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Hand stencil discoveries at Lene Hara Cave hint at Pleistocene age for the earliest painted art in Timor-Leste

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The distribution of known Pleistocene painted rock art in Island South-east Asia is currently limited to islands on the northern dispersal route to Australia. Here we report the discovery of at least 16 hand stencil motifs in Lene Hara Cave, Timor-Leste; a site on the alternate southern arc route. Superimposition, preservation state, differing 'canvas' materials (i.e. painted surfaces), and the location of the stencils in the internal (darker) part of the cave chamber together suggest that they represent an independent artistic phase that pre-dates the Holocene Austronesian Painting Tradition. The stencils are therefore recognised as a chronologically distinct painted rock art tradition, with a Pleistocene age considered most likely. Such findings have important implications for our understandings on the origins and spread of art in south-east Asia.

Keywords: Timor-Leste, Lene Hara, Pleistocene, Cave art, Hand stencils.

1. Introduction

Timor-Leste is home to an impressive array of rock art sites, primarily found in two zones: the Baucau Plateau in the north and the Tutuala region at its far eastern tip (Cinatti, 1963; Almeida, 1967; Glover, 1972; O'Connor, 2003; Arifin and Delanghe, 2004; cf. O'Connor and Oliveira, 2007). A diverse array of painted motifs, applied using a range of coloured pigments (black, red, yellow and green), includes: linear geometric designs, x-ray style and figurative animals, anthropomorphs, and boats. Many of the motifs are consistent with the Austronesian Painting Tradition (APT; Ballard, 1992), and thus post-date Austronesian expansion into the western Pacific. Some of the painted motifs in Timor-Leste and neighbouring islands also show strong stylistic similarities with motifs cast on objects associated with the South-east Asian Metal Age, such as Dong Son drums, which would place them within the last 2500 years (O'Connor, 2003; Ballard et al., 2004; O'Connor et al., 2017a; Oliveira et al. 2019). Together this suggests at least some of the art was created after 4000 BP.

Lene Hara cave is a key rock art site in Timor-Leste (Figure 1), and is dominated by motifs with affinities to the APT. This hypothesis is apparently supported by a U-series age of 6300 years for calcite underlying a layer of red pigment in a loose cave wall fragment removed from near a visible APT motif (Aubert et al., 2007). However, there was no direct stratigraphic relationship between the dated calcite and the APT motif — something that is today considered a critical prerequisite when deciding sampling locations for U-series dating (Hoffmann et al., 2016; Aubert et al., 2017) — so the validity of this date remains unclear.

Human occupation in Timor-Leste stretches back to at least ~44,000 cal. BP (Hawkins et al., 2017), with the earliest evidence of occupation in Lene Hara dating to ~43–41,000 cal. BP (O'Connor et al., 2017b), so humans were occupying the cave in the Pleistocene and it is feasible that a Pleistocene tradition of rock art could exist. Indeed, regarding Lene Hara, a carved face located on a stalagmitic column has been dated to between 12,500 and 10,200 years ago by U-series (O'Connor et al., 2010a), whilst

the aforementioned calcite chip was also found to contain a stratified layer of red pigment dated to between ~29,300 and ~24,000 years ago (Aubert et al., 2007). Whilst there is no conclusive proof that the pigment in the latter is art, and a direct relationship between the dated carbonate and the carving is difficult to ascertain (Aubert et al., 2017), together they pose the tantalising prospect that earlier, Pleistocene, rock art was also created in the region.

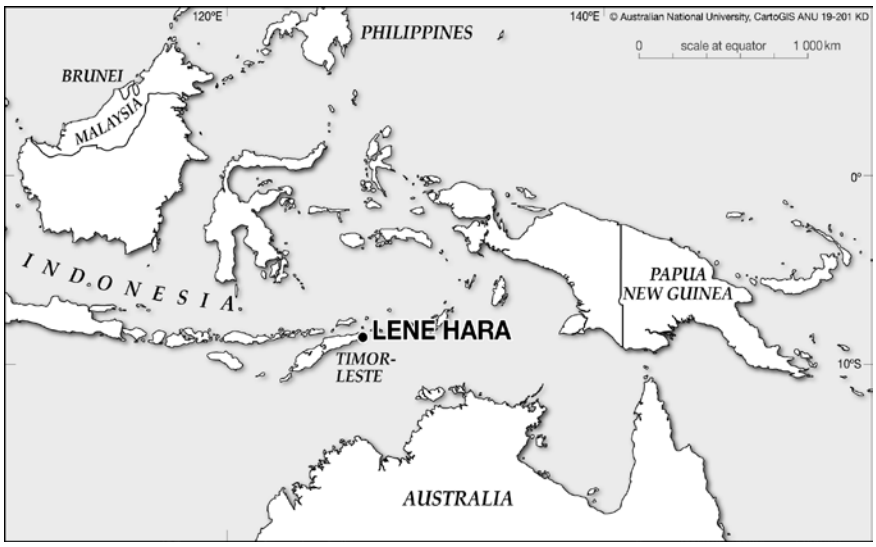

Figure 1. Map of Island South-east Asia showing the location of Lene Hara Cave.

