

STUDY OF THE SKULLS FROM MAŞAT HÖYÜK, EXCAVATED UNDER THE AUSPICES OF THE TURKISH HISTORICAL SOCIETY

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Maşat höyük (mound), near the village of Maşat in the district of Zile in the province of Tokat, was excavated in the summer of 1945 by a party under Dr. Ekrem Akurgal, assistant professor of archaeology in this university, and including Drs. Nimet and Tahsin Özgüç¹. This höyük contains occupation levels belonging to the Chalcolithic, Copper, Hittite and Phrygian periods. In the copper age level 7 skeletal remains have been unearthed, five of which have been brought to the writer for study. The excavators state that they have not brought back two badly broken and crushed children's skeletons (Nos. 1 and 5).

The five skeletal remains studied consist mainly of cranial fragments and, with the exception of individual No. 6, there are only a few post-cranial bones with them. However, according to the excavators the post-cranial skeletons of these individuals are present, but they have not been brought back as they are much broken and crushed. I am mentioning this merely to show that here we are not dealing with partial burials.

Of these skeletal remains, preserved in the department of Anthropology of the University of Ankara, only one skull (No. 7) has been restored. The others are very fragmentary and are represented by bone fragments and sometimes even by a broken lower jaw. Now we can study these remains according to the numbers given to them by the archaeologists.

Maşat No. 2. : This individual is represented by a fragment of the squama occipitalis, a rib fragment, a cervical vertebra and two metacarpal bones.

¹ The report of the excavators will be published later on.

The epiphyses of the metacarpal bones have been completely ossified. As these epiphyses close by the age of twenty, we infer that these remains belong to an adult individual. But a part of the sutura lambdoidea, preserved on one side of the fragment of squama occipitalis, shows that this suture had not yet completely synostosed externally. This indicates that the individual under consideration had not yet passed middle age. The great thickness of the squama occipitalis suggests that we are here dealing with a male individual.

Maşat No. 3. : This individual is represented by many small cranial fragments and 31 teeth. All the sutures on the cranial fragments are completely open. Also the third molars had not yet completed their development. Thus, these remains represent a 15 or 16 years old individual.

With the exception of the first right lower premolar all the teeth are present and they are generally very little worn. 30 of the available teeth are isolated and only one is found in situ in a mandibular fragment. The measurements of these teeth are shown in table 1. Also, for comparison, I have added in table 2 the measurements of a small and mixed series of teeth which I had measured at the Peabody museum of Harvard University. Some of the measurements of this series, composed of Europeans, ancient Egyptians, American Indians, Negroes and Melanesians, have been published in my earlier papers². The comparison of these tables shows that the majority of the Maşat teeth are smaller than those of the mixed series. A peculiarity seen in the Maşat series is that the second upper premolar is larger than the first upper premolar. However, this is not beyond the range of variation occurring in recent man, for although generally in the modern man the second is smaller than the first upper premolar, sometimes the opposite condition also may be found. The relatively small size of most of the teeth suggests that we may here be dealing with a female individual.

² Şenyürek, M. S. : Fossil man in Tangier. Papers of the Peabody museum of American archaeology and ethnology, Harvard University, XVI, No. 3, 1940 ; Şenyürek, M. S. : The dentition of Plesianthropus and Paranthropus. Annals of the Transvaal museum, XX, Part 3, 1941.

Regarding the morphology of the teeth, the upper incisors are of "shovel" shape, described by Dr. Hrdlicka³. The first upper molar has four cusps. In this tooth the hypocone is a well developed cusp. Although the second upper molar also has four relatively well developed cusps, the hypocone of this tooth is relatively smaller. In the third upper molar the hypocone is not present and there are only three cusps.

In the five-cusped first lower molar there is a relatively large contact line between the hypoconid and metaconid. That is, this tooth still retains the traces of the ancestral *Dryopithecus* pattern. In the second lower molar, with the loss of the hypoconulid, there remains only four cusps and the *Dryopithecus* pattern has been replaced by the plus pattern of Dr. Hellman⁴. In the third lower molar also we see four cusps and the plus pattern. The second and third lower molars represent Dr. Hellman's fourth stage. The skiagram of the first lower molar (fig. 1) shows a large pulp cavity. This represents a moderate degree of taurodontism.

Maşat No. 4.: This individual is represented by a corpus mandibulae (fig. 2). The mandible is broken behind the third molars on both sides. In this mandible the third molars have erupted and are considerably worn. Thus, it is evident that this mandible represents an adult individual. This strongly built lower jaw indicates that we are here dealing with a male individual. The measurements that could be taken on this jaw are shown in table 3.

