

University of Dundee

## DOCTOR OF PHILOSOPHY

### An anthropological investigation into the facial preservation of ceremonial tsantsa and commercial shrunken heads

Houlton, Tobias

*Award date:*  
2015

[Link to publication](#)

#### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

#### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# Appendix 4

## Morphometric dimensions (shrunken head collection)

---

The measurements recorded for each individual shrunken head, according to the category they are prescribed, are available in Table A4-1 (ceremonial – *appendix* pp.2-3), Table A4-2 (commercial – *appendix* pp.4-10), and Table A4-3 (ambiguous – *appendix* pp.11-15).

The calculated minimum, first quartile, median, third quartile, maximum, mean and standard deviation values are stated in Table A4-4 (ceremonial – *appendix* p.16-7), Table A4-5 (commercial – *appendix* p.17-8), and Table A4-6 (ambiguous – *appendix* p.18-9).

## Individual measurements

**Table A4-1 (set 1):** Morphometric recordings taken from ceremonial *tsantsa*.

Head ID	Processor origin	Max cranial breadth (eu-eu)	Cranial base width (t-t)	Max head length.		Forehead height (tr-g)	Auricular head height (v-po)	Upper face height (v-sn)
				1 (op-sto)	2 (op-g)			
A95789	Ceremonial	42	35	102	79	17	70.5	88.4
A121104	Ceremonial	56	45	105	81	25	64.8	79.5
A642550	Ceremonial	51	38	103	76	20	67.8	78.6
A642560	Ceremonial	50	48	110	80	21.1	64.9	75.4
E165119B0	Ceremonial	55	50.4	104.1	83.9	30.4	66	65.2
E403395-0	Ceremonial	56.9	57.5	109.5	81	21.9	74.6	77

**Table A4-1 (set 2):** Morphometric recordings taken from ceremonial *tsantsa*.

Head ID	Processor origin	Craniofacial height (v-gn)	Jaw width (go-go)	Supraorbital depth (g-t)	Orbito-tragial depth (ex-t)	Upper jaw depth (sn-t)	Lower jaw depth (gn-t)	Face height 1 (tr-gn)
A95789	Ceremonial	110.6	29.9	47.8	26.2	49.1	50.5	75.4
A121104	Ceremonial	97.6	37.9	41.2	23.6	45.9	45.7	72.5
A642550	Ceremonial	96.5	26.5	39.8	23.3	44.3	45.1	60.2
A642560	Ceremonial	101.2	44.7	47.9	25.9	53.4	55.8	81.3
E165119B0	Ceremonial	106.6	43	51.8	28.9	56.9	59.6	87.7
E403395-0	Ceremonial	114.4	46.4	49.4	25.4	56	56.6	75.8

**Table A4-1 (set 3):** Morphometric recordings taken from ceremonial *tsantsa*.

Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Inter-canthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
A95789	Ceremonial	36.5	30.2	19.3	12.6	26.4	9.4
A121104	Ceremonial	28.7	25.1	13.9	13.8	28.9	8.8

Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Intercanthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
A642550	Ceremonial	26.5	22.6	13.9	16.1	34.6	10
A642560	Ceremonial	38.8	31.2	21.8	15	33.5	10.8
E165119B0	Ceremonial	41.5	28	14	13.2	34	12.5
E403395-0	Ceremonial	35.9	24.6	13.9	13.6	14.4	13.2

**Table A4-1 (set 4):** Morphometric recordings taken from ceremonial *tsantsa*.

Head ID	Processor origin	Nose			
		Width (al-al)	Ala	Columella	Nasal tip protrusion
A95789	Ceremonial	17.2	1.8	3.9	12.2
A121104	Ceremonial	19.8	3.5	3.5	10.2
A642550	Ceremonial	18.2	3.5	3.5	8.5
A642560	Ceremonial	19.2	2.9	4	11.3
E165119B0	Ceremonial	11.9	3.1	3.6	11
E403395-0	Ceremonial	18.4	3	4	11.5

**Table A4-1 (set 5):** Morphometric recordings taken from ceremonial *tsantsa*.

Head ID	Processor origin	Ear		Mouth width (ch-ch)	Lip height		Neck circumference
		Length	Width		Upper	Lower	
A95789	Ceremonial	25.1	16.5	28	6.7	5	133
A121104	Ceremonial	25.5	17.8	35.2	5.9	5	114
A642550	Ceremonial	26.4	19.6	35.8	5	4.8	101
A642560	Ceremonial	24.5	18.6	25.3	6.8	5.2	150
E165119B0	Ceremonial	29.2	20.1	27.3	5.5	5.4	147
E403395-0	Ceremonial	28.7	21.9	25.8	4.8	4.8	125