Hand stencil motifs are also found in Timor-Leste (de Almeida, 1967; Glover, 1972; O'Connor, 2003; O'Connor and Oliveira, 2007), but they are generally considered to have a much lower frequency than in neighbouring regions. In fact, this is seen as one of the key differences between the rock art traditions of Timor-Leste and elsewhere in Island South-east Asia (O'Connor, 2003; Arifin and Delanghe, 2004). O'Connor (2003) grouped hand stencils, alongside simple red figurative motifs with solid infill, within a set of motifs that are distinct from the APT based on their distribution in deeper but accessible cave locations, yet stressed there is no evidence to suggest this is a chronologically distinct group. Nevertheless, whilst also produced in the modern era (Gunn, 2006), hand stencils are accepted as being an important feature of the first traditions of painted rock art both in Island South-east Asia (Aubert et al., 2014, 2018; Taçon et al., 2014) and other parts of the world (Pike et al., 2012; García-Diez et al., 2015; Hoffmann et al., 2018). This includes two examples from Lubang Jeriji Saléh, Borneo, dated to before 37,200 years ago (Aubert et al., 2018), and one from Leang Timpuseng, Sulawesi, dated to before 39,900 years ago, by U-series dating of

associated carbonate (Aubert et al., 2014). Following the hypothesis that hand stencils fall into a distinct set of motifs in Timor-Leste too, the possibility that some may be associated with a pre-APT painted rock art tradition is worthy of further investigation.

Prior to our work, two negative hands stencils were known in Lene Hara (Almedia, 1967). Here we present a minimum series of 16 previously unrecorded hand stencils discovered during fieldwork in August–September 2017. The stencils are discussed in terms of their placement, preservation, and superimposition in relation to other motifs, and are used to stimulate a discussion on the prospect of an early phase of rock painting in Timor-Leste.

2. Lene Hara

2.1. Site and location

Lene Hara is a large, open, solution cave (Figure 2) formed within an uplifted coralliferous limestone terrace near the village of Tutuala, Lautém Municipality, Timor-Leste. It is elliptical in cross-section, and opens to the east where areas of large roof-fall blocks can be found (primarily) below the well-defined drip-line. Sedimentation is widespread with the present day surface generally sloping down towards the north/north-east, whilst speleothem formations, including flowstone floors and large stalagmites and columns, are also present (O'Connor et al., 2010b; O'Connor et al., 2017b).

2.2. Human occupation

The first excavation to take place within Lene Hara was conducted in 1963 (Almeida and Zbyszewski, 1967). The resulting open trench was further considered by Glover (Glover, 1972), but no subsequent work was carried out at the site until a new research programme began in 2000. Over the following nine years, four 1x1 m squares were excavated and additional dating work performed (O'Connor et al., 2002, 2010b, 2017b; O'Connor and Veth, 2005). Squares A and B were located towards the south/south-western side of the cave, and D and F were located towards the north/north-east side of the cave (Figure 2).

In square A, pottery was primarily found in the top 0.25 m whilst stone artefacts, marine shells and bones were found throughout. The surficial layers were dated to the Holocene, but the vast majority of the 0.8 m sequence was dated to between ~39,000 and ~34,000 cal. BP. Most of the sedimentation within square B, which had a similar cultural sequence, dates to between ~30,000 and ~21,000 cal. BP. In contrast, squares D and F were entirely of Holocene age (O'Connor et al., 2010b). Cultural material cemented within a breccia underneath the edge of the large speleothem column towards the front of the cave was discovered in 2009, and this was dated to between ~43–41,000 cal. BP. Evidence therefore indicates human occupation of Lene Hara both in the Holocene and the Pleistocene (O'Connor et al., 2010b).

2.3. Rock art

The majority of the previously recorded painted rock art in Lene Hara is concentrated in the entrance zone, with motifs typically either found on the south-east wall or nearby on the bedded limestone roof within ~10 m of the dripline. Some are also found on the outer face of the large (southern) stalagmitic column located next to the area of excavation by Almeida and Zbyszewski. Non-figurative motifs are most common, particularly linear geometric forms, rayed star/sun motifs, and circles. Figurative motifs are also present, including boats, animals (e.g. birds and x-ray fish and flying fox), anthropomorphs, and zoomorphs with human features (Almedia, 1967; O'Connor, 2003). Two negative hand stencils were also known, located adjacent to each other by the southern stalagmitic column. The art is primarily in red and black pigments, although green is also present in one motif, and stylistically it is generally consistent with the APT. A series of petroglyphs, mainly with silhouettes of human faces, have also been recorded (O'Connor et al., 2010). Three are located facing into the cave on the side of a partially collapsed column in the cave entrance. A further two are located on the northern stalagmitic column.

