NOTES ON THE MEASUREMENTS OF THE TASMANIAN CRANIA IN THE TASMANIAN MUSEUM, HOBART.

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(PLATES.)

The crania of which the measurements are hereinafter given are all in the Tasmanian Museum at Hobart, and have never before been measured. It is to be regretted that more were not available, and that those in the Museum were so damaged and incomplete. However, as, comparatively speaking, very few complete craniometrical tables of Tasmanian skulls have been published, we believe that our efforts in this direction may prove of some value. We have not attempted to draw conclusions as to the origin of the Tasmanians, nor to define characteristics, we have simply taken the measurements as accurately and carefully as possible, and hope that our masters, the savants of the Old World, will find in their researches some use for these records of an extinct race. So that our measurements may be compared with those of other craniologists, we have thought it best to preface our tables by a short description of the system followed.

Practically the whole of the straight and curved measurements were taken as directed by Broca*. The vertex has been considered always as at the bregma, and the cephalic index arrived at by the formula:—

$$\frac{\textit{Maximum transverse diameter} \times 100}{\text{Glabello-occipital length.}}$$

The "ophryo-occipital and nasio-occipital lengths are also given.

The "minimum frontal" and stephanic diameters are the inferior and superior transverse frontal diameters of Broca, and the circumferences are those of the same master.

In taking the infra-auricular circumferences we have adopted the suggestion of Professor Scott †, and used a piece of fine cord instead of the usual tape. The palate was measured according to the directions given by Sir William Turner ‡, the length extending from the alveolar point to a

* "Instructions Craniologiques et Craniometriques," 1875, and "Anthropologie," Topinard.

† "Osteology of the Maori and Moriori," Scott. Trans. N.Z. Institute. 1893.

‡ Challenger reports, vol. x.

line drawn across the hinder borders of the maxillary bones, and its width between the outer borders of the alveolar arch immediately above the middle of the second molar tooth. The zygomatic projection is shown by the terms Phaenozygous (P.) and Cryptozygous (C.), and was ascertained by Sir William Turner's method. The breadth of the ramus is its antero-posteria diameter on a line with the alveolar border.

The projections given were determined by Topinard's craniophore, and the two angles arrived at by trigonometrical calculation.

We greatly regret that we have been compelled to omit several angles and curves owing to our inability to procure proper goniometers. However, we hope shortly to remedy this. By the way, we found the craniometer figured in Flowers' Osteological Catalogue very useful in measuring the various diameters.

In taking the important measurement of capacity, we have used No. 8 chilled shot, and a funnel made according to Sir William Turner's instructions. In fact, we here followed closely Turner's method, excepting that as we could not obtain the two litre measures, we were compelled to use the one litre and half litre measures of Broca. This measurement was taken separately by each of us, and again together in each case.

The Indices chosen are as follows :—

Cephalic	*Maximum transverse diameter* × 100 Glabello-occipital length.
Vertical	*Basi-bregmatic length* × 100. Glabello-occipital length.
Frontal	*Minimum frontal diameter* × 100. Maximum trans-diameter.
Stephanic	*Minimum frontal diameter* × 100. Stephanic diameter.
Foramen magnum ...	*Width* × 100. Length.
Orbital	*Height* × 100. Width.
Nasal	*Width, anterien nares* × 100. Nasio-spinal height.
Gnathic	*Basi-alveolar length* × 100. Basi-nasal length.
Palato Maxillary ...	*Breadth* × 100. Length.
Facial	*Ophryo-alveolar length* × 100. Bizygomatic diameter.

In grouping the skulls according to their indices, we have used the divisions as named and defined by Flower and Turner.

Dolicho-cephalic. Cephalic index, below 75.
Mesati-cephalic. „ „ between 75 and 80 inclusive.
Brachy-cephalic. „ „ above 80.

Tapeino-cephalic. Vertical index, below 72.
Metrio-cephalic. „ „ between 72 and 77 inclusive.
Akro-cephalic. „ „ above 77.

Micro-seme. Orbital index, below 84.
Meso-seme. „ „ between 84 and 89 inclusive.
Mega-seme. „ „ index above 89.

Lepto-rhine. Nasal index, below 48.
Meso-rhine. „ „ between 48 and 53 inclusive.
Platy-rhine. „ „ above 53.

Ortho-gnathous. Gnathic index, below 98.
Meso-gnathous. „ „ between 98 and 103 inclusive.
Pro-gnathous. „ „ above 103.

