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

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Appendix 11

Microscopic hair analysis (shrunken head collection)

Results from microscopic hair analysis, to ascertain the ancestry for each head, are recorded in Table A11-1 (ceremonial *tsantsa* – appendix pp.1-2), Table A11-2 (commercial heads – appendix pp.3-7) and Table A11-3 (ambiguous heads – appendix pp.8-10). A summary of the assigned ancestry groups, for each shrunken head category, is presented in Table A11-4 (appendix p.11).

Using microscopic and macroscopic analysis of the hair, findings pertaining the general condition (treatment and pathologies) and possible age of the subject (according to hair shaft diameter and canities) are recorded in Table A11-5 (appendix pp.11-14). The associated results are summarised in Table A11-6 and Table A11-7 (appendix p.15).

Table A11-1 (set 1): Microscopic hair analysis for the ceremonial *tsantsa*.

Head ID	Macroscopic texture	Microscopic colour	Pigment				
			Density	Granule size	Distribution	Aggregate shape	Aggregate size
A95789	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
A121104	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642550	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642560	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
E165119B0	Straight.	Brown - dark to opaque.	Heavy.	Coarse.	Uniform.	Streaked.	Medium.
E403395-0	Straight.	Brown - medium to dark.	Heavy.	Coarse.	Uniform.	Streaked.	Medium.

Table A11-1 (set 2): Microscopic hair analysis for the ceremonial *tsantsa*.

Head ID	Medulla				Cuticle					
	Continuity	Structure	Thickness (µm)	Opacity	Thickness (µm)	Inner margin	Outer scale profile	Scales	Surface	Pigment
A95789	Continuous.	Amorphous.	1/4 (19.11).	Opaque.	Thick (2.61).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A121104	Continuous/ Interrupted.	Amorphous.	1/6 (19.20).	Opaque.	Thick (4.49).	Distinct.	Smooth & ragged.	Imbricate.	Normal & damaged.	Absent.
A642550	Fragmentary/ Interrupted.	Amorphous.	1/5 (19.36).	Opaque.	Thick (2.63).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642560	Continuous.	Amorphous.	1/4 (29.70).	Opaque.	Thick (2.62).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E165119B0	Fragmentary.	Amorphous.	1/6 (13.95).	Opaque/ Translucent.	Thick (2.64).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E403395-0	Continuous/ Interrupted.	Amorphous.	1/5 (16.45).	Opaque.	Thin (2.33).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.

Table A11-1 (set 3): Microscopic hair analysis and determined ancestry for the ceremonial *tsantsa*.

Head ID	Shaft.		Aberration	Transverse cross section	Ancestry ID
	Max diam. (µm)	Coarseness			
A95789	85.2	Coarse.	Normal.	Round.	Mongoloid.
A121104	108.6	Coarse.	Normal.	Round.	Mongoloid.
A642550	95.4	Coarse.	Normal.	Oval.	Mongoloid.
A642560	115.8	Coarse.	Normal.	Round.	Mongoloid.
E165119B0	88.2	Coarse.	Normal.	Round.	Mongoloid.
E403395-0	84.6	Coarse.	Normal.	Round.	Mongoloid.

Table A11-2 (set 1): Microscopic hair analysis for the commercial shrunken heads.