3. Results: hand stencils

A minimum of 16 new hand stencils have been identified in Lene Hara, bringing the full number known to 18 (Figure 2, Figure 3 and Supplementary Information). Eight can be identified as left-hands (assuming palm down), seven as right-hands, whilst three could not be characterised. Most of the stencils depict hands with fingers splayed,

and only two include significant amounts of forearm. All were produced using red pigment. A macro-inspection of the motifs indicates that the pigment was applied on the wall with a blowing technique (Figure 4); the diffuse character of the distribution of the colorant and the existence of small pigment points (splattering) means the use of a rudimentary airbrush can be considered (d´Errico et al., 2017).

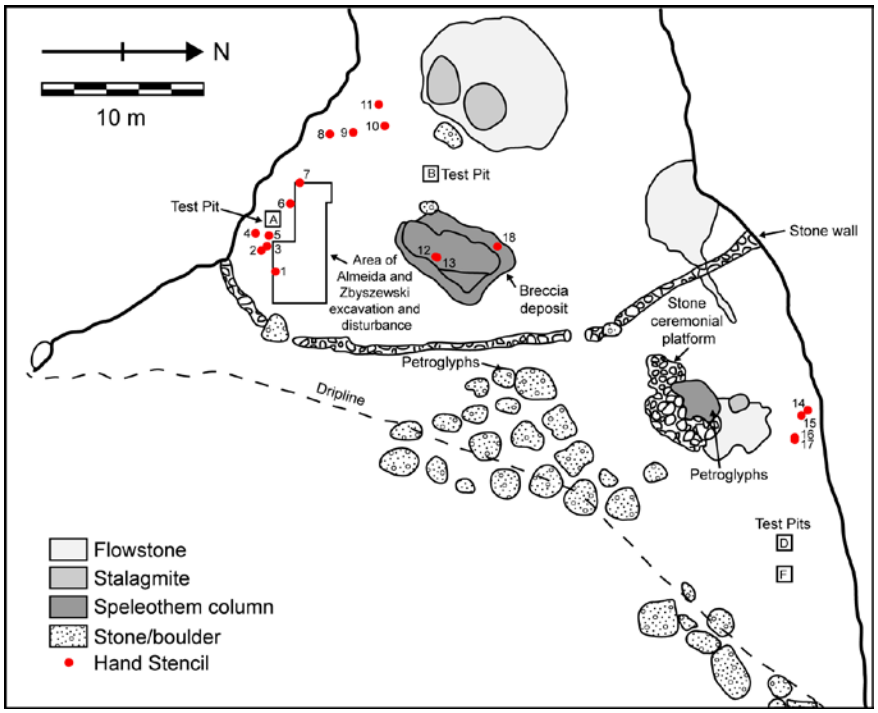

Figure 2. Map of Lene Hara Cave, including the locations of the hand stencils discussed. Adapted from O'Connor et al. (2017b) Figure 6.

The majority of the stencils are located on the cave walls within 20 m of the dripline and no greater than 2.2 m above the present day ground surface. Eleven are located on the southern wall and four on the northern, both of which step or slope up to the cave roof at an approximate angle of ~45°. The remaining three are found high-up on the ceiling by the southern speleothem column, however access to them is simple and they can easily be reached by unassisted climbing.

The distribution of the hand stencils contrast with the location of motifs thought to characterise the APT art, with the stencils found further into the cave. Only the pair in front of the large speleothem column (nos. 12 and 13) and the stencil situated nearest the entrance on the southern wall (no. 1) are in close proximity to APT motifs. This

demonstrates a preferably different implementation of the typology of motifs and clear segmentation of the decorated space.

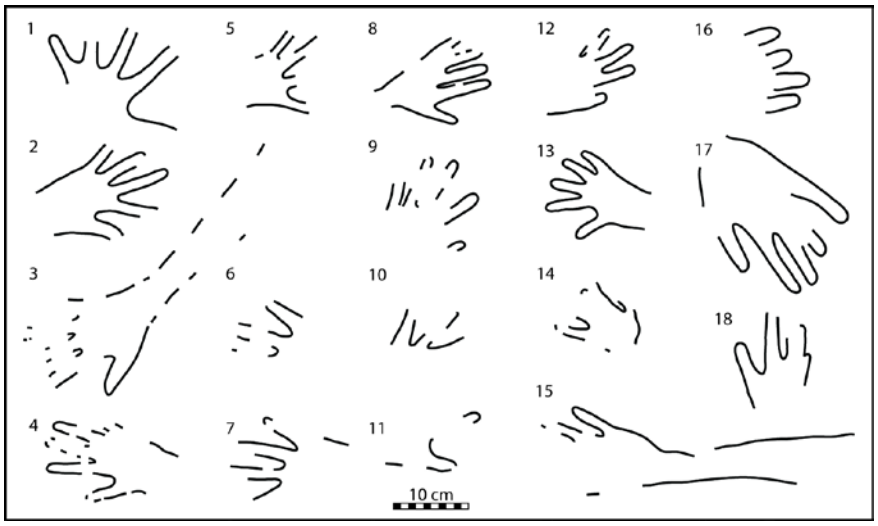

Figure 3. Schematic diagrams of the Lene Hara hand stencils.