Dolich-uranic. Palato-maxillary index, below 110.
Mes-uranic. „ „ „ between 110 and 115 inclusive.
Brachy-uranic. „ „ „ above 115.

The grouping of the skulls according to their cranial capacities is as follows :—

Micro-cephalic. Below 1,350cc.
Meso-cephalic. Between 1,350 and 1,450cc. inclusive.
Mega-cephalic. Above 1,450cc.

There are in the Museum 19 crania described as Tasmanian. Of this number we rejected at once three skulls as being incorrectly classed, and upon comparing the skulls after measurement, we decided to exclude three others, which in our opinion are those of half-castes. The measurements of these three crania are given in our table, but they are otherwise disregarded. Our table therefore gives the measurements of 12 Tasmanian crania, six male and six female.

A word with regard to No. 2. Viewed from above, it presents all the peculiarities of the cranial vault noticed in the Tasmanians, but differs from most of the other crania in the face. The upper border of the orbit does not project beyond the lower, but on the contrary is 5mm. behind, and al-

though the depression at the root of the nose is very noticeable, still the height of the face does not appear so contracted as in the remainder of the skulls. Again, while the molar bones are similar to the Tasmanians, the subnasal prognathism is greater. However, we have decided to class it amongst the Tasmanians.

GENERAL DESCRIPTION.

Cranial Vault.—The most striking feature of the cranial vault is that which is so well described by Dr. Paul Topinard* and quoted by J. Barnard Davis†. It is as follows:—

"At two or three centimetres from the bregma there begins to be marked out a convexity of an oval form which contracts, and freeing the bregma is transformed into an antero-posterior crest. This hollows in the middle to receive the sagittal suture, seems to double itself, and terminates about half way between the anterior and posterior fontanelles. Upon the sides of this crest, at about a centimetre before the coronal suture, take their rise at the same time two antero posterior grooves, which hollow more and more as they proceed, and end equally at half the length of the parietal. Lastly, quite outside, are situated the parietal bosses, very much developed, even conical."

This keel-shaped vault is noticeable in all the crania under consideration; in Truganini's skull it is particularly noticeable, as it is also in skull No. 2.

The parietal eminences are well-defined and prominent in every case, and the roof of the skull is markedly obovate in shape. Six of the skulls have the obelion depressed. The parietal foramina are very minute in most cases, but are present in all the skulls. Viewed sideways, the rounded form of the skulls in the region of the squamosals is striking in all the crania, and in the majority the temporal fossæ are deep and extensive. The temporal ridge is well marked, especially so in the male crania. The face presents features so pronounced as to lead one to believe it impossible to mistake a Tasmanian skull‡, even leaving out of consideration the characteristic keel-shaped vault. All the skulls show the depression at the root of the nose, and the projection of the glabella and supra-orbital ridges noticed by Dr. Topinard and others. No. 3 (a photograph of which, kindly

* "Etude sur les Tasmaniens." Mem. de la Soc. d'Anthropolegie de Paris, iii, 309. "Daily life of the Tasmanians." Bonwick, p. 116.

† The Osteology and Peculiarities of the Tasmanians. J. Barnard Davis, p. 10.

‡ I have seen in Australian skulls a depression of the root of the nose, a projection of the glabella and supra-orbital ridges equal to that of the average Tasmanian skull, but the contraction of the face, the size and shape of the orbits, and usually the position of the molar bones all serve to distinguish the latter.—W. R. H.

taken by Mr. Russell Young and Mr. Arthur Butler, accompanies this paper). Nos. 3 and 4, especially the latter, have a very sinister appearance on account of this.

Truganini, in her photographs taken during life, appears to have this appearance strongly marked, but it is hardly noticeable in the skull ; however, in a *photograph* of the cranium the peculiarity is more apparent. The molar bones as a rule are small if anything, and their front thrown well forward. The anterior nares are broad at the base and narrow very gradually ; in some of the skulls they appear almost rectangular. The nasal spine is almost obliterated in most of the skulls, in the remainder it is distinctly double. The nasal bones, where present, are high and very concave at the ends, and then sink somewhat abruptly, and at the root have that pinched appearance noted by Topinard. The superior maxilla adds to the contracted appearance of the face, the ascending process dips backwards, and further, just below the inferior border of the orbit, and near its junction with the molar bone, quite a well is formed in the majority of the skulls.

Topinard in his report on six Tasmanian crania, published in Bonwick's "Daily life of the Tasmanians," notices that the superior border of the orbit projects over the inferior, and compares this with the Australian skulls, in which the contrary is the rule. His table shows that the average projection in five male Tasmanian crania is 7·2, while in 10 Australian skulls the mean is—1 §. Our measurements do not go to prove this projection of the superior border of the orbit to be constant in Tasmanian crania, though it is usually the case.