Head ID	Macroscopic texture	Microscopic colour	Pigment				
			Density	Granule size	Distribution	Aggregate shape	Aggregate size
A38099	Wavy.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform & random.	Streaked.	Small & medium.
A61492	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
A63428	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A63429	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
A68229	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
A68231	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium.
A97275	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
A102935	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A109084	Straight-wavy.	Brown - light to medium.	Light to medium.	Coarse.	Random.	Streaked.	Medium.
A119820	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A130409	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked (S) & clumped (C).	Small (C) & medium (S).
A190320							
A221683	Afro-textured.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform & one-sided.	Streaked (S) & clumped (C).	Medium & large (S & C).
A230414	Straight.	Brown - light to medium.	Medium to heavy.	Coarse.	Random.	Streaked.	Medium & large.
A642477	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium.
A642549	Straight.	Brown - light to medium.	Medium to heavy.	Coarse.	Random.	Clumped.	Medium & large.
A642556	Straight.	Brown - medium to dark.	Heavy.	Coarse.	Uniform.	Streaked (S) & clumped (C).	Medium & large (S & C).
A642557	Curly.	Brown - medium to dark.	Medium to heavy.	Coarse.	Random.	Streaked (S) & clumped (C).	Medium & large (S & C).
A642564	Curly-wavy.	Brown - medium to dark.	Medium to heavy.	Coarse.	Random.	Streaked (S) & clumped (C).	Medium (S & C).
A642565	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
378202	Straight-wavy.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
CONTROL 400206	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
E326930-0	Straight.	Brown - medium to dark.	Light to medium.	Coarse.	Random.	Streaked.	Small - large.
E358641-0	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.

Head ID	Macroscopic texture	Microscopic colour	Pigment				
			Density	Granule size	Distribution	Aggregate shape	Aggregate size
E358642-0	Straight-wavy.	Brown - medium to dark.	Light to medium.	Coarse.	Random.	Streaked (S) & clumped (C).	Small & medium (S & C).
E378203-0	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
E378892	Straight.	Brown - medium to dark.	Light to medium.	Coarse.	Uniform.	Streaked.	Large.
E382592-0	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
E387845-0	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
E397131-0	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
E411333-0	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium & large.
N387872-0	Straight.	Brown - medium to dark.	Heavy.	Coarse.	Random.	Streaked (S) & clumped (C).	Medium (S & C).
P387657-0	Straight-wavy.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
P387659-0	Straight-wavy.	Brown - medium to dark.	Heavy.	Coarse.	Uniform.	Streaked.	Medium.
P387660-0	Afro-textured.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform & one-sided.	Streaked (S) & clumped (C).	Medium (S & C).
P387661-0	Straight.	Brown - medium to dark.	Heavy.	Coarse.	Uniform	Streaked.	Medium.

Table A11-2 (set 2): Microscopic hair analysis for the commercial shrunken heads.

Head ID	Medulla				Cuticle					
	Continuity	Structure	Thickness (µm)	Opacity	Thickness (µm)	Inner margin	Outer scale profile	Scales	Surface	Pigment
A38099	Fragmentary.	Amorphous.	1/5 (14.64).	Opaque.	Thick (2.68).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A61492	Continuous.	Amorphous.	1/5 (19.76).	Opaque.	Thick (3.46).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
A63428	Continuous/ Interrupted.	Amorphous.	1/5 (25.57).	Opaque/ Translucent.	Thick (3.21).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A63429	Continuous.	Amorphous.	1/5 (16.65).	Opaque	Thick (4.01).	Distinct.	Ragged & serrated.	Imbricate.	Normal.	Absent.
A68229	Interrupted.	Amorphous.	1/4 (21.89).	Opaque.	Thick (3.04).	Distinct.	Smooth & serrated.	Imbricate.	Normal.	Absent.
A68231	Continuous.	Amorphous.	1/6 (22.57).	Opaque.	Thick (4.41).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A97275	Fragmentary.	Amorphous.	1/6 (10.9).	Opaque.	Thin (1.88).	Varied.	Serrated.	Imbricate.	Normal.	Absent.
A102935	Continuous.	Amorphous.	1/5 (17.46).	Opaque.	Thick (2.51).	Varied.	Smooth.	Imbricate.	Normal.	Absent.

