

THE KEILOR FOSSIL SKULL: PALATE AND UPPER DENTAL ARCH.

By William Adam, D.D.Sc.

Plates X-XI.

Standard anatomical terms are used in describing the palate and teeth; the methods adopted for measurements are those of the Galton Laboratory, London University. The points between which measurements were made are those defined by Buxton and Morant (3); in addition, other measurements suggested by Campbell (4) are included. Standard anthropometric instruments and modifications of standard precision instruments were used. Data concerning recent Australian aborigines are quoted from Campbell (4) and those for recent Tasmanian aborigines are from an unpublished thesis submitted by the author of this paper for the Degree of D.D.Sc., in which his researches on jaws and teeth of 56 Tasmanian skulls are recorded; a typescript copy of this thesis has been deposited in the Melbourne University Library.

Although measurements are recorded to one-tenth of a millimetre, it is not claimed that this degree of accuracy is attained in every instance owing to the difficulty of precisely locating the position of certain points since the alveolar margins have been slightly abraded post-mortem.

The mandible is missing.

The upper jaw is large, well developed and somewhat projecting. The infra-orbital (canine) fossa is large and deep. The right maxilla is slightly larger than the left.

The following measurements give figures for the Keilor skull, modern Tasmanians and modern Australians. G'H is the Nasion-Alveolar Point chord; LB, the Nasion-Basion chord; and GL, the Basion-Alveolar chord. LB and GL for the Keilor skull were measured by Dr. J. Wunderly. The Tasmanian group includes both males and females; the figures in brackets are maximum and minimum measurements.

The Australian group (males) is Morant's pooled A group, first sample (Morant, 6, p. 437); the figures in brackets indicate the number of specimens measured:

	Keilor	Tasmanian	Australian
G'H	74.2	63.2 (57.5-74)	66.8 (79)
LB	109	96.2 (88.5-111)	102.1 (137)
GL	108	96.3 (89-109)	103.2 (106)

Flower's method (5) of determining the degree of prognathism is used for estimating the Gnathic Index. The length of the Basion-Alveolar Point chord is multiplied by 100 and divided by the length of the Basion-Nasion chord.

$$\text{Gnathic Index} = \frac{\text{GL} \times 100}{\text{LB}}$$

Keilor skull	99.1
Tasmanian adults	101.4 (93.3-107.6)
Australian adults	104.5 (93.1-115.3)

The condition is thus expressed:

Orthognathous—when the index is below 98.

Mesognathous—when the index is between 98.1 and 103.

Prognathous—when the index is above 103.

The Keilor skull and average Tasmanians are therefore mesognathous and average Australians are prognathous.

The palate is large and the upper dental arch is horseshoe-shaped, with the third molars and post-dental processes curving well inwards (Pl. X, fig. 1). It is not quite symmetrical, the right side being slightly larger than the left. The sagittal suture is plainly visible, but the transverse and pre-maxillary sutures are obscure, possibly on account of incomplete removal of the calcareous incrustation which originally covered the whole palate. There is a narrow, low maxillary torus which is slightly higher on the left than on the right side; it is continuous with a large palatine torus. The palate is very broad in relation to its length.

An interesting feature is an unerupted tooth lying in the sagittal plane in the maxillary torus on the left side; it is probably a supernumerary tooth, since all teeth of the permanent dentition or their sockets are present. Most of the tooth is covered with bone and its form cannot be determined. Professor A. Amies of the Melbourne University radiographed the palate from various angles, but the calcareous incrustation in the nasal fossae prevented satisfactory results.

The following are measurements of the palate: the first three are those used by the Galton Laboratory and the remainder are Campbell's:

G' ₁ .	Palate length; from orale to staphylion, 56.5 mm.
G ₂ .	Palate breadth; distance between points on the alveolar border on the palatal side of the upper second molar teeth, 47.2 mm.
EH.	Palate depth from G ₂ chord to the median palatal suture, 13.5 mm.
p.p.	Inner palatal width on the alveolar border opposite the second premolars, 41 mm.
c.c.	Inner palate width opposite the cuspids, 33.5 mm.