The height of the symphysis and the height and thickness of the corpus at the level of foramen mentale are normal measurements for modern man. The height-thickness index of the corpus is 40.47, that is, relative to its height the corpus is comparatively thin. This index conforms to the figures given by Martin⁵ for modern man. On the other hand, the Bi-mental width, or the anterior width of the mandible, is very large.

³ Hrdlicka, A.: Shovel-shaped teeth. *American Journal of Physical Anthropology*, 3, 1920.

⁴ Hellman, M.: Racial characters in human dentition. *Proceedings of the American Philosophical Society*, 68, No. 2, 1928.

⁵ Martin, R.: *Lehrbuch der Anthropologie*, 2, p. 979, 1928.

Regarding the morphological features, the chin is positive and projects very strongly. On the right side, the foramen mentale is single and is situated underneath the interalveolar septum of the first and second premolars. On the left side, there are more than one foramina. A considerably large foramen is found beneath the alveolus of the second premolar. There is another foramen underneath the interalveolar septum of the first and second premolars and a third below the canine tooth. These latter two foramina are very small. The genial tubercles show a moderate degree of development. There is no mandibular torus and the dental arcade shows a parabolic shape.

In this lower jaw, only the left second and left third and the right first and the right third molars are preserved. Caries has started in the second left molar and the preserved mesial root and a part of the crown of the first left molar shows that this tooth also was carious. The second right molar was lost during life. All the other teeth have fallen off after death. As the teeth are worn and their enamel chipped off, no measurements have been taken on them. The skiagram of the molars shows that the pulp cavity is small or cynodont.

Maşat No. 6: This is the skeleton of a new-born baby, represented by broken cranial fragments and by a number of post-cranial bones.

Maşat No. 7: This individual is represented by a calva, a broken maxilla, with the exception of the right condyle, a well preserved mandible, a broken right zygomatic bone, two complete and two broken cervical vertebrae, the upper epiphysis of a tibia, four metacarpal bones and a hand phalanx.

In the calva greater part of the frontal, parietal, occipital and temporal bones are preserved. The right half of the foramen megnum and the right condyle also are preserved. The fracture passes through the Opisthion but lateral to Basion. So the basion-bregma height has been measured from the inside of the right condyle. The skull has been deformed under the pressure of the overlying earth. It is evident that this deformation will give rise to a certain amount of error in the measurements. But as this uncertainty is more evident in the height measurements, only these have been shown by interrogation marks.



Şekil (fig.) 1 — Maşat No. 3'ün birinci sol alt molarinin rontgeni.
(Tabii büyüklükte.)

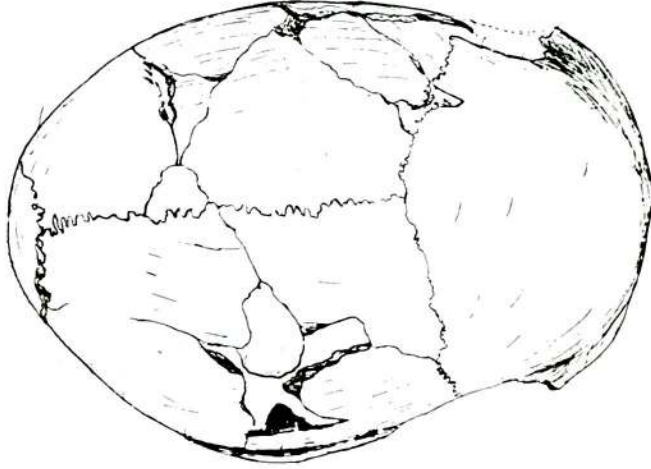
The skiagram of the first left lower molar of Maşat No. 3. (Natural Size.)



