	4.474	3.333	2.727	3.457	3.846	2.421	2.103	6.919	4.535
Japan_Jomon_H	11.686	8.202	6.386	6.676	4.747	5.334	4.164	3.497	7.412	6.140
Japan_Mainland_H	5.840	2.420	1.918	2.517	3.778	2.409	1.982	2.977	5.485	3.002
Java_H	4.079	0.958	1.939	2.367	6.111	2.521	1.861	2.993	5.912	2.978
Kenya_H	5.129	1.703	1.183	1.210	4.381	2.486	3.168	3.255	3.998	2.001
Korea_H	6.025	3.557	2.751	3.216	5.306	1.633	1.283	2.797	5.327	4.495
Laos_H	3.954	1.368	1.833	2.769	5.051	3.666	3.772	3.388	4.766	1.441
Malawi_H	4.109	2.380	2.923	2.423	7.381	3.086	3.330	3.737	4.064	3.164
Malay_H	2.744	1.286	1.659	1.743	6.916	2.012	1.983	2.760	6.232	3.137
Marquesas_H	5.649	3.725	4.115	3.915	8.481	4.912	3.924	4.713	8.153	6.417
Melanesia_H	3.333	1.041	1.183	2.219	4.810	1.965	1.489	2.318	4.058	1.860
Mexico_H	2.642	2.367	1.935	2.518	5.982	3.526	3.978	4.385	6.438	2.531
Micronesia_H	3.281	0.857	0.841	2.140	5.855	3.256	2.605	4.081	7.104	3.475
Molucca_H	4.844	1.457	2.340	3.068	7.195	4.215	2.005	5.439	6.271	4.518
Mongol_H	6.045	2.340	1.788	2.236	4.013	2.940	3.675	2.822	4.720	2.139
Moriori_H	6.550	3.458	2.978	3.559	6.915	3.933	5.157	4.492	7.261	4.975
Morocco_H	7.076	4.132	3.191	3.953	2.105	2.694	2.636	3.206	3.465	1.696
Nepal_H	3.310	0.720	0.590	1.100	5.495	1.125	2.326	3.012	5.844	2.796
Netherlands_H	6.197	3.500	3.384	4.350	4.752	3.190	3.291	2.916	1.975	1.742
NicobarIslands_H	5.813	4.075	3.174	3.295	3.096	3.046	1.958	3.674	5.471	4.065

Nigeria_H	4.883	2.166	1.188	1.027	5.160	1.757	3.221	2.702	4.109	2.658
Nubia_H	4.169	2.035	1.276	1.010	3.138	1.694	2.236	1.374	1.984	0.798
NZ_Maori_H	3.355	2.077	2.344	2.667	6.738	3.133	3.071	3.450	6.083	3.877
Okhotsk_H	6.696	4.111	3.434	3.383	4.804	4.653	2.808	3.751	9.512	5.827
Palestine_H	6.587	5.179	3.865	3.599	3.221	4.676	3.446	3.062	3.049	2.237
Patagonia_H	2.506	3.350	3.895	4.226	7.368	6.115	3.836	6.692	8.018	4.316
Peru_H	4.168	3.933	3.684	4.418	7.095	3.877	3.628	5.750	8.391	4.509
Philippines_H	3.498	0.423	1.024	1.469	5.113	2.513	1.947	3.384	6.483	2.686
PNG_H	4.196	0.735	1.045	1.718	6.303	2.878	2.291	3.261	5.282	3.072
Pol_Society_H	3.174	1.102	1.852	1.621	6.282	3.887	3.301	3.236	6.449	3.249
Russia_H	5.869	3.118	2.060	3.144	2.444	3.178	3.564	2.016	2.966	0.735
Sami_H	4.021	2.323	1.547	1.865	4.061	1.143	2.158	1.582	4.704	1.744
Siberia_H	0.000	3.067	4.304	4.964	10.345	4.573	4.413	7.160	7.924	4.502
Singapore_H	3.067	0.000	1.052	1.749	6.647	2.815	2.547	4.344	6.525	3.213
