DECODING ADOLESCENT RICKETS: THE EFFECTS OF THE ENVIRONMENTAL AND SOCIAL CONTEXTS ON THE DEVELOPMENT OF RICKETS IN ADOLESCENTS IN THE NETHERLANDS FROM THE 17TH TO 19TH CENTURIES

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ABSTRACT

Vitamin D deficiency at Middenbeemster and Hattem is the result of cultural variables that limit an individual's exposure to sunlight. During growth spurts, such as the pubertal growth spurt, high demand for vitamin D puts individuals at an increased risk for developing conditions such as rickets. This thesis aims to determine whether adolescent rickets can be identified in archaeological skeletal remains, and how to quantify the observed changes. The current work also aims to use the prevalence of adolescent rickets to understand the underlying social changes affecting individuals in the Netherlands in the 17th to 19th centuries. Two collections of archaeological human remains from the 17th to 19th century Dutch sites of Middenbeemster (n=246) and Hattem (n=117) were evaluated using macroscopic, metric, radiographic, and micro-CT analysis of skeletal remains. Adolescent individuals were evaluated for signs of active adolescent rickets, and adults were evaluated for signs of residual adolescent rickets. Statistical analysis found that measurements quantifying shape changes at the distal ulna, medial clavicle, and sacral angle can be used to identify adolescent rickets in a skeletal sample.

Adolescent rickets at Middenbeemster and Hattem was found to be distributed equally amongst males and females and was found to occur less frequently than rickets in infants and children from the same population. Rickets in adolescents was most likely caused by the onset of new jobs or roles resulting in individuals remaining indoors for long periods of time. Rickets may have also been caused by illness. By identifying rickets in adolescents, this thesis provides a window to view the changing roles of individuals as they begin to occupy new spaces in their transition from children into adults, thus providing a novel way to investigate the lives of adolescents.

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DECLARATION OF ACADEMIC ACHIEVEMENT

The research contained in this thesis was completed by Madeleine Lamer under the supervision of Dr. Megan Brickley and Dr. Tina Moffat. Research questions and methodology were developed in consultation with Dr. Brickley and Dr. Moffat. Permission to access the skeletal material used in this research was obtained by Dr. Brickley from Dr. Sarah Schrader of Leiden University and Dr. Barbara Veselka of Vrije Universiteit Brussel. Data collection and analysis was conducted by Madeleine Lamer, and the micro-CT scanning of the molars was conducted by Dr. Leo van Ruijven of Academisch Centrum Tandheelkunde Amsterdam (Academic Center for Dentistry Amsterdam). Funding for this project was provided by SSHRC, Michael Smith Foreign Study Supplement, Mitacs Globalink Research Award, Global Experience Award, Ontario Graduate Scholarship.

Chapter 1.0 – Introduction

Adolescence is a period of physical and social maturation beginning with the pubertal growth spurt and ending with the commencement of adult social roles. Adolescence in the Netherlands from the 17th to 19th centuries extends from age nine to 25 years, as individuals were not considered mature enough for adult roles such as marriage until their mid- to late 20's (Blom et al. *in review*; van Poppel and Nelissen, 1999). Subadults grow at predictable rates and undergo two large growth spurts prior to reaching adult size. The first growth spurt occurs during the first two years of life, and the second, during puberty (Moncrieff et al., 1973). Rickets is the inadequate endochondral mineralization of newly deposited osteoid resulting from vitamin D deficiency (Holick, 1995). The high demand for vitamin D and other minerals during these growth spurts puts individuals at an increased risk for developing rickets. Due to the high survival rate of rickets the shape changes that arise during active rickets and remain after normal levels of vitamin D are achieved are referred to as residual rickets and are visible to paleopathologists. The combination of the onset of new social roles as well as the rapid growth occurring during puberty makes early adolescence a crucial age at which to study vitamin D deficiency.

Adolescent rickets has not been systematically evaluated in an archaeological collection. While cases of rickets in adolescents have been recorded in living patients (Al Jurayyan et al., 2012; Agarwal and Gulati, 2009; Ford et al., 1972; Hess, 1930; Maxwell and Miles, 1925; Maxwell, 1935; Moncrieff et al., 1973; Snapper, 1943), this thesis will be the first to systematically evaluate adolescent rickets in archaeological human remains. Two archaeological skeletal collections Middenbeemster and Hattem, dating primarily from the 17th to the 19th centuries from the Netherlands are used.

The thesis aims to use a combination of non-metric features, measurements, and interglobular dentine to determine if adolescent rickets can be identified in skeletal human remains, and if so, how to quantify the resulting changes through the use of measurements of the skeletal elements most likely to be affected by adolescent rickets. The growth rates of the long bones and ribs and the fusion timing of the sacrum and sternum from birth to age 18 were calculated to interpret the timing and expression of rachitic shape changes and porotic lesions. Well studied lesions found in infants and children, as well as in adolescents in clinical studies, are evaluated to determine if they can be applied to the analysis and interpretation of adolescent rickets in archaeological human remains. The identification of which measurements and features are most likely to reflect the presence of adolescent rickets allows this disease to be recognized in adolescents from other skeletal populations, therefore improving our understanding of the process of coming of age cross-culturally. The current study also evaluates whether the use of growth rates of the long bones in the interpretation of porotic lesion formation, and the recording of porotic lesions at the rapidly growing distal femur and ulna and the slower growing medial clavicle, can provide a better understanding of the timing and progression of episodes of rickets.

The current work will use the presence of adolescent rickets to inform a biocultural approach to understanding the sociocultural context of the Netherlands throughout the 17th to the 19th centuries that may have influenced the development of the disease. Prior to food fortification, diet would not have contributed adequate levels of vitamin D to avoid a deficiency (Holick, 1995; Jones, 2018). There are many sociocultural factors that may have influenced the development of rickets in adolescents from Hattem and Middenbeemster, primarily involving work. Some jobs may have kept individuals indoors for longer periods of time, affecting their ability to synthesize vitamin D. Adolescent rickets provides a window into the social organization of the 17th to 19th century communities of Middenbeemster and Hattem, as well as allows us to see the changing roles of individuals as they transition into adults, thereby improving our understanding of adolescence as a biological and social age group.

The thesis is organized into six chapters with additional appendices containing information on the growth rates of the long bones and ribs and the fusion timing of the sacrum, as well as the data used for the calculation of Interclass Correlation Coefficient tests. Additionally, *Appendices A to M* contain the entirety of the data collected, as well as the z-scores calculated this thesis. Chapter Two sets out how vitamin D and vitamin D deficiency affect skeletal growth during adolescence, as well as provides an overview on the bioarchaeological study of adolescence, and the historical milieu of the Netherlands from the 17th to 19th centuries with a particular focus on the lifeways of children and adolescents. Chapter Three outlines information on the composition of the Middenbeemster and Hattem samples, and explains how the growth rates of the long bones and ribs and the fusion timing of the sternum and sacrum were used to select which bones to included in this research. The third chapter also describes the features observed and the measurements taken, the selection criteria for which molars were sampled for micro-CT analysis, and what statistical methods were used to analyze the data collected. Chapter Four provides the results of the micro-CT and statistical analyses. Chapter Five discusses the results obtained and the individuals with possible cases of adolescent rickets using four osteobiographies of individuals with adolescent rickets. Concluding remarks are set out in Chapter six.

Chapter 2.0 – Background

2.1 – Vitamin D Deficiency

Vitamin D is a hormone that plays an essential role in bone mineralization, as well as the regulation of calcium homeostasis (Holick, 1995). Insufficient levels of serum 25 hydroxyvitamin D (25(OH)D) result in the inadequate mineralization of newly deposited osteoid and the subsequent disorganization of the cartilage (Holick, 1995). Vitamin D is primarily synthesized through the dermal absorption of ultraviolet B (UVB) radiation. Vitamin D can also be obtained through dietary sources; however, few foods prior to fortification would have held significant enough vitamin D to prevent deficiency (Holick, 1995; Jones, 2018). Foods that naturally contain vitamin D include cod liver oil, fatty fish like herring and salmon (fresh or canned), egg yolks, and some mushrooms (Holick, 2006).

Terminology used in paleopathology in discussion of rickets and osteomalacia often separate rickets into vitamin D deficiency occurring in infants and children, and osteomalacia occurring in adults (Brickley and Ives, 2008: 91; Brickley et al., 2018). However, as rickets affects endochondral mineralization (Brickley and Ives, 2008: 90), it can occur in any actively growing long bone. The inadequate mineralization in the growing ends of the long bones in subadults results in rickets, while the inadequate mineralization of newly deposited osteoid in areas of the bone that are not actively growing results in osteomalacia, which can affect individuals of all ages (Agarwal et al., 2002; Brickley et al., 2005; Brickley et al., 2007; Holick, 1995; Mays et al., 2006; Veselka et al., 2015).

Endochondral bone mineralization is the mechanism responsible for the longitudinal growth of the long bones, and occurs at the growth plates between the epiphyses and metaphysis of the long bones (Scheuer and Black, 2000). The cartilage making up the growth plate is composed of chondrocytes, which form rapidly and become organized in pillars (Scheuer and Black, 2000). The cartilage closest to the metaphasis begins to hypertrophy, and is transformed into osteoblasts that are subsequently mineralized (Scheuer and Black, 2000). When the ossification fronts of the epiphysis and the metaphasis meet, epiphyseal fusion begins (Scheuer and Black, 2000).

Adequate exposure to UVB radiation can be affected by exogenous factors that limit access to sunlight. These can be culturally induced such as increased skin coverage by clothing, increased time spent indoors, and inadequate diet (Holick, 1995; Brickley et al., 2014). Factors limiting access to sunlight can also be environmentally induced, such as by atmospheric pollution, tall and dense urban architecture, time of day, seasonality, and latitude (Brickley et al., 2014; Holick, 1995, 2003). The Netherlands is located at a latitude of 52 degrees North. A study on the synthesis of vitamin D in the city of Edmonton (52 degrees North) found that the dermal synthesis of vitamin D only occurred between April and October (Webb et al., 1988). It is likely that cutaneous vitamin D synthesis was only possible throughout spring, summer, and fall in the Netherlands (Waters-Rist and Hoogland 2018). Vitamin D deficiency can provide valuable information regarding social organization, the gendered division of labour, and cultural practices (Brickley et al., 2014).

Rickets in infants and children has been extensively studied by paleopathologists since the mid-19th century, but clear diagnostic criteria for the identification of rickets in archaeological human remains was only developed by Ortner and Mays in 1998 (Mays and Brickley, 2018). Rickets causes bending of the shafts of the weight bearing bones, deformation at the ends of the bones, and costochondral flaring at the sternal rib ends (Brickley and Ives, 2008: 90-91; Brickley et al., 2018; Cesur et al., 2011; Hess, 1930; Mays et al., 2006; Ortner and Mays, 1998). More marked shape changes occurring as a result of infantile and childhood rickets can be preserved into adulthood and are referred to as residual rickets (Brickley et al. 2010). Many cases of residual rickets remodel over time, with only between 10-25% of cases being preserved into adulthood (Hess 1930: 291). Shape changes occurring as a result of active adolescent rickets that are preserved after the rickets has resolved are referred to as residual adolescent rickets.

Porotic lesions at the growth plates and the sternal rib ends have been associated with archaeological cases of active rickets by several researchers (Ortner and Mays (1998), Mays et al. (2006), Mays et al. (2009), Schattmann et al. (2016), and Lockau et al. (2019)). These lesions are caused by the body's failure to mineralize newly deposited osteoid at the growing ends of the bones (Brickley and Ives, 2008; Mays et al., 2006; Ortner and Mays, 1998). Should an individual die with an active case of rickets, the unmineralized osteoid will decompose, leaving porotic lesions at the growth plate and sternal rib ends (Lockau et al., 2019; Mays et al., 2006; Ortner and Mays, 1998). If rickets is resolved and the affected individual survives, the osteoid will mineralize, obliterating the lesion (Mays et al., 2006). Porotic lesions have only been examined in cases of infantile and childhood rickets, however, they can occur in any actively growing long bone, and therefore can be visible in any individual before the completion of growth.

2.2 – Interglobular Dentine

Interglobular dentine (IGD) is the inadequate mineralization of newly formed dentine due primarily to vitamin D deficiency. Mellanby (1928) was the first to identify the association between vitamin D deficiency and IGD. D'Ortenzio et al. (2016) have found that IGD can be used as a tool for diagnosing rickets in archaeological individuals. Dentine forms via appositional growth, and forms in concentric layers towards the root (D'Ortenzio et al. 2018). Mineralization occurs when the organic matrix is replaced by crystals composed of calcium salts (calcospherites), which fuse and form a homogenous matrix (D'Ortenzio et al. 2018). Similar to rickets, when an individual is deficient in vitamin D, the calcospherites making up the dentine are unable to adequately fuse, leaving visible spaces in the dentine (D'Ortenzio et al., 2016). Unlike rickets, however, the resulting line of unmineralized dentine cannot remodel, thus preserving evidence of the period of deficiency within the tooth (D'Ortenzio et al., 2016). Due to the fact that teeth grow at consistent rates, it is possible to determine at what age an individual with IGD experienced a period of vitamin D deficiency, based on the position of IGD within the tooth (Brickley et al., 2020b; D'Ortenzio et al., 2016; D'Ortenzio et al. 2018). The second and third molars mineralize during adolescence and are therefore the teeth that have the potential to contain IGD in cases of adolescent rickets.

IGD has been analysed using histological slices and micro computed tomography (micro-CT) scans. While micro-CT scans allow for the interior structure of the tooth to be viewed in a three-dimensional space, the lower resolution of the scans compared to histological slices mask the expression of lower grade IGD (grades one and two) (Colombo et al., 2019; Veselka et al., 2019). IGD is also affected by growth rates and can therefore be expressed in a higher grade should the rate of growth of the tooth be more rapid (D'Ortenzio et al., 2018). The severity of IGD has also been found to vary between the teeth of the same individuals (Tracy et al., 1971). The slower growth of root dentine may result in IGD forming in the roots being of a lower grade, and therefore more difficult to visualize on micro-CT scans. Furthermore, the appearance of post-depositional diagenetic changes surrounding the pulp chamber and in the root dentine, can complicate the identification of (D'Ortenzio et al., 2018: 103; Veselka et al., 2019).

2.3 –Adolescence and Adolescent Rickets

Adolescence can be considered the period between childhood and adulthood wherein individuals undergo rapid physical growth and social maturation, and extends from the beginning of puberty until the cessation of growth and the beginning of adulthood. Puberty is the period of rapid increase in height and the onset of the development of secondary sexual characteristics that signal sexual maturity (Gluckman and Hansen, 2006). Growth velocity for both males and females increases during puberty, with females beginning their growth spurt two years prior to males (Humphrey, 1998). Estrogen promotes the development of secondary sexual characteristics in females such as wider hips and the growth of breasts, however, it also inhibits bone growth (Duren et al., 2013). The female pubertal growth spurt ends after menarche, whereby the level of circulating estrogen increases (Duren et al., 2013). Unlike estrogen, testosterone promotes the growth of cartilage at the growth plates (Scheuer and Black, 2000: 28).

Bones that grow more rapidly are more likely to have the most obvious rachitic lesions. Children undergo two major growth spurts during which they are most susceptible to developing a nutritional deficiency. Moncrieff et al. (1973) have found a marked correlation between the occurrence of rickets and the timing of both the infant and adolescent growth spurts. The first major growth spurt occurs during the first years of life, and the other occurs during puberty between the ages of 10 and 15 (Agarwal and Gulati, 2009; Al Jurayyan et al., 2012; Ford et al., 1972; Moncrieff et al., 1973). The rapid growth occurring during adolescence paired with a lack of adequate dermal and dietary vitamin D can result in adolescents becoming susceptible to developing rickets.

In the majority of clinical cases of adolescent rickets, diagnoses are made based on radiographs of the wrists, knees, and ankles, however in more recent clinical investigations, diagnoses are made alongside a blood test to monitor serum 25(OH)D levels, calcium, and alkaline phosphatase levels (Agarwal and Gulati, 2009; Al Jurayyan et al., 2012). Changes such as swelling and pain in the wrists, knees, and ankles, and genu valgum (inward angulation) or genu varum (outward bowing) at the knees have been observed (Agarwal and Gulati, 2009; Narchi et al., 2001; Puri et al., 2008; Snapper, 1943). Swelling of the costochondral joints and pain in the rib cage has also been reported (Snapper, 1943). Growth and development have been observed to be stunted, with delayed epiphyseal fusion in more severe cases (Snapper, 1943). Radiographically, mild osteopenia, an increase in physeal height, metaphyseal fraying, sclerosis, and a cupping or saucer-like formation at the ends of the long bone diaphyses have been observed (Agarwal and Gulati, 2009; Narchi et al., 2001; Snapper, 1943; Üner et al., 2010); these changes are most commonly observed in the wrist, particularly at the distal ulna (Agarwal and Gulati, 2009; Snapper, 1943). Bending at the sacrum has been observed in individuals aged 12-13 in clinical cases of rickets by Maxwell and Miles (1925), Hess (1930) and Maxwell (1935).

Despite changes related to rickets occurring in adolescence being recognized clinically, they are very rarely recognized archaeologically. Anterior bending in the sacrum between the second and third sacral vertebrae has been noted by Molleson and Cox (1993) in human remains from the Spitalfields crypt, as well as by D'Ortenzio et al. (2016) in an individual from the Saint-Matthew archaeological site in Quebec. D'Ortenzio et al. (2016) also noted the presence of interglobular dentine in the second and third molars of an individual with a bent sacrum.

Adolescent rickets occurs less frequently than rickets in younger individuals, which has prompted some bioarchaeologists to state that the slower growth of adolescents may prevent clear rachitic skeletal changes from developing (Peacock et al., 2019). Clinicians have reported that adolescents with vitamin D deficiency are less likely show skeletal changes related to rickets than younger individuals (Al Jurayyan et al., 2012; Cesur et al., 2011). In a study of 946 children aged between four months and 15 years with nutritional rickets, rickets was found to result in skeletal changes most frequently in infants (Cesur et al., 2011). However, Ford et al. (1972) found rickets to be more common in adolescents in their study of Pakistani immigrants; though this was due to the fact that many of the infants and young children in the sample were taking supplements, while the adolescents were not. Earlier clinical research by Maxwell and Miles (1925), Maxwell (1930), and Snapper (1943) report clinical cases of adolescent rickets with clear skeletal changes. The belief by clinicians that adolescent rickets does not result in clear skeletal changes may be due to the fact that the use of blood serum levels in the diagnosis of rickets has resulted in the earlier detection and correction of vitamin D deficiencies, thereby preventing severe osteological changes from developing. It is also possible that the focus on the identification of rickets using blood serum levels in recent cases of adolescent rickets may result in clinicians not searching for or noticing skeletal changes associated with adolescent vitamin D deficiency.

The expression of porotic lesions at the growth plates can also be affected by the growth velocity of the long bones, whereby faster growing long bones will develop the porotic lesion earlier than slower growing long bones. Porotic lesions on faster growing bones may also resolve more rapidly than those on slower growing bones. This effect has been observed by Schattmann et al. (2016) who observed variation in growth plate porosity scores within the same individual. The observation of differences in the severity of growth plate porosity scores, and the timing of the appearance in growth plate porosity throughout the long bones can allow for the timing and the stage of progression of the vitamin D deficiency period to be analysed.

2.4 – The study of adolescents in bioarchaeology

The study of adolescence has only recently been considered in bioarchaeological investigations but is complicated by the fact that social age is culturally dependent and highly variable, and may not be reflective of actual chronological age (Halcrow and Tayles, 2008; Inglis and Halcrow, 2018: 42-43). While some authors posit that adolescence did not exist in pre-industrial and industrial European contexts (Schultz 1991), others define adolescence as a period of semi-independence taking place between childhood and adulthood (Hanawalt, 1992; Simonton, 2004).

2.5 – Childhood and adolescence in the Netherlands in the 17th to 19th centuries

Child labour in the Netherlands was not uncommon and was considered beneficial for the economy and a way to combat poverty throughout the 17th, 18th, and the first half of the 19th centuries (Smit, 2009). Children in the Netherlands were expected to help their parents work as early as five years of age, although work at this age would have consisted of easy tasks such as cow herding, chores in the home and caring for the younger children in the family (Schenkenveld, 2008). Each family member would have contributed to the economic output of the family unit (van Poppel et al., 2009). For example, if a family's main source of income was farming or weaving, each member of the family would have contributed their labour.

Manual and agricultural labour in the Netherlands throughout the 17th and 19th centuries was divided by gender (Schenkenveld, 2008; van Nederveen Meerkerk, 2015; van Poppel et al., 2009). Individuals working in agriculture began to work at age eight or nine, performing the simpler tasks such as caring for the animals, planting, weeding, and raking (van Nederveen Meerkerk, 2009). At farms in Beemster, girls began work between nine and fourteen years old (Schenkeveld, 2008). At Beemster, a survey from 1800 stated that children began to take part in cow milking and cheese making between the ages of nine to eleven (Schenkeveld, 2008). Individuals who lived on farms may have remained home to work on their family farm through puberty, as this was cheaper than hiring workers to assist with farm work (Kok, 1997; Schenkeveld, 2008). Many of the tasks, such as spinning, weaving, cheese making, and work as a servant, took place indoors or undercover (Veselka et al., 2018).

While agricultural work was more commonly done by men, women would have also worked in agriculture (Schenkeveld, 2008; van Cruyningen, 2005; van Nederveen Meerkerk, 2015: 21; Veselka et al., 2015; Veselka et al., 2018; Waters-Rist and Hoogland, 2018). van Cruyningen 's (2005) analysis of women's work in agriculture in the Dutch province of Zeeland in the 18th century states that it was common for women whose parents were farm owners to continue to work on their parent's farm until marriage. Working in service was the most common choice for adolescent girls, who often left their homes to work as servants for other families, which can be seen as a form of transmission of culture and training for girls to learn to care for households (Kok, 1997).

Due to the fact that many work contracts lasted only one year, youth tended to move to different cities rather frequently, however they often returned home and provided either a portion of their earnings, or their entire earnings to their parents (Kok, 1997). A study on the migration patterns of youth from Utrecht states that between 1850 and 1940, 30-55% of youths migrated to nearby towns for employment, however, the mean age at migration was 18-19 years old (Kok, 1997) so youth will have left home at earlier and later ages. While moving between jobs allowed youth to build their experiences and make connections, their return home between job placements indicated that they were still semi-dependent on their parents (Kok, 1997). Employment in the proto-industries as well as in traditional crafts were also available to youth, with most individuals employed in these fields between ages 12 and 14 years (van Nederveen Meerkerk, 2009). Boys also may have worked in the shipping and transport industry, and girls not working as servants may have also worked in the textile industry (van Nederveen Meerkerk, 2009).

While some children and adolescents attended school, absenteeism was common, particularly during the harvest season (Schenkeveld, 2008). It was also common for children to work in the fields or in their homes before school and after school (Schenkenveld, 2008). A concern for education and the subsequent decrease in child labour only began at the end of the 19^{th} century (Smit, 2009). In 1874, wage labour for individuals under the age of 12 was banned; however, this ban did not include agricultural labour (Schenkeveld, 2008). Education was made mandatory for a minimum of six years in 1900, however, children older than 10 years could spend up to six weeks on agricultural leave with an additional summer holiday (Schenkeveld, 2008).

In the Netherlands, marriage was considered a rite of passage, and the social maturity of the couple was deemed highly important (van Poppel and Nelissen, 1999). As such, couples were encouraged to wait to marry until after their vocational training or education was complete (van Poppel and Nelissen, 1999). Men in the Netherlands were believed to cease to be adolescents in their early 20's, and were not considered to be mature enough for marriage until the age of about 25 (van Poppel and Nelissen, 1999). It was believed that women entered adulthood earlier than men and were mature enough for marriage in their early 20's (van Poppel and Nelissen, 1999). From 1811-1838 the age of majority was 21 years for both males and females; however, individuals could marry as young as 15 for girls and 18 for boys (van Poppel and Nelissen, 1999). Despite the fact that marriage at 15 and 18 was legal, all females under 21 and all males under 25 required parental consent prior to being married (van Poppel and Nelissen, 1999). In 1838 the Netherlands increased the minimum age at marriage for girls to 16, and the age of majority to 23 (van Poppel and Nelissen, 1999).

2.6 –The Netherlands from the 17th to the 19th centuries

The Netherlands did not experience an Industrial Revolution like the rest of Northern Europe, and only began to industrialize its existing proto-industries after 1860 (De Vries, 2000; Drukker and Tassenaar, 1997; Haines, 2004; Mokyr. 1974, 2000; van Poppel et al., 2009). There are several factors that influenced the Netherlands' late industrialization, these being their already highly developed economy, and a series of wars and food shortages that prevented them from undergoing the industrial transformation experienced by Britain (De Vries, 2000; Drukker and Tassenaar, 1997; Haines, 2004; Mokyr, 1974, 2000; Wilson, 1939).

In the 17th and early 18th centuries, the Netherlands was the richest country in the world (Drukker and Tassenaar, 1997). During this time, also known as the Golden Years, the Netherlands focused primarily on international trade and the finishing industry, or traffic industry, which consisted of the finishing and redistribution of imported goods, such as beer, tobacco, and cotton (Drukker and Tassenaar, 1997; Mokyr, 1974, 2000; Wilson, 1939). The Netherlands also had a highly developed economy, referred to by some as the "first modern economy", which led to many people having high wages (Mokyr, 1974; Ryckbosch, 2016; van Gurp, 2008).

The wealthy bourgeois class that directly profited from international trade were reluctant to fund the mechanization of the Netherlands' industries, as they already deemed the Dutch economy to be advanced enough without industrialization (Drukker and Tassenaar 1997; Mokyr, 1974). This group of individuals actively blocked the industrialization of manufacturing processes in the Netherlands (Drukker and Tassenaar, 1997; Mokyr, 1974). Repeated wars with England and Spain and subsequent subjugation under France at the end of the 18th century, however, depleted the Dutch economy (Mokyr, 2000; van Gurp, 2008).

Despite the fact that the Netherlands was known as one of the richest countries of the world, this wealth was primarily controlled by a small percentage of individuals, while the rest of the country consisted of farmers and manufacturers (Drukker and

Tassenaar, 1997; van Oosten, 2016). Following the decline in the Dutch economy, agriculture continued to play an important role in the Netherlands during the 18th and 19th centuries, and was one of the few industries that continued to develop throughout this period (Mokyr 1974; De Vries 2000; Haines 2004; Ryckbosch 2016; van Oosten, 2016). The Netherlands also had a successful textile trade, primarily focused on cotton, linen, and wool, which were manufactured in the proto-industrial areas of Noord-Brabant and Twente (Drukker and Tassenaar, 1997; Mokyr, 2000; van Gurp, 2008; van Oosten, 2016; Wilson, 1939).

Quality of life varied by economic region, as each region had different economic outputs and access to resources. Quality of life began to decrease rapidly between 1818 and 1829 due to a decrease in food prices, resulting in a decrease in income in the agricultural regions, where income was reliant on the price of food (Drukker and Tassenaar, 1997). Sanitation was not adequate in Dutch cities and the lack of adequate disposal methods for human and industrial waste led to polluting of the canals, which were often used as water sources (van Oosten, 2016; Veselka et al., 2015). The lack of sanitation would have increased the risk of gastro-intestinal sicknesses such as cholera.

The decrease in the quality of life in the Netherlands during the mid-19th century is highlighted by the fluctuation in median height. Drukker and Tassenaar (1997) show an increase in median height throughout the Netherlands between 1817 and 1830, followed by a decrease in height between 1830 and 1857, and another rise in height between 1857 and 1887. There was also a peak in mortality between 1843 and 1853, coinciding with the Dutch potato famine, or the "Hungry Forties" (Drukker and Tassenaar, 1997). The mid-19th century was a period of widespread decrease in quality of life and an increase in diseases such as smallpox, typhoid fever, and cholera (Drukker and Tassenaar, 1997). Middenbeemster suffered outbreaks of rinderpest (paramyxovirus) in 1714-1720, 1744-1754, 1769-1784, 1851-1852 and 1865-1867 that resulted in the deaths of large proportions of the community's cattle population (Veselka et al., 2015; Veselka, 2019; Waters-Rist and Hoogland, 2018).

While the Netherlands was the wealthiest country in Europe from the 17th to 18th centuries, the majority of the population would not have had access to this wealth. The Dutch economy was weakened by wars with England, Spain and France in the 18th century (Mokyr, 2000; van Gurp, 2008), and the decrease in and income caused a decrease in the quality of life in the mid-19th century (Drukker and Tassenar, 1997). The potato famine (1845-1848) resulted in starvation and disease that severely impacted the quality of life (Drukker and Tassenar, 1997). The mid-19th century was therefore a time of turmoil in the Netherlands.

Chapter 3.0 – Materials and Methods

3.1 – Materials

3.1.1 – Middenbeemster and Hattem

The material used in this study come from two Dutch skeletal collections from the communities of Middenbeemster (MB11) and Hattem (HT15 or KER15), shown in *Figure 3.1*. Both sites were selected to research adolescent rickets, as findings by Veselka et al. (2015) and Veselka et al. (2019) identified high rates of rickets in individuals from these populations. In a comparison between Roosendaal, Gouda, Hattem, and Middenbeemster, Middenbeemster and Hattem were found to have the highest rates of residual rickets (Middenbeemster: 14.5% (29/200); Hattem: 23.9% (21/88)) and active rickets (Middenbeemster: 15.3% (9/59); Hattem: 23.8% (5/21)) (Veselka and Klomp, 2019). Both collections are housed at Leiden University.

Figure 3.1- Map of the Netherlands indicating location of Middenbeemster and Hattem.

Middenbeemster is a rural community built on the Beemster Polder in Noord-Holland and is north of Amsterdam (Figure 3.1). The skeletal remains from this sample were excavated from the Keyserkerk church cemetery in Middenbeemster from June 13 to August 5, 2011 due to renovations to the church (Hakvoort, 2013: 9). The Keyserkerk cemetery at Middenbeemster was in use from 1615 to 1866, however, the majority of the individuals were buried during the 19th century (Hakvoort, 2013: 9; Lemmers et al., 2013: 35; Veselka et al., 2015). The primary economic activity at Middenbeemster was cattle farming and cheese making (Veselka et al., 2015; Veselka, 2019; Waters-Rist and Hoogland, 2018), and the majority of the village's residents would have been engaged in labour relating to these industries.

The city of Hattem is located in the northern portion of the province of Gelderland, close to the border with the province of Overijssel (Figure 3.1). The city of Hattem was mainly agricultural, and underwent multiple military occupations by the Spanish and the French from the 16th through to 18th centuries (Veselka, 2019: 21). The skeletal remains from Hattem were excavated from the Andreaskerk Church cemetery in 2015 due to remodelling of the Andreaskerk Church square (Veselka, 2018). The Andreaskerk cemetery at Hattem was in use from 1190 to 1829, however, the majority of the burials included in this sample date from the 17th to 19th centuries (Veselka and Klomp, 2019). Hattem's primary industries include agriculture and the shipping and transport industry (Veselka, 2019; Veselka and Klomp, 2019). Individuals from Hattem would therefore have either worked in agriculture, or at the docks helping to transport goods up the Ijssel. Due to the fact that the Industrial Revolution in the Netherlands did not begin until 1860 (Section 2.6), it is unlikely that the individuals included in this study experienced the negative effects of the Industrial Revolution such as atmospheric pollution.

The Middenbeemster skeletal collection is composed of a total of 450 individuals (Veselka, 2019), and the Hattem skeletal collection is composed of 132 individuals (Veselka, 2018). Individuals were included in this research if they were older than nine years of age, and had been previously analyzed by the researchers at Laboratory for

Human Osteoarchaeology, Leiden University. Individuals who did not have any measurable or recordable ulnae, femora, clavicles, sacra, sterna, or ribs were excluded. The minimum age of nine was chosen as this is when the lower limit of when the pubertal growth spurt begins (Figures 3.2-3.4). There are 82 individuals from Middenbeemster are of known age and sex (Hakvoort, 2013). The Laboratory provided the known ages of all the individuals older than nine, as well as the sex of all the known subadults older than nine years of age. Individuals from Middenbeemster who are of known age and sex due to historical archives but who were not analyzed by the lab were included, as information on their sex and age was available. In selecting the final sample for analysis, individual MB11S428 was removed due to the previous diagnosis of conditions that may interfere with the identification of adolescent rickets (achondroplasia or hypochondroplasia).

Both adolescents (9 to 25 years) and adult (26 to 50+ years) individuals were analyzed, in order to understand the effects of active and residual adolescent rickets. For the purposes of this research, age at death was divided using the existing age categories published by Lemmers et al. (2013: 37-38), however, the age categories representing adolescents were changed better reflect biological and social adolescence (Table 3.1). *Early adolescent* (9-12 years) encompasses the earliest observed increase in growth velocity associated with puberty (Figures 3.2-3.4). *Middle adolescence* (13-17 years) encompasses the peak growth velocity for males and females, as well as the age at menarche (12-14 years) in late 19th to early 20th century Dutch youth (Blom et al. *in* review; Figures 3.2-3.4). The *Late adolescent* category (18-25 years) encompasses the completion of growth and the attainment of social maturity, whereby individuals become mature enough to take on adult roles such as marriage (Section 2.5). Extending the *Late adolescence* category also accounts for individuals who experienced a delay in growth. For the purposes of this thesis, the term “Adolescent” will refer to all individuals between the ages of nine and 25. Individuals whose age at death could not be specified further than “Adult” were listed as 18+, and are referred to as *Unspecified adult*. These individuals are not included in the *Late adolescent* age category.

Table 3.1 – Age categories used:

Age Category	Age in Years
Early adolescent	9-12
Middle adolescent	13-17
Late adolescent	18-25
Young adult	26-35
Middle adult	36-49
Old adult	50+
Unspecified adult	18+

3.1.2 – Sex and Age Estimation

The sex and age estimations previously made for the individuals included in these collections were used to allow for this data to be compared with previous work on these populations (Lemmers et al. 2013; Veselka 2018). Sex estimation for both the Middenbeemster and Hattem skeletal collections was performed by the Laboratory for Human Osteoarchaeology and follows the guideline put forward by the 1980 *Workshop of European Anthropologists* (Lemmers et al., 2013: 36; Veselka 2018). Sex was estimated by scoring morphological features on the cranium, mandible, pelvis, and sacrum using methods by Maat and Mastwijk (2007), Buikstra and Ubelaker (1994), Phenice (1960) and Bass (1987: 108) (Lemmers et al., 2013: 36; Veselka 2018). Metric evaluation was undertaken using measurements of the humerus, femur, mandible, clavicle, and scapula using methods by Stewart (1979), Steyn and İşcan (1999), McCormick et al. (1991), and Bainbridge and Genovés Tarazaga (1956) (Lemmers et al., 2013: 36; Veselka 2018). More weight was given to morphological scoring, and to the pelvis in particular, in the assessment of sex (Lemmers et al. 2013). Sex was estimated as being female (F), probable female (PF), indeterminate (I), probable male (PM), or male (M) (Lemmers et al., 2013: 36; Veselka 2018). Probable female was combined with the female category, while probable male was combined with the male category to strengthen statistical analysis and to keep this research consistent with previous research conducted by Veselka et al. (2018) using the Middenbeemster collection.

Age estimation was also conducted at Laboratory for Human Osteoarchaeology for both Middenbeemster and Hattem. Age estimation for subadults was conducted primarily through dental development using methods by Demirjian et al. (1973), Liversidge et al. (1999) and Moorrees et al. (1963) (Lemmers et al., 2013: 37; Veselka 2018), as well as through the analysis of bone growth and epiphyseal fusion following methods by Black and Scheuer (1996), and Schaefer et al. (2009) (Lemmers et al., 2013: 37). Age estimation in adults was calculated using a combination of scoring of degradation on the pubic symphysis and auricular surface using methods by Brooks and Suchey (1990) and Buckberry and Chaimberlain (2002). Cranial fusion (Meindle and Lovejoy 1985), sternal rib end growth (İşcan et al. 1984; 1985), dental wear (Maat 2001), and the degree of fusion of late fusing bones such as the iliac crest, the ischium, and the medial clavicle were also used to estimate age in adults (Lemmers et al., 2013: 37; Veselka, 2018).

The sample from Middenbeemster included in the current research is composed of a total of 112 males, 111 females, and 23 individuals of unknown sex, with a total sample size of 246 individuals (Table 3.1). Of these 246 individuals, 59 (24.0%) are between the ages of nine and 25 (Table 3.1). The sample from Hattem included in this thesis is composed of a total of 117 individuals, and consist of 53 males, 46 females, and 18 individuals of unknown sex, with 29/117 (24.8%) individuals between the ages of nine and 25 (Figure 3.2).

Table 3.1 – Age and sex distribution of sample.

Age Category In Years	Middenbeemster			Hattem			Total
	Male	Female	Unknown	Male	Female	Unknown	
9-12	0 (0%)	6 (1.6%)	7 (1.9%)	0 (0%)	0 (0%)	6 (1.6%)	19 (5.2%)
13-17	2 (0.6%)	1 (0.3%)	9 (2.5%)	0 (0%)	0 (0%)	7 (1.9%)	19 (5.2%)
18-25	10 (2.8%)	11 (3.0%)	5 (1.4%)	6 (1.6%)	6 (1.6%)	0 (0%)	38 (10.5%)
26-35	18 (5.0%)	26 (7.2%)	0 (0%)	9 (2.5%)	8 (2.2%)	2 (0.6%)	63 (17.4%)
36-49	28 (7.7%)	31 (8.5%)	1 (0.3%)	32 (9.1%)	23 (6.3%)	0 (0%)	115 (31.7%)
50+	45 (12.4%)	30 (8.3%)	0 (0%)	4 (1.1%)	8 (2.2%)	1 (0.3%)	88 (25.2%)
18+	9 (2.5%)	6 (1.6%)	1 (0.3%)	2 (0.6%)	1 (0.3%)	2 (0.6%)	21 (5.8%)
Total	**112 (30.9%)**	**111 (30.6%)**	**23 (6.3%)**	**53 (14.6%)**	**46 (12.7%)**	**18 (5.0%)**	**363 (100%)**

Note – The percentage is calculated out of the total sample count (363 individuals)

3.2 – Methods

3.2.1 – Growth Rates

Rachitic changes occur in regions where bone is actively growing and are thus most visible and severe where the bone is most rapidly growing during deficiency (Ford et al., 1972; Moncrieff et al., 1973). As the aim of this thesis is to understand how rickets affects the human skeleton during adolescence, the first step was to determine which regions of the skeleton are the most rapidly growing and fusing during the pubertal growth spurt. Rickets can continue to affect bones until fusion occurs. The comparison of growth rates throughout the skeleton was used to select which bones to investigate for the presence of adolescent rickets. The fusion timing for the sacrum and sternum were also calculated to determine which vertebrae and sternebrae are actively fusing during adolescence. The regions selected for analysis for adolescent rickets are the distal femur, the distal ulna, the medial clavicle, the sacrum, the sternum, and the sternal rib ends. Due to time constraints, only one arm bone and one leg bone were selected. Rachitic changes to the distal ulna are more frequently observed in clinical cases than rachitic changes to the distal radius or proximal humerus (Section 2.3), and the distal femur grows more rapidly than the proximal tibia and fibula from the ages nine to 14. The clavicle was included as it undergoes an increase in growth velocity during adolescence. Complete data sets for the absolute growth of all the long bones are listed in Appendix A.

As there is currently no published research containing longitudinal data on the growth rates of each bone in the human skeleton, the absolute annual growth rates of each long bone were calculated using data from a combination of longitudinal and cross-sectional growth studies. Longitudinal data sets and data sets comprised of large sample sizes originating from modern and well-documented populations were prioritized. Absolute growth rates were extrapolated using data from growth studies by subtracting the bone length from one year by the total bone length of the preceding year. Information on the data used to calculate the absolute growth is listed in *Table 3.3*. The growth contributions of the proximal and distal ends of the long bones not including the clavicle were calculated using Pritchett (1991; 1992; 1997). The growth contributions of the medial and lateral ends of the clavicle were calculated using Ogden (1979). The fusion timing was calculated by Flecker (1932) using cross-sectional data collected using radiographs of living hospital patients of European descent. The fusion timing of the long bones represent an average fusion time, as there can be variability in when fusion of the epiphyses occurs (Flecker, 1932).

Table 3.3 - Population composition and study design of the data used to calculate growth rates and fusion timing.

Bone	M	F	Age	Source	Study and Date	Type	Method	Nature of Sample
Femur	67	67	1-18	Anderson et al. (1964)	Harvard Growth Study 1918-2015*	Longitudinal	Roentgenogram Diaphysis + epiphyses	living subjects
Tibia	67	67	1-18	Anderson et al. (1964)	Harvard Growth Study 1918-2015*	Longitudinal	Roentgenogram Diaphysis + epiphyses	living subjects
Fibula	123	121	1 - 20	Maresh (1970)	The Child Research Council, Denver, Colorado 1935-1967	Longitudinal/ cross-sectional	Roentgenogram Birth to 10 - diaphyseal length 10-18 – diaphysis + epiphyses	Upper Middle Class – living subjects**
Humerus	123	121	1 - 20	Maresh (1970)	The Child Research Council, Denver, Colorado 1935-1967	Longitudinal/ cross-sectional	Roentgenogram Birth to 10 - diaphyseal length 10-18 – diaphysis + epiphyses	Upper Middle Class - living subjects**
Radius	138-64	123-45	1 mo 18 yrs	Gindhart (1973)	Fels Longitudinal Growth Study 1929-1967	Longitudinal	Radiographs Diaphyseal length	Middle Class Caucasian - living subjects
Ulna	123	121	1-18	Maresh (1970)	The Child Research Council, Denver, Colorado 1935-1967	Longitudinal/ cross-sectional	Roentgenogram Birth to 10 - diaphyseal length 10-18 – diaphysis + epiphyses	Upper Middle Class - living subjects**
Clavicle		961	Birth - 18	McGraw et al. 2009	Radiographs from Ohio University College of Osteopathic Medicine n.d.	Cross-sectional	Chest radiographs Measured from most lateral to most medial ossified border	N/A - living subjects
Ribs		32	1-18	Schwend et al. 2015	Hamann – Todd Osteological Collection 1910-1934***	Cross-sectional	Dry bone – High quality digital photographs with a grid	Low SES, African American and Caucasian - deceased subjects***
Sternum	894	250	Birth-85	Jit and Kaur 1989	North-West Indian cadavres 1971-1986	Cross-sectional	Dry bone and radiograph- cadavre	North-West Indians (Punjab, Haryana, Chandigarh)
Sacral bodies	53	52	Birth - 30	Broome et al. 1998	Research conducted in Milwaukee, WI n.d.	Cross-sectional	Helical CT and Radiographs	N/A - living subjects

Legend – M = male sample size; F = female sample size; mo. = months; yrs. = years
**Demographic data retrieved from LaFountain (2017); **Demographic data retrieved from Buschang (1982); ***Demographic data retrieved from Mensforth and Latimer (1989); SES: Socioeconomic status; N/A: Not Available.*

3.2.1.1 – Growth rates of the femur

Of the lower limb bones, the femur grows the most rapidly during adolescence. During the peak growth period occurring during the first year of life, the femur grows over 20mm in one year, as shown in *Figure 3.2*. The distal femur is responsible for approximately 70% of the growth of the bone and is also the fastest growing region in the human body. Fusion begins in females at 14.5 years and in males at 17 years (Scheuer and Black, 2000). The peak growth rate associated with the pubertal growth spurt occurs at ages 10 in females and 12 in males (Anderson et al., 1964).

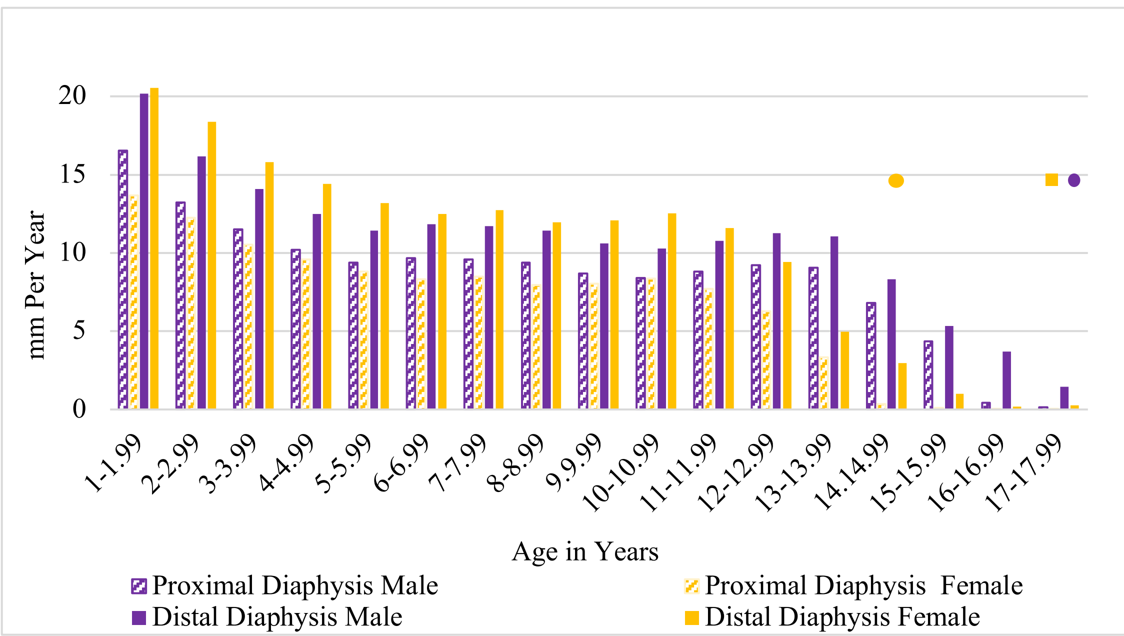

Figure 3.2 –Absolute growth contribution in millimetres of the proximal and distal ends of the femur based on data from Anderson et al. (1964), Pritchett (1992) and Flecker (1932). The circle marks fusion timing for the proximal end and the square marks the fusion timing for the distal end. Fusion of the distal femur in males occurs at age 19.

3.2.1.2 – Growth rates of the ulna

The distal ulna grows at a similar rate as the distal femur during adolescence, however, it does experience a more marked pubertal growth spurt than the distal femur (Figure 3.3). Fusion of the distal ulna occurs at 14 years in females and 17 years in males, and the peak growth velocity occurs at 11 in females and 13 in males. On average, the distal ulna contributes 75-85% of the total growth of the bone (Pritchett, 1991; Scheuer and Black, 2000).

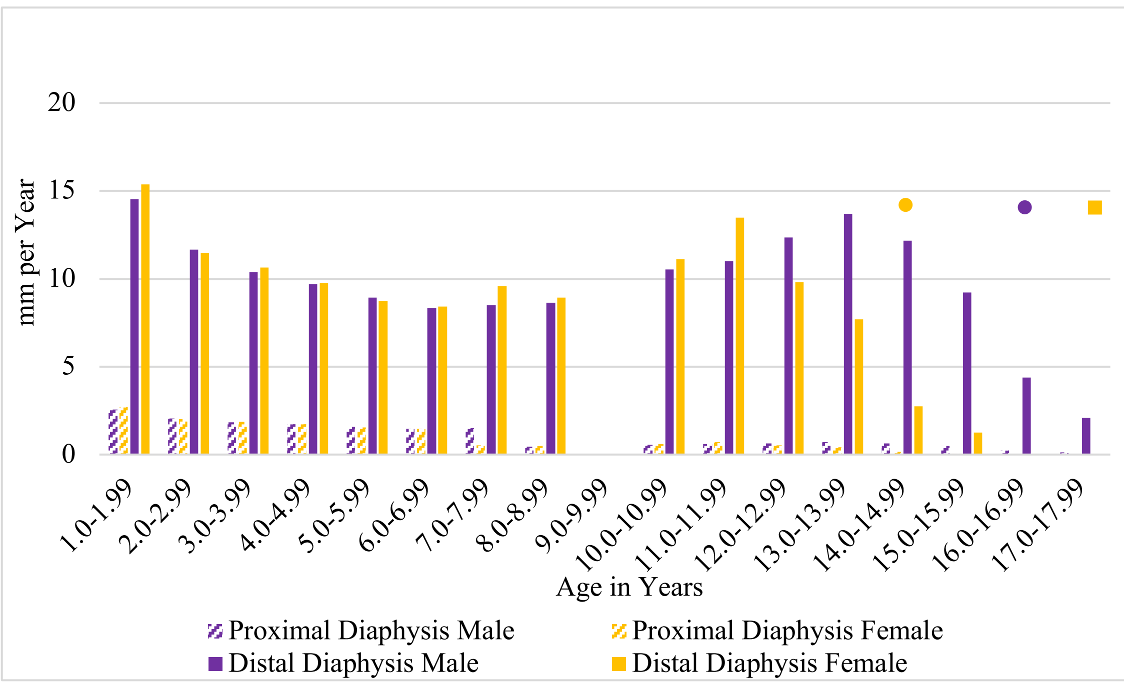

Figure 3.3 - Absolute growth contribution in millimetres of the proximal and distal ends of the ulna based on data from Maresh (1970), Pritchett (1991), and Flecker (1932). The circle marks fusion timing for the proximal end and the square marks the fusion timing for the distal end. Fusion at the distal ulna in males occurs at age 19.
Note: The graphs for ulna are based on Maresh's (1970) data that has not been smoothed to accommodate for the addition of the epiphyses in the measurement at 9-9.99 years. This column has thus been removed, as it does not represent actual growth.

3.2.1.3 – Growth rates of the clavicle

The medial clavicle is the latest fusing bone in the human body (Scheuer and Black, 2000: 251), and grows at a slower rate than the distal femur and ulna (Figure 3.4). *Figure 3.4* also shows that like the distal femur and ulna, the medial clavicle undergoes an adolescent growth spurt. The extended growth period and the growth spurt make this bone a good marker for adolescent rickets and rickets occurring in young adults, as it remains unfused for much longer than other long bones.

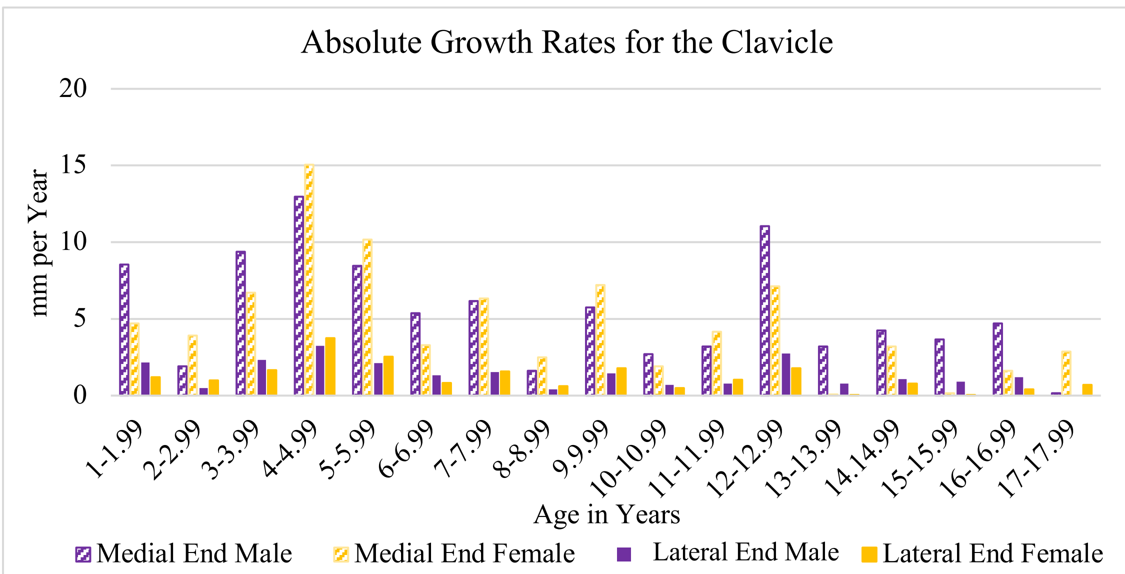

Figure 3.4 – Absolute annual growth rates of the clavicle based on data from McGraw et al. (2009).

3.2.1.4 – Fusion timing of the sternum and sacrum

The fusion of the sternebrae in the sternal body begins at age eight with the third and fourth sternabrae (Figure 3.5). The sternum does not finish fusing until age 24, with the first and second sternebrae being the last elements to fuse (Figure 3.5). The sacrum begins fusion between the fourth and fifth sacral vertebrae between ages five and 15

(Figure 3.5). All of the sacral vertebrae fuse during adolescence, with the first and second sacral vertebra fusing between the ages of 17 and 24 (Figure 3.5).

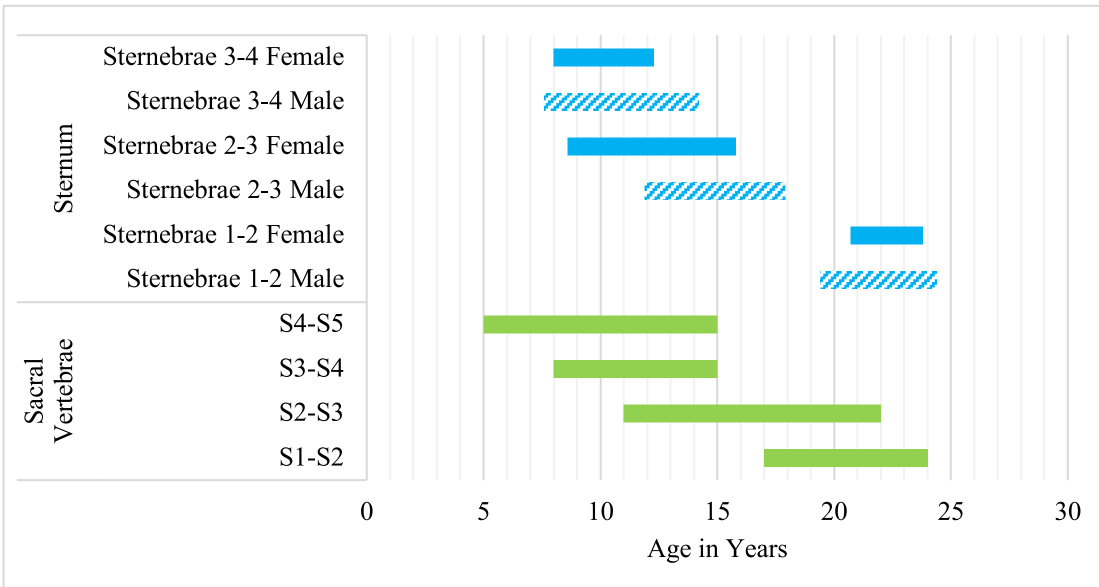

Figure 3.5 – Fusion timing for the sternal bodies based on data from Jit and Kaur (1989) and fusion timing of the sacral vertebrae using data from Broome et al. (1998).

3.2.1.5 – Growth rates of the ribs

Ribs 4-8 experience the most growth at just over 10mm per year, as seen in *Figure 3.6* (Schwend et al., 2012). Data on the annual growth of each rib was not available, however, the total average annual absolute growth of the first rib, ribs two to three, ribs four through eight, ribs nine to 10, and ribs 11 to 12 was able to be calculated. Lung and thoracic volume has been observed to increase rapidly during adolescence (Canavese and Dimeglio, 2013).

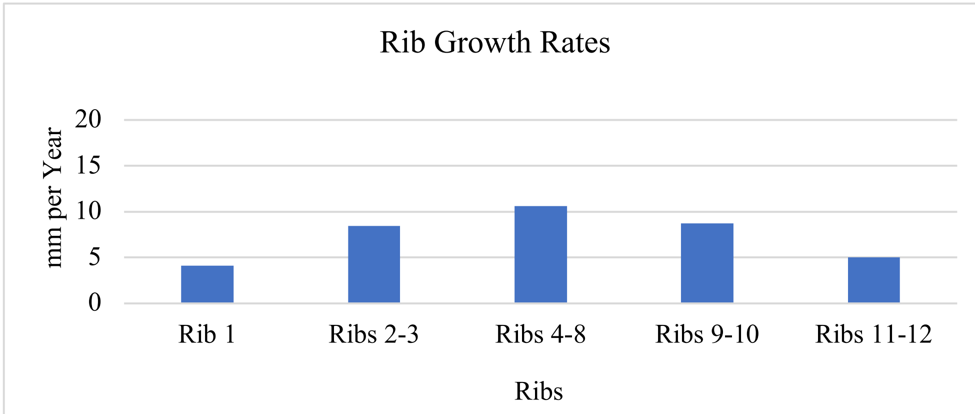

Figure 3.6 – Absolute growth rates of the ribs from ages 1 to 18 years based on data from Schwend et al. (2015).

The growth rates reviewed represent modern individuals of from upper-middle class families (Table 3.3), however the growth of modern and healthy individuals may not reflect the growth of individuals from historical populations, particularly individuals who have become deficient in vitamin D. While peak growth velocity in puberty in the modern populations used to calculate growth rates occurs in females between the ages nine and 14 and males between the ages 11 and 16 (Figures 3.2 – 3.4), late 19th to early 20th medical and archival sources note puberty taking place from 12 to 14 years in females and 14 to 19 years in males (Blom et al. *in review*). Furthermore, delay in growth, epiphyseal fusion, and a delay puberty has been observed to occur in individuals with rickets (Blom et al. *in review*; Snapper 1943). Females with vitamin D deficiency have also been observed to begin puberty earlier than their peers (Blom et al. *in review*). The differences in pubertal timing between historical populations and modern populations, as well as the delay in growth resulting from vitamin D deficiency, may result in the growth of individuals from Middenbeemster and Hattem not matching the calculated growth rates. The delay in epiphyseal fusion and long bone growth in individuals deficient in vitamin D may have also resulted in some individuals appearing younger than their true chronological age at death.

3.2.2 – Non-Metric Skeletal Indicators of Adolescent Rickets

Non-metric shape changes were recorded throughout the skeleton in order to identify whether they are related to adolescent rickets. Angulation and widening were recorded at the distal metaphases of the femur and ulna, and flaring was recorded at the medial clavicle. Angulation was recorded at the sternum and the sacrum, and costochondral flaring was recorded at the ribs. Shape changes at the distal metaphases associated with adolescent rickets would be most likely to form at the distal femur between ages nine and 14 years, at the distal ulna metaphases between the ages of 10 and 15 years, and at the medial clavicle between the ages of nine and 18 (Figures 3.2 to 3.3). The resulting shape changes could be preserved into adulthood, however, less severe changes may remodel over time. When these non-metric features were observed in individuals who were not experiencing active rickets at the time of death, the shape changes can be considered residual to adolescent rickets. All of the non-metric shape changes were recorded as present, absent, or not scored. Individuals who could not be scored either had missing skeletal elements or had damage that prevented the analysis of the non-metric shape change. Both the right and left sides were evaluated to account for potential asymmetry in the development of rachitic shape changes.

Shape changes at the distal femur and ulna and medial clavicle were recorded as these are the regions most rapidly growing or experiencing a growth spurt during adolescence, and therefore are the most susceptible to developing rachitic shape changes. Shape changes at the distal ulna associated with adolescent rickets have also been observed clinically (Section 2.3). Distal metaphyseal angulation was recorded at the distal femur and ulna metaphases when the distal ends appeared more angled than other individuals included in the sample and were only recorded in individuals who had fused epiphyses, as angulation at the distal metaphases is more difficult to visualize in unfused individuals. Distal metaphyseal widening was recorded at the distal femur and ulna, and medial metaphyseal flaring was recorded at the medial clavicle. Widening of the distal femur and ulna can be characterized as the presence of visibly larger distal metaphases than normal. Flaring of the medial clavicle can also be characterized as a visibly larger medial metaphasis, however, the shape change is more pronounced due to the smaller size of the medial clavicle epiphysis.

Angulation of the sacrum and sternum were recorded as both of these elements fuse during adolescence (Figure 3.5), thus making them susceptible to the development of shape changes resulting from adolescent rickets. Shape changes at the sacrum and sternum would be most likely to form during active fusion, as adequate levels of vitamin D are required for the bone to mineralize. When adequate levels of vitamin D are attained, the sacrum and sternum would fuse and preserve the resulting angulation. Angulation of the sacrum has also been observed in clinical cases of adolescent rickets (Section 2.3). Angulation was marked as present if the sacrum or sternum appeared to be more angled, either posteriorly or anteriorly, than what was normal for the population. The location of the angulation was recorded for the sacrum and the sternum when possible.

Costochondral flaring was evaluated at the sternal rib ends of each individual. Costochondral flaring has been observed in cases of rickets in infants and children (Mays et al., 2006; Ortner and Mays, 1998), and was recorded to determine if it also occurs due to adolescent rickets. The ribs were recorded in groups, with flaring being recorded separately for the first rib, ribs two to three, ribs four to eight, ribs nine to 10, ribs 11-12, and unassociated sternal rib ends. The ribs were separated into these groups to account for the variation in growth rates of each rib (Figure 3.6).

3.2.3 – Clavicle Radiographs

Rachitic changes to the medial clavicle have not been previously investigated, so it was unknown how possible cases of adolescent rickets might affect the medial clavicle radiographically. The medial clavicles for 10 individuals were radiographed at McMaster using a Vidisco XR200 x-ray machine. Permission for the radiographic analysis of the clavicles was only permitted for the Middenbeemster collection. Five individuals with possible rachitic lesions in the bones evaluated were selected for analysis, with five individuals with no IGD selected as controls (Table 3.4). No individuals over the age of 35 were included to limit the presence of age-related changes. The clavicles were radiographed first from the cranial-caudal aspect, and then from the medial-lateral aspect.

Table 3.4 – Selection criteria for clavicle radiographs:

Individual	Age	Side	Fused or Open	IGD	Reasoning
MB11S060	18-25	L	Open	-	Some porosity (medial clavicle met. GP), slight bend in sacrum
MB11S307	13-17	L	Open	-	Unusual shape of the clavicle
MB11S441	23	R	Fused	-	Slight bend in sacrum
MB11S345	28	R	Fused	-	Costochondral Flaring, bent sacrum
MB11S540	20	R	Semi-fused	-	Slight bend in sacrum, costochondral flaring
MB11S226	26-35	L	Fused	N	Control
MB11S238	18-25	L	Open	N	Control
MB11S452	18-25	L	Open	N	Control
MB11S460	16.5 ± 36 mo.	L	Semi-Fused	N	Control
MB11S275	15 ± 1 yr.	R	Open	N	Control

Legend: IGD = Interglobular dentine; mo. = months; yr. = years; L = left; R = right; N = none; *"-" = not sampled; met. GP = metaphyseal growth plate.*

3.2.4 – Metric Measurements of Adolescent Rickets Shape Changes

As the measurements taken for this research are probatory and aim to identify and quantify potential cases of adolescent rickets, a cautious and conservative approach to measurements was adopted. Measurements were taken only on well preserved bones with minimal damage. Bones that were broken and then glued or taped back together were not included, as the damage may affect the overall results of the measurement. When possible, measurements were taken on both the right and left sides to account for possible asymmetry. All measurements are recorded in millimeters. When using a measuring tape or osteometric board, measurements were recorded to one decimal point, and when using digital sliding calipers, measurements were recorded to two decimal points.

3.2.4.1 – Anatomical Distal Femoral Angle and the Posterior Distal Femoral Angle

As the distal femur is the most rapidly growing region of the femur during adolescence, shape changes resulting from adolescent rickets may cause angulation in this region. The Anatomical Lateral Distal Femoral Angle (A-LDFA) was evaluated to quantify medial or lateral angulation at the distal femur, and the Posterior Distal Femoral Angle (PDFA) was measured to quantify anterior or posterior angulation at the distal femur. Both the A-LDFA and PDFA are methods developed using in-vivo radiographs by Paley et al. (1994). The methodology was adapted for use in dry bone through the use of 2D images and ImageJ (version 1.52k).

Both medial and lateral bending and anterior or posterior bending of the femora were evaluated using photographs taken using Canon DSLR Rebel T6 and a tripod. A level was used to ensure the camera was positioned directly above the femur. Medial or lateral angulation of the femur was calculated using photographs of the femur lying flat, with both condyles and trochanters touching the surface (Figure 3.7). Posterior and anterior angulation was evaluated using images of the femur placed on its side with the head facing upwards towards the camera, and both condyles being vertically (Figure 3.8). The femur is held in this position using two pieces of wood or foam.

The A-LDFA is calculated by measuring the angle between the midpoint of the distal femur and the condylar plane. The condylar plane is determined by drawing a line touching the most distal points of both femoral condyles (Figure 3.7 – A). The midpoint of the distal femur is determined by first drawing two lines extending from the lateral to the medial side of the bone (Figure 3.7 – B) and marking the midpoint between these two lines. The line that crosses both midpoints and extends down the femur is the distal anatomical axis (Figure 3.7 – C). The angle where the distal anatomical axis bisects the condylar plane is the A-LDFA and is measured at the lateral portion of the femur using the angle tool on ImageJ (Figure 3.7). This measurement was not possible for individuals with broken or missing condyles, as this changed the visible angle of the condyles and would thus result in an incorrect measurement.

Figure 3.7 - Example of the measurement of the A-LDFA using ImageJ on individual MB11S441. The A-LDFA is marked as a red semi-circle. A – the condylar plane; B – Midpoints of the distal femur diaphysis; C – Distal anatomical axis.

The PDFA was taken on ImageJ by first drawing a line from the most anterior portion of the top of the medial condyle to the portion of bone directly superior to the posterior portion of the medial condyle (Figure 3.8 – A). The distal femoral axis is found in the same way as in the A-LDFA measurements, by finding the midpoint of two parallel lines that extend from the anterior to the posterior portion of the distal femur shaft (Figure 3.8 - B). The line that crosses the midpoint of both parallel lines and extends past the distal end of the femur is the distal femoral axis (Figure 3.8 – C). The PDFA is the angle created where this midline bisects the line that crosses the condyles and is measured at the posterior aspect of the bone using the ImageJ angle tool (Figure 3.8).

Figure 3.8- Example of the measurement of the PDFA using ImageJ on individual MB11S441. The PDFA is marked by a red semi-circle. A – Condylar plane; B – Midpoints of the distal femur diaphysis; C – Distal Femoral Axis.

3.2.4.2 – Ulna Measurements

Clinicians have observed a number of shape changes at the distal ends of the long bones such as cupping, widening, and fraying (Section 2.3). The minimum ulna distal circumference, the ulna circumference 20mm from the distal end, and the ulna ratio were taken to quantify possible widening at the distal ulna resulting from adolescent rickets. The ulna ratio was calculated by dividing the ulna maximum length by the ulna minimum circumference. The ulna maximum length was taken to use in the calculation of the ulna ratio and was measured from the most proximal portion of the olecranon to the most distal end of the styloid process using measurement number 48 by Buikstra and Ubelaker (1994: 81) and an osteometric board (Figure 3.9a). Ulnae that were missing styloid processes or with damage to the olecranon were not included in this measurement.

Minimum distal circumference was taken using measurement number 52 by Buikstra and Ubelaker (1994: 81) and was recorded using a measuring tape wrapped around the distal end (Figure 3.9b). The tape was moved up the shaft from the distal end until the smallest circumference was located. The position of this measurement varied by individual due to factors such as overall size of the bone, as well as robusticity. To account for the inconsistency of the location of the minimum distal circumference, the distal circumference of the ulna was also measured 20mm from the end of the ulna using a measuring tape (Figure 3.9c). The distal circumference 20mm from the end of the ulna was not possible in individuals with damage to the distal ulna.

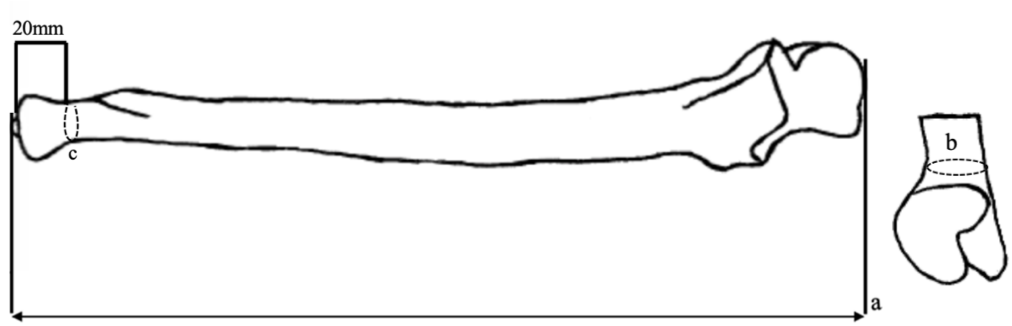

Figure 3.9- Ulna dimensions: a) is the maximum ulna length b) is the minimum distal circumference, and c) is the circumference 20mm from the end.

3.2.4.3 - Clavicle Measurements

The medial clavicle has not been evaluated in past investigations of rickets. As the clavicle is a long bone, adolescent rickets may cause similar changes to the medial clavicle as it does to the distal femur and ulna, such as widening and cupping of the medial clavicle (Section 2.3). The potential rachitic increase in size of the medial clavicle is quantified by calculating the medial clavicle diameter and the medial clavicle ratio. The maximum clavicular length was taken using measurement number 35 in Buikstra and Ubelaker (1994: 79) using an osteometric board (Figure 3.10a) and was taken to use to calculate the clavicle ratio. This measurement was obtained on clavicles with fused ends. Individuals with unfused clavicles were not measured, as the maximum length would not include the epiphyses.

The maximum medial diameter of the clavicle was taken using sliding calipers following methods by Andermahr et al. (2007). The shape of the medial clavicle varies greatly by individual, so this measurement was taken as the widest portion of the sternal clavicle (Figure 3.10b). Individuals with damage to the medial clavicle that prevented the measurement of the maximum medial clavicle diameter were excluded from this measurement. The clavicle ratio was calculated by dividing the clavicle length by the medial clavicle diameter to account for robusticity and bone size for larger individuals.

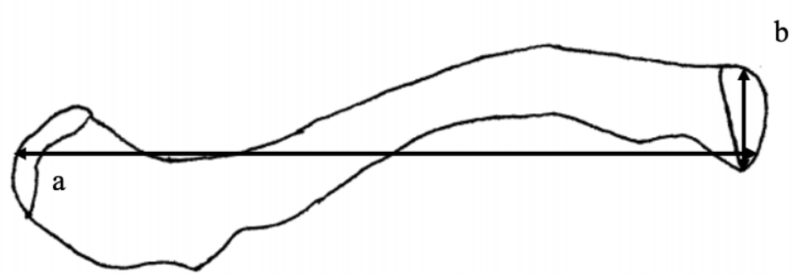

Figure 3.10- Clavicle dimensions recorded. a) represents the clavicle length using measurements by Buikstra and Ubelaker (1994), and b) represents the maximum sternal diameter using measurements from Andermahr et al. (2007).

3.2.4.4 – Sacral Angle

Anterior bending of the sacrum has been observed in cases of rickets by clinicians and paleopathologists (Section 2.3). The fusion timing of the sacrum (Figure 3.5) makes it susceptible to the development of shape changes resulting from adolescent rickets. Anterior bending of the sacrum was evaluated metrically by calculating the pelvic incidence using methods from Abola et al. (2018) (Figure 3.11). The pelvic incidence was calculated by subtracting the straight length of the sacrum from the curved length of the sacrum (Abola et al., 2018). The straight length of the sacrum was measured from the sacral promontory to the bottom of the fourth sacral vertebrae using sliding calipers (Figure 3.11a). The curved length of the sacrum was measured using a measuring tape placed against the ventral surface of the sacrum from the sacral promontory to the bottom of the fourth sacral vertebrae (Figure 3.11b).

Sacral bending was not taken on sacra with damage that would impede the reliable recording of the measurements. In individuals with sacralization, or when the fifth lumbar vertebrae becomes fused to the first sacral vertebrae, the straight and curved length is taken from the top of the first sacral vertebrae. In individuals with extra sacral vertebrae, this measurement was still taken from the first to the fourth sacral vertebrae. This measurement was not taken for individuals where S1-S4 were unfused, as it is impossible to reconstruct the position of the cartilage between the vertebrae. As the measurement was only taken from the first to the fourth sacral vertebrae, measurements were still taken on sacra with an unfused fifth vertebra.

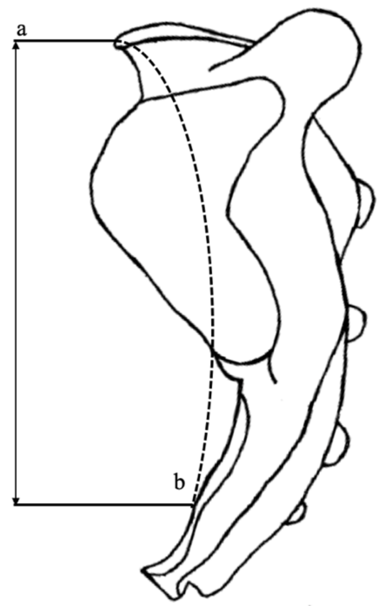

Figure 3.11- Measurements used to calculate the pelvic incidence derived from Abola et al. (2018). a) represents the straight length while b) represents the curved length.

3.2.4.5 – Sternal Angle

Anterior bending of the sternum has been observed in cases of rickets by clinicians and paleopathologists (Section 2.3). The degree of angulation of the sternum was quantified in order to better understand how it relates to adolescent rickets and was measured using methods adapted from Abola et al. (2018)'s method for determining pelvic incidence in the sacrum. The degree of anterior bending of the sternum is the difference between the curved length of the sternum and the straight length of the sternum (Figure 3.12). The straight length of the sternum is measured from the most superior region of the first sternebrae to the most inferior region of the fourth sternebrae using sliding calipers (Figure 3.12a). The curved length of the sternum is measured from the most superior portion to the most inferior portion of the sternum using a measuring tape laid flat against the sternum (Figure 3.12b). Both measurements are taken along the posterior portion of the sternum. Sternal angulation could only be measured on complete sterna. When the manubrium or the xiphoid process are fused, the measurements are taken where the sternum meets these elements. Sterna with damage to the posterior surface or to either end were not included, as damage of this nature interfered with the accurate recording of the straight and curved length. Due to the fragility of the sternum, many were poorly preserved and could not be recorded.

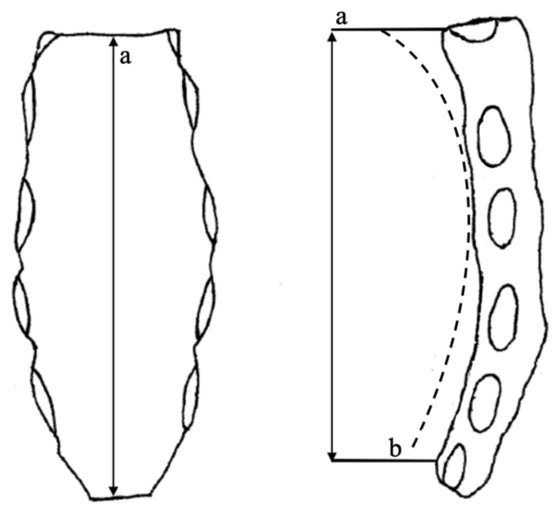

Figure 3.12- Measurements used to calculated sternal curvature. a) represents the straight length measurement, while b) dashed line, represents the curved length measurement.

3.2.4.6 – Sternal Rib End Ratio

Costochondral flaring has been recorded in cases of rickets in infants and children. While flaring of the costochondral joint was macroscopically recorded (Section 3.2.2), it was also quantified through the calculation of the sternal rib end ratio. The sternal rib end ratio was measured by subtracting the width of the sternal rib ends by the width of the ribs 15mm from the sternal rib end. Both of the rib measurements were taken using sliding calipers. The calculation of the sternal rib end ratio accounts for sternal rib ends that are larger than average due to overall body size rather than pathology.

3.2.5 – Porotic Lesions

Growth plate porosity was evaluated at the distal femur, ulna, and medial clavicle in individuals with open epiphyses using methods by Ortner and Mays (1998) and Mays et al. (2006). Porosity at the sternal rib ends was also recorded. Growth plate and sternal rib end porosity has been linked to cases of active rickets in infants and young children (Mays et al., 2006; Ortner and Mays, 1998), and was used in this research to identify cases of active adolescent rickets. A score of one was assigned if the surface appeared velvety, two if it showed fine grained roughness, three if it appeared rough with some pitting, and four if the growth plate was extremely rough and porous. In cases where the growth plate was present and no porosity was observed, this feature was scored as zero. Individuals with growth plate porosity were only included in statistical analysis if the porosity observed was bilateral and both the right and left sides were scored as grade two or higher. Bilateral cases were used as rickets affects endochondral mineralization on all actively growing bones (Section 2.1), and as such will affect both the right and left sides. Grade one growth plate porosity was not considered for statistical analysis, as this can be the result of a very early stage of rickets. Grade one porotic lesions at the growth plates may also represent normal growth defects, however, more research is needed. Individuals with growth plate porosity that do not meet the criteria to be included in statistical analysis are located in *Appendices B to D*. Due to the fact that the medial clavicle fuses from one side of the bone, individuals with partially fused medial clavicle epiphyses where at least 25% of the growth plate was still visible could be analysed.

3.2.6 – Micro-CT Analysis

Micro-CT analysis was conducted on the second and third molars to evaluate the presence of interglobular dentine (IGD), as IGD has been correlated with the occurrence of periods of vitamin D deficiency (Section 2.2). The second and third molars were selected as the dentine forms during adolescence (Brickley et al. 2020). Thus, a period of vitamin D deficiency occurring during adolescence would be most likely to be visible as IGD in the second and third molars. Potential rachitic lesions were tested against the presence or absence of IGD in the second and third molars. The results of the micro-CT analysis will be considered as a starting point for the consideration of the data obtained.

The selection criteria for Middenbeemster and Hattem teeth were different. For both collections, individuals with wear, damage, or carious lesions that would make viewing the resulting micro-CT scans difficult were not sampled. Due to the cost of micro-CT scans, not all of the individuals from Middenbeemster could be sampled. Individuals from Middenbeemster were selected to be sampled for micro-CT if they either showed signs of adolescent rickets such as growth plate porosity or other potential rachitic shape changes. Instructions provided by the Laboratory for Human Osteoarchaeology specified that only teeth that could easily be removed from the mandible or maxilla could be sampled from individuals from Middenbeemster. A total of 19 individuals from Middenbeemster met the criteria, and an additional 14 individuals with no signs of adolescent rickets were selected to act as controls. A total of 24 second molars and 20 third molars were sampled from Middenbeemster (Table 3.5). Work on the Hattem skeletal collection was conducted in collaboration with Dr. Veselka. In the interest of further research using the Hattem skeletal collection, second and third molars without wear or damage from all individuals were sampled. A total of 30 second molars and 25 third molars were sampled from Hattem (Table 3.5).

Table 3.5 - Number of teeth sampled from Middenbeemster and Hattem

Molar	Middenbeemster			Hattem		
	Male	Female	Unknown	Male	Female	Unknown
M2	6	10	8	11	12	7
M3	6	8	6	11	11	3
Total	12	18	14	22	23	10
Total	44			55		

Legend – M2 = second molar; M3 = third molar.

The micro-CT scans were conducted by the Academic Center for Dentistry Amsterdam (ACTA) using a Skyscan 1272 micro-CT scanner. Each image slice was 10 micrometers thick, resulting in the pixel size of the micro-CT images being 10 micrometers per pixel. The images were taken with a rotation step degree of 0.6, with an energy filter set at Cu 0.11mm. Each image was taken with a vertical position of 39.500mm with the camera in the standard central position above the sample. The maximum image height was 20mm, which did not extend the full length of the tooth for many individuals. When the micro-CT scans were conducted, it was believe that IGD was less likely to form at the end of the molar roots. Two dimensional images of each slice were also reconstructed by ACTA. The micro-CT scans for each tooth were analyzed for the presence of IGD using Microsoft Finder (version 10.14.4) and DataViewer software (version 1.5.6.2) by Bruker Support.

IGD was scored as present, absent, or unobservable, and was determined to be present when clear bands of demineralization were visible in the dentine of a given tooth. The lines of demineralization characteristic of IGD typically appear as rings or portions of rings that follow the outline of the dentine (D'Ortenzio et al., 2016; Veselka et al., 2019). Whenever IGD was found to be present, 3D models were made using DataViewer. Images were taken along the coronal and sagittal planes of the 3D model, as this allowed the age at which IGD was present to be estimated using the diagram provided by Brickley et al. (2020: Figure 3).

3.3 – Statistical Analysis

3.3.1 – Interclass Correlation Coefficient and Reliability

The Interclass Correlation Coefficient (ICC) assesses the agreement between measurements taken by the same observer and external observers (Marshall, 2016), and therefore determines the reliability of a measurement. Intra-observer error is the degree of error present when the measurement is repeated by the same observer, and inter-observer error is the degree of error present when the measurement is repeated by multiple observers. ICC tests also evaluate the absolute agreement and the consistency of a measurement. Absolute agreement is a measure of accuracy and how often a value matches exactly, while consistency measures how consistent each observer is in their measurements (Marshall, 2016).

The measurements taken in the current research that have not been accepted as standard measurements in anthropology (e.g. Buikstra and Ubelaker, 1994) were tested using ICC tests run in SPSS (version 1.0.0.1461). The measurements being tested were taken twice by the same observer using skeletal remains housed at McMaster University to determine if they were reliable enough to be used in further statistical analysis. The A-LDFA, sacral angle, and sternal angle were also tested by external observers using the skeletal remains from Middenbeemster and Hattem, as these were more complex. Measurements with a strength of agreement lower than "good" will not be accepted as reliable measurements and will not be used further in this thesis. Appendix E includes a table to interpret the ICC values, as well as the datasets used in the ICC test.

The ICC tests performed on the A-LDFA and PDFA showed that only the A-LDFA was reliable. The A-LDFA had a very good strength of agreement when tested both by the same observer twice, and by three external observers (Table 3.6). This measurement thus has very little intra- and inter-observer error. ICC tests performed on the Posterior Distal Femoral Angle (PDFA) showed that this measurement only had fair agreement (ICC=0.253) when measuring consistency (Table 3.6) and slight agreement (ICC= 0.164) when measuring accuracy (Table 3.6). The PDFA therefore has a high level of intra-observer error and was not tested by external observers or used in this project.

ICC tests for the sternal rib end diameter, sternal rib diameter 15mm from the end, the rib ratio, and the clavicle diameter all had very good strengths of agreement, while the ulna circumference 20mm from the end had a good strength of agreement when repeated by the same observer (Table 3.6). Due to the high reliability and simplicity of these measurements, they were not tested by external observers.

The ICC tests showed that the sacral straight length, curved length, and angle had very good agreement, and scored above 0.900 for both consistency and absolute agreement (Table 3.6). The sacral straight length, curved length, and angle all had very good reliability in both consistency and absolute agreement (Table 3.6). The measurement of the sacral angle is therefore reliable. The ICC tests evaluating the sternal straight length, curved length, and angle showed that these measurements all had very high ICC scores and were thus reliable when performed by the same observer (Table 3.6). When these measurements were tested by two external observers, the sternal straight length and curved length also yielded very high ICC scores and were thus reliable (Table 3.6). However, the sternal angle ICC scores showed only fair consistency and agreement using average measures (Table 3.6). This indicates that the sternal angle measurements are not repeatable, and were therefore not used in this thesis.

Table 3.6 – Interclass Correlation Coefficient tests for intra-observer and inter-observer error for the left A-LDFA, left PDFA, sacral angle, and sternal angle:

Measurement		**Consistency**		**Absolute agreement**		**Skeletal Materials Used**
		Interclass Correlation	Strength of Agreement	Interclass Correlation	Strength of Agreement	
A-LDFA	Intra-	0.979	Very good	0.979	Very good	MB11/HT15
A-LDFA	Inter-	0.885	Very good	0.888	Very good	MB11/HT15
PDFA	Intra-	0.253	Fair	0.164	Slight	MB11/HT15
Sternal Rib Diameter	Intra-	0.996	Very good	0.996	Very good	McMaster
Sternal Rib Diameter 15mm from End	Intra-	0.999	Very good	0.999	Very good	McMaster
Sternal Rib End Ratio	Intra	0.988	Very good	0.988	Very good	McMaster
Medial Clavicle Diameter	Intra-	0.998	Very good	0.998	Very good	McMaster
Ulna Circ. 20mm from End	Intra	0.736	Good	0.692	Good	McMaster
Sacrum Straight Length	Intra-	0.998	Very good	0.998	Very good	McMaster
Sacrum Straight Length	Inter-	0.966	Very good	0.965	Very good	MB11/HT15
Sacrum Curved Length	Intra-	0.995	Very good	0.991	Very good	McMaster
Sacrum Curved Length	Inter-	0.904	Very good	0.903	Very good	MB11/HT15
Sacral Angle	Intra-	0.966	Very good	0.953	Very good	McMaster
Sacral Angle	Inter-	0.910	Very good	0.908	Very good	MB11/HT15
Sternum Straight Length	Intra-	0.988	Very good	0.986	Very good	McMaster
Sternum Straight Length	Inter-	0.993	Very good	0.993	Very good	MB11/HT15
Sternum Curved Length	Intra-	0.986	Very good	0.984	Very good	McMaster
Sternum Curved Length	Inter-	0.987	Very good	0.986	Very good	MB11/HT15
Sternal Angle	Intra-	0.828	Very good	0.841	Very good	McMaster
Sternal Angle	Inter-	0.373	Fair	0.339	Fair	MB11/HT15

Legend – A-LDFA = Anatomical Distal Femoral Angle; PDFA = Posterior Distal Femoral Angle; Intra- = Intra-observer error; Inter- = Inter-observer error; circ. = circumference; MB11/HT15 = Middenbeemster and Hattem.

The repeatability of the assessment of the micro-CT scans was also tested. A sample of 20 micro-CT scans were shown to two external observers. The presence of IGD in the sample scans was only accepted if it could be observed by all three observers. Results from the inter-observer tests showed 16 of the 20 scans were agreed upon by all three observers (Table 3.7). IGD was scored as present by all three observers in only one individual (KER15S012); all other cases of agreement were when IGD was scored as absent. The presence of IGD in the remaining four teeth was not conclusive enough to be confirmed by all three observers. These teeth were thus listed as being inconclusive (Table 3.7).

Table 3.7 - Inter-observer error for Micro-CT scans:

Individual Number	Molar	Presence of IGD			
		Original Observer	Observer 2	Observer 3	Final Score
KER15S006	M2	A	A	A	A
KER15S012	M2	**P**	**P**	**P**	**P**
KER15S012	M3	**P**	A	A	I
KER15S015	M3	A	A	A	A
KER15S031	M2	A	A	A	A
KER15S031	M3	A	A	A	A
KER15S047	M2	A	A	A	A
KER15S071	M2	A	A	A	A
KER15S077	M2	**P**	**P**	A	I
KER15S077	M3	A	A	A	A
KER15S093	M2	**P**	A	A	I
HT15S126	M2	A	?	A	A
KER15S133	M3	**P**	**P**	A	I
MB11S206	M3	A	A	A	A
MB11S229	M3	A	A	A	A
MB11S238	M2	A	?	A	A
MB11S275	M3	A	A	A	A
MB11S370	M2	A	A	A	A
MB11S505	M3	A	A	A	A
MB11S522	M2	A	A	A	A

Legend – P = present; A = Absent; ? = unknown; I = inconclusive
Note – The recorded presence of IGD is marked in bold and red writing.

3.3.2 – Prevalence, Z-scores, Pearson Correlation, Chi-Squared, and Fisher's Exact Test

Statistical analyses were performed to better understand how each of the recorded features and measurements were related to each other, and to adolescent rickets. The true prevalence of each non-metric feature throughout the sample population was calculated using the counts of the features present, and the percent of the sample population affected. Z-scores were calculated for each measurement using Excel (version 16.39) in order to allow the values of each individual to be directly compared. Z-scores could not be calculated in samples of less than 30 individuals. The Z-scores were calculated by sex in order to account for sexual dimorphism in size difference. The nine subadults of known age and sex were included in the category with the individuals of unknown sex, as they are of similar size. Adult individuals of unknown sex were not included in the category of individuals of unknown sex as by the nature of their age, their dimensions would be larger than those of the adolescents also included in this category. Z-scores were considered significantly larger or smaller than the population mean if the score was equal to or larger than z=1.5 or equal or smaller than z=-1.5.

Pearson's Chi-squared analysis was used to understand how the non-metric features are related to each-other and to the presence of growth plate porosity or the presence of significant z-scores. Pearson's Chi-squared analysis was also used to determine how well each measurement represented the observed non-metric features, and how the presence or absence of significant z-scores in each measurement are related. In cases where the sample size was too small, Fisher's exact test was used. Pearson's Correlation analysis was used to evaluate which metric evaluations are correlated with each other. The Pearson's Correlation analysis was performed on the raw measurements for the left and right minimum ulna circumference, the left and right clavicle ratio and the sacral angle. Understanding how the features evaluated in this research are related to each other can improve our understanding of how adolescent rickets affects the skeleton. Both the Pearson's Chi-squared and the Pearson Correlation analysis were used to select which measurements were best able to identify adolescent rickets. Pearson Correlation, Chi-squared, and Fisher's Exact Tests were calculated in SPSS (version 1.0.0.1461) and the strength of the significance of the resulting p-values is listed in *Table 3.8*.

Table 3.8 – Strength of significance of Pearson Correlation, Chi-squared, and Fisher's Exact Tests:

P-Value	Significance
p > 0.05	Not significant
0.05 - 0.01	Significant
p < 0.01	Very significant

Legend – "x" = the p-value obtained in the statistical test.

3.3 - Summary

The current research uses materials from two Dutch skeletal collections, Middenbeemster and Hattem, dating primarily to the 17th to 19th centuries. A total of 363 individuals were included in this research, all above the age of nine years. Eighty-eight individuals included in this sample are adolescents (9-25 years). Micro-CT scans were made for a total of 99 teeth representing 69 individuals in this sample. A combination of non-metric shape changes and metric measurements and z-scores were calculated and compared to the presence and absence of IGD in the second and third molars to determine which shape changes and measurements could be associated with adolescent rickets. The relationship between the metric measurements and the non-metric features were evaluated using Pearson's Correlation Analysis, Chi-squared analysis and Fisher's Exact Tests.