The projection was determined with a Topinard's craniophore, the skull being placed on the alveolo-condylar plane. Owing to the very broken state of the skulls, especially of the base, we could only take the measurement satisfactorily in six skulls. In four of these the projection in question was noticeable, and averaged 3·7, while in the fifth, an undoubted Tasmanian skull (that of Augustus, a male, aged 50 years), the lower border projected beyond the upper for 3mm. The sixth (No. 2) has already been referred to. In all the skulls, the orbits are rectangular in shape ; in the male skulls this is particularly noticeable ; in fact, in three or four they are almost perfectly oblong.

In all the male skulls the palate is parabolic in shape, but the female palates show the U formation ; in Truganini, the palate is slightly elliptical.

Sutures.—The coronal suture is simple in every case except in the region of the stephanions ; the sagittal suture is some-

§ In one undoubtedly Australian skull in my possession, the superior border of the orbit projects over the inferior 7mm.—W. R. H.

what complicated, and the lambdoidal greatly so, as a rule. Wormian bones are of frequent occurrence in the lambdoidal, and at the pterion. Epipteric bones also appear in several instances. The pterion assumes quite a number of forms, although in the majority of cases it is of the usual H shape; in three skulls (Nos. 2, 4, and 6) it is K shaped, and in No. 8 the temporal pushing back the sphenoid touches the frontal for 13mm. on both sides. None of the skulls are metopic, nor are there any traces of an interparietal bone. The obliteration of the sutures starts from before backwards in every case.

Unfortunately, there were only four skulls with the lower jaw complete, one male and three female. The lower jaw is small in all measurements, the condylar height exceeds the coronoid in every case, with the exception of Truganini. In two skulls, the gonion shows a very wide angle, but this is merely due to old age.

In no skull is there a complete set of teeth. In most cases, however, the teeth have been lost after death; but in a few of the older skulls (such as Caroline) the teeth have been lost from old age, and the alveolas absorbed. In most skulls, three molars were present at the time of death, but in some specimens *(e.g.*, Augustus, No. 1), though well past middle life, the third molars are not fully erupted. There are no carious molars. All the molars are well worn, with the exception of some of the third molars, which are distorted. The incisors and canines have been lost in nearly every skull, as have also the bicuspids, but those which are left show the same grinding down as the molars, and the same absence of caries.

Capacity.

	No.	Average.	Minimum.	Maximum.	Class.
Male ...	3	1282	1155	1450	Micro-cephalic
Female ...	5	1089	1050	1135	,,
Total ...	8	1161	1050	1450	,,

The average male capacity of these specimens classes them as micro-cephalic, the females also have a very small capacity. The variation from the smallest female to the largest male capacity is 400cc. In comparing our measurements with others, we find that the skulls in the Tasmanian Museum have a smaller mean capacity than any other collection of Tasmanian skulls that have yet been measured¶, with the exception of two skulls in the Cambridge Museum, the measurements of which were kindly sent to us by Ling Roth. Flower, in six male and five female skulls in the

¶ Broca and Topinard rammed the shot, while we only used the thumb to push it down. J. B. Davis measured his capacities with sand, and Flower with mustard seed.

Museum of the Royal College of Surgeons of England, finds the average male capacity to be 1,309cc., and the female 1,140cc. Broca, in seven specimens, finds the male to be 1,452, and the female 1,201. J. Barnard Davis, six male 1,392, four female 1,273. Topinard, male, 1,376, female 1,103. Mr. W. L. H. Duckworth, in two male skulls in the Cambridge University collection, finds a capacity of 1,130.

These figures combined give an average capacity of 1,323cc. in the male, and 1,161cc. in the female, thus classing the Tasmanian skull as micro-cephalic.

Cephalic Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male ...	6	74·0	73·1	75·6	Dolicho-cephalic
Female ...	5	77.0	75·4	78·5	Mesati-cephalic
Total ...	11	75·4	73·1	78·5	Mesati-cephalic

Our average of 11 skulls gives a cephalic index of 75·4, which places these specimens in the mesati-cephalic class. The males, with an index of 74·0, have a longer skull than the females, 77·0. The variation, however, is small, 5·4. Broca, in 10 Tasmanian skulls, finds a cephalic index of 76·11*. Barnard Davis, in 17 Tasmanians, one of 75·6†. Topinard finds an index of 77·4 in the male, and 74·9 in the female‡, which makes the female skull the longer in proportion, contrary to our experience. Flower gives an index of 76·3, but as his measurement of length is taken from the ophryon instead of from the glabella, as in the other authors quoted, this makes his index higher than it would otherwise be§. Duckworth, in the two Cambridge skulls, finds an average cephalic index of 73·1. These figures combined therefore give an average cephalic index of 75·4, which, strangely enough, is the average of the skulls in the collection at the Tasmanian Museum, and classes the Tasmanians as mesati-cephalic.

