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Dental Microwear Analysis of Averbuch: A Dietary Reconstruction of a Mississippian Culture

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To the Graduate Council:

I am submitting herewith a dissertation written by Melissa G. Muendel entitled "Dental Microwear Analysis of Averbuch: A Dietary Reconstruction of a Mississippian Culture." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.

Murray K. Marks, Major Professor

We have read this dissertation and recommend its acceptance:

R.L. Jantz, David C. Jay, William M. Bass

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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A Dissertation Presented for the
Doctor of Philosophy
Degree
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Melissa Grace Muendel
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DEDICATION

For Mommy and Daddy

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ABSTRACT

This dissertation reconstructs subsistence patterns of the inhabitants of Averbuch, a prehistoric late Mississippian culture, using SEM (scanning electron microscopy) to quantitatively assess the dental microwear of the permanent adult second mandibular molar of a selected skeletal sample from the Averbuch archaeological site. A comparison among the patterns of the Averbuch and those reported from other prehistoric sites in the United States is presented. The study uses the mesiolingual cusp (metaconid) tip facet (Kay and Hiiemae, 1974) of the mandibular permanent second molar to measure dental microwear features. Every cusp in the human mouth has an occlusal relationship to the corresponding dentition revealed by wear facets. Like cusps, wear facets can be identified and studied and differences in the shape, size, and position of the cusps result in the difference and size of the wear facets which reflect evolutionary change in the molar function (Jordan et al., 1992). The Averbuch series offered a unique opportunity since no published microwear analysis of any Middle Cumberland Culture of a Mississippian "manifestation" exists. Averbuch represents three distinct cemeteries; two which may be contemporaneous; the third predating the first and second. Since, the site was only occupied for about 50 - 100 years (Eisenberg, 1986; Konigsberg and Frankenberg, 1995) any dietary changes within that time, as well as any quantifiable differences between sexes, among/between cemeteries, among age groups, and along the age continuum are discussed. SEM results were compared to the local/regional archaeological flora and faunal. This study addresses the following questions:

1. Are there quantifiable sex differences in dental microwear?
2. Are there quantifiable age differences in dental microwear?
3. Are there dietary differences among ages observed by dental microwear?
4. What are the intra and inter-cemetery differences in diet and are these differences related to sex and/or age?

How consistent are the dental microwear patterns and features within this population? What is the relative amount of vegetable matter in the diet? What does the relative amount of vegetable matter in the diet say about the regional Mississippian subsistence in general, and specifically, about the Averbuch population?

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CHAPTER ONE - Introduction

What is Dental Microwear?

Dental microwear is the microscopic study of the pits and scratches that form on a tooth's occlusal surface as the result of use, and the patterning of these events reflect dietary composition across time (Ungar, 1996a). Using scanning electron microscopy (SEM), dental microwear analysis (DMA) examines enamel/dentine abrasion, irregularities, and pits and scratches on skeletal and fossil teeth to make taxonomic assessments (Pastor, 1992) and clarify dietary and/or nutritional suppositions. Diet can be estimated by measuring pits and scratches that food and food preparation implements leave on the teeth. Since those measurements represent metric data, they can be statistically analyzed for comparisons and differences between the pits and scratches by sex, among different age groups, and across cultures and time. While such results probably will not reveal a one - to - one relationship between food and microwear feature, they can hint at dietary similarities, which may or may not support other lines of evidence from prehistoric populations.

Previous pioneer dental microwear research has focused on the occlusal surfaces of human and non-human primate molars for clues about subsistence patterns, dietary composition, and food consumed. Studies of human populations have provided insight into the subsistence strategies employed between hunter-gatherers and agriculturalists.

Research has suggested that dental microwear analysis can characterize whether an extinct animal was a browser or a grazer (Walker et al., 1978). Other research has shown that biomechanics of mastication can vary as evidenced by microwear patterning (Gordon,

1982). Most research concludes that it is very difficult to directly associate specific food processing techniques, particular types of food, or environmental factors based directly on microwear (Pastor and Johnston, 1992; Peters, 1982). Nevertheless, particular occlusal events and inter-proximal facets can be partially correlated with subsistence patterns and select food preparation techniques. Still, SEM can recognize broad characteristics that signal dietary differences. Heavily pitted and scratched occlusal molar surfaces signify that some object, harder than enamel, was being dragged across the grinding surface during the chewing stroke reflecting the artificial, yet common inclusion particles of nuts, bones, seeds, stone, etc. (Teaford, 1991). Shearing facets (discussed later in this chapter) on molars indicate a diet where teeth are used to tear food, meat and vegetable matter, and a combination of these facets and pits indicate a diet consisting of mixed properties (Turner and Machado, 1983; Ungar, 1996b)

Dental microwear analysis using SEM likewise has been used successfully to study the diets of fossil or extant non-primate mammals (Kay and Covert, 1983; Rensberger, 1978; Teaford and Walker, 1983; Ungar, 1990, 1996b; and Walker et al., 1978;) extant primates, wild trapped or museum specimens, (Teaford et al., 1994; Teaford and Oyen, 1989; Teaford and Runestad, 1992; and Ungar, 1990, 1994a, 1994b) non-human primates (Gordon, 1982; Teaford et al., 1984) early hominids and fossil primates (Covert and Kay, 1981; Gordon, 1984b; Grine, 1981, 1984, 1986, 1987; Grine and Kay, 1987; Puech et al., 1983a; Puech et al., 1986; Ryan, 1980; Ryan and Johanson, 1989; Teaford et al., 1996; Ungar and Grine, 1991; and Ungar and Teaford, 1996;) and prehistoric humans (Bullington, 1991; Fine and Craig, 1981; Gordon, 1986, 1990; Harmon and Rose, 1988;

Hojgaard, 1985; Marks et al.; 1985; Molleson and Jones, 1991; Pastor, 1992, 1993; Pastor and Johnson, 1992; Puech et al., 1983b; Rose, 1984; Rose and Marks, 1985; Rose et al., 1985; Shkurkin et al., 1975; Teaford, 1991; and Teaford and Tylenda, 1991). Although microwear research has been performed on anterior teeth (incisors) (Ungar, 1990, 1994a, 1994b; Ungar and Grine, 1991; Ungar and Teaford, 1996) occlusal wear patterning has concentrated primarily on molars. Such is the focus of this research.

The principal purpose of this study is to test for association between microwear analysis and subsistence patterns using a sample of molars from Averbuch cemeteries. Factors tested are inter- and intra-cemetery differences by gender and age. If differences are significant, they should be quantitatively distinguishable by DMA.

Research on the use of dental microwear analysis involving the SEM to address subsistence patterns in prehistoric human populations is in the formative stages. Early research was concerned with the evolution of diet and tooth shape (Covert and Kay, 1981; Fine and Craig, 1981; Hinton, 1982; Hylander, 1977; Puech, 1979). Tooth use and wear was the predominant topic posed by research on extinct mammals and early hominids. (Grine, 1981, 1984, 1986; Grine and Kay, 1987; Puech et al., 1983a; Puech et al 1986; Ryan and Johanson, 1989) More common, dental microwear analysis has been employed to observe the patterns, angles, and degrees of wear to assess mastication. (Gordon, 1984a; Peters, 1982; Teaford, 1991, 1994). Microwear studies of human populations demonstrate that some of the non-occlusal buccal and lingual surfaces could also provide evidence for subsistence patterns between hunter-gatherers and agriculturalists (Fine and Craig, 1981; Lalueza et al., 1993; Puech, 1976, 1983b). Fundamental to most of this research was a

time-honored conclusion that wear for given age is greater on the occlusal surfaces of hunter-gatherers than agriculturalists (Bullington, 1991; Gordon, 1986, 1990). Most dental wear studies, both macroscopic and microscopic, have revealed that hunter-gatherers generally consume coarser foods (Bullington, 1991; Gordon, 1986; Marks et al., 1985; Smith, 1984; Teaford, 1991) while agriculturalists eat refined foods. This *a priori* assumption was tested on the Averbuch sample and the results substantiated by quantitative microwear analysis.

Subsistence patterns and/or activities have been loosely defined as how food was obtained -- commonly thought as hunting and gathering and agricultural. Nutrition also can be inferred by looking at the paleopathological data obtained from dental and skeletal markers and from any archaeological data for food processing (Cohen and Armelagos, 1984; Gilbert and Mielke, 1985; Klepinger, 1992).

In earlier studies, skeletons from archaeological excavations were examined for paleopathological lesions and read as diagnostic tools for biological stress markers. There are numerous reports dealing with paleopathological diagnosis and interpretations of skeletal populations (Brothwell and Sandison, 1967; Steinbock, 1976; Verano and Ubelaker, 1992). This study will concentrate on only the Averbuch skeletal population (see Berryman, 1981, 1984a, 1984b; Eisenberg, 1986, Guagliardo and Jablonski, 1984; Jablonski, 1981, 1984a, 1984b). Stress markers, such as enamel hypoplasias, dental caries, and Harris Lines, have been interpreted to signal a change in subsistence, population, increasing pathogen contact, disease, resulting in overall decline of health. Pastor (1993), who studied the teeth from mesolithic and chalcolithic sites in India, questioned if

correlations may exist between diet and nutritional condition of individuals, as revealed by dental microwear and paleopathological indicators. An association between a specific type of dental microwear and a particular disease condition may provide information on nutritional components contributing to or improving a disease state. (Pastor, 1993).

A change in subsistence, transition from hunting-gathering to horticultural reliance can lead to a dependency on maize cultivation which is common throughout emergent Mississippian cultures. (Klippel, 1984, Klippel and Reed, 1984). Dental microwear results, consistent with the archaeological evidence indicate that Mississippian inhabitants used maize as a dietary staple and consumed proportionately fewer nuts and hard starchy seeds (Bullington, 1991, Rose et al., 1985). Evidence for these findings is seen in an increase in dental macropathology and a decrease in the occlusal attrition (Rose, 1984; Marks et al., 1985; Rose et al., 1985). Berryman (1984a, 1984b) concluded that the Averbuch crude mortality rate was high, and although warfare may have been partially responsible, biological stress, malnutrition and disease also play a role. He looked at three biological stress indicators at Averbuch: stature reduction, Harris lines, and enamel hypoplasias (Berryman, 1984a, 1984b). He also talked about the lack of burial artifacts.

> "When Averbuch is compared with other large Late Mississippian sites (e.g. Moundville, Etowah, etc.), there is a notable absence of the quantity of the more elaborate artifacts and exotic materials. However, an absence of artifacts has long been a characteristic of Middle Cumberland graves" (Berryman, 1984a; 8).

His conclusions that the collapse of the Mississippian culture in the Nashville basin was due to problems with 1)population pressure, 2) warfare, 3) food shortages, 4) the

reassignment of food procurement activities to other individuals, and 5) soil depletion (Berryman, 1984a).

Eisenberg (1986) studied the physical evidence for health and disease at Averbuch to answer questions regarding the prehistoric population density, diet, and cultural termination in the Nashville Basin. Her findings suggest that infectious disease and nutritional deficiencies were prevalent. Iron deficiency anemia may have been due to the "malabsorption" of available nutrients from the soil, infectious diseases, or a diet comprised largely from maize (Eisenberg, 1986). She compared the health condition of the inhabitants of Averbuch with other inhabitants from late non-marginal Mississippian sites: Dickson Mounds (Lallo, 1973); Hardin Village (Cassidy, 1972); Kane Mounds (Milner, 1982); Lubbub Creek (Powell, 1980); Moundville (Powell, 1985); and Toqua (Parham and Scott, 1980) to determine how the consequences of disease varied on the regional plane during the Mississippian period. She concluded that

> " the incidence of infectious pathology and dietary problems in the Averbuch series is squarely within the range, and sometimes considerably higher than the frequencies observed elsewhere" (Eisenberg, 1986; 168).

Dental microwear analysis has yet to be employed successfully to assess a population's health, but the suggestion has been made that D.M.A. could be used in conjunction with other paleopathological conditions to assess the health status of a population (Pastor, 1993). This highly statistical and technical process is just beginning to be used in conjunction with other skeletal analyses for evaluating health. Dental microwear analysis is an additional tool for appraising the subsistence patterns and possible food

preparation techniques of the inhabitants at Averbuch. It should be used in conjunction with the other biological studies of the Averbuch (Berryman, 1981, 1984a, 1984b; Jablonski, 1981; and Eisenberg, 1986) to assess the overall health of that population.

This research includes faunal and floral laboratory processing results of the Averbuch archaeological collection in an attempt to answer the aforementioned proposed questions and hopes to serve as a model for subsistence patterns in other prehistoric cultures.

Although dental microwear analysis has not been utilized frequently on teeth from prehistoric human populations for subsistence reconstruction, D.M.A. has been widely used for dietary reconstruction for early hominids and primates (Gordon, 1982, 1984; Grine, 1986, 1987; Teaford and Runestad, 1992; Teaford and Walker, 1984; Teaford et al., 1996; Teaford et al., 1994; Walker, 1981; Ungar, 1996b). Commonly, dental microwear analysis seeks to understand the pattern symmetry and the angle of wear to indicate the age of the subject as well as the jaw movement (Teaford, 1994).

Mastication depends on a chain of events which involve the rhythmic opening and closing of the jaw and specific movements of the tongue. There is also a tremendous amount of pressure exerted from the force on the food during mastication. This pressure, of course is dependent on the texture of the food (Berkovitz et al., 1992).

Humans generally chew on one side or the other. There are two phases of mastication or chewing which have been observed depending on the type of food. Phase I is the puncture/crushing phase when hard food is first contacted and crushed/pierced/punctured between the teeth without tooth to tooth contact. This action

would be defined as tooth-food-tooth contact (Berkovitz et al., 1992). The second phase, Phase II is the shearing stoke or shearing phase when food has been sufficiently reduced by saliva. This tooth-tooth contact produced attrition facets with "characteristic directional scratch lines"(Berkovitz et al, 1992: 98). The action of the teeth depends on morphology of teeth, movement of the mandible and forces generated by the contraction of the muscles The chewing cycle involves three basic movements or strokes of the maxilla in relation to the mandible .

> From a position in which the jaw is open, the closing stroke results in the teeth being brought into initial contact with the food. This is followed by the power stroke when the food undergoes reduction. Movement of the mandible in this phase is slower than that in the closing stroke because of the resistance caused by the food. Finally, there is the opening stroke, when the mandible is lowered, with an initial slower stage followed by a faster stage. From an open position, the mandible is moved upwards and outwards, bringing the buccal cusps of the maxillary and mandibular teeth on the working side in contact. The teeth may not initially contact each other during the initial masticatory cycle. In the power stroke, the mandibular teeth then slide upwards and medially against the maxillary teeth to momentarily attain intercuspal position. Following attainment of the intercuspal position, the mandibular teeth continue downwards and inwards against the maxillary teeth (the lingual phase). The opening stroke then follows and the cycle is repeated While the teeth on the working side are moving through the buccal phase, those on the balancing side are in the lingual phase but in the reverse direction (Berkovitz et al., 1992: 99).

Facets are formed, where teeth pass each other. Shearing facets or buccal facets are formed in Phase I of the chewing stroke and appear on buccal facing sides of mandibular molar cusps and on lingual facing sides of maxillary molar cusps when the occluding faces of the teeth slide in parallel planes during mastication (Kay and Hiiemae, 1974; Teaford, 1988b). Lingual (crushing/grinding) facets, are formed in Phase II of the chewing stroke on the lingual surfaces of the mandibular molar buccal cusps (Kay and

Hiiemae, 1974; Teaford, 1988b). The first researcher to delineate two-phase jaw movement of the mandible during primate mastication was Mills (1955). After examining gorilla skulls from a museum collection both macroscopically and microscopically he saw different striations and wear facets on both maxillary and mandibular molars. He developed two phases, the lingual and buccal phases of mastication. His lingual phase applied to the action of the mandible resulting in the cheek (buccal) cusps of the mandibular molars shearing past the buccal side of the lingual cusps of maxillary molars. His buccal phase consisted of the mandible moving in such a motion so that the buccal side of the buccal cusps of the mandibular molars slide up against the lingual side of the maxillary molar buccal cusps. Mills classified the facets as to whether they were buccal or lingual according to the mastication phase in which they produced.

Kay and Hiiemae (1974) also described two phases of mastication. They described the buccal (shearing) facets or Phase I facets because they were made during Phase I movements during mastication of the mandible and maxilla. Phase I facets are formed on the buccal facing sides of the mandibular molars cusps and on the lingual facing sides of maxillary molar cusps. Lingual (crushing/grinding) facets are formed during Phase II of mastication and appear on the lingual sides of the mandibular molar buccal cusps.

In accordance with other dental microwear researchers, Phase I facets refer to shearing (buccal) facets and Phase II facets refer to crushing /grinding (lingual) facets. The numbering of the facets for microwear analysis is based on Kay's (1977; Kay and Hiiemae, 1974) research (Rose, personal communication, 1997; Ungar, personal communication, 1997).

Dental microwear studies focus only on the chewing (occlusal) surfaces of the teeth, and close inspection of the progression from chewing to non-chewing surfaces should reveal less microwear. Teeth will begin to show significant microwear as they occlude. Thus, teeth that are not in occlusion will show little if any wear and the degree of wear will vary with the stage of eruption of the tooth and the general rate of wear of the dentition (Teaford, 1988b). The observed wear on particular occlusal surfaces of the teeth occurs in fairly regular patterns since the jaw movements that caused the wear also follow regular patterns. For example, on shearing facets along the sides of teeth, the bulk of the wear features will be scratches running roughly parallel to each other. On crushing facets bordering the central basins of teeth, wear features should reveal greater variation in size, shape, and orientation, because they can be caused by a variety of movements, (i.e., puncture/crushing and phases I & II of the power stroke of chewing) (Teaford, 1985).

I chose the metaconid tip facets for scanning because it is different from Phase I (shearing) and Phase II (grinding) facets in wear and function (Kay and Hiiemae, 1974; Gordon, 1984a; Teaford, 1985) and because it is one of the earliest developments of facet production (Gordon, 1984a). Gordon (1984b) says "because occlusal wear facets form at constant locations on teeth of the same species sampling procedures make site selection consistent from tooth to tooth.

This analysis has resulted from the observed comparisons of the occlusal facets. The development of molar cusps, their size, and wear patterns has been useful in determining jaw movement and function in extinct mammals. (Kay, 1975; Kay and Hiiemae, 1974). Evolutionary changes in tooth size can be used as evidence as a change in

diet and morphological changes can occur from behavioral changes (jaw movements) as diets change (Teaford, 1994). Gross morphological characteristics seen macroscopically on the occlusal facets are not detailed enough to determine the changes in wear and wear facets on teeth. A numbering system based on macroscopic molar angle wear planes and patterns of molar wear in hunter-gatherer populations and agriculturalists was devised to determine age and possible subsistence (Scott, 1979b; Smith, 1984; Lovejoy, 1985). Not widely used is an unfamiliar dental wear pattern observed on a Brazilian archaic skeletal population that was different from other macroscopically observed wear angles and facets (Turner and Machado, 1983). This new pattern, lingual surface attrition of the maxillary anterior teeth, or LSAMAT, was thought to be a result of a diet high in carbohydrate consumption and using the teeth as tools (Turner and Machado, 1983). Dental microwear studies also involve the size of the abrasive material and the size of the microwear feature, hardness of the food or abrasive particles, and the rates and patterns of the features (Teaford, 1994; Teaford and Oyen, 1989).

Other questions posed by dental researchers include the effect that acids or acidic foods have on teeth in terms of microwear features (Lucas and Corlette, 1991; Teaford, 1988a, 1994; Ungar and Grine, 1991). Erosion by dietary acidity can affect the entire crown and allow the surfaces to be scratched more easily (Lucas and Corlette, 1991). Are all features formed the same way, or are large features formed in a way distinctively different than small features (Teaford and Runestad, 1992; Puech et al., 1986; Rensberger, 1978). As Teaford (1994) pointed out, although much work has been done on the processes which might cause dental microwear features (Harmon and Rose, 1988; Grine,

1981, 1986; Teaford, 1988a; Teaford and Runestad, 1992), there is still much work to be done in this area.

One of the causes of dental microwear features results from wind-borne dust particles (Ungar, 1994; Puech et al., 1983b; Teaford, 1994) or abrasive material found in the food as a result of food preparation techniques and/or opal phytoliths (Grine, 1986; Walker, 1978). Vegetable matter absorbs silica from the soil and stores it in the plant tissue and these hard concretions are termed opal phytoliths. Silica within vegetable matter polishes enamel but scratches dentine (Puech et al., 1983b). The wind-born dust and sand particles are larger than silica and cut more deeply into the tooth structure. Dust is comprised mainly of quartz granules and when it is spread by the wind, everyone, and all food is at risk of being affected or contaminated by it. These "exogenous abrasives" (Teaford, 1994: 20) are the causes of dental microwear in many species (Ungar, 1994a).

As a sidebar, I have put in a caveat for *postmortem* wear on teeth which the untrained observer may mistake as dental microwear features. Grine, (1986), Teaford (1988b), Pastor (1993), and Ungar (personal communication, 1997) fully recognized the problem of mistaking diagenetic processes and artifactual marks as dental microwear features. Microwear patterns are deposited on explicit points on teeth on animals during life. At death, the dentition and skeletal remains are subjected to various forms of *postmortem* wear. If teeth have questionable markings that would not have occurred from normal use, they might be scratches from toothbrushes, dental picks or some other non-masticatory wear on teeth. Teaford (1988b) says that when analyzing fossil teeth one

should expect to lose about 30 - 40% of the sample due to artifactual or *postmortem wear* on teeth.

Macroscopic and Microscopic Wear

Generally, macroscopic dental wear displays the life cycle of an individual's masticatory habits while microwear patterns indicate masticating behavior of the last months to year of life. Dental microwear can demonstrate what a person ate immediately prior to death (Pastor, 1993). This phenomenon is sometimes referred to as the "Last Supper" (Grine, 1986) who noticed this critical aspect of dental microwear analysis with species which might have seasonal dietary habits. Since eating hard objects will tend to obliterate the microwear patterns of soft foods at a more rapid rate, this phenomenon is a significant factor (Grine, 1986).

Macroscopic dental wear is commonly known as gross attrition (occlusal to occlusal contact or tooth to tooth contact) and has been used generally as a method for skeletal aging (Lovejoy, 1985; Scott, 1979a, 1979b; Smith, 1984). It has also been used to evaluate the biomechanics of mastication and an indicator, like microwear analysis, to assist in the reconstruction of subsistence and dietary patterns(Pastor, 1994; Teaford and Oyen, 1989; Teaford and Walker, 1984) Abrasion, a form of both macrowear and microwear can be produced by tooth-food contact. or tooth-tooth contact. (Pastor, 1992, 1993; Pastor and Johnson, 1992).

Macroscopically, abrasion is characterized by the cusps becoming more blunt and featureless. Macroscopic and microscopic dental wear differs in that macroscopic (commonly known as attrition) looks at wear on teeth without the aid of a microscope. Many studies have used the macroscopic method to assess diet and subsistence, age related wear patterns, cultural behavior patterns, jaw movements, and sex differences (Hinton, 1982; Puech et al., 1983; Smith 1984; Teaford and Oyen, 1989; Teaford and Walker, 1984).

Microscopic wear looks at the pits and scratches with a scanning electron microscope allowing a much higher resolution and may actually reflect diet over the past two months (Teaford, 1991; Teaford and Lytle, 1996). Dental microwear features are a result of tooth-food-tooth contact. Dietary clues of dental microwear can be complicated to differentiate because of the high number of factors likely to contribute to patterns on the wear surfaces of the teeth. Attrition (tooth-to tooth contact, or wear caused by contact of the opposing tooth surface) has been suggested to be a cause of dental microwear patterning and some researchers attempted to find microscopic traces of attrition (Kay & Hiiemae, 1974). Most commonly, the stance has been to recognize that abrasion (tooth-food-tooth contact or contact with an superficial abrasive harder than tooth enamel), is responsible for the dental wear patterning (Gordon, 1982, 1984; Rensberger 1978; Teaford and Walker, 1983). Now the most prevalent and accepted perception among dental microwear researchers is that scratches cannot form without abrasive materials in the food (Ungar, personal communication, 1997).

Microscopically, abrasion is characterized by polished and pitted surface. Currently, microwear analysis is accomplished by 1) scanning electron microscopy 2) measurement and observation of the dental microwear features, and 3) by qualitative or quantitative methods.

Qualitative and Quantitative Microwear Analysis

Qualitative analyses can be used when there are easily observable differences in the amount, size, and shape of microwear features are present on the teeth. Since these features are readily discernible, mere descriptions are all required to characterize the differences. If the sample is too small to allow quantitative analysis, then a qualitative summary is all that can be warranted. Micrographs (photographs of the scanned surface of the tooth), depicting qualitative features can demonstrate dietary differences and how teeth might have been used. However, there are problems with qualitative dental microwear research. Since a feature is nothing more than a depression in the enamel of the tooth, it can occur in varying sizes, shapes, and orientations (Gordon, 1988). Gordon defines scratches as linear features with a discernible orientation. Gouges are a small subset of scratches and have more than one angle of orientation. Pits are features which have equal length and breadth measurements and no apparent angle of orientation (Gordon, 1988).

Harmon and Rose (1988) clarified their qualitative observations into four categories: 1) compression fractures (pits), 2) polish, 3) striations, and 4) striation margin morphology. They used these four characteristics to discuss the microwear features in an

attempt to reconstruct prehistoric diets in North America. Their analysis was derived from SEM micrographs from 49 individuals representing 13 archaeological sites (Harmon and Rose, 1988).

They described these observations in the following manner:

Compression fractures, more commonly known as pits, are a result of a hard particle, nut hull, rock or bone fragment, being crushed between the occlusal surfaces during the chewing stroke. The underlying affected enamel collapses leaving a "pit" or compression fracture that may imply diet (Rose and Marks, 1985). For instance, in the Red River and Lower Mississippi River Valley, these pits are not seen on any of the examined teeth from populations where maize-dependent agriculture is established (Rose and Marks, 1985). Evidence from this research shows that pits and compression fractures on molar teeth of prehistoric North Americans were commonly associated with the as diet of nuts and "non-pitted fruits."(Marks et al., 1985).

Polish is the area of flat featureless enamel usually caused by the silica in a very vegetable rich laden diet and it varies in degrees of smoothness (Puech et al., 1983a). The raised mounds of smoothed/polished enamel are actually the end of the enamel prisms brought into relief . Walker et al., (978) attribute polishing to the smoothing properties of the silica in leaves. It is also possible that polishing can be caused by fiber which contains very small grit particles which act as polishing buffers (Puech et al., 1983a).

Striations are linear depressions which appear as troughs. Harmon and Rose (1988) described them according to size: small, medium, and large. These striations on the occlusal surfaces of molars can be caused by the use of stone tools to process food; nuts,

berries, and vegetable matter (Rose and Marks, 1985). Small striations are defined as less than 1mm in width (as measured on the micrograph), regardless of the length. Medium striations are between 1mm and 2mm in width. Large striations are greater than 2mm in width.

Striation margin morphology refers to the relative sharpness, roughness, roundness of the striation troughs and margins. Harmon and Rose (1988) found that when used in conjunction with computing mean striation frequencies, margin morphology can be very helpful. For instance, the margins of the striations and troughs are very sharp and serrated when first cut into the enamel. These rough areas are eventually rounded when future polishing and striations are laid down by the further ingestion of food. The proportion of sharp striations can be calculated and interpreted in light of the three other factors (Harmon and Rose, 1988).

The Harmon and Rose research based on the qualitative method, made three conclusions: 1) the preponderance of compression fractures on the teeth indicated a diet with many nuts or fruits with hard seeds. In the North American southeast, compression fractures are consistent with a consumption of hickory nuts. 2) The amount of enamel polishing can be used to determine the consumption of vegetable fiber in the diet. In the North American southeast, vegetable consumption decreases over time, indicated by the decline of enamel polishing. And 3), the study of striation margin morphology in conjunction with enamel polishing and dental attrition can lead to understanding the changes in diet and food processing techniques. In the Caddoan region this transition from

stone utensils to wooden food preparation items was confirmed by the dental microwear data (Harmon and Rose, 1988).

The quantitative method for dental microwear analysis is primarily a statistical process as opposed to a visual one (Gordon, 1988). This method commonly has concentrated on the dental microwear formations and their association with forms of tooth use (Teaford, 1991). Gordon denotes several problems with quantitative analysis which can have significant results on dental microwear research: 1) Sampling bias has been small in most research because of the time constraints and difficulty; 2) the effect of SEM instrumentation on feature visibility will affect counting features; 3) the differences in magnification will affect the frequency count; and finally 4) the interpretation of variability which can be found within populations where dietary variability is presumed not to exist. The most difficult aspect of quantitative dental microwear analysis is that enormous amounts of time are required to put out very little data (Gordon, 1988). However, recent developments in the measurement of dental microwear features has reduced some of that tremendous amount of time resource devoted to the collection of data with the introduction and use of *Microware 2.2* and *Microware 3.0* (Ungar, 1996a, 1997). *Microware 2.2* and *Microware 3.0* a beta test update, allow microwear features to be measured with a mouse from micrographs loaded on a personal computer. This program runs in a Windows 95 format or Windows 3.1 format. Elaborate efforts, using a ruler, protractor, acetate sheets, and the knowledge of distinguishing a pit from a scratch are now obsolete. In earlier research, a micrograph was overlaid with an acetate sheet on which the researcher drew the observed pits and scratches and their relationship to Weibel grids. They had to measure

those features with a ruler and calculate the degree of orientation as well as the length and width of each feature. Data had to entered into a computer so that means and standard deviations could be calculated. *Microware 3.0* allows the researcher to load the picture into the computer and using the mouse, click on the two ends of each major and minor axis of each feature (4 points). The computer measures the major axis length, major axis slope, minor axis length, and minor axis slope and counts the number of features. For each tooth, the program calculates the major axis length mean, major axis length, standard deviation, minor axis length mean, minor axis length standard deviation, preferred orientation mean, preferred orientation standard deviation, major/minor axis ratio mean, major/minor axis ratio standard deviation, r (a measure of concentration), number of features, pit tally, pit length mean, pit length standard deviation, pit width mean, pit width standard deviation, scratch tally, scratch length mean, scratch length deviation, scratch breadth mean, scratch breadth standard deviation, scratch orientation mean, scratch orientation standard deviation and scratch r. The program recognizes a pit if the length to breadth of the feature is 4:1. The data then can be placed into databases or spreadsheets for statistical manipulation.

Some researchers have used 100x - 200x magnification, (Gordon, 1982; Grine, 1986; Puech et al., 1983b; Ungar, 1990;) while others concentrated at 500x. (Bullington, 1991; Harmon and Rose, 1988; Marks et al., 1985; Pastor, 1992, 1993, Teaford et al., 1994; Teaford and Walker, 1984; Ungar, 1996; Ungar and Grine, 1991). Other researchers have even used higher magnification for their analysis (Harmon and Rose, 1988). The optimum magnification is that one which allows the greatest ease of measurement of the features. Lower magnifications allow more of the tooth's surface to be examined but don't

allow as much accuracy as higher magnifications (Gordon, 1988). The obverse is likewise true, the higher the magnification, a smaller number of features are measurable (See micrographs from tooth #1, at 100x, 200x, 300x, 400x, and 500x in APPENDIX D). Comparisons of data from one prehistoric population to another are largely depend on the comparability of the magnification of the scanning electron. microscope. While employing the quantitative method, researchers may incorporate multivariate and univariate techniques (Pastor, 1992, 1993), while qualitative observations can produce nominal data for Chi squares (Fine and Craig, 1981).

This study employed the quantitative method for studying the dental microwear features from Averbuch, since I had access to *Microware 3.0*. Knowing the intra population differences would yield less startling results in dental patterning; I concentrated on the quantitative method. Furthermore, I also was ambivalent about using qualitative methods, as I felt the qualitative descriptions were too ambiguous. Since, the qualitative method is used for easily observable differences in the amount, size, and shape of microwear features, I chose the quantitative method after scanning the first ten teeth of my sample. I encountered much variation in the dental patterning of the wear.

Most of the prehistoric dental microwear research has focused on the qualitative method with handfuls of quantifiable data. To a large extent researchers who studied fossil primates, hominids, and extant mammals have used the quantitative method. I wanted to use the quantitative method on a prehistoric sample even though no comparative quantitative data exist using Microware 3.0. Results of this research would serve as a source of quantitative data for southeast prehistoric populations. More data can be added

to this as more prehistoric populations are studied and more quantitative dental microwear data collected.

CHAPTER TWO - History Of Dental Microwear Analysis

Dental microwear analysis is a recent development (about twenty years old) and was not used to its potential because of the difficulty of obtaining fossil and wild animal teeth, making casts of teeth, preparation of the teeth for SEM analysis, the enormous cost of using the scanning electron microscope, and the difficulty and the time consumption of measurement of the features. Research was incredibly exhausting which accounted for the small samples of teeth described in the microwear literature. Harmon and Rose (1988) used 49 teeth from 13 sites for sampling. Teaford (1991) used 27 maxillary molars from three American Southeast sites (pre contact, early contact, and late contact)for quantitative analysis. And Pastor (1993) used 31 molars specimens from three Gangetic site in India for quantitative microwear analysis.

Researchers used the occlusal surfaces of the teeth of human, and non-human primate molars for clues about the properties of food (Ungar 1992), and differences in tooth function and its relationship to shape (Teaford, 1996; Teaford et al., 1996). Some studies have used microscopic analysis to study the damage on fossil, prehistoric, or extant teeth for making nutritional and dietary inferences and well as mastication and jaw assessments (Kay and Covert, 1983). Walker (1978) used dental microwear analysis to see if the extinct animal was a browser or grazer. Other researchers, concluded that it was extremely difficult to directly associated microscopic striae with a particular type of food, food preparation or an environmental cause (Gordon, 1986; Peters, 1982). However, specific microwear pattern on the facets of dental crowns can partially correlated with diet,

feeding behaviors, and food preparations in early humans, non-human primates, prehistoric, and modern human populations (Kay and Covert, 1983, Teaford and Lytle, 1996). Much of the early work on dental microwear analysis was done on fossil and modern mammals, rather than humans (Kay and Covert, 1983; Gordon, 1982; Rensberger, 1978; Teaford and Walker, 1983, 1984; Walker et al; 1978). Early studies were interested in the biomechanics of mastication and whether an animal was a soft feeder or a hard feeder; patterns which are identifiable on the teeth (Teaford, 1988; Walker et al., 1978). With the advent and use of scanning electron microscopy (SEM) researchers have been able to see patterns on teeth as consequences of use. Casts from extant mammals, primates, and hominids, and living subjects have been used for analysis. Since I was not using museum specimens, fossil teeth, or teeth from living subjects, casting of the teeth was not necessary, and I was able to put the "wet" sample in the vacuum chamber of the scanning electron microscope. (For details of casting procedures for dental analysis please refer to Rose, 1983; Pastor, 1992, 1993; and Teaford and Oyen, 1989b).

The amount of research using the SEM for dental microwear analysis to aid in reconstruction of diet of prehistoric populations has been modest. What has been done has been confined to North America (Bullington, 1991; Gordon, 1986; Harmon and Rose, 1988; Marks et al, 1985; Rose and Marks, 1985; Rose, 1984; Ryan and Johanson 1981, 1989; Shkurkin et al., 1975, Teaford, 1991); Egypt (Puech et al., 1983b); India (Pastor, 1992, 1993; Pastor and Johnson, 1982); Japan (Hojo, 1989) and Syria (Molleson and Jones, 1991). Shkurkin and associates (1975) were some of the first researchers to use the scanning electron microscope for comparisons of human molars between contemporary

Americans and "paleo-Indians." Their study concluded that the SEM was a useful tool for comparisons between humans groups cross-culturally, and that different populations showed different wear of the enamel surface. They related these differences to diet and were some of the first to suggest that subsistence patterns and dietary reconstruction could be determined from microscopic wear analysis of the features of prehistoric individuals (Shkurkin et al., 1975). Ryan and Johanson (1980, 1989) looked at microwear on the anterior teeth of prehistoric Eskimo and Late Woodland Indians and found heavily pitted, chipped, and deeply scarred occlusal and labial surfaces. Since ethnographic data about the Eskimos were available, the researchers concluded that the Eskimos used their front teeth for non dietary activities, such as clamping and holding abrasive objects. Other microwear studies by Rose and associates (Harmon and Rose, 1988; Rose 1984; Marks et al., 1985; Rose and Marks 1985) give valuable qualitative comparative data from other prehistoric archaeological samples of teeth. They found that grit particles do not significantly change the width of scratches on enamel surfaces but change the size of pits.

Dental microwear analysis was conducted on the dentition from twenty individuals at Seminole Sink in Texas, an archaic site (Marks et al., 1985). Interpretation of the SEM data were compared to the faunal and floral analyzes from comparable sites. The second mandibular molar, mesiolingual cusp was used, but magnification was at 1500x. The researchers concluded that a high correlation existed between the presence of hickory nuts and compression fractures on molar. Polishing of the enamel is consistent with a high fibrous diet, and the diet was coarse, with a large ingestion of numerous seed and non-pitted fruits, requiring large mastication forces.

Rose and Marks'(1985) work at the Alexander house examined burials associated with a Mississippian occupation. They concluded, based on the SEM results and ensuing analysis that the absence of compression fractures (pits) indicated that the inhabitants of this site processed their nuts differently or the individuals died during a "nonfall" season of occupation. They also concluded that the diet was soft, "agricultural" and the food was processed with stone utensils. (Rose and Marks, 1985).

Microwear patterns were studied at Bug Hill (Rose et al., 1985) and showed an increase in the consumption of vegetable fiber and nuts in conjunction with stone preparation materials.

Kathleen Gordon's work on Zuni and Eskimo dentition (1986) showed differences in microwear patterns. She had the advantage of access to valuable ethnographic data for food and diet. The Zuni, who ate maize, had microwear features with large, broad scratches, big pits, and much roughening of the enamel. The Eskimos, who primarily had a diet of marine mammals, showed finer scratches and many smaller pits. The availability of ethnographic data was corroborated by stable isotope and trace element analysis. She concluded that microwear data in combination with ethnographic information, and stable isotope and trace element analyses can be used to distinguish paleo diets in populations where "diet and feeding behavior are as much functions of culture and technology as of the resources themselves" (Gordon, 1986: 207). She concluded that further work needed to be done on populations whose microwear features possessed less startling differences of features. Gordon (1990) also used multivariate and univariate statistical analysis for microwear data from several prehistoric populations from North America. Her samples

included marine mammal hunters, maize agriculturalists, and mixed hunter-gatherers. She had, again, access to ethnographic data and isotope and trace element analyzes for most of her samples. Her results showed that differences in dental microwear patterns resulted from dietary differences among the samples rather than differences in food processing (Gordon, 1990).

Comparable dental microwear data to the Averbuch is non-existent. The only data from the same cultural period, (Mississippian), are Bullington's (1991) study on deciduous teeth from juveniles from the lower Illinois River Valley and Rose and Marks (1985) teeth from four Mississippian burials from the central Arkansas River Valley.

Using SEM at 500x, Bullington collected qualitative and quantitative data from the micrographs which were scored qualitatively for enamel surface characteristics. She also collected feature frequencies, but did not collect feature dimensions. Her study showed that the frequency of pits on deciduous teeth increased with time and exposure to wear, regardless of the age of the individual. However, she found that the age of the individual did bias the amount of dental wear. Older individuals had less microwear than young adults and infants had less microwear than the younger adults. Based on these results, she concluded that the diet of the Middle Woodland was more hard and varied in contrast to the Mississippian.

Teaford (1991) used quantitative microwear analysis to document dietary reconstruction in the southeast. Twenty-seven maxillary first molars from sites along the Georgia and Florida coast were analyzed. They represented three different time periods in the southeastern United States. They are: 1) precontact: 400 B. P. - primarily hunting and

gathering of marine foods; 2) early contact: 1607 - 1690 A. D.; and 3) a late contact Spanish mission group: 1686 - 1702. The two last populations were more dependent on maize production than the former population group representing hunting and gathering of marine food. Teaford's results showed that the teeth of the precontact group (the hunters and gatherers of marine food) had many more pits and wider scratches than either of the other two groups. The average pit width for the precontact population showed less variation. Teaford suggested that the accidental ingestion of sand with the marine food acted as an abrasive particle which would score the teeth. The two contact groups did not have the extra grit in their maize diet. Teaford concluded that those two contact groups probably used wooden metates as shown to them by the Europeans who arrived with the development of Spanish missions as opposed to the earlier use of stone metates to process maize. These two agricultural populations, early contact and late contact, showed decreased enamel pitting. Teaford's results demonstrated a dietary shift among the populations

The teeth from Mesolithic and Neolithic Syrian groups (Molleson and Jones, 1991) were subjected to a quantitative and qualitative analysis of their occlusal surfaces. The sample size was small and no significant statistical data resulted from their analysis. However, Molleson and Jones were able to make some distinctions between the two groups. They found that food in the Neolithic Age was more coarse and harder than in the Mesolithic Age. During the Mesolithic Age, the diet was soft and contained small grains which required little crushing. This finding was corroborated by the paleobotanical

remains. The adult diet in Neolithic Age was similar , but was more varied and showed larger particles (Molleson and Jones, 1991).

Puech and coworkers (1983b) examined 603 pre-dynastic and dynastic skeletons for wear macroscopically and microscopically using Scott's (1979b) wear scale in combination with a qualitative study of the microwear features on the teeth. He concluded that degree of wear is a function of age, but wear on teeth in the same quadrant is less marked as the individual aged. He also concluded that desert Bedouin consuming the same diet as inhabitants of Arab villages had twice the amount of tooth wear, as a result of wind-blown sand in the diet causing more abrasions. Teaford also noticed that "exogenous abrasives" or "exogenous grit" (Teaford et al., 1996) such as wind-borne dust on food could be the cause of dental microwear in some species (Teaford, 1994; Teaford et al., 1994). Puech's qualitative study on the microwear features unfortunately cannot be used in comparison with other human populations because of the non-conformity of the description of the features which Puech called striations and furrows (Puech et al., 1983b).

Pastor's qualitative and quantitative research of a sample of teeth from the skeletal series of the Mesolithic site Mahadaha and chalcolithic site of Mehrgarh were the first intensive microwear studies on molar occlusal surfaces of prehistoric or contemporary human populations from south Asia. His early work on the Mehrgarh site showed a pattern distinctive to a culture having a sedentary agricultural life and a subsistence of processed grains (Pastor, 1992). His Mahadaha study also showed that microwear features of the second mandibular molar showed traits of sexual dimorphism (Pastor 1993).

Living human subjects also have not been frequently used for diet reconstruction because of the difficulty of making casts from teeth, albeit much easier from cooperative human subjects than wild animals. Teaford and Tylenda (1991) had a longitudinal experimental study where the documented changes from nine volunteers who ate an American diet were presented. Teaford and Lytle (1996) conducted a longitudinal study to see how switching from a coarse stone meal ground diet would change the base occlusal surface after a lifetime of a typical American diet. A baseline micrograph was taken of the subject's tooth. New pits and scratches were actually discernible after one week of a changed diet. Teaford concluded that rates of wear varied among individuals and the amount of stone ground maize in the diet of prehistoric or historic populations may have had more abrasion than his experiment, thus increasing the rate of wear. Despite the experiment limitation, Teaford proved that a stone ground maize diet can lead to increased dental microwear features (Teaford and Lytle, 1996).

Currently, dental microwear research is continuing using Microware 2.2 and Microware 3.0, which are becoming the standard among the leaders in dental microwear research (Ungar, personal communication, 1997). Standardization of magnification, 500x, is becoming the norm in the industry also (Ungar, personal communication, 1997). However, only a fortunate few have access to an environmental scanning electron microscope. At this time, researchers are trying to develop a software program to work in conjunction with Microware 3.0 which will actually recognize and measure the features on the screen without any observer interference of error. A topographical approach to dental microwear analysis using a profiler to collect high resolution topographical data on tooth

surfaces was developed by Walker and Hagen (1994). The instruments, used in sub-nanometer vertical resolution and a horizontal resolutions were used on a number of beta test programs. As of now, nothing more has been developed from this method (Ungar, personal communication, 1997).

CHAPTER THREE - Averbuch:

The Site and Setting

Averbuch, named after Mr. Sidney Averbuch, owner of the site when it was discovered in 1975 is in Davidson County, Tennessee, about nine kilometers or 5.5 miles from Nashville. The approximate 11- acre site sits on a hill about 450 meters from the Drake Branch, a slow moving stream. At the bottom of a low ridge a hill extends in a southern direction making a higher area than the rest of the adjacent hill slopes. The site rose to about 540 feet above sea level before the summit was destroyed in 1975 to make way for the construction of the Royal Hills subdivision in the Bordeaux section of Nashville (Reed, 1984a, 1984b).

This area of Tennessee, in the northwest section of the middle division of the state, lies within the Nashville Basin, an area covering 15,300 square kilometers within the state of Tennessee. It is bounded by the Highland Rim, a plateau of limestone. Averbuch is well within the outer portion of the Nashville Basin and approximately 15 kilometers south of the escarpment of the Western Highland Rim, which rises about 90 meters out of an ancient depression (Reed 1984a). This region of Tennessee and the United States is called the Cumberland or the Interior Low Plateau of Eastern North America Plateau. This plateau covers an area from the unglaciated portions of southern Ohio and Indiana south through Kentucky to the Tennessee River in the northern part of Alabama (Klippel and Reed, 1984). The climate of the site is classified as humid Mesothermal with seasonally

demarcated fluctuations in both temperature and precipitation (Reed, 1984a). Rainfall is distributed fairly evenly throughout the Nashville Basin and the heaviest rainfall occurs from late December to early April (see Figure 1). The area is characterized by a diverse deciduous forest. Trees dominating the forests are: American chestnut, beech,, chinkapin oak, red oak, sugar maple, tulip, white basswood, white oak, and yellow buckeye (Reed, 1984a). In less quantity, but "no less economically important" (Eisenberg, 1986) are birch, black cherry, blackgum, butternut hemlock, hickory, red maple, and white ash (Reed, 1984a; Eisenberg, 1986). These plant resources would have been made available to the prehistoric peoples inhabiting the area for "subsistence and maintenance exploitation" (Reed, 1984a). Two miles from the site, Drake Branch joined Whites Creek. 2.6 miles later this confluence joins the Cumberland River. The soils in this area are abundantly fertile for agricultural use.

Averbuch has been described as a Middle Cumberland Culture in the Mississippian Period (Klippel, 1984). Mississippian refers to a prehistoric cultural period starting from the 9th century in some locations and lasting until the 14th century (Smith, 1978b). North American archaeologists commonly assume Mississippian to involve agriculture and ranked social organization. Full blown Mississippian cultures have been characterized commonly by a dependency on maize agriculture and a ranked social organization and hierarchy (Crites, 1984). Averbuch is considered to be Middle Cumberland Culture, which is indigenous to the central part of Tennessee and began somewhere in the 13th century and lasted until the 16th century (Klippel and Reed, 1984).

Averbuch is in the northwest corner and identified by a ▲.

(Reed, 1984a; I.1.3)

Figure 1: Map of the Nashville Basin Locating Averbuch

According to Klippel and Reed (1984) our understanding of Averbuch as a Mississippian culture has been described as a culture with its own particular level of social and organizational hierarchy. Known Mississippian sites have generally been located in major river flood plains for the presence of fertile soil and the extensive amount of different species of plants and animals sustainable for human populations.

Averbuch has been called a "marginal Mississippian culture," because the site is not situated directly on the Cumberland River (Klippel and Reed, 1984). Rather, it is located about four miles away from the Cumberland on some smaller drainage feeders to the Cumberland. Marginal in this context meant that a site had spread farther from the main rivers (Klippel and Reed, 1984). The fact that the site was away from the Cumberland River and not situated directly on it, lead Drs. Bass and Klippel, the principal investigators of the site, to suspect that the move from the Cumberland River was from population pressure in the Nashville Basin (Klippel, 1984). This population pressure hypothesis was derived from the 1) fact that the site was not directly on the Cumberland River and 2) pathological lesions and biological stress markers discovered in human skeletal remains. (Berryman, 1981, 1984a, 1984b; Eisenberg, 1986; Guagliardo and Jablonski, 1984; Jablonski, 1981, 1984a, 1984b).

Berryman (1981, 1984a, 1984b) who constructed a paleodemographic model of the Averbuch population looked at enamel hypoplasias, Harris Lines, and stature reduction. Eisenberg (1986) looked at dry bone lesions in the 887 (she counted 888) skeletons from Averbuch in an attempt to add to the knowledge of prehistoric population density and diet in the area. Guagliardo and Jablonski (1984) looked at fluctuating dental asymmetry to see

if there were any deviations from the genetically occurring symmetry of teeth. Jablonski (1981, 1984a, 1984b) was interested in the Striae of Retzius, naturally occurring bands in the development of enamel on the teeth. Digressions from the normally occurring striations into pathological bands are thought to be caused also by stress in the individual, e.g. disease and malnutrition. Current research is investigating dental and oral macro pathology, i.e. incidence and rates of caries, hypoplasias, alveolar resorption, wear, abscesses, and *antemortem* teeth loss of 600 adult and deciduous dentition from Averbuch.

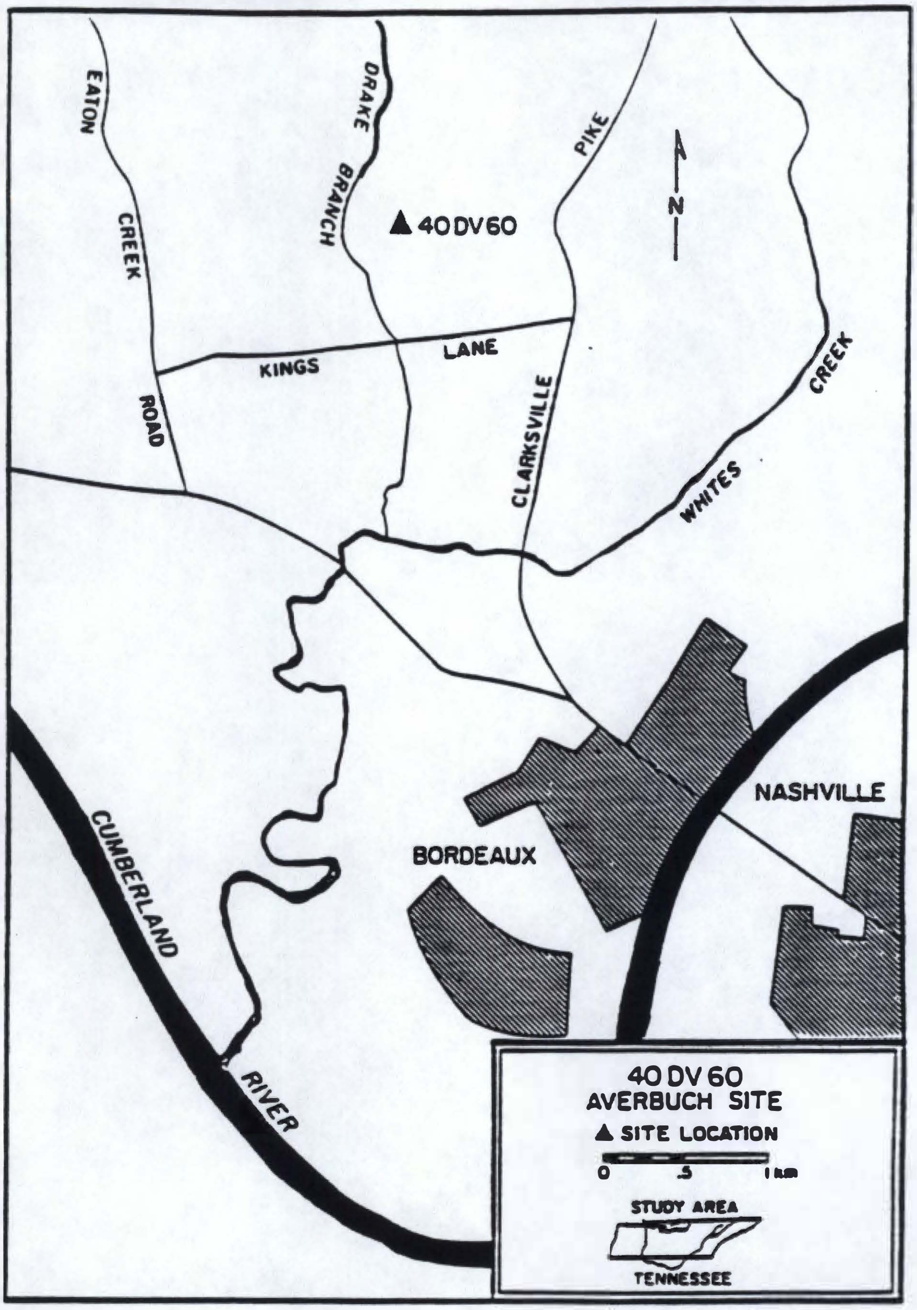
There are little data on subsistence patterns and nutrition for late Mississippian sites in the Nashville Basin (Klippel 1984). Previous archaeological investigations were concerned primarily with the burials goods and the stone coffins rather than the biocultural context and paleo demographics of the site (Jones, 1876, Thruston, 1890). Crites (1984) notes that the amount of charred floral remains was less than was expected for an agricultural site and there was a deficiency of charred floral remains recovered for the amount of structures and fill (Klippel 1984).

Archaeology of the Site

When the stone box graves were discovered during construction for the housing development in 1975, personnel from the Tennessee Division of Archaeology monitoring the bulldozing, determined that a large Middle Cumberland Culture had been disturbed. Upon their recommendation housing construction stopped and survey and salvage work begun under the direction of D. P. Rapp, Sr. and P. Coats in 1975 under the

auspices of the Tennessee Division of Archaeology. Their objective was to determine the expanse of the site and the impact of construction made thus far. From the results of the walkover or "pedestrian" survey it was concluded that about 30% of the site had been destroyed by eight houses and road construction (Reed, 1984b). The site was also eligible for inclusion in the National Register of Historic and mitigation of the site was approved in compliance with the Archaeological and Historic Preservation Act of 1974 (Reed, 1984b). Department of Anthropology, University of Tennessee was contracted to supervise the excavation of the site, and Drs. William Bass and Walter Klippel were the principal investigators. Dr. Klippel was also the Field Project Director and Dr. Hugh Berryman and Ms. Ann Reed (graduate students at the time) were in charge of the field excavations and subsequent laboratory work (see Figure 2).