Head ID	Medulla				Cuticle					
	Continuity	Structure	Thickness (µm)	Opacity	Thickness (µm)	Inner margin	Outer scale profile	Scales	Surface	Pigment
A109084	Continuous/ Interrupted.	Amorphous.	1/6 (13.47).	Opaque.	Thin (2.25).	Indistinct.	Ragged.	Imbricate.	Damaged.	Absent.
A119820	Continuous/ Interrupted.	Amorphous.	1/4 (27.13).	Opaque.	Thick (3.74).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A130409	Continuous/ Interrupted.	Amorphous.	1/6 (18.56).	Opaque.	Thick (4.48).	Distinct.	Ragged.	Imbricate.	Damaged.	Absent.
A190320										
A221683	Absent.				Uneven - Thick (4.87)/ Thick (2.95).	Distinct.	Smooth & ragged.	Imbricate.	Normal & damaged.	Absent.
A230414	Fragmented/ Interrupted.	Amorphous.	1/5 (9.96).	Opaque/ Translucent.	Thin (2.49).	Indistinct.	Ragged.	Imbricate.	Damaged.	Absent.
A642477	Continuous.	Amorphous.	1/4 (21.46).	Opaque.	Uneven - Thick (3.45) / Thin (1.64).	Varied.	Ragged.	Imbricate.	Damaged.	Absent.
A642549	Absent/ Fragmentary.	Amorphous.	1/5 (15.03).	Opaque.	Thin (2.40).	Varied.	Smooth & ragged.	Imbricate.	Damaged.	Absent.
A642556	Continuous/ Interrupted.	Amorphous.	1/4 (21.37).	Opaque.	Thick (2.60).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642557	Continuous/ Interrupted.	Amorphous.	1/5 (17.37).	Opaque.	Thin (2.28).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642564	Fragmentary.	Amorphous.	1/8 (11.21).	Opaque.	Thin (2.23).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A642565	Continuous.	Amorphous.	1/4 (21.15).	Opaque.	Thick (4.27).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
378202	Continuous/ Interrupted.	Amorphous.	1/5 (14.81).	Opaque.	Thick (3.09).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
CONTROL 400206	Continuous.	Amorphous.	1/4 (26.38).	Opaque.	Thick (3.12).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
E326930-0	Continuous/ Interrupted.	Amorphous.	1/6 (16.36).	Opaque.	Thin (2.42).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E358641-0	Fragmentary.	Amorphous.	1/6 (11.83).	Opaque.	Thin (1.67).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
E358642-0	Continuous.	Amorphous.	1/3 (31.28).	Opaque.	Thick (2.67).	Varied.	Smooth.	Imbricate.	Normal.	Absent.

Head ID	Medulla				Cuticle					
	Continuity	Structure	Thickness (µm)	Opacity	Thickness (µm)	Inner margin	Outer scale profile	Scales	Surface	Pigment
E378203-0	Fragmentary/ Interrupted.	Amorphous.	1/8 (10.38).	Opaque.	Thick (3.12).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
E378892	Absent.				Thin (2.21).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E382592-0	Continuous/ Interrupted.	Amorphous.	1/5 (16.04).	Opaque.	Thin (1.56).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E387845-0					Thick (2.68).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E397131-0					Thick (3.43).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
E411333-0	Fragmentary.				Thick (3.79).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
N387872-0	Fragmentary/ Interrupted.	Amorphous.	1/7 (12.18)	Opaque.	Thick (2.81).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
P387657-0	Fragmentary.	Amorphous.	1/7 (12.93).	Opaque.	Thin (2.18).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
P387659-0	Continuous.	Amorphous.	1/4 (20.94).	Opaque.	Thick (3.65).	Distinct.	Smooth & ragged.	Imbricate.	Normal.	Absent.
P387660-0	Continuous/ Interrupted.	Amorphous.	1/5 (16.51).	Opaque.	Uneven - Thick (3.44) / Thin (2.03).	Indistinct.	Smooth & ragged.	Imbricate.	Normal & damaged.	Absent.
P387661-0	Fragmentary.	Amorphous.	1/13 (5.90).	Opaque.	Thin (2.17).	Distinct.	Looped.	Imbricate.	Normal.	Absent.

Table A11-2 (set 3): Microscopic hair analysis and determined ancestry for the commercial shrunken heads.