**Table A4-2 (set 1):** Morphometric recordings taken from commercial shrunken heads.

Head ID	Processor origin	Max cranial breadth (eu-eu)	Cranial base width (t-t)	Max head length		Forehead height (tr-g)	Auricular head height (v-po)	Upper face height (v-sn)
				1 (op-sto)	2 (op-g)			
A38099	Commercial	73	74	110	96	32.5	75	87.8
A61492	Commercial	64	49	110	87	31.2	69	90.4
A63428	Commercial	52.3	55.5	105.5	82	76.5	66.2	87.9
A63429	Commercial	47	48	76	60	12.5	57.5	66.7
A68229	Commercial	57	55	104	84	24.4	70.1	71.4
A68231	Commercial	77	68	115	94	27	77.7	90.6
A97275	Commercial	77	72	112	87	26	74.5	82
A102935	Commercial	68	62	108	86	22	69.5	82.5
A109084	Commercial	56	52	99	81	21.8	66.3	83
A119820	Commercial	63.5	60.9	119	98	27.4	77.9	87.2
A130409	Commercial	51	55	108	86	21.1	69.4	90.1
A190320	Commercial	66	66	109	91	22	73.9	93.6
A221683	Commercial	56	51	103	78	24.1	62.3	81
A230414	Commercial	47	46	74	63	20.5	65.5	76.2
A642477	Commercial	79	74	122	105	26.6	85.8	101.2
A642549	Commercial	75	68	114	92	30.8	76	84.6
A642556	Commercial	64	62	108	92	22.5	75	90.4
A642557	Commercial	69	68	120	92	22.7	73.8	99.3
A642564	Commercial	84	75	132	102	25.7	82.5	107
A642565	Commercial	71	62	115	95	24	70.4	91.4
378202	Commercial	47.6	61	88	58.4	18.4	60.8	67.5
CONTROL 400206	Commercial	59.5	62.3	96.1	76.5	21	90	84.9
E326930-0	Commercial	63.8	68	101.9	84	65.7	57	57.9
E358641-0	Commercial	50.6	47.6	89.9	76.7	15.9	66.9	64
E358642-0	Commercial	65.8	66.4	90	76.5	17	57.2	54
E378203-0	Commercial	56.4	58.7	81.1	63.2	70.5	53.6	58.1
E378892	Commercial	55.2	49.4	77.6	60	22.5	59.4	62
E382592-0	Commercial	65.4	62	108.1	98.5	19	68	67

Head ID	Processor origin	Max cranial breadth (eu-eu)	Cranial base width (t-t)	Max head length		Forehead height (tr-g)	Auricular head height (v-po)	Upper face height (v-sn)
				1 (op-sto)	2 (op-g)			
E387845-0	Commercial	70.2	63.5	115.9	92.2	24.5	70.4	84
E397131-0	Commercial	61.8	59.8	91.3	73	37.3	66	71.3
E411333-0	Commercial	78.1	71.1	117.7	90.4	26.5	85.6	86
N387872-0	Commercial	61.3	64.1	71.7	69.8	24	61	63
P387657-0	Commercial	56.2	51.9	105	82	23.1	66.5	72
P387659-0	Commercial	52.8	55.3	89	66.1	15.6	68.5	68.3
P387660-0	Commercial	68.8	71.8	99.2	76.8	41.7	67.6	78
P387661-0	Commercial	70.7	66	107.7	89.5	15.2	71.2	78.2

**Table A4-2 (set 2):** Morphometric recordings taken from commercial shrunken heads.

Head ID	Processor origin	Craniofacial height (v-gn)	Jaw width (go-go)	Supraorbital depth (g-t)	Orbito-tragial depth (ex-t)	Upper jaw depth (sn-t)	Lower jaw depth (gn-t)	Face height 1 (tr-gn)
A38099	Commercial	106.6	68.3	59.5	32.7	58.3	60.5	85.5
A61492	Commercial	111.3	36.1	54.8	36	55	58.4	85.1
A63428	Commercial	107.9	58.3	51.6	28.6	55.9	60.5	78.4
A63429	Commercial	81.6	36.4	36.6	21.6	35.9	36.6	53.1
A68229	Commercial	107.9	46.9	55.3	33.3	56	53.9	77.5
A68231	Commercial	115.7	60.6	57	33.2	59.5	60	87.2
A97275	Commercial	108	66.8	63.5	39.8	59	62.4	95.3
A102935	Commercial	106	57	57.4	33.4	58.5	60.4	85.2
A109084	Commercial	101	43.4	50.3	30.3	51.1	52.3	75.2
A119820	Commercial	111.5	50.1	57	33.6	58.8	61.2	81.1
A130409	Commercial	107.8	47.7	53.8	32.1	56.8	56.5	28.3
A190320	Commercial	110.6	60	51.4	28.4	55.1	57.1	76.4
A221683	Commercial	97.8	44.4	45.6	23.3	50.8	50.8	75.3
A230414	Commercial	86.5	40.2	38.3	22.5	36.4	36.1	59.7
A642477	Commercial	119.4	59	67.1	39	62.2	61	81.5
A642549	Commercial	111.9	57	57.4	32.5	52.2	57.8	85.5