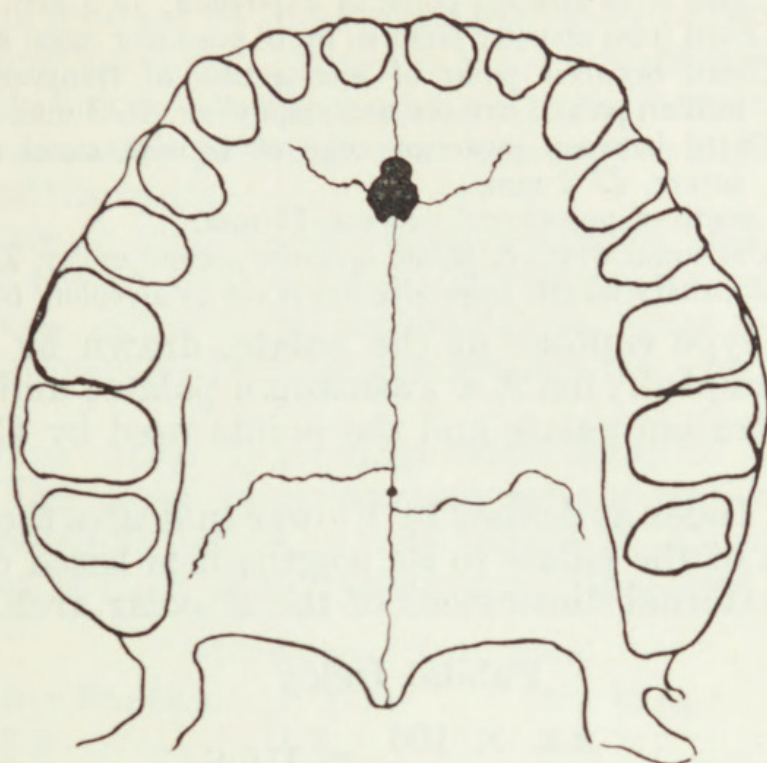


FIG. 1.
Keilor.

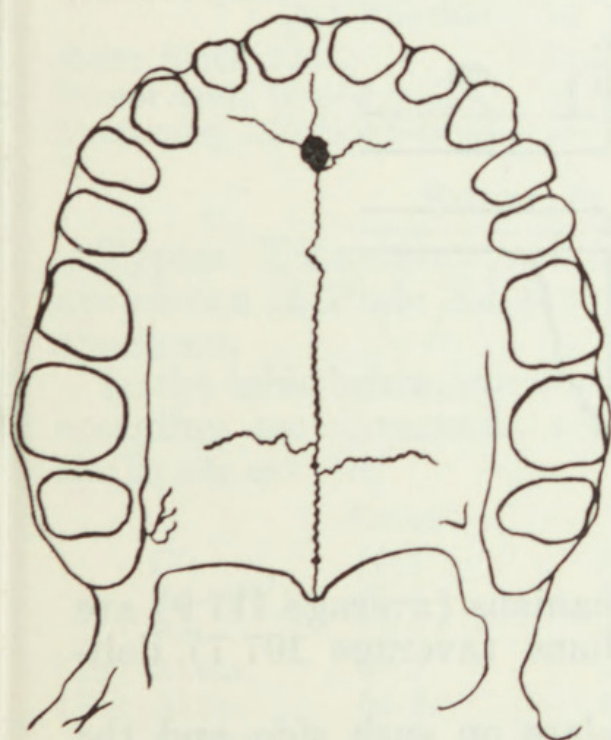


FIG. 2.
Tasmanian.

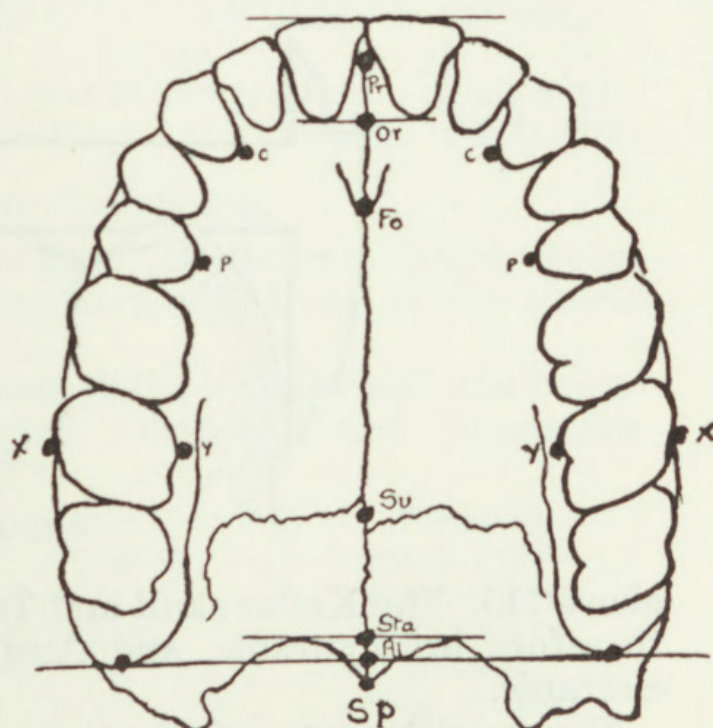


FIG. 3.
Australian (from Campbell, 1925).

