[Supplementary material]

Tropical island adaptations in Southeast Asia during the Last Glacial Maximum: evidence from Palawan

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List of supplementary information

OSM 1: excavation methodology

The excavation methodology employed was a contextual excavation approach, wherein deposited sediments were removed guided by the approach of single context excavation and recording. All sedimentary layers, features and elements in the stratigraphy were given individual context numbers. Within individual layers, a spit recovery approach was utilised to systematically remove thick layers of sediments encountered in an excavation unit. Each spit measured 100mm. All elevation values are based on one reference point, the datum point of

the site. All excavated sediments were dry-sieved using 2mm-mesh wires to further recover artifacts and faunal remains. Selected contexts (layers and features) were also sampled for wet-sieving and flotation for the recovery of plant remains and microvertebrates. Archaeological finds were bagged and recorded according to square, quadrant, context and depth. Potential samples for radiocarbon dating (such as bone, teeth and charcoal) were individually hand-collected, bagged and labelled. The finds were accessioned following the inventory protocols of the National Museum of the Philippines. The site was completely backfilled following NMP protocols.

OSM 2: methods in faunal analysis

Vertebrate identification, quantification and taphonomy

The zooarchaeological recording system used in the vertebrate analysis follows a modification of categories and attributes in the York System (Harland *et al*. 2003) and Bonecode (Meadow 1978). Recording of element portions follows the zonation method by Dobney and Reilly (1988). Taxonomic identifications were aided by morphometric measurements of teeth and postcranial elements. Reference measurements were gathered from museum collections of the University of Cambridge Museum of Zoology and Zooarchaeology Laboratory, Oxford University Museum of Natural History, Natural History Museum (London), and the Field Museum of Natural History (Chicago). The main unit of quantification used in the study is the NISP or number of identified specimens. The NISP includes specimens identified to both element (or portion of element) and taxon. Another counting unit used is the TNF or total number of fragments. This unit is equivalent to the NSP, or number of specimens. The taphonomic analysis employed in the study combines the taphonomic frameworks devised by Bar-Oz and Munro (2004) and Orton (2012). A sequential framework was used, with the first step being the recording of basic taphonomic variables and bone surface modifications involving biotic and abiotic processes. Thereafter, density-mediated attrition, anatomical representation and fragmentation were analysed. Further analysis of anthropic modifications was employed when observable, particularly in the form of burning, fracturing and butchery marks. Statistical analyses and visualisation of morphological and taphonomic data were implemented in R (R Core Team 2019) and R package ggplot2 v3.2.1 (Wickham 2016).

Mollusc identification and quantification

The main unit of quantification used for molluscs is also the NISP or number of identified

specimens. For the identification and quantification of bivalve shells, only specimens with the hinge part retained were considered here. The total number of specimens was then divided into two to get an estimate number of individual shells. While it is recognised that the left and right parts should have been counted separately to get the minimum number of individual shells or MNI, as is the convention in Claasen (1998) and Quentmayer (1985), the limitation of the samples dictated that the shells be counted as such—without distinguishing the left and right parts since there was difficulty in discerning the left or right of the bivalve shells as the umbo part was not apparent to show directionality. For gastropods, entire shells were counted as one and for the fragmented specimens, only those still having a significant part of the apex were considered in this analysis and counted. Most taxonomic determinations were to the genus level with a few shell types identified up to the species level. The basis for taxonomic identification and habitat determination were Abbott (1986), Springsteen & Leobrera (1986), Eisenberg (1989), Kress (2000), De Bruyne (2003), Laureta (2008) and MolluscaBase (2021).