Chapter 4.0 – Results

4.1 – MicroCT results

Of the 69 individuals that were sampled for interglobular dentine (IGD), six had IGD in the second molar, and one individual also had IGD in the third molar (Figure 4.1). All six of the cases are from Hattem (Table 4.1). Three of the six individuals with IGD are male, two are female, and one is of unknown sex. A total of 8.7% (6/69) of the sampled population had episodes of vitamin D deficiency in early childhood, and 1.5% (1/69) of the sampled collection had two episodes in early adolescence occurring at ages eight to 10 and again at age 11 (Table 4.1 and Figure 4.1). Many of the micro-CT scans do not extend the full length of the tooth. As such, the length of the scan and the age in years at the end of the scan are indicated in *Table 4.1.*

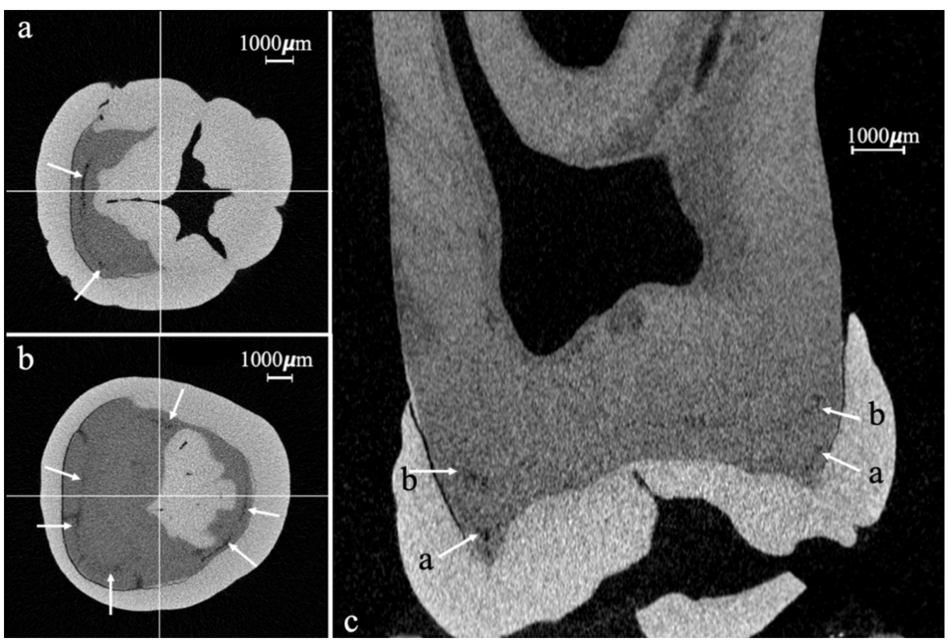

Figure 4.1- MicroCT scans of the third molar from KER15S018.
Legend: White arrows indicate episodes of vitamin D deficiency. 1a shows the first episode of deficiency occurring at ages 8-10, and 1b shows the second period of deficiency occurring at age 11. Both 1a and b are transaxial views. 1c is a coronal view showing two periods of deficiency. The letters a and b on figure c indicate which period of deficiency is referred to by figures a and b.

Table 4.1 –Micro-CT results:

Individual Number	**Sex**	**Age-At-Death**	**IGD M2**	**IGD M3**	**Age at Deficiency**	**Image height mm**	**Age at end of scan M2 (years)**	**Image height mm**	**Age at end of scan M3 (years)**
KER15S006	M	26-35	N*	N	-	20	13	20	17-20
KER15S012	F	36-49	**Y***	I*	6	20	13	20	17-20
KER15S014	F	18-25	N	N	-	20	13	20	17-20
KER15S015	M	36-49	**Y**	N*	5	20	13	20	17-20
KER15S017	M	36-49	N	-	-	20	12-13	-	-
KER15S018	M	18-25	**Y**	**Y**	3,5,6, 8-10, 11	20	13	20	17-20
KER15S031	U	17 ±1 yr.	N*	N*	-	11	10-11	20	17-20
KER15S035	F	26-35	N	N	-	20	13	20	17-20
KER15S038	F	36-49	N	-	-	20	12-13	-	-
KER15S046	M	26-35	N	N	-	11	12-13	11	17-20
KER15S047	A	26-35	N*	N	-	20	13	20	17-20
KER15S051	F	26-35	N	-	-	20	13	-	-
KER15S060	U	10 ± 1 yr.	N	-	-	20	10-11	-	-
KER15S062	F	36-49	N	-	-	20	13	-	-
KER15S064	M	36-49	-	N	-	-	-	11	17-20
KER15S071	M	18-25	N*	N	-	20	13	20	17-20
KER15S072	F	36-49	N	N	-	20	13	20	17-20
KER15S073	U	10 ± 1 yr.	N	-	-	11	10-11	-	-
KER15S075	F	36-49	-	N	-	-	-	20	17-20
KER15S077	M	26-35	I*	N	-	14	12	13	17-20
KER15S078	F	26-35	-	N	-	-	-	20	17-20
KER15S088	F	26-35	-	N	-	-	-	20	17-20
KER15S093	F	26-35	I*	N	-	20	13	20	17-20
KER15S094	F	18-25	N	N	-	20	13	20	17-20
KER15S099	F	18-25	N	-	-	20	13	-	-
KER15S103	M	18-25	N	N	-	20	12-13	20	17-20
KER15S106	M	36-49	N	N	-	20	13	20	17-20
KER15S120	F	18-25	-	D	-	-	-	20	17-20
HT15S126	U	8.5 ± 1.5 yrs.	N*	-	-	12	***8.5 +- 1.5***	-	-
KER15S127	U	9 ± 1 yrs.	**Y**	-	3.5	20	***9***	-	-
KER15S129	F	36-49	**Y**	-	5	20	13	-	-
KER15S130	M	18-25	**Y**	N	3-4	20	13	20	17-20
KER15S133	F	18-25	N	I*	-	20	13	20	17-25
KER15S134	M	36-49	N	-	-	20	13	-	-
KER15S150	U	14 ± 1.5 yrs.	N	N	-	20	13	20	***14***

Legend: M2=second molar; M3=third molar; M=male; F=female; U=unobservable; A=ambiguous; yr. = year; mo. = month; Y = yes; N = no; "-" = not sampled; D = too damaged to record. Table continued.

Note: Teeth with IGD present are written in bold red letters. Asterix indicates which tooth was included in the inter-observer error test. Bold and italicized ages in "Age at End of Scan" indicate that the entire tooth from crown to root was included in the scan.

Table 4.1 – continued…

Individual Number	Sex	Age-At-Death	IGD M2	IGD M3	Age at Deficiency	Image height mm	Age at end of scan M2 (years)	Image height mm	Age at end of scan (years)
MB11S151	M	36-49	-	N	-	-	-	20	17-20
MB11S167	F	12	N	-	-	20	12	-	-
MB11S194	M	50+	N	-	-	20	13	-	-
MB11S198	F	26-35	-	N	-	-	-	20	17-20
MB11S206	U	13-17	N	N*	-	20	13	20	***17-20***
MB11S226	M	26-35	N	N	-	20	13	20	17-20
MB11S229	U	13-17	-	N*	-	-	-	20	17-20
MB11S238	M	18-25	N*	-	-	20	13	-	-
MB11S248	F	9	N	-	-	20	9	-	-
MB11S269b	U	11 ± 30 mo.	N	-	-	20	10-11	-	-
MB11S275	U	15 ± 1 yr.	N	N*	-	20	13	20	***15***
MB11S290	M	18-25	-	N	-	-	-	20	17-20
MB11S292	U	11 ± 1 yr.	N	-	-	20	10-11	-	-
MB11S311	F	18-25	N	-	-	20	13	-	-
MB11S327	F	36-49	N	N	-	20	12-13	20	17-20
MB11S370	F	36-49	N*	-	-	20	12-13	-	-
MB11S379	M	18-25	N	N	-	20	13-14	20	18-25
MB11S404	M	26-35	-	N	-	-	-	20	17-20
MB11S446	U	22	N	N	-	20	13	20	17-20
MB11S452	F	18-25	-	N	-	-	-	20	17-25
MB11S454	U	21	-	N	-	-	-	20	17-20
MB11S460	U	16.5 ±36 mo.	N	N	-	20	12-13	20	17-20
MB11S461	F	28	-	N	-	-	-	20	17-20
MB11S465	M	15	N	N	-	20	12-13	20	***15***
MB11S487	F	29	N	N	-	20	13	20	17-20
MB11S488	F	36-49	N	-	-	20	12-13	-	-
MB11S501	F	18-25	N	N	-	20	13	20	17-20
MB11S505	M	18-25	N	N*	-	20	13	20	17-20
MB11S507	U	14 ± 2 yrs.	N	-	-	20	13	-	-
MB11S512	F	36-49	-	N	-	-	-	20	17-20
MB11S522	F	13	N*	-	-	20	13	-	-
MB11S527	F	26-35	-	N	-	-	-	20	17-20
MB11S549	U	11 ± 24 mo.	N	-	-	20	13	-	-
MB11S553	F	36-49	N	-	-	20	13	-	-

Legend: M2=second molar; M3=third molar; M=male; F=female; U=unobservable; A=ambiguous; yr. = year; mo. = month; Y = yes; N = no; "-" = not sampled; D = too damaged to record.
Note: Teeth with IGD present are written in bold red letters. Asterix indicates which tooth was included in the inter-observer error test. Bold and italicized ages in "Age at End of Scan" indicate that the entire tooth from crown to root was included in the scan.

4.2 - Prevalence of Non-Metric Skeletal Indicators of Residual Adolescent Rickets

The following sub-sections present the true counts of each of the non-metric skeletal indicators of adolescent rickets. The true count is calculated as the number of individuals affected and the total number of individuals with the portion of bone being evaluated that could have been affected. Findings are summarized in *Table 4.2.* The full datasets for each bone and counts for each of the non-metric skeletal indicators of adolescent rickets by side are located in *Appendices B to D* and *Appendices F to L*.

Angulation was most frequently observed at the distal femur metaphysis and was present in 27/289 (9%), and metaphyseal flaring was observed at the medial clavicle ends was present in 64/270 (24%) (Table 4.2). The statistical significance of each non-metric skeletal indicator for adolescent rickets is considered in Section 4.3 and Section 4.5.1.1.

Table 4.2 - Prevalence of rachitic non-metric skeletal indicators of adolescent rickets in individuals above the age of nine from Middenbeemster and Hattem:

Feature	Prevalence
Sternal rib end porosity	22/264 (8%)
Distal femur distal metaphyseal angulation	27/289 (9%)
Distal ulna distal metaphyseal angulation	21/266 (8%)
Femur distal metaphyseal widening	18/268 (7%)
Ulna distal metaphyseal widening	27/242 (11%)
Medial clavicle flaring	64/270 (24%)
Sacral angulation	86/200 (43%)
Sternal angulation	12/108 (11%)
Costochondral flaring	50/266 (19%)

4.2.1 – Distal Metaphyseal Angulation

Distal metaphyseal angulation of the femur and/or ulna was observed in 46/313 (14.7%) of individuals. Distal metaphyseal angulation was recorded as present if it was observed unilaterally or bi-laterally. Angulation at the distal femoral metaphysis was more commonly observed than angulation at the distal ulna metaphysis in all age categories except for 36-49 (Table 4.3). Twenty one of the 46 individuals (45.7%) were female, 21/46 (45.7%) were male, and four out of the 46 individuals (8.7%) were of unobservable sex (Table 4.3). In considering the 46 individuals evaluated two (4.3%) were between the ages of 13-17, 10 (21.7%) were between the ages of 18-25, eight (17.4%) between the ages of 26-35, 10 (21.7%) between the ages of 36-49, 13 (28.3%) were older than 50 years at death, and three (6.5%) were unspecified adults (Table 4.3).

Table 4.3 –Metaphyseal Angulation at the distal femur and ulna.

Individual Number	**Sex**	**Age at Death**	**Distal Femur Met. Angle.**		**Distal Ulna Met. Angle**		**Individual Number**	**Sex**	**Age at Death**	**Distal Femur Met. Angle.**		**Distal Ulna Met. Angle.**	
			L	R	L	R				L	R	L	R
KER15S017	M	36-49	A	A	**P**	-	**KER15S132**	F	50+	-	-	A	**P**
KER15S019	M	50+	-	**P**	A	A	**MB11S194**	M	50+	**P**	-	A	-
MB11S029	M	50+	A	A	**P**	**P**	**MB11S239**	M	23	A	A	**P**	**P**
KER15S029	M	36-49	**P**	-	A	**P**	**MB11S246**	U	19	-	-	-	**P**
MB11S040	F	18-25	A	A	-	**P**	**MB11S257**	M	26-35	**P**	A	A	A
KER15S043	M	36-49	A	A	**P**	A	**MB11S285**	M	71	A	A	A	**P**
MB11S059	M	36-49	A	A	**P**	A	**MB11S302**	F	50+	**P**	**P**	A	A
MB11S060	F	18-25	**P**	**P**	A	A	**MB11S307**	U	13-17	A	**P**	A	-
KER15S063	F	36-49	A	A	A	**P**	**MB11S327**	F	36-49	**P**	A	A	-
KER15S065	M	36-49	A	A	**P**	A	**MB11S344**	F	20	**P**	**P**	-	A
KER15S066	M	18+	**P**	-	-	-	**MB11S356**	F	78	**P**	**P**	A	-
MB11S070	M	18+	**P**	**P**	A	A	**MB11S379**	M	18-25	**P**	**P**	A	**P**
MB11S083	F	36-49	**P**	**P**	-	-	**MB11S383**	F	55	**P**	**P**	A	A
MB11S084	F	18+	**P**	**P**	A	A	**MB11S388**	F	21	**P**	**P**	A	A
KER15S090	F	50+	A	-	A	**P**	**MB11S422**	F	29	**P**	**P**	A	A
MB11S092	M	26-35	**P**	**P**	A	A	**MB11S454**	U	29	**P**	**P**	-	-
MB11S093	M	50+	A	A	**P**	**P**	**MB11S488**	F	36-49	**P**	**P**	A	A
KER15S098	F	26-35	**P**	A	A	A	**MB11S497**	M	26-35	A	A	**P**	A
KER15S111	M	26-35	**P**	**P**	A	A	**MB11S498**	F	50+	A	**P**	A	A
KER15S119b	U	14 ± 1 yr.	-	-	-	**P**	**MB11S501**	F	80	**P**	A	A	A
KER14S120	F	18-25	**P**	A	-	A	**MB11S505**	M	18-25	A	A	A	**P**
KER15S122	F	36-49	A	A	**P**	**P**	**MB11S544**	M	30	A	A	**P**	A
KER15S130	M	18-25	A	A	**P**	A	**MB11S550**	F	50+	**P**	A	A	-

Legend – Met. = metaphyseal; Angle. = angulation; M = male; F = female; U = unobservable; L = left; R = right; yr. = year; P = present; A = absent; - = not observable.

Note – Metaphyseal angulation is marked as bold and in red.

4.2.2 – Distal Metaphyseal Widening of the Ulna and Femur and Medial Metaphyseal Flaring of the Clavicle

Widening of the distal metaphases of the femur and ulna and flaring at the medial clavicle was observed in 92/340 (27.0%). Of the 92 individuals with distal metaphyseal widening of the femur or ulna or medial clavicle flaring, 23 (25%) were female, 58 (63%) were male, nine (9.8%) of the individuals were of unobservable sex and two (2.1%) of the individuals were of ambiguous sex (Table 4.4). Of the shape changes associated with healed rickets, flaring of the medial clavicle was most commonly observed and was present in 64/270 (24%) of individuals (Table 4.4).

Table 4.4– Distal metaphyseal widening of the femur and ulna and medial metaphyseal flaring of the clavicle:

Individual Number	**Sex**	**Age at Death**	**Distal Fem. Met. Widen.**		**Distal Ulna Met. Widen.**		**Medial Clav. Met. Flaring**		**Individual Number**	**Sex**	**Age at Death**	**Distal Fem. Met. Widen.**		**Distal Ulna Met. Widen.**		**Medial Clav. Met. Flaring**	
			L	R	L	R	L	R				L	R	L	R	L	R
KER15S008	A	50+	-	-	A	-	**P**	A	**MB11S240**	M	36-49	A	A	A	A	**P**	**P**
KER15S011	M	36-49	-	-	A	A	**P**	A	**MB11S242**	M	50+	A	A	**P**	A	**P**	A
KER15S016	M	18-25	A	A	A	A	A	**P**	**MB11S247**	M	50+	-	-	-	-	A	**P**
KER15S017	M	36-49	A	-	-	-	**P**	**P**	**MB11S249**	M	26-35	A	A	-	A	**P**	**P**
KER15S021	M	36-49	A	-	-	A	-	**P**	**MB11S260**	M	18-25	A	-	-	-	-	**P**
KER15S024	M	36-49	A	A	A	A	A	**P**	**MB11S263**	M	36-49	**P**	**P**	A	-	A	A
KER15S026	M	36-49	A	A	A	A	A	**P**	**MB11S269b**	U	11 ± 30 mo.	**P**	-	-	-	-	-
MB11S029	M	50+	**P**	**P**	-	-	A	A	**MB11S270**	M	18-25	A	A	A	A	**P**	**P**
KER15S029	M	36-49	A	-	A	A	**P**	**P**	**MB11S271**	M	50+	-	-	**P**	A	A	A
KER15S037	M	50+	A	A	A	A	**P**	A	**MB11S281**	M	36-49	A	A	-	A	**P**	-
KER15S040	M	18+	-	-	-	-	**P**	-	**MB11S285**	M	71	A	A	-	**P**	**P**	**P**
MB11S051	M	74	A	A	-	**P**	A	A	**MB11S301a**	F	36-49	A	A	-	A	**P**	**P**
KER15S053	U	15 ± 1 yr.	-	**P**	-	**P**	-	-	**MB11S306**	M	31	**P**	**P**	**P**	-	A	A
KER15S054	A	26-35	**P**	-	-	-	-	-	**MB11S310**	M	35	**P**	**P**	A	-	-	-
KER15S055	F	36-49	-	-	A	-	**P**	-	**MB11S324**	M	36-49	A	-	A	A	**P**	**P**
MB11S059	M	36-49	A	A	**P**	-	A	A	**MB11S337**	M	68	A	A	-	**P**	A	-

Legend – M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = month/months; L = left; R = right; P = present; A = absent; - = absent/not observable. Table continued.
Note – Metaphyseal widening and flaring is marked as bold and in red.

Table 4.4 – continued…

Individual Number	Sex	Age at Death	Distal Fem. Met. Widen.		Distal Ulna Met. Widen.		Medial Clav. Met. Flaring		Individual Number	Sex	Age at Death	Distal Fem. Met. Widen.		Distal Ulna Met. Widen.		Medial Clav. Met. Flaring	
			L	R	L	R	L	R				L	R	L	R	L	R
KER15S064	M	36-49	-	-	-	A	**P**	**P**	**MB11S347**	M	50+	**P**	A	A	A	A	A
KER15S065	M	36-49	A	A	A	A	-	**P**	**MB11S359**	F	46	**P**	**P**	A	A	-	-
KER15S076	M	26-35	A	A	-	A	**P**	**P**	**MB11S368**	M	26-35	A	A	**P**	-	**P**	**P**
MB11S084	F	18+	**P**	**P**	A	-	-	A	**MB11S369**	F	30	A	A	A	A	**P**	A
KER15S085	M	36-49	-	-	-	-	A	**P**	**MB11S371**	M	36-49	A	A	-	A	**P**	**P**
KER15S087	M	36-49	A	A	**P**	-	-	A	**MB11S375**	M	74	A	A	A	**P**	**P**	**P**
MB11S092	M	26-35	-	A	**P**	**P**	A	A	**MB11S379**	M	18-25	A	A	-	**P**	**P**	**P**
KER15S092	F	50+	-	-	**P**	A	**P**	**P**	**MB11S380**	M	36-49	A	A	-	**P**	A	A
MB11S100	M	18+	A	A	A	A	**P**	**P**	**MB11S402**	M	36-49	A	A	A	-	A	**P**
KER15S101	M	36-49	A	A	**P**	A	**P**	**P**	**MB11S411**	M	36-49	-	A	**P**	-	-	-
KER15S102	M	50+	-	A	-	-	A	**P**	**MB11S415**	M	50+	A	A	A	A	**P**	**P**
KER15S106	M	36-49	A	**P**	A	A	A	A	**MB11S416**	M	36-49	A	A	-	**P**	**P**	**P**
MB11S108	M	26-35	-	-	-	A	A	**P**	**MB11S426**	F	55	**P**	**P**	-	**P**	**P**	**P**
KER15S117	F	36-49	A	-	A	-	**P**	**P**	**MB11S434**	F	36-49	A	A	-	**P**	A	A
KER15S119a	U	12 ± 1 yr.	-	-	-	-	**P**	**P**	**MB11S456**	M	36-49	A	-	**P**	**P**	A	-
KER15S122	F	36-49	A	A	A	A	**P**	-	**MB11S457**	F	50+	-	A	**P**	**P**	A	**P**
KER15S124	U	13 ± 1 yr.	-	-	-	-	**P**	**P**	**MB11S460**	U	16.5 ± 36 mo.	-	-	-	-	**P**	**P**
KER15S126	U	8.5 ± 1.5 yrs.	**P**	**P**	A	A	**P**	A	**MB11S466b**	F	43	A	A	A	A	A	**P**
KER15S127	U	9 ± 1 yr.	**P**	**P**	A	A	A	**P**	**MB11S473**	M	42	A	A	A	A	**P**	**P**
KER15S132	F	50+	-	-	A	A	**P**	-	**MB11S476**	F	31	A	A	A	A	**P**	**P**
KER15S136	U	13 ± 2 yrs.	**P**	**P**	A	A	-	A	**MB11S477**	M	61	A	A	**P**	**P**	**P**	**P**
MB11S149	F	26-35	A	A	**P**	**P**	A	A	**MB11S484**	M	50+	A	-	A	-	**P**	**P**
KER15S150	U	14 ± 1.5 yrs.	**P**	**P**	A	A	A	A	**MB11S485**	F	36-49	**P**	**P**	-	-	-	-
MB11S151	F	26-25	**P**	**P**	A	-	A	A	**MB11S488**	F	36-49	-	A	A	A	**P**	**P**
KER15S151	M	36-49	A	A	A	A	**P**	**P**	**MB11S489**	M	36-49	A	A	A	A	**P**	**P**
MB11S160	F	26-35	A	A	-	A	**P**	**P**	**MB11S497**	M	26-35	A	A	-	**P**	A	A
MB11S162	M	36-49	A	-	-	-	**P**	**P**	**MB11S502**	M	25	A	A	**P**	A	A	**P**
MB11S170	F	50+	-	A	**P**	**P**	-	-	**MB11S511**	M	50+	A	-	-	A	A	**P**
MB11S205	M	50+	A	A	-	-	**P**	-	**MB11S522**	M	35+	A	A	-	-	**P**	**P**
MB11S207	F	50+	A	A	A	A	**P**	**P**	**-**	-	-	-	-	-	-	-	-
Total												18/268 (7%)		27/242 (11%)		64/270 (24%)	

Legend – M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = month/months; L = left; R = right; P = present; A = absent; - = absent/not observable.

Note – Metaphyseal widening and flaring is marked as bold and in red.

4.2.3 – Angulation at the Sacrum and Sternum

Angulation at the sacrum was observed in 86/200 (43%) of individuals. Of the individuals with angled sacra, 30/86 (35%) were female, 51/86 (59%) were male, and 5/86 (6%) were of unknown sex (Table 4.5). Only 2/86 (2%) individuals with angled sacra were between the ages of 13-17 years, while 12/86 (14.0%) were between the ages of 18-25, 14/86 (16%) were between the ages 26-35, 31/86 (36%) were between the ages of 36-49, 24/86 (27.9%) were older than 50 years at death, and three (3.5%) were unspecified adults (Table 4.5). Angulation between the second and third vertebra was the most common location observed, with 52/86 (60%) of the sacra being angled at this location (Table 4.5). Angulation between the first and second sacral vertebrae was observed in 9/86 (10%) of cases, and angulation between the third and fourth sacral vertebrae was observed in 37/86 (43%) of cases. The location of the angulation could not be specified in 13/86 (15%) of cases (Table 4.5). Some of the individuals for whom the location of the angulation could not be specified also were unable to be measured (Table 4.5) and others, the angulation was present but was too gradual to determine the location.

Angulation at the sternum was observed in 12/108 (11%) individuals. Of the 12 individuals with angled sterna, four (33%) were female, four (33%) were male, three (25%) were of unknown sex, and one (8%) was of ambiguous sex (Table 4.5). Three of the 12 (25%) individuals with angled sterna were between the ages of 13-17, four (33%) were between the ages of 18-25, two (17%) were between the ages of 26-35, two (17%) were between the ages of 36-49, and one (8%) individual was older than 50 years at death (Table 4.5). Angulation between the second and third sternabrae was most commonly observed, affecting eight of the 12 (67%) individuals with sternal angulation. Angulation between the first and second sternabrea and between the third and fourth sternebrae both occurred in three of the 12 (25%) individuals (Table 4.5). One of the 12 (8%) individuals with sternal angulation had angulation in an unspecified location. Individuals with marked angulation of the sacrum or the sternum but that could not be measured are indicated in *Table 4.5*.

Table 4.5 – Visible angulation at the sacrum and sternum:

Individual Number	Sex	Age at Death	Sacral Angle		Sternal Angle		Individual Number	Sex	Age at Death	Sacral Angle		Sternal Angle	
			Presence of Angle	Location of Angle	Presence Angle	Location of Angle				Presence of Angle	Location of Angle	Presence of Angle	Location of Angle
KER15S009[1]	M	36-49	**P**	2-3, 3-4	A	-	**MB11S297[1,2]**	M	84	**P**	2-3	-	-
KER15S012	F	36-49	**P**	2-3	-	-	**MB11S303[1]**	F	44	**P**	3-4	A	-
KER15S015	M	36-49	**P**	2-3	-	-	**MB11S307[1]**	U	13-17	**P**	3-4	**P**	2-3, 3-4
KER15S016[1]	M	18-25	**P**	2-3, 3-4	-	-	**MB11S313**	M	46	**P**	3-4	A	-
KER15S018[1]	M	18-25	**P**	2-3	-	-	**MB11S324**	M	36-49	A	-	**P**	2-3
KER15S019[1]	M	50+	**P**	2-3	-	-	**MB11S340**	U	19	A	-	**P**	1-2, 2-3
KER15S024[1]	M	36-49	**P**	1-2, 2-3	-	-	**MB11S341[1]**	M	50+	**P**	2-3	-	-
KER15S025	M	36-49	A	-	**P**	1-2	**MB11S344[1]**	F	20	**P**	-	A	-
KER15S036[1,2,3]	M	36-49	**P**	-	-	-	**MB11S345**	F	28	**P**	-	A	-
KER15S074	M	36-49	**P**	-	-	-	**MB11S347[1]**	M	50+	**P**	-	A	-
KER15S076[1]	M	26-35	**P**	2-3	-	-	**MB11S356**	F	78	**P**	-	-	-
KER15S083[1]	M	36-49	**P**	2-3, 3-4	A	-	**MB11S363[1]**	M	61	**P**	1-2, 2-3	-	-
KER15S090	F	50+	**P**	2-3	A	-	**MB11S368**	M	26-35	**P**	2-3	-	-
KER15S094	F	18-25	**P**	2-3, 3-4	A	-	**MB11S370[1]**	F	36-49	**P**	-	A	-
KER15S101	M	36-49	**P**	3-4	A	-	**MB11S394[1]**	F	50+	**P**	2-3, 3-4	-	-
KER15S102[1]	M	50+	**P**	2-3	-	-	**MB11S402**	M	36-49	**P**	3-4	-	-
KER15S106[1,2]	M	36-49	**P**	2-3	A	-	**MB11S404**	M	26-35	**P**	-	A	-
KER15S112	M	26-35	**P**	2-3	A	-	**MB11S413**	F	39	**P**	3-4	-	-
KER15S114	F	50+	**P**	2-3	-	-	**MB11S434**	F	36-49	**P**	1-2, 2-3	-	-
KER15S115[1,2]	M	36-49	**P**	-	-	-	**MB11S435**	M	45	**P**	2-3, 3-4	A	-
KER15S134[1]	M	36-49	**P**	2-3	-	-	**MB11S441[1,2]**	F	23	**P**	3-4	-	-
MB11S045[1]	F	47	**P**	2-3	A	-	**MB11S446[1,2]**	A	22	**P**	3-4	A	-
MB11S060	F	18-25	**P**	2-3	**P**	-	**MB11S454[1]**	A	21	**P**	2-3, 3-4	-	-
MB11S077	F	58	**P**	1-2, 2-3	-	-	**MB11S460**	U	16.5 ± 36 mo.	-	-	**P**	1-2, 2-3
MB11S092	M	26-35	**P**	2-3	-	-	**MB11S466a[1,2,3,4]**	M	83	**P**	-	-	-
MB11S088	F	26-35	-	-	**P**	3-4	**MB11S467**	M	26-35	**P**	1-2, 2-3	A	-
MB11S107	F	18-25	-	-	**P**	2-3	**MB11S468[1]**	F	36-49	**P**	2-3, 3-4	A	-
MB11S108	M	26-35	-	-	**P**	2-3	**MB11S473**	M	42	**P**	2-3	A	-

Legend – M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = month/months; L = left; R = right; P = present; A = absent; - = absent/not observable. [1]No measurements possible; [2]marked angulation and no measurements; [3]possible osteomalacia; [4]possible sacral fracture. Table continued. Note – Presence of angulation marked in bold and in red.

Table 4.5 – continued…

Individual Number	Sex	Age	Sacral Angle		Sternal Angle		Individual Number	Sex	Age	Sacral Angle		Sternal Angle	
			Presence of Angle	Location of Angle	Presence of Angle	Location of Angle				Presence of Angle	Location of Angle	Presence of Angle	Location of Angle
MB11S137[1]	F	36-49	**P**	3-4	-	-	**MB11S488**	F	36-49	**P**	1-2, 2-3, 3-4	A	-
MB11S144[1]	M	36-50	**P**	3-4	-	-	**MB11S495[1]**	F	26-35	**P**	2-3, 3-4	-	-
MB11S153[1]	M	57	**P**	2-3, 3-4	-	-	**MB11S498[1]**	F	50+	**P**	2-3, 3-4	**P**	2-3
MB11S158	M	60	**P**	1-2	A	-	**MB11S502**	M	25	A	-	**P**	2-3
MB11S160	F	26-35	**P**	3-4	A	-	**MB11S505[1]**	M	18-25	**P**	2-3	A	-
MB11S170	F	50+	**P**	2-3	-	-	**MB11S514**	M	26-35	**P**	2-3, 3-4	-	-
MB11S180	M	18-25	**P**	3-4	-	-	**MB11S518[1,2]**	F	18+	**P**	3-4	-	-
MB11S183	F	26-35	**P**	2-3	A	-	**MB11S519[1]**	M	36-49	**P**	2-3, 3-4	-	-
MB11S186	M	36-49	**P**	2-3	A	-	**MB11S520[1]**	M	50+	**P**	3-4	-	-
MB11S194	M	50+	**P**	-	A	-	**MB11S521**	M	69	**P**	3-4	-	-
MB11S216	F	36-49	**P**	2-3	-	-	**MB11S523**	M	50+	**P**	1-2, 2-3	-	-
MB11S233	M	18+	**P**	3-4	-	-	**MB11S525[1]**	M	50+	**P**	2-3	-	-
MB11S234[1]	F	18-25	**P**	2-3, 3-4	-	-	**MB11S534[1]**	M	36-49	**P**	2-3, 3-4	-	-
MB11S237[1]	M	50+	**P**	-	-	-	**MB11S538[1]**	F	26-35	**P**	2-3, 3-4	A	-
MB11S240	M	36-49	**P**	3-4	-	-	**MB11S540[1]**	A	20	**P**	2-3	-	-
MB11S242[1]	M	50+	**P**	2-3	A	-	**MB11S544[1]**	M	30	**P**	3-4	A	-
MB11S267[1]	M	26-35	**P**	2-3	-	-	**MB11S550**	F	50+	**P**	3-4	A	-
MB11S275[1]	U	15 ± 1 yr.	**P**	2-3	**P**	3-4	**MB11S552**	M	18+	**P**	2-3	-	-
MB11S278[1,2,3]	F	36-49	**P**	-	-	-							
MB11S281	M	36-49	**P**	3-4	A	-							

Legend – M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = month/months; L = left; R = right; P = present; A = absent; - = absent/not observable. [1]No measurements possible; [2]marked angulation and no measurements; [3]possible osteomalacia; [4]possible sacral fracture.
Note – Presence of angulation marked in bold and in red.

4.2.4 – Costochondral Flaring

Costochondral flaring was observed in 50/266 (19%) of individuals. Fifteen of the 50 (30%) individuals with costochondral flaring were female, 21/50 (42%) of the individuals were male, 13/50 (26%) of the individuals were of unobservable sex, and one of the 50 (2%) was of ambiguous sex (Table 4.6). Eight of the 50 (16%) individuals were between the ages of 8-12 at death, six of the 50 (12%) individuals were between the ages of 13-17 at death, 11/50 (22%) were between the ages of 18-25 at death, six of the 50 (12%) individuals were between the ages of 26-35 at death, 11/50 (22%) of the individuals were between the ages of 36-49 at death, seven of the 50 (14%) of the individuals were older than 50 years at death, and one (2%) of the individuals was an unspecified adult (Table 4.6). Costochondral flaring was most commonly observed in ribs four through eight.

Table 4.6 – Macroscopic costochondral flaring in the right and left ribs.

Individual Number	Sex	Age	costochondral flaring	Left Ribs Costochondral Flaring					Right ribs Costochondral Flaring				
				Rib 1	Ribs 2-3	Ribs 4-8	Ribs 9-10	Ribs 11-12	Rib 1	Ribs 2-3	Ribs 4-8	Ribs 9-10	Ribs 11-12
KER15S016	M	18-25	**P**	A	A	A	A	A	A	-	A	-	A
KER15S036	M	36-49	**P**	-	-	-	-	-	-	-	-	-	-
MB11S053	F	36-49	**P**	-	-	-	-	-	-	-	-	-	-
KER15S053	U	15 ± 1 yr.	**P**	-	-	-	-	-	-	-	-	-	-
MB11S097	F	50+	**P**	A	A	**P**	-	-	A	-	A	-	A
MB11S100	M	18+	**P**	-	-	-	-	-	-	-	-	-	-
MB11S101	F	26-35	**P**	-	-	**P**	A	A	-	-	-	-	-
MB11S110	F	26-35	**P**	-	-	**P**	-	-	A	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	**P**	-	-	-	-	-	-	-	**P**	-	-
KER15S127	U	9 ± 1 yr.	**P**	A	A	**P**	-	A	A	A	**P**	A	A
KER15S136	U	13 ± 2 yrs.	**P**	-	-	-	-	-	A	**P**	**P**	-	-
KER15S150	U	14 ± 1.5 yrs.	**P**	-	-	**P**	-	-	A	-	**P**	A	A

Legend - M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = month/months; L = left; R = right; P = present; A = absent; - = not observable. Table continued.
Note – Presence of costochondral flaring marked in bold and in red.

Table 4.6 – continued…

Individual Number	Sex	Age	costochondral flaring	Left Ribs Costochondral Flaring					Right ribs Costochondral Flaring				
				Rib 1	Ribs 2-3	Ribs 4-8	Ribs 9-10	Ribs 11-12	Rib 1	Ribs 2-3	Ribs 4-8	Ribs 9-10	Ribs 11-12
MB11S167	F	12	**P**	A	A	**P**	-	-	A	-	-	-	-
MB11S180	M	18-25	**P**	A	-	**P**	A	A	A	A	A	-	-
MB11S186	M	36-49	**P**	A	A	**P**	-	-	A	-	A	-	-
MB11S194	M	50+	**P**	A	A	A	A	A	A	A	**P**	-	-
MB11S205	M	50+	**P**	-	-	-	-	-	-	-	-	-	-
MB11S216	F	36-49	**P**	A	A	**P**	A	A	A	A	**P**	A	A
MB11S263	M	36-49	**P**	-	-	**P**	-	A	A	-	**P**	-	-
MB11S270	M	18-25	**P**	-	-	A	-	A	A	A	**P**	A	A
MB11S282	U	12 ± 12 mo.	**P**	A	A	A	-	-	A	-	A	-	-
MB11S286	F	10	**P**	A	-	**P**	-	A	-	-	**P**	-	A
MB11S290	M	18-25	**P**	A	-	A	-	A	A	A	-	-	-
MB11S307	U	13-17	**P**	A	**P**	**P**	-	A	A	-	-	-	-
MB11S325	M	36-49	**P**	**P**	-	**P**	-	-	**P**	A	**P**	-	-
MB11S325	M	36	**P**	-	-	**P**	A	A	-	-	-	-	-
MB11S331	F	74	**P**	A	-	A	-	A	-	-	-	-	-
MB11S334	F	9	**P**	A	A	**P**	A	A	A	A	**P**	A	A
MB11S340	U	19	**P**	A	A	**P**	-	A	A	**P**	A	-	-
MB11S345	F	28	**P**	A	-	A	-	-	A	-	**P**	A	A
MB11S349	M	50+	**P**	-	-	-	-	-	A	-	A	-	-
MB11S375	M	74	**P**	A	A	**P**	A	-	A	-	A	-	-
MB11S379	M	18-25	**P**	A	A	**P**	A	A	A	A	**P**	**P**	A
MB11S388	F	21	**P**	A	A	A	A	A	A	A	**P**	A	A
MB11S399	A	36-49	**P**	A	-	A	A	A	A	A	**P**	-	-
MB11S404	M	26-35	**P**	A	-	A	-	-	A	**P**	**P**	-	-
MB11S416	M	36-49	**P**	A	-	A	-	A	A	A	**P**	A	A
MB11S446	U	22	**P**	-	**P**	**P**	A	-	**P**	-	**P**	A	A
MB11S454	U	21	**P**	-	-	**P**	A	A	A	A	**P**	-	-
MB11S466b	F	43	**P**	-	-	A	-	-	-	-	**P**	-	A
MB11S467	M	26-35	**P**	A	-	A	-	-	A	A	**P**	-	-
MB11S468	F	36-49	**P**	A	-	A	-	A	A	A	**P**	A	-
MB11S471	F	9	**P**	-	-	**P**	-	-	A	-	**P**	-	-
MB11S477	M	61	**P**	A	-	**P**	-	A	A	-	**P**	-	-
MB11S492	M	26-35	**P**	-	-	-	-	-	A	A	**P**	-	-
MB11S505	M	18-25	**P**	A	-	**P**	A	-	-	-	-	A	A
MB11S507	U	14 ± 2 yrs.	**P**	A	-	**P**	-	-	A	-	-	-	A
MB11S522	F	13	**P**	-	-	**P**	-	-	A	-	**P**	-	-
MB11S540	U	20	**P**	A	-	**P**	-	-	-	-	**P**	-	-
MB11S549	U	11 ± 24 mo.	**P**	A	A	A	A	-	-	A	A	A	A

Legend - M = male; F = female; A = ambiguous sex; U = unobservable sex; yr./yrs. = year/years; mo. = months; L = left; R = right; P = present; A = absent; - = not observable.

Note - Presence of costochondral flaring marked in bold and in red.

4.3 – Association between Observed Non-Metric Features

The association between each non-metric feature was examined using Chi-squared analysis and Fisher's exact tests (Tables 4.7a and b). Distal metaphyseal widening of the femur was significantly related to costochondral flaring ($\chi^2 = 5.227$; p = 0.033) (Table 4.7a). Angulation at the distal ulna was significantly related to macroscopic angulation at the sacrum ($\chi^2 = 4.365$; p = 0.037), and distal metaphyseal widening of the ulna was significantly related to flaring at the medial clavicle ($\chi^2 = 8.842$; p = 0.003) (Table 4.7a). Shape changes at the distal femur and ulna should develop at the same time, however, there was no association between the shape changes at these bones (Table 4.7a).

Table 4.7a – Chi-squared results testing the association between the non-metric features:

Feature	Distal Femur Met.								Distal Ulna Met.							
	Widening				Angulation				Angulation				Ulna Widening			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Distal Femur Angulation	236	0.004	x	1.000	-	-	-	-	-	-	-	-	-	-	-	-
Distal Met. Ulna Angulation	210	0.012	x	1.000	242	0.031	x	0.695	-	-	-	-	-	-	-	-
Distal Met. Ulna Widening	199	1.078	x	0.392	204	0.150	x	1.000	222	3.480	x	0.082	-	-	-	-
Medial Met. Clavicle Flaring	206	0.000	x	1.000	213	0.957	0.328	0.451	216	1.718	x	0.258	202	8.842	**0.003**	**0.005**
Sacral Angle	173	0.314	x	0.694	185	0.326	0.568	0.650	175	4.365	**0.037**	0.061	159	0.738	0.390	0.456
Costo-chondral Flaring	204	5.227	x	**0.033**	210	1.067	x	0.344	209	0.141	x	1.000	197	0.000	0.994	1.000
Sternal Angle	90	0.465	x	1.000	95	3.704	x	0.089	96	1.155	x	0.591	89	0.000	x	1.000

Legend - N = number of valid cases; χ^2 = Pearson Chi Square value; p = Significance (asymptotic two-tailed); F = Fisher's Exact Test (two-tailed); Met. = metaphyseal; "-" = repeated values; x = expected value too small for Chi-squared.
Note – Significant values in bold and red.

Both angulation at the distal femur metaphasis and angulation of the sternum were not significantly associated with any of the non-metric features observed (Tables 4.7 a and b).

Table 4.7b – Chi-squared results testing the association between the non-metric features:

Feature	Medial Met. Clavicle Flaring				Sacral Angle				Costochondral Flaring			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Sacral Angle	165	0.239	0.625	0.703	-	-	-	-	-	-	-	-
Costo-chondral Flaring	235	0.140	0.708	0.711	160	1.163	0.281	0.302	-	-	-	-
Sternal Angle	104	0.557	x	0.482	84	0.010	x	1.000	101	0.944	x	0.389

Legend - N = number of valid cases; χ^2 = Pearson Chi Square value; p = Significance (asymptotic two-tailed); F = Fisher's exact test (two-tailed); Met. = metaphyseal; "-" = repeated values; x = expected value too small for Chi-squared.
Note – Significant values in bold and red writing.

4.4 – Clavicle Radiographs

Of the 10 clavicles radiographed (Section 3.2.3), one (MB11S307) was found not to meet inclusion criteria and was excluded from further consideration, as the lesions visible on the medial clavicle were not related to rickets. Four had potentially rachitic changes to the medial clavicle (Table 4.8). Of the four individuals with radiographic rachitic changes, MB11S345 and MB11S460 are potential cases of active rickets, and MB11S345 and MB11S549 are potential cases of healed rickets. The observed features are summarized in *Table 4.8.* Generalized osteopenia was noted when there was a decrease in density of the trabecular bone.

Table 4.8– Results of clavicle radiographs:

Individual Number	Age	Sex	GP Score	Side	Trabeculae		Cortical Bone				Evaluation			
					Normal	Coarse	Normal	Thin	Thickened/ Buttressed	Clearly defined	Generalized Osteopenia	Normal	Healed	Active
MB11S060	18-25	F	3	L	**P**	A	**P**	A	A	**P**	**P**	Y		
MB11S226	26-35	M	-	L	**P**	A	**P**	**P**	A	A	A	Y		
MB11S238	18-25	M	0	L	**P**	**P**	A	**P**	A	A	A		Y	
MB11S275	15 ± 1 yr.	U	1	R	**P**	A	A	A	**P**	A	A	Y		
MB11S345	28	F	-	R	A	**P**	A	**P**	A	**P**	**P**			Y
MB11S441	23	F	0	R	**P**	A	**P**	A	A	**P**	A	Y		
MB11S452	18-25	F	0	L	**P**	**P**	**P**	A	A	**P**	A	Y		
MB11S460	16.5 ± 36 mo.	U	0	L	A	A	A	**P**	A	**P**	**P**			Y
MB11S540	20	U	0	R	A	A	A	A	**P**	A	A		Y	

Legend – P=Present; A=Absent; "-" = Not measurable; M = male; F = female; U = unknown sex; yr, = year; mo. = months; GP = metaphyseal growth plate porosity.
Note – Features observed as "Present" are bold and in red.

The radiographs for individual MB11S238 show coarse trabeculae bordered by normal trabeculae at the medial end, as well as thin cortical bone throughout (*Figure 4.2)*. The combination of coarse and normal trabeculae as well as thin cortical bone indicates this individual likely recovered from a previous episode of rickets. While the radiographic changes observed in MB11S238 are not as clearly visible as the rachitic changes observed in radiographs of faster growing long bones such as the femur or tibia (see Figures in Schattmann et al., 2016: 71), the changes are observed in both the cranial-caudal view and the anterior-posterior view.

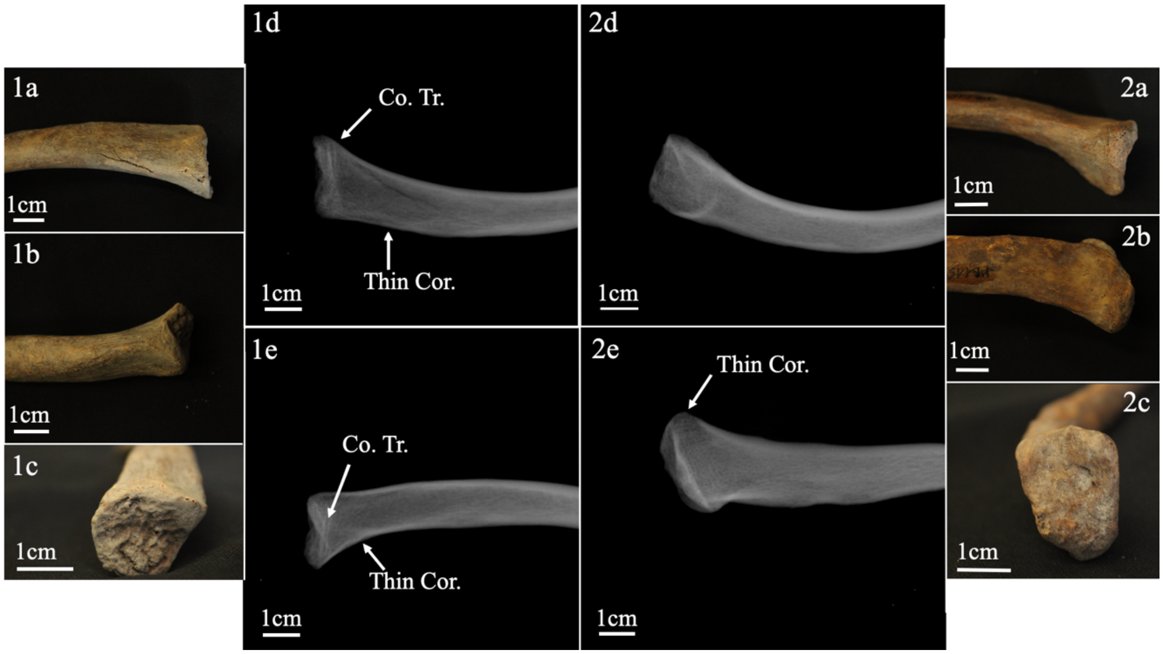

Figure 4.2 –Photographs and radiographs of the left clavicle of MB11S238 (1a-e) and of the left clavicle of MB11S226 (2a-e). Figures a and d show the cranial caudal aspect, b and e show anterior posterior aspect and c shows the medial end. MB11S226 is not rachitic. Tr. = Trabecular bone; Cor. = Cortical bone.

The radiographs for individuals MB11S345 and MB11S460 show that both of these individuals have thin but clearly defined cortical bone (Figures 4.3 – 1d,e and 4.4 – 1d,e). MB11S345 has coarse trabecular bone at the medial aspect of the clavicle (Figure 4.3 – 1d), MB11S460 has osteopenia at the medial aspect of the clavicle (Figure 4.4 – 1e), and a MB11S345 has generalized osteopenia throughout the bone (Figure 4.3 – 1e). The bone loss visible at the medial end of MB11S460 is pathological and not due to post-mortem damage, as can be seen in *Figure 4.4-1b*.

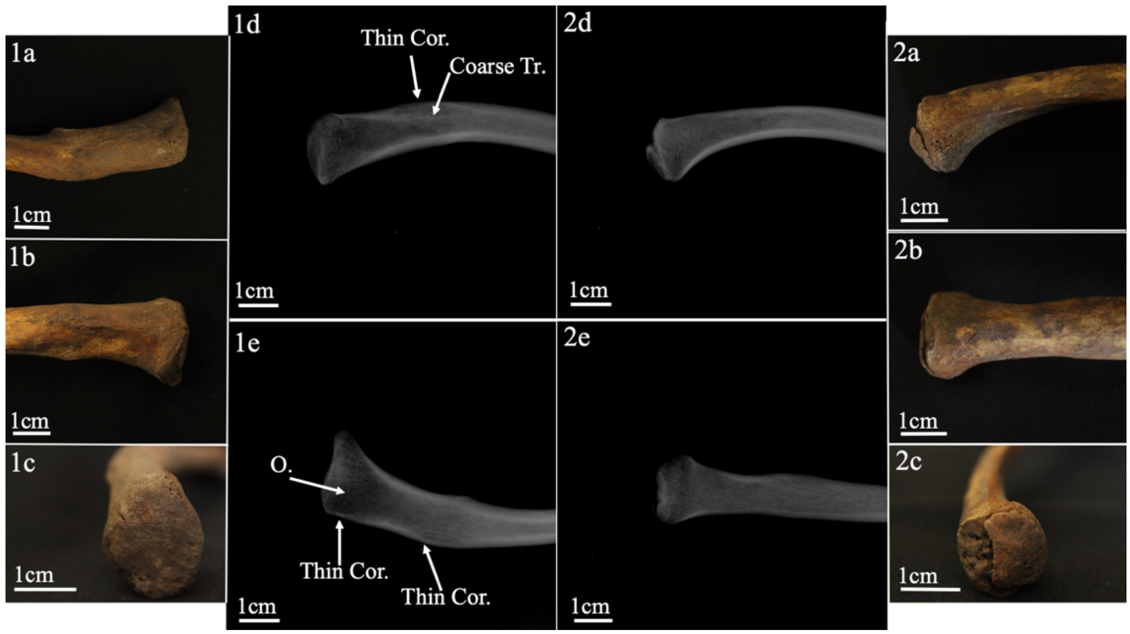

Figure 4.3 –Photographs and radiographs of the right clavicle of MB11S345 (1a-e) and the right clavicle of MB11S441 (2a-e). Figures a and d show the cranial caudal aspect, b and e show the anterior posterior aspect and c shows medial end. MB11S441 is not rachitic. Tr. = Trabecular bone; Cor. = Cortical bone; O. = osteopenia.

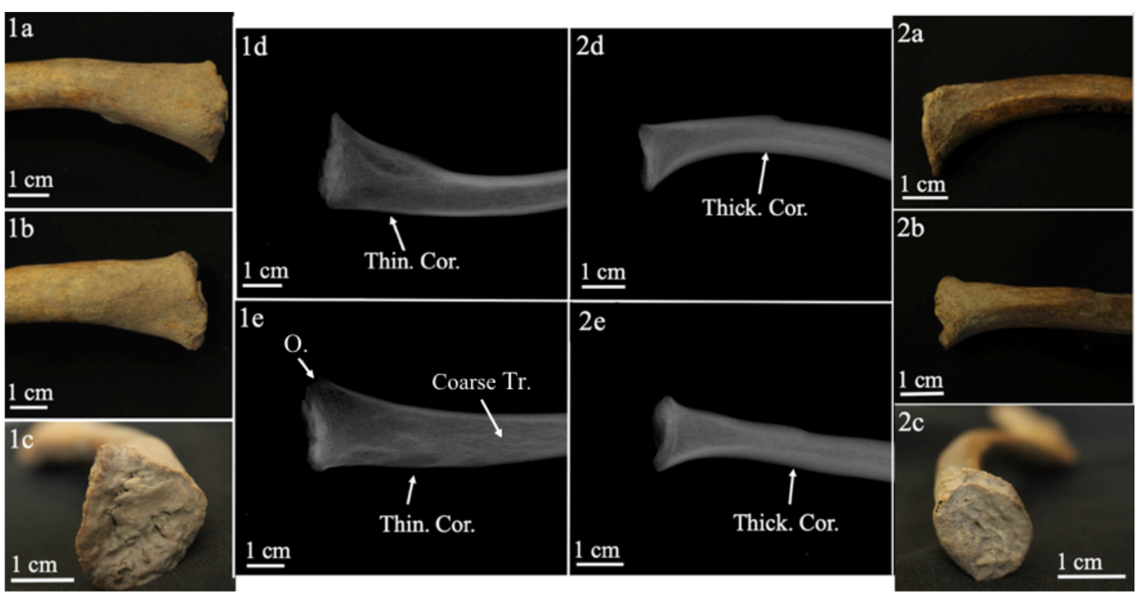

Figure 4.4 – Photographs and radiographs of the left clavicle of MB11S460 (1a-e) and of the left clavicle of MB11S275 (2a-e). Figures a and d show the cranial caudal aspect, b and e show the anterior posterior aspect, and c shows the medial end. MB11S226 is not rachitic. Tr. = Trabecular bone; Cor. = Cortical bone; O. = osteopenia.

The radiographs for individual MB11S540 shows thickened cortical bone throughout the clavicle (Figure 4.5-1d-e). The trabeculae throughout this bone is not coarse, however, the cortical bone is buttressed.

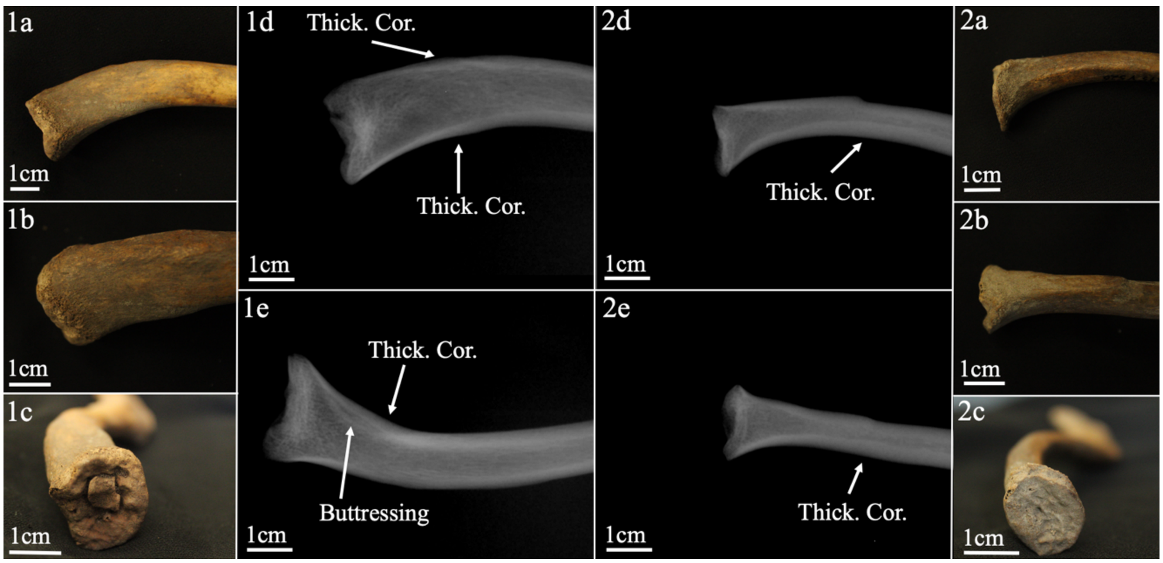

Figure 4.5 –Photographs and radiographs of the right clavicle of MB11S540 (1a-e) and the left clavicle of MB11S275 (2a-e). Figures a and d show the cranial caudal aspect, b and e show the anterior posterior aspect, c shows the medial growth plate. Legend: Cor. = Cortical bone.

4.5 - Metric Measurements and Z-scores of Residual Adolescent Rickets Shape Changes

The total counts of each measurement, and the total count of individuals with calculated z-scores are available in *Table 4.9*. As the adolescents of known age and sex were included in the unknown sex category for the z-score calculations (Section 3.4.2), they were also included in the unknown sex category for the total z-score counts (Table 4.9). The known adolescents were only included in the female or male categories for the total measurement counts (Table 4.9). In the case of ribs, the first number presented is the number of individuals included followed by the number of sternal rib ends (Table

4.9). Each rib end was considered a separate data point in the calculation of z-scores. While some individuals had more than one rib, the rib z-scores were calculated as individual data points in order to properly calculate the range in variation in rib dimensions. All of the raw measurements and z-scores are located in Appendices: femur measurements and z-scores in *Appendix B*, ulna measurements and z-scores in *Appendix C*, the clavicle measurements and z-scores in *Appendix D*, the sacrum measurements and z-scores in *Appendix F*, the sternum measurements and z-scores in *Appendix G*, the measurements and z-scores for the sternal rib ends from *Appendix H-L*.

Table 4.9- Sample sizes for each measurement taken and for each z-score calculated:

Element	Female		Male		Unknown Sex	
	Measurement Count	Z -Score Count	Measurement Count	Z -Score Count	Measurement Count	Z -Score Count
L. A-LDFA	62	62	95	95	3	-
R. A-LDFA	64	64	85	85	4	-
L. ulna min. circ	92	87	116	115	18	-
R. ulna min. circ	89	86	106	106	16	-
L. ulna circ 20mm	89	89	111	111	4	-
R. ulna circ 20mm	79	79	98	98	4	-
L. ulna length	65	-	77	-	1	-
R. ulna length	64	-	79	-	2	-
L. ulna ratio	60	60	72	72	1	-
R. ulna ratio	59	59	71	71	2	-
L. clav. length	54	-	61	-	2	-
R. clav. length	47	-	63	-	2	-
L. clav. diameter	64	61	78	78	19	-
R. clav. diameter	59	54	73	72	17	-
L. clav. ratio	47	47	49	49	2	-
R. clav. ratio	31	31	45	45	1	-
Sacrum	42	41	50	50	8	-
L. rib 1 ratio	55	51	65	63	13	-
R. rib 1 ratio	48	44	75	74	14	-
L. ribs 2-3 ratio	17/22	-	14/16	-	5/8	-
R. ribs 2-3 ratio	22/31	-	16/19	-	6/9	-
L. ribs 4-8 ratio	44/109	38/95	57/120	57/120	16/36	18/37
R. ribs 4-8 ratio	44/108	40/98	47/93	47/93	13/33	13/30
L. ribs 9-10 ratio	22/27	-	23/26	-	3/4	-
R. ribs 9-10 ratio	19/25	-	17/19	-	6/8	-
L. ribs 11-12 ratio	36/45	32/41	42/50	42/50	5/6	-
R. ribs 11-12 ratio	37/45	34/42	37/46	37/46	7/10	-

Legend: L=left; R=right; A- LDFA = Anatomical Lateral Distal Femoral Angle; circ=circumference; clav. = clavicle; unassoc.=unassociated; "-" = not calculated.

4.5.1 – Exploring the Relationship Between the Non-Metric Skeletal Indicators and the Z-Scores

Chi-squared and Fisher's exact tests were run to explore the relationship between the non-metric features and the metric measurements. The Chi-squared and Fisher's exact tests examining the relationship between the non-metric features found an association between distal femur widening and costochondral flaring, distal ulna metaphyseal angulation and visibly angled sacra, distal ulna widening and medial clavicle flaring, and costochondral flaring (Tables 4.7a and b). Shape changes at the distal ulna were found to be associated with sacral angulation and clavicle flaring, and as such, measurements quantifying these shape changes were selected for use in identifying adolescent rickets in archaeological samples.

4.5.1.1 – Pearson's Chi-Squared and Fisher's Exact Tests

To explore which measurements best represent the shape changes being evaluated, the presence of significant z-scores was tested against the presence of non-metric skeletal indicators for adolescent rickets. The significance was calculated using Fisher's Exact tests due to sample size. The presence of significant z-scores at the minimum distal ulna circumference was significantly associated with distal ulnar metaphyseal widening (χ^2 = 7.175; p=0.027), while the ulna circumference 20mm from the end and the ulna ratio were not (Table 4.10). The ulna circumference 20mm from the end was also significantly related to distal femur metaphyseal widening (χ^2 = 16.038; p=0.002) (Table 4.10). Widening at the distal ulna metaphases was recorded in 27/289 (11%) of individuals (Table 4.2), however, significant z-scores at the minimum ulna distal circumference was only reported in 22/244 (9%) of the measured individuals.

Table 4.10 –Pearson's Chi-squared and Fisher's exact test results for the presence of significant z-scores in the distal ulna measurements and the non-metric skeletal indicators of adolescent rickets:

	Ulna Min. Circ. Sig. Z-Score				**Ulna Circ. 20mm from end**				**Ulna Ratio**			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Distal Met. Femur Widening	193	5.362	x	0.054	184	16.038	x	**0.002**	158	0.204	x	0.505
Distal Femur Angle.	225	0.002	x	1.000	215	0.732	x	0.703	178	0.102	x	1.000
Distal Met. Ulna Angle.	242	1.620	x	0.191	231	0.209	x	1.000	188	1.026	x	0.280
Distal Met. Ulna Widening	214	7.175	x	**0.017**	202	3.147	x	0.145	175	1.503	x	0.204
Medial Met. Clavicle Flaring	200	0.150	x	0.772	190	1.836	x	0.256	158	1.108	x	0.325
Costochondral Flaring	196	0.073	x	1.000	185	1.115	x	0.476	156	2.039	x	0.367
Sternal Rib Porosity	194	0.461	x	1.000	183	0.474	x	1.000	155	0.356	x	0.356

Legend – N = number of valid cases; χ^2 = Pearson Chi Square value; p = Significance (asymptotic two-tailed); F = Fisher's exact test (two-tailed) significance; min. = minimum; circ. =circumference; Angle. = Angulation; sig. = significant; met. = metaphyseal; "x" = minimum expected values too small for Chi-squared, use Fisher's Exact.
Note: significant values are bold and in red.

Both the presence of significant clavicle ratio z-scores (χ^2 = 18.690; p = 0.000) and the presence of significant medial clavicle diameter z-scores (χ^2 = 41.977; p = 0.000) were significantly associated with clavicle flaring (Table 4.11). The presence of significant z-scores at the medial clavicle diameter is also significantly associated with the presence of the macroscopic recording of distal ulna widening (χ^2 = 7.069; p = 0.015). The presence of a significant rib ratio was significantly associated with ulna widening (χ^2 = 0.334; p = 0.023), but not with costochondral flaring (χ^2 = 0.122; p = 0.689) (Table 4.11). The presence of significant sacral angle z-scores was not associated with any of the non-metric skeletal indicators for adolescent rickets.

Table 4.11 - Pearson's Chi-squared and Fisher's exact test results for the presence of significant z-scores in the distal clavicle, sacral, and rib measurements and the non-metric skeletal indicators of adolescent rickets:

	Clavicle Diam. Sig. Z-Score				**Clavicle Ratio Sig. Z-Score**				**Sacral Angle Sig. Z-Score**				**Sig. Rib Ratio**			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Distal Met. Femur Widening	137	0.275	x	0.490	100	0.463	x	1.000	84	0.239	x	1.000	168	0.439	x	1.000
Distal Femur Angle.	157	0.016	x	1.000	113	0.004	x	1.000	89	0.001	x	1.000	177	0.167	x	1.000
Distal Met. Ulna Angle.	156	1.020	x	0.393	112	5.234	x	0.055	87	0.401	x	0.456	175	0.000	x	1.000
Distal Met. Ulna Widening	137	7.069	x	**0.015**	97	3.556	x	0.080	77	1.707	x	0.334	169	5.988	x	**0.023**
Medial Met. Clavicle Flaring	168	41.977	**0.000**	**0.000**	119	18.690	x	**0.000**	77	0.072	x	1.000	195	0.160	0.689	0.837
Costochondral Flaring	153	1.216	x	0.279	113	0.377	x	0.625	79	2.845	x	0.122	213	3.135	0.077	0.106
Sternal Rib Porosity	152	0.739	x	1.000	113	0.220	x	1.000	79	0.410	x	1.000	212	0.064	x	0.731

Legend – N = number of valid cases; χ^2 = Pearson Chi Square value; p = Significance (asymptotic two-tailed); F = Fisher's exact test (two-tailed) significance; min. = minimum; circ. =circumference; Angle. = Angulation; sig. = significant; met. = metaphyseal; "x" = minimum expected values too small for Chi-squared.
Note: significant values are bold and in red.

The association between the presence of significant z-scores at the ulna minimum circumference, the clavicle diameter, the clavicle ratio, and the sacral angle, were tested against each other. Only the presence of significant z-scores at the clavicle diameter was significantly associated with the presence of significant z-scores at the clavicle ratio (p=0.000) (Table 4.12).

Table 4.12 – Pearson Chi-squared and Fisher's exact test results for the presence of significant z-scores:

	Ulna Min. Circ.				**Clav. Diam.**				**Clav. Ratio**				**Sacral Angle**			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Clav. Diam.	153	3.697	x	0.076	-	-	-	-	-	-	-	-	-	-	-	-
Clav. Ratio	110	1.291	x	0.254	120	61.467	x	**0.000**	-	-	-	-	-	-	-	-
Sacral Angle	85	1.038	x	0.290	66	0.043	x	1.000	47	0.035	x	1.000	-	-	-	-

Legend - N = number of valid cases; χ^2 = Pearson Chi Square value; p = Significance (asymptotic two-tailed); F = Fisher's exact test (two-tailed) significance; min. = minimum; circ. =circumference; clav. = clavicle; sig. = significant; met. = metaphyseal; "x" = minimum expected values too small for Chi-squared, "-" = not possible.
Notes: Significant values are bold and in red.

4.5.1.2 – Pearson Correlation Coefficient

The Pearson's Correlation Coefficient test results show that all of the measurements determined to be useful in the quantification of non-metric rachitic shape changes were significantly correlated with one another except for the sacral angle measurement (Table 4.13). The right and left minimum distal ulna circumference were significantly related to each other, (p=0.000), as were the right and left clavicle ratio (p=0.000) (Table 4.13). The clavicle ratio is significantly negatively correlated with the distal ulna minimum circumference, with the left ulna minimum distal circumference being significantly negatively correlated with the left clavicle ratio (p = 0.002) and the right clavicle ratio (p = 0.003), while the right distal ulna minimum circumference is significantly negatively correlated to both the left and right clavicle ratio with a significance of p = 0.000 (Table 4.13). The negative correlation indicates that while the minimum distal ulna circumference becomes larger, the clavicle ratio becomes smaller. Due to the fact that the clavicle ratio is calculated by dividing the clavicle length by the medial clavicle diameter, the larger the medial clavicle diameter is, the smaller the clavicle ratio is. Thus, the Pearson Correlation Coefficient test shows that larger distal ulna circumferences are significantly related to larger clavicle ratios. The sacral angle was only associated with the right distal ulna minimum circumference (p=0.025) (Table 4.13).

Table 4.13 - Pearson Correlation Results using raw measurements:

		L. Ulna Min. Distal Circ.	R. Ulna Min. Distal Circ.	L. Clavicle Ratio	R. Clavicle Ratio
R. Ulna Min. distal circ.	r	**.912**[**]	-	-	-
	p	**0.000**	-	-	-
	N	**165**	-	-	-
L. Clavicle Ratio	r	**-.340**[**]	**-.424**[**]	-	-
	p	**0.002**	**0.000**	-	-
	N	**79**	**75**	-	-
R. Clavicle Ratio	R	**-.367**[**]	**-.458**[**]	**.828**[**]	-
	p	**0.003**	**0.000**	**0.000**	-
	N	**63**	**58**	**53**	-
Sacral Angle	r	0.209	**.256**[*]	-0.178	0.126
	p	0.058	**0.025**	0.253	0.493
	N	83	**77**	43	32

*Legend: L. = Left; R. = Right; min. = minimum; circ. = circumference; r = Pearson Correlation; p = Two tailed significance; N = Number of individuals included; * = significant to the p=0.05 level; ** = significant to the p=0.01 level; "-" = repeated values.*
Note: significant values are bold and in red.

4.5.2 – Significant Z-scores

Significant z-scores for the minimum ulna circumference, clavicle ratio, and sacral angle are set out in *Table 4.14*. The clavicle ratio was selected in lieu of the clavicle diameter as it accounts for body size. The summary of the number of individuals with significant z-scores in the measurements not used further in this research, and the tables including all of the individuals with significant z-scores in these measurements are located in *Appendix M.* The clavicle ratio was the most frequently statistically significantly different measurement with 12/120 (10%) of individuals measured having statistically significantly wider medial clavicles (Table 4.10).

Table 4.14 – Significant Z-scores for the distal ulna minimum circumference, clavicle ratio, and sacral angle:

Individual Number	Sex	Age	Distal Ulna Minimum Circ. Sig. Z-Score		Clavicle Ratio Sig. Z-Score		Sacral Angle Sig. Z-Score
			L	R	L	R	
KER15S012	F	36-49	-0.2	0.0	-	-	**1.5**
KER15S029	M	36-49	0.8	0.6	**-1.9**	-	-
KER15S044	M	36-49	**1.5**	1.3	-	-	-
MB11S059	M	36-49	**1.9**	-	1.0	-	0.2
MB11S060	F	18-25	1.4	**2.5**	-	-	1.0
KER15S064	M	36-49	-	0.6	-	**-1.6**	-
MB11S084	F	18+	**2.0**	**1.7**	-	-	0.6
KER15S090	F	50+	-	-0.7	**-2.0**	-	**3.2**
MB11S093	M	50+	1.1	**1.5**	-	-	-
MB11S100	M	18+	**1.9**	1.3	-	-	-
MB11S107	F	18-25	**2.8**	**3.1**	-	-	-
MB11S149	F	26-35	**2.2**	1.4	-	-	-0.3
KER15S151	M	36-49	-0.2	0.0	**-1.5**	-0.4	-0.2
MB11S158	M	60	**3.5**	**3.9**	-0.3	-0.5	0.7
MB11S170	F	50+	1.4	**1.7**	-0.4	-	0.8
MB11S174	F	36-49	**3.2**	-	-	-	-0.3
MB11S186	M	36-49	1.0	**1.5**	0.8	-	**2.4**
MB11S194	M	50+	0.6	-	0.7	**1.5**	**3.6**
MB11S216	F	36-49	0.5	1.1	-	-	**1.9**
MB11S233	M	18+	**1.6**	-	-1.4	0.4	0.2
MB11S236	M	24	**1.6**	0.8	-	-	-0.6
MB11S240	M	36-49	0.8	0.5	-0.6	0.3	**3.5**
MB11S249	M	26-35	-	**1.5**	-	-	-
MB11S285	M	71	**2.7**	**3.9**	-1.4	**-1.7**	-0.5
MB11S310	M	35	**1.6**	-	-	-	-
MB11S324	M	36-49	0.8	0.0	**-1.5**	**-2.0**	-0.1
MB11S337	M	68	**1.6**	-1.5	-	-	-1.0
MB11S341	M	50+	**1.9**	1.3	-	-	-
MB11S347	M	50+	**3.2**	**3.3**	0.6	0.6	-
MB11S368	M	26-35	0.0	-	**-2.2**	**-2.4**	-0.5
MB11S369	F	30	-0.6	-0.4	**-1.6**	-0.9	-
MB11S371	M	36-49	1.4	1.0	**-1.9**	-	0.0
MB11S375	M	74	0.6	1.3	-1.2	**-1.6**	-0.2
MB11S401	F	26-35	-0.6	-1.1	**-1.8**	-	0.7
MB11S457	F	50+	**1.7**	1.4	-	**-2.8**	-
MB11S476	F	31	0.0	**3.4**	-1.3	-0.9	**1.6**
Total Significant			22/244 (9%)		12/120 (10%)		7/91 (7.7%)

Legend – L = left; R = right; M = male; F = female; circ. = circumference; sig. = significant; "-" = Missing/damaged.
Note – Significant z-scores are bold and red.

4.6 – Porotic Lesions

Porotic lesions at the distal growth plates for the femur and ulna and medial growth plate of the clavicle are present in a total of 17/69 (24.6%) individuals. It was most frequently observed at the medial clavicle growth plate and present in 15/59 (25%) of cases (Table 4.15). Of the 17 individuals with growth plate porosity, four (23.5%) were between the ages of nine and 12, five (29.4%) between the ages of 13-17, seven (41.2%) between the ages of 18-25, and one between the ages of 26-35 (Table 4.15). All of the individuals with porotic lesions at the distal femur and ulna growth plates were younger than 14 ± 1.5 years (Table 4.15). Sternal rib end porosity was observed in 22/264 (8%) of individuals. The majority of the individuals with sternal rib end porosity were subadults, with eight of the 22 (36%) being between the ages of 9-13, and six of the 22 (27%) between the ages of 13-17. Sternal rib end porosity was also observed in older individuals, with six of the 22 (27%) individuals with sternal rib porosity being aged between 18-25, and two of the 22 (9%) being aged between 26-35 (Table 4.15).

Table 4.15 –Growth plate porosity for the distal femur, distal ulna, and medial clavicle and porosity at the sternal rib ends:

Individual Number	Sex	Age	Distal Femur Met. Growth Plate		Distal Ulna Met. Growth Plate		Medial Clav. Met. Growth Plate		Sternal Rib Porosity
			L	R	L	R	L	R	
HT15S126	U	8.5 ± 1.5 yrs.	**4**	**4**	0	0	**2**	**2**	**P**
KER15S018	M	18-25	-	-	-	-	**2**	**2**	A
KER15S031	U	17 ± 1 yr.	-	-	-	2	-	-	**P**
KER15S053	U	15 ± 1 yr.	0	0	-	3	-	-	**P**
KER15S060	U	10 ± 1 yr.	0	-	**3**	**3**	1	1	-
KER15S093	F	26-35	-	-	-	-	-	-	**P**
KER15S099	F	18-25	-	-	-	-	**2**	**2**	A
KER15S103	M	18-25	0	-	0	0	**2**	**2**	A
KER15S119a	U	12 ± 1 yr.	-	-	-	-	**2**	**2**	A

Note: Porosity reported here is scored as 2 or above see the Section 3.2.2.1. Legend – yr./yrs. = year/years; L = left; R = right; P = present; A = absent; - = not present/not possible. Bilateral growth plate porosity scores higher than two and the presence of sternal rib end porosity are bold and red. Table continued…

Table 4.15 – continued…

Individual Number	Sex	Age	Distal Femur Met. Growth Plate		Distal Ulna Met. Growth Plate		Medial Clav. Met. Growth Plate		Sternal Rib Porosity
			L	R	L	R	L	R	
KER15S119b	U	14 ± 1 yr.	0	0	1	-	**2**	**2**	-
KER15S120	F	18-25	-	-	-	-	**2**	**2**	A
KER15S127	U	9 ± 1 yr.	0	0	0	0	**2**	**2**	**P**
KER15S130	M	18-25	-	-	-	-	**2**	**2**	A
KER15S136	U	13 ± 2 yrs.	-	1	1	-	-	1	**P**
KER15S150	U	14 ± 1.5 yrs.	**2**	**3**	**2**	**2**	1	1	A
MB11S044	U	12 ± 12 mo.	0	0	0	-	0	0	**P**
MB11S060	F	18-25	-	-	-	-	**3**	**2**	-
MB11S149	F	26-35	-	-	-	-	**2**	**2**	A
MB11S167	F	12	0	0	0	-	**2**	**2**	**P**
MB11S180	M	18-25	-	-	-	-	0	0	**P**
MB11S206	U	13-17	1	1	-	-	-	-	**P**
MB11S229	U	13-17	**2**	**2**	**2**	**2**	**2**	**3**	A
MB11S239	M	23	-	-	-	-	0	0	**P**
MB11S282	U	12 ± 12 mo.	-	0	0	-	-	-	**P**
MB11S286	F	10	0	0	0	0	0	0	**P**
MB11S290	M	18-25	-	-	-	-	**2**	**2**	A
MB11S307	U	13-17	-	-	-	-	0	0	**P**
MB11S334	F	9	0	0	0	-	0	0	**P**
MB11S340	U	19	0	0	0	0	0	0	**P**
MB11S345	F	28	-	-	-	-	-	-	**P**
MB11S379	M	18-25	-	-	-	-	0	0	**P**
MB11S446	U	22	0	0	0	0	0	0	**P**
MB11S471	F	9	0	0	0	0	0	0	**P**
MB11S522	F	13	0	0	-	1	**2**	**2**	**P**
MB11S540	U	20	-	2	2	-	0	0	**P**
Total			3/34 (9%)		3/34 (9%)		15/59 (25%)		22/264 (8.3%)

Note: Porosity reported here is scored as 2 or above see the Section 3.2.2.1. Legend – yr./yrs. = year/years; L = left; R = right; P = present; A = absent; - = not present/not possible. Bilateral growth plate porosity scores higher than two and the presence of sternal rib end porosity are bold and red.

The relationship between costochondral flaring and distal femur metaphyseal widening and the presence of growth plate porosity at the distal femur and ulna and the medial clavicle and porotic lesions at the sternal rib ends were explored using Chi-squared analysis and Fisher's exact tests. The significance was calculated using Fisher's Exact tests due to sample size. Z-scores were not assessed in relation to porotic lesions, as z-scores were not calculated for subadult individuals. The Chi-squared and Fisher's exact test results for the association between the non-metric shape changes not considered further in this research and porotic lesions are located in *Appendix M.* Growth plate porosity at the distal femur, ulna, or clavicle are not significantly associated with any of the non-metric skeletal indicators of adolescent rickets (Table 4.16). Costochondral flaring was found to be significantly related to sternal rib end porosity ($\chi^2 = 53.195$; p = 0.000) (Table 4.16).

Table 4.16 - Pearson Chi-squared and Fisher's exact test results for the association between porotic lesions with the non-metric skeletal indicators for adolescent rickets:

Feature	Distal Femur Growth Plate Porosity				Distal Ulna Growth Plate Porosity				Medial Clavicle Growth Plate Porosity				Sternal Rib End Porosity			
	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F	N	χ^2	p	F
Distal Met. Femur Widening	29	5.729	x	0.068	28	0.549	x	0.459	48	0.670	x	0.587	202	9.132	x	**0.015**
Costo-chondral Flaring	27	0.077	x	1.000	30	0.039	x	1.000	53	0.010	0.922	1.000	264	53.195	x	**0.000**

Legend – N = number of valid cases; χ^2 = Chi-squared value*; p = Asymptotic Significance; F = Fisher's exact test (two-tailed) significance; Met. = metaphyseal; "-" = not possible due to insufficient sample size; x = expected value too small for Chi-squared.*
Note: both the Chi-squared asymptotic significance and Fisher's exact test significance are two-tailed.

The presence of porotic lesions at the distal femur and ulna and medial clavicle growth plates were tested against each other. Only porotic lesions on the distal femur and ulna growth plates were significantly associated with each other (p=0.027) (Table 4.17). Porotic lesions on the medial clavicle growth plate were not significantly associated with porotic lesions at the distal femur and ulna growth plates.

Table 4.17 –Pearson Chi-squared and Fisher's exact test results exploring the relationship between porotic lesions:

		Distal Femur GP Porosity	Distal Ulna GP Porosity	Medial GP Clavicle Porosity
Distal Ulna Growth Plate Porosity	Sample Size	26	-	-
	χ^2	10.097	-	-
	p	x	-	-
	Fisher's Exact sig.	**0.027**	-	-
Medial Clavicle Growth Plate Porosity	Sample Size	25	30	-
	χ^2	2.528	0.186	-
	p	x	x	-
	Fisher's Exact sig.	0.180	1.000	-
Sternal Rib Porosity	Sample Size	27	30	52
	χ^2	0.675	2.143	0.000
	p	x	x	x
	Fisher's Exact	0.569	0.483	1.000

Legend – "x" = expected values too small for Chi-squared; χ^2 = chi-squared value; p = significance (chi-squared); sig. = significance (two-tailed); "-" = not possible; GP = growth plate. Note – Significant values are bold and red.

4.7 – Summary

The results of the micro-CT analysis suggest one out of the 69 individuals sampled were vitamin D deficient during puberty. Of the non-metric features recorded, angulation at the distal ulna metaphases is associated with sacral angulation, widening at the distal ulna metaphases is associated with flaring at the medial clavicle, and widening at the distal femur metaphases is associated with costochondral flaring. Angulation at the distal femur metaphasis and sternal angulation are not associated with the other non-metric features of adolescent rickets. Four clavicles showed potentially radiographic rachitic changes. Only the z-scores at the distal ulna minimum circumference are related to distal ulna metaphyseal widening, while both the clavicle diameter and clavicle ratio z-scores are related to flaring at the medial clavicle. The sternal rib end ratio z-scores are not associated with costochondral flaring. The distal ulna minimum circumference is associated with both the clavicle ratio and the sacral angle. Porotic lesions at the distal femur and ulna growth plates are significantly related to each other, and porotic lesions at the sternal rib ends are related to widening at the distal femur metaphases and costochondral flaring.

Chapter 5.0 – Discussion

Adolescent rickets was found to have affected individuals living in both Middenbeemster and Hattem during the 17th and 19th centuries. Males and females were affected equally, but following patterns seen in contemporary populations, rickets occurred at much lower levels in adolescents than amongst children (Al Jurayyan et al., 2012; Cesur et al., 2011). Features associated with residual adolescent rickets identified in this thesis are anterior angulation of the sacrum, widening of the distal ulna, flaring of the medial clavicle and costochondral flaring in the ribs. The use of measurements to detect shape changes removes the subjectivity in the recording of rachitic shape changes. Features used to identify cases of active adolescent rickets include porosity of the medial clavicle growth plate, distal femur and ulna growth plates, and of the sternal rib ends.

5.1 - Significant Measurements

The skeletal expression of adolescent rickets in archaeological samples has never been systematically studied or quantified and it was unknown how adolescent rickets could affect the skeleton. As the aim of this thesis was to identify and subsequently quantify skeletal changes caused by adolescent rickets in archaeological samples, potential skeletal indicators of active and residual adolescent rickets were recorded and measured throughout the skeleton. Through the calculation of z-scores, individuals who are significantly different from the rest of the skeletal sample were identified.

Of the non-metric features, angulation at the distal ulna metaphases was significantly related to macroscopic sacral angulation, and widening at the distal ulna metaphases was significantly related to flaring at the medial clavicle (Table 4.7a). Both widening at the distal ulna and angulation at the sacrum have been recorded in clinical cases of adolescent rickets (Section 2.3). As such, widening at the distal ulna, flaring at the medial clavicle, and sacral angulation were considered as potential markers for adolescent rickets in this research.

5.1.1 – Sacral Angulation

Significant anterior sacral angulation was observed in seven adult individuals from Middenbeemster and Hattem (Table 4.14). The sacral vertebrae are actively fusing throughout adolescence and require adequate levels of vitamin D to mineralize. If adequate vitamin D is not available during fusion, the vertebrae are more susceptible to mechanical pressures, causing them to bend anteriorly. When the vitamin D levels are restored, the sacrum is able to fuse, resulting in the angulation being preserved into adulthood. Angulation at the sacrum can only be evaluated in individuals with fused sacral vertebrae which is unlikely to remodel during adulthood. *Figure 5.1* shows an example of a statistically significantly angled sacrum from an individual from Hattem.

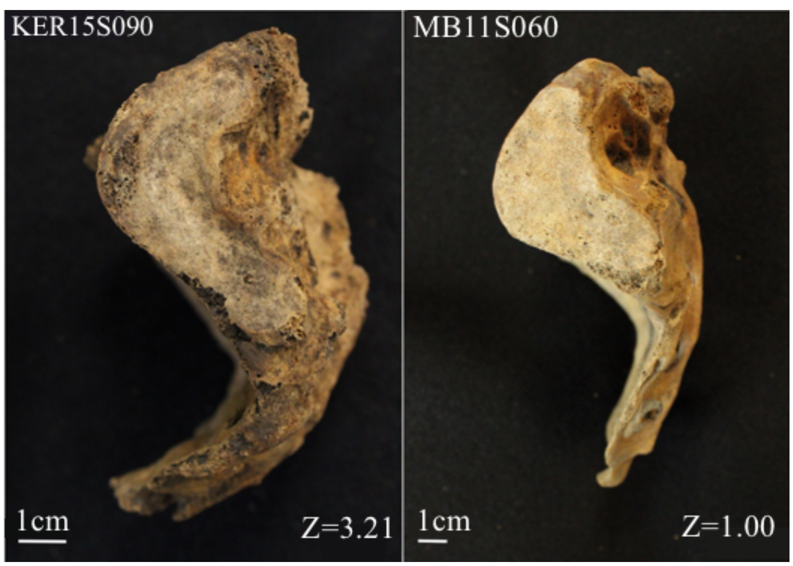

Figure 5.1- KER15S090 represents a significantly anteriorly angled sacrum. MB11S060 represents a sacrum within the normal range of variation. Both individuals are female.

Sacral angulation has been discussed by clinicians in association with obstruction of the pelvic inlet. Early descriptions of abnormally angled sacra by Maxwell and Miles (1925), Hess (1930), and Maxwell (1935) have attributed this deformation to late rickets or osteomalacia. The lack of clear terminology in the description of the cause of this lesion is the result of the poor understanding of vitamin D deficiency at the time. Maxwell and Miles (1925) in particular noticed this lesion developing in individuals aged 12-13 years, and Hess (1930) attributed sacral angulation to pubertal growth, but also observed this angulation in younger individuals. Due to the fact that the sacrum fuses during adolescence, angulation occurring during this growth period would be preserved more readily than angulation occurring in earlier childhood or infancy. Angulation between the third and fourth sacral vertebrae would be most likely to form between the ages eight and 15, and angulation between the second and third sacral vertebrae would be most likely to form between the ages 11 and 22 (Figure 3.5). While the second and third sacral vertebrae have been known to continue to fuse until age 22, angulation occurring between these vertebrae would be most likely to occur between the ages of 11 and 15, as this is when growth is most rapid (Figures 3.2 - 3.4). The longer time range for the fusion of the first and second and second and third sacral vertebrae is due to the variability in fusion timing across individuals, meaning the timing of fusion of these sacral elements is less accurate and reliable.

Both Maxwell (1935) and Hess (1930) attribute angulation of the sacrum during periods of vitamin D deficiency to posture while seated or lying down. The clinical descriptions of angled sacra become less frequent after Maxwell (1935) and are no longer described in modern cases of adolescent rickets. It is likely that most modern cases of adolescent vitamin D deficiency are recognized and treated early enough that the sacrum does not have time to become angled; however, it is also possible that clinicians simply are not evaluating the sacrum when treating adolescent rickets, causing any angulation to go unnoticed. Clinical evaluations of angled sacra have also not properly quantified the observed angulation, which would aid in the diagnosis of acutely angled sacra. This research provides a measurement that allows this angulation to be quantified in skeletal remains, thus aiding in the recognition of angled sacra in any population.

Angulation of the sacrum has also been observed in archaeological research by Molleson and Cox (1993), Wakely (1996), Brickley et al. (2005), Brickley et al. (2007), D'Ortenzio et al. (2016), Brickley et al. (2018), Mays et al. (2018), and Lockau et al. (2019), however, the angulation has not been analyzed metrically. Molleson and Cox (1993), D'Ortenzio et al. (2016), Brickley et al. (2018), and Lockau et al. (2019) are the only authors to link the formation of the sacral angulation to the fusion timing of the sacral vertebrae, and Molleson and Cox (1993) suggest that the "pull of muscle attachments can distort the normal sacral curvature" (p. 138). Molleson and Cox (1993) do not elaborate further on the mechanisms causing the rachitic bending of the sacrum, and whether they are suggesting the bending observed in the Spitalfields sample was the result of normal muscle pulling or remaining in a seated posture during a period of rickets. There are many large muscles that attach to the sacrum, so the normal pull of muscles on a weakened sacrum should not be ruled out as a mechanism for the formation of sacral angulation. Paleopathological analyses of sacral angulation have not attempted any further explanation as to the formation of sacral angulation, despite the fact that not all individuals with adolescent rickets develop an acutely angled sacrum. If the development of an anteriorly angled sacrum is caused by sitting for long periods of time, the distribution of individuals with angled sacra in a sample can be informative of lifestyle during deficiency. It is likely that posture influenced the development of angled sacra in the individuals from the Middenbeemster and Hattem collections, as not all individuals were found to have this shape change. Individuals with angled sacra at Middenbeemster and Hattem may have spent an extended period of time in a seated position while deficient in vitamin D, causing their sacrum to fold inwards.

Most paleopathological descriptions of acutely angled sacra state that they are more angled than what could be considered normal. For example, to illustrate the extent of the angulation of the sacra recovered from Spitalfields, Molleson and Cox (1993) super-imposed a diagram of an abnormally angled sacrum with examples of normally angled sacra. This is problematic, as there is no adequate description of what can be considered normal, and how angled a sacrum needs to be to be considered pathological. Brickley et al. (2005: 400) highlight this point by explaining that normal variation in sacral angulation resulting from body size and sexual dimorphism can cause pathological sacral angulation to be difficult to recognize. The angulation of the sacrum is best captured through the use of the sacral angle measurement, as this measurement removes subjectivity from the recording of shape changes and allows for pathological angulation to be distinguished from normal variation.

The measurement of the sacral angle and the use of z-scores by sex allows for normal variation of sacral curvature to be established, and for individuals with significantly abnormally angled sacra to be revealed. The usefulness of this measurement is further exemplified by the fact that some sacra were noted as being angled upon initial analysis, however, when the z-scores for the sacral angle were calculated, these sacra fell within the normal range of variation for their sex. Of the 39 individuals with macroscopically angled sacra and calculated z-scores, only six (15.4%) were actually significantly angled. One additional person (MB11S476) had a z-score significant angulation sacrum but this was not noticed macroscopically. While some of the individuals with visibly angled sacra and no possible measurements may indeed be significantly angled, the unreliability of macroscopic evaluation of sacral angulation indicate that z-scores should be used where possible to establish if a sacrum truly exhibits an abnormal angle. Individuals with marked angulation of the sacra and no possible measurements are indicated in *Table 4.6*. As they do not have associated measurements, they are not included in the total count for rickets. Sacral bending was also noted for individuals with posterior bending (flattening), however, there is no clear clinical evidence that posterior bending or flattening of the sacrum is caused by rickets in adolescence.

Acute angulation of the sacrum has been known to obstruct the birthing canal and cause significant difficulties during childbirth, sometimes resulting in the death of the mother or child or both (Hess, 1930; Maxwell and Miles, 1925; Maxwell, 1935). Besides the obstruction of the birthing canal, it is unknown to what degree sacral angulation can impact the lives of those affected. Constriction of the spinal column in sacral fracture patients has caused a loss of control of the bowels and a loss of sensation of needing to urinate (Novkov et al., 1996; Hart et al., 2004). While this is the case for individuals with sacral trauma, it is possible that with significant enough anterior sacral bending, the spinal column could become similarly constricted.

5.1.2 – Measurements and Shape changes at the distal ulna and medial clavicle metaphases and sternal rib ends

Rachitic changes to the distal ulna have been observed in many clinical studies of adolescent rickets. Maxwell (1935) described rachitic changes to the distal metaphysis of the ulna and radius occurring in a 16-year-old individual, and Hess (1930) remarked that cupping, concavity, or spreading of the distal ulna metaphysis in association with vitamin D deficiency occurred sometimes weeks before any rachitic changes began to appear on the radius. Hess (1930) found that when compared to the radius, the ulna showed rachitic changes several weeks earlier than the distal radius. Snapper (1943) also observed delayed fusion of the distal ulna, and cupping of the distal ulnar metaphysis in radiographs from two 16-year-old females with vitamin D deficiency.