Vertical Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male ...	4	70·0	66·8	73·9	Tapeino-cephalic
Female ...	4	72·5	68·0	78·2	Metrio-cephalic
Total ...	8	71·2	66·8	78·2	Tapeino-cephalic

This table of vertical indices shows that our collection of skulls should be classed as Tapeino-cephalic, having an

* "Sur la Classification et la Nomenclature d'après les indices cephaliques." Paul Broca. Revue D'Anthropologie, vol. 1, p. 385, 1872.

† "Thesaurus Craniorum." Barnard Davis.

‡ "The Tasmanians." H. Ling Roth.

§ "Osteological Catalogue of the Museum of the Royal College of Surgeons of England." W. H. Flower.

average index of 71·2. The male skulls, with an index of 70·0, are not as lofty as the female, which average 72·5. The variation in this table is larger, 11·4. Topinard gives an average index of 71·0 for the male, and 63·5 for the female, thus making the male skull the higher in proportion, which is the opposite to what we have found in our specimens. In one specimen in the Cambridge collection the index is 68·4. These figures combined give an average of 69·8 in the male, and 70·5 in the female, or 70·1 in both sexes. The Tasmanians should therefore be classed as Tapeino-cephalic.

Orbital Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male	6	79·4	66·7	91·9	Microseme
Female ...	4	84·8	80·0	88·9	Mesoseme
Total	10	81·6	66·7	91·9	Microseme

This table gives an average of 81·6 in these crania, classing the skulls as microseme ; the males have a lower and wider orbit (index 79·4) than the females (84·8). The variation is considerable (25·2). The variation of the male skulls (25·2) is much greater than that of the female (8·9). Topinard gives an average index of 76·6 in the male, and 81 in the female. Flower finds the male index to be 76·7 and the female 84·9 in 14 skulls which he measured. In the two skulls in the Cambridge collection the average index is 77·3. These figures combined give an average male index of 77·5 ; and female of 83·6 ; the average for both sexes is 80·5. The Tasmanian skull is therefore microseme.

Nasal Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male... ...	6	54·0	49·1	62·2	Platyrhine
Female ...	3	55·2	49·0	58·7	„
Average ...	9	54·4	49·0	62·2	„

In nine skulls we find the average nasal index to be 54·4. In the male the index (54) is lower than that of the female (55 2). Both sexes therefore belong to the platyrhine group. The variation is 13·2. Broca, in eight Tasmanians, finds a nasal index of 56·92. Flower, in 14 Tasmanians, one of 57·4. In the Cambridge collection the average nasal index of the two skulls is 64·1. This is much higher than any of the other nasal indices ; it is indeed higher than the maximum nasal index in our collection (62·4). On working out the nasal index from the measurements of Topinard, quoted in Ling Roth's " Tasmanians," we find it to be 55·1 in the males, and 60·5 in the females. These figures combined give an average nasal index of 58·1, and class the Tasmanians as Platyrhine.

Gnathic Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male ...	4	107·5	103·0	110·0	Prognathous
Female ...	2	102·7	101·0	104·0	,,
Total ...	6	106·0	101·0	110·0	,,

In six specimens which we have measured we find the gnathic index to be 106, classing the skulls as prognathous. The male index, 107·5, is greater than the female, 102·7. The variation is 9. Flower, in 11 specimens, finds an average index of 103·3 The two Cambridge specimens measured give an average of 108·1. These figures combined give an average gnathic index of 105·8, which classes the Tasmanian skull as prognathous.

Palato-maxillary Index.

	No.	Average.	Minimum.	Maximum.	Class.
Male ...	2	118·0	116·4	119·6	Brachyuranic
Female ...	3	111·5	103·5	122·0	Mesuranic
Average	5	114·6	103·5	122·0	,,

The male palate, with an average index of 118, is broader than the female, with an average of 111·5. The total average, 114·6, classes these specimens as mesuranic. The two Cambridge specimens which were measured give an average of 114·5. These averages combined give an index of 114·55, which classes those Tasmanian skulls of which we have measurements as mesuranic.