OSM 3: mortuary ceramics of Pilanduk Cave

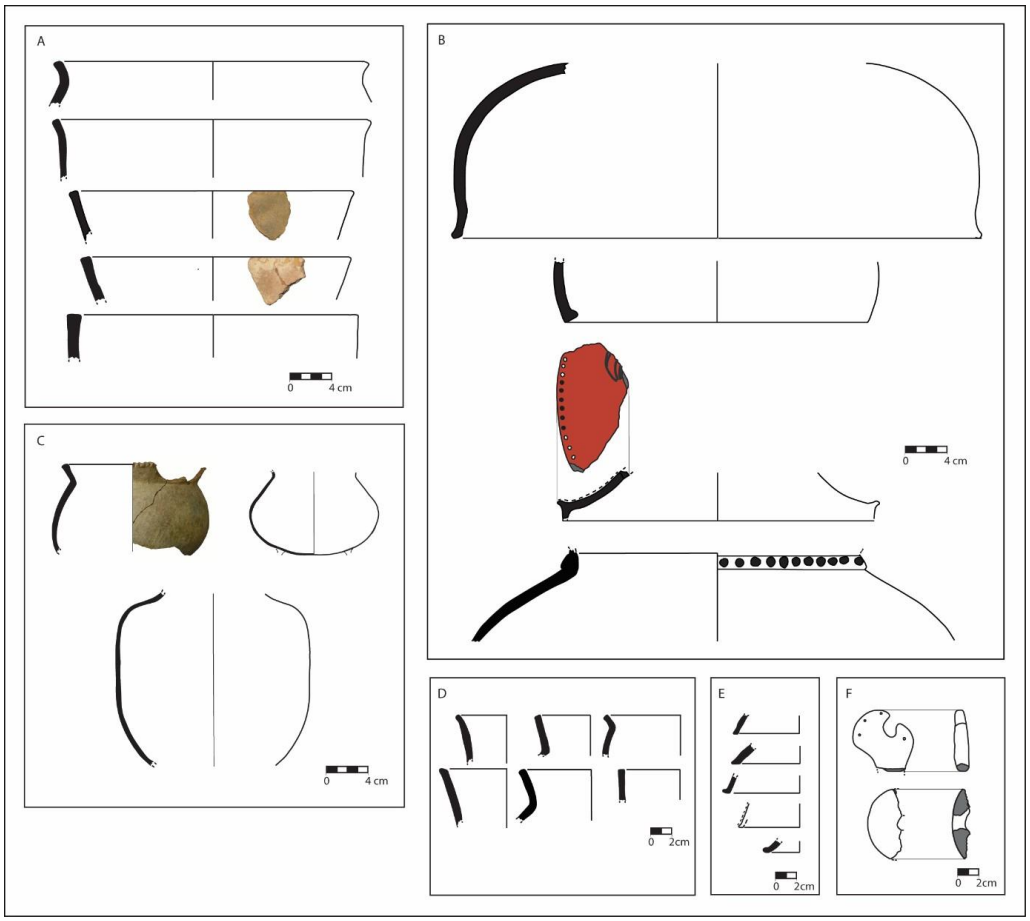

Figure S1. A) Large ceremonial vessels: mortuary vessels that are mostly restricted, have globular or rounded bottoms, with either everted or direct rims. Mouth rims range from 240–

300mm in diameter and are 6–12mm thick. Most are plain although some rims are decorated with lip notches. Prior excavations by Kress indicate most of these burial jars have tall, everted rims, with some at least 120mm tall; B) Lids & necks of large vessels: jar covers with hemispherical or possible conical or trunconical forms with mouth diameters that range from 280 to 510mm. Most are polished smooth and undecorated although a red-slipped piece with punctate circles and incised decoration occurs. The Pilanduk assemblage also includes a sherd decorated with an applied band of impressed circles that goes around the neck of the jar (bottom, B); C–E) Small ceremonial vessels: vessels with rim diameters that range from 100–180mm and thicknesses from 2–7mm. These vessels are mostly everted-rimmed (D) and globular in shape although some exhibit a squat and squarish shape (C, bottom). Vessel decoration includes lip notches, incisions, and carved paddle impressions (C, top left). Some of these small vessels have foot rings (E) based on attachment scars observed in some sherds (C, top right); F) Other finds: vessel fragment with zoomorphic motif that possibly topped the lid of a burial jar. This is almost similar to a sherd Kress (1978) found in his excavations. Clay disc fragment that is 80mm in diameter, 15mm thick, and has a 15mm perforation in the centre (bottom) (image © A. de Leon).

The Pilanduk ceramics exhibit some stylistic affinities with earthenware vessels found across various archaeological sites on Palawan Island. For instance, restricted globular burial jars with tall, everted rims and an appliqué neck band decorated with stamped impressions also occur at Guarda Rockshelter (Bautista 2003); dome, conical or trunconical lids are found at the Tabon Caves (Fox 1970); and decorations such as lip notching, incised lines, carved paddle impressions and red-slipping are also exhibited in ceramics from Ille Cave, Linaminan, Leta-leta and the Tabon Caves (Fox 1970; Szabo & Dizon 2007; Balbaligo 2010, 2015). Although the stylistic relationships with Pilanduk appear to be weak as noted by Kress (1978), the similarities suggest cultural connections among social groups across Palawan sometime in the ‘Late Neolithic’ and ‘Metal Age’.