Al.Sta.	Chord from alveolar point to staphylion, 59·5 mm.
Al.Sp.	Chord from alveolar point to tip of posterior nasal spine, 64·5 mm.
Su.Sta.	Chord between point of intersection of transverse palatal and median palatal sutures and staphylion, 16·3 mm.
Fo.Su.	Chord between posterior edge of incisive canal and transverse suture, 27·2 mm.
Pd.	Length of post-dental process, 11 mm.
x.x.	Maximum width of palate opposite second molar, 71·5 mm.
Max.L.	Maxillary length from alveolar point to alveolon, 61·3 mm.

Fig. 1 is a type contour of the palate, drawn by the method adopted by Campbell; fig. 2, a Tasmanian palate; and fig. 3 illustrates an Australian palate and the points used by Campbell (4, fig. 5, p. 37).

The Palatal Index as defined by Flower indicates the proportion of the breadth of the palate to its length; it is based on measurements of the external dimensions of the alveolar arch.

Palatal Index

$$\frac{x.x. \times 100}{\text{Max.L.}} = 116\cdot6$$

Turner (6) classified palates as dolichuranic, Palatal Index below 110; mesuranic, between 110 and 115; and brachyuranic,

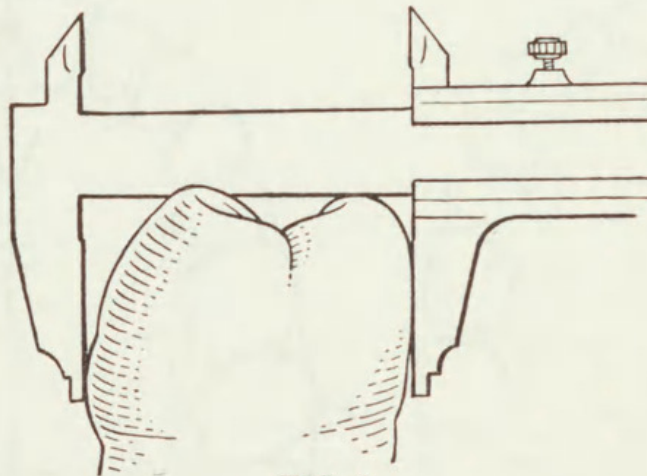


FIG. 4.

above 115. The Keilor skull and Tasmanians (average 111·9) are therefore brachyuranic, and Australians (average 107·7) dolichuranic.

The maxillae are intact; three molars on each side and the right second premolar are present, together with some roots of teeth which have broken off post-mortem. The sockets of all missing teeth are present. The bone at the necks of the teeth is slightly abraded. The arch is symmetrical, and the teeth are large and well formed. Attrition is marked, class 3 of Broca (2), and

there is a fair amount of inter-proximal wear. The teeth, though well worn, show no caries. There is some recession of the alveolar bony margins, but in life there was only slight if any pyorrhoea; post-mortem abrasion probably accounts for the slight loss of bone at the necks of the teeth.

It is possible to record only the mesio-distal and bucco-lingual diameters of the crowns of the teeth. These measurements were carefully taken, but are only approximate, since the crowns are worn by attrition; those on the left side are too worn for measurement.

With vernier callipers readings were taken to one-tenth of a millimetre. The crown measurements are the projective readings taken with callipers placed at right angles to the long axis of the teeth as shown in fig. 4. The terminology is that used by Black (1).

MESIO-DISTAL DIAMETERS.

	2nd Premolar	1st Molar	2nd Molar	3rd Molar
Keilor Skull	7.1	11.2	9.9	9.7
Recent Aust.	7.23(6.5-8.25)	11.43(10-13)	10.93(10-12.5)	10.3(8-13)
Tasmanian	7.6(6.2-8.8)	11.3(10.2-12.2)	11(10-12.5)	10.3(8.9-12.5)

BUCCO-LINGUAL DIAMETERS.

	2nd Premolar	1st Molar	2nd Molar	3rd Molar
Keilor Skull	10.6	13.2	13	12
Recent Aust.	10.4(8.5-12)	12.84(11.5-14.75)	13.1(11-16)	12.33(10-15)
Tasmanian	10.5(9.5-12.3)	12.7(11.4-14)	13(11.8-14.8)	12.5(11-13.7)

SUMMARY AND DISCUSSION.