Frontal Index.

	No.	Average.	Minimum.	Maximum.
Male	6	67·9	65·4	70·4
Female	6	66·7	62·9	73·5
Total	12	67·3	62·9	73·5

This index is fairly constant, averaging 67·9 in the males, and 66·7 in the females, or 67·3 in both sexes. The greatest variation is 10·6. Broca finds in eight Tasmanian crania an index of 67·0. In deducing this index from Topinard's measurements in Ling Roth's "Tasmanians," we find it to be 65·7 in the males and 70·2 in the female. These figures combined give an average index of 67·4, so that this index is fairly constant in the skulls of whose measurements we have a record.

Stephanic Index.

	No.	Average.	Minimum.	Maximum.
Male	6	91·5	86·5	97·8
Female	6	88·6	83·0	97·9
Total	12	90·0	83·0	97·9

This index again is fairly constant, averaging 90 in 12 skulls; the average being 91·5 in the males, and 88·6 in the females. The greatest variation is 14·9.

Index of Foramen Magnum.

	No.	Average.	Minimum.	Maximum.
Male	4	87·0	79·4	100·0
Female	5	85·1	76·5	88·6
Total	9	85·9	76·5	100·0

This index averages 85·9 in nine skulls; 87 in the male, and 85·1 in the female. The variation is considerable (23·5). Topinard's figures are approximate to this being 85·5 in the male, and 81·2 in the female. These figures combined give an average of 86·7 in the male, and 83·1 in the female, or 84·7 in both sexes.

Facial Index.

	No.	Average.	Minimum.	Maximum.
Male	3	72·6	68·4	76.7
Female	1	69·7		
Total	4	71·9	68·4	76·7

This index averages 71·9. In the three males which we have measured it is 72·6, and in the one female, 69·7. Broca, in eight Tasmanians, finds an average of 62·6. Calculating from Topinard's figures in Ling Roth's "Tasmanians," we obtain an index of 69·2 in the male, and 65·0 in the female. In one skull in the Cambridge collection which was measured, the facial index was 70·2. These figures combined give an average facial index of 67·9.

Median Circumference.—In measuring the arcs of this circumference, we find in eleven skulls that were available that the average length of the parietal arc, 126·1, is longer than that of the frontal, 125·7, or the occipital arc, 111·5. This is borne out by J. Barnard Davis's measurements of 10 skulls, where he finds the same condition; his figures also are fairly approximate to ours, viz., frontal arc, 125mm.; parietal, 130mm.; and occipital, 110mm.

Horizontal Circumference.—We find the average horizontal circumference of six males and five females to be 502. J. B. Davis, in 10 skulls, finds an average of 507. Topinard, taking the averages of the two sexes combined, as in the other instances quoted, one of 514. In the Cambridge collection, two skulls give an average of 500. Combined, these figures give an average horizontal circumference of 506mm.

Bizygomatic Diameter.—The diameter, which shows the maximum breadth of the face, averages 129mm. in the five skulls which we were able to measure. In 10 skulls, J. B. Davis finds an average of 130. Topinard, one of 127. In one skull in the Cambridge collection this diameter measured 124mm. These figures combined give an average bizygomatic diameter of 127mm.

In conclusion, we wish to express our thanks to the Fellows of the Society and to the other gentlemen who have given us assistance in various ways. First of all to the Museum authorities for their courtesy in allowing us the use of their room in the evenings. To Mr. J. B. Walker for the loan of books and papers. To Mr. Russell Young and Mr. Arthur Butler for the excellent photographs which accompany this paper. To Mr. Ward and others for the loan of measuring glasses, instruments, shot, etc. Lastly, Mr. Chairman, ladies, and gentlemen, we thank you for your kind attention to a paper which, in order to be scientifically accurate, must necessarily be somewhat tedious to any but an enthusiastic anthropologist.

EXPLANATION OF PLATES.

PLATE 1.—*(a)* Truganini, No. 7. Full Face.
(b) „ „ Profile.
(c) „ „ Base of Skull.

PLATE 2.—*(a)* No. 3. Full Face.
(b) „ Profile.
(c) „ Base of Skull.

N.B —The figures refer to the number of the skulls in the table of measurements.

