

The Pain Haka burial ground in Flores: Indonesian evidence for a shared Neolithic belief system in Southeast Asia

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Recent excavations at the coastal cemetery of Pain Haka on Flores have revealed evidence of burial practices similar to those documented in other parts of Southeast Asia. Chief among these is the use of pottery jars alongside other forms of container for the interment of the dead. The dating of the site combined with the fact that this burial practice is present over such a wide geographic area suggests a widespread belief system during the Neolithic period across much of Southeast Asia.

Keywords: Indonesia, Neolithic, mortuary practice, pottery, belief system

Supplementary details for Table 1

All samples collected for AMS dating (charcoal and bone) were prepared and analysed at the University of Waikato Radiocarbon Dating Laboratory (Hamilton, New Zealand). The bone collagen from all of the analysed individuals reached standard quality control indicators indicative of well-preserved collagen for AMS dating: a wt%N between 11 and 16, a wt%C between 30 and 45, and a C:N ratio range of 3.1–3.5, with a collagen yield $\geq 0.5\%$ (van Klinken 1999; Brock *et al.* 2007) collagen was ultrafiltered with Millipore Amicon Ultra-4 centrifugal filters (30,000 NMWL), which may reduce the collagen yield by 50% or more (Müldner & Richards 2007), and is probably why the yields were generally low. Calibration of AMS dates was performed using Oxcal v4.2.2 (Bronk Ramsey 2013) and using the IntCal curve of Reimer *et al.* (2009). No corrections in the AMS dates were made for the possible

consumption of marine protein. Although the nitrogen stable isotope ratios were low and carbon stable isotope ratios high (possibly indicating the consumption of C₄ plants), it is likely that this is a reflection of low trophic level marine foods in the diet, as the site is located directly next to a reef and intertidal zone. If the Pain Haka individuals were incorporating ~25% carbon from marine protein this would result in an approximately 100-year error in the calibrated age ranges (i.e. 100 years older; F. Petchey *pers. comm.*). As a result of the dietary uncertainties at the site we favour reporting the calibrated dates at the 95% confidence level in the text and both the 68% and 95% confidence levels in Table 1. One very recent date on charcoal from an unsecure context in zone 5 (Wk-36711) was dismissed.

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Table S1. Demographic information, area of interment, burial type and orientation, associated ceramics and dates for the individuals interred at Pain Haka.

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
1	1	N/A	infant	unknown	primary	flexed on right side	north–south	jar burial	C1 (burial jar)
2 (aka ST1)	4	N/A	child ~5 years	unknown	UK	unknown	unknown	jar burial	C2 (burial jar) + C3 (small clay bottle) + Obj8 (shell beads)
3 (aka ST4)	4	N/A	child (UK)	unknown	UK	unknown	unknown	jar burial	C7 (burial jar)
4 (aka ST2)	5	N/A	adult	unknown	UK	unknown	unknown	jar burial	C11 (burial jar)
5A (aka ST5)	5	N/A	adult	unknown	UK	unknown	unknown	jar burial	C14 (burial jar)
5B (aka ST5)	5	N/A	infant	unknown	UK	unknown	unknown	jar burial	C14 (burial jar)
6 (aka SQ2)	4	N/A	young adult	female	primary	extended supine	north–south	no	shell bracelets on both upper arms (<i>Trochus</i> sp.)(Obj5 right arm bracelet, Obj6 left arm bracelet); Obj4 pig molar near the right hand; shell beads around the head (Obj39).
7A (aka SQ1)	5	N/A	old adult	male	primary	extended supine	north–north-west	no	<i>Cassis</i> sp. shell adze (Obj 38)
7B (aka SQ1)	5	N/A	adult	unknown	intrusion	N/A	N/A	no	

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
8 (aka ST4)	5	N/A	infant	unknown	UK	unknown	unknown	jar burial	C13 (burial jar: the one with human faces)
9A	6	VW11/VW12	young adult	unknown	primary	seated	north-south	no	Obj1 (shell bead); Obj26 (shell bead)
9B	6	VW11/VW12	child (UK)	unknown	intrusion	N/A	unknown	no	
10	6	V10	child 12 years	unknown	primary	extended supine	east-west	no	Obj11 (shell bead)
11a	6	ST27/ST28	old adult	female?	primary	extended supine	north-south	no	Obj30 (shell bead); Obj31 (polished quadrangular stone adze) located near shoulder/head region
11b	6	ST27/ST28	child 2-3 years	unknown	intrusion	n/a	n/a	no	
12	6	T33/U33	young adult	male?	primary	extended supine	north-south	no	Obj12 (shell beads)
13	6	V10/V11	mid adult	female	primary	extended supine	north-east-south-west	no	
14	6	W12	adult	unknown	primary	unknown	unknown	no	
15A	6	U27/U28	adult	unknown	secondary bundle burial	n/a	n/a	no	
15B	6	U27/U28	adult	unknown	secondary bundle burial	n/a	n/a	no	
16 (aka SQ6)	4	N/A	adult	unknown	primary	UK, lower limbs flexed	north-south	no	
17	6	W10/W11	adult	unknown	secondary bundle	N/A	N/A	no	