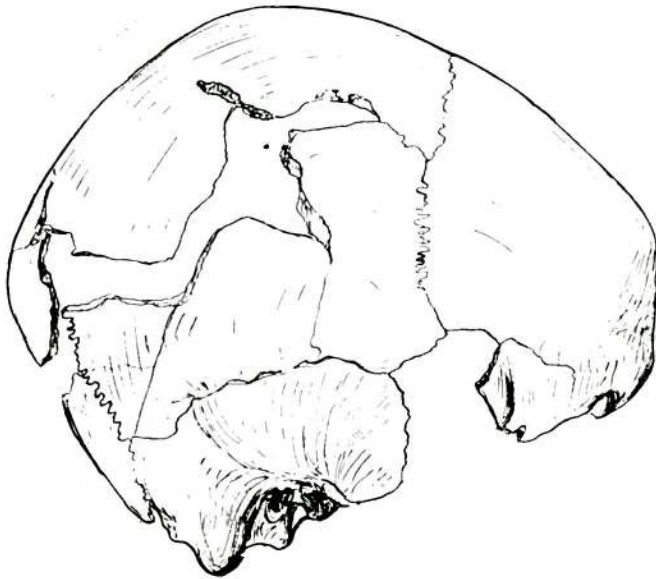
Şekil (fig.) 2 — Maşat No. 4'ün alt çenesi. (Tabii büyüklükte.)

The Mandible of Maşat No. 4. (Natural size.)

Lev. XXVI



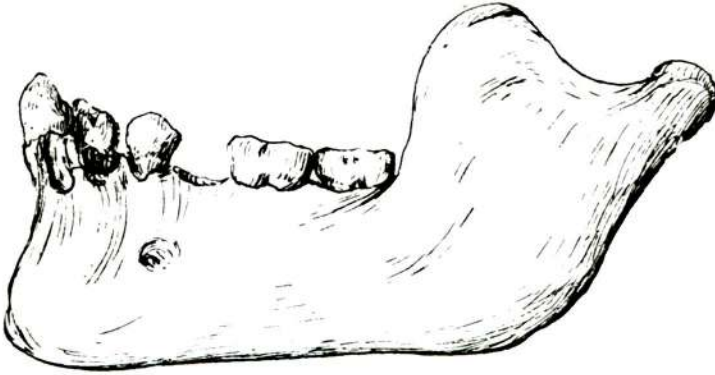
Şekil (fig.) 3 — Maşat No. 7 kafatasının yukarıdan görünüşü. (1/2 büyüklükte.)
The skull of Maşat No. 7 in norma verticalis. (1/2 natural size.)



Şekil (fig.) 4 — Maşat No. 7 kafatasının yandan görünüşü. (1/2 büyüklükte.)
The skull of Maşat No. 7 in norma verticalis. (1/2 natural size.)



Şekil (fig.) 5 — Maşat No. 7'nin damağı. (Tabii büyüklükte.)
The palate of Maşat No. 7. (Natural size.)



Şekil (fig.) 6 — Maşat No. 7'nin alt çenesi. (Tabii büyüklükte.)
The Mandible of Maşat No. 7. (Natural size.)

On the calva all the sutures present are open. Also in both the upper and lower jaws the third molars have not yet erupted and are still within their sockets. The fact that the upper epiphysis of the tibia as well as the epiphyses of the metacarpal bones and of the phalanx have still not joined their respective shafts, shows that we are not dealing here with a delayed eruption of the wisdom teeth. The epiphyses of the metacarpal bones and phalanx should have been united by the age of 20 and that of tibia between 19 th and 24 th years. Thus we can put the age of this individual at 15-16 years. It is known that the determination of sex of the skeleton of a young individual, especially in the absence of Pelvis, is a difficult job. However, certain features of the calva rather suggest a male individual.

The measurements of this calva are shown in table 4. The calva is of medium length and small breadth and is dolichocrane or more properly hyperdolichocrane. Basion-bregma height is of medium elevation. Height (Basion-bregma)-length index is orthocrane. On the other hand, the height-breadth index is akrocrane. But this relative height is rather due to the narrowness of the skull. The auricular height-length index, an account of the deformation, is different on the right and left sides. This index is hypsicrane on the right and orthocrane on the left side. On the contrary, the auricular height-breadth index, while considerably different, is on both sides akrocrane. The uncertainty in the height-length index of the two sides is evident. However, we can consider this skull orthocrane in the height-length indices and akrocrane in the height-breadth indices. The minimum frontal diameter is rather narrowish. But the fronto-parietal index is eurymetop, that is rather large. This is due to the narrowness of the skull rather than the width of the forehead.

In norma verticalis the form of the skull is ovoid (fig. 3). The structure of the coronal, sagittal and lambdoid sutures is rather simple. Glabella and the brow ridges are rather weak. The forehead is of medium height and of medium slope. No trace of the metopic suture is left and in its place there is a median crest of medium development. The frontal bosses are large and the postorbital constriction is pronounced. In the parietal region there is no sagittal crest. The parietal bosses are relatively small.