A backhoe was used to delineate the boundaries of the site to determine its relationship in size to other Middle Cumberland Culture sites. Over the course of the next year until the end of 1978, 645 graves were excavated, representing 887 individuals. All the graves in Cemetery One were excavated except for several which had already been destroyed by construction of a street (Berryman, 1984a). Every uncovered grave in Cemetery Two was excavated. Some of the graves had been destroyed by earlier plowing. The burials in Cemetery Two were not as deep as the burials in Cemetery One and Three. All the burials in Cemetery Three were excavated except for four graves. In addition, part of the cemetery which ran beneath a street could not be excavated (Berryman, 1984a). The majority of the burials were confined to the three "separate and distinct" cemeteries, although a small number was found in the accompanying

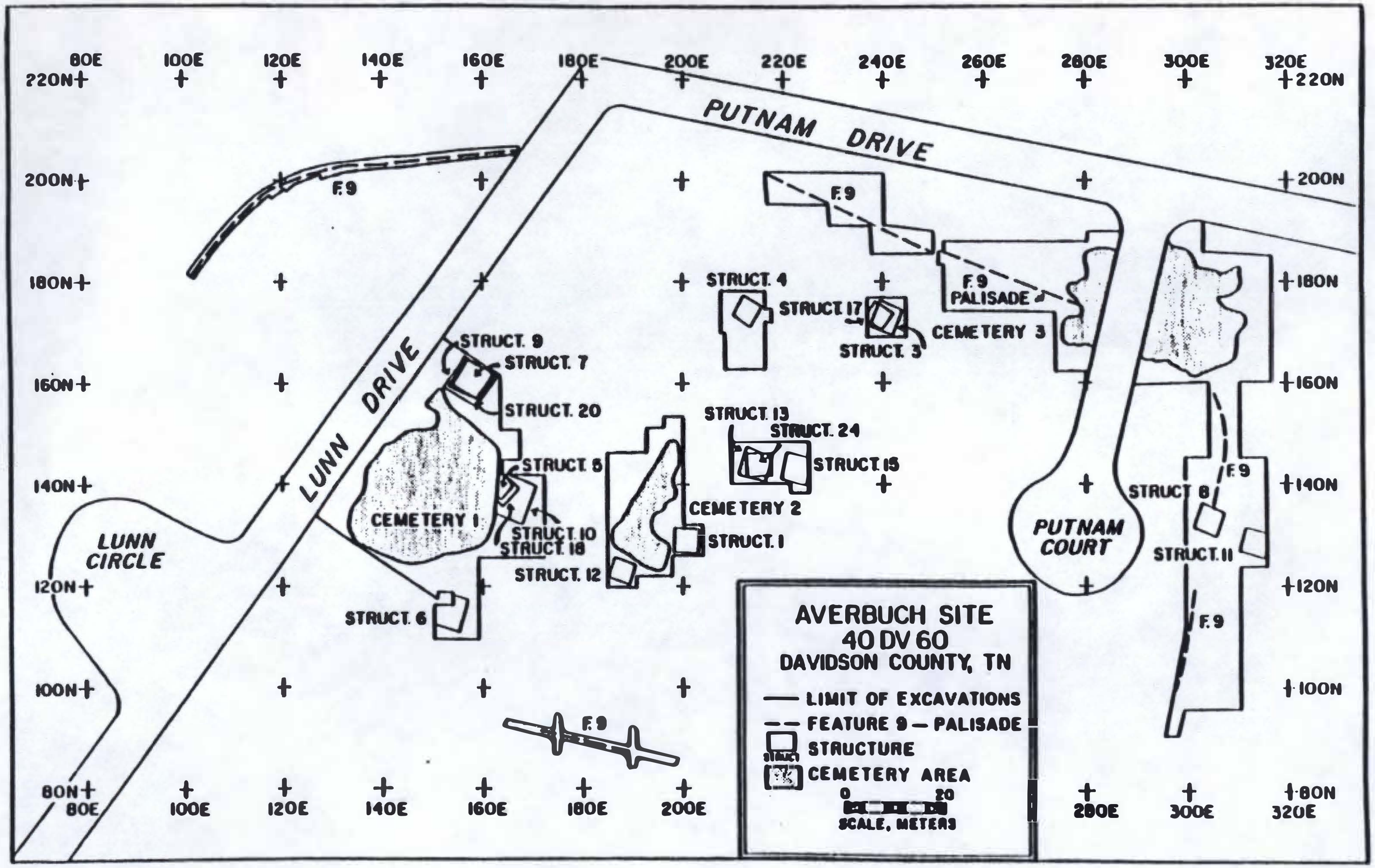


(Reed, 1984a; I.1.2)

Figure 2: Location Map of Averbuch

structures (Berryman, 1981) (see Figure 3). The remains of a palisade wall were found by a backhoe trenching to delineate the site. This palisade wall surrounds most of the site except for Cemetery Three in the northeast corner of the site, which the palisade wall cuts through. As a result Cemetery Three is thought to predate the palisade wall and Cemetery One and Cemetery Two. A radiocarbon analysis of the wood from the palisade wall dated the wall between 1273 and 1489 with a mid point of 1363. Applying the Monte Carlo Method to radiocarbon dating to some of the radio samples from the Averbuch site, Konigsberg and Frankenberg had a median start date of 1285 and a median end date of about 1400 and a temporal span of about 100 year (Konigsberg and Frankenberg, 1995).

Cemeteries One and Two are on the western portion of the site and wholly contained within the wall. Cemetery One is the largest and cuts through some earlier structures. The dates of Averbuch are given as 1275 A. D. - 1400 A. D. and it is thought to have been occupied approximately 50 - 100 years. The lack of "artifact homogeneity" (Klippel, 1984) and the lack of "extensive midden accumulation" (Klippel, 1984) encouraged Klippel to argue for an occupation less than one century during the fourteenth century (Klippel, 1984). Berryman's (1984a) estimate of the duration was probably not exceeding 25 years . Regardless of whose estimate is used for duration of occupation,(Berryman, 1984a; Eisenberg, 1986, Klippel, 1984; Konigsberg, 1995) the consensus is that the site was occupied somewhere between 25 and 100 years.



(Reed, 1984b; I.3.8)

Figure 3: Location Map of the Cemeteries

Burials

Every excavated skeleton was assigned age and sex by Berryman, when relevant skeletal information was available (Berryman, 1981, 1984a, 1984b). The cemeteries were thought to be deficient in infants until 30 fetal to 2.5 year old skeletons were found under house structures throughout the site. Cemetery One, containing 564 individuals, is the largest of the three cemeteries. The ratio of males to females is about equal. Males accounted for about 32.6%; females 29.8%; and unsexed 37.8%. Cemetery Two has 98 individuals and a higher male female ratio. Males account for 41.3%; females, 24.9%; and unsexed individuals, 35.23%. Cemetery Three, the earliest cemetery, with 190 burials has about the same ratio of males to females. Males account for 33.05%; females 31.19%; and unsexed individuals, 35.75%. Berryman's demographic reconstruction (1981, 1984a) concluded there was no exclusion of any sex or particular age group from the three cemeteries. Obviously the unsexed individuals (n=315) are children under the age of 15.5 years of age. The only exception is the discovery of the 30 infants buried within the house structures encountered throughout the site. Also, not all the house structures were excavating, preventing the possibility of recovering more infant burials. Because there are three distinct cemeteries the individuals may not be contemporaneous. Of the 645 graves excavated 457 were single burials. Almost one third, 29.2 %, of the burials had more individual interred in them; 6.8% contained more than two; and 1.4% contained more than three. In some instances males were joined with females suggesting a connubial

relationship, while infants were placed with female adults implying a consanguineal relationship (Berryman 1984a, Eisenberg, 1986).

Results of the of the Floral and Faunal Analysis

Biocultural data collected from other Middle Cumberland sites, within a Mississippian manifestation, have been insufficient for dental microwear comparisons. To date, this dental microwear study is the first of its kind to be done on a Mississippian site in Tennessee and consequently the comparisons to other dental microwear features from other Mississippian sites are largely dependent on the comparable subsistence regimes of other Mississippian sites. Food preparation items recovered from archaeological excavations including grinding stones of mortar, pestles, pounders (metates); can provide information on diet and food consumption. But, complicating the understanding are unknown storage techniques and processes which can mask or give a distorted view of diet. (Gordon, 1986) Using the analysis from recorded paleoethnobotanical screenings can be difficult for determining paleodietary habits , because those screenings do not tell food storage or food preparation techniques.

Samples from carbonized plant remains came from excavated structures (68.36%), features (29.42%) and stone box burials (2.2%) (Crites, 1984). The results from the screening at Averbuch showed that Northern Flint maize was the predominant botanical vestige. Other paleobotanical remains recovered were: lambs quarter, black walnut, butternut, and acorn, persimmon (although the number of seeds recovered was so small

that the seeds may not have been consumed (Crites, 1984). Honey locust seeds were found. Although they are not edible, the pulp of the fruit can be used in the preparation of tea. Persimmon and honey locust seeds were probably not eaten but used in the preparation of food. (Crites, 1984). Other seeds, grapes, blackberry, raspberry, knotweed, sunflower ash, blackgum, ironwood and blackhaw were also recovered. A variety of bean *(phaseolus vulgaris)* was also recovered. Maize was the most prevalent plant food recovered from the features (Crites, 1984). Wild plant food remains were scarce (Crites, 1984).

Bones recovered from Averbuch were classified into four categories: mammal, bird, fish, and reptile or amphibian (Romanowski, 1984). In addition to the labeling and processing for curating the bone, the bones were examined to see if they had butchering marks on them; were burnt, or had been gnawed, evidences of some cultural application. Butchering cuts were identified on predominately white-tailed deer, elk, turkey and Canada goose and snow goose. Minimal specimens of butchering were found also on a black bear, raccoon, stripped skunk, fox, Eastern cottontail rabbit, opossum and an Eastern mole (Romanowski, 1984). Other mammal remains found at the site were mountain lion, beaver, woodchuck, domestic dog, gray fox, red fox, muskrat, Eastern Fox squirrel, Eastern Gray Squirrel, Eastern chipmunk, mink, shorttail shrew, Southern bog lemming, vole, Eastern woodrat, rice rat and mouse. In addition to the mammal remains with butcher marks, the following mammals could also have been used for consumption: beaver, woodchuck, raccoon, squirrels, chipmunks, and skunks (Romanowski, 1984).

Turkey was the most predominant bird remain found at Averbuch making it fourth in rank of meat producers, behind elk, white tailed deer, and bear. Elk and white-tailed deer together made up 50% of the estimated meat weight (Romanowski, 1984). Smaller amounts of other bird remains - bobwhite, a small quail, sandhill cranes, and pied-billed grebes could have been eaten.

Fish provided an excellent source of protein and were probably a common food staple. Fish were obtained by nets, fish traps, spears, or hooks. Fish recovered at Averbuch were freshwater drum and catfish (the most predominant species), gar, minnow, stoneroller, sucker, redhorse, sunfish and bass (Romanowski, 1984) .

Turtles, including one snapping turtle, and snakes remains were also found at Averbuch. All of these reptiles could have been used for consumption (Romanowski, 1984). Although amphibian remains were recovered, they were not plenty and probably too small to offer much food. Frogs were found, and provided a tasty source of food, but for the amount recovered, they would not have been a major source of food (Romanowski, 1984). Mollusks, bivalves remains were recovered and probably used for food. Since Averbuch is within the migratory flyway, many fowl, including turtles, many species of fresh water fish, and seventy six species of mussels were found in the nearby Cumberland River (Romanowski 1984) which could supplement an agrarian diet. Averbuch was ideally situated to exploit many resources and the inhabitants were in an excellent environment for hunting and eating the available game and cultivating maize.

Basins, or pits containing surface fired areas of burned and fire spalled limestone were identified as cooking facilities based on the evidence of fire cracked rock and the use

of limestone for retention of heat (Reed and Klippel, 1984). Three corn cob pits, referred to as smudge pits (Reed and Klippel, 1984) were filled with charred or carbonized kernels and cobs of corn.

Dippers made from turtle shell could have been utilized for food processing. Modified shells were found within ceramic vessels and in seventeen burials at Averbuch (Romanowski, 1984). Pounders or metates were not recovered (Klippel, personal communication; 1997; Reed, personal communication, 1997).

Prehistoric Diet and Subsistence Patterns at Averbuch

The term Mississippian has changed over the years. It was originally a term referring to a geographic region that consisted of an area which distributed Middle Mississippi pottery family (Scarry, 1995). Subsequently the term was used to refer to the prehistoric groups which shared a minimal set of material attributes, including shell-tempered pottery, rectangular wall trench houses, and flat-topped pyramidal mounds (Scarry, 1996). Recently Mississippian has incorporated more than just the material characteristics to included definitions of economy, political organization and social hierarchy.

> Today, when we discuss the late prehistoric and protohistoric peoples of the Southeast, we talk of hereditary chiefs, ascribed social inequality, and differential access to resources. We discuss diet and the role of agricultural production in the evolution and maintenance of the Mississippian societies. We look for evidence of exchange between groups and at production within societies (Scarry, 1996: 13).

Now, Mississippian refers to those groups of people who lived in the prehistoric Southeast and practiced cleared-field agriculture with maize as the dominant crop, had hierarchical political organizations with evidence of defined status differentiation, and who shared a set of religious cult institutions and "pan regional ideological systems" (Rogers, 1995). This definition excluded the Timucuan chiefdoms and other societies of peninsular Florida, the Fort Ancient and other nonranked agricultural societies of the Midwest and Northeast, and the agricultural Siouan and Algonquian societies of the Middle Atlantic Coastal Plain (Scarry, 1996).

One of the most consistent themes in the discussion of Mississippian subsistence economies has been the dominant position that corn played in the diet. Evidence abounds in archaeological botanical samples and in trace element studies of human skeletal remains (Rose et al., 1991).

"Little is known of Middle Cumberland subsistence systems" (Crites, 1984: I.12.1). As a Middle Cumberland Culture within a Late Mississippian manifestation in the central Tennessee basin, the inhabitants of Averbuch likewise were considered to be agriculturalists and maize dependent with a supplement of fowl, mammal meat, freshwater mussels and fish, amphibians, nuts, sumpweed, grapes, and sunflower seeds (Crites, 1984; Romanowski, 1984). As a Mississippian site the supposed and expected subsistence pattern would commonly be a maize agricultural society complemented by fish and mussels from the freshwater Cumberland River (Klippel, 1984). These assumptions about Mississippian subsistence systems however can be paradoxical. In fact, through paleobotany recovery and processing, the floral and faunal remains provide the evidence

that the diet at Averbuch was more broadly based and not as dependent on maize agriculture as other Mississippian sites (Klippel 1984).

Crites' states that "to interpret season of abandonment of structures is just as distorted by the botanical record as are efforts to reconstruct subsistence patterns"(Crites, 1984: I.12.16). He concluded that

> if paleoethnobotanical samples provide only a distorted view of diet and seasonality, indications of nutritional structure of the diet, as derived from plant remains, are masked by plant processing and storage techniques, deposition and disposal patterns, differential preservability of plant parts, and the biases of field recovery and lab processing methods (Crites, 1984, I.12.16).

But, if maize is the bulk of the dietary staple of Middle Cumberland Cultures, then the paleobotanical analysis of the Averbuch site would indicate the probability of protein/amino acid deficiencies for the population. This would corroborate the stress indicators observed on the skeletal remains as discussed in Chapter One and earlier in this chapter (Berryman, 1981, 1984a, 1984b; Eisenberg, 1986; Jablonski, 1981,1984; Guagliardo and Jablonski, 1984).

CHAPTER FOUR - Materials and Methods

I performed the following steps in order to assure strict authority over the research.

1. Identification of the target sample (teeth) which included manipulation of two data bases
2. Collection of the teeth
3. Cleaning of the teeth
4. Mounting of the teeth
5. Scanning the teeth
5. Measurement of the features
6. Statistical analysis of the data

Sample Selection

To begin the research I had to identify those individuals (as identified by burial numbers) which had a permanent second mandibular molar with a first molar adjacent to it. The use of the second mandibular molar was not chosen indiscriminately. It had been the tooth of choice for analysis for many researchers (Grine, 1986, Gordon, 1982, Teaford and Walker, 1984; Rose and Marks 1985; Marks et al., 1985; Pastor, 1993). Individuals (identified by burial numbers) which had either a non-pathological left (#18) or right (#31) second mandibular molar (but only if a non-pathological first molar was *in situ* mesial to the target tooth) were used for this study. An *antemortem* loss of a first molar can result in

a mesial shift of the second molar altering the occlusal pattern on the mesiolingual cusp. When teeth are in malocclusion, discrepancies in the analysis of wear can occur (Marks, personal communication 1997; Puech et al., 1983b).

I used a combination of two databases to earmark my target sample. I used the database devised by Berryman (1981) because it had sex and age assignments for each burial. After some formatting, I combined it with *Osteo.mdb* a Microsoft Access database of the Averbuch skeletal material created by Dr. Lyle Konigsberg (NSF Grant; SBR-9307693; 1993-1994) of the University of Tennessee. *Osteo.mdb* included metrics and indices for crania and post cranial skeletal remains, dental development and wear marks for teeth. Age and sex assignments were not included in *Osteo.mdb* which required combining the two databases. I decided to employ Berryman's ages and sex assignments so they would compare with current and possibly future research.. For example, Jablonski, Berryman, and Eisenberg conducted their research using Berryman's age and sex assignments. Dental measurements were recorded and all statistics computed based on Berryman's ages and sexes (Jablonski and Guagliardo, 1984). Berryman's life tables and ages provided Eisenberg background for her subsequent work on biocultural insights from paleopathology at Averbuch (Eisenberg, 1986). All or most of the aging and sexing techniques that Berryman used for his analysis are used still today in forensic and biological anthropology. There is no reason to suspect that his aging and sexing techniques are inaccurate.

Since, Berryman's age definitions were narrowly demarcated, it was decided I should group his 34 age groups into four broader categories: <20; 20-29; 30-39; and 40+.

This would allow greater ease for statistical procedures and a hope that any significant differences among the age groups would show up more readily in four broader categories. Included in *Osteo.mdb* are the dental wear scores (Smith, 1984) and tooth development phases (Moorrees, Fanning, and Hunt, 1963).

Using both databases, Berryman's and *Osteo.mdb* I created my own database. From Osteo.mdb I retrieved information dental wear scores (Smith, 1984) for the right first mandibular molar, right second mandibular molar, left first mandibular molar, left second mandibular molar and dental developmental scores (Moorrees, Fanning, and Hunt, 1963a and b). From Berryman's database I retrieved burial numbers, cemetery, age, and sex information. After combining those two sets of data, I had my own database, which I converted into a Microsoft Excel spreadsheet. Thus I was provided with a list of every burial which had either both left or right permanent first and second molars, age and sex assignment, and cemetery affiliation . From that list, (n=341) I divided the burial list three different ways:

1. into four (4) age groups:
   1} less than 20; <20
   2} 20 - 29
   3} 30 - 39
   4} more than 40; 40+

2. into the three (3) cemetery groups:
   1} Cemetery 1
   2} Cemetery 2
   3} Cemetery 3

3. into the two (2) gender groups:
   1} male
   2} female

From that spreadsheet I created tables for all burials for which age, sex, and cemetery affiliation had been assigned. Not every individual had been assigned a gender or put into one of the age categories. In a few instances, I had the appropriate dentition, but age and sex were not determined for those individuals because of a lack of more diagnostic cranial and post cranial remains . Of those 341 burials 49 burials were dropped leaving a total of 292 burials available for analysis prior to visible confirmation. I randomly selected 141 burials for my sample. I visually examined all teeth from the burials, dropping those where the second mandibular molar was completely carious or dentinous. The final tally of suitable teeth for analysis was 109 from which I drew my sample of 68 teeth. I originally had planned to work with a sample of three from each of the 24 sets (3 cemeteries x 4 age groups x 2 sexes); for a total of 72 teeth. However, there were no teeth representing my criteria for females from Cemetery 3 in the 40+ age group and only two teeth were available for males in the 40+ age group in Cemetery 3. This brought the total sample to 68 teeth. I numbered the teeth used for the SEM analysis in sequential order starting with #1. Tooth number 1 will always relate to its corresponding micrograph (image1.bmp) and overlay or coordinate file (image1.crd).

The original teeth were used without risk to them. The alternative was to use casts of teeth, which is a long process involving impression materials and epoxy. This procedure is useful for live animals, museum specimens, or teeth which are still attached to a large portion of the bone. The teeth were cleaned with acetone for two minutes to remove any preservatives on them. Teeth were then rinsed with water and cleaned again with denatured alcohol. They were then left to air dry for two days. After positioning the teeth

in proper anatomical position on a glass slide with modeling clay, the occlusal surface of the tooth was swabbed lightly with denatured alcohol to remove any debris, dust, or dirt. Prior to being put in the vacuum chamber of the microscope, the occlusal surface was cleaned with compressed air.

The Scanning Electron Microscope

These sample teeth were taken to Dr. David Joy, Director of the EM Facility in the Science and Technology Center at the University of Tennessee for SEM examination. The scanning electron microscope uses an electron bean to look at the surface topography of the specimen. At higher magnification, 500x in this analysis, a small area, in this case, the mesiolingual cusp (metaconid), can be thoroughly scanned. This electron beam causes other electrons to be emitted from the surface of the specimen. These electrons emanating from the surface of the specimen are portrayed on a cathode ray tube which makes the resulting image look like a television picture. In actuality, the resulting picture is an image of variations of brightness caused by the emanating electrons. Since any dirt, debris, or dust, can change the surface of the tooth, the resulting picture or micrograph can be altered.

The scanning electron microscope used was a Hitachi S-3200N Scanning Electron Microscope running on 20KV. Physically, it is an environmental microscope, meaning that "wet" samples can be put in the vacuum chamber for analysis without any casts or coatings (sputterings) of gold. The word"environmental" in conjunction with scanning electron

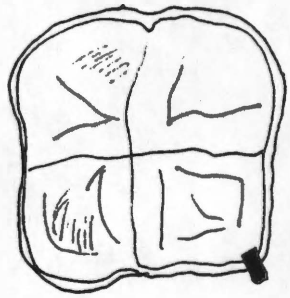
microscope is actually a trade name belonging to another company. The particular microscope I used is an N-SEM; N meaning "Nature." The Hitachi took pictures (micrographs) at a normal incidence (perpendicular) beam angle, which is 90 degrees. A total of 80 seconds was needed to do a computer exposure of the tooth, and the vacuum chamber needed to be pumped up to 30 PA between each "run." The SEM analysis was non-destructive. The teeth were put in the chamber and scanned at 60x to observe the surface of the tooth and determine the location on the mesiolingual cusp tip facet for closer observation and data gathering (see Figure 4). Selection of areas for photography was based on the following: First, the area to be scanned had to have some representative features present on the facet. And some of the features had to lie entirely within the scanning area. I had some features that truncated outside the boundaries of the field. Second, I had to have some adjacent areas with features present, since my research was depended wholly on collecting, counting and measuring pits and scratches. Micrographs of each tooth magnified at 500x were compiled to access surface topography. Micrographs of Tooth #1 were taken at 100x, 200x, 300x, and 400x to illustrate the selection process of the facet used for measurement at 500x. The computer generated photos (micrographs) were taken by Quartz PCI, which runs in conjunction with the scanning electron microscope. The micrographs were downloaded as BMP (Microsoft Windows 3.0 Bitmaps) images onto computer diskette. I used *Microware 3.0*, a software package designed specifically for the measurement of dental microwear features by Dr. Peter Ungar of the University of Arkansas (Ungar, 1996, 1997). These programs displayed the photomicrograph image of each tooth on my computer screen which allowed me to

measure each feature with the mouse. I made four measurements for each feature: major axis at either end and minor axis - a either end. Pits were determined by the computer with a default setting in which the major and minor axis lengths form a ratio of less than four to one. This 4:1 ratio is considered the "norm"of dental microwear research today for distinguishing pits from scratches (Ungar, personal communication. (Please refer to Raw Data Descriptions by Tooth (APPENDIX F) and Feature Summary Statistics (APPENDIX E). On the lower border of the micrographs is a scale in which each dot represents 10 microns. Overlay lines for each feature of every image were saved as coordinate files. For every pit and scratch I measured, the software calculated length and width as well as other descriptive statistics for every identifiable and measured feature.

Overlay lines have been drawn in red on Image01.bmp, the first micrograph (APPENDIX D) to illustrate the microwear features.

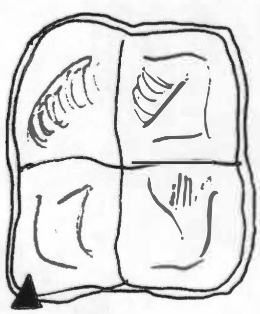
The micrographs, the photo image of the occlusal surface of the tooth at 500x, were printed using software Adobe Photo Deluxe Version 1.0 and printed with a Canon Bubble Jet 4200. The resolution of each micrograph was 640 x 480 resolution or 142 pixels per inch.

Right Mandibular Second Molar



■ indicates area of analysis

Left Mandibular Second Molar



▲ indicates area of analysis

Figure 4: Location of the Mesiolingual Cusp Tip

After reviewing the micrographs on the computer screen and in a printed format, I discovered that 13 teeth had to be dropped from my sample. Those 13 teeth upon closer examination showed artifactual marks and/or areas with unusually low feature densities. Low feature density is a common occurrence for some prehistoric and fossil specimens. Teeth with low feature density or artifactual marks should be dropped from the sample (Teaford, 1988b).

As a result, I recalculated my age and sex specimens and created new tables (Tables 1 - 5) summarizing the sample distribution which would be used for analysis.

Table 1: Distribution of Teeth by Sex: Cemetery One (n=22)

Cemetery One				
	<20	20 - 29	30 - 39	40+
Male	3	5	3	3
Female	2	1	3	2
Total	5	6	6	5

Table 2: Distribution of Teeth by Sex: Cemetery Two (n=17)

Cemetery Two				
	<20	20 - 29	30 - 39	40+
Male	1	3	2	2
Female	2	3	2	3
Total	3	5	4	5

Table 3: Distribution of Teeth by Sex: Cemetery Three (n=16)

Cemetery Three				
	<20	20 - 29	30 - 39	40+
Male	2	2	2	2
Female	3	3	2	0
Total	5	5	4	2

Table 4: Distribution of Teeth by Sex: All Cemeteries (n=55)

	<20	**20 - 29**	**30 - 39**	**40+**
Male	6	9	7	7
Female	7	7	7	5
Total	13	16	14	12

Table 5: Distribution of Sex within each Cemetery (n=55)

Cemetery	**Male**	**Female**	**Total**
One	14	8	22
Two	7	10	17
Three	8	8	16
Total	29	26	55

Regardless of the drop in my sample I still had an approximate 10% sample. There were 887 burials recovered; of those 537 were adults for whom age and sex could be determined. The remaining 350 burials, primarily children were under the age of 15.5 for whom sex could not be assigned. Of those 537 burials, only 292 had the proper dentition for analysis. In that regard the 55 sampled teeth represent 18.8% .

As an ancillary component of this research project, I have included some samples of teeth from other archaeologically derived skeletal populations for illustrative purposes. Two adult permanent second molars from the site of Mobridge and three adult permanent second molars from the site of Leavenworth in South Dakota are represented by micrographs taken at 500x magnification. Mobridge teeth, from burials uncovered at Mobridge, South Dakota are from the cultural-historical framework of a Plains Village 2, (protohistoric period) extending in time from about 1250 until 1750 A D. (Blakeslee, 1994). The Leavenworth teeth, from excavations at Leavenworth, South Dakota represent a site of the historic Arikara period 1700 A. D. onward (Blakeslee, 1994). Micrographs of each the tip of the mesiolingual cusp (metaconid) from each tooth magnified at 500x are included APPENDIX D with the corpus of the study material. These teeth are added to illuminate the considerable resources for interpopulation comparisons, discuss the effectiveness of quantifiable dental microwear analysis, and will be discussed in Chapter Six.

Statistical Procedures

I used quantitative methods to analyze the micrographs of the teeth. Because of the recent development of software with a cursor-mouse measuring device (Ungar, 1996, 1997) the quantitative process was not as arduous as the measurement process has been in previous studies. Quantitative methods involve counting features from which ratios can be computed. As a result correlation coefficients can be calculated and logarithmic data can be used for linear and hard regression and analysis of variance (Ungar, 1996a). Thus, this method was the approach I used for the analysis of the Averbuch teeth.

The data set of feature measurements, means, and standard deviations were created using Micrograph 3.0. The sets of measured data were imported into two Quattro Pro spreadsheets, the raw data and feature summary statistics (see APPENDIX E: Feature Summary Statistics and APPENDIX F: Raw Data Summary) and then converted into SPSS. The feature dimensions are measured in microns (μ). Orientation is measured in degrees.

Since, quantitative microwear analysis depends on the measurements of pits and scratches and their relationship to each other, the percentage of pits to the total features and percentage of scratches to the total features are also calculated. The nine independent data variables used for analysis came from the Features Summary Statistics data. They are:

1) Pit Tally: total number of pits per tooth
2) Scratch Tally: total number of scratches per tooth

3) Pit Tally /Scratch Tally ratio: pit to scratch ratio (calculated from pit tally and scratch pit tally)

4) Pit Tally/Number of Features ratio: number of pits to total number of features per tooth

5) Scratch Tally/Number of Features ratio: number of scratches to total number of features per tooth

6) Mean Pit Length: average length of pit per tooth

7) Mean Pit Width: average width of pit per tooth

8) Mean Scratch Length: average length of scratch per tooth

9) Mean Scratch Breadth: average breadth of scratch per tooth

A test for normality was performed on the nine variables to see if the data were distributed evenly. The results of those tests confirmed that the five count and ratio variables: pit tally, scratch tally, pit /total features ratio, scratch/total features ratio, and pit/ scratch ratio were non normal. The other metric variables: pit length, pit width, scratch length, and scratch breadth could not be shown to be non-normal. As a result the non normally distributed data had to be transformed before proper analysis of variation testing. If data are not distributed normally, then the outcome of the analysis of variation testing can be invalid. These following transformations were used to stabilize the variance. The pit tally and scratch tally were transformed into square roots; the pit/total features and the scratch/ total features were transformed using arcsine transformation; and the metric data, pit length, pit width, scratch length, and scratch breadth, were transformed into logarithmic 10 formats. The pit/scratch ratio was calculated from the tally counts of the pits and

scratches. Since the tallies for pits and scratches were not normal, then the pit/scratch ratio was not normal either. However, the pit/scratch ratio could not be transformed mathematically because the absolute value of the argument for the ARCSIN function was greater than 1. Since the pit/scratch ratio could be greater than 1 on some teeth, those teeth would have to be dropped from the sample. Table 6 below provides information on data variables, data names (for use in tables) and transformed names. This will assist in reading the descriptive summary statistics and the MANOVA tables.

Table 6: Data Variables and Their Names

Variable	Data Name	Transformed Data Name
Pit Tally	PITS	SQPITS
Scratch Tally	SCRTCHS	SQSCRTCH
Pit Tally/Scratch Tally Ratio	P2SRATIO	not transformed
Pit Tally/Total Ratio	PCPITS	ARCPITS
Scratch Tally/Total Ratio	PCSCRTCH	ARCSCRTH
Mean Pit Length	PITL_M	LOGPITL
Mean Pit Width	PITW_M	LOGPITW
Mean Scratch Length	SCRTL_M	LOGSL
Mean Scratch Breadth	SCRTB_M	LOGSB

Following the transformation of the variables and the SPSS Test of Normality for the eight transformed variables I used an alpha level of .05 to reject the null hypothesis and accepted that the data were normally distributed.

Descriptive summary statistics for each original (non-transformed) pit and scratch variable were calculated by age and sex, by age, and by sex. Data were analyzed independently for each transformed variable using a three-way factor multivariate analysis of variance (MANOVA) where cemetery, sex, and age were the three factors and eight aforementioned variables were the dependent variables: SQPITS (number of pits), SQSCRTCH (number of scratches), ARCPITS (percentage pits), ARCSCRTH (percentage scratches), LOGPITL(pit length), LOGPITW (pit width), LOGSL (scratch length), and LOGSB (scratch breadth). The MANOVA procedure was used to answer the four questions proposed in the introduction (see Chapter One).

After viewing the results of the aforementioned MANOVA, I decided to look at summary statistics on four more variables: R (R), Orientation Mean (ORIENT_M), Feature Length (LENGTH), and Feature Breadth (BREADTH). Feature Length was calculated by taking the mean of pit length and scratch length and Feature Breadth was calculated by taking the mean of pit width and scratch breadth. After the summary descriptive statistics were calculated, four more two-way factors of analysis of variance (ANOVA) using the Proc GLM procedure in SPSS were run on the following variables: R, ORIENT_M, LENGTH, and BREADTH. Again, sex and age were the factors.

The following list summarizes the statistical procedures and identifies and identifies the tables where the test results are presented. A discussion of those results follows in the next chapter.

1. MANOVA (Tables 7 & 8)
2. ANOVA for R (Tables 9, 10, & 11)

3. Summary Statistics for R (Tables 12, 13, & 14)

4. ANOVA for Orientation (Tables 9, 15, & 16)

5. Summary Statistics for Orientation (Tables, 17,18, & 19)

6. ANOVA for Feature Length (Tables 9 & 20)

7. ANOVA for Feature Breadth (Tables 9 & 21)

8. Summary Statistics for Pits (Tables, 22, 23, & 24)

9. Summary Statistics for Scratches (Tables 25, 26, & 27)

10. Summary Statistics for Percentage Pits (Tables 28, 29, & 30)

11. Summary Statistics for Percentage Scratches (Tables 31, 32, & 33)

12. Summary Statistics for Pit Length (Tables 34, 35, & 36)

13. Summary Statistics for Pit Width by Age (Tables 37, 38, & 39)

14. Summary Statistics for Scratch Length (Tables 40, 41, & 42)

15. Summary Statistics for Scratch Breadth (Tables 43, 44, & 45)

CHAPTER FIVE - Results

Statistical Analysis

Data from the microwear study reveal no significant differences. The relationship between metric pit and scratch data by cemetery, gender, and age showed some unforeseen results. The MANOVA looked for significant variation among the treatment means of the metric data for the 55 teeth. In the MANOVA procedure, the alpha level of .05 was chosen to reject the null hypothesis. The results of the MANOVA (Tables 7 & 8) revealed F values in the Wilks' Lambda far in excess of .05 to reject the null hypothesis. The three-factor MANOVA did not indicate significant variation among the genders, cemeteries, or ages in the frequency of pit and/or scratch tallies, pit length, pit width, scratch, length, scratch breadth, and pit and/or scratch ratios. As a result, the only conclusion that could be made is that based on the microwear data, there are no significant comparisons among any tested variables. There are no correlations among any of the dependent variables through time as an individual aged. I had hoped to see a difference in the amount of scratches as one grew older, but the frequency of scratches and pits did not increase or decrease through out the age of the individual. I also hoped to see some difference among the cemeteries, as Cemetery 3 was thought to have predated the other two cemeteries. Again, there were no significant differences among the dependent variables. Cemetery One did not show any significant differences between Cemetery Two or Three and Cemetery Two was not significantly different from Cemetery Three. The results of the MANOVA are seen in Tables 7 and 8 on the following page.

Table 7: MANOVA: Cemetery by Age by Sex

Between - Subjects Factors									
	Cemetery 1	Cemetery 2	Cemetery 3	Female	Male	<20	20 - 29	30 - 39	40+
Number	22	17	16	26	29	13	16	14	12

Table 8: MANOVA: Results

Wilks' Lambda Results of Multivariate Tests							
Effect	Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power
Intercept	.001	5092.224	8.000	25.000	.000	40737.795	1.000
Cemetery	.590	.944	16.000	50.000	.528	15.109	.535
Sex	.753	1.025	8.000	25.000	.444	8.197	.368
Age	.466	.916	24.000	73.109	.581	21.162	.639
Cemetery by Sex	.697	.618	16.000	50	.854	9.892	.343
Cemetery by Age	.295	.747	48.000	127.073	.875	28.713	.646
Sex by Age	.525	.758	24.000	73.109	.774	17.510	.531
Cemetery by Sex by Age	.353	.753	40.000	111.767	.845	25.860	.632

In an attempt to find some significance among the metric variables, I performed four ANOVAs on four previously untested variables as suggested by Ungar (Ungar, personal communication). They were 1) R, orientation vector length, a measure of concentration (Ungar, 1994a, 1996a), 2) ORIENT_M, mean of the orientation of the major axis slope, 3) feature length, (LENGTH), and 4) feature breadth (BREADTH). R is the length of mean striation vector, a measure of concentration or angle homogeneity. Shorter vectors indicate a more random distribution of scratches about a circle such that at $R = 0$, points are evenly distributed (Ungar, 1994a). Prior to proceeding with the ANOVA tests for the four variables: R, ORIENT_M, LENGTH, and BREADTH, I collapsed the cemetery data. Because, it was proven statistically, that cemetery affiliation did not affect the dental microwear patterning at all as shown by the results of the MANOVA, the four ANOVAs were performed without considering the cemetery factor. The results of the ANOVA for R, (Tables 9, 10 & 11) indicated a significant difference between age and R for the less than 20 age group (<20) and the 30 - 39 age group and the 40+ age group. This test showed that there was a significant difference between the concentration of features between the <20 and 30-39 age groups and the <20 and 40+ age groups (see Tables 9, 10, & 11 on the following pages). The implication of this significant difference is that it demonstrates that as people age, the concentration of striations becomes more evenly and randomly distributed. Table 12 shows that as the Averbuch population aged, the value of R comes closer to “0". Since the range of values for R are between “0" and “1", the closer to “0", the more random and evenly distributed are the striations. Younger

individuals have less randomly distributed and less concentrated striations (Tables 12, 13, & 14)

This result is not surprising because as an individual ages teeth become more worn. Teeth are designed for guides for chewing and the crests guide the chewing strokes (Mills, 1955; Kay and Hiiemae, 1974). As occluding teeth are more close to "head on", the striations of dental microwear patterning are more homogenous. When teeth become worn through attrition and crests and cusps become more blunt and flat, there is less guidance in the chewing stoke and occlusion becomes less consistent and more random. The R value will be lower if occlusion is going in all directions without the crests for guidance (Ungar, personal communication, 1997). As demonstrated in the Averbuch sample, the more teeth are worn, (as in the older age groups) the more random are the striations.

Table 9: ANOVA: Sex by Age; R, ORIENT_M, LENGTH, and BREADTH

Between - Subjects Factors						
	Female	Male	<20	20 - 29	30 - 39	40+
Number	26	29	13	16	14	12

Table 10: ANOVA: R; Sex by Age

Tests of Between - Subjects Factors							
Effect	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	.505	7.000	7.219E-02	2.501	.029	17.507	.825
Intercept	7.005	1.000	7.005	242.700	.000	242.700	1.000
Sex	1.624E-03	1.000	1.624E-03	.056	.814	.056	.056
Age	.468	3.000	.156	5.408	.003	16.223	.915
Sex by Age	3.827E-02	3.000	1.276E-02	.442	.724	1.326	.132
Error	1.357	47.000	2.886E-02				
Total	9.025	55.000					
Corrected Total	1.862	54.000					

Table 11: Post Hoc Tests for Age; Dependent Variable: R

Bonferroni Multiple Comparisons						
Age (I)	Age (J)	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
<20	20 - 29	.1191	.063	.400	-6.48E-02	.3030
	30 - 39	.2142	.065	.012	2.447E-02	.4039
	40+	.2423	.068	.005	4.506E-02	.4395
20 - 29	<20	-.1991	.063	.400	-.3030	6.483E-02
	30 - 39	9.510E-02	.062	.797	-8.52E-02	.2754
	40+	.1231	.065	.383	-6.50E-02	.3113
30 - 39	<20	-.2142	.065	.012	-.4039	-.245E-02
	20 - 29	-9.51E-02	.062	.797	-.2754	8.518E-02
	40+	2.805E-02	.067	1.000	-.1657	.1657
40+	<20	-.2423	.068	.005	-.4395	-4.51E-02
	20 - 29	-.1231	.065	.383	-.3113	6.497E-02
	30 - 39	-2.80E-02	.067	1.000	-.2218	.1657

Table 12: Summary Statistics for R by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	.28	.13	.09	.04
Maximum	.73	.79	.66	.48
Mean	.5029	.3838	.2887	.2607
Standard Deviation	.1327	.2068	.1785	.1090

Table 13: Summary Statistics for R by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	.04	.09
Maximum	.79	.70
Mean	.3489	.3743
Standard Deviation	.1947	.1779

Table 14: Summary Statistics for R by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	.36	.13	.13	.04	.28	.13	.09	.18
Maximum	.73	.79	.66	.48	.68	.70	.57	.33
Mean	.5320	.3449	.2910	.2550	.4780	.4339	.2864	.2686
Standard Deviation	.1349	.2086	.1908	.1401	.1361	.2091	.1805	5.604

The results of the second ANOVA procedure for the dependent variable ORIENT_M (Tables 15 and 16) indicated a significant interaction between the 30 - 39 age group and 40+ age group for orientation slope of the feature main axis. When viewing the data in Tables 17, 18, & 19, 180 represents a horizontal line and 90 refers to a straight up and down vertical line, perpendicular to 180. The implication of this age variance shows the directionality of the orientation of the features. The mean of the 30 - 39 age group is 56.1021 degrees as opposed to the 40+ age group with a orientation mean of 104.8150 degrees. The divergence in orientation mean also results from the increased wear of teeth experienced by people as they age. The reasons for the difference observed in the R value are also true for the difference in orientation mean.

The last two ANOVAS tested for feature length (LENGTH) and feature breadth (BREADTH) by sex and by age (see Tables 9, 20, & 21). The results did not show any significant differences.

Table 15: ANOVA: Orientation (ORIENT_M); Sex by Age

Tests of Between - Subjects Factors							
Effect	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	.505	7	7.219E-02	2.501	.029	17.507	.825
Intercept	7.005	1	7.005	242.700	.000	242.700	1.000
Sex	1.6242E-03	1	1.624E-03	.056	.814	.056	.056
Age	.468	3	.156	5.408	.003	16.223	.915
Sex by Age	3.827E-02	3	1.276E-02	.442	.724	1.326	.132
Error	1.357	47	2.886E-02				
Total	9.025	55					
Corrected Total	1.862	54					

Table 16: Post Hoc Tests for Age; Dependent Variable: ORIENT_M

Bonferroni Multiple Comparisons						
Age (I)	Age (J)	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
<20	20 - 29	-14.7101	13.846	1.000	-52.8486	23.4283
	30 - 29	15.5771	14.282	1.000	-24.7636	53.9177
	40+	-.34.1358	14.844	.156	-75.0244	6.7529
20 - 29	<20	14.7101	13.846	1.000	-23.4283	52.8486
	30 - 39	29.2872	13.570	.216	-8.0921	66.6666
	40+	-19.4256	14.160	1.000	-58.4309	19.5797
30 - 39	<20	-14.5771	14.282	1.000	-53.9177	24.7636
	20 - 29	-29.2872	13.570	.216	-66.6666	8.0921
	40+	-48.7129*	14.587	.010	-88.8945	-8.5313
40+	<20	34.1358	14.844	.156	-6.7529	75.0244
	20 - 29	19.4256	14.160	1.000	-19.5797	58.4309
	30 - 39	48.7129*	14.587	.010	8.5313	88.8945

* The mean difference is significant at the .05 level.

Table 17: Summary Statistics for Orientation (ORIENT_M) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	30.44	3.91	1.99	35.70
Maximum	118.99	166.57	100.72	176.82
Mean	70.6792	85.3894	56.1021	104.8150
Standard Deviation	24.9616	42.5402	32.0281	43.0575

Table 18: Summary Statistics for Orientation (ORIENT_M) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	3.91	1.99
Maximum	176.82	166.57
Mean	74.9614	82.8612
Standard Deviation	42.0945	37.2913

Table 19: Summary Statistics for Orientation (ORIENT_M) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	30.44	3.91	13.19	35.70	49.28	62.48	1.99	82.64
Maximum	118.99	164.85	88.48	176.82	106.98	166.57	100. 72	149.81
Mean	69.3550	72.6289	57.38	100.347	71.8143	101.795	54.8243	111.070
Standard Deviation	30.0683	47.0427	29.1887	50.6059	22.1243	31.8622	36.97	34.2503

Table 20: ANOVA: LENGTH; Sex by Age

Tests of Between - Subjects Factors							
Effect	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	141.408	7	20.201	2.189	.052	15.325	.761
Intercept	15409.418	1	15409.418	1670.011	.000	1670.011	1.000
Sex	23.699	1	23.699	2.568	.116	2.568	.348
Age	65.884	3	21.961	2.380	.082	7.140	.560
Sex by Age	58.166	3	19.389	2.101	.113	6.304	.503
Error	433.675	47	9.227				
Total	16404.022	55					
Corrected Total	575.083	54					

Table 21: ANOVA: BREADTH; Sex by Age

Tests of Between - Subjects Factors							
Effect	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	.419	7	5.986E-02	.294	.953	2.061	.127
Intercept	331.144	1	331.114	1628.676	.000	1628.676	1.000
Sex	.166	1	.166	.814	.372	.814	.143
Age	.207	3	6.916E-02	.340	.796	1.020	.111
Sex by Age	3.165E-02	3	1.055E-02	.052	.984	.156	.059
Error	9.556	47	.203				
Total	350.060	55					
Corrected Total	9.975	54					

I was hoping that the results of the ANOVA for feature breadth showed some significant differences as I wanted to test the relationship between feature breadth (BREADTH) and feature orientation (ORIENT_M) as suggested by Maas (1991). She proposed that scratch width was affected by the orientation of the shearing stroke relative to enamel prisms and crystallites on mammal molars rather than size of the food fragment (Maas, 1991).

Tables of the descriptive summary statistics of the non-transformed variables follow on the next eight pages (Tables 22 - 45). Discussion of these summary statistics is moot as there are no significance differences among the treatments. However, it is interesting to contemplate how large the standard deviation is in most descriptions. The range of numbers for pits and scratch tallies are broad. In the <20 age category, the minimum number of pits on any one tooth is 2; the maximum is 55. In the 20 - 29 age group, the minimum number of pits is 7; the maximum 66. In the 30- 39 age group, the minimum number of pits for any given tooth is 8, the maximum is 50; and in the 40+ age group, the minimum number of pits is 2; the maximum is 110. When considering the gender issue, the average number of pits on female teeth is 20.6 with a standard deviation of 13.9. The average number of pits on male teeth is 26.6, with a standard deviation of 22.2.

Table 22: Summary Statistics for Pits (PITS) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	2.00	7.00	8.00	2.00
Maximum	55.00	66.00	50.00	110.00
Mean	16.8462	20.0625	26.4286	33.0833
Standard Deviation	14.0110	15.3426	12.8225	28.7764

Table 23: Summary Statistics for Pits (PITS) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	6.00	2.00
Maximum	110.00	55.00
Mean	26.6207	20.5769
Standard Deviation	22.1560	13.9576

Table 24: Summary Statistics for Pits (PITS) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	6.00	7.00	8.00	15.00	2.00	8.00	10.00	2.00
Maximum	22.00	66.00	48.00	110.00	55.00	35.00	50.00	32.00
Mean	12.5	21.8889	26.5714	44.8571	20.571	17.714	26.286	16.600
Standard Deviation	7.0922	18.8841	12.4212	31.5934	17.765	10.078	14.209	14.064

Table 25: Summary Statistics for Scratches (SCRTCHS) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	13.00	11.00	25.00	11.00
Maximum	77.00	102.00	88.00	115.00
Mean	54.2308	56.4375	52.7857	48.8333
Standard Deviation	20.0672	23.9471	22.3475	28.3287

Table 26: Summary Statistics for Scratches (SCRTCHS) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	17.00	11.00
Maximum	115.00	102.00
Mean	54.5517	51.9615
Standard Deviation	21.6755	25.2341

Table 27: Summary Statistics for Scratches (SCRTCHS) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	24.00	17.00	26.00	23.00	13.00	11.00	25.00	11.00
Maximum	77.00	72.00	88.00	115.00	75.00	102.00	78.00	85.00
Mean	54.6667	51.6667	58.5714	54.1429	53.8571	62.5714	47.0000	41.4000
Standard Deviation	17.6711	17.8955	24.2133	29.7905	23.3412	30.4733	20.4369	27.5191

Table 28: Summary Statistics for Percentage Pits (PCPITS) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	.03	.08	.08	.15
Maximum	.81	.80	.56	.64
Mean	.2471	.2534	.3783	.3614
Standard Deviation	.2094	.1719	.1487	.1573

Table 29: Summary Statistics for Percentage Pits (PCPITS) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	.08	.03
Maximum	.80	.81
Mean	.3154	.2821
Standard Deviation	.1811	.1725

Table 30: Summary Statistics for Percentage Pits (PCPITS) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	.10	.12	.08	.25	.03	.08	.14	.15
Maximum	.47	.80	.49	.64	.81	.34	.56	.46
Mean	.1995	.2839	.3322	.4383	.2880	.2143	.3643	.2537
Standard Deviation	.1432	.2117	.1585	.1353	.2576	.1045	.1490	.1255

Table 31: Summary Statistics for Percentage Scratches (PCSCRTCH) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	.19	.19	.44	.36
Maximum	.97	.92	.92	.85
Mean	.7529	.7121	.6517	.6386
Standard Deviation	.2094	.2212	.1487	.1573

Table 32: Summary Statistics for Percentage Scratches (PCSCRTCH) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	.20	.19
Maximum	.92	.97
Mean	.6846	.6967
Standard Deviation	.1811	.2011

Table 33: Summary Statistics for Percentage Scratch (PCSCRTCH) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	.53	.20	.51	.36	.19	.19	.44	.54
Maximum	.90	.88	.92	.75	.97	.92	.86	.85
Mean	.8005	.7161	.6678	.5617	.7120	.7069	.6357	.7463
Standard Deviation	.1432	.2117	.1585	.1353	.2576	.2501	.1490	.1255

Table 34: Summary Statistics for Pit Length (PITL_M) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	4.06	3.32	3.51	4.03
Maximum	10.40	11.42	9.68	7.48
Mean	6.2900	6.4031	5.6093	5.5083
Standard Deviation	1.9945	2.1941	1.9307	1.0733

Table 35: Summary Statistics for Pit Length (PITL_M-M) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	3.32	3.51
Maximum	11.42	9.68
Mean	6.0234	5.9296
Standard Deviation	1.9829	1.7840

Table 36: Summary Statistics for Pit Length (PITL_M-M) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	4.34	3.32	4.38	4.03	4.06	3.76	3.51	4.92
Maximum	10.40	11.42	8.56	6.80	8.69	8.43	9.68	7.48
Mean	6.5483	6.5989	5.8029	5.0543	6.0686	6.1514	5.4157	6.140
Standard Deviation	2.2663	2.6102	1.5155	.8738	1.8848	1.6790	2.3857	1.0757

Table 37: Summary Statistics for Pit Width (PITW_M) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	1.94	1.91	1.93	2.15
Maximum	5.02	4.97	4.16	3.75
Mean	3.0092	3.1006	2.8293	2.9792
Standard Deviation	.8159	.7589	.7233	.4453

Table 38: Summary Statistics for Pit Width (PITW_M) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	1.91	1.93
Maximum	5.02	4.16
Mean	3.0066	2.9577
Standard Deviation	.6917	.7139

Table 39: Summary Statistics for Pit Width (PITW_M) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	2.17	1.91	2.18	2.36	1.94	2.34	1.93	2.15
Maximum	5.02	4.97	3.90	3.14	3.83	4.05	4.16	3.75
Mean	3.1500	3.0689	2.9314	2.8756	2.8886	3.1414	2.7271	3.1200
Standard Deviation	.9881	.8650	.5332	.2911	.6934	.6624	.9083	.6129

Table 40: Summary Statistics for Scratch Length (SCRTL_M) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	11.31	17.21	18.65	21.02
Maximum	36.99	45.89	40.49	33.53
Mean	28.5869	30.1825	25.7786	26.8175
Standard Deviation	6.2168	7.3246	6.2573	4.1230

Table 41: Summary Statistics for Scratch Length (SCRTL_M) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	17.21	11.31
Maximum	45.89	40.04
Mean	29.1121	26.6542
Standard Deviation	6.2039	6.2304

Table 42: Summary Statistics for Scratch Length (SCRTL_M) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	27.39	17.21	22.71	21.02	11.31	24.86	18.65	22.88
Maximum	36.99	45.89	40.49	33.53	34.46	40.04	32.82	29.86
Mean	31.3317	28.84	29.2886	27.3829	26.2343	31.9086	22.2686	26.0260
Standard Deviation	3.1611	8.9187	5.7032	4.9133	7.4147	4.6786	4.8540	3.0321

Table 43: Summary Statistics for Scratch Breadth (SCRTB_M) by Age

Descriptive Statistics				
	<20	20 - 29	30 - 39	40+
Number	13	16	14	12
Minimum	1.47	1.09	1.41	1.28
Maximum	2.60	2.85	2.52	2.39
Mean	1.9477	2.0275	1.9564	2.0242
Standard Deviation	.3616	.4092	.3772	.3207

Table 44: Summary Statistics for Scratch Breadth (SCRTB_M) by Sex

Descriptive Statistics		
	Male	Female
Number	29	26
Minimum	1.09	1.28
Maximum	2.85	2.48
Mean	2.0766	1.8931
Standard Deviation	.3884	.3132

Table 45: Summary Statistics for Scratch Breadth (SCRTB_M) by Sex and Age

Descriptive Statistics								
	Male				Female			
	<20	20 - 29	30 - 39	40+	<20	20 - 29	30 - 39	40+
Number	6	9	7	7	7	7	7	5
Minimum	1.47	1.09	1.43	2.02	1.50	1.7	1.41	1.28
Maximum	2.6	2.85	2.52	2.39	2.34	2.19	2.48	2.20
Mean	2.0133	2.2144	1.9643	2.1814	1.8914	1.9029	1.9486	1.8040
Standard Deviation	.4345	.5144	.3784	.1248	.3100	.1833	.4062	.3944

Whenever an experiment is performed or study conducted there is the need to consider power, the ability to reject the null hypothesis when it is false. Generally, power depends on the magnitude of the true differences and sample sizes. If true differences exist and are very large, then a small sample should detect those differences. If, however, the true differences are small, it is important to have large samples to detect those differences. Then the amount to consider in your sample is depended on power analysis (Norusis, 1994). There are three cautions for the results experienced in the analysis: 1)Tests for Normality, 2) equal variance assumption has to be considered, and 3) the power argument. The tests for normality transformed the data into a normal distribution; however, the pit and scratch tallies (frequencies) were not normally distributed prior to or after transformation. The equal variance assumption implies that within each variable the variance is equal between the means. The power argument implied that the amount used for the sample was not great enough to show any differences. In my analysis, I showed statistically there were no significant differences among any of the variables across any of the factors. Did the acceptance of the null hypothesis result from the size of the sample? Was the sample not large enough or were there no differences because differences did not exist? This question will be discussed in the next chapter.

Since the statistics failed to reveal any significant comparisons among any of the tested data, I was forced to accept the null hypothesis: there are no sex differences in dental microwear patterning in the Averbuch population; there are no age differences in dental microwear patterning; there are no dietary differences among the ages indicated by microwear and there are no intra or inter cemetery differences in diet relating to sex and/or

age. There is no consistency of dental microwear patterning and feature dimension within the population at Averbuch.

Despite the lack of statistically significant differences in the tooth sample, there are some interesting visual features on the teeth that warrant some discussion here.

Since pits result from the compression of the enamel due to the grinding/compression force of the jaw on some hard object; e.g. nuts or stone fragments as a result of food preparation, the assumption must be those foods were not ingested by individuals whose teeth showed very little or no pitting. All the Averbuch teeth had some pits. The teeth with the least amount of pits were numbers 31 and 57, each of which had two pits (Please refer to the Micrographs in APPENDIX D). Other teeth which had very few pits are teeth number 11, 21, 31, 54, 58, and 64. Teeth with many pits are 3 (pit tally=3) and 41 (pit tally=110). Pits which have a value of "0" in the Minor Axis Column in the Raw Data by Teeth (APPENDIX F) are so small that the slope could not be calculated (Ungar, personal communication, 1997).

Stippling and honeycombed effects seen on some of the micrographs (29, 36, 37) are the ends of the enamel rods (Marks, personal communication, 1997; Ungar, personal communication, 1997). The ends of the enamel rods furnish the appearance of honeycombs. Usually found in older individuals, this stippling appearance may mark the beginning degradation of the enamel in older individuals. The illustrative micrographs (29, 36,37) are derived from individuals in the 40+ age group.

Hinton (1982) says that crisscrossed patterning of scratches (see micrographs 23, 30, 42, 59) with newer scratches being laid down effacing the older scratches, is due to the

mastication biomechanics by teeth with reduced cusp height. This reduced and worn down cusp height resulted from a diet of nuts, seeds, and wild animals in archaic Tennessee Valley Indians (Hinton, 1982). The Averbuch sample also has evidence of crisscross scratching on some of the teeth. However these examples come from individuals less than 20 years of age (see micrographs 25 and 49). Floral and faunal analysis provides evidence that the inhabitants of Averbuch also ate nuts, seeds, and wild animals, but not exclusively.

Visually, the teeth of Averbuch showed a multitude and various collection of striations, polishing, pits, and striation margin morphology. Broad and deep scratches, fine and thin scratches, and big and small pits were all seen on at least some of the teeth. Margins of the features were blunt, others were sharp and well defined. Features on some teeth looked dull and faint, other looked like they had been formed immediately prior to death. However, none of these qualitative features were characteristic of any one age group, cemetery or gender, and any difference seen on one tooth to another is insignificant.

In the next chapter, I will discuss the results of these statistical analyses and how they relate to other data from other prehistoric human microwear studies. Finally I will discuss how the analytical results of Averbuch fit into the larger picture of the Mississippian culture.

CHAPTER SIX - Discussion

The results presented by this study indicate that the adult Averbuch inhabitants did differ in the dental microwear patterning of pits and scratches on their second mandibular molars, but that the difference is not patterned by cemetery, sex, or age.

If the statistical analysis had given different results, I would have focused on the interpretation of those differences as well as any large qualifiable differences. Hence, I was unable to combine the microwear evidence with the floral and faunal analysis to prove conclusively differences in diet and food processing other than to make a generalization - the complexity of the Averbuch diet left a complex set of dental microwear patterning.

In spite of the disappointing results, I was not totally surprised by them. In reality, I would have been more surprised to see that differences existed among the teeth from all cemeteries. Since the site had been occupied for less than 100 years, the time span was too short to see a difference in microwear patterning. The subsistence regime and food preparation would not have changed that drastically over such a short span of time to make a difference in the dental microwear patterning.