OSM 4: lithic artefacts from Trench 3 of Pilanduk Cave

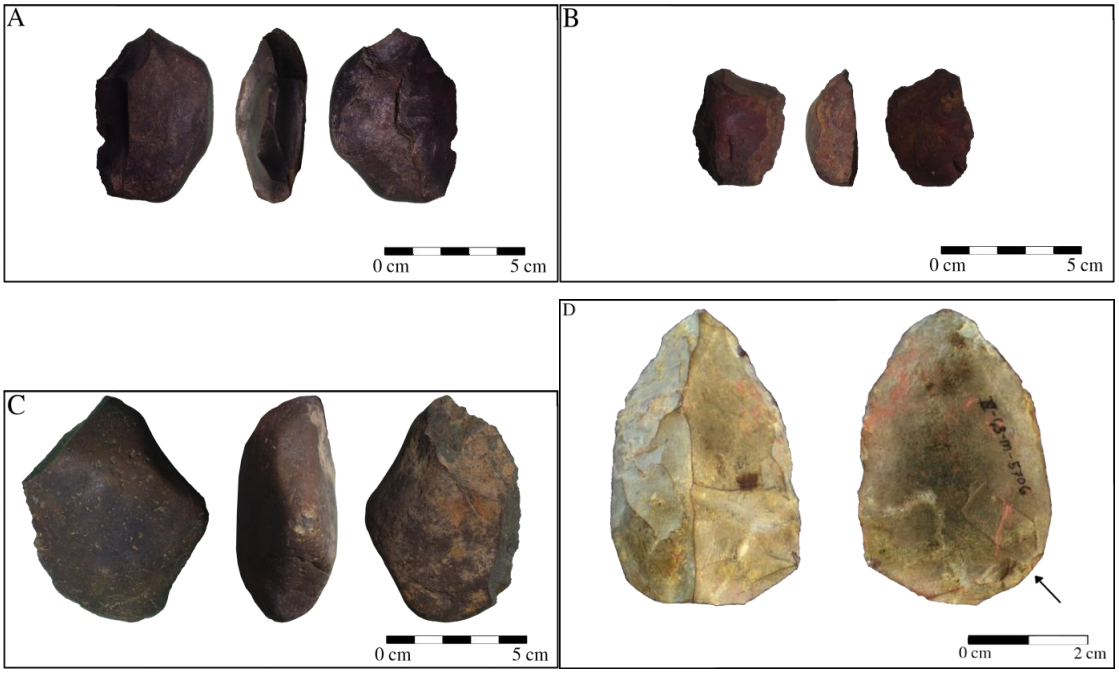

Figure S2. A) Artefact number 5701, technologically oriented: a brownish chert core from Trench 3, context 112. Flaked mostly on one end and retaining much of its cortex, it is possibly a core tool weighing 70.7g (photograph by T. Palconit and P. Cabrera); B) artefact number 5105, technologically oriented: a brownish chert flake from Trench 3, context 112. Flaked mostly on one side, it retains considerable cortex and weighs 21.8g (photograph by T. Palconit and P. Cabrera); C) artefact number 6073, technologically oriented: a greyish chert core from Trench 3, context 117. Flaked mostly on one side, it retains much of its cortex. It is possibly a core tool weighing 164.1g (photograph by T. Palconit and P. Cabrera); and D) artefact number 5076, morphologically oriented: a non-cortical light brownish chert flake from Trench 3, context 112 weighing 22.7g and with around 12 negatives on its dorsal face. There are possible signs of retouch and/or use on the left and right medial and distal edges visible to the naked eye. The arrow refers to the flake's point of percussion (photograph by C. Jago-on).

OSM 5: butchery marks on deer remains.