Head ID	Processor origin	Craniofacial height (v-gn)	Jaw width (go-go)	Supraorbital depth (g-t)	Orbito-tragial depth (ex-t)	Upper jaw depth (sn-t)	Lower jaw depth (gn-t)	Face height 1 (tr-gn)
A642556	Commercial	105.5	48.7	53.7	32.3	53.2	50.9	77.5
A642557	Commercial	119.8	67	63.5	35.7	66.7	68.4	99.2
A642564	Commercial	126.2	67	65	41.9	66.3	65.3	91.9
A642565	Commercial	107.1	54	51	27.3	54.7	54.5	77.7
378202	Commercial	96.3	53	49	28.5	51.3	55	68.3
CONTROL 400206	Commercial	131.8	60	61	39.6	62	66	86.3
E326930-0	Commercial	87	56	52	29	54	55.5	66.5
E358641-0	Commercial	97.1	41.5	41.4	24.5	41.3	42	59.1
E358642-0	Commercial	84.7	48.3	48	27.4	48.4	50	63.2
E378203-0	Commercial	87.5	37.5	52	34	54.2	48	69.9
E378892	Commercial	84.2	44.9	37.4	22.6	35.2	37	50.9
E382592-0	Commercial	98.7	53.8	50.5	27	50.4	50	63.5
E387845-0	Commercial	120	57.8	56	32.2	58.4	65.6	83.7
E397131-0	Commercial	96.4	50.9	52	25.5	49	50.8	85
E411333-0	Commercial	127.7	60.6	72.5	43.4	67.2	69.4	29.1
N387872-0	Commercial	97	61.4	58	35.2	59.5	65	85.5
P387657-0	Commercial	107.1	54.2	48	29.1	51.4	53.7	72.8
P387659-0	Commercial	99.8	48.9	54.9	33.2	56.3	56.9	71
P387660-0	Commercial	118.3	55.5	33.3	33	61.3	71.4	102
P387661-0	Commercial	116.8	53.3	52.4	31.7	54.1	55.7	71

**Table A4-2 (set 3):** Morphometric recordings taken from commercial shrunken heads.

Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Intercanthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
A38099	Commercial	33.7	24.2	19.5	22.6	53.4	12.5
A61492	Commercial	35.9	26.2	18.5	9	38.6	13.8
A63428	Commercial	34.5	23.5	17.1	15.9	37.8	14.5

Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Intercanthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
A63429	Commercial	22	14.8	10.2	11.9	32.5	9.9
A68229	Commercial	33.2	33.6	15.7	21.8	43.3	13.9
A68231	Commercial	26	25.1	16.8	19.7	39.3	10.5
A97275	Commercial	39	30.7	23.2	22.5	20.3	14.2
A102935	Commercial	37	24.7	16.5	16.7	43.1	16
A109084	Commercial	31.2	22.6	14.8	20.8	46	14.5
A119820	Commercial	32.9	21.2	16.2	22.3	48.5	14.4
A130409	Commercial	36.9	25.4	17.2	16	34.5	10.4
A190320	Commercial	32.3	24.5	14.6	13.9	47	14.9
A221683	Commercial	34	25	14	11.1	31.9	11.1
A230414	Commercial	20.6	14.5	6.5	14.4	31.2	10.7
A642477	Commercial	32.7	23	16.5	23	47.9	13.5
A642549	Commercial	33.5	25.6	16.4	22	38.6	9.7
A642556	Commercial	32.7	22.3	16.1	16.3	31.5	8.7
A642557	Commercial	47	36.1	23.2	30	50	13.1
A642564	Commercial	36.6	26.5	15	31.2	51.7	13.4
A642565	Commercial	30.1	21.7	14.1	21.5	47.9	15.4
378202	Commercial	26.2	16.3	12.1	20.8	46.4	13.6
CONTROL 400206	Commercial	35.9	20.8	17.4	18.9	47.5	16
E326930-0	Commercial	30.1	18.8	14	13.6	32.6	10.7
E358641-0	Commercial	24.6	16	11.1	13.8	30.6	19.2
E358642-0	Commercial	26.3	18.5	12.1	18.2	40.6	12.5
E378203-0	Commercial	19.3	17.5	11.5	21.9	46.05	12.6
E378892	Commercial	15.8	19.7	6.4	9.3	35.8	12.2
E382592-0	Commercial	27.2	17.9	13	17.3	19.1	15.4
E387845-0	Commercial	35.1	24.9	15.1	18.6	44.9	14.4
E397131-0	Commercial	29.6	18.5	13	15.7	39.8	14.3
E411333-0	Commercial	39	25	18.3	31.2	61.4	21



Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Intercanthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
N387872-0	Commercial	36	22.9	18.3	27.1	53.8	15.4
P387657-0	Commercial	19	18.8	14.9	14.5	46.9	15.8
P387659-0	Commercial	34.7	22	18.1	22.6	42.2	13.1
P387660-0	Commercial	36.8	23.5	15.9	13.8	35.4	12
P387661-0	Commercial	34.8	22	18.7	21.5	42.9	12.1

**Table A4-2 (set 4):** Morphometric recordings taken from commercial shrunken heads.

Head ID	Processor origin	Nose			
		Width (al-al)	Ala	Columella	Nasal tip protrusion
A38099	Commercial	21.1	3.2	3.9	8.7
A61492	Commercial	19.2	2.9	3.3	9.9
A63428	Commercial	16.5	3.5	3.9	10.1
A63429	Commercial	12.7	2	2	6.7
A68229	Commercial	21.8	2.3	4.1	7.3
A68231	Commercial	18.1	3	4.5	9.8
A97275	Commercial	17.7	2.2	4	13.1
A102935	Commercial	16.8	2.1	3.3	11.7
A109084	Commercial	19.9	4	3.8	10.2
A119820	Commercial	21.4	3.4	3.9	9.2
A130409	Commercial	22.1	4.2	4.2	10.5
A190320	Commercial	22.8	3.5	4.5	19.8
A221683	Commercial	17.5	3.3	4.7	10.4
A230414	Commercial	12	1.8	2.1	6.3
A642477	Commercial	24.1	4.3	4.1	10.4
A642549	Commercial	10.1	1.4	3.6	10.7
A642556	Commercial	13.1	1.4	2.7	10.5
A642557	Commercial	27.5	4.5	5	10.6
A642564	Commercial	25.1	3.5	5	10.8