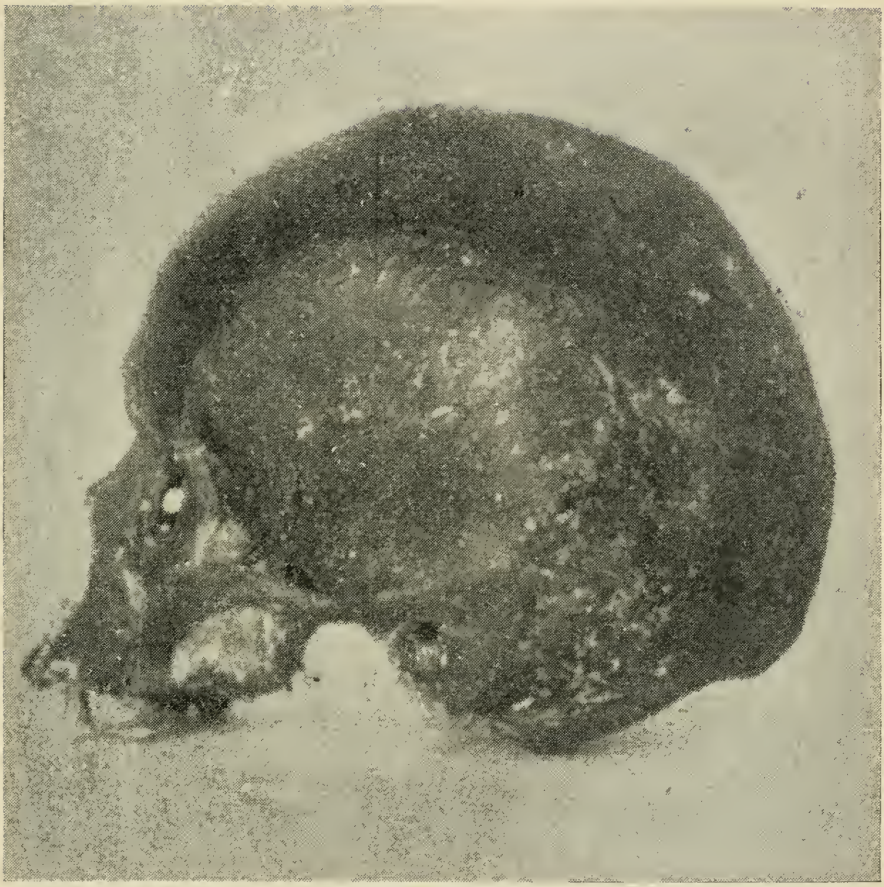

PLATE 1. *(b)*

No. 7. TRUGANINI. PROFILE.