In the temporal region the supramastoid crest shows a medium and the mastoid process a submedium degree of development. In *norma lateralis* the curve of the occipital region is pronounced (fig. 4). Besides this, there is a considerably large lambdoid flattening.

The zygomatic bone is relatively small. As for the maxilla, we note the presence of *sutura infraorbitalis* on the left side. This slightly erased suture runs from the infraorbital foramen to the lower margin of the orbit and crosses it. Although the floor of the orbit is broken, it is probable that the suture also continued over it. As this part on the right side of the maxilla is broken, we could not determine whether the suture was present also on this side or not. The canine fossa is deep on both sides. The relatively narrow pyriforme aperture indicates that the nasal index was leptorrhine. The sill of the *apertura pyriformis* is not sharp. The nasal spine has been broken.

The external measurements of the palate are shown in table 5. The external palatal index is brachyuranic, but the upper jaw has not yet completed its development. The shape of the dental arcade is parabolic (fig. 5).

The measurements of the mandible are shown in table 6. The most important peculiarity seen among the mandibular measurements is the very low depth (6.5 millimeters) of the sigmoid notch (*incisura mandibulae*). The depth of the sigmoid notch of this mandible is even less than that of a six years old copper age child (Kusura V. S. W. C. 94) with which it has been compared. The absolute depth and the depth index of the sigmoid notch of the Maşat mandible are much lower than the figures for recent man given by Martin⁶. This peculiarity of the Maşat mandible reminds one of that of some primitive men.

As for the morphological observations, the projection of the chin is relatively slight, but this is due more to the presence of a pronounced alveolar prognathism than to the weakness of the chin. The *foramen mentale*, which is single on either side, is situated on the right side below the second premolar and on the left it is beneath the interalveolar septum of the first and second

⁶ Martin: Op. cit. p. 982.

premolars. On the ramus of the mandible the area of attachment of the masseter muscle is fairly deep. On the internal surface of the ramus the area of attachment of the internal pterygoid muscle is considerably rough. On the internal side of the symphysis the areas of attachment of the digastric muscle (digastric fossae) are well defined. The gonial angles are slightly everted outward.

In the upper and lower jaws fifteen teeth are preserved. The teeth preserved are as follows: first right upper incisor, right upper canine, first and second right upper premolars, first and second right and left upper molars, right lower canine, right and left first lower premolars, and first and second right and left lower molars. All the missing teeth have fallen off after death. The measurements of the available teeth are shown in table 7. The comparison of this table with table 2 shows that all the Maşat teeth present are larger than the corresponding teeth of the mixed series. Also, most of the teeth of Maşat No. 7 are larger than those of Maşat No. 3 (table 1). Only the first upper premolars are equal and the second upper premolar is somewhat smaller. The greater size of most of the teeth supports the idea that these remains represent a male individual.

Regarding the morphological features of the teeth, the first upper incisor is shovel-shaped. In the first upper molar the hypocone is well developed and there are four cusps. On the contrary, in the second upper molar the hypocone has atrophied and coalesced with the protocone. Thus, there remains only three cusps in the second upper molar. The process of disappearance of the hypocone has progressed further on the left than on the right side. The third right upper molar has been broken and lost. But the chewing surface of the third left upper molar, which is still in its socket, can be seen. In this the hypocone has completely vanished and there remains only three cusps.

In the five cusped first lower molar we see the plus pattern. This represents stage III of Dr. Hellman⁷. In the second lower molar, with the loss of the hypoconulid, there remains only four cusps. This tooth, showing the plus pattern, represent stage IV of Dr.

⁷ Hellman: *Op. cit.*

Hellman. The skiagram of the lower molars shows a small or cynodont pulp cavity.

As a whole, we note that the teeth of individual No. 7, in spite of their larger size, show a more advanced morphology than those of individual No. 3.

Although it is evident that no far-reaching conclusions can be drawn from such a fragmentary series, we can briefly touch upon a few points. In a former study⁸ I had shown that the majority of the chalcolithic and copper age populations of Anatolia were longheaded. The one Maşat skull that could be restored does not differ in this respect from the other copper age inhabitants of Anatolia. However, the fact that the individual under consideration (No. 7) is still young and has not yet completed his development makes it very difficult to determine with certainty to which one of the two long-headed types of the copper age inhabitants of Anatolia, namely the Mediterranean and Eurafrican elements, he belonged to.