Head ID	Shaft		Aberration	Transverse cross section	Ancestry ID
	Max diam. (µm)	Coarseness			
A38099	76.2	Medium.	Normal.	Oval.	Mixed: Mongoloid/Caucasoid.
A61492	92.4	Coarse.	Splitting.	Oval-Flat.	Mongoloid.
A63428	124.2	Coarse.	Normal.	Oval-Flat.	Mongoloid.
A63429	78	Medium.	Normal.	Round.	Mongoloid.
A68229	90.6	Coarse.	Normal.	Oval.	Mongoloid.
A68231	141.6	Coarse.	Normal.	Round.	Mongoloid.
A97275	65.4	Medium.	Normal.	Oval.	Mixed: Mongoloid/Caucasoid.
A102935	79.2	Medium.	Normal.	Oval.	Mongoloid.
A109084	85.2	Coarse.	Normal.	Round.	Mongoloid.

Head ID	Shaft		Aberration	Transverse cross section	Ancestry ID
	Max diam. (µm)	Coarseness			
A119820	110.4	Coarse.	Normal.	Round.	Mongoloid.
A130409	105	Coarse.	Normal.	Round.	Mongoloid.
A190320					Unclassifiable.
A221683	119.4	Coarse.	Undulating (distinct).	Flat.	Negroid.
A230414	52.2	Medium.	Normal.	Round.	Mixed: Mongoloid/Caucasoid – Possible juvenile.
A642477	95.4	Coarse.	Normal.	Round.	Mongoloid.
A642549	76.8	Medium.	Normal.	Oval-Flat.	Caucasoid.
A642556	94.2	Coarse.	Normal.	Round.	Mongoloid.
A642557	90	Medium-coarse.	Undulating (moderate).	Oval.	Mixed: Negroid/Caucasoid.
A642564	94.2	Coarse.	Undulating (gentle).	Round.	Caucasoid.
A642565	88.8	Coarse.	Normal.	Flat.	Mongoloid.
378202	81	Coarse.	Normal.	Oval.	Mongoloid.
CONTROL 400206	107.4	Coarse.	Normal.	Round.	Mongoloid.
E326930-0	96	Coarse.	Normal.	Round.	Mongoloid.
E358641-0	72	Medium.	Normal.	Round.	Mixed: Mongoloid/Caucasoid.
E358642-0	108.6	Coarse.	Normal.	Round.	Mongoloid.
E378203-0	81	Coarse.	Normal.	Round.	Mongoloid.
E378892	26.4	Fine.	Normal.	Round.	Mixed: Mongoloid/Caucasoid – Possible infant.
E382592-0	81	Coarse.	Normal.	Round.	Mongoloid.
E387845-0	62.4	Medium.	Normal.	Round.	Mixed: Mongoloid/Caucasoid.
E397131-0	122.4	Coarse.	Normal.	Oval.	Mongoloid.
E411333-0	78.6	Medium.	Normal.	Oval.	Mixed: Mongoloid/Caucasoid.
N387872-0	84	Coarse.	Normal.	Oval.	Mongoloid.
P387657-0	89.4	Coarse.	Normal.	Oval.	Mixed: Mongoloid/Caucasoid.
P387659-0	93.6	Coarse.	Normal.	Round.	Mongoloid.
P387660-0	78	Medium.	Undulating (distinct).	Flat.	Negroid.
P387661-0	75	Medium.	Normal.	Round.	Mixed: Mongoloid/Caucasoid.

Table A11-3 (set 1): Microscopic hair analysis for the ambiguous shrunken heads.