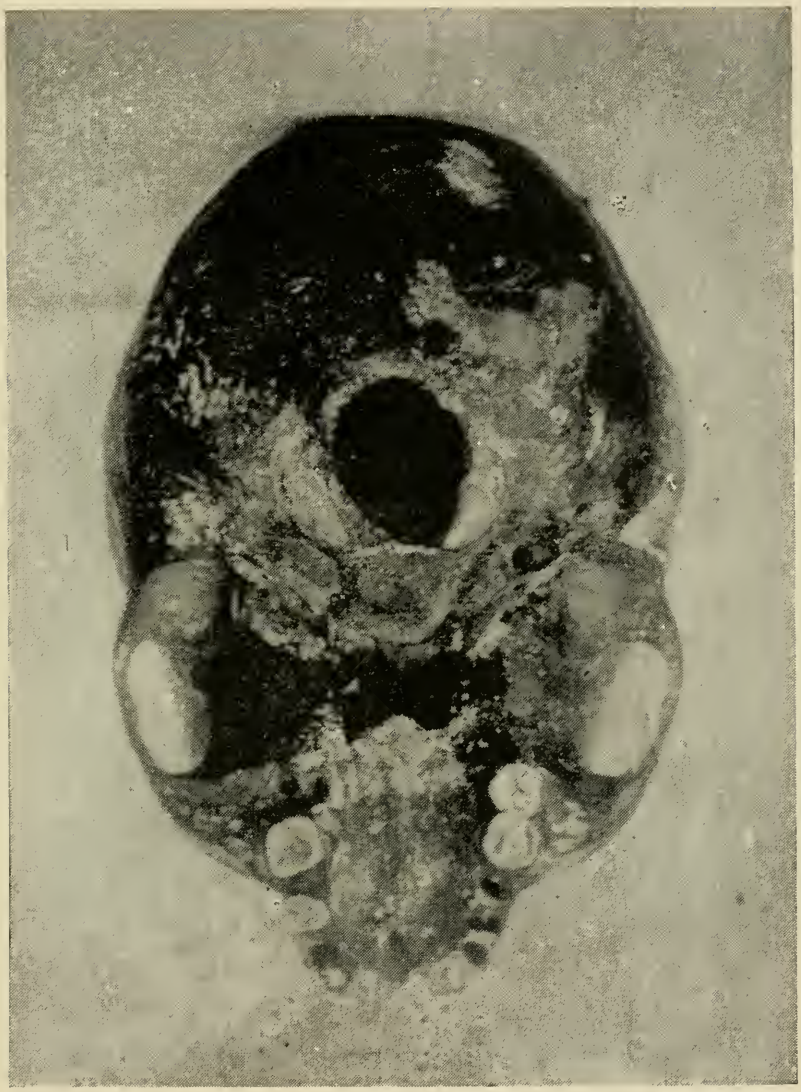

PLATE I. *(c)*

No. 7. TRUGANINI. BASE OF SKULL.

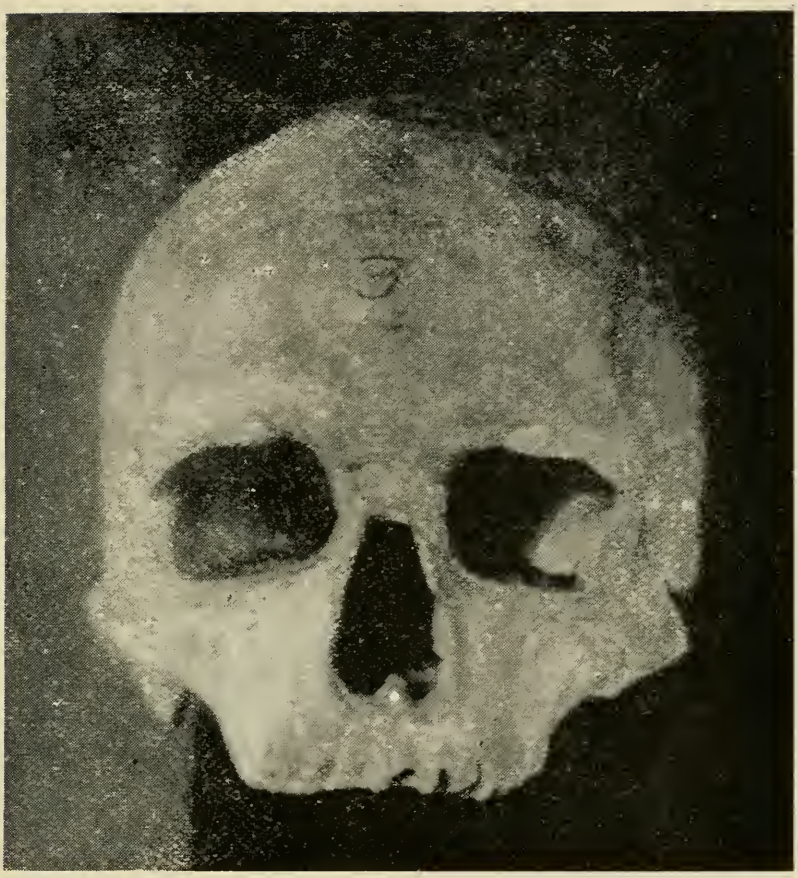

PLATE 2. *(a)*

No. 3. FULL FACE.