Another point observed in this study is the fact that most of the individuals are under twenty years of age. Only two individuals had passed twenty, but there is no evidence to show that they had passed their middle age. We are merely noting this as an observation here. However, an investigation I have made on the duration of life of the skeletal remains belonging to the chalcolithic, copper age, Hittite and Phrygian periods of Anatolia has shown that a great majority of these represent young or middle aged individuals and that they died at a relatively early age. A detailed study appertaining to this subject will be published soon.

⁸ Şenyürek, M. S.: Anadolu Bakır çağı ve Eti sekencesinin kraniyolojik tetkiki, A craniological study of the Copper age and Hittite populations of Anatolia. Belleten, No. 19, 1941.

TABLE 1
Measurements of the teeth of Maşat No. 3¹

| Maxillary Teeth | Length | Breadth | Height | Crown Index | Robustness Value |
|-------------------------|--------|---------|--------|-------------|------------------|
| First incisor | 8.6 | 6.8 | 11.4 | 79.05 | 58.48 |
| Second incisor | 6.6 | 6.2 | 10.3 | 93.93 | 40.92 |
| Canine | 7.8 | 8.6 | 11.9 | 110.25 | 67.08 |
| First premolar | 7.0 | 9.3 | 8.5 | 141.42 | 69.3 |
| Second premolar | 7.5 | 9.9 | 8.0 | 132.0 | 74.25 |
| First molar | 10.4 | 11.1 | 6.8 | 106.73 | 115.44 |
| Second molar | 9.8 | 11.2 | 7.2 | 114.28 | 109.56 |
| Third molar | 8.3 | 10.4 | 5.8 | 125.3 | 86.32 |
| Mandibular Teeth | | | | | |
| First incisor | 5.6 | 5.6 | 8.6 | 100.0 | 31.36 |
| Second incisor | 6.3 | 5.8 | 9.0 | 92.06 | 36.54 |
| Canine | 6.7 | 8.0 | 11.5 | 119.4 | 53.6 |
| First premolar | 7.1 | 7.7 | 8.3 | 108.45 | 54.67 |
| Second premolar | 7.6 | 8.2 | 7.9 | 107.89 | 62.32 |
| First molar | 10.9 | 10.4 | 6.4 | 95.41 | 113.36 |
| Second molar | 10.8 | 10.0 | 7.4 | 92.59 | 108.0 |
| Third molar | 10.2 | 9.2 | 5.7 | 90.19 | 93.84 |

¹ In all the tables concerning the teeth the term «length» is used as a synonym for the mesio-distal diameter of the crown and the term «breadth» as a synonym of the bucco-lingual diameter. The height has been measured on the buccal surface of the crown. The crown index expresses the breadth as a percentage of the length ($\frac{\text{breadth} \times 100}{\text{length}}$). The value of robustness is obtained by multiplying the length by breadth and is used as an index of crown size.

TABLE 2

Measurements of the teeth of the mixed series (Europeans, ancient Egyptians, American Indians, Negroes and Melanesians) ¹

| Maxillary Teeth | Length | Breadth | Height | Crown Index | Robustness Value |
|-------------------------|------------|------------|------------|-------------|------------------|
| First incisor | (15) 8.34 | (15) 7.31 | — | (15) 87.72 | (15) 61.08 |
| Second incisor | (15) 7.04 | (15) 6.55 | — | (15) 93.30 | (15) 46.57 |
| Canine | (17) 7.89 | (17) 8.53 | (15) 10.16 | (17) 108.18 | (17) 67.67 |
| First premolar | (19) 6.96 | (19) 9.37 | (18) 8.06 | (19) 134.91 | (19) 65.31 |
| Second premolar | (19) 6.73 | (19) 9.37 | (17) 7.47 | (19) 139.43 | (19) 63.27 |
| First molar | (20) 10.45 | (20) 11.63 | (20) 6.92 | (20) 111.34 | (20) 121.75 |
| Second molar | (20) 9.54 | (20) 11.52 | (19) 7.17 | (20) 121.03 | (20) 110.23 |
| Third molar | (12) 8.63 | (12) 10.96 | (11) 6.98 | (12) 127.08 | (12) 95.12 |
| Mandibular Teeth | | | | | |
| First incisor | (16) 5.25 | (16) 5.85 | — | (16) 111.42 | (16) 30.84 |
| Second incisor | (16) 6.08 | (16) 6.15 | — | (16) 101.71 | (16) 37.45 |
| Canine | (17) 6.99 | (17) 7.83 | (13) 10.65 | (17) 112.65 | (17) 55.21 |
| First premolar | (21) 6.86 | (21) 7.93 | (18) 8.18 | (21) 115.69 | (21) 54.57 |
| Second premolar | (21) 7.03 | (21) 8.32 | (17) 7.66 | (21) 118.15 | (21) 58.78 |
| First molar | (22) 11.05 | (22) 10.68 | (17) 7.0 | (22) 96.75 | (22) 118.32 |
| Second molar | (23) 10.49 | (23) 10.27 | (20) 7.23 | (23) 98.05 | (23) 108.10 |
| Third molar | (13) 10.16 | (13) 9.94 | (11) 6.97 | (13) 97.16 | (13) 101.49 |