Today, wrist radiographs of living individuals have been suggested as a screening method for rickets. The distal ulna fuses at approximately age 17 in females and 19 in males (Flecker 1932), which is older than when shape changes resulting from adolescent rickets would be most likely to occur (ages 10-15). Agarwal and Gulati (2009) observed rachitic changes at the distal ulna in 100% (51/51) of the individuals aged 10-13 with adolescent rickets as determined by blood serum levels. Agarwal and Gulati (2009) also found that the ulna was the last rachitic feature to resolve once the affected individual attained normal levels of vitamin D. Furthermore, Cesur et al. (2011) reported that while older children and adolescents with clinical rickets did not show many physical changes, 20/90 (22%) of the individuals aged 12 to 15 with rickets had visible macroscopic widening of the hand and the wrist.

Yet, not all researchers believe the distal ulna to be a useful place to observe adolescent rickets. Hunter et al. (1984) state that fusion during adolescence would prevent rachitic changes to the distal ulna from forming, resulting in the distal ulna being deemed a less useful marker for adolescent rickets, however, they still observed rachitic changes in the wrist of a 14-year-old female. Hunter et al.'s (1984) article explores radiographic methods for examining adolescent rickets in individuals who have already begun epiphyseal fusion of the long bones by comparing the diagnostic strength of the iliac crest and the distal ulna. Rachitic changes that can occur at the iliac crest are a widening of the growth plate as well as fraying of the metaphysis underlying the growth plate (Hunter et al. (1984).

Lesions and morphological changes at the distal ulna have been described in cases of rickets paleopathologically, however, they have primarily been associated with rickets occurring in infancy and childhood, not rickets in adolescence. Mays et al. (2006) have described metaphyseal flaring of the ulna in infants and young children, and state that the ulna was the long bone that most often showed rachitic deformities. Despite the lack of archaeological evidence in previous research, the clinical findings suggest that the distal ulna is a useful region to consider when looking for adolescent rickets, with Agarwal and Gulati (2009) even suggesting that radiographic changes to the distal ulna should be considered as a screening tool for adolescent rickets, along with analysis of serum alkaline phosphatase levels. As such, gross osteological changes to the distal ulna in the form of widening was considered in this research as a potential indication of adolescent rickets.

Agarwal and Gulati's (2009) findings contradict those of Hunter et al. (1984), highlighting the differing opinions existing in the clinical literature concerning adolescent rickets. Clinicians often rely on the use of radiographs and macroscopic assessments of patients for the diagnosis of rachitic shape changes, while paleopathologists have the benefit of being able to work with dry bones enabling direct assessment and/or measurement of rachitic changes. By evaluating the bone directly, paleopathologists are able to see more discrete rachitic shape changes than what is visible to clinicians. The use of the minimum distal ulna circumference is preferable to the macroscopic evaluation of the shape change, as this removes subjectivity in the diagnosis of rachitic shape changes, and accounts for normal population variation.

Chi-squared analysis and Fisher's exact tests found that significant z-scores at the distal ulna minimum circumference were significantly related to distal ulna metaphyseal widening, however, the ulna circumference 20mm from the end, and the ulna ratio were not (Table 4.10). The distal ulna minimum circumference is therefore the best measurement to use to capture widening at the distal ulna. Due to the timing of the adolescent growth spurt in the distal ulna, this shape change is most likely to form between ages 10 and 13 in females and 10 and 15 in males (Figure 3.3). However, due to the extended growth period experienced by males (Figure 3.3), this shape change can occur as late as age 17. Residual changes at the distal ulna will be preserved into adulthood after the individual recovers from the period of deficiency, therefore, larger distal ulna minimum circumferences in adults may capture changes caused by residual adolescent rickets. The youngest individual to have macroscopic widening at the distal ulna was 15 ± 1 year (KER15S053; Table 4.4), however, as z-scores could only be calculated for adults, there are no subadults with significantly larger minimum distal ulna circumferences (Table 4.14). It is likely that over time, less severe widening at the distal ulna may remodel to the point where it will not be visible macroscopically or captured metrically.

Compared to the distal ulna, rachitic changes to the clavicle associated with adolescent rickets has seldom been described clinically. Hess (1930) has described a "swelling of the inner extremity of the clavicle with subluxation of the joint" (p.300), which he includes in a list of "deformities of adolescence". There is no further or more in-depth description of this lesion in Hess (1930). Snapper (1943) has also noted that one 16-year-old had a deformed clavicle accompanied by fractures on both scapulae. Snapper (1943) is not specific as to what the nature of the clavicular deformity was, or how it may have been caused. Currently there are no paleopathological consideration of shape changes to the medial clavicle metaphasis in association with adolescent rickets. The fact that the clavicle continues to grow throughout adolescence indicates that it can be affected by rickets and should be considered by both clinicians and paleopathologists.

The medial clavicle goes through several periods of rapid growth during adolescence, first at age nine, again at age 12, and a smaller increase in growth velocity at ages 14-16 (Figure 3.4). Shape changes at the medial clavicle are most likely to form when growth is most rapid, and would likely be preserved into adulthood if the individual recovers from the period of deficiency. As with the distal ulna, remodelling may result in more slight changes not being detected macroscopically or metrically. The youngest person to have a macroscopically widened medial clavicle was aged 8.5 ± 1.5 years at death (Table 4.4). No subadults were evaluated metrically, as clavicle length was only measured on fused clavicles.

The z-scores at both the clavicle diameter and clavicle ratio were found to be significantly related to medial clavicle flaring (Table 4.11). Z-scores at the clavicle diameter were also significantly related to distal ulna metaphyseal widening (Table 4.11). While only the clavicle diameter is associated with distal ulna metaphyseal widening, this may be due to the fact that there are more observances of significant medial clavicle diameter z-scores than significant clavicle ratio z-scores, as the clavicle ratio considers body size as a factor in the presence of larger medial clavicle diameters. The use of the clavicle ratio z-scores to recognize medial clavicle flaring accounts for population variation and body size and is therefore preferable to the macroscopic recording of the shape change.

Costochondral flaring has been considered indicative of rickets in both clinical and paleopathological research, however, as it is difficult to view in living patients radiographically (Hess, 1930), it is discussed in more detail in paleopathological research. Maxwell and Miles (1925) report that some individuals with vitamin D deficiency had rib pain, while Hess (1930), Snapper (1943) and Cesur et al. (2011) report costochondral flaring. Agarwal and Gulati (2009) did not report finding evidence for the involvement of ribs in older adolescents. However, Hess (1930) states that the sternal rib end was the first region to show rachitic changes, and that "late rickets", or rickets in adolescence, can result in macroscopic beading of the ribs when individuals are examined closely (p. 295-296). Costochondral flaring and porotic lesions at the sternal rib ends has been found in archaeological cases of rickets by Molleson and Cox (1993), Ortner and Mays (1998), Mays et al. (2006), Schattmann et al. (2016), Mays et al. (2018), and Lockau et al. (2019), however, these cases discuss rickets in infants and children, and do not discuss adolescent individuals. Previous research recording costochondral flaring has also not attempted to measure costochondral flaring.

The ribs continue to grow throughout adolescence, and the presence of porotic lesions at the sternal rib ends in adolescents from Middenbeemster and Hattem indicate that this region can be affected by rickets in adolescence. It is possible that due to the slower growth of adolescents compared to younger children, that this lesion forms more slowly than in younger individuals. Due to the fact that rachitic shape changes at the sternal rib ends can occur at any stage of the growth period, these cannot be used as a primary diagnostic tool for adolescent rickets, however, they can be used to further strengthen a diagnosis. More severe costochondral flaring occurring in adolescents from Middenbeemster and Hattem may have been visible to contemporary doctors through careful examination, while more slight costochondral flaring may have gone unnoticed, and would likely have not come to the attention of medical professionals.

While the rib ratio is significantly related to distal ulna metaphyseal widening, the lack of association between the rib ratio and costochondral flaring indicates that this measurement is not a good representation of costochondral flaring (Table 4.11). The rib ratio measurement may not be capturing costochondral flaring, as it is calculated by subtracting the rib diameter 15mm from the sternal rib end from the sternal rib diameter (Section 3.2.4.6). The distance of the diameter 15mm from the sternal rib end varies due to body size, which may result in inconsistencies in the measurement. The macroscopic recording of costochondral flaring should be used in lieu of calculating the rib ratios.

5.1.3 – Difficulties in the use of non-metric shape changes to identify potential cases of adolescent rickets

The recording of shape changes associated with adolescent rickets is complicated by the slower growth of adolescents compared to younger children, and the difficulties in distinguishing changes related to normal variation and pathological changes. Brickley et al. (2010), Schattmann et al. (2016), and Brickley et al. (2018) have discussed the complications involved in recognizing shape changes resulting from rickets due to the range of variation of what shape changes can be considered normal, and what can be considered pathological. Both Brickley et al. (2010) and Schattmann et al. (2016) have used side-by-side comparisons of bones to determine which shape changes could be considered pathological. As children grow more rapidly than adolescents, shape changes associated with residual childhood rickets are more marked than those associated with residual adolescent rickets, thus distinguishing normal variation from pathological shape changes becomes even more difficult for adolescent rickets.

Many of the shape changes evaluated macroscopically and metrically in this research were over-diagnosed, with many individuals being recorded as having widening of the distal ulna or flaring of the clavicle, while the associated z-scores showed that these elements were within the normal range of variation. The use of measurements and z-scores by sex in this research overcomes this complication by calculating to what degree a measurement falls within the normal range of variation for the population and sex being evaluated, and which individuals can be considered abnormal. While recording shape changes morphologically can be a useful exploratory task, measurements and z-scores should be used to identify pathological shape changes associated with residual adolescent rickets, as these changes can be more slight and difficult to distinguish from normal variation. It is therefore recommended that measurements of the sacral angle, distal ulna minimum circumference, and clavicle ratio be taken on at least 30 individuals per sex in order to discern potential cases of adolescent rickets in other populations.

5.1.4 – Establishing the measurements used to diagnose adolescent rickets

Not all individuals with significant measurements at the distal ulna and medial clavicle also have significantly angled sacra, and not all individuals with significantly angled sacra have corresponding changes to the distal ulna and medial clavicle. The lack of association between the sacral angle and significant z-scores at the minimum distal ulna circumference and clavicle ratio (Table 4.12) may be due to the fact that changes at the distal ulna can occur earlier in childhood, while changes at the medial clavicle can occur in late adolescence and early adulthood, as the clavicle does not fuse until age 29 in some individuals (Scheuer and Black, 2000: 251-252), and therefore does not always overlap with the timing of sacral fusion. Pearson Correlation Coefficient analysis found that each measurement was significantly correlated, except for the measurement of the sacral angle, which was only correlated with the right distal ulna minimum circumference (Table 4.13). The lack of association between the presence of significant z-scores at the sacral angle, and the presence of significant z-scores in the other measurements (Table 4.12) may also be a reflection of the very small number of individuals with significantly angled sacra (n=7).

The ulna circumference 20mm from the end was significantly associated with widening at the distal femur metaphases (Table 4.10). Shape changes at the distal ulna and distal femur are likely to form at the same time, due the similar timing of their growth spurts. However, as the ulna circumference 20mm from the end was found to not be associated with distal ulna metaphyseal widening, and there are no measurements considered in this research that quantify the widening of the distal femur metaphases, these changes were not considered further in the diagnosis of adolescent rickets.

Through the use of measurements and z-scores, shape changes caused by adolescent rickets can be distinguished from normal population variation, and potential cases of adolescent rickets can be identified. The presence of significant z-scores at the distal ulna minimum circumference, medial clavicle ratio, and sacral angle were used to select potential cases of healed adolescent rickets, and the presence of porotic lesions at the medial clavicle, distal femur, and distal ulna growth plates were used to identify cases of adolescent rickets in 25 individuals, who will be discussed in Section 5.4.

Due to the differences in lesion timing at the fact that widening at the distal ulna can occur in younger individuals and flaring at the medial clavicle can occur in older individuals, these shape changes must be observed together, or with the angulation of the sacrum, in order to establish that the period of deficiency occurred in adolescence. Individuals with significant z-scores at the medial clavicle and sacral angle but not the distal ulna minimum circumference may have experienced a period of adolescent rickets in middle or late adolescence, while individuals with significant z-scores at the distal ulna minimum circumference and the sacrum may have experienced a period of rickets in early or middle adolescence. If a significant minimum ulna circumference or significant sacral angle are not present, then the flaring of the medial clavicle could be linked to rickets in early adulthood.

5.1.5 – Differential diagnosis

Sacral angulation can also occur as a result of osteomalacia or fracture. Brickley et al. (2005) have reported anterior angulation of the sacrum in relation to osteomalacia. Osteomalacic changes to the sacrum are more likely to cause bending within the vertebral body (Brickley et al. 2005) rather than between the bodies, however, it is sometimes difficult to detect where bending occurred. While sacral bending due to traumatic fracture is possible, a recent literature review of pediatric trauma cases revealed that fractures to the sacrum resulting in anterior angulation of the sacrum, and dislocation of the sacral vertebrae were very rare, and required radiographic analysis and surgical intervention (Baba-Rasul et al., 2017; Džupa et al., 2005; Hart et al., 2004; Novkov et al., 1996). This level of medical intervention would not have been possible in the Netherlands from 17th to 19th centuries.

Widening of the distal ulna and flaring of the medial clavicle can also be caused by metaphyseal dysplasia (Moffatt et al., 2013; Al-Yassin et al., 2018) or metaphyseal chondrodysplasia (Lee et al., 2003). Metaphyseal dysplasia and metaphyseal chondrodysplasia are genetic disorders that affect the ends of the metaphases, causing widening and flaring of the bone, however, these diseases are uncommon (Lee et al., 2003; Moffatt et al., 2013; Al-Yassin et al., 2018). The medial clavicle diameter has also been shown to increase with age (Králik et al., 2014).

5.2 - Porotic Lesions

Bilateral porotic lesions at the growth plates were observed and recorded at the distal femur, distal ulna, and medial clavicle in 17 individuals. Porotic lesions at the growth plate have been associated with active rickets by Ortner and Mays (1998), Mays et al. (2006), Mays et al. (2009), Schattmann et al. (2016), and Lockau et al. (2019). Porotic lesions at the sternal rib ends can indicate if a deficiency is active, which is useful to understand the progression of the deficiency. Porotic lesions at the sternal rib ends can also be caused by scurvy (Schattmann, et al. 2016; Veselka et al., 2015), and are therefore not considered diagnostic of adolescent rickets on their own for the purposes of this research. Porotic lesions of the growth plates are affected by the growth rates of the long bones, resulting in a variation of growth plate porosity scores within the same individual (Table 4.15). As such, faster growing bones such as the distal femur and ulna would be first to form porotic lesions at the growth plates if the period of rickets is active when the distal epiphyses are unfused, and the resulting porotic lesions would be more severe than those in slower growing bones.

Porotic lesions at the medial clavicle growth plate have previously not been considered by paleopathologists, however, the slow growth of the clavicle make porotic lesions at this location useful in determining the timing and progression of periods of rickets. The growth rates of the medial clavicle are comparable to those at the distal femur and ulna is from age 12 to 12.99 (Figures 3.2 to 3.4). By age 13, the distal femur in females grows at a similar rate as the medial clavicle (Figures 3.2 and 3.4). The slower growth of the clavicle may result in lesions at the medial growth plate forming more slowly than porotic lesions at the distal femur and ulna. Similarly, when adequate levels of vitamin D are achieved, porotic lesions affecting the distal femur and ulna would resolve faster than those at the medial clavicle, causing the previously unmineralized osteoid to mineralize, thereby obliterating the lesion. The slower growth of the medial clavicle may result in porotic lesions resolving more slowly than porotic lesions at the distal femur and ulna. Thus, if an individual has normal growth plates at the distal femur and ulna, but has growth plate porosity at the medial clavicle, they may have recently received adequate levels of vitamin D prior to death. Considering the medial clavicle in the analysis of growth plate porosity can allow for a more fine-tuned understanding of the progression and the stage of the vitamin D deficiency being experienced by the affected individual. Porotic lesions at the medial clavicle were used to understand the timing of the period of rickets in individuals included in the osteobiographies (Sections 5.4.2 and 5.4.4).

Recording porotic lesions at the medial clavicle is also is valuable because it continues to grow throughout adolescence and into early adulthood (Scheuer and Black, 2000: 251), allowing active rickets to be identified in older individuals who have already completed epiphyseal fusion in the other long bones. *Figure 5.2* presents an example of growth plate porosity at the medial clavicle growth plate (grade two), however, the individual in question also has macro-porosity present. While the macro-porosity indicated by the white arrow may be pathological in origin, it is not linked to rickets and is not discussed further. The micro-porosity indicated by the white squares (Figure 5.2) is rachitic and linked to failure to mineralize osteoid while rickets is active.

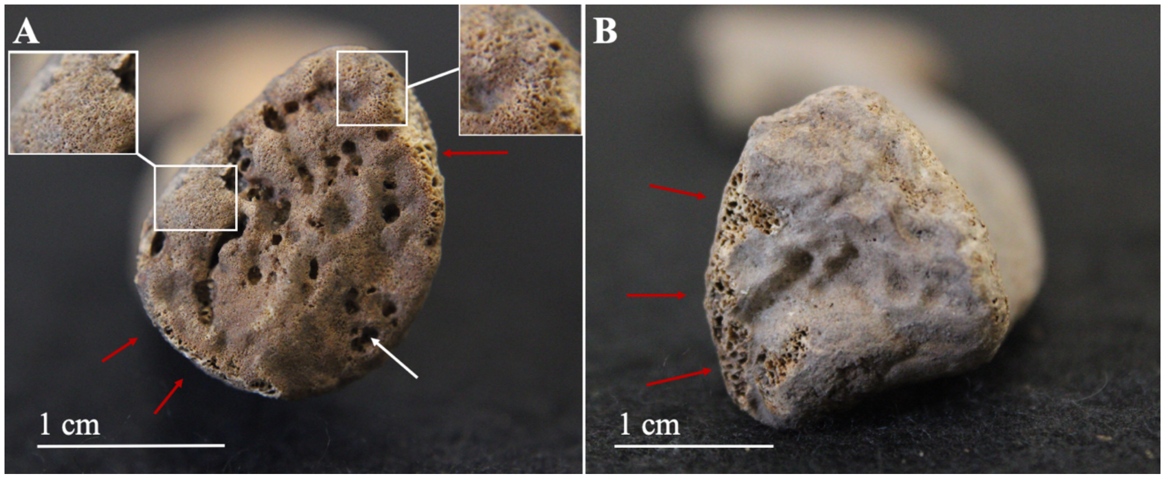

Figure 5.2 – A: Medial clavicle growth plate porosity of KER15S018. The white arrow indicates macro-porosity and the white squares indicate rachitic micro-porosity. B: Medial clavicle normal metaphyseal growth plate of MB11S540. Post-depositional damage is present in both bones and is indicated by red arrows.

While the Chi-squared and Fisher's exact test found that the presence of porotic lesions were not associated with non-metric shape changes (Table 4.16), it is likely due to the fact that the shape changes being observed form later than the porotic lesions. Growth plate porosity occurs in earlier stages of active rickets, so some individuals may not have yet developed shape changes at the time of death. Both costochondral flaring and widening at the distal femur metaphases were associated with porotic lesions at the sternal rib ends (Table 4.16). Costochondral flaring and rib porosity can occur at any age during growth and are not exclusively related to deficiency in adolescence. Both costochondral flaring and porotic lesions at the sternal rib ends would likely develop at the same time if linked to the same period of deficiency. The presence of porotic lesions were not tested against the presence of significant z-scores, as z-scores were not calculated for subadults (Table 4.9).

Lesion timing should be considered in the interpretation of Chi-squared and Fisher's exact test results, and is exemplified by the association found between porotic lesions at the distal ulna and femur ($\chi^2 = 10.097$; p=0.027) and the lack of significant association between porotic lesions at the medial clavicle and the distal femur ($\chi^2 = 2.528$;

p=0.180) and the medial clavicle and distal ulna (χ^2 = 0.186; p=1.000). Rapid growth resulting from the adolescent growth spurt takes place at the distal femur between the ages of nine and 14 (Figure 3.2) and the distal ulna between the ages of 10 and 15 (Figure 3.3). The medial clavicle experiences a peak growth spurt at age 12, and another small increase in growth between the ages of 14 and 16 (Figure 3.4). The lack of association between the presence of porotic lesions at the distal femur and ulna growth plates and the medial clavicle growth plates suggest that porotic lesions at the medial clavicle growth plate form later than those occurring at the distal femur and ulna growth plates.

5.3 - Interglobular Dentine

Several of the individuals with active growth plate porosity and micro-CT scanned molars did not have any IGD associated with the active period of deficiency. While growth plate porosity has been recognized in the paleopathological literature as being associated with rickets (Section 2.3), it has not yet been observed in association with IGD in bioarchaeological or clinical cases. Porotic lesions in clinical cases are characterized as fraying of the ends of the metaphases as viewed on radiographs (Brickley et al., 2020a: 99). More work on IGD and its association with rachitic lesions is needed.

Due to the age of individuals with adolescent rickets, it is likely that most associated IGD would be located in the root dentine formed between the ages of 10 and 16 (Brickley et al. 2020: Figure 3). IGD is less frequently observed in the roots in part due to the slower growth of root dentine, as suggested by D'Ortenzio et al. (2018) and Veselka et al. (2019). Low grade IGD was observed in the root dentine in histological slices after re-evaluation of a second molar from individual number 15A S36, an individual with residual rickets from Quebec, using the timing information set out in Brickley et al. (2020: Figure 3). The IGD observed was not reported in the D'Ortenzio et al. (2016) publication, as its slight nature led to it going unnoticed even in histological evaluation.

Previous research on the Hattem and Middenbeemster skeletal collections found rickets to be present in five out of 21 (23.8%) individuals from Hattem and nine out of 59 (15.3%) of individuals from Middenbeemster, and residual rickets in 21 out of 88 (23.9%) of individuals from Hattem and 29 out of 200 (14.5%) from Middenbeemster (Veselka and Klomp, 2019). As outlined in Section 3.3, all possible second and third molars from individuals older than nine from Hattem were sampled, and 25 individuals showing potential signs of adolescent rickets were sampled from Middenbeemster. In this research, IGD was only found in the molars of six individuals, all of whom were from Hattem. While some of the individuals with active rickets may have been too young to have been included in the sample evaluated for this thesis, there is a clear discrepancy between the macroscopic findings and the micro-CT scan results, as the high rates of rickets reported at both Hattem and Middenbeemster should be reflected in the presence of IGD.

Previous research by Veselka et al. (2019) and Colombo et al. (2019) has established that lower grade IGD is not visible on micro-CT scans, due to the lower resolution of this screening tool compared to the resolution available from histological slices. Veselka et al.'s (2019) research on Middenbeemster and Hattem found that of the 16 individuals with macroscopic evidence for rickets and first molars sampled using both micro-CT analysis and histological analysis, 13/16 (81.2%) had IGD visible the histological slices, but only 6/16 (37.5%) had IGD visible in the micro-CT scans. The molars sampled in this research were analysed using micro-CT scans rather than histological slices, so it is likely that any lower grade IGD present in the root dentine was masked by the lower resolution of the micro-CT scans used in the current study. The micro-CT scans used also did not extend along the full root of the tooth, which may have resulted in IGD occurring later in growth to not be included in the scans.

5.4 - Adolescent Rickets

Using the criteria established in Section 5.1.4 and the presence of porotic lesions at the growth plates, possible cases of adolescent rickets were diagnosed in 25 individuals from Middenbeemster and Hattem (Table 5.1). The physical expression of rickets in adolescence can be separated into active or recently resolved cases and cases of residual adolescent rickets. Active or recently resolved cases are defined by the presence of porotic lesions at the growth plates and sternal rib ends occurring during adolescence (Brickley et al., 2018). Cases of residual adolescent rickets are characterized by the presence of a combination of significant z-scores at the distal ulna minimum circumference, the clavicle ratio, and the sacral angle, and normal growth plates if the growth plates are still visible. Active and recently resolved adolescent rickets was found in 16/76 (21.1%) of adolescents, while residual adolescent rickets was found in 9/287 (3.1%) of the adults in the Middenbeemster and Hattem sample. Thus, adolescent rickets at Middenbeemster and Hattem had a total prevalence of 25/363 (6.9%) at Middenbeemster and Hattem. Previous research has identified rickets in a total of 64/368 (17.5%) individuals from Middenbeemster and Hattem (14/80 active and 50/288 residual) (Veselka and Klomp 2019). The counts of active and healed rickets from Hattem and Middenbeemster were reported separately in Veselka and Klomp (2019), however they were pooled into one group to allow them to be compared to the results presented in this thesis.

Table 5.1 - Individuals with one or more features indicative of adolescent rickets

Individual Number	Sex	Age	Micro-CT Scans		Porosity				Sig. Z-Scores			Costochondral Flaring	Age at Death and Deficiency					
			Age at Deficiency	Age Span of Scan	Distal Femur GP	Distal Ulna GP	Medial Clavicle GP	Sternal Rib	Ulna Min. Circ.	Clavicle Ratio	Sacral Angle		9-12	13-17	18-25	26-35	36-49	50+
HT15S126	U	8.5 ± 1.5 yrs.	N	2.5-8.5 ± 1.5 yrs.*	4	0	2	P	-	-	-	P	D/X					
KER15S127	U	9 ± 1 yr.	3.5	2.5-9*	0	0	2	P	-	-	-	P	D/X					
KER15S060	U	10 ± 1 yr.	N	2.5-10/11	0	3	1	-	-	-	-	-	D/X					
MB11S167	F	12	N	2.5-12	0	0	2	P	-	-	-	P	D/X					
KER15S119a	U	12 ± 1 yr.	-	-	-	-	2	A	-	-	-	A	D/X					
MB11S522	F	13	N	2.5-13	0	1	2	P	-	-	-	P		D/X				
KER15S119b	U	14 ± 1 yr.	-	-	0	1	2	-	-	-	-	-		D/X				
KER15S150	U	14 ± 1.5 yrs.	N	2.5-14*	3	2	1	A	-	-	-	P		D/X				
MB11S229	U	13-17	-	8/10-17/20	2	2	3	A	-	-	-	A		D/X				
KER15S018	M	18-25	8-11**	2.5-17/20	-	-	2	A	A	-	-	A	D		D/X			
MB11S060	F	18-25	-	-	-	-	3	-	P	-	A	-			D/X			
KER15S099	F	18-25	N	2.5 - 13	-	-	2	A	A	-	-	A			D/X			
KER15S120	F	18-25	-	-	-	-	2	A	A	-	-	A			D/X			
KER15S130	M	18-25	3-4	2.5 – 17/20	-	-	2	A	A	-	A	A			D/X			
MB11S290	M	18-25	-	8/10 – 17/20	-	-	2	A	A	-	-	P			D/X			
KER15S103	M	18-25	N	2.5 – 17/20	0	0	2	A	A	-	-	A			D/X			

*Legend – GP = Growth plate; Sig. = significant; M = male; F = female; U = unobservable; yr./yrs. = year/years; * = entire tooth included in scan; ** = repeating periods of IGD; N = none; A = absent; P = present; "-" = unobservable; D = period of deficiency; X = Death. Table continued.*

Note – The numbers in the growth plate porosity category are the scores.

Table 5.1 – continued…

Individual Number	Sex	Age	Micro-CT Scans		Porosity				Sig. Z-Scores			Costochondral Flaring	Age at Death and Deficiency					
			Age at Deficiency	Age Span of Scan	Distal Femur GP	Distal Ulna GP	Medial Clavicle GP	Sternal Rib	Ulna Min. Circ.	Clavicle Ratio	Sacral Angle		9-12	13-17	18-25	26-35	36-49	50+
MB11S476	F	31	-	-	-	-	-	A	P	A	P	A	D	D		X		
KER15S012	F	36-49	6	2.5-17/20	-	-	-	A	A	-	P	A	D	D			X	
MB11S216	F	36-49	-	-	-	-	-	A	A	-	P	P	D	D			X	
MB11S186	M	36-49	-	-	-	-	-	A	P	A	P	P	D	D			X	
MB11S240	M	36-49	-	-	-	-	-	A	A	A	P	A	D	D			X	
MB11S457	F	50+	-	-	-	-	-	A	P	P	-	A	D	D				X
MB11S194	M	50+	N	2.5-13	-	-	-	A	A	A	P	P	D	D				X
KER15S090	F	50+	-	-	-	-	-	A	A	P	P	A	D	D	D			X
MB11S285	M	71	-	-	-	-	-	A	P	P	A	A	D	D				X

*Legend – GP = Growth plate; Sig. = significant; M = male; F = female; U = unobservable; yr./yrs. = year/years; * = entire tooth included in scan; ** = repeating periods of IGD; N = none; A = absent; P = present; "-" = unobservable; D = period of deficiency; X = Death.*
Note – The numbers in the growth plate porosity category are the scores.

Adolescent rickets was found to be relatively evenly distributed between males (n=8) and females (n=10) from both Hattem and Middenbeemster. The distribution of rickets occurring in adolescence from Middenbeemster and Hattem indicate that both male and female Dutch adolescents underwent a change in activity patterns or lifestyles that resulted in them being equally susceptible to becoming deficient in vitamin D.

The lower rate of adolescent rickets compared to rickets in infants and children from Middenbeemster and Hattem indicate that while some adolescents spent less time outdoors, more individuals overall had access to sunlight. The age at which individuals were most susceptible to the development of adolescent rickets, between the ages of 10 and 15, coincides with the commencement of work among Dutch youth (Section 2.5).

Some youth may have left home for work, returning to provide portions of their earnings to their families (Section 2.5; Kok, 1997). While some of these youth may have been working indoors, their semi-emancipation from their parents meant that they had the liberty to spend more time outdoors. Those youth that did become deficient likely worked in jobs that were indoors such as manufacturing goods, the textile industry, cheese making, or working in service.

Adequate UVB would have been readily absorbable in the Netherlands throughout the summer months. Fish and eggs would have been available to individuals in the Netherlands, however, to what degree these food items were available inland or during the period of food scarcity accompanying the potato famine is unknown. Previous research found that individuals with rickets from Middenbeemster consumed fewer high-trophic level proteins, such as fish and eggs, than their non-rachitic counterparts (Waters-Rist and Hoogland, 2018). It is likely that the development of rickets is most strongly influenced by changes in social roles or acute or chronic illnesses, resulting in some individuals spending more time out of the sunlight (Brickley et al., 2014 Jones, 2018; Veselka et al., 2015). Illnesses such as Celiac disease or Crohn's disease can also result in vitamin D deficiency due to the inability to absorb calcium and vitamin D (Assiri et al., 2013; Harries et al., 1985).

The Netherlands began to industrialize much later than other Northern European countries, only experiencing an Industrial Revolution in 1860 (Drukker and Tassenaar, 1997; Mokyr, 1974, 2000). As the latest burials included in the skeletal sample from Middenbeemster were buried in 1866, and the latest burials from Hattem were buried in 1829, it is unlikely that the individuals included would have experienced the negative effects of the Industrial Revolution such as atmospheric pollution. The Netherlands did however experience several periods of famine and instability; for example, severe potato famine from 1845-1847, which resulted in a decrease in the quality of life and an increase in infectious diseases such as cholera (Bergman, 1967; Drukker and Tassenar, 1997). It is possible that in addition to the change in social roles experienced by adolescents, the increase in disease would have contributed to the development of rickets by causing individuals who became ill to remain indoors.

The prevalence of rickets in children and infants at Middenbeemster and Hattem is similar to the prevalence of rickets from St. Martins, Birmingham, where 21/164 (13%) of subadults were affected by rickets (Mays et al., 2006). Research by Brickley et al. (2007) has also reported osteomalacia in 7/143 (4.89%) individuals from St. Martins. The prevalence of osteomalacia at St. Martins is lower than the prevalence of adolescent rickets at Middenbeemster and Hattem. Atmospheric pollution and dense urban architecture were found to negatively impact the individuals from St. Martins (Mays et al., 2006; Brickley et al., 2007). Furthermore, clinical research by Agarwal et al. (2002) found atmospheric pollution to be correlated with vitamin D status. Due to the Netherland's late industrialization, individuals living in Middenbeemster and Hattem would not have suffered the negative effects of the Industrial Revolution, and instead became deficient in vitamin D as a result of working indoors or illness.

In the following sections, adolescent rickets in each age category will be discussed, and an osteobiographies will be presented to illustrate the cultural and societal effects influencing the development of adolescent rickets in the Netherlands in the 17th to 19th centuries. Due to the small sample size included in each age category, a cautious approach was taken in the interpretations of the various lifeways by which individuals may have become deficient in vitamin D during adolescence.

5.4.1 - Rickets in Early Adolescence (Ages 9 to 12 years)

Five individuals with adolescent rickets were included in this group, the youngest being aged 8.5 ± 1.5 years at death (Table 5.1). This youngest age category encompasses individuals who are beginning their pubertal growth spurt and would also have been taking on more complex jobs. Three individuals had porotic lesions exclusively at the medial clavicle growth plates (KER15S127, MB11S167, and KER15S119a), one individual had grade three porotic lesions at the distal ulna growth plate and grade one porotic lesions at the medial clavicle (KER15S060), and one individual had porotic lesions at both the distal femur and the medial clavicle growth plates (HT15S126) (Table 5.1). The growth rates of the long bones (Figures 3.2 to 3.4) were used to interpret the timing and progression of the period of rickets. The distribution of the porotic lesions at the growth plates indicate that two of the five individuals (KER15S127 and MB11S167) had received adequate levels of vitamin D shortly prior to death, as the porotic lesions were only present in the medial clavicle and sternal rib ends. The remaining three individuals were likely experiencing active cases of rickets that had not begun to resolve.

Individuals with active rickets were possibly deficient as a result of a changing job status which kept them indoors for longer periods of time. At this age, individuals were expected to work in more complicated jobs as outlined in Section 2.5. While work is likely not the only possible cause for rickets developing at this age, clothing style would not have changed significantly between childhood and puberty. Therefore, a change in job status may have been drastic enough to result in the development of rickets. Individuals with active rickets may have also become ill and became deficient in vitamin D as a result of remaining indoors.

5.4.2 - Osteobiography of Individual KER15S127

Individual KER15S127 lived in Hattem, and died at the age of nine shortly after receiving adequate levels of vitamin D following a period of rickets, indicated by the presence of porotic lesions on the growth plate of the medial clavicle, and on the sternal rib ends and the absence of porotic lesions at the distal femur and ulna (Section 5.2) (Table 5.1). KER15S127 experienced a period of vitamin D deficiency at age 3.5, as indicated by the IGD present in the second molar (Table 4.1). The period of early childhood deficiency may have been caused by cultural practices such as conservative clothing covering much of the skin, as well as the practice of keeping young children indoors due to the risk of them falling into canals, as established in previous research by Veselka et al. (2015) and Veselka et al. (2018). Individual KER15S127 also had visible costochondral flaring. While the costochondral flaring may also be a residual shape change from the earlier period of rickets, the presence of sternal rib end porosity indicates that there had been a more recent phase of rickets that could have contributed to shape change.

The sex of this individual is unknown, however both boys and girls were expected to help their families work. If this individual was male, he may have been engaged in agricultural work, or may have worked by the canals in shipping, as the transport of goods upstream along the Ijssel was an important source of income for the city of Hattem (Veselka, 2019). If this individual was female, she would likely have worked in the home, helping her mother and grandmothers care for her siblings, as well as tend to the housework. Individual number KER15S127 may also have been ill and may have been kept indoors for a period until they recovered and were able to return to the outdoors and were exposed to enough UVB to begin to heal prior to their death.

Individual KER15S127 was deficient in vitamin D as a young child, and again at the beginning of puberty. Their early childhood was likely spent indoors and out of the sunlight. While the reason for limited UVB access and resulting vitamin D deficiency is unknown, the fact that they recovered, and resumed normal mineralization prior to their untimely death indicated that they may have experienced a short term illness or worked in a seasonal job that kept them indoors for long enough to become vitamin D deficient.

5.4.3 - Rickets in Middle Adolescence (Ages 13 to 17 years)

The second group of cases of adolescent rickets includes four individuals aged 13 to 17 years at death. Throughout this time span, growth velocity is the most rapid, and fusion of the distal femur and ulna epiphyses begins. Individuals may have been taking on more complicated jobs and some may have even left home temporarily to seek employment elsewhere. Many job contracts for lasted only one year, so youth often migrated to nearby towns to seek employment, and returned home in between job placements (Kok, 1997). This is therefore a group where great changes occur, both biologically and socially.

Two individuals in this age category had active rickets at the time of death (KER15S150 and MB11S229), and two individuals may have recently recovered from rickets, as exemplified by the distribution of the porotic lesions throughout the growth plates (MB11S522 and KER15S199b). Individuals with active rickets tend to be older than the individuals with healed rickets.

5.4.4 - Osteobiography of Individual Number KER15S150

Individual number KER15S150 lived in Hattem and died at the age of 14. This individual was likely experiencing the beginning of a period of deficiency. The stage of the deficiency is exemplified by the presence of higher grade porotic lesions at the distal femur and ulna growth plates, and grade one porotic lesions at the medial clavicle growth plate (Tables 4.15 and 5.1). The distribution of severity of porotic lesions in this individual indicate that they had been deficient in vitamin D for long enough for the faster growing long bones to develop growth plate porosity, but growth plate porosity at the medial clavicle was still in its early stages, as explained in Section 5.2.

The presence of costochondral flaring but no porotic lesions at the sternal rib ends indicate that KER15S150 had possibly experienced an earlier period of vitamin D deficiency that they subsequently recovered from. The lower resolution of the micro-CT scans of the second and third molars may have prevented this previous period of deficiency from being visible in the dentine, as the age range of the scans span from 2.5 years to 14 years. Previous research on this individual did not report the presence of childhood or infantile rickets (Veselka 2018).

The sex of this individual is unknown, however, by age 14, the majority individuals in this Dutch community would have been engaged in work. If the individual was male, he would likely have worked in one of Hattem's main industries, such as agriculture or in the transportation of goods (Veselka, 2019). Similar to the case of younger individuals, the time spent working indoors, and the conservative clothing style, would have effectively prevented adequate absorption of vitamin D, causing rickets (Veselka et al., 2015; Veselka et al., 2018).

Girls not working in their parent's home may have been working as servants in the homes of others until marriage (van Nederveen Meerkerk, 2015: 21). Therefore, if this individual was female, she likely would have worked in service (Kok, 1997; van Nederveen Meerkerk, 2015: 21). Working in service would have resulted in a limited exposure to UVB in the middle of the day, when it was most readily available for dermal absorption (Holick, 1995; Holick, 2003).

Individual KER15S150 was experiencing an early stage of rickets at the time of death, thus it is possible that they experienced a recent life change that led to them spending more time indoors. While this may have been the result of a new job, this individual most likely was ill, and spent more time indoors leading to the development of vitamin D deficiency prior to death. An illness may also explain why this individual died at such an early stage in their vitamin D deficiency.

5.4.5 – Rickets in Late Adolescence (Ages 18 to 25 years)

Seven individuals with active rickets in late adolescence were identified (Table 5.1; Individual KER15S018 to Individual KER15S103). All of the individuals had porotic lesions at the medial clavicle metaphyseal growth plate, and two individuals (KER15S018 and KER15S130) had IGD present. One individual (KER15S103) had porotic lesions at the medial clavicle metaphyseal growth plates, and normal growth plates at the distal femur and ulna, indicating that he had recently recovered from a period of rickets. One individual (MB11S290) had costochondral flaring present and also had micro-CT scans taken at the second molar. It is possible that MB11S290 had experienced a period of rickets during childhood which was either not captured by the micro-CT scans, or occurred prior to age eight, which is the age at which the dentine in the third molar begins to form (Brickley et al. 2020).

The group of individuals with active rickets from ages 18-25 would have been taking on more adult social roles, and would have been working in jobs similar to the individuals aged 13-17 years, and may have also migrated to different towns in search of employment (Kok, 1997). Males in this age category were considered to be too immature to be married, however some females may have gotten married before the age of 25 years (van Poppel and Nelissen, 1999). Archival records state that the average age for marriage at Middenbeemster was 25.8 years for females and 27.5 years for males (Blom et al. *in review*).

5.4.6 – Osteobiography for Individual KER15S018

Individual number KER15S018 was a male from Hattem, and died between the ages of 18 and 25 years. This individual had IGD in both the second and third molars spanning from age three to age 11. KER15S018 experienced five episodes of rickets throughout childhood and adolescence, and died while experiencing another period of active rickets, visible as porotic lesions at the medial clavicle metaphyseal growth plate. KER15S018 did not have any accompanying shape changes associated with residual rickets, however, he also did not have a measurable sacrum or medial clavicle.

KER15S018 experienced repeated episodes of vitamin D deficiency throughout his growth, and may possibly have suffered from a chronic illness such as celiac or Crohn’s disease. Both of these illnesses would have caused him to be unable to absorb adequate levels of vitamin D or calcium, or caused excess wasting of vitamin D and calcium through diarrhea (Assiri et al., 2013; Harries et al., 1985). An illness of this nature may not have been able to be adequately treated in the 17th to 18th centuries, and may have resulted in this individual’s untimely death. KER15S018 may have also experienced seasonal vitamin D deficiency, which has been recorded in individuals from Hattem in previous (Veselka et al. 2019).

5.4.7 - Residual Adolescent Rickets in Individuals 18+ years

There are nine individuals included in the Residual Adolescent Rickets group (Table 5.1; Individual MB11S476 to Individual MB11S285). Adolescent rickets was evenly distributed between males and females in this group, suggesting that both males and females experienced a change in lifestyle resulting in an increased time spent indoors. This group of individuals survived their period of deficiency and lived into adulthood. It is likely that the changes resulting from adolescent rickets did not have a significant impact on their daily lives, due to their slight and non-specific nature.

Changes related to residual adolescent rickets were captured at the distal ulna, medial clavicle, the sacral vertebrae, and the sternal rib ends. While more slight changes would remodel over time (Section 2.1), if the shape changes associated with healed rickets is significant enough, it will likely still be evident in adulthood. Residual childhood rickets may have also been present, however, these changes were not recorded.

There is no clear pattern in lesion expression for residual adolescent rickets. Due to the timing of the fusion of the sacrum (Figure 3.5), anterior angulation of the sacrum is a strong indicator for adolescent rickets, and does not need to be observed in combination with flaring of the medial clavicle or widening of the distal ulna to be diagnostic. Other lesions associated with residual adolescent rickets develop either between the ages of nine to 12 years or 12-17 years, and affect the distal ends of the ulna, and medial ends of the clavicle, as these are the regions of the bone that are actively growing at these ages. Changes at the distal ulna and medial clavicle can occur independent of each other at different ages, however, they are observed together when a deficiency occurs during adolescence. As such, changes relating to rickets in adolescence can only be diagnostic when observed in combination with each other. To explore cases of residual adolescent rickets two osteobiographies will be used.

The discussion of individual MB11S457 explores the possible causes of shape changes at the distal ulna and medial clavicle. The second osteobiography focuses on a middle adult with a significantly bent sacrum. Angulation of the sacrum is diagnostic of adolescent rickets and can provide information on the affected individual's lifestyle, as not all individuals with rickets develop an angled sacrum (Section 5.1.1).

5.4.8 - Osteobiography of Individual Number MB11S457

Individual MB11S457 was a female who lived in Middenbeemster and lived to be older than 50 years of age. Metric analysis revealed a significantly larger minimum distal ulna circumference at the left ulna, as well as a significant clavicle ratio, and a significantly larger medial clavicle diameter at the right clavicle. Due to the timing of the peak growth period of the ulna at age 11 and of the clavicle at age 12 (Figures 3.3 and 3.4), it is possible that this person experienced a period of deficiency during this period of peak growth velocity. The distal ulna does not cease growth until ages 15-16 (Figure 3.3), and does not fuse until ages 17-18, and the clavicle can continue to grow until early adulthood, so it is possible that she experienced a period of adolescent rickets between ages 12 and 16, prior to the fusion of the ulna.

MB11S457 became deficient in vitamin D sometime between the ages of 10 and 16, as is suggested by the timing of the growth of the affected bones. It is possible that she had transitioned to a job that required her to remain indoors or would have kept her out of the sun during when UVB was most readily available for dermal absorption (Holick, 2003). The timing of the adolescent deficiency experienced by this individual coincides with the timing of work at farms on the Beemster Polder, whereby the majority of girls would commence work between the ages of nine and 14 years of age (Schenkeveld, 2008).

5.4.9 - Osteobiography for Individual Number MB11S186

Individual MB11S186 was male and died between the ages of 36 and 49 years. He would have lived in Middenbeemster prior to his death, however, whether he lived there his entire life, or migrated to Middenbeemster later in life is unknown. Individual

MB11S186 had a significantly larger minimum ulna circumference at the right distal ulna, as well as significant anterior bending of the sacrum between the second and third sacral vertebrae, and costochondral flaring. Due to the fact that the distal ulna grows most rapidly in males from ages 12 to 14 (Figure 3.3), and the second and third vertebrae of the sacrum fuse between ages 11 and 22 (Figure 3.5), it is likely that MB11S186 experienced a period of rickets between the ages of 12 and 14.

Not all cases of adolescent rickets result in anterior bending of the sacrum. As such, it is possible that this individual acquired this lesion through extended periods of time spent in a seated position while he was affected by active rickets and therefore may have engaged in work indoors. The resulting shape change was captured when normal levels of mineralization were resumed. Due to the fact that MB11S186 was male, it is more likely that he engaged in labour such as agriculture, or manufacturing goods (Waters-Rist and Hoogland, 2018). If MB11S186 was manufacturing goods, it is likely that he worked indoors or under cover. UVB is unable to penetrate through window glass, therefore preventing the dermal absorption of vitamin D, even if this individual was seated by a window (Holick, 1995). The insides of rural Dutch homes in the 19th century were also dark and poorly lit, as is shown in the reconstruction of a typical Dutch home in the town of Zaans Schans, in Noord Holland seen in *Figure 5.3*.

It is also possible that he became deficient in vitamin D as a result of being kept indoors due to an unrelated illness which would have likely made him too weak to work. The potato blight brought with it outbreaks of cholera in 1849, as well as typhus and influenza (Vanhaute et al., 2006). A diarrheal disease such as cholera may have resulted in reduced or absent intestinal absorption of calcium or vitamin D. MB11S186 recovered from his deficiency, so it is possible that the change in lifestyle or health status that left them in a seated position indoors for an extended period of time was not permanent, and was therefore not the result of a chronic illness. This man was able to once again have access to sunlight, allowing his body to heal, and for his sacrum to fuse, albeit in its newly deformed state. As sacral angulation can result in birthing complications in females, most clinical researchers have focused on sacral angulation in females (Hess, 1930: 182; Maxwell and Miles, 1925; Maxwell, 1935). Sacral angulation in males has therefore not been as frequently reported as in females. Working with human skeletal remains allows paleopathologists to have access to the entire sample population, therefore allowing this shape change to be observed in both males and females.

Figure 5.3 – Inside of a restored Dutch 18th-19th century home in the town of Zaans Schans, Noord Holland. A – The living, dining, and sleeping space. B – The family workspace containing looms.

5.5 – Limitations

This study faced several limitations that may have affected the ability to recognize adolescent rickets. These limitations involve the differential growth rates between modern and historical populations, and the difficulties in recognizing IGD in micro-CT scans. Growth rates were calculated for the long bones and the ribs and the fusion timing was calculated for the sternum and the sacrum using data from modern longitudinal growth studies (Section 3.2.1). Puberty amongst late 19th and early 20th century Dutch youth occurs later than the peak pubertal growth velocity observed using the calculated annual growth rates (Section 3.2.1). Currently there are no datasets that allow for the annual growth rates of each bone to be calculated, and that is comparable to growth rates amongst historical populations. Furthermore, rickets has also been observed to delay growth and epiphyseal fusion, as well as affect the timing of puberty (Blom et al. *in review*; Snapper 1943). The disruption of growth and the delay of puberty may have resulted in some individuals appearing younger than their chronological age, causing them being recorded as younger individuals. Shape changes related residual adolescent rickets may have also occurred slightly later than what can be estimated.

Low grade IGD (grades one and two) is not visible on micro-CT scans (Colombo et al., 2019; Veselka et al., 2019). As histological analysis is destructive, micro-CT scans were used to analyze the second and third molars. An episode of adolescent rickets would affect the growth of dentine in the roots of the second and third molars (Brickley et al., 2020b). It is possible that due to the slow growth of the third molar and of the molar roots in particular, that periods of IGD occurring in the root molar of the second and third molars would be less likely to form large and well-marked defects, making periods of IGD that may have formed in the second and third molar roots more difficult to visualise using micro-CT scans. Further work on the effects of growth rates on the formation and expression of IGD is needed.

5.6 – Summary

Adolescent rickets was identified in 25/363 (6.9%) individuals. The prevalence of residual rickets in adolescence (9/287; 3.1%) was lower than the prevalence or residual rickets in infants and children from Middenbeemster and Hattem, which was present in 50/288 (17.4%) individuals (Veselka and Klomp, 2019). A comparison between active cases is not representative of the difference in rates of adolescent and childhood rickets, as previous research recorded active rickets in all subadult individuals, which includes adolescent individuals. Furthermore, as discussed in Section 5.4, rickets occurring in childhood at Middembeemster was found to be more common amongst females (Veselka et al., 2018), while an equal amount of males and females were affected by adolescent rickets (Table 5.1). The selective pressures affecting young children were different from those affecting adolescents.

It is likely that the periods of famine, infectious disease and instability resulting from the rinderpests that killed a large portion of the population's cattle, wars with England and France, and the potato famine (Section 2.6), had an overall negative impact on the health of individuals living in the Netherlands at the time. While famine and infectious disease are not the primary cause of rickets, they may force people to remain indoors or be unable to work for long enough that they become rachitic.

Chapter 6.0 – Conclusion

The results of this thesis found that measurements and z-scores of the ulna minimum distal circumference, clavicle ratio, and sacral angle can be used to identify cases of adolescent rickets in archaeological skeletal remains. Through the use of the measurements outlined in the current work, 25 individuals with adolescent rickets were identified. The prevalence of adolescent rickets at Middenbeemster and Hattem is lower than that of rickets in infants and children, which is consistent with the clinical finding that rickets is more likely to result in clear skeletal changes in infants and children than in adolescents (Al Jurayyan et al., 2012; Cesur et al. 2011). The lower prevalence of rickets in adolescents may be a reflection of the slower growth rates in this period of life compared to those that occur during infancy and early childhood.

The use of z-scores was found to be an effective method in the identification of shape changes linked to residual adolescent rickets, as z-scores allow paleopathologists to distinguish between normal variation and pathological shape changes, while also removing the subjectivity in the identification of shape changes. While adolescent rickets results in more subtle changes than rickets in younger individuals (Al Jurayyan et al., 2012; Cesur et al., 2011), the use of measurements and z-scores rather than macroscopic evaluation allowed for rachitic shape changes to be identified and quantified. Measurements of the distal ulna circumference, medial clavicle diameter, and sacral angle can also be used to identify cases of adolescent rickets in other archaeological skeletal samples, thereby providing new means by which to study rickets in the past.

Porotic lesions at the medial clavicle were found to be associated with later occurring cases of rickets. The consideration of porotic lesions at the medial clavicle growth plate in the current thesis has allowed for a more detailed understanding of the progression of cases of rickets. The distribution of growth plate porosity can be used to determine the progression and severity of the period of rickets.

The current research aimed to use the presence of adolescent rickets to better understand the changing lives of adolescents at Middenbeemster and Hattem. Due to the effects of cultural practices on vitamin D deficiency, the presence and distribution of rickets in a sample can be used to interpret social organization (Brickley et al., 2014). Adolescent rickets was found to be evenly distributed between males and females, suggesting that both males and females had an equal risk of developing adolescent rickets. Adolescence is a period of great change, and acts as a transitory and learning period between childhood and adulthood. Cases of rickets in adolescence in the communities of Middenbeemster and Hattem in the 17th to the 19th centuries were likely the result of taking on new roles in society and working indoors more frequently. Individuals may have left their childhood homes to seek employment. Some individuals may have fallen ill or become malnourished, resulting in them spending more time indoors to recover. The time indoors would have reduced their vitamin D levels resulting in rickets. The ability to recognize adolescent rickets in past populations allows their various lifeways to be better understood, thus providing a window into their changing lives.

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Appendix A- Absolute Growth Rates of the Long Bones and Fusion Timing of the Sternum and Sacrum

Growth Rate Figures

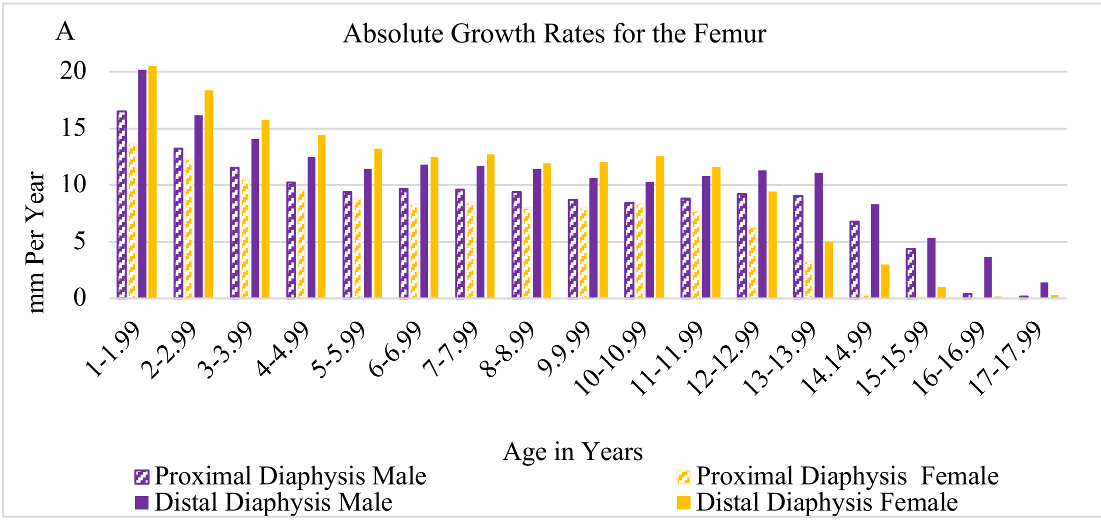

Figure A1- Absolute growth contribution in millimetres of the proximal and distal ends of the femur. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Anderson et al. (1964).

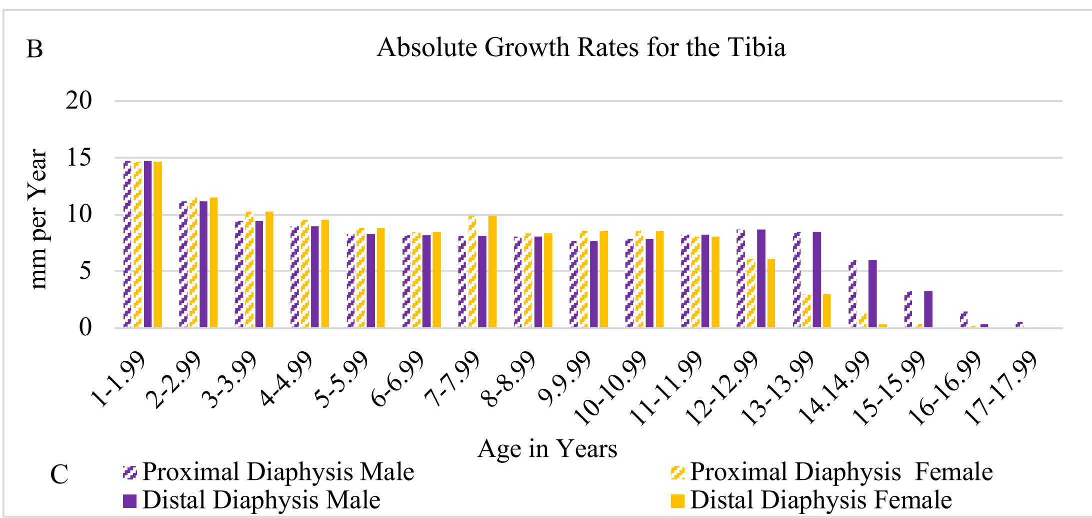

Figure A2- Absolute growth contribution in millimetres of the proximal and distal ends of the tibia. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Anderson et al. (1964).

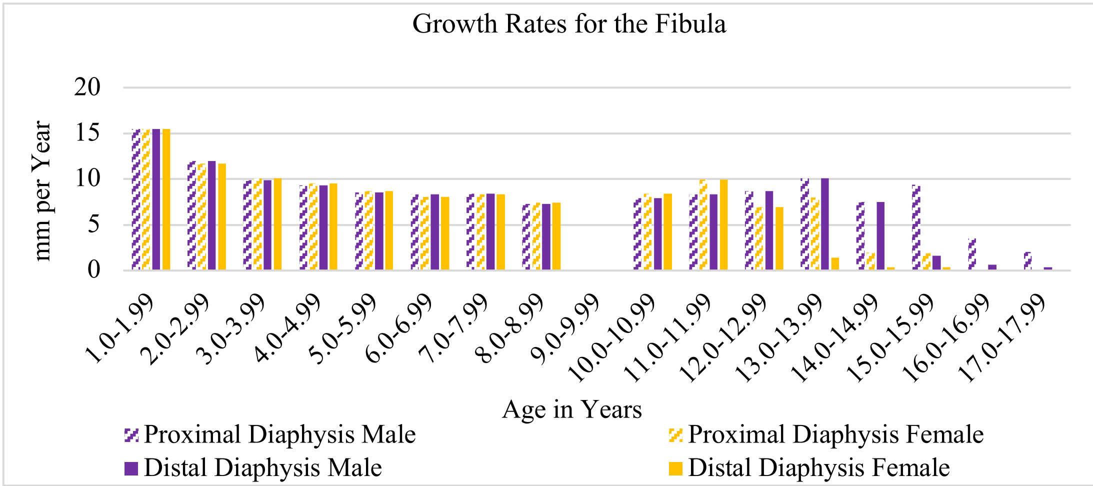

Figure A3- Absolute growth contribution in millimetres of the proximal and distal ends of the fibula. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Maresh (1970).

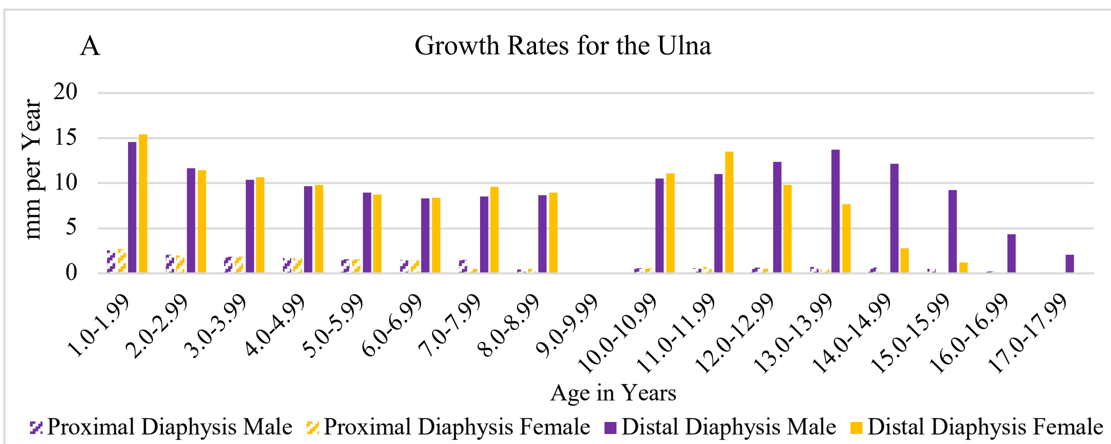

Figure A4- Absolute growth contribution in millimetres of the proximal and distal ends of the ulna. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Maresh (1970)

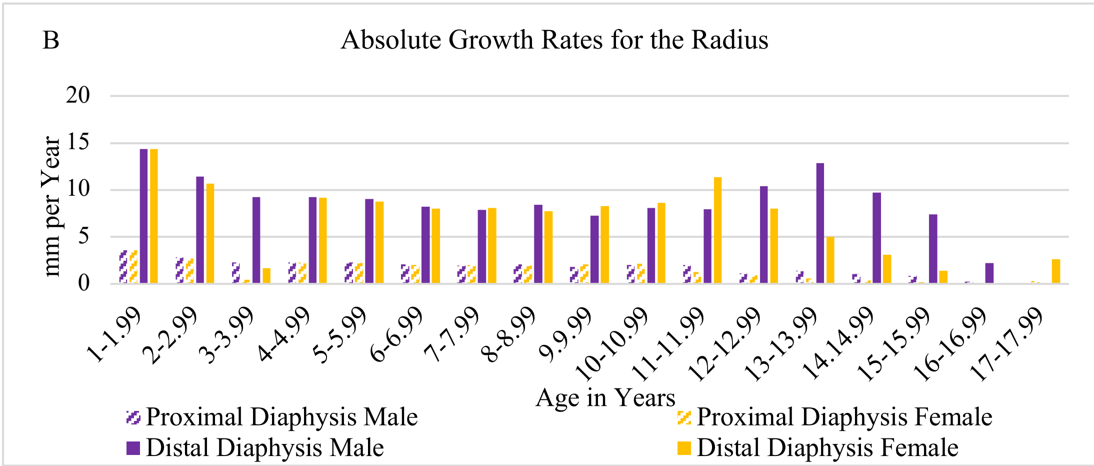

Figure A5- Absolute growth contribution in millimetres of the proximal and distal ends of the radius. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Gindhart (1973).

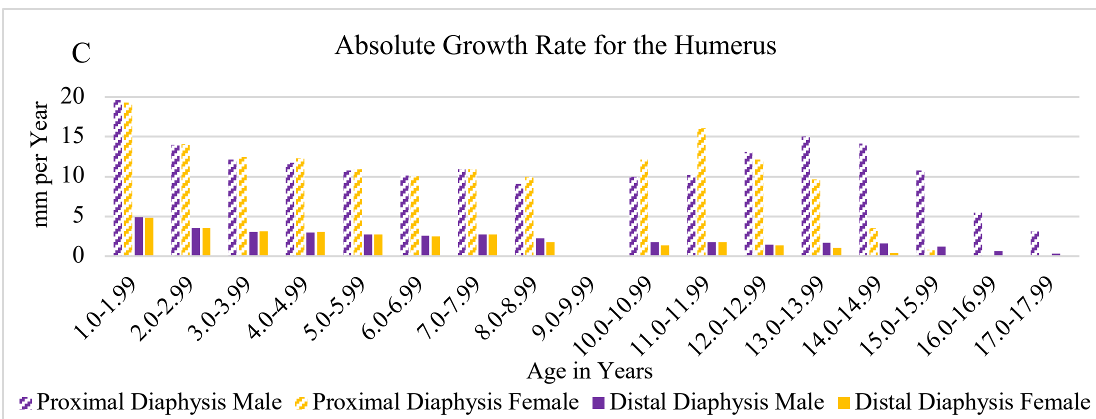

Figure A6- Absolute growth contribution in millimetres of the proximal and distal ends of the humerus. Absolute growth is shown for each end of the diaphysis over time. Age is shown in yearly increments, and the data represents males, and females. Based on data from Maresh (1970).

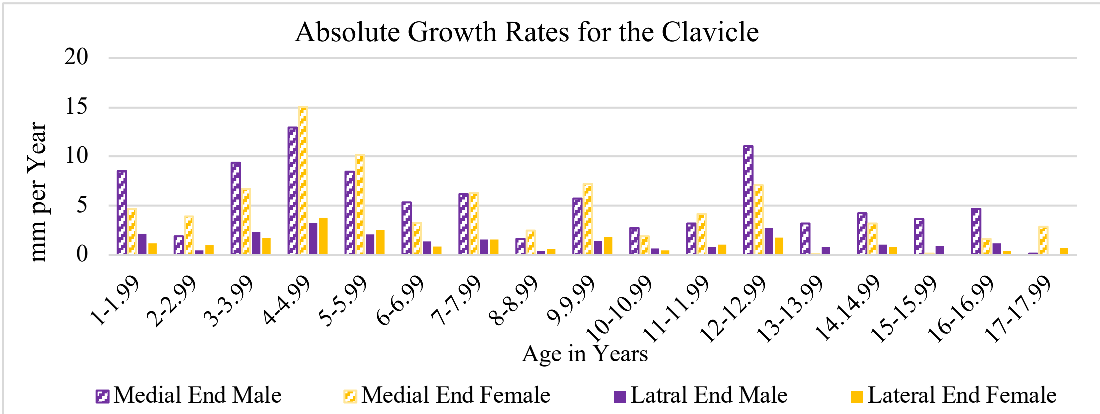

Figure A7 – Absolute annual growth rates of the clavicle based on data from McGraw et al. (2009).

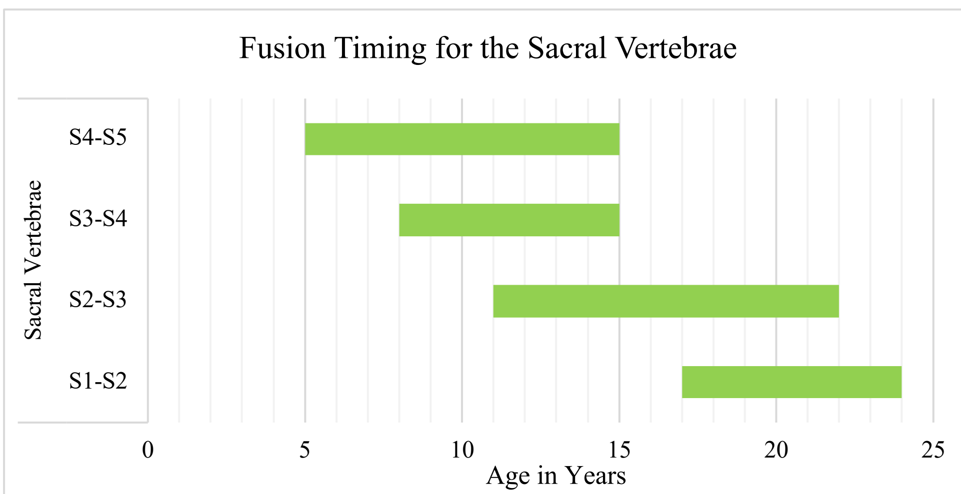

Figure A8 – Fusion timing of the sacral vertebrae using data from Broome et al. (1998).

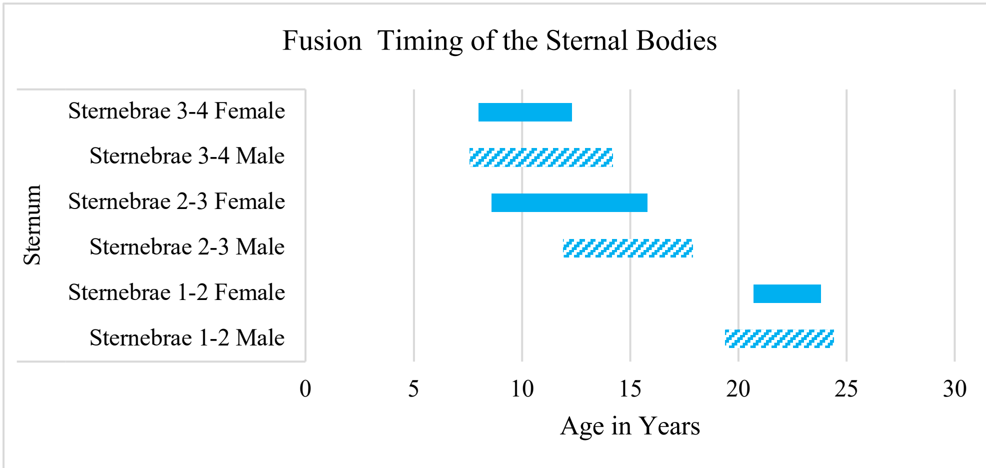

Figure A9 – Fusion timing for the sternal bodies based on data from Jit and Kaur (1989).

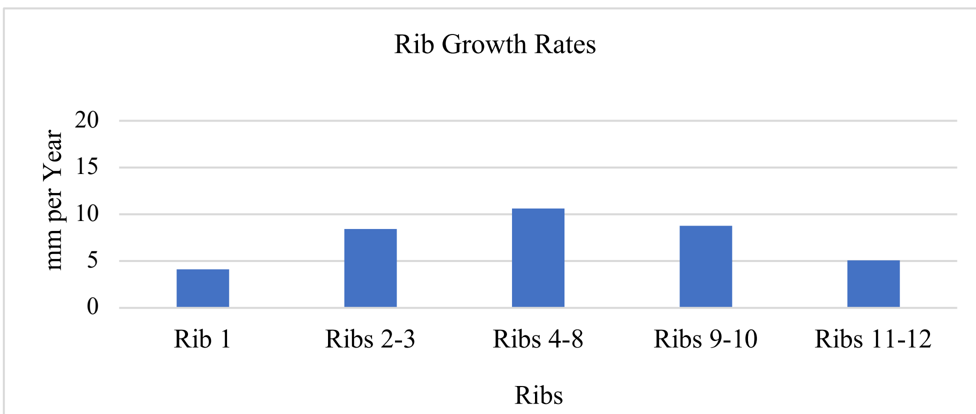

Figure A10 – Absolute growth rates of the ribs from ages 1 to 18 years based on data from Schwend et al. (2015).

Absolute Growth Data for the Long Bones

Table A1- Absolute Long Bone Growth Rates over time in millimetres.

Age	Femur		Tibia		Fibula		Humerus		Radius		Ulna		Clavicle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1-1.99	36.7	34.2	29.5	29.4	31	31	24.5	24.1	17.91	17.94	17.1	18.1	10.7	5.9
2-2.99	29.4	30.6	22.4	23	24	23.4	17.5	17.6	14.24	13.34	13.7	13.5	2.4	4.9
3-3.99	25.6	26.3	18.8	20.5	19.7	20.1	15.2	15.6	11.53	2.08	12.2	12.5	11.7	8.4
4-4.99	22.7	24	17.9	19.1	18.6	19.1	14.7	15.4	11.57	11.44	11.4	11.5	16.2	18.8
5-5.99	20.8	22	16.6	17.6	17.1	17.4	13.5	13.7	11.31	10.98	10.5	10.3	10.6	12.7
6-6.99	21.5	20.8	16.4	16.9	16.7	16.1	12.7	12.6	10.25	9.98	9.8	9.9	6.7	4.1
7-7.99	21.3	21.2	16.2	19.7	16.8	16.7	13.7	13.7	9.83	10.1	10	10.1	7.7	7.9
8-8.99	20.8	19.9	16.1	16.7	14.6	14.9	11.4	11.7	10.52	9.68	9.1	9.4	2	3.1
9-9.99	19.3	20.1	15.4	17.2	44.8	44.2	29.6	28.1	9.07	10.33	15.8	19.5	7.2	9
10-10.99	18.7	20.9	15.7	17.2	15.8	16.8	11.7	13.5	10.11	10.81	11.1	11.7	3.4	2.4
11-11.99	19.6	19.3	16.5	16.1	16.6	19.9	12	17.9	9.96	12.61	11.6	14.2	4	5.2
12-12.99	20.5	15.7	17.4	12.2	17.4	13.9	14.6	13.5	11.58	8.91	13	10.3	13.8	8.9
13-13.99	20.1	8.3	16.9	6.0	20.1	9.4	16.7	10.7	14.28	5.58	14.4	8.1	4	0.1
14-14.99	15.1	3.3	12	1.6	15	2.3	15.7	3.9	10.78	3.45	12.8	2.9	5.3	4
15-15.99	9.7	1.1	6.6	0.4	11	2.2	12	0.9	8.19	1.59	9.7	1.3	4.6	0.2
16-16.99	4.1	0.2	1.8	0.2	4.1	-5.6	6.1	-1.1	2.48	-0.36	4.6	-2.1	5.9	2
17-17.99	1.6	0.3	0.7	-	2.4	-	3.5	0	-0.2	2.91	2.2	0	0.2	3.6

Note - Age is given in yearly increments until growth ceases. Negative values due to population variation and sampling bias. Blank values (-) represent completion of bone growth.

Table A2 - The percent of the contribution of each growing end of the diaphysis during growth in the lower limbs.

Age	**Proximal Femur**		**Distal Femur**		**Proximal Tibia**		**Distal Tibia**		**Proximal Fibula**		**Distal Fibula**	
	M	F	M	F	M	F	M	F	M	F	M	F
1-1.99	45	40	55	60	50	50	50	50	50	50	50	50
2-2.99	45	40	55	60	50	50	50	50	50	50	50	50
3-3.99	45	40	55	60	50	50	50	50	50	50	50	50
4-4.99	45	40	55	60	50	50	50	50	50	50	50	50
5-5.99	45	40	55	60	50	50	50	50	50	50	50	50
6-6.99	45	40	55	60	50	50	50	50	50	50	50	50
7-7.99	45	40	55	60	50	50	50	50	50	50	50	50
8-8.99	45	40	55	60	50	50	50	50	50	50	50	50
9-9.99	45	40	55	60	50	50	50	50	50	50	50	50
10-10.99	45	40	55	60	50	50	50	50	50	50	50	50
11-11.99	45	40	55	60	50	50	50	50	50	50	50	50
12-12.99	45	40	55	60	50	50	50	50	50	50	50	50
13-13.99	45	40	55	60	50	50	50	50	50	85	50	15
14-14.99	45	10	55	90	50	80	50	20	50	85	50	15
15-15.99	45	10	55	90	50	80	50	20	85	85	15	15
16-16.99	10	10	90	90	80	80	20	20	85	85	15	15
17-17.99	10	10	90	90	80	80	20	20	85	85	15	15

Note- Age is shown in yearly increments from 1-17.99. Data is shown for males, females, and individuals of unknown. Data obtained from Pritchett 1992 and 1997.

Table A3 - The percent of the contribution of each growing end of the diaphysis during growth in the upper limbs and the pectoral girdle.

Age	Proximal Humerus		Distal Humerus		Proximal Radius		Distal Radius		Proximal Ulna		Distal Ulna		Medial Clavicle		Lateral Clavicle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1-1.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
2-2.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
3-3.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
4-4.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
5-5.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
6-6.99	80	80	20	20	20	20	80	80	15	15	85	85	80	80	20	20
7-7.99	80	80	20	20	20	20	80	80	15	5	85	95	80	80	20	20
8-8.99	80	85	20	15	20	20	80	80	5	5	95	95	80	80	20	20
9-9.99	85	85	15	15	20	20	80	80	5	5	95	95	80	80	20	20
10-10.99	85	90	15	10	20	20	80	80	5	5	95	95	80	80	20	20
11-11.99	85	90	15	10	20	10	80	90	5	5	95	95	80	80	20	20
12-12.99	90	90	10	10	10	10	90	90	5	5	95	95	80	80	20	20
13-13.99	90	90	10	10	10	10	90	90	5	5	95	95	80	80	20	20
14-14.99	90	90	10	10	10	10	90	90	5	5	95	95	80	80	20	20
15-15.99	90	90	10	10	10	10	90	90	5	5	95	95	80	80	20	20
16-16.99	90	-	10	-	10	-	90	-	5	-	95	-	80	80	20	20
17-17.99	90	-	10	-	10	-	90	-	5	-	95	-	80	80	20	20

Note: Age is shown in yearly increments from 1-17.99. Data is shown for males, females, and individuals of unknown sex. Data from Pritchett 1991.

Table A4 - Absolute growth contribution in millimeters of each growing end of the diaphysis during growth in the lower limbs.

Age	**Proximal Femur**		**Distal Femur**		**Proximal Tibia**		**Distal Tibia**		**Proximal Fibula**		**Distal Fibula**	
	M	F	M	F	M	F	M	F	M	F	M	F
1-1.99	16.15	13.68	20.19	20.52	14.75	14.70	14.75	14.70	15.5	15.5	15.5	15.5
2-2.99	13.23	12.24	16.17	18.36	11.20	11.50	11.20	11.50	12	11.7	12	11.7
3-3.99	11.52	10.52	14.08	15.78	9.40	10.25	9.40	10.25	9.85	10.05	9.85	10.05
4-4.99	10.22	9.60	12.46	14.40	8.95	9.55	8.95	9.55	9.3	9.55	9.3	9.55
5-5.99	9.36	8.80	11.44	13.20	8.30	8.80	8.30	8.80	8.55	8.7	8.55	8.7
6-6.99	9.68	8.32	11.83	12.48	8.20	8.45	8.20	8.45	8.35	8.05	8.35	8.05
7-7.99	9.59	8.48	11.72	12.72	8.10	9.85	8.10	9.85	8.4	8.35	8.4	8.35
8-8.99	9.36	7.96	11.44	11.94	8.05	8.35	8.05	8.35	7.3	7.45	7.3	7.45
9-9.99	8.69	8.04	10.62	12.06	7.70	8.60	7.70	8.60	22.4	22.1	22.4	22.1
10-10.99	8.42	8.36	10.29	12.54	7.85	8.60	7.85	8.60	7.9	8.4	7.9	8.4
11-11.99	8.82	7.72	10.78	11.58	8.25	8.05	8.25	8.05	8.3	9.95	8.3	9.95
12-12.99	9.23	6.28	11.28	9.42	8.70	6.10	8.70	6.10	8.7	6.95	8.7	6.95
13-13.99	9.05	3.32	11.06	4.98	8.45	3.00	8.45	3.00	10.05	7.99	10.05	1.41
14-14.99	6.80	0.33	8.31	2.97	6.00	1.28	6.00	0.32	7.5	1.955	7.5	0.345
15-15.99	4.37	0.11	5.32	0.99	3.30	0.32	3.30	0.08	9.35	1.87	1.65	0.33
16-16.99	0.41	0.02	3.69	0.18	1.44	0.16	0.36	0.04	3.485	-	0.615	-
17-17.99	0.16	0.03	1.44	0.27	0.56	0.00	0.14	0.00	2.04	-	0.36	-

Note: Age is shown in yearly increments from 1-17.99. Data is shown for males, females, and individuals of unknown.

Table A5 - Absolute growth contribution in millimeters of each growing end of the diaphysis during growth in the humerus and radius.

Age	Proximal Humerus		Distal Humerus		Proximal Radius		Distal Radius	
	M	F	M	F	M	F	M	F
1-1.99	19.6	19.28	4.9	4.82	3.58	3.59	14.33	14.35
2-2.99	14	14.08	3.5	3.52	2.85	2.67	11.39	10.67
3-3.99	12.16	12.48	3.04	3.12	2.31	0.42	9.22	1.66
4-4.99	11.76	12.32	2.94	3.08	2.31	2.29	9.26	9.15
5-5.99	10.8	10.96	2.7	2.74	2.26	2.20	9.05	8.78
6-6.99	10.16	10.08	2.54	2.52	2.05	2.00	8.20	7.98
7-7.99	10.96	10.96	2.74	2.74	1.97	2.02	7.86	8.08
8-8.99	9.12	9.945	2.28	1.7555	2.10	1.94	8.42	7.74
9-9.99	25.16	23.885	4.44	4.215	1.81	2.07	7.26	8.26
10-10.99	9.945	12.15	1.7555	1.35	1.99	2.16	8.09	8.65
11-11.99	10.2	16.11	1.8	1.79	1.16	1.26	7.97	11.35
12-12.99	13.14	12.15	1.46	1.35	1.43	0.89	10.42	8.02
13-13.99	15.03	9.63	1.67	1.07	1.08	0.56	12.85	5.02
14-14.99	14.13	3.51	1.57	0.39	0.82	0.35	9.70	3.11
15-15.99	10.8	0.81	1.2	0.09	0.82	0.16	7.37	1.43
16-16.99	5.49	-	0.61	-	0.25	-0.04	2.23	-0.32
17-17.99	3.15	-	0.35	-	-0.02	0.29	-0.18	2.62

Note: Age is shown in yearly increments from 1-17.99. Data is shown for males, females, and individuals of unknown sex.

Table A6 - Absolute growth contribution in millimeters of each growing end of the diaphysis during growth in the ulna and clavicle.

Age	Proximal Ulna		Distal Ulna		Medial Clavicle		Lateral Clavicle	
	M	F	M	F	M	F	M	F
1-1.99	2.565	2.715	14.535	15.385	8.56	4.72	2.14	1.18
2-2.99	2.055	2.025	11.645	11.475	1.92	3.92	0.48	0.98
3-3.99	1.83	1.875	10.37	10.625	9.36	6.72	2.34	1.68
4-4.99	1.71	1.725	9.69	9.775	12.96	15.04	3.24	3.76
5-5.99	1.575	1.545	8.925	8.755	8.48	10.16	2.12	2.54
6-6.99	1.47	1.485	8.33	8.415	5.36	3.28	1.34	0.82
7-7.99	1.5	0.505	8.5	9.595	6.16	6.32	1.54	1.58
8-8.99	0.455	0.47	8.645	8.93	1.60	2.48	0.40	0.62
9-9.99	0.79	0.975	15.01	18.525	5.76	7.2	1.44	1.8
10-10.99	0.555	0.585	10.545	11.115	2.72	1.92	0.68	0.48
11-11.99	0.58	0.71	11.02	13.49	3.20	4.16	0.80	1.04
12-12.99	0.65	0.515	12.35	9.785	11.04	7.12	2.76	1.78
13-13.99	0.72	0.405	13.68	7.695	3.20	0.08	0.80	0.02
14-14.99	0.64	0.145	12.16	2.755	4.24	3.20	1.06	0.8
15-15.99	0.485	0.065	9.215	1.235	3.68	0.16	0.92	0.04
16-16.99	0.23	-	4.37	-	4.72	1.60	1.18	0.4
17-17.99	0.11	-	2.09	-	0.16	2.88	0.04	0.72

Table A7 - Fusion timing for the long bones in both males and females.

Bone	**Proximal Male**	**Proximal Female**	**Distal male**	**Distal female**
Humerus	19	17	16	13
Radius	16	14	19	18
Ulna	16	14	19	17
Femur	17	14	19	17
Tibia	18	15	17	14
Fibula	19	17	17	14

Note: Data from Flecker 1932.

Absolute Growth Rates for the Ribs

Table A8 - Absolute growth rate of the sternal rib ends per year until growth ceases.

	Rib 1	Ribs 2-3	Ribs 4-8	Ribs 9-10	Ribs 11-12
mm Per Year	4.1	8.45	10.62	8.75	5.05

Note - Data retrieved from Schwend et al. 2015 and uses the Hamann – Todd Osteological Collection collected between 1912 and 1938.

Bones where the age of fusion is critical to the expression of lesions

Table A9 - Fusion timing for the sacral elements.

Element	Fusion Begins	Fusion Complete
Sacral Elements 1-2	17	24
Sacral Elements 2-3	11	22
Sacral Elements 3-4	8	15
Sacral Elements 4-5	5	15

Note: Data on the fusion of the sacral bodies from Broome et al. (1998).

Table A10 - Fusion timing for the sternebrae.

Element	Fusion Begins		Fusion Complete	
	M	**F**	**M**	**F**
Sternebrae 1-2	19.4	20.7	24.4	23.8
Sternebrae 2-3	11.9	8.6	17.9	15.8
Sternebrae 3-4	7.6	8.0	14.2	12.3

Note: Data from Jit and Kaur (1989).

Appendix B – Femur Measurements, Z-Scores, and Non-Metric Features

Table B1 – Metric measurements of the femur

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
KER15S006	M	26-35	68.109	58.100	80.422	79.891
KER15S007	F	36-49	-	-	-	-
KER15S008	A	50+	-	-	-	-
KER15S009	M	36-49	71.656	77.392	-	78.742
KER15S010	M	36-49	78.323	74.427	78.398	75.790
KER15S011	M	36-49	91.416	67.786	-	-
KER15S012	F	36-49	66.594	-	-	-
KER15S014	F	18-25	-	-	-	-
KER15S015	M	36-49	79.754	78.945	80.595	79.585
KER15S016	M	18-25	62.796	52.652	78.71	79.186
KER15S017	M	36-49	71.320	72.011	74.605	75.757
KER15S018	M	18-25	74.555	64.951	81.007	82.321
KER15S019	M	50+	-	-	-	-
KER15S020	U	15 ± 2	-	-	-	-
KER15S021	M	36-49	87.097	90.290	74.992	79.433
KER15S024	M	36-49	-	-	-	-
KER15S025	M	36-49	84.892	84.288	84.709	-
KER15S026	M	36-49	-	-	79.586	-
KER15S028	F	36-49	81.481	84.540	-	80.793
KER15S029	M	36-49	91.878	76.294	84.862	-
KER15S030	M	36-49	-	-	-	-
KER15S031	U	17 ± 1 yr.	83.583	91.008	78.832	77.988
KER15S032	F	36-49	81.832	-	80.976	-
KER15S035	F	26-35	85.506	92.952	-	-
KER15S036	M	36-49	-	86.038	-	-
KER15S037	M	50+	80.098	80.146	84.573	80.768
KER15S038	F	36-49	-	-	-	-
KER15S040	M	18+	97.458	94.464	-	-
KER15S042	M	36-49	82.006	83.913	81.248	81.001
KER15S043	M	36-49	75.689	88.654	77.862	80.431
KER15S044	M	36-49	-	-	-	-
KER15S045	M	36-49	73.699	73.653	79.134	81.033
KER15S046	M	26-35	-	-	-	-
KER15S047	A	26-35	-	-	-	-
KER15S050	A	18+	-	-	-	-
KER15S051	F	26-35	-	-	-	-
KER15S052	F	50+	87.957	74.690	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-
KER15S054	A	26-35	90.731	-	-	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.