Somalia_H	4.304	1.052	0.000	0.849	3.956	2.276	2.877	3.204	5.484	2.439
SouthAfrica_H	4.964	1.749	0.849	0.000	4.502	2.427	3.450	2.404	5.178	2.722
Spain_H	10.345	6.647	3.956	4.502	0.000	5.791	4.880	3.843	5.633	3.166
SriLanka_H	4.573	2.815	2.276	2.427	5.791	0.000	2.814	2.353	3.766	2.434
Sumatra_H	4.413	2.547	2.877	3.450	4.880	2.814	0.000	3.544	5.427	3.855
Sweden_H	7.160	4.344	3.204	2.404	3.843	2.353	3.544	0.000	3.807	2.065
Switzerland_H	7.924	6.525	5.484	5.178	5.633	3.766	5.427	3.807	0.000	1.828
Syria_H	4.502	3.213	2.439	2.722	3.166	2.434	3.855	2.065	1.828	0.000
Tanzania_H	5.162	1.589	1.208	1.489	4.686	1.402	2.495	2.176	2.945	1.670
Thailand_H	4.537	0.941	0.774	1.778	5.946	3.523	2.386	4.847	8.868	4.854
Tibet_H	5.386	1.520	1.288	2.175	4.615	1.240	2.693	3.228	4.221	2.195
Turkey_H	6.820	6.122	3.986	4.128	2.659	3.598	2.781	2.548	2.256	2.273
UK_Medieval_H	7.780	4.583	3.434	3.439	3.440	3.123	4.097	2.478	1.757	1.551
Ukraine_H	3.446	2.225	1.578	2.281	2.747	2.209	2.158	2.180	3.376	0.732
Vietnam_H	3.929	1.119	0.906	1.837	4.455	1.729	1.278	2.033	4.896	2.399
Yugoslavia_H	5.301	3.245	3.165	3.700	4.073	3.042	3.736	2.851	1.564	0.912

Table B.11. (continued). Tanzania_H to Yugoslavia_H.

	Tanzania_H	Thailand_H	Tibet_H	Turkey_H	UK_Medieval_H	Ukraine_H	Vietnam_H	Yugoslavia_H
Afghanistan_H	2.372	3.471	2.613	1.712	2.269	2.006	1.880	3.174
Alaska_Inuit_H	2.960	2.024	2.131	5.088	5.002	1.993	2.323	5.059
Aleut_H	3.770	2.905	2.812	5.008	5.265	2.381	3.000	5.902
Andaman_Isl_H	0.683	2.493	0.535	2.591	1.604	1.335	1.097	2.406
Australia_Aboriginal_H	2.474	2.469	4.025	4.757	5.786	3.336	1.680	4.036
Austria_H	1.096	4.514	2.002	2.393	0.732	1.191	1.939	1.065
Bangladesh_H	2.230	3.003	2.156	3.234	3.490	1.692	1.418	3.093
Bedouin_H	2.379	5.055	2.486	1.758	2.470	1.427	2.802	1.804
Bismarck_H	4.541	3.589	5.082	7.248	8.631	4.117	2.978	6.684
Bolivia_H	3.606	3.544	2.506	5.220	5.524	2.171	3.133	5.613
Borneo_H	2.218	1.943	2.108	4.759	4.895	1.541	0.868	3.133
Bulgaria_H	5.148	6.911	3.989	3.116	3.645	2.146	4.501	3.632
Burma_NHM_H	0.827	1.062	0.869	4.765	3.241	1.913	0.860	3.124
Buryat_H	2.459	4.009	1.185	2.895	2.507	1.647	2.292	3.580
Cambodia_H	4.554	3.417	3.231	4.295	6.663	2.538	2.610	5.467
Cameroon_H	1.039	1.910	1.491	4.235	3.871	2.419	1.403	3.033
Canada_Indigenous_H	4.233	2.731	3.576	4.593	7.220	1.603	2.418	5.199
Canada_Inuit_H	6.581	3.398	5.515	4.895	8.655	3.786	3.936	7.650