¹ Figures in the brackets refer to the number of individuals measured.

TABLE 3

Measurements of the mandible No. 4

| | |
|--|-------|
| Bi-mental width (Distance between the two foramina mentalia) | 48.0 |
| Height of symphysis | 30.7 |
| Height of corpus (At the level of foramen mentale) | 32.7 |
| Thickness of corpus (At the level of foramen mentale) | 13.3 |
| Height-thickness index of the corpus | 40.47 |

TABLE 4

Measurements of Maşat No. 7 : The calva

| | |
|------------------------------|-------------------------------|
| Glabello - occipital length | 181.0 |
| Maximum width | 121.0 |
| Minimum frontal diameter | 93.5 |
| Basion - bregma height | 131.0 (?) |
| Porion - bregma height | Right 120 (??), Left 107 (??) |
| Mean thickness left parietal | 4.5 |
| Horizontal circumference | 487.0 |
| Nasion - opisthion arc | 365.0 |
| Transverse arc | 295.0 |
| Cranial index | 66.85 |
| Height - length index | 72.37 |
| Height - breadth index | 108.26 |
| Po - b - length index | Right 66.29, Left 59.11 |
| Po - b - breadth index | Right 99.17, Left 88.42 |
| Fronto - parietal index | 77.27 |

TABLE 5

Measurements of Maşat No. 7 : The maxilla

| | |
|--------------------------|--------|
| Palate - external length | 51.0 |
| Palate - external width | 61.5 |
| External palatal index | 127.45 |

TABLE : 6
Measurements of Maşat No. 7: The mandible

| | |
|---|---------|
| Bigonial width | 89.0 |
| Bi-mental width (Distance between the two foramina mentalia) | 39.4 |
| Condylo - symphysial length | 88.0(?) |
| Height of symphysis | 30.0 |
| Height of corpus (At the level of foramen mentale) | 26.5 |
| Height of corpus (At the level of M2) | 21.8 |
| Thickness of corpus (At the level of foramen mentale) | 10.9 |
| Height of ascending ramus (From gonion to the highest point of the condyle) | 47.5 |
| Height of ascending ramus (Projected) | 39.0 |
| Depth of incisura mandibulae | 6.5 |
| Width of incisura mandibulae | 30.0 |
| Minimum breadth of ascending ramus | 31.0 |
| Mean angle mandible | 127° |
| Height index of the mandible | 72.66 |
| Height - thickness index of the corpus | 41.13 |
| Index of ascending ramus | 65.26 |
| Index of incisura mandibulae | 21.66 |

TABLE 7
Measurements of the teeth of Maşat No. 7

| Maxillary Teeth | Length | Breadth | Height | Crown Index | Robustness Value |
|-------------------------|--------|---------|--------|-------------|------------------|
| First incisor | 9.8 | 7.3 | 11.5 | 74.48 | 71.54 |
| Canine | 8.1 | 8.8 | 11.9 | 108.64 | 71.28 |
| First premolar | 7.4 | 9.4 | 8.7 | 127.02 | 69.56 |
| Second premolar | 6.9 | 9.6 | 8.8 | 139.13 | 66.24 |
| First molar | 10.8 | 12.5 | 7.0 | 115.74 | 135.0 |
| Second molar | 10.4 | 12.5 | 7.3 | 120.19 | 130.0 |
| Mandibular Teeth | | | | | |
| Canine | 7.3 | 8.1 | 11.8 | 110.95 | 59.13 |
| First premolar | 7.5 | 7.8 | 8.5 | 104.0 | 58.50 |
| First molar | 11.7 | 11.0 | 6.1 | 94.01 | 128.7 |
| Second molar | 11.3 | 10.5 | 6.1 | 92.92 | 118.65 |