Note - All measurements in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
KER15S055	F	36+	88.851	89.672	-	-
KER15S056	F	36-49	-	-	-	-
KER15S057	F	50+	89.977	83.083	-	-
KER15S058	M	26-35	82.287	-	81.270	-
KER15S059	F	36-49	80.320	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-
KER15S061	M	36-49	86.976	86.331	79.775	-
KER15S062	F	36-49	84.017	81.48	-	81.248
KER15S063	F	36-49	82.746	88.858	79.769	-
KER15S064	M	36-49	-	-	79.325	78.756
KER15S065	M	36-49	82.920	84.906	83.212	-
KER15S066	M	18+	85.861	-	82.517	-
KER15S068	F	18+	87.973	75.657	-	83.777
KER15S070	F	36-49	-	-	-	-
KER15S071	M	18-25	79.973	79.757	78.058	-
KER15S072	F	36-49	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-
KER15S074	M	36-49	87.823	86.663	75.822	88.598
KER15S075	F	36-49	-	92.228	-	76.863
KER15S076	M	26-35	88.879	90.592	79.133	81.09
KER15S077	M	26-35	82.194	84.771	79.054	77.153
KER15S078	F	26-35	-	-	83.039	80.916
KER15S079	U	12 ± 2 yrs.	-	-	-	-
KER15S080	M	26-35	77.809	65.929	83.113	81.213
KER15S081	A	18+	-	-	-	-
KER15S082	F	50+	-	78.288	-	81.753
KER15S083	M	36-49	82.747	-	79.172	-
KER15S084	F	36-49	-	77.847	-	79.287
KER15S085	M	36-49	-	-	-	-
KER15S086	M	36-49	-	-	-	-
KER15S087	M	36-49	81.694	81.601	82.267	-
KER15S088	F	26-35	77.315	-	-	-
KER15S089	M	50+	78.065	82.721	-	-
KER15S090	F	50+	80.44	-	77.283	-
KER15S091	F	36-49	75.571	60.936	79.774	-
KER15S092	F	50+	-	-	-	-
KER15S093	F	26-35	78.823	70.506	80.313	80.257
KER15S094	F	18-25	75.652	65.781	80.875	85.018
KER15S096	F	36-49	71.812	63.879	79.421	79.548
KER15S097	F	50+	66.674	-	79.114	-
KER15S098	F	26-35	71.716	65.561	76.091	76.853

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
KER15S099	F	18-25	-	-	-	-
KER15S100	M	26-35	75.871	63.418	78.699	-
KER15S101	M	36-49	75.414	76.86	79.872	79.049
KER15S102	M	50+	62.684	68.629	-	79.073
KER15S103	M	18-25	-	-	-	-
KER15S105	M	18-25	74.301	63.532	81.247	78.813
KER15S106	M	36-49	68.107	68.72	84.516	81.993
KER15S107	F	26-35	-	-	-	-
KER15S108	M	36-49	74.431	68.771	77.584	77.984
KER15S109	F	36-49	69.943	64.264	77.522	80.939
KER15S110	F	18-25	-	65.996	-	-
KER15S111	M	26-35	68.669	74.505	84.442	86.159
KER15S112	M	26-35	75.446	67.462	-	-
KER15S113	M	36-49	67.270	-	80.862	-
KER15S114	F	50+	77.544	87.248	83.608	81.126
KER15S115	M	36-49	74.890	69.707	79.941	79.619
KER15S116	F	36-49	-	-	-	-
KER15S117	F	36-49	67.541	-	82.124	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-
KER15S120	F	18-25	76.677	68.063	75.65	77.567
KER15S122	F	36-49	66.958	72.768	76.038	77.043
HT15S124	U	13 ± 1 yr.	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-
KER15S129	F	36-49	89.136	80.019	-	-
KER15S130	M	18-25	70.274	58.501	78.690	75.513
KER15S132	F	50+	-	-	-	-
KER15S133	F	18-25	-	-	-	-
KER15S134	M	36-49	79.536	68.979	79.740	80.321
KER15S136	U	13 ± 2 yrs.	-	-	-	-
KER15S142	F	26-35	65.256	61.291	-	-
KER15S143	M	36-49	80.885	70.010	79.868	81.171
KER15S145	F	36-49	77.54	66.061	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-
KER15S151	M	36-49	69.240	70.827	82.012	79.155
KER15S154	F	36+	70.189	69.855	-	76.614
MB11S019	A	18+	78.373	-	-	
MB11S029	M	50+	71.466	75.198	-	79.966
MB11S040	F	18-25	77.618	70.867	74.005	-
MB11S044	U	12 ± 12 mo.	-	-	-	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S045	F	47	77.183	68.749	80.814	-
MB11S047	F	21	72.961	70.405	-	79.218
MB11S051	M	74	72.545	70.291	80.595	81.298
MB11S053	F	36-49	68.592	70.861	-	-
MB11S056	F	50+	80.129	69.232	-	
MB11S059	M	36-49	72.829	62.044	-	77.990
MB11S060	F	18-25	67.868	64.982	-	-
MB11S064	M	26-35	73.584	74.887	-	-
MB11S070	M	18+	74.907	69.672	81.045	-
MB11S077	F	58	68.466	79.898	-	-
MB11S083	F	36-49	78.457	73.880	-	-
MB11S084	F	18+	73.377	61.064	78.376	-
MB11S088	F	26-35	83.317	72.677	80.725	80.862
MB11S092	M	26-35	79.644	72.407	79.462	79.211
MB11S093	M	50+	68.387	65.598	-	-
MB11S097	F	50+	76.448	60.620	-	-
MB11S100	M	18+	71.888	60.980	80.398	77.357
MB11S101	F	26-35	60.522	52.048	-	-
MB11S107	F	18-25	73.046	71.877	-	-
MB11S108	M	26-35	76.178	-	-	-
MB11S110	F	26-35	70.887	66.106	-	-
MB11S121	F	36-49	80.200	77.121	-	-
MB11S123	U	13-17	-	-	-	-
MB11S126	F	36-49	72.529	66.854	-	-
MB11S137	F	36-49	81.688	-	-	-
MB11S144	M	36-50	71.400	75.893	-	-
MB11S149	F	26-35	82.057	79.907	80.307	-
MB11S151	F	26-35	76.053	77.959	75.764	-
MB11S153	M	57	71.928	68.918	-	-
MB11S155a	M	50+	77.236	70.204	-	-
MB11S155b	F	50+	73.427	74.778	79.907	-
MB11S157	F	18+	69.686	74.094	77.645	78.893
MB11S158	M	60	71.030	68.149	78.466	79.460
MB11S160	F	26-35	70.660	61.995	77.193	75.688
MB11S162	M	36-49	64.560	64.313	-	-
MB11S167	F	12	-	-	-	-
MB11S170	F	50+	66.178	68.281	-	76.278
MB11S174	F	36-49	73.774	72.972	78.459	77.355
MB11S180	M	18-25	70.196	65.408	80.611	82.407
MB11S183	F	26-35	64.119	66.552	77.261	78.88
MB11S186	M	36-49	72.581	69.954	-	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S192	F	26-35	79.560	74.016	-	78.200
MB11S194	M	50+	75.520	-	77.421	-
MB11S195	F	36-49	-	73.125	-	-
MB11S198	F	26-35	82.335	77.302	78.230	77.113
MB11S202	F	26-35	81.205		-	-
MB11S205	M	50+	73.485	69.115	78.532	79.774
MB11S206	U	13-17	-	-	-	-
MB11S207	F	50+	79.051	79.749	-	77.918
MB11S216	F	36-49	65.381	69.979	82.494	-
MB11S220	F	36-49	79.598	75.243	-	-
MB11S225	M	50+	73.032	78.529	-	-
MB11S226	M	26-35	68.634	66.466	85.533	84.001
MB11S228	M	36-49	86.673	77.029	-	78.098
MB11S229	U	13-17	-	-	-	-
MB11S233	M	18+	77.460	77.202	80.426	81.631
MB11S234	F	18-25	-	72.694	-	-
MB11S235	M	18+	-	81.785	-	-
MB11S236	M	24	67.330	70.828	81.553	81.233
MB11S237	M	50+	71.102	69.410	85.229	-
MB11S238	M	18-25	-	-	-	-
MB11S239	M	23	67.927	62.021	-	-
MB11S240	M	36-49	82.749	82.795	82.333	81.824
MB11S242	M	50+	76.273	83.568	79.025	77.130
MB11S243	F	62	85.607	71.291	-	83.031
MB11S246	U	19	-	-	-	-
MB11S247	M	50+	-	71.763	-	-
MB11S248	F	9	-	-	-	-
MB11S249	M	26-35	83.698	62.154	79.460	80.023
MB11S250	M	73	72.822	74.553	-	-
MB11S251	M	36-49	69.254	71.736	78.351	79.991
MB11S253	M	78	76.452	73.265	-	81.439
MB11S254	M	36-49	80.997	-	79.354	-
MB11S257	M	26-35	74.145	69.310	-	82.305
MB11S260	M	18-25	80.114	-	77.410	-
MB11S261	M	79	72.479	65.248	-	-
MB11S263	M	36-49	-	-	-	-
MB11S267	M	26-35	67.231	78.437	-	78.953
MB11S269a	M	18+	75.746	69.425	-	-
MB11S269b	U	11± 30 mo.	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-
MB11S270	M	18-25	73.515	79.659	83.993	80.715

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S271	M	50+	79.846	-	79.769	-
MB11S275	U	15 ± 1 yr.	73.696	70.477	83.286	78.469
MB11S278	F	36-49	76.272	73.609	81.299	79.979
MB11S281	M	36-49	82.104	72.193	80.475	79.426
MB11S282	U	12 ± 12 mo.	-	-	-	-
MB11S285	M	71	77.349	70.570	82.653	81.447
MB11S286	F	10	-	-	-	-
MB11S289	M	50+	78.023	74.058	-	80.362
MB11S290	M	18-25	78.190	71.546	84.576	81.027
MB11S292	U	11 ± 1 yr.	-	-	-	-
MB11S294	F	66	71.304	68.07	-	-
MB11S297	M	84	77.292	75.745	79.239	79.188
MB11S301a	F	36-49	80.918	77.868	-	78.549
MB11S301b	U	6-10	-	-	-	-
MB11S302	F	50+	80.783	77.586	-	-
MB11S303	F	44	76.609	68.112	-	-
MB11S306	M	31	70.667	74.024	82.754	80.173
MB11S307	U	13-17	76.125	79.010	-	77.582
MB11S309	F	58	79.635	68.537	-	73.921
MB11S310	M	35	69.793	71.439	-	-
MB11S311	F	18-25	72.266	-	-	-
MB11S313	M	46	79.292	76.203	84.100	82.601
MB11S317	M	80	68.215	69.510	-	-
MB11S319	F	69	86.971	81.113	80.600	76.861
MB11S321	M	50+	79.182	73.214	84.148	81.876
MB11S324	M	36-49	78.542	79.67	-	-
MB11S325	M	36	76.405	97.297	81.87	-
MB11S327	F	36-49	80.466	69.547	75.397	81.001
MB11S331	F	74	68.301	67.337	79.500	76.504
MB11S334	F	9	-	-	-	-
MB11S337	M	68	75.753	69.168	81.992	80.319
MB11S338	F	33	79.989	70.416	79.982	76.505
MB11S339	F	64	-	-	-	-
MB11S340	U	19	-	-	-	-
MB11S341	M	50+	80.830	81.654	-	-
MB11S342	M	75	85.474	71.657	78.652	-
MB11S344	F	20	77.530	71.199	77.638	73.207
MB11S345	F	28	73.673	67.272	-	-
MB11S346	F	36-49	74.227	70.830	81.740	80.964
MB11S347	M	50+	72.909	76.515	78.771	80.095
MB11S349	M	50+	78.909	78.074	-	80.023

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S350	U	16 ± 1 yr.	-	-	-	-
MB11S355	F	50+	81.365	79.254	-	77.071
MB11S356	F	78	80.554	72.719	75.543	-
MB11S358	F	74	81.826	72.653	78.355	75.409
MB11S359	F	46	71.121	65.210	-	-
MB11S360	F	66	75.930	78.326	-	-
MB11S363	M	61	72.289	74.730	-	-
MB11S367	F	11	-	-	-	-
MB11S368	M	26-35	79.932	73.288	83.999	83.443
MB11S369	F	30	73.795	68.403	78.542	76.902
MB11S370	F	36-49	83.767	74.296	79.651	81.416
MB11S371	M	36-49	86.014	74.898	-	82.473
MB11S374	M	80	74.818	69.863	80.777	77.169
MB11S375	M	74	76.054	67.090	83.840	81.902
MB11S377	M	18+	-	69.702	-	-
MB11S379	M	18-25	75.781	64.100	-	-
MB11S380	M	36-49	66.946	68.236	80.414	80.763
MB11S382	F	50+	97.773	-	-	-
MB11S383	F	55	72.972	66.818	82.115	81.621
MB11S385	F	25	-	-	-	-
MB11S386	F	36-49	75.235	73.662	79.153	78.120
MB11S387	F	43	77.190	84.709	-	-
MB11S388	F	21	79.933	72.314	82.021	83.095
MB11S390	F	71	80.215	75.383	-	-
MB11S391	M	50+	73.946	78.948	-	-
MB11S392	F	50+	70.955	69.958	82.321	82.797
MB11S394	F	50+	79.346	71.469	79.423	-
MB11S399	A	36-49	72.492	69.097	75.123	74.918
MB11S401	F	26-35	67.97	73.247	78.826	-
MB11S402	M	36-49	75.024	74.300	-	79.321
MB11S404	M	26-35	68.368	77.36	80.382	78.917
MB11S405	F	36-49	71.557	-	-	-
MB11S407	M	18+	72.261	74.186	81.654	79.216
MB11S409	F	18+	83.746	72.223	-	-
MB11S411	M	36-49	80.455	71.013	-	81.416
MB11S413	F	39	72.293	72.127	-	77.546
MB11S415	M	50+	81.918	76.434	81.971	-
MB11S416	M	36-49	72.282	77.166	81.115	-
MB11S420	F	26-35	73.778	78.828	-	-
MB11S422	F	29	69.896	68.541	-	-
MB11S426	F	55	80.798	83.073	79.702	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S427	M	27	80.650	77.460	-	-
MB11S428	F	50+	60.271	-	-	-
MB11S430	F	30	79.167	64.920	79.226	78.570
MB11S432	M	26-35	81.855	72.778	82.523	82.012
MB11S434	F	36-49	-	76.781	-	81.415
MB11S435	M	45	79.450	76.622	81.575	83.239
MB11S436	F	18+	75.535	62.415	-	-
MB11S437	F	26-35	69.133	72.073	-	79.227
MB11S441	F	23	83.523	73.655	84.869	81.456
MB11S446	U	22	-	-	-	-
MB11S452	F	18-25	64.927	66.664	82.297	-
MB11S453	F	26-35	-	72.059	-	79.413
MB11S454	U	21	81.003	-	-	-
MB11S455	M	50+	77.372	72.945	-	81.756
MB11S456	M	36-49	69.925	-	79.074	-
MB11S457	F	50+	79.057	74.360	79.068	74.069
MB11S460	U	16.5 ± 36 mo.	-	-	-	-
MB11S461	F	28	69.246	68.982	-	-
MB11S462	M	16	-	-	-	-
MB11S464	M	36-49	-	-	-	-
MB11S465	M	15	-	-	-	-
MB11S466a	M	83	81.303	78.678	-	-
MB11S466b	F	43	67.523	60.284	81.266	78.562
MB11S467	M	26-35	66.722	63.435	78.579	81.397
MB11S468	F	36-49	78.352	71.679	78.038	77.902
MB11S469	M	43	-	-	-	-
MB11S470	M	50+	71.982	72.591	-	-
MB11S471	F	9	-	-	-	-
MB11S473	M	42	77.968	72.583	78.457	79.212
MB11S474	F	50+	66.841	73.442	79.950	-
MB11S476	F	31	74.372	65.963	80.560	82.008
MB11S477	M	61	-	-	-	-
MB11S479	U	12-18	-	-	-	-
MB11S481	F	29	65.517	55.948	-	78.685
MB11S482	M	36	70.973	72.459	88.282	86.280
MB11S484	M	50+	66.289	61.032	80.593	-
MB11S485	F	36-49	-	-	-	-
MB11S487	F	29	-	69.683	-	74.784
MB11S488	F	36-49	74.099	76.827	76.339	77.414
MB11S489	M	36-49	-	-	-	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B1 – continued…

Individual Number	Sex	Age	L. PDFA	R. PDFA	L. A-LDFA	R. A-LDFA
MB11S490a	F	36-49	-	-	-	-
MB11S490b	M	18+	-	-	-	-
MB11S492	M	26-35	72.663	-	-	-
MB11S494	M	50+	81.490	72.837	83.324	86.709
MB11S495	F	26-35	69.439	-	82.982	-
MB11S497	M	26-35	71.233	71.789	79.203	79.202
MB11S498	F	50+	73.234	67.046	71.223	71.632
MB11S501	F	18-25	63.338	64.453	78.477	79.812
MB11S502	M	25	76.583	61.437	81.389	81.066
MB11S504	F	36-49	77.996	78.403	-	77.849
MB11S505	M	18-25	79.973	68.371	-	77.703
MB11S507	U	14 ± 2 yrs.	-	-	-	-
MB11S508	M	50+	74.757	-	80.988	-
MB11S511	M	50+	82.735	-	82.423	-
MB11S512	F	36-49	70.705	72.230	77.842	81.759
MB11S514	M	26-35	81.051	77.569		
MB11S516	M	50+	81.465	72.139	85.706	80.549
MB11S518	F	18+	-	-	-	-
MB11S519	M	36-49	-	63.339	-	-
MB11S520	M	50+	75.257	68.892	79.387	79.349
MB11S521	M	69	81.114	72.878	82.004	80.481
MB11S522	F	13	-	-	-	-
MB11S523	M	50+	72.623	72.433	-	-
MB11S524	M	36-49	80.220	68.196	78.874	79.628
MB11S525	M	50+	73.004	66.277	79.538	80.435
MB11S526	M	50+ (50-72)	-	60.652	-	-
MB11S527	F	26-35	73.073	73.343	74.892	75.964
MB11S530	F	75	77.493	71.558	-	80.263
MB11S533	F	50-65	82.511	72.062	-	80.856
MB11S534	M	36-49	85.182	81.061	-	-
MB11S538	F	26-35	68.619	64.393	77.55	-
MB11S540	U	20	-	-	-	-
MB11S543	F	18+	-	-	-	-
MB11S544	M	30	79.853	75.605	-	82.555
MB11S545	F	49	-	-	-	-
MB11S549	U	11 ± 24 mo.	-	-	-	-
MB11S550	F	50+	70.335	68.517	74.516	-
MB11S552	M	18+	74.858	80.853	82.500	83.649
MB11S553	F	36-49	-	-	-	-

Legend – L. = Left; R. = Right; F = female; M= male; U = unknown sex; A = ambiguous sex; max. = maximum; PDFA = Posterior Distal Femoral Angle; LDFA = Lateral Distal Femoral Angle; FNA; Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; "-" = absent/damaged; yr/yrs = year/years; mo = months.
Note - All measurements represent angulation and are in degrees. Table continued…

Table B2 – Femur z-scores

Individual Number	Sex	Age	Z-Scores by Sex		Individual Number	Sex	Age	Z-Scores by Sex	
			L. A-LDFA	R. A-LDFA				L. ALDFA	R. ALDFA
KER15S006	M	26-35	-0.2	-0.3	**KER15S054**	A	26-35	-	-
KER15S007	F	36-49	-	-	**KER15S055**	F	36+	-	-
KER15S008	U	50+	-	-	**KER15S056**	F	36-49	-	-
KER15S009	M	36-49	-	-0.8	**KER15S057**	F	50+	-	-
KER15S010	M	36-49	-1.0	**-2.1**	**KER15S058**	M	26-35	0.2	-
KER15S011	M	36-49	-	-	**KER15S059**	F	36-49	-	-
KER15S012	F	36-49	-	-	**KER15S060**	U	10 ± 1 yr.	-	-
KER15S014	F	18-25	-	-	**KER15S061**	M	36-49	-0.4	-
KER15S015	M	36-49	-0.1	-0.4	**KER15S062**	F	36-49	-	0.9
KER15S016	M	18-25	-0.9	-0.6	**KER15S063**	F	36-49	-0.6	-
KER15S017	M	36-49	**-2.6**	**-2.1**	**KER15S064**	M	36-49	-0.7	-0.8
KER15S018	M	18-25	0.1	0.8	**KER15S065**	M	36-49	1.0	-
KER15S019	M	50+	-	-	**KER15S066**	M	18+	0.7	-
KER15S020	U	15 ± 2	-	-	**KER15S068**	F	18+	-	**1.8**
KER15S021	M	36-49	**-2.4**	-0.5	**KER15S070**	F	36-49	-	-
KER15S024	M	36-49	-	-	**KER15S071**	M	18-25	-1.1	-
KER15S025	M	36-49	**1.6**	-	**KER15S072**	F	36-49	-	-
KER15S026	M	36-49	-0.5	-	**KER15S073**	U	10 ± 1 yr.	-	-
KER15S028	F	36-49	-	0.7	**KER15S074**	M	36-49	**-2.1**	**3.6**
KER15S029	M	36-49	**1.7**	-	**KER15S075**	F	36-49	-	-0.7
KER15S030	M	36-49	-	-	**KER15S076**	M	26-35	-0.7	0.3
KER15S031	U	17 ± 1 yr.	-	-	**KER15S077**	M	26-35	-0.7	-1.5
KER15S032	F	36-49	0.7	-	**KER15S078**	F	26-35	**1.5**	0.8
KER15S035	F	26-35	-	-	**KER15S079**	U	12 ± 2 yrs.	-	-
KER15S036	M	36-49	-	-	**KER15S080**	M	26-35	0.9	0.3
KER15S037	M	50+	**1.5**	0.1	**KER15S081**	U	18+	-	-
KER15S038	F	36-49	-	-	**KER15S082**	F	50+	-	1.2
KER15S040	M	18+	-	-	**KER15S083**	M	36-49	-0.7	-
KER15S042	M	36-49	0.2	0.2	**KER15S084**	F	36-49	-	0.2
KER15S043	M	36-49	-1.2	-0.0	**KER15S085**	M	36-49	-	-
KER15S044	M	36-49	-	-	**KER15S086**	M	36-49	-	-
KER15S045	M	36-49	-0.7	0.2	**KER15S087**	M	36-49	0.6	-
KER15S046	M	26-35	-	-	**KER15S088**	F	26-35	-	-
KER15S047	A	26-35	-	-	**KER15S089**	M	50+	-	-
KER15S050	A	18+	-	-	**KER15S090**	F	50+	-0.7	-
KER15S051	F	26-35	-	-	**KER15S091**	F	36-49	0.3	-
KER15S052	F	50+	-	-	**KER15S092**	F	50+	-	-
KER15S053	U	15 ± 1 yr.	-	-	**KER15S093**	F	26-35	0.5	0.5

Legend: L. = left; R. = Right; FNA = Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; F = female; M= male; A = ambiguous sex; U = unknown sex; max. = maximum; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.
Note: Significant z-scores are boldened and red. Table continued…

Table B2 – continued…

Individual Number	Sex	Age	Z-Scores by Sex		Individual Number	Sex	Age	Z-Scores by Sex	
			L. A-LDFA	R. A-LDFA				L. ALDFA	R. LDFA
KER15S094	F	18-25	0.7	**2.3**	**KER15S151**	M	36-49	0.5	-0.6
KER15S096	F	36-49	0.1	0.3	**KER15S154**	F	36+	-	-0.8
KER15S097	F	50+	0.0	-	**MB11S019**	U	18+	-	-
KER15S098	F	26-35	-1.2	-0.7	**MB11S029**	M	50+	-	-0.2
KER15S099	F	18-25	-	-	**MB11S040**	F	18-25	**-2.0**	-
KER15S100	M	26-35	-0.9	-	**MB11S044**	U	12 ± 12 mo.	-	-
KER15S101	M	36-49	-0.4	-0.6	**MB11S045**	F	47	0.7	-
KER15S102	M	50+	-	-0.6	**MB11S047**	F	21	-	0.1
KER15S103	M	18-25	-	-	**MB11S051**	M	74	-0.1	0.4
KER15S105	M	18-25	0.2	-0.7	**MB11S053**	F	36-49	-	-
KER15S106	M	36-49	**1.5**	0.7	**MB11S056**	F	50+	-	-
KER15S107	F	26-35	-	-	**MB11S059**	M	36-49	-	-1.1
KER15S108	M	36-49	-1.3	-1.1	**MB11S060**	F	18-25	-	-
KER15S109	F	36-49	-0.6	0.8	**MB11S064**	M	26-35	-	-
KER15S110	F	18-25	-	-	**MB11S070**	M	18+	0.1	-
KER15S111	M	26-35	**1.5**	**2.5**	**MB11S077**	F	58	-	-
KER15S112	M	26-35	-	-	**MB11S083**	F	36-49	-	-
KER15S113	M	36-49	0.1	-	**MB11S084**	F	18+	-0.3	-
KER15S114	F	50+	**1.7**	0.9	**MB11S088**	F	26-35	0.6	0.8
KER15S115	M	36-49	-0.3	-0.4	**MB11S092**	M	26-35	-0.6	-0.6
KER15S116	F	36-49	-	-	**MB11S093**	M	50+	-	-
KER15S117	F	36-49	1.2	-	**MB11S097**	F	50+	-	-
KER15S119a	U	12 ± 1 yr.	-	-	**MB11S100**	M	18+	-0.2	-1.4
KER15S119b	U	14 ± 1 yr.	-	-	**MB11S101**	F	26-35	-	-
KER15S120	F	18-25	-1.3	-0.5	**MB11S107**	F	18-25	-	-
KER15S122	F	36-49	-1.2	-0.7	**MB11S108**	M	26-35	-	-
HT15S124	U	13 ± 1 yr.	-	-	**MB11S110**	F	26-35	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	**MB11S121**	F	36-49	-	-
KER15S127	U	9 ± 1 yr.	-	-	**MB11S123**	U	13-17	-	-
KER15S129	F	36-49	-	-	**MB11S126**	F	36-49	-	-
KER15S130	M	18-25	-0.9	**-2.2**	**MB11S137**	F	36-49	-	-
KER15S132	F	50+	-	-	**MB11S144**	M	36-50	-	-
KER15S133	F	18-25	-	-	**MB11S149**	F	26-35	0.5	-
KER15S134	M	36-49	-0.4	-0.1	**MB11S151**	F	26-35	-1.3	-
KER15S136	U	13 ± 2 yrs.	-	-	**MB11S153**	M	57	-	-
KER15S142	F	26-35	-	-	**MB11S155a**	M	50+	-	-
KER15S143	M	36-49	-0.4	0.3	**MB11S155b**	F	50+	0.3	-
KER15S145	F	36-49	-	-	**MB11S157**	F	18+	-0.6	0.0
KER15S150	U	14 ± 1.5 yrs.	-	-	**MB11S158**	M	60	-1.0	-0.5

Legend: L. = left; R. = Right; FNA = Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; F = female; A = ambiguous sex; U = unknown sex; max. = maximum; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.
Note: Significant z-scores are boldened and red. Table continued…

Table B2 – continued…

Individual Number	Sex	Age	Z-Scores by Sex: L. A-LDFA	Z-Scores by Sex: R. A-LDFA	Individual Number	Sex	Age	Z-Scores by Sex: L. A-LDFA	Z-Scores by Sex: R. A-LDFA
MB11S160	F	26-35	-0.7	-1.2	**MB11S254**	M	36-49	-0.6	-
MB11S162	M	36-49	-	-	**MB11S257**	M	26-35	-	0.8
MB11S167	F	12	-	-	**MB11S260**	M	18-25	-1.4	-
MB11S170	F	50+	-	-1.0	**MB11S261**	M	79	-	-
MB11S174	F	36-49	-0.2	-0.6	**MB11S263**	M	36-49	-	-
MB11S180	M	18-25	-0.1	0.9	**MB11S267**	M	26-35	-	-0.7
MB11S183	F	26-35	-0.7	0.0	**MB11S269a**	M	18+	-	-
MB11S186	M	36-49	-	-	**MB11S269b**	U	11 ± 30 mo.	-	-
MB11S192	F	26-35	-	-0.2	**MB11S269c**	U	10 ± 1 yr.	-	-
MB11S194	M	50+	-1.4	-	**MB11S270**	M	18-25	1.3	0.1
MB11S195	F	36-49	-	-	**MB11S271**	M	50+	-0.4	-
MB11S198	F	26-35	-0.3	-0.7	**MB11S275**	U	15 ± 1 yr.	-	-
MB11S202	F	26-35	-	-	**MB11S278**	F	36-49	0.9	0.4
MB11S205	M	50+	-0.9	-0.3	**MB11S281**	M	36-49	-0.1	-0.5
MB11S206	U	13-17	-	-	**MB11S282**	U	12 ± 12 mo.	-	-
MB11S207	F	50+	-	-0.4	**MB11S285**	M	71	0.8	0.4
MB11S216	F	36-49	1.3	-	**MB11S286**	F	10	-	-
MB11S220	F	36-49	-	-	**MB11S289**	M	50+	-	-0.1
MB11S225	M	50+	-	-	**MB11S290**	M	18-25	**1.5**	0.2
MB11S226	M	26-35	**1.9**	**1.6**	**MB11S292**	U	11 ± 1 yr.	-	-
MB11S228	M	36-49	-	-1.1	**MB11S294**	F	66	-	-
MB11S229	U	13-17	-	-	**MB11S297**	M	84	-0.7	-0.6
MB11S233	M	18+	-0.2	0.5	**MB11S301a**	F	36-49	-	-0.1
MB11S234	F	18-25	-	-	**MB11S301b**	U	6-10	-	-
MB11S235	M	18+	-	-	**MB11S302**	F	50+	-	-
MB11S236	M	24	0.3	0.3	**MB11S303**	F	44	-	-
MB11S237	M	50+	**1.8**	-	**MB11S306**	M	31	0.8	-0.1
MB11S238	M	18-25	-	-	**MB11S307**	U	13-17	-	-
MB11S239	M	23	-	-	**MB11S309**	F	58	-	**-1.8**
MB11S240	M	36-49	0.7	0.6	**MB11S310**	M	35	-	-
MB11S242	M	50+	-0.7	-1.5	**MB11S311**	F	18-25	-	-
MB11S243	F	62	-	**1.6**	**MB11S313**	M	46	1.4	0.9
MB11S246	U	19	-	-	**MB11S317**	M	80	-	-
MB11S247	M	50+	-	-	**MB11S319**	F	69	0.6	-0.7
MB11S248	F	9	-	-	**MB11S321**	M	50+	1.4	0.6
MB11S249	M	26-35	-0.6	-0.2	**MB11S324**	M	36-49	-	-
MB11S250	M	73	-	-	**MB11S325**	M	36	0.4	-
MB11S251	M	36-49	-1.0	-0.2	**MB11S327**	F	36-49	-1.4	0.8
MB11S253	M	78	-	0.4	**MB11S331**	F	74	0.2	-0.9

Legend: L. = left; R. = Right; FNA = Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; F = female; M= male; A = ambiguous sex; U = unknown sex; max. = maximum; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.
Note: Significant z-scores are boldened and red. Table continued…

Table B2 – continued…

Individual Number	Sex	Age	Z-Scores by Sex: L. A-LDFA	Z-Scores by Sex: R. A-LDFA	Individual Number	Sex	Age	Z-Scores by Sex: L. A-LDFA	Z-Scores by Sex: R. A-LDFA
MB11S334	F	9	-	-	**MB11S399**	A	36-49	-	-
MB11S337	M	68	0.5	-0.1	**MB11S401**	F	26-35	-0.1	-
MB11S338	F	33	0.3	-0.9	**MB11S402**	M	36-49	-	-0.5
MB11S339	F	64	-	-	**MB11S404**	M	26-35	-0.2	-0.7
MB11S340	U	19	-	-	**MB11S405**	F	36-49	-	-
MB11S341	M	50+	-	-	**MB11S407**	M	18+	0.3	-0.6
MB11S342	M	75	-0.9	-	**MB11S409**	F	18+	-	-
MB11S344	F	20	-0.6	**-2.1**	**MB11S411**	M	36-49	-	0.4
MB11S345	F	28	-	-	**MB11S413**	F	39	-	-0.5
MB11S346	F	36-49	1.0	0.8	**MB11S415**	M	50+	0.5	-
MB11S347	M	50+	-0.8	-0.2	**MB11S416**	M	36-49	0.1	-
MB11S349	M	50+	-	-0.2	**MB11S420**	F	26-35	-	-
MB11S350	U	16 ± 1 yr.	-	-	**MB11S422**	F	29	-	-
MB11S355	F	50+	-	-0.7	**MB11426**	F	55	0.2	-
MB11S356	F	78	-1.4	-	**MB11S427**	M	27	-	-
MB11S358	F	74	-0.3	-1.3	**MB11S428**	F	50+	-	-
MB11S359	F	46	-	-	**MB11S430**	F	30	0.1	-0.1
MB11S360	F	66	-	-	**MB11S432**	M	26-35	0.7	0.7
MB11S363	M	61	-	-	**MB11S434**	F	36-49	-	1.0
MB11S367	F	11	-	-	**MB11S435**	M	45	0.3	1.2
MB11S368	M	26-35	1.3	1.3	**MB11S436**	F	18+	-	-
MB11S369	F	30	-0.2	-0.7	**MB11S437**	F	26-35	-	0.1
MB11S370	F	36-49	0.2	1.0	**MB11S441**	F	23	**2.2**	1.0
MB11S371	M	36-49	-	0.9	**MB11S446**	U	22	-	-
MB11S374	M	80	-0.0	-1.5	**MB11S452**	F	18-25	1.2	-
MB11S375	M	74	1.2	0.6	**MB11S453**	F	26-35	-	0.2
MB11S377	M	18+	-	-	**MB11S454**	U	21	-	-
MB11S379	M	18-25	-	-	**MB11S455**	M	50+	-	0.6
MB11S380	M	36-49	-0.2	0.1	**MB11S456**	M	36-49	-0.7	-
MB11S382	F	50+	-	-	**MB11S457**	F	50+	-0.0	**-1.8**
MB11S383	F	55	1.2	1.0	**MB11S460**	U	16.5 ± 36 mo.	-	-
MB11S385	F	25	-	-	**MB11S461**	F	28	-	-
MB11S386	F	36-49	0.0	-0.3	**MB11S462**	M	16	-	-
MB11S387	F	43	-	-	**MB11S464**	M	36-49	-	-
MB11S388	F	21	1.1	**1.6**	**MB11S465**	M	15	-	-
MB11S390	F	71	-	-	**MB11S466a**	M	83	-	-
MB11S391	M	50+	-	-	**MB11S466b**	F	43	0.8	-0.1
MB11S392	F	50+	1.2	1.5	**MB11S467**	M	26-35	-0.9	0.4
MB11S394	F	50+	0.1	-	**MB11S468**	F	36-49	-0.4	-0.4

Legend: L. = left; R. = Right; FNA = Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; F = female; M= male; A = ambiguous sex; U = unknown sex; max. = maximum; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.
Note: Significant z-scores are boldened and red. Table continued…

Table B2 – continued…

Individual Number	Sex	Age	Z-Scores by Sex L. A-LDFA	Z-Scores by Sex R. A-LDFA	Individual Number	Sex	Age	Z-Scores by Sex L. A-LDFA	Z-Scores by Sex R. A-LDFA
MB11S469	M	43	-	-	**MB11S508**	M	50+	0.07	-
MB11S470	M	50+	-	-	**MB11S511**	M	50+	0.66	-
MB11S471	F	9	-	-	**MB11S512**	F	36-49	-0.48	1.09
MB11S473	M	42	-0.97	-0.56	**MB11S514**	M	26-35	-	-
MB11S474	F	50+	0.33	-	**MB11S516**	M	50+	**2.01**	0.03
MB11S476	F	31	0.57	1.18	**MB11S518**	F	18+	-	-
MB11S477	M	61	-	-	**MB11S519**	M	36-49	-	-
MB11S479	U	12-18	-	-	**MB11S520**	M	50+	-0.59	-0.50
MB11S481	F	29	-	-0.06	**MB11S521**	M	69	0.49	0.00
MB11S482	M	36	**3.06**	**2.56**	**MB11S522**	F	13	-	-
MB11S484	M	50+	-0.09	-	**MB11S523**	M	50+	-	-
MB11S485	F	36-49	-	-	**MB11S524**	M	36-49	-0.80	-0.38
MB11S487	F	29	-	**-1.51**	**MB11S525**	M	50+	-0.52	-0.02
MB11S488	F	36-49	-1.06	-0.53	**MB11S526**	M	50+ (50-72)	-	-
MB11S489	M	36-49	-	-	**MB11S527**	F	26-35	**-1.62**	-1.07
MB11S490a	F	36-49	-	-	**MB11S530**	F	75	-	0.53
MB11S490b	M	18+	-	-	**MB11S533**	F	50-65	-	0.75
MB11S492	M	26-35	-	-	**MB11S534**	M	36-49	-	-
MB11S494	M	50+	1.03	**2.75**	**MB11S538**	F	26-35	-0.59	-
MB11S495	F	26-35	**1.50**	-	**MB11S540**	U	20	-	-
MB11S497	M	26-35	-0.66	-0.56	**MB11S543**	F	18+	-	-
MB11S498	F	50+	**-3.03**	**-2.69**	**MB11S544**	M	30	-	0.92
MB11S501	F	18-25	-0.24	0.36	**MB11S545**	F	49	-	-
MB11S502	M	25	0.23	0.26	**MB11S549**	U	11 ± 24 mo.	-	-
MB11S504	F	36-49	-	-0.37	**MB11S550**	F	50+	**-1.76**	-
MB11S505	M	18-25	-	-1.23	**MB11S552**	M	18+	0.69	1.40
MB11S507	U	14 ± 2 yrs.	-	-	**MB11S553**	F	36-49	-	-

Legend: L. = left; R. = Right; FNA = Femoral Neck Angle; A-LDFA = Anatomical Distal Femoral Angle; F = female; M= male; A = ambiguous sex; U = unknown sex; max. = maximum; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.
Note: Significant z-scores are boldened and red.

Table B3 – Femur non-metric features

Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.	
	L.	R.	L.	R.	L.	R.		L.	R.	L.	R.	L.	R.
KER15S006	-	-	A	A	A	A	**MB11S238**	-	-	-	-	-	-
KER15S007	-	-	-	-	-	-	**MB11S239**	-	-	A	A	A	A
KER15S008	-	-	-	-	-	-	**MB11S240**	-	-	A	A	A	A
KER15S009	-	-	A	A	A	A	**MB11S242**	-	-	A	A	A	A
KER15S010	-	-	A	A	A	A	**MB11S243**	-	-	A	A	-	-
KER15S011	-	-	A	A	-	-	**MB11S246**	0	0	-	-	A	A
KER15S012	-	-	A	-	A	-	**MB11S247**	-	-	-	A	-	-
KER15S014	-	-	-	-	-	-	**MB11S248**	0	0	-	-	A	A
KER15S015	-	-	A	A	A	A	**MB11S249**	-	-	A	A	A	A
KER15S016	-	-	A	A	A	A	**MB11S250**	-	-	A	A	-	-
KER15S017	-	-	A	A	A	-	**MB11S251**	-	-	A	A	A	A
KER15S018	-	-	A	A	A	A	**MB11S253**	-	-	A	A	-	A
KER15S019	-	-	-	P	-	A	**MB11S254**	-	-	A	A	A	A
KER15S020	0	-	-	-	-	-	**MB11S257**	-	-	P	A	A	A
KER15S021	-	-	A	A	A	-	**MB11S260**	-	-	A	-	A	-
KER15S024	-	-	A	A	A	A	**MB11S261**	-	-	A	A	A	A
KER15S025	-	-	-	A	-	-	**MB11S263**	-	-	-	-	P	P
KER15S026	-	-	A	A	A	A	**MB11S267**	-	-	A	A	A	A
KER15S028	-	-	-	A	-	A	**MB11S269a**	-	-	A	A	A	-
KER15S029	-	-	P	-	A	-	**MB11S269b**	-	-	-	-	P	-
KER15S030	-	-	-	-	-	-	**MB11S269c**	0	0	-	-	A	-
KER15S031	-	-	A	A	A	-	**MB11S270**	-	-	A	A	A	A
KER15S032	-	-	A	-	A	-	**MB11S271**	-	-	A	A	-	-
KER15S035	-	-	A	-	A	-	**MB11S275**	-	-	A	A	A	A
KER15S036	-	-	-	-	-	-	**MB11S278**	-	-	A	A	A	A
KER15S037	-	-	A	A	A	A	**MB11S281**	-	-	A	A	A	A
KER15S038	-	-	A	A	-	-	**MB11S282**	-	0	-	-	A	A
KER15S040	-	-	A	A	-	-	**MB11S285**	-	-	A	A	A	A
KER15S042	-	-	A	A	A	A	**MB11S286**	0	0	-	-	A	A
KER15S043	-	-	A	A	A	A	**MB11S289**	-	-	A	A	A	A
KER15S044	-	-	-	-	-	-	**MB11S290**	-	-	A	A	A	A
KER15S045	-	-	A	A	A	A	**MB11S292**	0	0	-	-	A	-
KER15S046	-	-	-	-	-	-	**MB11S294**	-	-	A	A	A	A
KER15S047	-	-	-	-	-	-	**MB11S297**	-	-	A	A	A	A
KER15S050	-	-	-	-	-	-	**MB11S301a**	-	-	A	A	A	A
KER15S051	-	-	-	-	-	-	**MB11S301b**	-	0	-	-	-	-
KER15S052	-	-	A	A	A	-	**MB11S302**	-	-	P	P	-	-
KER15S053	0	0	-	-	-	P	**MB11S303**	-	-	A	A	A	A
KER15S054	-	-	-	-	P	-	**MB11S306**	-	-	A	A	P	P
KER15S055	-	-	A	A	-	-	**MB11S307**	-	-	A	P	A	A
KER15S056	-	-	-	-	-	-	**MB11S309**	-	-	A	A	A	A

Legend – L. = left; R. = right; dist. = distal; G.P. = growth plate; Angle. = angulation; Widen. = widening; A = absent; P = present; Met. = Metaphyseal; "-" = missing/damaged. Table continued…

Note – The growth plate porosity is written as a score, not present/absent.

Table B3 – Continued…

Individual Number	Distal G.P. Porosity		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal G.P. Porosity		Distal Met. Angle.		Distal Met. Widen.	
	L.	R.	L.	R.	L.	R.		L.	R.	L.	R.	L.	R.
KER15S057	-	-	A	A	-	-	**MB11S310**	-	-	A	A	P	P
KER15S058	-	-	A	-	-	-	**MB11S311**	-	-	A	A	-	-
KER15S059	-	-	-	-	-	-	**MB11S313**	-	-	A	A	A	A
KER15S060	0	-	-	-	A	-	**MB11S317**	-	-	A	A	-	A
KER15S061	-	-	A	A	A	-	**MB11S319**	-	-	A	A	P	A
KER15S062	-	-	-	A	A	A	**MB11S321**	-	-	A	A	-	-
KER15S063	-	-	A	A	A	-	**MB11S324**	-	-	A	A	A	-
KER15S064	-	-	A	A	-	-	**MB11S325**	-	-	A	A	A	-
KER15S065	-	-	A	A	A	A	**MB11S327**	-	-	P	A	A	A
KER15S066	-	-	P	-	A	-	**MB11S331**	-	-	A	A	-	A
KER15S068	-	-	A	-	A	-	**MB11S334**	0	0	-	-	A	A
KER15S070	-	-	-	-	-	-	**MB11S337**	-	-	A	A	A	A
KER15S071	-	-	A	A	A	-	**MB11S338**	-	-	A	A	A	A
KER15S072	-	-	-	-	-	-	**MB11S339**	-	-	A	A	A	-
KER15S073	0	-	-	-	A	-	**MB11S340**	0	0	-	-	A	A
KER15S074	-	-	A	A	-	A	**MB11S341**	-	-	A	A	-	-
KER15S075	-	-	-	A	-	-	**MB11S342**	-	-	A	A	A	A
KER15S076	-	-	A	A	A	A	**MB11S344**	-	-	P	P	A	A
KER15S077	-	-	A	A	A	A	**MB11S345**	-	-	A	A	-	-
KER15S078	-	-	A	A	-	A	**MB11S346**	-	-	A	A	A	A
KER15S079	-	-	-	-	-	-	**MB11S347**	-	-	A	A	P	A
KER15S080	-	-	A	A	A	A	**MB11S349**	-	-	A	A	A	A
KER15S081	-	-	-	-	-	-	**MB11S350**	-	-	-	-	-	-
KER15S082	-	-	-	A	-	-	**MB11S355**	-	-	A	A	A	A
KER15S083	-	-	A	-	A	-	**MB11S356**	-	-	P	P	A	A
KER15S084	-	-	-	A	-	A	**MB11S358**	-	-	A	A	-	-
KER15S085	-	-	-	-	-	-	**MB11S359**	-	-	A	A	P	P
KER15S086	-	-	-	-	-	-	**MB11S360**	-	-	A	A	A	-
KER15S087	-	-	A	A	A	A	**MB11S363**	-	-	A	A	A	A
KER15S088	-	-	-	-	-	-	**MB11S367**	0	0	-	-	A	A
KER15S089	-	-	A	A	-	-	**MB11S368**	-	-	A	A	A	A
KER15S090	-	-	A	-	-	-	**MB11S369**	-	-	A	A	A	A
KER15S091	-	-	A	A	A	-	**MB11S370**	-	-	A	A	A	A
KER15S092	-	-	A	-	-	-	**MB11S371**	-	-	A	A	A	A
KER15S093	-	-	A	A	A	A	**MB11S374**	-	-	A	A	A	A
KER15S094	-	-	A	A	A	A	**MB11S375**	-	-	A	A	A	A
KER15S096	-	-	A	A	-	-	**MB11S377**	-	-	A	A	-	-
KER15S097	-	-	A	-	-	-	**MB11S379**	-	-	P	P	A	A
KER15S098	-	-	P	A	A	A	**MB11S380**	-	-	A	A	A	A
KER15S099	-	-	-	-	-	-	**MB11S382**	-	-	A	-	-	-
KER15S100	-	-	A	A	-	-	**MB11S383**	-	-	P	P	A	A
KER15S101	-	-	A	A	A	A	**MB11S385**	-	-	A	A	-	-

Legend – L. = left; R. = right; dist. = distal; G.P. = growth plate; Angle. = angulation; Widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table B3 – continued…

Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.	
	L.	R.	L.	R.	L.	R.		L.	R.	L.	R.	L.	R.
KER15S102	-	-	A	A	-	A	**MB11S386**	-	-	A	A	A	A
KER15S103	0	-	-	-	-	-	**MB11S387**	-	-	A	A	-	-
KER15S105	-	-	A	A	A	A	**MB11S388**	-	-	P	P	A	A
KER15S106	-	-	A	A	A	P	**MB11S390**	-	-	A	A	-	-
KER15S107	-	-	-	-	-	-	**MB11S391**	-	-	A	A	A	A
KER15S108	-	-	A	A	-	-	**MB11S392**	-	-	A	A	-	A
KER15S109	-	-	A	A	A	A	**MB11S394**	-	-	A	A	A	-
KER15S110	-	-	-	A	-	A	**MB11S399**	-	-	A	A	-	A
KER15S111	-	-	P	P	A	-	**MB11S401**	-	-	A	A	A	A
KER15S112	-	-	A	A	A	A	**MB11S402**	-	-	A	A	A	A
KER15S113	-	-	A	-	A	-	**MB11S404**	-	-	A	A	A	A
KER15S114	-	-	A	A	A	A	**MB11S405**	-	-	A	A	A	-
KER15S115	-	-	A	A	A	A	**MB11S407**	-	-	A	A	A	A
KER15S116	-	-	-	-	-	-	**MB11S409**	-	-	A	A	A	-
KER15S117	-	-	A	-	A	-	**MB11S411**	-	-	A	A	-	A
KER15S119a	-	-	-	-	-	-	**MB11S413**	-	-	A	A	-	-
KER15S119b	0	0	-	-	A	A	**MB11S415**	-	-	A	A	A	A
KER15S120	-	-	P	A	A	A	**MB11S416**	-	-	A	A	A	A
KER15S122	-	-	A	A	A	A	**MB11S420**	-	-	A	A	A	-
HT15S124	-	-	-	-	-	-	**MB11S422**	-	-	P	P	A	A
HT15S126	4	4	-	-	P	P	**MB11S426**	-	-	A	A	P	P
KER15S127	0	0	-	-	P	P	**MB11S427**	-	-	A	A	A	A
KER15S129	-	-	A	A	A	A	**MB11S428**	-	-	A	-	A	-
KER15S130	-	-	A	A	A	A	**MB11S430**	-	-	A	A	A	A
KER15S132	-	-	-	-	-	-	**MB11S432**	-	-	A	A	-	-
KER15S133	-	-	-	-	-	-	**MB11S434**	-	-	-	A	A	A
KER15S134	-	-	A	A	A	-	**MB11S435**	-	-	A	A	A	A
KER15S136	-	1	-	-	P	P	**MB11S436**	-	-	A	A	-	-
KER15S142	-	-	-	A	-	-	**MB11S437**	-	-	A	A	A	A
KER15S143	-	-	A	A	A	A	**MB11S441**	-	-	A	A	A	A
KER15S145	-	-	A	A	-	-	**MB11S446**	0	0	-	-	A	A
KER15S150	2	3	-	-	P	P	**MB11S452**	-	-	A	A	A	A
KER15S151	-	-	A	A	A	A	**MB11S453**	-	-	A	A	A	A
KER15S154	-	-	A	A	A	A	**MB11S454**	-	-	P	P	A	-
MB11S019	-	-	A	-	-	-	**MB11S455**	-	-	A	A	-	A
MB11S029	-	-	A	A	P	P	**MB11S456**	-	-	A	-	A	-
MB11S040	-	-	A	A	A	A	**MB11S457**	-	-	A	A	-	A
MB11S044	0	0	-	-	A	A	**MB11S460**	-	-	-	-	-	-
MB11S045	-	-	A	A	A	A	**MB11S461**	-	-	A	A	A	A
MB11S047	-	-	A	A	A	A	**MB11S462**	0	0	-	-	A	-
MB11S051	-	-	A	A	A	A	**MB11S464**	-	-	-	-	-	-
MB11S053	-	-	A	A	A	A	**MB11S465**	0	0	-	-	-	A

Legend – L. = left; R. = right; dist. = distal; G.P. = growth plate; Angle. = angulation; Widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table B3 – Continued…

Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal G. P. Porosity		Distal Met. Angle.		Distal Met. Widen.	
	L.	R.	L.	R.	L.	R.		L.	R.	L.	R.	L.	R.
MB11S056	-	-	A	A	-	A	**MB11S466a**	-	-	A	A	A	A
MB11S059	-	-	A	A	A	A	**MB11S466b**	-	-	A	A	A	A
MB11S060	-	-	P	P	A	A	**MB11S467**	-	-	A	A	A	A
MB11S064	-	-	A	A	A	A	**MB11S468**	-	-	A	A	A	A
MB11S070	-	-	P	P	-	-	**MB11S469**	-	-	-	-	-	-
MB11S077	-	-	A	A	-	-	**MB11S470**	-	-	A	A	A	-
MB11S083	-	-	P	P	A	A	**MB11S471**	0	0	-	-	A	A
MB11S084	-	-	P	P	P	P	**MB11S473**	-	-	A	A	A	A
MB11S088	-	-	A	A	A	A	**MB11S474**	-	-	A	A	-	-
MB11S092	-	-	P	P	-	A	**MB11S476**	-	-	A	A	A	A
MB11S093	-	-	A	A	A	-	**MB11S477**	-	-	A	A	A	A
MB11S097	-	-	A	A	A	A	**MB11S479**	0	0	-	-	A	A
MB11S100	-	-	A	A	A	A	**MB11S481**	-	-	A	A	A	A
MB11S101	-	-	A	A	-	A	**MB11S482**	-	-	A	A	A	A
MB11S107	-	-	A	A	A	A	**MB11S484**	-	-	A	A	A	-
MB11S108	-	-	A	A	-	-	**MB11S485**	-	-	A	A	P	P
MB11S110	-	-	A	A	A	A	**MB11S487**	-	-	A	A	A	A
MB11S121	-	-	A	A	-	-	**MB11S488**	-	-	P	P	-	A
MB11S123	0	-	-	-	-	-	**MB11S489**	-	-	A	A	A	A
MB11S126	-	-	A	A	-	-	**MB11S490a**	-	-	-	-	-	-
MB11S137	-	-	A	-	A	-	**MB11S490b**	-	-	-	-	-	-
MB11S144	-	-	A	A	-	-	**MB11S492**	-	-	A	-	-	-
MB11S149	-	-	A	A	A	A	**MB11S494**	-	-	A	A	-	A
MB11S151	-	-	A	A	P	P	**MB11S495**	-	-	A	-	A	-
MB11S153	-	-	A	A	A	A	**MB11S497**	-	-	A	A	A	A
MB11S155a	-	-	A	A	A	A	**MB11S498**	-	-	A	P	A	A
MB11S155b	-	-	A	A	A	-	**MB11S501**	-	-	P	A	A	A
MB11S157	-	-	A	A	A	A	**MB11S502**	-	-	A	A	A	A
MB11S158	-	-	A	A	A	-	**MB11S504**	-	-	A	A	A	A
MB11S160	-	-	A	A	A	A	**MB11S505**	-	-	A	A	A	A
MB11S162	-	-	A	A	A	-	**MB11S507**	0	-	-	-	A	A
MB11S167	0	0	-	-	A	A	**MB11S508**	-	-	A	-	A	-
MB11S170	-	-	A	A	-	A	**MB11S511**	-	-	A	-	A	-
MB11S174	-	-	A	A	A	A	**MB11S512**	-	-	A	A	A	A
MB11S180	-	-	A	A	A	A	**MB11S514**	-	-	A	A	A	A
MB11S183	-	-	A	A	A	A	**MB11S516**	-	-	A	A	A	-
MB11S186	-	-	A	A	A	A	**MB11S518**	-	-	-	-	-	-
MB11S192	-	-	A	A	A	-	**MB11S519**	-	-	A	A	-	-
MB11S194	-	-	P	-	A	-	**MB11S520**	-	-	A	A	A	A
MB11S195	-	-	A	A	-	-	**MB11S521**	-	-	A	A	A	A
MB11S198	-	-	A	A	A	A	**MB11S522**	0	0	-	-	A	A
MB11S202	-	-	A	A	-	-	**MB11S523**	-	-	A	A	A	A

Legend – L. = left; R. = right; dist. = distal; G.P. = growth plate; Angle. = angulation; Widen. = widening; A = absent; P = present; "-" = missingt/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Table B3 – continued…

Individual Number	Distal G. P. Porosity		Distal Met. Angle		Distal Met. Widen.		Individual Number	Distal G. P. Porosity		Distal Met. Angle		Distal Met. Widen.	
	L.	R.	L.	R.	L.	R.		L.	R.	L.	R.	L.	R.
MB11S205	-	-	A	A	A	A	**MB11S524**	-	-	A	A	A	A
MB11S206	1	1	-	-	-	-	**MB11S525**	-	-	A	A	-	A
MB11S207	-	-	A	A	A	A	**MB11S526**	-	-	-	A	A	-
MB11S216	-	-	A	A	-	A	**MB11S527**	-	-	A	A	-	A
MB11S220	-	-	A	A	-	-	**MB11S530**	-	-	A	A	-	-
MB11S225	-	-	A	A	A	-	**MB11S533**	-	-	A	A	-	-
MB11S226	-	-	A	A	A	A	**MB11S534**	-	-	A	A	A	A
MB11S228	-	-	A	A	-	A	**MB11S538**	-	-	A	A	A	A
MB11S229	1	1	-	-	A	A	**MB11S540**	-	2	-	-	-	A
MB11S233	-	-	A	A	A	A	**MB11S543**	-	-	-	-	-	-
MB11S234	-	-	-	A	-	A	**MB11S544**	-	-	A	A	A	-
MB11S235	-	-	-	A	-	-	**MB11S545**	-	-	-	-	-	-
MB11S236	-	-	A	A	-	A	**MB11S549**	0	0	-	-	A	-
MB11S237	-	-	A	A	A	A	**MB11S550**	-	-	P	A	A	-
-	-	-	-	-	-	-	**MB11S552**	-	-	A	A	A	A
-	-	-	-	-	-	-	**MB11S553**	-	-	-	-	-	-

Legend – L. = left; R. = right; dist. = distal; G.P. = growth plate; Angle. = angulation; Widen. = widening; A = absent; P = present; "-" = missingt/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Appendix C – Ulna Measurements, Z-Scores, and Non-Metric Features

Table C1 – Ulna Metric Measurements:

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
S006V002	M	26-35	-	34	37.5	37	-	-	-	-
S007V003	F	36-49	35	-	37.5	-	-	-	-	-
S008V004	A	50+	-	-	-	-	-	-	-	-
S009V005	M	36-49	-	35	-	36	-	250	-	7.14
S010V006	M	36-49	-	39	-	41	-	262	-	6.72
S011V007	M	36-49	35	37.5	37	40	256	-	7.31	-
S012V008	F	36-49	35.5	36	36.5	36	260.5	261	7.34	7.25
S014V010	F	18-25	38	-	39	-	-	-	-	-
S015V011	M	36-49	35.5	36	38	37	-	255	-	7.08
S016V012	M	18-25	39	40	40.5	-	253	-	6.49	-
S017V013	M	36-49	35	-	35	-	-	-	-	-
S018V014	M	18-25	35	36	36.5	38.5	261.5	263	7.47	7.31
S019V015	M	50+	38.5	38.5	41	41	247.5	-	6.43	-
S020V017	U	15 ± 2 yrs.	-	-	-	-	-	-	-	-
S021V018	M	36-49	38.5	40	39.5	40.5	-	257.5	-	6.44
S024V019	M	36-49	38	41	39.5	44.5	260	270	6.84	6.59
S025V020	M	36-49	-	36.5	-	38.5	-	246.5	-	6.75
S026V021	M	36-49	41	41	42.5	45	276.5	273.5	6.74	6.67
S028V024	F	36-49	-	-	35	-	230	-	-	-
S029V025	M	36-49	43	42.5	-	-	-	-	-	-
S030V026	M	36-49	-	-	-	-	-	-	-	-
S031V028	U	17 ± 1 y.r	-	36	-	-	-	-	-	-
S032V029	F	36-49	-	-	-	-	-	-	-	-
S035V030	F	26-35	39.5	-	39.5	-	-	-	-	-
S036V031	M	36-49	38	-	42	44	-	-	-	-
S037V032	M	50+ (22-88)	41.5	-	46	47	261	-	6.29	-
S038V033	F	36-49	36	-	36	-	-	-	-	-
S040V035	M	18+	-	34.5	-	35	-	249	-	7.22
S042V032	M	36-49	34.5	37.5	34	37.5	267.5	-	7.75	-
S043V038	M	36-49	36	38	36	38	262	265	7.28	6.97
S044V040	M	36-49	45.5	45	46.5	47	284.5	284	6.25	6.31
S045V041	M	36-49	37	40	40.5	46	264	-	7.14	-
S046V042	M	26-35	-	-	-	-	-	-	-	-
S047V043	A	26-35	-	-	-	-	-	-	-	-
S050V046	A	>23	-	-	-	-	-	-	-	-
S051V047	F	26-35	-	-	-	-	-	-	-	-
S052V048	F	50+	31	32	-	33.5	-	-	-	-
S053V049	U	15 ± 1 yr.	-	-	-	-	-	-	-	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…
Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
S054V050	A	26-35	-	-	-	-	-	-	-	-
S055V052	F	36+	36.5	-	37	-	-	-	-	-
S056V053	F	36-49	-	-	-	-	-	-	-	-
S057V058	F	50+	-	-	-	-	-	-	-	-
S058V059	M	26-35	-	36	-	37	-	-	-	-
S059V060	F	36-49	-	-	-	-	-	-	-	-
S060V065	U	10 ± 1 yr.	-	-	-	-	-	-	-	-
S061V066	M	36-49	-	-	-	-	-	-	-	-
S062V068	F	36-49	34	37	37.5	40	248	-	7.29	-
S063V069	F	36-49	35	34	35	36	229	226.5	6.54	6.66
S064V070	M	36-49	-	42.5	43	46	261	-	-	-
S065V071	M	36-49	39	40	42	43	-	250	-	6.25
S066V073	M	>35	-	-	-	-	-	-	-	-
S068V075	F	18+	-	-	30.5	-	-	-	-	-
KER15S070	F	36-49	-	-	36.5	-	-	-	-	-
KER15S071	M	18-25	38	-	38	-	-	-	-	-
KER15S072	F	36-49	34.5	-	34.5	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S074	M	36-49	43	44	44	49	-	269.5	-	6.13
KER15S075	F	36-49	-	-	-	-	-	-	-	-
KER15S076	M	26-35	-	42	-	45.5	-	278.5	-	6.63
KER15S077	M	26-35	36	-	37.5	-	252	-	7.00	-
KER15S078	F	26-35	-	-	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-	-	-	-
KER15S080	M	26-35	39.5	37	41.5	38	-	-	-	-
KER15S081	A	18+	-	-	-	-	-	-	-	-
KER15S082	F	50+	33	34	33	34	254	253.5	7.70	7.46
KER15S083	M	36-49	39	-	40.5	-	263	-	6.74	-
KER15S084	F	36-49	-	38	-	38.5	-	-	-	-
KER15S085	M	36-49	-	-	-	-	-	-	-	-
KER15S086	M	36-49	39	-	39	-	-	-	-	-
KER15S087	M	36-49	44	-	47.5	47	-	277	-	-
KER15S088	F	26-35	30.5	33	31.5	33.5	-	-	-	-
KER15S089	M	50+	39	40	39	40.5	268	273	6.87	6.83
KER15S090	F	50+	-	33.5	-	35	-	236.5	-	7.06
KER15S091	F	36-49	-	34	34.5	35	235	239.5	-	7.04
KER15S092	F	50+	35	34.5	35.5	37	226.5	-	6.47	-
KER15S093	F	26-35	35	33.5	34	34	241.5	-	6.90	-
KER15S094	F	18-25	38	36	41	40	233	236.5	6.13	6.57
KER15S096	F	36-49	-	34.5	-	34	-	242.5	-	7.03
KER15S097	F	50+	-	34.5	-	35	-	-	-	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…
Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
KER15S098	F	26-35	-	29	30	30	232.5	235.5	-	8.12
KER15S099	F	18-25	-	34	-	34	-	-	-	-
KER15S100	M	26-35	-	-	-	-	-	-	-	-
KER15S101	M	36-49	38	37.5	39.5	-	239	243	6.29	6.48
KER15S102	M	50+	-	-	-	-	-	-	-	-
KER15S103	M	18-25	38.5	37	42	39	-	-	-	-
KER15S105	M	18-25	40.5	41	40.5	41.5	285	-	7.04	-
KER15S106	M	36-49	44	42	46.5	45	276	277.5	6.27	6.61
KER15S107	F	26-35	37	-	38	-	239.5	-	6.47	-
KER15S108	M	36-49	38	-	38.5	-	-	-	-	-
KER15S109	F	36-49	37.5	38	40	42	239	239	6.37	6.29
KER15S110	F	18-25	-	33	-	37	-	235.5	-	7.14
KER15S111	M	26-35	40.5	41	41.5	43	265	-	6.54	-
KER15S112	M	26-35	38.5	-	41	-	-	-	-	-
KER15S113	M	36-49	40	-	43	-	272.5	-	6.81	-
KER15S114	F	50+	33	34	33.5	34	-	-	-	-
KER15S115	M	36-49	39.5	39	39.5	40	-	266	-	6.82
KER15S116	F	36-49	-	-	-	-	-	-	-	-
KER15S117	F	36-49	35.5	39.5	36.5	41	248.5	248.5	7.00	6.29
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S120	F	18-25	-	35	-	-	-	250	-	7.14
KER15S122	F	36-49	36	36	36	36	246	249	6.83	6.92
HT15S124	U	13 ± 1 yr.	-	-	-	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	30	28	-	-	-	-	-	-
KER15S127	U	9 +- 1 yr.	28	29	-	-	-	-	-	-
KER15S129	F	36-49	-	-	-	31.5	-	-	-	-
KER15S130	M	18-25	37	40	38.5	41	253	-	6.84	-
KER15S132	F	50+	-	37.5	35.5	37.5	-	227	-	6.05
KER15S133	F	18-25	-	-	-	-	-	240	-	-
KER15S134	M	36-49	38	-	40	38	238	240.5	6.26	-
KER15S136	U	13 ± 2 yrs.	31	-	-	-	-	-	-	-
KER15S142	F	26-35	31	-	31	-	-	-	-	-
KER15S143	M	36-49	30	29	30.5	29	249	-	8.30	-
KER15S145	F	36-49	32	-	32	-	237	-	7.41	-
KER15S150	U	14 ± 1.5 yrs.	35	34	-	-	-	-	-	-
KER15S151	M	36-49	39	40	39	40	274.5	278	7.04	6.95
KER15S154	F	36+	33	-	38	33	-	-	-	-
MB11S019	U	18+	-	-	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-	-	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo. = months; yr./yrs. = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…
Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S040	F	18-25	-	-	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	30	-	-	-	-	-	-	-
MB11S045	F	47	39	38	39	38	230	-	5.90	-
MB11S047	F	21	-	30	-	30	-	-	-	-
MB11S051	M	74	-	38	-	38	-	-	-	-
MB11S053	F	36-49	-	-	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-	-	-
MB11S059	M	36-49	47	-	-	-	264	265.5	5.62	-
MB11S060	F	18-25	41	45	-	-	-	242.5	-	5.39
MB11S064	M	26-35	-	-	-	-	-	-	-	-
MB11S070	M	18+	42	44	37	39.5	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-	-	-
MB11S084	F	18+	43	42	38	38.5	241	-	5.60	-
MB11S088	F	26-35	41	40	37	35	238.5	234.5	5.82	5.86
MB11S092	M	26-35	41	41	36	36.5	-	-	-	-
MB11S093	M	50+	44	46	34	42	-	-	-	-
MB11S097	F	50+	-	37	-	-	233	240	-	6.49
MB11S100	M	18+	47	45	47	45	-	258	-	5.73
MB11S101	F	26-35	39	36	-	-	213	-	5.46	-
MB11S107	F	18-25	46	47	40	43	234.5	-	5.10	-
MB11S108	M	26-35	-	42	-	-	-	264.5	-	6.30
MB11S110	F	26-35	-	36	-	-	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-	-	-
MB11S144	M	36-50	-	-	36	-	250	255.5	-	-
MB11S149	F	26-35	44	41	36	37	-	-	-	-
MB11S151	F	26-35	41	41	33	25.5	256.5	261	6.26	6.37
MB11S153	M	57	36	-	37	-	257.5	-	7.15	-
MB11S155a	M	50+	45	45	41.5	42	260.5	-	5.79	-
MB11S155b	F	50+	-	39	-	34	-	236	-	6.05
MB11S157	F	18+	37	37	33	33	225.5	229	6.09	6.19
MB11S158	M	60	53	55	48	51.5	-	-	-	-
MB11S160	F	26-35	38	41	33	33.5	-	232	-	5.66
MB11S162	M	36-49	-	-	-	-	-	242.5	-	-
MB11S167	F	12	30	-	-	-	-	-	-	-
MB11S170	F	50+	41	42	34.5	35.5	241.5	246.5	5.89	5.87
MB11S174	F	36-49	47.5	-	41	-	236	-	4.97	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…

Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S180	M	18-25	37.5	41	39	41	276.5	282	7.37	6.88
MB11S183	F	26-35	39	39	33.5	34.5	233.5	232.5	5.99	5.96
MB11S186	M	36-49	43.5	46	38	40.5	271.5	275.5	6.24	5.99
MB11S192	F	26-35	-	-	-	-	-	-	-	-
MB11S194	M	50+	42	-	39.5	-	290.5	-	6.92	-
MB11S195	F	36-49	41	-	36.5	-	231.5	-	5.65	-
MB11S198	F	26-35	36	-	31	-	228	-	6.33	-
MB11S202	F	26-35	-	-	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-	-	-
MB11S207	F	50+	38	38	35	35	229	233.5	6.03	6.14
MB11S216	F	36-49	38	40	37.5	39	246	248.5	6.47	6.21
MB11S220	F	36-49	-	-	-	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-	-	-
MB11S226	M	26-35	40	40	39	40	276.5	277.5	6.91	6.94
MB11S228	M	36-49	-	-	-	-	-	-	-	-
MB11S229	U	13-17	41	39.5	-	-	-	-	-	-
MB11S233	M	18+	46	-	47	-	282.5	-	6.14	-
MB11S234	F	18-25	-	-	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-	-	-
MB11S236	M	24	46	43	45.5	43.5	271.5	-	5.90	-
MB11S237	M	50+	44	44	42.5	43	-	-	-	-
MB11S238	M	18-25	41	40	41	41	-	-	-	-
MB11S239	M	23	38	38	38.5	39	-	244.5	-	6.43
MB11S240	M	36-49	43	42	42.5	42.5	240	242	5.58	5.76
MB11S242	M	50+	39	37	41	38	247.5	247.5	6.35	6.69
MB11S243	F	62	38	-	37	-	-	-	-	-
MB11S246	U	19	38	37	38	36.5	-	-	-	-
MB11S247	M	50+	-	-	-	-	-	-	-	-
MB11S248	F	9	27	-	-	-	-	-	-	-
MB11S249	M	26-35	-	46	-	45	-	256	-	5.57
MB11S250	M	73	-	37	-	37.5	-	-	-	-
MB11S251	M	36-49	39	36	38.5	37	259	259	6.64	7.19
MB11S253	M	78	41	39	40	40	-	254	-	6.51
MB11S254	M	36-49	-	-	-	-	-	-	-	-
MB11S257	M	26-35	38	41	37	40	252	256.5	6.63	6.26
MB11S260	M	18-25	41	43	-	-	-	-	-	-
MB11S261	M	79	-	-	-	-	-	267	-	-
MB11S263	M	36-49	39	-	41.5	-	262.5	-	6.73	-
MB11S267	M	26-35	42	41	42	40.5	-	244	-	5.95
MB11S269a	M	18+	-	39	-	-	-	255	-	6.54

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…

Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	31	30	-	-	-	-	-	-
MB11S270	M	18-25	39	43	41	45.5	-	283	-	6.58
MB11S271	M	50+	42	41	43	40	265	266	6.31	6.49
MB11S275	U	15 ± 1 yr.	31	31	31	31	220.5	217.5	7.11	7.02
MB11S278	F	36-49	39	-	39	-	-	-	-	-
MB11S281	M	36-49	33	35	33	34	-	243.5	-	6.96
MB11S282	U	12 ± 12 mo.	34	34	-	-	-	-	-	-
MB11S285	M	71	50	55	51	56	287.5	281	5.75	5.11
MB11S286	F	10	24	24	-	-	-	-	-	-
MB11S289	M	50+	36	35.5	36	36	261.5	-	7.26	-
MB11S290	M	18-25	36	36	36	36	-	258	-	7.17
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-	-	-
MB11S294	F	66	41	39	40.5	39	232.5	-	5.67	-
MB11S297	M	84	40	39	39	39	-	275	-	7.05
MB11S301a	F	36-49	33	33	33	33	230.5	235.5	6.98	7.14
MB11S301b	U	6-10	-	28	-	-	-	-	-	-
MB11S302	F	50+	-	33	-	32	-	224	-	6.79
MB11S303	F	44	35	35	35	35	228.5	226	6.53	6.46
MB11S306	M	31	42	-	44	-	263.5	-	6.27	-
MB11S307	U	13-17	-	-	-	-	-	-	-	-
MB11S309	F	58	-	40	-	40	-	241.5	-	6.04
MB11S310	M	35	46	-	49	-	-	-	-	-
MB11S311	F	18-25	-	32.5	33	-	-	254	-	7.82
MB11S313	M	46	39	39	41	41.5	251.5	251	6.45	6.44
MB11S317	M	80	-	-	-	-	-	-	-	-
MB11S319	F	69	40	38	39	38	238	240.5	5.95	6.33
MB11S321	M	50+	-	-	-	-	-	-	-	-
MB11S324	M	36-49	43	40	38.5	37	260	266	6.05	6.65
MB11S325	M	36	-	43	-	44	264.5	-	-	-
MB11S327	F	36-49	-	-	40	-	-	-	-	-
MB11S331	F	74	38	-	38	-	252	-	6.63	-
MB11S334	F	9	27	-	-	-	-	-	-	-
MB11S337	M	68	46	46	48	47	278	281.5	6.04	6.12
MB11S338	F	33	36	37.5	36	38	212	-	5.89	-
MB11S339	F	64	41	-	40	-	235	240	5.73	-
MB11S340	U	19	44	44	45	45	-	-	-	-
MB11S341	M	50+	47	45	47.5	45.5	277	273	5.89	6.07
MB11S342	M	75	-	-	-	-	-	-	-	-
MB11S344	F	20	-	34	-	33.5	-	-	-	-
MB11S345	F	28	30	30	30	30	220	223.5	7.33	7.45

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…
Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S346	F	36-49	-	34	-	-	-	220	-	6.47
MB11S347	M	50+	52	53	47	44	295	296.5	5.67	5.59
MB11S349	M	50+	37	-	38	-	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	38	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-	-	-	-
MB11S356	F	78	36	36	35	-	212	-	5.89	-
MB11S358	F	74	33	34	33	33.5	-	-	-	-
MB11S359	F	46	38	38	40	40.5	-	236.5	-	6.22
MB11S360	F	66	36	39	36	38.5	238	240.5	6.61	6.17
MB11S363	M	61	40	40.5	41	40.5	259	260	6.48	6.42
MB11S367	F	11	-	-	-	-	-	-	-	-
MB11S368	M	26-35	40	-	43	-	253	-	6.33	-
MB11S369	F	30	34	34.5	35.5	36	231.5	231	6.81	6.70
MB11S370	F	36-49	30	31	29	30	228	234	7.60	7.55
MB11S371	M	36-49	45	44	48	49	-	264	-	6.00
MB11S374	M	80	38	39	-	-	-	139.5	-	3.58
MB11S375	M	74	42	45	-	-	254	260	6.05	5.78
MB11S377	M	18+	-	-	-	-	-	-	-	-
MB11S379	M	18-25	39.5	39	-	-	279	280	7.06	7.18
MB11S380	M	36-49	40	40	-	-	239	243.5	5.98	6.09
MB11S382	F	50+	36	35.5	-	-	-	-	-	-
MB11S383	F	55	35	37	38	37	240.5	244	6.87	6.59
MB11S385	F	25	-	-	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-	-	-
MB11S388	F	21	36	36	36.5	38	242.5	249	6.74	6.92
MB11S390	F	71	-	-	-	-	-	-	-	-
MB11S391	M	50+	35	-	36	-	-	-	-	-
MB11S392	F	50+	35	-	35	-	233	-	6.66	-
MB11S394	F	50+	-	35	-	36.5	260	261	-	7.46
MB11S399	A	36-49	39	38	40	39	-	264	-	6.95
MB11S401	F	26-35	34	32	34	34	233	231	6.85	7.22
MB11S402	M	36-49	39	-	39	-	247.5	247.5	6.35	-
MB11S404	M	26-35	38.5	-	40.5	-	263	-	6.83	-
MB11S405	F	36-49	34	35	35	35	-	-	-	-
MB11S407	M	18+	-	-	-	-	-	-	-	-
MB11S409	F	18+	-	-	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	41	258.5	-	-	-
MB11S413	F	39	-	30	-	34	-	224	-	7.47
MB11S415	M	50+	36	37.5	36	38	244	251.5	6.78	6.71

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…

Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S416	M	36-49	42	40	43	42	-	267	-	6.68
MB11S420	F	26-35	-	-	-	-	-	-	-	-
MB11S422	F	29	32	34	33	35	243	252	7.59	7.41
MB11S426	F	55	36.5	38	38	40.5	-	248.5	-	6.54
MB11S427	M	27	38	39	40	40	-	265.5	-	6.81
MB11S428	F	50+	46	43	46	48	198.5	-	4.32	-
MB11S430	F	30	-	-	-	-	-	-	-	-
MB11S432	M	26-35	39	37	40	38	262	-	6.72	-
MB11S434	F	36-49	-	36	-	37.5	-	-	-	-
MB11S435	M	45	40.5	39	42	43	266.5	-	6.58	-
MB11S436	F	18+	34	33	34	33	-	225.5	-	6.83
MB11S437	F	26-35	-	-	-	-	-	-	-	-
MB11S441	F	23	31	-	31	-	252	257	8.13	-
MB11S446	U	22	40	46	-	-	-	-	-	-
MB11S452	F	18-25	35	35	37	39	247.5	249.5	7.07	7.13
MB11S453	F	26-35	34.5	34	37	35	239.5	238.5	6.94	7.01
MB11S454	U	21	38	38	-	-	-	-	-	-
MB11S455	M	50+	36	36	37	-	264	-	7.33	-
MB11S456	M	36-49	43	42.5	43	44	278.5	272	6.48	6.40
MB11S457	F	50+	42	41	35	35	216.5	220.5	5.15	5.38
MB11S460	U	16.5 ± 36 mo.	34.5	38	-	-	-	-	-	-
MB11S461	F	28	36	-	38	-	249	254	6.92	-
MB11S462	M	16	35	-	-	-	-	-	-	-
MB11S464	M	36-49	-	38	-	38	-	252.5	-	6.64
MB11S465	M	15	-	-	-	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	-	-	-	-
MB11S466b	F	43	38	38	39	40	260	258	6.84	6.79
MB11S467	M	26-35	39	38	42	41	259	260	6.64	6.84
MB11S468	F	36-49	36	35	37	35.5	230.5	228	6.40	6.51
MB11S469	M	43	34.5	37.5	36.5	39	-	254	-	6.77
MB11S470	M	50+	39	-	39	-	-	-	-	-
MB11S471	F	9	24	25	-	-	-	-	-	-
MB11S473	M	42	42	40	42	41	-	285	-	7.13
MB11S474	F	50+	-	33	-	35.5	-	243.5	-	7.38
MB11S476	F	31	36	48	37	39	245	250	6.81	5.21
MB11S477	M	61	37	39	38	40	263.5	262	7.12	6.72
MB11S479	U	12-18	26.5	-	-	-	-	-	-	-
MB11S481	F	29	36	-	36	-	250.5	254.5	6.96	-
MB11S482	M	36	38.5	38	41	43	278	276	7.22	7.26
MB11S484	M	50+	39	-	41	-	270	-	6.92	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…

Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued…

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S485	F	36-49	-	-	-	-	-	-	-	-
MB11S487	F	29	31.5	31	32	31	-	248	-	8.00
MB11S488	F	36-49	33	34.5	34	35	268	272	8.12	7.88
MB11S489	M	36-49	39	39.5	39.5	42	-	251	-	6.35
MB11S490a	M	36-49	-	-	-	-	-	-	-	-
MB11S490b	F	18+	35	-	37	-	243	-	6.94	-
MB11S492	M	26-35	-	36	-	36.5	-	261.5	-	7.26
MB11S494	M	50+	41	-	43	-	274.5	-	6.70	-
MB11S495	F	26-35	32.5	-	32.5	-	242	-	7.45	-
MB11S497	M	26-35	37	38	39	39.5	261	264.5	7.05	6.96
MB11S498	F	50+	30	31	30.5	31	241.5	245	8.05	7.90
MB11S501	F	18-25	33	33.5	34.5	36.5	219	220	6.64	6.57
MB11S502	M	25	42.5	40	47	42.5	282	282.5	6.64	7.06
MB11S504	F	36-49	34	34	-	34	-	-	-	-
MB11S505	M	18-25	34	37	36	-	248.5	-	7.31	-
MB11S507	U	14 ± 2 yr.	-	-	-	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-	-	-	-
MB11S511	M	50+	-	-	-	-	-	256	-	-
MB11S512	F	36-49	32	34	33	36	-	-	-	-
MB11S514	M	26-35	42	40	42	40	275	276.5	6.55	6.91
MB11S516	M	50+	37	38	38	-	271	-	7.32	-
MB11S518	F	18+	33.5	-	-	-	231	-	6.90	-
MB11S519	M	36-49	-	-	-	-	-	-	-	-
MB11S520	M	50+	35	38	37	39	-	265	-	6.97
MB11S521	M	69	34	38	34.5	38	-	262	-	6.89
MB11S522	F	13	-	30.5	-	-	-	-	-	-
MB11S523	M	50+	-	38	-	40	247.5	-	-	-
MB11S524	M	36-49	36	35	36	37	272	272.5	7.56	7.79
MB11S525	M	50+	38	40	39	40.56	269.5	-	7.09	-
MB11S526	M	50+ (50-72)	-	38	-	38	-	255.5	-	6.72
MB11S527	F	26-35	36	36	37	38	148	150.5	4.11	4.18
MB11S530	F	75	-	-	-	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	-	-	-	-
MB11S538	F	26-35	-	34	-	34	-	-	-	-

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres. Table continued…

Note – All measurements except for the ulna ratio are in millimeters.

Table C1 – continued….

Individual Number	Sex	Age	Ulna Min. Distal Circ.		Ulna Circ. 20mm from End		Ulna Maximum Length		Ulna Ratio	
			L	R	L	R	L	R	L	R
MB11S540	U	20	42	-	-	-	-	-	-	-
MB11S543	F	18+	-	-	-	-	-	-	-	-
MB11S544	M	30	37	38	38	38	274	271.5	7.41	7.14
MB11S545	F	49	31.5	33	32	33.5	218	222.5	6.92	6.74
MB11S549	U	11 ± 24 mo.	26	-	-	-	-	-	-	-
MB11S550	F	50+	35	-	38	-	-	-	-	-
MB11S552	M	18+	39.5	40.5	42	42	263	262.5	6.66	6.48
MB11S553	F	36-49	34.5	35	34	35	-	233	-	6.66

Legend: M = male; F = female; A = ambiguous sex; U = unknown sex; mo = months; yr = years; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres.
Note – All measurements except for the ulna ratio are in millimeters.

Table C2 – Ulna z-scores by sex

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
KER15S006	M	26-35	-	-1.6	-0.8	-1.0	-	-
KER15S007	F	36-49	-0.3	-	0.7	-	-	-
KER15S008	A	50+	-	-	-	-	-	-
KER15S009	M	36-49	-	-1.3	-	-1.3	-	1.0
KER15S010	M	36-49	-	-0.3	-	0.0	-	0.3
KER15S011	M	36-49	-1.3	-0.7	-0.9	-0.3	1.2	-
KER15S012	F	36-49	-0.2	0.0	0.3	0.1	1.0	0.8
KER15S014	F	18-25	0.5	-	1.2	-	-	-
KER15S015	M	36-49	-1.2	-1.0	-0.6	-1.0	-	0.9
KER15S016	M	18-25	-0.2	0.0	0.0	-	-0.4	-
KER15S017	M	36-49	-1.3	-	-1.4	-	-	-
KER15S018	M	18-25	-1.3	-1.0	-1.0	-0.6	1.5	1.2
KER15S019	M	50+	-0.4	-0.4	0.2	0.0	-0.5	-
KER15S020	U	15 ± 2	-	-	-	-	-	-
KER15S021	M	36-49	-0.4	0.0	-0.2	-0.1	-	-0.2
KER15S024	M	36-49	-0.5	0.3	-0.2	0.9	0.3	0.0
KER15S025	M	36-49	-	-0.9	-	-0.6	-	0.3
KER15S026	M	36-49	0.3	0.3	0.6	1.0	0.1	0.2
KER15S028	F	36-49	-	-	-0.2	-	-	-
KER15S029	M	36-49	0.8	0.6	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-	-
KER15S035	F	26-35	1.0	-	1.4	-	-	-
KER15S036	M	36-49	-0.5	-	0.4	0.8	-	-
KER15S037	M	50+	0.4	-	**1.5**	**1.5**	-0.7	-
KER15S038	F	36-49	0.0	-	0.1	-	-	-
KER15S040	M	18+	-	-1.4	-	-1.5	-	1.1
KER15S042	M	36-49	-1.4	-0.7	-1.7	-0.9	2.0	-
KER15S043	M	36-49	-1.0	-0.5	-1.2	-0.8	1.1	0.7
KER15S044	M	36-49	**1.5**	1.3	**1.6**	**1.5**	-0.8	-0.4
KER15S045	M	36-49	-0.8	0.0	0.0	1.3	0.9	-
KER15S046	M	26-35	-	-	-	-	-	-
KER15S047	A	26-35	-	-	-	-	-	-
KER15S050	A	18+	-	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-	-
KER15S052	F	50+	-1.4	-1.1	-	-0.7	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-
KER15S054	A	26-35	-	-	-	-	-	-
KER15S055	F	36+	0.1	-	0.5	-	-	-

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months.
Note: Significant z-scores boldened and red. Table continued…

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
KER15S056	F	36-49	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-
KER15S058	M	26-35	-	-1.0	-	-1.0	-	-
KER15S059	F	36-49	-	-	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-
KER15S062	F	36-49	-0.6	0.3	0.7	1.4	0.9	-
KER15S063	F	36-49	-0.3	-0.5	-0.2	0.1	0.0	0.0
KER15S064	M	36-49	-	0.6	0.7	1.3	-	-
KER15S065	M	36-49	-0.2	0.0	0.4	0.5	-	-0.5
KER15S066	M	18+	-	-	-	-	-	-
KER15S068	F	18+	-	-	-1.8	-	-	-
KER15S070	F	36-49	-	-	0.3	-	-	-
KER15S071	M	18-25	-0.5	-	-0.6	-	-	-
KER15S072	F	36-49	-0.4	-	-0.4	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S074	M	36-49	0.8	1.0	1.0	**2.1**	-	-0.7
KER15S075	F	36-49	-	-	-	-	-	-
KER15S076	M	26-35	-	0.5	-	1.2	-	0.1
KER15S077	M	26-35	-1.0	-	-0.8	-	0.6	-
KER15S078	F	26-35	-	-	-	-	-	-
KER15S079	U	12 ± 2 yr.	-	-	-	-	-	-
KER15S080	M	26-35	-0.1	-0.8	0.3	-0.8	-	-
KER15S081	A	18+	-	-	-	-	-	-
KER15S082	F	50+	-0.9	-0.5	-0.9	-0.5	1.5	1.0
KER15S083	M	36-49	-0.2	-	0.0	-	0.1	-
KER15S084	F	36-49	-	0.6	-	0.9	-	-
KER15S085	M	36-49	-	-	-	-	-	-
KER15S086	M	36-49	-0.2	-	-0.4	-	-	-
KER15S087	M	36-49	1.1	-	**1.9**	**1.5**	-	-
KER15S088	F	26-35	-1.6	-0.8	-1.4	-0.7	-	-
KER15S089	M	50+	-0.2	0.0	-0.4	-0.1	0.4	0.4
KER15S090	F	50+	-	-0.7	-	-0.2	-	0.5
KER15S091	F	36-49	-	-0.5	-0.4	-0.2	-	0.5
KER15S092	F	50+	-0.3	-0.4	0.0	0.5	-0.1	-
KER15S093	F	26-35	-0.3	-0.7	-0.6	-0.5	0.4	-
KER15S094	F	18-25	0.5	0.0	**1.9**	1.4	-0.5	-0.1
KER15S096	F	36-49	-	-0.4	-	-0.5	-	0.5
KER15S097	F	50+	-	-0.4	-	-0.2	-	-
KER15S098	F	26-35	-	-1.9	-2.0	-1.8	-	1.9
KER15S099	F	18-25	-	-0.5	-	-0.5	-	-

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
KER15S100	M	26-35	-	-	-	-	-	-
KER15S101	M	36-49	-0.5	-0.7	-0.2	-	-0.7	-0.2
KER15S102	M	50+	-	-	-	-	-	-
KER15S103	M	18-25	-0.4	-0.8	0.4	-0.5	-	-
KER15S105	M	18-25	0.2	0.3	0.0	0.1	0.7	-
KER15S106	M	36-49	1.1	0.5	**1.6**	1.0	-0.8	0.1
KER15S107	F	26-35	0.3	-	0.9	-	-0.1	-
KER15S108	M	36-49	-0.5	-	-0.5	-	-	-
KER15S109	F	36-49	0.4	0.6	**1.6**	**2.1**	-0.2	-0.5
KER15S110	F	18-25	-	-0.8	-	0.5	-	0.6
KER15S111	M	26-35	0.2	0.3	0.3	0.5	-0.3	-
KER15S112	M	26-35	-0.4	-	0.2	-	-	-
KER15S113	M	36-49	0.0	-	0.7	-	0.3	-
KER15S114	F	50+	-0.9	-0.5	-0.7	-0.5	-	-
KER15S115	M	36-49	-0.1	-0.3	-0.2	-0.3	-	0.4
KER15S116	F	36-49	-	-	-	-	-	-
KER15S117	F	36-49	-0.2	1.0	0.3	**1.8**	0.6	-0.5
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-
KER15S120	F	18-25	-	-0.3	-	-	-	0.6
KER15S122	F	36-49	0.0	0.0	0.1	0.1	0.4	0.3
HT15S124	U	13 ± 1 yr.	-	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yr.	-	-	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-	-	-
KER15S129	F	36-49	-	-	-	-1.3	-	-
KER15S130	M	18-25	0.8	0.0	-0.5	0.0	0.3	-
KER15S132	F	50+	-	0.4	0.0	0.6	-	-0.8
KER15S133	F	18-25	-	-	-	-	-	-
KER15S134	M	36-49	-0.5	-	-0.1	-0.8	-0.8	-
KER15S136	U	13 ± 2 yr.	-	-	-	-	-	-
KER15S142	F	26-35	-1.4	-	-1.6	-	-	-
KER15S143	M	36-49	-2.6	-2.8	-2.6	-3.1	3.0	-
KER15S145	F	36-49	-1.1	-	-1.3	-	1.1	-
KER15S150	U	14 ± 1.5 yr.	-	-	-	-	-	-
KER15S151	M	36-49	-0.2	0.0	-0.4	-0.3	0.7	0.6
KER15S154	F	36+	-0.9	-	0.9	-0.8	-	-
MB11S019	A	18+	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	-	-	-

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S045	F	47	0.8	0.6	1.2	0.8	-0.8	-
MB11S047	F	21	-	-1.7	-	-1.8	-	-
MB11S051	M	74	-	-0.5	-	-0.8	-	-
MB11S053	F	36-49	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-
MB11S059	M	36-49	**1.9**	-	-	-	**-2.0**	-
MB11S060	F	18-25	1.4	**2.5**	-	-	-	**-1.7**
MB11S064	M	26-35	-	-	-	-	-	-
MB11S070	M	18+	0.6	1.0	-0.9	-0.4	-	-
MB11S077	F	58	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-
MB11S084	F	18+	**2.0**	**1.7**	0.9	0.9	-1.2	-
MB11S088	F	26-35	1.4	1.1	0.5	-0.2	-0.9	-1.1
MB11S092	M	26-35	0.3	0.3	-1.2	-1.1	-	-
MB11S093	M	50+	1.1	**1.5**	-1.7	0.3	-	-
MB11S097	F	50+	-	0.3	-	-	-	-0.3
MB11S100	M	18+	**1.9**	1.3	**1.8**	1.0	-	-1.4
MB11S101	F	26-35	0.8	0.0	-	-	-1.4	-
MB11S107	F	18-25	**2.8**	**3.1**	**1.6**	**2.4**	**-1.8**	-
MB11S108	M	26-35	-	0.5	-	-	-	-0.5
MB11S110	F	26-35	-	0.0	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-
MB11S144	M	36-50	-	-	-1.2	-	-	-
MB11S149	F	26-35	**2.2**	1.4	0.1	0.5	-	-
MB11S151	F	26-35	1.4	1.4	-0.9	-3.2	-0.4	-0.4
MB11S153	M	57	-1.0	-	-0.9	-	0.9	-
MB11S155a	M	50+	1.4	1.3	0.3	0.3	**-1.6**	-
MB11S155b	F	50+	-	0.9	-	-0.5	-	-0.8
MB11S157	F	18+	0.3	0.3	-0.9	-0.8	-0.6	-0.7
MB11S158	M	60	**3.5**	**3.9**	**2.0**	**2.7**	-	-
MB11S160	F	26-35	0.5	1.4	-0.9	-0.7	-	-1.4
MB11S162	M	36-49	-	-	-	-	-	-
MB11S167	F	12	-	-	-	-	-	-
MB11S170	F	50+	1.4	**1.7**	-0.4	0.0	-0.8	-1.1
MB11S174	F	36-49	**3.2**	-	**1.9**	-	**-2.0**	-
MB11S180	M	18-25	-0.6	0.3	-0.4	0.0	1.3	0.5
MB11S183	F	26-35	0.8	0.9	-0.7	-0.3	-0.7	-1.0
MB11S186	M	36-49	1.0	**1.5**	-0.6	-0.1	-0.8	-1.0

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S192	F	26-35	-	-	-	-	-	-
MB11S194	M	50+	0.6	-	-0.2	-	0.4	-
MB11S195	F	36-49	1.4	-	0.3	-	-1.1	-
MB11S198	F	26-35	0.0	-	-1.6	-	-0.3	-
MB11S202	F	26-35	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-
MB11S207	F	50+	0.5	0.6	-0.2	-0.2	-0.7	-0.7
MB11S216	F	36-49	0.5	1.1	0.7	1.1	-0.1	-0.6
MB11S220	F	36-49	-	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-
MB11S226	M	26-35	0.0	0.0	-0.4	-0.3	0.4	0.6
MB11S228	M	36-49	-	-	-	-	-	-
MB11S229	U	13-17	-	-	-	-	-	-
MB11S233	M	18+	**1.6**	-	**1.8**	-	-1.0	-
MB11S234	F	18-25	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-
MB11S236	M	24	**1.6**	0.8	1.4	0.7	-1.4	-
MB11S237	M	50+	1.1	1.0	0.6	0.5	-	-
MB11S238	M	18-25	0.3	0.0	0.2	0.0	-	-
MB11S239	M	23	-0.5	-0.5	-0.5	-0.5	-	-0.2
MB11S240	M	36-49	0.8	0.5	0.6	0.4	**-2.0**	-1.3
MB11S242	M	50+	-0.2	-0.8	0.2	-0.8	-0.6	0.2
MB11S243	F	62	0.5	-	0.5	-	-	-
MB11S246	U	19	-	-	-	-	-	-
MB11S247	M	50+	-	-	-	-	-	-
MB11S248	F	9	-	-	-	-	-	-
MB11S249	M	26-35	-	**1.5**	-	1.0	-	**-1.7**
MB11S250	M	73	-	-0.8	-	-0.9	-	-
MB11S251	M	36-49	-0.2	-1.0	-0.5	-1.0	-0.1	1.0
MB11S253	M	78	0.3	-0.3	-0.1	-0.3	-	-0.1
MB11S254	M	36-49	-	-	-	-	-	-
MB11S257	M	26-35	-0.5	0.3	-0.9	-0.3	-0.1	-0.5
MB11S260	M	18-25	0.3	0.8	-	-	-	-
MB11S261	M	79	-	-	-	-	-	-
MB11S263	M	36-49	-0.2	-	0.3	-	0.1	-
MB11S267	M	26-35	0.6	0.3	0.4	-0.1	-	-1.0
MB11S269a	M	18+	-	-0.3	-	-	-	-0.1
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-	-	-
MB11S270	M	18-25	-0.2	0.8	0.2	1.2	-	0.0

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S271	M	50+	0.6	0.3	0.7	-0.3	-0.7	-0.1
MB11S275	U	15 ± 1 yr.	-	-	-	-	-	-
MB11S278	F	36-49	0.8	-	1.2	-	-	-
MB11S281	M	36-49	-1.8	-1.3	-2.0	-1.8	-	0.6
MB11S282	U	12 ± 12 mo.	-	-	-	-	-	-
MB11S285	M	71	**2.7**	**3.9**	**2.8**	**3.9**	**-1.7**	**-2.4**
MB11S286	F	10	-	-	-	-	-	-
MB11S289	M	50+	-1.0	-1.2	-1.2	-1.3	1.1	-
MB11S290	M	18-25	-1.0	-1.0	-1.2	-1.3	-	1.0
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-
MB11S294	F	66	1.4	0.9	**1.7**	1.1	-1.1	-
MB11S297	M	84	0.0	-0.3	-0.4	-0.5	-	0.8
MB11S301a	F	36-49	-0.9	-0.8	-0.9	-0.8	0.6	0.6
MB11S301b	U	6-10	-	-	-	-	-	-
MB11S302	F	50+	-	-0.8	-	-1.1	-	0.1
MB11S303	F	44	-0.3	-0.3	-0.2	-0.2	0.0	-0.3
MB11S306	M	31	0.6	-	1.0	-	-0.8	-
MB11S307	U	13-17	-	-	-	-	-	-
MB11S309	F	58	-	1.1	-	1.4	-	-0.9
MB11S310	M	35	**1.6**	-	**2.3**	-	-	-
MB11S311	F	18-25	-	-1.0	-0.9	-	-	1.5
MB11S313	M	46	-0.2	-0.3	0.2	0.1	-0.4	-0.2
MB11S317	M	80	-	-	-	-	-	-
MB11S319	F	69	1.1	0.6	1.2	0.8	-0.8	-0.5
MB11S321	M	50+	-	-	-	-	-	-
MB11S324	M	36-49	0.8	0.0	-0.5	-1.0	-1.2	0.1
MB11S325	M	36	-	0.8	-	0.8	-	-
MB11S327	F	36-49	-	-	**1.6**	-	-	-
MB11S331	F	74	0.5	-	0.9	-	0.1	-
MB11S334	F	9	-	-	-	-	-	-
MB11S337	M	68	**1.6**	-1.5	**2.0**	**1.5**	-1.2	-0.8
MB11S338	F	33	0.0	0.4	0.1	0.8	-0.8	-
MB11S339	F	64	1.4	-	**1.6**	-	-1.0	-
MB11S340	U	19	-	-	-	-	-	-
MB11S341	M	50+	**1.9**	1.3	**1.9**	1.2	**-1.5**	-0.8
MB11S342	M	75	-	-	-	-	-	-
MB11S344	F	20	-	-0.5	-	-0.7	-	-
MB11S345	F	28	-1.7	-1.7	-2.0	-1.8	1.0	1.0
MB11S346	F	36-49	-	-0.5	-	-	-	-0.3
MB11S347	M	50+	**3.2**	**3.3**	**1.8**	0.8	**-1.9**	**-1.6**
MB11S349	M	50+	-0.8	-	-0.6	-	-	-

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S350	U	16 ± 1 yr.	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-	-
MB11S356	F	78	0.0	0.0	-0.2	-	-0.8	-
MB11S358	F	74	-0.9	-0.5	-0.9	-0.7	-	-
MB11S359	F	46	0.5	0.6	**1.6**	**1.6**	-	-0.6
MB11S360	F	66	0.0	0.9	0.1	0.9	0.1	-0.7
MB11S363	M	61	0.0	0.1	0.2	-0.1	-0.4	-0.3
MB11S367	F	11	-	-	-	-	-	-
MB11S368	M	26-35	0.0	-	0.7	-	-0.7	-
MB11S369	F	30	-0.6	-0.4	0.0	0.1	0.3	0.0
MB11S370	F	36-49	-1.7	-1.4	-2.3	-1.8	1.3	1.2
MB11S371	M	36-49	1.4	1.0	**2.0**	**2.1**	-	-0.9
MB11S374	M	80	-0.5	-0.3	-	-	-	**-5.0**
MB11S375	M	74	0.6	1.3	-	-	-1.2	-1.3
MB11S377	M	18+	-	-	-	-	-	-
MB11S379	M	18-25	-0.1	-0.3	-	-	0.7	1.0
MB11S380	M	36-49	0.0	0.0	-	-	-1.3	-0.8
MB11S382	F	50+	0.0	-0.1	-	-	-	-
MB11S383	F	55	-0.3	0.3	0.9	0.5	0.4	-0.1
MB11S385	F	25	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-
MB11S388	F	21	0.0	0.0	0.3	0.8	0.2	0.3
MB11S390	F	71	-	-	-	-	-	-
MB11S391	M	50+	-1.3	-	-1.2	-	-	-
MB11S392	F	50+	-0.3	-	-0.2	-	0.1	-
MB11S394	F	50+	-	-0.3	-	0.3	-	1.0
MB11S399	A	36-49	-	-	-	-	-	-
MB11S401	F	26-35	-0.6	-1.1	-0.6	-0.5	0.4	0.7
MB11S402	M	36-49	-0.2	-	-0.4	-	-0.6	-
MB11S404	M	26-35	-0.4	-	0.0	-	0.3	-
MB11S405	F	36-49	-0.6	-0.3	-0.2	-0.2	-	-
MB11S407	M	18+	-	-	-	-	-	-
MB11S409	F	18+	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	0.0	-	-
MB11S413	F	39	-	-1.7	-	-0.5	-	1.1
MB11S415	M	50+	-1.0	-0.7	-1.2	-0.8	0.2	0.2
MB11S416	M	36-49	0.6	0.0	0.7	0.3	-	0.2
MB11S420	F	26-35	-	-	-	-	-	-
MB11S422	F	29	-1.1	-0.5	-0.9	-0.2	1.3	1.0
MB11S426	F	55	0.1	0.6	0.9	**1.6**	-	-0.2

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S427	M	27	-0.5	-0.3	-0.1	-0.3	-	0.4
MB11S428	F	50+	-	-	-	-	-	-
MB11S430	F	30	-	-	-	-	-	-
MB11S432	M	26-35	-0.2	-0.8	-0.1	-0.8	0.1	-
MB11S434	F	36-49	-	0.0	-	0.6	-	-
MB11S435	M	45	0.2	-0.3	0.4	0.5	-0.2	-
MB11S436	F	18+	-0.6	-0.8	-0.6	-0.8	-	0.2
MB11S437	F	26-35	-	-	-	-	-	-
MB11S441	F	23	-1.4	-	-1.6	-	2.0	-
MB11S446	U	22	-	-	-	-	-	-
MB11S452	F	18-25	-0.3	-0.3	0.5	1.1	0.7	0.6
MB11S453	F	26-35	-0.4	-0.5	0.5	-0.2	0.5	0.4
MB11S454	U	21	-	-	-	-	-	-
MB11S455	M	50+	-1.0	-1.0	-0.9	-	1.2	-
MB11S456	M	36-49	0.8	0.6	0.7	0.8	-0.4	-0.3
MB11S457	F	50+	**1.7**	1.4	-0.2	-0.2	**-1.8**	**-1.7**
MB11S460	U	16.5 ± 36 mo.	-	-	-	-	-	-
MB11S461	F	28	0.0	-	0.9	-	0.5	-
MB11S462	M	16	-	-	-	-	-	-
MB11S464	M	36-49	-	-0.5	-	-0.8	-	0.1
MB11S465	M	15	-	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	-	-
MB11S466b	F	43	0.5	0.6	1.2	1.4	0.4	0.1
MB11S467	M	26-35	-0.2	-0.5	0.4	0.0	-0.1	0.5
MB11S468	F	36-49	0.0	-0.3	0.5	0.0	-0.2	-0.2
MB11S469	M	43	-1.4	-0.7	-1.0	-0.5	-	0.3
MB11S470	M	50+	-0.2	-	-0.4	-	-	-
MB11S471	F	9	-	-	-	-	-	-
MB11S473	M	42	0.6	0.0	0.4	0.0	-	0.9
MB11S474	F	50+	-	-0.8	-	0.0	-	0.9
MB11S476	F	31	0.0	**3.4**	0.5	1.1	0.3	-2.0
MB11S477	M	61	-0.8	-0.3	-0.6	-0.3	0.8	0.3
MB11S479	U	12-18	-	-	-	-	-	-
MB11S481	F	29	0.0	-	0.1	-	0.5	-
MB11S482	M	36	-0.4	-0.5	0.2	0.5	1.0	1.2
MB11S484	M	50+	-0.2	-	0.2	-	0.5	-
MB11S485	F	36-49	-	-	-	-	-	-
MB11S487	F	29	-1.3	-1.4	-1.3	-1.5	-	1.8
MB11S488	F	36-49	-0.9	-0.4	-0.6	-0.2	2.0	1.6
MB11S489	M	36-49	-0.2	-0.1	-0.2	0.3	-	-0.4
MB11S490a	F	36-49	-	-	-	-	-	-

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months. Table continued…
Note: Significant z-scores boldened and red.