Head ID	Processor origin	Nose			
		Width (al-al)	Ala	Columella	Nasal tip protrusion
A642565	Commercial	21.4	3.1	3.6	8.1
378202	Commercial	19.5	3.1	4.5	6.8
CONTROL 400206	Commercial	24.1	3.6	3.4	11
E326930-0	Commercial	14.9	2.9	3.1	8.2
E358641-0	Commercial	13.1	2.3	2.9	6.1
E358642-0	Commercial	19.1	2.9	3.9	9.1
E378203-0	Commercial	19.8	3.7	6.4	9.1
E378892	Commercial	11.8	2.1	2	6.9
E382592-0	Commercial	16.3	1.9	3.6	11.6
E387845-0	Commercial	21.7	2.7	4.2	12.3
E397131-0	Commercial	16.3	1.8	4.2	7.9
E411333-0	Commercial	25.2	5.2	5.5	12.3
N387872-0	Commercial	24.8	3.9	4.3	11.2
P387657-0	Commercial	19.9	3.2	4.2	10
P387659-0	Commercial	20.6	3.8	3.7	9.6
P387660-0	Commercial	16.4	3	5.8	11.1
P387661-0	Commercial	22	4	4.6	11.8

**Table A4-2 (set 5):** Morphometric recordings taken from commercial shrunken heads.

Head ID	Processor origin	Ear		Mouth width (ch-ch)	Lip height		Neck circumference
		Length	Width		Upper	Lower	
A38099	Commercial	33.7	20.5	27.8	2.5	3	123
A61492	Commercial	30.5	22.9	35.3	2	1.3	146
A63428	Commercial	27.4	17	26.4	2.8	4.8	182
A63429	Commercial	25.4	20.7	26.8	2.8	3.4	124
A68229	Commercial	29.6	21.5	37.9	4.2	6.2	154
A68231	Commercial	32.4	21.8	40	3.4	5.3	136
A97275	Commercial	31.9	21	37.8	2.5	2.6	186

Head ID	Processor origin	Ear		Mouth width (ch-ch)	Lip height		Neck circumference
		Length	Width		Upper	Lower	
A102935	Commercial	30.5	23.3	35	1.2	2.2	193
A109084	Commercial	30.5	21.1	35.4	3	4.6	152
A119820	Commercial	32.2	19.9	41.7	4	-	166
A130409	Commercial	30.9	20.5	40	4.8	4.5	140
A190320	Commercial	28	20.9	38	2.5	-	136
A221683	Commercial	29.3	23	37.7	1.5	3	142
A230414	Commercial	20.3	13.5	25.6	0.8	2.9	45
A642477	Commercial	29.2	22	36.4	3	4.8	184
A642549	Commercial	40.3	29.5	38.2	3.5	6	125
A642556	Commercial	30.5	23.1	38.2	3.8	4.3	118
A642557	Commercial	32.8	25.4	43.7	4.9	6	160
A642564	Commercial	27.8	18.5	47.5	4.6	5.3	155
A642565	Commercial	26.1	16.2	44.2	2	5	149
378202	Commercial	27	21	35.6	5	4.2	125
CONTROL 400206	Commercial	36.2	24.8	43.7	3.5	4	155
E326930-0	Commercial	24.2	16	29.8	5.2	5.3	158
E358641-0	Commercial	22	17.1	20	4.2	3.8	113
E358642-0	Commercial	28.8	21.9	32.6	4.3	3.9	123
E378203-0	Commercial	28.6	14.4	32	4.9	4.3	108
E378892	Commercial	17.8	12.4	16.2	2	2	117
E382592-0	Commercial	30	22.2	26.8	3.8	3.9	148
E387845-0	Commercial	30.8	20	43.3	7	6.5	176
E397131-0	Commercial	30.4	16.5	35.8	2.8	3	142
E411333-0	Commercial	38	17.5	38.9	4	5	163
N387872-0	Commercial	32.4	24.8	39.7	4.5	4.6	134
P387657-0	Commercial	27.9	20.1	35.9	3.1	4.3	133
P387659-0	Commercial	30.8	23.4	28.8	4.5	4.1	115
P387660-0	Commercial	32	20.7	34.5	5.4	6	200
P387661-0	Commercial	30	23.2	30.7	4	3.5	125