Celebes_H	2.090	0.698	2.013	5.027	5.147	2.135	0.556	4.182
Chile_H	6.477	4.687	5.419	5.635	9.524	3.221	4.452	6.016
China_North_H	0.794	2.175	0.751	3.263	1.897	1.074	0.769	1.761
China_South_H	1.554	2.328	1.063	5.277	3.005	1.423	1.165	2.493
Chukchi_H	5.762	3.048	4.739	7.675	7.724	4.694	3.313	6.140
Colombia_H	6.065	6.239	6.223	8.004	9.926	3.733	5.287	6.534
Congo_H	1.508	2.144	2.044	3.240	3.637	2.183	1.125	2.864
Cyprus_H	2.548	3.609	3.305	3.247	4.510	1.918	1.651	2.406
Czech_H	0.891	3.273	1.781	2.012	0.978	0.809	1.286	0.830
DW_Burma	**1.933**	**2.041**	**2.315**	**4.686**	**3.529**	**3.438**	**2.047**	**3.544**
Easter_Isl_H	7.814	4.771	8.114	8.545	12.404	6.280	4.896	8.577
Ecuador_H	3.353	3.976	4.168	4.518	6.134	1.757	3.291	3.736

Egypt_H	0.768	3.177	1.255	1.902	0.878	0.779	1.320	0.966
Finland_H	3.252	6.452	4.663	2.807	2.104	2.955	3.236	1.859
France_H	1.206	4.064	1.810	1.620	0.667	0.836	1.456	0.938
Gabon_H	1.318	2.051	2.322	5.815	4.819	3.221	2.157	3.493
Germany_H	0.894	4.149	2.475	2.693	1.026	1.899	1.605	0.930
Ghana_Ashanti_H	0.845	1.646	1.788	3.403	3.118	1.840	1.457	2.714
Greece_H	1.644	4.626	1.836	2.216	1.660	0.906	1.668	0.869
Greenland_H	4.901	2.195	4.617	6.247	7.211	3.280	3.442	6.971
Hawaii_H	4.478	2.554	4.608	5.991	7.936	3.418	2.398	5.116
Hungary_H	0.874	3.414	1.795	1.849	1.072	0.892	1.474	1.131
India_Bengal_H	0.639	2.784	0.696	2.698	1.383	0.911	1.496	1.299
India_Northeast_H	0.533	2.225	0.363	3.114	1.744	1.057	1.088	2.002
India_Northwest_H	1.736	1.999	2.127	3.928	4.632	2.107	0.942	3.681
India_Pakistan_Punjab_H	0.984	4.663	1.597	1.598	0.590	1.228	2.214	1.266
India_South_H	0.978	2.759	1.208	3.268	1.783	0.908	1.869	1.866
Iraq_H	2.102	3.798	1.651	2.397	2.644	1.060	1.858	1.690
Israel_H	0.821	4.188	2.071	2.678	1.280	1.997	1.346	1.087
Italy_H	1.383	4.108	1.836	1.332	0.957	0.833	1.529	1.195
Japan_Ainu_H	3.555	3.533	3.472	2.972	4.770	2.476	2.323	5.120
Japan_Jomon_H	5.640	7.189	5.220	3.347	6.535	3.978	4.338	6.540
Japan_Mainland_H	1.672	2.241	1.000	3.289	2.040	1.657	1.204	3.476
Java_H	1.434	1.771	1.144	4.777	3.710	1.536	0.821	3.095
Kenya_H	0.662	2.243	1.297	4.028	2.952	1.562	1.782	2.360
Korea_H	2.628	3.016	2.883	2.972	4.360	3.314	1.498	4.345
Laos_H	2.160	3.024	1.941	4.666	3.690	1.064	1.765	2.034
Malawi_H	2.141	3.904	4.067	5.162	4.904	3.620	2.747	2.770
Malay_H	1.814	1.521	2.678	4.829	4.892	2.354	1.137	4.170
Marquesas_H	5.419	4.327	5.698	6.106	8.522	4.819	3.305	5.735