Table C2 – continued…

Individual Number	Sex	Age	Ulna Min. Circ.		Ulna Circ. 20mm From End		Ulna Ratio	
			L	R	L	R	L	R
MB11S490b	M	18+	-0.3	-	0.5	-	0.5	-
MB11S492	M	26-35	-	-1.0	-	-1.1	-	1.2
MB11S494	M	50+	0.3	-	0.7	-	0.0	-
MB11S495	F	26-35	-1.0	-	-1.1	-	1.1	-
MB11S497	M	26-35	-0.8	-0.5	-0.4	-0.4	0.7	0.7
MB11S498	F	50+	-1.7	-1.4	-1.8	-1.5	1.9	1.6
MB11S501	F	18-25	-0.9	-0.7	-0.4	0.3	0.1	-0.2
MB11S502	M	25	0.7	0.0	**1.8**	0.4	-0.1	0.8
MB11S504	F	36-49	-0.6	-0.5	-	-0.5	-	-
MB11S505	M	18-25	-1.5	-0.8	-1.2	-	1.2	-
MB11S507	U	14 ± 2 yr.	-	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-	-
MB11S511	M	50+	-	-	-	-	-	-
MB11S512	F	36-49	-1.1	-0.5	-0.9	0.1	-	-
MB11S514	M	26-35	0.6	0.0	0.4	-0.3	-0.2	0.6
MB11S516	M	50+	-0.8	-0.5	-0.6	-	1.2	-
MB11S518	F	18+	-0.7	-	-	-	0.4	-
MB11S519	M	36-49	-	-	-	-	-	-
MB11S520	M	50+	-1.3	-0.5	-0.9	-0.5	-	0.7
MB11S521	M	69	-1.5	-0.5	-1.6	-0.8	-	0.5
MB11S522	F	13	-	-	-	-	-	-
MB11S523	M	50+	-	-0.5	-	-0.3	-	-
MB11S524	M	36-49	-1.0	-1.3	-1.2	-1.0	1.6	2.0
MB11S525	M	50+	-0.5	0.0	-0.4	-0.1	0.8	-
MB11S526	M	50+ (50-72)	-	-0.5	-	-0.8	-	0.3
MB11S527	F	26-35	0.0	0.0	0.5	0.8	**-3.1**	**-3.4**
MB11S530	F	75	-	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	-	-
MB11S538	F	26-35	-	-0.5	-	-0.5	-	-
MB11S540	U	20	-	-	-	-	-	-
MB11S543	F	18+	-	-	-	-	-	-
MB11S544	M	30	-0.8	-0.5	-0.6	-0.8	1.4	1.0
MB11S545	F	49	-1.3	-0.8	-1.3	-0.7	0.5	0.1
MB11S549	U	11 ± 24 mo.	-	-	-	-	-	-
MB11S550	F	50+	-0.3	-	0.9	-	-	-
MB11S552	M	18+	-0.1	0.1	0.4	0.3	0.0	-0.2
MB11S553	F	36-49	-0.4	-0.3	-0.6	-0.2	-	0.0

Legend - Legend: M = male; F = female; A = Ambiguous sex; U = unknown sex; L. = left; R. = right; min. = minimum; max. = maximum; circ. = circumference; mm = millimetres; yr./yrs. = year/years; mo. = months.
Note: Significant z-scores boldened and red.

Table C3 – Non-metric features of the ulna

Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.	
	L	R	L	R	L	R		L	R	L	R	L	R
KER15S006	-	-	A	A	A	A	**MB11S238**	-	-	A	A	A	A
KER15S007	-	-	A	-	A	-	**MB11S239**	-	-	P	P	A	A
KER15S008	-	-	A	-	A	-	**MB11S240**	-	-	A	A	A	A
KER15S009	-	-	-	A	-	A	**MB11S242**	-	-	A	A	P	A
KER15S010	-	-	-	A	-	A	**MB11S243**	-	-	A	-	A	-
KER15S011	-	-	A	A	A	A	**MB11S246**	0	0	-	P	A	A
KER15S012	-	-	A	A	A	A	**MB11S247**	-	-	A	A	-	-
KER15S014	-	-	A	-	A	-	**MB11S248**	0	-	-	-	A	-
KER15S015	-	-	A	A	A	A	**MB11S249**	-	-	-	A	-	A
KER15S016	-	-	A	A	A	A	**MB11S250**	-	-	-	A	-	A
KER15S017	-	-	P	-	-	-	**MB11S251**	-	-	A	A	A	-
KER15S018	-	-	A	A	A	A	**MB11S253**	-	-	A	A	-	-
KER15S019	-	-	A	A	A	A	**MB11S254**	-	-	-	-	-	-
KER15S020	-	-	-	-	-	-	**MB11S257**	-	-	A	A	A	A
KER15S021	-	-	A	A	-	A	**MB11S260**	-	-	-	-	-	-
KER15S024	-	-	A	A	A	A	**MB11S261**	-	-	-	A	-	A
KER15S025	-	-	A	A	-	A	**MB11S263**	-	-	A	-	A	-
KER15S026	-	-	A	A	A	A	**MB11S267**	-	-	A	A	-	A
KER15S028	-	-	-	-	-	-	**MB11S269a**	-	-	-	A	-	-
KER15S029	-	-	A	P	A	A	**MB11S269b**	-	-	-	-	-	-
KER15S030	-	-	-	-	-	-	**MB11S269c**	0	0	-	-	A	A
KER15S031	-	2	-	-	-	-	**MB11S270**	-	-	A	A	A	A
KER15S032	-	-	-	-	-	-	**MB11S271**	-	-	A	A	P	A
KER15S035	-	-	A	-	A	-	**MB11S275**	-	-	A	A	A	A
KER15S036	-	-	A	A	A	-	**MB11S278**	-	-	A	-	A	-
KER15S037	-	-	A	A	A	A	**MB11S281**	-	-	A	A	-	A
KER15S038	-	-	A	-	-	-	**MB11S282**	0	-	-	-	-	-
KER15S040	-	-	A	-	-	-	**MB11S285**	-	-	A	P	-	P
KER15S042	-	-	A	A	A	A	**MB11S286**	0	0	-	-	A	A
KER15S043	-	-	P	A	A	A	**MB11S289**	-	-	A	A	-	-
KER15S044	-	-	A	A	A	A	**MB11S290**	-	-	A	A	A	A
KER15S045	-	-	-	A	A	A	**MB11S292**	-	-	-	-	-	-
KER15S046	-	-	-	-	-	-	**MB11S294**	-	-	A	A	A	A
KER15S047	-	-	-	-	-	-	**MB11S297**	-	-	A	A	-	A
KER15S050	-	-	-	-	-	-	**MB11S301a**	-	-	A	A	-	A
KER15S051	-	-	-	-	-	-	**MB11S301b**	-	0	-	-	-	-
KER15S052	-	-	-	A	-	A	**MB11S302**	-	-	A	A	A	A
KER15S053	-	3	-	-	-	P	**MB11S303**	-	-	A	A	A	A
KER15S054	-	-	-	-	-	-	**MB11S306**	-	-	A	-	P	-

Legend – L. = left; R. = right; GP. = growth plate; Angle. = angulation; widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table C3 – continued…

Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.	
	L	R	L	R	L	R		L	R	L	R	L	R
KER15S055	-	-	A	-	A	-	**MB11S307**	-	-	A	-	-	-
KER15S056	-	-	-	-	-	-	**MB11S309**	-	-	A	A	-	A
KER15S057	-	-	-	-	-	-	**MB11S310**	-	-	A	-	A	-
KER15S058	-	-	-	A	-	A	**MB11S311**	-	-	-	A	-	A
KER15S059	-	-	-	-	-	-	**MB11S313**	-	-	A	A	A	A
KER15S060	3	3	-	-	A	A	**MB11S317**	-	-	A	-	-	-
KER15S061	-	-	-	-	-	-	**MB11S319**	-	-	A	A	A	A
KER15S062	-	-	A	A	-	A	**MB11S321**	-	-	-	-	-	-
KER15S063	-	-	A	P	A	-	**MB11S324**	-	-	A	A	A	A
KER15S064	-	-	A	A	-	A	**MB11S325**	-	-	A	A	-	A
KER15S065	-	-	P	A	A	A	**MB11S327**	-	-	A	-	-	-
KER15S066	-	-	-	-	-	-	**MB11S331**	-	-	A	-	A	-
KER15S068	-	-	A	A	-	-	**MB11S334**	0	-	-	-	A	-
KER15S070	-	-	-	-	-	-	**MB11S337**	-	-	A	A	-	P
KER15S071	-	-	A	A	A	-	**MB11S338**	-	-	A	A	A	A
KER15S072	-	-	A	-	-	-	**MB11S339**	-	-	A	A	A	A
KER15S073	-	-	-	-	-	-	**MB11S340**	0	0	-	-	A	A
KER15S074	-	-	A	A	-	A	**MB11S341**	-	-	A	A	-	A
KER15S075	-	-	-	-	-	-	**MB11S342**	-	-	-	-	-	-
KER15S076	-	-	-	A	-	A	**MB11S344**	-	-	-	A	-	-
KER15S077	-	-	A	A	A	-	**MB11S345**	-	-	A	A	A	A
KER15S078	-	-	-	-	-	-	**MB11S346**	-	-	A	A	-	A
KER15S079	0	-	-	-	-	-	**MB11S347**	-	-	A	A	A	A
KER15S080	-	-	A	A	-	A	**MB11S349**	-	-	A	A	-	-
KER15S081	-	-	-	-	-	-	**MB11S350**	-	0	-	-	-	A
KER15S082	-	-	A	A	A	A	**MB11S355**	-	-	-	-	-	-
KER15S083	-	-	A	-	A	-	**MB11S356**	-	-	A	-	A	-
KER15S084	-	-	-	A	-	A	**MB11S358**	-	-	A	A	-	-
KER15S085	-	-	-	-	-	-	**MB11S359**	-	-	A	A	A	A
KER15S086	-	-	A	-	A	-	**MB11S360**	-	-	A	A	A	A
KER15S087	-	-	A	A	P	-	**MB11S363**	-	-	A	A	-	-
KER15S088	-	-	A	A	-	-	**MB11S367**	-	-	-	-	-	-
KER15S089	-	-	A	A	A	A	**MB11S368**	-	-	A	-	P	-
KER15S090	-	-	A	P	-	-	**MB11S369**	-	-	A	A	A	A
KER15S091	-	-	A	A	-	-	**MB11S370**	-	-	A	A	A	A
KER15S092	-	-	A	A	P	A	**MB11S371**	-	-	A	A	-	A
KER15S093	-	-	A	A	A	-	**MB11S374**	-	-	A	A	A	A
KER15S094	-	-	A	A	A	A	**MB11S375**	-	-	A	A	A	P
KER15S096	-	-	-	A	-	-	**MB11S377**	-	-	-	-	-	-

Legend – L. = left; R. = right; GP. = growth plate; Angle. = angulation; widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table C3 – continued…

Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.		Individual Number	Distal GP Por.		Distal Met. Angle.		Distal Met. Widen.	
	L	R	L	R	L	R		L	R	L	R	L	R
KER15S097	-	-	-	A	-	A	**MB11S379**	-	-	A	P	-	P
KER15S098	-	-	A	A	-	A	**MB11S380**	-	-	A	A	-	P
KER15S099	-	-	-	A	-	A	**MB11S382**	-	-	A	A	A	A
KER15S100	-	-	-	-	-	-	**MB11S383**	-	-	A	A	A	A
KER15S101	-	-	A	A	P	A	**MB11S385**	-	-	-	-	-	-
KER15S102	-	-	-	-	-	-	**MB11S386**	-	-	-	A	-	-
KER15S103	0	0	-	-	A	A	**MB11S387**	-	-	-	-	-	-
KER15S105	-	-	A	A	A	-	**MB11S388**	-	-	A	A	A	A
KER15S106	-	-	A	A	A	A	**MB11S390**	-	-	A	-	-	-
KER15S107	-	-	A	-	-	-	**MB11S391**	-	-	A	A	A	-
KER15S108	-	-	A	-	-	-	**MB11S392**	-	-	A	A	A	-
KER15S109	-	-	A	A	A	A	**MB11S394**	-	-	A	A	A	A
KER15S110	-	-	-	A	-	A	**MB11S399**	-	-	A	A	A	A
KER15S111	-	-	A	A	A	A	**MB11S401**	-	-	A	A	A	A
KER15S112	-	-	A	A	-	-	**MB11S402**	-	-	A	A	A	-
KER15S113	-	-	A	-	A	-	**MB11S404**	-	-	A	-	A	-
KER15S114	-	-	A	A	A	-	**MB11S405**	-	-	A	A	A	A
KER15S115	-	-	A	A	A	A	**MB11S407**	-	-	-	-	-	-
KER15S116	-	-	-	-	-	-	**MB11S409**	-	-	-	-	-	-
KER15S117	-	-	A	A	A	-	**MB11S411**	-	-	A	-	P	-
KER15S119a	-	-	-	-	-	-	**MB11S413**	-	-	-	A	-	-
KER15S119b	1	-	-	P	-	-	**MB11S415**	-	-	A	A	A	A
KER15S120	-	-	-	A	-	A	**MB11S416**	-	-	A	A	-	P
KER15S122	-	-	P	P	A	A	**MB11S420**	-	-	-	-	-	-
HT15S124	0	-	A	-	-	-	**MB11S422**	-	-	A	A	A	A
HT15S126	0	0	-	-	A	A	**MB11S426**	-	-	A	A	-	P
KER15S127	0	0	-	-	A	A	**MB11S427**	-	-	A	A	A	A
KER15S129	-	-	-	A	-	-	**MB11S428**	-	-	A	-	P	P
KER15S130	-	-	P	A	A	A	**MB11S430**	-	-	-	-	-	-
KER15S132	-	-	A	P	A	A	**MB11S432**	-	-	A	A	A	A
KER15S133	-	-	-	A	-	A	**MB11S434**	-	-	-	A	-	P
KER15S134	-	-	A	A	A	A	**MB11S435**	-	-	A	A	A	-
KER15S136	1	-	-	-	A	A	**MB11S436**	-	-	A	A	A	A
KER15S142	-	-	A	-	A	-	**MB11S437**	-	-	-	-	-	-
KER15S143	-	-	A	A	A	-	**MB11S441**	-	-	A	A	A	A
KER15S145	-	-	A	-	A	-	**MB11S446**	0	0	-	-	-	-
KER15S150	2	2	-	-	A	A	**MB11S452**	0	-	A	A	A	A
KER15S151	-	-	A	A	A	A	**MB11S453**	-	-	A	A	A	A
KER15S154	-	-	A	A	A	-	**MB11S454**	0	0	-	-	-	-

Legend – L. = left; R. = right; GP. = growth plate; Angle. = angulation; widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table C3 – continued…

Individual Number	**Distal GP Por.**		**Distal Met. Angle.**		**Distal Met. Widen.**		**Individual Number**	**Distal GP Por.**		**Distal Met. Angle.**		**Distal Met. Widen.**	
	L	R	L	R	L	R		L	R	L	R	L	R
MB11S019	-	-	-	-	-	-	**MB11S455**	-	-	A	A	A	-
MB11S029	-	-	P	P	-	-	**MB11S456**	-	-	A	A	P	P
MB11S040	-	-	-	P	-	-	**MB11S457**	-	-	A	A	P	P
MB11S044	0	-	-	-	A	-	**MB11S460**	0	-	-	-	-	-
MB11S045	-	-	A	A	A	A	**MB11S461**	-	-	A	A	A	-
MB11S047	-	-	-	A	-	-	**MB11S462**	1	-	-	-	A	-
MB11S051	-	-	-	A	-	P	**MB11S464**	-	-	-	A	-	A
MB11S053	-	-	A	A	-	-	**MB11S465**	-	-	-	-	-	-
MB11S056	-	-	-	-	-	-	**MB11S466a**	-	-	-	-	-	-
MB11S059	-	-	P	A	A	-	**MB11S466b**	-	-	A	A	A	A
MB11S060	-	-	A	A	A	A	**MB11S467**	-	-	A	A	A	A
MB11S064	-	-	-	-	-	-	**MB11S468**	-	-	A	A	A	A
MB11S070	-	-	A	A	A	A	**MB11S469**	-	-	A	A	A	A
MB11S077	-	-	-	-	-	-	**MB11S470**	-	-	A	-	-	-
MB11S083	-	-	-	-	-	-	**MB11S471**	0	0	-	-	-	-
MB11S084	-	-	A	A	A	-	**MB11S473**	-	-	A	A	A	A
MB11S088	-	-	A	A	A	A	**MB11S474**	-	-	-	A	-	A
MB11S092	-	-	A	A	P	P	**MB11S476**	-	-	A	A	A	A
MB11S093	-	-	P	P	-	-	**MB11S477**	-	-	A	A	P	P
MB11S097	-	-	A	A	-	A	**MB11S479**	0	-	-	-	A	-
MB11S100	-	-	A	A	A	A	**MB11S481**	-	-	A	A	A	A
MB11S101	-	-	A	A	A	A	**MB11S482**	-	-	A	A	A	A
MB11S107	-	-	A	A	A	-	**MB11S484**	-	-	A	-	A	-
MB11S108	-	-	-	A	-	A	**MB11S485**	-	-	-	-	-	-
MB11S110	-	-	-	A	-	-	**MB11S487**	-	-	A	A	A	-
MB11S121	-	-	-	-	-	-	**MB11S488**	-	-	A	A	A	A
MB11S123	-	-	-	-	-	-	**MB11S489**	-	-	A	A	A	A
MB11S126	-	-	-	-	-	-	**MB11S490a**	-	-	A	A	A	-
MB11S137	-	-	-	-	-	-	**MB11S490b**	-	-	-	-	-	-
MB11S144	-	-	A	A	A	-	**MB11S492**	-	-	-	A	-	-
MB11S149	-	-	A	A	P	P	**MB11S494**	-	-	A	-	A	-
MB11S151	-	-	A	A	A	-	**MB11S495**	-	-	A	-	A	-
MB11S153	-	-	A	-	A	-	**MB11S497**	-	-	P	A	-	P
MB11S155a	-	-	A	A	A	-	**MB11S498**	-	-	A	A	A	A
MB11S155b	-	-	-	A	-	A	**MB11S501**	-	-	A	A	A	A
MB11S157	-	-	A	A	A	A	**MB11S502**	-	-	A	A	P	A
MB11S158	-	-	A	A	A	-	**MB11S504**	-	-	-	A	-	-
MB11S160	-	-	A	A	-	A	**MB11S505**	-	1	A	P	A	A
MB11S162	-	-	-	A	-	-	**MB11S507**	-	-	-	-	-	-

Legend – L. = left; R. = right; GP. = growth plate; Angle. = angulation; widen. = widening; A = absent; P = present; "-" = missing/damaged. Table continued…
Note – The growth plate porosity is written as a score, not present/absent.

Table C3 – continued…

Individual Number	Distal Growth Plate Porosity		Distal Metaphyseal Bending		Distal Metaphyseal Thickening		Individual Number	Distal Growth Plate Porosity		Distal Metaphyseal Bending		Distal Metaphyseal Thickening	
	L	R	L	R	L	R		L	R	L	R	L	R
MB11S167	0	-	-	-	A	-	**MB11S508**	-	-	-	-	-	-
MB11S170	-	-	A	A	P	P	**MB11S511**	-	-	-	A	-	A
MB11S174	-	-	A	-	A	-	**MB11S512**	-	-	A	A	A	A
MB11S180	-	-	A	A	A	A	**MB11S514**	-	-	A	A	A	A
MB11S183	-	-	A	A	A	A	**MB11S516**	-	-	A	-	A	-
MB11S186	-	-	A	A	A	A	**MB11S518**	-	-	A	-	A	-
MB11S192	-	-	-	-	-	-	**MB11S519**	-	-	-	-	-	-
MB11S194	-	-	A	-	A	-	**MB11S520**	-	-	A	A	A	A
MB11S195	-	-	A	-	-	-	**MB11S521**	-	-	A	A	A	A
MB11S198	-	-	A	-	A	-	**MB11S522**	-	1	-	A	-	-
MB11S202	-	-	-	-	-	-	**MB11S523**	-	-	A	A	A	A
MB11S205	-	-	-	-	-	-	**MB11S524**	-	-	A	A	A	A
MB11S206	-	-	-	-	-	-	**MB11S525**	-	-	A	A	A	-
MB11S207	-	-	A	A	A	A	**MB11S526**	-	-	-	A	-	A
MB11S216	-	-	A	A	A	A	**MB11S527**	-	-	A	A	A	A
MB11S220	-	-	-	-	-	-	**MB11S530**	-	-	-	-	-	-
MB11S225	-	-	-	-	-	-	**MB11S533**	-	-	-	-	-	-
MB11S226	-	-	A	A	A	A	**MB11S534**	-	-	-	-	-	-
MB11S228	-	-	-	-	-	-	**MB11S538**	-	-	-	A	-	-
MB11S229	2	2	-	-	-	A	**MB11S540**	2	-	-	-	A	-
MB11S233	-	-	A	-	-	-	**MB11S543**	-	-	-	-	-	-
MB11S234	-	-	-	-	-	-	**MB11S544**	-	-	P	A	A	A
MB11S235	-	-	-	-	-	-	**MB11S545**	-	-	A	A	-	A
MB11S236	-	-	A	A	A	A	**MB11S549**	0	-	-	-	A	-
MB11S237	-	-	A	A	A	-	**MB11S550**	-	-	A	-	-	-
-	-	-	-	-	-	-	**MB11S552**	-	-	A	A	A	A
-	-	-	-	-	-	-	**MB11S553**	-	-	A	A	A	A

Legend – L. = left; R. = right; GP. = growth plate; Angle. = angulation; widen. = widening; A = absent; P = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Appendix D – Clavicle Measurements, Z-Scores, and Non-Metric Features

Table D1 – Metric clavicle measurements:

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
KER15S006	M	26-35	-	-	-	-	-	-
KER15S007	F	36-49	-	-	-	-	-	-
KER15S008	A	50+	-	-	29.04	-	-	-
KER15S009	M	36-49	156.5	-	26.98	27.19	5.80	-
KER15S010	M	36-49	-	-	-	-	-	-
KER15S011	M	36-49	-	-	29.59	26.75	-	-
KER15S012	F	36-49	-	-	-	-	-	-
KER15S014	F	18-25	-	-	21.35	23.15	-	-
KER15S015	M	36-49	140.5	-	25.62	-	5.48	-
KER15S016	M	18-25	139.5	-	-	-	-	-
KER15S017	M	36-49	137.5	131	25.82	24.61	5.33	5.32
KER15S018	M	18-25	-	-	20.89	20.93	-	-
KER15S019	M	50+	-	-	27.56	27.77	-	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-	-	-
KER15S021	M	36-49	-	152	-	31.69	-	4.80
KER15S024	M	36-49	-	-	-	31.23	-	-
KER15S025	M	36-49	-	147	-	-	-	-
KER15S026	M	36-49	157	154	26.61	-	5.90	-
KER15S028	F	36-49	-	-	-	-	-	-
KER15S029	M	36-49	155.5	-	35.35	32.66	4.40	-
KER15S030	M	36-49	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-	-
KER15S035	F	26-35	149	150	21.76	24.34	6.85	6.16
KER15S036	M	36-49	-	-	-	-	-	-
KER15S037	M	50+	-	156	-	-	-	-
KER15S038	F	36-49	-	129	23.25	23.08	-	5.59
KER15S040	M	18+	-	-	27.62	-	-	-
KER15S042	M	36-49	155.5	150	28.12	-	5.53	-
KER15S043	M	36-49	-	-	23.6	23.28	-	-
KER15S044	M	36-49	-	170	27.77	-	-	-
KER15S045	M	36-49	-	-	25.65	-	-	-
KER15S046	M	26-35	-	-	-	-	-	-
KER15S047	A	26-35	-	-	-	-	-	-
KER15S050	A	18+	-	136	-	-	-	-
KER15S051	F	26-35	-	142.5	-	-	-	-
KER15S052	F	50+	-	-	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-
KER15S054	A	26-35	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
KER15S056	F	36-49	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-
KER15S058	M	26-35	-	-	28.47	-	-	-
KER15S059	F	36-49	-	-	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S061	M	36-49	-	-	29.11	29.53	-	-
KER15S062	F	36-49	-	-	-	-	-	-
KER15S063	F	36-49	-	148.5	25.02	22.46	-	6.61
KER15S064	M	36-49	-	150	-	33.21	-	4.52
KER15S065	M	36-49	-	152.5	-	26.31	-	5.80
KER15S066	M	18+	-	-	-	-	-	-
KER15S068	F	18+	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-
KER15S071	M	18-25	152.5	146	-	-	-	-
KER15S072	F	36-49	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S074	M	36-49	-	-	-	-	-	-
KER15S075	F	36-49	-	-	-	-	-	-
KER15S076	M	26-35	-	-	28.83	29.51	-	-
KER15S077	M	26-35	-	-	-	-	-	-
KER15S078	F	26-35	-	-	23.7	-	-	-
KER15S079	U	12 ± 2 yr.	-	-	-	-	-	-
KER15S080	M	26-35	146	-	29.71	-	4.91	-
KER15S081	A	18+	-	-	-	25.73	-	-
KER15S082	F	50+	-	-	-	-	-	-
KER15S083	M	36-49	159.5	-	26.17	-	6.09	-
KER15S084	F	36-49	-	-	-	-	-	-
KER15S085	M	36-49	-	153	26.77	27.89	-	5.49
KER15S086	M	36-49	-	-	-	-	-	-
KER15S087	M	36-49	-	156	-	28.37	-	5.50
KER15S088	F	26-35	142	139.5	22.11	22.47	6.42	6.21
KER15S089	M	50+	-	151	-	29.82	-	5.06
KER15S090	F	50+	120	123	25.44	-	4.72	-
KER15S091	F	36-49	148.5	-	23.73	-	6.26	-
KER15S092	F	50+	-	-	26.81	27.52	-	-
KER15S093	F	26-35	139.5	139	19.47	23.79	7.16	5.84
KER15S094	F	18-25	-	-	-	24.7	-	-
KER15S096	F	36-49	-	-	24.8	20.7	-	-
KER15S097	F	50+	-	149	19.92	22.89	-	6.51
KER15S098	F	26-35	140.5	135.5	17.61	19.45	7.98	6.97
KER15S099	F	18-25	-	-	-	-	-	-
KER15S100	M	26-35	-	131.5	-	23.67	-	5.56
KER15S101	M	36-49	-	-	27.85	28.29	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex; yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
KER15S102	M	50+	158.5	159	29.12	29.88	5.44	5.32
KER15S103	M	18-25	-	-	-	-	-	-
KER15S105	M	18-25	-	-	-	-	-	-
KER15S106	M	36-49	170	170	29.87	31.09	5.69	5.47
KER15S107	F	26-35	-	-	-	-	-	-
KER15S108	M	36-49	-	-	-	-	-	-
KER15S109	F	36-49	-	-	-	-	-	-
KER15S110	F	18-25	-	138.5	-	23.54	-	5.88
KER15S111	M	26-35	-	169.5	24.91	25.62	-	6.62
KER15S112	M	26-35	-	-	-	-	-	-
KER15S113	M	36-49	-	-	-	-	-	-
KER15S114	F	50+	-	-	-	-	-	-
KER15S115	M	36-49	151	153	28.47	27.7	5.30	5.52
KER15S116	F	36-49	143	140.5	22.59	24.39	6.33	5.76
KER15S117	F	36-49	-	134.5	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	18.23	16.53	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-	-
KER15S122	F	36-49	151	-	28.36	-	5.32	-
HT15S124	U	13 ± 1 yr.	-	-	25.14	22.93	-	-
HT15S126	U	8.5 ± 1.5 yr.	-	-	20.55	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	15.26	17.42	-	-
KER15S129	A	36-49	145.5	-	-	-	-	-
KER15S130	M	18-25	-	-	25.48	-	-	-
KER15S132	F	50+	-	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-	-
KER15S134	M	36-49	142	-	-	-	-	-
KER15S136	U	13 ± 2 yr.	-	-	-	-	-	-
KER15S142	F	26-35	-	-	-	-	-	-
KER15S143	M	36-49	137	134	-	26.31	-	5.09
KER15S145	F	36-49	-	-	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	17.58	18.38	-	-
KER15S151	M	36-49	152	146.5	33.19	28.62	4.58	5.12
KER15S154	F	36+	-	-	-	-	-	-
MB11S019	A	18+	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	15.67	-	-
MB11S045	F	47	126.5	127.5	24.33	-	5.20	-
MB11S047	F	21	-	-	-	-	-	-
MB11S051	M	74	167.5	170	29.57	28.96	5.66	5.87
MB11S053	F	36-49	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S059	M	36-49	147.5	-	24.63	23.32	5.99	-
MB11S060	F	18-25	-	-	20.42	20.7	-	-
MB11S064	M	26-35	-	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-
MB11S084	F	18+	-	-	-	-	-	-
MB11S088	F	26-35	135.5	136.5	-	23.57	-	5.79
MB11S092	M	26-35	-	149	24.8	24.23	-	6.15
MB11S093	M	50+	-	-	-	-	-	-
MB11S097	F	50+	144.5	-	23.16	26.11	6.24	-
MB11S100	M	18+	-	-	34.4	-	-	-
MB11S101	F	26-35	-	-	-	-	-	-
MB11S107	F	18-25	-	-	-	-	-	-
MB11S108	M	26-35	149	-	25.27	24.49	5.90	-
MB11S110	F	26-35	-	131	-	20.63	-	6.35
MB11S121	F	36-49	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-
MB11S144	M	36-50	153	142	-	-	-	-
MB11S149	F	26-35	-	-	18.84	17.78	-	-
MB11S151	F	26-35	-	-	-	17.67	-	-
MB11S153	M	57	-	-	-	28.76	-	-
MB11S155a	M	50+	151.5	149	-	-	-	-
MB11S155b	F	50+	139.5	-	20.97	-	6.65	-
MB11S157	F	18+	-	-	-	-	-	-
MB11S158	M	60	150.5	150.5	28.53	29.53	5.28	5.10
MB11S160	F	26-35	144	148.5	24.37	-	5.91	-
MB11S162	M	36-49	147	145	25.46	26.13	5.77	5.55
MB11S167	F	12	-	-	18.35	17.63	-	-
MB11S170	F	50+	148	-	25.38	-	5.83	-
MB11S174	F	36-49	-	-	-	-	-	-
MB11S180	M	18-25	-	-	28.46	29.71	-	-
MB11S183	F	26-35	125.5	134.5	21.53	21.9	5.83	6.14
MB11S186	M	36-49	156	-	26.69	22.04	5.84	-
MB11S192	F	26-35	-	-	-	-	-	-
MB11S194	M	50+	159	159.5	27.45	26.01	5.79	6.13
MB11S195	F	36-49	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-
MB11S207	F	50+	138.5	-	26.82	25.67	5.16	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S216	F	36-49	-	152.5	-	-	-	-
MB11S220	F	36-49	-	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-
MB11S226	M	26-35	-	152	29.55	29.44	-	5.16
MB11S228	M	36-49	-	-	-	-	-	-
MB11S229	U	13-17	-	-	25.8	21.4	-	-
MB11S233	M	18+	145.5	150.5	31.24	27.04	4.66	5.57
MB11S234	F	18-25	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-
MB11S236	M	24	-	-	23.44	-	-	-
MB11S237	M	50+	-	-	-	-	-	-
MB11S238	M	18-25	153	-	23.8	-	6.43	-
MB11S239	M	23	-	-	25.95	25.03	-	-
MB11S240	M	36-49	149	149.5	29.14	27.26	5.11	5.48
MB11S242	M	50+	157.5	156.5	27.18	-	5.79	-
MB11S243	F	62	140	138	18.71	20.96	7.48	6.58
MB11S246	U	19	-	-	23.92	-	-	-
MB11S247	M	50+	-	167.5	-	34.01	-	4.93
MB11S248	F	9	-	-	-	16.47	-	-
MB11S249	M	26-35	-	149.5	-	-	-	-
MB11S250	M	73	-	-	-	-	-	-
MB11S251	M	36-49	-	-	-	-	-	-
MB11S253	M	78	146.5	151.5	26.98	27.53	5.43	5.50
MB11S254	M	36-49	-	-	-	-	-	-
MB11S257	M	26-35	147	146	26.52	25.98	5.54	5.62
MB11S260	M	18-25	-	-	-	30.6	-	-
MB11S261	M	79	-	-	-	-	-	-
MB11S263	M	36-49	143	146	26.04	-	5.49	-
MB11S267	M	26-35	147	151	24.82	26.02	5.92	5.80
MB11S269a	M	18+	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	15.13	-	-
MB11S270	M	18-25	-	-	28.85	30.05	-	-
MB11S271	M	50+	-	143	28.87	30.39	-	4.71
MB11S275	U	15 ± 1 yr.	-	-	19.7	19.48	-	-
MB11S278	F	36-49	145	-	19.57	-	7.41	-
MB11S281	M	36-49	140.5	-	27.46	-	5.12	-
MB11S282	U	12 ± 12 mo.	113.5	-	15.44	14.65	7.35	-
MB11S285	M	71	151	147	32.55	32.86	4.64	4.47
MB11S286	F	10	-	-	-	13.6	-	-
MB11S289	M	50+	-	-	-	-	-	-
MB11S290	M	18-25	-	-	22.9	23.6	-	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex; yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S294	F	66	136	141	20.71	22.49	6.57	6.27
MB11S297	M	84	-	-	-	-	-	-
MB11S301a	F	36-49	137	138	23.5	-	5.83	-
MB11S301b	U	6-10	-	-	-	-	-	-
MB11S302	F	50+	-	-	-	-	-	-
MB11S303	F	44	148	146.5	24.56	22.7	6.03	6.45
MB11S306	M	31	-	-	-	-	-	-
MB11S307	U	13-17	-	-	19.73	17.7	-	-
MB11S309	F	58	147.5	-	-	-	-	-
MB11S310	M	35	-	-	-	-	-	-
MB11S311	F	18-25	-	134	-	-	-	-
MB11S313	M	46	-	136.5	-	26.76	-	5.10
MB11S317	M	80	-	-	-	-	-	-
MB11S319	F	69	140.5	-	23.65	28	5.94	-
MB11S321	M	50+	-	-	-	-	-	-
MB11S324	M	36-49	142	140	30.87	32.59	4.60	4.30
MB11S325	M	36	155.5	154	-	-	-	-
MB11S327	F	36-49	-	-	23.45	25.39	-	-
MB11S331	F	74	-	-	-	-	-	-
MB11S334	F	9	-	-	11.74	13.04	-	-
MB11S337	M	68	159.5	-	-	-	-	-
MB11S338	F	33	-	-	-	-	-	-
MB11S339	F	64	-	-	-	-	-	-
MB11S340	U	19	-	-	23.05	23.72	-	-
MB11S341	M	50+	-	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-	-
MB11S344	F	20	-	-	-	-	-	-
MB11S345	F	28	136	137.5	22.62	22.83	6.01	6.02
MB11S346	F	36-49	135	134	22.66	25.14	5.96	5.33
MB11S347	M	50+	169.5	173	29.58	30.52	5.73	5.67
MB11S349	M	50+	157	150.56	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	25.32	-	-	-
MB11S355	F	50+	-	-	-	-	-	-
MB11S356	F	78	147.5	140	-	-	-	-
MB11S358	F	74	137	139	24.16	25.49	5.67	5.45
MB11S359	F	46	-	-	-	-	-	-
MB11S360	F	66	134.5	-	23.47	24.12	5.73	-
MB11S363	M	61	-	146.5	-	26.78	-	5.47
MB11S367	F	11	-	-	-	-	-	-
MB11S368	M	26-35	140	137	33.29	33.21	4.21	4.13
MB11S369	F	30	142	141.5	28.75	26.22	4.94	5.40
MB11S370	F	36-49	145	-	21.1	20.6	6.87	-
MB11S371	M	36-49	165	-	37.92	32.21	4.35	-
MB11S374	M	80	-	-	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S375	M	74	151	150.5	31.6	33.22	4.78	4.53
MB11S377	M	18+	-	-	-	-	-	-
MB11S379	M	18-25	-	-	24.28	25.79	-	-
MB11S380	M	36-49	150.5	153	23.75	-	6.34	-
MB11S382	F	50+	-	-	-	-	-	-
MB11S383	F	55	140.5	137.5	26.12	25.57	5.38	5.38
MB11S385	F	25	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-
MB11S388	F	21	151	146	21.45	22.89	7.04	6.38
MB11S390	F	71	132.5	130	-	-	-	-
MB11S391	M	50+	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-
MB11S394	F	50+	-	-	-	21.26	-	-
MB11S399	A	36-49	152	156	25.52	27.89	5.96	5.59
MB11S401	F	26-35	140	138.5	28.83	-	4.86	-
MB11S402	M	36-49	143.5	143	26.88	29.84	5.34	4.79
MB11S404	M	26-35	158	154	27.7	27.84	5.70	5.53
MB11S405	F	36-49	135.5	131	23.49	25.36	5.77	5.17
MB11S407	M	18+	-	-	-	-	-	-
MB11S409	F	18+	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	-	-	-
MB11S413	F	39	141.5	135	22.17	-	6.38	-
MB11S415	M	50+	147	140	29.46	28.33	4.99	4.94
MB11S416	M	36-49	161.5	169	30.23	33.3	5.34	5.08
MB11S420	F	26-35	134	135	20.33	-	6.59	-
MB11S422	F	29	-	-	-	22.62	-	-
MB11S426	F	55	149	150.5	27.41	26.39	5.44	5.70
MB11S427	M	27	147	145	26.47	24.85	5.55	5.84
MB11S428	F	50+	128	124.5	-	22.81	-	5.46
MB11S430	F	30	140.5	137.5	-	-	-	-
MB11S432	M	26-35	-	-	26.69	-	-	-
MB11S434	F	36-49	-	-	-	25.57	-	-
MB11S435	M	45	143	150	27.95	27.23	5.12	5.51
MB11S436	F	18+	-	-	-	-	-	-
MB11S437	F	26-35	136	137	22.79	23.57	5.97	5.81
MB11S441	F	23	144	137.5	20.96	18.75	6.87	7.33
MB11S446	U	22	-	-	22.93	24.36	-	-
MB11S452	F	18-25	-	-	21.22	20.17	-	-
MB11S453	F	26-35	-	-	-	-	-	-
MB11S454	U	21	-	-	-	-	-	-
MB11S455	M	50+	-	-	-	-	-	-
MB11S456	M	36-49	161.5	-	-	-	-	-
MB11S457	F	50+	-	126	-	29.42	-	4.28

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters.

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S460	U	16.5 ± 36 mo.	-	-	27.75	28.07	-	-
MB11S461	F	28	-	-	-	24.9	-	-
MB11S462	M	16	-	-	-	-	-	-
MB11S464	M	36-49	-	-	-	25.1	-	-
MB11S465	M	15	-	-	-	21.4	-	-
MB11S466a	M	83	-	-	-	-	-	-
MB11S466b	F	43	-	-	-	-	-	-
MB11S467	M	26-35	156.5	155	30.52	29.45	5.13	5.26
MB11S468	F	36-49	-	143	-	25.8	-	5.54
MB11S469	M	43	147.5	-	-	-	-	-
MB11S470	M	50+	-	-	-	-	-	-
MB11S471	F	9	-	-	12.45	13.21	-	-
MB11S473	M	42	165	163.5	29.5	29.11	5.59	5.62
MB11S474	F	50+	139.5	-	23.21	-	6.01	-
MB11S476	F	31	149	146.5	28.69	26.99	5.19	5.43
MB11S477	M	61	154.5	154	30.05	-	5.14	-
MB11S479	U	12-18	-	-	-	-	-	-
MB11S481	F	29	145	-	21.19	-	6.84	-
MB11S482	M	36	-	158	24.29	26.1	-	6.05
MB11S484	M	50+	166	158.5	30.05	-	5.52	-
MB11S485	F	36-49	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-	-
MB11S488	F	36-49	155	153	28.34	27.01	5.47	5.66
MB11S489	M	36-49	-	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	26.53	-	-
MB11S490b	M	18+	-	-	-	-	-	-
MB11S492	M	26-35	-	-	-	-	-	-
MB11S494	M	50+	147.5	148	28.28	25.94	5.22	5.71
MB11S495	F	26-35	-	-	-	22.19	-	-
MB11S497	M	26-35	148	141	28.2	-	5.25	-
MB11S498	F	50+	146.5	148	23.12	22.14	6.34	6.68
MB11S501	F	80	-	-	21.52	21.31	-	-
MB11S502	M	25	-	-	25.92	26.17	-	-
MB11S504	F	36-49	141	-	21.37	-	6.60	-
MB11S505	M	18-25	-	-	-	20.9	-	-
MB11S507	U	14 ± 2 yrs.	-	-	19.59	-	-	-
MB11S508	M	50+	-	-	-	-	-	-
MB11S511	M	50+	-	-	25.75	30.94	-	-
MB11S512	F	36-49	139	-	24.02	24.01	5.79	-
MB11S514	M	26-35	-	-	-	-	-	-
MB11S516	M	50+	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters. Table continued…

Table D1 – continued…

Individual Number	Sex	Age	Length		Medial Diameter		Ratio	
			L.	R.	L.	R.	L.	R.
MB11S520	M	50+	163	151	-	-	-	-
MB11S521	M	69	-	-	23.45	-	-	-
MB11S522	F	13	-	-	-	-	-	-
MB11S523	M	50+	-	-	-	-	-	-
MB11S524	M	36-49	156.5	155	26.81	26.84	5.84	5.77
MB11S525	M	50+	-	-	-	-	-	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-
MB11S527	F	26-35	154.5	155.5	23.75	24.44	6.51	6.36
MB11S530	F	75	-	-	24.43	-	-	-
MB11S533	F	50-65	-	141	-	-	-	-
MB11S534	M	36-49	161	-	23.22	-	6.93	-
MB11S538	F	26-35	128	-	22.61	-	5.66	-
MB11S540	U	20	-	-	25.43	26.89	-	-
MB11S543	F	18+	140.5	-	23.12	23.97	6.08	-
MB11S544	M	30	-	-	-	-	-	-
MB11S545	F	49	136.5	-	22.58	-	6.05	-
MB11S549	U	11 ± 24 mo.	-	-	15.7	16.04	-	-
MB11S550	F	50+	132	-	-	24.73	-	-
MB11S552	M	18+	-	-	-	27.97	-	-
MB11S553	F	36-49	-	138.5	24.67	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex yr/yrs = year/years; mo = months.
Note – All measurements in millimeters.

Table D2 – Clavicle z-scores by sex:

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
KER15S006	M	26-35	-	-	-	-
KER15S007	F	36-49	-	-	-	-
KER15S008	A	50+	-	-	-	-
KER15S009	M	36-49	-0.3	-0.3	0.7	-
KER15S010	M	36-49	-	-	-	-
KER15S011	M	36-49	0.6	-0.4	-	-
KER15S012	F	36-49	-	-	-	-
KER15S014	F	18-25	-0.7	-0.1	-	-
KER15S015	M	36-49	-0.7	-	0.1	-
KER15S016	M	18-25	-	-	-	-
KER15S017	M	36-49	-0.6	-1.1	-0.2	0.0
KER15S018	M	18-25	-2.3	-2.3	-	-
KER15S019	M	50+	-0.1	-0.1	-	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-
KER15S021	M	36-49	-	1.2	-	-1.1
KER15S024	M	36-49	-	1.1	-	-
KER15S025	M	36-49	-	-	-	-
KER15S026	M	36-49	-0.4	-	0.9	-
KER15S028	F	36-49	-	-	-	-
KER15S029	M	36-49	**2.6**	**1.5**	**-1.9**	-
KER15S030	M	36-49	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-
KER15S032	F	36-49	-	-	-	-
KER15S035	F	26-35	-0.6	0.3	1.0	0.3
KER15S036	M	36-49	-	-	-	-
KER15S037	M	50+	-	-	-	-
KER15S038	F	36-49	0.0	-0.2	-	-0.6
KER15S040	M	18+	0.0	-	-	-
KER15S042	M	36-49	0.1	-	0.2	-
KER15S043	M	36-49	-1.4	-1.5	-	-
KER15S044	M	36-49	0.0	-	-	-
KER15S045	M	36-49	-0.7	-	-	-
KER15S046	M	26-35	-	-	-	-
KER15S047	A	26-35	-	-	-	-
KER15S050	A	18+	-	-	-	-
KER15S051	F	26-35	-	-	-	-
KER15S052	F	50+	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-
KER15S054	A	26-35	-	-	-	-
KER15S055	F	36+	-	-	-	-
KER15S056	F	36-49	-	-	-	-
KER15S057	F	50+	-	-	-	-
KER15S058	M	26-35	0.3	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex; yr/yrs = year/years; mo = months.Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
KER15S059	F	36-49	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-
KER15S061	M	36-49	0.5	0.5	-	-
KER15S062	F	36-49	-	-	-	-
KER15S063	F	36-49	0.7	-0.4	-	1.1
KER15S064	M	36-49	-	**1.7**	-	**-1.6**
KER15S065	M	36-49	-	-0.5	-	0.9
KER15S066	M	18+	-	-	-	-
KER15S068	F	18+	-	-	-	-
KER15S070	F	36-49	-	-	-	-
KER15S071	M	18-25	-	-	-	-
KER15S072	F	36-49	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-
KER15S074	M	36-49	-	-	-	-
KER15S075	F	36-49	-	-	-	-
KER15S076	M	26-35	0.4	0.5	-	-
KER15S077	M	26-35	-	-	-	-
KER15S078	F	26-35	0.2	-	-	-
KER15S079	U	12 ± 2 yr.	-	-	-	-
KER15S080	M	26-35	0.7	-	-0.9	-
KER15S081	A	18+	-	-	-	-
KER15S082	F	50+	-	-	-	-
KER15S083	M	36-49	-0.5	-	1.2	-
KER15S084	F	36-49	-	-	-	-
KER15S085	M	36-49	-0.3	0.0	-	0.3
KER15S086	M	36-49	-	-	-	-
KER15S087	M	36-49	-	0.1	-	0.3
KER15S088	F	26-35	-0.4	-0.4	0.4	0.4
KER15S089	M	50+	-	0.6	-	-0.5
KER15S090	F	50+	0.9	-	**-2.0**	-
KER15S091	F	36-49	0.2	-	0.2	-
KER15S092	F	50+	1.4	**1.6**	-	-
KER15S093	F	26-35	-1.5	0.1	1.5	-0.2
KER15S094	F	18-25	-	0.5	-	-
KER15S096	F	36-49	0.6	-1.1	-	-
KER15S097	F	50+	-1.3	-0.2	-	0.9
KER15S098	F	26-35	-2.2	-1.6	2.6	1.6
KER15S099	F	18-25	-	-	-	-
KER15S100	M	26-35	-	-1.4	-	0.4
KER15S101	M	36-49	0.0	0.1	-	-
KER15S102	M	50+	0.5	0.6	0.0	-0.1
KER15S103	M	18-25	-	-	-	-
KER15S105	M	18-25	-	-	-	-

Legend – L. = left; R. = right; max. = maximum; M = male; F = female; U = Unknown Sex; A = Ambiguous Sex; yr/yrs = year/years; mo = months.
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
KER15S106	M	36-49	0.7	1.0	0.5	0.2
KER15S107	F	26-35	-	-	-	-
KER15S108	M	36-49	-	-	-	-
KER15S109	F	36-49	-	-	-	-
KER15S110	F	18-25	-	0.0	-	-0.1
KER15S111	M	26-35	-1.0	-0.8	-	2.5
KER15S112	M	26-35	-	-	-	-
KER15S113	M	36-49	-	-	-	-
KER15S114	F	50+	-	-	-	-
KER15S115	M	36-49	0.3	-0.1	-0.2	0.4
KER15S116	F	36-49	-0.2	0.3	0.3	-0.3
KER15S117	F	36-49	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-
KER15S120	F	18-25	-	-	-	-
KER15S122	F	36-49	**2.0**	-	-1.1	-
HT15S124	U	13 ± 1 yr.	-	-	-	-
HT15S126	U	8.5 ± 1.5 yr.	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-
KER15S129	A	36-49	-	-	-	-
KER15S130	M	18-25	-0.8	-	-	-
KER15S132	F	50+	-	-	-	-
KER15S133	F	18-25	-	-	-	-
KER15S134	M	36-49	-	-	-	-
KER15S136	U	13 ± 2 yr.	-	-	-	-
KER15S142	F	26-35	-	-	-	-
KER15S143	M	36-49	-	-0.5	-	-0.5
KER15S145	F	36-49	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-
KER15S151	M	36-49	**1.8**	0.2	**-1.5**	-0.4
KER15S154	F	36+	-	-	-	-
MB11S019	A	18+	-	-	-	-
MB11S029	M	50+	-	-	-	-
MB11S040	F	18-25	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	-
MB11S045	F	47	0.4	-	-1.3	-
MB11S047	F	21	-	-	-	-
MB11S051	M	74	0.6	0.3	0.5	1.0
MB11S053	F	36-49	-	-	-	-
MB11S056	F	50+	-	-	-	-
MB11S059	M	36-49	-1.0	-1.5	1.0	-
MB11S060	F	18-25	-1.1	-1.1	-	-
MB11S064	M	26-35	-	-	-	-
MB11S070	M	18+	-	-	-	-

Legend – L. = left; R. = right; U = Unknown Sex; A = Ambiguous Sex
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S077	F	58	-	-	-	-
MB11S083	F	36-49	-	-	-	-
MB11S084	F	18+	-	-	-	-
MB11S088	F	26-35	-	0.0	-	-0.3
MB11S092	M	26-35	-1.0	-1.2	-	1.6
MB11S093	M	50+	-	-	-	-
MB11S097	F	50+	0.0	1.0	0.2	-
MB11S100	M	18+	**2.2**	-	-	-
MB11S101	F	26-35	-	-	-	-
MB11S107	F	18-25	-	-	-	-
MB11S108	M	26-35	-0.8	-1.1	0.9	-
MB11S110	F	26-35	-	-1.1	-	0.6
MB11S121	F	36-49	-	-	-	-
MB11S123	U	13-17	-	-	-	-
MB11S126	F	36-49	-	-	-	-
MB11S137	F	36-49	-	-	-	-
MB11S144	M	36-50	-	-	-	-
MB11S149	F	26-35	-1.7	-2.3	-	-
MB11S151	F	26-35	-	-2.3	-	-
MB11S153	M	57	-	0.3	-	-
MB11S155a	M	50+	-	-	-	-
MB11S155b	F	50+	-0.9	-	0.8	-
MB11S157	F	18+	-	-	-	-
MB11S158	M	60	0.3	0.5	-0.3	-0.5
MB11S160	F	26-35	0.4	-	-0.3	-
MB11S162	M	36-49	-0.8	-0.6	0.6	0.4
MB11S167	F	12	-	-	-	-
MB11S170	F	50+	0.8	-	-0.4	-
MB11S174	F	36-49	-	-	-	-
MB11S180	M	18-25	0.3	0.6	-	-
MB11S183	F	26-35	-0.7	-0.6	-0.4	0.3
MB11S186	M	36-49	-0.4	-1.9	0.8	-
MB11S192	F	26-35	-	-	-	-
MB11S194	M	50+	-0.1	-0.6	0.7	1.5
MB11S195	F	36-49	-	-	-	-
MB11S198	F	26-35	-	-	-	-
MB11S202	F	26-35	-	-	-	-
MB11S205	M	50+	-	-	-	-
MB11S206	U	13-17	-	-	-	-
MB11S207	F	50+	1.4	0.9	-1.3	-
MB11S216	F	36-49	-	-	-	-
MB11S220	F	36-49	-	-	-	-
MB11S225	M	50+	-	-	-	-
MB11S226	M	26-35	0.6	0.5	-	-0.4

Legend – L. = left; R. = right; U = Unknown Sex; A = Ambiguous Sex
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S228	M	36-49	-	-	-	-
MB11S229	U	13-17	-	-	-	-
MB11S233	M	18+	1.2	-0.3	-1.4	0.4
MB11S234	F	18-25	-	-	-	-
MB11S235	M	18+	-	-	-	-
MB11S236	M	24	-1.4	-	-	-
MB11S237	M	50+	-	-	-	-
MB11S238	M	18-25	-1.3	-	1.8	-
MB11S239	M	23	-0.6	-1.0	-	-
MB11S240	M	36-49	0.5	-0.2	-0.6	0.3
MB11S242	M	50+	-0.2	-	0.7	-
MB11S243	F	62	-1.7	-1.0	1.9	1.0
MB11S246	U	19	-	-	-	-
MB11S247	M	50+	-	**2.0**	-	-0.8
MB11S248	F	9	-	-	-	-
MB11S249	M	26-35	-	-	-	-
MB11S250	M	73	-	-	-	-
MB11S251	M	36-49	-	-	-	-
MB11S253	M	78	-0.3	-0.1	0.0	0.3
MB11S254	M	36-49	-	-	-	-
MB11S257	M	26-35	-0.4	-0.7	0.2	0.5
MB11S260	M	18-25	-	0.9	-	-
MB11S261	M	79	-	-	-	-
MB11S263	M	36-49	-0.6	-	0.1	-
MB11S267	M	26-35	-1.0	-0.6	0.9	0.9
MB11S269a	M	18+	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-
MB11S270	M	18-25	0.4	0.7	-	-
MB11S271	M	50+	0.4	0.8	-	-1.2
MB11S275	U	15 ± 1 yr.	-	-	-	-
MB11S278	F	36-49	-1.4	-	1.8	-
MB11S281	M	36-49	-0.1	-	-0.6	-
MB11S282	U	12 ± 12 mo.	-	-	-	-
MB11S285	M	71	**1.6**	**1.6**	-1.4	**-1.7**
MB11S286	F	10	-	-	-	-
MB11S289	M	50+	-	-	-	-
MB11S290	M	18-25	-1.6	-1.4	-	-
MB11S292	U	11 ± 1 yr.	-	-	-	-
MB11S294	F	66	-1.0	-0.4	0.6	0.5
MB11S297	M	84	-	-	-	-
MB11S301a	F	36-49	0.1	-	-0.4	-
MB11S301b	U	6-10	-	-	-	-
MB11S302	F	50+	-	-	-	-

Legend – L. = left; R. = right; U = Unknown Sex; A = Ambiguous Sex
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S303	F	44	0.5	-0.3	-0.1	0.8
MB11S306	M	31	-	-	-	-
MB11S307	U	13-17	-	-	-	-
MB11S309	F	58	-	-	-	-
MB11S310	M	35	-	-	-	-
MB11S311	F	18-25	-	-	-	-
MB11S313	M	46	-	-0.4	-	-0.5
MB11S317	M	80	-	-	-	-
MB11S319	F	69	0.2	**1.8**	-0.2	-
MB11S321	M	50+	-	-	-	-
MB11S324	M	36-49	1.1	**1.5**	**-1.5**	**-2.0**
MB11S325	M	36	-	-	-	-
MB11S327	F	36-49	0.1	0.7	-	-
MB11S331	F	74	-	-	-	-
MB11S334	F	9	-	-	-	-
MB11S337	M	68	-	-	-	-
MB11S338	F	33	-	-	-	-
MB11S339	F	64	-	-	-	-
MB11S340	U	19	-	-	-	-
MB11S341	M	50+	-	-	-	-
MB11S342	M	75	-	-	-	-
MB11S344	F	20	-	-	-	-
MB11S345	F	28	-0.2	-0.3	-0.1	0.1
MB11S346	F	36-49	-0.2	0.6	-0.2	-1.1
MB11S347	M	50+	0.6	0.8	0.6	0.6
MB11S349	M	50+	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	-	-
MB11S355	F	50+	-	-	-	-
MB11S356	F	78	-	-	-	-
MB11S358	F	74	0.4	0.8	-0.6	-0.8
MB11S359	F	46	-	-	-	-
MB11S360	F	66	0.1	0.2	-0.5	-
MB11S363	M	61	-	-0.4	-	0.2
MB11S367	F	11	-	-	-	-
MB11S368	M	26-35	**1.9**	**1.7**	**-2.2**	**-2.4**
MB11S369	F	30	**2.1**	1.1	**-1.6**	-0.9
MB11S370	F	36-49	-0.8	-1.2	1.1	-
MB11S371	M	36-49	**3.4**	1.4	**-1.9**	-
MB11S374	M	80	-	-	-	-
MB11S375	M	74	1.3	**1.7**	-1.2	**-1.6**
MB11S377	M	18+	-	-	-	-
MB11S379	M	18-25	-1.2	-0.7	-	-
MB11S380	M	36-49	-1.3	-	1.7	-
MB11S382	F	50+	-	-	-	-

Legend – L. = left; R. = right; U = Unknown Sex; A = Ambiguous Sex
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S383	F	55	1.1	0.8	-1.0	-1.0
MB11S385	F	25	-	-	-	-
MB11S386	F	36-49	-	-	-	-
MB11S387	F	43	-	-	-	-
MB11S388	F	21	-0.7	-0.2	1.3	0.7
MB11S390	F	71	-	-	-	-
MB11S391	M	50+	-	-	-	-
MB11S392	F	50+	-	-	-	-
MB11S394	F	50+	-	-0.9	-	-
MB11S399	A	36-49	-	-	-	-
MB11S401	F	26-35	**2.2**	-	**-1.8**	-
MB11S402	M	36-49	-0.3	0.6	-0.1	-1.1
MB11S404	M	26-35	0.0	0.0	0.5	0.4
MB11S405	F	36-49	0.1	0.7	-0.5	-1.3
MB11S407	M	18+	-	-	-	-
MB11S409	F	18+	-	-	-	-
MB11S411	M	36-49	-	-	-	-
MB11S413	F	39	-0.4	-	0.4	-
MB11S415	M	50+	0.6	0.1	-0.8	-0.8
MB11S416	M	36-49	0.8	1.8	-0.1	-0.5
MB11S420	F	26-35	-1.1	-	0.7	-
MB11S422	F	29	-	-0.4	-	-
MB11S426	F	55	**1.6**	1.1	-0.9	-0.4
MB11S427	M	27	-0.4	-1.0	0.2	1.0
MB11S428	F	50+	-	-	-	-
MB11S430	F	30	-	-	-	-
MB11S432	M	26-35	-0.4	-	-	-
MB11S434	F	36-49	-	0.8	-	-
MB11S435	M	45	0.1	-0.2	-0.6	0.3
MB11S436	F	18+	-	-	-	-
MB11S437	F	26-35	-0.2	0.0	-0.2	-0.3
MB11S441	F	23	-0.9	-1.9	1.1	2.2
MB11S446	U	22	-	-	-	-
MB11S452	F	18-25	-0.8	-1.3	-	-
MB11S453	F	26-35	-	-	-	-
MB11S454	U	21	-	-	-	-
MB11S455	M	50+	-	-	-	-
MB11S456	M	36-49	-	-	-	-
MB11S457	F	50+	-	**2.3**	-	**-2.8**
MB11S460	U	16.5 ± 36 mo.	-	-	-	-
MB11S461	F	28	-	0.6	-	-
MB11S462	M	16	-	-	-	-
MB11S464	M	36-49	-	-0.9	-	-
MB11S465	M	15	-	-	-	-

Legend – L. = left; R. = right
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S466a	M	83	-	-	-	-
MB11S466b	F	43	-	-	-	-
MB11S467	M	26-35	0.9	0.5	-0.5	-0.2
MB11S468	F	36-49	-	0.9	-	-0.7
MB11S469	M	43	-	-	-	-
MB11S470	M	50+	-	-	-	-
MB11S471	F	9	-	-	-	-
MB11S473	M	42	0.6	0.4	0.3	0.5
MB11S474	F	50+	0.0	-	-0.1	-
MB11S476	F	31	**2.1**	1.4	-1.3	-0.9
MB11S477	M	61	0.8	-	-0.5	-
MB11S479	U	12-18	-	-	-	-
MB11S481	F	29	-0.8	-	1.0	-
MB11S482	M	36	-1.2	-0.6	-	1.4
MB11S484	M	50+	0.8	-	0.2	-
MB11S485	F	36-49	-	-	-	-
MB11S487	F	29	-	-	-	-
MB11S488	F	36-49	**2.0**	1.4	-0.9	-0.5
MB11S489	M	36-49	-	-	-	-
MB11S490a	F	36-49	-	-0.5	-	-
MB11S490b	M	18+	-	-	-	-
MB11S492	M	26-35	-	-	-	-
MB11S494	M	50+	0.2	-0.7	-0.4	0.7
MB11S495	F	26-35	-	-0.5	-	-
MB11S497	M	26-35	0.2	-	-0.3	-
MB11S498	F	50+	0.0	-0.5	0.3	1.2
MB11S501	F	18-25	-0.7	-0.9	-	-
MB11S502	M	25	-0.6	-0.6	-	-
MB11S504	F	36-49	-0.7	-	0.7	-
MB11S505	M	18-25	-	-2.3	-	-
MB11S507	U	14 ± 2 yrs.	-	-	-	-
MB11S508	M	50+	-	-	-	-
MB11S511	M	50+	-0.7	1.0	-	-
MB11S512	F	36-49	0.3	0.2	-0.5	-
MB11S514	M	26-35	-	-	-	-
MB11S516	M	50+	-	-	-	-
MB11S518	F	18+	-	-	-	-
MB11S519	M	36-49	-	-	-	-
MB11S520	M	50+	-	-	-	-
MB11S521	M	69	-1.4	-	-	-
MB11S522	F	13	-	-	-	-
MB11S523	M	50+	-	-	-	-
MB11S524	M	36-49	-0.3	-0.4	0.8	0.8
MB11S525	M	50+	-	-	-	-

Legend – L. = left; R. = right
Note – Significant z-scores are boldened and red. Table continued…

Table D2 – Continued…

Individual Number	Sex	Age	Clavicle Diameter		Clavicle Ratio	
			Left	Right	Left	Right
MB11S526	M	50+ (50-72)	-	-	-	-
MB11S527	F	26-35	0.2	0.4	0.6	0.6
MB11S530	F	75	0.5	-	-	-
MB11S533	F	50-65	-	-	-	-
MB11S534	M	36-49	-1.5	-	2.8	-
MB11S538	F	26-35	-0.2	-	-0.6	-
MB11S540	U	20	-	-	-	-
MB11S543	F	18+	0.0	0.2	0.0	-
MB11S544	M	30	-	-	-	-
MB11S545	F	49	-0.2	-	-0.1	-
MB11S549	U	11 ± 24 mo.	-	-	-	-
MB11S550	F	50+	-	0.5	-	-
MB11S552	M	18+	-	0.0	-	-
MB11S553	F	36-49	0.6	-	-	-

Legend – L. = left; R. = right; U = Unknown Sex; A = Ambiguous Sex
Note – Significant z-scores are boldened and red.

Table D3 – Non-metric features of the clavicle

Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening		Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening	
	L.	R.	L.	R.		L.	R.	L.	R.
KER15S006	-	-	-	-	**MB11S238**	0	-	A	-
KER15S007	0	-	A	-	**MB11S239**	0	0	A	A
KER15S008	-	-	P	A	**MB11S240**	-	-	P	P
KER15S009	-	-	A	A	**MB11S242**	-	-	P	A
KER15S010	-	-	-	-	**MB11S243**	-	-	A	A
KER15S011	-	-	P	A	**MB11S246**	0	0	A	A
KER15S012	-	-	-	-	**MB11S247**	-	-	A	P
KER15S014	-	-	A	A	**MB11S248**	0	0	A	A
KER15S015	-	-	A	A	**MB11S249**	-	-	P	P
KER15S016	-	-	A	P	**MB11S250**	-	-	-	-
KER15S017	-	-	P	P	**MB11S251**	-	-	A	-
KER15S018	2	2	A	A	**MB11S253**	-	-	A	A
KER15S019	-	-	A	A	**MB11S254**	-	-	A	A
KER15S020	-	-	-	-	**MB11S257**	-	-	A	A
KER15S021	-	-	-	P	**MB11S260**	-	0	-	P
KER15S024	-	-	A	P	**MB11S261**	-	-	-	-
KER15S025	-	-	A	A	**MB11S263**	-	-	A	A
KER15S026	-	-	A	P	**MB11S267**	-	-	A	A
KER15S028	-	-	-	-	**MB11S269a**	-	-	-	-
KER15S029	-	-	P	P	**MB11S269b**	-	-	-	-
KER15S030	-	-	-	-	**MB11S269c**	0	0	A	A
KER15S031	-	-	-	-	**MB11S270**	0	0	P	P
KER15S032	-	-	-	-	**MB11S271**	-	-	A	A
KER15S035	-	-	A	A	**MB11S275**	2	1	A	A
KER15S036	-	-	A	A	**MB11S278**	-	-	A	-
KER15S037	-	-	P	A	**MB11S281**	-	-	P	-
KER15S038	-	-	A	A	**MB11S282**	-	-	A	A
KER15S040	-	-	P	-	**MB11S285**	-	-	P	P
KER15S042	-	-	A	A	**MB11S286**	3	2	A	A
KER15S043	-	-	A	A	**MB11S289**	-	-	A	-
KER15S044	-	-	A	A	**MB11S290**	2	2	A	A
KER15S045	-	-	A	A	**MB11S292**	-	-	-	-
KER15S046	-	-	A	A	**MB11S294**	-	-	A	A
KER15S047	-	-	A	A	**MB11S297**	-	-	-	-
KER15S050	-	-	-	A	**MB11S301a**	-	-	P	P
KER15S051	-	-	-	A	**MB11S301b**	-	0	-	A
KER15S052	-	-	-	-	**MB11S302**	-	-	-	-
KER15S053	-	-	-	-	**MB11S303**	-	-	A	A
KER15S054	-	-	-	-	**MB11S306**	-	-	A	A

Legend – L. = left; R. = right; A = absent; P = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Table D3 – continued…

Individual Number	Medial Clavicle Growth Plate		Medial End Thickening		Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening	
	L.	R.	L.	R.		L.	R.	L.	R.
KER15S055	-	-	P	-	**MB11S307**	0	0	A	A
KER15S056	-	-	-	-	**MB11S309**	-	-	A	A
KER15S057	-	-	A	A	**MB11S310**	-	-	-	-
KER15S058	-	-	A	-	**MB11S311**	-	-	-	A
KER15S059	-	-	A	A	**MB11S313**	-	-	A	A
KER15S060	1	1	A	A	**MB11S317**	-	-	-	-
KER15S061	-	-	A	A	**MB11S319**	-	-	A	A
KER15S062	-	-	-	-	**MB11S321**	-	-	-	-
KER15S063	-	-	A	A	**MB11S324**	-	-	P	P
KER15S064	-	-	P	P	**MB11S325**	-	-	A	A
KER15S065	-	-	-	P	**MB11S327**	-	-	A	A
KER15S066	-	-	-	-	**MB11S331**	-	-	-	A
KER15S068	-	-	-	-	**MB11S334**	0	0	A	A
KER15S070	-	-	-	-	**MB11S337**	-	-	A	-
KER15S071	-	-	A	A	**MB11S338**	-	-	A	-
KER15S072	-	-	A	A	**MB11S339**	-	-	-	-
KER15S073	-	-	-	-	**MB11S340**	0	0	A	A
KER15S074	-	-	-	-	**MB11S341**	-	-	A	-
KER15S075	-	-	A	-	**MB11S342**	-	-	-	-
KER15S076	-	-	P	P	**MB11S344**	0	0	A	A
KER15S077	-	-	-	-	**MB11S345**	-	-	A	A
KER15S078	-	-	A	-	**MB11S346**	-	-	A	A
KER15S079	0	-	-	-	**MB11S347**	-	-	A	A
KER15S080	-	-	A	A	**MB11S349**	-	-	A	A
KER15S081	-	-	-	A	**MB11S350**	0	0	A	A
KER15S082	-	-	A	A	**MB11S355**	-	-	-	-
KER15S083	-	-	A	A	**MB11S356**	-	-	A	A
KER15S084	-	-	A	-	**MB11S358**	-	-	A	A
KER15S085	-	-	A	P	**MB11S359**	-	-	-	-
KER15S086	-	-	A	-	**MB11S360**	-	-	A	A
KER15S087	-	-	-	A	**MB11S363**	-	-	A	-
KER15S088	-	-	A	A	**MB11S367**	-	-	-	-
KER15S089	-	-	A	A	**MB11S368**	-	-	P	P
KER15S090	-	-	A	A	**MB11S369**	-	-	P	A
KER15S091	-	-	A	-	**MB11S370**	-	0	A	A
KER15S092	-	-	P	P	**MB11S371**	-	-	P	P
KER15S093	-	-	A	A	**MB11S374**	-	-	A	A
KER15S094	-	-	A	A	**MB11S375**	-	-	P	P
KER15S096	-	-	A	A	**MB11S377**	-	-	-	-
KER15S097	-	-	A	A	**MB11S379**	0	0	P	P

Legend – L. = left; R. = right; A = absent; P = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Table D3 – continued…

Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening		Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening	
	L.	R.	L.	R.		L.	R.	L.	R.
KER15S098	-	-	A	A	**MB11S380**	-	-	A	A
KER15S099	2	2	A	A	**MB11S382**	-	-	-	-
KER15S100	-	-	A	A	**MB11S383**	-	-	A	A
KER15S101	0	0	P	P	**MB11S385**	-	-	-	-
KER15S102	-	-	A	P	**MB11S386**	-	-	-	-
KER15S103	2	2	A	A	**MB11S387**	-	-	-	-
KER15S105	-	-	-	-	**MB11S388**	-	-	A	A
KER15S106	-	-	A	A	**MB11S390**	-	-	A	A
KER15S107	-	-	-	-	**MB11S391**	-	-	-	-
KER15S108	-	-	-	-	**MB11S392**	-	-	-	-
KER15S109	-	-	A	-	**MB11S394**	-	-	A	A
KER15S110	-	-	-	A	**MB11S399**	-	-	A	A
KER15S111	-	-	A	A	**MB11S401**	-	-	A	A
KER15S112	-	-	-	-	**MB11S402**	-	-	A	P
KER15S113	-	-	-	-	**MB11S404**	-	-	A	A
KER15S114	-	-	A	-	**MB11S405**	-	-	A	A
KER15S115	-	-	A	A	**MB11S407**	-	-	-	-
KER15S116	-	-	A	A	**MB11S409**	-	-	A	A
KER15S117	-	-	P	P	**MB11S411**	-	-	-	-
KER15S119a	2	2	P	P	**MB11S413**	-	-	A	A
KER15S119b	2	2	A	A	**MB11S415**	-	-	P	P
KER15S120	2	2	A	A	**MB11S416**	-	-	P	P
KER15S122	-	-	P	-	**MB11S420**	-	-	A	A
HT15S124	0	0	P	P	**MB11S422**	-	-	A	A
HT15S126	2	2	P	A	**MB11S426**	-	-	P	P
KER15S127	2	2	A	P	**MB11S427**	-	-	A	A
KER15S129	-	-	A	A	**MB11S428**	-	-	A	A
KER15S130	2	2	A	A	**MB11S430**	-	-	A	A
KER15S132	-	-	A	-	**MB11S432**	-	-	A	A
KER15S133	0	0	A	A	**MB11S434**	-	-	A	A
KER15S134	-	-	A	A	**MB11S435**	-	-	A	A
KER15S136	-	1	-	A	**MB11S436**	-	-	-	-
KER15S142	-	-	-	-	**MB11S437**	-	-	A	A
KER15S143	-	-	A	A	**MB11S441**	-	0	A	A
KER15S145	-	-	-	A	**MB11S446**	0	0	A	A
KER15S150	1	1	A	A	**MB11S452**	0	0	A	A
KER15S151	-	-	P	P	**MB11S453**	-	-	A	A
KER15S154	-	-	-	-	**MB11S454**	0	-	A	-
MB11S019	-	-	-	-	**MB11S455**	-	-	A	-
MB11S029	-	-	A	A	**MB11S456**	-	-	A	-

Legend – L. = left; R. = right; A = absent; P = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Table D3 – continued…

Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening		Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening	
	L.	R.	L.	R.		L.	R.	L.	R.
MB11S040	-	-	-	-	**MB11S457**	-	-	A	P
MB11S044	0	0	A	A	**MB11S460**	0	0	P	P
MB11S045	-	-	A	A	**MB11S461**	-	-	-	A
MB11S047	0	-	A	A	**MB11S462**	0	0	A	A
MB11S051	-	-	A	A	**MB11S464**	-	-	A	A
MB11S053	-	-	-	A	**MB11S465**	0	0	A	A
MB11S056	-	-	-	-	**MB11S466a**	-	-	-	-
MB11S059	-	-	A	A	**MB11S466b**	-	-	A	P
MB11S060	3	2	A	A	**MB11S467**	-	-	A	A
MB11S064	-	-	-	-	**MB11S468**	-	-	A	A
MB11S070	-	-	-	-	**MB11S469**	-	-	A	-
MB11S077	-	-	-	-	**MB11S470**	-	-	-	-
MB11S083	-	-	-	-	**MB11S471**	0	0	A	A
MB11S084	-	-	-	A	**MB11S473**	-	-	P	P
MB11S088	-	-	A	A	**MB11S474**	-	-	A	A
MB11S092	-	-	A	A	**MB11S476**	-	-	P	P
MB11S093	-	-	-	-	**MB11S477**	-	-	P	P
MB11S097	-	-	A	A	**MB11S479**	-	-	-	-
MB11S100	-	-	P	P	**MB11S481**	-	-	A	-
MB11S101	-	-	-	-	**MB11S482**	-	-	A	A
MB11S107	-	-	-	-	**MB11S484**	-	-	P	P
MB11S108	-	-	A	P	**MB11S485**	-	-	-	-
MB11S110	-	-	-	A	**MB11S487**	-	-	-	-
MB11S121	-	-	-	-	**MB11S488**	-	-	P	P
MB11S123	-	-	-	-	**MB11S489**	-	-	P	P
MB11S126	-	-	-	-	**MB11S490a**	-	-	-	-
MB11S137	-	-	-	A	**MB11S490b**	-	-	-	A
MB11S144	-	-	A	A	**MB11S492**	-	-	-	-
MB11S149	2	2	A	A	**MB11S494**	-	-	A	A
MB11S151	0	-	A	A	**MB11S495**	-	-	-	A
MB11S153	-	-	A	A	**MB11S497**	-	-	A	A
MB11S155a	-	-	A	-	**MB11S498**	-	-	A	A
MB11S155b	-	-	A	-	**MB11S501**	2	1	A	A
MB11S157	-	-	-	A	**MB11S502**	0	0	A	P
MB11S158	-	-	A	A	**MB11S504**	-	-	A	-
MB11S160	-	-	P	P	**MB11S505**	1	0	A	A
MB11S162	-	-	P	P	**MB11S507**	1	0	A	A
MB11S167	2	2	A	A	**MB11S508**	-	-	-	-
MB11S170	-	-	-	-	**MB11S511**	-	-	A	P
MB11S174	-	-	-	-	**MB11S512**	-	-	A	A

Legend – L. = left; R. = right; A = absent; P = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Table D3 – continued…

Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening		Individual Number	Medial Clavicle Growth Plate Porosity		Medial End Thickening	
	L.	R.	L.	R.		L.	R.	L.	R.
MB11S180	0	0	A	A	**MB11S514**	-	-	-	-
MB11S183	-	-	A	A	**MB11S516**	-	-	-	-
MB11S186	-	-	A	A	**MB11S518**	-	-	-	-
MB11S192	-	-	-	-	**MB11S519**	-	-	-	-
MB11S194	-	-	A	A	**MB11S520**	-	-	A	A
MB11S195	-	-	-	-	**MB11S521**	-	-	A	-
MB11S198	-	-	-	-	**MB11S522**	2	2	P	P
MB11S202	-	-	-	-	**MB11S523**	-	-	-	A
MB11S205	-	-	P	-	**MB11S524**	-	-	A	A
MB11S206	-	-	-	-	**MB11S525**	-	-	-	-
MB11S207	-	-	P	P	**MB11S526**	-	-	-	-
MB11S216	-	-	A	A	**MB11S527**	-	-	A	A
MB11S220	-	-	-	-	**MB11S530**	-	-	A	A
MB11S225	-	-	-	-	**MB11S533**	-	-	A	A
MB11S226	-	-	A	A	**MB11S534**	-	-	A	A
MB11S228	-	-	-	-	**MB11S538**	-	-	A	A
MB11S229	2	3	A	A	**MB11S540**	0	0	A	A
MB11S233	-	-	A	A	**MB11S543**	-	-	A	A
MB11S234	-	-	-	-	**MB11S544**	-	-	-	-
MB11S235	-	-	-	-	**MB11S545**	-	-	A	A
MB11S236	0	0	A	A	**MB11S549**	0	0	A	A
MB11S237	-	-	-	-	**MB11S550**	-	-	A	P
-	-	-	-	-	**MB11S552**	-	-	-	A
-	-	-	-	-	**MB11S553**	-	-	A	A

Legend – L. = left; R. = right; 0 = absent; 1 = present; "-" = missing/damaged.
Note – The growth plate porosity is written as a score, not present/absent.

Appendix E – Interclass Correlation

Table E1 – Interpreting Interclass Correlation Coefficient:

Interclass Correlation	Strength of Agreement
<0	Poor (worse than chance)
0 - 0.2	Slight
0.21 - 0.4	Fair
0.41 – 0.6	Moderate
0.61 – 0.8	Good
0.81 - 1	Very good

From Marshall (2016)

Table E2 – Intra-observer measurements for the left A-LDFA

Individual Number	measurement 1	measurement 2
KER15S006	79.862	80.422
KER15S010	78.398	77.198
KER15S016	78.71	79.264
KER15S017	74.151	74.605
KER15S021	74.992	74.899
KER15S042	81.248	79.102
KER15S065	83.212	82.35
KER15S111	84.442	84.93
MB11S226	85.533	85.663
MB11S237	85.333	85.19
MB11S321	84.148	84.718
MB11S327	75.397	75.918
MB11S435	81.575	81.238
MB11S437	77.299	77.493
MB11S520	79.387	78.911
MB11S524	78.874	78.696

Note – Measurements are in degrees.

Table E3 – Intra-observer error for the left PDFA

Individual Number	measurement 1	measurement 2
KER15S006	90.258	68.109
KER15S009	88.781	71.656
KER15S010	93.906	78.323
KER15S011	93.756	91.416
KER15S016	99.869	62.796
KER15S032	81.832	78.411
KER15S035	85.506	58.39
KER15S037	80.098	67.403
KER15S061	86.976	79.486
KER15S068	87.973	76.351
KER15S080	77.809	61.157
KER15S098	71.716	70.717
KER15S114	77.544	67.622
KER15S129	89.136	79.691
MB11S083	78.457	78.031
MB11S160	70.66	69.675
MB11S192	79.56	74.51
MB11S220	79.598	70.219
MB11S242	76.273	70.704
MB11S436	75.535	67.557
MB11S461	69.246	69.848
MB11S481	65.517	69.227
MB11S492	72.663	71.535
MB11S494	81.49	80.493
MB11S498	73.234	72.95
MB11S516	81.465	81.601
MB11S523	72.623	69.617

Note – Measurements are in degrees.

Table E4 – Intra-Observer Error for the Rib Dimensions

Individual Number	Rib end diameter 1	Rib end diameter 2	Rib diameter 15mm from end1	Rib diameter 15mm from end2	Rib ratio 1	Rib ratio 2
1 mid rib left	14.45	14.44	14.25	14.25	0.2	0.19
1 rib 1 left	15.69	15.74	17.19	17.24	-1.5	-1.5
1 rib 1 right	15.99	15.91	17.16	17.06	-1.17	-1.15
2 mid rib right	16.37	16.63	15.93	15.94	0.44	0.69
2 rib 1 left	22.78	23.4	20.52	20.44	2.26	2.96
2 rib 1 right	22.4	22.18	20.05	20.16	2.35	2.02
3 mid rib left	15.22	15.18	14.46	14.21	0.76	0.97
3 mid rib right	16.09	15.57	16.85	16.79	-0.76	-1.22
3 rib 1 left	17.19	17.21	16.45	16.36	0.74	0.85
3 rib 1 right	17.61	17.62	17.19	17.17	0.42	0.45
4 mid rib left	12.88	12.7	12.41	12.35	0.47	0.35
4 rib 1 left	19.04	18.52	20.91	20.81	-1.87	-2.29
4 rib 1 right	19.03	18.73	22.1	22.18	-3.07	-3.45
5 mid rib right	12.72	12.67	12.14	11.93	0.58	0.74
5 mid rib left	11.96	11.92	9.41	9.47	2.55	2.45
5 rib 1 left	16.71	16.97	20.1	20.14	-3.39	-3.17
5 rib 1 right	17.32	16.85	20.17	20.13	-2.85	-3.28
6 mid rib right	12.68	13.17	12.88	12.95	-0.2	0.22
6 rib 1 left	17.04	16.82	16.38	16.33	0.66	0.49
6 rib 1 right	15.05	15.12	16.34	16.2	-1.29	-1.08
7 mid rib left	12.65	12.62	13.74	13.69	-1.09	-1.07
7 mid rib right	12.15	12.11	10.84	10.86	1.31	1.25
7 rib 1 left	14.63	14.55	19.65	19.55	-5.02	-5
7 rib 1 right	16.45	16.46	16.19	16.21	0.26	0.25
8 mid rib left	16.36	16.33	17.13	17.03	-0.77	-0.7
8 rib 1 left	16.8	16.92	17.15	17.11	-0.35	-0.19
8 rib 1 right	20.91	21.07	24.41	24.4	-3.5	-3.33
9a rib 1 left	24.69	24.49	26.95	26.69	-2.26	-2.2
9a right mid rib	15.86	15.8	16.36	16.54	-0.5	-0.74
10a midrib left	11.42	12.62	12.73	12.87	-1.31	-0.25
10a rib 1 left	16.42	16.62	17.08	16.96	-0.66	-0.34
10a rib1 right	17.27	17.33	17.92	17.78	-0.65	-0.45
11 a rib 4 right	12.66	12.62	11.27	11.35	1.39	1.27
11a rib 1 right	12.97	13.21	16.44	16.52	-3.47	-3.31
12a mid rib left	15.29	15.14	18.41	18.3	-3.12	-3.16
12a rib 1 left	19.72	19.88	21.18	21.1	-1.46	-1.22
12a rib 1 right	22.63	22.7	18.33	17.77	4.3	4.93

Note – All measurements in millimeters. Mid = middle.