**Table A4-3 (set 1):** Morphometric recordings taken from ambiguous shrunken heads.

Head ID	Processor origin	Max cranial breadth (eu-eu)	Cranial base width (t-t)	Max head length		Forehead height (tr-g)	Auricular head height (v-po)	Upper face height (v-sn)
				1 (op-sto)	2 (op-g)			
A36675	Ambiguous	48	38	105	77	22.6	68.5	84.8
A41122	Ambiguous	50	41	108	82	22	66.3	89.1
A44058	Ambiguous	53	48	103	76	19.9	64.8	69
A95788	Ambiguous	52	37	110	80	75.2	71.6	86.5
A121091	Ambiguous	63.1	53.2	117	90	28	70.6	96.1
A155039	Ambiguous	63	58	116	89	29.9	73.9	87.7
A161722	Ambiguous	63	56	105	79	25.5	66.2	71.2
A191643	Ambiguous	56	45	111	80	24.6	66.8	73
A233681	Ambiguous	60	60	109	82	25.9	72.3	85.6
A642548	Ambiguous	61	55	107	85	23.3	69.5	83.7
A642551	Ambiguous	58	49	94	74	18.3	56.2	61.5
A642552	Ambiguous	48	46	95	72	24.1	61.5	65.6
A642553	Ambiguous	53	50	98	71	21.8	55.2	59.5
A642554	Ambiguous	38	43	82	63.5	14.8	48.5	57.4
A642555	Ambiguous	53.4	49.3	105	82	22.1	64	68
A642558	Ambiguous	65	54	106	86	22.4	68	74.1
A642559	Ambiguous	56	46.4	106	84.3	18.9	63.1	68
A642561	Ambiguous	52	49	106	86	21.7	65	80.1
A642562	Ambiguous	56	49	116	91	23.1	70	85.2
A642563	Ambiguous	52.3	58	106	81	25.2	70.6	84
E039500	Ambiguous	43.4	39.1	101	80.7	20.3	61	64.3
E315111-0	Ambiguous	46.5	38.5	93	71.1	21.7	52	46.2
Elgin1	Ambiguous	58.5	50.8	109	81	20.5	49.8	62.7

**Table A4-3 (set 2):** Morphometric recordings taken from ambiguous shrunken heads.

Head ID	Processor origin	Craniofacial height (v-gn)	Jaw width (go-go)	Supraorbital depth (g-t)	Orbito-tragial depth (ex-t)	Upper jaw depth (sn-t)	Lower jaw depth (gn-t)	Face height 1 (tr-gn)
A36675	Ambiguous	103.3	29.6	49.2	27.9	49.6	50.7	77.5
A41122	Ambiguous	107	39.6	51.8	27.8	52.6	56	85
A44058	Ambiguous	92	36.5	47.9	29	48.4	49.6	69.9
A95788	Ambiguous	106.5	36.5	48.7	26.5	52.7	51.4	75.5
A121091	Ambiguous	106	50	51.1	26.1	54	55.3	77.9
A155039	Ambiguous	112.3	52	50.8	27	53	58.4	80.3
A161722	Ambiguous	94.8	50.9	50.5	24.1	51	52.4	80.7
A191643	Ambiguous	99.6	41.5	46.5	25.2	52.4	56.5	84.5
A233681	Ambiguous	97	57.8	46.2	23.6	48.9	49.4	67.3
A642548	Ambiguous	98.3	49.5	52.8	26.5	52.6	19.5	70.4
A642551	Ambiguous	79	35.5	41.2	21	41.1	44.5	59.5
A642552	Ambiguous	84.5	36.8	45.2	29	46.5	45.6	64
A642553	Ambiguous	78.7	44.9	46.2	24.3	49	49.4	69.5
A642554	Ambiguous	67	34.2	33.9	18.1	36	34.9	46.3
A642555	Ambiguous	90.5	34.4	47.1	26.1	49.6	48.7	69
A642558	Ambiguous	97.8	47.8	48.5	24.6	49.3	53.2	75
A642559	Ambiguous	99.9	35.3	48.2	26.5	49.4	50.1	77.5
A642561	Ambiguous	100	47.1	50.8	25	51.1	50.7	78.9
A642562	Ambiguous	100.1	45.1	52.9	25.6	53.1	51.3	75.1
A642563	Ambiguous	107	52.8	49.9	25.4	53.8	59.6	72.6
E039500	Ambiguous	92	28.3	47.9	-	46.5	48.1	67.5
E315111-0	Ambiguous	78.3	29.4	34.3	20.5	42	44	60.8
Elgin1	Ambiguous	88.8	32.3	24.6	28.2	50.5	50.9	67.3

**Table A4-3 (set 3):** Morphometric recordings taken from ambiguous shrunken heads.

Head ID	Processor origin	Lower face height (sn-gn)	Anterior lower jaw height (sto-gn)	Chin height (sl-gn)	Intercanthal width (en-en)	Orbital width (ex-ex)	Eye fissure length (en-ex)
A36675	Ambiguous	32.6	21.2	13.4	11.8	26.3	9.2
A41122	Ambiguous	34.8	27.7	17.4	13.2	28.6	11.4
A44058	Ambiguous	32.6	25.2	13.1	12.9	32.4	8.7
A95788	Ambiguous	31.5	25.5	14	14	25.2	11.6
A121091	Ambiguous	33.5	22.3	16.7	13.2	37.2	13.5
A155039	Ambiguous	33.8	28	15.3	15.9	40	11.9
A161722	Ambiguous	34.9	28.8	19.2	13.2	34.7	10.7
A191643	Ambiguous	36	27.8	17.9	12.3	17	10
A233681	Ambiguous	22.8	18.2	9.3	13	29	9.8
A642548	Ambiguous	28.1	24.8	13.9	18.6	36.9	10.1
A642551	Ambiguous	23	18.7	11.3	11.3	30	8
A642552	Ambiguous	27.9	22	13.4		30.4	
A642553	Ambiguous	26.6	21	13.9	14.2	26.4	8.3
A642554	Ambiguous	17.5	14.8	6.9	11.7	26.8	7.1
A642555	Ambiguous	34.3	25.9	20.3	14.2	32.6	9.5
A642558	Ambiguous	33.5	27	16.2	20	35.5	18.6
A642559	Ambiguous	32.5	23.7	11.5	13.5	28.7	10.9
A642561	Ambiguous	33	27	15.7	16.1	31.5	12.6
A642562	Ambiguous	31.1	24.9	16.5	15.3	35	12.6
A642563	Ambiguous	30.3	24	15.2	13.6	38.5	12.6
E039500	Ambiguous	28.5	21	10.4			
E315111-0	Ambiguous	23.2	14.5	19.1	13	30.5	11
Elgin1	Ambiguous	26	13.8	11	13.3	32.7	11.5