Melanesia_H	1.049	1.794	1.554	3.208	3.181	1.134	0.316	1.688
Mexico_H	3.054	2.719	2.788	4.546	5.764	1.169	2.504	4.344
Micronesia_H	1.871	0.822	2.470	5.454	5.231	2.216	0.842	3.435
Molucca_H	2.443	1.996	3.106	5.640	6.222	3.239	2.075	4.081
Mongol_H	1.836	3.026	1.277	3.817	1.553	1.790	1.757	2.941
Moriori_H	4.530	4.152	4.283	6.259	7.866	4.048	3.249	4.818
Morocco_H	2.158	4.583	1.762	2.415	1.414	1.548	2.649	2.471
Nepal_H	1.076	0.876	1.059	4.800	3.996	1.869	0.769	3.321
Netherlands_H	1.912	5.384	2.751	2.959	1.372	2.501	2.120	0.789
NicobarIslands_H	3.437	3.830	3.093	2.594	3.846	2.442	2.400	3.453

Nigeria_H	1.064	2.397	1.946	3.742	3.970	2.123	1.665	2.861
Nubia_H	0.752	2.936	1.649	1.732	1.455	0.890	1.208	1.105
NZ_Maori_H	3.430	3.015	3.809	4.801	5.768	3.003	1.795	3.444
Okhotsk_H	5.309	3.029	4.392	4.597	7.478	3.107	2.798	6.804
Palestine_H	4.178	5.823	4.623	1.371	3.076	2.308	3.765	3.578
Patagonia_H	4.906	3.886	4.910	5.498	7.595	2.248	3.912	5.407
Peru_H	4.839	3.676	4.120	5.557	8.638	2.589	3.814	6.774
Philippines_H	1.437	0.789	1.324	5.139	4.022	1.556	0.989	3.474
PNG_H	0.794	1.241	1.680	4.771	3.397	2.228	0.591	2.679
Pol_Society_H	2.803	2.254	3.226	5.354	4.758	2.403	1.666	3.245
Russia_H	1.662	4.085	2.079	2.423	1.209	1.011	1.621	1.042
Sami_H	1.569	2.340	1.450	2.764	2.549	1.120	1.057	3.338
Siberia_H	5.162	4.537	5.386	6.820	7.780	3.446	3.929	5.301
Singapore_H	1.589	0.941	1.520	6.122	4.583	2.225	1.119	3.245
Somalia_H	1.208	0.774	1.288	3.986	3.434	1.578	0.906	3.165
SouthAfrica_H	1.489	1.778	2.175	4.128	3.439	2.281	1.837	3.700
Spain_H	4.686	5.946	4.615	2.659	3.440	2.747	4.455	4.073
SriLanka_H	1.402	3.523	1.240	3.598	3.123	2.209	1.729	3.042
Sumatra_H	2.495	2.386	2.693	2.781	4.097	2.158	1.278	3.736
Sweden_H	2.176	4.847	3.228	2.548	2.478	2.180	2.033	2.851
Switzerland_H	2.945	8.868	4.221	2.256	1.757	3.376	4.896	1.564
Syria_H	1.670	4.854	2.195	2.273	1.551	0.732	2.399	0.912
Tanzania_H	0.000	2.372	0.774	3.391	1.592	1.644	0.935	1.616
Thailand_H	2.372	0.000	2.221	6.081	5.796	2.900	1.191	5.483
Tibet_H	0.774	2.221	0.000	4.074	2.351	1.500	1.178	2.435
Turkey_H	3.391	6.081	4.074	0.000	2.325	1.870	3.151	2.952
UK_Medieval_H	1.592	5.796	2.351	2.325	0.000	2.387	2.859	1.519
Ukraine_H	1.644	2.900	1.500	1.870	2.387	0.000	1.245	1.620
Vietnam_H	0.935	1.191	1.178	3.151	2.859	1.245	0.000	2.386
Yugoslavia_H	1.616	5.483	2.435	2.952	1.519	1.620	2.386	0.000

Table B.12. D^2 matrix for MMS traits.