Figure S3. Examples of deer bones from Pilanduk Cave, showing helical fractures and butchery marks in the form of cutmarks and chop marks: a) Pil-5413 proximal tibia (cranial) and midshaft with cutmarks (context 112); b) Pil-6232 frontal bone fragment (dorsal) with chop marks on the base of pedicle (context 118); c) Pil-5645 distal humerus (medial) with cutmarks on medial side (context 112); d) Pil-6156 distal humerus (cranial) with cutmarks on

medial side (context 117); e) Pil-5806a proximal metacarpal (cranial, context 112); f) Pil-5806b distal metacarpal (caudal, context 112) (images by P. Cabrera, T. Palconit and J. Ochoa).

Table S1. Lithic artefacts from Trench 3.

Context	Andesite			Basalt			Black chert			Brown chert			Red chert			Grey chert			Total
	Cores	Flakes	Debris	Cores	Flakes	Debris	Cores	Flakes	Debris	Cores	Flakes	Debris	Cores	Flakes	Debris	Cores	Flakes	Debris	
110	0	3	1	0	0	0	0	3	0	4	20	8	1	10	0	0	2	1	53
111	1	5	3	1	1	0	0	5	3	1	91	27	1	15	5	1	6	0	166
112	0	8	0	0	0	0	2	11	1	11	150	30	2	14	3	0	2	0	234
116/117	0	12	0	0	1	0	0	6	1	1	67	5	0	23	0	1	5	0	122
Total	1	28	4	1	2	0	2	25	5	17	328	70	4	62	8	2	15	1	575

Table S2. Number of identified specimens (NISP) for mollusc taxa.

Trench	Layer	Context	Terrestrial						Freshwater			Marine														Mangrove			
			Helicostyla satyrus	*Helicostyla turbo*	*Helicostyla* sp. (1)	*Helicostyla* sp. (2)	*Cyclophorus* sp.	*Obba* sp.	*Melanoides* spp.	*Thiara tuberculata*	*Batissa* sp.	*Natica* sp.	*Cypraea* sp.	*Trachycardium*	*Placuna placenta*	*Conus* sp.	*Cantharus fumosus*	*Clypeomorus* sp.	*Nassarius* sp.	*Nerita planospira*	*Rhinoclavis* sp.	*Placuna placenta*	*Paphia textile*	*Nerita albicilla*	*Meretrix lusoria*	*Neritodryas dubia*	*Neritina* sp.	*Telescopium* sp.	**Total**
1	1 and 2 (mixed)		3						6				1																10
		2					1																				1		2
		5	3			5	3		25				1				2					1	1	1				42
		6	1			1			25				1															28
2	1 and 2 (mixed)	100																											
			2		3		3		32		2							1					2				1		46
	2	102	9	1	7		4		106	1	1	2		1											1				133
3	1 and 2 (mixed)	110	2		2			2	22		1	1							1										31
	1	115			2		1		13			1														1			18
	2	111	12		3		1		118			4	1	2								1							142
	2	112	2		1		5		193		1	3		1					1	1					1	1			210
	2	116	2						50																				52
	2	117							149		1																		150
	3	118	4		5				50			1																	60
4	1 and 2 (mixed)	121	6	5		9	2		281	2	1	2	1	1		1	1	1		1	2					1	1		318

	2	122	1						3																			1			5
	2	124	3			1			59																						63
	2	125	1		1				391			2																			395
	2	127	3			3	1	1	557					1		1															567
	2	128				2						1																			3
	2	129							37					1																	38
	2	130							15			1																			16
Total NISP			54	6	24	21	21	3	2132	3	7	18	5	7	1	1	3	2	2	2	2	2	3	1	1	5	2	1	2329		

Table S3. Number of identified specimens (NISP) by mollusc habitat ecology.

Layer	Context	NISP by habitat			
		Terrestrial	Freshwater	Marine	Mangrove
Trench 1					
Layer 1 and 2	2, 5 and 6	17	56	8	1
Trench 2					
Layer 1 and 2	100	8	34	3	1
Layer 2	102	21	108	4	
Trench 3					
Layer 1 and 2	110, 115	9	36	3	1
Layer 2	111, 112, 116, 117	26	512	14	2
Layer 3	118	9	50	1	
Trench 4					
Layer 1 and 2	121	22	284	10	2
Layer 2	122, 124, 125, 127, 128, 129, 130	17	1062	7	1
Total NISP		**129**	**2142**	**50**	**8**
%NISP		5.5	92.0	2.1	0.3

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