The stencils were applied onto a mineral crust which itself directly overlies the limestone bedrock (Figure 5). However, natural weathering and heavy exfoliation has resulted in the loss of variable — but often significant — proportions of this crust, and in some places it has disappeared altogether leaving many of the stencils heavily fragmented (Figure 6).

In addition to the 18 stencils listed so far, a further 8 probable stencils were seen based on identification of pigment splatter and regularly formed edges (6 on the southern wall and 2 on the northern wall). However, these were too incomplete for further recording; a result of the poor preservation of the mineral crust ‘canvas’ (i.e. the painted surface). One further example was identified when reviewing on-site photography. With many more patches of red colouration seen on often isolated fragments of this mineral crust, the true number of hand stencils on the walls of Lene Hara would once have been far higher than that reported here.

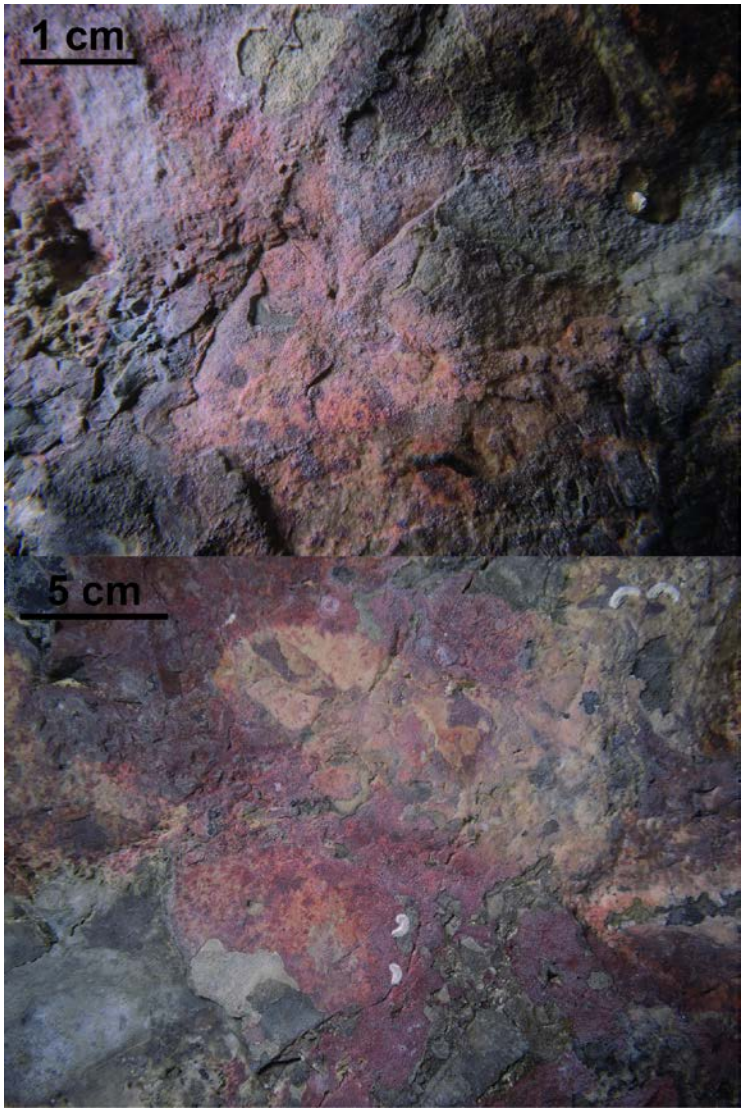

Figure 4. Macro-photo of stencil detail showing clearly defined boarders and pigment splatter (stencil 3 top, stencil 5 bottom).

All stencils were inspected for datable carbonate formations in direct association with pigment. However, the crust on which the majority of the stencils were applied is gypsum-based, and no significant formations were found overlying the pigment. Assessing the absolute age of the hand stencils is therefore problematic; however, it is possible to identify some superimposition to aid a relative chronology. Stencil 1 is clearly behind a sun (or star) motif (Figure 7). Sun-ray (or rayed-sun) motifs range from simple circles with radiating spokes to more complex motifs composed of sets of concentric circles and triangular rays, and are recognised as one of the hallmark motifs of the APT (Wilson and Ballard, 2018). The recorded superimposition therefore indicates that this hand stencil pre-dates the APT. Furthermore, the stencil was applied

to the now fragmented mineral crust, whereas the sun/star motif was painted onto both the exposed bedrock and the mineral crust and therefore clearly post-dates both the creation of the stencil and the crust's weathering.