The only significant variations found in the Averbuch sample, i. e., R and Orientation Mean, were not surprising and should have been expected. Visual examination of the sample teeth, exhibited that the teeth in the older age groups were more worn than the teeth in the younger groups. Crests and cusps had been worn so that they were no longer capable of guiding the teeth during mastication; hence the haphazard more random striations of the microwear features.

By contrast, Pastor (1993) found that the second mandibular molar tooth in his prehistoric human samples from India appeared to be a key tooth because most of the significant differences occurred on that tooth. A greater pit density was recorded on female molars than male molars. He discovered that pits are larger on female second molars than male second molars in his Harappa and Mehrgarh samples. He found both quantitative and qualitative differences for the second mandibular molar using scanning electron microscopy. His sample consisted of two males and two females for a total of four teeth. In my sample, I had 26 females and 29 males and found no gender differences. There are two possible scenarios to consider for the lack of difference: 1) the sample was too small or 2) there are not any intra-population differences between the sexes in regards to diet.

In the following discussion I will demonstrate that the lack of difference and the conformity of the patterning is due to intraspecific uniformity. The microwear patterning at Averbuch is many-sided but that variability extends across all age groups, throughout all three cemeteries and between the sexes. Not one specific patterning is seen on any group of individuals at Averbuch. Both sexes and all age groups from all three cemeteries exhibit all features and not any one feature distinction is dominant in any age group, cemetery or sex.

The lack of quantifiable differences in the measures provides evidence that horticulturally grown food as well as wild food was ingested by the inhabitants of Averbuch. Their diverse microwear patterning not only relates to adaptation in diet between agrarian and hunting methods for food but also to methods of food preparation.

Comparisons between this study and other prehistoric samples are not fully compatible. First, all previously published reports dealing with prehistoric teeth data used different microscope technology. The teeth in the other reports had been, cast, coated, or cast and coated and scanned with a non-SEM. I was fortunate to have access to an environmental SEM which did not require me to make casts or the teeth or to have them coated. What difference the microscope technology plays in revealing microwear features is not yet fully understood. In the opinion of experts, teeth scanned in an environmental SEM show a more clear and true picture of the tooth's occlusal surface (Dr. David Joy, personal communication). As the teeth used in this sample were uncast and uncoated, their appearance probably differs slightly from other published data of scanned teeth from prehistoric human samples. One way to test the effect technology plays in dental microwear analysis would be to compare measurements from two micrographs of the same tooth facet taken with two different instruments. Using an environmental scanning electron microscope, one micrograph would be taken of a particular tooth facet which had not been cast or coated. Features could be delineated and measured. Those measurements subsequently could be compared to another micrograph of the same tooth facet which had been cast and coated and taken by a non-environmental scanning electron microscope. By counting and comparing the features and measurements the possibility might exist to determine if there were any quantifiable differences in scanning electron microscopy for dental microwear analysis. Research of this kind would be very tedious and almost insurmountable to accomplish. While access to electron microscopy is costly and arduous,

researchers would need access to two different types of scanning electron microscopes and would have to locate and measure the exact positions and features on each tooth.

Second, I was not able to make the definitive pronouncement of what is the Averbuch dental microwear pattern. Without having that uniform pattern, comparisons to other sites are ineffectual.

Since the mesiolingual cusps tips were used for measurement and analysis, I was not too surprised to see that there were no consistent patterns. Cusp tips and crushing facets on the molar teeth should be expected to show much more feature variation in size, shape, and orientation simply because of the manner of movement of the teeth: e.g., puncturing, crushing, and chewing (Teaford, 1988a).

Another fact which should be taken into consideration when evaluating the lack of consistent patterning differences is the differences between facets of one species are far less deviate than those between homologous facets of different species (Teaford and Walker, 1984).

Gordon (1984b) stated that microwear patterning may change dramatically from tooth to tooth, and even facet to facet on the same tooth. If molar position, facet type, and dental age, are controlled for quantitative analysis then the diversity seen by normal variation within the group is irrelevant in questions relating to diet. As this research project was a controlled experiment, internally consistent, and without interobserver error, the conclusion must be that the variation of microwear patterning within the Averbuch population was wide, but widely spread among all age groups, cemeteries, and between

sexes. Simply expressed, the diversity of the patterning was congruous throughout the population.

Some dental microwear researchers consider the ratio of pits to scratches on occlusal surfaces of the molars to determine the degree of ingestion of vegetal matter (or folivory, leaf eating) and the hardness of food in primates (Grine 1981, Teaford and Walker, 1984, Teaford, 1985, 1988a). There was no significance between percentage of pitting on the molars and the consumption of hard foods for the teeth examined in the Averbuch study. Although macroscopic wear increases with age, the frequency of dental microwear features did not increase or decrease with age in the Averbuch sample. Dental microwear features occur regardless of age, and they occur on a daily basis by whatever is eaten. According to the statistical results, there are not data to support age related frequencies of features or percentage of pits or scratches to total features in the Averbuch sample.

To test the intra cemetery relationships in the Averbuch skeletal collection, Berryman, (1984a) used nonmetric traits and cranial measurements to determine the extent that cranial morphology differed between the sexes, the three cemeteries, and the interaction of sex and cemetery. The results of the multivariate analysis of variation indicated no significant biological difference among the three cemeteries. He concluded that the Averbuch skeletal population appeared to be relatively homogeneous (Berryman, 1984a). Although tooth morphometric homogeneity is not synonymous with microwear homogeneity, homogenous tooth morphology partially can be responsible for the homogeneity of occlusion.

Even if significant differences had been found among the tested data those results may have been irrelevant since the sample was intraspecific and within the same temporal span. If some individuals had significantly different patterning their teeth may not have had anything to do with the amount of vegetal matter they consumed.

Teaford's suggested that the biological age of the individual must exert some influence over the amount of dental microwear features, as both infants and older adults exhibit less microwear than young adults (Bullington, 1991; Gordon, 1984; Teaford, 1991). Unfortunately, that premise was not supported by the evidence of microwear features on Averbuch teeth. Infants were not a part of the sample group and deciduous molars were not tested. There were no significant differences among the age groups, and older adults (40+) did not exhibit any more wear on their teeth than younger adults (Groups 1 and 2 respectively, <20 and 20 - 29). What was manifested was that there were as many features on older teeth as younger teeth, but they were harder to see. But those features could still be measured regardless of their faint appearance. Again the only age related differences R and orientation were directly related to tooth attrition.

Because the patterning of dental microwear of the Averbuch population is so encompassing, I concluded that the larger the number of edibles in the diet, the larger the complexity of the scratches and pits. If the inhabitants of Averbuch were consuming a strict frugivore diet, then I would have expected to see microwear features associated entirely with fruits and nuts, i.e. heavily pitted surfaces. For instance, in the Red River and Lower Mississippi River Valley, pits were not seen on any of the examined teeth from populations when dependency on maize agriculture was established. (Rose and Marks,

1985). This result is different from the result found at the Averbuch site. Pits were found on all teeth at Averbuch. If the inhabitants were consuming a diet of strictly leaves (folivore) then I would have expected to see much enamel polishing. It is part of the foundation of dental microwear analysis that microwear differences suggest dietary differences. Hence because of the huge diversity of the feature morphology and metrics, I am lead to conclude that not one strict diet was consumed at Averbuch, and that the Mississippian diet, at least at Averbuch, was much more complex and varied than previously thought. This variation cannot be measured on the teeth, because no one age or gender has exclusivity of a particular dental microwear patterning. This lead me to question whether Averbuch was truly a Mississippian site in the strictest interpretation, e.g. maize dependent, or that "marginal" meant something more than just being away from the main river and population center.

Gordon's Eskimo teeth (1986) displayed little scratches, thin striations, and smooth surfaces. Her analysis of the Zuni teeth showed big, broad, and tough, rough scratches. Some Averbuch teeth had the same characteristics on their occlusal surfaces. Gordon showed two completely different diets for two completely different populations. Eskimos ate marine food, the Zuni ate maize. Logical reasoning would conclude then, that people who ate a combination of those foods would have a combination of those features. The inhabitants at Averbuch ate both marine food (albeit freshwater) and maize. If what Smith (1978) and Rostlund (1952) say is true about the consumption of fish being equal to the consumption of game and plant food in Mississippian cultures, then their decision would be

well founded, and we could agree that the dental microwear features do mirror the paleodietary habits of the Averbuch.

Consequent to the verdict of insignificant dental microwear patterning differences among the Averbuch, I am compelled to consider that a small splinter or "marginal" band of a homogeneous group of people, would probably not have any differences in their eating habits. The variation in the patterning is homogeneous and extends throughout the sample and is not confined to any one sex, cemetery affiliation or age group. I proved that the lack of clear differential patterning is a result of interspecific homogeneity and not sample size. Clearly it can be said that the diet of the Averbuch inhabitants was more varied and complex than expected, and the patterning of the dental microwear features reflects that complexity.

The variation in microwear patterning at Averbuch which is not distinguished by sex, age or cemetery affiliation has to be attributed to differences in individual diets. As people age, diet habits change due to illnesses, loss of dentition, or a host of other impending geriatric ailments which can change eating habits and call for new dietary regimens. As people age, diets change, and changes can be viewed as variation in microwear patterning. Also, there is no reason not to think that dietary preferences were not conventional in prehistoric populations as preferences are prevalent in today's society. There should be no unusual wonderment, that prehistoric peoples could choose to eat what they liked or what agreed with their stomachs. Granted that their selection of food was not as encompassing as modern populations have today, especially in the United States, but the population at Averbuch alive 700 years ago still had individual tastes, likes, and dislikes.

How does this conclusion fit into the understanding of the Mississippian culture and specifically the inferred paleodietary habits of the Mississippian tradition? One possibility is that the accepted perception of Mississippian cultures does not extend into the Averbuch site. A component of the Mississippian culture is an evidence of ranked social hierarchy and political structure. Based on the mortuary practices at Averbuch, there was no regard to burial status for social ranking (Berryman, 1984a). Nor, were there any difference in diet, as different social status might dictate. The diet of the inhabitants of Averbuch appears to have been the same for all adult individuals regardless of social status, class, sex, or age. The inhabitants ate everything that was available as a food resource. The variation seen among individuals has to be attributed to dietary likes and dislikes and/or the ability of some people to eat different foods than other individuals due to age, physiological changes, or caries, all of which play a role in food consumption. Averbuch appears to have been a small nucleated village without the established hierarchical settlement system. The degree of social differentiation within Mississippian societies appears to be quite variable. Middle Mississippian groups that occupied large temple mound centers, such as Cahokia, Etowah, and Moundville, are characterized by ranked societies or complex chiefdoms, while Upper Mississippian "tribal level" complexes, such as Fort Ancient seem to have had only minimal levels of social differentiation. The settlement patterns that developed in the two areas are also quite distinct (Nass and Yerkes, 1995). The term "marginal" as applied to Averbuch may have more than one connotation--the first being a locational situation, being farther away from the main source of water - and the second; indicating a more social and cultural "fringe" population. This population lived on the banks of a small stream, having been

forced out in competition for arable land by a population pressure. They survived on whatever they grew and found to eat in the natural environment.

Although dental microwear analysis was not studied at Moundville, a comparison between the Averbuch teeth and the Moundville teeth can be made vis a vis wear. Powell's results of the dental analysis at Moundville (Powell, 1988) showed no evidence of any significant dietary differences between the sexes or status. Although, she looked at macroscopic wear, she found that any observed variations were not significant or clearly patterned (Powell, 1988). The archaeological data from Moundville also presented a subsistence rich in abundant resources (Powell, 1988).

Powell suggests that the use of teeth as tools in chores determined by sex or social rank may contribute to greater dental wear for one sex or ranked status segment. She suggests that dental samples should be carefully matched by age and sex before comparisons along social dimensions can be attempted within and between populations (Powell, 1988).

The archaeological evidence for diet at Averbuch suggests that subsistence was broadly based. The archaeological evidence for diet coincides nicely with the dental microwear analysis. No microwear data suggest that one suite of patterning is more prevalent among the inhabitants at Averbuch.

Infections, and nutritional deficiency diseases anemias, enamel hypoplasias, porotic hyperostosis, and cribra orbitalia have been observed as the most prevalent stress indicators of the skeletal population at Averbuch (Berryman, 1981, 1984a; Eisenberg, 1986; Jablonski, 1981, 1984a, b). Iron deficiency anemia is seen among skeletal populations

which have a high dependency on maize agricultural and dependency (Cohen and Armelagos, 1984). According to the ethnobotanical findings at Averbuch, there is a broad representation of maize recovered from the site. However, other floral and faunal analyses from Averbuch support the idea that the prehistoric inhabitants at Averbuch were taking advantage of all the other available resources in that area; namely small and large mammals, fish; mussels, waterfowl, and many nuts and berries in addition to their agricultural efforts. But, the paleopathological data retrieved from the skeletal collection infers that the paleodietary habits of the inhabitants of Averbuch were not nutritionally balanced with proper components of protein and carbohydrates (Eisenberg, 1986). However, as demonstrated by the dental microwear analysis, the teeth at Averbuch cannot be compared with teeth from other Mississippian sites or any other published data from other sites.

Results of this dental microwear study are corroborated by the conclusions regarding diet found by Eisenberg (1986). Her results of the skeletal indicators of nutritional deficiencies suggest more than a deficient diet. She concluded, as well, that the subsistence at Averbuch was broad, based on the archaeological evidence. Her data also contradict the conventional idea that Mississippian diets were maize - dependent (Eisenberg, 1986).

One of the problems with comparisons to other Mississippian sites, is that most of the characteristic information about the Mississippian culture is derived from excavations of major or monumental sites encompassing mounds, earthworks, and complex social organizational hierarchy. The attempt to assimilate the preconceived subsistence patterns at Averbuch into the bigger Mississippian tableau may provide a distorted view of marginal

sites. The subsistence patterns at Averbuch were more varied and complex as evidenced by the dental microwear patterning on their teeth. Research on more teeth from marginal sites may prove to be more complex in their patterning than teeth from strict Mississippian regimes. It would very enlightening to see the comparisons or differences from the teeth of Moundville or Cahokia to the Averbuch teeth.

To test the effectiveness of the Averbuch quantitative dental microwear analysis, I performed a preliminary and scant experiment with teeth from a different population. As mentioned in Chapter Four (see page 57), I took micrographs of the cusp tip of the metaconid of second mandibular molars from five Plains Indian teeth from the sites of Mobridge and Leavenworth. I measured their features and combined both sexes, all ages, and both sites of Mobridge and Leavenworth to attain descriptive statistics of Plains Indian teeth. I obtained descriptive statistics for the Averbuch teeth by collapsing the cemetery, age, and sex factors for each variable. I looked at the means of those descriptive statistics to see comparisons and/or differences (see Tables 46 and 47).

Based on this introductory analysis, Averbuch teeth have more pits than Plains teeth, but Plains teeth have more scratches than Averbuch teeth. Also suggested by the data are: pit length of the Plains teeth is almost double the pit length of Averbuch teeth; pit width in Plains teeth is almost twice that of Averbuch teeth; and scratch length is longer in Plains teeth but scratch width is wider in Averbuch teeth. Although the Plains teeth are based on a sample size of five, the preliminary data **suggest** these differences but no tests were run to establish or confirm them, so conclusions cannot be drawn based on these descriptive statistics. However, what is important about this experiment is that dental

microwear analysis is a valuable tool in comparing microwear patterning which can lead to paleodietary comparisons among prehistoric populations. The micrographs of the Plains Indian teeth looked different than the micrographs of the Averbuch teeth and subsequent measurements quantified those observed differences.

Table 46: Summary Statistics for Averbuch Teeth

Descriptive Statistics					
	Number	Minimum	Maximum	Mean	Standard Deviation
PITS	55	2.00	110.00	23.7636	18.8149
SCRTCHS	55	11.00	115.00	53.9091	22.5514
PCPITS	55	.03	.81	.2996	.1763
PCSCRTCH	55	.19	.97	.7004	.1763
PITL_M	55	3.32	11.42	5.9791	1.8747
PITW_M	55	1.91	5.02	2.9835	.6962
SCRTL_M	55	11.31	45.89	28.2195	.66706
SCRTB_M	55	1.09	2.85	1.9876	.3627
R	55	.04	.79	.3609	.1857
ORIENT_M	55	1.99	176.82	78.6858	39.7297

Table 47: Summary Statistics for Plains Teeth

Descriptive Statistics					
	Number	Minimum	Maximum	Mean	Standard Deviation
PITS	5	1.00	24.00	14.8000	8.6718
SCRTCHS	5	13.00	130.00	71.000	44.7158
PCPITS	5	.02	.59	.2172	.2202
PCSCRTCH	5	.41	.98	.7828	.2202
PITL_M	5	4.36	32.01	10.9180	11.8571
PITW_M	5	2.63	11.18	5.0580	3.5696
SCRTL_M	5	16.74	41.17	33.2040	9.5845
SCRTB_M	5	1.42	1.76	1.5520	.1375
R	5	.08	.46	.2922	.1612
ORIENT_M	5	31.19	104.09	76.4300	27.1914

DMA can be an effective tool when used in conjunction with associated archaeological remains, knowledge about food gathering and preparation techniques, some control for postmortem wear, and other analysis such as bone isotope work. By itself, it is a new approach and can raise more questions than answers (Teaford, 1994). DMA cannot by itself answer all the questions about a population's dietary habits or tooth use, but it is just another tool used in paleobiological commentaries.

In the final analysis what can be said about the prehistoric people of Averbuch? Envision a panorama where a population of 800 - 1,400 people live on the banks of a small moving stream, four miles away from the main waters of the Cumberland River. This fringe population is disassociated with the ranked social hierarchy and elaborate earthworks of its other Mississippian cousin cities in other parts of the American Southeast. This marginal group of people, living on the peripheries of the great Mississippian population centers, has been pushed out into the hinterlands by the pressures of expanding population and/or warfare. Unable to compete for arable land, they live far away from the powerful chiefdoms of the Mississippian manifestation and subsist on the food they grow and the animals they trap and hunt. Everyone is equal in this settlement. Their burials denote no special social hierarchy, and their diets do not reflect any difference due to social structure. These ordinary people eat corn, squash, nuts, berries, fish, elk, and turkey, and every inhabitant has his or her own likes, dislikes, and preferences for particular foods. As they age, their diets adapt due to illnesses, impending old age, or changes in preferences, likes, and dislikes, much the same way modern humans change their diets today. Their infants die and most are buried in the floors of their houses. The population is stressed so much

that the mortality rate exceeds that of the fertility rate. They survive on what is available to eat, a varied and complex diet until that diet is no longer able to sustain the population, and the site is abandoned.

CHAPTER SEVEN- Conclusions

This research has focused on the dental microwear patterns in a late Mississippian site to learn more about the prehistoric dietary habits of the inhabitants of Averbuch. Visual results exhibited teeth that had many scratches, pits, enamel polishing and a varied striation morphology. Quantifiable results did not show any significant or distinct dental patterning differences among the four age groups, between the sexes, or among the three cemeteries. Combined with the results of the archaeological record and the paleobotanical, floral, and faunal analyzes, the teeth showed that a marginal Mississippian diet was very varied and complex, and that no one suite of microwear features was predominant or indicative of a specific diet or food process. The variation of the microwear patterning was consistent and could not be attributed to one specific diet.

The importance of this study is that dental microwear analysis using SEM should be used in association with other methods of analysis of skeletal remains from archaeological sites. DMA should be used in conjunction with paleopathological analysis of archaeological skeletal remains, including, but not limited to,` isotope and trace element analysis. Perhaps with the continuing research between paleodietary and dental microwear analysis, we might get a clearer view of how dental microwear analysis fits in with the biocultural approach in archaeological skeletal collections and improve our knowledge of prehistoric subsistence patterns.

In the past fifteen to twenty years, a great deal of dental microwear work has taken place on a large variety of teeth to document diet in extant and fossil mammals, early

hominids, and prehistoric human populations. Dental microwear analysis should not be viewed as an ultimate resource to answer questions about biocultural representations. It should be used as an ancillary resource to provide insight into prehistoric diets. As reported by this study, no clear and standard procedures for this type of analysis has been formulated, although there are consensus about magnification, facet identification, and pit definition from the dental anthropologists. The standardization of the instrumentation has not been established. As seen by this study, the use of an environmental versus non-environmental scanning electron microscope may yield different results.

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APPENDICES

APPENDIX A

SAMPLE OF TEETH BY NUMBER

Sample of Teeth by Tooth Number

Tooth Number	*Site*	*Burial Number*	*Cemetery*	*Sex*	*Age*	*Side*
01	Averbuch	11B	1	F	40+	Right
03	Averbuch	29A	1	M	20-29	Right
05	Averbuch	130	1	F	30-39	Left
07	Averbuch	146A	1	M	30-39	both
08	Averbuch	148	1	M	20-29	Left
09	Averbuch	168	1	F	40+	Left
10	Averbuch	208	1	M	<20	Left
11	Averbuch	214C	1	M	<20	Right
12	Averbuch	225C	1	M	40+	Left
13	Averbuch	229B	1	M	20-29	Right
15	Averbuch	251	1	F	30-39	Right
17	Averbuch	277A	1	M	20-29	Right
19	Averbuch	310	1	F	<20	Right
20	Averbuch	311B	1	M	20-29	Left
21	Averbuch	327	1	M	<20	Right
22	Averbuch	359A	1	F	20-29	Left
23	Averbuch	363	1	M	30-39	Right
24	Averbuch	381	1	M	30-39	Left
25	Averbuch	394A	2	F	<20	Right
27	Averbuch	404A	2	F	<20	Right
28	Averbuch	405	2	F	20-29	Left
29	Averbuch	423	2	M	<20	Left
30	Averbuch	426	1	F	30-39	Left
31	Averbuch	432A	2	F	40+	Right
32	Averbuch	435A	2	M	30-39	Right
34	Averbuch	436A	2	M	20-29	Right
35	Averbuch	437B	2	F	40+	Left
36	Averbuch	442A	1	M	40+	Left
37	Averbuch	446	2	F	40+	Right
38	Averbuch	447	2	F	20-29	Left
39	Averbuch	457	2	M	40+	Left
40	Averbuch	459	2	M	20-29	Left
41	Averbuch	462	2	M	40+	Right
42	Averbuch	469A	1	M	40+	Left
43	Averbuch	471	2	M	30-39	Right
44	Averbuch	477B	2	F	30-39	Right
45	Averbuch	482	1	F	<20	Left
46	Averbuch	491	2	F	30-39	Right
47	Averbuch	502	2	F	20-29	Right
48	Averbuch	507B	3	F	<20	Left
51	Averbuch	524	3	F	<20	Right
52	Averbuch	525	3	M	40+	Left
53	Averbuch	546	3	M	30-39	Right
54	Averbuch	562	3	M	<20	Left
55	Averbuch	567	3	F	<20	Right
56	Averbuch	568B	3	F	30-39	Left

Sample of Teeth by Tooth Number

Tooth Number	*Site*	*Burial Number*	*Cemetery*	*Sex*	*Age*	*Side*
58	Averbuch	604	3	F	20-29	Right
59	Averbuch	626	3	M	40+	Left
61	Averbuch	640	3	M	<20	Right
62	Averbuch	656	3	F	20-29	Left
63	Averbuch	665	3	F	20-29	Left
64	Averbuch	679	3	M	20-29	Right
66	Averbuch	695	3	M	20-29	Left
67	Averbuch	700A	3	M	30-39	Right
68	Averbuch	701A	3	F	30-39	Left
69	Mobridge	F 303	N. A.	F	Adult	Left
70	Mobridge	F 303	N. A.	?	Adolescent	Left
71	Mobridge	F 301	N. A.	?	Adult	Right
72	Leavenworth	F 120	N. A.	F	Adult	Left
73	Leavenworth	F 120	N. A.	M	Adult	Right

APPENDIX B

AVERBUCH TEETH BY CEMETERY, SEX, AND AGE

Averbuch Teeth by Cemetery, Sex, and Age

Tooth Number	*Burial Number*	*Cemetery*	*Sex*	*Age*	*Side*
19	310	1	F	<20	Right
45	482	1	F	<20	Left
22	359A	1	F	20-29	Left
05	130	1	F	30-39	Left
15	251	1	F	30-39	Right
30	426	1	F	30-39	Left
01	11B	1	F	40+	Right
09	168	1	F	40+	Left
10	208	1	M	<20	Left
11	214C	1	M	<20	Right
21	327	1	M	<20	Right
03	29A	1	M	20-29	Right
08	148	1	M	20-29	Left
13	229B	1	M	20-29	Right
17	277A	1	M	20-29	Right
20	311B	1	M	20-29	Left
07	146A	1	M	30-39	both
23	363	1	M	30-39	Right
24	381	1	M	30-39	Left
12	225C	1	M	40+	Left
36	442A	1	M	40+	Left
42	469A	1	M	40+	Left
25	394A	2	F	<20	Right
27	404A	2	F	<20	Right
28	405	2	F	20-29	Left
38	447	2	F	20-29	Left
47	502	2	F	20-29	Right
44	477B	2	F	30-39	Right
46	491	2	F	30-39	Right
31	432A	2	F	40+	Right
35	437B	2	F	40+	Left
37	446	2	F	40+	Right
29	423	2	M	<20	Left
34	436A	2	M	20-29	Right
40	459	2	M	20-29	Left
32	435A	2	M	30-39	Right
43	471	2	M	30-39	Right
39	457	2	M	40+	Left
41	462	2	M	40+	Right
48	507B	3	F	<20	Left
51	524	3	F	<20	Right
55	567	3	F	<20	Right
58	604	3	F	20-29	Right
62	656	3	F	20-29	Left
63	665	3	F	20-29	Left
56	568B	3	F	30-39	Left

Averbuch Teeth by Cemetery, Sex, and Age

Tooth Number	*Burial Number*	*Cemetery*	*Sex*	*Age*	*Side*
68	701A	3	F	30-39	Left
54	562	3	M	<20	Left
61	640	3	M	<20	Right
64	679	3	M	20-29	Right
66	695	3	M	20-29	Left
53	546	3	M	30-39	Right
67	700A	3	M	30-39	Right
52	525	3	M	40+	Left
59	626	3	M	40+	Left

APPENDIX C

MICROGRAPH INVENTORY

Micrograph Inventory

Tooth Identification	*Image Number .BMP*	*Overlay Number .CRD*	*Side*	*Magnification*
01	01	image01	right	500x
01	1@100x		right	100x
01	1@200x		right	200x
01	1@300x		right	300x
01	1@400x		right	400x
01	1@500x		right	500x
02	02	image 02	left	500x
03	03	image 03	right	500x
04	04	image04	left	500x
05	05	image05	left	500x
06	06	image06	right	500x
07	07	image07	left	500x
08	08	image08	left	500x
09	09	image09	left	500x
10	10	image10	left	500x
11	11	image11	right	500x
12	12	image12	left	500x
13	13	image13	right	500x
14	14	image14	right	500x
15	15	image15	right	500x
16	16	image16	left	500x
17	17	image17	right	500x
18	18	image18	left	500x
19	19	image19	right	500x
20	20	image20	left	500x
21	21	image21	right	500x
22	22	image22	left	500x
23	23	image23	right	500x
24	24	image24	left	500x
25	25	image25	right	500x
26	26	image26	left	500x
27	27	image27	right	500x
28	28	image28	left	500x
29	29	image29	left	500x
30	30	image30	left	500x
31	31	image31	right	500x

Micrograph Inventory

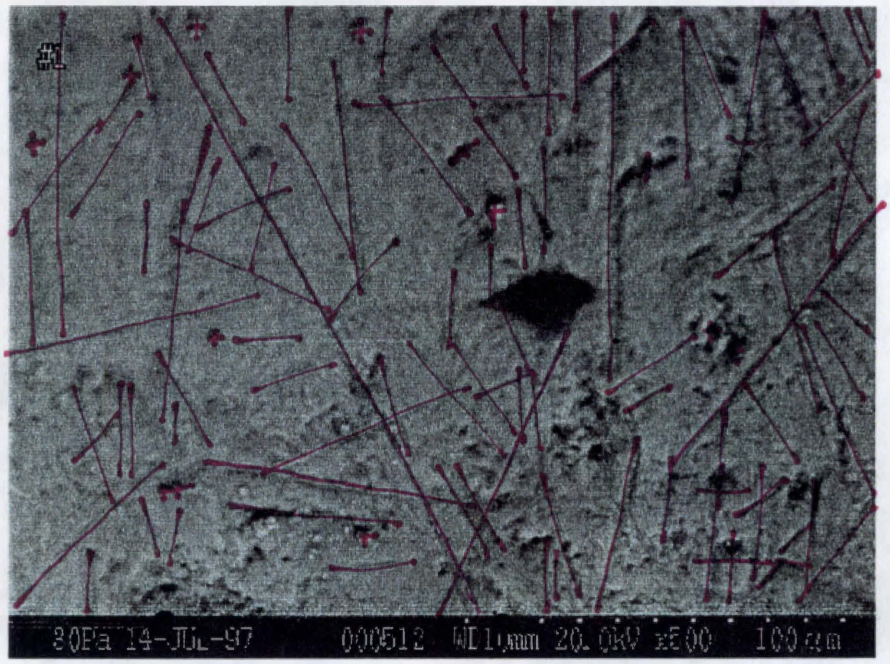
Tooth Identification	*Image Number .BMP*	*Overlay Number .CRD*	*Side*	*Magnification*
32	32	image32	right	500x
33	33	image33	left	500x
34	34	image34	right	500x
35	35	image35	left	500x
36	36	image36	left	500x
37	37	image37	right	500x
38	38	image38	left	500x
39	39	image39	left	500x
40	40	image40	left	500x
41	41	image41	right	500x
42	42	image42	left	500x
43	43	image43	right	500x
44	44	image44	right	500x
45	45	image45	left	500x
46	46	image46	right	500x
47	47	image47	right	500x
48	48	image48	left	500x
49	49	image49	right	500x
50	50	image50	right	500x
51	51	image51	right	500x
52	52	image52	left	500x
53	53	image53	right	500x
54	54	image54	left	500x
55	55	image55	right	500x
56	56	image56	left	500x
57	57	image57	left	500x
58	58	image58	right	500x
59	59	image59	left	500x
60	60	image60	left	500x
61	61	image61	right	500x
62	62	image62	right	500x
63	63	image63	left	500x
64	64	image64	right	500x
65	65	image65	left	500x
66	66	image66	left	500x
67	67	image67	right	500x

Micrograph Inventory

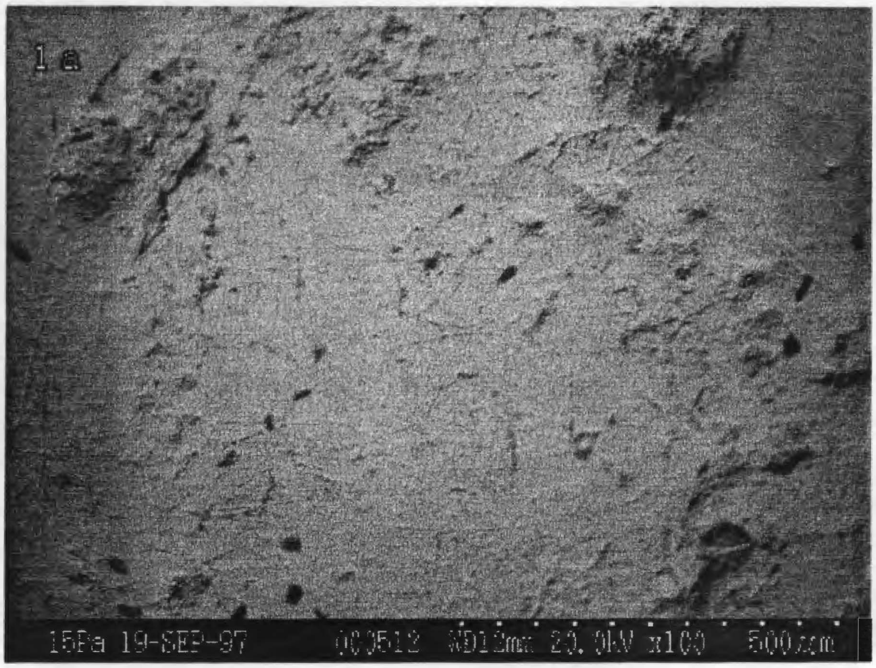
Tooth Identification	*Image Number .BMP*	*Overlay Number .CRD*	*Side*	*Magnification*
68	68	image68	left	500x
69	69	image69	left	500x
70	70	image70	left	500x
71	71	image71	right	500x
72	72	image72	left	500x
73	73	image73	right	500x

APPENDIX D

MICROGRAPHS

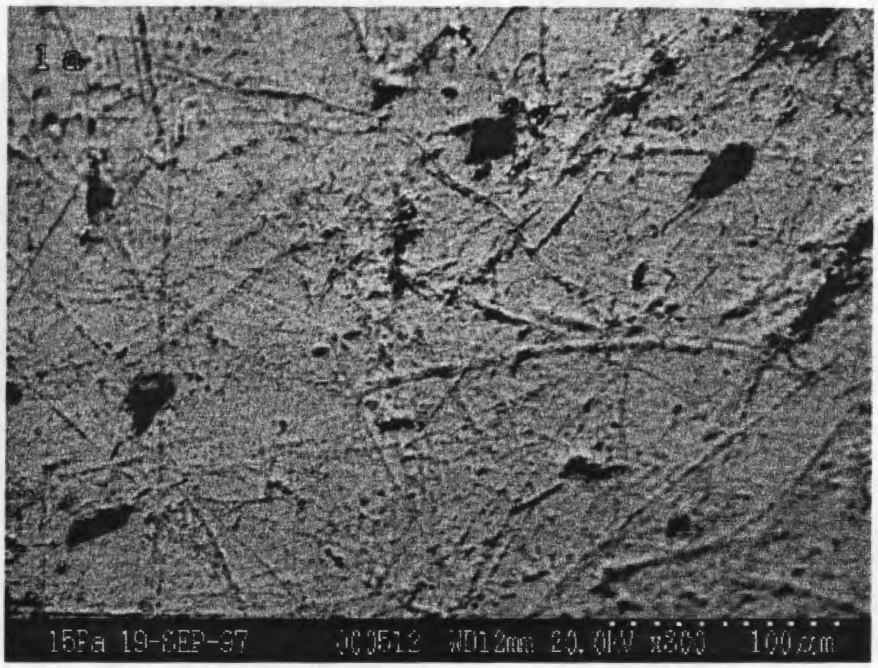


Tooth 01
Burial 11B
Cemetery 1
Female
Age 40+

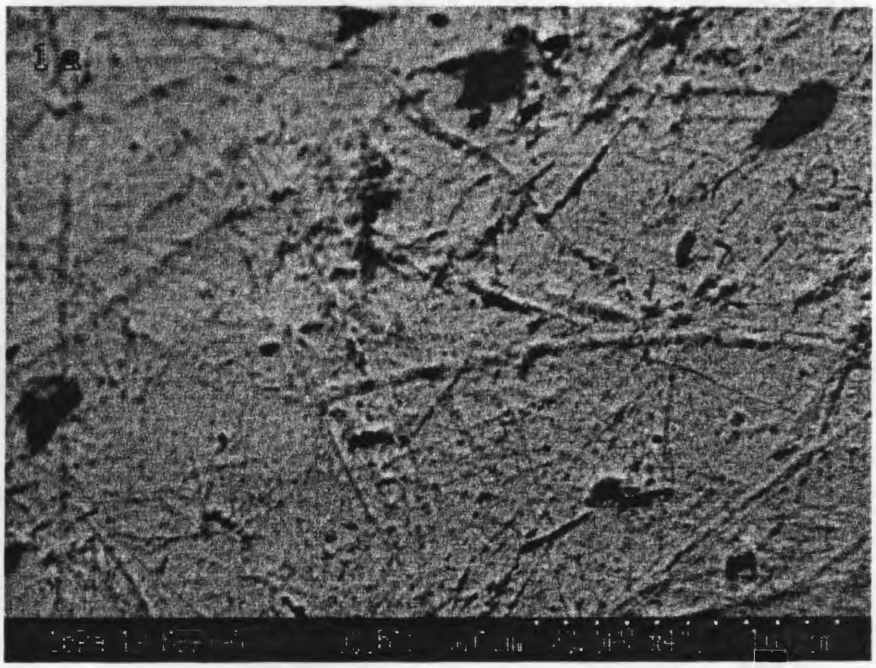


Tooth 01
Averbuch
100x

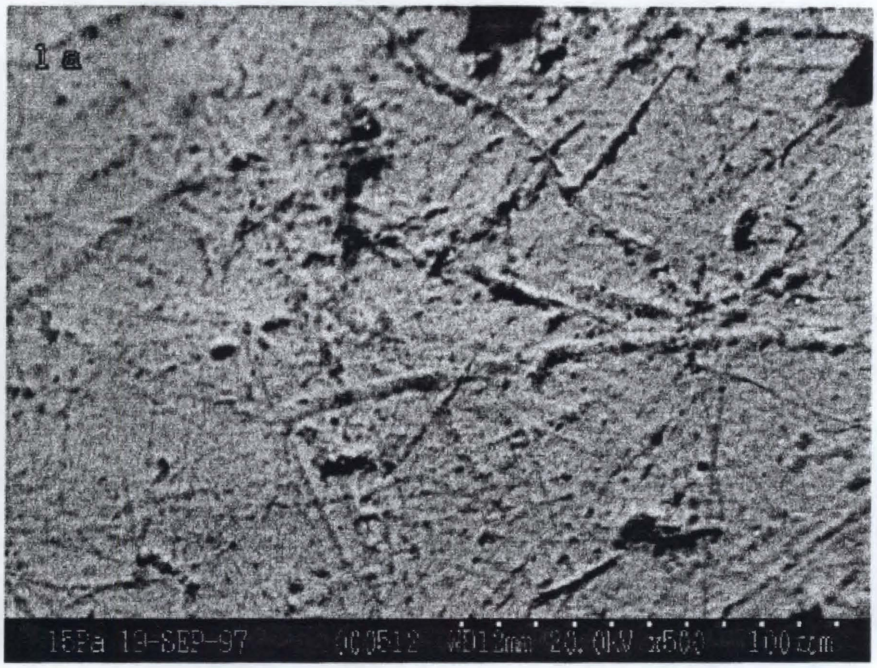
Tooth 01
Averbuch
200x



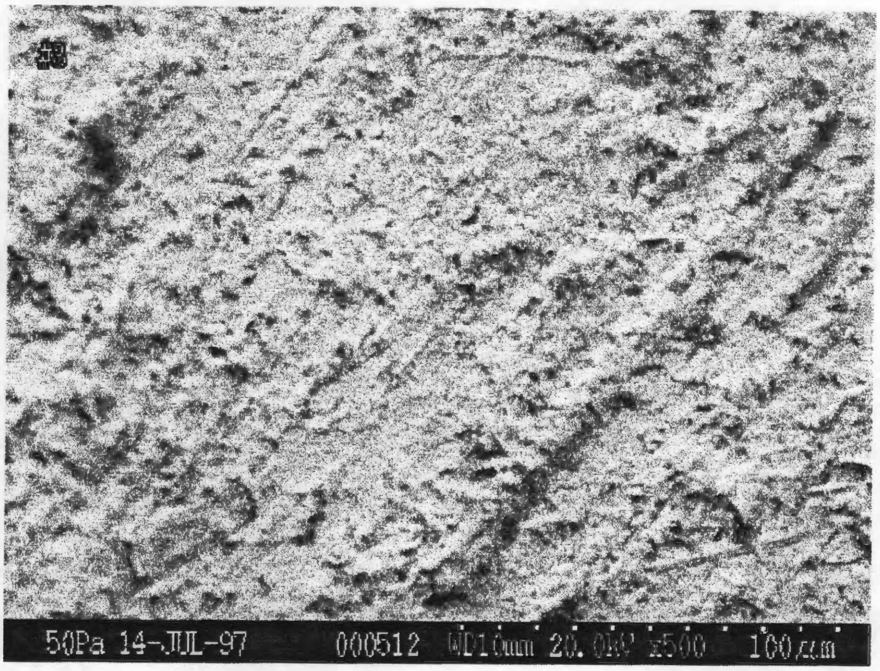
Tooth 01
Averbuch
300x



Tooth 01
Averbuch
400x

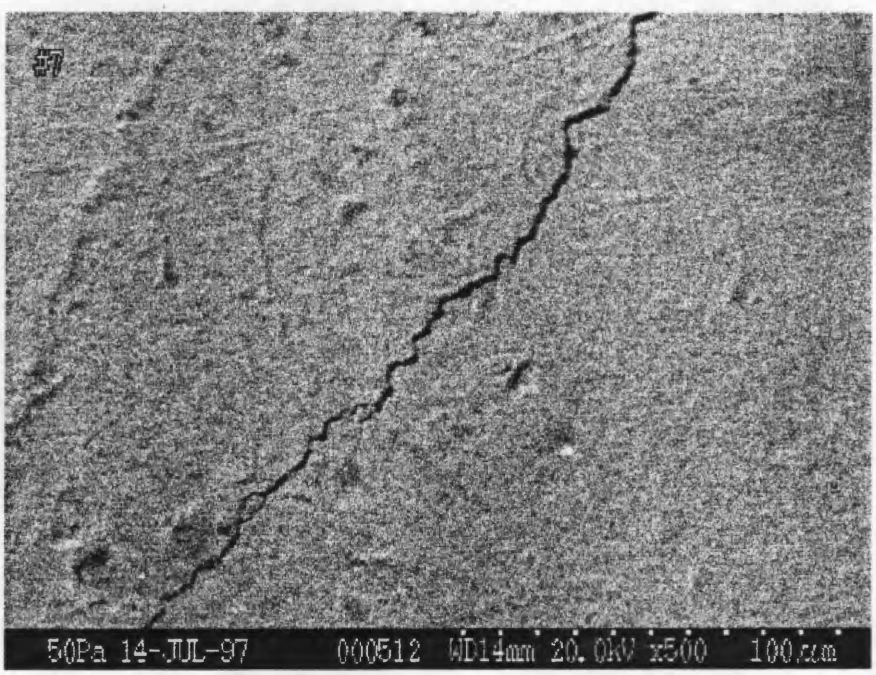


Tooth 01
Averbuch
500x

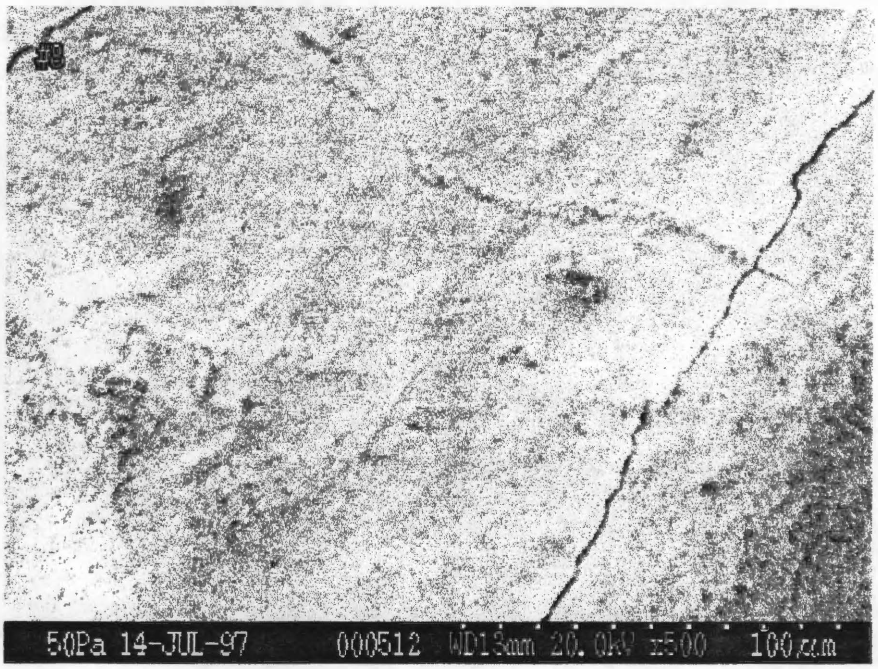


Tooth 03
Burial 29A
Cemetery 1
Male
Age 20-29

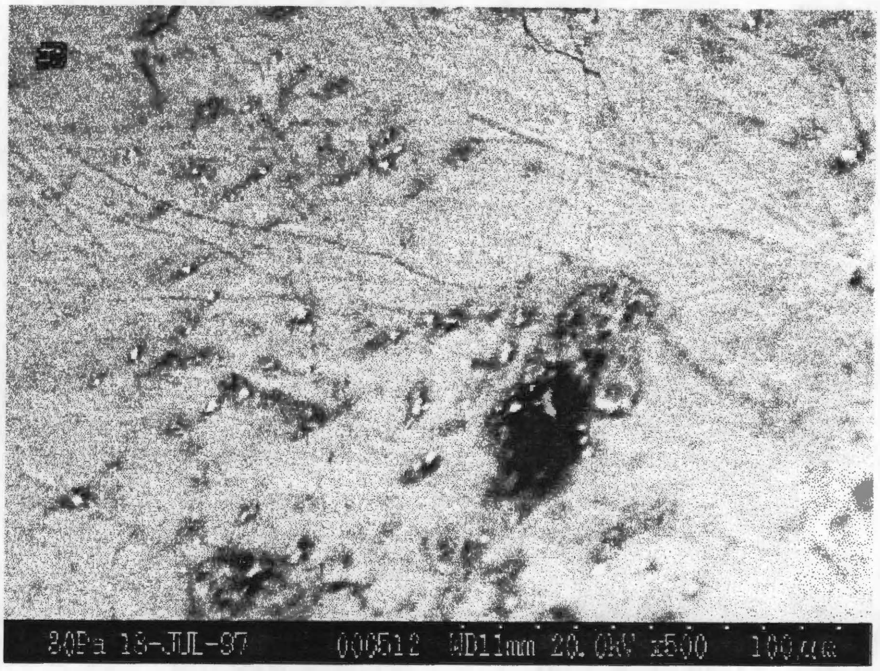
Tooth 05
Burial 130
Cemetery 1
Female
Age 30-39



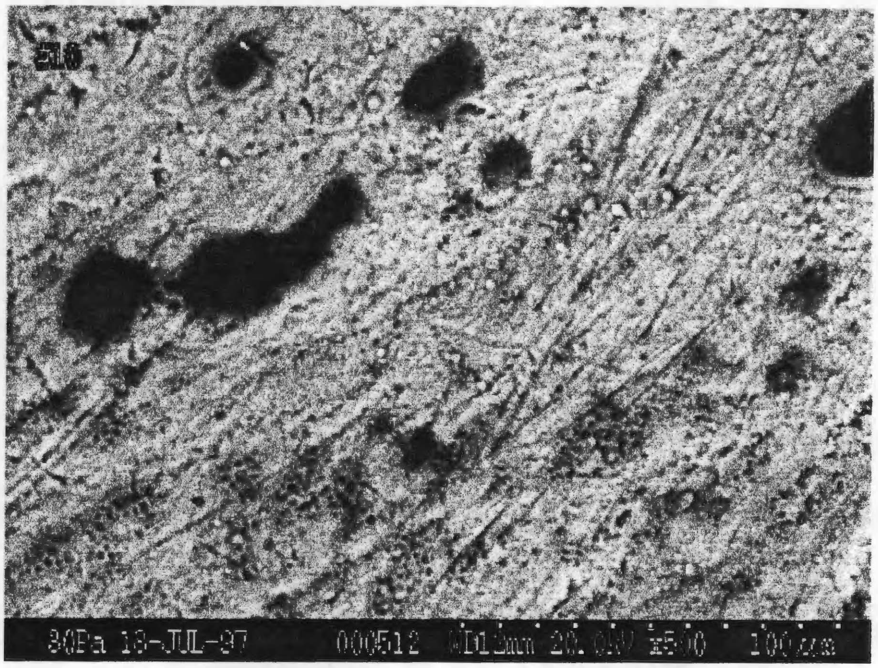
Tooth 07
Burial 146A
Cemetery 1
Male
Age 30-39



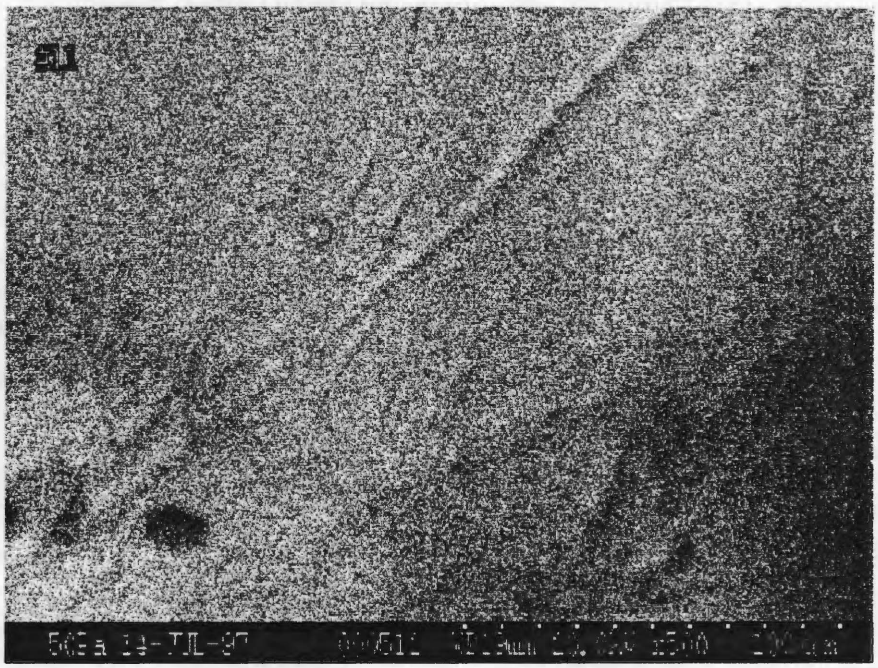
Tooth 08
Burial 148
Cemetery 1
Male
Age 20-29



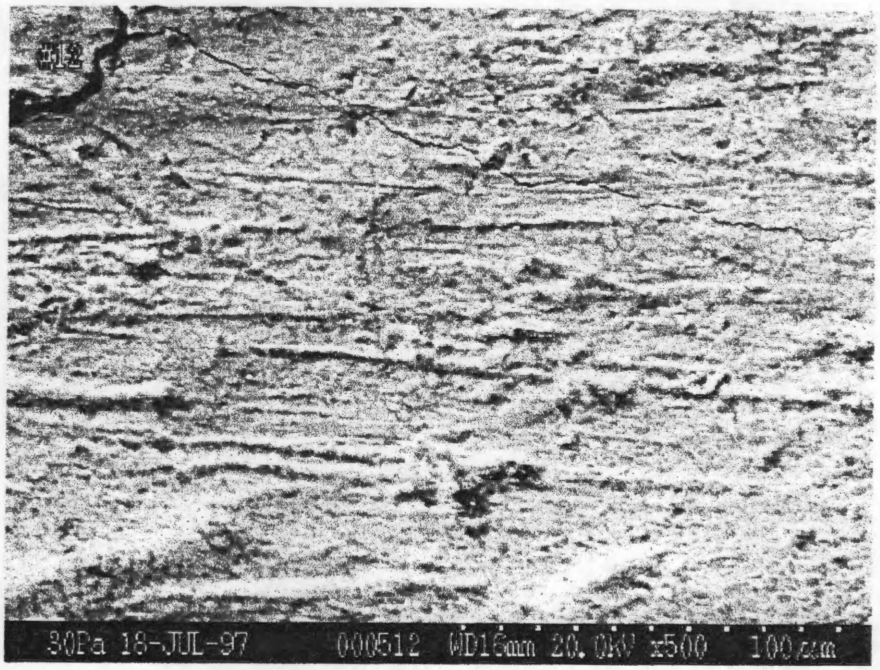
Tooth 09
Burial 168
Cemetery 1
Female
Age 40+



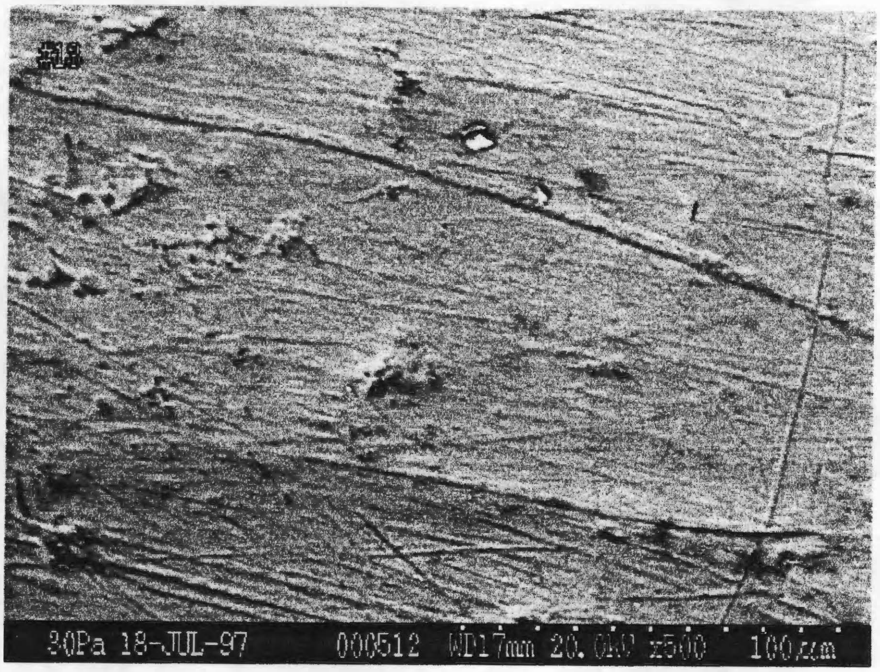
Tooth 10
Burial 208
Cemetery 1
Male
Age <20



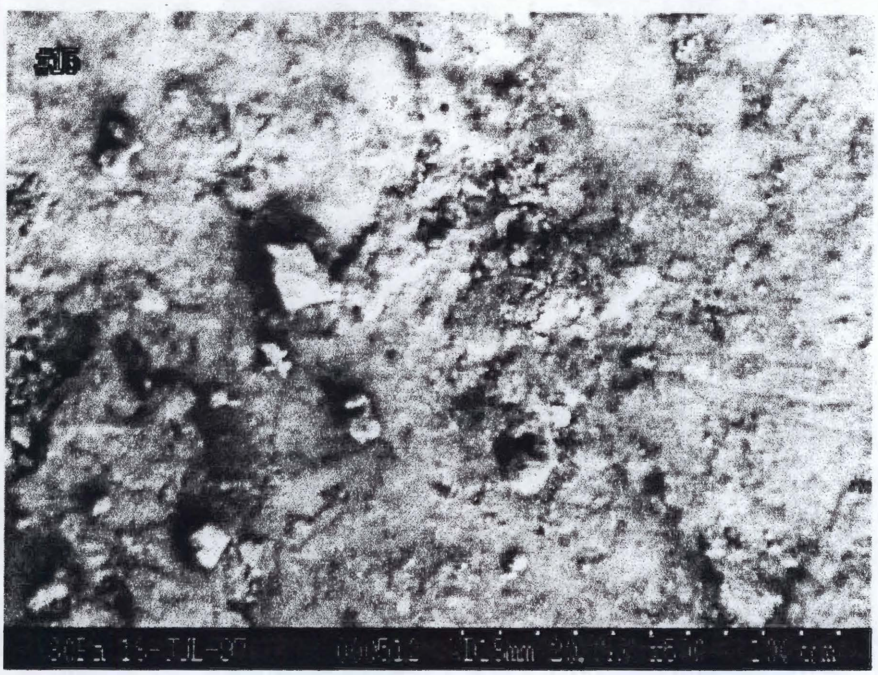
Tooth 11
Burial 214C
Cemetery 1
Male
Age <20