Typical Tasmanian and Australian palates and dental arches are shown in Plate XI for comparison with those of the Keilor specimen.

In the table below, measurements of the Keilor Skull and corresponding measurements of recent Australian and Tasmanian skulls are set out.

	Keilor	Australian	Tasmanian
G ₁	56.5	51.5(46.5-59.5)	49(40.5-59)
G ₂ (YY)	47.2	39(32-44.5)	38.6(31-45.5)
EH	13.5	10.95(7-17.5)	9.1(3.2-13)
(Pr) Al.Sta.	59.5	57.8(51.5-67.5)	52.9(48.7-57.4)
(Pr) Al.Sp.	64.5	62.7(51-73)	56.8(52.3-66)
Su.Sta.	16.3	12.7(8-17.5)	9.9(6.2-14.7)
Fo.Su.	27.2	29.4(20-35)	30.5(27.2-35.8)
p.p.	41	34.2(30-41)	35.5(32-41)
c.c.	33.5	26.4(22.5-31)	26.8(23.7-33)
Pd.	11	8.85(4-15)	7.5(3.5-10.8)
Max.L.	61.3	60.5(54-67)	56.4(51.5-61.5)
x.x.	71.5	62.1(56-75.5)	63.8(57.5-71)

From these measurements it will be seen that the Keilor is larger than average Australian and Tasmanian skulls, but with the two exceptions of G₂ (the inner width of the palate between the 2nd molar teeth) and c.c., all measurements of the Keilor skull lie within those of the largest recorded Australian skulls. Seven of its measurements exceed the maxima of those recorded by the writer for Tasmanian skulls.

The Keilor skull with a Gnathic Index of 99.1 and the average Tasmanian skull with a Gnathic Index of 101.4 are mesognathic; the average Australian skull has a Gnathic Index of 104.5 and is prognathous.

The palate of the Keilor skull is very large and well developed. Though larger measurements are recorded by Campbell for some Australian skulls, the upper jaw of the Keilor skull is larger than most modern Australian jaws and is larger in a number of its measurements than any of the Tasmanian jaws examined by the writer.

The teeth of the Keilor skull, though slightly smaller in their mesio-distal diameters than the average corresponding Australian and Tasmanian teeth, are about the same size in bucco-lingual diameter; all measurements fall within the range of measurements for corresponding Australian and Tasmanian teeth.

The teeth are too much worn to admit a comparison of cusp form, but the type of wear is similar to that found in Australian and Tasmanian cusps. The food of Keilor man was evidently coarse and required vigorous mastication.

Any supernumerary tooth such as the one situated in the horizontal part of the left maxilla of the Keilor skull is rare in primitive skulls. No similar occurrence is recorded by Campbell in the series of 630 Australian skulls examined by him nor by the writer in Tasmanian skulls. Since radiographs were unsuccessful, it is impossible to determine its form without dissecting out the tooth.

A comparison of the Keilor palate with those of Tasmanians and Australians (Pl. VII and VIII) discloses that it is more Tasmanoid than Australoid in the following respects:

1. The palatal contour is horseshoe-shaped, with the third molars turning well inwards.
2. It is relatively broad like the Tasmanian palate (brachyuranic); the Australian palate is relatively narrower (dolichuranic).
3. Well-developed maxillary and palatine tori are present.
4. The infra-orbital fossa is deep.

To Mr. L. A. Baillôt of the Melbourne Technical College I am

indebted for the photographs reproduced in Plate X, fig. 1, and Plate XI, fig. 2.

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PLATES

- X. The Keilor Palate and Dental Arch.
- XI. Fig. 1. Tasmanian Palate and Dental Arch.
2. Australian Palate and Dental Arch.



Fig. 1 ($\times 0.98$ approx.)