Head ID	Macroscopic texture	Microscopic colour	Pigment				
			Density	Granule size	Distribution	Aggregate shape	Aggregate size
A36675	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A41122	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A44058	Straight.	Brown - light to medium.	Light to medium.	Coarse.	Uniform.	Streaked.	Small & medium.
A95788	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Large.
A121091	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A155039	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium.
A161722	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A191643	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium.
A233681	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium.
A642548	Straight.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
A642551	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642552	Straight.	Brown - light to medium.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Small & medium.
A642553	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642554	Straight-wavy.	Brown - medium to dark.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
A642555	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642558	Straight.	Brown - medium to dark.	Heavy.	Coarse.	Uniform.	Streaked.	Medium.
A642559	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642561	Straight-wavy.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642562	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
A642563	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Medium & large.
E039500	Straight.	Brown - light to medium.	Medium to heavy.	Coarse.	Uniform.	Streaked.	Medium.
E315111-0	Straight.	Brown - dark to opaque.	Heavy.	Coarse.	Uniform.	Streaked.	Medium.
Elgin1	Straight.	Brown - dark to opaque.	Heavy to opaque.	Coarse.	Uniform.	Streaked.	Large.

Table A11-3 (set 2): Microscopic hair analysis for the ambiguous shrunken heads.

Head ID	Medulla				Cuticle					
	Continuity	Structure	Thickness (µm)	Opacity	Thickness (µm)	Inner margin	Outer scale profile	Scales	Surface	Pigment
A36675	Continuous.	Amorphous.	1/4 (32.75).	Opaque.	Thick (2.63).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
A41122	Continuous/ Interrupted.	Amorphous.	1/4 (17.03).	Opaque.	Thin (1.86).	Indistinct.	Smooth.	Imbricate.	Normal & damaged	Absent.
A44058	Continuous.	Amorphous.	1/4 (21.37).	Opaque.	Thin (1.60).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A95788	Continuous/ Interrupted.	Amorphous.	1/6 (16.37).	Opaque.	Thin (2.35).	Indistinct.	Smooth & ragged.	Imbricate.	Normal.	Absent.
A121091	Continuous.	Amorphous	1/5 (17.54).	Opaque	Thick (2.90).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A155039	Continuous.	Amorphous.	1/8 (15.07).	Opaque.	Thin (2.37).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A161722	Continuous.	Amorphous	1/4 (26.29).	Opaque	Thick (2.50).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A191643	Absent.				Thick (3.25).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A233681	Interrupted.	Amorphous.	1/5 (17.63).	Opaque.	Thick (4.33).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A642548	Continuous.	Amorphous.	1/4 (26.87).	Opaque.	Thick (3.12).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642551	Fragmentary/ Interrupted.	Amorphous.	1/5 (19.09).	Opaque.	Thin (2.14).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642552	Fragmentary.	Amorphous	1/6 (11.47).	Opaque	Thin (1.55).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642553	Continuous.	Amorphous.	1/4 (24.94).	Opaque.	Thick (2.51).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642554	Continuous/ Interrupted.	Amorphous.	1/7 (12.46).	Opaque.	Thick (2.60).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
A642555	Continuous.	Amorphous.	1/5 (21.09).	Opaque.	Thick (2.63).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A642558					Thin (2.15).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642559	Continuous.	Amorphous.	1/3 (31.11).	Opaque.	Thick (3.36).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
A642561	Continuous.	Amorphous.	1/4 (27.18).	Opaque.	Thick (2.92).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
A642562	Continuous.	Amorphous.	1/4 (27.67).	Opaque.	Thick (2.67).	Indistinct.	Smooth.	Imbricate.	Normal.	Absent.
A642563	Continuous.	Amorphous.	1/4 (26.83).	Opaque.	Thick (3.73).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
E039500	Fragmentary.	Amorphous.	1/6 (12.02).	Opaque.	Thick (2.50).	Varied.	Smooth.	Imbricate.	Normal.	Absent.
E315111-0	Continuous/ Interrupted.	Amorphous.	1/5 (18.06).	Opaque.	Thick (2.69).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.
Elgin1	Continuous/ Interrupted.	Amorphous.	1/4 (27.88).	Opaque.	Thick (2.62).	Distinct.	Smooth.	Imbricate.	Normal.	Absent.