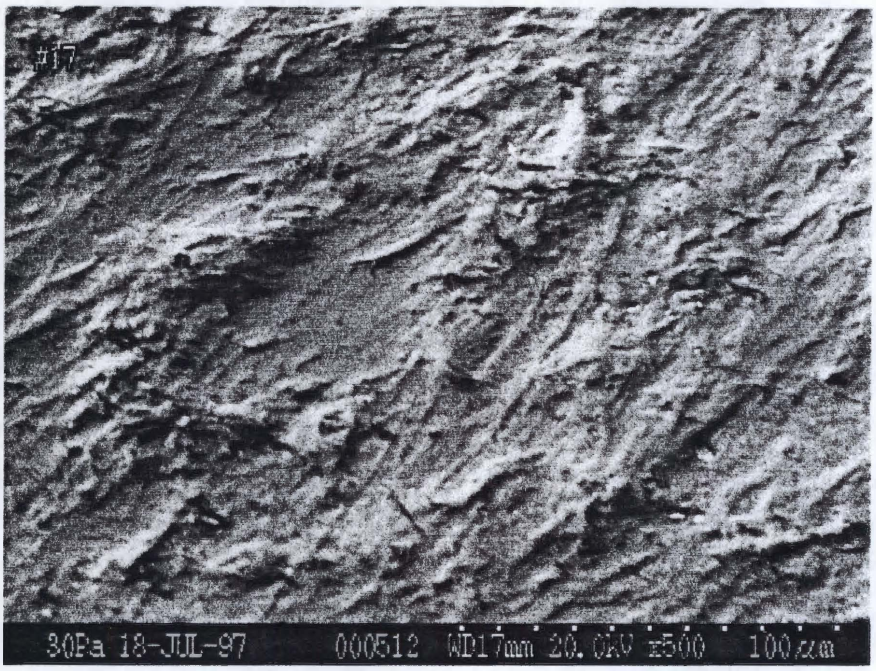
Tooth 12
Burial 225C
Cemetery 1
Male
Age 40+



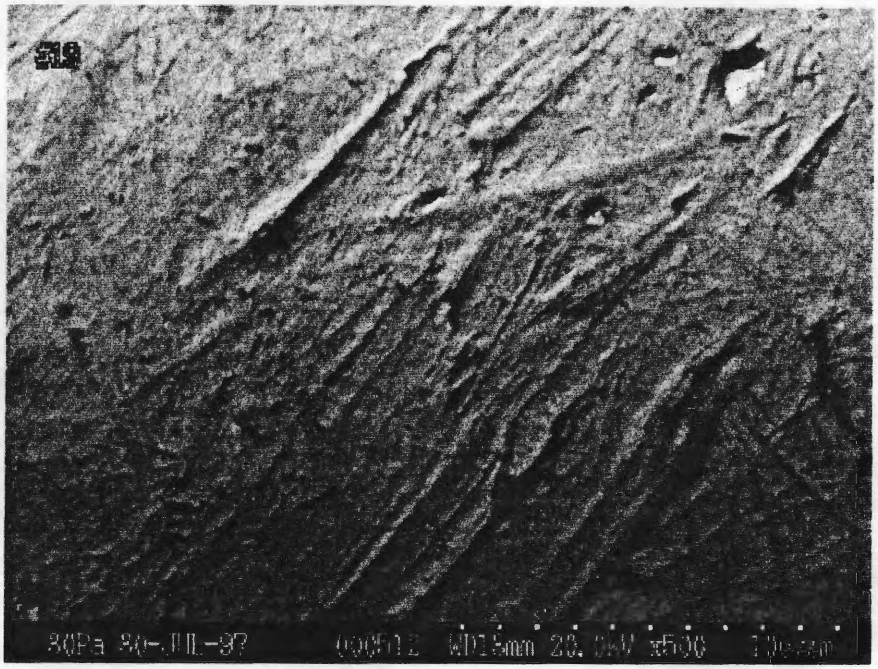
Tooth 13
Burial 229B
Cemetery 1
Male
Age 20-29



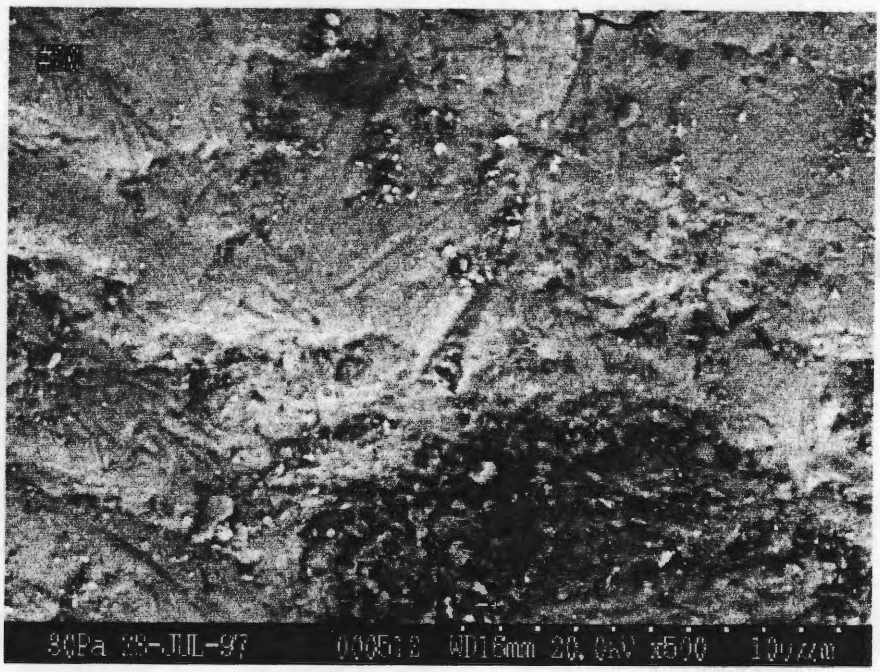
Tooth 15
Burial 251
Cemetery 1
Female
Age 30-39



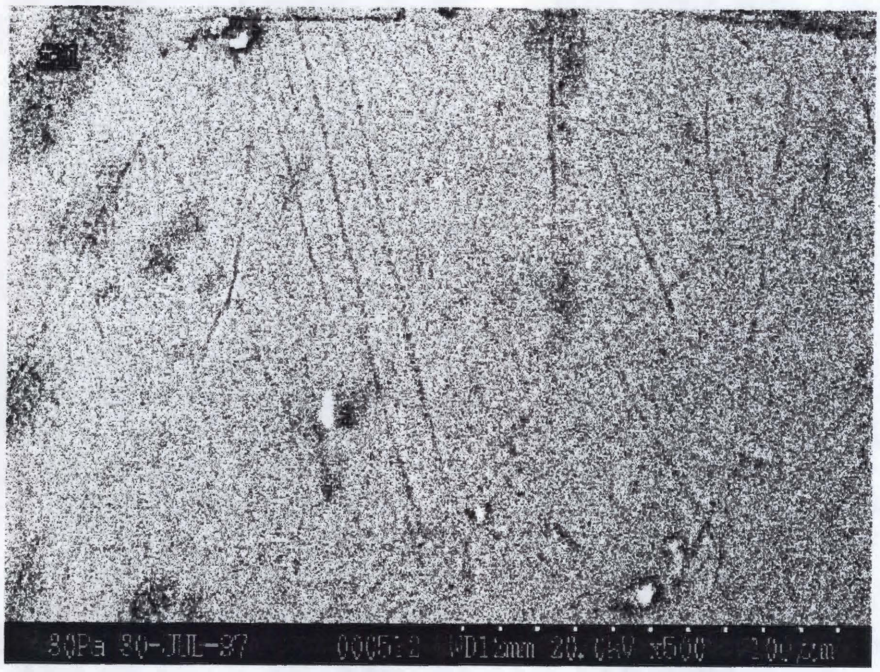
Tooth 17
Burial 277A
Cemetery 1
Male
Age 20-29



Tooth 19
Burial 310
Cemetery 1
Female
Age <20

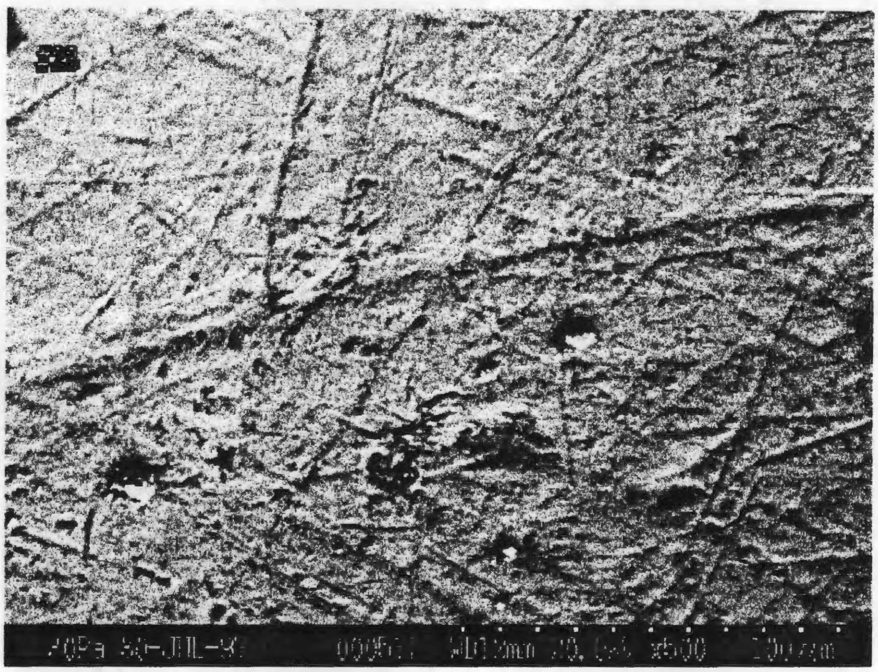


Tooth 20
Burial 311B
Cemetery 1
Male
Age 20-29

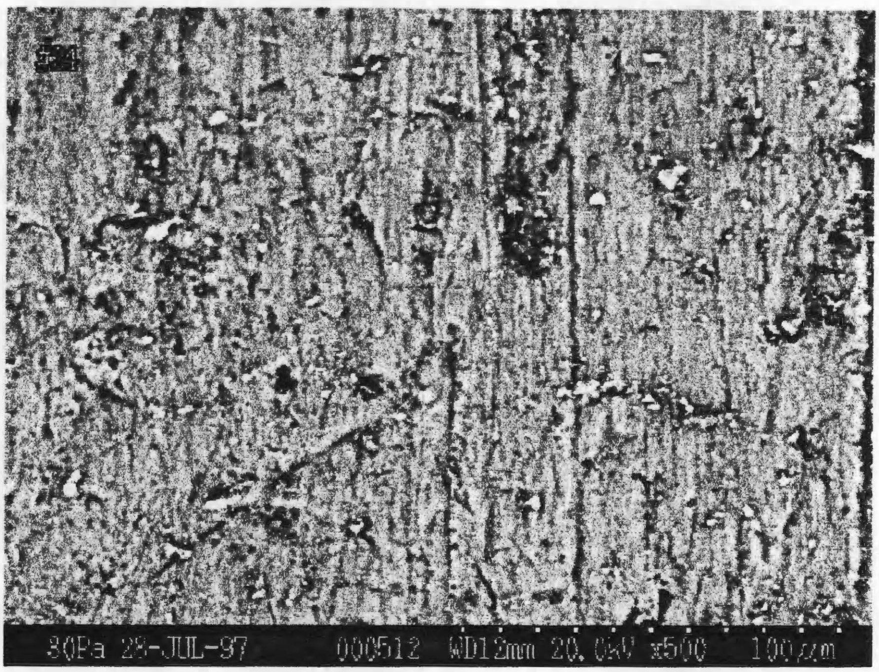


Tooth 21
Burial 327
Cemetery 1
Male
Age <20

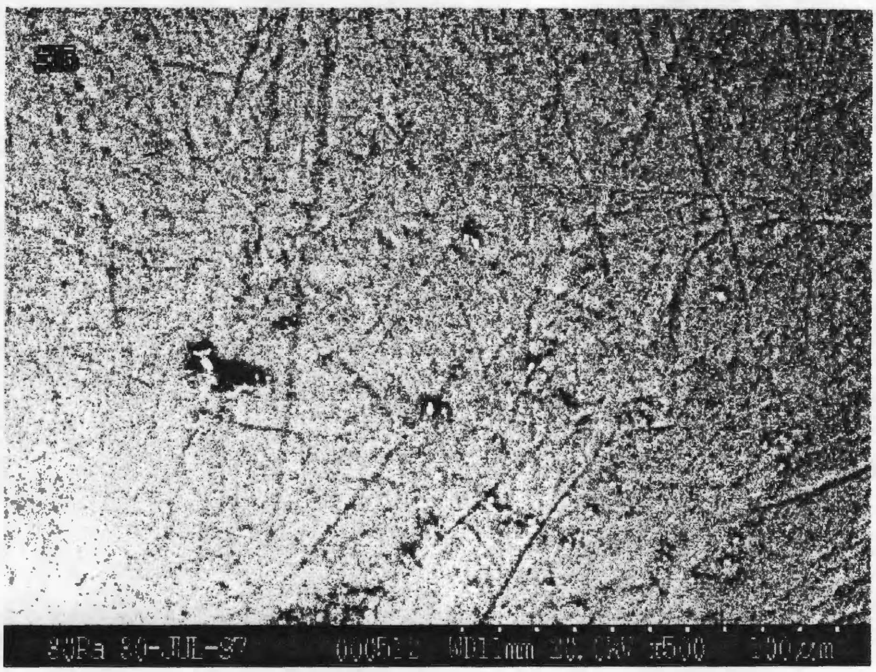
Tooth 22
Burial 359A
Cemetery 1
Female
Age 20-29



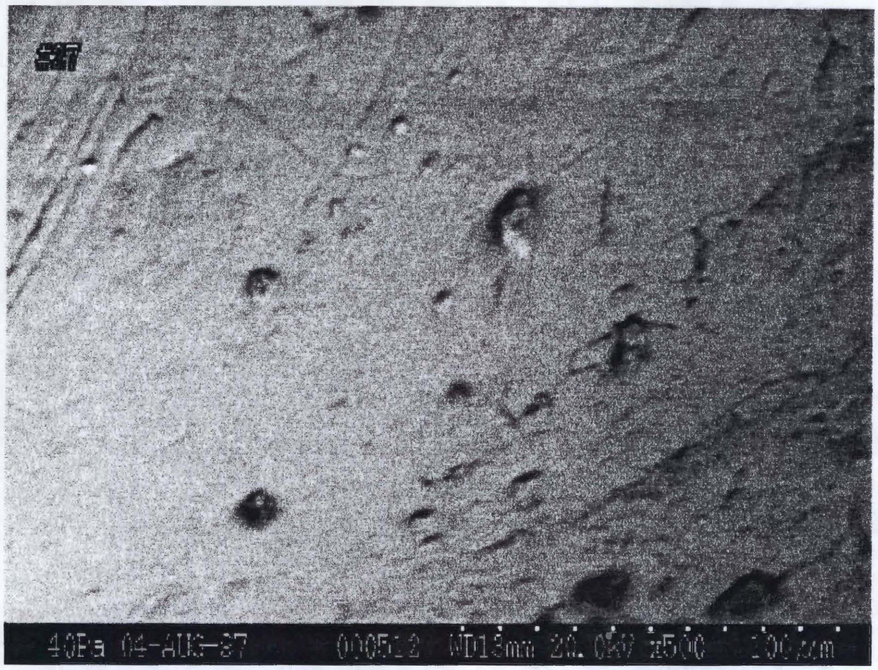
Tooth 23
Burial 363
Cemetery 1
Male
Age 30-39



Tooth 24
Burial 381
Cemetery 1
Male
Age 30-39

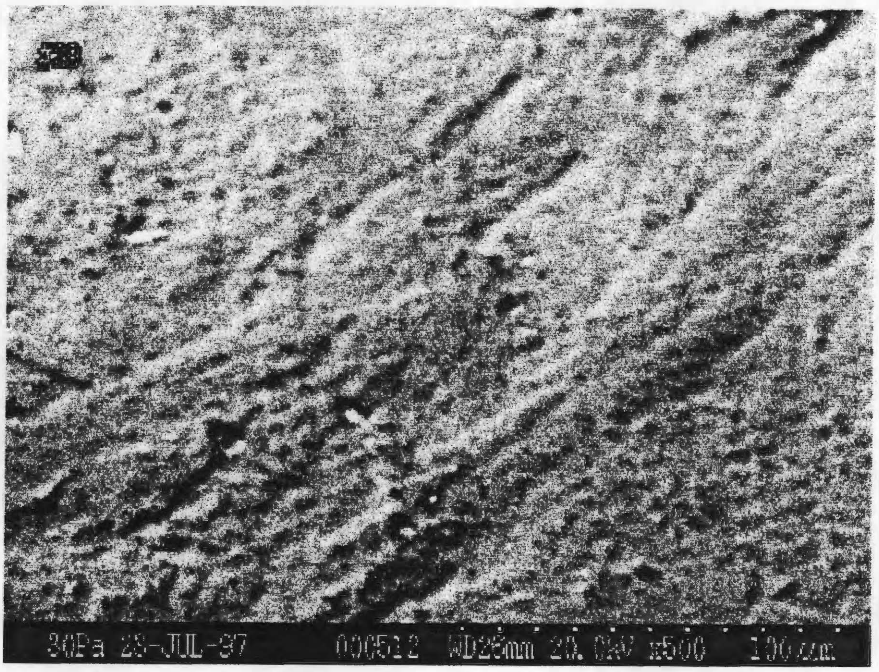


Tooth 25
Burial 394A
Cemetery 2
Female
Age <20



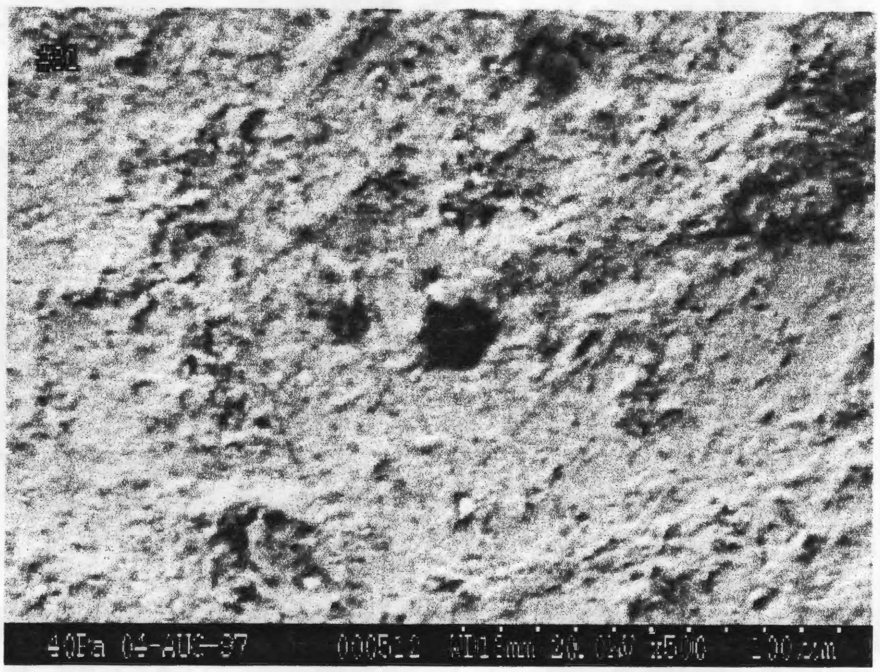
Tooth 27
Burial 404A
Cemetery 2
Female
Age <20

Tooth 28
Burial 405
Cemetery 2
Female
Age 20-29

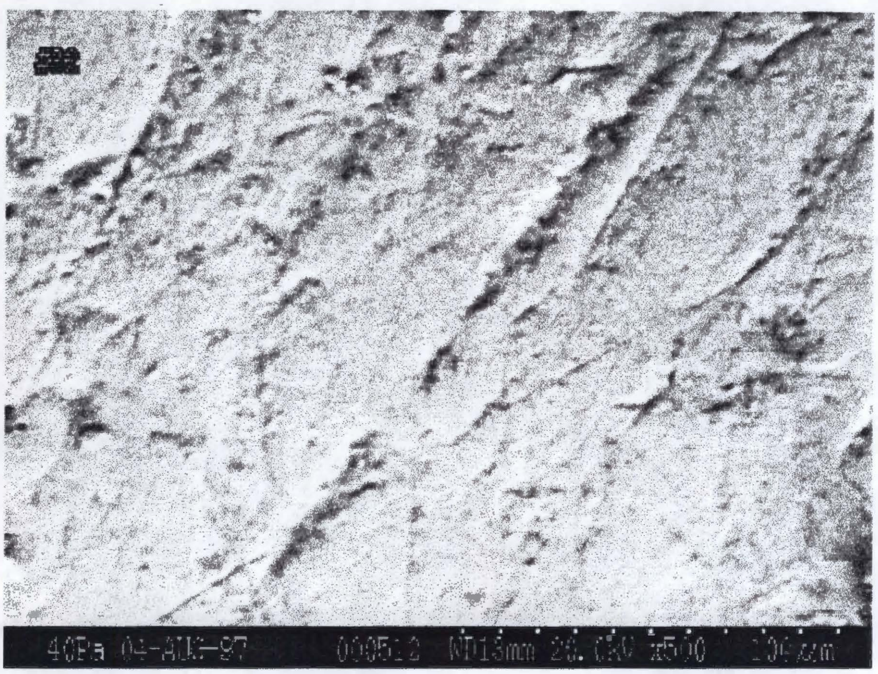


Tooth 29
Burial 423
Cemetery 2
Male
Age <20

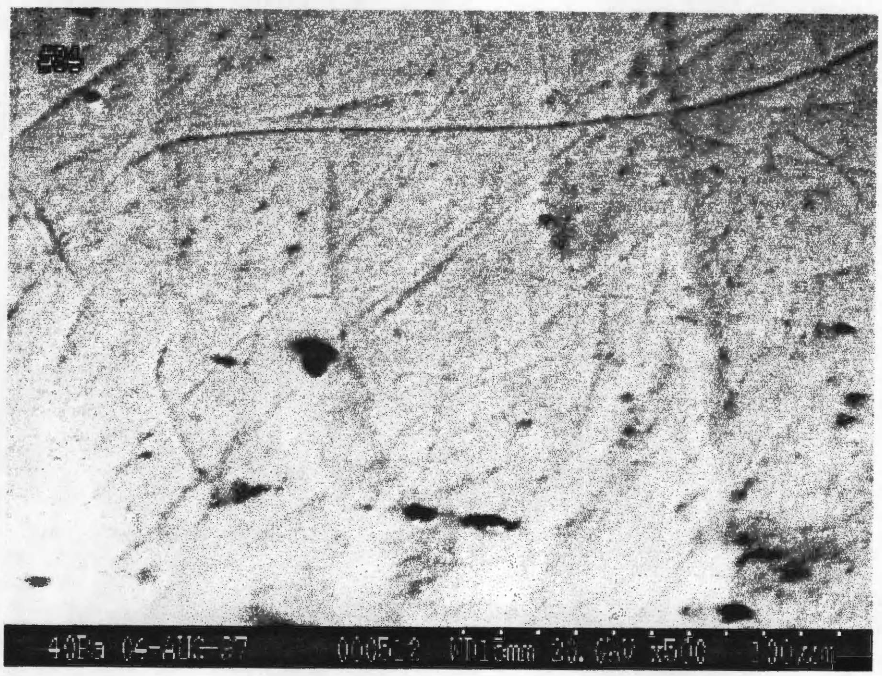
Tooth 30
Burial 426
Cemetery 1
Female
Age 30-39



Tooth 31
Burial 432A
Cemetery 2
Female
Age 40+

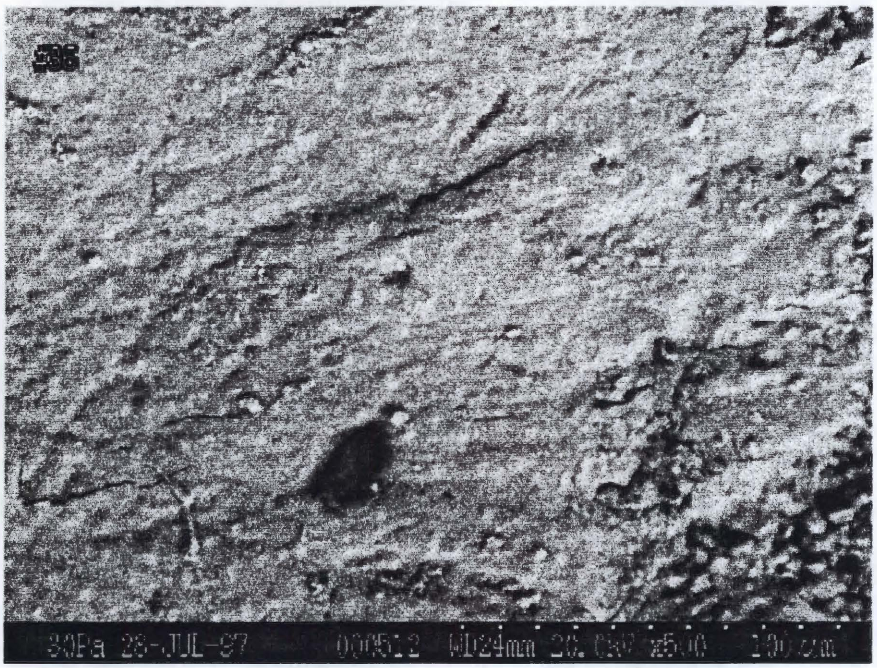


Tooth 32
Burial 435A
Cemetery 2
Male
Age 30-39

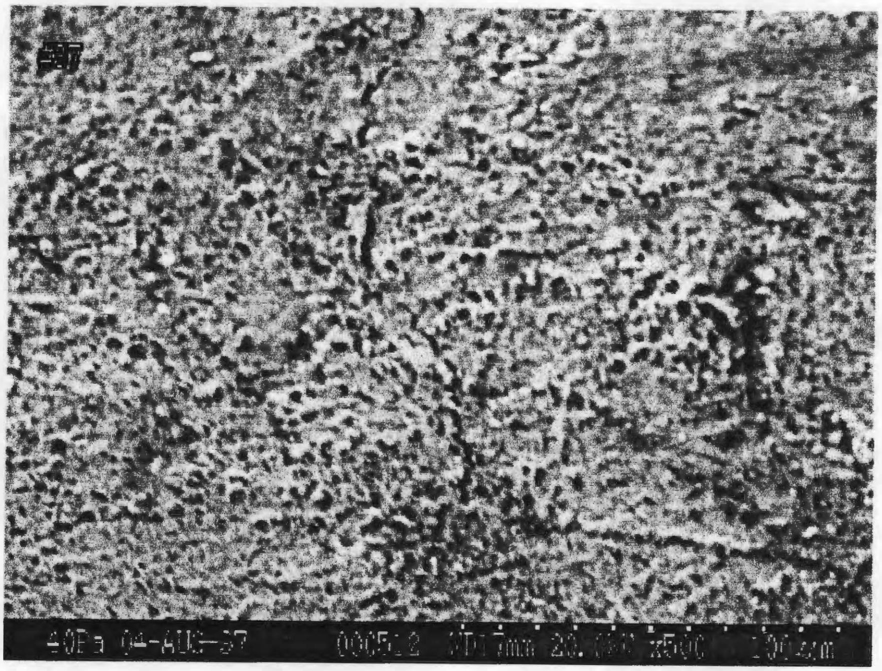


Tooth 34
Burial 436A
Cemetery 2
Male
Age 20-29

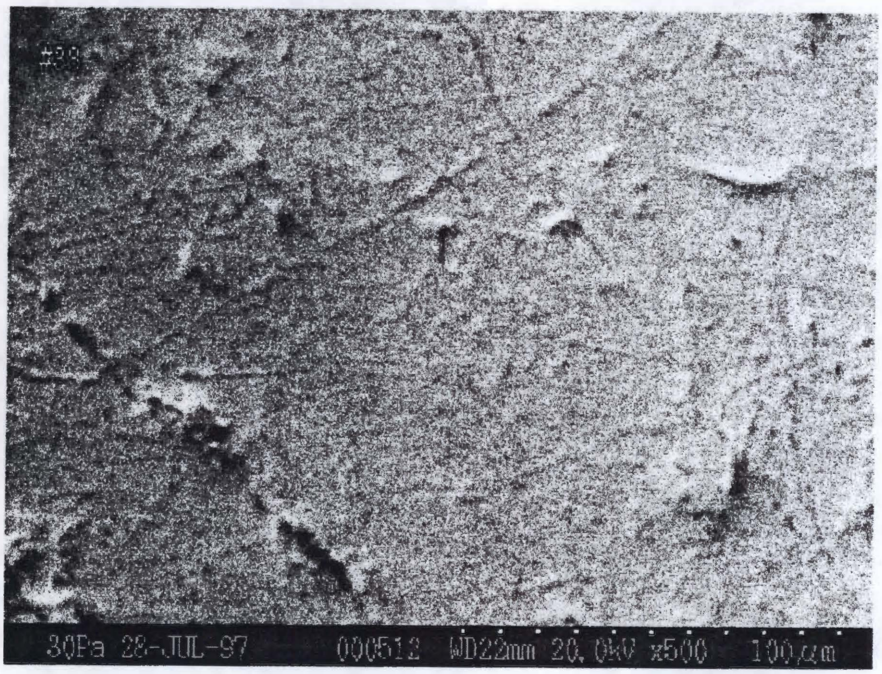
Tooth 35
Burial 437B
Cemetery 2
Female
Age 40+



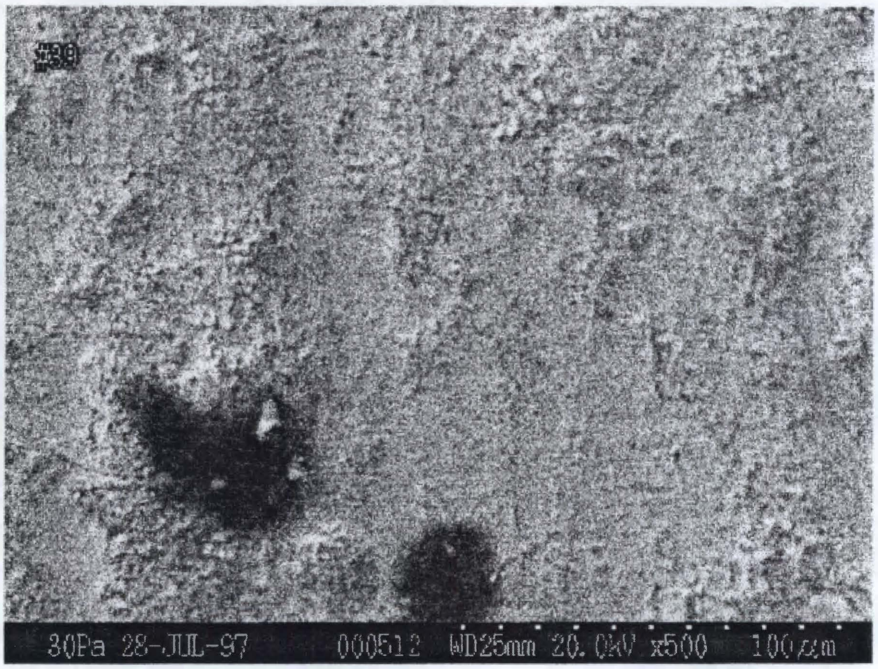
Tooth 36
Burial 442A
Cemetery 1
Male
Age 40+



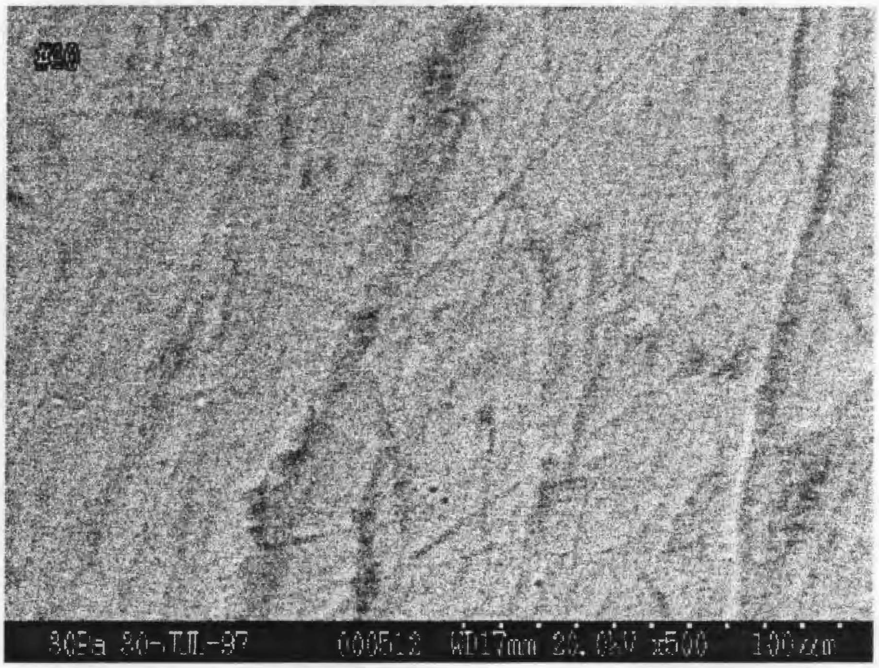
Tooth 37
Burial 446
Cemetery 2
Female
Age 40+



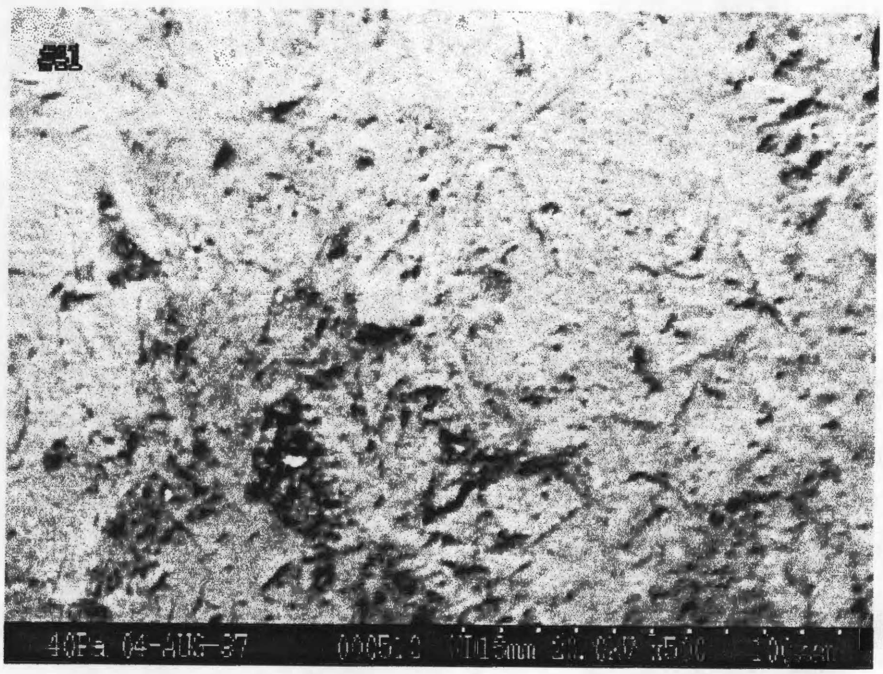
Tooth 38
Burial 447
Cemetery 2
Female
Age 20-29



Tooth 39
Burial 457
Cemetery 2
Male
Age 40+

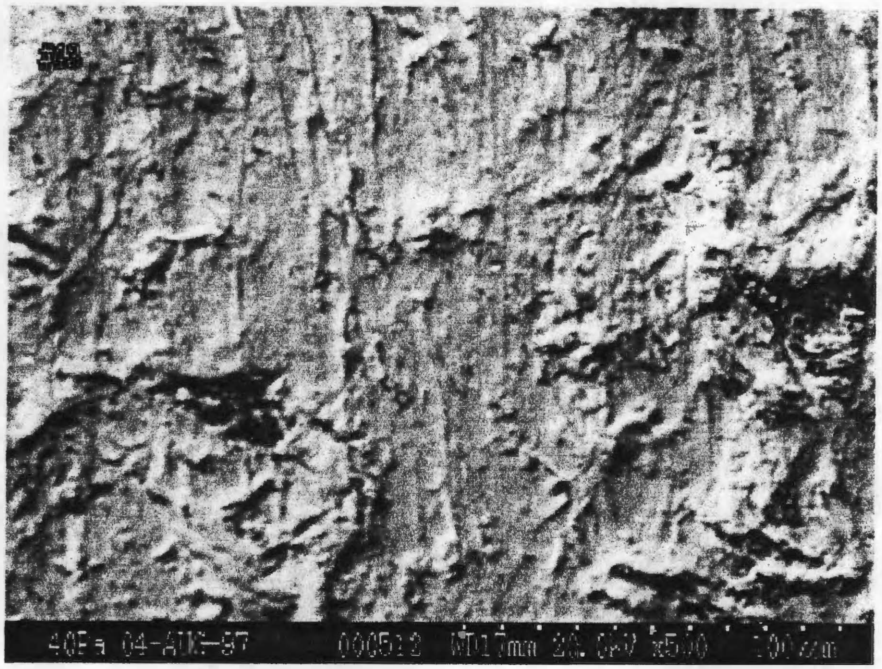


Tooth 40
Burial 459
Cemetery 2
Male
Age 20-29

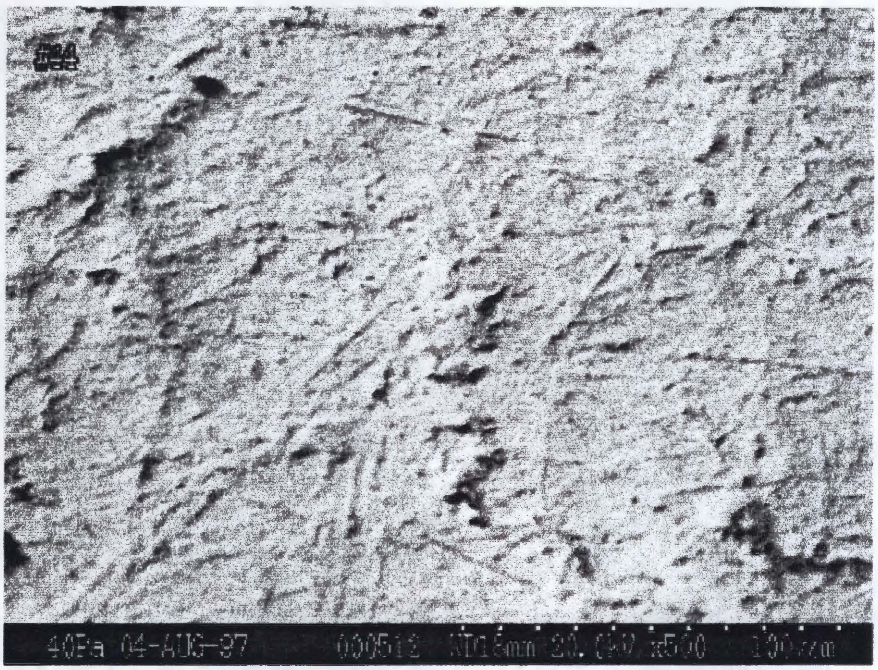


Tooth 41
Burial 462
Cemetery 2
Male
Age 40+

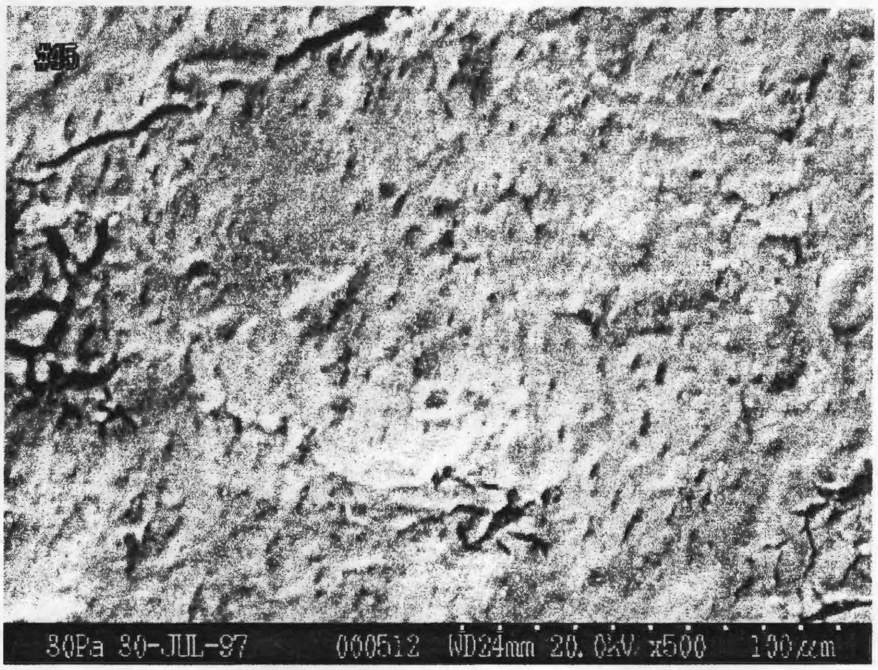
Tooth 42
Burial 469A
Cemetery 1
Male
Age 40+



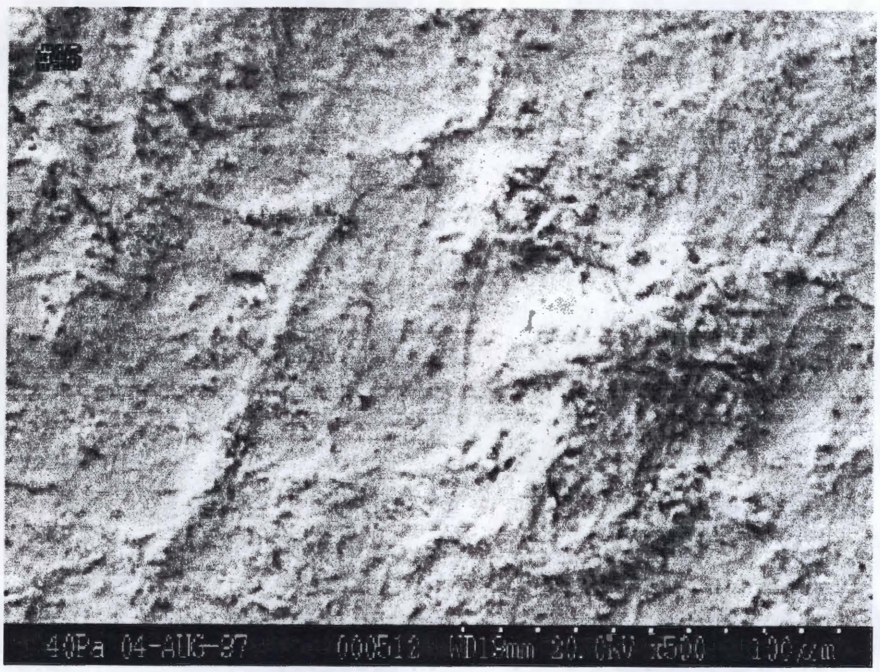
Tooth 43
Burial 471
Cemetery 2
Male
Age 30-39



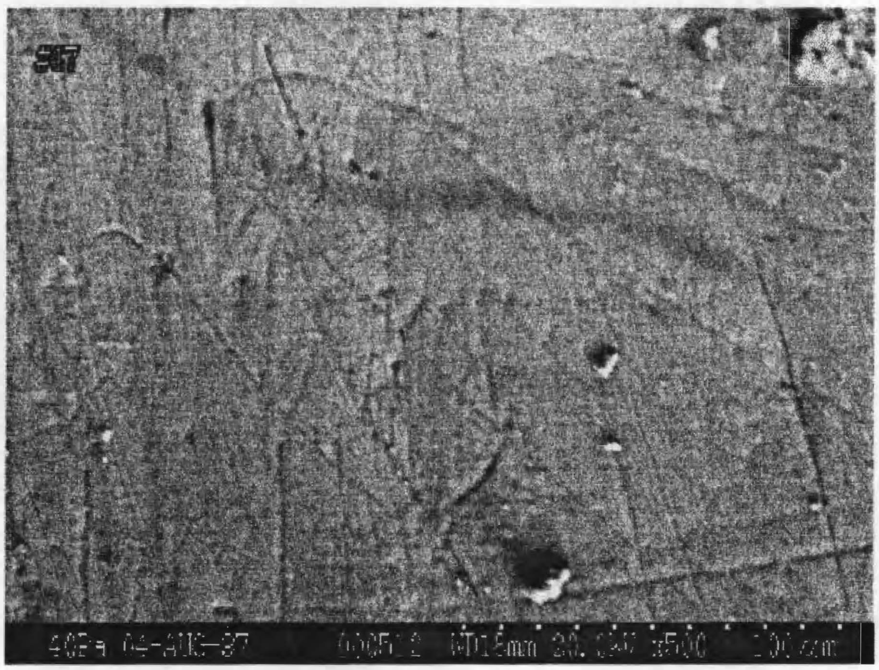
Tooth 44
Burial 477B
Cemetery 2
Female
Age 30-39



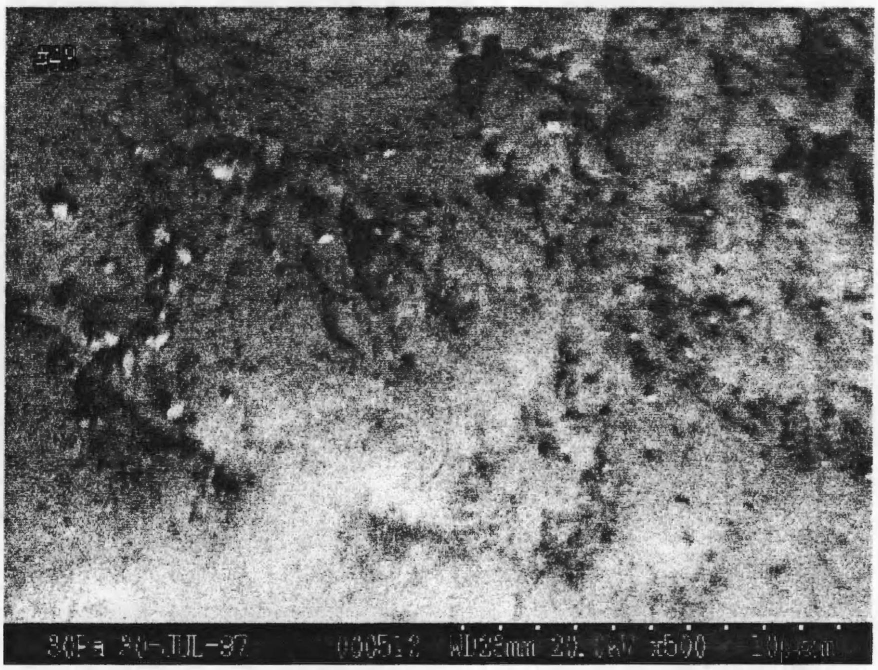
Tooth 45
Burial 482
Cemetery 1
Female
Age <20



Tooth 46
Burial 491
Cemetery 2
Female
Age 30-39

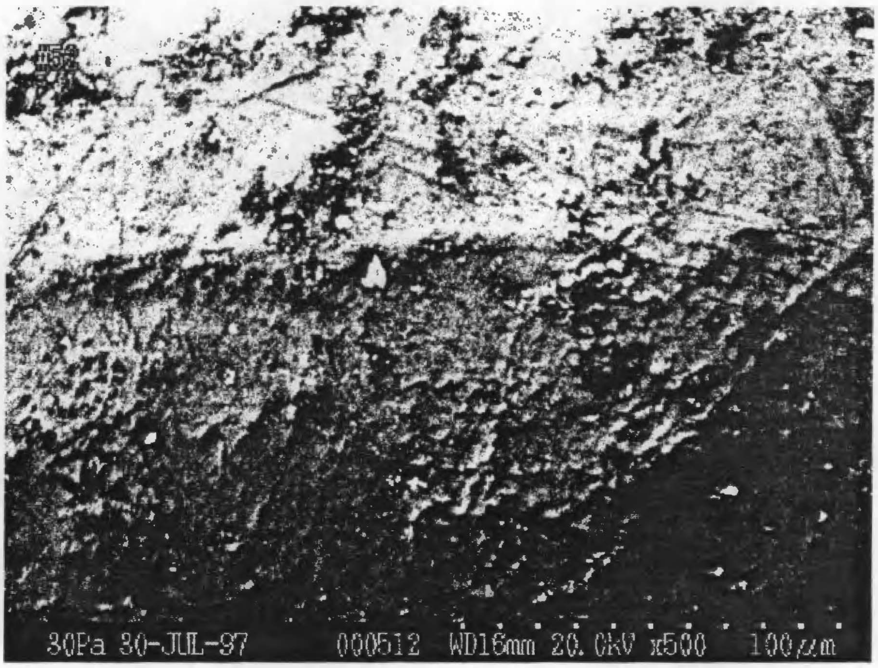


Tooth 47
Burial 502
Cemetery 2
Female
Age 20-29

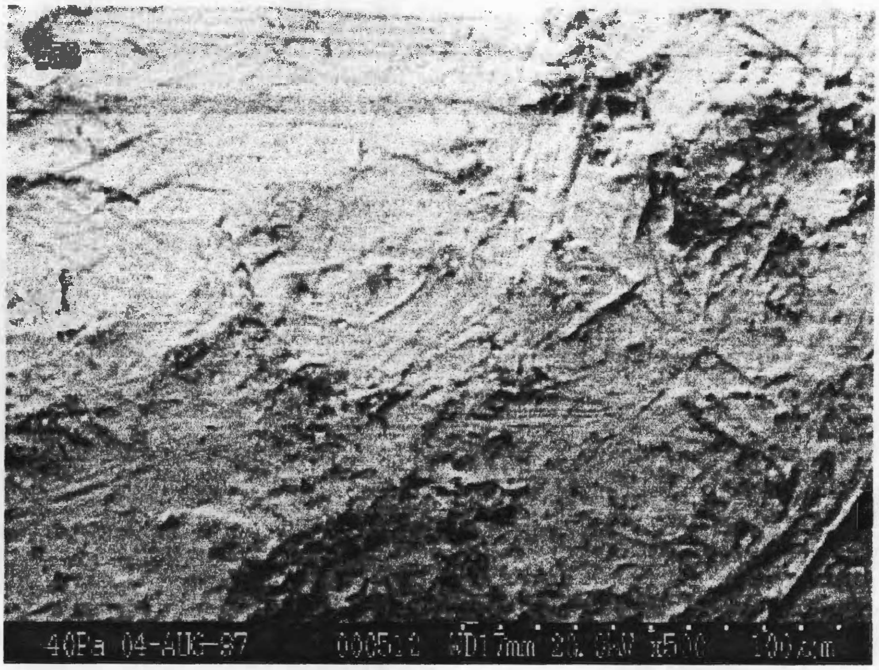


Tooth 48
Burial 507B
Cemetery 3
Female
Age <20

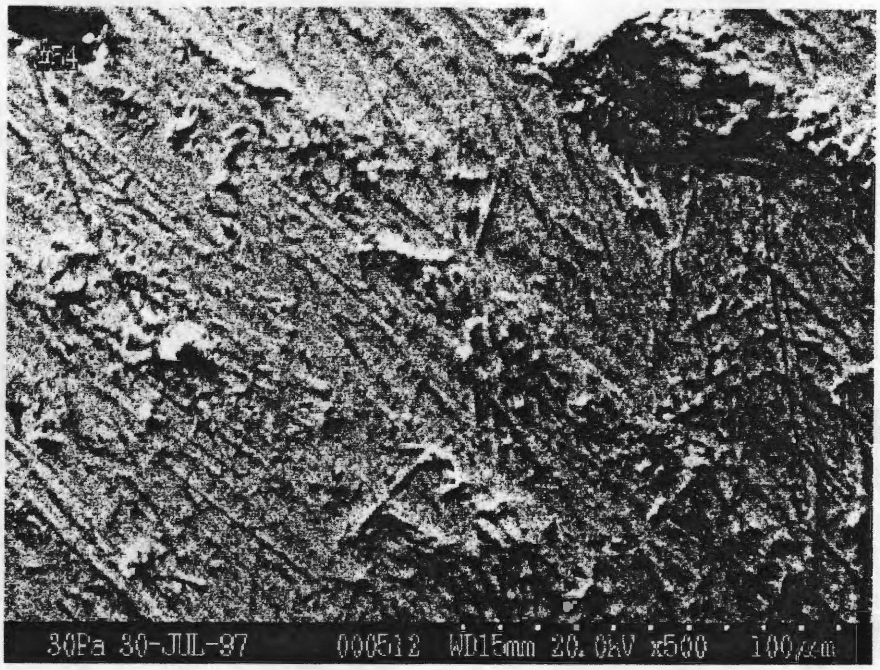
Tooth 51
Burial 524
Cemetery 3
Female
Age <20



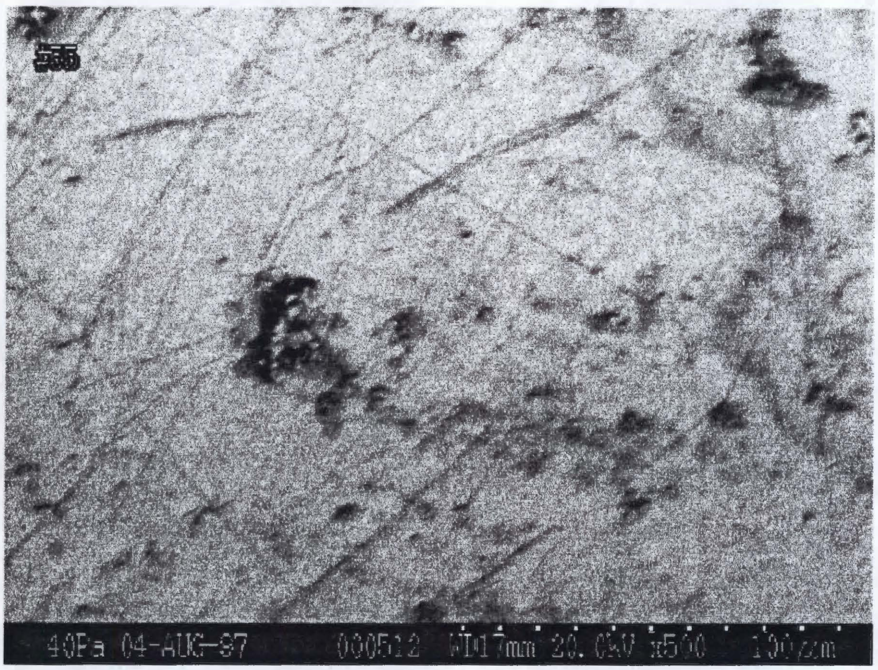
Tooth 52
Burial 525
Cemetery 3
Male
Age 40+



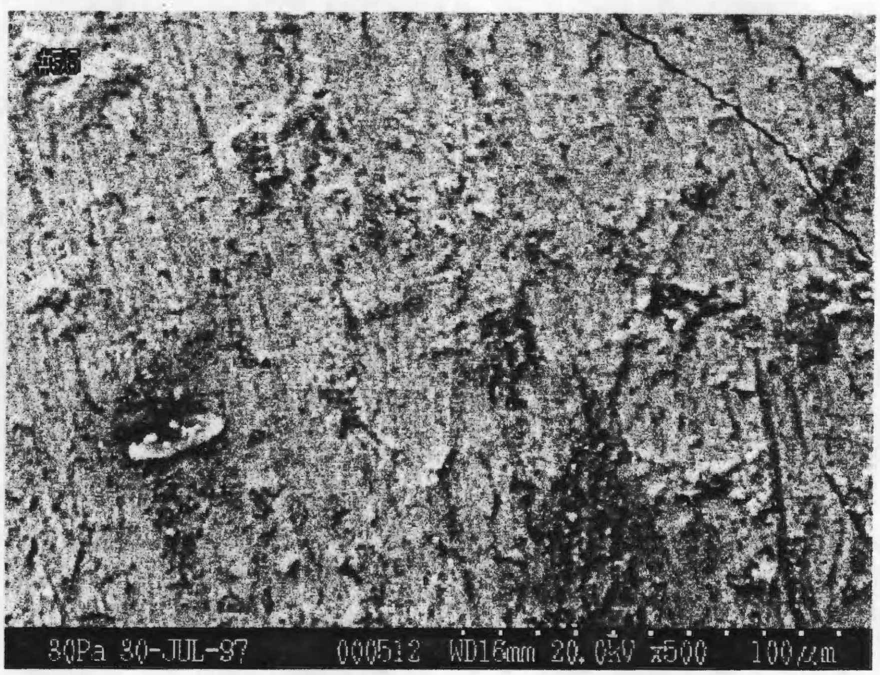
Tooth 53
Burial 546
Cemetery 3
Male
Age 30-39