	AmericanBlack	AmericanWhite	Chinese	Colombian	**DW_Burma**	Guatemalan	Japanese	Mexico	PacificAmerindian	Peruvian	SWHispanic	Thailand
AmericanBlack	0	4.708	11.015	2.497	**5.362**	2.768	4.569	3.828	6.290	3.421	3.545	6.429
AmericanWhite	4.708	0	12.013	4.241	**2.282**	4.243	5.028	1.519	3.175	1.351	0.535	4.056
Chinese	11.015	12.013	0	12.151	**13.768**	6.546	2.479	11.146	10.003	11.048	8.965	11.163
Colombian	2.497	4.241	12.151	0	**6.952**	2.158	4.967	6.748	5.252	3.272	3.067	8.144
DW_Burma	**5.362**	**2.282**	**13.768**	**6.952**	**0**	**5.367**	**6.672**	**2.148**	**2.157**	**2.704**	**2.658**	**3.315**
Guatemalan	2.768	4.243	6.546	2.158	**5.367**	0	1.163	4.349	4.912	4.787	2.621	5.823
Japanese	4.569	5.028	2.479	4.967	**6.672**	1.163	0	4.603	5.337	5.531	3.013	6.263
Mexico	3.828	1.519	11.146	6.748	**2.148**	4.349	4.603	0	5.543	3.350	2.086	2.715
PacificAmerindian	6.290	3.175	10.003	5.252	**2.157**	4.912	5.337	5.543	0	1.809	2.207	6.216
Peruvian	3.421	1.351	11.048	3.272	**2.704**	4.787	5.531	3.350	1.809	0	1.260	4.466
SWHispanic	3.545	0.535	8.965	3.067	**2.658**	2.621	3.013	2.086	2.207	1.260	0	5.249
Thailand	6.429	4.056	11.163	8.144	**3.315**	5.823	6.263	2.715	6.216	4.466	5.249	0

Table B.13. D^2 matrix for dental nonmetric data.

	Dart_Black_P	**DW_Burma**	Japan_Chiba_P	Kirsten_Black_P	Kirsten_Coloured_P	Pretoria_Black_P	Pretoria_White_P	TXST_White_P	UTK_Black_P	UTK_Hispanic_P	UTK_White_P
Dart_Black_P	0	**10.786**	8.993	1.591	1.060	1.641	3.585	1.829	3.950	6.610	3.006
DW_Burma	**10.786**	**0**	**4.556**	**10.909**	**9.046**	**9.717**	**8.360**	**9.479**	**7.570**	**9.298**	**10.700**
Japan_Chiba_P	8.993	**4.556**	0	8.140	6.794	6.463	7.113	4.926	7.608	3.609	5.690
Kirsten_Black_P	1.591	**10.909**	8.140	0	2.118	3.228	2.973	2.678	6.357	5.161	3.772
Kirsten_Coloured_P	1.060	**9.046**	6.794	2.118	0	1.012	3.573	1.054	2.418	5.644	1.272
Pretoria_Black_P	1.641	**9.717**	6.463	3.228	1.012	0	4.606	1.637	4.035	7.132	1.947
Pretoria_White_P	3.585	**8.360**	7.113	2.973	3.573	4.606	0	3.953	3.420	3.539	6.094
TXST_White_P	1.829	**9.479**	4.926	2.678	1.054	1.637	3.953	0	4.171	4.510	0.578
UTK_Black_P	3.950	**7.570**	7.608	6.357	2.418	4.035	3.420	4.171	0	6.458	5.179
UTK_Hispanic_P	6.610	**9.298**	3.609	5.161	5.644	7.132	3.539	4.510	6.458	0	6.003
UTK_White_P	3.006	**10.700**	5.690	3.772	1.272	1.947	6.094	0.578	5.179	6.003	0

Appendix C: Additional Comparative Samples

Table C.1. Additional craniometric comparative samples from the Hanihara and FDB datasets. Institution abbreviations are explained in the footnote.