Table A11-3 (set 3): Microscopic hair analysis and determined ancestry for the ambiguous shrunken heads.

Head ID	Shaft		Aberration	Transverse cross section	Ancestry ID
	Max diam. (µm)	Coarseness			
A36675	124.2	Coarse.	Normal.	Oval.	Mongoloid.
A41122	67.8	Medium.	Normal.	Oval.	Mongoloid.
A44058	90	Coarse.	Normal.	Round.	Mongoloid.
A95788	94.8	Coarse.	Normal.	Round.	Mongoloid.
A121091	90.6	Coarse.	Normal.	Round.	Mongoloid.
A155039	117	Coarse.	Normal.	Oval-Flat.	Mongoloid.
A161722	102	Coarse.	Normal.	Round.	Mongoloid.
A191643	117.6	Coarse.	Normal.	Round.	Mongoloid.
A233681	95.4	Coarse.	Normal.	Round.	Mongoloid.
A642548	105	Coarse.	Normal.	Round.	Mongoloid.
A642551	93.6	Coarse.	Normal.	Oval.	Mongoloid.
A642552	67.2	Medium.	Normal.	Round.	Mixed: Mongoloid/Caucasoid.
A642553	102.6	Coarse.	Normal.	Round.	Mongoloid.
A642554	83.4	Coarse.	Normal.	Round.	Mongoloid.
A642555	110.4	Coarse.	Normal.	Round.	Mongoloid.
A642558	95.4	Coarse.	Normal.	Oval.	Mongoloid.
A642559	106.2	Coarse.	Normal.	Round.	Mongoloid.
A642561	112.2	Coarse.	Normal.	Oval.	Mongoloid.
A642562	114.6	Coarse.	Normal.	Round.	Mongoloid.
A642563	99	Coarse.	Normal.	Round.	Mongoloid.
E039500	78	Medium.	Normal.	Round.	Mongoloid.
E315111-0	84.6	Coarse.	Normal.	Round.	Mongoloid.
Elgin1	102.6	Coarse.	Normal.	Round.	Mongoloid.

	Mongoloid	Caucasoid	Negroid	Mixed: Mongoloid/ Caucasoid	Mixed: Negroid/ Caucasoid	Unclassifiable
Ceremonial	6					
% of 6 heads	100					
Commercial	21	2	2	9	1	1
% of 36 heads	58.33	5.56	5.56	25	2.78	2.78
Ambiguous	22			1		
% of 23 heads	95.65			4.35		
TOTAL	49	2	2	10	1	1
% of 65 heads	75.38	3.08	3.08	15.38	1.54	1.54

Table A11-4: Frequency of ancestry groups determined across the collection and for each shrunken head category.

Table A11-5: Findings pertaining to pathology, damage and staining, evident within the hair.

Head ID	Processor origin	Hair treatments	Sun bleaching	Diseases, disorders and traumas	Insect, arachnid presence/damage	Fungal presence/damage	Fine hair and canities
A95789	Ceremonial		Present.				
A121104	Ceremonial						
A642550	Ceremonial		Present.			Fungal damage - Black piedra.	
A642560	Ceremonial						
E165119B0	Ceremonial		Present - strong.				
E403395-0	Ceremonial		Present.				
A38099	Commercial		Present.				

Head ID	Processor origin	Hair treatments	Sun bleaching	Diseases, disorders and traumas	Insect, arachnid presence/damage	Fungal presence/damage	Fine hair and canities
A61492	Commercial			Central trichoptilosis (longitudinal fracture).			
A63428	Commercial				Nits from the pediculosis humanus capitis (head lice).		
A63429	Commercial		Present.				
A68229	Commercial						Greying (minimal).
A68231	Commercial		Present.				
A97275	Commercial				Nits from the pediculosis humanus capitis (head lice).		
A102935	Commercial			Trichorrhesis nodosa.			
A109084	Commercial		Present.		Nits from the pediculosis humanus capitis (head lice).		
A119820	Commercial		Present.		Nits from the pediculosis humanus capitis (head lice).		
A130409	Commercial				Nits from the pediculosis humanus capitis (head lice).	Fungal presence.	
A190320	Commercial						
A221683	Commercial						
A230414	Commercial				Nits from the pediculosis humanus capitis (head lice).		Fine shaft (52.2µm) – juvenile.
A642477	Commercial					Fungal presence.	
A642549	Commercial						Greying (minimal).
A642556	Commercial				Nits from the pediculosis humanus capitis (head lice).		
A642557	Commercial				Nits from the pediculosis humanus capitis (head lice).		Greying (minimal).
A642564	Commercial						Greying (strong).
A642565	Commercial						