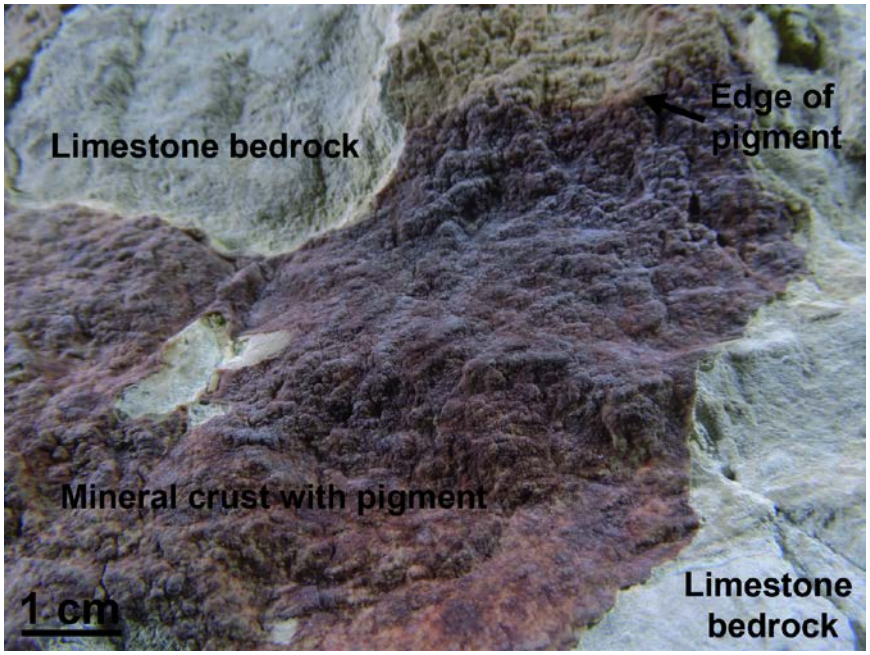

Figure 5. Macro photo of (gypsum based) mineral crust on which the stencils were applied. The above example shows stencil 11.

Stencils 12 and 13, the pair located by the large speleothem column, were also applied onto the now fragmented mineral crust. Whilst no direct superimposition is discernible here, there are faded geometric motifs immediately adjacent which are again directly on the limestone bedrock and therefore likely post-date the weathering of the crust (Figure 8). The placement of art more generally in the cave follows a similar pattern. All of the hand stencils were painted onto the mineral crust and have since become fragmented wherever this crust has been lost, whereas the APT art was primarily applied directly to the bedrock therefore avoiding fragmentation (although it should be noted that the original extent of the mineral crust is unknown). There is also a sun/star motif near stencils 12 and 13 which clearly overlies a discrete patch of pigment most similar to that used to form the cave's hand stencils, although no such stencil (or other motif) can be clearly identified in this instance (Figure 8). Nevertheless, for the above reasons, the hand stencils are recognised as a distinct, and importantly, earlier artistic phase to that of the APT style motifs.

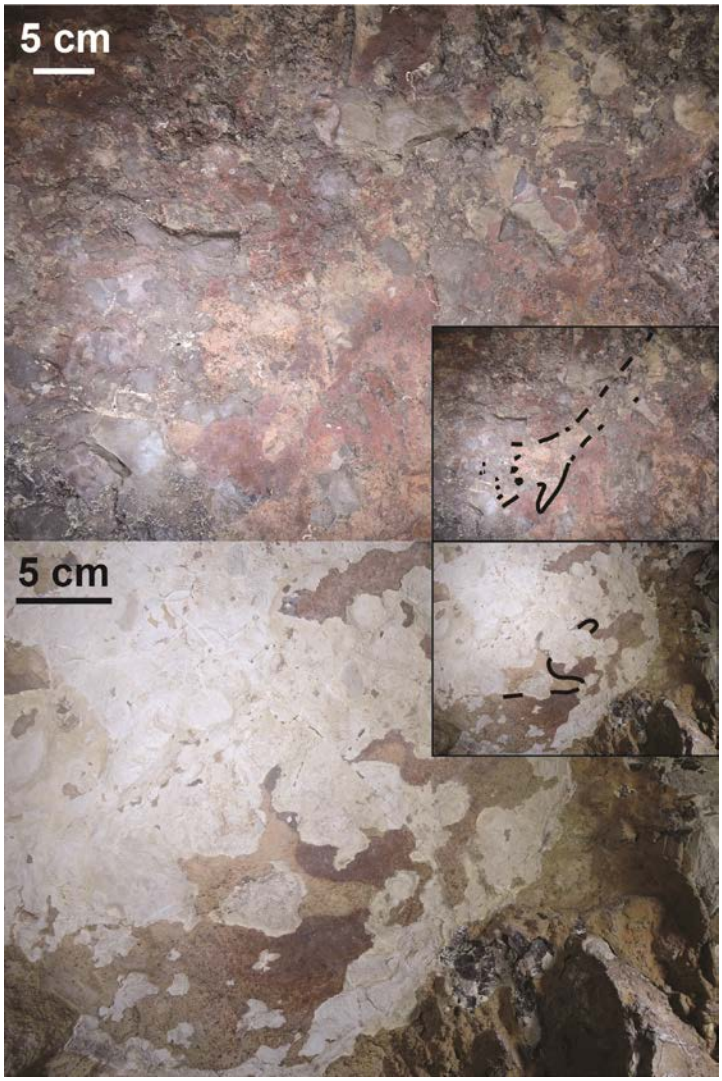

Figure 6. Hand stencils 3 (top) and 11 (bottom), showing variable levels of preservation due to loss of the mineral crust ‘canvas’.