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)^a	Female	Male	Total	Reference
Alaska_Inupiat_H	Alaska (Inupiat)	Arctic	Not Available	NHM, CAM	86	94	180	Hanihara (1992, 2000)
Alaska_PtBarrow_H	Alaska (Point Barrow)	Arctic	Not Available	NHM, CAM	32	48	80	Hanihara (1992, 2000)
Alaska_Yupik_H	Alaska (Yup'ik)	Arctic	Not Available	NHM, CAM	101	105	206	Hanihara (1992, 2000)
Aleut_H	Aleut	Arctic	Not Available	SI-NMNH, AMNH	99	138	237	Hanihara (1992, 2000)
Am_Black_FDB	American Black	North America	Modern	UTK, TXST, SI-NMNH	54	96	150	Jantz & Moore-Jansen (1988)
Am_White_FDB	American White	North America	Modern	UTK, TXST, SI-NMNH	76	74	150	Jantz & Moore-Jansen (1988)
Australia_ Aboriginal_H	New South Wales, South Australia, Murray River	Oceania	Not Available	AM, NHM, CAM	23	181	204	Hanihara (1992, 2000)
Austria_H	Austria	Central Europe	16th-17th century	NHM	55	75	130	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference
Borneo_H	Borneo	Southeast Asia	Not Available	NHM, CAM, MDH, UOS, SAuM-A	6	62	68	Hanihara (1992, 2000)
Burma_NHM_H	Myanmar	Southeast Asia	Not Available	DW-CAM	3	43	46	Hanihara (1992, 2000)
Canada_Indegenous_H	Subarctic & Northwest America	North America	Not Available	NHM, CAM	25	70	95	Hanihara (1992, 2000)
China_North_H	Northern Chinese	East Asia	Not Available	UOT, UOK, NHM	13	98	111	Hanihara (1992, 2000)
China_South_H	Southern Chinese	East Asia	Not Available	NHM, MDH	0	59	59	Hanihara (1992, 2000)
Czech_H	Czech	Central Europe	Not Available	SAuM-A, NHM	32	79	111	Hanihara (1992, 2000)
East_Asian_FDB	East Asian	East Asia	Modern	Not Available	2	16	18	Jantz & Moore-Jansen (1988)
EasterIslands_H	Easter	Oceania	Not Available	NHM, CAM	17	55	72	Hanihara (1992, 2000)
Egypt_Gizeh_H	Gizeh (Egypt)	North Africa	664–343 B.C.	CAM	26	105	131	Hanihara (1992, 2000)
Egypt_Naqada_H	Naqada (Egypt)	North Africa	ca. 5,000–4,000 years B.P.	CAM	0	64	64	Hanihara (1992, 2000)
Egypt_Upper_H	Upper Egypt	North Africa	Not Available	CAM	82	100	182	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)^a	Female	Male	Total	Reference
France_H	France	Western Europe	Not Available	NHM, CAM	0	45	45	Hanihara (1992, 2000)
Gabon_H	Gabon	Central Africa	Not Available	NHM	4	61	65	Hanihara (1992, 2000)
Germany_H	Germany	Western Europe	Not Available	NHM, CAM	54	86	140	Hanihara (1992, 2000)
Ghana_Ashanti_H	Ashanti, Ghana	West Africa	Not Available	NHM, CAM	37	46	83	Hanihara (1992, 2000)
Greece_H	Greece	Southern Europe	Not Available	NHM	64	53	117	Hanihara (1992, 2000)
Greenland_H	Greenland	North America	Not Available	NHM, CAM, MDH	39	89	128	Hanihara (1992, 2000)
Hawaii_H	Hawaii	Oceania	Not Available	NHM, CAM	0	64	64	Hanihara (1992, 2000)