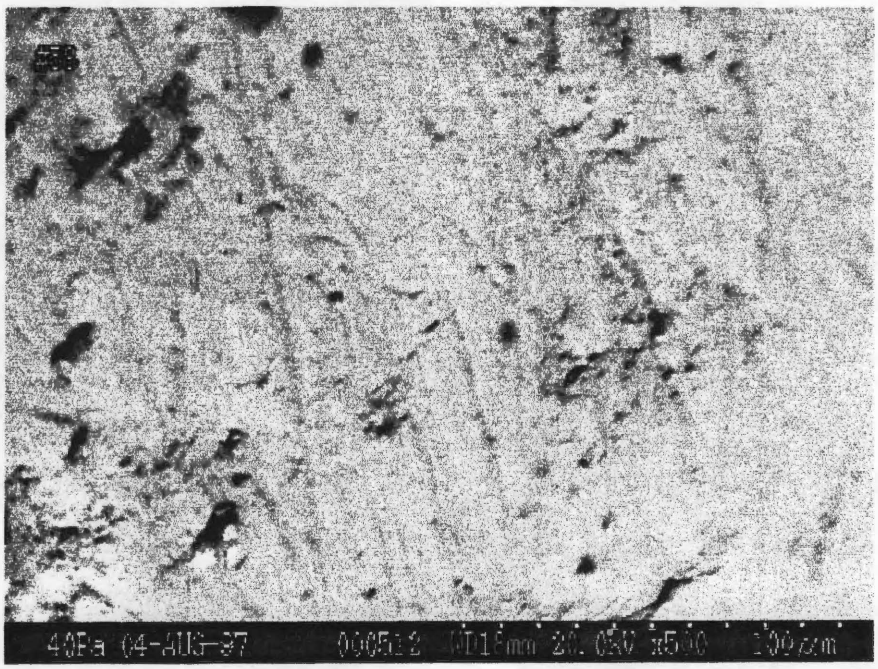
Tooth 54
Burial 562
Cemetery 3
Male
Age <20



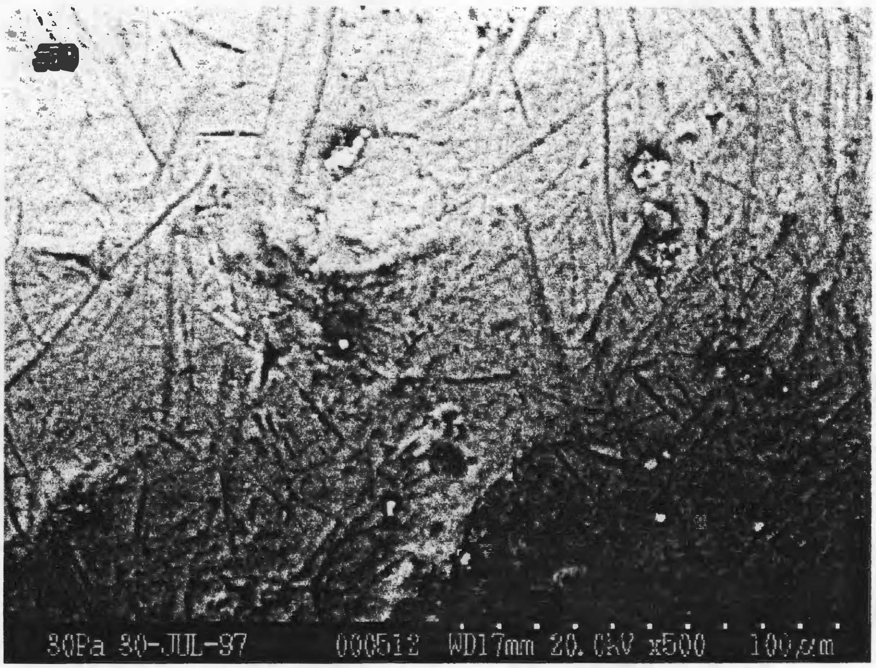
Tooth 55
Burial 567
Cemetery 3
Female
Age <20



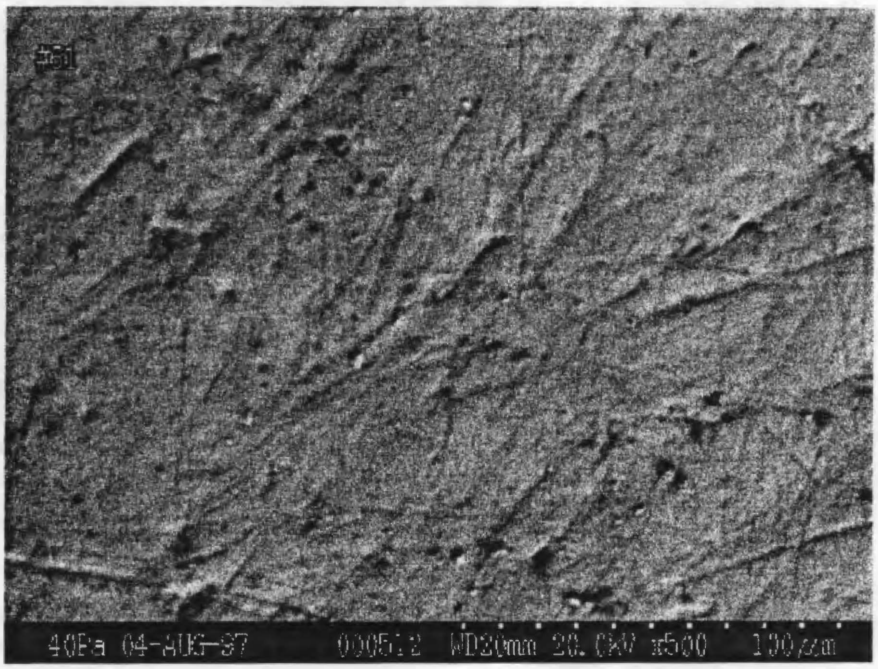
Tooth 56
Burial 568B
Cemetery 3
Female
Age 30-39



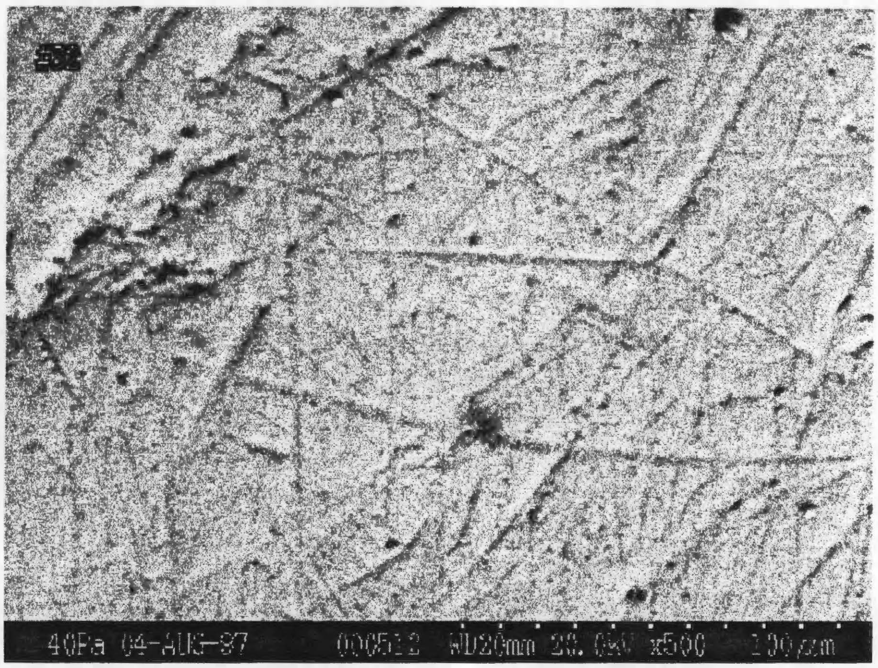
Tooth 58
Burial 604
Cemetery 3
Female
Age 20-29



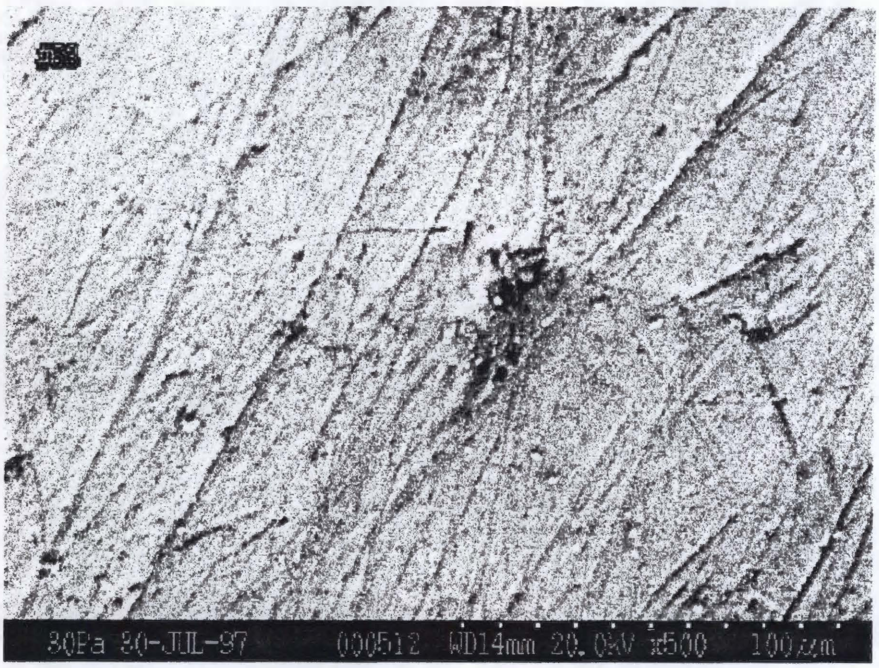
Tooth 59
Burial 626
Cemetery 3
Male
Age 40+



Tooth 61
Burial 640
Cemetery 3
Male
Age <20



Tooth 62
Burial 656
Cemetery 3
Female
Age 20-29



Tooth 63
Burial 665
Cemetery 3
Female
Age 20-29

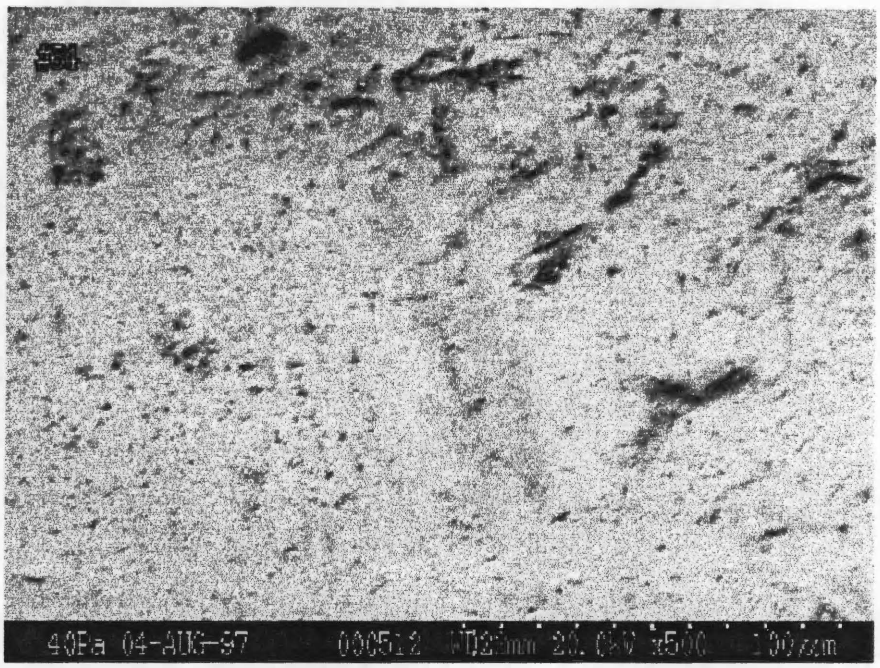
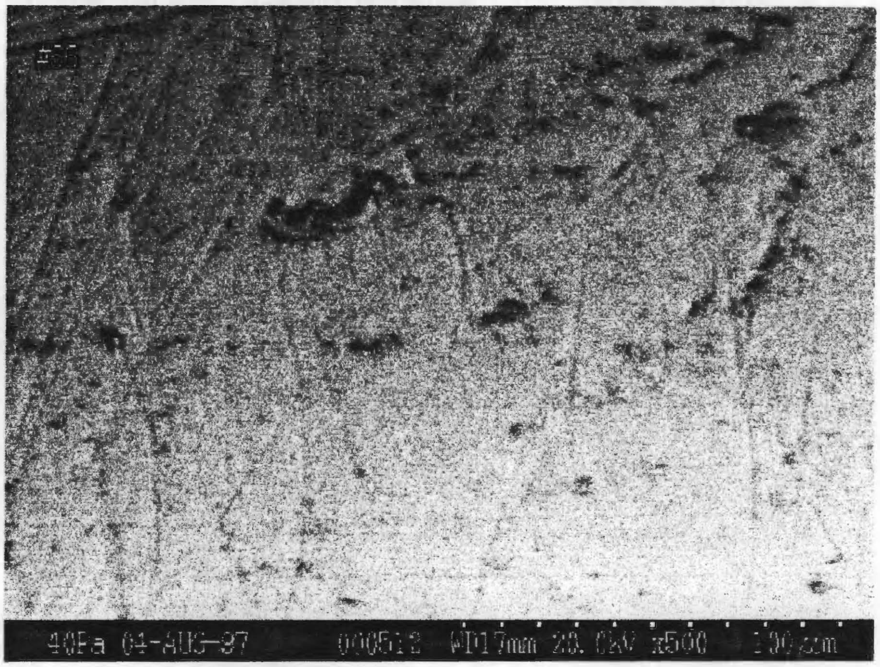
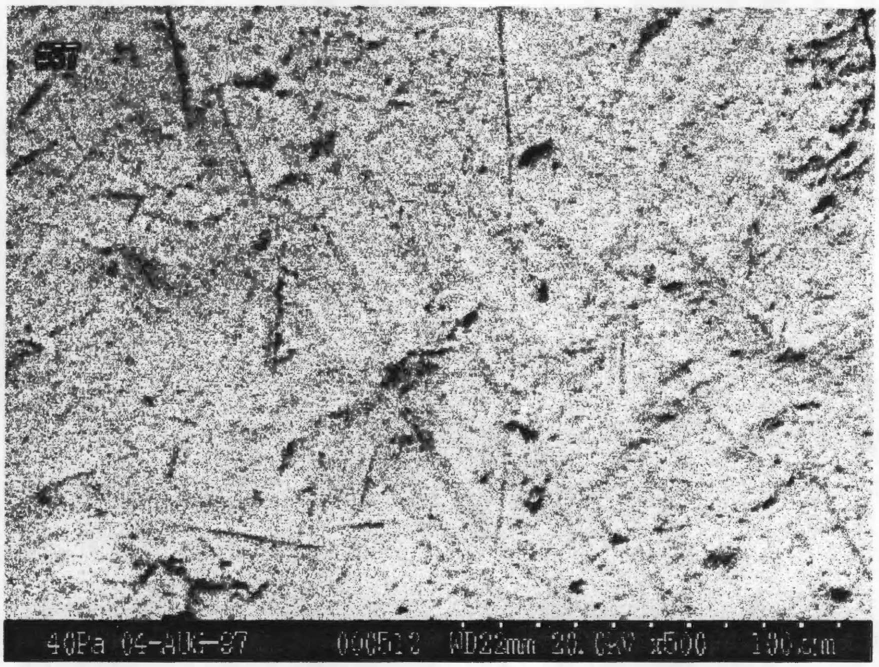


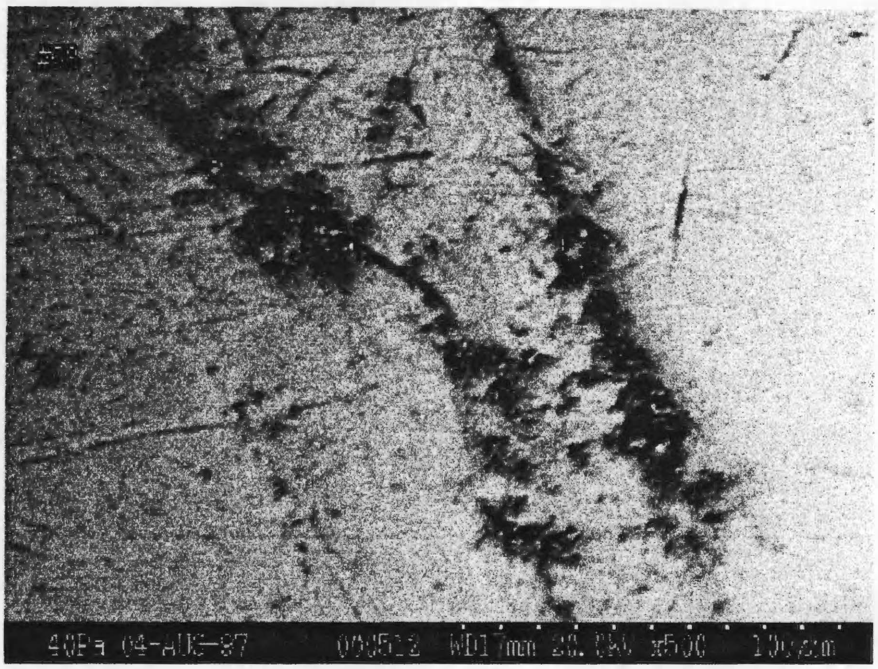
Photo 64
Burial 679
Cemetery 3
Male
Age 20-29



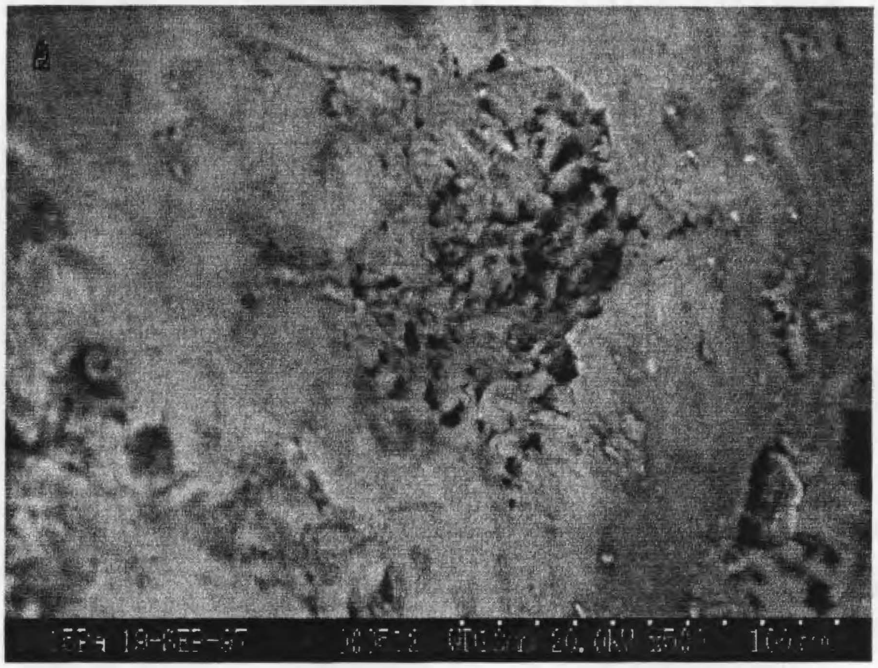
Tooth 66
Burial 695
Cemetery 3
Male
Age 20-29



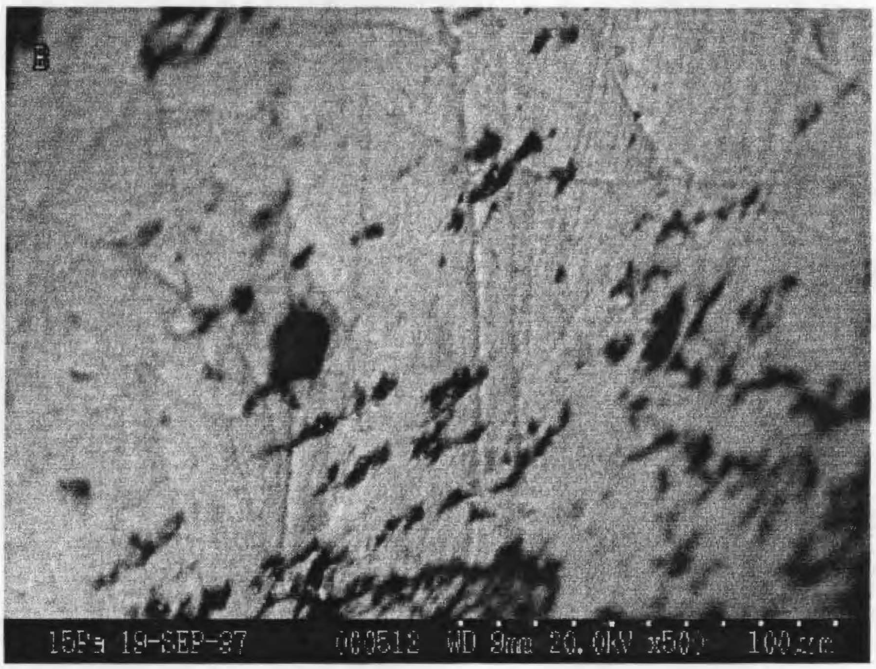
Tooth 67
Burial 700A
Cemetery 3
Male
Age 30-39



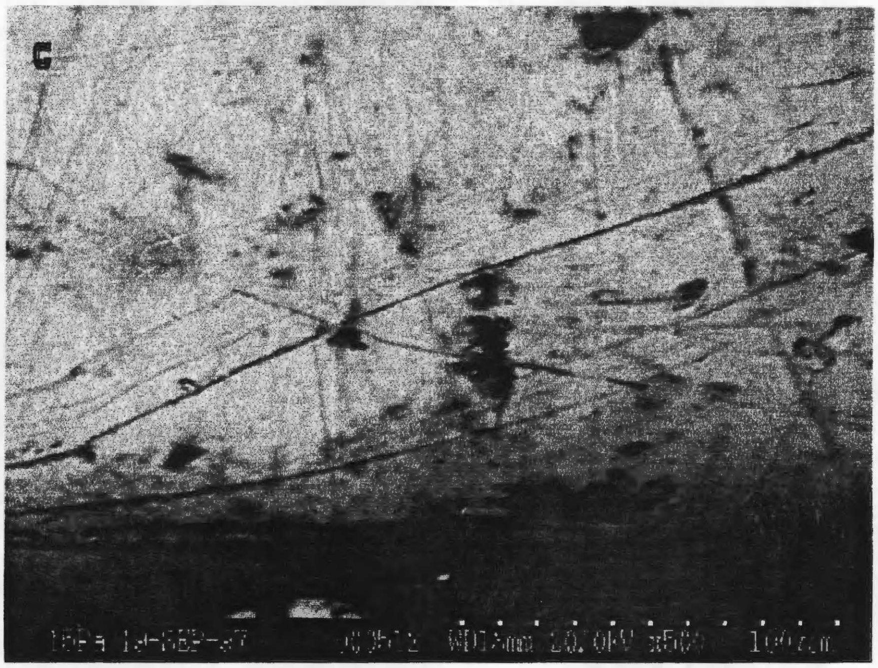
Tooth 68
Burial 701A
Cemetery 3
Female
Age 30-39



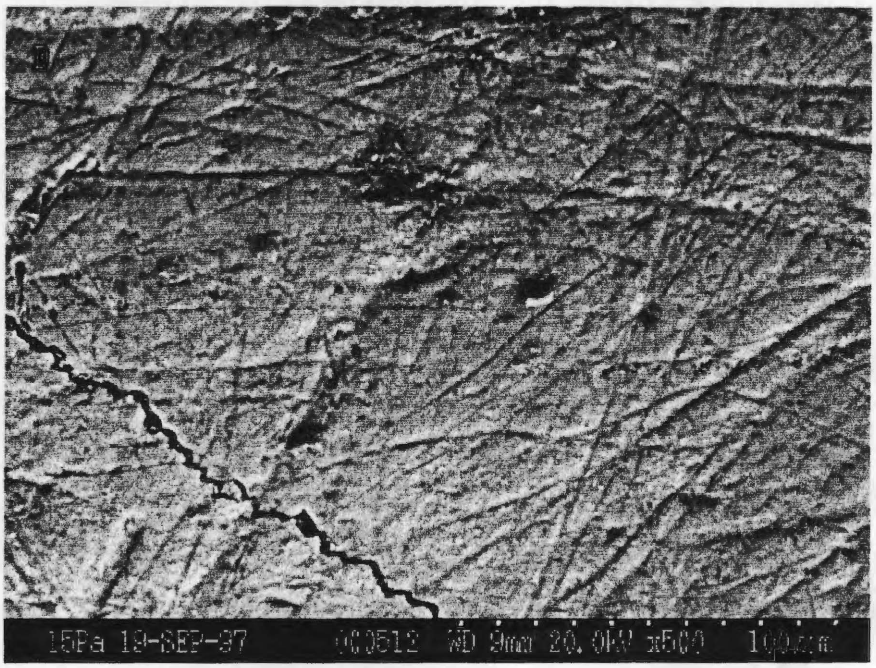
Tooth 69
Mobridge
Adult Female



Tooth 70
Mobridge
Adolescent



Tooth 71
Mobridge
Adult



Tooth 72
Leavenworth
Adult Female

Tooth 73
Leavenworth
Adult Male

APPENDIX E

FEATURE SUMMARY STATISTICS

Feature Summary Statistics

Image File	*Major Axis Length Mean*	*Major Axis Length S. D.*	*Minor Axis Length Mean*	*Minor Axis Length S. D.*	*Preferred Orientation Mean*	*Preferred Orientation S. D.*	*Major/Minor Axis Ratio Mean*	*Major/Minor Axis Ratio S. D.*	*R*
01	17.97	17.936	1.78	2.198	90.29	43.98	14.99	15.56	0.307
03	7.68	15.044	2.1	1.505	3.91	54.398	3.64	5.572	0.164
05	10.89	11.628	1.77	0.767	29.6	54.575	7.21	8.076	0.162
07	19.3	26.633	3.2	1.696	48.96	47.759	6.78	7.449	0.249
08	13.45	8.599	2.43	1.123	58.72	44.309	6.14	4.493	0.302
09	23.8	18.872	2.01	1.078	147.1	52.914	16.05	15.724	0.181
10	21.42	16.473	1.8	1.162	53.72	26.355	17.38	18.099	0.654
11	28.92	22.081	2.94	1.984	67.59	33.519	12.25	9.341	0.504
12	16.7	15.971	2.44	0.835	176.82	34.67	7.32	6.381	0.48
13	39.56	34.028	1.33	0.885	164.85	19.76	41.18	38.673	0.788
15	16.83	12.209	2.9	1.901	73.44	62.705	7.41	6.679	0.091
17	17.18	12.017	2.38	1.188	31.74	35.299	8.38	6.041	0.468
19	20.5	20.974	2.02	0.992	56.05	38.42	11	9.916	0.406
20	21.34	13.641	1.96	1.139	111.5	50.075	13.57	10.185	0.217
21	33.2	27.046	1.78	0.641	84.37	34.231	21.33	19.163	0.489
22	23.73	25.453	1.92	0.762	94.5	24.302	14.92	18.86	0.697
23	24.98	29.529	2.49	1.265	13.19	56.43	11.56	13.676	0.143
24	19.79	15.183	1.7	0.981	88.48	26.033	15.95	15.743	0.661
25	26.83	17.276	1.97	0.761	98.1	45.709	15.06	10.429	0.28
27	20.43	18.991	2.64	1.286	49.28	29.636	8.84	8.155	0.585
28	19.37	14.498	2.65	1.968	87.47	37.71	10.43	11.147	0.42
29	19.45	22.401	2.7	1.101	30.44	35.889	7.58	6.818	0.456
30	29	21.758	2.43	1.081	73.26	50.436	13.4	10.246	0.212

Feature Summary Statistics

Image File	Number of Features	Pit Tally	Pit Length Mean	Pit Length S. D.	Pit Width Mean	Pit Width S. D.	Scratch Tally	Scratch Length Mean	Scratch Length S. D.	Scratch Breadth Mean
01	117	32	4.92	4.8	3.13	3.811	85	22.88	18.615	1.28
03	83	66	3.32	1.984	1.91	0.937	17	24.58	27.605	2.85
05	90	50	3.58	1.809	1.93	0.762	40	20.03	12.261	1.57
07	51	25	6.63	2.648	3.9	1.886	26	31.48	33.12	2.52
08	51	17	5.93	2.995	2.7	1.422	34	17.21	8.001	2.3
09	58	12	5.58	1.883	3.52	1.281	46	28.55	18.402	1.61
10	85	22	4.34	2.656	2.74	1.669	63	27.39	15.018	1.47
11	57	8	10.4	3.357	5.02	3.479	49	31.95	22.377	2.6
12	99	42	4.79	2.023	2.66	0.867	57	25.48	16.078	2.28
13	66	10	4.09	1.739	2.69	1.235	56	45.89	33.142	1.09
15	41	16	9.68	7.25	4.16	2.462	25	21.4	12.641	2.09
17	91	21	7.03	3.067	3.26	1.466	70	20.23	12.035	2.12
19	93	30	4.59	2.331	2.31	1.316	63	28.07	21.669	1.88
20	64	10	8.64	3.639	3.53	1.724	54	23.69	13.523	1.67
21	67	8	5.23	1.922	2.17	0.841	59	36.99	26.634	1.73
22	102	35	4.55	2.104	2.35	0.902	67	33.75	26.307	1.7
23	111	48	4.62	2.759	2.88	1.597	63	40.49	31.243	2.19
24	107	19	6.26	3.05	2.99	1.344	88	22.71	15.178	1.43
25	81	11	6.88	4.623	2.38	1.036	70	29.96	16.418	1.9
27	70	23	6.24	2.868	3.26	1.879	47	27.37	19.676	2.34
28	59	19	7.81	6.134	4.05	2.899	40	24.86	14.111	1.99
29	45	21	6.55	2.595	2.99	1.102	24	30.73	25.875	2.45
30	69	10	6.44	3.563	3.29	1.428	59	32.82	21.225	2.28

Feature Summary Statistics

Image File	*Scratch Breadth S. D.*	*Scratch Orientation Mean*	*Scratch Orientation S. D.*	*Scratch R*	*Cemetery*	*Sex*	*Age*
01	0.6	93.44	38.994	0.395	1	F	40+
03	2.703	32.7	25.997	0.662	1	M	20-29
05	0.733	24.6	28.668	0.606	1	F	30-39
07	1.167	70.99	38.628	0.402	1	M	30-39
08	0.935	53.79	38.436	0.406	1	M	20-29
09	0.547	143.4	43.273	0.319	1	F	40+
10	0.683	52.73	23.163	0.721	1	M	<20
11	1.412	68.17	33.04	0.514	1	M	<20
12	0.778	174.82	34.301	0.488	1	M	40+
13	0.532	164.33	17.758	0.825	1	M	20-29
15	0.703	70.27	60.955	0.103	1	F	30-39
17	0.956	38.45	33.56	0.503	1	M	20-29
19	0.769	57.57	36.61	0.441	1	F	<20
20	0.695	104.54	49.602	0.223	1	M	20-29
21	0.6	86.45	34.945	0.475	1	M	<20
22	0.571	93.58	15.771	0.859	1	F	20-29
23	0.833	173.13	51.805	0.194	1	M	30-39
24	0.602	88.37	24.993	0.683	1	M	30-39
25	0.697	94.63	46.282	0.271	2	F	<20
27	0.713	59.28	26.466	0.652	2	F	<20
28	0.696	87.93	34.888	0.476	2	F	20-29
29	1.059	33.44	23.951	0.705	2	M	<20
30	0.95	71.18	51.874	0.194	1	F	30-39

Feature Summary Statistics

Image File	*Major Axis Length Mean*	*Major Axis Length S. D.*	*Minor Axis Length Mean*	*Minor Axis Length S. D.*	*Preferred Orientation Mean*	*Preferred Orientation S. D.*	*Major/Minor Axis Ratio Mean*	*Major/Minor Axis Ratio S. D.*	*R*
31	20.97	12.522	1.97	0.933	82.64	46.253	13.37	10.626	0.271
32	18.79	21.19	2.28	0.988	62.61	41.08	8.76	7.704	0.357
34	24.85	29.826	2.33	1.057	48.1	52.124	11.84	14.187	0.191
35	16.06	15.138	2.92	4.065	85.51	47.137	8.56	9.325	0.258
36	16.71	17.072	2.64	0.895	35.7	41.195	7.72	8.961	0.355
37	26.42	18.724	2.19	0.892	149.81	42.888	12.99	9.595	0.326
38	34.74	32.776	2.43	1.042	166.57	52.587	17.44	18.696	0.185
39	16.98	16.956	2.58	2.582	93.01	51.011	8.31	9.213	0.204
40	24.56	22.707	2.49	0.995	63.61	35.025	10.29	8.568	0.473
41	10.09	16.478	2.24	1.719	66	52.414	4.84	6.535	0.187
42	26.46	21.837	2.34	0.901	76.91	50.892	13.02	10.641	0.206
43	17.35	15.432	2.49	1.731	88.44	41.04	8.76	9.24	0.358
44	14.89	13.264	2.11	0.686	21.01	43.646	7.02	5.725	0.313
45	5.45	4.566	1.86	0.738	69.68	25.177	3.31	3.603	0.679
46	12.47	10.19	1.87	0.883	83.75	33.979	8.23	8.527	0.494
47	27.58	20.966	1.85	0.833	101.85	34.862	17.01	14.075	0.476
48	18.91	11.908	2.65	1.556	106.98	33.451	9.05	6.822	0.505
51	28.91	19.563	1.97	0.853	65.02	40.455	16.17	10.569	0.368
52	19.85	21.773	2.63	1.371	159.67	71.499	9.18	10.58	0.044
53	23.69	14.717	1.86	0.879	27.41	58.109	15.47	12.217	0.127
54	28.02	15.906	2.06	0.688	118.99	22.789	15.22	10.66	0.728
55	31.16	22.678	1.68	0.817	57.59	32.574	22.84	17.737	0.523
56	15.09	12.382	2.97	1.714	100.72	30.545	5.74	4.641	0.566

Feature Summary Statistics

Image File	*Number of Features*	*Pit Tally*	*Pit Length Mean*	*Pit Length S. D.*	*Pit Width Mean*	*Pit Width S. D.*	*Scratch Tally*	*Scratch Length Mean*	*Scratch Length S. D.*	*Scratch Breadth Mean*
31	35	6	7.05	2.412	3.05	1.345	29	23.85	11.8	1.74
32	74	31	4.38	2.125	2.55	1	43	29.17	22.664	2.08
34	96	37	4.7	3.138	2.56	1.179	59	37.48	32.088	2.19
35	67	31	5.69	5.815	3.75	5.418	36	24.99	15.034	2.2
36	76	42	4.65	1.408	2.84	0.867	34	31.62	15.679	2.39
37	13	2	7.48	1.261	2.15	0.169	11	29.86	18.324	2.19
38	58	15	6.27	1.914	3.45	1.321	43	44.67	32.656	2.07
39	79	36	4.89	4.382	3.12	3.694	43	27.09	16.971	2.13
40	81	19	5.51	4.127	2.66	0.931	62	30.4	22.88	2.44
41	171	110	4.03	3.094	2.36	1.984	61	21.02	23.732	2.02
42	61	15	4.78	2.435	3.13	0.844	46	33.53	20.644	2.09
43	69	32	5.73	4.956	2.87	2.295	37	27.39	14.321	2.16
44	103	38	3.51	1.881	2	0.621	65	21.54	12.514	2.17
45	68	55	4.06	1.727	1.94	0.748	13	11.31	7.547	1.5
46	47	20	3.65	2.23	2.19	1.094	27	19.01	8.71	1.64
47	93	11	5.54	2.411	2.82	1.721	82	30.53	20.585	1.72
48	49	14	8.69	2.959	3.83	2.134	35	23	11.691	2.18
51	77	2	7.95	2.209	3.48	0.562	75	29.47	19.514	1.92
52	41	18	5.44	3.229	3.14	1.625	23	31.12	23.474	2.22
53	95	8	8.56	3.788	3.15	1.329	87	25.09	14.571	1.74
54	62	6	7.83	4.673	2.69	1.062	56	30.18	15.145	2
55	83	9	4.07	1.372	3.02	1.236	74	34.46	21.817	1.52
56	67	32	7.07	4.638	3.51	2.238	35	22.43	12.73	2.48

Feature Summary Statistics

Image File	*Scratch Breadth S. D.*	*Scratch Orientation Mean*	*Scratch Orientation S. D.*	*Scratch R*	*Cemetery*	*Sex*	*Age*
31	0.657	79.35	47.718	0.249	2	F	40+
32	0.942	68.66	32.162	0.532	2	M	30-39
34	0.957	50.93	40.725	0.364	2	M	20-29
35	2.205	101.72	40.812	0.362	2	F	40+
36	0.88	37.19	31.338	0.549	1	M	40+
37	0.975	146.93	35.468	0.464	2	F	40+
38	0.626	173.48	42.993	0.324	2	F	20-29
39	0.738	92.36	36.239	0.449	2	M	40+
40	1.015	65.44	30.512	0.567	2	M	20-29
41	1.071	87.12	42.558	0.331	2	M	40+
42	0.77	86.4	47.75	0.249	1	M	40+
43	0.944	93.23	24.665	0.69	2	M	30-39
44	0.719	22.63	42.453	0.333	2	F	30-39
45	0.592	78.08	23.282	0.718	1	F	<20
46	0.61	81.88	28.877	0.601	2	F	30-39
47	0.526	103.22	34.168	0.491	2	F	20-29
48	0.938	103.59	34.131	0.491	3	F	<20
51	0.824	66.29	39.85	0.38	3	F	<20
52	0.993	163.52	63.081	0.088	3	M	40+
53	0.729	26.04	55.827	0.149	3	M	30-39
54	0.613	118.59	22.829	0.727	3	M	<20
55	0.578	58.37	31.537	0.545	3	F	<20
56	0.784	103.99	23.481	0.714	3	F	30-39

Feature Summary Statistics

Image File	*Major Axis Length Mean*	*Major Axis Length S. D.*	*Minor Axis Length Mean*	*Minor Axis Length S. D.*	*Preferred Orientation Mean*	*Preferred Orientation S. D.*	*Major/Minor Axis Ratio Mean*	*Major/Minor Axis Ratio S. D.*	*R*
58	27.38	21.771	1.97	1.285	106.32	32.68	19.39	19.004	0.521
59	17.2	12.728	2.37	1.016	94.32	43.888	8.16	6.908	0.309
61	27.79	16.508	1.99	0.84	61.02	40.847	16.79	11.963	0.361
62	31.81	24.38	2.04	0.94	93.38	57.67	18.28	15.696	0.131
63	31.06	26.577	2.12	0.762	62.48	28.625	16.24	13.859	0.607
64	24.88	18.519	2.63	2.183	91.96	57.438	12.26	13.054	0.133
66	29.88	18.298	2.32	1.618	79.27	40.479	17.26	13.627	0.368
67	22.42	22.774	1.77	0.702	72.57	56.548	14.65	17.348	0.142
68	15.9	11.891	1.52	0.635	1.99	54.16	12.18	10.512	0.167
69	11.38	11.908	3.7	7.959	87.42	37.996	6.09	6.574	0.414
70	35.29	21.586	1.79	0.556	81	35.647	21.39	14.362	0.461
71	34.15	37.625	1.81	1.039	104.09	64.267	23.61	28.354	0.08
72	34.25	25.335	1.8	0.94	31.19	53.505	23.66	21.264	0.174
73	29.4	28.277	1.66	0.96	78.45	42.503	22.02	21.498	0.332

Feature Summary Statistics

Image File	Number of Features	Pit Tally	Pit Length Mean	Pit Length S. D.	Pit Width Mean	Pit Width S. D.	Scratch Tally	Scratch Length Mean	Scratch Length S. D.	Scratch Breadth Mean
58	62	8	6.7	3.772	3.27	1.007	54	30.44	21.67	1.78
59	166	51	6.8	3.458	2.9	1.326	115	21.82	12.624	2.14
61	87	10	4.94	1.003	3.29	1.132	77	30.75	15.186	1.83
62	111	9	8.43	5.108	3.71	1.509	102	33.88	24.336	1.89
63	109	27	3.76	1.599	2.34	0.659	82	40.04	24.714	2.05
64	48	7	8.75	5.208	3.34	1.521	41	27.63	18.591	2.51
66	82	10	11.42	4.88	4.97	2.925	72	32.45	18.007	1.95
67	89	23	4.44	1.876	2.18	0.748	66	28.69	23.383	1.63
68	96	18	3.98	1.729	2.01	0.861	78	18.65	11.528	1.41
69	32	19	7.72	12.913	5.25	10.13	13	16.74	7.986	1.42
70	48	1	32.01	n/a	11.18	n/a	47	35.87	21.441	1.76
71	87	17	5.26	2.818	3.17	1.639	70	41.17	38.82	1.48
72	108	13	5.24	1.884	3.06	1.556	95	38.22	24.451	1.62
73	154	24	4.36	3.13	2.63	1.587	130	34.02	28.433	1.48

Feature Summary Statistics

Image File	*Scratch Breadth S. D.*	*Scratch Orientation Mean*	*Scratch Orientation S. D.*	*Scratch R*	*Cemetery*	*Sex*	*Age*
58	1.214	109.25	29.934	0.579	3	F	20-29
59	0.736	93.04	38.963	0.396	3	M	40+
61	0.631	61.65	39.782	0.381	3	M	<20
62	0.715	88.6	53.164	0.178	3	F	20-29
63	0.784	64.3	26.383	0.654	3	F	20-29
64	2.269	98.08	52.708	0.184	3	M	20-29
66	0.881	83.62	34.523	0.483	3	M	20-29
67	0.632	95.91	56.704	0.141	3	M	30-39
68	0.515	175.34	50.537	0.21	3	F	30-39
69	0.536	90.48	52.418	0.187	MoB	F	Adult
70	0.54	80.51	36.143	0.451	MoB	?	Adolescent
71	0.397	102.37	58.077	0.128	Mob	?	Adult
72	0.668	32.42	51.417	0.199	Leaven	F	Adult
73	0.661	79.07	37.631	0.421	Leaven	M	Adult

APPENDIX F

RAW DATA BY TOOTH

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
01	1	126.79	117	1.43	44
01	2	39.94	97	1.84	164
01	3	45.73	10	2.39	122
01	4	45.02	86	1.01	0
01	5	15.78	93	1.77	0
01	6	27.89	100	0.71	44
01	7	20.58	54	1.27	143
01	8	10.07	56	1.01	0
01	9	39.29	73	0.91	146
01	10	69.37	88	3.14	165
01	11	33.02	90	1.6	18
01	12	24.7	94	0.8	18
01	13	59.46	51	1.01	90
01	14	32.65	105	0.8	71
01	15	19.47	120	1.27	53
01	16	9.56	140	0.8	71
01	17	19.4	104	1.01	0
01	18	4.32	176	3.84	82
01	19	20.78	122	0.56	63
01	20	47.56	19	0.8	108
01	21	16.01	104	1.01	0
01	22	70.6	173	2.03	90
01	23	17.24	46	0.76	0
01	24	13.04	83	1.29	168
01	25	17.58	79	0.71	44
01	26	14.22	88	6.2	145
01	27	9.1	120	0.56	63
01	28	40.07	120	0.91	33
01	29	16.47	116	2.8	5
01	30	34.42	11	1.27	90
01	31	4.66	29	1.01	90
01	32	25.32	45	1.27	126
01	33	10.17	92	1.04	165
01	34	8.9	86	0.76	0
01	35	10.74	6	0.76	90
01	36	31.23	79	1.79	8
01	37	8.2	111	1.48	30
01	38	9.72	40	1.27	126
01	39	15.51	129	0.35	n/a

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
01	40	34.81	88	0.91	56
01	41	13.75	85	1.36	21
01	42	28.61	83	23.19	61
01	43	13.77	112	1.43	44
01	44	24.26	109	0.91	56
01	45	53.28	64	1.7	153
01	46	19.23	123	4.25	17
01	47	55.46	81	0.91	33
01	48	12.81	140	1.04	75
01	49	3.31	94	1.77	0
01	50	3.45	72	2.34	167
01	51	2.55	84	1.54	9
01	52	2.54	90	1.79	8
01	53	4.06	90	2.34	12
01	54	3.31	175	3.04	90
01	55	9.91	87	1.52	0
01	56	29.8	124	1.07	44
01	57	17.55	93	0.8	161
01	58	5.23	119	1.13	26
01	59	14.18	134	1.98	39
01	60	29.72	89	1.04	14
01	61	15.5	108	1.27	53
01	62	15.15	103	1.27	53
01	63	9	111	1.04	75
01	64	6.35	0	4.77	64
01	65	3.09	9	2.97	109
01	66	3.55	90	3.04	0
01	67	12.23	175	1.98	50
01	68	3.55	0	2.54	90
01	69	4.63	9	1.83	56
01	70	3.05	4	2.03	90
01	71	4.31	44	1.93	113
01	72	4.82	90	3.55	0
01	73	14.76	116	1.29	11
01	74	19.78	119	0.56	63
01	75	21.13	20	1.01	90
01	76	34.07	159	1.36	68
01	77	16.28	86	1.04	165
01	78	9.58	32	1.07	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
01	79	17.99	103	1.54	9
01	80	9.9	88	1.01	0
01	81	8.38	35	1.6	108
01	82	4.66	67	1.77	0
01	83	3.96	129	1.98	39
01	84	3.94	14	2.3	96
01	85	5.23	67	2.97	160
01	86	1.93	156	1.93	66
01	87	1.93	66	1.6	161
01	88	4.81	71	2.73	158
01	89	3.81	90	3.56	175
01	90	3.84	7	2.79	90
01	91	2.55	174	0.76	90
01	92	4.07	176	2.3	83
01	93	8.59	71	1.29	168
01	94	11.63	36	1.62	141
01	95	5.8	23	2.17	110
01	96	19.27	108	0.71	44
01	97	7.5	118	1.04	75
01	98	31.19	96	1.04	14
01	99	24.21	77	1.27	0
01	100	42.16	89	1.01	0
01	101	6.18	19	1.27	126
01	102	5.43	52	0.56	153
01	103	3.3	157	1.62	51
01	104	14.76	93	1.79	8
01	105	18.69	36	1.79	135
01	106	9.52	136	1.04	75
01	107	8.63	90	0.8	18
01	108	5.57	114	0.91	56
01	109	24.8	34	1.27	126
01	110	18.86	136	0.76	90
01	111	29.96	82	2.55	174
01	112	29.98	38	1.48	120
01	113	6.62	32	1.13	116
01	114	4.31	118	1.27	36
01	115	3.75	118	1.7	26
01	116	8.38	0	1.79	81
01	117	9.39	90	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
03	1	34.52	11	1.52	90
03	2	19.04	43	1.04	165
03	3	8.51	10	1.29	101
03	4	24.91	50	1.01	0
03	5	2.55	174	2.34	49
03	6	8.38	54	1.62	141
03	7	2.5	156	1.43	44
03	8	2.04	172	2.03	90
03	9	1.84	105	1.6	18
03	10	3.4	153	1.98	50
03	11	1.36	158	1.13	63
03	12	3.34	171	1.52	90
03	13	4.81	161	2.34	77
03	14	3.25	141	1.27	36
03	15	1.27	53	0.71	135
03	16	2.04	97	1.01	0
03	17	1.62	51	1.6	108
03	18	3.1	145	1.98	50
03	19	1.29	101	1.07	44
03	20	6.59	15	1.79	98
03	21	6.11	4	2.5	113
03	22	2.04	29	1.7	116
03	23	5.9	64	1.6	161
03	24	3.94	14	1.93	113
03	25	3.1	124	2.97	19
03	26	2.55	95	1.04	14
03	27	4.36	125	1.7	26
03	28	4.32	93	3.38	12
03	29	9.2	6	2.65	106
03	30	2.18	54	2.04	150
03	31	6.1	16	1.43	135
03	32	3.09	9	1.29	101
03	33	2.04	97	1.77	0
03	34	2.04	172	1.79	81
03	35	2.79	0	2.55	84
03	36	3.05	94	2.79	0
03	37	2.28	0	1.54	99
03	38	20.83	44	3.45	126
03	39	2.7	48	2.18	144

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
03	40	3.23	135	1.83	33
03	41	2.34	139	1.48	30
03	42	1.54	170	1.04	75
03	43	3.34	98	2.28	0
03	44	7.87	178	1.79	98
03	45	5.86	94	4.81	18
03	46	4.93	78	2.8	174
03	47	11.27	112	7.26	53
03	48	2.04	172	1.77	90
03	49	2.51	135	2.04	29
03	50	3.3	112	1.6	18
03	51	4.34	110	1.48	30
03	52	2.5	23	1.79	135
03	53	1.54	99	1.52	0
03	54	2.04	7	1.27	90
03	55	2.34	139	1.29	78
03	56	3.25	141	1.62	38
03	57	4.32	130	1.01	0
03	58	1.27	0	1.27	90
03	59	1.27	0	1.27	90
03	60	1.77	0	1.27	90
03	61	2.34	12	2.04	97
03	62	2.8	5	1.29	78
03	63	2.3	6	1.27	90
03	64	3.14	165	1.84	74
03	65	1.54	9	1.27	90
03	66	9.36	102	3.18	151
03	67	2.89	52	1.7	153
03	68	2.18	125	1.77	0
03	69	9	21	0.76	90
03	70	28.7	0	0.8	71
03	71	123.09	50	8.24	146
03	72	33.69	49	7.84	155
03	73	2.27	63	1.48	149
03	74	39.76	48	8.75	163
03	75	13.29	44	2.96	149
03	76	5.92	170	1.52	90
03	77	16.42	58	2.3	173
03	78	19.47	15	2.65	73

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
03	79	3.34	171	2.03	90
03	80	3.34	171	1.6	71
03	81	3.04	90	2.3	6
03	82	6.53	13	2.3	83
03	83	4.88	8	1.77	90
05	1	42.64	12	1.29	101
05	2	42.77	15	1.54	99
05	3	19.43	173	1.52	90
05	4	16.69	56	1.77	0
05	5	3.38	102	1.36	21
05	6	5.94	109	2.74	33
05	7	5.04	130	1.27	36
05	8	43.83	11	2.04	82
05	9	20.94	14	0.8	108
05	10	22.5	16	1.27	90
05	11	2.04	7	1.77	90
05	12	12.15	26	1.04	104
05	13	16.58	25	1.54	99
05	14	15.91	28	1.36	111
05	15	21.95	60	5.14	147
05	16	33.11	4	1.27	90
05	17	57.69	2	1.77	90
05	18	8.44	21	1.48	120
05	19	2.55	95	1.77	0
05	20	17.59	72	1.01	0
05	21	6.27	68	1.27	0
05	22	17.42	45	1.62	128
05	23	10.23	43	0.91	146
05	24	19.83	13	1.13	116
05	25	22.37	26	1.43	135
05	26	8.45	32	1.6	108
05	27	2.17	110	1.01	0
05	28	2.3	96	1.7	26
05	29	4.31	151	1.62	51
05	30	2.89	142	1.07	44
05	31	1.48	30	1.43	135
05	32	1.29	101	0.76	0
05	33	3.63	102	2.04	7
05	34	2.54	90	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
05	35	33.75	28	1.52	90
05	36	18.38	78	1.27	0
05	37	14.53	174	2.03	90
05	38	6.11	175	1.48	59
05	39	1.01	90	0.76	0
05	40	11.94	87	0.76	0
05	41	9.77	27	1.04	104
05	42	3.61	39	1.54	99
05	43	6.2	34	1.29	101
05	44	6.74	70	4.93	11
05	45	7.22	10	3.56	85
05	46	2.28	90	1.77	0
05	47	5.79	105	1.6	18
05	48	2.3	83	1.7	153
05	49	2.54	0	2.28	90
05	50	31.84	158	2.28	90
05	51	36.14	161	1.27	90
05	52	26.96	29	1.79	98
05	53	1.79	98	1.6	18
05	54	10.37	21	1.52	90
05	55	21.79	21	1.04	104
05	56	3.04	0	1.77	90
05	57	2.83	63	2.09	165
05	58	2.55	5	2.28	90
05	59	3.69	15	1.77	90
05	60	3.52	149	1.7	63
05	61	2.39	32	1.98	129
05	62	2.89	164	1.77	90
05	63	4.74	15	1.48	120
05	64	4.16	127	1.27	0
05	65	2.09	104	2.04	7
05	66	2.54	126	2.4	18
05	67	2.74	123	2.27	26
05	68	1.62	38	1.52	0
05	69	5.47	111	3.86	156
05	70	5.35	121	1.48	30
05	71	1.79	171	1.77	90
05	72	2.61	60	1.98	140
05	73	3.09	80	1.04	165

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
05	74	7.22	71	2.3	6
05	75	3.77	137	1.36	21
05	76	5.04	40	1.6	108
05	77	12.19	91	2.28	0
05	78	10.44	94	3.41	41
05	79	4.32	86	1.7	26
05	80	10.06	169	2.34	77
05	81	10.5	32	0.8	71
05	82	5	120	2.34	49
05	83	2.3	6	1.77	90
05	84	3.3	157	2.5	66
05	85	10.22	104	1.01	0
05	86	32.2	18	2.27	116
05	87	4.06	90	2.55	174
05	88	3.59	171	2.34	102
05	89	9.8	36	1.54	99
05	90	11.51	14	2.55	95
07	1	118.03	14	3.45	107
07	2	83.72	68	5.62	161
07	3	14.78	94	2.54	0
07	4	13.32	82	1.52	0
07	5	119.88	14	4.63	99
07	6	14.57	67	3.66	146
07	7	4.09	82	3.84	172
07	8	4.85	6	4.57	93
07	9	15.82	84	2.28	0
07	10	6.11	85	2.54	0
07	11	10.77	98	2.28	0
07	12	84.3	64	4.81	161
07	13	16.82	28	3.53	111
07	14	6.27	21	3.77	109
07	15	5.43	37	1.43	135
07	16	6.37	156	2.54	53
07	17	7.79	109	0.91	33
07	18	16.14	12	2.8	95
07	19	8.86	62	5.11	153
07	20	9.3	55	6.1	135
07	21	23.48	141	2.18	54
07	22	8.13	1	7.62	91

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
07	23	6.97	169	1.79	81
07	24	31.65	80	1.52	0
07	25	13.2	30	2.83	116
07	26	24.29	96	2.83	10
07	27	6.11	85	4.68	12
07	28	6.37	4	4.31	90
07	29	7.62	1	5.34	87
07	30	38.02	67	1.6	161
07	31	17.74	66	2.5	156
07	32	8.65	86	1.01	0
07	33	7.47	17	1.79	98
07	34	14.47	90	1.27	0
07	35	4.34	20	2.79	90
07	36	5.73	12	3.3	90
07	37	4.31	90	2.79	0
07	38	4.31	0	4.07	86
07	39	11.67	44	9.98	97
07	40	12.14	37	1.7	116
07	41	31.87	95	1.54	9
07	42	5.23	22	2.55	95
07	43	3.81	0	3.59	81
07	44	3.31	175	2.8	84
07	45	9.96	70	2.04	172
07	46	58.03	11	3.3	90
07	47	10.08	130	2.27	63
07	48	5.23	22	3.31	85
07	49	6.47	101	1.98	39
07	50	10.21	145	3.1	55
07	51	16.14	77	2.73	158
08	1	3.55	90	2.59	11
08	2	9.24	142	1.62	51
08	3	28.7	166	1.52	90
08	4	16.62	18	3.75	118
08	5	6.14	82	1.77	0
08	6	2.79	90	1.01	0
08	7	16.84	156	2.54	53
08	8	34.82	87	2.04	172
08	9	24.63	37	1.83	123
08	10	9.49	74	3.38	167

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
08	11	30.71	45	4.36	144
08	12	13.07	97	1.48	30
08	13	9.48	69	1.93	156
08	14	10.87	52	1.62	141
08	15	25.57	55	2.39	147
08	16	27.77	50	4.72	126
08	17	12.15	169	7.38	86
08	18	6.62	122	2.18	35
08	19	3.55	0	3.04	90
08	20	3.04	0	2.59	78
08	21	5.67	169	3.81	86
08	22	10.94	93	1.01	0
08	23	27.15	27	3.45	126
08	24	4.66	67	2.89	164
08	25	14.05	49	1.83	146
08	26	15.27	47	2.39	147
08	27	15.39	37	1.98	129
08	28	24.63	90	1.04	165
08	29	10.07	123	2.15	44
08	30	2.79	0	2.03	90
08	31	5.67	79	1.84	164
08	32	13.54	30	1.48	120
08	33	7.9	135	1.62	51
08	34	10.9	27	2.04	119
08	35	9.53	48	2.15	135
08	36	3.09	80	1.52	0
08	37	8.53	67	2.4	161
08	38	16.81	104	2.65	16
08	39	8.98	137	1.93	66
08	40	4.82	90	2.03	0
08	41	10.07	56	1.62	141
08	42	15.99	43	2.73	111
08	43	33.79	47	4.36	144
08	44	13.25	53	2.87	135
08	45	10.7	67	2.34	167
08	46	12.04	65	1.6	161
08	47	23.14	176	2.09	75
08	48	9.48	82	1.54	170
08	49	6.5	128	1.83	56