Table E5 – Intra-observer error for the ulna circumference 20mm from the end

Individual Number	Ulna circ. 20mm from end 1	Ulna circ. 20mm from end day 2
1 left	31	31
1 right	33	33
2 left	31	30
2 right	32	32
3 left	34.5	34
3 right	35.5	35
4 left	32.5	32.5
4 right	34	34
5 left	39	34
5 right	39.5	34
6 left	33	33
6 right	31	31
7 left	32.5	32
7 right	32	32
8 left	34.5	33
8 right	34	34
9a left	37	36
9a right	36	36
10a left	35.5	35
10a right	35	35
11a left	34	33
11a right	33	32
12a left	31.5	31
12a right	33	33

Legend – Circ. = circumference
Note – All measurements in millimeters.

Table E6 – Intra-Observer Error for the Clavicle Diameter

Individual number	Clavicle diameter 1	Clavicle diameter 2
11a right	20.26	20.21
11a left	20.17	20.15
9a left	20.88	20.87
7 right	22.49	22.62
7 left	24.24	24.23
5 left	27.22	27.38
3 left	22.66	22.56
1 right	25.08	25.02
1 left	25.64	25.86
4 right	21.62	21.58
6 right	22.79	22.81
6 left	22.71	22.75
8 left	25.9	26.26
10a left	24.15	24.16
10a right	22.22	22.42
12 a right	26.17	26.17
12 a left	25.97	26.15

Note – All measurements in millimeters.

Table E7 – Intra-observer error for the sacrum

Individual Number	Straight length 1	Straight length 2	Curved length 1	Curved length 2	Sacral angle 1	Sacral angle 2
1	99.39	99.23	105	104	5.61	4.77
4	94.73	93.95	96	95	1.27	1.05
5	86.21	86.58	99	97	12.79	10.42
6	89.92	89.15	93	92	3.08	2.85
7	76.18	76.26	86	84	9.82	7.74
9a	85.4	84.8	88	88	2.6	3.2
10a	102.42	102.17	104.5	104	2.08	1.83
11a	93.43	93.94	97	97	3.57	3.06
12a	101.32	101.57	110	110	8.68	8.43

Note – All measurements in millimeters.

Table E8 – Intra-observer error for the sternum

Individual Number	Straight length 1	Straight length 2	Curved length 1	Curved length 2	Sternal angle 1	Sternal angle 2
11a	75.43	75.75	76	76	0.57	0.25
9a	87.66	88.92	89	90	1.34	1.08
7	64.32	62.76	65	63	0.68	0.24
5	61.12	60.21	62	61	0.88	0.79
3	80.37	80.5	81.5	82	1.13	1.5
1	85.76	91.06	87	93	1.24	1.94
12a	106.06	106.01	107.5	107	1.44	0.99
10a	97.71	98.69	98	99	0.29	0.31
6	88.18	88.72	90	91	1.82	2.28
4	89.32	93.86	90.5	95	1.18	1.14
2	78.87	79.95	81	82	2.13	2.05

Note – All measurements in millimeters.

Table E9 – Interobserver error for A-LDFA

Individual Number	Original Observer	External Observer 1	External Observer 2	External Observer 3
KER15S006	80.422	80.339	80.56	80.092
KER15S018	81.007	80.619	81.296	97.965
KER15S042	79.102	81.585	78.518	80.162
KER15S077	79.054	76.75	77.175	77.471
KER15S080	83.113	83.774	83.519	83.478
KER15S098	79.091	76.913	75.932	76.096
KER15S111	84.442	83.494	81.501	80.088
MB11S226	85.533	85.454	84.75	84.943
MB11S237	85.229	85.53	86.548	84.746
MB11S321	84.148	84.144	82.55	80.653
MB11S327	75.397	75.543	75.045	76.126
MB11S356	75.543	75.304	74.394	74.387
MB11S435	81.239	80.812	80.792	84.144
MB11S516	85.706	85.289	85.855	83.572
MB11S520	79.387	79.113	78.472	81.231
MB11S524	78.874	78.169	78.74	77.416

Note – All measurements in degrees.

Table E10 – Interobserver error for the sacrum

Individual Number	Straight Length			Curved Length			Sacral Angle		
	Original Observer	External Observer 1	External Observer 2	Original Observer	External Observer 1	External Observer2	Original Observer	External Observer 1	External Observer 2
KER15S042	103.89	99.57	103.43	111	106.5	113	7.11	6.93	9.57
KER15S065	98.41	99.18	96.91	107	108.5	110	8.59	9.32	13.09
KER15S090	75.1	75.72	72.2	98	97	97	22.9	21.28	24.8
KER15S094	90.74	92.42	94.46	93	95.5	102	2.26	3.08	7.54
KER15S098	86.6	102.24	102.01	93	105	110	6.4	2.76	7.9
KER15S101	85.9	85	85.81	92	90	101	6.1	5	15.19
KER15S112	75.69	75.43	73.93	85	88	84	9.31	12.57	10.07
MB11S149	91.79	98.55	97.86	98	103.5	101	6.21	4.95	3.14
MB11S160	86.1	85.37	83.28	97	96	99	10.9	10.63	15.72
MB11S162	88.29	98.05	96.55	95	109	106	6.71	10.95	9.45
MB11S186	94.86	92.7	91.99	119	105	109	24.14	12.3	17.01
MB11S194	82.05	81.72	77.26	113	103	112	30.95	21.28	34.74
MB11S239	90.77	89.97	91.21	98	99	97	7.23	9.03	5.79
MB11S307	101.14	117.43	102.91	109	125.5	109	7.86	8.07	6.09
MB11S324	91.3	93.5	90.86	100	104	98	8.7	10.5	7.14
MB11S371	100.23	100.13	98.81	110	112	110	9.77	11.87	11.19
MB11S375	86.65	86.12	85.77	95	96.5	95	8.35	10.38	9.23
MB11S404	91.52	90.5	90.76	103	106	106	11.48	15.5	15.24
MB11S416	93.84	93.39	91.54	100	100.5	106	6.16	7.11	14.46
MB11S427	82.88	94.2	83.02	87	106	85	4.12	11.8	1.98
MB11S430	102.2	102.45	100.25	110	107.5	110	7.8	5.05	9.75
MB11S435	107.35	108	107.62	116.5	117.5	117	9.15	9.5	9.38
MB11S446	79.78	71.65	79.25	89	76	88	9.22	4.35	8.75
MB11S452	85.51	85.38	84.34	92	92	90	6.49	6.62	5.66
MB11S464	103.4	103.45	103.31	109	111	112	5.6	7.55	8.67
MB11S467	102.91	102.46	103.59	105	106	106	2.09	3.54	2.41
MB11S473	113.82	114.19	112.18	118	119.5	118	4.18	5.31	5.82
MB11S476	91.51	90.54	90.81	107	106.5	100	15.49	15.96	8.19
MB11S488	101.08	100.98	100.49	103	104	103	1.92	3.02	2.51
MB11S502	99.67	98.37	99.7	105	105	106	5.33	6.63	6.3
MB11S512	92.28	94.47	90.7	100	104	103	7.72	9.53	12.3

Note – All measurements in millimeters.

Table E11 – Interobserver error for the sternum

Individual Number	Sternum Straight Length			Sternum Curved Length			Sternal Angle		
	Original Observer	External Observer 1	External Observer 2	Original Observer	External Observer 1	External Observer 2	Original Observer	External Observer 1	External Observer 2
KER15S042	96.78	96.75	97.3	98	100	113	1.22	3.25	15.7
KER15S045	90.48	86.05	92.5	92	89.5	95	1.52	3.45	2.5
KER15S065	122.27	123.54	121.2	123	124.5	124	0.73	0.96	2.8
KER15S090	83.26	84.8	85.72	84	88	87	0.74	3.2	1.28
KER15S094	69.67	70.3	71.83	70	71.5	82	0.33	1.2	10.17
KER15S098	69.88	71.61	72.75	71	74	73	1.12	2.39	0.25
KER15S101	104.5	105.18	105.27	105.5	106	108	1	0.82	2.73
KER15S112	81.59	82.09	83.37	82	83	84	0.41	0.91	0.63
MB11S149	71	70	70.54	74	71	71	3	1	0.46
MB11S160	68.19	69.11	67.24	72	71	70	3.81	1.89	2.76
MB11S162	83.86	83.1	81.7	86	84	83	2.14	0.9	1.3
MB11S186	115.99	117.13	116.85	119	118	119	3.01	0.87	2.15
MB11S194	111.55	112.5	110.05	115	116.5	112	3.45	4	1.95
MB11S239	89	89.65	87.9	89	91	90	0	1.35	2.1
MB11S307	86.92	89	85.85	91	94	97	4.08	5	11.15
MB11S324	89.1	88.8	88.42	93.5	90.5	90	4.5	1.7	1.58
MB11S371	97.84	86.7	95.42	98.5	89	100	0.66	2.3	4.58
MB11S404	102.83	103.2	102.56	103.5	105	104	0.67	1.8	1.44
MB11S416	99.04	98.82	98.88	99	100	106	-0.04	1.18	7.12
MB11S427	93.6	94.4	94.65	94	96	96	0.4	1.6	1.35
MB11S430	86.92	86.43	85.87	87	88	88	0.08	1.57	2.13
MB11S435	105.31	104	105.15	105.5	106.5	106	0.19	2.5	0.85
MB11S446	105.13	102.5	104.32	105	103	106	-0.13	0.5	1.68
MB11S452	79.29	79.9	81.22	79.5	80.5	82	0.21	0.6	0.78
MB11S464	102.66	103.5	102.27	103	105	104	0.34	1.5	1.73
MB11S467	98.44	98.75	104.66	99.5	100.5	106	1.06	1.75	1.34
MB11S473	113.53	113.82	107.55	113.5	114.5	108	-0.03	0.7	0.45
MB11S476	80.7	80.4	76.52	81	83	80	0.3	2.6	3.48
MB11S488	99.21	101.5	96.57	100	103	101	0.79	1.5	4.43
MB11S502	116.79	107.8	116.45	118	109	117	1.21	1.2	0.55
MB11S512	84.12	83.1	83.65	85	85.5	85	0.88	2.4	1.35

Note – All measurements in millimeters.

Appendix F – Sacral Measurements, Z-Scores, and Non-Metric Features

Table F1 – Sacrum Dimensions, z-scores, and non-metric features

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
KER15S006	M	26-35	-	-	-	-	A	-	-	-
KER15S007	F	36-49	-	-	-	-	-	-	-	-
KER15S008	Am	50+	-	-	-	-	-	-	-	-
KER15S009	M	36-49	-	-	-	-	P	-	P	P
KER15S010	M	36-49	-	-	-	-	-	-	-	-
KER15S011	M	36-49	-	-	-	-	-	-	-	-
KER15S012	F	36-49	80.28	95	14.72	**1.5**	P	-	P	-
KER15S014	F	18-25	-	-	-	-	-	-	-	-
KER15S015	M	36-49	80.81	92	11.19	0.3	P	-	P	-
KER15S016	M	18-25	-	-	-	-	P	-	P	P
KER15S017	M	36-49	-	-	-	-	A	-	-	-
KER15S018	M	18-25	-	-	-	-	P	-	P	-
KER15S019	M	50+	-	-	-	-	P	-	P	-
KER15S020	U	15 ± 2	-	-	-	-	-	-	-	-
KER15S021	M	36-49	-	-	-	-	-	-	-	-
KER15S024	M	36-49	-	-	-	-	P	P	P	-
KER15S025	M	36-49	-	-	-	-	A	-	-	-
KER15S026	M	36-49	-	-	-	-	-	-	-	-
KER15S028	F	36-49	-	-	-	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	A	-	-	-
KER15S030	M	36-49	-	-	-	-	A	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-	-	-	-
KER15S035	F	26-35	-	-	-	-	A	-	-	-
KER15S036	M	36-49	-	-	-	-	P	-	-	-
KER15S037	M	50+	-	-	-	-	-	-	-	-
KER15S038	F	36-49	-	-	-	-	-	-	-	-
KER15S040	M	18+	-	-	-	-	-	-	-	-
KER15S042	M	36-49	103.89	111	7.11	-0.4	A	-	-	-
KER15S043	M	36-49	-	-	-	-	A	-	-	-
KER15S044	M	36-49	-	-	-	-	-	-	-	-
KER15S045	M	36-49	-	-	-	-	A	-	-	-
KER15S046	M	26-35	-	-	-	-	-	-	-	-
KER15S047	Am	26-35	-	-	-	-	-	-	-	-
KER15S050	Am	18+	-	-	-	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged.
Note – Significant Z-scores are bold and red. Table continue…

Table F1 – continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
KER15S052	F	50+	-	-	-	-	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S054	Am	26-35	-	-	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	A	-	-	-
KER15S057	F	50+	-	-	-	-	-	-	-	-
KER15S058	M	26-35	-	-	-	-	A	-	-	-
KER15S059	F	36-49	-	-	-	-	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	A	-	-	-
KER15S063	F	36-49	-	-	-	-	A	-	-	-
KER15S064	M	36-49	-	-	-	-	A	-	-	-
KER15S065	M	36-49	98.41	107	8.59	-0.2	A	-	-	-
KER15S066	M	18+	-	-	-	-	-	-	-	-
KER15S068	F	18+	-	-	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-	-	-
KER15S071	M	18-25	-	-	-	-	A	-	-	-
KER15S072	F	36-49	-	-	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S074	M	36-49	97.35	106	8.65	-0.1	P	-	-	-
KER15S075	F	36-49	-	-	-	-	-	-	-	-
KER15S076	M	26-35	-	-	-	-	P	-	P	-
KER15S077	M	26-35	64.97	74	9.03	-0.1	A	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-	-	-	-
KER15S081	Am	18+	-	-	-	-	-	-	-	-
KER15S082	F	50+	-	-	-	-	A	-	-	-
KER15S083	M	36-49	-	-	-	-	P	-	P	P
KER15S084	F	36-49	-	-	-	-	-	-	-	-
KER15S085	M	36-49	-	-	-	-	-	-	-	-
KER15S086	M	36-49	-	-	-	-	-	-	-	-
KER15S087	M	36-49	-	-	-	-	-	-	-	-
KER15S088	F	26-35	-	-	-	-	A	-	-	-
KER15S089	M	50+	-	-	-	-	A	-	-	-
KER15S090	F	50+	75.1	98	22.9	**3.2**	P	-	P	-
KER15S091	F	36-49	-	-	-	-	A	-	-	-
KER15S092	F	50+	-	-	-	-	-	-	-	-
KER15S093	F	26-35	-	-	-	-	A	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – continued…

Individual Number	**Sex**	**Age**	**Sacral Dimensions**				**Presence of Angulation**	**Location of Angulation**		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
KER15S094	F	18-25	90.74	93	2.26	-1.2	P	-	P	P
KER15S096	F	36-49	-	-	-	-	-	-	-	-
KER15S097	F	50+	-	-	-	-	A	-	-	-
KER15S098	F	26-35	86.6	93	6.4	-0.3	A	-	-	-
KER15S099	F	18-25	-	-	-	-	-	-	-	-
KER15S100	M	26-35	-	-	-	-	A	-	-	-
KER15S101	M	36-49	85.9	92	6.1	-0.6	P	-	-	P
KER15S102	M	50+	-	-	-	-	P	-	P	-
KER15S103	M	18-25	-	-	-	-	-	-	-	-
KER15S105	M	18-25	95.97	108	12.03	0.4	A	-	-	-
KER15S106	M	36-49	-	-	-	-	P	-	P	-
KER15S107	F	26-35	86.95	98	11.05	0.7	A	-	-	-
KER15S108	M	36-49	-	-	-	-	A	-	-	-
KER15S109	F	36-49	-	-	-	-	A	-	-	-
KER15S110	F	18-25	-	-	-	-	-	-	-	-
KER15S111	M	26-35	-	-	-	-	A	-	-	-
KER15S112	M	26-35	75.69	85	9.31	0.0	P	-	P	-
KER15S113	M	36-49	-	-	-	-	-	-	-	-
KER15S114	F	50+	76.36	87	10.64	0.6	P	-	P	-
KER15S115	M	36-49	-	-	-	-	P	-	-	-
KER15S116	F	36-49	-	-	-	-	A	-	-	-
KER15S117	F	36-49	-	-	-	-	A	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-	-	-	-
KER15S122	F	36-49	-	-	-	-	-	-	-	-
HT15S124	U	13 ± 1 yr.	-	-	-	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-	-	-	-	-
KER15S129	F	36-49	-	-	-	-	-	-	-	-
KER15S130	M	18-25	90.92	100	9.08	-0.1	A	-	-	-
KER15S132	F	50+	-	-	-	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-	-	-	-
KER15S134	M	36-49	-	-	-	-	P	-	P	-
KER15S136	U	13 ± 2 yrs.	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P= present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
KER15S142	F	26-35	-	-	-	-	-	-	-	-
KER15S143	M	36-49	88.38	94	5.62	-0.7	A	-	-	-
KER15S145	F	36-49	-	-	-	-	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-	-	-	-	-
KER15S151	M	36-49	102.57	111	8.43	-0.2	A	-	-	-
KER15S154	F	36+	-	-	-	-	-	-	-	-
MB11S019	Am	18+	-	-	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	A	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	-	-	-	-	-
MB11S045	F	47	-	-	-	-	P	-	P	-
MB11S047	F	21	95.79	104	8.21	0.1	A	-	-	-
MB11S051	M	74	-	-	-	-	-	-	-	-
MB11S053	F	36-49	-	-	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-	-	-
MB11S059	M	36-49	87.06	98	10.94	0.2	A	-	-	-
MB11S060	F	18-25	82.55	95	12.45	1.0	P	-	P	-
MB11S064	M	26-35	96	105	9	-0.1	A	-	-	-
MB11S070	M	18+	-	-	-	-	-	-	-	-
MB11S077	F	58	89.93	100.5	10.57	0.6	P	P	P	-
MB11S083	F	36-49	-	-	-	-	-	-	-	-
MB11S084	F	18+	102.4	113	10.6	0.6	A	-	-	-
MB11S088	F	26-35	-	-	-	-	A	-	-	-
MB11S092	M	26-35	79.11	94	14.89	0.9	P	-	P	-
MB11S093	M	50+	-	-	-	-	-	-	-	-
MB11S097	F	50+	108.46	113	4.54	-0.7	A	-	-	-
MB11S100	M	18+	-	-	-	-	-	-	-	-
MB11S101	F	26-35	-	-	-	-	A	-	-	-
MB11S107	F	18-25	-	-	-	-	-	-	-	-
MB11S108	M	26-35	-	-	-	-	-	-	-	-
MB11S110	F	26-35	-	-	-	-	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	P	-	-	P
MB11S144	M	36-50	-	-	-	-	P	-	-	P
MB11S149	F	26-35	91.79	98	6.21	-0.3	A	-	-	-
MB11S151	F	26-35	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S153	M	57	-	-	-	-	P	-	P	P
MB11S155a	M	50+	-	-	-	-	-	-	-	-
MB11S155b	F	50+	-	-	-	-	-	-	-	-
MB11S157	F	18+	90.53	95	4.47	-0.7	A	-	-	-
MB11S158	M	60	99.04	113	13.96	0.7	P	P	-	-
MB11S160	F	26-35	86.1	97	10.9	0.7	P	-	-	P
MB11S162	M	36-49	88.29	95	6.71	-0.5	A	-	-	-
MB11S167	F	12	83.66	87	3.34	-	A	-	-	-
MB11S170	F	50+	89.31	101	11.69	0.8	P	-	P	-
MB11S174	F	36-49	81.58	88	6.42	-0.3	A	-	-	-
MB11S180	M	18-25	92.21	99	6.79	-0.5	P	-	-	P
MB11S183	F	26-35	99.93	111	11.07	0.7	P	-	P	-
MB11S186	M	36-49	94.86	119	24.14	**2.4**	P	-	P	-
MB11S192	F	26-35	-	-	-	-	-	-	-	-
MB11S194	M	50+	82.05	113	30.95	**3.6**	P	-	-	-
MB11S195	F	36-49	-	-	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	A	-	-	-
MB11S202	F	26-35	85.97	97	11.03	0.7	A	-	-	-
MB11S205	M	50+	-	-	-	-	-	-	-	-
MB11S206	U	13-17	92.13	98	5.87	-	A	-	-	-
MB11S207	F	50+	-	-	-	-	-	-	-	-
MB11S216	F	36-49	81.39	98	16.61	**1.9**	P	-	P	-
MB11S220	F	36-49	-	-	-	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-	-	-
MB11S226	M	26-35	107.62	110	2.38	-1.2	A	-	-	-
MB11S228	M	36-49	-	-	-	-	-	-	-	-
MB11S229	U	13-17	91.87	93	1.13	-	A	-	-	-
MB11S233	M	18+	88.24	99	10.76	0.2	P	-	-	P
MB11S234	F	18-25	-	-	-	-	P	-	P	P
MB11S235	M	18+	-	-	-	-	-	-	-	-
MB11S236	M	24	103.08	109	5.92	-0.6	A	-	-	-
MB11S237	M	50+	-	-	-	-	P	-	-	-
MB11S238	M	18-25	-	-	-	-	-	-	-	-
MB11S239	M	23	90.77	98	7.23	-0.4	A	-	-	-
MB11S240	M	36-49	99.25	130	30.75	**3.5**	P	-	-	P
MB11S242	M	50+	-	-	-	-	P	-	P	-
MB11S243	F	62	-	-	-	-	-	-	-	-
MB11S246	U	19	-	-	-	-	A	-	-	-
MB11S247	M	50+	-	-	-	-	-	-	-	-
MB11S248	F	9	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S249	M	26-35	-	-	-	-	A	-	-	-
MB11S250	M	73	-	-	-	-	-	-	-	-
MB11S251	M	36-49	-	-	-	-	A	-	-	-
MB11S253	M	78	-	-	-	-	-	-	-	-
MB11S254	M	36-49	-	-	-	-	-	-	-	-
MB11S257	M	26-35	-	-	-	-	A	-	-	-
MB11S260	M	18-25	-	-	-	-	A	-	-	-
MB11S261	M	79	-	-	-	-	A	-	-	-
MB11S263	M	36-49	-	-	-	-	-	-	-	-
MB11S267	M	26-35	-	-	-	-	P	-	P	-
MB11S269a	M	18+	-	-	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-	-	-	-	-
MB11S270	M	18-25	-	-	-	-	-	-	-	-
MB11S271	M	50+	-	-	-	-	-	-	-	-
MB11S275	U	15 ± 1 yr.	94.92	97	2.08	-	P	-	P	-
MB11S278	F	36-49	-	-	-	-	P	-	-	-
MB11S281	M	36-49	90.32	106	15.68	1.0	P	-	-	P
MB11S282	U	12 ± 12mo	-	-	-	-	-	-	-	-
MB11S285	M	71	82.56	89	6.44	-0.5	A	-	-	-
MB11S286	F	10	-	-	-	-	-	-	-	-
MB11S289	M	50+	-	-	-	-	A	-	-	-
MB11S290	M	18-25	-	-	-	-	A	-	-	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-	-	-
MB11S294	F	66	-	-	-	-	-	-	-	-
MB11S297	M	84	-	-	-	-	P	-	P	-
MB11S301a	F	36-49	-	-	-	-	A	-	-	-
MB11S301b	U	6-10	-	-	-	-	-	-	-	-
MB11S302	F	50+	-	-	-	-	-	-	-	-
MB11S303	F	44	-	-	-	-	P	-	-	P
MB11S306	M	31	-	-	-	-	-	-	-	-
MB11S307	U	13-17	101.14	109	7.86	-	P	P	-	P
MB11S309	F	58	82.3	88	5.7	-0.4	A	-	-	-
MB11S310	M	35	-	-	-	-	-	-	-	-
MB11S311	F	18-25	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S313	M	46	100.86	107	6.14	-0.6	P	-	-	P
MB11S317	M	80	-	-	-	-	-	-	-	-
MB11S319	F	69	-	-	-	-	A	-	-	-
MB11S321	M	50+	-	-	-	-	-	-	-	-
MB11S324	M	36-49	91.3	100	8.7	-0.1	A	-	-	-
MB11S325	M	36	-	-	-	-	-	-	-	-
MB11S327	F	36-49	97.93	101	3.07	-1.0	A	-	-	-
MB11S331	F	74	-	-	-	-	-	-	-	-
MB11S334	F	9	-	-	-	-	-	-	-	-
MB11S337	M	68	100.38	104	3.62	-1.0	A	-	-	-
MB11S338	F	33	84.65	94	9.35	0.3	A	-	-	-
MB11S339	F	64	95.84	104	8.16	0.1	A	-	-	-
MB11S340	U	19	85.61	95	9.39	-	A	-	-	-
MB11S341	M	50+	-	-	-	-	P	-	P	-
MB11S342	M	75	-	-	-	-	-	-	-	-
MB11S344	F	20	-	-	-	-	P	-	-	-
MB11S345	F	28	73.24	78	4.76	-0.6	P	-	-	-
MB11S346	F	36-49	-	-	-	-	A	-	-	-
MB11S347	M	50+	-	-	-	-	P	-	-	-
MB11S349	M	50+	99.44	103	3.56	-1.0	A	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	A	-	-	-
MB11S356	F	78	94.54	95	0.46	-1.5	P	-	-	-
MB11S358	F	74	-	-	-	-	-	-	-	-
MB11S359	F	46	87.01	88	0.99	-1.4	A	-	-	-
MB11S360	F	66	-	-	-	-	A	-	-	-
MB11S363	M	61	-	-	-	-	P	P	P	-
MB11S367	F	11	-	-	-	-	-	-	-	-
MB11S368	M	26-35	93.44	100	6.56	-0.5	P	-	P	-
MB11S369	F	30	-	-	-	-	-	-	-	-
MB11S370	F	36-49	-	-	-	-	P	-	-	-
MB11S371	M	36-49	100.23	110	9.77	0.0	A	-	-	-
MB11S374	M	80	-	-	-	-	A	-	-	-
MB11S375	M	74	86.65	95	8.35	-0.2	A	-	-	-
MB11S377	M	18+	-	-	-	-	-	-	-	-
MB11S379	M	18-25	78.75	89	10.25	0.1	A	-	-	-
MB11S380	M	36-49	96.98	105	8.02	-0.3	A	-	-	-
MB11S382	F	50+	-	-	-	-	-	-	-	-
MB11S383	F	55	-	-	-	-	A	-	-	-
MB11S385	F	25	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S386	F	36-49	-	-	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-	-	-
MB11S388	F	21	88.61	92.5	3.89	-0.8	A	-	-	-
MB11S390	F	71	-	-	-	-	-	-	-	-
MB11S391	M	50+	-	-	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-	-	-
MB11S394	F	50+	-	-	-	-	P	-	P	P
MB11S399	Am	36-49	90.08	95	4.92	-	A	-	-	-
MB11S401	F	26-35	81.96	93	11.04	0.7	A	-	-	-
MB11S402	M	36-49	88.61	100	11.39	0.3	P	-	-	P
MB11S404	M	26-35	91.52	103	11.48	0.3	P	-	-	-
MB11S405	F	36-49	92.61	101.5	8.89	0.2	A	-	-	-
MB11S407	M	18+	-	-	-	-	A	-	-	-
MB11S409	F	18+	-	-	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	-	-	-	-	-
MB11S413	F	39	86.27	88	1.73	-1.3	P	-	-	P
MB11S415	M	50+	-	-	-	-	-	-	-	-
MB11S416	M	36-49	93.84	100	6.16	-0.6	A	-	-	-
MB11S420	F	26-35	-	-	-	-	A	-	-	-
MB11S422	F	29	87.94	92	4.06	-0.8	A	-	-	-
MB11S426	F	55	93.51	101	7.49	-0.1	A	-	-	-
MB11S427	M	27	82.88	87	4.12	-0.9	A	-	-	-
MB11S428	F	50+	81.84	82	0.16	-	A	-	-	-
MB11S430	F	30	102.2	110	7.8	0.0	A	-	-	-
MB11S432	M	26-35	-	-	-	-	A	-	-	-
MB11S434	F	36-49	99.33	101.5	2.17	-1.2	P	P	P	-
MB11S435	M	45	107.35	116.5	9.15	-0.1	P	-	P	P
MB11S436	F	18+	-	-	-	-	A	-	-	-
MB11S437	F	26-35	-	-	-	-	-	-	-	-
MB11S441	F	23	-	-	-	-	P	-	-	P
MB11S446	U	22	79.78	89	9.22	-	P	-	-	P
MB11S452	F	18-25	85.51	92	6.49	-0.3	A	-	-	-
MB11S453	F	26-35	-	-	-	-	A	-	-	-
MB11S454	U	21	90.91	91	0.09	-	P	-	P	P
MB11S455	M	50+	-	-	-	-	A	-	-	-
MB11S456	M	36-49	-	-	-	-	-	-	-	-
MB11S457	F	50+	-	-	-	-	-	-	-	-
MB11S460	U	16.5 ± 36 mo.	-	-	-	-	-	-	-	-
MB11S461	F	28	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged. Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S462	M	16	-	-	-	-	-	-	-	-
MB11S464	M	36-49	103.4	109	5.6	-0.7	A	-	-	-
MB11S465	M	15	-	-	-	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	P	-	-	-
MB11S466b	F	43	-	-	-	-	-	-	-	-
MB11S467	M	26-35	102.91	105	2.09	-1.2	P	P	P	-
MB11S468	F	36-49	-	-	-	-	P	-	P	P
MB11S469	M	43	-	-	-	-	-	-	-	-
MB11S470	M	50+	-	-	-	-	-	-	-	-
MB11S471	F	9	-	-	-	-	-	-	-	-
MB11S473	M	42	113.82	118	4.18	-0.9	P	-	P	-
MB11S474	F	50+	-	-	-	-	-	-	-	-
MB11S476	F	31	91.51	107	15.49	**1.6**	A	-	-	-
MB11S477	M	61	97.18	113	15.82	1.1	A	-	-	-
MB11S479	U	12-18	-	-	-	-	-	-	-	-
MB11S481	F	29	91.93	102	10.07	0.5	A	-	-	-
MB11S482	M	36	-	-	-	-	A	-	-	-
MB11S484	M	50+	-	-	-	-	-	-	-	-
MB11S485	F	36-49	-	-	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	A	-	-	-
MB11S488	F	36-49	101.08	103	1.92	-1.2	P	P	P	P
MB11S489	M	36-49	-	-	-	-	A	-	-	-
MB11S490a	F	36-49	-	-	-	-	-	-	-	-
MB11S490b	M	18+	-	-	-	-	-	-	-	-
MB11S492	M	26-35	-	-	-	-	-	-	-	-
MB11S494	M	50+	-	-	-	-	A	-	-	-
MB11S495	F	26-35	-	-	-	-	P	-	P	P
MB11S497	M	26-35	-	-	-	-	A	-	-	-
MB11S498	F	50+	-	-	-	-	P	-	P	P
MB11S501	F	18-25	93.37	98	4.63	-0.7	A	-	-	-
MB11S502	M	25	99.67	105	5.33	-0.7	A	-	-	-
MB11S504	F	36-49	-	-	-	-	-	-	-	-
MB11S505	M	18-25	-	-	-	-	P	-	P	-
MB11S507	U	14 ± 2yrs.	-	-	-	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-	-	-	-
MB11S511	M	50+	-	-	-	-	-	-	-	-
MB11S512	F	36-49	92.28	100	7.72	0.0	A	-	-	-
MB11S514	M	26-35	111.46	115	3.45	-1.0	P	-	P	P
MB11S516	M	50+	-	-	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	P	-	-	P

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged.
Note – Significant Z-scores are bold and red. Table continued…

Table F1 – Continued…

Individual Number	Sex	Age	Sacral Dimensions				Presence of Angulation	Location of Angulation		
			Straight length	Curved length	Sacral Angle	Sacral Angle Z-Score by Sex		Vert. 1-2	Vert. 2-3	Vert. 3-4
MB11S519	M	36-49	-	-	-	-	P	-	P	P
MB11S520	M	50+	-	-	-	-	P	-	-	P
MB11S521	M	69	85.62	92.5	6.88	-0.4	P	-	-	P
MB11S522	F	13	-	-	-	-	-	-	-	-
MB11S523	M	50+	82.94	99	16.06	1.1	P	P	P	-
MB11S524	M	36-49	85.9	98	12.1	0.4	A	-	-	-
MB11S525	M	50+	-	-	-	-	P	-	P	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-	-	-
MB11S527	F	26-35	-	-	-	-	A	-	-	-
MB11S530	F	75	-	-	-	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	P	-	P	P
MB11S538	F	26-35	-	-	-	-	P	-	P	P
MB11S540	U	20	-	-	-	-	P	-	P	-
MB11S543	F	18+	-	-	-	-	-	-	-	-
MB11S544	M	30	-	-	-	-	P	-	-	P
MB11S545	F	49	-	-	-	-	-	-	-	-
MB11S549	U	11 ± 24mo.	-	-	-	-	-	-	-	-
MB11S550	F	50+	97.09	103.5	6.41	-0.3	P	-	-	P
MB11S552	M	18+	107.73	113	5.27	-0.7	P	-	P	-
MB11S553	F	36-49	-	-	-	-	-	-	-	-

Legend – F=female; M=male; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs.=year/years; mo. = months; A = absent; P = present; "-" = missing/damaged.
Note – Significant Z-scores are bold and red.

Appendix G – Sterनal Measurements and Non-Metric Features

Table G1 – Metric measurements, and non-metric features

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
KER15S006	M	26-35	-	-	-	A	-
KER15S007	F	36-49	-	-	-	-	-
KER15S008	Am	50+	-	-	-	-	-
KER15S009	M	36-49	98.55	99	0.45	A	-
KER15S010	M	36-49	-	-	-	-	-
KER15S011	M	36-49	-	-	-	-	-
KER15S012	F	36-49	-	-	-	-	-
KER15S014	F	18-25	77.44	78	0.56	A	-
KER15S015	M	36-49	-	-	-	-	-
KER15S016	M	18-25	-	-	-	-	-
KER15S017	M	36-49	110.05	110.5	0.45	A	-
KER15S018	M	18-25	-	-	-	-	-
KER15S019	M	50+	-	-	-	-	-
KER15S020	U	15 ± 2	-	-	-	-	-
KER15S021	M	36-49	91.68	93	1.32	A	-
KER15S024	M	36-49	-	-	-	-	-
KER15S025	M	36-49	-	-	-	P	1-2
KER15S026	M	36-49	-	-	-	A	-
KER15S028	F	36-49	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-
KER15S035	F	26-35	-	-	-	-	-
KER15S036	M	36-49	-	-	-	-	-
KER15S037	M	50+	-	-	-	-	-
KER15S038	F	36-49	-	-	-	-	-
KER15S040	M	18+	-	-	-	-	-
KER15S042	M	36-49	96.78	98	1.22	A	-
KER15S043	M	36-49	-	-	-	A	-
KER15S044	M	36-49	97.96	98.5	0.54	A	-
KER15S045	M	36-49	90.48	92	1.52	A	-
KER15S046	M	26-35	-	-	-	-	-

Legend – M = male; F = female; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged. Table continued…

Table G1 = continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
KER15S047	Am	26-35	-	-	-	-	-
KER15S050	Am	18+	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-
KER15S052	F	50+	-	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	-
KER15S054	Am	26-35	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-
KER15S058	M	26-35	-	-	-	-	-
KER15S059	F	36-49	-	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	-
KER15S063	F	36-49	-	-	-	-	-
KER15S064	M	36-49	105.83	106	0.17	A	-
KER15S065	M	36-49	122.27	123	0.73	A	-
KER15S066	M	18+	-	-	-	-	-
KER15S068	F	18+	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-
KER15S071	M	18-25	-	-	-	-	-
KER15S072	F	36-49	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-
KER15S074	M	36-49	-	-	-	-	-
KER15S075	F	36-49	-	-	-	-	-
KER15S076	M	26-35	-	-	-	-	-
KER15S077	M	26-35	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-
KER15S081	Am	18+	-	-	-	-	-
KER15S082	F	50+	-	-	-	A	-
KER15S083	M	36-49	-	-	-	A	-
KER15S084	F	36-49	-	-	-	-	-
KER15S085	M	36-49	90.96	91	0.04	A	-
KER15S086	M	36-49	-	-	-	-	-
KER15S087	M	36-49	-	-	-	-	-

Legend – M = male; F = female; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
KER15S088	F	26-35	89.92	91	1.08	A	-
KER15S089	M	50+	-	-	-	-	-
KER15S090	F	50+	83.26	84	0.74	A	-
KER15S091	F	36-49	-	-	-	-	-
KER15S092	F	50+	-	-	-	-	-
KER15S093	F	26-35	77.46	78	0.54	A	-
KER15S094	F	18-25	69.67	70	0.33	A	-
KER15S096	F	36-49	-	-	-	-	-
KER15S097	F	50+	-	-	-	A	-
KER15S098	F	26-35	69.88	71	1.12	A	-
KER15S099	F	18-25	-	-	-	A	-
KER15S100	M	26-35	106.07	107	0.93	A	-
KER15S101	M	36-49	104.5	105.5	1	A	-
KER15S102	M	50+	-	-	-	-	-
KER15S103	M	18-25	-	-	-	-	-
KER15S105	M	18-25	-	-	-	-	-
KER15S106	M	36-49	-	-	-	A	-
KER15S107	F	26-35	-	-	-	-	-
KER15S108	M	36-49	-	-	-	-	-
KER15S109	F	36-49	-	-	-	-	-
KER15S110	F	18-25	-	-	-	-	-
KER15S111	M	26-35	-	-	-	-	-
KER15S112	M	26-35	81.59	82	0.41	A	-
KER15S113	M	36-49	-	-	-	-	-
KER15S114	F	50+	-	-	-	-	-
KER15S115	M	36-49	-	-	-	-	-
KER15S116	F	36-49	91.03	91.5	0.47	A	-
KER15S117	F	36-49	-	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-
KER15S122	F	36-49	99.4	101	1.6	A	-
HT15S124	U	13 ± 1 yr.	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yr.	-	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-	-
KER15S129	F	36-49	-	-	-	-	-
KER15S130	M	18-25	-	-	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
KER15S132	F	50+	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-
KER15S134	M	36-49	-	-	-	-	-
KER15S136	U	13 ± 2 yr.	-	-	-	-	-
KER15S142	F	26-35	-	-	-	-	-
KER15S143	M	36-49	-	-	-	A	-
KER15S145	F	36-49	-	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-	-
KER15S151	M	36-49	-	-	-	-	-
KER15S154	F	36+	-	-	-	-	-
MB11S019	Am	18+	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	57.17	57	-0.17	A	-
MB11S045	F	47	-	-	-	A	-
MB11S047	F	21	-	-	-	-	-
MB11S051	M	74	-	-	-	-	-
MB11S053	F	36-49	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-
MB11S059	M	36-49	-	-	-	-	-
MB11S060	F	18-25	-	-	-	P	-
MB11S064	M	26-35	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-
MB11S084	F	18+	-	-	-	-	-
MB11S088	F	26-35	91.44	95	3.56	P	3-4
MB11S092	M	26-35	-	-	-	-	-
MB11S093	M	50+	-	-	-	-	-
MB11S097	F	50+	-	-	-	-	-
MB11S100	M	18+	-	-	-	-	-
MB11S101	F	26-35	-	-	-	-	-
MB11S107	F	18-25	-	-	-	P	2-3
MB11S108	M	26-35	98.79	101	2.21	P	2-3
MB11S110	F	26-35	-	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-

Legend – M = male; F = female; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S137	F	36-49	-	-	-	-	-
MB11S144	M	36-50	-	-	-	-	-
MB11S149	F	26-35	71	74	3	A	-
MB11S151	F	26-35	-	-	-	A	-
MB11S153	M	57	-	-	-	-	-
MB11S155a	M	50+	-	-	-	-	-
MB11S155b	F	50+	-	-	-	-	-
MB11S157	F	18+	-	-	-	-	-
MB11S158	M	60	-	-	-	A	-
MB11S160	F	26-35	68.19	72	3.81	A	-
MB11S162	M	36-49	83.86	86	2.14	A	-
MB11S167	F	12	-	-	-	-	-
MB11S170	F	50+	-	-	-	-	-
MB11S174	F	36-49	-	-	-	-	-
MB11S180	M	18-25	-	-	-	-	-
MB11S183	F	26-35	-	-	-	A	-
MB11S186	M	36-49	115.99	119	3.01	A	-
MB11S192	F	26-35	-	-	-	-	-
MB11S194	M	50+	111.55	115	3.45	A	-
MB11S195	F	36-49	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-
MB11S205	M	50+	-	-	-	A	-
MB11S206	U	13-17	-	-	-	-	-
MB11S207	F	50+	-	-	-	-	-
MB11S216	F	36-49	-	-	-	-	-
MB11S220	F	36-49	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-
MB11S226	M	26-35	-	-	-	-	-
MB11S228	M	36-49	-	-	-	-	-
MB11S229	U	13-17	-	-	-	-	-
MB11S233	M	18+	-	-	-	-	-
MB11S234	F	18-25	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-
MB11S236	M	24	-	-	-	-	-
MB11S237	M	50+	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-
MB11S239	M	23	89	89	0	A	-

Legend – M = male; F = female; Am = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S240	M	36-49	-	-	-	-	-
MB11S242	M	50+	84.68	85	0.32	A	-
MB11S243	F	62	-	-	-	-	-
MB11S246	U	19	-	-	-	-	-
MB11S247	M	50+	-	-	-	-	-
MB11S248	F	9	-	-	-	-	-
MB11S249	M	26-35	-	-	-	-	-
MB11S250	M	73	-	-	-	-	-
MB11S251	M	36-49	109.59	109.5	-0.09	A	-
MB11S253	M	78	-	-	-	-	-
MB11S254	M	36-49	-	-	-	-	-
MB11S257	M	26-35	98.04	98	-0.04	A	-
MB11S260	M	18-25	-	-	-	-	-
MB11S261	M	79	-	-	-	-	-
MB11S263	M	36-49	111.99	113	1.01	A	-
MB11S267	M	26-35	-	-	-	-	-
MB11S269a	M	18+	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-
MB11S239	M	23	89	89	0	A	-
MB11S240	M	36-49	-	-	-	-	-
MB11S242	M	50+	84.68	85	0.32	A	-
MB11S243	F	62	-	-	-	-	-
MB11S246	U	19	-	-	-	-	-
MB11S247	M	50+	-	-	-	-	-
MB11S248	F	9	-	-	-	-	-
MB11S249	M	26-35	-	-	-	-	-
MB11S250	M	73	-	-	-	-	-
MB11S251	M	36-49	109.59	109.5	-0.09	A	-
MB11S253	M	78	-	-	-	-	-
MB11S254	M	36-49	-	-	-	-	-
MB11S257	M	26-35	98.04	98	-0.04	A	-
MB11S260	M	18-25	-	-	-	-	-
MB11S261	M	79	-	-	-	-	-
MB11S263	M	36-49	111.99	113	1.01	A	-
MB11S267	M	26-35	-	-	-	-	-
MB11S269a	M	18+	-	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Presence	Location
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-	-
MB11S270	M	18-25	-	-	-	A	-
MB11S271	M	50+	-	-	-	-	-
MB11S275	U	15 ± 1 yr.	-	-	-	P	3-4
MB11S278	F	36-49	-	-	-	-	-
MB11S281	M	36-49	-	-	-	A	-
MB11S282	U	12 ± 12 mo.	-	-	-	-	-
MB11S285	M	71	-	-	-	-	-
MB11S286	F	10	-	-	-	-	-
MB11S289	M	50+	-	-	-	-	-
MB11S290	M	18-25	86.85	87	0.15	A	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-
MB11S294	F	66	85.67	86	0.33	A	-
MB11S297	M	84	-	-	-	-	-
MB11S301a	F	36-49	82.88	83	0.12	A	-
MB11S301b	U	6-10	-	-	-	-	-
MB11S302	F	50+	-	-	-	-	-
MB11S303	F	44	81.84	82.5	0.66	A	-
MB11S306	M	31	-	-	-	-	-
MB11S307	U	13-17	86.92	91	4.08	P	2-3; 3-4
MB11S309	F	58	-	-	-	-	-
MB11S310	M	35	-	-	-	-	-
MB11S311	F	18-25	-	-	-	-	-
MB11S313	M	46	100.89	101	0.11	A	-
MB11S317	M	80	-	-	-	-	-
MB11S319	F	69	-	-	-	-	-
MB11S321	M	50+	-	-	-	-	-
MB11S324	M	36-49	89.1	93.5	4.5	P	2-3
MB11S325	M	36	-	-	-	A	-
MB11S327	F	36-49	-	-	-	-	-
MB11S331	F	74	-	-	-	A	-
MB11S334	F	9	-	-	-	-	-
MB11S337	M	68	-	-	-	-	-
MB11S338	F	33	-	-	-	-	-
MB11S339	F	64	-	-	-	-	-
MB11S340	U	19	-	-	-	P	1-2; 2-3

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S341	M	50+	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-
MB11S344	F	20	-	-	-	A	-
MB11S345	F	28	67.36	67.5	0.14	A	-
MB11S346	F	36-49	79.03	79.5	0.47	A	-
MB11S347	M	50+	121.87	124	2.13	A	-
MB11S349	M	50+	-	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-
MB11S356	F	78	-	-	-	-	-
MB11S358	F	74	-	-	-	A	-
MB11S359	F	46	-	-	-	-	-
MB11S360	F	66	-	-	-	-	-
MB11S363	M	61	-	-	-	-	-
MB11S367	F	11	-	-	-	-	-
MB11S368	M	26-35	-	-	-	-	-
MB11S369	F	30	-	-	-	A	-
MB11S370	F	36-49	68.9	70	1.1	A	-
MB11S371	M	36-49	97.84	98.5	0.66	A	-
MB11S374	M	80	-	-	-	-	-
MB11S375	M	74	-	-	-	A	-
MB11S377	M	18+	-	-	-	-	-
MB11S379	M	18-25	-	-	-	-	-
MB11S380	M	36-49	93.45	93.5	0.05	A	-
MB11S382	F	50+	-	-	-	-	-
MB11S383	F	55	-	-	-	-	-
MB11S385	F	25	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-
MB11S388	F	21	69.45	69	-0.45	A	-
MB11S390	F	71	-	-	-	-	-
MB11S391	M	50+	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-
MB11S394	F	50+	-	-	-	-	-
MB11S399	Am	36-49	109.88	110	0.12	A	-
MB11S401	F	26-35	80.48	80.5	0.02	A	-
MB11S402	M	36-49	-	-	-	-	-
MB11S404	M	26-35	102.83	103.5	0.67	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S405	F	36-49	86.41	86.5	0.09	A	-
MB11S407	M	18+	-	-	-	-	-
MB11S409	F	18+	88.78	89	0.22	A	-
MB11S411	M	36-49	-	-	-	-	-
MB11S413	F	39	-	-	-	-	-
MB11S415	M	50+	-	-	-	-	-
MB11S416	M	36-49	99.04	99	-0.04	A	-
MB11S420	F	26-35	-	-	-	-	-
MB11S422	F	29	-	-	-	-	-
MB11S426	F	55	-	-	-	-	-
MB11S427	M	27	93.6	94	0.4	A	-
MB11S428	F	50+	-	-	-	-	-
MB11S430	F	30	86.92	87	0.08	A	-
MB11S432	M	26-35	-	-	-	A	-
MB11S434	F	36-49	-	-	-	-	-
MB11S435	M	45	105.31	105.5	0.19	A	-
MB11S436	F	18+	-	-	-	-	-
MB11S437	F	26-35	79.57	80	0.43	A	-
MB11S441	F	23	-	-	-	-	-
MB11S446	U	22	105.13	105	-0.13	A	-
MB11S452	F	18-25	79.29	79.5	0.21	A	-
MB11S453	F	26-35	-	-	-	A	-
MB11S454	U	21	-	-	-	-	-
MB11S455	M	50+	-	-	-	-	-
MB11S456	M	36-49	101.68	102	0.32	A	-
MB11S457	F	50+	-	-	-	-	-
MB11S460	U	16.5 ± 36 mo.	-	-	-	P	1-2; 2-3
MB11S461	F	28	-	-	-	-	-
MB11S462	M	16	-	-	-	-	-
MB11S464	M	36-49	102.66	103	0.34	A	-
MB11S465	M	15	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	-
MB11S466b	F	43	-	-	-	-	-
MB11S467	M	26-35	98.44	99.5	1.06	A	-
MB11S468	F	36-49	81.71	81.5	-0.21	A	-
MB11S469	M	43	-	-	-	-	-
MB11S470	M	50+	-	-	-	-	-
MB11S471	F	9	-	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S473	M	42	113.53	113.5	-0.03	A	-
MB11S474	F	50+	-	-	-	-	-
MB11S476	F	31	80.7	81	0.3	A	-
MB11S477	M	61	-	-	-	-	-
MB11S479	U	12 -18	-	-	-	-	-
MB11S481	F	29	-	-	-	-	-
MB11S482	M	36	109.95	110	0.05	A	-
MB11S484	M	50+	-	-	-	-	-
MB11S485	F	36-49	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-
MB11S488	F	36-49	99.21	100	0.79	A	-
MB11S489	M	36-49	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	-	-
MB11S490b	M	18+	100.77	100	-0.77	A	-
MB11S492	M	26-35	-	-	-	-	-
MB11S494	M	50+	104.38	105	0.62	A	-
MB11S495	F	26-35	-	-	-	-	-
MB11S497	M	26-35	-	-	-	-	-
MB11S498	F	50+	89.04	91	1.96	P	2-3
MB11S501	F	80	60.83	60	-0.83	A	-
MB11S502	M	25	116.79	118	1.21	P	2-3
MB11S504	F	36-49	-	-	-	-	-
MB11S505	M	18-25	-	-	-	A	-
MB11S507	U	14 ± 2 yrs.	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-
MB11S511	M	50+	-	-	-	-	-
MB11S512	F	36-49	84.12	85	0.88	A	-
MB11S514	M	26-35	-	-	-	-	-
MB11S516	M	50+	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-
MB11S520	M	50+	-	-	-	-	-
MB11S521	M	69	-	-	-	-	-
MB11S522	F	13	-	-	-	-	-
MB11S523	M	50+	-	-	-	-	-
MB11S524	M	36-49	-	-	-	-	-
MB11S525	M	50+	-	-	-	-	-
MB11S526	M	50+ (50-72)	-	-	-	-	-
MB11S527	F	26-35	-	-	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Table G1 – continued…

Individual Number	Sex	Age	Metric and Z-Scores			Macro	
			Straight length	Curved length	Angulation	Angulation	Location
MB11S530	F	75	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	-
MB11S538	F	26-35	87.79	88	0.21	A	-
MB11S540	U	20	-	-	-	-	-
MB11S543	F	18+	-	-	-	-	-
MB11S544	M	30	76.8	75	-1.8	A	-
MB11S545	F	49	-	-	-	-	-
MB11S549	U	11 ± 24 mo.	-	-	-	-	-
MB11S550	F	50+	-	-	-	A	-
MB11S552	M	18+	-	-	-	-	-
MB11S553	F	36-49	-	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; Macro = Macroscopic; A = absent; P = present; "-" = missing/damaged.

Appendix H – Costochondral Flaring, Sternal Rib Porosity, and Rib 1 Measurements, Z-Scores and Non-Metric Features

Table H1 – Costochondral Flaring and Sternal Rib Porosity

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
KER15S006	M	26-35	-	-	-	-	-	-
KER15S007	F	36-49	A	A	A	-	-	-
KER15S008	Am	50+	A	A	-	-	A	-
KER15S009	M	36-49	A	A	A	-	A	-
KER15S010	M	36-49	A	A	-	-	A	-
KER15S011	M	36-49	A	A	A	-	-	-
KER15S012	F	36-49	A	A	A	-	A	-
KER15S014	F	18-25	A	A	A	-	A	-
KER15S015	M	36-49	A	A	A	-	A	-
KER15S016	M	18-25	P	A	P	?	P	?
KER15S017	M	36-49	A	A	A	-	A	-
KER15S018	M	18-25	A	A	A	-	A	-
KER15S019	M	50+	A	A	A	-	A	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-	-	-
KER15S021	M	36-49	A	A	A	-	-	-
KER15S024	M	36-49	-	-	-	-	-	-
KER15S025	M	36-49	-	-	-	-	-	-
KER15S026	M	36-49	A	A	A	-	A	-
KER15S028	F	36-49	-	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	A	P	-	-	A	-
KER15S032	F	36-49	A	A	A	-	-	-
KER15S035	F	26-35	-	-	-	-	-	-
KER15S036	M	36-49	P	A	-	-	P	?
KER15S037	M	50+	A	A	A	-	A	-
KER15S038	F	36-49	A	A	A	-	-	-
KER15S040	M	18+	A	A	-	-	A	-
KER15S042	M	36-49	A	A	A	-	A	-
KER15S043	M	36-49	A	A	A	-	A	-
KER15S044	M	36-49	A	A	A	-	A	-
KER15S045	M	36-49	A	A	A	-	-	-
KER15S046	M	26-35	A	A	A	-	-	-
KER15S047	Am	26-35	A	A	A	-	-	-
KER15S050	Am	18+	A	A	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
KER15S051	F	26-35	A	A	A	-	A	-
KER15S052	F	50+	A	A	A	-	-	-
KER15S053	U	15 ± 1 yr.	P	P	P	?	-	-
KER15S054	Am	26-35	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	-	-
KER15S057	F	50+	A	A	A	-	-	-
KER15S058	M	26-35	A	A	A	-	A	-
KER15S059	F	36-49	A	A	A	-	A	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	-	-
KER15S063	F	36-49	A	A	A	-	A	-
KER15S064	M	36-49	A	A	-	-	A	-
KER15S065	M	36-49	A	A	A	-	A	-
KER15S066	M	18+	A	A	A	-	A	-
KER15S068	F	18+	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-
KER15S071	M	18-25	A	A	A	-	A	-
KER15S072	F	36-49	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	A	A	-	-	-	-
KER15S074	M	36-49	A	A	-	-	A	-
KER15S075	F	36-49	-	-	-	-	-	-
KER15S076	M	26-35	A	A	A	-	A	-
KER15S077	M	26-35	-	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	A	A	A	-	-	-
KER15S080	M	26-35	A	A	A	-	A	-
KER15S081	Am	18+	A	A	-	-	A	-
KER15S082	F	50+	A	A	A	-	A	-
KER15S083	M	36-49	A	A	A	-	A	-
KER15S084	F	36-49	A	-	A	-	-	-
KER15S085	M	36-49	A	A	A	-	A	-
KER15S086	M	36-49	A	A	-	-	-	-
KER15S087	M	36-49	A	A	-	-	A	-
KER15S088	F	26-35	A	A	A	-	A	-
KER15S089	M	50+	A	A	A	-	-	-
KER15S090	F	50+	A	A	A	-	-	-
KER15S091	F	36-49	A	A	A	-	-	-
KER15S092	F	50+	A	A	A	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
KER15S093	F	26-35	A	P	A	-	A	-
KER15S094	F	18-25	A	A	A	-	A	-
KER15S096	F	36-49	A	A	A	-	-	-
KER15S097	F	50+	A	A	A	-	-	-
KER15S098	F	26-35	A	A	A	-	A	-
KER15S099	F	18-25	A	A	A	-	-	-
KER15S100	M	26-35	A	A	A	-	A	-
KER15S101	M	36-49	A	A	A	-	A	-
KER15S102	M	50+	A	A	A	-	A	-
KER15S103	M	18-25	A	A	A	-	A	-
KER15S105	M	18-25	A	A	A	-	A	-
KER15S106	M	36-49	A	A	A	-	A	-
KER15S107	F	26-35	A	A	-	-	-	-
KER15S108	M	36-49	A	A	A	-	-	-
KER15S109	F	36-49	-	-	-	-	-	-
KER15S110	F	18-25	-	-	-	-	-	-
KER15S111	M	26-35	A	A	A	-	A	-
KER15S112	M	26-35	-	-	-	-	-	-
KER15S113	M	36-49	-	-	-	-	-	-
KER15S114	F	50+	A	A	A	-	A	-
KER15S115	M	36-49	A	A	A	-	A	-
KER15S116	F	36-49	A	A	-	-	A	-
KER15S117	F	36-49	A	A	A	-	A	-
KER15S119a	U	12 ± 1 yr.	A	A	A	-	A	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-
KER15S120	F	18-25	A	A	A	-	-	-
KER15S122	F	36-49	A	A	A	-	A	-
HT15S124	U	13 ± 1 yr.	A	A	A	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	P	P	-	-	P	4-8
KER15S127	U	9 ± 1 yr.	P	P	P	4-8	P	4-8
KER15S129	F	36-49	A	A	A	-	A	-
KER15S130	M	18-25	A	A	A	-	A	-
KER15S132	F	50+	A	A	A	-	-	-
KER15S133	F	18-25	A	A	-	-	A	-
KER15S134	M	36-49	A	A	-	-	A	-
KER15S136	U	13 ± 2 yrs.	P	P	-	-	P	2-3; 4-8
KER15S142	F	26-35	-	-	-	-	-	-
KER15S143	M	36-49	A	A	A	-	-	-
KER15S145	F	36-49	A	A	A	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
KER15S150	U	14 ± 1.5 yrs.	P	A	P	4-8	P	4-8
KER15S151	M	36-49	P	A	A	-	A	-
KER15S154	F	36+	-	-	-	-	-	-
MB11S019	Am	18+	A	P	A	-	A	-
MB11S029	M	50+	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	-	-	-
MB11S045	F	47	A	A	A	-	A	-
MB11S047	F	21	A	A	-	-	-	-
MB11S051	M	74	A	A	A	-	A	-
MB11S053	F	36-49	P	A	P	?	-	-
MB11S056	F	50+	-	-	-	-	-	-
MB11S059	M	36-49	A	A	A	-	A	-
MB11S060	F	18-25	-	-	-	-	-	-
MB11S064	M	26-35	-	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-
MB11S084	F	18+	A	A	A	-	A	-
MB11S088	F	26-35	A	A	A	-	A	-
MB11S092	M	26-35	A	A	A	-	A	-
MB11S093	M	50+	-	-	-	-	-	-
MB11S097	F	50+	P	A	P	4-8	A	-
MB11S100	M	18+	P	A	P	?	-	-
MB11S101	F	26-35	P	A	P	4-8	-	-
MB11S107	F	18-25	-	-	-	-	-	-
MB11S108	M	26-35	A	A	A	-	A	-
MB11S110	F	26-35	P	A	P	4-8	A	-
MB11S121	F	36-49	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-
MB11S126	F	36-49	A	A	A	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-
MB11S144	M	36-50	-	-	-	-	A	-
MB11S149	F	26-35	A	A	-	-	-	-
MB11S151	F	26-35	A	-	A	-	-	-
MB11S153	M	57	A	A	-	-	-	-
MB11S155a	M	50+	A	A	A	-	A	-
MB11S155b	F	50+	A	A	A	-	-	-
MB11S157	F	18+	A	A	-	-	A	-
MB11S158	M	60	A	A	A	-	A	-
MB11S160	F	26-35	A	A	A	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S162	M	36-49	A	A	A	-	A	-
MB11S167	F	12	P	P	P	4-8	A	-
MB11S170	F	50+	A	A	A	-	-	-
MB11S174	F	36-49	-	-	-	-	-	-
MB11S180	M	18-25	P	P	A	-	A	-
MB11S183	F	26-35	A	A	A	-	A	-
MB11S186	M	36-49	P	A	P	4-8	A	-
MB11S192	F	26-35	-	-	-	-	-	-
MB11S194	M	50+	P	A	A	-	P	4-8
MB11S195	F	36-49	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-	-
MB11S205	M	50+	P	A	P	?	-	-
MB11S206	U	13-17	A	P	-	-	-	-
MB11S207	F	50+	A	A	A	-	A	-
MB11S216	F	36-49	P	A	P	4-8	P	4-8
MB11S220	F	36-49	A	A	-	-	A	-
MB11S225	M	50+	-	-	-	-	-	-
MB11S226	M	26-35	A	A	A	-	A	-
MB11S228	M	36-49	-	-	-	-	-	-
MB11S229	U	13-17	A	A	A	-	A	-
MB11S233	M	18+	A	A	-	-	A	-
MB11S234	F	18-25	A	A	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-
MB11S236	M	24	A	A	A	-	A	-
MB11S237	M	50+	-	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-	-
MB11S239	M	23	A	P	A	-	A	-
MB11S240	M	36-49	A	A	A	-	A	-
MB11S242	M	50+	A	A	A	-	A	-
MB11S243	F	62	A	A	A	-	A	-
MB11S246	U	19	A	A	A	-	-	-
MB11S247	M	50+	A	A	A	-	A	-
MB11S248	F	9	A	A	A	-	A	-
MB11S249	M	26-35	A	A	A	-	A	-
MB11S250	M	73	A	A	-	-	-	-
MB11S251	M	36-49	A	A	A	-	A	-
MB11S253	M	78	A	A	A	-	A	-
MB11S254	M	36-49	A	A	A	-	A	-
MB11S257	M	26-35	A	A	A	-	A	-
MB11S260	M	18-25	A	A	-	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S261	M	79	-	-	-	-	-	-
MB11S263	M	36-49	P	A	P	4-8	P	4-8
MB11S267	M	26-35	A	A	A	-	A	-
MB11S269a	M	18+	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	A	A	A	-	A	-
MB11S270	M	18-25	P	A	A	-	P	4-8
MB11S271	M	50+	A	A	A	-	-	-
MB11S275	U	15 ± 1 yr.	A	A	A	-	A	-
MB11S278	F	36-49	A	A	A	-	A	-
MB11S281	M	36-49	A	A	A	-	A	-
MB11S282	U	12 ± 12 mo.	P	P	P	?	P	?
MB11S285	M	71	A	A	A	-	A	-
MB11S286	F	10	P	P	P	4-8	P	4-8
MB11S289	M	50+	-	-	-	-	-	-
MB11S290	M	18-25	P	A	P	?	A	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-
MB11S294	F	66	A	A	A	-	A	-
MB11S297	M	84	A	A	-	-	A	-
MB11S301a	F	36-49	A	A	A	-	A	-
MB11S301b	U	6-10	-	-	-	-	A	-
MB11S302	F	50+	-	-	-	-	-	-
MB11S303	F	44	A	A	A	-	A	-
MB11S306	M	31	A	A	-	-	A	-
MB11S307	U	13-17	P	P	P	2-3; 4-8	A	-
MB11S309	F	58	A	A	A	-	A	-
MB11S310	M	35	-	-	-	-	-	-
MB11S311	F	18-25	A	A	A	-	A	-
MB11S313	M	46	A	A	A	-	A	-
MB11S317	M	80	-	-	-	-	-	-
MB11S319	F	69	A	A	-	-	A	-
MB11S321	M	50+	-	-	-	-	-	-
MB11S324	M	36-49	P	A	P	1; 4-8	P	1, 4-8
MB11S325	M	36	P	A	P	4-8	-	-
MB11S327	F	36-49	A	A	-	-	A	-
MB11S331	F	74	P	A	P	?	-	-
MB11S334	F	9	P	P	P	4-8	P	4-8
MB11S337	M	68	A	A	A	-	A	-
MB11S338	F	33	-	-	-	-	-	-
MB11S339	F	64	A	A	A	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S340	U	19	P	P	P	4-8	P	2-3
MB11S341	M	50+	-	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-	-
MB11S344	F	20	A	A	A	-	-	-
MB11S345	F	28	P	P	A	-	P	4-8
MB11S346	F	36-49	A	A	A	-	A	-
MB11S347	M	50+	A	A	A	-	A	-
MB11S349	M	50+	P	A	P	?	A	-
MB11S350	U	16 ± 1 yr.	A	A	A	-	A	-
MB11S355	F	50+	-	-	-	-	-	-
MB11S356	F	78	A	A	A	-	-	-
MB11S358	F	74	A	A	A	-	A	-
MB11S359	F	46	-	-	-	-	-	-
MB11S360	F	66	A	A	A	-	A	-
MB11S363	M	61	-	-	-	-	-	-
MB11S367	F	11	A	A	A	-	A	-
MB11S368	M	26-35	A	A	A	-	A	-
MB11S369	F	30	A	A	A	-	A	-
MB11S370	F	36-49	A	A	A	-	A	-
MB11S371	M	36-49	A	A	A	-	A	-
MB11S374	M	80	A	A	A	-	A	-
MB11S375	M	74	P	A	P	4-8	A	-
MB11S377	M	18+	-	-	-	-	-	-
MB11S379	M	18-25	P	P	P	4-8	P	4-8; 9-10
MB11S380	M	36-49	A	A	A	-	A	-
MB11S382	F	50+	A	A	-	-	-	-
MB11S383	F	55	A	A	-	-	A	-
MB11S385	F	25	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-
MB11S388	F	21	P	A	A	-	P	4-8
MB11S390	F	71	A	A	-	-	-	-
MB11S391	M	50+	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-
MB11S394	F	50+	A	A	A	-	A	-
MB11S399	Am	36-49	P	A	A	-	P	4-8
MB11S401	F	26-35	A	A	A	-	A	-
MB11S402	M	36-49	A	A	A	-	A	-
MB11S404	M	26-35	P	A	A	-	P	2-3; 4-8
MB11S405	F	36-49	A	A	A	-	A	-
MB11S407	M	18+	A	A	A	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S409	F	18+	A	A	A	-	A	-
MB11S411	M	36-49	-	-	-	-	-	-
MB11S413	F	39	A	A	A	-	A	-
MB11S415	M	50+	A	A	A	-	A	-
MB11S416	M	36-49	P	A	A	-	P	4-8
MB11S420	F	26-35	-	-	-	-	-	-
MB11S422	F	29	A	A	A	-	-	-
MB11S426	F	55	A	A	-	-	A	-
MB11S427	M	27	A	A	A	-	A	-
MB11S430	F	30	A	A	A	-	A	-
MB11S432	M	26-35	A	A	A	-	A	-
MB11S434	F	36-49	A	A	A	-	A	-
MB11S435	M	45	A	A	A	-	A	-
MB11S436	F	18+	-	-	-	-	-	-
MB11S437	F	26-35	A	A	A	-	A	-
MB11S441	F	23	A	A	A	-	A	-
MB11S446	U	22	P	P	P	2-3; 4-8	P	1, 4-8
MB11S452	F	18-25	A	A	A	-	A	-
MB11S453	F	26-35	A	A	A	-	A	-
MB11S454	U	21	P	A	P	4-8	P	4-8
MB11S455	M	50+	-	-	-	-	-	-
MB11S456	M	36-49	A	A	A	-	A	-
MB11S457	F	50+	A	A	A	-	A	-
MB11S460	U	16.5 ± 36 mo.	A	A	A	-	A	-
MB11S461	F	28	-	-	-	-	-	-
MB11S462	M	16	-	-	A	-	-	-
MB11S464	M	36-49	-	-	-	-	-	-
MB11S465	M	15	A	A	A	-	A	-
MB11S466a	M	83	-	-	-	-	-	-
MB11S466b	F	43	P	A	P	?	P	4-8
MB11S467	M	26-35	P	A	A	-	P	4-8
MB11S468	F	36-49	P	A	A	-	P	4-8
MB11S469	M	43	A	A	-	-	A	-
MB11S470	M	50+	A	A	-	-	-	-
MB11S471	F	9	P	P	P	4-8	P	4-8
MB11S473	M	42	A	A	A	-	A	-
MB11S474	F	50+	A	A	-	-	A	-
MB11S476	F	31	A	A	A	-	A	-
MB11S477	M	61	P	A	P	4-8	P	4-8
MB11S479	U	12-18	A	A	-	-	A	-
MB11S481	F	29	A	A	-	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S482	M	36	A	A	A	-	A	-
MB11S484	M	50+	A	A	A	-	-	-
MB11S485	F	36-49	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-	-
MB11S488	F	36-49	A	A	A	-	A	-
MB11S489	M	36-49	-	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	-	-	-
MB11S490b	M	18+	-	-	-	-	-	-
MB11S492	M	26-35	P	A	-	-	P	4-8
MB11S494	M	50+	A	A	A	-	A	-
MB11S495	F	26-35	-	-	-	-	-	-
MB11S497	M	26-35	A	A	A	-	A	-
MB11S498	F	50+	A	A	A	-	A	-
MB11S501	F	80	A	A	A	-	A	-
MB11S502	M	25	A	A	A	-	A	-
MB11S504	F	36-49	-	-	-	-	-	-
MB11S505	M	18-25	P	A	P	4-8	A	-
MB11S507	U	14 ± 2 yrs.	P	A	P	4-8	A	-
MB11S508	M	50+	-	-	-	-	-	-
MB11S511	M	50+	A	A	A	-	A	-
MB11S512	F	36-49	A	A	A	-	A	-
MB11S514	M	26-35	A	A	A	-	A	-
MB11S516	M	50+	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-	-
MB11S520	M	50+	A	A	A	-	A	-
MB11S521	M	69	A	A	A	-	A	-
MB11S522	F	13	P	P	P	4-8	P	4-8
MB11S523	M	50+	-	-	-	-	-	-
MB11S524	M	36-49	A	A	A	-	A	-
MB11S525	M	50+	A	A	A	-	A	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-
MB11S527	F	26-35	A	A	A	-	A	-
MB11S530	F	75	A	A	A	-	A	-
MB11S533	F	50-65	-	-	-	-	-	-
MB11S534	M	36-49	A	A	-	-	-	-
MB11S538	F	26-35	A	A	A	-	-	-
MB11S540	U	20	P	P	P	4-8	P	4-8
MB11S543	F	18+	A	A	-	-	A	-
MB11S544	M	30	A	A	A	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location. Table continued…

Table H1 – Continued…

Individual Number	Sex	Age	Costochondral Flaring Total	Rib Porosity Total	Left Ribs Costochondral Flaring		Right Ribs Costochondral Flaring	
					P/A	Location	P/A	Location
MB11S545	F	49	A	A	A	-	A	-
MB11S549	U	11 ± 24 mo.	P	A	P	?	A	-
MB11S550	F	50+	A	A	A	-	-	-
MB11S552	M	18+	-	-	-	-	-	-
MB11S553	F	36-49	A	A	A	-	A	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; A = absent; P = present; "-" = missing/damaged; ? = unknown location.

Table H2 – Rib 1 Metric Measurements:

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S006	M	26-35	-	-	-	-	-	-
KER15S007	F	36-49	-	-	-	-	-	-
KER15S008	Am	50+	-	-	-	19.15	24.06	-4.91
KER15S009	M	36-49	23.02	-	-	20.91	-	-
KER15S010	M	36-49	-	-	-	19.3	-	-
KER15S011	M	36-49	-	-	-	-	-	-
KER15S012	F	36-49	20.14	18.53	1.61	20.29	19.23	1.06
KER15S014	F	18-25	20.64	20.13	0.51	-	-	-
KER15S015	M	36-49	16.45	17.07	-0.62	16.7	15.54	1.16
KER15S016	M	18-25	21.58	21.39	0.19	-	-	-
KER15S017	M	36-49	19.59	18.71	0.88	16.63	19.4	-2.77
KER15S018	M	18-25	20.76	23.26	-2.5	16.18	21.09	-4.91
KER15S019	M	50+	19.4	20.85	-1.45	-	-	-
KER15S020	U	15 ± 2	-	-	-	-	-	-
KER15S021	M	36-49	-	-	-	-	-	-
KER15S024	M	36-49	-	-	-	-	-	-
KER15S025	M	36-49	-	-	-	-	-	-
KER15S026	M	36-49	-	-	-	20.42	26.64	-6.22
KER15S028	F	36-49	-	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-
KER15S032	F	36-49	18.94	20.71	1.77	-	-	-
KER15S035	F	26-35	-	-	-	-	-	-
KER15S036	M	36-49	-	-	-	-	-	-
KER15S037	M	50+	-	-	-	-	-	-
KER15S038	F	36-49	15.08	16.95	-1.87	-	-	-
KER15S040	M	18+	-	-	-	18.35	20.22	-1.87
KER15S042	M	36-49	17.19	-	-	18.43	20.67	-2.24
KER15S043	M	36-49	-	-	-	20.28	18.42	1.86
KER15S044	M	36-49	17.75	-	-	22.01	25.47	-3.46
KER15S045	M	36-49	-	-	-	-	-	-
KER15S046	M	26-35	16.84	18.27	-1.43	-	-	-
KER15S047	Am	26-35	-	-	-	-	-	-
KER15S050	Am	18+	-	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-	-
KER15S052	F	50+	-	-	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-
KER15S054	Am	26-35	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-
KER15S058	M	26-35	22.32	23.01	-0.69	18.42	20.41	-1.99
KER15S059	F	36-49	-	-	-	15.01	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	-	-
KER15S063	F	36-49	13.77	16.65	-2.88	13.46	14.68	-1.22
KER15S064	M	36-49	-	-	-	23.06	23.93	-0.87
KER15S065	M	36-49	-	-	-	20.75	19.72	1.03
KER15S066	M	18+	-	-	-	17.8	21.61	-3.81
KER15S068	F	18+	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-
KER15S071	M	18-25	-	-	-	19.84	22.76	-2.92
KER15S072	F	36-49	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-
KER15S074	M	36-49	-	-	-	-	-	-
KER15S075	F	36-49	-	-	-	-	-	-
KER15S076	M	26-35	16.8	19.43	-2.63	18.1	21.36	-3.26
KER15S077	M	26-35	-	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-	-
KER15S081	Am	18+	-	-	-	-	-	-
KER15S077	M	26-35	-	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-	-
KER15S081	Am	18+	-	-	-	-	-	-
KER15S082	F	50+	19.03	19.86	-0.83	19.72	-	-
KER15S083	M	36-49	-	-	-	-	-	-
KER15S084	F	36-49	-	-	-	-	-	-
KER15S085	M	36-49	20.1	21.09	-0.99	20.3	20.44	-0.14
KER15S086	M	36-49	-	-	-	-	-	-
KER15S087	M	36-49	-	-	-	20.21	18.93	1.28
KER15S088	F	26-35	19.34	20.57	-1.23	18.49	20.57	-2.08
KER15S089	M	50+	19.72	-	-	-	-	-

Legend – M = male; F = female; Am = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S090	F	50+	19.77	22.33	-2.56	-	-	-
KER15S091	F	36-49	16.93	18.73	-1.8	-	-	-
KER15S092	F	50+	18.37	18.25	0.12	19.95	19.36	0.59
KER15S093	F	26-35	17.91	18.41	-0.5	17.35	19.79	-2.44
KER15S094	F	18-25	-	-	-	20.54	21.56	-1.02
KER15S096	F	36-49	-	-	-	-	-	-
KER15S097	F	50+	-	-	-	-	-	-
KER15S098	F	26-35	15.01	18.99	-3.98	17.74	20.56	-2.82
KER15S099	F	18-25	15.25	19.9	-4.65	-	-	-
KER15S100	M	26-35	24.08	25.99	-1.91	22.68	-	-
KER15S101	M	36-49	-	-	-	20.28	18.16	2.12
KER15S102	M	50+	20.28	20.55	-0.27	19.93	18.01	1.92
KER15S103	M	18-25	-	-	-	-	-	-
KER15S105	M	18-25	18.21	18.76	-0.55	16.6	18.91	-2.31
KER15S106	M	36-49	23.81	23.8	0.01	23.33	23.45	-0.12
KER15S107	F	26-35	-	-	-	-	-	-
KER15S108	M	36-49	15.15	-	-	-	-	-
KER15S109	F	36-49	-	-	-	-	-	-
KER15S110	F	18-25	-	-	-	-	-	-
KER15S111	M	26-35	18.28	19.45	-1.17	19.05	-	-
KER15S112	M	26-35	-	-	-	-	-	-
KER15S113	M	36-49	-	-	-	-	-	-
KER15S114	F	50+	-	-	-	-	-	-
KER15S115	M	36-49	21.83	22.73	-0.9	-	-	-
KER15S116	F	36-49	-	-	-	-	-	-
KER15S117	F	36-49	-	-	-	-	-	-
KER15S119a	U	12 ± 1 yr.	11.98	12.2	-0.22	12.63	11.46	1.17
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-	-
KER15S122	F	36-49	18.15	19.91	-1.76	17.85	21.29	-3.44
HT15S124	U	13 ± 1 yr.	13.42	13.47	-0.05	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-	-	-
KER15S127	U	9 ± 1 yr.	18.15	19.91	-1.76	13.09	12.46	0.63
KER15S129	F	36-49	18.15	19.91	-1.76	18.34	19.49	-1.15
KER15S130	M	18-25	18.15	19.91	-1.76	16.25	20.9	-4.65
KER15S132	F	50+	-	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-	-
KER15S134	M	36-49	-	-	-	20.65	20.9	-0.25
KER15S136	U	13 ± 2 yrs.	-	-	-	12.64	15.62	-2.98
KER15S142	F	26-35	-	-	-	-	-	-
KER15S143	M	36-49	22.77	23.36	-0.59	-	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; “-“ missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S145	F	36-49	15.53	17.5	-1.97	15.27	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	18.55	18.59	-0.04
KER15S151	M	36-49	23.5	21.98	1.52	22.16	23.82	-1.66
KER15S154	F	36+	-	-	-	-	-	-
MB11S019	Am	18+	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	14.95	15.62	-0.67	15.56	15.75	-0.19
MB11S045	F	47	-	-	-	-	-	-
MB11S047	F	21	-	-	-	-	-	-
MB11S051	M	74	19.81	18.64	1.17	21.83	23.38	-1.55
MB11S053	F	36-49	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-
MB11S059	M	36-49	12.1	17.26	-5.16	16.48	21.87	-5.39
MB11S060	F	18-25	-	-	-	-	-	-
MB11S064	M	26-35	-	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-
MB11S084	F	18+	-	-	-	19.26	20.9	-1.64
MB11S088	F	26-35	19.85	21.68	-1.83	21.34	-	-
MB11S092	M	26-35	18.01	21.17	-3.16	18.33	20.35	-2.02
MB11S093	M	50+	-	-	-	-	-	-
MB11S097	F	50+	19.56	20.05	-0.49	21.9	23.42	-1.52
MB11S100	M	18+	-	-	-	24.67	-	-
MB11S101	F	26-35	-	-	-	-	-	-
MB11S107	F	18-25	-	-	-	-	-	-
MB11S108	M	26-35	17.7	18.76	-1.06	15.79	17.7	-1.91
MB11S110	F	26-35	-	-	-	15.48	-	-
MB11S121	F	36-49	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-
MB11S144	M	36-50	-	-	-	-	-	-
MB11S149	F	26-35	17.18	20.26	-3.08	18.33	19.1	-0.77
MB11S151	F	26-35	12.84	17.15	-4.31	-	-	-
MB11S153	M	57	20.41	-	-	-	-	-
MB11S155a	M	50+	-	-	-	17.79	16.63	1.16
MB11S155b	F	50+	-	-	-	-	-	-
MB11S157	F	18+	-	-	-	-	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S158	M	60	24.01	23.77	0.24	25.95	24.42	1.53
MB11S160	F	26-35	17.7	17.54	0.16	15.91	16.22	-0.31
MB11S162	M	36-49	18.46	24.71	-6.25	19.87	25.05	-5.18
MB11S167	F	12	13.72	14.15	-0.43	14.61	14.5	0.11
MB11S170	F	50+	-	-	-	-	-	-
MB11S174	F	36-49	-	-	-	-	-	-
MB11S180	M	18-25	18.94	20.28	-1.34	18.51	20.11	-1.6
MB11S183	F	26-35	-	-	-	20.67	21.19	-0.52
MB11S186	M	36-49	19.79	20.32	-0.53	23.11	20.92	2.19
MB11S192	F	26-35	-	-	-	-	-	-
MB11S194	M	50+	17.81	16.32	1.49	17.63	16.38	1.25
MB11S195	F	36-49	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-
MB11S207	F	50+	19.74	19.84	-0.1	18.88	19.49	-0.61
MB11S216	F	36-49	16.99	-	-	21.43	22.47	-1.04
MB11S220	F	36-49	-	-	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-
MB11S226	M	26-35	-	-	-	-	-	-
MB11S228	M	36-49	-	-	-	-	-	-
MB11S229	U	13-17	21.59	21.79	-0.2	-	-	-
MB11S233	M	18+	-	-	-	21.34	20.52	0.82
MB11S234	F	18-25	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-
MB11S236	M	24	-	-	-	15.76	23.9	-8.14
MB11S237	M	50+	-	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-	-
MB11S239	M	23	16.03	5.47	10.56	19.32	20.79	-1.47
MB11S240	M	36-49	21.54	22.33	-0.79	19.79	20.9	-1.11
MB11S242	M	50+	17.35	17.69	-0.34	17.37	19.88	-2.51
MB11S243	F	62	15.32	18.05	-2.73	16.47	16.98	-0.51
MB11S246	U	19	16.36	19.64	-3.28	-	-	-
MB11S247	M	50+	24.64	24.36	0.28	23.32	25.46	-2.14
MB11S248	F	9	13.62	12.7	0.92	13.14	12.05	1.09
MB11S249	M	26-35	22.24	21.59	0.65	21.72	23.37	-1.65
MB11S250	M	73	-	-	-	-	-	-
MB11S251	M	36-49	-	-	-	-	-	-
MB11S253	M	78	21.41	24.47	-3.06	21.22	23.99	-2.77

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S254	M	36-49	21.27	19.45	1.82	-	-	-
MB11S257	M	26-35	21.53	23.38	-1.85	22.66	-	-
MB11S260	M	18-25	-	-	-	22.22	23.72	-1.5
MB11S261	M	79	-	-	-	-	-	-
MB11S263	M	36-49	-	-	-	18.56	18.65	-0.09
MB11S267	M	26-35	21.89	26.3	-4.41	23.79	27.34	-3.55
MB11S269a	M	18+	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	15.66	16.52	-0.86	14.64	16.82	-2.18
MB11S270	M	18-25	-	-	-	23.31	24.22	-0.91
MB11S271	M	50+	22.08	22.78	-0.7	-	-	-
MB11S275	U	15 ± 1 yr.	-	-	-	13.3	-	-
MB11S278	F	36-49	16.24	17.92	-1.68	15.39	-	-
MB11S281	M	36-49	-	-	-	23.37	22.82	0.55
MB11S282	U	12 ± 12 mo.	13.46	13.88	-0.42	11.44	13.28	-1.84
MB11S285	M	71	28.52	28.17	0.35	31.44	26.45	4.99
MB11S286	F	10	14.17	13.5	0.67	-	-	-
MB11S289	M	50+	-	-	-	-	-	-
MB11S290	M	18-25	18.94	22.62	-3.68	21.9	25.02	-3.12
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-
MB11S294	F	66	19.07	20.54	-1.47	20.2	22.41	-2.21
MB11S297	M	84	-	-	-	21.42	24.74	-3.32
MB11S301a	F	36-49	20.38	20.56	-0.18	18.06	18.61	-0.55
MB11S301b	U	6-10	-	-	-	12.34	13.86	-1.52
MB11S302	F	50+	-	-	-	-	-	-
MB11S303	F	44	18.72	20.73	-2.01	19.17	20.28	-1.11
MB11S306	M	31	-	-	-	-	-	-
MB11S307	U	13-17	11.18	10.49	0.69	14.15	11.92	2.23
MB11S309	F	58	-	-	-	19.61	21.12	-1.51
MB11S310	M	35	-	-	-	-	-	-
MB11S311	F	18-25	15.99	18.95	-2.96	-	-	-
MB11S313	M	46	18.3	18.22	0.08	-	-	-
MB11S317	M	80	-	-	-	-	-	-
MB11S319	F	69	-	-	-	20.71	22.54	-1.83
MB11S321	M	50+	-	-	-	-	-	-
MB11S324	M	36-49	24.29	24.2	0.09	26.51	24.1	2.41
MB11S325	M	36	-	-	-	-	-	-
MB11S327	F	36-49	-	-	-	-	-	-
MB11S331	F	74	17.72	22.36	-4.64	-	-	-
MB11S334	F	9	10.09	9.08	1.01	11.32	11.1	0.22

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S337	M	68	-	-	-	-	-	-
MB11S338	F	33	-	-	-	-	-	-
MB11S339	F	64	-	-	-	-	-	-
MB11S340	U	19	18.01	19.02	-1.01	16.69	18.79	-2.1
MB11S341	M	50+	-	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-	-
MB11S344	F	20	-	-	-	-	-	-
MB11S345	F	28	16.03	17.65	-1.62	18.93	16.22	2.71
MB11S346	F	36-49	17.74	17.77	-0.03	18.81	17.17	1.64
MB11S347	M	50+	18.31	20.79	-2.48	20.32	21.89	-1.57
MB11S349	M	50+	19.95	-	-	22.39	20.67	1.72
MB11S350	U	16 ± 1 yr.	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-	-
MB11S356	F	78	16.53	15.29	1.24	-	-	-
MB11S358	F	74	18.87	19.21	-0.34	17.26	18.17	-0.91
MB11S359	F	46	-	-	-	-	-	-
MB11S360	F	66	22.92	23.43	-0.51	24.58	22.1	2.48
MB11S363	M	61	-	-	-	-	-	-
MB11S367	F	11	-	-	-	-	-	-
MB11S368	M	26-35	19.35	20.26	-0.91	20.26	22.59	-2.33
MB11S369	F	30	18.4	18.81	-0.41	-	-	-
MB11S370	F	36-49	14.65	18.54	-3.89	14.32	17.5	-3.18
MB11S371	M	36-49	20.24	23.29	-3.05	22.55	23.08	-0.53
MB11S374	M	80	-	-	-	-	-	-
MB11S375	M	74	24.17	25.29	-1.12	25.06	25.11	-0.05
MB11S377	M	18+	-	-	-	-	-	-
MB11S379	M	18-25	16.73	19.62	-2.89	21.04	19.36	1.68
MB11S380	M	36-49	25.51	20.13	5.38	24.07	21.97	2.1
MB11S382	F	50+	-	-	-	-	-	-
MB11S383	F	55	-	-	-	-	-	-
MB11S385	F	25	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-
MB11S388	F	21	17.07	21.57	-4.5	17.35	23.02	-5.67
MB11S390	F	71	-	-	-	-	-	-
MB11S391	M	50+	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-
MB11S394	F	50+	-	-	-	-	-	-
MB11S399	Am	36-49	21.71	20.83	0.88	21.36	19.72	1.64
MB11S401	F	26-35	-	-	-	-	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S402	M	36-49	23	21.8	1.2	20.93	19.87	1.06
MB11S404	M	26-35	-	-	-	-	-	-
MB11S405	F	36-49	19.36	17.47	1.89	18.48	20.25	-1.77
MB11S407	M	18+	-	-	-	-	-	-
MB11S409	F	18+	17.44	17.06	0.38	-	-	-
MB11S411	M	36-49	-	-	-	-	-	-
MB11S413	F	39	14.09	14.78	-0.69	-	-	-
MB11S415	M	50+	21.42	21.28	0.14	20.83	22.03	-1.2
MB11S416	M	36-49	24.19	23.18	1.01	23.56	22.81	0.75
MB11S420	F	26-35	-	-	-	-	-	-
MB11S422	F	29	18.14	17.52	0.62	-	-	-
MB11S426	F	55	-	-	-	-	-	-
MB11S427	M	27	20.17	20.74	-0.57	17.88	20.73	-2.85
MB11S428	F	50+	-	-	-	18.49	17.11	1.38
MB11S430	F	30	18.85	20.05	-1.2	17.74	19.46	-1.72
MB11S432	M	26-35	21.89	20.16	1.73	-	-	-
MB11S434	F	36-49	-	-	-	-	-	-
MB11S435	M	45	20.37	19.35	1.02	19.29	21.18	-1.89
MB11S436	F	18+	-	-	-	-	-	-
MB11S437	F	26-35	17.85	17.7	0.15	17.86	18.97	-1.11
MB11S441	F	23	12.28	16.04	-3.76	12.75	16.42	-3.67
MB11S446	U	22	-	-	-	26.07	21.68	4.39
MB11S452	F	18-25	16.98	21	-4.02	17.79	19.64	-1.85
MB11S453	F	26-35	-	-	-	-	-	-
MB11S454	U	21	-	-	-	-	-	-
MB11S455	M	50+	-	-	-	-	-	-
MB11S456	M	36-49	-	-	-	18.09	21.67	-3.58
MB11S457	F	50+	16.95	15.71	1.24	15.35	16.52	-1.17
MB11S460	U	16.5 ± 36 mo.	-	-	-	-	-	-
MB11S461	F	28	-	-	-	-	-	-
MB11S462	M	16	17.09	18.24	-1.15	-	-	-
MB11S464	M	36-49	-	-	-	-	-	-
MB11S465	M	15	20.19	19.85	0.34	15.29	16.83	-1.54
MB11S466a	M	83	-	-	-	-	-	-
MB11S466b	F	43	-	-	-	-	-	-
MB11S467	M	26-35	19.84	19.72	0.12	19.98	18.69	1.29
MB11S468	F	36-49	17.74	-	-	17.13	19.36	-2.23
MB11S469	M	43	-	-	-	18.38	18.63	-0.25
MB11S470	M	50+	-	-	-	-	-	-
MB11S471	F	9	-	-	-	15.87	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S473	M	42	19.72	20.83	-1.11	20.72	22.36	-1.64
MB11S474	F	50+	-	-	-	16.39	20.64	-4.25
MB11S476	F	31	16.44	18.38	-1.94	19.02	19.67	-0.65
MB11S477	M	61	-	-	-	22.14	25.93	-3.79
MB11S479	U	12-18	-	-	-	14.5	12.37	2.13
MB11S481	F	29	-	-	-	16.78	19.75	-2.97
MB11S482	M	36	17.74	18.1	-0.36	19.74	20.44	-0.7
MB11S484	M	50+	-	-	-	-	-	-
MB11S485	F	36-49	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-	-
MB11S488	F	36-49	20.18	19.13	1.05	20.25	19.21	1.04
MB11S489	M	36-49	-	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	-	-	-
MB11S490b	M	18+	-	-	-	-	-	-
MB11S492	M	26-35	-	-	-	21.27	18.61	2.66
MB11S494	M	50+	21.16	20.85	0.31	-	-	-
MB11S495	F	26-35	-	-	-	-	-	-
MB11S497	M	26-35	22.47	20.74	1.73	20.17	19.8	0.37
MB11S498	F	50+	-	-	-	17.96	17.1	0.86
MB11S501	F	80	-	-	-	14.2	16.33	-2.13
MB11S502	M	25	15.5	18.17	-2.67	17.82	18.66	-0.84
MB11S504	F	36-49	-	-	-	-	-	-
MB11S505	M	18-25	18.42	19.45	-1.03	-	-	-
MB11S507	U	14 ± 2 yrs.	16.62	18.38	-1.76	16.41	-	-
MB11S508	M	50+	-	-	-	-	-	-
MB11S511	M	50+	20.69	22.52	-1.83	19.37	23.22	-3.85
MB11S512	F	36-49	16.89	18.11	-1.22	16.83	17.26	-0.43
MB11S514	M	26-35	-	-	-	-	-	-
MB11S516	M	50+	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-	-
MB11S520	M	50+	24.42	20.17	4.25	23.11	22.5	0.61
MB11S521	M	69	-	-	-	-	-	-
MB11S522	F	13	-	-	-	11.59	13.35	-1.76
MB11S523	M	50+	-	-	-	-	-	-
MB11S524	M	36-49	17.31	17.66	-0.35	18.63	19.48	-0.85
MB11S525	M	50+	-	-	-	-	-	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-
MB11S527	F	26-35	19.18	21.57	-2.39	-	-	-
MB11S530	F	75	21.5	-	-	-	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged. Table continued…

Table H2 – continued…

Individual Number	Sex	Age	Left Rib 1			Right Rib 1		
			Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S533	F	50-65	-	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	-	-
MB11S538	F	26-35	14.16	17.29	-3.13	-	-	-
MB11S540	U	20	-	-	-	-	-	-
MB11S543	F	18+	-	-	-	17.95	20.09	-2.14
MB11S544	M	30	-	-	-	-	-	-
MB11S545	F	49	-	-	-	14.09	15.09	-1
MB11S549	U	11 ± 24 mo.	14.71	15.2	-0.49	-	-	-
MB11S550	F	50+	-	-	-	-	-	-
MB11S552	M	18+	-	-	-	-	-	-
MB11S553	F	36-49	15.97	-	-	-	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.