**Table A4-3 (set 4):** Morphometric recordings taken from ambiguous shrunken heads.

Head ID	Processor origin	Nose			
		Width (al-al)	Ala	Columella	Nasal tip protrusion
A36675	Ambiguous	17	3	3.6	14.2
A41122	Ambiguous	19.6	3.2	3.1	12.1
A44058	Ambiguous	15.8	3.2	3.3	11.4
A95788	Ambiguous	21.7	3.2	5.4	11.5
A121091	Ambiguous	19	4.1	4.9	14.8
A155039	Ambiguous	21.9	4.4	2.3	11
A161722	Ambiguous	19.9	3.4	4	10.5
A191643	Ambiguous	18.2	3.5	3.9	12.3
A233681	Ambiguous	17.4	3.4	3.7	9
A642548	Ambiguous	19.5	3.6	3.9	12.4
A642551	Ambiguous	18.7	3.1	4.6	9.5
A642552	Ambiguous	16.6	3	3.1	11.1
A642553	Ambiguous	18.8	3.7	3.7	9.8
A642554	Ambiguous	14.2	2.7	3.4	7
A642555	Ambiguous	20.6	4.1	4.6	11.8
A642558	Ambiguous	19.1	3	3	10.1
A642559	Ambiguous	18.4	2.8	4.1	9.3
A642561	Ambiguous	20.1	3.3	4.4	10.4
A642562	Ambiguous	21.7	4	3.3	10.2
A642563	Ambiguous	19	3.7	4.2	12.6
E039500	Ambiguous	15.5	1.8		11.8
E315111-0	Ambiguous	15.5	2.6	2.6	9.1
Elgin1	Ambiguous	18.4	2.6	3.8	11.1

**Table A4-3 (set 5):** Morphometric recordings taken from ambiguous shrunken heads.

Head ID	Processor origin	Ear		Mouth width (ch-ch)	Lip height		Neck circumference
		Length	Width		Upper	Lower	
A36675	Ambiguous	28.8	19.6	27.4	5	4.8	130
A41122	Ambiguous	27.7	20.3	32.5	5.9	4.2	138
A44058	Ambiguous	27.1	17.2	26.6	5	4.4	99
A95788	Ambiguous	28.1	21.9	38	6	5.1	126
A121091	Ambiguous	28.4	19.9	33.1	7.1	5.8	161
A155039	Ambiguous	33.7	22.5	39.9	6.9	5.4	139
A161722	Ambiguous	27.9	17.8	30.4	5.8	5.3	165
A191643	Ambiguous	26.1	18	24.6	5.3	5.9	155
A233681	Ambiguous	24	20.3	27	4.8	5	140
A642548	Ambiguous	24	16.5	32.9	5.8	6.1	145
A642551	Ambiguous	26	18.5	34.5	5.5	5.3	101
A642552	Ambiguous	26.3	19	30.6	4	3.8	98
A642553	Ambiguous	29.9	17.4	29.7	5	4.1	102
A642554	Ambiguous	22.7	17.2	29.1	3.1	4.2	74
A642555	Ambiguous	28.8	20.9	25.2	5.8	4.2	123
A642558	Ambiguous	24.6	17.5	28.2	6	4.4	116
A642559	Ambiguous	25.7	18	25.9	5.2	4.5	128
A642561	Ambiguous	30	22	30.1	5	4.2	158
A642562	Ambiguous	28.7	23.6	39.7	5.2	5.2	138
A642563	Ambiguous	29.5	21.6	31.1	6.8	4.3	138
E039500	Ambiguous	29.8	19	26.2	4.9	3.4	123
E315111-0	Ambiguous	26	15.2	20.2	5.5	4.6	92
Elgin1	Ambiguous	28.3	21.3	30.07	5	4.8	142