Fig. 2

The Keilor Palate and Dental Arch

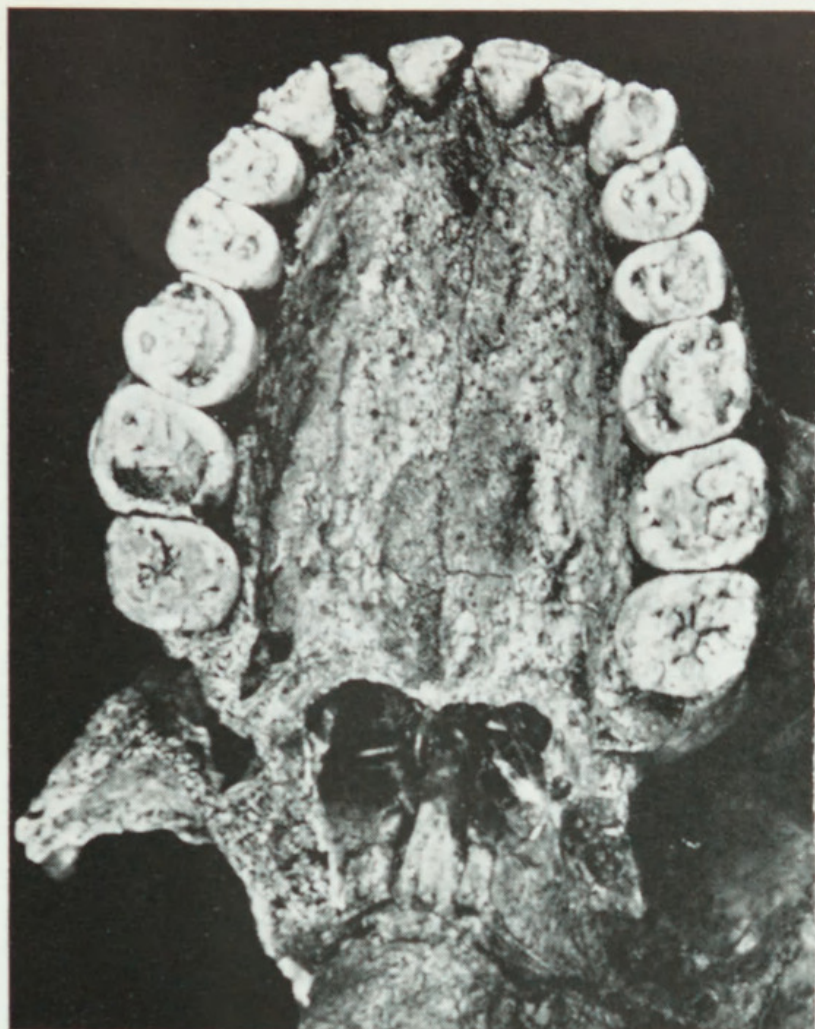


Fig. 1. Tasmanian ($\times 1.1$ approx.)

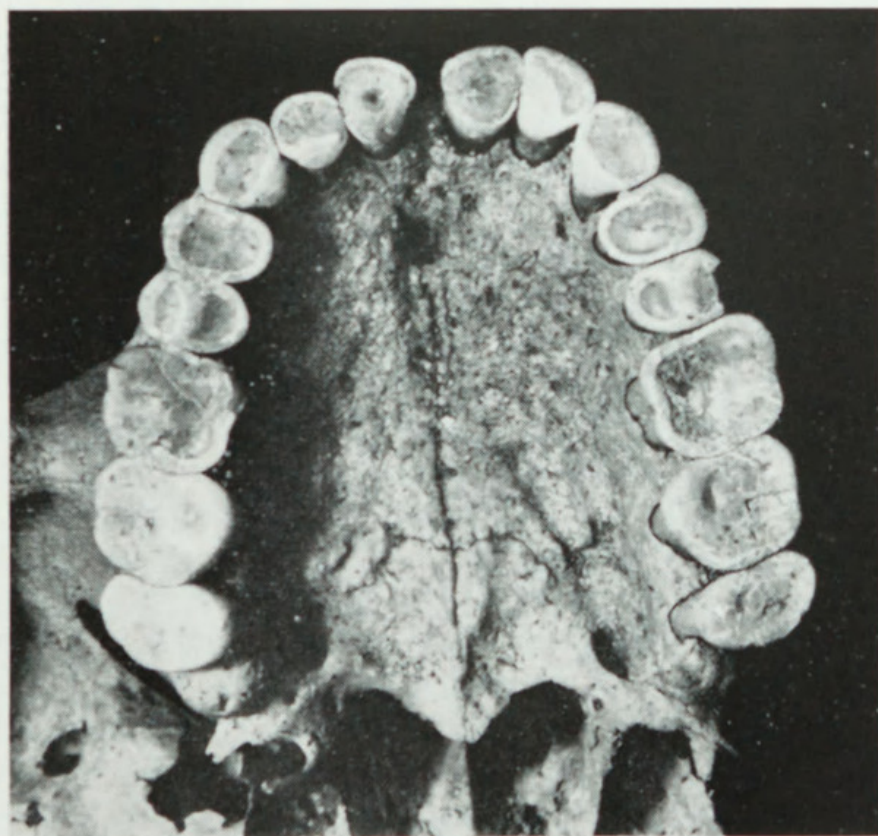


Fig. 2. Australian ($\times 1.02$ approx.)



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