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
08	50	11.78	7	3.56	85
08	51	23.18	42	3.41	131
09	1	22.6	115	1.01	0
09	2	46.45	13	2.04	82
09	3	30.31	171	1.77	90
09	4	42.09	162	2.15	44
09	5	27.28	61	1.27	0
09	6	33.27	90	0.5	0
09	7	35.93	145	1.04	75
09	8	49.08	83	0.76	0
09	9	20.12	42	1.13	116
09	10	19.95	111	1.27	90
09	11	34.12	156	1.77	90
09	12	11.89	109	1.79	8
09	13	3.84	82	2.54	0
09	14	40.23	21	1.13	116
09	15	6.64	136	1.7	26
09	16	6.13	114	1.07	44
09	17	16.32	110	1.6	18
09	18	26.18	140	1.98	50
09	19	28.02	8	1.77	90
09	20	36.36	151	1.84	74
09	21	92.3	158	1.27	90
09	22	41.74	131	1.36	68
09	23	26.04	135	1.29	78
09	24	12.4	112	1.01	0
09	25	50.32	2	1.77	90
09	26	11.94	87	1.77	0
09	27	26.03	84	1.79	8
09	28	55.75	158	2.3	83
09	29	20.22	64	1.54	170
09	30	35.5	123	1.98	39
09	31	13.48	47	2.89	127
09	32	5.59	92	3.96	39
09	33	4.66	67	3.81	3
09	34	4.07	86	3.3	0
09	35	5.38	160	1.27	90
09	36	6.13	155	1.52	90
09	37	17.99	161	2.03	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
09	38	41.94	159	2.28	90
09	39	9	106	0.56	26
09	40	21.73	136	1.13	63
09	41	22.26	110	1.7	26
09	42	34.37	145	1.93	66
09	43	2.79	0	2.54	90
09	44	4.83	176	4.31	90
09	45	11.17	0	1.77	90
09	46	13.46	35	2.03	90
09	47	7.74	41	5.35	121
09	48	7.62	90	0.76	0
09	49	11.15	120	2.28	0
09	50	49.03	1	1.77	90
09	51	81.04	1	1.77	90
09	52	8.62	42	5.84	2
09	53	3.87	31	2.03	90
09	54	8.07	24	4.09	82
09	55	6.2	34	2.79	90
09	56	20.81	160	1.29	78
09	57	14.99	141	3.1	34
09	58	33.14	13	2.03	90
10	1	59.2	67	1.27	126
10	2	3.56	94	3.31	4
10	3	45.23	67	0.56	153
10	4	32.45	59	1.01	0
10	5	23.41	65	1.01	0
10	6	81.55	31	1.52	90
10	7	51.05	47	1.84	105
10	8	26.04	43	1.13	153
10	9	19.91	119	1.36	68
10	10	14.32	127	1.6	108
10	11	10.31	142	1.52	90
10	12	23.71	45	1.27	90
10	13	27.5	61	1.04	165
10	14	24.76	100	1.07	44
10	15	36.16	29	1.52	90
10	16	10.04	110	1.13	26
10	17	44.4	54	2.04	172
10	18	32.94	27	1.7	116

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
10	19	47.27	164	1.07	44
10	20	29.92	49	0.5	0
10	21	15.81	60	1.01	0
10	22	28.74	56	1.54	9
10	23	20.39	76	1.54	9
10	24	41.14	57	1.04	165
10	25	23.41	65	1.04	165
10	26	7.5	61	1.07	135
10	27	19.37	55	4.44	149
10	28	30.32	36	0.76	90
10	29	2.7	138	1.84	74
10	30	23.35	44	1.36	111
10	31	4.49	42	2.28	0
10	32	14.48	52	0.76	0
10	33	6.86	51	1.79	8
10	34	38.43	29	0.5	90
10	35	9.08	63	1.52	0
10	36	54.68	57	0.76	0
10	37	22.31	48	1.27	0
10	38	13.54	66	1.04	14
10	39	24.46	41	2.04	172
10	40	25.37	41	1.04	165
10	41	20.6	30	1.36	68
10	42	28.03	107	1.07	44
10	43	18.47	58	2.15	135
10	44	11.43	36	1.6	161
10	45	71.73	37	1.98	140
10	46	52.02	54	1.52	0
10	47	28.15	15	2.09	75
10	48	20.81	66	2.79	0
10	49	16.7	45	0.76	0
10	50	28.32	29	2.09	104
10	51	19.6	73	1.84	164
10	52	22.31	41	1.62	128
10	53	40.67	27	3.04	90
10	54	2.79	0	2.79	90
10	55	1.52	0	1.52	90
10	56	1.79	98	1.52	0
10	57	37.42	60	0.5	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
10	58	5.63	54	2.83	10
10	59	34.64	36	1.62	141
10	60	9.7	83	1.04	14
10	61	29.52	54	1.27	143
10	62	3.56	4	3.3	90
10	63	10.11	64	8.03	161
10	64	2.55	84	2.28	0
10	65	4.31	0	2.28	90
10	66	8.29	62	0.5	0
10	67	11.38	51	2.8	174
10	68	17.96	56	1.54	9
10	69	2.96	59	1.52	0
10	70	17.4	56	1.77	0
10	71	1.84	15	1.77	90
10	72	20.78	57	1.52	0
10	73	4.09	7	2.54	90
10	74	27.22	49	2.04	7
10	75	11.41	32	3.31	175
10	76	15.95	52	1.52	0
10	77	8.19	73	6.85	0
10	78	4.49	47	1.29	168
10	79	20.22	35	1.6	161
10	80	3.38	77	3.04	0
10	81	2.3	83	2.03	0
10	82	2.18	35	1.27	143
10	83	4.66	44	2.83	100
10	84	27.13	43	1.48	149
10	85	16.3	52	2.8	5
11	1	15.62	82	1.52	0
11	2	15.91	73	1.6	161
11	3	17.61	61	1.79	135
11	4	6.35	90	4.34	173
11	5	18.4	63	2.27	153
11	6	30.5	55	1.93	156
11	7	47.83	59	1.84	164
11	8	70.54	100	3.53	21
11	9	38.3	143	1.62	38
11	10	54.8	146	1.48	30
11	11	9.67	76	2.55	174

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
11	12	20.65	58	1.48	149
11	13	153.68	41	2.87	135
11	14	31.32	67	2.28	0
11	15	9.65	63	3.53	158
11	16	16.23	69	1.36	158
11	17	29.8	60	1.62	128
11	18	33.58	77	2.03	0
11	19	19.69	120	1.83	33
11	20	16.63	97	1.7	26
11	21	39.95	55	3.96	140
11	22	46.78	87	1.54	9
11	23	40.16	60	2.34	139
11	24	13.74	168	5.38	70
11	25	37.03	9	1.48	120
11	26	19.38	58	3.94	165
11	27	17.7	171	2.27	63
11	28	21.55	68	1.7	153
11	29	34.76	121	2.83	26
11	30	26.81	118	1.93	23
11	31	34.38	48	5.04	130
11	32	14.69	161	13.18	74
11	33	27.28	65	4.68	167
11	34	6.7	65	4.81	161
11	35	40.79	57	4.93	145
11	36	21.28	70	1.52	0
11	37	32.95	173	2.54	90
11	38	20.45	61	4.6	173
11	39	61.2	23	4.13	100
11	40	26.61	76	1.52	0
11	41	24.7	75	2.8	174
11	42	30.68	143	6.35	53
11	43	14.11	59	4.25	162
11	44	9.65	90	2.3	173
11	45	8.33	52	2.09	165
11	46	14.37	46	2.51	135
11	47	19.71	104	3.45	17
11	48	10	66	1.93	156
11	49	41.75	9	2.54	90
11	50	24.58	66	1.6	161

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
11	51	16.27	67	1.54	170
11	52	38.64	177	2.8	95
11	53	16.2	76	1.54	170
11	54	53.16	44	2.09	165
11	55	15.5	71	2.17	159
11	56	25.22	99	2.03	0
11	57	44.8	55	8.24	146
12	1	27.7	148	1.62	38
12	2	60.33	152	2.61	60
12	3	39.43	3	2.28	90
12	4	6.11	175	2.3	83
12	5	2.83	10	1.27	90
12	6	4.06	0	1.7	63
12	7	25.3	72	1.77	0
12	8	8.13	178	4.31	90
12	9	10.66	0	1.52	90
12	10	31.25	178	4.31	90
12	11	54.31	174	2.5	66
12	12	43.48	177	2.8	84
12	13	19.38	5	1.77	90
12	14	13.11	8	2.59	101
12	15	30.58	125	2.74	33
12	16	38.16	176	1.77	90
12	17	6.64	46	1.83	146
12	18	13.25	159	2.54	53
12	19	6.62	94	4.6	6
12	20	5.35	174	2.79	90
12	21	30.33	175	1.54	80
12	22	24.38	178	1.52	90
12	23	16.47	109	3.45	17
12	24	54.12	1	3.04	90
12	25	19.85	3	2.79	90
12	26	20.37	4	2.79	90
12	27	3.3	0	2.3	83
12	28	7.64	74	1.52	0
12	29	18.14	133	1.48	30
12	30	26.03	174	2.04	82
12	31	4.31	61	2.55	174
12	32	3.18	61	1.54	9

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
12	33	4.06	90	2.28	0
12	34	25.93	98	1.79	8
12	35	25.45	102	1.29	11
12	36	61.47	0	2.54	90
12	37	12.76	47	2.18	144
12	38	14.73	54	2.04	150
12	39	15.12	172	1.01	90
12	40	25.68	177	3.94	75
12	41	69.13	2	4.32	93
12	42	8.07	24	1.98	129
12	43	39.45	176	2.73	68
12	44	8.38	178	2.34	77
12	45	6.42	161	4.83	86
12	46	3.94	14	2.3	83
12	47	4.82	0	3.59	81
12	48	6.7	52	3.25	128
12	49	4.34	83	4.09	7
12	50	4.77	154	4.06	90
12	51	2.97	70	2.59	168
12	52	13.44	22	2.74	123
12	53	2.8	174	2.3	83
12	54	21.08	179	2.34	77
12	55	9.24	105	1.36	21
12	56	9.42	94	1.27	0
12	57	22.44	174	1.84	74
12	58	37.08	0	2.04	82
12	59	11.98	122	1.52	0
12	60	11.22	127	3.3	22
12	61	17.89	173	2.3	83
12	62	38.67	176	2.04	82
12	63	14.08	172	2.3	83
12	64	19.81	1	2.03	90
12	65	9.54	115	1.83	33
12	66	24.79	173	2.4	71
12	67	20.47	44	3.25	141
12	68	15.34	173	3.31	85
12	69	3.45	107	2.54	0
12	70	4.82	0	3.86	113
12	71	10.41	102	1.27	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
12	72	3.55	0	2.03	90
12	73	4.34	173	3.56	85
12	74	5.35	174	1.79	81
12	75	2.8	174	2.03	90
12	76	2.97	19	2.8	95
12	77	15.79	4	1.79	98
12	78	6.18	160	2.51	44
12	79	20.42	158	1.7	63
12	80	12.38	164	1.04	75
12	81	4.06	0	3.55	90
12	82	14.51	94	3.05	4
12	83	9.11	12	2.73	111
12	84	7.36	0	2.83	79
12	85	2.79	0	2.03	90
12	86	2.04	172	1.52	90
12	87	2.03	0	2.03	90
12	88	3.31	175	2.54	90
12	89	12.21	46	2.89	127
12	90	3.05	85	2.03	0
12	91	19.81	0	2.3	83
12	92	4.34	173	2.04	82
12	93	15.45	170	1.77	90
12	94	50.1	177	2.79	90
12	95	73.92	0	3.81	90
12	96	4.31	0	2.79	90
12	97	3.05	175	2.55	84
12	98	4.81	161	2.17	69
12	99	6.35	163	1.93	66
13	1	167.36	163	1.29	78
13	2	115.32	79	0.91	33
13	3	52.41	79	0.76	0
13	4	108.78	172	1.27	90
13	5	57.14	139	0.5	90
13	6	64.89	141	1.01	90
13	7	43.28	175	0.76	90
13	8	8.44	158	1.01	90
13	9	2.28	0	1.77	90
13	10	65.51	167	1.01	90
13	11	98.81	166	0.76	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
13	12	83.39	169	1.04	75
13	13	7.43	172	5.45	62
13	14	47.81	171	1.27	90
13	15	3.69	74	1.77	0
13	16	30.31	171	0.8	108
13	17	29.06	170	0.56	63
13	18	41.88	171	1.54	80
13	19	39.29	171	1.04	75
13	20	35.71	168	1.36	68
13	21	41.46	149	0.56	63
13	22	26.36	166	1.13	63
13	23	115.66	172	0.8	71
13	24	46.09	167	1.01	90
13	25	17.54	177	0.76	90
13	26	27.89	146	1.04	104
13	27	70.95	10	1.01	90
13	28	26.11	172	1.13	63
13	29	52.5	151	1.27	90
13	30	25.78	152	1.01	90
13	31	68.87	174	1.27	90
13	32	67.81	175	0.76	90
13	33	17.43	161	0.76	90
13	34	106.49	2	1.29	101
13	35	30.22	138	1.04	14
13	36	61.44	161	1.01	90
13	37	30.58	4	1.52	90
13	38	42.65	162	1.27	90
13	39	19.71	158	1.13	63
13	40	82.87	167	1.04	104
13	41	59.87	166	1.01	90
13	42	18.98	164	2.03	90
13	43	18.37	130	4.07	3
13	44	22.54	165	1.13	63
13	45	9.3	124	0.56	26
13	46	84.74	172	0.5	90
13	47	23.85	161	1.27	90
13	48	16.98	158	0.8	71
13	49	13.25	167	0.5	90
13	50	29.48	162	1.29	78

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
13	51	26.93	164	0.8	71
13	52	44.08	175	1.27	90
13	53	19.87	153	1.13	63
13	54	4.2	115	2.5	23
13	55	6.86	141	4.13	47
13	56	4.06	0	3.05	85
13	57	18.87	169	0.8	71
13	58	21.37	170	0.5	90
13	59	2.54	0	1.6	71
13	60	18.87	19	1.36	111
13	61	34.31	136	1.01	90
13	62	3.88	168	1.77	90
13	63	10.22	165	1.04	75
13	64	10.04	163	2.34	77
13	65	2.89	164	2.54	90
13	66	3.05	4	2.3	96
15	1	12.85	60	1.27	143
15	2	28.05	73	1.52	0
15	3	32.5	135	1.48	30
15	4	2.59	78	2.28	0
15	5	4.06	90	2.3	173
15	6	46.02	169	1.79	81
15	7	43.76	176	1.77	90
15	8	51.42	42	2.39	122
15	9	17.47	125	1.79	44
15	10	28.02	98	2.28	0
15	11	5.58	90	3.53	21
15	12	28.96	37	11.89	109
15	13	9.15	86	5.84	0
15	14	9.4	51	1.79	135
15	15	21.87	105	5.89	7
15	16	7.4	120	1.54	170
15	17	7.87	88	2.04	7
15	18	8.13	1	3.04	90
15	19	28.06	27	2.28	90
15	20	15.24	53	2.7	131
15	21	16.03	60	1.7	153
15	22	20.82	90	1.77	0
15	23	26.2	176	2.04	97

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
15	24	5.08	0	4.32	86
15	25	6.35	2	3.3	90
15	26	5.73	77	1.29	11
15	27	10.16	167	1.79	81
15	28	22.46	132	4.31	28
15	29	15.95	166	2.04	82
15	30	14.05	49	3.23	135
15	31	2.54	0	2.3	83
15	32	21.99	96	2.97	160
15	33	8.1	147	2.17	69
15	34	8.38	0	5.35	95
15	35	16.38	108	2.59	11
15	36	9.2	65	3.04	0
15	37	8.74	154	3.94	75
15	38	32.26	25	2.73	111
15	39	18.35	85	5.33	0
15	40	7.13	85	1.77	0
15	41	5.61	174	1.36	68
17	1	52.9	56	1.6	161
17	2	12.7	126	1.48	30
17	3	18.87	61	1.84	164
17	4	38.8	17	3.77	109
17	5	28.68	16	2.27	116
17	6	68.72	62	2.7	138
17	7	16.92	62	1.7	153
17	8	51.14	55	2.51	135
17	9	12.45	129	1.27	36
17	10	12.81	50	2.7	138
17	11	40.58	16	3.09	99
17	12	31.14	52	3.87	148
17	13	23.64	24	2.04	119
17	14	13.97	24	1.07	135
17	15	16.03	40	2.04	119
17	16	10.95	45	2.7	138
17	17	16.39	49	2.61	150
17	18	28.16	50	1.83	123
17	19	22.89	56	1.04	165
17	20	20.22	57	3.88	168
17	21	29.59	55	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
17	22	11.72	175	4.13	79
17	23	11.31	44	2.87	135
17	24	11.54	50	2.04	119
17	25	9.54	28	2.5	156
17	26	17.12	54	2.15	135
17	27	27.85	28	2.27	116
17	28	10.02	8	1.29	78
17	29	11.98	4	2.03	90
17	30	4.83	3	1.04	75
17	31	33.18	16	1.7	153
17	32	22.4	150	2.09	75
17	33	28.22	42	4.13	137
17	34	3.81	0	3.56	94
17	35	23.18	34	3.81	126
17	36	21.95	48	2.34	139
17	37	23.85	26	2.97	109
17	38	44.88	55	3.63	155
17	39	10.61	68	2.59	168
17	40	11.51	48	2.51	135
17	41	7.53	147	2.27	63
17	42	9.58	32	2.34	130
17	43	7.97	170	1.48	59
17	44	29.83	11	4.57	90
17	45	23.62	73	1.84	164
17	46	16.39	49	3.4	153
17	47	18.05	2	1.13	116
17	48	7.53	32	1.07	135
17	49	16.77	54	0.76	0
17	50	14.28	51	0.91	146
17	51	10.06	169	5.62	71
17	52	6.1	16	4.43	113
17	53	5.62	161	1.98	50
17	54	5.86	17	2.83	116
17	55	17.33	145	2.83	63
17	56	15.59	149	1.27	36
17	57	11.81	151	1.27	36
17	58	33.97	58	1.84	164
17	59	11.48	54	1.48	149
17	60	24.06	79	1.93	156

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
17	61	2.65	163	2.4	71
17	62	3.18	28	2.27	116
17	63	7.41	128	1.48	59
17	64	12.39	45	6.47	131
17	65	6.6	22	6.43	99
17	66	21.37	43	1.98	129
17	67	9.81	79	1.52	0
17	68	5.28	125	2.17	20
17	69	10.59	45	1.98	140
17	70	32.95	173	3.3	90
17	71	11.27	165	2.03	90
17	72	2.54	53	1.52	0
17	73	9.68	4	3.56	94
17	74	9.65	26	2.96	120
17	75	19.19	25	1.7	116
17	76	8.59	34	3.97	116
17	77	17.13	173	1.29	101
17	78	17.08	95	1.01	0
17	79	30.5	87	1.52	0
17	80	6.14	172	1.01	90
17	81	4.66	135	3.1	34
17	82	12.29	141	1.36	68
17	83	12.65	51	1.83	123
17	84	9.11	12	1.77	90
17	85	12.95	25	1.62	128
17	86	3.97	153	1.62	51
17	87	25.2	40	5.49	123
17	88	16.35	64	2.03	0
17	89	8.84	39	1.48	120
17	90	6.36	28	1.27	126
17	91	6.93	23	1.84	105
19	1	4.83	176	2.4	108
19	2	4.13	47	2.04	7
19	3	7	46	3.31	147
19	4	5.04	40	3.05	138
19	5	6.1	44	2.34	139
19	6	13.73	70	7.65	174
19	7	61.45	46	2.5	113
19	8	16.26	38	1.43	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
19	9	18.89	36	1.29	168
19	10	12.28	150	1.54	80
19	11	14.52	53	1.36	158
19	12	28.19	90	0.56	153
19	13	17.02	88	1.04	165
19	14	33.63	62	1.43	135
19	15	30.91	46	2.5	113
19	16	21.55	44	1.93	156
19	17	8.17	53	1.43	135
19	18	6.58	62	2.61	150
19	19	8.51	26	1.62	141
19	20	42.92	45	3.41	131
19	21	40.22	62	2.09	165
19	22	6.11	175	1.01	90
19	23	4.82	0	1.27	90
19	24	5.35	5	1.79	98
19	25	120.95	50	2.34	139
19	26	61.86	47	2.74	123
19	27	73.71	53	2.51	135
19	28	54.41	54	3.14	165
19	29	39.52	33	2.34	102
19	30	32.68	135	3.21	71
19	31	35.1	107	1.48	30
19	32	8.59	34	1.13	116
19	33	38.42	24	2.04	119
19	34	39.71	50	3.56	4
19	35	37.06	114	2.04	7
19	36	5.59	92	1.77	0
19	37	5.08	90	1.52	0
19	38	3.96	50	1.13	153
19	39	4.79	57	3.21	108
19	40	22.99	135	1.07	44
19	41	22.45	135	1.27	36
19	42	18.05	103	1.29	11
19	43	25.89	7	1.54	99
19	44	25.8	6	1.27	90
19	45	19.11	70	1.04	165
19	46	15.82	137	1.27	36
19	47	21.61	29	1.79	98

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
19	48	15.29	85	1.77	0
19	49	11.4	78	1.29	168
19	50	28.7	36	1.29	78
19	51	16.6	96	1.77	0
19	52	34.39	54	4.22	122
19	53	113.18	11	3.14	75
19	54	36.28	44	2.39	147
19	55	29.34	41	2.65	163
19	56	41.84	145	1.54	80
19	57	19.61	85	2.09	165
19	58	14.17	53	1.52	0
19	59	5.49	33	2.27	116
19	60	2.83	63	1.29	11
19	61	5.21	133	1.6	71
19	62	3.05	131	2.18	35
19	63	3.56	175	1.84	74
19	64	9.65	90	2.28	0
19	65	9.23	82	1.01	0
19	66	11.82	75	2.74	123
19	67	1.93	23	1.29	101
19	68	18.35	131	1.83	33
19	69	10.42	46	1.07	135
19	70	24.17	93	3.05	175
19	71	13.29	135	2.09	75
19	72	2.8	95	2.03	0
19	73	12.76	42	2.27	116
19	74	18.62	95	1.04	14
19	75	3.61	39	1.27	0
19	76	5.11	63	1.01	0
19	77	4.6	173	1.84	74
19	78	2.27	153	2.03	90
19	79	2.04	82	1.79	171
19	80	2.04	97	1.52	0
19	81	3.4	26	2.18	125
19	82	2.04	97	1.54	9
19	83	2.4	71	1.52	0
19	84	19.12	50	1.54	170
19	85	27.44	88	1.27	0
19	86	41.07	40	2.04	150

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
19	87	29.75	50	2.54	143
19	88	18.18	61	2.03	0
19	89	35.66	35	1.54	99
19	90	15.95	37	0.71	135
19	91	6.77	77	4.57	0
19	92	12.7	78	2.79	0
19	93	6.71	29	4.32	130
20	1	39.43	111	1.27	0
20	2	63.22	139	1.7	63
20	3	40.29	105	1.77	0
20	4	12.37	109	1.79	8
20	5	33.19	31	1.84	105
20	6	47.03	62	2.54	143
20	7	9.54	151	2.39	57
20	8	26.92	152	1.48	59
20	9	6.11	94	1.27	0
20	10	8.1	138	0.8	71
20	11	11.17	158	1.13	63
20	12	12.76	137	1.27	53
20	13	17.33	58	1.7	153
20	14	4.32	130	1.84	15
20	15	20.67	63	5.11	153
20	16	70.79	105	1.27	0
20	17	46.51	104	2.28	0
20	18	25.26	80	1.04	14
20	19	24.21	80	0.8	161
20	20	11.43	0	2.28	90
20	21	21.02	64	1.27	143
20	22	21.71	65	1.01	0
20	23	28.63	83	2.28	0
20	24	22.42	80	0.76	0
20	25	26	84	0.76	0
20	26	21.66	85	0.76	0
20	27	20.16	58	1.01	0
20	28	6.93	28	4.18	75
20	29	15.29	147	1.54	80
20	30	9.89	150	1.43	44
20	31	41.86	148	1.83	56
20	32	13.17	140	1.43	44

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
20	33	9.41	93	4.07	3
20	34	12.7	0	1.27	90
20	35	24.38	89	2.59	11
20	36	19.35	109	2.04	7
20	37	20.92	150	1.29	78
20	38	13.4	152	1.79	81
20	39	16.86	127	1.27	36
20	40	25.01	119	1.83	33
20	41	11.65	163	1.84	74
20	42	30.44	100	1.79	171
20	43	15.99	46	1.27	143
20	44	36.84	74	2.28	0
20	45	40.28	48	1.84	105
20	46	26.92	178	1.77	90
20	47	18.13	11	2.04	82
20	48	16.54	162	1.7	63
20	49	21.34	34	1.83	123
20	50	15.1	109	1.13	26
20	51	19.85	106	2.04	7
20	52	17.61	65	2.89	164
20	53	18.67	67	1.29	168
20	54	13.41	155	2.04	82
20	55	5.61	95	1.29	11
20	56	7.15	117	1.98	50
20	57	9.96	70	1.27	0
20	58	5.62	161	3.05	94
20	59	44.35	156	1.93	66
20	60	16.06	55	4.18	165
20	61	4.88	152	1.83	56
20	62	25.6	10	2.34	102
20	63	10.2	108	4.38	10
20	64	12.28	161	7.43	82
21	1	80.33	61	1.13	116
21	2	86.98	101	1.54	9
21	3	34.27	96	0.76	0
21	4	8.44	96	0.76	0
21	5	14.72	75	0.76	0
21	6	10.37	158	1.79	81
21	7	44.13	78	2.34	139

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
21	8	33.11	81	1.27	0
21	9	35.02	71	1.79	171
21	10	52.6	115	2.18	54
21	11	106.45	103	1.84	15
21	12	97.09	104	1.6	18
21	13	59.94	104	1.52	0
21	14	54.84	105	1.27	0
21	15	23.85	71	1.48	149
21	16	16.25	114	1.62	38
21	17	23.51	117	2.54	53
21	18	30.38	77	2.04	150
21	19	40.9	91	2.79	0
21	20	18.21	67	0.76	0
21	21	12.5	60	2.54	143
21	22	63.81	111	1.48	30
21	23	29.77	86	1.52	0
21	24	40.05	164	2.03	90
21	25	43.48	92	1.52	0
21	26	73.61	104	1.6	18
21	27	100.22	81	1.27	0
21	28	19.68	107	1.48	30
21	29	35.23	137	2.83	63
21	30	8.76	100	1.93	23
21	31	20.08	99	2.03	0
21	32	107.43	43	2.04	119
21	33	79.42	43	1.04	104
21	34	54.27	43	1.36	111
21	35	63.49	41	1.7	116
21	36	58.16	117	2.39	32
21	37	19.78	65	2.59	168
21	38	16.35	83	2.04	172
21	39	14.37	46	1.98	140
21	40	7.61	64	1.29	168
21	41	11.5	6	1.27	90
21	42	5.92	46	2.04	172
21	43	15.5	121	1.43	44
21	44	4.74	74	1.6	161
21	45	14.21	28	1.48	120
21	46	11.51	41	2.34	102

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
21	47	5.47	68	3.04	0
21	48	37.3	60	1.7	153
21	49	2.59	78	1.52	0
21	50	2.55	95	1.29	11
21	51	41.65	0	2.4	108
21	52	27.8	84	3.21	18
21	53	38.61	134	1.54	80
21	54	33.52	173	2.89	74
21	55	14.9	171	3.04	90
21	56	19.99	62	1.27	0
21	57	22.76	79	0.8	18
21	58	32.07	98	1.04	14
21	59	29.23	97	0.91	33
21	60	20.45	75	1.52	0
21	61	8.62	137	1.54	80
21	62	5.42	79	1.52	0
21	63	7.55	70	2.8	5
21	64	7.57	166	3.52	59
21	65	14.69	108	1.6	18
21	66	32.68	67	2.03	0
21	67	16.15	53	1.6	161
22	1	66.72	94	1.79	171
22	2	15.49	100	1.77	0
22	3	28.96	91	2.03	0
22	4	3.04	90	2.03	0
22	5	30.24	82	2.03	0
22	6	57.34	100	1.52	0
22	7	55.79	98	2.27	26
22	8	51.69	99	1.6	18
22	9	114.28	77	3.3	0
22	10	112.86	76	1.07	135
22	11	94.65	69	0.8	161
22	12	26.88	67	1.54	9
22	13	59.54	99	1.77	0
22	14	12.15	79	1.84	164
22	15	25.26	105	1.79	8
22	16	85.7	95	2.17	159
22	17	51.51	95	2.3	173
22	18	4.85	96	1.79	8

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
22	19	4.32	93	1.77	0
22	20	3.3	90	1.27	0
22	21	26.7	92	1.29	11
22	22	34.47	95	1.29	168
22	23	10.46	84	1.77	0
22	24	8.8	56	1.52	0
22	25	17.45	98	1.27	0
22	26	7.4	95	1.27	0
22	27	3.66	56	2.34	167
22	28	3.77	132	3.05	41
22	29	6.42	18	2.3	83
22	30	55.75	93	1.54	9
22	31	51.81	89	1.6	18
22	32	39.66	96	1.6	161
22	33	39.08	98	1.04	14
22	34	80.34	99	2.3	173
22	35	89.09	95	1.43	44
22	36	55.85	97	1.54	9
22	37	47	91	1.52	0
22	38	41	94	1.27	0
22	39	8.24	33	4.01	108
22	40	14.53	95	2.34	12
22	41	5.45	27	3.04	90
22	42	21.07	102	3.25	51
22	43	7.15	96	1.79	171
22	44	8.59	108	1.98	39
22	45	8.62	76	1.01	0
22	46	15.62	97	2.79	0
22	47	16.78	92	1.83	33
22	48	6.27	111	2.87	44
22	49	12	83	1.77	0
22	50	68.98	86	1.77	0
22	51	4.34	159	2.89	52
22	52	9.39	71	2.51	135
22	53	2.28	90	1.84	164
22	54	2.4	161	1.79	81
22	55	7.79	70	5.67	10
22	56	9.93	94	2.55	174
22	57	3.3	22	3.21	108

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
22	58	3.94	75	1.04	165
22	59	4.06	90	2.89	142
22	60	4.16	142	3.25	38
22	61	24.76	103	1.27	0
22	62	30.14	102	1.77	0
22	63	19.12	100	1.77	0
22	64	36.01	96	1.29	168
22	65	33.82	93	1.79	171
22	66	14.4	130	3.53	68
22	67	19.25	98	1.77	0
22	68	6.14	141	2.28	90
22	69	24.76	95	1.77	0
22	70	33.77	96	2.83	26
22	71	2.59	101	2.04	29
22	72	2.54	90	1.84	15
22	73	16.88	96	1.79	8
22	74	9.98	97	2.03	0
22	75	2.8	84	1.77	0
22	76	21.71	169	2.04	97
22	77	18.08	169	1.52	90
22	78	71.2	98	1.77	0
22	79	27.5	94	1.52	0
22	80	29.59	95	2.28	0
22	81	19.34	93	1.83	33
22	82	3.84	97	2.34	12
22	83	2.3	96	1.77	0
22	84	2.34	102	1.27	36
22	85	9.2	96	1.62	38
22	86	3.88	101	1.29	11
22	87	4.93	101	1.36	21
22	88	2.79	90	2.27	26
22	89	7.43	172	3.56	94
22	90	31.72	96	1.01	0
22	91	20.83	99	1.01	0
22	92	13.47	92	1.27	0
22	93	3.61	129	2.04	82
22	94	2.34	167	2.28	90
22	95	7.38	86	0.56	26
22	96	3.69	164	2.09	75

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
22	97	5.67	100	1.29	11
22	98	6.93	28	1.6	108
22	99	6.87	85	1.29	11
23	100	25.01	74	1.13	26
23	101	12.76	95	0.56	153
23	102	11.24	96	1.6	18
23	1	8.19	7	5.89	97
23	2	4.57	56	3.3	0
23	3	10.92	17	9.36	102
23	4	6.09	0	3.81	90
23	5	3.59	81	1.79	171
23	6	6.49	120	6.42	71
23	7	4.06	90	3.05	175
23	8	5.38	44	2.03	0
23	9	3.45	17	2.03	90
23	10	2.5	66	2.28	0
23	11	5.58	0	4.85	96
23	12	5.63	97	4.63	9
23	13	9.24	142	7.07	21
23	14	18.14	43	2.61	150
23	15	10.44	85	2.03	0
23	16	54.91	80	2.59	168
23	17	43.43	76	2.59	168
23	18	3.81	0	2.3	96
23	19	2.83	63	1.77	0
23	20	4.1	21	1.27	90
23	21	5.92	30	2.03	90
23	22	2.34	49	1.83	146
23	23	2.97	160	1.77	90
23	24	2.8	95	1.7	153
23	25	2.28	90	2.03	0
23	26	164.34	11	2.54	90
23	27	2.09	14	2.09	75
23	28	2.79	0	1.52	90
23	29	2.09	75	1.52	0
23	30	2.03	90	1.54	9
23	31	52.31	5	3.3	90
23	32	44.59	47	1.79	8
23	33	88.33	65	2.8	174

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
23	34	31.92	64	1.79	171
23	35	29.82	4	1.77	90
23	36	49.65	152	3.34	81
23	37	26.08	22	4.07	93
23	38	31.54	176	2.28	90
23	39	57.2	127	2.39	57
23	40	24.51	95	1.52	0
23	41	4.57	0	2.27	63
23	42	3.4	63	2.8	174
23	43	135.68	56	2.04	150
23	44	4.07	176	4.07	86
23	45	6.39	96	3.09	9
23	46	29.34	159	1.52	90
23	47	14.34	157	1.84	105
23	48	2.55	5	2.27	116
23	49	6.74	109	1.43	44
23	50	40.11	148	1.77	90
23	51	41.59	151	1.84	74
23	52	4.13	42	2.27	116
23	53	12.01	13	1.84	105
23	54	10.46	150	1.7	63
23	55	6.41	146	1.01	90
23	56	5.84	90	1.27	0
23	57	8.56	78	1.01	0
23	58	16.38	18	2.15	135
23	59	95.22	155	2.09	75
23	60	27.88	149	1.36	21
23	61	2.04	82	2.03	0
23	62	2.61	60	2.28	0
23	63	1.77	0	1.77	90
23	64	7.57	140	2.17	69
23	65	50.29	23	2.03	90
23	66	59.52	70	1.93	156
23	67	2.03	0	1.84	74
23	68	3.3	0	3.18	61
23	69	47.83	3	3.81	93
23	70	48.24	138	1.6	71
23	71	38.81	149	1.52	90
23	72	54.45	47	1.98	140

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
23	73	60.78	84	2.28	0
23	74	30.25	156	3.38	77
23	75	22.13	31	3.1	124
23	76	12.19	91	1.52	0
23	77	21.37	76	1.84	164
23	78	13.01	174	2.03	90
23	79	2.5	113	2.17	20
23	80	38.39	157	2.09	75
23	81	133.64	157	3.88	78
23	82	83.24	160	1.6	71
23	83	73.25	157	1.36	68
23	84	35.9	85	1.79	171
23	85	22.15	63	1.79	171
23	86	18.79	179	2.34	77
23	87	52.23	20	2.4	108
23	88	35.02	140	3.06	65
23	89	39.6	32	2.04	97
23	90	64.25	161	2.28	90
23	91	36.22	157	2.54	90
23	92	4.32	176	2.8	84
23	93	3.56	175	2.4	71
23	94	2.03	0	1.27	90
23	95	36.86	97	1.01	0
23	96	10.21	34	1.48	120
23	97	12.85	52	3.81	0
23	98	11.7	40	3.09	170
23	99	11.16	17	3.05	138
23	100	4.16	37	2.39	147
23	101	9.77	171	2.09	75
23	102	5.08	0	3.97	63
23	103	21.59	1	1.52	90
23	104	41.42	156	1.36	68
23	105	2.79	90	2.61	29
23	106	31.32	149	2.28	90
23	107	52.6	152	3.1	55
23	108	31.54	93	3.05	4
23	109	35.74	39	5.73	167
23	110	5.61	174	2.79	90
23	111	10.29	15	1.84	164

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
24	1	34.82	92	1.01	0
24	2	100.85	91	2.03	0
24	3	13.21	92	0.76	0
24	4	48.77	89	0.76	0
24	5	20.86	86	1.01	0
24	6	25.22	85	0.8	18
24	7	17.78	89	0.8	18
24	8	5.59	92	0.56	26
24	9	7.13	85	1.27	0
24	10	12.06	98	0.76	0
24	11	7.57	166	1.01	90
24	12	19.55	90	0.8	18
24	13	7.4	22	1.13	116
24	14	24.63	90	0.8	18
24	15	14.3	96	2.55	5
24	16	41.6	95	2.04	7
24	17	13.12	42	0.91	123
24	18	24.43	86	1.01	0
24	19	23.95	55	2.18	125
24	20	6.6	92	0.76	0
24	21	19.58	80	2.54	0
24	22	33.32	93	2.04	7
24	23	24.4	92	2.54	0
24	24	25.96	86	1.62	141
24	25	6.47	131	1.29	78
24	26	10.44	94	1.01	0
24	27	23.11	90	0.25	n/a
24	28	19.09	93	1.01	0
24	29	46.25	88	2.03	0
24	30	40.66	48	2.04	119
24	31	27.71	87	2.79	0
24	32	21.91	85	0.8	18
24	33	33.47	78	2.34	167
24	34	59.31	33	1.13	116
24	35	22.91	148	2.3	83
24	36	22.74	173	2.97	70
24	37	28.44	79	1.52	0
24	38	5.92	80	5.84	177
24	39	6.7	155	4.09	60

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
24	40	9.67	150	1.43	44
24	41	43.52	86	1.27	0
24	42	15.99	110	2.39	32
24	43	7.91	84	1.52	0
24	44	15.49	90	1.54	9
24	45	51.51	95	1.04	14
24	46	16.95	106	1.52	0
24	47	18.3	92	1.54	9
24	48	48.3	104	1.52	0
24	49	26.96	86	1.13	153
24	50	38.39	92	1.27	0
24	51	37.44	94	1.79	8
24	52	19.83	87	1.79	8
24	53	12.45	92	3.55	0
24	54	17.52	89	1.79	8
24	55	7.87	90	3.3	0
24	56	39.88	89	1.79	8
24	57	3.75	61	3.05	138
24	58	10.58	59	2.09	165
24	59	7.27	65	2.04	150
24	60	20.35	86	1.01	0
24	61	41.91	27	2.04	119
24	62	20.98	83	2.04	172
24	63	16.88	83	0.56	26
24	64	6.27	121	2.96	30
24	65	3.56	85	3.09	9
24	66	2.55	5	2.34	77
24	67	8.07	77	1.27	0
24	68	22.11	88	0.76	0
24	69	43.44	88	0.76	0
24	70	13.75	94	3.59	8
24	71	11.14	65	1.83	146
24	72	24.13	89	1.29	168
24	73	8.13	51	2.74	123
24	74	8.38	88	6.35	0
24	75	10.91	114	2.27	26
24	76	15.49	90	2.04	7
24	77	5.08	87	2.65	16
24	78	9.24	69	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
24	79	10.63	56	1.62	141
24	80	38.62	96	0.76	0
24	81	6.42	71	2.79	0
24	82	20.08	124	1.07	44
24	83	9.56	106	1.79	8
24	84	2.83	116	1.27	36
24	85	21.08	88	1.77	0
24	86	6.39	96	1.79	8
24	87	5.11	63	2.27	153
24	88	8.73	144	1.93	23
24	89	7.04	25	1.13	116
24	90	15.59	77	2.34	167
24	91	2.4	108	1.98	39
24	92	10.71	84	1.01	0
24	93	19.03	103	1.27	0
24	94	44.19	62	0.76	0
24	95	17.91	71	1.52	0
24	96	2.89	74	0.5	0
24	97	9.39	90	1.01	0
24	98	7.97	149	0.91	33
24	99	4.16	142	1.07	44
24	100	21.13	85	1.01	0
24	101	12.38	118	0.71	44
24	102	27.99	86	1.01	0
24	103	36.88	86	0.8	18
24	104	12.7	90	1.04	14
24	105	11.43	90	1.52	0
24	106	20.25	30	1.83	123
24	107	14.33	150	1.84	74
25	1	101.03	83	2.3	173
25	2	58.71	80	2.89	164
25	3	28.44	72	1.79	171
25	4	14.16	165	1.36	68
25	5	66.9	100	2.03	0
25	6	21.82	155	1.01	90
25	7	28.51	154	1.27	90
25	8	28.08	155	1.52	90
25	9	30.66	153	1.48	59
25	10	29.27	135	1.98	50

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
25	11	11.03	113	2.04	172
25	12	6.83	131	1.13	63
25	13	10.61	21	1.77	90
25	14	24.15	87	1.6	18
25	15	30.2	109	2.04	29
25	16	43.7	96	1.54	9
25	17	20.52	139	2.4	71
25	18	51.26	104	1.01	0
25	19	7.53	122	2.04	172
25	20	3.88	101	2.34	12
25	21	32.03	62	2.61	150
25	22	16.58	101	2.28	0
25	23	32.28	104	1.93	23
25	24	30.92	104	2.04	172
25	25	43.88	77	2.03	0
25	26	50.96	12	2.28	90
25	27	50.33	177	1.77	90
25	28	19.78	167	2.03	90
25	29	18.4	39	2.28	90
25	30	21	75	1.79	8
25	31	17.01	0	2.3	96
25	32	46.36	112	2.04	29
25	33	49.81	55	1.52	0
25	34	16.98	124	2.34	12
25	35	20.08	108	0.5	0
25	36	48.16	154	2.8	84
25	37	21.96	79	1.52	0
25	38	14.46	59	2.65	163
25	39	24.53	53	2.27	153
25	40	55.02	50	4.34	173
25	41	32.15	76	2.03	0
25	42	14.61	82	1.01	0
25	43	38.6	78	2.03	0
25	44	28.58	75	1.52	0
25	45	47.85	170	2.04	82
25	46	25.86	17	2.83	116
25	47	24.18	162	0.76	90
25	48	46.52	159	1.01	90
25	49	34.72	95	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
25	50	11.92	116	1.84	15
25	51	50.41	40	2.34	130
25	52	42.97	55	4.32	176
25	53	15.5	124	1.54	80
25	54	15.75	110	1.04	14
25	55	33.99	96	1.27	36
25	56	36.58	88	1.79	8
25	57	5.08	36	1.79	44
25	58	14.19	137	1.36	158
25	59	16.55	110	3.41	41
25	60	22.37	87	2.97	19
25	61	17.15	64	1.54	9
25	62	11.31	80	1.01	0
25	63	16.34	57	2.28	0
25	64	8.53	53	1.29	11
25	65	7.22	18	1.83	146
25	66	2.83	100	1.79	98
25	67	18.52	64	1.62	38
25	68	28.7	89	1.36	158
25	69	22.26	69	1.79	171
25	70	47.81	93	1.77	0
25	71	39.15	20	1.79	8
25	72	19.65	115	4.99	104
25	73	19.11	160	1.29	11
25	74	12.34	143	1.54	80
25	75	3.81	86	1.27	36
25	76	32.88	51	2.28	0
25	77	33.36	149	2.09	165
25	78	4.72	143	1.6	71
25	79	6.5	128	2.51	44
25	80	5.34	87	2.74	33
25	81	9.1	157	3.3	0
27	1	60.24	65	1.83	146
27	2	10.69	85	1.79	171
27	3	27.16	61	2.34	139
27	4	27.76	57	3.31	147
27	5	2.55	84	2.54	0
27	6	31.45	58	3.23	135
27	7	6.9	6	1.01	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
27	8	6.35	2	1.52	90
27	9	4.85	6	1.77	90
27	10	42.03	152	1.98	50
27	11	35.6	75	2.3	173
27	12	24.53	64	3.1	145
27	13	14.65	33	3.97	116
27	14	18.3	60	3.53	158
27	15	15.56	5	3.05	94
27	16	43.1	44	2.34	130
27	17	60.88	72	2.83	169
27	18	41.64	30	2.97	109
27	19	20.72	36	1.62	128
27	20	23.73	47	2.15	135
27	21	21.18	52	3.05	131
27	22	100.75	59	2.89	142
27	23	13.01	84	3.05	175
27	24	28.7	90	2.28	0
27	25	11.18	39	2.3	96
27	26	31.59	53	1.7	153
27	27	4.44	59	2.17	159
27	28	17.06	75	2.55	174
27	29	14.79	74	2.65	163
27	30	36.89	69	2.04	172
27	31	34.94	70	1.52	0
27	32	29.05	67	2.04	150
27	33	19.67	78	2.03	0
27	34	4.99	14	1.6	108
27	35	6.7	24	2.39	122
27	36	16.16	81	2.89	164
27	37	14.18	135	2.18	35
27	38	7.11	55	1.98	140
27	39	10.57	65	1.52	0
27	40	27.63	36	3.52	120
27	41	4.31	0	3.14	75
27	42	13.86	61	2.15	135
27	43	13.64	61	2.89	164
27	44	12.61	49	2.15	135
27	45	61.16	53	2.18	144
27	46	37.49	37	1.43	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
27	47	22.75	56	2.54	143
27	48	3.84	7	3.3	90
27	49	3.77	47	2.34	139
27	50	4.43	13	3.09	99
27	51	4.01	55	3.41	138
27	52	8.29	49	1.7	153
27	53	84.74	25	3.52	120
27	54	10.42	34	7.77	128
27	55	8.66	174	7.82	76
27	56	6.9	53	3.14	165
27	57	6.62	122	1.62	51
27	58	10.45	25	3.31	122
27	59	6.09	0	3.55	90
27	60	30.8	74	1.27	0
27	61	4.57	70	3.09	170
27	62	4.88	27	1.48	120
27	63	5.06	17	1.52	90
27	64	25.13	75	3.05	175
27	65	9.42	75	1.04	14
27	66	20.11	65	1.6	161
27	67	3.86	23	1.83	146
27	68	9.36	40	2.4	161
27	69	15.99	10	3.81	90
27	70	7.72	9	7.38	86
28	1	53.77	82	2.03	0
28	2	24.74	107	1.27	36
28	3	28.14	100	1.84	164
28	4	39.1	101	0.76	0
28	5	42.21	83	2.83	169
28	6	49.91	100	2.17	159
28	7	29.9	83	2.59	168
28	8	24.7	30	1.01	90
28	9	2.28	0	2.28	90
28	10	2.3	83	2.17	159
28	11	2.79	0	2.54	90
28	12	20.44	83	1.77	0
28	13	42.06	82	3.3	0
28	14	67.52	75	2.59	168
28	15	64.84	80	1.04	165

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
28	16	26.08	83	1.54	170
28	17	32.5	114	1.6	18
28	18	26.74	175	2.03	90
28	19	2.8	174	2.28	90
28	20	14.24	148	1.62	51
28	21	17.72	152	1.29	78
28	22	16.54	72	3.31	4
28	23	27.94	82	2.8	174
28	24	7.37	91	6.98	160
28	25	3.55	90	1.77	0
28	26	7.4	22	3.05	85
28	27	20.29	134	2.83	63
28	28	14.11	81	1.29	11
28	29	23.51	79	1.54	9
28	30	16.25	89	2.54	0
28	31	3.81	0	2.55	84
28	32	12.97	176	3.09	80
28	33	20.81	19	6.47	101
28	34	14.3	19	2.34	102
28	35	7.27	60	2.55	5
28	36	3.55	90	2.03	0
28	37	2.03	0	2.03	90
28	38	7.87	88	5.84	0
28	39	7.62	91	2.04	29
28	40	21.52	160	6.77	77
28	41	14.61	82	1.77	0
28	42	16.64	77	1.52	0
28	43	13.92	51	3.31	147
28	44	11.5	96	1.04	165
28	45	20.24	70	2.03	0
28	46	14.94	35	2.39	122
28	47	18.98	65	2.04	172
28	48	18.29	103	1.01	0
28	49	4.38	100	2.8	5
28	50	23.37	137	1.77	90
28	51	12.28	97	2.04	7
28	52	18.79	108	2.04	29
28	53	17.44	163	1.77	90
28	54	13.33	72	2.3	173

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
28	55	15.95	80	13.11	135
28	56	12	83	3.04	0
28	57	16.14	155	1.04	75
28	58	13.54	66	2.5	156
28	59	13.03	146	6.62	85
29	1	22.2	35	3.05	131
29	2	17.31	85	1.77	0
29	3	43.95	38	3.94	104
29	4	27.48	35	3.87	121
29	5	117.55	37	5.8	113
29	6	92.3	36	3.06	114
29	7	6.47	131	4.31	28
29	8	7.55	137	5.59	39
29	9	7	46	1.62	128
29	10	23.21	36	2.83	116
29	11	13.21	177	4.38	79
29	12	6.2	34	1.7	116
29	13	8.19	7	2.8	84
29	14	3.59	44	1.27	126
29	15	14.77	155	2.04	97
29	16	27.4	20	1.79	98
29	17	39.2	24	2.89	127
29	18	3.14	104	1.77	0
29	19	6.02	152	2.73	68
29	20	4.34	159	2.89	52
29	21	4.32	93	3.69	15
29	22	4.38	10	2.03	90
29	23	11.2	32	2.18	125
29	24	5.43	52	2.96	149
29	25	8.22	8	2.54	126
29	26	4.44	59	2.04	150
29	27	8.45	57	3.31	147
29	28	7.84	150	2.15	44
29	29	51.22	42	2.34	139
29	30	35.44	63	1.6	161
29	31	23.54	66	1.79	171
29	32	4.82	90	3.55	0
29	33	4.07	86	4.06	0
29	34	20.94	165	1.93	66

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
29	35	6.37	4	1.84	105
29	36	10.68	25	4.22	122
29	37	9.9	22	2.96	120
29	38	8.17	36	0.56	153
29	39	43.73	25	2.39	122
29	40	12.49	26	1.48	120
29	41	18.55	30	2.27	116
29	42	14.88	27	3.3	112
29	43	22.89	49	2.54	143
29	44	16.35	154	1.7	63
29	45	25.7	18	2.03	90
30	1	113.2	86	4.32	3
30	2	23.13	92	2.03	0
30	3	59.75	165	2.34	77
30	4	19.37	79	1.79	171
30	5	19.09	76	1.52	0
30	6	15.06	95	1.04	14
30	7	4.66	44	2.39	147
30	8	85.02	146	1.6	71
30	9	84.11	146	2.89	52
30	10	1.79	98	1.54	9
30	11	89.19	96	1.52	0
30	12	46.94	24	2.09	104
30	13	42.32	23	2.3	96
30	14	24.46	102	0.8	18
30	15	15.12	7	1.01	90
30	16	16	54	1.36	158
30	17	6.11	175	1.36	68
30	18	13.73	56	2.96	149
30	19	26.99	160	2.27	63
30	20	13.18	74	2.09	165
30	21	40.9	118	2.27	26
30	22	26.28	138	2.04	82
30	23	21.71	96	1.79	171
30	24	26.27	73	1.29	168
30	25	24.38	91	2.83	10
30	26	37.61	64	2.73	158
30	27	35.46	144	1.93	66
30	28	33.6	145	1.43	44

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
30	29	31.64	108	2.65	16
30	30	20.88	108	1.27	0
30	31	38.05	101	5.42	10
30	32	10.92	17	5.35	95
30	33	33.76	24	3.3	90
30	34	30.6	18	2.79	90
30	35	26.58	153	1.7	63
30	36	33.4	140	2.61	60
30	37	20.72	160	1.79	81
30	38	22.09	43	2.17	110
30	39	29.84	47	1.93	156
30	40	17.74	23	1.52	90
30	41	21.48	24	2.54	90
30	42	53.12	83	3.04	0
30	43	55.93	50	2.87	135
30	44	6.82	44	2.61	150
30	45	33.48	67	2.54	0
30	46	44.1	56	1.98	129
30	47	38.82	96	2.39	32
30	48	8.13	178	3.34	81
30	49	22.48	13	2.03	90
30	50	52.92	13	2.54	90
30	51	16.91	41	3.05	131
30	52	10.23	23	1.27	143
30	53	4.93	124	2.89	37
30	54	29.24	78	2.54	0
30	55	27.69	78	1.29	11
30	56	20.78	38	2.03	0
30	57	13.46	90	6.09	0
30	58	20.51	158	4.07	86
30	59	15.27	86	3.04	0
30	60	28.43	71	2.4	161
30	61	27.47	107	1.29	11
30	62	77.94	85	5.23	50
30	63	22.37	92	1.6	18
30	64	14	44	1.77	90
30	65	15.75	37	2.04	97
30	66	4.63	80	3.81	3
30	67	23.21	156	4.22	57

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
30	68	6.03	112	2.59	11
30	69	3.05	85	2.3	6
31	1	42.24	108	1.6	18
31	2	10.85	10	3.04	90
31	3	32.41	113	1.04	14
31	4	9.08	26	1.98	129
31	5	21.1	87	3.04	0
31	6	18.87	95	0.76	0
31	7	39.38	157	2.09	75
31	8	44.29	67	2.34	167
31	9	32.34	43	3.63	155
31	10	37.27	118	1.48	30
31	11	5.92	80	2.89	164
31	12	28.15	111	1.52	0
31	13	30.58	101	1.52	0
31	14	25.47	99	0.8	161
31	15	16.47	160	1.62	38
31	16	5.9	115	2.18	54
31	17	11.59	28	1.48	120
31	18	11.13	145	1.07	44
31	19	13.21	127	1.98	39
31	20	34.38	22	2.18	125
31	21	35.09	92	1.52	0
31	22	36.66	93	0.76	0
31	23	14.43	61	1.54	170
31	24	19.29	99	2.54	0
31	25	8.63	88	4.82	0
31	26	7.04	64	4.25	162
31	27	9.7	96	1.01	0
31	28	43.8	40	1.93	113
31	29	19.42	11	2.09	104
31	30	17.53	10	1.48	120
31	31	17.18	34	2.39	122
31	32	8.45	57	1.7	153
31	33	3.96	129	1.13	26
31	34	12.5	60	1.54	170
31	35	9.7	42	1.98	140
32	1	6.93	8	3.3	90
32	2	25.15	69	1.52	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
32	3	23.4	64	1.84	164
32	4	29.79	50	1.98	129
32	5	7.11	90	4.82	0
32	6	9.95	174	3.94	75
32	7	23.88	119	1.7	26
32	8	49.97	31	2.09	104
32	9	5.99	36	0.91	123
32	10	29.34	84	1.52	0
32	11	57.21	57	2.39	147
32	12	26.79	68	1.36	158
32	13	40.34	69	2.59	168
32	14	41.89	100	2.7	41
32	15	7.07	158	2.09	75
32	16	7.36	133	1.62	51
32	17	37.88	92	2.54	0
32	18	2.54	90	1.54	9
32	19	2.4	18	1.84	105
32	20	5.28	54	1.93	156
32	21	4.18	75	3.21	161
32	22	3.66	56	2.51	135
32	23	1.77	0	1.52	90
32	24	2.03	0	1.54	80
32	25	3.75	28	1.62	128
32	26	2.96	120	2.34	40
32	27	2.34	40	2.18	144
32	28	2.27	153	1.98	50
32	29	7.82	35	1.79	135
32	30	26.07	132	4.22	32
32	31	14.08	27	1.43	135
32	32	24.81	67	2.03	0
32	33	30.5	87	2.03	0
32	34	35.87	79	2.28	0
32	35	3.3	0	3.05	85
32	36	13.43	164	1.27	90
32	37	33.6	34	3.05	138
32	38	19.6	126	1.62	51
32	39	15.12	130	1.98	39
32	40	20.5	56	1.77	0
32	41	2.55	5	1.84	74