4. Discussion

The data presented here favour the presence of a wider tradition of creating hand stencils in Timor-Leste than previously recognised, and it is highly likely that further examples remain unrecognised elsewhere in the region. This is more in line with neighbouring rock art-bearing areas, such as Australia and Indonesia, where hand stencil traditions are widely known (Chaloupka, 1993; Chazine, 2000; Plagnes et al., 2003; Taçon et al., 2012, 2014; Aubert et al., 2014, 2017, 2018).

O’Connor (2003) hypothesised that the hand stencils in Timor-Leste are part of a distinct artistic group, alongside simple red figurative motifs, based on their distribution

in deeper but accessible cave locations. The newly identified stencils presented are found further into the cave than the APT art and as such have a complimentary distribution, thus supporting this hypothesis. O'Connor (2003) saw no evidence to argue that this group is chronologically distinct. However, in relation to the Lene Hara hand stencils, it is concluded here that they are. This is based on relations of superimposition, the differing 'canvas' material, and the clear disparity in preservation state between the two graphic traditions. The stencils must therefore date from either the early to middle Holocene, or the Pleistocene. The mineral crust on which the hand stencils were applied is neither weak nor visibly deteriorating in the present day, implying this weathering is not exclusively a recent/current event. Evidence therefore points to the stencils being significantly older than the APT motifs.

Hand stencils, alongside simple geometric designs and figurative animal representations, all composed of red pigment, are frequently recognised as being part of the earliest artistic traditions (Förster et al., 2012; Taçon et al., 2014; García-Diez et al., 2015). They are, in fact, amongst the earliest dated painted motifs currently known, with most Pleistocene hand stencils dated to 27,000 BP or earlier (García-Diez et al., 2015; Hoffmann et al., 2018), including two stencils at Lubang Jeriji Saléh, Borneo, with minimum ages of 37,200 years (Aubert et al., 2018), and one at Leang Timpuseng, Sulawesi, with a minimum age of 39,900 years (Aubert et al., 2014). Furthermore, Aubert et al. (2017) reports that images at sites with dated Pleistocene art on Sulawesi are also significantly weathered. The limestone surfaces on which the artistic panels have been applied are described as: "extensively exfoliated, and in many instances only isolated patches of red paint or fragments of a hand stencil or animal painting are visible" (Aubert et al., 2017: S561). This bears a striking resemblance to the situation in Lene Hara. The implication, therefore, is that the Lene Hara stencils could also be of early, i.e. Pleistocene, age, and that Timor-Leste may be home to an important collection of early painted rock art sites. This is not unexpected considering that the Pleistocene dates associated with rock art on Borneo and Sulawesi suggests the first modern humans in the region marked their landscape in this way.