Hispanic_FDB	Hispanic	North America	Modern	UTK, TXST, SI-NMNH	7	48	55	Jantz & Moore-Jansen (1988)
Hungary_H	Hungary	Central Europe	Not Available	NHM	51	84	135	Hanihara (1992, 2000)
India_Bengal_H	Bengal-Bihar	South Asia	Not Available	NHM, CAM	23	54	77	Hanihara (1992, 2000)
India_Northwest_H	Delhi-Northwest India	South Asia	Not Available	NHM, CAM	0	25	25	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference
India_Pakistan_Punjab_H	Punjab-Kashmir	South Asia	Not Available	NHM, CAM	0	58	58	Hanihara (1992, 2000)
India_South_H	Madras	South Asia	Not Available	NHM, SAuM-A	9	102	111	Hanihara (1992, 2000)
Italy_H	Italy	Southern Europe	Not Available	NHM	0	77	77	Hanihara (1992, 2000)
Japan_Ainu_H	Ainu	East Asia	18th-19th century?	UHOK, SMU	42	77	119	Hanihara (1992, 2000)
Japan_Jomon_H	Jomon	East Asia	ca. 5,300–2,300 years B.P.	UHOK	6	14	20	Hanihara (1992, 2000)
Japan_MainIsland_H	Mainland Japan	East Asia	18th-20th century	UHOK, TKO	39	116	155	Hanihara (1992, 2000)
Java_H	Java	Southeast Asia	Not Available	NHM, CAM, MDH	6	54	60	Hanihara (1992, 2000)
Kenya_H	Kenya	East Africa	Not Available	NHM, CAM	20	61	81	Hanihara (1992, 2000)
Korea_South_H	Korea	East Asia	Not Available	TKO, KYO	0	19	19	Hanihara (1992, 2000)
Laos_H	Laos	Southeast Asia	Not Available	MDH	0	16	16	Hanihara (1992, 2000)
Malaysia_H	Malay	Southeast Asia	Not Available	NHM, CAM, SAuM-A	0	30	30	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference
Maori_H	Maori	Oceania	Not Available	AM, UOS, SAuM-A, NHM, CAM	19	103	122	Hanihara (1992, 2000)
Marquesas_H	Marquesas	Oceania	ca. 2,000 years B.P.	BPB-HON, NHM, CAM	20	59	79	Hanihara (1992, 2000)
Mel_NewCaledonia_H	New Caledonia	Oceania	Not Available	AM, UOS, SAuM-A, NHM, CAM	9	31	40	Hanihara (1992, 2000)
Mel_Solomon_H	Santa Cruz & Solomon Islands	Oceania	Not Available	AM, UOS, SAuM-A, NHM, CAM	21	60	81	Hanihara (1992, 2000)
Mel_TorresStrait_H	Torres Strait	Oceania	Not Available	NHM, CAM	5	41	46	Hanihara (1992, 2000)
Mexico_H	Mesoamerica	North America	Not Available	NHM, CAM	36	56	92	Hanihara (1992, 2000)
Molucca_H	Celebes-Molucca	Southeast Asia	Not Available	NHM, CAM	3	17	20	Hanihara (1992, 2000)
Mongolia_H	Mongolia	East Asia	Not Available	MDH	51	121	172	Hanihara (1992, 2000)
Mongolia_Metal_H	Mongolia	East Asia	ca. 2300-1800 years BP	Not Available	11	29	40	Hanihara (1992, 2000)
Moriori_H	Moriori	Oceania	Not Available	AM, UOS, SAuM-A, NHM, CAM	3	70	73	Hanihara (1992, 2000)
Nigeria_H	Nigeria	West Africa	Not Available	NHM, CAM	24	74	98	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference
Nubia_Early_H	Nubia, Sudan	North Africa	Not Available	CAM	0	25	25	Hanihara (1992, 2000)
Nubia_Kerma_H	Nubia, Sudan	North Africa	12th–13th Dynasty of Nubia	CAM	0	69	69	Hanihara (1992, 2000)