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
32	42	2.83	79	1.52	0
32	43	80.82	65	2.5	156
32	44	32.86	94	1.29	11
32	45	6.14	29	1.83	123
32	46	31.25	38	3.05	138
32	47	13.97	117	1.7	26
32	48	12.53	96	1.36	21
32	49	21.45	73	1.7	153
32	50	25.64	82	1.29	168
32	51	4.43	13	2.4	108
32	52	33.99	60	3.53	158
32	53	20.72	72	1.52	0
32	54	20.27	77	1.79	8
32	55	37.44	36	2.04	119
32	56	4.85	6	1.77	90
32	57	29.36	30	2.04	119
32	58	5.23	75	1.77	0
32	59	5.23	75	1.29	11
32	60	4.57	90	2.54	0
32	61	24.09	42	2.34	130
32	62	20.37	79	0.8	18
32	63	2.55	95	2.34	12
32	64	3.55	0	3.31	85
32	65	4.13	79	3.84	172
32	66	4.57	90	2.3	6
32	67	4.09	29	2.7	131
32	68	3.97	116	1.93	23
32	69	142.92	51	6.3	139
32	70	30.15	66	1.93	156
32	71	13.43	74	2.04	7
32	72	17.6	26	2.8	95
32	73	10.36	36	5	120
32	74	4.57	93	4.57	0
34	1	143.02	9	3.3	90
34	2	139.55	47	3.61	129
34	3	31.72	107	2.89	15
34	4	38.76	37	2.51	135
34	5	23.78	120	1.84	15
34	6	17.47	125	1.48	59

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
34	7	20.5	56	1.79	135
34	8	69.73	23	2.28	90
34	9	4.18	104	2.17	20
34	10	17.78	45	2.15	135
34	11	41.62	73	1.84	164
34	12	22.29	47	2.89	142
34	13	9.72	130	1.62	51
34	14	33.72	157	1.27	90
34	15	43.01	176	1.52	90
34	16	7.89	3	6.1	92
34	17	4.6	173	1.52	90
34	18	59.63	45	2.18	144
34	19	38.17	64	1.79	171
34	20	121.2	47	1.36	158
34	21	45.15	8	3.31	85
34	22	87.15	98	2.5	23
34	23	25.92	48	1.98	129
34	24	89.5	39	1.7	116
34	25	37.35	19	2.79	90
34	26	11.94	92	1.27	0
34	27	27.4	97	0.76	0
34	28	114.12	35	2.09	104
34	29	57.53	39	1.79	135
34	30	81.4	169	2.51	44
34	31	21.25	75	3.38	167
34	32	42.71	26	1.36	111
34	33	28.06	80	4.57	0
34	34	29.42	152	1.48	59
34	35	23.3	73	3.05	175
34	36	15.8	23	2.73	111
34	37	6.58	62	1.01	0
34	38	5.49	33	1.43	135
34	39	3.04	0	1.77	90
34	40	3.81	3	2.55	84
34	41	2.83	10	2.55	84
34	42	37.82	166	2.34	77
34	43	15.15	140	2.39	57
34	44	25.67	2	1.79	81
34	45	88.78	100	5.23	14

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
34	46	10.07	123	3.05	48
34	47	37.08	13	5.58	90
34	48	33.83	54	2.4	161
34	49	28.4	58	2.18	144
34	50	22.15	40	1.43	135
34	51	17.22	37	1.62	141
34	52	20.39	50	1.43	135
34	53	9.34	42	3.77	132
34	54	13.42	60	1.83	146
34	55	14.37	107	1.01	0
34	56	38.45	23	2.27	116
34	57	11.98	175	2.55	84
34	58	16.58	101	1.84	15
34	59	11.82	104	1.54	9
34	60	19.29	99	6.93	8
34	61	13.21	52	1.43	135
34	62	3.66	56	2.27	153
34	63	3.04	90	2.28	0
34	64	4.52	141	1.83	56
34	65	4.72	126	1.98	50
34	66	3.21	18	2.03	90
34	67	2.79	0	2.04	97
34	68	2.3	96	2.03	0
34	69	15.25	92	1.27	0
34	70	16.46	38	2.74	123
34	71	2.09	165	1.6	71
34	72	3.09	99	2.59	11
34	73	2.34	167	1.79	81
34	74	2.55	84	1.79	171
34	75	3.59	8	1.6	108
34	76	2.54	90	2.27	26
34	77	5	66	4.38	169
34	78	5.63	172	1.98	50
34	79	23.64	39	1.48	149
34	80	18.96	39	1.27	143
34	81	14.74	47	1.29	168
34	82	3.86	113	1.93	23
34	83	7.02	102	3.86	23
34	84	7.18	98	2.5	23

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
34	85	3.21	161	2.73	68
34	86	13.91	68	2.79	0
34	87	3.31	147	2.54	53
34	88	6.37	175	2.79	90
34	89	3.81	176	3.3	67
34	90	3.05	4	1.84	74
34	91	31.61	66	2.03	0
34	92	5.3	73	1.79	171
34	93	3.3	0	2.8	95
34	94	2.79	90	1.52	0
34	95	3.04	90	2.8	174
34	96	14.29	102	2.96	30
35	1	2.89	52	2.28	0
35	2	6.62	57	5.35	5
35	3	3.56	175	2.04	97
35	4	2.59	11	2.03	90
35	5	3.05	48	2.39	147
35	6	2.54	90	2.04	7
35	7	26.04	43	1.79	135
35	8	2.54	90	2.03	0
35	9	6.7	65	2.65	163
35	10	3.56	85	3.3	0
35	11	2.03	0	1.36	111
35	12	6.5	51	2.3	173
35	13	8.37	165	1.36	68
35	14	12.29	38	1.7	153
35	15	3.1	55	1.54	170
35	16	3.97	63	2.03	0
35	17	15.7	22	2.3	96
35	18	2.83	169	2.28	90
35	19	17.17	97	1.27	0
35	20	19.17	101	1.52	0
35	21	10.36	162	1.83	56
35	22	12.82	123	0.25	n/a
35	23	12.82	123	0.76	90
35	24	8.38	35	2.04	150
35	25	14.19	153	1.54	80
35	26	71.88	101	9.42	4
35	27	37.16	114	1.48	30

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
35	28	9.31	64	1.27	143
35	29	25.44	62	1.52	0
35	30	11.14	65	1.52	0
35	31	42.29	114	2.04	29
35	32	63.03	113	1.98	50
35	33	22.88	92	1.29	11
35	34	20.52	126	1.27	53
35	35	28.47	105	1.79	8
35	36	41.65	112	1.93	23
35	37	24.35	78	2.03	0
35	38	20.82	90	4.49	42
35	39	25.42	111	2.09	14
35	40	21.45	16	2.04	119
35	41	3.63	77	1.79	171
35	42	7.97	157	6.93	66
35	43	5.73	102	2.09	14
35	44	2.83	100	2.59	11
35	45	4.09	150	3.38	77
35	46	2.79	90	2.59	168
35	47	7.33	14	3.38	77
35	48	26.34	109	1.48	30
35	49	26.15	101	1.36	21
35	50	19.52	147	1.29	78
35	51	5.84	90	2.74	33
35	52	14.18	135	1.7	63
35	53	6.83	48	2.17	159
35	54	40.16	107	2.54	36
35	55	31.79	86	1.52	0
35	56	16.26	38	5.89	172
35	57	8.44	83	3.05	175
35	58	8.4	25	1.79	135
35	59	24.74	70	2.04	7
35	60	32.68	67	1.13	153
35	61	33.13	4	32.1	85
35	62	52.42	147	11.96	86
35	63	2.55	5	2.3	96
35	64	2.8	95	2.28	0
35	65	3.94	75	1.84	164
35	66	4.83	176	2.55	95

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
35	67	5.1	84	5.08	177
36	1	3.94	14	3.81	90
36	2	4.34	6	2.54	90
36	3	2.55	84	2.4	161
36	4	5.8	23	2.65	106
36	5	2.79	90	1.93	23
36	6	3.31	85	2.83	10
36	7	4.5	16	2.28	90
36	8	4.43	13	2.8	95
36	9	4.13	100	4.09	7
36	10	3.31	85	3.09	170
36	11	2.83	169	2.79	90
36	12	5	59	2.34	167
36	13	4.09	7	2.03	90
36	14	5.48	13	3.81	90
36	15	5.63	125	4.54	26
36	16	4.01	18	2.65	73
36	17	5.06	17	3.31	85
36	18	41.76	85	1.77	0
36	19	77.51	41	2.61	119
36	20	30.53	11	2.04	97
36	21	36.7	18	3.56	94
36	22	35.85	76	3.55	0
36	23	57.16	51	2.54	143
36	24	25.81	166	3.56	85
36	25	4.57	0	3.77	109
36	26	17.33	58	3.55	0
36	27	14.28	51	3.04	0
36	28	19.88	61	2.3	6
36	29	20.21	26	1.36	111
36	30	15.37	59	1.54	9
36	31	21.37	69	1.54	9
36	32	23.17	63	2.03	0
36	33	6.9	173	5.08	90
36	34	4.07	176	2.79	90
36	35	2.8	5	2.55	95
36	36	2.09	14	1.29	101
36	37	6.1	87	3.3	0
36	38	29.35	9	2.18	35

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
36	39	67.45	10	2.03	90
36	40	62.53	46	1.52	90
36	41	3.09	170	1.77	90
36	42	7.22	79	2.55	174
36	43	46.82	15	1.79	8
36	44	40.67	64	3.3	90
36	45	32.14	63	3.14	165
36	46	6.09	90	2.09	165
36	47	15.24	0	3.34	81
36	48	4.93	78	2.79	0
36	49	4.57	19	3.14	75
36	50	5.14	110	3.05	175
36	51	4.68	12	1.36	21
36	52	6.18	9	2.03	90
36	53	21.18	37	2.8	95
36	54	22.1	1	4.01	124
36	55	5.62	71	2.17	69
36	56	22.54	67	2.55	174
36	57	23.69	70	1.27	0
36	58	22.54	67	2.3	173
36	59	38.25	14	2.03	0
36	60	30.43	14	2.3	96
36	61	4.22	122	2.4	108
36	62	3.59	44	2.03	90
36	63	4.57	90	3.63	12
36	64	5.89	82	2.83	10
36	65	4.88	62	4.44	149
36	66	2.54	143	2.34	77
36	67	3.88	78	1.77	0
36	68	6.43	9	3.38	77
36	69	5.14	69	2.55	5
36	70	8.9	176	4.34	69
36	71	21.53	72	0.76	0
36	72	19.91	5	1.27	0
36	73	29.01	3	1.27	90
36	74	30.29	3	1.52	90
36	75	16.81	25	3.81	93
36	76	45.53	164	3.25	141
37	1	11.17	90	1.77	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
37	2	19.41	132	1.48	30
37	3	35.46	11	2.27	116
37	4	54.95	163	1.79	81
37	5	6.59	74	2.03	0
37	6	39.35	133	4.1	21
37	7	15.83	164	1.77	90
37	8	15.5	161	1.36	68
37	9	62.14	171	2.3	83
37	10	45.02	147	1.6	71
37	11	18.17	74	4.06	0
37	12	11.5	112	1.62	38
37	13	8.37	14	2.27	116
38	1	145.41	33	1.36	111
38	2	69.46	124	1.13	26
38	3	5.48	103	4.99	14
38	4	68.79	148	2.28	90
38	5	14.79	168	2.03	90
38	6	72.35	22	2.34	102
38	7	59.09	100	2.34	12
38	8	81.67	93	1.29	11
38	9	13.22	176	3.04	90
38	10	86.64	137	3.75	61
38	11	24.4	2	1.52	90
38	12	11.94	177	1.27	90
38	13	26.67	179	1.77	90
38	14	68.26	123	1.98	50
38	15	145.01	32	2.96	120
38	16	18.13	142	1.83	33
38	17	41.02	13	1.84	105
38	18	37.4	15	1.93	113
38	19	27.73	8	1.29	101
38	20	86.98	137	3.96	50
38	21	13.26	174	1.77	90
38	22	23.88	1	2.8	84
38	23	44.19	179	1.79	81
38	24	64.9	22	1.83	123
38	25	68.87	149	2.3	83
38	26	91.7	89	2.34	40
38	27	8.9	93	3.05	4

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
38	28	48.68	136	1.6	71
38	29	39.69	135	1.48	59
38	30	17.06	134	1.04	75
38	31	21.34	91	1.77	0
38	32	8.93	75	2.03	0
38	33	17.55	14	2.04	97
38	34	23.8	50	2.51	135
38	35	11.55	146	2.27	63
38	36	4.82	90	1.77	0
38	37	8.16	174	3.31	85
38	38	11.17	0	2.03	90
38	39	33.49	71	2.54	0
38	40	28.19	90	2.28	0
38	41	6.1	44	2.7	138
38	42	6.62	4	4.57	90
38	43	30.94	170	2.83	79
38	44	24.64	26	2.18	125
38	45	47.77	8	2.03	90
38	46	48.48	9	2.54	90
38	47	44.86	7	2.03	90
38	48	9.24	105	2.59	168
38	49	8.66	174	5.33	90
38	50	6.1	177	4.13	79
38	51	6.9	96	4.32	3
38	52	6.83	158	5.79	37
38	53	3.55	90	2.04	7
38	54	28.99	161	1.54	80
38	55	5.63	97	2.28	0
38	56	3.81	90	1.77	0
38	57	3.31	94	3.05	4
38	58	27.83	64	1.6	18
39	1	25.46	128	2.04	29
39	2	17.89	83	2.03	0
39	3	17.08	78	1.52	0
39	4	21.36	115	2.7	41
39	5	14.86	123	1.48	30
39	6	47.95	97	1.52	0
39	7	16.55	131	1.6	71
39	8	19.04	170	1.79	81

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
39	9	10.11	61	2.27	153
39	10	21.13	94	2.03	0
39	11	54.44	83	4.85	173
39	12	36.88	93	3.56	175
39	13	13.54	30	1.77	90
39	14	48.63	61	1.36	158
39	15	38.51	62	1.79	135
39	16	25.2	85	23.62	178
39	17	43.6	98	1.79	171
39	18	42.89	98	2.03	0
39	19	11.16	72	2.54	0
39	20	9.42	75	1.84	164
39	21	3.3	0	2.17	110
39	22	2.73	158	2.61	60
39	23	6.22	78	2.04	172
39	24	2.54	126	2.51	44
39	25	14.16	75	2.89	164
39	26	30	103	1.77	0
39	27	35.41	171	1.27	90
39	28	39.91	87	1.29	168
39	29	17.89	96	4.32	3
39	30	92.58	95	2.59	11
39	31	15.46	42	2.3	96
39	32	23.64	2	2.3	96
39	33	8.44	105	1.04	14
39	34	16.51	88	4.82	0
39	35	3.31	4	2.04	82
39	36	5.08	0	2.3	83
39	37	7.52	168	2.61	60
39	38	3.88	101	3.31	4
39	39	27.12	56	2.5	156
39	40	14.19	132	2.18	54
39	41	4.43	166	1.54	80
39	42	2.74	123	2.04	29
39	43	9.23	82	7.97	170
39	44	2.55	5	2.03	90
39	45	2.4	161	2.04	82
39	46	4.18	75	2.79	0
39	47	5.08	36	2.87	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
39	48	11.74	68	1.62	141
39	49	3.87	58	1.48	149
39	50	2.04	82	1.93	156
39	51	4.13	169	2.65	73
39	52	4.34	69	2.89	15
39	53	4.32	86	4.06	0
39	54	7.22	169	2.04	82
39	55	6.14	7	2.55	84
39	56	54.71	21	1.83	123
39	57	20.13	150	2.27	63
39	58	13.67	111	2.17	20
39	59	11.81	98	2.04	172
39	60	29.51	105	2.03	0
39	61	35.65	85	1.29	168
39	62	37.18	85	2.34	139
39	63	3.45	143	1.98	39
39	64	3.38	12	2.65	106
39	65	3.23	135	2.51	44
39	66	24.54	173	2.55	84
39	67	2.27	26	1.93	113
39	68	3.06	65	1.77	0
39	69	3.09	170	2.54	90
39	70	13.72	128	2.15	44
39	71	48.13	82	1.79	171
39	72	7.89	176	1.77	90
39	73	3.31	94	2.59	11
39	74	3.31	85	2.3	173
39	75	2.03	0	1.77	90
39	76	2.28	0	1.77	90
39	77	2.54	0	2.03	90
39	78	26.95	87	2.65	163
39	79	5.23	75	1.7	153
40	1	79.92	45	1.62	141
40	2	56.95	70	1.77	0
40	3	119.21	69	7.11	0
40	4	29.01	103	3.05	4
40	5	34.28	80	3.59	8
40	6	17.33	10	1.04	104
40	7	17.74	13	1.04	104

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
40	8	21.77	82	2.04	7
40	9	35.85	34	1.79	98
40	10	3.81	90	3.59	8
40	11	3.59	98	2.97	19
40	12	30.22	90	2.04	7
40	13	102.77	79	4.06	0
40	14	29.16	37	2.18	125
40	15	41.55	85	2.54	0
40	16	15.07	57	2.27	153
40	17	16.51	89	1.6	18
40	18	31.05	15	3.97	116
40	19	29.5	48	2.17	159
40	20	33.02	89	2.04	7
40	21	16.9	57	2.3	173
40	22	35.37	68	3.09	170
40	23	36.36	21	1.29	101
40	24	14.21	114	3.77	19
40	25	19.41	42	1.98	129
40	26	35.02	70	3.31	4
40	27	28.06	68	3.81	0
40	28	10.57	125	2.3	6
40	29	16.69	76	1.77	0
40	30	19.03	76	3.59	171
40	31	20.4	18	1.7	116
40	32	9.06	78	1.84	15
40	33	2.28	90	1.79	8
40	34	2.28	0	1.77	90
40	35	28.19	60	2.55	174
40	36	30.66	63	2.79	0
40	37	32.26	68	2.54	0
40	38	13.09	18	2.28	90
40	39	4.36	54	3.31	175
40	40	2.28	0	1.77	90
40	41	1.79	171	1.27	90
40	42	4.66	60	2.54	0
40	43	14.72	32	4.5	163
40	44	45.33	110	2.89	37
40	45	26.74	67	3.56	175
40	46	47.63	72	2.03	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
40	47	118.13	66	3.81	176
40	48	21.13	76	2.28	0
40	49	39.98	63	2.79	0
40	50	32.9	55	3.3	0
40	51	38.07	165	1.52	90
40	52	35.06	172	5.08	90
40	53	12.73	61	3.59	8
40	54	10.81	80	2.03	0
40	55	9.06	78	1.79	8
40	56	19.61	48	2.89	127
40	57	10.46	60	2.28	0
40	58	21.94	52	2.55	174
40	59	23.91	67	3.3	0
40	60	9.72	109	2.04	29
40	61	6.62	147	3.31	85
40	62	3.75	118	1.93	23
40	63	4.07	176	2.97	70
40	64	25.15	16	2.3	96
40	65	8.77	67	1.52	0
40	66	5.45	27	2.03	90
40	67	17.37	153	1.27	53
40	68	12.95	1	1.62	51
40	69	31.79	82	1.27	0
40	70	24.17	86	1.77	0
40	71	3.87	58	2.18	125
40	72	1.48	59	1.36	158
40	73	11.24	64	1.54	170
40	74	26.51	94	1.98	50
40	75	48.13	175	2.03	90
40	76	23.9	75	2.04	7
40	77	21.98	67	2.54	0
40	78	8.98	47	3.66	123
40	79	13.09	71	2.3	173
40	80	3.81	0	2.28	90
40	81	17.51	73	2.04	7
41	1	69.53	43	2.7	131
41	2	7.63	93	2.28	0
41	3	7.75	31	1.79	135
41	4	5.21	46	2.54	143

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
41	5	3.84	97	2.83	10
41	6	2.79	0	2.15	135
41	7	1.27	0	1.27	90
41	8	1.29	101	0.8	18
41	9	155.54	170	3.21	71
41	10	2.04	60	1.52	0
41	11	1.93	23	1.77	90
41	12	46.03	109	1.48	30
41	13	16.58	78	1.29	11
41	14	2.7	48	1.83	123
41	15	8.77	22	1.62	128
41	16	80.97	170	3.04	90
41	17	26.38	113	5.86	17
41	18	18.56	176	13.47	87
41	19	2.03	90	1.79	8
41	20	17.95	115	2.09	14
41	21	29.21	36	1.27	126
41	22	19.6	148	2.89	37
41	23	2.03	0	1.52	90
41	24	2.04	82	1.77	0
41	25	24.91	106	2.96	30
41	26	3.3	22	1.27	90
41	27	13.11	68	1.84	164
41	28	8.56	168	2.65	73
41	29	2.03	0	2.03	90
41	30	2.34	102	1.79	8
41	31	24.76	10	1.6	108
41	32	4.01	55	2.34	139
41	33	6.47	25	3.31	122
41	34	4.31	44	2.04	119
41	35	1.79	81	1.54	170
41	36	2.34	167	2.09	75
41	37	2.34	12	2.03	90
41	38	3.31	122	2.61	29
41	39	19.08	80	2.17	159
41	40	2.28	0	2.03	90
41	41	32.42	78	1.52	0
41	42	11.94	88	2.04	172
41	43	18.52	33	3.18	118

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
41	44	3.97	26	1.6	108
41	45	2.27	116	2.03	0
41	46	3.04	0	2.61	60
41	47	2.96	59	2.04	172
41	48	2.83	100	2.09	14
41	49	15.79	94	1.52	0
41	50	16.23	110	0.91	33
41	51	4.07	86	2.8	174
41	52	4.13	42	1.84	164
41	53	2.83	63	2.18	144
41	54	5.38	171	4.57	86
41	55	14.12	142	2.34	49
41	56	12.41	59	3.14	165
41	57	5.86	17	1.48	120
41	58	8.45	57	1.84	164
41	59	9.08	153	1.7	63
41	60	5.33	0	5.33	90
41	61	11.38	141	1.48	59
41	62	8.45	131	1.54	9
41	63	18.21	98	3.55	0
41	64	8.02	169	1.54	80
41	65	12.82	97	2.3	173
41	66	8.68	110	3.09	9
41	67	15.37	82	1.04	165
41	68	25.94	113	3.94	14
41	69	32.04	115	5.11	26
41	70	8.44	46	1.43	135
41	71	18.41	114	2.8	5
41	72	13.69	130	1.13	26
41	73	4.72	36	1.98	140
41	74	5.67	79	1.27	0
41	75	6.62	94	3.04	0
41	76	9.17	94	1.27	0
41	77	11.25	61	1.93	156
41	78	9.24	164	1.27	53
41	79	20.08	32	12.4	79
41	80	4.57	70	1.01	0
41	81	14.86	106	1.54	170
41	82	24.91	106	2.4	18

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
41	83	11.32	47	2.04	7
41	84	7.55	42	2.34	130
41	85	8.1	41	1.62	128
41	86	21.4	94	1.6	161
41	87	2.34	139	1.01	0
41	88	2.3	96	2.04	29
41	89	1.79	8	1.77	90
41	90	3.75	61	1.77	0
41	91	3.3	90	1.36	158
41	92	4.2	64	1.54	170
41	93	6.3	130	1.36	158
41	94	1.77	90	1.27	36
41	95	3.05	48	1.52	0
41	96	2.17	159	2.09	75
41	97	1.52	90	1.52	0
41	98	6.74	70	1.77	0
41	99	3.86	156	1.29	168
41	100	1.54	80	1.27	90
41	101	1.79	98	1.29	11
41	102	1.79	8	1.29	78
41	103	2.28	0	1.52	90
41	104	2.74	56	2.54	0
41	105	6.35	73	1.48	149
41	106	5.11	153	1.36	158
41	107	10.8	41	2.18	54
41	108	5.02	44	1.6	108
41	109	79.21	96	2.34	139
41	110	3.34	8	2.28	90
41	111	2.28	90	2.03	0
41	112	3.84	172	1.27	0
41	113	7.55	137	2.09	75
41	114	7.33	14	1.13	63
41	115	5.38	171	2.4	108
41	116	11.97	72	1.36	68
41	117	1.83	146	1.79	81
41	118	3.05	175	2.79	90
41	119	2.03	90	1.27	0
41	120	2.03	90	2.03	0
41	121	1.52	90	1.52	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
41	122	3.77	19	1.27	0
41	123	2.89	52	1.48	120
41	124	9.33	67	1.79	135
41	125	3.31	57	2.17	159
41	126	2.61	60	2.5	156
41	127	2.39	147	2.04	82
41	128	2.18	54	1.77	0
41	129	4.68	40	2.73	158
41	130	3.3	112	2.27	116
41	131	3.96	50	2.18	35
41	132	2.83	10	1.98	140
41	133	1.52	90	1.52	90
41	134	1.84	15	1.29	78
41	135	3.04	0	2.83	10
41	136	2.03	90	1.52	90
41	137	4.38	79	2.03	0
41	138	4.66	29	1.52	0
41	139	11.5	43	1.62	128
41	140	3.66	123	1.48	59
41	141	2.65	163	2.39	57
41	142	2.89	37	1.98	140
41	143	1.54	99	1.04	14
41	144	1.79	81	1.52	0
41	145	1.79	81	1.54	9
41	146	4.1	158	1.83	33
41	147	7.33	165	5.13	81
41	148	4.32	49	2.18	144
41	149	3.1	145	1.98	39
41	150	2.55	5	1.77	90
41	151	3.21	71	1.79	171
41	152	4.66	67	1.01	0
41	153	7.54	44	0.71	135
41	154	43.74	115	5.63	35
41	155	15.7	99	1.36	21
41	156	20.16	121	1.7	26
41	157	12.44	178	11.43	88
41	158	11.37	29	9.6	142
41	159	8.8	33	2.7	131
41	160	6.87	4	2.39	57

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
41	161	4.13	79	1.52	0
41	162	2.59	78	1.01	0
41	163	9.24	74	1.27	0
41	164	29.3	42	1.27	143
41	165	8.63	24	2.18	125
41	166	2.96	59	1.62	128
41	167	2.28	0	1.54	99
41	168	1.84	74	1.77	0
41	169	4.09	82	3.31	175
41	170	23.63	110	3.31	32
41	171	5.38	70	1.29	168
42	1	102.62	90	4.06	0
42	2	14.08	97	1.77	0
42	3	8.91	109	0.8	18
42	4	7.57	103	1.04	14
42	5	10.12	72	1.77	0
42	6	80.15	165	1.52	90
42	7	79.94	21	3.18	118
42	8	50.6	87	3.31	4
42	9	53.88	45	1.43	135
42	10	5.04	49	3.61	140
42	11	71.92	21	2.55	95
42	12	31.84	21	1.93	113
42	13	41.49	24	2.73	111
42	14	4.57	3	4.06	90
42	15	3.31	85	2.3	173
42	16	8.72	171	3.86	66
42	17	13.97	70	1.52	0
42	18	33.89	19	1.98	129
42	19	48	105	1.7	26
42	20	51.95	105	1.77	0
42	21	39.87	117	2.28	90
42	22	28.71	88	1.13	153
42	23	37.36	87	1.6	161
42	24	3.56	94	2.79	0
42	25	4.93	11	3.55	90
42	26	33.04	44	1.79	171
42	27	17.3	139	2.8	84
42	28	25.51	125	1.01	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
42	29	28.88	129	1.83	33
42	30	37.55	32	2.83	153
42	31	17.07	157	1.52	90
42	32	30.98	104	1.93	23
42	33	27.95	72	2.03	0
42	34	11.68	91	4.32	3
42	35	22.06	168	2.3	83
42	36	4.06	90	3.81	0
42	37	3.52	30	2.79	90
42	38	31.25	82	1.01	0
42	39	48.13	20	3.1	124
42	40	11.24	108	1.98	39
42	41	15	92	2.03	0
42	42	47.21	5	2.28	90
42	43	38.86	88	2.04	172
42	44	30.58	85	1.79	171
42	45	21.2	83	2.04	150
42	46	23.77	161	3.75	61
42	47	26.22	58	3.1	145
42	48	60.17	171	2.34	77
42	49	22.15	86	1.29	168
42	50	26.17	91	1.52	0
42	51	31.45	137	3.06	65
42	52	16.35	6	2.79	90
42	53	13.52	50	3.3	0
42	54	2.59	11	2.55	95
42	55	4.31	61	2.55	174
42	56	5.23	60	1.77	0
42	57	13.54	66	1.27	0
42	58	18.23	102	1.36	21
42	59	2.03	90	1.77	0
42	60	4.31	0	4.13	79
42	61	3.81	0	3.04	90
43	1	33.27	90	1.29	11
43	2	34.32	87	1.79	8
43	3	25.94	108	3.61	50
43	4	56.64	90	1.54	170
43	5	19.55	89	1.01	0
43	6	36.04	105	1.93	23

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
43	7	35.26	101	1.13	26
43	8	10.6	106	1.27	36
43	9	51.34	87	2.79	0
43	10	21.64	121	1.6	18
43	11	10.61	101	4.32	176
43	12	12.01	76	1.01	0
43	13	4.52	38	2.51	135
43	14	4.32	93	1.93	23
43	15	18.07	94	3.56	4
43	16	24.13	90	2.54	0
43	17	57.15	90	2.65	16
43	18	22.09	171	12.21	86
43	19	9.77	152	2.03	90
43	20	9.56	169	3.81	86
43	21	2.03	90	1.27	0
43	22	8.88	30	2.34	130
43	23	5.49	146	1.7	63
43	24	26.49	150	2.87	44
43	25	10.67	91	2.27	26
43	26	55.97	86	3.04	0
43	27	10.36	72	2.89	164
43	28	41.4	90	1.27	0
43	29	43.22	96	1.29	11
43	30	6.35	106	1.77	0
43	31	5.59	87	1.52	0
43	32	12.42	40	1.62	128
43	33	30.68	96	2.28	0
43	34	1.93	66	1.52	0
43	35	29.78	93	2.55	5
43	36	12.89	147	2.18	54
43	37	12.45	73	1.93	156
43	38	2.55	174	1.77	90
43	39	3.88	11	2.28	90
43	40	2.04	172	2.04	97
43	41	12.19	88	3.3	0
43	42	46.49	91	2.34	12
43	43	41.38	98	2.54	0
43	44	17.33	95	0.76	0
43	45	19.58	80	1.04	165

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
43	46	23.77	113	3.05	85
43	47	16.32	105	2.96	30
43	48	2.39	32	2.3	96
43	49	20.99	55	2.04	119
43	50	16.88	68	2.54	0
43	51	2.4	18	2.09	104
43	52	3.09	80	2.28	0
43	53	2.27	26	1.36	158
43	54	24.13	90	5.58	0
43	55	3.38	167	2.55	95
43	56	2.79	0	2.03	90
43	57	39.44	72	1.6	161
43	58	10.05	44	1.7	116
43	59	6.35	0	2.54	90
43	60	2.03	0	2.03	90
43	61	15.42	162	2.89	37
43	62	20.08	177	10.16	88
43	63	4.06	90	2.28	0
43	64	3.56	4	2.79	90
43	65	2.3	83	1.77	0
43	66	2.8	84	2.79	0
43	67	2.79	0	2.28	90
43	68	3.04	0	2.3	83
43	69	7.77	38	3.04	90
44	1	23.88	45	2.7	131
44	2	18.75	81	2.28	0
44	3	30.85	81	2.03	0
44	4	34.01	21	2.4	108
44	5	11.4	78	2.79	0
44	6	19.27	161	1.93	66
44	7	20.9	152	2.18	54
44	8	8.83	161	1.48	59
44	9	25.09	35	1.93	113
44	10	16.04	79	1.77	0
44	11	26.83	40	2.96	120
44	12	11.27	97	1.27	0
44	13	32.14	44	2.87	135
44	14	51.57	15	2.03	90
44	15	35.54	39	3.66	146

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
44	16	22.11	88	1.77	0
44	17	38.54	174	3.14	75
44	18	22.41	51	1.62	141
44	19	84.27	166	2.61	60
44	20	22.05	61	1.83	146
44	21	12.69	109	2.34	12
44	22	15.66	109	1.29	11
44	23	36.22	71	2.83	169
44	24	38.76	102	3.31	4
44	25	28.05	5	3.59	81
44	26	17.17	172	2.34	77
44	27	47.42	156	2.39	57
44	28	14.76	3	2.28	90
44	29	14.1	13	2.17	110
44	30	2.74	56	1.48	149
44	31	2.97	70	2.34	167
44	32	2.74	56	2.04	150
44	33	17.68	122	2.5	23
44	34	8.63	178	1.54	80
44	35	6.18	160	1.62	51
44	36	18.24	55	1.36	158
44	37	32.4	41	1.98	129
44	38	16.71	70	2.17	159
44	39	5.92	80	2.03	0
44	40	27.96	177	1.77	90
44	41	22.27	7	2.03	90
44	42	7.36	0	1.84	74
44	43	2.65	73	1.77	0
44	44	12.81	13	3.09	80
44	45	12.25	5	1.54	80
44	46	9.7	6	2.03	90
44	47	7.47	99	2.3	173
44	48	10.94	3	2.3	83
44	49	14.9	13	3.04	90
44	50	7.82	54	1.13	153
44	51	17.54	2	1.79	98
44	52	15.52	176	2.03	90
44	53	15.04	168	2.03	90
44	54	13.48	176	1.52	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
44	55	12.21	176	1.52	90
44	56	4.1	111	2.79	0
44	57	6.28	43	2.15	135
44	58	18.7	41	2.87	135
44	59	8.65	40	2.83	153
44	60	8.72	8	2.03	90
44	61	2.04	172	1.52	90
44	62	1.52	0	1.27	90
44	63	2.55	174	1.27	90
44	64	1.54	170	1.54	80
44	65	2.03	90	1.79	171
44	66	1.77	0	1.52	90
44	67	25.51	9	2.28	90
44	68	2.54	0	1.52	90
44	69	2.03	0	1.84	74
44	70	2.03	90	1.84	15
44	71	2.3	83	1.77	0
44	72	28.1	167	1.27	90
44	73	10.58	30	2.18	125
44	74	28.56	9	2.04	97
44	75	10.63	40	1.98	140
44	76	4.57	0	3.38	77
44	77	3.38	12	1.6	108
44	78	5.59	50	4.44	149
44	79	4.38	10	1.79	81
44	80	2.04	172	1.84	74
44	81	30.18	112	5.48	13
44	82	22.13	93	1.52	0
44	83	11.5	157	1.79	44
44	84	28.61	16	2.54	90
44	85	19.3	90	1.79	171
44	86	3.59	98	2.04	7
44	87	16.25	61	1.93	156
44	88	4.63	9	1.27	90
44	89	2.09	14	1.79	98
44	90	1.79	8	1.52	90
44	91	3.21	108	2.83	26
44	92	12.15	26	1.43	135
44	93	2.28	0	1.79	81

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
44	94	2.59	78	2.28	0
44	95	23.89	87	1.77	0
44	96	13.84	42	2.34	139
44	97	5.84	0	2.04	82
44	98	1.79	8	1.77	90
44	99	2.03	0	1.79	81
44	100	6.83	41	0.91	146
44	101	3.05	4	2.55	84
44	102	17.97	23	2.03	90
44	103	3.31	175	2.03	90
45	1	4.54	63	2.09	165
45	2	7.27	60	1.29	168
45	3	4.68	77	0.76	0
45	4	5.3	73	1.52	0
45	5	3.88	78	1.36	158
45	6	3.18	61	1.13	153
45	7	3.63	12	3.31	85
45	8	2.83	100	1.52	0
45	9	4.66	67	0.8	18
45	10	1.79	81	1.52	0
45	11	6.35	0	4.07	93
45	12	6.14	82	2.28	0
45	13	5.1	5	2.65	106
45	14	3.3	67	1.01	0
45	15	6.36	61	1.36	158
45	16	4.9	68	1.77	0
45	17	3.31	94	1.27	0
45	18	4.18	75	4.13	169
45	19	1.93	66	1.6	161
45	20	4.66	60	1.79	171
45	21	3.21	71	1.77	0
45	22	3.94	165	2.54	53
45	23	19.94	173	2.04	97
45	24	1.93	23	1.77	90
45	25	3.66	56	1.48	149
45	26	2.61	60	1.6	161
45	27	2.55	84	2.03	0
45	28	2.73	68	1.29	168
45	29	8.75	60	2.27	153

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
45	30	3.21	71	2.04	172
45	31	1.52	90	0.76	0
45	32	3.77	70	1.52	0
45	33	5.08	90	1.01	0
45	34	3.21	71	1.52	0
45	35	2.03	90	1.52	0
45	36	17.72	62	2.17	159
45	37	10.44	94	2.27	26
45	38	6.1	92	1.6	18
45	39	7.82	76	1.27	0
45	40	2.54	90	1.01	0
45	41	21.19	103	0.76	0
45	42	27.32	106	2.4	18
45	43	3.21	18	2.65	106
45	44	5.06	72	1.7	153
45	45	8.07	77	1.84	15
45	46	3.77	70	1.93	156
45	47	6.27	68	2.5	156
45	48	6.66	49	1.79	135
45	49	6.51	69	1.54	170
45	50	6.62	94	3.04	0
45	51	3.05	175	3.04	90
45	52	6.58	62	2.09	165
45	53	3.81	176	2.34	77
45	54	3.55	90	3.3	0
45	55	9.54	61	3.81	176
45	56	3.45	53	1.13	153
45	57	5.28	54	1.48	149
45	58	4.44	59	1.84	164
45	59	3.4	63	1.93	156
45	60	3.45	72	1.6	161
45	61	2.17	69	1.36	158
45	62	5.34	64	1.52	0
45	63	5.11	63	1.48	149
45	64	2.15	44	1.83	146
45	65	3.25	51	1.48	149
45	66	1.77	90	1.29	11
45	67	2.79	90	2.03	0
45	68	6.1	73	1.79	171

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
46	1	31.68	77	1.27	0
46	2	4.85	83	4.32	176
46	3	2.83	169	2.54	90
46	4	24.21	74	1.77	0
46	5	4.13	79	2.28	0
46	6	9.24	74	1.01	0
46	7	21.31	74	0.5	0
46	8	32.54	82	2.04	172
46	9	3.84	82	1.01	0
46	10	3.59	81	0.5	0
46	11	9.99	117	2.34	40
46	12	40.13	96	1.77	0
46	13	21.23	53	2.87	135
46	14	13.5	48	1.6	108
46	15	29.33	60	2.4	161
46	16	2.03	90	1.52	0
46	17	7.47	170	4.9	68
46	18	10.57	144	1.48	59
46	19	17.07	59	1.48	149
46	20	9.73	74	1.27	0
46	21	19.44	107	2.61	29
46	22	22.86	167	1.01	90
46	23	10.23	133	3.77	42
46	24	12.28	172	1.52	90
46	25	14.17	126	2.51	44
46	26	2.39	57	1.04	165
46	27	20.78	54	2.15	135
46	28	2.3	83	1.01	0
46	29	2.03	90	1.52	0
46	30	2.03	90	1.52	0
46	31	2.3	96	1.54	9
46	32	6.24	63	2.97	70
46	33	3.55	90	1.77	0
46	34	5.49	123	2.83	10
46	35	14.08	115	1.79	44
46	36	16.17	67	1.62	51
46	37	23.25	83	1.04	165
46	38	12.79	96	1.27	0
46	39	1.54	80	1.29	11

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
46	40	2.04	7	1.79	81
46	41	3.05	138	2.34	12
46	42	2.34	40	1.79	171
46	43	23.09	81	2.3	83
46	44	23.81	78	1.27	0
46	45	2.28	0	1.98	140
46	46	7.77	78	1.52	0
46	47	28.53	85	1.29	11
47	1	66.07	88	1.27	0
47	2	29.58	60	2.15	135
47	3	19.44	109	2.17	20
47	4	32.51	90	1.54	9
47	5	27.95	91	1.27	0
47	6	45.62	107	1.54	9
47	7	21.14	65	1.79	171
47	8	40.8	54	1.27	143
47	9	11.68	90	0.76	0
47	10	18.83	93	1.52	0
47	11	42.27	110	1.48	59
47	12	66.73	120	2.04	29
47	13	6.86	92	1.79	8
47	14	19.61	85	1.54	170
47	15	47.95	135	1.83	33
47	16	43	97	1.04	14
47	17	25.46	141	0.5	90
47	18	10.51	142	2.17	69
47	19	18.87	95	1.01	0
47	20	25.2	94	1.77	0
47	21	30.78	123	1.79	44
47	22	29.34	95	1.52	0
47	23	83.03	106	2.4	18
47	24	46.6	155	2.5	66
47	25	41.36	161	2.17	69
47	26	69.5	105	1.48	30
47	27	98.98	147	1.62	51
47	28	8.29	49	2.96	120
47	29	3.88	11	3.31	94
47	30	9.65	0	7.62	91
47	31	36.11	102	1.52	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
47	32	14.75	92	1.52	0
47	33	23.68	94	1.01	0
47	34	49.75	134	1.84	74
47	35	4.18	75	2.34	167
47	36	27.47	160	1.7	63
47	37	19.34	29	1.98	140
47	38	11.65	110	1.79	8
47	39	8.97	115	1.62	38
47	40	12.85	18	1.54	99
47	41	33.85	116	1.6	71
47	42	6.64	96	1.52	0
47	43	22.24	6	2.34	102
47	44	75.02	109	1.27	36
47	45	47.1	137	2.04	82
47	46	56	8	2.54	90
47	47	34.82	2	1.29	101
47	48	56.99	132	2.18	35
47	49	42.24	86	2.83	169
47	50	6.68	81	1.52	0
47	51	11.01	64	1.83	146
47	52	11.5	83	1.77	0
47	53	22.89	130	2.83	63
47	54	2.34	102	2.17	159
47	55	2.3	96	1.77	0
47	56	13.83	82	2.04	172
47	57	17.54	92	1.52	0
47	58	17.06	85	1.52	0
47	59	15.59	127	1.29	78
47	60	11.22	95	0.91	146
47	61	5.86	85	1.77	0
47	62	35.02	161	1.27	90
47	63	31.65	162	1.77	90
47	64	28.94	100	2.28	0
47	65	44.58	101	1.77	0
47	66	31.16	109	2.34	12
47	67	42.92	98	1.52	0
47	68	13.25	12	1.36	111
47	69	9.2	96	1.52	0
47	70	11.94	156	2.03	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
47	71	59.36	108	1.62	38
47	72	5.14	147	1.6	71
47	73	35.02	113	1.27	36
47	74	88.83	95	1.27	0
47	75	21.54	52	2.54	143
47	76	9.01	57	1.6	161
47	77	20.12	94	1.29	168
47	78	20.52	102	1.04	14
47	79	17.79	92	1.13	26
47	80	17.53	88	2.03	0
47	81	77.28	105	2.5	23
47	82	7.87	91	3.55	0
47	83	4.6	96	2.17	20
47	84	10.85	106	1.01	0
47	85	11.89	109	0.91	33
47	86	10.11	78	1.13	153
47	87	19.34	86	2.03	0
47	88	14.18	134	1.79	44
47	89	19.42	27	1.79	98
47	90	16.82	28	2.18	125
47	91	23.86	163	3.04	90
47	92	23.68	67	1.98	140
47	93	18.31	93	3.3	0
48	1	38.79	5	1.77	90
48	2	48.87	136	3.31	32
48	3	15.84	131	1.6	18
48	4	19.67	129	1.27	36
48	5	32.9	132	2.17	20
48	6	53.29	142	3.21	71
48	7	31.88	78	2.73	158
48	8	9	111	2.79	0
48	9	13.8	102	1.79	8
48	10	23.76	79	2.59	168
48	11	14.88	64	1.6	161
48	12	5.59	92	2.54	0
48	13	28.27	98	5.08	2
48	14	29.94	77	2.5	156
48	15	6.5	141	2.54	36
48	16	12.4	112	2.04	29

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
48	17	10.28	122	1.43	44
48	18	9.7	96	1.27	0
48	19	6.87	94	2.04	7
48	20	11.9	140	2.18	54
48	21	6.68	98	2.04	29
48	22	13.48	132	3.23	44
48	23	8.53	149	2.34	40
48	24	29.89	80	1.01	0
48	25	25.62	70	2.54	143
48	26	20.09	87	1.01	0
48	27	14.86	123	1.84	15
48	28	25.92	87	1.27	0
48	29	10.47	50	1.6	161
48	30	31.32	138	2.34	40
48	31	20.32	18	1.01	90
48	32	32.8	2	1.29	78
48	33	14.15	68	6.71	150
48	34	6.35	92	5.84	0
48	35	18.83	93	1.84	15
48	36	46.7	69	3.86	156
48	37	11.65	110	8.07	12
48	38	15.56	153	2.27	63
48	39	7.11	90	2.59	11
48	40	4.66	157	2.8	84
48	41	11.06	170	7.27	65
48	42	15.04	111	3.53	21
48	43	19.97	97	3.14	14
48	44	13.43	105	2.28	0
48	45	32.17	84	1.79	8
48	46	10.25	138	2.7	48
48	47	13.29	118	3.4	26
48	48	6.18	80	1.01	0
48	49	16.13	97	3.05	4
51	1	23.82	35	1.62	128
51	2	14.79	164	1.83	56
51	3	32.81	93	4.83	3
51	4	12.85	52	1.48	149
51	5	21	75	1.27	0
51	6	13.92	75	1.6	161

Raw Data by Tooth

Tooth Number	Feature Number	Major Axis Length	Major Axis Slope	Minor Axis Length	Minor Axis Slope
51	7	26.62	74	1.01	0
51	8	28.05	73	1.29	11
51	9	35.5	17	1.93	113
51	10	30.63	168	0.8	71
51	11	32.48	15	2.03	90
51	12	66.43	93	1.52	0
51	13	31.08	22	1.84	105
51	14	100.22	44	2.61	119
51	15	64.26	53	1.36	158
51	16	32.1	30	2.73	111
51	17	18.81	2	1.13	63
51	18	23.88	91	1.27	0
51	19	62.3	35	3.05	131
51	20	41.85	72	2.03	0
51	21	51.99	94	2.59	168
51	22	22.12	92	1.77	0
51	23	16.24	116	2.04	29
51	24	33.5	63	1.54	170
51	25	16.72	59	2.18	144
51	26	62.77	146	1.98	39
51	27	37.18	71	1.54	170
51	28	17.8	93	1.27	0
51	29	17.15	64	2.34	139
51	30	30.05	22	1.36	111
51	31	29.2	76	1.52	0
51	32	46.82	71	1.84	164
51	33	97.05	156	2.89	52
51	34	16.18	137	2.27	26
51	35	12.45	50	2.87	135
51	36	39.37	99	1.79	8
51	37	61.71	78	2.03	0
51	38	11.13	34	1.84	105
51	39	7.64	74	1.27	0
51	40	15.25	92	1.27	0
51	41	19.37	79	1.27	0
51	42	14.16	57	1.48	149
51	43	17.39	83	2.04	7
51	44	29.87	142	1.98	50
51	45	7.39	15	1.84	105

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
51	46	41.06	16	0.8	108
51	47	37.71	164	1.07	44
51	48	27.47	103	1.29	168
51	49	6.39	173	3.09	80
51	50	15.56	151	1.62	51
51	51	9.52	43	3.88	101
51	52	25.09	58	1.7	153
51	53	27.29	95	1.29	11
51	54	14.53	84	1.29	11
51	55	22.55	97	2.28	0
51	56	70.13	68	6.03	165
51	57	45.79	17	2.39	122
51	58	76.83	68	2.87	135
51	59	21.14	35	3.1	124
51	60	25.54	131	1.13	26
51	61	18.9	59	2.74	146
51	62	5.86	85	1.27	0
51	63	21.07	74	1.01	0
51	64	15.66	19	2.17	110
51	65	16.9	147	2.34	49
51	66	20.78	141	3.06	65
51	67	17.68	35	2.17	110
51	68	10.42	55	1.83	146
51	69	17.96	98	1.77	0
51	70	23.74	63	1.29	168
51	71	19.44	19	1.27	90
51	72	32.05	65	1.54	170
51	73	15.21	75	2.55	174
51	74	20.91	65	2.09	165
51	75	15.21	75	1.52	0
51	76	20.33	177	2.3	96
51	77	23.45	72	2.59	168
52	1	48.13	54	1.54	170
52	2	2.54	0	2.03	90
52	3	99.05	158	2.34	77
52	4	18.01	21	2.28	90
52	5	20.72	11	2.28	90
52	6	20.58	128	1.79	8
52	7	24.05	158	3.09	80

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
52	8	38.56	160	1.62	51
52	9	18	163	1.36	68
52	10	72.08	73	2.28	0
52	11	45.79	67	2.03	0
52	12	7.82	76	5.92	170
52	13	28.42	114	6.35	0
52	14	15.34	109	2.04	7
52	15	34.63	175	1.79	81
52	16	32.03	165	1.77	90
52	17	19.81	157	1.77	90
52	18	7.15	83	3.3	0
52	19	5.84	90	2.28	0
52	20	7.97	37	4.32	176
52	21	2.3	6	1.77	90
52	22	16.69	146	1.79	81
52	23	2.54	0	1.54	99
52	24	16.76	90	2.54	0
52	25	15.29	57	2.04	172
52	26	20.72	36	2.89	127
52	27	18.31	56	2.09	165
52	28	78.02	49	2.17	159
52	29	15.02	86	6.62	175
52	30	3.04	0	2.83	79
52	31	7.08	165	6.27	68
52	32	2.79	90	2.04	7
52	33	2.7	131	2.17	20
52	34	5.38	19	2.28	90
52	35	8.68	20	2.83	116
52	36	4.81	108	2.34	40
52	37	6.5	141	1.48	59
52	38	8.38	90	1.77	0
52	39	3.88	101	2.17	20
52	40	5.61	95	4.1	21
52	41	2.73	158	1.77	90
53	1	52.61		1.07	135
53	2	86.2	177	1.27	53
53	3	37.9	176	2.09	75
53	4	66.87	177	1.27	90
53	5	20.14	103	1.27	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
53	6	25.9	90	1.13	153
53	7	31.85	85	2.61	150
53	8	22.91	54	3.4	116
53	9	49.95	39	3.3	112
53	10	32.73	24	3.06	114
53	11	25.28	22	1.83	123
53	12	30.15	23	2.04	119
53	13	15	33	2.27	116
53	14	18.03	32	3.31	122
53	15	16.45	98	1.01	0
53	16	35.6	92	1.54	170
53	17	6.98	109	1.48	30
53	18	9.49	164	5.67	100
53	19	11.43	88	1.79	171
53	20	22.15	86	1.54	9
53	21	12.45	163	1.6	71
53	22	29.62	5	1.04	104
53	23	27.26	152	1.04	75
53	24	28.19	150	1.07	44
53	25	20.32	143	0.91	56
53	26	17.96	146	1.27	53
53	27	34.34	82	3.66	146
53	28	39.76	48	1.27	126
53	29	26.37	28	2.27	116
53	30	39.37	178	1.29	101
53	31	38.1	179	1.01	90
53	32	18.54	179	1.01	90
53	33	8.07	114	1.77	0
53	34	8.44	136	1.07	44
53	35	8.37	104	0.76	0
53	36	63.71	70	2.27	153
53	37	12.07	22	2.09	104
53	38	49.43	16	2.04	97
53	39	44.47	13	1.77	90
53	40	7.97	9	2.5	113
53	41	14.9	13	1.6	108
53	42	30.49	150	2.74	56
53	43	48.27	178	1.77	90
53	44	28.95	179	1.29	78

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
53	45	26.45	176	0.91	56
53	46	20.07	38	3.1	124
53	47	43.23	73	2.83	153
53	48	47.68	104	2.79	0
53	49	15.1	70	3.87	148
53	50	18.47	71	1.29	168
53	51	13.86	76	1.79	171
53	52	47.09	137	1.07	44
53	53	11.56	19	1.98	140
53	54	11.43	36	1.98	129
53	55	4.74	105	2.89	15
53	56	31.99	163	1.13	63
53	57	12.14	37	1.62	128
53	58	14.91	42	2.4	161
53	59	29.4	148	0.56	63
53	60	10.92	91	1.27	0
53	61	9.3	55	1.62	128
53	62	16.85	83	1.77	0
53	63	16.69	116	1.29	11
53	64	14.72	57	1.27	143
53	65	17.8	137	1.27	36
53	66	24.55	140	0.91	56
53	67	23.74	145	0.8	71
53	68	18.52	42	1.98	140
53	69	12.61	139	4.01	34
53	70	33.28	38	3.25	128
53	71	30.58	52	2.89	164
53	72	12.61	64	2.55	174
53	73	33.83	41	2.15	135
53	74	20	81	1.79	8
53	75	30.48	79	1.01	0
53	76	12.28	60	1.84	164
53	77	19.03	18	1.48	120
53	78	7.05	30	1.13	116
53	79	4.81	108	1.36	21
53	80	5.18	78	2.28	0
53	81	14.72	14	1.84	105
53	82	8.59	34	2.61	119
53	83	14.74	1	2.54	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
53	84	15	156	2.04	60
53	85	22.06	168	2.55	95
53	86	24.19	4	2.65	106
53	87	12.78	110	1.04	165
53	88	18.24	145	2.54	0
53	89	20.87	143	1.04	14
53	90	26.8	41	2.15	135
53	91	17.17	23	1.27	90
53	92	11.24	154	1.04	75
53	93	16.76	90	1.01	0
53	94	20.76	7	1.48	120
53	95	9.14	88	0.76	0
54	1	59.57	110	2.4	18
54	2	53.71	141	1.83	56
54	3	40.85	141	1.6	18
54	4	13.17	129	1.27	53
54	5	13.25	77	1.52	0
54	6	11.2	122	1.79	44
54	7	15.94	120	2.34	40
54	8	49.44	120	2.04	29
54	9	40.64	89	1.04	14
54	10	32.12	71	0.91	146
54	11	55.68	136	3.52	30
54	12	61.06	81	2.28	0
54	13	26.11	127	2.89	37
54	14	27.6	75	1.84	164
54	15	20.55	140	1.62	38
54	16	9.33	112	1.77	0
54	17	34.15	112	2.34	12
54	18	31.79	134	1.98	50
54	19	39.7	133	1.62	38
54	20	33.04	135	1.43	44
54	21	20.67	117	1.93	23
54	22	46.94	142	1.27	53
54	23	11.87	131	2.51	44
54	24	19.06	131	1.79	44
54	25	32.71	148	1.7	63
54	26	35.46	141	1.48	59
54	27	39.54	129	1.62	38