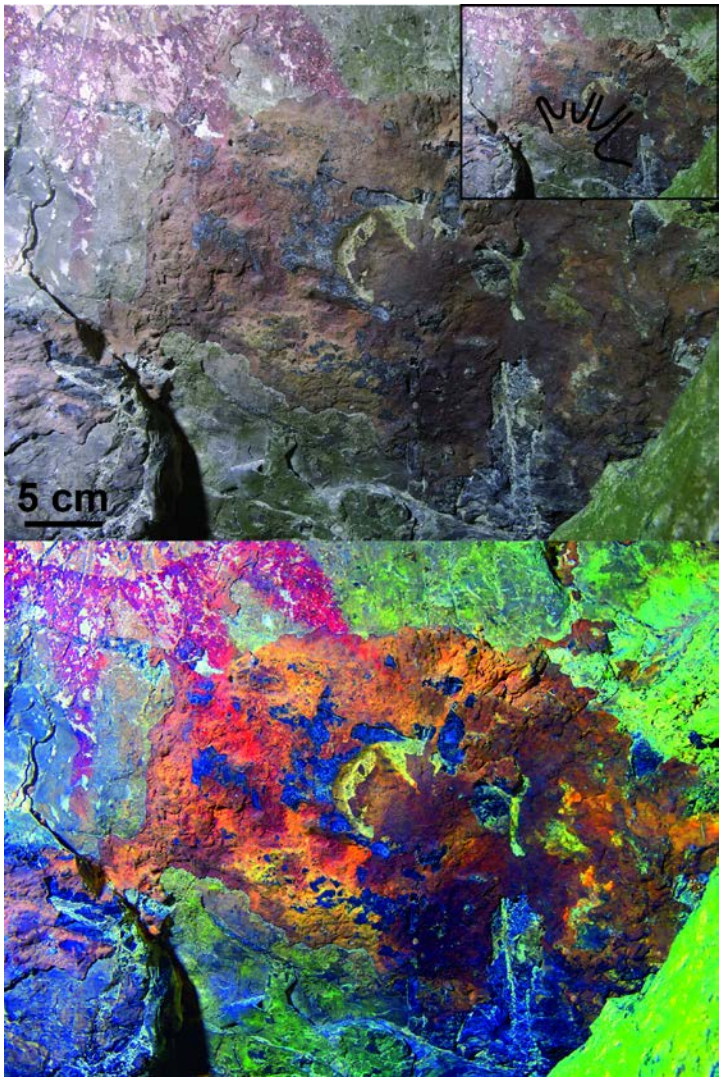

Figure 7. Superimposition of artistic styles in Lene Hara; hand stencil 1 is underneath the sun/star motif. The upper picture shows the original photo, the lower is the same picture after application of DStretch (Clogg et al. 2000; correlation LRE 15%).

Other potential early art sites do exist in Timor-Leste, such as Lene Kici and Lie Siri. Lene Kici is a series of caves within the same uplifted coralliferous limestone terraces as Lene Hara, and ~2 km from the village of Tutuala (O'Connor, 2003). Lene Kici 1 hosts a number of painted motifs, including a fine red canoe with a central staging near its entrance (typical of the APT). However, further inside are a series of "less well-preserved red motifs including some possible faded geometrics, two hand stencils, and the tail of a fish in solid red pigment" (O'Connor, 2003: 114). Lene Kici 5 contains at least two red hand stencils alongside other, faded, red motifs, whilst Lene Kici 6 hosts at least one red hand stencil and further faded red markings (O'Connor, 2003). Lie Siri, situated on the Baucau Plateau, hosts a series of hand stencils and prints that

were created using a variety of red pigments (Glover, 1972). All are good examples of the group of red motifs identified by O'Connor that are typically found in deep but accessible cave locations, and this group is entirely consistent with the artistic motifs that are now frequently being dated to the Pleistocene elsewhere in Island South-east Asia (e.g. Aubert et al. 2014; 2018).

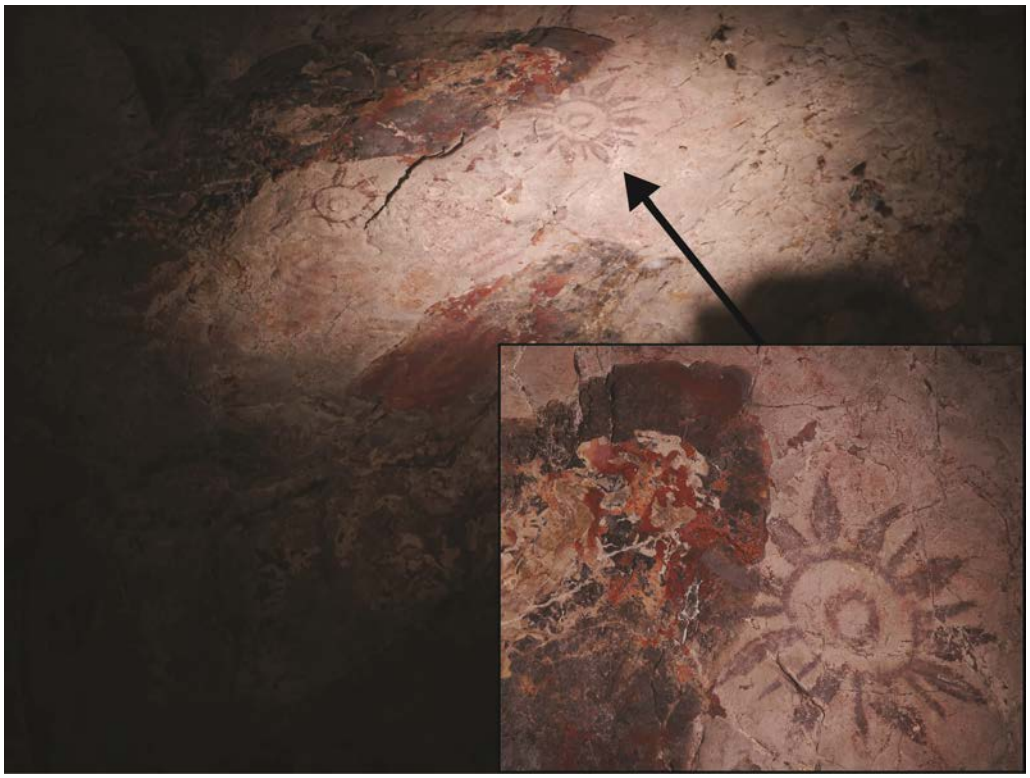

Figure 8. Hand stencils 12 and 13 (centre) with surrounding, faded, geometric motifs alongside a sun/star motif directly overlying further red pigment.