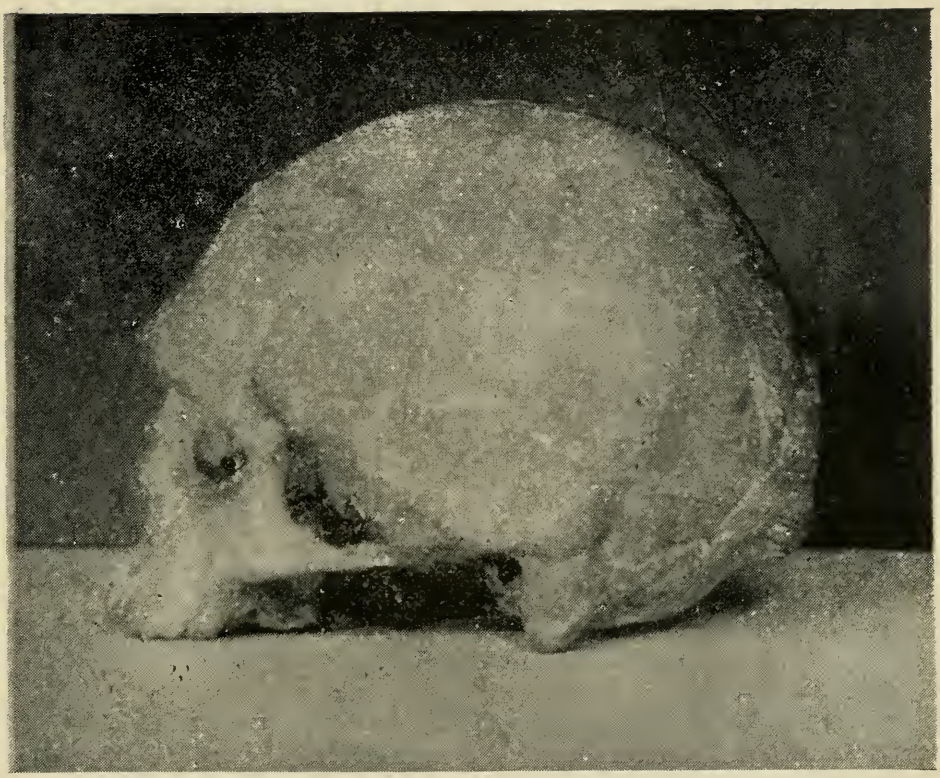

PLATE 2. *(b)*

No. 3. PROFILE.

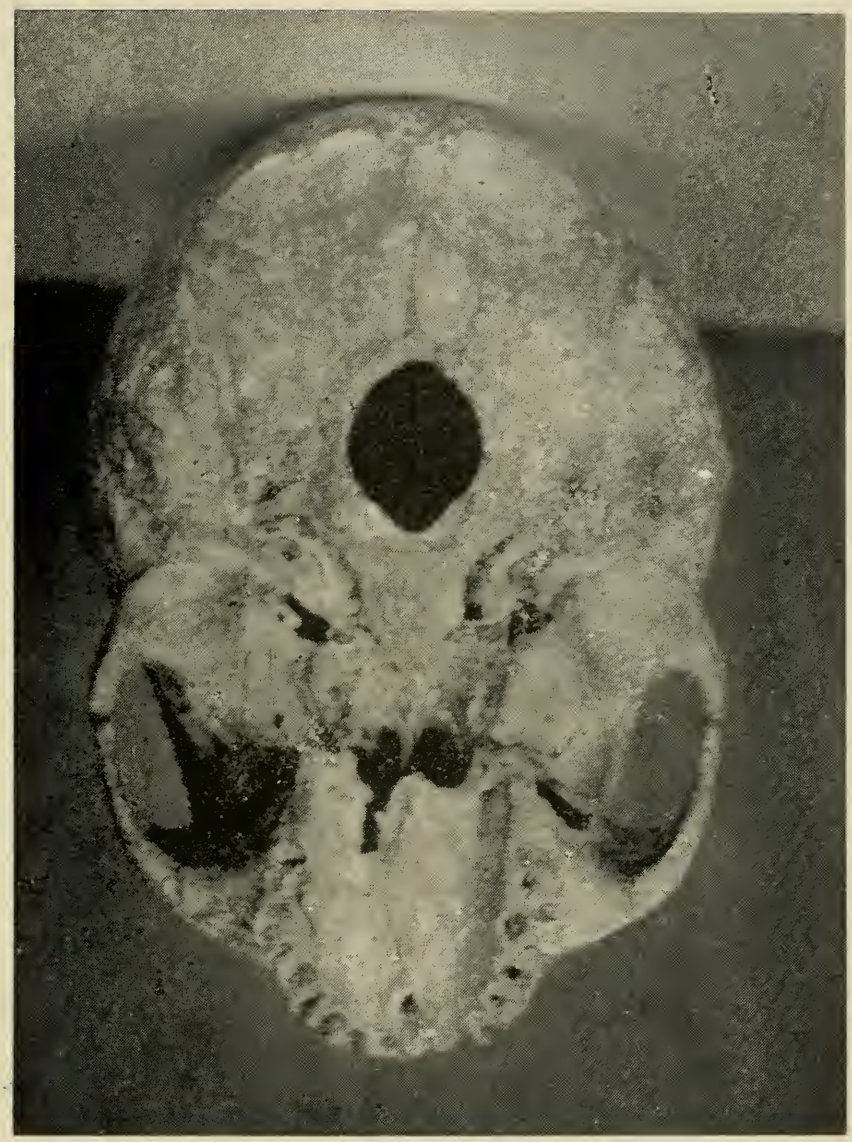

PLATE 2. *(c)*

No. 3. BASE OF SKULL.