## Calculated minimum, maximum, mean, and standard deviations

**Table A4-4:** Measurements recorded for ceremonial *tsantsa*.

Ceremonial <i>tsantsa</i> (n=6)	Minimum (mm)	First Quartile (mm)	Median (mm)	Third Quartile (mm)	Maximum (mm)	Mean (mm)	Standard Deviation (mm)
Max cranial breadth (eu-eu)	42	50.25	53	55.75	56.9	51.817	5.546
Cranial base width (t-t)	35	39.75	46.5	49.8	57.5	45.65	8.257
Max head length: 1 (op-sto)	102	103.275	104.55	108.375	110	105.6	3.373
Max head length: 2 (op-g)	76	79.25	80.5	81	83.9	80.15	2.611
Forehead height (tr-g)	17	20.275	21.5	24.225	30.4	22.567	4.636
Auricular head height (v-po)	64.8	65.175	66.9	69.825	74.6	68.1	3.838
Upper face height (v-sn)	65.2	75.8	77.8	79.275	88.4	77.35	7.481
Craniofacial height (v-gn)	96.5	98.5	103.9	109.6	114.4	104.483	7.241
Jaw width (go-go)	26.5	31.9	40.45	44.275	46.4	38.067	8.225
Supraorbital depth (g-t)	39.8	42.85	47.85	49.025	51.8	46.317	4.752
Orbito-tragial depth (ex-t)	23.3	24.05	25.65	26.125	28.9	25.55	2.032
Upper jaw depth (sn-t)	44.3	46.7	51.25	55.35	56.9	50.933	5.293
Lower jaw depth (gn-t)	45.1	46.9	53.15	56.4	59.6	52.217	6.044
Face height 1 (tr-gn)	60.2	73.225	75.6	79.925	87.7	75.483	9.227
Lower face height (sn-gn)	26.5	30.5	36.2	38.225	41.5	34.65	5.847
Anterior lower jaw height (sto-gn)	22.6	24.725	26.55	29.65	31.2	26.95	3.394
Chin height (sl-gn)	13.9	13.9	13.95	17.975	21.8	16.133	3.512
Intercanthal width (en-en)	12.6	13.3	13.7	14.7	16.1	14.05	1.28
Orbital width (ex-ex)	14.4	27.025	31.2	33.875	34.6	28.633	7.691
Eye fissure length (en-ex)	8.8	9.55	10.4	12.075	13.2	10.783	1.746
Nose width (al-al)	11.9	17.45	18.3	19	19.8	17.45	2.861
Ala	1.8	2.925	3.05	3.4	3.5	2.967	0.625
Columella	3.5	3.525	3.75	3.975	4	3.75	0.243
Nasal tip protrusion	8.5	10.4	11.15	11.45	12.2	10.783	1.295

<b>Ceremonial <i>tsantsa</i> (n=6)</b>	<b>Minimum (mm)</b>	<b>First Quartile (mm)</b>	<b>Median (mm)</b>	<b>Third Quartile (mm)</b>	<b>Maximum (mm)</b>	<b>Mean (mm)</b>	<b>Standard Deviation (mm)</b>
<b>Ear Length</b>	24.5	25.2	25.95	28.125	29.2	26.567	1.953
<b>Ear Width</b>	16.5	18	19.1	19.975	21.9	19.083	1.886
<b>Mouth width (ch-ch)</b>	25.3	26.175	27.65	33.4	35.8	29.567	4.703
<b>Upper lip height</b>	4.8	5.125	5.7	6.5	6.8	5.783	0.842
<b>Lower lip height</b>	4.8	4.85	5	5.15	5.4	5.033	0.234
<b>Neck circumference</b>	101	116.75	129	143.5	150	128.333	18.991

**Table A4-5:** Measurements recorded for commercial shrunken heads.

<b>Commercial heads (n=36)</b>	<b>Minimum (mm)</b>	<b>First Quartile (mm)</b>	<b>Median</b>	<b>Third Quartile (mm)</b>	<b>Maximum (mm)</b>	<b>Mean (mm)</b>	<b>Standard Deviation (mm)</b>
<b>Max cranial breadth (eu-eu)</b>	47	56	63.9	70.325	84	63.361	9.883
<b>Cranial base width (t-t)</b>	46	55	62	68	75	61.175	8.327
<b>Max head length: 1 (op-sto)</b>	71.7	90.975	106.6	112.5	132	102.603	14.672
<b>Max head length: 2 (op-g)</b>	58.4	76.5	85	92	105	82.906	12.528
<b>Forehead height (tr-g)</b>	12.5	21.075	24	27.1	76.5	27.756	14.493
<b>Auricular head height (v-po)</b>	53.6	65.875	69.2	74.625	90	69.667	8.451
<b>Upper face height (v-sn)</b>	54	68.1	82.25	88.45	107	79.458	13.056
<b>Craniofacial height (v-gn)</b>	81.6	97.075	107.1	112.85	131.8	105.569	12.802
<b>Jaw width (go-go)</b>	36.1	47.5	53.9	59.25	68.3	52.958	8.788
<b>Supraorbital depth (g-t)</b>	33.3	49.975	53.05	57.4	72.5	53.006	8.561
<b>Orbito-tragial depth (ex-t)</b>	21.6	28.15	32.25	33.7	43.4	31.483	5.418
<b>Upper jaw depth (sn-t)</b>	35.2	51.25	55.05	58.85	67.2	54.344	7.774
<b>Lower jaw depth (gn-t)</b>	36.1	50.875	56.7	61.05	71.4	56.017	8.755
<b>Face height 1 (tr-gn)</b>	28.3	67.85	77.5	85.275	102	74.567	16.383
<b>Lower face height (sn-gn)</b>	15.8	26.975	33.05	35.9	47	31.45	6.571
<b>Anterior lower jaw height (sto-gn)</b>	14.5	18.8	22.75	25	36.1	22.619	4.736
<b>Chin height (sl-gn)</b>	6.4	13.75	15.8	17.25	23.2	15.333	3.63
<b>Intercanthal width (en-en)</b>	9	14.475	18.75	22.075	31.2	18.928	5.599