Nubia_Recent_H	Nubia, Sudan	North Africa	Not Available	NHM	0	62	62	Hanihara (1992, 2000)
Okhotsk_H	Okhotsk	East Asia	Not Available	Not Available	14	24	38	Hanihara (1992, 2000)
Palestine_H	Palestine	Middle East	ca. 5,000–3,000 years B.P.	NHM	5	56	61	Hanihara (1992, 2000)
Patagonia_H	Patagonia	South America	Not Available	NHM	11	48	59	Hanihara (1992, 2000)
Peru_H	Peruvians	South America	Not Available	NHM	140	210	350	Hanihara (1992, 2000)
Philippines_General_H	Philippines	Southeast Asia	Not Available	NHM, CAM, MDH	32	96	128	Hanihara (1992, 2000)
Philippines_Luzon_H	Philippines Luzon	Southeast Asia	Not Available	NHM, MDH	7	21	28	Hanihara (1992, 2000)
PNG_H	Papua New Guinea	Oceania	Not Available	AM, UOS, SAuM-A, NHM, CAM	129	211	340	Hanihara (1992, 2000)
Russia_H	Russia	Eastern Europe	Not Available	NHM, CAM	6	42	48	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)^a	Female	Male	Total	Reference
Singapore_H	Singapore	Southeast Asia	Not Available	Not Available	15	43	58	Hanihara (1992, 2000)
Somalia_H	Somalia	East Africa	Not Available	CAM	3	43	46	Hanihara (1992, 2000)
SouthAfrica_H	South Africa	South Africa	Not Available	NHM, CAM	10	100	110	Hanihara (1992, 2000)
SriLanka_H	Veddah	South Asia	Not Available	NHM, SAuM-A	7	13	20	Hanihara (1992, 2000)
Sumatra_H	Sumatra	Southeast Asia	Not Available	NHM	3	26	29	Hanihara (1992, 2000)
Switzerland_H	Switzerland	Northern Europe	Not Available	NMNH	21	35	56	Hanihara (1992, 2000)
Tanzania_H	Tanzania	East Africa	Not Available	NHM, CAM	23	71	94	Hanihara (1992, 2000)
Thailand_H	Thailand	Southeast Asia	Not Available	NHM, MDH, UOS	10	29	39	Hanihara (1992, 2000)
Turkey_H	Turkey	Middle East	Not Available	NHM	17	41	58	Hanihara (1992, 2000)
UK_Medieval_H	UK	Western Europe	Medieval England	NHM, CAM	64	240	304	Hanihara (1992, 2000)
Vietnam_H	Vietnamese	Southeast Asia	Not Available	MDH	0	20	20	Hanihara (1992, 2000)

Population Code	Population	Geographic Region	Time Period	Collection Institute(s)[a]	Female	Male	Total	Reference

[a] AM = Australian Museum; AMNH = American Museum of Natural History, New York; BPB-HON = Bernice P. Bishop Museum, Honolulu; CAM = University of Cambridge; KYO = Kyoto University, Faculty of Science, Laboratory of Physical Anthropology; MDH = Musée de l'Homme, Paris; NHM = British Natural History Museum; SAuM-A = South Australian Museum, Adelaide; SI-NMNH = National Museum of Natural History, Smithsonian Institution; TKO = University of Tokyo, University Museum, Tokyo; TXST = Texas State University Donated Skeletal Collection, San Marcos, TX; UHOK = Hokkaido University, Sapporo, Japan; UTK = William Bass Donated Collection, University of Tennessee, Knoxville, TN.