Table H3 – Rib 1 z-scores

Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex		Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex	
			Left	Right				Left	Right
KER15S006	M	26-35	-	-	**MB11S238**	M	18-25	-	-
KER15S007	F	36-49	-	-	**MB11S239**	M	23	**4.6**	-0.1
KER15S008	A	50+	-	-	**MB11S240**	M	36-49	-0.1	0
KER15S009	M	36-49	-	-	**MB11S242**	M	50+	0.1	-0.6
KER15S010	M	36-49	-	-	**MB11S243**	F	62	-0.8	0.4
KER15S011	M	36-49	-	-	**MB11S246**	U	19	-	-
KER15S012	F	36-49	**1.7**	1.4	**MB11S247**	M	50+	0.3	-0.4
KER15S014	F	18-25	1.1	-	**MB11S248**	F	9	-	-
KER15S015	M	36-49	0	1	**MB11S249**	M	26-35	0.5	-0.2
KER15S016	M	18-25	0.3	-	**MB11S250**	M	73	-	-
KER15S017	M	36-49	0.6	-0.7	**MB11S251**	M	36-49	-	-
KER15S018	M	18-25	-0.8	-1.6	**MB11S253**	M	78	-1.1	-0.7
KER15S019	M	50+	-0.4	-	**MB11S254**	M	36-49	1	-
KER15S020	U	15 ± 2 yrs.	-	-	**MB11S257**	M	26-35	-0.6	-
KER15S021	M	36-49	-	-	**MB11S260**	M	18-25	-	-0.2
KER15S023	F	18-25	-	-	**MB11S261**	M	79	-	-
KER15S024	M	36-49	-	-	**MB11S263**	M	36-49	-	0.4
KER15S025	M	36-49	-	-	**MB11S267**	M	26-35	-1.6	-1
KER15S026	M	36-49	-	-2.2	**MB11S269a**	M	18+	-	-
KER15S028	F	36-49	-	-	**MB11S269b**	U	11 ± 30 mo.	-	-
KER15S029	M	36-49	-	-	**MB11S269c**	U	10 ± 1 yr.	-	-
KER15S030	M	36-49	-	-	**MB11S270**	M	18-25	-	0.1
KER15S031	U	17 ± 1 yr.	-	-	**MB11S271**	M	50+	-0.1	-
KER15S032	F	36-49	**1.8**	-	**MB11S275**	U	15 ± 1 yr.	-	-
KER15S035	F	26-35	-	-	**MB11S278**	F	36-49	-0.2	-
KER15S036	M	36-49	-	-	**MB11S281**	M	36-49	-	0.7
KER15S037	M	50+	-	-	**MB11S282**	U	12 ± 12 mo.	-	-
KER15S038	F	36-49	-0.3	-	**MB11S285**	M	71	0.4	**2.6**
KER15S040	M	18+	-	-0.3	**MB11S286**	F	10	-	-
KER15S042	M	36-49	-	-0.5	**MB11S289**	M	50+	-	-
KER15S043	M	36-49	-	1.3	**MB11S290**	M	18-25	-1.3	-0.8
KER15S044	M	36-49	-	-1	**MB11S292**	U	11 +- 1 yr.	-	-
KER15S045	M	36-49	-	-	**MB11S294**	F	66	-0.1	-0.6
KER15S046	M	26-35	-0.4	-	**MB11S297**	M	84		-0.9
KER15S047	A	26-35	-	-	**MB11S301a**	F	36-49	0.7	0.4
KER15S050	A	18+	-	-	**MB11S301b**	U	6-10	-	-
KER15S051	F	26-35	-	-	**MB11S302**	F	50+	-	-
KER15S052	F	50+	-	-	**MB11S303**	F	44	-0.4	0.1
KER15S053	U	15 ± 1 yr.	-	-	**MB11S306**	M	31	-	-
KER15S054	A	26-35	-	-	**MB11S307**	U	13-17	-	-
KER15S055	F	36+	-	-	**MB11S309**	F	58	-	-0.2
KER15S056	F	36-49	-	-	**MB11S310**	M	35	-	-

Legend – M = male; F = female; I = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.

Note – Significant z-scores are emboldened and red. Table continued…

Table H3 – continued…

Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex		Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex	
			Left	Right				Left	Right
KER15S057	F	50+	-	-	**MB11S311**	F	18-25	-0.9	-
KER15S058	M	26-35	-0.1	-0.4	**MB11S313**	M	46	0.2	-
KER15S059	F	36-49	-	-	**MB11S317**	M	80	-	-
KER15S060	U	10 ± 1 yr.	-	-	**MB11S319**	F	69	-	-0.4
KER15S061	M	36-49	-	-	**MB11S321**	M	50+	-	-
KER15S062	F	36-49	-	-	**MB11S324**	M	36-49	0.2	**1.5**
KER15S063	F	36-49	-0.8	0.0	**MB11S325**	M	36	-	-
KER15S064	M	36-49	-	0.1	**MB11S327**	F	36-49	-	-
KER15S065	M	36-49	-	0.9	**MB11S331**	F	74	-1.8	-
KER15S066	M	18+	-	-1.1	**MB11S334**	F	9	-	-
KER15S068	F	18+	-	-	**MB11S337**	M	68	-	-
KER15S070	F	36-49	-	-	**MB11S338**	F	33	-	-
KER15S071	M	18-25	-	-0.8	**MB11S339**	F	64	-	-
KER15S072	F	36-49	-	-	**MB11S340**	U	19	-	-
KER15S073	U	10 ± 1 yr.	-	-	**MB11S341**	M	50+	-	-
KER15S074	M	36-49	-	-	**MB11S342**	M	75	-	-
KER15S075	F	36-49	-	-	**MB11S344**	F	20	-	-
KER15S076	M	26-35	-0.9	-0.9	**MB11S345**	F	28	-0.1	**2.4**
KER15S077	M	26-35	-	-	**MB11S346**	F	36-49	0.8	**1.8**
KER15S078	F	26-35	-	-	**MB11S347**	M	50+	-0.8	-0.2
KER15S079	U	12 ± 2 yrs.	-	-	**MB11S349**	M	50+	-	1.2
KER15S080	M	26-35	-	-	**MB11S350**	U	16 ± 1 yr.	-	-
KER15S081	A	18+	-	-	**MB11S355**	F	50+	-	-
KER15S082	F	50+	0.3	-	**MB11S356**	F	78	**1.5**	-
KER15S083	M	36-49	-	-	**MB11S357**	F	50+	-	-
KER15S084	F	36-49	-	-	**MB11S358**	F	74	0.6	0.2
KER15S085	M	36-49	-0.2	0.4	**MB11S359**	F	46	-	-
KER15S086	M	36-49	-	-	**MB11S360**	F	66	0.5	**2.3**
KER15S087	M	36-49	-	1	**MB11S363**	M	61	-	-
KER15S088	F	26-35	0.1	-0.5	**MB11S367**	F	11	-	-
KER15S089	M	50+	-	-	**MB11S368**	M	26-35	-0.2	-0.5
KER15S090	F	50+	-0.7	-	**MB11S369**	F	30	0.5	-
KER15S091	F	36-49	-0.2	-	**MB11S370**	F	36-49	-1.4	-1.2
KER15S092	F	50+	0.8	1.1	**MB11S371**	M	36-49	-1.1	0.2
KER15S093	F	26-35	0.5	-0.7	**MB11S374**	M	80	-	-
KER15S094	F	18-25	-	0.1	**MB11S375**	M	74	-0.3	0.5
KER15S096	F	36-49	-	-	**MB11S377**	M	18+	-	-
KER15S097	F	50+	-	-	**MB11S379**	M	18-25	-1	1.2
KER15S098	F	26-35	-1.5	-1.0	**MB11S380**	M	36-49	**2.5**	1.4
KER15S099	F	18-25	-1.8	-	**MB11S382**	F	50+	-	-
KER15S100	M	26-35	-0.6	-	**MB11S383**	F	55	-	-
KER15S101	M	36-49	-	1.4	**MB11S385**	F	25	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.
Note – Significant z-scores are emboldened and red. Table continued…

Table H3 – continued…

Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex		Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex	
			Left	Right				Left	Right
KER15S102	M	50+	0.1	1.3	**MB11S386**	F	36-49	-	-
KER15S103	M	18-25	-	-	**MB11S387**	F	43	-	-
KER15S105	M	18-25	0	-0.5	**MB11S388**	F	21	-1.8	-2.7
KER15S106	M	36-49	0.2	0.4	**MB11S390**	F	71	-	-
KER15S107	F	26-35	-	-	**MB11S391**	M	50+	-	-
KER15S108	M	36-49	-	-	**MB11S392**	F	50+	-	-
KER15S109	F	36-49	-	-	**MB11S394**	F	50+	-	-
KER15S110	F	18-25	-	-	**MB11S399**	A	36-49	-	-
KER15S111	M	26-35	-0.3	-	**MB11S401**	F	26-35	-	-
KER15S112	M	26-35	-	-	**MB11S402**	M	36-49	0.7	0.9
KER15S113	M	36-49	-	-	**MB11S404**	M	26-35	-	-
KER15S114	F	50+	-	-	**MB11S405**	F	36-49	**1.8**	-0.3
KER15S115	M	36-49	-0.2	-	**MB11S407**	M	18+	-	-
KER15S116	F	36-49	-	-	**MB11S409**	F	18+	1	-
KER15S117	F	36-49	-	-	**MB11S411**	M	36-49	-	-
KER15S119a	U	12 ± 1 yr.	-	-	**MB11S413**	F	39	0.4	-
KER15S119b	U	14 ± 1 yr.	-	-	**MB11S415**	M	50+	0.3	0
KER15S120	F	18-25	-	-	**MB11S416**	M	36-49	0.6	0.8
KER15S122	F	36-49	-0.2	-1.3	**MB11S420**	F	26-35	-	-
HT15S124	U	13 ± 1 yr.	-	-	**MB11S422**	F	29	1.1	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	**MB11S426**	F	55	-	-
KER15S127	U	9 ± 1 yr.	-	-	**MB11S427**	M	27	0	-0.7
KER15S129	F	36-49	-0.2	0.1	**MB11S428**	F	50+	-	-
KER15S130	M	18-25	-0.5	-1.5	**MB11S430**	F	30	0.1	-0.3
KER15S132	F	50+	-	-	**MB11S432**	M	26-35	0.9	-
KER15S133	F	18-25	-	-	**MB11S434**	F	36-49	-	-
KER15S134	M	36-49	-	0.4	**MB11S435**	M	45	0.6	-0.3
KER15S136	U	13 ± 2 yrs.	-	-	**MB11S436**	F	18+	-	-
KER15S142	F	26-35	-	-	**MB11S437**	F	26-35	0.9	0.1
KER15S143	M	36-49	0	-	**MB11S441**	F	23	-1.3	-1.5
KER15S145	F	36-49	-0.3	-	**MB11S446**	U	22	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	**MB11S452**	F	18-25	-1.5	-0.4
KER15S151	M	36-49	0.8	-0.2	**MB11S453**	F	26-35	-	-
KER15S154	F	36+	-	-	**MB11S454**	U	21	-	-
MB11S019	A	18+	-	-	**MB11S455**	M	50+	-	-
MB11S029	M	50+	-	-	**MB11S456**	M	36-49	-	-1
MB11S040	F	18-25	-	-	**MB11S457**	F	50+	**1.5**	0
MB11S044	U	12 ± 12 mo.	-	-	**MB11S460**	U	16.5 ± 36 mo.	-	-
MB11S045	F	47	-	-	**MB11S461**	F	28	-	-
MB11S047	F	21	-	-	**MB11S462**	M	16	-	-
MB11S051	M	74	0.7	-0.2	**MB11S464**	M	36-49	-	-
MB11S053	F	36-49	-	-	**MB11S465**	M	15	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.
Note – Significant z-scores are emboldened and red. Table continued…

Table H3 – continued…

Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex		Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex	
			Left	Right				Left	Right
MB11S056	F	50+	-	-	**MB11S466a**	M	83	-	-
MB11S059	M	36-49	-1.9	-1.8	**MB11S466b**	F	43	-	-
MB11S060	F	18-25	-	-	**MB11S467**	M	26-35	0.3	1
MB11S064	M	26-35	-	-	**MB11S468**	F	36-49	-	-0.6
MB11S070	M	18+	-	-	**MB11S469**	M	43	-	0.4
MB11S077	F	58	-	-	**MB11S470**	M	50+	-	-
MB11S083	F	36-49	-	-	**MB11S471**	F	9	-	-
MB11S084	F	18+	-	-0.2	**MB11S473**	M	42	-0.3	-0.2
MB11S088	F	26-35	-0.3	-	**MB11S474**	F	50+	-	-1.8
MB11S092	M	26-35	-1.1	-0.4	**MB11S476**	F	31	-0.3	0.4
MB11S093	M	50+	-	-	**MB11S477**	M	61	-	-1.1
MB11S097	F	50+	0.5	-0.2	**MB11S479**	U	12-18	-	-
MB11S100	M	18+	-	-	**MB11S481**	F	29	-	-1.0
MB11S101	F	26-35	-	-	**MB11S482**	M	36	0.1	0.2
MB11S107	F	18-25	-	-	**MB11S484**	M	50+	-	-
MB11S108	M	26-35	-0.2	-0.3	**MB11S485**	F	36-49	-	-
MB11S110	F	26-35	-	-	**MB11S487**	F	29	-	-
MB11S121	F	36-49	-	-	**MB11S488**	F	36-49	1.4	1.4
MB11S123	U	13-17	-	-	**MB11S489**	M	36-49	-	-
MB11S126	F	36-49	-	-	**MB11S490a**	F	36-49	-	-
MB11S129	A	18-25	-	-	**MB11S490b**	M	18+	-	-
MB11S137	F	36-49	-	-	**MB11S492**	M	26-35	-	**1.6**
MB11S144	M	36-50	-	-	**MB11S494**	M	50+	0.3	-
MB11S149	F	26-35	-1	0.3	**MB11S495**	F	26-35	-	-
MB11S151	F	26-35	-1.6	-	**MB11S497**	M	26-35	0.9	0.6
MB11S153	M	57	-	-	**MB11S498**	F	50+	-	1.3
MB11S155a	M	50+	-	1	**MB11S501**	F	80	-	-0.5
MB11S155b	F	50+	-	-	**MB11S502**	M	25	-0.9	0.1
MB11S157	F	18+	-	-	**MB11S504**	F	36-49	-	-
MB11S158	M	60	0.3	1.1	**MB11S505**	M	18-25	-0.2	-
MB11S159	F	76	-	-	**MB11S507**	U	14 ± 2 yrs.	-	-
MB11S160	F	26-35	0.9	0.6	**MB11S508**	M	50+	-	-
MB11S162	M	36-49	-2.4	-1.7	**MB11S511**	M	50+	-0.6	-1.2
MB11S167	F	12	-	-	**MB11S512**	F	36-49	0.1	0.5
MB11S170	F	50+	-	-	**MB11S514**	M	26-35	-	-
MB11S174	F	36-49	-	-	**MB11S516**	M	50+	-	-
MB11S180	M	18-25	-0.3	-0.2	**MB11S518**	F	18+	-	-
MB11S183	F	26-35	-	0.4	**MB11S519**	M	36-49	-	-
MB11S186	M	36-49	0	1.4	**MB11S520**	M	50+	**2**	0.7
MB11S192	F	26-35	-	-	**MB11S521**	M	69	-	-
MB11S194	M	50+	0.8	1	**MB11S522**	F	13	-	-
MB11S195	F	36-49	-	-	**MB11S523**	M	50+	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.
Note – Significant z-scores are emboldened and red. Table continued…

Table H3 – continued…

Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex		Individual Number	Sex	Age	Rib 1 Ratio Z-Score by Sex	
			Left	Right				Left	Right
MB11S198	F	26-35	-	-	**MB11S524**	M	36-49	0.1	0.1
MB11S202	F	26-35	-	-	**MB11S525**	M	50+	-	-
MB11S205	M	50+	-	-	**MB11S526**	M	50+ (50-72)	-	-
MB11S206	U	13-17	-	-	**MB11S527**	F	26-35	-0.6	-
MB11S207	F	50+	0.7	0.4	**MB11S530**	F	75	-	-
MB11S216	F	36-49	-	0.1	**MB11S533**	F	50-65	-	-
MB11S220	F	36-49	-	-	**MB11S534**	M	36-49	-	-
MB11S225	M	50+	-	-	**MB11S538**	F	26-35	-1	-
MB11S226	M	26-35	-	-	**MB11S540**	U	20	-	-
MB11S228	M	36-49	-	-	**MB11S543**	F	18+	-	-0.5
MB11S229	U	13-17	-	-	**MB11S544**	M	30	-	-
MB11S233	M	18+	-	0.8	**MB11S545**	F	49	-	0.1
MB11S234	F	18-25	-	-	**MB11S549**	U	11 ± 24 mo.	-	-
MB11S235	M	18+	-	-	**MB11S550**	F	50+	-	-
MB11S236	M	24	-	-3	**MB11S552**	M	18+	-	-
MB11S237	M	50+	-	-	**MB11S553**	F	36-49	-	-

Legend – M = male; F = female; A = ambiguous sex; U = unknown sex; yr./yrs. = year/years; mo. = months; "-" missing/damaged.
Note – Significant z-scores are emboldened and red.

Appendix I – Ribs 2-3 Measurements and Non-Metric Features

Table I1 – Ribs 2-3 Metric Measurements

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S006	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S007	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S008	A	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S009	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S010	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S011	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S012	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S014	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S015	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S016	M	18-25	15.3	15.87	-0.57	-	-	-	-	-	-	-	-	-
KER15S017	M	36-49	12.36	11.79	0.57	-	-	-	-	-	-	-	-	-
KER15S018	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S019	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S021	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S024	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S025	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S026	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S028	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S035	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S036	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S037	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S038	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S040	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S042	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S043	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S044	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S045	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S046	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S047	A	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S050	A	18+	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S051	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S052	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S054	A	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S058	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S059	F	36-49	-	-	-	-	-	-	11.51	12.81	-1.3	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S063	F	36-49	-	-	-	-	-	-	11.61	9.74	1.87	-	-	-
KER15S064	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S065	M	36-49	-	-	-	-	-	-	15	13.32	1.68	-	-	-
KER15S066	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S068	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S071	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S072	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S074	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S075	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S076	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S077	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S081	A	18+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S082	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S083	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S084	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S085	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S086	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S087	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S088	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S089	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S090	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S091	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S092	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S093	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S094	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S096	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S097	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S098	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S099	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S100	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S101	M	36-49	13.39	12.5	0.89	-	-	-	17.58	18.41	-0.83	-	-	-
KER15S102	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S103	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S105	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S106	M	36-49	-	-	-	-	-	18.65	19.58	-0.93	-	-	-	-
KER15S107	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S108	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S109	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S110	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S111	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S112	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S113	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S114	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S115	M	36-49	-	-	-	-	-	-	14.97	13.13	1.84	-	-	-
KER15S116	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S117	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S122	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
HT15S124	U	13 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "- " = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S127	U	9 ± 1 yr.	-	-	-	-	-	-	9.41	9.61	-0.2	-	-	-
KER15S129	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S130	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S132	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
KER15S134	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S136	U	13 ± 2 yrs.	-	-	-	-	-	-	10.65	9.72	0.93	11.92	10.86	1.06
KER15S142	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
KER15S143	M	36-49	14.2	11.55	2.65	-	-	-	-	-	-	-	-	-
KER15S145	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-	-	-	-	-	-	-	-	-
KER15S151	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
KER15S154	F	36+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S019	U	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S045	F	47	15.92	-	-	-	-	-	-	-	-	-	-	-
MB11S047	F	21	-	-	-	-	-	-	-	-	-	-	-	-
MB11S051	M	74	-	-	-	-	-	-	-	-	-	-	-	-
MB11S053	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S059	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S060	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S064	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S084	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S088	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S092	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S093	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S097	F	50+	11.42	13.24	-1.82	-	-	-	-	-	-	-	-	-
MB11S100	M	18+	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S101	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S107	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S108	M	26-35	-	-	-	-	-	-	13.85	-	-	-	-	-
MB11S110	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-	-	-	-	-	-	-
MB11S126	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S144	M	36-50	-	-	-	-	-	-	-	-	-	-	-	-
MB11S149	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S151	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S153	M	57	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155a	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155b	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S157	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S158	M	60	-	-	-	-	-	-	-	-	-	-	-	-
MB11S160	F	26-35	11.75	10.06	1.69	12.28	12.3	-0.02	12.68	9.47	3.21	-	-	-
MB11S162	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S167	F	12	-	-	-	-	-	-	-	-	-	-	-	-
MB11S170	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S174	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S180	M	18-25	-	-	-	-	-	-	11.9	13.47	-1.57	-	-	-
MB11S183	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S186	M	36-49	13.86	14.71	-0.85	-	-	-	-	-	-	-	-	-
MB11S192	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S194	M	50+	-	-	-	17.23	16.7	0.53	15.62	15.31	0.31	15.32	15.88	-0.56
MB11S195	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-	-	-	-	-	-	-
MB11S207	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	F	36-49	15.1	-	-	-	-	-	15.1	15.07	0.03	-	-	-
MB11S220	F	36-49	-	-	-	-	-	-	11.52	12.7	-1.18	13.92	14.65	-0.73
MB11S225	M	50+	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S226	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S228	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S229	U	13-17	-	-	-	-	-	-	13.11	12.44	0.67	-	-	-
MB11S233	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S234	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S236	M	24	-	-	-	-	-	-	-	-	-	-	-	-
MB11S237	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S239	M	23	-	-	-	-	-	-	-	-	-	-	-	-
MB11S240	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S242	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S243	F	62	-	-	-	-	-	-	9.25	-	-	-	-	-
MB11S246	U	19	-	-	-	-	-	-	-	-	-	-	-	-
MB11S247	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S248	F	9	-	-	-	-	-	-	-	-	-	-	-	-
MB11S249	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S250	M	73	-	-	-	-	-	-	-	-	-	-	-	-
MB11S251	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S253	M	78	-	-	-	-	-	-	-	-	-	-	-	-
MB11S254	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S257	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S260	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S261	M	79	-	-	-	-	-	-	-	-	-	-	-	-
MB11S263	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S267	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269a	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S270	M	18-25	-	-	-	-	-	-	14.18	14.97	-0.79	-	-	-
MB11S271	M	50+	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S275	U	15 ± 1 yr.	9.93	10.35	-0.42	-	-	-	10.11	10.82	-0.71	11.53	13.96	-2.43
MB11S278	F	36-49	11.44	9.54	1.9	13.78	13.71	0.07	11.92	9.09	2.83	12.65	-	-
MB11S281	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S282	U	12 ± 12 mo.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S285	M	71	-	-	-	-	-	-	-	-	-	-	-	-
MB11S286	F	10	-	-	-	-	-	-	-	-	-	-	-	-
MB11S289	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S290	M	18-25	-	-	-	-	-	-	14.6	14.94	-0.34	-	-	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S294	F	66	13.51	11.59	1.92	14.23	-	-	14.05	11.3	2.75	-	-	-
MB11S297	M	84	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301a	F	36-49	-	-	-	-	-	-	15.55	14.77	0.78	16.18	13.47	2.71
MB11S301b	U	6-10	-	-	-	-	-	-	-	-	-	-	-	-
MB11S302	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S303	F	44	12.6	14.03	-1.43	-	-	-	-	-	-	-	-	-
MB11S306	M	31	-	-	-	-	-	-	-	-	-	-	-	-
MB11S307	U	13-17	10.05	8.42	1.63	12.36	8.75	3.61	-	-	-	-	-	-
MB11S309	F	58	-	-	-	-	-	-	-	-	-	-	-	-
MB11S310	M	35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S311	F	18-25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S313	M	46	-	-	-	-	-	-	13.2	-	-	-	-	-
MB11S317	M	80	-	-	-	-	-	-	-	-	-	-	-	-
MB11S319	F	69	-	-	-	-	-	-	-	-	-	-	-	-
MB11S321	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S324	M	36-49	-	-	-	-	-	-	17.1	16.37	0.73	-	-	-
MB11S325	M	36	-	-	-	-	-	-	-	-	-	-	-	-
MB11S327	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S331	F	74	-	-	-	-	-	-	-	-	-	-	-	-
MB11S334	F	9	9.43	8.76	0.67	10.46	9.59	0.87	8.88	9.3	-0.42	10.98	8.76	2.22
MB11S337	M	68	-	-	-	-	-	-	-	-	-	-	-	-
MB11S338	F	33	-	-	-	-	-	-	-	-	-	-	-	-
MB11S339	F	64	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; “-“ = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S340	U	19	14.34	12.07	2.27	15.19	12.26	2.93	13.77	12.52	1.25	17.18	12.96	4.22
MB11S341	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-	-	-	-	-	-	-	-
MB11S344	F	20	12.91	12.16	0.75	-	-	-	-	-	-	-	-	-
MB11S345	F	28	-	-	-	-	-	-	-	-	-	-	-	-
MB11S346	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S349	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S356	F	78	10.8	12.55	-1.75	-	-	-	-	-	-	-	-	-
MB11S357	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	F	74	-	-	-	-	-	-	12.68	14.28	-1.6	-	-	-
MB11S359	F	46	-	-	-	-	-	-	-	-	-	-	-	-
MB11S360	F	66	10.93	10.48	0.45	-	-	-	-	-	-	-	-	-
MB11S363	M	61	-	-	-	-	-	-	-	-	-	-	-	-
MB11S367	F	11	-	-	-	-	-	-	-	-	-	-	-	-
MB11S368	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S369	F	30	13.28	11.77	1.51	-	-	-	12.37	11.82	0.55	-	-	-
MB11S370	F	36-49	14.45	-	-	-	-	-	10.59	10.75	-0.16	14.14	15.27	-1.13
MB11S371	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S374	M	80	-	-	-	-	-	-	-	-	-	-	-	-
MB11S375	M	74	14.41	14.02	0.39	-	-	-	-	-	-	-	-	-
MB11S377	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S379	M	18-25	-	-	-	16.34	16.37	-0.03	13.16	14.52	-1.36	17.36	16.52	0.84
MB11S380	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S382	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S383	F	55	-	-	-	-	-	-	-	-	-	-	-	-
MB11S385	F	25	-	-	-	-	-	-	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-	-	-	-	-	-	-
MB11S388	F	21	12.11	14.11	-2	-	-	-	12.8	13.68	-0.88	13.28	13.89	-0.61
MB11S390	F	71	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S391	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S394	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S399	A	36-49	-	-	-	-	-	-	15.63	12.35	3.28	-	-	-
MB11S401	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S402	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S404	M	26-35	-	-	-	-	-	-	17.55	15.11	2.44	-	-	-
MB11S405	F	36-49	14.02	13.44	0.58	-	-	-	15.39	14.31	1.08	16.67	15.96	0.71
MB11S407	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S409	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S413	F	39	-	-	-	-	-	-	-	-	-	-	-	-
MB11S415	M	50+	16.2	-	-	18.53	18.19	0.34	-	-	-	-	-	-
MB11S416	M	36-49	-	-	-	-	-	-	15.74	14.99	0.75	-	-	-
MB11S420	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S422	F	29	-	-	-	-	-	-	-	-	-	-	-	-
MB11S426	F	55	-	-	-	-	-	-	-	-	-	-	-	-
MB11S427	M	27	14.01	13.33	0.68	16.32	16.56	-0.24	14.6	15.28	-0.68	-	-	-
MB11S428	F	50+	13.11	-	-	14.93	-	-	14.87	16.46	-1.59	-	-	-
MB11S430	F	30	12.48	14.37	-1.89	-	-	-	13.17	14.47	-1.3	-	-	-
MB11S432	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S434	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S435	M	45	15.33	14.2	1.13	-	-	-	-	-	-	-	-	-
MB11S436	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S437	F	26-35	-	-	-	-	-	-	11.41	12.17	-0.76	14.72	15.5	-0.78
MB11S441	F	23	12.57	16.28	-3.71	12.08	13.87	-1.79	-	-	-	-	-	-
MB11S446	U	22	14.94	14.18	0.76	18.29	14.3	3.99	-	-	-	-	-	-
MB11S452	F	18-25	11.22	11.78	-0.56	12.85	13.2	-0.35	-	-	-	-	-	-
MB11S453	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S454	U	21	-	-	-	-	-	-	-	-	-	-	-	-
MB11S455	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S456	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S457	F	50+	-	-	-	-	-	-	13.57	12.14	1.43	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S460	U	16.5 ± 36 mo.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S461	F	28	-	-	-	-	-	-	-	-	-	-	-	-
MB11S462	M	16	-	-	-	-	-	-	-	-	-	-	-	-
MB11S464	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S465	M	15	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466b	F	43	-	-	-	-	-	-	-	-	-	-	-	-
MB11S467	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S468	F	36-49	-	-	-	-	-	-	12.59	12.21	0.38	15.13	14.2	0.93
MB11S469	M	43	-	-	-	-	-	-	-	-	-	-	-	-
MB11S470	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S471	F	9	-	-	-	-	-	-	-	-	-	-	-	-
MB11S473	M	42	-	-	-	-	-	-	-	-	-	-	-	-
MB11S474	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S476	F	31	13.96	12.38	1.58	-	-	-	11.11	9.68	1.43	16.19	13.1	3.09
MB11S477	M	61	-	-	-	-	-	-	-	-	-	-	-	-
MB11S479	U	12-18	-	-	-	-	-	-	-	-	-	-	-	-
MB11S481	F	29	-	-	-	-	-	-	-	-	-	-	-	-
MB11S482	M	36	-	-	-	-	-	-	-	-	-	-	-	-
MB11S484	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S485	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-	-	-	-	-	-	-	-
MB11S488	F	36-49	-	-	-	14.05	14.83	-0.78	-	-	-	-	-	-
MB11S489	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490b	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S492	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S494	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S495	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S497	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S498	F	50+	-	-	-	-	-	-	14.21	14.81	-0.6	-	-	-
MB11S501	F	80	-	-	-	-	-	-	-	-	-	-	-	-
MB11S502	M	25	13.76	11.88	1.88	15.64	14.01	1.63	13.72	11.9	1.82	14.59	13.04	1.55
MB11S504	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S505	M	18-25	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Table I1 – continued…

Individual Number	Sex	Age	Left Ribs 2-3			Left Ribs 2-3			Right Ribs 2-3			Right Ribs 2-3		
			Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S507	U	14 ± 2 yrs.	-	-	-	-	-	-	-	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S511	M	50+	14.67	13.31	1.36	-	-	-	-	-	-	-	-	-
MB11S512	F	36-49	-	-	-	-	-	-	13.94	14.62	-0.68	-	-	-
MB11S514	M	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S516	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S520	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S521	M	69	-	-	-	-	-	-	15.88	17.37	-1.49	-	-	-
MB11S522	F	13	-	-	-	-	-	-	-	-	-	-	-	-
MB11S523	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S524	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S525	M	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-	-	-	-	-	-	-
MB11S527	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S530	F	75	-	-	-	-	-	-	-	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-	-	-	-	-	-	-	-
MB11S534	M	36-49	-	-	-	-	-	-	-	-	-	-	-	-
MB11S538	F	26-35	-	-	-	-	-	-	-	-	-	-	-	-
MB11S540	U	20	-	-	-	-	-	-	-	-	-	-	-	-
MB11S543	F	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S544	M	30	-	-	-	-	-	-	-	-	-	-	-	-
MB11S545	F	49	-	-	-	-	-	-	11.64	10.78	0.86	-	-	-
MB11S549	U	11 ± 24 mo.	10.49	10.58	-0.09	-	-	-	-	-	-	-	-	-
MB11S550	F	50+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S552	M	18+	-	-	-	-	-	-	-	-	-	-	-	-
MB11S553	F	36-49	-	-	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; U = unknown sex; A = ambiguous sex; yr./yrs. = year/years; mo. = months; "-" = missing/damaged.

Appendix J – Ribs 4-8 Metric Measurements, Z-Scores, and Non-Metric Features

Table J1 – Left ribs 4-8 Metric Measurements

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S011	-	-	-	18.10	15.34	2.76	-	-	-	-	-	-	-	-	-
KER15S012	14.34	14.52	-0.18	-	-	-	-	-	-	-	-	-	-	-	-
KER15S014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S015	-	-	-	17.37	15.56	1.81	-	-	-	-	-	-	-	-	-
KER15S016	17.79	18.37	-0.58	18.11	19.72	-1.61	17.71	-	-	-	-	-	-	-	-
KER15S017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S018	-	-	-	15.36	13.27	2.09	-	-	-	-	-	-	-	-	-
KER15S019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S021	18.54	17.76	0.78	-	-	-	-	-	-	-	-	-	-	-	-
KER15S024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S026	12.58	11.68	0.90	19.02	17.87	1.15	19.47	17.47	2.00	-	-	-	-	-	-
KER15S028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S038	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S042	16.93	15.68	1.25	14.21	13.83	0.38	-	-	-	-	-	-	-	-	-
KER15S043	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S044	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S045	18.92	19.20	-0.28	-	-	-	-	-	-	-	-	-	-	-	-
KER15S046	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S051	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S052	-	-	-	15.21	13.77	1.44	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged. Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S054	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S055	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S056	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S057	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S058	15.90	16.21	-0.31	-	-	-	-	-	-	-	-	-	-	-	-
KER15S059	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S061	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S062	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S063	9.16	9.30	-0.14	15.64	13.38	2.26	-	-	-	-	-	-	-	-	-
KER15S064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S065	20.66	17.73	2.93	-	-	-	-	-	-	-	-	-	-	-	-
KER15S066	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S073	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S074	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S076	15.63	16.53	-0.90	16.04	16.11	-0.07	-	-	-	-	-	-	-	-	-
KER15S077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S079	12.62	11.01	1.61	-	-	-	-	-	-	-	-	-	-	-	-
KER15S080	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S082	14.89	14.68	0.21	15.49	13.91	1.58	-	-	-	-	-	-	-	-	-
KER15S083	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S085	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S086	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S087	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S088	15.27	14.76	0.51	-	-	-	13.66	13.30	0.36	12.21	10.77	1.44	15.74	14.28	1.46
KER15S089	17.87	17.21	0.66	-	-	-	-	-	-	-	-	-	-	-	-
KER15S090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S091	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S092	15.68	17.16	-1.48	12.45	13.71	-1.26	-	-	-	-	-	-	-	-	-
KER15S093	14.52	13.87	0.65	-	-	-	13.56	14.60	-1.04	-	-	-	-	-	-
KER15S094	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S097	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S098	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S099	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S100	19.96	15.98	3.98	-	-	-	19.76	16.83	2.93	-	-	-	-	-	-
KER15S101	16.94	18.62	-1.68	-	-	-	17.88	-	-	-	-	-	-	-	-
KER15S102	15.44	13.14	2.30	21.30	19.92	1.38	12.14	10.18	1.96	-	-	-	-	-	-
KER15S103	15.01	14.36	0.65	-	-	-	-	-	-	-	-	-	-	-	-
KER15S105	-	-	-	15.93	17.94	-2.01	-	-	-	-	-	-	-	-	-
KER15S106	20.95	20.81	0.14	17.80	-	-	14.86	13.10	1.76	-	-	-	-	-	-
KER15S107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S111	16.76	19.11	-2.35	11.14	-	-	-	-	-	-	-	-	-	-	-
KER15S112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S117	16.14	13.59	2.55	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S122	18.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HT15S124	-	-	-	11.65	10.81	0.84	12.65	11.32	1.33	-	-	-	-	-	-
HT15S126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S127	12.38	10.15	2.23	14.08	10.67	3.41	-	-	-	-	-	-	-	-	-
KER15S129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S130	14.47	15.46	-0.99	-	-	-	-	-	-	-	-	-	-	-	-
KER15S132	10.60	8.87	1.73	-	-	-	-	-	-	-	-	-	-	-	-
KER15S133	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S143	-	-	-	12.37	11.45	0.92	10.82	9.86	0.96	-	-	-	-	-	-
KER15S145	14.10	11.49	2.61	-	-	-	-	-	-	-	-	-	-	-	-
KER15S150	13.49	11.12	2.37	11.26	8.69	2.57	-	-	-	-	-	-	-	-	-
KER15S151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S044	11.10	8.53	2.57	11.55	9.06	2.49	10.55	7.75	2.80	12.03	8.81	3.22	-	-	-
MB11S045	13.84	13.54	0.30	14.72	12.47	2.25	13.46	11.05	2.41	13.22	10.32	2.90	12.63	10.07	2.56
MB11S047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S051	19.09	16.79	2.30	-	-	-	-	-	-	-	-	-	-	-	-
MB11S053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S056	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S059	9.49	10.25	-0.76	11.61	10.99	0.62	-	-	-	-	-	-	-	-	-
MB11S060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S083	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S092	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S093	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S097	14.01	13.71	0.30	12.7	12.36	0.34	12.33	12.61	-0.28	13.03	12.19	0.84	-	-	-
MB11S100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S101	12.16	8.74	3.42	13.35	9.08	4.27	12.81	10.98	1.83	11.18	9.33	1.85	-	-	-
MB11S107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S126	13.09	11.49	1.60	-	-	-	-	-	-	-	-	-	-	-	-
MB11S137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S155a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S158	-	-	-	12.74	11.48	1.26	13.17	12.07	1.10	-	-	-	-	-	-
MB11S160	-	-	-	11.41	9.32	2.09	13.07	10.31	2.76	9.17	8.23	0.94	10.32	9.55	0.77
MB11S162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S167	-	-	-	10.30	8.24	2.06	12.02	8.22	3.80	-	-	-	-	-	-
MB11S170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S180	14.66	15.51	-0.85	15.37	-	-	14.92	13.55	1.37	16.26	12.64	3.62	-	-	-
MB11S183	-	-	-	-	-	-	10.89	12.93	-2.04	-	-	-	-	-	-
MB11S186	18.03	15.93	2.10	16.89	13.93	2.96	17.89	14.91	2.98	-	-	-	-	-	-
MB11S192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S194	17.55	20.56	-3.01	15.00	17.92	-2.92	13.25	11.29	1.96	14.64	14.64	0.00	14.82	13.21	1.61
MB11S195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S202	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	-	-	-	13.90	9.43	4.47	-	-	-	-	-	-	-	-	-
MB11S220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S229	15.31	12.60	2.71	-	-	-	13.67	13.95	-0.28	10.99	9.61	1.38	-	-	-
MB11S233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S235	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S236	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S237	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S238	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S239	14.46	14.56	-0.10	15.57	15.55	0.02	14.45	14.12	0.33	-	-	-	-	-	-
MB11S240	13.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S242	-	-	-	17.02	14.47	2.55	12.07	10.57	1.50	14.98	14.30	0.68	-	-	-
MB11S243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S248	-	-	-	-	-	-	7.90	6.43	1.47	-	-	-	-	-	-
MB11S249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – “-“ = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S251	15.49	15.67	-0.18	-	-	-	-	-	-	-	-	-	-	-	-
MB11S253	12.92	15.71	-2.79	-	-	-	-	-	-	-	-	-	-	-	-
MB11S254	19.65	16.57	3.08	13.9	12.81	1.09	16.51	14.01	2.50	-	-	-	-	-	-
MB11S257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S261	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S263	20.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S267	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269c	9.97	9.42	0.55	8.49	8.20	0.29	-	-	-	-	-	-	-	-	-
MB11S270	-	-	-	16.20	15.39	0.81	-	-	-	10.87	9.56	1.31	13.79	11.87	1.92
MB11S271	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S275	9.79	8.88	0.91	9.71	8.83	0.88	-	-	-	-	-	-	-	-	-
MB11S278	8.37	7.19	1.18	12.18	9.85	2.33	9.40	8.61	0.79	13.58	10.96	2.62	-	-	-
MB11S281	14.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S282	12.42	11.92	0.50	-	-	-	-	-	-	-	-	-	-	-	-
MB11S285	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S286	9.38	6.90	2.48	9.10	5.66	3.44	8.26	5.85	2.41	-	-	-	-	-	-
MB11S289	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S290	16.32	14.04	2.28	-	-	-	-	-	-	-	-	-	-	-	-
MB11S292	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S294	16.14	12.70	3.44	-	-	-	-	-	-	-	-	-	-	-	-
MB11S297	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301a	12.99	11.87	1.12	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S303	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S306	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S307	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S309	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S311	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S313	17.51	17.80	-0.29	-	-	-	18.20	16.64	1.56	14.65	14.32	0.33	-	-	-
MB11S317	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S319	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S324	15.54	15.40	0.14	16.83	16.98	-0.15	19.79	17.61	2.18	19.4	17.76	1.64	16.99	16.57	0.42
MB11S325	20.72	19.54	1.18	11.72	11.78	-0.06	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S327	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S331	12.14	9.31	2.83	-	-	-	-	-	-	-	-	-	-	-	-
MB11S334	12.61	10.24	2.37	10.80	10.75	0.05	-	-	-	12.58	9.55	3.03	11.60	8.77	2.83
MB11S337	13.93	13.19	0.74	17.94	-	-	22.82	-	-	-	-	-	-	-	-
MB11S338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S340	16.89	14.13	2.76	13.93	13.44	0.49	11.82	11.05	0.77	16.63	13.85	2.78	-	-	-
MB11S341	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S342	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S344	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S345	12.93	10.86	2.07	-	-	-	-	-	-	-	-	-	-	-	-
MB11S346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S347	20.91	20.03	0.88	-	-	-	22.33	18.92	3.41	19.73	18.13	1.60	14.82	12.40	2.42
MB11S349	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S350	15.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S355	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S356	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S359	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S360	12.9	14.07	-1.17	14.51	-	-	-	-	-	-	-	-	-	-	-
MB11S363	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S367	-	-	-	8.45	7.08	1.37	-	-	-	-	-	-	-	-	-
MB11S368	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S369	13.19	12.68	0.51	14.05	12.40	1.65	14.52	12.43	2.09	10.00	9.52	0.48	9.89	8.78	1.11
MB11S370	13.45	13.19	0.26	13.29	12.57	0.72	15.36	12.89	2.47	-	-	-	-	-	-
MB11S371	11.58	9.78	1.80	15.63	14.81	0.82	-	-	-	13.35	12.68	0.67	17.57	14.67	2.90
MB11S374	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S375	19.81	17.34	2.47	22.61	16.62	5.99	-	-	-	-	-	-	-	-	-
MB11S377	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S379	-	-	-	-	-	-	15.20	13.55	1.65	16.03	14.97	1.06	15.21	13.21	2.00
MB11S380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S382	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S386	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S388	12.58	13.48	-0.9	13.16	12.44	0.72	12.9	10.07	2.83	9.84	9.10	0.74	11.84	10.62	1.22
MB11S390	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S391	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S392	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S394	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S399	19.46	16.19	3.27	-	-	-	-	-	-	-	-	-	-	-	-
MB11S401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S402	18.70	16.12	2.58	16.74	14.28	2.46	-	-	-	13.46	10.58	2.88	-	-	-
MB11S404	16.06	12.67	3.39	18.32	13.39	4.93	-	-	-	-	-	-	-	-	-
MB11S405	15.29	13.45	1.84	13.41	11.19	2.22	13.51	10.35	3.16	-	-	-	-	-	-
MB11S407	19.72	16.89	2.83	17.06	14.99	2.07	-	-	-	-	-	-	-	-	-
MB11S409	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S413	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S415	17.39	16.49	0.90	17.92	17.1	0.82	19.53	15.44	4.09	-	-	-	-	-	-
MB11S416	21.53	20.21	1.32	-	-	-	-	-	-	15.38	12.76	2.62	-	-	-
MB11S420	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S422	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S427	16.08	14.71	1.37	13.78	13.38	0.40	17.07	16.67	0.40	-	-	-	-	-	-
MB11S428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S430	13.34	13.33	0.01	-	-	-	11.57	12.02	-0.45	11.87	11.54	0.33	10.01	10.99	-0.98
MB11S432	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S434	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S435	18.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S436	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S441	11.43	12.41	-0.98	10.41	8.17	2.24	7.53	6.90	0.63	-	-	-	-	-	-
MB11S446	15.59	12.6	2.99	14.25	12.23	2.02	-	-	-	16.20	12.77	3.43	13.15	10.26	2.89
MB11S452	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S453	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S454	-	-	-	14.56	11.38	3.18	14.96	12.36	2.60	12.7	10.77	-10.77	-	-	-
MB11S455	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S456	10.85	10.01	0.84	17.26	14.35	2.91	12.68	12.00	0.68	17.25	14.66	2.59	-	-	-
MB11S457	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S460	16.13	13.01	3.12	-	-	-	-	-	-	-	-	-	-	-	-
MB11S461	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S462	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S464	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S465	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466b	14.86	15.57	-0.71	-	-	-	-	-	-	-	-	-	-	-	-
MB11S467	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S468	15.41	15.11	0.30	17.78	15.84	1.94	16.42	15.53	0.89	12.64	12.01	0.63	10.64	9.65	0.99

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S469	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S471	10.15	8.55	1.60	10.34	7.12	3.22	11.12	7.94	3.18	-	-	-	-	-	-
MB11S473	17.49	16.89	0.60	-	-	-	-	-	-	-	-	-	-	-	-
MB11S474	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S476	13.02	11.74	1.28	13.15	12.00	1.15	12.93	11.22	1.71	15.54	13.18	2.36	11.04	9.34	1.70
MB11S477	18.59	14.63	3.96	23.63	16.33	7.30	15.16	11.42	3.74	-	-	-	-	-	-
MB11S479	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S481	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S482	-	-	-	-	-	-	12.32	11.72	0.60	-	-	-	-	-	-
MB11S484	16.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S488	15.3	16.10	-0.8	14.63	15.16	-0.53	14.65	12.73	1.92	16.03	14.75	1.28	14.28	9.14	5.14
MB11S489	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S492	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S495	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S497	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S498	13.84	11.95	1.89	13.86	10.59	3.27	13.33	9.30	4.03	-	-	-	-	-	-
MB11S501	13.39	12.70	0.69	-	-	-	-	-	-	-	-	-	-	-	-
MB11S502	15.46	13.71	1.75	14.63	14.13	0.50	14.57	14.55	0.02	17.36	14.46	2.90	14.85	12.38	2.47
MB11S504	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S505	-	-	-	-	-	-	10.86	9.27	1.59	-	-	-	-	-	-
MB11S507	12.77	-	-	16.76	13.36	3.40	14.29	12.82	1.47	-	-	-	-	-	-
MB11S508	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S511	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S512	-	-	-	14.22	12.56	1.66	13.75	14.08	-0.33	-	-	-	-	-	-
MB11S514	14.46	13.28	1.18	-	-	-	14.03	13.73	0.30	-	-	-	-	-	-
MB11S516	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S518	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S520	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S521	-	-	-	18.24	17.54	0.70	-	-	-	-	-	-	-	-	-
MB11S522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S523	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S524	12.80	19.78	-6.98	-	-	-	-	-	-	-	-	-	-	-	-
MB11S525	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J1 – continued…

Individual Number	Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8			Left ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S527	11.46	9.31	2.15	14.17	10.33	3.84	-	-	-	-	-	-	-	-	-
MB11S530	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S533	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S534	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S543	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S544	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S545	13.19	12.50	0.69	12.17	10.78	1.39	-	-	-	-	-	-	-	-	-
MB11S549	10.93	11.22	-0.29	-	-	-	-	-	-	-	-	-	-	-	-
MB11S550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S553	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – Right ribs 4-8 metric measurements

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S016	-	-	-	18.19	20.54	-2.35	-	-	-	-	-	-	-	-	-
KER15S017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S026	17.87	15.60	2.27	-	-	-	17.09	16.00	1.09	17.13	16.48	0.65	13.71	-	-
KER15S028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S038	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S042	14.91	14.97	-0.06	17.48	16.49	0.99	-	-	-	-	-	-	-	-	-
KER15S043	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S044	20.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S045	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S046	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S051	16.32	12.90	3.42	-	-	-	-	-	-	-	-	-	-	-	-
KER15S052	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S054	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S055	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S056	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S057	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S058	16.32	17.12	-0.80	-	-	-	-	-	-	-	-	-	-	-	-
KER15S059	13.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S061	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S062	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S065	-	-	-	18.27	16.87	1.40	-	-	-	-	-	-	-	-	-
KER15S066	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S073	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S074	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S076	14.86	13.11	1.75	-	-	-	-	-	-	-	-	-	-	-	-
KER15S077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S079	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S080	19.26	16.44	2.82	20.13	16.90	3.23	-	-	-	-	-	-	-	-	-
KER15S081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S082	-	-	-	12.55	12.74	-0.19	-	-	-	12.58	11.02	1.56	-	-	-
KER15S083	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S085	-	-	-	15.84	14.87	0.97	-	-	-	-	-	-	-	-	-
KER15S086	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S087	-	-	-	18.36	16.83	1.53	-	-	-	-	-	-	-	-	-
KER15S088	13.65	12.37	1.28	12.07	11.33	0.74	11.61	11.13	0.48	14.21	15.43	-1.22	14.19	-	-
KER15S089	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S091	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S092	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S093	12.38	12.87	-0.49	12.09	-	-	11.61	-	-	14.02	13.6	0.42	-	-	-
KER15S094	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S096	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S097	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S098	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S099	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S101	18.33	19.32	-0.99	-	-	-	-	-	-	-	-	-	-	-	-
KER15S102	15.14	12.24	2.90	-	-	-	-	-	-	-	-	-	-	-	-
KER15S103	13.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S105	15.76	17.15	-1.39	15.31	15.74	-0.43	12.46	11.48	0.98	11.25	10.97	0.28	-	-	-
KER15S106	14.51	13.78	0.73	-	-	-	-	-	-	-	-	-	-	-	-
KER15S107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S111	17.54	18.09	-0.55	-	-	-	-	-	-	-	-	-	-	-	-
KER15S112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S115	17.52	15.84	1.68	-	-	-	-	-	-	-	-	-	-	-	-
KER15S116	-	-	-	14.21	14.72	-0.51	-	-	-	-	-	-	-	-	-
KER15S117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S122	17.60	17.09	0.51	13.65	11.23	2.42	19.54	-	-	17.82	15.72	2.10	-	-	-
HT15S124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HT15S126	13.70	10.44	3.26	-	-	-	-	-	-	-	-	-	-	-	-
KER15S127	12.62	9.99	2.63	-	-	-	13.51	10.31	3.20	-	-	-	-	-	-
KER15S129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S130	14.64	14.58	0.06	-	-	-	-	-	-	-	-	-	-	-	-
KER15S132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S133	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S136	11.00	10.52	0.48	14.17	10.68	3.49	10.40	8.83	1.57	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
KER15S142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S145	12.62	11.76	0.86	-	-	-	-	-	-	-	-	-	-	-	-
KER15S150	14.12	11.68	2.44	13.30	10.00	3.30	-	-	-	13.29	10.11	3.18	-	-	-
KER15S151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S044	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S045	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S051	19.41	17.30	2.11	-	-	-	-	-	-	-	-	-	-	-	-
MB11S053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S056	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S059	12.28	10.59	1.69	14.16	12.57	1.59	-	-	-	-	-	-	-	-	-
MB11S060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S083	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S092	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S093	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S097	13.53	12.94	0.59	13.28	11.95	1.33	12.57	12.13	0.44	12.37	10.95	1.42	-	-	-
MB11S100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S151	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S153	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S155a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S158	14.85	13.41	1.44	-	-	-	-	-	-	-	-	-	-	-	-
MB11S159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S160	10.6	9.77	0.83	9.84	10.20	-0.36	-	-	-	-	-	-	-	-	-
MB11S162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S180	14.29	14.07	0.22	-	-	-	13.14	11.67	1.47	-	-	-	-	-	-
MB11S183	11.73	12.61	-0.88	12.06	12.82	-0.76	-	-	-	-	-	-	-	-	-
MB11S186	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S194	16.47	16.44	0.03	14.01	12.54	1.47	14.41	14.65	-0.24	-	-	-	-	-	-
MB11S195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S202	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S207	15.08	13.52	1.56	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	14.63	14.72	-0.09	17.65	15.35	2.30	13.77	9.75	4.02	23.07	15.82	7.25	10.71	8.71	2.00
MB11S220	11.94	15.14	-3.20	-	-	-	-	-	-	-	-	-	-	-	-
MB11S225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S226	13.32	10.46	2.86	-	-	-	-	-	-	-	-	-	-	-	-
MB11S228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S229	14.1	11.63	2.47	-	-	-	-	-	-	-	-	-	-	-	-
MB11S233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S235	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S236	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S237	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S238	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S248	9.09	7.07	2.02	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S251	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S253	12.42	13.31	-0.89	-	-	-	-	-	-	-	-	-	-	-	-
MB11S254	14.20	11.91	2.29	20.34	19.17	1.17	-	-	-	-	-	-	-	-	-
MB11S257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S261	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S263	18.35	14.50	3.85	-	-	-	-	-	-	-	-	-	-	-	-
MB11S267	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269c	10.76	9.17	1.59	-	-	-	-	-	-	-	-	-	-	-	-
MB11S270	18.12	18.24	-0.12	15.8	15.36	0.44	14.29	15.07	-0.78	-	-	-	-	-	-
MB11S271	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S275	11.61	12.8	-1.19	10.73	10.13	0.60	10.14	8.48	1.66	11.45	9.63	1.82	11.98	10.11	1.87
MB11S278	8.10	6.67	1.43	12.7	10.68	2.02	9.45	8.74	0.71	-	-	-	-	-	-
MB11S281	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S282	12.72	12.66	0.06	-	-	-	-	-	-	14.95	12.75	2.20	-	-	-
MB11S285	13.35	11.88	1.47	-	-	-	-	-	-	-	-	-	-	-	-
MB11S286	9.76	6.94	2.82	-	-	-	9.12	6.18	2.94	-	-	-	-	-	-
MB11S289	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S292	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S294	14.53	11.55	2.98	14.60	12.93	1.67	11.76	9.41	2.35	11.44	9.54	1.90	-	-	-
MB11S297	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301a	13.81	12.91	0.90	13.06	12.07	0.99	-	-	-	12.18	10.25	1.93	12.27	-	-
MB11S301b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S303	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S306	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S307	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S309	10.32	9.26	1.06	-	-	-	-	-	-	-	-	-	-	-	-
MB11S310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S311	11.23	11.92	-0.69	12.60	12.15	0.45	-	-	-	-	-	-	-	-	-
MB11S313	15.87	14.54	1.33	15.45	16.05	-0.60	20.12	18.08	2.04	17.94	15.25	2.69	-	-	-
MB11S317	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S319	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S324	16.68	16.95	-0.27	19.43	16.32	3.11	14.75	12.84	1.91	-	-	-	-	-	-
MB11S325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S327	13.53	-	-	15.58	14.37	1.21	-	-	-	-	-	-	-	-	-
MB11S331	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S334	11.29	9.52	1.77	11.18	10.04	1.14	10.84	9.00	1.84	11.71	9.27	2.44	10.84	7.61	3.23
MB11S337	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S340	-	-	-	15.05	13.77	1.28	10.97	9.61	1.36	-	-	-	-	-	-
MB11S341	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S342	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S344	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S345	-	-	-	12.66	12.12	0.54	15.63	11.50	4.13	-	-	-	-	-	-
MB11S346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S347	19.43	17.35	2.08	16.22	14.81	1.41	17.97	16.65	1.32	19.53	19.43	0.10	10.17	18.45	-8.28
MB11S349	16.73	14.33	2.40	-	-	-	-	-	-	-	-	-	-	-	-
MB11S350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S355	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S356	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S357	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S359	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S360	13.49	14.10	-0.61	-	-	-	-	-	-	-	-	-	-	-	-
MB11S363	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S367	7.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S368	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S369	13.93	13.65	0.28	10.98	10.48	0.50	-	-	-	-	-	-	-	-	-
MB11S370	13.46	13.54	-0.08	12.01	11.28	0.73	-	-	-	-	-	-	-	-	-
MB11S371	18.58	16.57	2.01	18.27	14.76	3.51	-	-	-	-	-	-	-	-	-
MB11S374	14.38	13.68	0.70	16.22	14.8	1.42	13.95	12.35	1.60	-	-	-	-	-	-
MB11S375	17.38	16.66	0.72	19.98	17.83	2.15	16.69	15.27	1.42	-	-	-	-	-	-
MB11S377	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S379	16.89	14.74	2.15	14.32	14.07	0.25	19.52	17.39	2.13	12.5	11.02	1.48	-	-	-
MB11S380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S382	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S386	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S388	12.41	13.35	-0.94	11.38	11.05	0.33	-	-	-	13.30	11.58	1.72	11.67	11.49	0.18

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S390	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S391	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S392	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S394	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S399	-	-	-	18.55	15.30	3.25	18.55	15.88	2.67	21.6	15.93	5.67	-	-	-
MB11S401	12.92	13.28	-0.36	-	-	-	-	-	-	-	-	-	-	-	-
MB11S402	16.05	14.68	1.37	15.43	-	-	-	-	-	-	-	-	-	-	-
MB11S404	18.01	16.05	1.96	16.26	12.55	3.71	16.08	13.90	2.18	16.33	14.29	2.04	-	-	-
MB11S405	13.52	11.25	2.27	-	-	-	-	-	-	-	-	-	-	-	-
MB11S407	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S409	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S413	9.23	8.20	1.03	-	-	-	-	-	-	-	-	-	-	-	-
MB11S415	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S416	21.23	20.04	1.19	23.86	20.02	3.84	-	-	-	-	-	-	-	-	-
MB11S420	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S422	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S426	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S427	-	-	-	15.67	14.74	0.93	16.43	15.87	0.56	-	-	-	-	-	-
MB11S428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S430	12.95	15.13	-2.18	12.34	12.26	0.08	11.73	12.73	-1.00	10.67	10.81	-0.14	-	-	-
MB11S432	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S434	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S435	18.51	17.10	1.41	19.21	17.36	1.85	20.81	18.88	1.93	16.92	13.80	3.12	-	-	-
MB11S436	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S437	14.3	14.42	-0.12	-	-	-	15.38	12.62	2.76	12.96	11.67	1.29	15.37	12.44	2.93
MB11S441	13.78	13.49	0.29	11.05	11.15	-0.10	11.07	11.41	-0.34	8.57	6.01	2.56	9.96	8.15	1.81
MB11S446	13.21	10.72	2.49	14.13	11.57	2.56	16.51	12.50	4.01	13.48	11.78	1.70	11.43	9.22	2.21
MB11S452	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S453	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S454	-	-	-	12.58	12.12	0.46	13.21	11.02	2.19	12.74	11.39	1.35	-	-	-
MB11S455	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S456	16.26	13.43	2.83	11.43	10.00	1.43	17.89	14.12	3.77	14.01	13.02	0.99	17.58	14.97	2.61
MB11S457	11.7	9.88	1.82	-	-	-	-	-	-	-	-	-	-	-	-
MB11S460	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S461	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S462	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S464	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S465	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S466b	16.37	14.82	1.55	14.92	14.57	0.35	13.87	14.89	-1.02	-	-	-	-	-	-
MB11S467	-	-	-	12.51	11.82	0.69	-	-	-	-	-	-	-	-	-
MB11S468	14.63	14.15	0.48	14.18	13.31	0.87	15.31	15.02	0.29	18.88	16.62	2.26	-	-	-
MB11S469	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S471	11.31	8.78	2.53	10.04	8.09	1.95	-	-	-	-	-	-	-	-	-
MB11S473	15.29	16.52	-1.23	20.05	-	-	-	-	-	-	-	-	-	-	-
MB11S474	9.53	9.37	0.16	-	-	-	-	-	-	-	-	-	-	-	-
MB11S476	12.74	12.80	-0.06	12.42	12.57	-0.15	13.4	12.82	0.58	13.70	13.34	0.36	11.8	11.92	-0.12
MB11S477	-	-	-	22.86	17.21	5.65	-	-	-	-	-	-	-	-	-
MB11S479	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S481	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S484	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S488	-	-	-	14.74	12.24	2.50	14.58	13.51	1.07	15.91	13.75	2.16	12.59	10.33	2.26
MB11S489	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S492	22.41	19.76	2.65	-	-	-	-	-	-	-	-	-	-	-	-
MB11S494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S495	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S497	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S498	-	-	-	12.40	-	-	10.47	-	-	-	-	-	-	-	-
MB11S501	-	-	-	14.71	14.75	-0.04	13.38	13.30	0.08	10.10	9.74	0.36	-	-	-
MB11S502	15.76	15.25	0.51	16.18	14.41	1.77	15.34	14.17	1.17	-	-	-	-	-	-
MB11S504	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S505	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S507	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S508	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S511	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S512	12.93	12.63	0.30	-	-	-	14.75	14.65	0.10	12.55	14.24	-1.69	11.98	13.29	-1.31
MB11S514	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S516	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S518	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S520	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S521	16.73	17.05	-0.32	17.55	16.19	1.36	-	-	-	-	-	-	-	-	-
MB11S522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J2 – continued…

Individual Number	Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8			Right Ribs 4-8		
	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio	Diameter	Diameter 15mm from end	Ratio
MB11S523	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S524	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S525	-	-	-	17.59	-	-	-	-	-	-	-	-	-	-	-
MB11S526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S527	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S530	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S533	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S534	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S543	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S544	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S545	12.49	12.23	0.26	12.07	10.45	1.62	-	-	-	-	-	-	-	-	-
MB11S549	-	-	-	12.53	10.82	1.71	10.62	9.70	0.92	-	-	-	-	-	-
MB11S550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S553	14.33	11.00	3.33	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = Missing/damaged.
Note – All measurements in millimeters.

Table J3 – Ribs 4-8 ratio z-score

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
KER15S006	M	26-35	-	-	-	-	-	-	-	-	-	-
KER15S007	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S008	A	50+	-	-	-	-	-	-	-	-	-	-
KER15S009	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S010	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S011	M	36-49	0.8	-	-	-	-	-	-	-	-	-
KER15S012	F	36-49	-1	-	-	-	-	-	-	-	-	-
KER15S014	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S015	M	36-49	0.3	-	-	-	-	-	-	-	-	-
KER15S016	M	18-25	-1	-1.6	-	-	-	-2.2	-	-	-	-
KER15S017	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S018	M	18-25	0.5	-	-	-	-	-	-	-	-	-
KER15S019	M	50+	-	-	-	-	-	-	-	-	-	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-	-	-	-	-	-	-
KER15S021	M	36-49	-0.3	-	-	-	-	-	-	-	-	-
KER15S024	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S025	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S026	M	36-49	-0.2	0	0.4	-	-	0.6	-0.1	-0.4	-	-
KER15S028	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S029	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S030	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S032	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S035	F	26-35	-	-	-	-	-	-	-	-	-	-
KER15S036	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S037	M	50+	-	-	-	-	-	-	-	-	-	-
KER15S038	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S040	M	18+	-	-	-	-	-	-	-	-	-	-
KER15S042	M	36-49	0	-0.5	-	-	-	-0.8	-0.2	-	-	-
KER15S043	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S044	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S045	M	36-49	-0.8	-	-	-	-	-	-	-	-	-
KER15S046	M	26-35	-	-	-	-	-	-	-	-	-	-
KER15S047	A	26-35	-	-	-	-	-	-	-	-	-	-
KER15S050	A	18+	-	-	-	-	-	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-	**1.8**	-	-	-	-
KER15S052	F	50+	0.1	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
KER15S053	U	15 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S054	A	26-35	-	-	-	-	-	-	-	-	-	-
KER15S055	F	36+	-	-	-	-	-	-	-	-	-	-
KER15S056	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-	-	-	-	-
KER15S058	M	26-35	-0.9	-	-	-	-	-1.2	-	-	-	-
KER15S059	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S061	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S062	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S063	F	36-49	-1	0.7	-	-	-	-	-	-	-	-
KER15S064	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S065	M	36-49	0.9	-	-	-	-	0.1	-	-	-	-
KER15S066	M	18+	-	-	-	-	-	-	-	-	-	-
KER15S068	F	18+	-	-	-	-	-	-	-	-	-	-
KER15S070	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S071	M	18-25	-	-	-	-	-	-	-	-	-	-
KER15S072	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S074	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S075	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S076	M	26-35	-1.2	0.7	-	-	-	0.3	-	-	-	-
KER15S077	M	26-35	-	-	-	-	-	-	-	-	-	-
KER15S078	F	26-35	-	-	-	-	-	-	-	-	-	-
KER15S079	U	12 ± 2 yrs.	-0.3	-	-	-	-	-	-	-	-	-
KER15S080	M	26-35	-	-	-	-	-	0.9	1.2	-	-	-
KER15S081	A	18+	-	-	-	-	-	-	-	-	-	-
KER15S082	F	50+	-0.8	0.2	-	-	-	-0.7	0.5	-	-	-
KER15S083	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S084	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S085	M	36-49	-	-	-	-	-	-0.2	-	-	-	-
KER15S086	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S087	M	36-49	-	-	-	-	-	0.2	-	-	-	-
KER15S088	F	26-35	-0.5	-0.7	0.1	0.1	-	0.3	-0.1	-0.2	-1.4	-
KER15S089	M	50+	-0.3	-	-	-	-	-	-	-	-	-
KER15S090	F	50+	-	-	-	-	-	-	-	-	-	-
KER15S091	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S092	F	50+	-2	-1.8	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
KER15S093	F	26-35	-0.5	-1.7	-	-	-	-0.9	-0.3	-	-	-
KER15S094	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S096	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S097	F	50+	-	-	-	-	-	-	-	-	-	-
KER15S098	F	26-35	-	-	-	-	-	-	-	-	-	-
KER15S099	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S100	M	26-35	**1.5**	0.9	-	-	-	-	-	-	-	-
KER15S101	M	36-49	-1.6	-	-	-	-	-1.3	-	-	-	-
KER15S102	M	50+	0.6	0.1	0.4	-	-	1.0	-	-	-	-
KER15S103	M	18-25	-0.3	-	-	-	-	-	-	-	-	-
KER15S105	M	18-25	-1.8	-	-	-	-	-1.6	-1	-0.2	-0.6	-
KER15S106	M	36-49	-0.6	0.3	-	-	-	-0.3	-	-	-	-
KER15S107	F	26-35	-	-	-	-	-	-	-	-	-	-
KER15S108	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S109	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S110	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S111	M	26-35	-2	-	-	-	-	-1.1	-	-	-	-
KER15S114	F	50+	-	-	-	-	-	-	-	-	-	-
KER15S112	M	26-35	-	-	-	-	-	-	-	-	-	-
KER15S113	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S114	F	50+	-	-	-	-	-	-	-	-	-	-
KER15S115	M	36-49	-	-	-	-	-	0.3	-	-	-	-
KER15S116	F	36-49	-	-	-	-	-	-0.9	-	-	-	-
KER15S117	F	36-49	0.9	-	-	-	-	-	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
KER15S120	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S122	F	36-49	-	-	-	-	-	-0.2	1.1	0.9	-	-
HT15S124	U	13 ± 1 yr.	-1	-0.6	-	-	-	-	-	-	-	-
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-	-	1.2	-	-	-	-
KER15S127	U	9 ± 1 yr.	0.2	1.3	-	-	-	0.6	1.1	-	-	-
KER15S129	F	36-49	-	-	-	-	-	-	-	-	-	-
KER15S130	M	18-25	-1.2	-	-	-	-	-0.7	-	-	-	-
KER15S132	F	50+	0.3	-	-	-	-	-	-	-	-	-
KER15S133	F	18-25	-	-	-	-	-	-	-	-	-	-
KER15S134	M	36-49	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
KER15S136	U	13 ± 2 yrs.	-	-	-	-	-	-1.4	1.4	-0.4	-	-
KER15S142	F	26-35	-	-	-	-	-	-	-	-	-	-
KER15S143	M	36-49	-0.2	-0.2	-	-	-	-	-	-	-	-
KER15S145	F	36-49	0.9	-	-	-	-	0	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	0.3	0.5	-	-	-	0.4	1.2	1.1	-	-
KER15S151	M	36-49	-	-	-	-	-	-	-	-	-	-
KER15S154	F	36+	-	-	-	-	-	-	-	-	-	-
MB11S019	A	18+	-	-	-	-	-	-	-	-	-	-
MB11S029	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S040	F	18-25	-	-	-	-	-	-	-	-	-	-
MB11S044	U	12 ± 12 mo.	0.5	0.4	0.7	1.1	-	-	-	-	-	-
MB11S045	F	47	-0.7	0.7	0.8	1.1	0.9	-	-	-	-	-
MB11S047	F	21	-	-	-	-	-	-	-	-	-	-
MB11S051	M	74	0.6	-	-	-	-	0.5	-	-	-	-
MB11S053	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S056	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S059	M	36-49	-1.1	-0.3	-	-	-	0.3	0.2	-	-	-
MB11S060	F	18-25	-	-	-	-	-	-	-	-	-	-
MB11S064	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S070	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S077	F	58	-	-	-	-	-	-	-	-	-	-
MB11S083	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S084	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S088	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S092	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S093	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S097	F	50+	-0.7	-0.7	-1.1	-0.3	-	-0.2	0.3	-0.3	0.4	-
MB11S100	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S101	F	26-35	**1.5**	**2.1**	0.4	0.4	-	-	-	-	-	-
MB11S107	F	18-25	-	-	-	-	-	-	-	-	-	-
MB11S108	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S110	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S121	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S123	U	13-17	-	-	-	-	-	-	-	-	-	-
MB11S126	F	36-49	0.2	-	-	-	-	-	-	-	-	-
MB11S137	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S144	M	36-50	-	-	-	-	-	-	-	-	-	-
MB11S149	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S151	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S153	M	57	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S155a	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S155b	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S157	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S158	M	60	0	-0.1	-	-	-	0.1	-	-	-	-
MB11S160	F	26-35	0.6	1	-0.2	-0.4	-	0	-0.8	-	-	-
MB11S162	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S167	F	12	0.1	**1.6**	-	-	-	-	-	-	-	-
MB11S170	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S174	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S180	M	18-25	-1.2	0.1	1.3	-	-	-0.6	0.1	-	-	-
MB11S183	F	26-35	-2.4	-	-	-	-	-1.2	-1.1	-	-	-
MB11S186	M	36-49	0.5	1	1	-	-	-	-	-	-	-
MB11S192	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S194	M	50+	-2.4	-2.3	0.4	-0.7	0.2	-0.7	0.1	-0.9	-	-
MB11S195	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S198	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S202	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S205	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S206	U	13-17	-	-	-	-	-	-	-	-	-	-
MB11S207	F	50+	-	-	-	-	-	0.5	-	-	-	-
MB11S216	F	36-49	**2.3**	-	-	-	-	-0.6	1	**2.2**	**4.4**	0.8
MB11S220	F	36-49	-	-	-	-	-	-2.8	-	-	-	-
MB11S225	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S226	M	26-35	-	-	-	-	-	1.0	-	-	-	-
MB11S228	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S229	U	13-17	0.6	-2	-0.5	-	-	0.4	-	-	-	-
MB11S233	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S234	F	18-25	-	-	-	-	-	-	-	-	-	-
MB11S235	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S236	M	24	-	-	-	-	-	-	-	-	-	-
MB11S237	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S238	M	18-25	-	-	-	-	-	-	-	-	-	-
MB11S239	M	23	-0.7	-0.7	-0.5	-	-	-	-	-	-	-
MB11S240	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S242	M	50+	0.7	0.1	-0.3	-	-	-	-	-	-	-
MB11S243	F	62	-	-	-	-	-	-	-	-	-	-
MB11S246	U	19	-	-	-	-	-	-	-	-	-	-
MB11S247	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S248	F	9	-0.5	-	-	-	-	0	-	-	-	-
MB11S249	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S250	M	73	-	-	-	-	-	-	-	-	-	-
MB11S251	M	36-49	-0.8	-	-	-	-	-	-	-	-	-
MB11S253	M	78	-2.2	-	-	-	-	-1.3	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S254	M	36-49	1	-0.1	0.7	-	-	0.6	0.0	-	-	-
MB11S257	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S260	M	18-25	-	-	-	-	-	-	-	-	-	-
MB11S261	M	79	-	-	-	-	-	-	-	-	-	-
MB11S263	M	36-49	-	-	-	-	-	**1.6**	-	-	-	-
MB11S267	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S269a	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S269b	U	11 ± 30 mo.	-	-	-	-	-	-	-	-	-	-
MB11S269c	U	10 ± 1 yr.	-1.3	-1.5	-	-	-	-0.4	-	-	-	-
MB11S270	M	18-25	-0.2	0	0.4	-	-	-0.8	-0.5	-1.2	-	-
MB11S271	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S275	U	15 ± 1 yr.	-0.9	-1	-	-	-	-3	-1.3	-0.3	-0.2	-0.1
MB11S278	F	36-49	-0.1	0.7	-0.4	0.9	-	0.4	0.8	-0.1	-	-
MB11S281	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S282	U	12 ± 12 mo.	-1.3	-	-	-	-	-1.8	0.2	-	-	-
MB11S285	M	71	-	-	-	-	-	0.1	-	-	-	-
MB11S286	F	10	0.4	1.3	0.4	-	-	0.8	0.9	-	-	-
MB11S289	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S290	M	18-25	0.6	-	-	-	-	-	-	-	-	-
MB11S292	U	11 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
MB11S294	F	66	**1.5**	-	-	-	-	**1.5**	0.6	1	0.7	-
MB11S297	M	84	-	-	-	-	-	-	-	-	-	-
MB11S301a	F	36-49	-0.1	-	-	-	-	0	0.1	0.7	-	-
MB11S301b	U	6-10	-	-	-	-	-	-	-	-	-	-
MB11S302	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S303	F	44	-	-	-	-	-	-	-	-	-	-
MB11S306	M	31	-	-	-	-	-	-	-	-	-	-
MB11S307	U	13-17	-	-	-	-	-	-	-	-	-	-
MB11S309	F	58	-	-	-	-	-	0.1	-	-	-	-
MB11S310	M	35	-	-	-	-	-	-	-	-	-	-
MB11S311	F	18-25	-	-	-	-	-	-1.1	-0.3	-	-	-
MB11S313	M	46	-0.8	**1.6**	-0.5	-	-	0.1	-1.1	0.5	0.9	-
MB11S317	M	80	-	-	-	-	-	-	-	-	-	-
MB11S319	F	69	-	-	-	-	-	-	-	-	-	-
MB11S321	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S324	M	36-49	-0.6	-0.8	0.5	0.2	-0.5	-0.9	1.1	0.4	-	-
MB11S325	M	36	0	-0.7	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S327	F	36-49	-	-	-	-	-	0.3	-	-	-	-
MB11S331	F	74	1.1	-	-	-	-	-	-	-	-	-
MB11S334	F	9	0.3	-1.7	0.9	0.7	-	-0.2	-0.8	-0.1	0.4	1.1
MB11S337	M	68	-0.3	-	-	-	-	-	-	-	-	-
MB11S338	F	33	-	-	-	-	-	-	-	-	-	-
MB11S339	F	64	-	-	-	-	-	-	-	-	-	-
MB11S340	U	19	-	-	-	-	-	-	-	-	-	-
MB11S341	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S342	M	75	-	-	-	-	-	-	-	-	-	-
MB11S344	F	20	-	-	-	-	-	-	-	-	-	-
MB11S345	F	28	0.6	-	-	-	-	-0.2	2.3	-	-	-
MB11S346	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S347	M	50+	-0.2	1.2	0.2	0.7	-	0.5	0.1	0.1	-0.7	-5.7
MB11S349	M	50+	-	-	-	-	-	0.7	-	-	-	-
MB11S350	U	16 ± 1 yr.	-	-	-	-	-	-	-	-	-	-
MB11S355	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S356	F	78	-	-	-	-	-	-	-	-	-	-
MB11S358	F	74	-	-	-	-	-	-	-	-	-	-
MB11S359	F	46	-	-	-	-	-	-	-	-	-	-
MB11S360	F	66	-1.7	-	-	-	-	-1	-	-	-	-
MB11S363	M	61	-	-	-	-	-	-	-	-	-	-
MB11S367	F	11	-0.5	-	-	-	-	-	-	-	-	-
MB11S368	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S369	F	30	-0.5	0.3	0.6	-0.6	-0.1	-0.4	-0.2	-	-	-
MB11S370	F	36-49	-0.7	-0.4	0.8	-	-	-0.6	-0.1	-	-	-
MB11S371	M	36-49	0.3	-0.2	-0.3	0.9	-	0.5	1.4	-	-	-
MB11S374	M	80	-	-	-	-	-	-0.3	0.1	0.2	-	-
MB11S375	M	74	0.7	**2.6**	-	-	-	-0.3	0.5	0.1	-	-
MB11S377	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S379	M	18-25	0.2	-0.1	0.4	-	-	0.5	-0.6	0.5	0.1	-
MB11S380	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S382	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S383	F	55	-	-	-	-	-	-	-	-	-	-
MB11S385	F	25	-	-	-	-	-	-	-	-	-	-
MB11S386	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S387	F	43	-	-	-	-	-	-	-	-	-	-
MB11S388	F	21	-1.6	-0.4	1.1	-0.4	0	-1.2	-0.4	0.6	-0.5	-
MB11S390	F	71	-	-	-	-	-	-	-	-	-	-
MB11S391	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S392	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S394	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S399	A	36-49	-	-	-	-	-	-	-	-	-	-
MB11S401	F	26-35	-	-	-	-	-	-0.8	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S402	M	36-49	0.7	0.7	0.9	-	-	0.1	-	-	-	-
MB11S404	M	26-35	1.2	**2**	-	-	-	0.4	**1.5**	0.6	0.5	-
MB11S405	F	36-49	0.4	0.7	1.3	-	-	1.0	-	-	-	-
MB11S407	M	18+	0.9	0.5	-	-	-	-	-	-	-	-
MB11S409	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S411	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S413	F	39	-	-	-	-	-	0.1	-	-	-	-
MB11S415	M	50+	-0.2	-0.2	**1.6**	-	-	-	-	-	-	-
MB11S416	M	36-49	0	0.8	-	-	-	0.0	**1.6**	-	-	-
MB11S420	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S422	F	29	-	-	-	-	-	-	-	-	-	-
MB11S426	F	55	-	-	-	-	-	-	-	-	-	-
MB11S427	M	27	0.1	-0.5	-0.5	-	-	-0.2	-0.4	-	-	-
MB11S428	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S430	F	30	-0.9	-1.2	-0.7	-1.6	-	-2.1	-0.5	-1.3	-0.7	-
MB11S432	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S434	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S435	M	45	-	-	-	-	-	0.1	0.4	0.4	1.1	-
MB11S436	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S437	F	26-35	-	-	-	-	-	-0.7	1.3	0.3	1.4	-
MB11S441	F	23	-1.6	0.7	-0.5	-	-	-0.4	-0.6	-0.8	1.2	0.7
MB11S446	U	22	-	-	-	-	-	-	-	-	-	-
MB11S452	F	18-25	-	-	-	-	-	-	-	-	-	-
MB11S453	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S454	U	21	-	-	-	-	-	-	-	-	-	-
MB11S455	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S456	M	36-49	-0.2	0.9	-0.3	0.7	-	1.0	0.1	**1.5**	-0.2	0.8
MB11S457	F	50+	-	-	-	-	-	0.7	-	-	-	-
MB11S460	U	16.5 ± 36 mo.	1	-	-	-	-	-	-	-	-	-
MB11S461	F	28	-	-	-	-	-	-	-	-	-	-
MB11S462	M	16	-	-	-	-	-	-	-	-	-	-
MB11S464	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S465	M	15	-	-	-	-	-	-	-	-	-	-
MB11S466a	M	83	-	-	-	-	-	-	-	-	-	-
MB11S466b	F	43	-1.4	-	-	-	-	0.5	-0.3	-1.3	-	-
MB11S467	M	26-35	-	-	-	-	-	-0.3	-	-	-	-
MB11S468	F	36-49	-0.7	0.5	-0.3	-0.5	-0.2	-0.2	0	-0.4	1	-
MB11S469	M	43	-	-	-	-	-	-	-	-	-	-
MB11S470	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S471	F	9	-0.3	1.1	1	-	-	0.6	0	-	-	-
MB11S473	M	42	-0.4	-	-	-	-	-1.5	-	-	-	-
MB11S474	F	50+	-	-	-	-	-	-0.5	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.

Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S476	F	31	0	-0.1	0.3	0.8	0.3	-0.6	-0.7	-0.2	-0.3	-0.7
MB11S477	M	61	**1.5**	**3.4**	1.4	-	-	**2.6**	-	-	-	-
MB11S479	U	12-18	-	-	-	-	-	-	-	-	-	-
MB11S481	F	29	-	-	-	-	-	-	-	-	-	-
MB11S482	M	36	-0.4	-	-	-	-	-	-	-	-	-
MB11S484	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S485	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S487	F	29	-	-	-	-	-	-	-	-	-	-
MB11S488	F	36-49	-1.5	-1.3	0.5	0	**2.7**	1.1	0.2	0.9	1	-
MB11S489	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S490a	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S490b	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S492	M	26-35	-	-	-	-	-	0.8	-	-	-	-
MB11S494	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S495	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S497	M	26-35	-	-	-	-	-	-	-	-	-	-
MB11S498	F	50+	0.4	1.4	**2**	-	-	-	-	-	-	-
MB11S501	F	80	-0.4	-	-	-	-	-0.6	-0.5	-0.3	-	-
MB11S502	M	25	0.3	-0.4	-0.7	0.9	0.7	-0.4	0.3	0.0	-	-
MB11S504	F	36-49	-	-	-	-	-	-	-	-	-	-
MB11S505	M	18-25	0.3	-	-	-	-	-	-	-	-	-
MB11S507	U	14 ± 2 yrs.	1.2	-0.5	-	-	-	-	-	-	-	-
MB11S508	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S511	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S512	F	36-49	0.3	-1.1	-	-	-	-0.4	-0.5	-1.7	-1.5	-
MB11S514	M	26-35	0	-0.5	-	-	-	-	-	-	-	-
MB11S516	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S518	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S519	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S520	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S521	M	69	-0.3	-	-	-	-	-0.9	0.1	-	-	-
MB11S522	F	13	-	-	-	-	-	-	-	-	-	-
MB11S523	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S524	M	36-49	-4.5	-	-	-	-	-	-	-	-	-
MB11S525	M	50+	-	-	-	-	-	-	-	-	-	-
MB11S526	M	50+ (50-72)	-	-	-	-	-	-	-	-	-	-
MB11S527	F	26-35	0.6	**1.8**	-	-	-	-	-	-	-	-
MB11S530	F	75	-	-	-	-	-	-	-	-	-	-
MB11S533	F	50-65	-	-	-	-	-	-	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Table J3 – continued…

Individual Number	Sex	Age	Left Ribs 4-8 Ratio Z-Score by Sex					Right Ribs 4-8 Ratio Z-Score by Sex				
			1	2	3	4	5	1	2	3	4	5
MB11S534	M	36-49	-	-	-	-	-	-	-	-	-	-
MB11S538	F	26-35	-	-	-	-	-	-	-	-	-	-
MB11S540	U	20	-	-	-	-	-	-	-	-	-	-
MB11S543	F	18+	-	-	-	-	-	-	-	-	-	-
MB11S544	M	30	-	-	-	-	-	-	-	-	-	-
MB11S545	F	49	-0.4	0.1	-	-	-	-0.4	0.5	-	-	-
MB11S549	U	11 ± 24 mo.	-2	-	-	-	-	-0.3	-1	-	-	-
MB11S550	F	50+	-	-	-	-	-	-	-	-	-	-
MB11S552	M	18+	-	-	-	-	-	-	-	-	-	-
MB11S553	F	36-49	-	-	-	-	-	**1.7**	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months; "-" = missing/damage.
Note – Significant z-scores are emboldened and red. Ribs four through eight not ordered. Each rib distinguished by numbers 1-5.