Head ID	Processor origin	Hair treatments	Sun bleaching	Diseases, disorders and traumas	Insect, arachnid presence/damage	Fungal presence/damage	Fine hair and canities
378202	Commercial		Present - strong.				
CONTROL 400206	Commercial						
E326930-0	Commercial		Present - strong.				
E358641-0	Commercial		Present - strong.				
E358642-0	Commercial		Present - strong.				Greying (minimal).
E378203-0	Commercial		Present.		Nits from the pediculosis humanus capitis (head lice).	Fungal damage.	
E378892	Commercial		Present.				Fine (26.4µm) – infant.
E382592-0	Commercial		Present - strong.		Nits from the pediculosis humanus capitis (head lice).		
E387845-0	Commercial		Present.				
E397131-0	Commercial						
E411333-0	Commercial						
N387872-0	Commercial						
P387657-0	Commercial		Present.				
P387659-0	Commercial		Present.		Nits from the pediculosis humanus capitis (head lice).		
P387660-0	Commercial						Greying (strong).
P387661-0	Commercial				Nits from the pediculosis humanus capitis (head lice).		
A36675	Ambiguous						
A41122	Ambiguous				Nits from the pediculosis humanus capitis (head lice).		
A44058	Ambiguous		Present - strong.	Hair casts.			
A95788	Ambiguous		Present.				

Head ID	Processor origin	Hair treatments	Sun bleaching	Diseases, disorders and traumas	Insect, arachnid presence/damage	Fungal presence/damage	Fine hair and canities
A121091	Ambiguous		Present.				
A155039	Ambiguous						
A161722	Ambiguous		Present.				
A191643	Ambiguous						
A233681	Ambiguous						
A642548	Ambiguous						
A642551	Ambiguous						
A642552	Ambiguous		Present - strong.				
A642553	Ambiguous		Present - strong.				
A642554	Ambiguous		Present - strong.				
A642555	Ambiguous		Present.				
A642558	Ambiguous				Nits from the pediculosis humanus capitis (head lice) - sparse.	Fungal damage - Black piedra.	
A642559	Ambiguous					Fungal damage - Black piedra.	
A642561	Ambiguous						
A642562	Ambiguous						
A642563	Ambiguous						
E039500	Ambiguous		Present - strong.				
E315111-0	Ambiguous		Present - strong.				
Elgin1	Ambiguous		Present.			Fungal damage - Black piedra.	

	Sun bleaching	Diseases, disorders and traumas	Insect, arachnid presence/damage	Fungal presence/damage
Ceremonial	4			1
% of 6 heads	66.67			16.67
Commercial	15	2	12	3
% of 36 heads	41.67	5.56	33.33	8.33
Ambiguous	11	1	2	3
% of 23 heads	47.83	4.35	8.70	13.04
TOTAL	30	3	14	7
% of 65 heads	46.15	4.62	21.54	10.77

Table A11-6: Pathological findings, hair treatments and damage identified.

	Present	Present – strong
Ceremonial	3	1
% of 6 heads	50	16.67
Commercial	10	5
% of 36 heads	27.78	13.89
Ambiguous	5	6
% of 23 heads	21.74	26.09
TOTAL	18	12
% of 65 heads	29.23	18.46

Table A11-7: Degree of sun bleaching evident.