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
54	28	30.54	43	2.27	153
54	29	13.87	113	2.09	14
54	30	14.59	121	4.5	16
54	31	4.88	98	2.04	7
54	32	35.46	114	2.74	33
54	33	56.07	97	1.29	168
54	34	23.77	108	2.55	5
54	35	11	108	1.79	171
54	36	21.99	104	1.27	0
54	37	60.02	98	1.52	0
54	38	65.88	97	1.52	0
54	39	40.1	141	3.25	51
54	40	32.04	138	3.4	63
54	41	27.68	132	1.43	44
54	42	15.42	107	1.29	11
54	43	16.44	103	1.29	168
54	44	7.62	150	2.04	60
54	45	9.31	107	1.52	0
54	46	12.26	140	2.27	26
54	47	39.02	113	2.5	23
54	48	33.82	79	1.84	164
54	49	25.6	143	2.15	44
54	50	12.42	139	3.45	53
54	51	14.38	110	2.65	16
54	52	29.78	93	2.4	161
54	53	23.64	87	2.8	5
54	54	4.06	90	2.3	173
54	55	32.76	142	2.87	44
54	56	10.99	139	1.43	44
54	57	46.02	142	1.79	44
54	58	26.49	145	1.79	44
54	59	3.41	131	1.79	8
54	60	16.32	110	3.04	0
54	61	21.69	115	2.74	33
54	62	22.86	89	2.03	0
55	1	122.84	148	2.03	90
55	2	45.92	40	1.07	135
55	3	17.04	93	0.76	0
55	4	26.77	51	0.71	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
55	5	27	148	1.07	44
55	6	8.26	44	1.62	128
55	7	70.09	56	3.45	143
55	8	36.28	80	0.5	0
55	9	41.05	79	0.5	0
55	10	26.7	55	0.56	153
55	11	77.36	129	1.27	53
55	12	50.86	87	1.13	153
55	13	45.52	87	0.76	0
55	14	26.74	22	1.13	116
55	15	27.96	34	0.91	146
55	16	23.56	48	1.62	141
55	17	6.47	25	1.27	90
55	18	12.61	9	2.18	54
55	19	17.03	72	1.36	158
55	20	26.1	70	1.6	161
55	21	15.04	68	1.54	170
55	22	7.27	12	1.77	90
55	23	29.94	57	1.79	135
55	24	37.92	50	1.13	153
55	25	39.27	53	1.27	143
55	26	32.61	56	0.8	161
55	27	24.22	60	1.6	161
55	28	31.28	7	2.3	96
55	29	10.63	56	0.5	0
55	30	36.06	78	1.27	0
55	31	12.54	31	1.98	129
55	32	49.99	73	1.27	0
55	33	57.59	72	2.09	165
55	34	49.41	62	1.27	143
55	35	33.28	15	2.03	90
55	36	23.65	14	1.79	81
55	37	11.85	9	1.29	78
55	38	8.38	144	1.48	30
55	39	45.66	64	1.48	149
55	40	20.93	35	2.04	150
55	41	14.97	75	1.04	165
55	42	16.48	56	1.7	153
55	43	25.62	72	1.52	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
55	44	55.54	63	2.04	150
55	45	22.54	56	1.7	153
55	46	60.28	86	1.77	0
55	47	57.3	40	2.39	122
55	48	30.07	37	1.79	135
55	49	109.86	99	1.77	0
55	50	45.33	62	1.52	0
55	51	27.09	38	1.27	143
55	52	64.55	99	1.27	0
55	53	28.81	99	1.79	8
55	54	27.84	46	1.79	135
55	55	27.28	151	1.93	66
55	56	44.01	170	1.01	90
55	57	71.29	29	3.06	114
55	58	40.04	68	1.84	164
55	59	29.11	47	2.51	135
55	60	22.52	29	2.18	125
55	61	35.37	57	2.5	156
55	62	68.91	158	2.34	77
55	63	15.49	90	1.52	0
55	64	17.43	71	1.01	0
55	65	17.54	67	1.84	164
55	66	14.88	64	1.6	161
55	67	20.23	61	1.01	0
55	68	21.86	59	1.36	158
55	69	2.96	30	1.83	123
55	70	3.81	36	3.23	135
55	71	3.81	0	3.04	90
55	72	4.43	76	2.55	174
55	73	36.07	88	0.8	18
55	74	27.12	67	1.04	14
55	75	21.3	39	1.83	123
55	76	57.15	97	1.52	0
55	77	47.39	94	1.01	0
55	78	4.31	90	2.34	12
55	79	3.53	21	3.04	90
55	80	3.3	90	2.73	21
55	81	7.47	80	6.1	177
55	82	14.9	60	0.76	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
55	83	3.04	0	2.3	96
56	1	30.68	109	2.61	29
56	2	20	110	3.06	24
56	3	17.27	107	2.89	15
56	4	48.27	88	3.55	0
56	5	6.97	56	2.17	159
56	6	26.24	104	2.34	12
56	7	8.8	146	2.03	90
56	8	17.13	78	2.59	168
56	9	52.48	99	2.8	5
56	10	51.37	104	2.34	12
56	11	47.59	69	3.06	155
56	12	6.47	154	5.23	67
56	13	18	106	1.79	8
56	14	16.26	104	1.79	8
56	15	3.81	90	3.05	4
56	16	16.64	102	2.83	26
56	17	10.58	149	2.83	63
56	18	17.91	161	4.36	54
56	19	10.68	118	1.29	78
56	20	10.71	103	1.27	0
56	21	3.09	99	2.27	26
56	22	4.5	163	3.59	98
56	23	3.45	36	2.27	116
56	24	13.86	61	3.66	146
56	25	23.01	67	2.09	165
56	26	12.2	102	3.56	4
56	27	12.21	16	2.54	90
56	28	17.2	106	2.5	23
56	29	21.07	102	1.52	0
56	30	15.75	110	2.5	23
56	31	24.97	80	2.54	0
56	32	19.65	104	2.27	26
56	33	5.9	64	2.5	156
56	34	12.04	137	1.29	78
56	35	19.94	136	2.15	44
56	36	19.92	17	10.29	105
56	37	3.21	18	2.4	108
56	38	4.13	47	1.6	161

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
56	39	5.57	136	1.62	51
56	40	10.91	77	4.07	176
56	41	6.72	79	1.54	170
56	42	15.84	111	2.04	29
56	43	39.77	106	2.89	37
56	44	37.47	105	3.21	18
56	45	2.97	109	2.17	20
56	46	8.68	110	2.61	29
56	47	7.43	97	1.52	0
56	48	18.5	43	2.87	135
56	49	3.06	114	2.61	29
56	50	5.1	95	3.84	7
56	51	9.98	104	2.97	19
56	52	5.94	109	2.27	26
56	53	4.1	111	1.83	33
56	54	9.24	15	8.02	100
56	55	14.16	104	2.83	26
56	56	12.21	110	1.84	15
56	57	36.91	102	3.69	15
56	58	6.03	75	1.93	156
56	59	20.11	114	4.36	35
56	60	19.03	103	10.61	11
56	61	7.11	90	5.08	177
56	62	3.88	101	3.77	19
56	63	4.07	93	3.4	26
56	64	1.84	15	1.84	105
56	65	2.09	14	2.09	104
56	66	4.85	96	2.04	7
56	67	13.81	36	4.01	124
58	1	8.98	98	1.04	14
58	2	36.46	31	1.83	123
58	3	27.17	110	1.48	30
58	4	12.23	85	2.28	0
58	5	28.29	114	3.21	18
58	6	4.34	69	3.14	165
58	7	14.81	112	2.54	0
58	8	111.66	99	2.03	0
58	9	13.86	118	1.48	30
58	10	19.31	116	1.93	66

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
58	11	36.3	107	1.27	0
58	12	21.4	85	4.88	171
58	13	14.29	167	2.5	66
58	14	12.28	150	2.7	48
58	15	7.4	84	2.03	0
58	16	28.25	93	1.27	0
58	17	11.95	77	4.43	166
58	18	23.67	123	1.36	21
58	19	9.36	102	0.8	161
58	20	4.13	132	0.8	18
58	21	10.8	60	1.43	135
58	22	27.25	140	0.71	44
58	23	67.72	105	1.13	26
58	24	3.18	151	2.04	60
58	25	55.54	100	1.27	0
58	26	51.65	101	0.8	18
58	27	23.18	145	1.36	21
58	28	58.85	83	1.01	0
58	29	83.7	93	1.52	0
58	30	11.35	169	2.3	83
58	31	38.73	106	2.04	7
58	32	12.4	42	4.66	135
58	33	7.27	60	3.09	170
58	34	4.2	154	3.97	63
58	35	2.89	74	2.8	5
58	36	26.94	101	0.76	0
58	37	51.07	122	3.05	48
58	38	54.56	97	1.77	0
58	39	43.28	85	0.5	0
58	40	57.07	94	1.79	171
58	41	53.53	94	1.77	0
58	42	23.62	116	1.43	44
58	43	34.05	92	1.01	0
58	44	8.14	86	1.77	0
58	45	62.53	92	1.01	0
58	46	26.25	114	1.07	44
58	47	20.33	110	1.36	21
58	48	8.39	176	1.54	80
58	49	12.44	1	1.52	90

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
58	50	7.62	178	1.27	90
58	51	22.77	82	5.49	56
58	52	23.88	135	1.98	50
58	53	23.11	54	1.27	143
58	54	10.27	140	1.27	53
58	55	10.42	136	1.13	26
58	56	60.68	100	7.63	3
58	57	33.51	104	1.13	26
58	58	32.09	103	1.04	165
58	59	26.25	12	1.29	101
58	60	30.71	97	1.77	0
58	61	10.23	119	1.7	26
58	62	18.69	137	1.79	81
59	1	44.85	76	2.03	0
59	2	34.68	76	2.4	161
59	3	13.2	0	2.28	90
59	4	56.45	47	1.48	120
59	5	16.32	159	3.06	65
59	6	14.19	116	2.27	26
59	7	33.8	120	2.3	6
59	8	16.78	79	1.54	170
59	9	26.71	119	2.18	35
59	10	26.26	99	1.27	0
59	11	36.79	125	1.79	44
59	12	70.6	71	2.73	158
59	13	11.74	128	1.79	44
59	14	9.42	117	0.56	26
59	15	8.89	90	2.34	12
59	16	23.88	147	1.93	66
59	17	44.01	83	2.55	174
59	18	33.52	96	2.03	0
59	19	27.27	85	0.5	0
59	20	23.53	103	1.79	8
59	21	2.28	90	1.52	0
59	22	2.54	0	1.79	98
59	23	2.55	84	2.04	172
59	24	4.18	14	1.7	116
59	25	10.78	46	4.87	128
59	26	18.24	171	2.04	60

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
59	27	11.1	100	2.34	12
59	28	22.17	50	1.98	140
59	29	19.44	107	1.93	23
59	30	15.02	71	3.84	172
59	31	10.92	72	2.59	168
59	32	47.65	94	2.8	5
59	33	52.06	34	2.96	120
59	34	62.73	108	3.66	33
59	35	23.41	61	2.17	159
59	36	17.52	90	2.03	0
59	37	38.67	128	2.34	40
59	38	21.39	132	3.1	34
59	39	5.38	109	1.83	33
59	40	6.81	116	2.54	0
59	41	20.92	79	2.89	164
59	42	21.62	77	4.85	173
59	43	11.24	83	1.52	0
59	44	5.84	90	2.54	0
59	45	6.9	173	5.63	82
59	46	13.34	158	4.52	51
59	47	13.52	61	1.48	149
59	48	14.72	57	2.15	135
59	49	6.66	17	1.77	90
59	50	7.97	142	1.83	56
59	51	12.31	111	1.07	44
59	52	6.53	13	1.04	75
59	53	12.75	102	1.52	0
59	54	18.99	119	1.7	26
59	55	11.47	117	1.98	39
59	56	6.43	80	1.77	0
59	57	2.3	173	1.54	80
59	58	9.42	14	1.79	81
59	59	10.28	32	2.51	135
59	60	9.99	27	2.39	122
59	61	12.5	150	1.98	50
59	62	15.42	69	2.73	158
59	63	11.76	57	1.7	153
59	64	8.98	118	1.79	44
59	65	32.37	85	2.28	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
59	66	35.61	66	3.97	153
59	67	18.66	123	2.54	36
59	68	19.82	87	2.04	7
59	69	16.77	57	1.36	158
59	70	7.43	7	2.79	90
59	71	14.55	119	1.36	21
59	72	20.58	80	2.28	0
59	73	11.82	104	1.27	0
59	74	6.2	34	2.09	104
59	75	4.09	60	1.62	141
59	76	11.35	100	1.52	0
59	77	10.12	107	2.17	20
59	78	23.51	153	1.84	74
59	79	15.89	102	2.09	14
59	80	6.1	87	3.21	18
59	81	1.79	98	1.77	0
59	82	10.71	95	9.14	0
59	83	8.44	158	1.36	68
59	84	7.27	150	1.83	56
59	85	8.68	142	1.62	51
59	86	12.45	69	1.6	161
59	87	13.21	1	2.55	95
59	88	11.92	63	3.31	147
59	89	6.05	123	2.39	32
59	90	10.16	77	2.03	0
59	91	2.51	44	1.83	123
59	92	2.73	21	2.55	95
59	93	25.55	96	2.83	10
59	94	7.18	98	3.59	8
59	95	11.03	66	1.6	161
59	96	12.78	139	1.48	59
59	97	17.18	18	1.54	99
59	98	35.71	84	2.8	5
59	99	12.74	156	2.55	84
59	100	3.81	3	3.55	90
59	101	2.83	10	2.04	97
59	102	11.44	92	2.17	20
59	103	5.59	39	2.39	122
59	104	38.2	54	2.27	153

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
59	105	15.34	118	1.79	44
59	106	7.33	14	2.3	96
59	107	11.35	130	1.62	51
59	108	13.97	19	1.48	120
59	109	27.24	106	1.48	30
59	110	1.84	105	1.77	0
59	111	5.57	155	3.69	105
59	112	15.07	122	2.17	20
59	113	56.06	162	1.84	74
59	114	10.21	174	3.09	80
59	115	38.61	45	2.34	139
59	116	21.7	110	3.05	4
59	117	29.45	113	1.93	23
59	118	19.41	83	2.03	0
59	119	18.39	54	1.7	153
59	120	23.47	54	3.25	141
59	121	22.09	72	2.79	0
59	122	26.01	62	2.5	156
59	123	4.85	47	2.7	138
59	124	5.84	90	3.55	0
59	125	12.99	94	3.34	8
59	126	30.99	49	2.97	160
59	127	9.58	122	1.62	38
59	128	9.08	116	2.34	40
59	129	10.08	139	4.44	59
59	130	25.09	31	2.89	127
59	131	13.41	127	2.27	63
59	132	21.51	30	1.48	120
59	133	23.9	75	1.52	0
59	134	16.21	54	2.18	144
59	135	39.12	91	4.88	8
59	136	39.11	108	2.39	32
59	137	13.92	128	3.66	56
59	138	7.18	98	2.04	7
59	139	20.37	100	2.04	29
59	140	18.23	102	1.36	21
59	141	40.55	40	3.06	155
59	142	15.18	107	3.09	9
59	143	5.34	177	3.56	85

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
59	144	31.07	57	2.27	153
59	145	9.7	132	3.06	24
59	146	23.11	22	2.73	111
59	147	17.47	35	2.74	123
59	148	28.92	20	4.43	113
59	149	13.59	147	4.9	68
59	150	4.06	90	2.03	0
59	151	25.52	132	1.48	30
59	152	27.74	78	2.65	163
59	153	5.47	111	2.83	10
59	154	10.44	108	1.6	18
59	155	7.33	104	1.48	30
59	156	16.54	107	2.04	29
59	157	36.21	84	2.28	0
59	158	12.79	96	2.17	20
59	159	8.38	90	1.29	11
59	160	8.63	1	4.07	86
59	161	7.18	122	1.27	36
59	162	10.27	81	2.79	0
59	163	4.6	173	2.8	84
59	164	6.6	112	2.83	10
59	165	16.54	86	1.29	168
59	166	3.77	109	2.04	29
61	1	49.31	56	1.43	135
61	2	22.61	91	1.01	0
61	3	45.59	77	1.01	0
61	4	24.67	81	1.27	0
61	5	44.45	90	1.52	0
61	6	43.69	77	1.01	0
61	7	18.4	39	2.27	116
61	8	41.55	138	1.48	30
61	9	36.2	49	1.93	113
61	10	36.36	61	1.6	161
61	11	49.3	27	1.48	120
61	12	32.17	174	1.62	51
61	13	46.76	17	1.93	113
61	14	77.69	97	1.77	0
61	15	27.6	63	1.29	168
61	16	32.12	34	1.6	108

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
61	17	4.25	72	1.52	0
61	18	72.56	20	1.84	105
61	19	64.36	168	1.48	59
61	20	4.09	97	3.38	12
61	21	53.26	17	2.04	119
61	22	73.4	140	1.52	90
61	23	32	89	0.56	26
61	24	37.27	84	2.04	150
61	25	24.35	78	2.4	161
61	26	28.95	76	2.3	173
61	27	29.62	59	1.83	146
61	28	13.97	92	1.01	0
61	29	30.8	86	1.36	158
61	30	15.35	55	1.27	126
61	31	22.45	44	2.7	131
61	32	13.18	74	1.01	0
61	33	16.39	139	1.07	44
61	34	31.82	171	4.07	93
61	35	12.56	104	1.77	0
61	36	28.06	99	1.27	0
61	37	27.6	96	2.65	163
61	38	17.47	32	1.83	123
61	39	40.23	28	2.34	130
61	40	36.84	13	2.09	104
61	41	45.11	54	2.83	153
61	42	39.13	6	1.6	71
61	43	17.04	28	2.34	130
61	44	16.79	93	3.81	3
61	45	23.41	167	2.34	49
61	46	27.6	165	1.27	53
61	47	9.53	48	2.09	165
61	48	17.04	65	2.17	159
61	49	38.74	104	1.54	9
61	50	32.14	45	1.62	141
61	51	6.02	27	3.88	101
61	52	5.8	156	4.13	79
61	53	16.75	104	0.8	18
61	54	47.07	17	3.05	94
61	55	41.23	154	1.62	51

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
61	56	25.15	133	2.34	49
61	57	5.06	72	1.54	170
61	58	30.1	84	1.84	164
61	59	41.4	90	1.79	171
61	60	43.09	78	2.83	169
61	61	18.95	72	1.01	0
61	62	24.87	57	2.5	156
61	63	3.53	21	2.83	100
61	64	5.1	5	4.38	100
61	65	6.09	90	4.57	0
61	66	5.84	0	4.13	79
61	67	13.81	57	2.34	139
61	68	3.59	81	2.55	174
61	69	14.99	51	1.83	146
61	70	21.92	43	2.4	161
61	71	43.39	112	1.54	9
61	72	20.82	52	1.54	170
61	73	23.81	56	2.04	150
61	74	38.61	179	1.29	101
61	75	18.54	76	1.52	0
61	76	19.47	77	1.77	0
61	77	16.34	57	1.13	153
61	78	12.68	57	1.84	164
61	79	10.63	56	2.04	150
61	80	14.55	42	2.73	158
61	81	33.11	85	2.03	0
61	82	5.92	80	1.04	165
61	83	14.55	137	2.34	49
61	84	31.51	40	1.62	128
61	85	31.81	160	2.18	54
61	86	23.69	30	1.62	141
61	87	51.83	28	1.7	116
62	1	7.27	167	6.37	85
62	2	132.08	148	2.18	54
62	3	55.18	109	1.27	0
62	4	46.61	94	1.01	0
62	5	63.02	178	1.77	90
62	6	97.97	93	1.77	0
62	7	5.63	97	1.27	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
62	8	91.23	91	2.04	7
62	9	24.54	61	2.54	143
62	10	51.1	52	3.4	153
62	11	8.03	161	1.7	63
62	12	36.21	55	1.62	128
62	13	9.9	0	1.52	90
62	14	6.76	145	1.43	44
62	15	34.23	123	1.6	18
62	16	12.19	125	1.13	26
62	17	8.86	117	1.27	36
62	18	25.65	121	2.34	49
62	19	26.15	82	0.56	153
62	20	39.66	32	2.17	110
62	21	15.47	156	1.83	56
62	22	9.15	160	2.5	66
62	23	47.35	3	1.79	81
62	24	47.75	0	3.04	90
62	25	42.61	61	1.7	153
62	26	36.12	64	1.84	164
62	27	10.68	151	2.04	60
62	28	30.15	34	1.84	105
62	29	53.61	41	3.1	124
62	30	20.32	71	1.27	0
62	31	39.87	55	2.34	139
62	32	14.51	147	3.87	31
62	33	29.89	24	2.89	127
62	34	120.25	174	2.79	90
62	35	25.54	41	2.74	146
62	36	71.23	101	1.01	0
62	37	71.7	95	1.01	0
62	38	39.98	126	1.93	23
62	39	12.7	91	1.04	14
62	40	14.23	87	1.04	14
62	41	8.94	145	3.69	15
62	42	51.61	47	1.62	128
62	43	14.02	137	1.93	23
62	44	15.26	161	2.04	60
62	45	33.76	148	1.43	44
62	46	41.14	89	2.65	163

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
62	47	22.65	107	2.17	20
62	48	23.69	107	1.01	0
62	49	18.14	136	1.48	30
62	50	30.98	89	2.55	174
62	51	17.82	122	2.04	7
62	52	9.23	7	1.01	90
62	53	29.44	34	2.04	119
62	54	29.26	13	2.97	109
62	55	17.2	163	3.18	61
62	56	9.6	142	1.84	15
62	57	19.59	76	1.01	0
62	58	40.7	119	2.79	0
62	59	39.39	35	2.74	123
62	60	53.83	38	2.34	139
62	61	22.5	69	2.04	172
62	62	15.54	78	2.28	0
62	63	11.95	102	1.6	18
62	64	26.97	37	4.49	132
62	65	13.94	123	1.29	11
62	66	44.68	49	2.96	149
62	67	21.93	47	2.17	159
62	68	44.76	173	1.77	90
62	69	53.45	69	1.04	165
62	70	31.1	141	2.89	37
62	71	58.19	44	2.5	113
62	72	72.92	68	3.31	175
62	73	96.66	96	1.77	0
62	74	73.8	93	1.52	0
62	75	46.07	75	1.13	153
62	76	41.43	83	1.01	0
62	77	50.77	99	1.6	18
62	78	23.18	42	1.98	129
62	79	2.79	90	2.28	0
62	80	20.01	23	1.48	149
62	81	41.25	9	1.01	90
62	82	22.74	159	1.79	44
62	83	20	20	2.09	104
62	84	13.54	149	2.03	90
62	85	16.07	148	1.7	63

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
62	86	13.2	149	2.15	44
62	87	27.85	77	1.52	0
62	88	6.42	71	0.8	161
62	89	7.18	81	1.01	0
62	90	28.51	152	2.87	44
62	91	17.78	21	5.79	105
62	92	12.09	39	1.79	135
62	93	16.94	19	1.98	129
62	94	7.72	117	1.43	44
62	95	46.28	87	1.01	0
62	96	8.59	161	3.77	70
62	97	3.4	153	3.14	75
62	98	18.9	131	1.27	36
62	99	17.26	122	1.54	9
62	100	37.67	86	1.54	9
62	101	12.85	119	1.6	18
62	102	26.15	78	2.04	7
62	103	19.94	83	2.03	0
62	104	35.62	38	4.2	154
62	105	18.14	43	1.93	156
62	106	7.89	56	1.79	135
62	107	3.41	41	1.98	129
62	108	56.64	90	1.84	15
62	109	30.86	129	1.13	63
62	110	27.48	136	1.98	50
62	111	74.73	92	1.52	0
63	1	4.13	100	3.14	14
63	2	54.9	20	2.65	106
63	3	42.46	53	2.39	147
63	4	34.23	56	1.62	141
63	5	27.4	55	1.6	161
63	6	3.38	77	2.17	159
63	7	71.26	30	2.34	130
63	8	4.34	83	2.54	0
63	9	13.34	68	2.17	159
63	10	44.58	108	1.43	44
63	11	2.5	23	2.34	102
63	12	83.84	6	1.77	90
63	13	125.86	62	3.31	147

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
63	14	123.86	65	3.45	162
63	15	28.11	67	3.77	160
63	16	36.03	99	3.56	175
63	17	15.9	26	1.93	113
63	18	29.19	27	1.62	141
63	19	10.92	54	2.03	0
63	20	2.27	63	1.54	170
63	21	5.23	67	3.69	164
63	22	89.23	108	1.79	8
63	23	28.91	51	1.79	135
63	24	84.37	60	1.36	158
63	25	26.49	145	3.18	61
63	26	52.88	143	4.16	52
63	27	127.08	61	3.31	147
63	28	58.38	78	1.04	165
63	29	65.85	78	1.27	0
63	30	23.42	99	1.04	14
63	31	18.85	104	1.36	21
63	32	34.48	44	1.48	120
63	33	30.39	41	1.7	116
63	34	31.11	47	1.43	135
63	35	39.85	67	2.18	144
63	36	2.3	83	1.52	0
63	37	3.05	4	2.04	82
63	38	3.63	65	3.38	167
63	39	4.34	159	2.39	57
63	40	64.11	52	3.61	140
63	41	31.7	33	1.6	108
63	42	9.17	48	2.83	169
63	43	43.87	69	2.28	0
63	44	60.61	125	2.04	60
63	45	34.81	54	1.79	135
63	46	27.78	53	1.36	158
63	47	35.88	97	1.07	44
63	48	28.53	110	1.62	51
63	49	12.13	109	2.96	30
63	50	31.63	60	1.77	0
63	51	18.31	66	2.03	0
63	52	16.88	68	1.29	11

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
63	53	75.68	54	1.93	156
63	54	33.69	5	2.3	83
63	55	25.95	73	0.8	161
63	56	54.57	61	1.7	153
63	57	22.76	79	1.27	0
63	58	49.27	37	2.04	150
63	59	53.34	68	2.03	0
63	60	60.94	59	3.04	0
63	61	52.11	79	3.55	0
63	62	4.43	76	2.54	0
63	63	37.63	87	1.29	11
63	64	37.08	90	1.77	0
63	65	36.05	66	2.17	159
63	66	40.09	63	3.18	151
63	67	34.57	77	1.04	165
63	68	50	69	1.54	170
63	69	4.85	47	2.61	119
63	70	3.59	44	2.5	113
63	71	44.56	65	2.09	165
63	72	3.84	7	1.77	90
63	73	3.25	38	2.51	135
63	74	40.99	120	2.04	29
63	75	40.55	115	1.62	38
63	76	13.17	56	1.98	140
63	77	36.46	63	2.83	153
63	78	2.73	68	2.27	153
63	79	2.34	167	2.04	60
63	80	35.37	60	1.54	170
63	81	19.31	114	1.62	51
63	82	10.63	49	1.27	143
63	83	8.07	65	1.79	171
63	84	30.9	38	2.34	139
63	85	14.99	51	2.54	143
63	86	36.54	72	3.04	0
63	87	3.06	65	1.01	0
63	88	29.53	64	1.04	165
63	89	26.67	88	1.54	170
63	90	7.39	74	1.13	153
63	91	70.65	63	1.29	168

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
63	92	36.65	50	2.51	135
63	93	32.04	64	3.77	160
63	94	22.86	49	1.62	128
63	95	2.8	5	2.3	83
63	96	2.55	95	2.34	12
63	97	7.41	51	3.04	0
63	98	1.54	80	1.27	0
63	99	4.07	3	3.09	99
63	100	4.1	21	2.17	110
63	101	35.96	53	1.07	135
63	102	2.65	73	1.27	0
63	103	3.87	58	2.89	142
63	104	24.92	29	2.18	125
63	105	23.03	55	1.84	164
63	106	14.02	58	2.04	172
63	107	16.77	35	2.34	139
63	108	30.08	49	1.62	141
63	109	58.41	73	3.56	175
64	1	59.07	13	2.17	110
64	2	17.1	40	6.55	144
64	3	47.52	98	1.54	170
64	4	64.09	118	3.61	39
64	5	25.78	72	4.43	156
64	6	24.53	143	1.83	33
64	7	31.35	40	2.34	139
64	8	23.53	96	2.28	0
64	9	5.57	24	2.73	111
64	10	14.15	99	2.28	0
64	11	15.98	45	1.98	129
64	12	70.44	97	2.28	0
64	13	30.27	93	1.52	0
64	14	15.09	6	2.09	104
64	15	23.86	11	2.09	104
64	16	17.17	156	2.7	48
64	17	13.03	33	3.87	121
64	18	75.77	113	15.52	15
64	19	69.65	97	1.77	0
64	20	61.09	96	0.76	0
64	21	18.64	52	4.09	150

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
64	22	20.58	144	3.86	66
64	23	33.94	174	1.36	68
64	24	16.39	73	2.54	0
64	25	18.23	71	1.79	8
64	26	15.52	74	1.27	0
64	27	35.91	107	2.59	168
64	28	30.02	93	1.54	9
64	29	16.03	93	1.01	0
64	30	30.81	119	2.61	29
64	31	5.75	41	1.27	126
64	32	19.61	131	2.04	60
64	33	31.54	3	1.79	81
64	34	27.58	126	2.79	0
64	35	24.87	122	1.98	39
64	36	9.24	20	2.09	104
64	37	8.94	173	2.28	90
64	38	24.14	1	4.85	83
64	39	2.28	90	2.17	20
64	40	6.41	33	1.43	135
64	41	4.2	154	2.97	19
64	42	12	96	1.13	26
64	43	10.44	85	1.54	9
64	44	15.24	169	2.34	40
64	45	15.91	28	1.83	123
64	46	9.58	122	1.48	30
64	47	15.24	179	2.34	77
64	48	10.16	90	2.8	5
66	1	32.15	13	1.7	116
66	2	16.64	12	1.52	90
66	3	20.61	67	1.29	168
66	4	67.22	71	1.27	0
66	5	15.71	55	1.83	146
66	6	94.74	69	2.61	150
66	7	85.97	69	1.13	153
66	8	7.18	171	2.3	83
66	9	16.39	40	2.04	119
66	10	13.66	41	1.79	98
66	11	22.05	104	1.01	0
66	12	38.63	107	2.28	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
66	13	32.14	58	1.48	149
66	14	33.49	58	1.54	170
66	15	37.05	96	1.01	0
66	16	51	84	1.01	0
66	17	8.81	41	2.34	130
66	18	36.32	90	1.01	0
66	19	33.65	98	3.94	14
66	20	46.72	61	1.79	135
66	21	46.62	113	3.94	14
66	22	56.66	88	1.54	170
66	23	25.52	174	2.59	78
66	24	31.25	97	1.79	171
66	25	22.1	42	1.83	146
66	26	38.67	86	1.54	9
66	27	29.45	77	1.04	14
66	28	32.38	73	2.4	161
66	29	20.32	179	3.45	72
66	30	71.57	107	2.03	0
66	31	28.77	137	2.4	18
66	32	33.26	110	2.73	21
66	33	10.71	31	4.77	115
66	34	20.78	35	3.61	129
66	35	24.35	78	1.04	14
66	36	26.74	85	1.04	14
66	37	23.36	89	0.76	0
66	38	26.91	107	0.5	0
66	39	17.83	100	1.52	0
66	40	10.77	55	1.98	129
66	41	27.84	54	4.2	115
66	42	43.14	84	2.3	6
66	43	38.47	70	5.38	160
66	44	5.63	7	3.59	81
66	45	14.94	107	1.54	9
66	46	36.5	68	1.93	156
66	47	36.59	91	1.27	0
66	48	21.21	16	11.7	102
66	49	18.44	51	6.03	165
66	50	20.89	110	1.29	168
66	51	32.33	175	2.55	84

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
66	52	14.33	119	1.27	36
66	53	17.57	94	2.54	0
66	54	34.38	147	1.27	0
66	55	55.29	11	3.04	90
66	56	36.22	77	2.8	5
66	57	12.1	80	1.52	0
66	58	10.23	113	1.62	38
66	59	21.64	58	1.36	158
66	60	29.45	104	2.03	0
66	61	16.27	124	1.62	51
66	62	51.38	96	1.79	8
66	63	28.97	87	1.29	168
66	64	14.24	121	1.84	15
66	65	38.01	84	1.7	153
66	66	47	76	2.4	161
66	67	56.06	76	1.43	135
66	68	42.01	107	2.34	12
66	69	79.62	19	3.63	114
66	70	19.68	107	1.79	171
66	71	11.85	135	3.88	11
66	72	8.32	12	4.57	90
66	73	11.43	0	7.82	76
66	74	12.5	60	1.27	0
66	75	9.48	7	1.77	90
66	76	12.74	23	2.51	135
66	77	10.6	16	2.73	111
66	78	16.64	58	1.48	149
66	79	44.66	107	1.54	9
66	80	23.81	101	1.77	0
66	81	46.15	164	2.04	60
66	82	13.71	88	2.54	0
67	1	111.77	89	1.01	0
67	2	81.66	57	2.27	116
67	3	77.43	55	1.48	149
67	4	20.65	58	2.54	143
67	5	54.41	92	1.04	14
67	6	50.3	91	1.27	0
67	7	46.71	136	1.93	66
67	8	100.72	130	1.27	53

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
67	9	23.71	99	1.52	0
67	10	39.98	116	1.7	26
67	11	35.57	46	2.04	119
67	12	17.85	129	1.79	44
67	13	11.9	50	2.04	150
67	14	9.72	33	1.83	146
67	15	23.78	59	1.7	153
67	16	15.58	160	0.91	33
67	17	11.2	3	2.09	104
67	18	7.17	67	1.52	0
67	19	67.76	132	1.36	68
67	20	25.24	23	1.6	108
67	21	54.28	170	1.27	90
67	22	6.35	73	1.84	164
67	23	29.42	63	1.13	153
67	24	23.98	84	1.79	8
67	25	11.51	75	1.27	0
67	26	14.33	7	2.28	90
67	27	3.66	56	1.62	141
67	28	4.07	93	2.09	14
67	29	37.93	110	1.04	14
67	30	57.32	136	1.62	51
67	31	44.85	126	1.83	56
67	32	32.05	114	2.28	0
67	33	7.22	10	3.3	90
67	34	4.43	166	2.54	90
67	35	10.42	46	1.27	143
67	36	19.83	99	2.28	0
67	37	21.57	12	1.93	113
67	38	9.77	114	1.07	44
67	39	8.65	49	2.18	144
67	40	3.84	82	1.52	0
67	41	6.68	171	1.01	90
67	42	3.77	132	0.71	44
67	43	4.43	76	3.14	165
67	44	19.67	23	1.83	123
67	45	30.98	157	1.48	30
67	46	26.98	157	1.04	14
67	47	10.77	55	1.52	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
67	48	26.84	150	2.04	60
67	49	26.93	105	4.34	6
67	50	6.14	51	1.04	165
67	51	2.04	29	1.84	105
67	52	7.97	30	1.54	99
67	53	7.41	51	0.56	116
67	54	17.37	52	2.7	131
67	55	2.65	163	2.4	71
67	56	84.19	122	3.81	36
67	57	40.99	120	1.62	38
67	58	24.96	121	1.83	56
67	59	4.81	18	2.4	108
67	60	8.86	62	0.76	0
67	61	3.77	47	1.7	153
67	62	5.35	31	1.93	113
67	63	9.86	78	1.54	170
67	64	12.49	127	0.8	18
67	65	1.52	0	1.52	90
67	66	2.28	0	1.27	90
67	67	5.58	0	1.54	80
67	68	4.13	42	1.13	116
67	69	6.36	151	1.13	63
67	70	4.01	71	1.52	0
67	71	8.53	67	3.05	138
67	72	2.28	90	2.03	0
67	73	31.01	19	2.17	110
67	74	26.79	21	1.62	128
67	75	5.59	2	1.27	90
67	76	27.16	118	1.83	33
67	77	16.25	61	2.04	172
67	78	8.89	90	1.77	0
67	79	3.59	44	2.18	125
67	80	12.19	88	1.52	0
67	81	18.54	88	1.52	0
67	82	46	173	2.03	90
67	83	34.96	168	1.36	68
67	84	4.57	176	3.84	82
67	85	22.97	108	1.29	168
67	86	30.7	128	1.48	59

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
67	87	25.46	128	1.01	0
67	88	4.34	83	3.56	4
67	89	7.18	44	1.62	141
68	1	24.13	81	1.27	0
68	2	13.67	54	1.27	0
68	3	16.79	3	1.13	63
68	4	22.83	152	2.18	54
68	5	15.26	161	1.43	44
68	6	28.76	29	2.59	101
68	7	9.2	65	1.04	165
68	8	15.24	1	1.27	90
68	9	26.02	114	1.52	0
68	10	20.33	25	1.27	126
68	11	9	163	2.18	35
68	12	1.04	165	1.04	75
68	13	18.14	6	1.27	90
68	14	18.17	7	1.04	104
68	15	13.99	3	1.01	90
68	16	26.76	136	1.13	63
68	17	34.11	3	1.29	101
68	18	45.59	118	1.52	0
68	19	6.62	147	1.07	44
68	20	24.09	161	1.27	53
68	21	16.99	170	0.91	56
68	22	32.65	174	1.36	68
68	23	14.61	7	1.27	90
68	24	26	121	0.76	0
68	25	35.88	97	1.36	158
68	26	14.95	20	1.36	111
68	27	41.43	124	1.43	44
68	28	12.9	36	2.34	130
68	29	41.25	9	2.03	90
68	30	6.98	160	1.04	75
68	31	8.07	155	1.04	75
68	32	64.01	0	1.29	78
68	33	9.45	120	1.27	0
68	34	9.1	59	1.77	0
68	35	8.41	174	0.8	71
68	36	6.02	117	1.04	14

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
68	37	34.92	10	1.6	108
68	38	45.98	8	2.17	110
68	39	7.87	0	3.09	80
68	40	22.96	51	2.34	139
68	41	12.19	54	1.62	141
68	42	10.94	111	1.27	0
68	43	13.46	0	1.79	81
68	44	29.99	2	1.01	90
68	45	11.82	75	1.54	170
68	46	12.4	67	1.27	0
68	47	11.63	36	0.91	123
68	48	9.4	178	1.6	71
68	49	9.42	85	1.01	0
68	50	17.26	153	2.28	0
68	51	16.15	36	1.43	135
68	52	10.85	110	0.91	56
68	53	5.75	138	1.04	14
68	54	6.09	0	1.01	90
68	55	12.89	147	1.6	18
68	56	15.02	108	0.76	0
68	57	12.59	138	1.29	11
68	58	6.24	63	1.04	165
68	59	3.31	94	1.13	26
68	60	2.54	90	1.77	0
68	61	3.88	101	2.59	11
68	62	3.04	0	2.28	90
68	63	2.83	79	2.09	165
68	64	1.27	0	0.76	90
68	65	3.31	4	1.29	78
68	66	4.09	119	1.27	53
68	67	11.07	126	1.01	0
68	68	3.53	68	1.52	0
68	69	15.75	20	2.55	95
68	70	15.03	74	0.25	n/a
68	71	10.63	146	1.43	44
68	72	13.47	135	0.91	33
68	73	13.94	33	1.27	126
68	74	16.97	128	2.79	0
68	75	9.1	157	1.13	63

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
68	76	20.87	53	1.62	141
68	77	53.19	118	1.13	26
68	78	18.31	19	1.07	135
68	79	12.28	29	1.93	113
68	80	6.51	69	1.27	0
68	81	8.17	53	1.43	135
68	82	3.87	58	1.43	135
68	83	22.62	2	1.01	90
68	84	21.13	13	1.52	90
68	85	23.55	73	1.01	0
68	86	11.92	153	1.27	36
68	87	6.35	36	1.93	113
68	88	4.57	176	1.84	74
68	89	24.15	22	3.1	124
68	90	18.38	101	0.8	18
68	91	16.98	111	2.18	35
68	92	3.52	30	2.39	122
68	93	4.85	132	3.06	24
68	94	5.63	35	4.13	132
68	95	6.14	38	2.54	126
68	96	25.68	177	1.79	81
69	1	12.96	2	1.48	120
69	2	21.13	159	1.84	74
69	3	16.58	154	1.62	38
69	4	5.57	59	.76	0
69	5	16.13	61	2.89	164
69	6	22.36	105	1.07	44
69	7	22.81	134	1.70	63
69	8	10.23	82	9.15	176
69	9	7.31	159	6.62	85
69	10	6.68	81	1.79	171
69	11	13.06	116	1.13	26
69	12	13.89	59	1.43	135
69	13	10.42	46	1.13	116
69	14	8.08	46	1.07	135
69	15	19.61	85	9.52	170
69	16	2.79	90	2.28	0
69	17	58.20	87	45.73	178
69	18	36.74	98	1.29	168

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
69	19	17.92	110	1.07	44
69	20	4.74	74	3.05	4
69	21	2.03	90	1.60	18
69	22	6.11	94	2.80	174
69	23	3.04	0	2.34	77
69	24	4.18	75	2.17	20
69	25	2.55	5	2.09	75
69	26	2.79	90	2.28	0
69	27	2.03	90	1.01	0
69	28	3.04	90	1.27	0
69	29	2.80	5	1.79	98
69	30	2.59	101	.80	18
69	31	2.54	90	.76	0
69	32	3.34	81	2.80	5
70	1	102.68	92	2.04	7
70	2	54.78	99	1.62	38
70	3	39.33	44	1.62	128
70	4	40.91	49	1.43	135
70	5	74.16	80	1.60	161
70	6	98.15	55	2.17	110
70	7	31.01	109	2.34	12
70	8	42.73	109	1.62	38
70	9	47.52	41	1.60	108
70	10	41.97	105	.80	18
70	11	39.88	173	1.27	90
70	12	17.95	115	2.04	7
70	13	13.15	79	1.01	0
70	14	31.92	84	2.30	173
70	15	57.92	72	2.30	173
70	16	83.89	92	1.13	26
70	17	47.09	50	1.27	143
70	18	39.87	46	1.13	116
70	19	55.58	85	1.54	9
70	20	27.53	60	1.29	168
70	21	44.46	66	2.27	153
70	22	38.78	150	2.34	49
70	23	55.26	166	1.84	74
70	24	12.98	59	1.54	170
70	25	30.10	116	2.70	41

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
70	26	26.93	69	1.27	0
70	27	25.56	76	1.54	170
70	28	12.76	148	1.27	53
70	29	27.94	97	1.60	18
70	30	33.04	73	2.28	0
70	31	32.82	79	1.54	9
70	32	29.94	79	2.55	5
70	33	20.64	55	2.18	144
70	34	55.16	53	3.06	155
70	35	21.87	74	2.30	6
70	36	18.56	73	1.52	0
70	37	17.78	126	1.98	50
70	38	18.87	151	2.79	90
70	39	10.80	138	2.39	32
70	40	19.42	64	1.27	0
70	41	18.87	107	2.04	7
70	42	8.13	91	2.83	10
70	43	22.26	62	1.36	158
70	44	20.47	60	1.36	158
70	45	12.04	117	1.27	53
70	46	11.22	84	.76	0
70	47	32.00	172	2.28	90
70	48	27.47	176	1.54	99
71	1	171.45	21	1.27	126
71	2	90.91	114	1.70	26
71	3	123.56	19	1.70	116
71	4	78.48	90	1.01	0
71	5	27.25	4	1.27	90
71	6	56.14	1	1.60	71
71	7	53.61	63	2.27	153
71	8	7.53	32	4.54	116
71	9	7.18	147	4.68	49
71	10	80.34	166	2.04	82
71	11	62.93	8	2.34	102
71	12	66.63	60	1.48	149
71	13	56.50	65	1.36	158
71	14	36.95	70	1.36	158
71	15	13.97	152	2.03	90
71	16	8.75	16	1.04	104

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
71	17	6.11	131	1.13	26
71	18	2.89	127	.56	26
71	19	5.23	29	1.48	120
71	20	53.37	92	1.29	11
71	21	53.50	49	1.04	104
71	22	37.77	102	1.13	26
71	23	6.35	0	1.29	101
71	24	74.32	127	1.62	38
71	25	136.83	13	1.93	113
71	26	33.94	95	1.54	170
71	27	22.46	100	1.36	21
71	28	38.86	68	1.93	156
71	29	27.16	103	1.77	0
71	30	13.77	22	1.60	108
71	31	20.59	92	1.27	0
71	32	21.74	112	1.27	36
71	33	31.50	82	2.30	173
71	34	30.80	139	1.62	51
71	35	43.32	60	1.79	135
71	36	32.40	138	1.43	44
71	37	31.36	95	1.70	26
71	38	35.56	90	2.04	7
71	39	33.27	90	1.01	0
71	40	28.83	121	1.79	44
71	41	23.36	90	1.29	11
71	42	110.23	22	1.36	111
71	43	19.31	87	1.04	14
71	44	34.96	168	1.54	80
71	45	22.83	20	1.48	120
71	46	30.95	113	2.27	26
71	47	122.46	13	.80	108
71	48	23.92	93	1.27	36
71	49	24.95	94	1.54	9
71	50	160.50	20	1.93	113
71	51	159.20	21	1.43	135
71	52	14.90	13	1.27	90
71	53	29.42	117	1.07	44
71	54	14.69	99	1.04	14
71	55	28.79	120	.56	26

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
71	56	20.00	69	1.04	165
71	57	23.62	143	1.29	78
71	58	11.46	12	1.43	135
71	59	10.27	98	1.93	23
71	60	11.56	109	2.15	44
71	61	22.69	174	2.03	90
71	62	27.94	89	1.27	0
71	63	12.04	132	1.29	78
71	64	12.21	159	1.13	63
71	65	18.31	109	1.13	26
71	66	4.44	149	1.62	51
71	67	3.61	140	1.79	81
71	68	9.91	39	4.54	153
71	69	12.17	23	6.76	124
71	70	5.57	133	1.27	53
71	71	1.27	0	1.27	90
71	72	1.52	90	1.29	11
71	73	16.49	9	1.77	90
71	74	20.03	140	1.48	59
71	75	5.63	172	3.94	75
71	76	15.75	90	2.03	0
71	77	3.05	4	3.04	90
71	78	5.49	56	5.10	174
71	79	5.89	97	4.60	6
71	80	4.31	118	2.89	37
71	81	13.54	66	1.27	143
71	82	5.08	2	2.28	90
71	83	2.28	90	1.84	15
71	84	31.29	3	1.52	90
71	85	18.58	3	1.52	90
71	86	25.99	33	1.43	135
71	87	4.83	176	2.28	90
72	1	132.57	58	2.39	147
72	2	21.84	54	4.66	157
72	3	28.75	54	1.27	143
72	4	19.67	113	1.13	26
72	5	18.64	70	1.60	161
72	6	7.02	167	1.83	56
72	7	56.39	0	1.29	101

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
72	8	102.49	22	1.27	90
72	9	4.83	93	1.79	8
72	10	28.22	120	1.27	36
72	11	86.44	2	1.27	90
72	12	27.35	79	2.28	0
72	13	50.82	1	1.93	66
72	14	11.51	104	1.48	30
72	15	29.72	1	2.04	82
72	16	47.16	82	.76	0
72	17	47.73	61	1.84	164
72	18	117.96	111	1.60	18
72	19	5.38	81	3.69	15
72	20	56.00	33	1.70	116
72	21	65.45	38	1.93	156
72	22	79.42	171	2.73	68
72	23	57.29	75	2.28	0
72	24	57.83	78	1.27	0
72	25	30.31	171	3.09	80
72	26	32.54	177	1.36	68
72	27	45.04	15	.80	108
72	28	3.05	4	2.34	77
72	29	2.27	63	1.84	15
72	30	33.89	60	3.21	161
72	31	43.50	64	1.84	164
72	32	15.95	170	.80	71
72	33	15.45	62	1.36	158
72	34	9.14	1	1.27	90
72	35	21.39	137	1.43	44
72	36	39.30	165	1.54	80
72	37	72.45	165	1.04	75
72	38	32.53	169	1.36	68
72	39	55.86	23	2.70	131
72	40	29.88	121	1.27	36
72	41	57.73	41	.91	146
72	42	10.18	94	1.36	21
72	43	48.49	164	1.04	75
72	44	9.31	17	1.01	90
72	45	64.46	36	1.70	116
72	46	77.85	72	2.04	172

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
72	47	58.25	68	1.01	0
72	48	23.53	46	.91	146
72	49	14.83	38	1.04	104
72	50	15.78	56	1.36	158
72	51	14.08	146	1.79	44
72	52	24.43	43	1.79	135
72	53	31.25	172	1.01	90
72	54	30.36	55	1.27	0
72	55	35.65	139	1.62	51
72	56	41.25	36	1.27	126
72	57	30.58	122	1.13	26
72	58	47.55	55	1.79	171
72	59	39.22	65	1.36	158
72	60	27.95	151	1.48	59
72	61	16.98	148	1.70	63
72	62	11.70	24	1.36	111
72	63	28.30	158	1.29	78
72	64	52.85	17	1.84	105
72	65	52.82	62	2.34	167
72	66	12.21	93	1.36	21
72	67	14.06	110	1.62	38
72	68	21.85	1	1.52	90
72	69	39.51	44	1.29	168
72	70	80.40	19	1.48	120
72	71	69.37	40	.80	161
72	72	67.57	7	1.29	101
72	73	24.44	122	1.62	51
72	74	15.19	128	1.48	30
72	75	63.13	160	1.62	51
72	76	10.16	1	2.03	90
72	77	23.01	127	2.30	6
72	78	57.90	47	1.43	135
72	79	30.44	102	2.73	21
72	80	45.66	62	1.84	164
72	81	28.40	121	1.70	63
72	82	39.77	20	2.17	110
72	83	25.75	36	1.62	128
72	84	14.65	25	1.29	101
72	85	63.32	48	2.40	161

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
72	86	45.79	33	1.98	140
72	87	48.43	77	1.04	14
72	88	5.84	87	5.84	0
72	89	6.62	4	3.84	97
72	90	3.14	104	2.17	20
72	91	7.62	143	1.93	66
72	92	7.93	7	2.03	90
72	93	29.32	4	1.77	90
72	94	24.42	115	1.36	21
72	95	25.41	178	1.79	81
72	96	9.40	178	1.93	66
72	97	36.80	27	2.96	120
72	98	7.72	99	1.36	21
72	99	4.57	0	3.81	90
72	100	6.60	92	6.37	175
72	101	3.31	175	2.30	83
72	102	8.88	120	1.36	21
72	103	24.99	64	1.04	165
72	104	63.52	10	.50	90
72	105	11.18	92	.80	18
72	106	11.81	98	1.07	44
72	107	14.94	17	1.13	116
72	108	36.06	11	4.07	93
73	1	117.11	71	1.27	0
73	2	137.92	54	1.70	153
73	3	90.76	35	1.29	101
73	4	172.25	158	2.04	82
73	5	87.01	156	2.09	75
73	6	91.45	78	1.52	0
73	7	43.87	110	1.04	14
73	8	43.30	72	1.04	165
73	9	27.19	145	1.27	53
73	10	35.10	72	.50	0
73	11	118.56	109	1.29	11
73	12	43.99	37	1.48	120
73	13	7.33	75	1.01	0
73	14	116.38	71	1.52	0
73	15	54.36	174	1.01	90
73	16	9.48	82	8.12	0

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
73	17	3.05	85	2.79	0
73	18	13.46	178	5.92	80
73	19	97.44	107	1.01	0
73	20	17.44	106	.76	0
73	21	10.01	59	1.07	135
73	22	19.39	135	.80	71
73	23	10.93	120	.56	26
73	24	34.15	51	3.95	135
73	25	16.98	55	1.62	141
73	26	18.16	69	1.79	135
73	27	48.56	113	1.29	11
73	28	18.60	57	1.36	158
73	29	62.37	40	1.13	116
73	30	35.29	103	1.13	26
73	31	61.62	17	2.89	105
73	32	87.87	108	1.62	38
73	33	117.60	14	1.60	108
73	34	45.92	101	1.13	26
73	35	31.23	104	1.54	9
73	36	40.02	106	1.13	63
73	37	50.56	88	.50	0
73	38	27.39	72	1.01	0
73	39	38.68	119	.91	33
73	40	18.97	116	.91	33
73	41	29.49	132	.91	33
73	42	25.55	116	1.04	75
73	43	11.10	79	4.06	0
73	44	2.04	172	2.04	82
73	45	2.03	90	.80	18
73	46	3.56	4	2.55	95
73	47	4.85	173	2.30	83
73	48	16.00	54	1.13	153
73	49	48.27	71	1.36	158
73	50	19.54	152	1.62	51
73	51	3.04	90	1.54	9
73	52	2.54	0	2.28	90
73	53	47.48	98	1.79	8
73	54	38.88	109	1.79	81
73	55	29.99	46	1.13	116

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
73	56	27.76	81	.80	161
73	57	30.37	60	.80	161
73	58	28.66	60	1.27	0
73	59	33.28	38	1.27	126
73	60	9.80	121	1.04	14
73	61	45.14	70	1.84	164
73	62	14.48	52	1.48	149
73	63	25.86	107	1.70	26
73	64	2.04	7	2.03	90
73	65	1.77	0	1.52	90
73	66	14.55	150	1.79	81
73	67	31.77	55	2.83	153
73	68	30.54	93	1.60	18
73	69	59.82	103	1.29	11
73	70	29.29	168	1.54	80
73	71	44.98	18	1.60	108
73	72	67.71	93	1.01	0
73	73	39.37	89	1.13	26
73	74	21.33	81	2.54	0
73	75	42.83	69	1.84	164
73	76	37.82	63	3.31	175
73	77	6.72	79	3.30	0
73	78	3.31	94	3.30	0
73	79	3.84	7	3.56	94
73	80	4.07	176	2.54	90
73	81	19.19	64	1.79	171
73	82	22.73	71	.76	0
73	83	37.60	91	1.27	0
73	84	37.29	58	3.77	160
73	85	31.56	56	2.18	144
73	86	28.91	51	1.60	108
73	87	38.34	73	1.29	168
73	88	21.36	61	1.04	165
73	89	7.91	95	1.04	14
73	90	19.53	116	1.98	39
73	91	10.79	63	1.62	128
73	92	33.81	92	.80	18
73	93	38.16	93	1.13	26
73	94	45.55	64	1.36	158

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
73	95	33.04	87	1.13	26
73	96	42.62	52	1.70	153
73	97	50.47	82	1.54	170
73	98	12.00	173	1.54	80
73	99	12.68	32	2.61	119
73	100	25.26	170	1.79	81
73	101	9.81	111	1.04	75
73	102	24.57	18	2.27	116
73	103	24.31	62	3.05	175
73	104	35.65	85	2.04	7
73	105	23.62	88	1.79	8
73	106	16.48	61	1.04	165
73	107	22.43	74	4.57	160
73	108	26.51	53	1.29	168
73	109	18.60	57	1.62	141
73	110	28.62	41	1.07	135
73	111	7.84	155	1.29	78
73	112	18.31	66	1.54	170
73	113	8.59	108	1.01	0
73	114	21.01	172	1.27	90
73	115	11.10	169	1.04	75
73	116	9.17	41	1.27	126
73	117	12.04	145	1.04	75
73	118	28.40	117	1.27	36
73	119	11.98	85	1.79	171
73	120	8.84	129	.80	71
73	121	17.83	70	2.83	153
73	122	8.02	100	2.54	0
73	123	38.99	129	1.27	53
73	124	10.80	60	1.62	141
73	125	11.84	54	.80	161
73	126	20.64	71	1.36	158
73	127	2.09	165	1.84	74
73	128	3.05	175	1.54	99
73	129	2.34	167	1.52	90
73	130	2.65	163	1.60	71
73	131	9.20	62	1.83	146
73	132	20.45	75	.76	0
73	133	13.17	56	1.43	135

Raw Data by Tooth

Tooth Number	*Feature Number*	*Major Axis Length*	*Major Axis Slope*	*Minor Axis Length*	*Minor Axis Slope*
73	134	19.47	59	1.04	165
73	135	23.22	5	1.27	90
73	136	18.39	35	2.04	119
73	137	3.81	0	2.03	90
73	138	3.81	3	1.77	90
73	139	22.86	88	.76	0
73	140	21.59	88	1.27	0
73	141	16.13	123	1.79	81
73	142	23.97	105	.91	33
73	143	2.03	90	1.54	170
73	144	10.11	78	1.04	14
73	145	6.71	60	1.48	149
73	146	8.97	115	2.18	35
73	147	26.16	88	1.13	153
73	148	5.14	159	1.27	36
73	149	8.91	160	1.79	81
73	150	13.00	77	1.83	146
73	151	61.02	48	1.07	135
73	152	12.61	130	.91	56
73	153	19.34	76	.80	161
73	154	39.06	69	2.34	167

VITA

VITA

Melissa Grace Muendel was born at All Souls Hospital in Morristown, New Jersey on March 31, 1951. She was raised in Basking Ridge, New Jersey and educated at Bernards Township Public Schools and graduated from Saint John Baptist School, Mendham, New Jersey (1969). She graduated from Green Mountain College for Women in Poultney, Vermont (1971) with an A. A. in Liberal Arts. She received her B. A. in History from Lehigh University, Bethlehem, Pennsylvania (1973) and was one of the first ten women to receive a bachelor's degree from Lehigh.

After a three year vocation as a registered representative in an investment banking firm on Wall Street, Missy toured Europe, and after returning started graduate school at Drew University in Madison, New Jersey, where she earned her Master's degree in Near Eastern Archaeology (1981). She dug at Caesarea Maritima (1978) and Tell el-Hesi (1979, 1981) in Israel and after receiving her master's spent the next four years doing contract prehistoric and historic archaeology in Delaware, District of Columbia, Kentucky, New Jersey, New York City, and Virginia for Louis Berger and Associates, New Jersey Department of Transportation; New York City Historical Commission; Department of Parks and Recreations, Washington, D. C.; Engineering Sciences; and other companies. She started her Ph. D. in Syro - Palestinian Archaeology in the Department of Oriental Studies, at the University of Pennsylvania but left to concentrate her studies on physical anthropology at the University of Tennessee, where she began the Ph. D. program in 1991.

She moved to Knoxville in 1985 and worked at the Greater Knoxville Chamber of Commerce where she started the Research Department and was Director of Research for ten years. After becoming President of the American Chamber of Commerce Researcher's Association, she served on the board of directors of the American Chamber of Commerce Executives and the American Economic Development Council. In February 1997, she left the Chamber of Commerce and has been working on her dissertation full-time.

She is a member of Archaeological Institute of America and has recently joined the American Association of Physical Anthropology and will present a paper in Salt Lake City about this research project in April 1998.