Appendix K – Ribs 9-10 Measurements and Non-Metric Features

Table K1 – Ribs 9-10 metric measurements

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S006	-	-	-	-	-	-	-	-	-	-	-	-
KER15S007	-	-	-	-	-	-	-	-	-	-	-	-
KER15S008	-	-	-	-	-	-	-	-	-	-	-	-
KER15S009	-	-	-	-	-	-	-	-	-	-	-	-
KER15S010	-	-	-	-	-	-	-	-	-	-	-	-
KER15S011	-	-	-	-	-	-	-	-	-	-	-	-
KER15S012	10.12	10.02	0.1	-	-	-	12.82	11.9	0.92	-	-	-
KER15S014	-	-	-	-	-	-	-	-	-	-	-	-
KER15S015	-	-	-	-	-	-	-	-	-	-	-	-
KER15S016	10.6	12.08	-1.48	-	-	-	-	-	-	-	-	-
KER15S017	-	-	-	-	-	-	-	-	-	-	-	-
KER15S018	-	-	-	-	-	-	-	-	-	-	-	-
KER15S019	-	-	-	-	-	-	-	-	-	-	-	-
KER15S020	-	-	-	-	-	-	-	-	-	-	-	-
KER15S021	-	-	-	-	-	-	-	-	-	-	-	-
KER15S024	-	-	-	-	-	-	-	-	-	-	-	-
KER15S025	-	-	-	-	-	-	-	-	-	-	-	-
KER15S026	-	-	-	-	-	-	-	-	-	-	-	-
KER15S028	-	-	-	-	-	-	-	-	-	-	-	-
KER15S029	-	-	-	-	-	-	-	-	-	-	-	-
KER15S030	-	-	-	-	-	-	-	-	-	-	-	-
KER15S031	-	-	-	-	-	-	-	-	-	-	-	-
KER15S032	-	-	-	-	-	-	-	-	-	-	-	-
KER15S035	-	-	-	-	-	-	-	-	-	-	-	-
KER15S036	-	-	-	-	-	-	-	-	-	-	-	-
KER15S037	-	-	-	-	-	-	-	-	-	-	-	-
KER15S038	-	-	-	-	-	-	-	-	-	-	-	-
KER15S040	-	-	-	-	-	-	-	-	-	-	-	-
KER15S042	-	-	-	-	-	-	-	-	-	-	-	-
KER15S043	8.9	10.28	-1.38	-	-	-	10.05	9.6	0.45	-	-	-
KER15S044	12.06	12.69	-0.63	-	-	-	13.15	11.23	1.92	-	-	-
KER15S045	-	-	-	-	-	-	-	-	-	-	-	-
KER15S046	-	-	-	-	-	-	-	-	-	-	-	-
KER15S047	-	-	-	-	-	-	-	-	-	-	-	-
KER15S050	-	-	-	-	-	-	-	-	-	-	-	-
KER15S051	7.03	8.52	-1.49	-	-	-	-	-	-	-	-	-
KER15S052	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S053	-	-	-	-	-	-	-	-	-	-	-	-
KER15S054	-	-	-	-	-	-	-	-	-	-	-	-
KER15S055	-	-	-	-	-	-	-	-	-	-	-	-
KER15S056	-	-	-	-	-	-	-	-	-	-	-	-
KER15S057	-	-	-	-	-	-	-	-	-	-	-	-
KER15S058	-	-	-	-	-	-	-	-	-	-	-	-
KER15S059	-	-	-	-	-	-	-	-	-	-	-	-
KER15S060	-	-	-	-	-	-	-	-	-	-	-	-
KER15S061	-	-	-	-	-	-	-	-	-	-	-	-
KER15S062	-	-	-	-	-	-	-	-	-	-	-	-
KER15S063	-	-	-	-	-	-	-	-	-	-	-	-
KER15S064	-	-	-	-	-	-	-	-	-	-	-	-
KER15S065	-	-	-	-	-	-	-	-	-	-	-	-
KER15S066	-	-	-	-	-	-	-	-	-	-	-	-
KER15S068	-	-	-	-	-	-	-	-	-	-	-	-
KER15S070	-	-	-	-	-	-	-	-	-	-	-	-
KER15S071	-	-	-	-	-	-	-	-	-	-	-	-
KER15S072	-	-	-	-	-	-	-	-	-	-	-	-
KER15S073	-	-	-	-	-	-	-	-	-	-	-	-
KER15S074	-	-	-	-	-	-	-	-	-	-	-	-
KER15S075	-	-	-	-	-	-	-	-	-	-	-	-
KER15S076	-	-	-	-	-	-	-	-	-	-	-	-
KER15S077	-	-	-	-	-	-	-	-	-	-	-	-
KER15S078	-	-	-	-	-	-	-	-	-	-	-	-
KER15S079	-	-	-	-	-	-	-	-	-	-	-	-
KER15S080	-	-	-	-	-	-	-	-	-	-	-	-
KER15S081	-	-	-	-	-	-	-	-	-	-	-	-
KER15S082	8.55	11	-2.45	-	-	-	-	-	-	-	-	-
KER15S083	10.82	10.57	0.25	-	-	-	13.77	12.41	1.36	-	-	-
KER15S084	-	-	-	-	-	-	-	-	-	-	-	-
KER15S085	-	-	-	-	-	-	-	-	-	-	-	-
KER15S086	-	-	-	-	-	-	-	-	-	-	-	-
KER15S087	-	-	-	-	-	-	-	-	-	-	-	-
KER15S088	-	-	-	-	-	-	-	-	-	-	-	-
KER15S089	-	-	-	-	-	-	-	-	-	-	-	-
KER15S090	-	-	-	-	-	-	-	-	-	-	-	-
KER15S091	-	-	-	-	-	-	-	-	-	-	-	-
KER15S092	9.08	9.56	-0.48	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S093	8.91	9.05	-0.14	-	-	-	8.82	8.66	0.16	-	-	-
KER15S094	-	-	-	-	-	-	-	-	-	-	-	-
KER15S096	10.8	12.53	-1.73	-	-	-	-	-	-	-	-	-
KER15S097	-	-	-	-	-	-	-	-	-	-	-	-
KER15S098	-	-	-	-	-	-	-	-	-	-	-	-
KER15S099	-	-	-	-	-	-	-	-	-	-	-	-
KER15S100	-	-	-	-	-	-	-	-	-	-	-	-
KER15S101	-	-	-	-	-	-	-	-	-	-	-	-
KER15S102	14.67	11.86	2.81	-	-	-	10.75	8.99	1.76	-	-	-
KER15S103	-	-	-	-	-	-	10.99	10.81	0.18	-	-	-
KER15S105	-	-	-	-	-	-	-	-	-	-	-	-
KER15S106	11.91	11.69	0.22	13.25	11.79	1.46	13.13	13.07	0.06	11.83	12.2	-0.37
KER15S107	-	-	-	-	-	-	-	-	-	-	-	-
KER15S108	-	-	-	-	-	-	-	-	-	-	-	-
KER15S109	-	-	-	-	-	-	-	-	-	-	-	-
KER15S110	-	-	-	-	-	-	-	-	-	-	-	-
KER15S111	-	-	-	-	-	-	16.48	8.55	7.93	-	-	-
KER15S112	-	-	-	-	-	-	-	-	-	-	-	-
KER15S113	-	-	-	-	-	-	-	-	-	-	-	-
KER15S114	-	-	-	-	-	-	-	-	-	-	-	-
KER15S115	-	-	-	-	-	-	-	-	-	-	-	-
KER15S116	-	-	-	-	-	-	-	-	-	-	-	-
KER15S117	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119a	-	-	-	-	-	-	6.43	8.12	-1.69	-	-	-
KER15S119b	-	-	-	-	-	-	-	-	-	-	-	-
KER15S120	-	-	-	-	-	-	-	-	-	-	-	-
KER15S122	12.21	11.17	1.04	-	-	-	-	-	-	-	-	-
HT15S124	-	-	-	-	-	-	-	-	-	-	-	-
HT15S126	-	-	-	-	-	-	-	-	-	-	-	-
KER15S127	-	-	-	-	-	-	10.06	9.12	0.94	-	-	-
KER15S129	-	-	-	-	-	-	-	-	-	-	-	-
KER15S130	-	-	-	-	-	-	-	-	-	-	-	-
KER15S132	-	-	-	-	-	-	-	-	-	-	-	-
KER15S133	-	-	-	-	-	-	-	-	-	-	-	-
KER15S134	-	-	-	-	-	-	-	-	-	-	-	-
KER15S136	-	-	-	-	-	-	-	-	-	-	-	-
KER15S142	-	-	-	-	-	-	-	-	-	-	-	-
KER15S143	-	-	-	8.99	10.16	-1.17	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S145	-	-	-	-	-	-	-	-	-	-	-	-
KER15S150	-	-	-	-	-	-	8.44	7.46	0.98	-	-	-
KER15S151	13.46	12.65	0.81	-	-	-	-	-	-	-	-	-
KER15S154	-	-	-	-	-	-	-	-	-	-	-	-
MB11S019	-	-	-	-	-	-	-	-	-	-	-	-
MB11S029	-	-	-	-	-	-	-	-	-	-	-	-
MB11S040	-	-	-	-	-	-	-	-	-	-	-	-
MB11S044	-	-	-	-	-	-	-	-	-	-	-	-
MB11S045	-	-	-	11.37	10.45	0.92	-	-	-	-	-	-
MB11S047	-	-	-	-	-	-	-	-	-	-	-	-
MB11S051	-	-	-	-	-	-	-	-	-	-	-	-
MB11S053	-	-	-	-	-	-	-	-	-	-	-	-
MB11S056	-	-	-	-	-	-	-	-	-	-	-	-
MB11S059	-	-	-	-	-	-	-	-	-	8.41	-	-
MB11S060	-	-	-	-	-	-	-	-	-	-	-	-
MB11S064	-	-	-	-	-	-	-	-	-	-	-	-
MB11S070	-	-	-	-	-	-	-	-	-	-	-	-
MB11S077	-	-	-	-	-	-	-	-	-	-	-	-
MB11S083	-	-	-	-	-	-	-	-	-	-	-	-
MB11S084	-	-	-	-	-	-	-	-	-	-	-	-
MB11S088	-	-	-	-	-	-	-	-	-	-	-	-
MB11S092	-	-	-	-	-	-	-	-	-	-	-	-
MB11S093	-	-	-	-	-	-	-	-	-	-	-	-
MB11S097	-	-	-	-	-	-	-	-	-	-	-	-
MB11S100	-	-	-	-	-	-	-	-	-	-	-	-
MB11S101	7.33	8.91	-1.58	-	-	-	-	-	-	-	-	-
MB11S107	-	-	-	-	-	-	-	-	-	-	-	-
MB11S108	-	-	-	-	-	-	-	-	-	-	-	-
MB11S110	-	-	-	-	-	-	-	-	-	-	-	-
MB11S121	-	-	-	-	-	-	-	-	-	-	-	-
MB11S123	-	-	-	-	-	-	-	-	-	-	-	-
MB11S126	-	-	-	-	-	-	-	-	-	-	-	-
MB11S137	-	-	-	-	-	-	-	-	-	-	-	-
MB11S144	-	-	-	-	-	-	-	-	-	-	-	-
MB11S149	-	-	-	-	-	-	-	-	-	-	-	-
MB11S151	-	-	-	-	-	-	-	-	-	-	-	-
MB11S153	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155a	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S155b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S157	-	-	-	-	-	-	-	-	-	-	-	-
MB11S158	10.19	10.69	-0.5	-	-	-	13.54	12.6	0.94	-	-	-
MB11S160	9.49	9.77	-0.28	-	-	-	9.37	10.05	-0.68	-	-	-
MB11S162	-	-	-	-	-	-	10.01	10.99	-0.98	-	-	-
MB11S167	-	-	-	-	-	-	-	-	-	-	-	-
MB11S170	-	-	-	-	-	-	-	-	-	-	-	-
MB11S174	-	-	-	-	-	-	-	-	-	-	-	-
MB11S180	10.67	11.91	-1.24	-	-	-	-	-	-	-	-	-
MB11S183	-	-	-	-	-	-	-	-	-	-	-	-
MB11S186	-	-	-	-	-	-	-	-	-	-	-	-
MB11S192	-	-	-	-	-	-	-	-	-	-	-	-
MB11S194	10.01	8.15	1.86	-	-	-	-	-	-	-	-	-
MB11S195	-	-	-	-	-	-	-	-	-	-	-	-
MB11S198	-	-	-	-	-	-	-	-	-	-	-	-
MB11S202	-	-	-	-	-	-	-	-	-	-	-	-
MB11S205	-	-	-	-	-	-	-	-	-	-	-	-
MB11S206	-	-	-	-	-	-	-	-	-	-	-	-
MB11S207	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	12.26	10.77	1.49	-	-	-	12.45	9.26	3.19	-	-	-
MB11S220	-	-	-	-	-	-	-	-	-	-	-	-
MB11S225	-	-	-	-	-	-	-	-	-	-	-	-
MB11S226	11.51	9.96	1.55	-	-	-	13.75	12.26	1.49	-	-	-
MB11S228	-	-	-	-	-	-	-	-	-	-	-	-
MB11S229	-	-	-	-	-	-	-	-	-	-	-	-
MB11S233	-	-	-	-	-	-	-	-	-	-	-	-
MB11S234	-	-	-	-	-	-	-	-	-	-	-	-
MB11S235	-	-	-	-	-	-	-	-	-	-	-	-
MB11S236	-	-	-	-	-	-	-	-	-	-	-	-
MB11S237	-	-	-	-	-	-	-	-	-	-	-	-
MB11S238	-	-	-	-	-	-	-	-	-	-	-	-
MB11S239	-	-	-	-	-	-	-	-	-	-	-	-
MB11S240	-	-	-	-	-	-	-	-	-	-	-	-
MB11S242	11.56	10.3	1.26	-	-	-	14.62	13.56	1.06	-	-	-
MB11S243	-	-	-	-	-	-	-	-	-	-	-	-
MB11S246	-	-	-	-	-	-	-	-	-	-	-	-
MB11S247	-	-	-	-	-	-	-	-	-	-	-	-
MB11S248	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S249	-	-	-	-	-	-	-	-	-	-	-	-
MB11S250	-	-	-	-	-	-	-	-	-	-	-	-
MB11S251	-	-	-	-	-	-	-	-	-	-	-	-
MB11S253	-	-	-	-	-	-	-	-	-	-	-	-
MB11S254	13.89	13.2	0.69	-	-	-	-	-	-	-	-	-
MB11S257	-	-	-	-	-	-	-	-	-	-	-	-
MB11S260	-	-	-	-	-	-	-	-	-	-	-	-
MB11S261	-	-	-	-	-	-	-	-	-	-	-	-
MB11S263	-	-	-	-	-	-	-	-	-	-	-	-
MB11S267	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269c	-	-	-	-	-	-	-	-	-	-	-	-
MB11S270	-	-	-	-	-	-	10.42	9.05	1.37	-	-	-
MB11S271	-	-	-	-	-	-	-	-	-	-	-	-
MB11S275	-	-	-	-	-	-	10.05	8.2	1.85	8.64	8.34	0.3
MB11S278	5.45	6.35	-0.9	-	-	-	13.62	11.24	2.38	-	-	-
MB11S281	-	-	-	-	-	-	-	-	-	-	-	-
MB11S282	-	-	-	-	-	-	-	-	-	-	-	-
MB11S285	-	-	-	-	-	-	-	-	-	-	-	-
MB11S286	-	-	-	-	-	-	-	-	-	-	-	-
MB11S289	-	-	-	-	-	-	-	-	-	-	-	-
MB11S290	-	-	-	-	-	-	-	-	-	-	-	-
MB11S292	-	-	-	-	-	-	-	-	-	-	-	-
MB11S294	-	-	-	-	-	-	-	-	-	-	-	-
MB11S297	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301a	-	-	-	-	-	-	11.18	9.98	1.2	-	-	-
MB11S301b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S302	-	-	-	-	-	-	-	-	-	-	-	-
MB11S303	-	-	-	-	-	-	-	-	-	-	-	-
MB11S306	-	-	-	-	-	-	-	-	-	-	-	-
MB11S307	-	-	-	-	-	-	-	-	-	-	-	-
MB11S309	-	-	-	-	-	-	8.28	8.38	-0.1	-	-	-
MB11S310	-	-	-	-	-	-	-	-	-	-	-	-
MB11S311	-	-	-	-	-	-	-	-	-	-	-	-
MB11S313	-	-	-	-	-	-	-	-	-	-	-	-
MB11S317	-	-	-	-	-	-	-	-	-	-	-	-
MB11S319	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S321	-	-	-	-	-	-	-	-	-	-	-	-
MB11S324	-	-	-	-	-	-	-	-	-	-	-	-
MB11S325	10.87	12.26	-1.39	-	-	-	-	-	-	-	-	-
MB11S327	-	-	-	-	-	-	-	-	-	-	-	-
MB11S331	-	-	-	-	-	-	-	-	-	-	-	-
MB11S334	9.4	6.71	2.69	8.41	7.19	1.22	9.38	7.62	1.76	8.71	7.56	1.15
MB11S337	-	-	-	-	-	-	-	-	-	-	-	-
MB11S338	-	-	-	-	-	-	-	-	-	-	-	-
MB11S339	-	-	-	-	-	-	-	-	-	-	-	-
MB11S340	-	-	-	-	-	-	-	-	-	-	-	-
MB11S341	-	-	-	-	-	-	-	-	-	-	-	-
MB11S342	-	-	-	-	-	-	-	-	-	-	-	-
MB11S344	-	-	-	-	-	-	-	-	-	-	-	-
MB11S345	-	-	-	-	-	-	-	-	-	-	-	-
MB11S346	-	-	-	-	-	-	-	-	-	-	-	-
MB11S347	15.04	12.04	3.00	11.73	11.99	-0.26	14.97	13.31	1.66	-	-	-
MB11S349	-	-	-	-	-	-	-	-	-	-	-	-
MB11S350	-	-	-	-	-	-	-	-	-	-	-	-
MB11S355	-	-	-	-	-	-	-	-	-	-	-	-
MB11S356	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	-	-	-	-	-	-	10.48	7.55	2.93	-	-	-
MB11S359	-	-	-	-	-	-	-	-	-	-	-	-
MB11S360	-	-	-	-	-	-	-	-	-	-	-	-
MB11S363	-	-	-	-	-	-	-	-	-	-	-	-
MB11S367	-	-	-	-	-	-	-	-	-	-	-	-
MB11S368	-	-	-	-	-	-	-	-	-	-	-	-
MB11S369	7.85	8.07	-0.22	7.94	9.26	-1.32	-	-	-	-	-	-
MB11S370	-	-	-	-	-	-	-	-	-	-	-	-
MB11S371	13.77	11.43	2.34	-	-	-	-	-	-	-	-	-
MB11S374	-	-	-	-	-	-	-	-	-	-	-	-
MB11S375	13.61	11.91	1.70	-	-	-	-	-	-	-	-	-
MB11S377	-	-	-	-	-	-	-	-	-	-	-	-
MB11S379	11.94	10.16	1.78	-	-	-	16.37	16.98	-0.61	-	-	-
MB11S380	-	-	-	-	-	-	-	-	-	-	-	-
MB11S382	-	-	-	-	-	-	-	-	-	-	-	-
MB11S383	-	-	-	-	-	-	-	-	-	-	-	-
MB11S385	-	-	-	-	-	-	-	-	-	-	-	-
MB11S386	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S387	-	-	-	-	-	-	-	-	-	-	-	-
MB11S388	10.53	9.30	1.23	-	-	-	10.70	10.62	0.08	-	-	-
MB11S390	-	-	-	-	-	-	-	-	-	-	-	-
MB11S391	-	-	-	-	-	-	-	-	-	-	-	-
MB11S392	-	-	-	-	-	-	-	-	-	-	-	-
MB11S394	8.62	6.92	1.70	8.28	8.00	0.28	-	-	-	-	-	-
MB11S399	-	-	-	-	-	-	-	-	-	-	-	-
MB11S401	-	-	-	-	-	-	-	-	-	-	-	-
MB11S402	12.64	11.82	0.82	-	-	-	0.06	-	-	-	-	-
MB11S404	-	-	-	-	-	-	-	-	-	-	-	-
MB11S405	-	-	-	-	-	-	-	-	-	-	-	-
MB11S407	-	-	-	-	-	-	-	-	-	-	-	-
MB11S409	-	-	-	-	-	-	-	-	-	-	-	-
MB11S411	-	-	-	-	-	-	-	-	-	-	-	-
MB11S413	7.52	7.82	-0.30	-	-	-	10.22	7.83	2.39	-	-	-
MB11S415	12.77	10.41	2.36	13.49	10.36	3.13	-	-	-	-	-	-
MB11S416	-	-	-	-	-	-	12.90	10.37	2.53	-	-	-
MB11S420	-	-	-	-	-	-	-	-	-	-	-	-
MB11S422	-	-	-	-	-	-	-	-	-	-	-	-
MB11S426	-	-	-	-	-	-	-	-	-	-	-	-
MB11S427	9.57	8.89	0.68	-	-	-	-	-	-	-	-	-
MB11S428	-	-	-	-	-	-	-	-	-	-	-	-
MB11S430	9.81	9.46	0.35	8.90	9.65	-0.75	10.02	9.63	0.39	9.46	10.54	-1.08
MB11S432	-	-	-	-	-	-	-	-	-	-	-	-
MB11S434	-	-	-	-	-	-	-	-	-	-	-	-
MB11S435	-	-	-	-	-	-	-	-	-	15.16	14.48	0.68
MB11S436	-	-	-	-	-	-	-	-	-	-	-	-
MB11S437	-	-	-	-	-	-	11.73	11.06	0.67	10.93	10.14	0.79
MB11S441	7.26	10.96	-3.70	-	-	-	11.36	10.49	0.87	8.78	8.09	0.69
MB11S446	8.21	7.59	0.62	-	-	-	9.46	9.11	0.35	9.57	10.2	-0.63
MB11S452	-	-	-	-	-	-	-	-	-	-	-	-
MB11S453	11.95	-	-	-	-	-	-	-	-	-	-	-
MB11S454	10.53	9.10	1.43	9.44	8.43	1.01	-	-	-	-	-	-
MB11S455	-	-	-	-	-	-	-	-	-	-	-	-
MB11S456	-	-	-	-	-	-	11.73	10.76	0.97	11.55	11.47	0.08
MB11S457	-	-	-	-	-	-	-	-	-	-	-	-
MB11S460	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S461	-	-	-	-	-	-	-	-	-	-	-	-
MB11S462	-	-	-	-	-	-	-	-	-	-	-	-
MB11S464	-	-	-	-	-	-	-	-	-	-	-	-
MB11S465	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S467	-	-	-	-	-	-	-	-	-	-	-	-
MB11S468	-	-	-	-	-	-	10.26	10.68	-0.42	-	-	-
MB11S469	-	-	-	-	-	-	-	-	-	-	-	-
MB11S470	-	-	-	-	-	-	-	-	-	-	-	-
MB11S471	-	-	-	-	-	-	-	-	-	-	-	-
MB11S473	-	-	-	-	-	-	-	-	-	-	-	-
MB11S474	-	-	-	-	-	-	-	-	-	-	-	-
MB11S476	11.54	11.44	0.10	-	-	-	11.57	10.08	1.49	11.20	9.67	1.53
MB11S477	-	-	-	-	-	-	-	-	-	-	-	-
MB11S479	-	-	-	-	-	-	-	-	-	-	-	-
MB11S481	-	-	-	-	-	-	-	-	-	-	-	-
MB11S482	10.64	11.41	-0.77	-	-	-	-	-	-	-	-	-
MB11S484	-	-	-	-	-	-	-	-	-	-	-	-
MB11S485	-	-	-	-	-	-	-	-	-	-	-	-
MB11S487	-	-	-	-	-	-	-	-	-	-	-	-
MB11S488	10.62	9.50	1.12	-	-	-	15.45	12.44	3.01	12.61	9.87	2.74
MB11S489	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S492	-	-	-	-	-	-	-	-	-	-	-	-
MB11S494	-	-	-	-	-	-	-	-	-	-	-	-
MB11S495	-	-	-	-	-	-	-	-	-	-	-	-
MB11S497	-	-	-	-	-	-	-	-	-	-	-	-
MB11S498	10.50	8.69	1.81	10.24	9.05	1.19	10.47	7.45	3.02	-	-	-
MB11S501	-	-	-	-	-	-	11.12	10.01	1.11	-	-	-
MB11S502	-	-	-	-	-	-	-	-	-	-	-	-
MB11S504	-	-	-	-	-	-	-	-	-	-	-	-
MB11S505	9.23	10.18	-0.95	-	-	-	-	-	-	-	-	-
MB11S507	-	-	-	-	-	-	-	-	-	-	-	-
MB11S508	-	-	-	-	-	-	-	-	-	-	-	-
MB11S511	-	-	-	-	-	-	-	-	-	-	-	-
MB11S512	12.63	12.16	0.47	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Table K1 – continued…

Individual Number	Left Ribs 9-10						Right Ribs 9-10					
	Left Ribs 9-10			Left Ribs 9-10			Right Ribs 9-10			Right Ribs 9-10		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S514	-	-	-	-	-	-	-	-	-	-	-	-
MB11S516	-	-	-	-	-	-	-	-	-	-	-	-
MB11S518	-	-	-	-	-	-	-	-	-	-	-	-
MB11S519	-	-	-	-	-	-	-	-	-	-	-	-
MB11S520	-	-	-	-	-	-	-	-	-	-	-	-
MB11S521	-	-	-	-	-	-	-	-	-	-	-	-
MB11S522	-	-	-	-	-	-	-	-	-	-	-	-
MB11S523	-	-	-	-	-	-	-	-	-	-	-	-
MB11S524	-	-	-	-	-	-	-	-	-	-	-	-
MB11S525	-	-	-	-	-	-	-	-	-	-	-	-
MB11S526	-	-	-	-	-	-	-	-	-	-	-	-
MB11S527	-	-	-	-	-	-	-	-	-	-	-	-
MB11S530	-	-	-	-	-	-	-	-	-	-	-	-
MB11S533	-	-	-	-	-	-	-	-	-	-	-	-
MB11S534	-	-	-	-	-	-	-	-	-	-	-	-
MB11S538	-	-	-	-	-	-	-	-	-	-	-	-
MB11S540	-	-	-	-	-	-	-	-	-	-	-	-
MB11S543	-	-	-	-	-	-	-	-	-	-	-	-
MB11S544	-	-	-	-	-	-	-	-	-	-	-	-
MB11S545	-	-	-	-	-	-	-	-	-	-	-	-
MB11S549	7.78	8.45	-0.67	-	-	-	7.97	8.2	-0.23	-	-	-
MB11S550	-	-	-	-	-	-	-	-	-	-	-	-
MB11S552	-	-	-	-	-	-	-	-	-	-	-	-
MB11S553	-	-	-	-	-	-	-	-	-	-	-	-

Legend – All measurements in millimeters.
Note – "-" = missing/damaged.

Appendix L - Ribs 11-12 Measurements, Z-Scores, and Non-Metric Features

Table L1 – Ribs 11-12 Metric Measures

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S006	-	-	-	-	-	-	-	-	-	-	-	-
KER15S007	-	-	-	-	-	-	-	-	-	-	-	-
KER15S008	-	-	-	-	-	-	-	-	-	-	-	-
KER15S009	-	-	-	-	-	-	-	-	-	-	-	-
KER15S010	-	-	-	-	-	-	-	-	-	-	-	-
KER15S011	-	-	-	-	-	-	-	-	-	-	-	-
KER15S012	8.32	10.61	-2.29	-	-	-	5.48	7.80	-2.32	-	-	-
KER15S014	-	-	-	-	-	-	-	-	-	-	-	-
KER15S015	-	-	-	-	-	-	-	-	-	-	-	-
KER15S016	9.97	12.29	-2.32	-	-	-	9.60	12.30	-2.70	-	-	-
KER15S017	-	-	-	-	-	-	-	-	-	-	-	-
KER15S018	4.93	8.83	-3.90	-	-	-	8.48	11.80	-3.32	-	-	-
KER15S019	-	-	-	-	-	-	-	-	-	-	-	-
KER15S020	-	-	-	-	-	-	-	-	-	-	-	-
KER15S021	-	-	-	-	-	-	-	-	-	-	-	-
KER15S023	-	-	-	-	-	-	-	-	-	-	-	-
KER15S024	-	-	-	-	-	-	-	-	-	-	-	-
KER15S025	-	-	-	-	-	-	-	-	-	-	-	-
KER15S026	-	-	-	-	-	-	4.13	10.06	-5.93	-	-	-
KER15S028	-	-	-	-	-	-	-	-	-	-	-	-
KER15S029	-	-	-	-	-	-	-	-	-	-	-	-
KER15S030	-	-	-	-	-	-	-	-	-	-	-	-
KER15S031	-	-	-	-	-	-	-	-	-	-	-	-
KER15S032	-	-	-	-	-	-	-	-	-	-	-	-
KER15S035	-	-	-	-	-	-	-	-	-	-	-	-
KER15S036	-	-	-	-	-	-	-	-	-	-	-	-
KER15S037	9.00	10.19	-1.19	-	-	-	-	-	-	-	-	-
KER15S038	-	-	-	-	-	-	-	-	-	-	-	-
KER15S040	-	-	-	-	-	-	-	-	-	-	-	-
KER15S042	4.5	8.74	-4.24	-	-	-	-	-	-	-	-	-
KER15S043	-	-	-	-	-	-	8.84	10.68	-1.84	-	-	-
KER15S044	9.46	11.79	-2.33	-	-	-	9.15	12.33	-3.18	-	-	-
KER15S045	-	-	-	-	-	-	-	-	-	-	-	-
KER15S046	-	-	-	-	-	-	-	-	-	-	-	-
KER15S047	-	-	-	-	-	-	-	-	-	-	-	-
KER15S050	-	-	-	-	-	-	-	-	-	-	-	-
KER15S051	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S052	-	-	-	-	-	-	-	-	-	-	-	-
KER15S053	-	-	-	-	-	-	-	-	-	-	-	-
KER15S054	-	-	-	-	-	-	-	-	-	-	-	-
KER15S055	-	-	-	-	-	-	-	-	-	-	-	-
KER15S056	-	-	-	-	-	-	-	-	-	-	-	-
KER15S057	10.31	10.18	0.13	7.53	-	-	-	-	-	-	-	-
KER15S058	-	-	-	-	-	-	-	-	-	-	-	-
KER15S059	6.84	8.51	-1.67	-	-	-	-	-	-	-	-	-
KER15S060	-	-	-	-	-	-	-	-	-	-	-	-
KER15S061	-	-	-	-	-	-	-	-	-	-	-	-
KER15S062	-	-	-	-	-	-	-	-	-	-	-	-
KER15S063	9.62	9.2	0.42	-	-	-	7.96	10.44	-2.48	-	-	-
KER15S064	-	-	-	-	-	-	5.93	10.65	-4.72	-	-	-
KER15S065	-	-	-	-	-	-	-	-	-	-	-	-
KER15S066	-	-	-	-	-	-	-	-	-	-	-	-
KER15S068	-	-	-	-	-	-	-	-	-	-	-	-
KER15S070	-	-	-	-	-	-	-	-	-	-	-	-
KER15S071	10.15	13.04	-2.89	-	-	-	-	-	-	-	-	-
KER15S072	-	-	-	-	-	-	-	-	-	-	-	-
KER15S073	-	-	-	-	-	-	-	-	-	-	-	-
KER15S074	-	-	-	-	-	-	-	-	-	-	-	-
KER15S075	-	-	-	-	-	-	-	-	-	-	-	-
KER15S076	8.27	11.65	-3.38	-	-	-	-	-	-	-	-	-
KER15S077	-	-	-	-	-	-	-	-	-	-	-	-
KER15S078	-	-	-	-	-	-	-	-	-	-	-	-
KER15S079	-	-	-	-	-	-	-	-	-	-	-	-
KER15S080	-	-	-	-	-	-	-	-	-	-	-	-
KER15S081	-	-	-	-	-	-	-	-	-	-	-	-
KER15S082	6.73	10.26	-3.53	-	-	-	5.70	9.95	-4.25	-	-	-
KER15S083	-	-	-	-	-	-	-	-	-	-	-	-
KER15S084	-	-	-	-	-	-	-	-	-	-	-	-
KER15S085	-	-	-	-	-	-	-	-	-	-	-	-
KER15S086	-	-	-	-	-	-	-	-	-	-	-	-
KER15S087	-	-	-	-	-	-	12.08	12.58	-0.50	-	-	-
KER15S088	-	-	-	-	-	-	-	-	-	-	-	-
KER15S089	9.40	11.04	-1.64	-	-	-	-	-	-	-	-	-
KER15S090	-	-	-	-	-	-	-	-	-	-	-	-
KER15S091	-	-	-	-	-	-	-	-	-	-	-	-
KER15S092	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S093	-	-	-	-	-	-	-	-	-	4.02	8.68	-4.66
KER15S094	-	-	-	6.32	10.20	-3.88	-	-	-	6.92	11.54	-4.62
KER15S096	-	-	-	-	-	-	-	-	-	-	-	-
KER15S097	5.41	7.57	-2.16	-	-	-	-	-	-	-	-	-
KER15S098	-	-	-	-	-	-	-	-	-	4.58	5.33	-0.75
KER15S099	-	-	-	-	-	-	-	-	-	-	-	-
KER15S100	-	-	-	-	-	-	-	-	-	-	-	-
KER15S101	8.10	10.63	-2.53	-	-	-	7.74	9.93	-2.19	8.47	10.87	-2.40
KER15S102	4.69	6.93	-2.24	3.65	6.92	-3.27	-	-	-	-	-	-
KER15S103	8.62	12.13	-3.51	-	-	-	6.60	10.35	-3.75	-	-	-
KER15S105	-	-	-	-	-	-	-	-	-	-	-	-
KER15S106	5.18	8.78	-3.60	4.85	7.43	-2.58	5.90	9.69	-3.79	6.23	11.71	-5.48
KER15S107	-	-	-	-	-	-	-	-	-	-	-	-
KER15S108	-	-	-	-	-	-	-	-	-	-	-	-
KER15S109	-	-	-	-	-	-	-	-	-	-	-	-
KER15S110	-	-	-	-	-	-	-	-	-	-	-	-
KER15S111	-	-	-	-	-	-	-	-	-	-	-	-
KER15S112	-	-	-	-	-	-	-	-	-	-	-	-
KER15S113	-	-	-	-	-	-	-	-	-	-	-	-
KER15S114	-	-	-	-	-	-	-	-	-	-	-	-
KER15S115	-	-	-	-	-	-	8.02	11.24	-3.22	-	-	-
KER15S116	-	-	-	-	-	-	-	-	-	-	-	-
KER15S117	-	-	-	-	-	-	7.17	9.80	-2.63	-	-	-
KER15S119a	-	-	-	-	-	-	-	-	-	-	-	-
KER15S119b	-	-	-	-	-	-	-	-	-	-	-	-
KER15S120	2.30	6.20	-3.90	-	-	-	-	-	-	-	-	-
KER15S122	-	-	-	-	-	-	-	-	-	-	-	-
HT15S124	-	-	-	-	-	-	-	-	-	-	-	-
HT15S126	-	-	-	-	-	-	-	-	-	-	-	-
KER15S127	7.29	9.00	-1.71	-	-	-	-	-	-	-	-	-
KER15S129	8.22	11.20	-2.98	5.83	9.79	-3.96	8.60	10.73	-2.13	-	-	-
KER15S130	7.22	10.85	-3.63	-	-	-	4.99	7.87	-2.88	-	-	-
KER15S132	-	-	-	-	-	-	-	-	-	-	-	-
KER15S133	-	-	-	-	-	-	2.99	8.83	-5.84	-	-	-
KER15S134	-	-	-	-	-	-	-	-	-	-	-	-
KER15S136	-	-	-	-	-	-	-	-	-	-	-	-
KER15S142	-	-	-	-	-	-	-	-	-	-	-	-
KER15S143	7.05	9.04	-1.99	-	-	-	-	-	-	-	-	-
KER15S145	4.22	8.66	-4.44	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
KER15S150	-	-	-	-	-	-	5.58	8.26	-2.68	-	-	-
KER15S151	-	-	-	-	-	-	-	-	-	-	-	-
KER15S154	-	-	-	-	-	-	-	-	-	-	-	-
MB11S019	-	-	-	-	-	-	-	-	-	-	-	-
MB11S029	-	-	-	-	-	-	-	-	-	-	-	-
MB11S040	-	-	-	-	-	-	-	-	-	-	-	-
MB11S044	-	-	-	-	-	-	-	-	-	-	-	-
MB11S045	6.93	9.62	-2.69	-	-	-	-	-	-	-	-	-
MB11S047	-	-	-	-	-	-	-	-	-	-	-	-
MB11S051	-	-	-	-	-	-	-	-	-	-	-	-
MB11S053	-	-	-	-	-	-	-	-	-	-	-	-
MB11S056	-	-	-	-	-	-	-	-	-	-	-	-
MB11S059	-	-	-	-	-	-	5.39	8.97	-3.58	-	-	-
MB11S060	-	-	-	-	-	-	-	-	-	-	-	-
MB11S064	-	-	-	-	-	-	-	-	-	-	-	-
MB11S070	-	-	-	-	-	-	-	-	-	-	-	-
MB11S077	-	-	-	-	-	-	-	-	-	-	-	-
MB11S083	-	-	-	-	-	-	-	-	-	-	-	-
MB11S084	-	-	-	-	-	-	-	-	-	-	-	-
MB11S088	-	-	-	-	-	-	-	-	-	3.89	7.00	-3.11
MB11S092	-	-	-	-	-	-	-	-	-	-	-	-
MB11S093	-	-	-	-	-	-	-	-	-	-	-	-
MB11S097	-	-	-	-	-	-	6.70	9.65	-2.95	-	-	-
MB11S100	-	-	-	-	-	-	6.84	9.63	-2.79	9.52	11.65	-2.13
MB11S101	1.43	4.80	-3.37	-	-	-	-	-	-	-	-	-
MB11S107	-	-	-	-	-	-	-	-	-	-	-	-
MB11S108	-	-	-	-	-	-	-	-	-	-	-	-
MB11S110	-	-	-	-	-	-	-	-	-	-	-	-
MB11S121	-	-	-	-	-	-	-	-	-	-	-	-
MB11S123	-	-	-	-	-	-	-	-	-	-	-	-
MB11S126	-	-	-	-	-	-	-	-	-	-	-	-
MB11S129	-	-	-	-	-	-	-	-	-	-	-	-
MB11S137	-	-	-	-	-	-	-	-	-	-	-	-
MB11S144	-	-	-	-	-	-	-	-	-	-	-	-
MB11S149	-	-	-	-	-	-	-	-	-	-	-	-
MB11S151	-	-	-	-	-	-	-	-	-	-	-	-
MB11S153	-	-	-	-	-	-	-	-	-	-	-	-
MB11S155a	10.94	11.81	-0.87	-	-	-	-	-	-	-	-	-
MB11S155b	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S157	-	-	-	-	-	-	-	-	-	-	-	-
MB11S158	-	-	-	-	-	-	10.90	11.78	-0.88	-	-	-
MB11S159	-	-	-	-	-	-	-	-	-	-	-	-
MB11S160	-	-	-	-	-	-	7.71	-	-	-	-	-
MB11S162	-	-	-	-	-	-	5.01	9.46	-4.45	-	-	-
MB11S167	-	-	-	-	-	-	-	-	-	-	-	-
MB11S170	6.98	8.79	-1.81	-	-	-	-	-	-	-	-	-
MB11S174	-	-	-	-	-	-	-	-	-	-	-	-
MB11S180	6.11	9.00	-2.89	-	-	-	-	-	-	-	-	-
MB11S183	-	-	-	-	-	-	-	-	-	-	-	-
MB11S186	-	-	-	-	-	-	-	-	-	-	-	-
MB11S192	-	-	-	-	-	-	-	-	-	-	-	-
MB11S194	10.34	11.05	-0.71	-	-	-	-	-	-	-	-	-
MB11S195	-	-	-	-	-	-	-	-	-	-	-	-
MB11S198	-	-	-	-	-	-	-	-	-	-	-	-
MB11S202	-	-	-	-	-	-	-	-	-	-	-	-
MB11S205	-	-	-	-	-	-	-	-	-	-	-	-
MB11S206	-	-	-	-	-	-	-	-	-	-	-	-
MB11S207	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	6.14	8.35	-2.21	3.09	9.60	-6.51	7.41	8.84	-1.43	2.82	8.86	-6.04
MB11S220	-	-	-	-	-	-	-	-	-	-	-	-
MB11S225	-	-	-	-	-	-	-	-	-	-	-	-
MB11S226	12.26	10.80	1.46	9.39	11.60	-2.21	5.29	9.4	-4.11	-	-	-
MB11S228	-	-	-	-	-	-	-	-	-	-	-	-
MB11S229	5.63	-	-	-	-	-	-	-	-	-	-	-
MB11S233	-	-	-	-	-	-	-	-	-	-	-	-
MB11S234	-	-	-	-	-	-	-	-	-	-	-	-
MB11S235	-	-	-	-	-	-	-	-	-	-	-	-
MB11S236	-	-	-	-	-	-	-	-	-	-	-	-
MB11S237	-	-	-	-	-	-	-	-	-	-	-	-
MB11S238	-	-	-	-	-	-	-	-	-	-	-	-
MB11S239	-	-	-	-	-	-	-	-	-	-	-	-
MB11S240	-	-	-	-	-	-	-	-	-	-	-	-
MB11S242	6.18	9	-2.82	5.18	8.88	-3.7	6.71	8.57	-1.86	5.95	9.04	-3.09
MB11S243	-	-	-	-	-	-	-	-	-	-	-	-
MB11S246	-	-	-	-	-	-	-	-	-	-	-	-
MB11S247	-	-	-	-	-	-	-	-	-	-	-	-
MB11S248	7.24	7.69	-0.45	-	-	-	-	-	-	-	-	-
MB11S249	-	-	-	-	-	-	4.78	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S250	-	-	-	-	-	-	-	-	-	-	-	-
MB11S251	2.71	7.73	-5.02	-	-	-	6.74	9.46	-2.72	-	-	-
MB11S253	-	-	-	-	-	-	-	-	-	-	-	-
MB11S254	-	-	-	-	-	-	-	-	-	-	-	-
MB11S257	5.07	8.19	-3.12	-	-	-	2.31	8.53	-6.22	-	-	-
MB11S260	-	-	-	-	-	-	-	-	-	-	-	-
MB11S261	-	-	-	-	-	-	-	-	-	-	-	-
MB11S263	-	-	-	8.4	9.81	-1.41	-	-	-	-	-	-
MB11S267	-	-	-	-	-	-	5.17	8.43	-3.26	-	-	-
MB11S269a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S269c	-	-	-	-	-	-	5.17	6.26	-1.09	-	-	-
MB11S270	8.44	10.81	-2.37	-	-	-	7.34	10.39	-3.05	-	-	-
MB11S271	-	-	-	-	-	-	-	-	-	-	-	-
MB11S275	3.91	6.49	-2.58	-	-	-	5.67	8.44	-2.77	3.16	6.47	-3.31
MB11S278	8.86	8.31	0.55	3.88	8.2	-4.32	7.63	8.2	-0.57	8.06	7.94	0.12
MB11S281	9.02	10.03	-1.01	-	-	-	11.4	12.03	-0.63	5.99	10.36	-4.37
MB11S282	-	-	-	-	-	-	-	-	-	-	-	-
MB11S285	-	-	-	13.55	15.93	-2.38	-	-	-	-	-	-
MB11S286	7	7.15	-0.15	-	-	-	8.19	6.92	1.27	-	-	-
MB11S289	-	-	-	-	-	-	-	-	-	-	-	-
MB11S290	9.79	10.18	-0.39	6.41	10.17	-3.76	-	-	-	-	-	-
MB11S292	-	-	-	-	-	-	-	-	-	-	-	-
MB11S294	-	-	-	-	-	-	-	-	-	-	-	-
MB11S297	-	-	-	-	-	-	-	-	-	-	-	-
MB11S301a	5.23	8.14	-2.91	-	-	-	9.52	10.01	-0.49	5.59	8.23	-2.64
MB11S301b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S302	-	-	-	-	-	-	-	-	-	-	-	-
MB11S303	-	-	-	-	-	-	-	-	-	-	-	-
MB11S306	-	-	-	-	-	-	-	-	-	-	-	-
MB11S307	-	-	-	3.3	4.64	-1.34	-	-	-	-	-	-
MB11S309	2.88	8.29	-5.41	-	-	-	6.05	6.25	-0.2	-	-	-
MB11S310	-	-	-	-	-	-	-	-	-	-	-	-
MB11S311	-	-	-	-	-	-	-	-	-	-	-	-
MB11S313	13.7	13.87	-0.17	10.11	12.6	-2.49	-	-	-	-	-	-
MB11S317	-	-	-	-	-	-	-	-	-	-	-	-
MB11S319	-	-	-	-	-	-	5.54	8.74	-3.2	-	-	-
MB11S321	-	-	-	-	-	-	-	-	-	-	-	-
MB11S324	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S325	7.27	11.3	-4.03	-	-	-	-	-	-	-	-	-
MB11S327	-	-	-	-	-	-	-	-	-	-	-	-
MB11S331	3.85	6.78	-2.93	-	-	-	-	-	-	-	-	-
MB11S334	8.11	7.51	0.6	-	-	-	-	-	-	5.9	6.69	-0.79
MB11S337	11.78	12.63	-0.85	-	-	-	10.98	13	-2.02	7.31	9.39	-2.08
MB11S338	-	-	-	-	-	-	-	-	-	-	-	-
MB11S339	-	-	-	5.88	8.96	-3.08	-	-	-	6.19	10.17	-3.98
MB11S340	-	-	-	-	-	-	-	-	-	-	-	-
MB11S341	-	-	-	-	-	-	-	-	-	-	-	-
MB11S342	-	-	-	-	-	-	-	-	-	-	-	-
MB11S344	-	-	-	-	-	-	-	-	-	-	-	-
MB11S345	-	-	-	-	-	-	5.64	9.78	-4.14	4.38	8.59	-4.21
MB11S346	-	-	-	-	-	-	-	-	-	-	-	-
MB11S347	-	-	-	11.73	11.99	-0.26	-	-	-	-	-	-
MB11S349	-	-	-	-	-	-	-	-	-	-	-	-
MB11S350	-	-	-	4.08	7.60	-3.52	14.30	13.36	0.94	-	-	-
MB11S355	-	-	-	-	-	-	-	-	-	-	-	-
MB11S356	-	-	-	-	-	-	-	-	-	-	-	-
MB11S357	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	-	-	-	-	-	-	10.26	6.33	3.93	-	-	-
MB11S359	-	-	-	-	-	-	-	-	-	-	-	-
MB11S360	-	-	-	-	-	-	-	-	-	-	-	-
MB11S363	-	-	-	-	-	-	-	-	-	-	-	-
MB11S367	3.25	5.34	-2.09	-	-	-	-	-	-	3.03	5.46	-2.43
MB11S368	9.10	10.28	-1.18	-	-	-	9.28	10.55	-1.27	-	-	-
MB11S369	5.11	8.16	-3.05	-	-	-	-	-	-	-	-	-
MB11S370	-	-	-	-	-	-	-	-	-	-	-	-
MB11S371	13.78	15.00	-1.22	-	-	-	3.06	9.15	-6.09	-	-	-
MB11S374	-	-	-	-	-	-	-	-	-	-	-	-
MB11S375	-	-	-	-	-	-	-	-	-	-	-	-
MB11S377	-	-	-	-	-	-	-	-	-	-	-	-
MB11S379	8.55	11.21	-2.66	-	-	-	10.71	11.51	-0.80	-	-	-
MB11S380	-	-	-	-	-	-	3.58	7.78	-4.20	-	-	-
MB11S382	-	-	-	-	-	-	-	-	-	-	-	-
MB11S383	-	-	-	-	-	-	-	-	-	-	-	-
MB11S385	-	-	-	-	-	-	-	-	-	-	-	-
MB11S386	-	-	-	-	-	-	-	-	-	-	-	-
MB11S387	-	-	-	-	-	-	-	-	-	-	-	-
MB11S388	8.06	9.58	-1.52	5.61	9.58	-3.97	8.94	10.64	-1.70	5.26	9.66	-4.40

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continue…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S390	-	-	-	-	-	-	-	-	-	-	-	-
MB11S391	-	-	-	-	-	-	-	-	-	-	-	-
MB11S392	-	-	-	-	-	-	-	-	-	-	-	-
MB11S394	-	-	-	-	-	-	-	-	-	-	-	-
MB11S399	-	-	-	-	-	-	-	-	-	-	-	-
MB11S401	8.34	10.20	-1.86	5.39	7.35	-1.96	3.63	6.13	-2.50	-	-	-
MB11S402	7.65	8.21	-0.56	-	-	-	-	-	-	6.30	11.2	-4.90
MB11S404	-	-	-	-	-	-	-	-	-	-	-	-
MB11S405	-	-	-	-	-	-	-	-	-	-	-	-
MB11S407	-	-	-	-	-	-	-	-	-	-	-	-
MB11S409	-	-	-	-	-	-	1.85	5.51	-3.66	-	-	-
MB11S411	-	-	-	-	-	-	-	-	-	-	-	-
MB11S413	-	-	-	-	-	-	-	-	-	3.4	5.47	-2.07
MB11S415	-	-	-	-	-	-	-	-	-	-	-	-
MB11S416	11.29	11.08	0.21	9.49	10.66	-1.17	13.04	12.48	0.56	8.18	10.36	-2.18
MB11S420	-	-	-	-	-	-	-	-	-	-	-	-
MB11S422	-	-	-	-	-	-	-	-	-	-	-	-
MB11S426	-	-	-	-	-	-	-	-	-	-	-	-
MB11S427	-	-	-	-	-	-	-	-	-	-	-	-
MB11S428	-	-	-	-	-	-	9.03	14.31	-5.28	-	-	-
MB11S430	5.09	7.52	-2.43	-	-	-	-	-	-	-	-	-
MB11S432	-	-	-	-	-	-	-	-	-	-	-	-
MB11S434	6.41	10.57	-4.16	-	-	-	5.79	8.22	-2.43	-	-	-
MB11S435	-	-	-	-	-	-	12.23	12.36	-0.13	11.09	13.13	-2.04
MB11S436	-	-	-	-	-	-	-	-	-	-	-	-
MB11S437	9.04	10.21	-1.17	4.89	7.48	-2.59	-	-	-	5.89	8.58	-2.69
MB11S441	-	-	-	-	-	-	9.41	11.5	-2.09	-	-	-
MB11S446	-	-	-	-	-	-	9.17	9.49	-0.32	6.89	10.07	-3.18
MB11S452	-	-	-	-	-	-	-	-	-	-	-	-
MB11S453	-	-	-	-	-	-	-	-	-	-	-	-
MB11S454	6.55	8.58	-2.03	6.12	8.31	-2.19	-	-	-	-	-	-
MB11S455	-	-	-	-	-	-	-	-	-	-	-	-
MB11S456	7.95	9.09	-1.14	-	-	-	5.07	7.97	-2.9	-	-	-
MB11S457	10.76	12.18	-1.42	-	-	-	11.77	11.35	0.42	-	-	-
MB11S460	-	-	-	-	-	-	-	-	-	-	-	-
MB11S461	-	-	-	-	-	-	-	-	-	-	-	-
MB11S462	-	-	-	-	-	-	-	-	-	-	-	-
MB11S464	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S465	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S466b	-	-	-	-	-	-	6.01	9.96	-3.95	-	-	-
MB11S467	-	-	-	-	-	-	-	-	-	-	-	-
MB11S468	9.35	11.54	-2.19	6.70	11.47	-4.77	-	-	-	-	-	-
MB11S469	-	-	-	-	-	-	-	-	-	-	-	-
MB11S470	-	-	-	-	-	-	-	-	-	-	-	-
MB11S471	-	-	-	-	-	-	-	-	-	-	-	-
MB11S473	-	-	-	-	-	-	6.67	8.66	-1.99	-	-	-
MB11S474	-	-	-	-	-	-	7.11	10.32	-3.21	-	-	-
MB11S476	6.21	10.66	-4.45	-	-	-	7.23	11.75	-4.52	4.88	8.44	-3.56
MB11S477	12.62	-	-	-	-	-	-	-	-	-	-	-
MB11S479	-	-	-	-	-	-	-	-	-	-	-	-
MB11S481	-	-	-	-	-	-	-	-	-	-	-	-
MB11S482	11.16	12.47	-1.31	-	-	-	5.30	11.52	-6.22	-	-	-
MB11S484	-	-	-	-	-	-	-	-	-	-	-	-
MB11S485	-	-	-	-	-	-	-	-	-	-	-	-
MB11S487	-	-	-	-	-	-	-	-	-	-	-	-
MB11S488	10.29	8.82	1.47	7.29	8.5	-1.21	11.24	9.67	1.57	7.07	8.87	-1.80
MB11S489	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490a	-	-	-	-	-	-	-	-	-	-	-	-
MB11S490b	-	-	-	-	-	-	-	-	-	-	-	-
MB11S492	-	-	-	-	-	-	-	-	-	-	-	-
MB11S494	-	-	-	-	-	-	-	-	-	-	-	-
MB11S495	-	-	-	-	-	-	-	-	-	-	-	-
MB11S497	-	-	-	-	-	-	-	-	-	-	-	-
MB11S498	7.23	8.98	-1.75	3.99	8.26	-4.27	8.31	8.78	-0.47	2.04	5.24	-3.20
MB11S501	-	-	-	-	-	-	-	-	-	-	-	-
MB11S502	8.92	9.30	-0.38	7.20	9.18	-1.98	10.45	10.87	-0.42	8.00	10.73	-2.73
MB11S504	-	-	-	-	-	-	-	-	-	-	-	-
MB11S505	-	-	-	-	-	-	-	-	-	-	-	-
MB11S507	-	-	-	-	-	-	6.76	9.40	-2.64	4.90	8.60	-3.70
MB11S508	-	-	-	-	-	-	-	-	-	-	-	-
MB11S511	-	-	-	-	-	-	-	-	-	-	-	-
MB11S512	-	-	-	-	-	-	8.30	11.11	-2.81	-	-	-
MB11S514	-	-	-	-	-	-	5.90	10.08	-4.18	-	-	-
MB11S516	-	-	-	-	-	-	-	-	-	-	-	-
MB11S518	-	-	-	-	-	-	-	-	-	-	-	-
MB11S519	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L1 – continued…

Individual Number	Left Ribs 11-12						Right Ribs 11-12					
	Left Ribs 11-12			Left Ribs 11-12			Right Ribs 11-12			Right Ribs 11-12		
	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio	Diameter	Diameter 15 mm from end	Ratio
MB11S520	5.03	11.08	-6.05	-	-	-	-	-	-	-	-	-
MB11S521	-	-	-	-	-	-	3.98	7.38	-3.40	-	-	-
MB11S522	-	-	-	-	-	-	-	-	-	-	-	-
MB11S523	-	-	-	-	-	-	-	-	-	-	-	-
MB11S524	9.02	12.01	-2.99	-	-	-	-	-	-	-	-	-
MB11S525	8.09	11.10	-3.01	-	-	-	-	-	-	-	-	-
MB11S526	-	-	-	-	-	-	-	-	-	-	-	-
MB11S527	-	-	-	-	-	-	6.40	9.05	-2.65	-	-	-
MB11S530	-	-	-	-	-	-	-	-	-	-	-	-
MB11S533	-	-	-	-	-	-	-	-	-	-	-	-
MB11S534	-	-	-	-	-	-	-	-	-	-	-	-
MB11S538	-	-	-	-	-	-	-	-	-	-	-	-
MB11S540	-	-	-	-	-	-	-	-	-	-	-	-
MB11S543	-	-	-	-	-	-	-	-	-	-	-	-
MB11S544	10.10	13.28	-3.18	-	-	-	-	-	-	-	-	-
MB11S545	7.20	7.43	-0.23	-	-	-	-	-	-	-	-	-
MB11S549	-	-	-	-	-	-	3.70	6.83	-3.13	-	-	-
MB11S550	7.56	9.14	-1.58	-	-	-	-	-	-	-	-	-
MB11S552	-	-	-	-	-	-	-	-	-	-	-	-
MB11S553	-	-	-	-	-	-	-	-	-	-	-	-

Legend – "-" = missing/damaged.
Note – All measurements in millimeters.

Table L2 –Ribs 11-12 z-score

Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio		Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio	
			1	2	1	2				1	2	1	2
KER15S006	M	26-35	-	-	-	-	**MB11S238**	M	18-25	-	-	-	-
KER15S007	F	36-49	-	-	-	-	**MB11S239**	M	23	-	-	-	-
KER15S008	A	50+	-	-	-	-	**MB11S240**	M	36-49	-	-	-	-
KER15S009	M	36-49	-	-	-	-	**MB11S242**	M	50+	-0.4	-1.0	0.7	-0.1
KER15S010	M	36-49	-	-	-	-	**MB11S243**	F	62	-	-	-	-
KER15S011	M	36-49	-	-	-	-	**MB11S246**	U	19	-	-	-	-
KER15S012	F	36-49	0.2	-	0.1	-	**MB11S247**	M	50+	-	-	-	-
KER15S014	F	18-25	-	-	-	-	**MB11S248**	F	9	-	-	-	-
KER15S015	M	36-49	-	-	-	-	**MB11S249**	M	26-35	-	-	-	-
KER15S016	M	18-25	-0.1	-	0.2	-	**MB11S250**	M	73	-	-	-	-
KER15S017	M	36-49	-	-	-	-	**MB11S251**	M	36-49	-1.9	-	0.1	-
KER15S018	M	18-25	-1.2	-	-0.2	-	**MB11S253**	M	78	-	-	-	-
KER15S019	M	50+	-	-	-	-	**MB11S254**	M	36-49	-	-	-	-
KER15S020	U	15 ± 2 yrs.	-	-	-	-	**MB11S257**	M	26-35	-0.6	-	-2.0	-
KER15S021	M	36-49	-	-	-	-	**MB11S260**	M	18-25	-	-	-	-
KER15S023	F	18-25	-	-	-	-	**MB11S261**	M	79	-	-	-	-
KER15S024	M	36-49	-	-	-	-	**MB11S263**	M	36-49	0.6	-	-	-
KER15S025	M	36-49	-	-	-	-	**MB11S267**	M	26-35	-	-	-0.2	-
KER15S026	M	36-49	-	-	-1.8	-	**MB11S269a**	M	18+	-	-	-	-
KER15S028	F	36-49	-	-	-	-	**MB11S269b**	U	11 ± 30 mo.	-	-	-	-
KER15S029	M	36-49	-	-	-	-	**MB11S269c**	U	10 ± 1 yr.	-	-	-	-
KER15S030	M	36-49	-	-	-	-	**MB11S270**	M	18-25	-0.1	-	-0.1	-
KER15S031	U	17 ± 1 yr.	-	-	-	-	**MB11S271**	M	50+	-	-	-	-
KER15S032	F	36-49	-	-	-	-	**MB11S275**	U	15 ± 1 yr.	-	-	-	-
KER15S035	F	26-35	-	-	-	-	**MB11S278**	F	36-49	**1.9**	-1	1.0	1.3
KER15S036	M	36-49	-	-	-	-	**MB11S281**	M	36-49	0.8	-	1.4	-0.9
KER15S037	M	50+	0.7	-	-	-	**MB11S282**	U	12 ± 12 mo.	-	-	-	-
KER15S038	F	36-49	-	-	-	-	**MB11S285**	M	71	-0.1	-	-	-
KER15S040	M	18+	-	-	-	-	**MB11S286**	F	10	-	-	-	-
KER15S042	M	36-49	-1.4	-	-	-	**MB11S289**	M	50+	-	-	-	-
KER15S043	M	36-49	-	-	0.7	-	**MB11S290**	M	18-25	1.3	-1.1	-	-
KER15S044	M	36-49	-0.1	-	-0.1	-	**MB11S292**	U	11 ± 1 yr.	-	-	-	-
KER15S045	M	36-49	-	-	-	-	**MB11S294**	F	66	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.
Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Table L2 – continued…

Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio		Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio	
			1	2	1	2				1	2	1	2
KER15S046	M	26-35	-	-	-	-	**MB11S297**	M	84	-	-	-	-
KER15S047	A	26-35	-	-	-	-	**MB11S301a**	F	36-49	-0.2	-	1.0	-0.1
KER15S050	A	18+	-	-	-	-	**MB11S301b**	U	6-10	-	-	-	-
KER15S051	F	26-35	-	-	-	-	**MB11S302**	F	50+	-	-	-	-
KER15S052	F	50+	-	-	-	-	**MB11S303**	F	44	-	-	-	-
KER15S053	U	15 ± 1 yr.	-	-	-	-	**MB11S306**	M	31	-	-	-	-
KER15S054	A	26-35	-	-	-	-	**MB11S307**	U	13-17	-	-	-	-
KER15S055	F	36+	-	-	-	-	**MB11S309**	F	58	-1.7	-	1.2	-
KER15S056	F	36-49	-	-	-	-	**MB11S310**	M	35	-	-	-	-
KER15S057	F	50+	**1.6**	-	-	-	**MB11S311**	F	18-25	-	-	-	-
KER15S058	M	26-35	-	-	-	-	**MB11S313**	M	46	1.4	-0.2	-	-
KER15S059	F	36-49	0.5	-	-	-	**MB11S317**	M	80	-	-	-	-
KER15S060	U	10 ± 1 yr.	-	-	-	-	**MB11S319**	F	69	-	-	-0.4	-
KER15S061	M	36-49	-	-	-	-	**MB11S321**	M	50+	-	-	-	-
KER15S062	F	36-49	-	-	-	-	**MB11S324**	M	36-49	-	-	-	-
KER15S063	F	36-49	**1.8**	-	0.0	-	**MB11S325**	M	36	-1.3	-	-	-
KER15S064	M	36-49	-	-	-1.1	-	**MB11S327**	F	36-49	-	-	-	-
KER15S065	M	36-49	-	-	-	-	**MB11S331**	F	74	-0.2	-	-	-
KER15S066	M	18+	-	-	-	-	**MB11S334**	F	9	-	-	-	-
KER15S068	F	18+	-	-	-	-	**MB11S337**	M	68	1.0	-	0.6	0.5
KER15S070	F	36-49	-	-	-	-	**MB11S338**	F	33	-	-	-	-
KER15S071	M	18-25	-0.5	-	-	-	**MB11S339**	F	64	-0.3	-	-0.8	-
KER15S072	F	36-49	-	-	-	-	**MB11S340**	U	19	-	-	-	-
KER15S073	U	10 ± 1 yr.	-	-	-	-	**MB11S341**	M	50+	-	-	-	-
KER15S074	M	36-49	-	-	-	-	**MB11S342**	M	75	-	-	-	-
KER15S075	F	36-49	-	-	-	-	**MB11S344**	F	20	-	-	-	-
KER15S076	M	26-35	-0.8	-	-	-	**MB11S345**	F	28	-	-	-0.9	-0.9
KER15S077	M	26-35	-	-	-	-	**MB11S346**	F	36-49	-	-	-	-
KER15S078	F	26-35	-	-	-	-	**MB11S347**	M	50+	1.4	-	-	-
KER15S079	U	12 ± 2 yrs.	-	-	-	-	**MB11S349**	M	50+	-	-	-	-
KER15S080	M	26-35	-	-	-	-	**MB11S350**	U	16 ± 1 yr.	-	-	-	-
KER15S081	A	18+	-	-	-	-	**MB11S355**	F	50+	-	-	-	-
KER15S082	F	50+	-0.6	-	-0.9	-	**MB11S356**	F	78	-	-	-	-
KER15S083	M	36-49	-	-	-	-	**MB11S357**	F	50+	-	-	-	-
KER15S084	F	36-49	-	-	-	-	**MB11S358**	F	74	-	-	**3.3**	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.
Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Table L2 – continued…

Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio		Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio	
			1	2	1	2				1	2	1	2
KER15S085	M	36-49	-	-	-	-	**MB11S359**	F	46	-	-	-	-
KER15S086	M	36-49	-	-	-	-	**MB11S360**	F	66	-	-	-	-
KER15S087	M	36-49	-	-	**1.5**	-	**MB11S363**	M	61	-	-	-	-
KER15S088	F	26-35	-	-	-	-	**MB11S367**	F	11	-	-	-	-
KER15S089	M	50+	0.4	-	-	-	**MB11S368**	M	26-35	0.7	-	1.0	-
KER15S090	F	50+	-	-	-	-	**MB11S369**	F	30	-0.3	-	-	-
KER15S091	F	36-49	-	-	-	-	**MB11S370**	F	36-49	-	-	-	-
KER15S092	F	50+	-	-	-	-	**MB11S371**	M	36-49	0.7	-	-1.9	-
KER15S093	F	26-35	-	-	-1.1	-	**MB11S374**	M	80	-	-	-	-
KER15S094	F	18-25	-0.8	-	-1.1	-	**MB11S375**	M	74	-	-	-	-
KER15S096	F	36-49	-	-	-	-	**MB11S377**	M	18+	-	-	-	-
KER15S097	F	50+	0.3	-	-	-	**MB11S379**	M	18-25	-0.3	-	1.3	-
KER15S098	F	26-35	-	-	0.9	-	**MB11S380**	M	36-49	-	-	-0.8	-
KER15S099	F	18-25	-	-	-	-	**MB11S382**	F	50+	-	-	-	-
KER15S100	M	26-35	-	-	-	-	**MB11S383**	F	55	-	-	-	-
KER15S101	M	36-49	-0.2	-	0.5	0.3	**MB11S385**	F	25	-	-	-	-
KER15S102	M	50+	0.0	-0.7	-	-	**MB11S386**	F	36-49	-	-	-	-
KER15S103	M	18-25	-0.9	-	-0.5	-	**MB11S387**	F	43	-	-	-	-
KER15S105	M	18-25	-	-	-	-	**MB11S388**	F	21	0.6	-0.8	0.4	-1.0
KER15S106	M	36-49	-1.0	-0.3	-0.5	-1.5	**MB11S390**	F	71	-	-	-	-
KER15S107	F	26-35	-	-	-	-	**MB11S391**	M	50+	-	-	-	-
KER15S108	M	36-49	-	-	-	-	**MB11S392**	F	50+	-	-	-	-
KER15S109	F	36-49	-	-	-	-	**MB11S394**	F	50+	-	-	-	-
KER15S110	F	18-25	-	-	-	-	**MB11S399**	A	36-49	-	-	-	-
KER15S111	M	26-35	-	-	-	-	**MB11S401**	F	26-35	0.4	0.4	0.0	-
KER15S112	M	26-35	-	-	-	-	**MB11S402**	M	36-49	1.2	-	-1.2	-
KER15S113	M	36-49	-	-	-	-	**MB11S404**	M	26-35	-	-	-	-
KER15S114	F	50+	-	-	-	-	**MB11S405**	F	36-49	-	-	-	-
KER15S115	M	36-49	-	-	-0.2	-	**MB11S407**	M	18+	-	-	-	-
KER15S116	F	36-49	-	-	-	-	**MB11S409**	F	18+	-	-	-0.6	-
KER15S117	F	36-49	-	-	-0.1	-	**MB11S411**	M	36-49	-	-	-	-
KER15S119a	U	12 ± 1 yr.	-	-	-	-	**MB11S413**	F	39	-	-	0.2	-
KER15S119b	U	14 ± 1 yr.	-	-	-	-	**MB11S415**	M	50+	-	-	-	-
KER15S120	F	18-25	-0.8	-	-	-	**MB11S416**	M	36-49	**1.7**	0.7	**2.1**	0.5
KER15S122	F	36-49	-	-	-	-	**MB11S420**	F	26-35	-	-	-	-
HT15S124	U	13 ± 1 yr.	-	-	-	-	**MB11S422**	F	29	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.
Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Table L2 – continued…

Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio		Individual Number	Sex	Age	Left ribs 11-12 Ratio		Right ribs 11-12 Ratio	
			1	2	1	2				1	2	1	2
HT15S126	U	8.5 ± 1.5 yrs.	-	-	-	-	**MB11S426**	F	55	-	-	-	-
KER15S127	U	9 ± 1 yr.	-	-	-	-	**MB11S427**	M	27	-	-	-	-
KER15S129	F	36-49	-0.2	-0.8	0.2	-	**MB11S428**	F	50+	-	-	-	-
KER15S130	M	18-25	-1.0	-	0.1	-	**MB11S430**	F	30	0.1	-	-	-
KER15S132	F	50+	-	-	-	-	**MB11S432**	M	26-35	-	-	-	-
KER15S133	F	18-25	-	-	-1.7	-	**MB11S434**	F	36-49	-0.9	-	0	-
KER15S134	M	36-49	-	-	-	-	**MB11S435**	M	45	-	-	**1.7**	0.6
KER15S136	U	13 ± 2 yrs.	-	-	-	-	**MB11S436**	F	18+	-	-	-	-
KER15S142	F	26-35	-	-	-	-	**MB11S437**	F	26-35	0.8	0.0	-0.1	-
KER15S143	M	36-49	0.2	-	-	-	**MB11S441**	F	23	-	-	0.2	-
KER15S145	F	36-49	-1.1	-	-	-	**MB11S446**	U	22	-	-	-	-
KER15S150	U	14 ± 1.5 yrs.	-	-	-	-	**MB11S452**	F	18-25	-	-	-	-
KER15S151	M	36-49	-	-	-	-	**MB11S453**	F	26-35	-	-	-	-
KER15S154	F	36+	-	-	-	-	**MB11S454**	U	21	-	-	-	-
MB11S019	A	18+	-	-	-	-	**MB11S455**	M	50+	-	-	-	-
MB11S029	M	50+	-	-	-	-	**MB11S456**	M	36-49	0.8	-	0	-
MB11S040	F	18-25	-	-	-	-	**MB11S457**	F	50+	0.7	-	**1.5**	-
MB11S044	U	12 ± 12 mo.	-	-	-	-	**MB11S460**	U	16.5 ± 36 mo.	-	-	-	-
MB11S045	F	47	-0.1	-	-	-	**MB11S461**	F	28	-	-	-	-
MB11S047	F	21	-	-	-	-	**MB11S462**	M	16	-	-	-	-
MB11S051	M	74	-	-	-	-	**MB11S464**	M	36-49	-	-	-	-
MB11S053	F	36-49	-	-	-	-	**MB11S465**	M	15	-	-	-	-
MB11S056	F	50+	-	-	-	-	**MB11S466a**	M	83	-	-	-	-
MB11S059	M	36-49	-	-	-0.4	-	**MB11S466b**	F	43	-	-	-0.8	-
MB11S060	F	18-25	-	-	-	-	**MB11S467**	M	26-35	-	-	-	-
MB11S064	M	26-35	-	-	-	-	**MB11S468**	F	36-49	0.2	-1.3	-	-
MB11S070	M	18+	-	-	-	-	**MB11S469**	M	43	-	-	-	-
MB11S077	F	58	-	-	-	-	**MB11S470**	M	50+	-	-	-	-
MB11S083	F	36-49	-	-	-	-	**MB11S471**	F	9	-	-	-	-
MB11S084	F	18+	-	-	-	-	**MB11S473**	M	42	-	-	0.6	-
MB11S088	F	26-35	-	-	-0.3	-	**MB11S474**	F	50+	-	-	-0.4	-
MB11S092	M	26-35	-	-	-	-	**MB11S476**	F	31	-1.1	-	-1.0	-0.6

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.
Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Table L2 – continued…

Individual Number	Sex	Age	Left ribs 11-12 Ratio Z-Score By Sex		Right ribs 11-12 Ratio Z-Score By Sex		Individual Number	Sex	Age	Left ribs 11-12 Ratio Z-Score By Sex		Right ribs 11-12 Ratio Z-Score By Sex	
			1	2	1	2				1	2	1	2
MB11S093	M	50+	-	-	-	-	**MB11S477**	M	61	-	-	-	-
MB11S097	F	50+	-	-	-0.2	-	**MB11S479**	U	12-18	-	-	-	-
MB11S100	M	18+	-	-	0.1	0.5	**MB11S481**	F	29	-	-	-	-
MB11S101	F	26-35	-0.5	-	-	-	**MB11S482**	M	36	0.6	-	-2.0	-
MB11S107	F	18-25	-	-	-	-	**MB11S484**	M	50+	-	-	-	-
MB11S108	M	26-35	-	-	-	-	**MB11S485**	F	36-49	-	-	-	-
MB11S110	F	26-35	-	-	-	-	**MB11S487**	F	29	-	-	-	-
MB11S121	F	36-49	-	-	-	-	**MB11S488**	F	36-49	**2.4**	0.8	**2.1**	0.4
MB11S123	U	13-17	-	-	-	-	**MB11S489**	M	36-49	-	-	-	-
MB11S126	F	36-49	-	-	-	-	**MB11S490a**	F	36-49	-	-	-	-
MB11S129	A	18-25	-	-	-	-	**MB11S490b**	M	18+	-	-	-	-
MB11S137	F	36-49	-	-	-	-	**MB11S492**	M	26-35	-	-	-	-
MB11S144	M	36-50	-	-	-	-	**MB11S494**	M	50+	-	-	-	-
MB11S149	F	26-35	-	-	-	-	**MB11S495**	F	26-35	-	-	-	-
MB11S151	F	26-35	-	-	-	-	**MB11S497**	M	26-35	-	-	-	-
MB11S153	M	57	-	-	-	-	**MB11S498**	F	50+	0.5	-1	1.0	-0.4
MB11S155a	M	50+	0.9	-	-	-	**MB11S501**	F	18-25	-	-	-	-
MB11S155b	F	50+	-	-	-	-	**MB11S502**	M	25	1.3	0.2	**1.5**	0.1
MB11S157	F	18+	-	-	-	-	**MB11S504**	F	36-49	-	-	-	-
MB11S158	M	60	-	-	1.3	-	**MB11S505**	M	18-25	-	-	-	-
MB11S159	F	76	-	-	-	-	**MB11S507**	U	14 ± 2 yrs.	-	-	-	-
MB11S160	F	26-35	-	-	-	-	**MB11S508**	M	50+	-	-	-	-
MB11S162	M	36-49	-	-	-0.9	-	**MB11S511**	M	50+	-	-	-	-
MB11S167	F	12	-	-	-	-	**MB11S512**	F	36-49	-	-	-0.2	-
MB11S170	F	50+	0.5	-	-	-	**MB11S514**	M	26-35	-	-	-0.7	-
MB11S174	F	36-49	-	-	-	-	**MB11S516**	M	50+	-	-	-	-
MB11S180	M	18-25	-0.5	-	-	-	**MB11S518**	F	18+	-	-	-	-
MB11S183	F	26-35	-	-	-	-	**MB11S519**	M	36-49	-	-	-	-
MB11S186	M	36-49	-	-	-	-	**MB11S520**	M	50+	-2.7	-	-	-
MB11S192	F	26-35	-	-	-	-	**MB11S521**	M	69	-	-	-0.3	-
MB11S194	M	50+	1.1	-	-	-	**MB11S522**	F	13	-	-	-	-
MB11S195	F	36-49	-	-	-	-	**MB11S523**	M	50+	-	-	-	-
MB11S198	F	26-35	-	-	-	-	**MB11S524**	M	36-49	-0.5	-	-	-
MB11S202	F	26-35	-	-	-	-	**MB11S525**	M	50+	-0.6	-	-	-
MB11S205	M	50+	-	-	-	-	**MB11S526**	M	50+ (50-72)	-	-	-	-
MB11S206	U	13-17	-	-	-	-	**MB11S527**	F	26-35	-	-	-0.1	-
MB11S207	F	50+	-	-	-	-	**MB11S530**	F	75	-	-	-	-
MB11S216	F	36-49	0.2	-2.3	0.5	-1.8	**MB11S533**	F	50-65	-	-	-	-
MB11S220	F	36-49	-	-	-	-	**MB11S534**	M	36-49	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.

Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Table L2 – continued…

Individual Number	**Sex**	**Age**	**Left ribs 11-12 Ratio Z-Score By Sex**		**Right ribs 11-12 Ratio Z-Score By Sex**		**Individual Number**	**Sex**	**Age**	**Left ribs 11-12 Ratio Z-Score By Sex**		**Right ribs 11-12 Ratio Z-Score By Sex**	
			1	2	1	2				1	2	1	2
MB11S225	M	50+	-	-	-	-	**MB11S538**	F	26-35	-	-	-	-
MB11S226	M	26-35	**2.6**	0.0	-0.7	-	**MB11S540**	U	20	-	-	-	-
MB11S228	M	36-49	-	-	-	-	**MB11S543**	F	18+	-	-	-	-
MB11S229	U	13-17	-	-	-	-	**MB11S544**	M	30	-0.7	-	-	-
MB11S233	M	18+	-	-	-	-	**MB11S545**	F	49	1.4	-	-	-
MB11S234	F	18-25	-	-	-	-	**MB11S549**	U	11 ± 24 mo.	-	-	-	-
MB11S235	M	18+	-	-	-	-	**MB11S550**	F	50+	0.6	-	-	-
MB11S236	M	24	-	-	-	-	**MB11S552**	M	18+	-	-	-	-
MB11S237	M	50+	-	-	-	-	**MB11S553**	F	36-49	-	-	-	-

Legend – M = male; F = female; A = Ambiguous Sex; U = Unknown Sex; yr./yrs. = year/years; mo. = months, "-" = missing/damaged.
Note – Significant z-scores are emboldened and red. Ribs 11 and 12 not ordered. Each rib distinguished by numbers 1-2.

Appendix M – List of Significant Z-Scores Not Used in the Identification of Adolescent Rickets

Table M1 – Counts of the significant z-scores for each measurement:

Measurement	Female	Male	Unknown Sex and Known Subadults	Total	Total R. and L. Combined
L. A-LDFA	8/62 (12.9%)	13/95 (13.7%)	-	21/157 (13.4%)	36/197 (18.3%)
R. A-LDFA	10/64 (15.6%)	11/85 (12.9%)	-	21/149 (14.1%)	
L. ulna min. circ	5/87 (5.7%)	11/115 (9.6%)	-	16/202 (7.9%)	22/244 (9.0%)
R. ulna min. circ	5/86 (5.8%)	6/106 (5.7%)	-	11/192 (5.7%)	
L. ulna circ 20mm	8/89 (9.0%)	14/111 (12.6%)	-	22/200 (11.0%)	25/234 (10.7%)
R. ulna circ 20mm	5/79 (6.3%)	8/98 (8.2%)	-	13/177 (7.3%)	
L. ulna ratio	4/60 (6.7%)	6/72 (8.3%)	-	10/132 (7.6%)	14/188 (7.4%)
R. ulna ratio	4/59 (8.2%)	4/71 (5.6%)	-	8/130 (6.2%)	
L. clav. diameter	6/61 (9.8%)	6/78 (7.7%)	-	12/139 (8.6%)	20/169 (11.8%)
R. clav. diameter	3/54 (5.6%)	8/72 (11.1%)	-	11/126 (8.7%)	
L. clav. ratio	3/47 (6.4%)	5/49 (10.2%)	-	8/96 (8.3%)	12/120 (10.0%)
R. clav. ratio	1/31 (3.2%)	5/45 (11.1%)	-	6/76 (7.9%)	
Sacrum	4/41 (9.8%)	3/50 (6.0%)	-	7/91 (7.7%)	7/91 (7.7%)
L. rib 1 ratio	5/51 (9.8%)	3/63 (4.8%)	-	8/114 (7.0%)	14/152 (9.2%)
R. rib 1 ratio	3/44 (6.8%)	3/74 (4.1%)	-	6/118 (5.1%)	
L. ribs 4-8 ratio	6/38 (15.8%)	6/57 (10.5%)	1/18 (5.6%)	13/113 (11.5%)	19/141 (13.5%)
R. ribs 4-8 ratio	5/40 (12.5%)	5/47 (10.6%)	0/13 (0%)	10/100 (10.0%)	
L. ribs 11-12 ratio	4/32 (12.5%)	2/42 (4.8%)	-	6/74 (8.1%)	11/105 (10.5%)
R. ribs 11-12 ratio	3/34 (8.8%)	4/37 (10.8%)	-	7/71 (9.9%)	

Legend: L=left; R=right; A- LDFA = Anatomical Lateral Distal Femoral Angle; circ=circumference; clav. = clavicle; "-" = not calculated.
Note - For the ribs, the total number is per individual, not rib end.

Table M2 – Significant z-scores for the long bones and sacrum:

Individual Number	Sex	Age	A-LDFA Sig. Z-Score		Ulna Circ. 20mm From end Sig. Z-Score		Ulna Ratio Sig. Z-Score		Clavicle Diameter Sig. Z-Score	
			L	R	L	R	L	R	L	R
KER15S010	M	36-49	-1.0	**-2.1**	-	0.0	-	0.3	-	-
KER15S017	M	36-49	**-2.6**	**-2.1**	-1.4	-	-	-	-0.6	-1.1
KER15S021	M	36-49	**-2.4**	-0.5	-0.2	-0.1	-	-0.2	-	1.2
KER15S025	M	36-49	**1.6**	-	-	-0.6	-	0.3	-	-
KER15S029	M	36-49	**1.7**	-	-	-	-	-	**2.6**	**1.5**
KER15S037	M	50+	**1.5**	0.1	**1.5**	**1.5**	-0.7	-	-	-
MB11S040	F	18-25	**-2.0**	-	-	-	-	-	-	-
KER15S044	M	36-49	-	-	**1.6**	**1.5**	-0.8	-0.4	0.0	-
MB11S059	M	36-49	-	-1.1	-	-	**-2.0**	-	-1.0	**-1.5**
MB11S060	F	18-25	-	-	-	-	-	**-1.7**	-1.1	-1.1
KER15S068	F	18+	-	**1.8**	-1.8	-	-	-	-	-
KER15S074	M	36-49	**-2.1**	**3.6**	1.0	**2.1**	-	-0.7	-	-
KER15S077	M	26-35	**-0.7**	**-1.5**	-0.8	-	0.6	-	-	-
KER15S078	F	26-35	**1.5**	0.8	-	-	-	-	0.2	-
KER15S087	M	36-49	0.6	-	**1.9**	**1.5**	-	-	-	0.1
KER15S092	F	50+	-	-	0.0	0.5	-0.1	-	**1.4**	**1.6**
KER15S094	F	18-25	0.7	**2.3**	**1.9**	1.4	-0.5	-0.1	-	0.5
MB11S100	M	18+	-0.2	-1.4	**1.8**	1.0	-	-1.4	**2.2**	-
KER15S106	M	36-49	**1.5**	0.7	**1.6**	1.0	-0.8	0.1	0.7	1.0
MB11S107	F	18-25	-	-	**1.6**	**2.4**	**-1.8**	-	-	-
KER15S109	F	36-49	-0.6	0.8	**1.6**	**2.1**	-0.2	-0.5	-	-
KER15S111	M	26-35	**1.5**	**2.5**	0.3	0.5	-0.3	-	-1.0	-0.8
KER15S114	F	50+	**1.7**	0.9	-0.7	-0.5	-	-	-	-
KER15S117	F	36-49	1.2	-	0.3	**1.8**	0.6	-0.5	-	-
KER15S130	M	18-25	-0.9	**-2.2**	-0.5	0.0	0.3	-	-0.8	-
MB11S149	F	26-35	0.5	-	0.1	0.5	-	-	**-1.7**	**-2.3**
KER15S151	M	36-49	0.5	-0.6	-0.4	-0.3	0.7	0.6	**1.8**	0.2
MB11S155a	M	50+	-	-	0.3	0.3	**-1.6**	-	-	-
MB11S158	M	60	-1.0	-0.5	**2.0**	**2.7**	-	-	0.3	0.5
MB11S174	F	36-49	-0.2	-0.6	**1.9**	-	**-2.0**	-	-	-
MB11S186	M	36-49	-	-	-0.6	-0.1	-0.8	-1.0	-0.4	**-1.9**
MB11S226	M	26-35	**1.9**	**1.6**	-0.4	-0.3	0.4	0.6	0.6	0.5
MB11S233	M	18+	-0.2	0.5	**1.8**	-	-1.0	-	1.2	-0.3
MB11S237	M	50+	**1.8**	-	0.6	0.5	-	-	-	-
MB11S240	M	36-49	0.7	0.6	0.6	0.4	**-2.0**	-1.3	0.5	-0.2
MB11S242	M	50+	-0.7	**-1.5**	0.2	-0.8	-0.6	0.2	-0.2	-
MB11S243	F	62	-	**1.6**	0.5	-	-	-	-1.7	-1.0

Legend – M = male; F = female; L = left; R = right; sig. = significant; - = not measurable. Table continued…

Note: Statistically significant z-scores emboldened and red. Significantly smaller minimum ulna, and significantly larger ulna and clavicle ratio not selected.

Table M2 – continued…

Individual Number	Sex	Age	A-LDFA Sig. Z-Score		Ulna Circ. 20mm From end Sig. Z-Score		Ulna Ratio Sig. Z-Score		Clavicle Diameter Sig. Z-Score	
			L	R	L	R	L	R	L	R
MB11S247	M	50+	-	-	-	-	-	-	-	**2.0**
MB11S249	M	26-35	-0.6	-0.2	-	1.0	-	**-1.7**	-	-
MB11S285	M	71	0.8	0.4	**2.8**	**3.9**	**-1.7**	**-2.4**	**1.6**	**1.6**
MB11S290	M	18-25	**1.5**	0.2	-1.2	-1.3	-	1.0	-1.6	-1.4
MB11S294	F	66	-	-	**1.7**	1.1	-1.1	-	-1.0	-0.4
MB11S309	F	58	-	**-1.8**	-	1.4	-	-0.9	-	-
MB11S310	M	35	-	-	**2.3**	-	-	-	-	-
MB11S319	F	69	0.6	-0.7	1.2	0.8	-0.8	-0.5	0.2	**1.8**
MB11S324	M	36-49	-	-	-0.5	-1.0	-1.2	0.1	1.1	**1.5**
MB11S327	F	36-49	-1.4	0.8	**1.6**	-	-	-	0.1	0.7
MB11S337	M	68	0.5	-0.1	**2.0**	**1.5**	-1.2	-0.8	-	-
MB11S339	F	64	-	-	**1.6**	-	-1.0	-	-	-
MB11S341	M	50+	-	-	**1.9**	1.2	**-1.5**	-0.8	-	-
MB11S344a	F	20	-0.6	**-2.1**	-	-0.7	-	-	-	-
MB11S347	M	50+	-0.8	-0.2	**1.8**	0.8	**-1.9**	**-1.6**	0.6	0.8
MB11S359	F	46	-	-	**1.6**	**1.6**	-	-0.6	-	-
MB11S368	M	26-35	1.3	1.3	0.7	-	-0.7	-	**1.9**	**1.7**
MB11S369	F	30	-0.2	-0.7	0.0	0.1	0.3	0.0	**2.1**	1.1
MB11S371	M	36-49	-	0.9	**2.0**	**2.1**	-	-0.9	**3.4**	1.4
MB11S374	M	80	0.0	**-1.5**	-	-	-	**-5.0**	-	-
MB11S375	M	74	1.2	0.6	-	-	-1.2	-1.3	1.3	**1.7**
MB11S388	F	21	1.1	**1.6**	0.3	0.8	0.2	0.3	-0.7	-0.2
MB11S392	F	50+	1.2	**1.5**	-0.2	-	0.1	-	-	-
MB11S401	F	26-35	-0.1	-	-0.6	-0.5	0.4	0.7	**2.2**	-
MB11S416	M	36-49	0.1	-	0.7	0.3	-	0.2	0.8	**1.8**
MB11S426	F	55	0.2	-	0.9	**1.6**	-	-0.2	**1.6**	1.1
MB11S441	F	23	**2.2**	1.0	-1.6	-	2.0	-	-0.9	-1.9
MB11S457	F	50+	0.0	**-1.8**	-0.2	-0.2	**-1.8**	**-1.7**	-	**2.3**
MB11S476	F	31	0.6	1.2	0.5	1.1	0.3	**-2.0**	**2.1**	1.4
MB11S482	M	36	**3.1**	**2.6**	0.2	0.5	1.0	1.2	-1.2	-0.6
MB11S487	F	29	-	**-1.5**	-1.3	-1.5	-	1.8	-	-
MB11S488	F	36-49	-1.1	-0.5	-0.6	-0.2	2.0	1.6	**2.0**	1.4
MB11S494	M	50+	1.0	**2.8**	0.7	-	0.0	-	0.2	-0.7
MB11S495	F	26-35	**1.5**	-	-1.1	-	1.1	-	-	-0.5
MB11S498	F	50+	**-3.0**	**-2.7**	-1.8	-1.5	1.9	1.6	0.0	-0.5
MB11S502	M	25	0.2	0.3	**1.8**	0.4	-0.1	0.8	-0.6	-0.6
MB11S516	M	50+	**2.0**	0.0	-0.6	-	1.2	-	-	-
MB11S527	F	26-35	**-1.6**	-1.1	0.5	0.8	**-3.1**	**-3.4**	0.2	0.4
MB11S550	F	50+	**-1.8**	-	0.9	-	-	-	-	0.5

Legend – M = male; F = female; L = left; R = right; sig. = significant; - = not measurable.

Note: Statistically significant z-scores emboldened and red. Significantly smaller minimum ulna, and significantly larger ulna and clavicle ratio not selected.

Table M3 – Statistically significantly larger sternal rib end ratio z-scores by sex:

Individual Number	Sex	Age	L. rib 1 Ratio	Left Ribs 4-8 Ratio					Left Ribs 11-12 Ratio		R. rib 1 ratio	Right Ribs 4-8 Ratio					Right Ribs 11-12 Ratio	
				1	2	3	4	5	1	2		1	2	3	4	5	1	2
KER15S012	F	36-49	**1.7**	-1	-	-	-	-	0.2	-	1.4	-	-	-	-	-	0.1	-
KER15S032	F	36-49	**1.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KER15S051	F	26-35	-	-	-	-	-	-	-	-	-	**1.8**	-	-	-	-	-	-
KER15S057	F	50+	-	-	-	-	-	-	**1.6**	-	-	-	-	-	-	-	-	-
KER15S063	F	36-49	-0.8	-1	0.7	-	-	-	**1.8**	-	0	-	-	-	-	-	0.0	-
KER15S087	M	36-49	-	-	-	-	-	-	-	-	1.0	0.2	-	-	-	-	**1.5**	-
KER15S100	M	26-35	-0.6	**1.5**	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S101	F	26-35	-	**1.5**	**2.1**	0.4	0.4	-	-0.5	-	-	-	-	-	-	-	-	-
MB11S167	F	12	-	0.1	**1.6**	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S216	F	36-49	-	**2.3**	-	-	-	-	0.2	-2.3	0.1	-0.6	1.0	**2.2**	**4.4**	0.8	0.5	-1.8
MB11S226	M	26-35	-	-	-	-	-	-	**2.6**	0.0	-	1.0	-	-	-	-	-0.7	-
MB11S239	M	23	**4.6**	-0.7	-0.7	-0.5	-	-	-	-	-0.1	-	-	-	-	-	-	-
MB11S263	M	36-49	-	-	-	-	-	-	0.6	-	0.4	**1.6**	-	-	-	-	-	-
MB11S278	F	36-49	-0.2	-0.1	0.7	-0.4	0.9	-	**1.9**	-1.0	-	0.4	0.8	-0.1	-	-	1.0	1.3
MB11S285	M	71	0.4	-	-	-	-	-	-0.1	-	**2.6**	0.1	-	-	-	-	-	-
MB11S294	F	66	-0.1	**1.5**	-	-	-	-	-	-	-0.6	**1.5**	0.6	1.0	0.7	-	-	-
MB11S313	M	46	0.2	-0.8	**1.6**	-0.5	-	-	1.4	-0.2	-	0.1	-1.1	0.5	0.9	-	-	-
MB11S324	M	36-49	0.2	-0.6	-0.8	0.5	0.2	-0.5	-	-	**1.5**	-0.9	1.1	0.4	-	-	-	-
MB11S345	F	28	-0.1	0.6	-	-	-	-	-	-	**2.4**	-0.2	2.3	-	-	-	-0.9	-0.9
MB11S346	F	36-49	0.8	-	-	-	-	-	-	-	**1.8**	-	-	-	-	-	-	-
MB11S356	F	78	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB11S358	F	74	0.6	-	-	-	-	-	-	-	0.2	-	-	-	-	-	**3.3**	-
MB11S360	F	66	0.5	-1.7	-	-	-	-	-	-	**2.3**	-1.0	-	-	-	-	-	-
MB11S375	M	74	-0.3	0.7	**2.6**	-	-	-	-	-	0.5	-0.3	0.5	0.1	-	-	-	-
MB11S380	M	36-49	**2.5**	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-0.8	-
MB11S404	M	26-35	-	1.2	**2.0**	-	-	-	-	-	-	0.4	**1.5**	0.6	0.5	-	-	-
MB11S405	F	36-49	**1.8**	0.4	0.7	1.3	-	-	-	-	-0.3	1.0	-	-	-	-	-	-
MB11S415	M	50+	0.3	-0.2	-0.2	**1.6**	-	-	-	-	0	-	-	-	-	-	-	-
MB11S416	M	36-49	0.6	0	0.8	-	-	-	**1.7**	0.7	0.8	0.0	**1.6**	-	-	-	**2.1**	0.5
MB11S435	M	45	0.6	-	-	-	-	-	-	-	-0.3	0.1	0.4	0.4	1.1	-	**1.7**	0.6
MB11S456	M	36-49	-	-0.2	0.9	-0.3	0.7	-	0.8	-	-1	1.0	0.1	**1.5**	-0.2	0.8	0.0	-
MB11S457	F	50+	**1.5**	-	-	-	-	-	0.7	-	0.0	0.7	-	-	-	-	**1.5**	-
MB11S477	M	61	-	**1.5**	**3.4**	1.4	-	-	-	-	-1.1	**2.6**	-	-	-	-	-	-
MB11S488	F	36-49	1.4	-1.5	-1.3	0.5	0	**2.7**	**2.4**	0.8	1.4	1.1	0.2	0.9	1.0	-	**2.1**	0.4
MB11S492	M	26-35	-	-	-	-	-	-	-	-	**1.6**	0.8	-	-	-	-	-	-
MB11S498	F	50+	-	0.4	1.4	**2**	-	-	0.5	-1.0	1.3	-	-	-	-	-	1.0	-0.4
MB11S502	M	25	-0.9	0.3	-0.4	-0.7	0.9	0.7	1.3	0.2	0.1	-0.4	0.3	0.0	-	-	**1.5**	0.1
MB11S520	M	50+	**2**	-	-	-	-	-	-2.7	-	0.7	-	-	-	-	-	-	-
MB11S527	F	26-35	-0.6	0.6	**1.8**	-	-	-	-	-	-	-	-	-	-	-	-0.1	-
MB11S553	F	36-49	-	-	-	-	-	-	-	-	-	**1.7**	-	-	-	-	-	-

Legend - Legend – M = male; F = female; L = left; R = right; sig. = significant; - = not measurable.

Note – Significant z-scores are emboldened and red.

Table M4 – Chi-squared and Fisher's exact test results for the association between porotic lesions and non-metric shape changes.

Feature	Distal Femur Growth Plate Porosity				Distal Ulna Growth Plate Porosity				Medial Clavicle Growth Plate Porosity				Sternal Rib Porosity			
	N	P	A	N	C	S	F	F	N	P	A	F	N	C	S	F
Distal Met. Femur Widening	29	5.729	x	0.068	28	0.549	x	0.459	48	0.670	x	0.587	202	9.132	x	**0.015**
Distal Femur Angulation	-	-	-	-	4	-	-	-	25	0.111	x	1.000	208	2.480	x	0.162
Distal Met. Ulna Angulation	3	-	-	-	6	-	-	-	31	0.067	x	1.000	207	4.413	x	0.094
Distal Met. Ulna Widening	20	0.186	x	1.000	23	0.157	x	1.000	43	0.019	x	1.000	195	0.000	x	1.000
Medial Met. Clavicle Flaring	26	1.578	x	0.319	30	0.667	x	1.000	58	0.781	x	0.450	233	0.239	x	0.787
Sacral Angle	7	0.467	x	1.000	9	0.900	x	1.000	28	1.197	x	0.396	160	0.006	x	1.000
Sternal Angle	3	-	-	-	6	-	-	-	21	0.236	x	1.000	100	3.520	x	0.120

Legend - N = number of valid cases; C = Pearson Chi Square value; S = Significance (asymptotic two-tailed); F = Fisher's Exact Test (two-tailed); Met. = metaphyseal; "-" = not possible due to insufficient sample size; x = expected value too small for Chi-squared. Note – Significant values in bold and red writing.