Commercial heads (n=36)	Minimum (mm)	First Quartile (mm)	Median	Third Quartile (mm)	Maximum (mm)	Mean (mm)	Standard Deviation (mm)
Orbital width (ex-ex)	19.1	35.175	42.55	47.125	61.4	41.138	9.036
Eye fissure length (en-ex)	8.7	12.075	13.55	14.6	21	13.483	2.529
Nose width (al-al)	10.1	16.375	19.65	21.85	27.5	19.067	4.296
Ala	1.4	2.275	3.1	3.625	5.2	3.047	0.912
Columella	2	3.55	3.95	4.5	6.4	3.958	0.962
Nasal tip protrusion	6.1	8.575	10.15	11.025	19.8	9.994	2.469
Ear Length	17.8	27.875	30.2	31.925	40.3	29.617	4.351
Ear Width	12.4	18.25	20.95	22.925	29.5	20.508	3.543
Mouth width (ch-ch)	16.2	30.475	35.85	39.1	47.5	34.942	6.921
Upper lip height	0.8	2.725	3.65	4.5	7	3.556	1.317
Lower lip height	1.3	3.425	4.3	5	6.5	4.224	1.26
Neck circumference	45	124.75	142	158.5	200	143.083	29.34

**Table A4-6:** Measurements recorded for ambiguous shrunken heads.

Ambiguous heads (n=23)	Minimum (mm)	First Quartile (mm)	Median (mm)	Third Quartile (mm)	Maximum (mm)	Mean (mm)	Standard Deviation (mm)
Max cranial breadth (eu-eu)	38	51	53.4	59.25	65	54.313	6.818
Cranial base width (t-t)	37	44	49	53.6	60	48.404	6.785
Max head length: 1 (op-sto)	82	102	106	109	117	104.696	8.138
Max head length: 2 (op-g)	63.5	76.5	81	84.65	91	80.157	6.708
Forehead height (tr-g)	14.8	21.1	22.4	24.9	75.2	24.861	11.437
Auricular head height (v-po)	48.5	61.25	66.2	69.75	73.9	64.148	7.304
Upper face height (v-sn)	46.2	64.95	73	85	96.1	74.057	12.579
Craniofacial height (v-gn)	67	89.65	97.8	101.7	112.3	94.8	11.279
Jaw width (go-go)	28.3	34.85	39.6	48.65	57.8	41.209	8.588
Supraorbital depth (g-t)	24.6	46.2	48.2	50.65	52.9	46.357	6.857
Orbito-tragial depth (ex-t)	18.1	24.375	25.85	26.875	29	25.364	2.731
Upper jaw depth (sn-t)	36	48.65	49.6	52.6	54	49.265	4.448

<b>Ambiguous heads (n=23)</b>	<b>Minimum (mm)</b>	<b>First Quartile (mm)</b>	<b>Median (mm)</b>	<b>Third Quartile (mm)</b>	<b>Maximum (mm)</b>	<b>Mean (mm)</b>	<b>Standard Deviation (mm)</b>
<b>Lower jaw depth (gn-t)</b>	19.5	48.4	50.7	52.8	59.6	49.139	8.322
<b>Face height 1 (tr-gn)</b>	46.3	67.4	72.6	77.7	85	71.826	8.883
<b>Lower face height (sn-gn)</b>	17.5	27.25	31.5	33.5	36	29.913	4.833
<b>Anterior lower jaw height (sto-gn)</b>	13.8	21	24	26.45	28.8	22.948	4.482
<b>Chin height (sl-gn)</b>	6.9	12.3	14	16.6	20.3	14.417	3.367
<b>Intercanthal width (en-en)</b>	11.3	13	13.3	14.2	20	14.014	2.16
<b>Orbital width (ex-ex)</b>	17	28.625	31	34.925	40	31.177	5.231
<b>Eye fissure length (en-ex)</b>	7.1	9.5	10.9	11.9	18.6	10.933	2.437
<b>Nose width (al-al)</b>	14.2	17.2	18.8	19.75	21.9	18.548	2.079
<b>Ala</b>	1.8	3	3.2	3.65	4.4	3.278	0.588
<b>Columella</b>	2.3	3.3	3.75	4.175	5.4	3.768	0.747
<b>Nasal tip protrusion</b>	7	9.95	11.1	11.95	14.8	11	1.733
<b>Ear Length</b>	22.7	26	27.9	28.8	33.7	27.483	2.466
<b>Ear Width</b>	15.2	17.65	19	21.1	23.6	19.357	2.172
<b>Mouth width (ch-ch)</b>	20.2	26.8	30.07	32.7	39.9	30.129	4.829
<b>Upper lip height</b>	3.1	5	5.3	5.85	7.1	5.417	0.887
<b>Lower lip height</b>	3.4	4.2	4.6	5.25	6.1	4.739	0.693
<b>Neck circumference</b>	74	109	130	141	165	127.435	24.017