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
					burial				
18 (aka ST5)	4	N/A	infant	unknown	primary	unknown	unknown	jar burial	C8 (burial jar)
19 (aka SQ4)	4	N/A	adult	female?	primary	flexed	east–west	no	Obj14 (shell beads)
20	6	U26	mid adult	unknown	primary	unknown	unknown	no	
21A	4	N/A	young adult	female	primary	supine, flexed limbs	east–west	no	
21B	4	N/A	adult	unknown	primary	unknown, lower limbs flexed	south–north	no	
21C	4	N/A	adult	unknown	UK	unknown	unknown	no	
21D	4	N/A	young adult	male	primary	extended supine	west–east	no	Obj21 (stingray barb)
22	6	ST24/ST25	adolescent 16–17 years	male	secondary bundle burial	N/A	N/A	jar burial	C20 (burial jar); Obj16 (quadrangular stone adze)
23 (ST3)	5	N/A	old adult	male	primary	flexed on right side	west–east	jar burial	C12 (burial jar); Obj17 (shell bracelet on left arm, probably <i>Conus</i> sp.); Obj 18 (shell bracelet on right arm, probably <i>Conus</i> sp.); Obj 25 (shell beads)
24	6	V12/V13	infant	unknown	unknown	UK	unknown	jar burial	C23 (burial jar); C22 (small pot with hole in the bottom covering C23)
25	6	XY9/XY10	young adult	female	primary	extended	north–south	no	Obj34 (<i>Trochus</i> shell located west of the right

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
						supine			humerus, between the burial and C21. Pot C21 and C19 (the one with lizard applique inside C21) is probably associated with this burial.
26	6	Y9	mid adult	female	primary	extended prone	north–south	no	Obj36 (trochus shell); Obj37 (Lambis sp. shell); Obj38 (unidentified shell) all placed on the spine in the mid-thoracic region. A small trochus shell (Obj35) was located on the lateral, anterior portion of the left mandible. A sherd of pottery (Obj39) was located lateral to the left distal humerus.
27	4	N/A				not excavated			
28	5	N/A	mid adult	female?	secondary bundle burial	N/A	N/A	jar burial	C26 (burial jar)
29A	6	UV11	adolescent 15–16 years	unknown	primary	extended supine	north–south	no	Obj40 (<i>Tridacna</i> shell located east of the left knee of 29A); Obj41 (two sherds of pottery located east the lumbar vertebrae, west of the medial left forearm and distal left humerus, directly north the left ilium); Obj51 (pottery sherds located west of the distal aspect of the right tibia and fibula.
29B	6	U11	adult	unknown	secondary burial	N/A	north–south	no	none observable but as it is interred with 29A it is difficult to discern.
30	4	N/A				not excavated			
31A	6	W11	old adult	female	primary	supine, flexed lower limbs	north–south	No	

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
31B	6	W11	young adult	unknown	primary	extended supine	west–east	No	
32	5	N/A				not excavated			C25 (burial jar)
33	5	N/A				not excavated			
34	6	W12	child 6–7 years	unknown	primary	seated	unknown	jar burial	C29 (burial jar)
35	6	W13	adolescent 14–16	unknown	primary	extended supine	north–south	no	Obj42 (<i>Lambis</i> sp. shell)
36	6	V12	young adult	male	primary	extended supine	north–south	no	Obj43 (<i>Trochus</i> shell located west of the mid section of the right femora)
37	6	V13	adult	male?	primary	extended supine	north–south	no	
38	6	V13/W13	adult	female?	primary	extended supine	north–south	no	Obj44 (<i>Trochus</i> shell located east of where the left forearm would have been)
39	6	V13	adult	unknown	primary	extended supine	north–south	no	Obj45 (<i>Trochus</i> shell located west of the distal femur).
40	6	V13/W13	adult	unknown	primary	extended supine	east–west	no	
41	6	W11	mid adult	female	secondary	unknown	unknown	no	
42	6	U11	adult	unknown	primary	unknown	unknown	no	
43	6	W12	mid adult	male	secondary	unknown	facing west	no	Mandible and lower skull resting on a stone (Obj52)

Burial	Zone	Square	Age	Sex	Type	Burial position	Orientation	Jar burial	Ceramic (C)/object association
44	6	V13	adult	unknown	primary	unknown	north–south	no	
45	6	U9/U10	adolescent 17–19 years	female	primary	supine, flexed limbs	north–south	no	Obj46 (two coral boulders, one between the feet, the other located south of the right hand).
46	6	U9	mid adult	unknown	primary	extended supine	north–south	no	Obj47 (one coral boulder located south of burial 46 and to the east of burial 45); Obj48 (two pieces of pottery located south of the cluster of bones of burial 46); Obj49 (<i>Trochus</i> shell located to the south-east of burial 46).
47A	6	V9	mid adult	male	primary	extended supine	north–south	no	Obj50 (<i>Tridacna</i> shell located to the north-west of burial 47A's skull)
47B	6	V9	child ~13 years	unknown	primary	flexed on right side	south–north	no	
48	6	V9	young adult	female	primary	flexed on right side	north–south	no	



Figure S1. South-west view of zone 4 at Pain Haka after a superficial cleaning of the surface. An earthquake and subsequent tsunami have remodelled this coastal plain and removed the surface soil exposing some of the burials and burial jars.



Figure S2. A composite image of burial 22, a late adolescent individual probably dismembered and the body portions placed in a small pottery vessel. a) The upper level of the excavation into the vessel, which illustrates semi-articulated limb portions. A stone adze had been placed in the vessel and was overlying hand bones; b) the lower portion of the excavation into the vessel, which illustrates the near-complete cranium articulated with the mandible. At the base of the vessel, just below the mandible, there were articulated ribs; c) right patella (knee cap) with a peri-mortem chop mark on the articular surface of the distal femur; d) right fifth metatarsal with chop mark on lateral aspect of joint at site of tendon attachment; e) right distal humerus with chop mark on posterior and medial aspect of the joint at the site of tendon attachment.



Figure S3. Burials 21a–d, the remains of at least four individuals possibly interred around the same time in a burial pit.