Regarding Lene Hara, evidence of occupation dates from ~43,000 cal. BP (O'Connor et al., 2017b), so it is clear that humans were present in the cave from an early time. The oldest evidence of occupation comes from the breccia by the southern speleothem column and square A immediately by the southern cave wall. Both are locations immediately adjacent to hand stencils (Figure 2), showing that these parts of the cave were a focus of early human activity. Furthermore, the calcite chip with stratified pigment dated to between ~29,300 and ~24,000 years ago by Aubert et al. (2007) suggests Pleistocene painted art could have been a feature of this cave, although it should be noted that none of the hand stencils discussed here were

associated with significant carbonate crust formation and its association with a specific artistic motif remains unclear.

Ochre-stained artefacts and ochre fragments with evidence of use-wear have been documented from a number of Timor-Leste sites, and demonstrate red pigment use from ~42,000 BP (Langley and O'Connor, 2019). At Lene Hara, ochre with evidence of use-wear was recovered from both square A (scraping/grinding dated to ~35–33,000 cal. BP, although note two Holocene beads have been recovered from probable Pleistocene contexts in this square indicating reworking of smaller material: O'Connor et al., 2017b) and square B (grinding/rubbing dated to ~22,000 cal. BP), whilst fragmented grinding stones with traces of pigment have also been recovered from the site. Grinding and scraping actions are typically used to produce powder (Langley and O'Connor, 2019), and would have been required for the production of liquid pigments prior to creating the stencil art presented here. Clearly such evidence cannot be linked directly to the production of these motifs as other uses for pigment, such as personal adornment, do exist. However, the stencils were probably made using the airbrush technique, thus the artistic process involved the creation of a fine and homogeneously reduced dye or powder (d´Errico et al., 2016). Processing of colorant in Lene Hara during the Pleistocene is therefore consistent with the hypothesis of a Pleistocene painted rock art tradition in Timor-Leste.

To summarise, whilst it was not possible to place the Lene Hara hand stencil tradition within an absolute chronology and an early to middle Holocene age is possible, we consider a Pleistocene age more likely based on the highly desperate preservation states of the stencils compared to the APT motifs and their differing 'canvas' materials. Clear evidence of ochre-processing at the site during the Pleistocene, and similarities with dated Pleistocene examples in neighbouring Indonesia, are both consistent with this hypothesis. It should be remembered that it is only in exceptional circumstances that rock art will be amenable to absolute dating techniques. Particularly for motifs produced from mineral pigments, it remains almost impossible to date them unless they are located on limestone geologies where U-Series dating of associated speleothems becomes a possibility. Yet even then, there is no guarantee that good quality carbonate in direct association with pigment will be present (see Hoffmann et al., 2016, for an overview of this approach) and debate on the validity of this technique

is ongoing (e.g. Aubert, 2017; Pons-Branchu et al., 2017; Sauvet et al., 2017; Pike et al., 2017). Detailed fieldwork, as presented here, identifying poorly preserved motifs, examining patinas and assessing superimposition, can, however, play an important role in improving our understanding of early cave art. Not only does it provide us with a more complete picture of the number and distribution of particular motifs, but it also helps us build a relative chronology that can be interpreted in the context of both the site and the wider region, improving our understanding of the range and location of sites marked in the landscape.

Aubert et al. (2017) have recently summarised some of the key questions relating to the origins and spread of Pleistocene rock art in south-east Asia. After noting that the only sites to contain “known or presumed” (Aubert et al., 2017: S563) Pleistocene rock art fall along the proposed northern dispersal route of Birdsell (1977), they hypothesised that the appearance of rock art in south-east Asia may reflect the routes used by the first modern humans to colonise the region before reaching Sahul. As Timor is situated at the end of an alternate route — the southern arc (Balme et al., 2009) — identification of Pleistocene art here, or indeed at other locations along alternate dispersal routes, has important implications for such theories.

Aubert et al. (2017) also discuss whether there was a single artistic tradition that spread across Island South-east Asia from a common point of origin, or whether multiple traditions of similar styles appeared throughout the region. The early art identified elsewhere consists of large figurative animals and hand stencils, and except for the possible fish tail at Lene Kici 1, it is noticeable that Timor-Leste lacks the former. This is, however, unsurprising considering the absence of large terrestrial fauna; stegadons, which were present on Timor, appear to have gone extinct prior to the arrival of humans (Louys et al., 2016). The hand stencils presented here are therefore consistent with a wider, pan-Island South-east Asian, early artistic tradition. If other early motifs are also present on Timor-Leste, then following the region’s depauperate terrestrial fauna and maritime Pleistocene economy (O’Connor et al., 2011), figurative representations of marine animals are most likely.

5. Conclusions

The discovery of at least 16 new hand stencil motifs in Lene Hara suggests a wider stencilling tradition was present on Timor-Leste than previously recognised. This is more consistent with the pattern found in neighbouring regions of Island South-east Asia and Australia.

Preservation of the stencils is poor; they were applied onto a mineral crust that has weathered significantly, leaving many examples heavily fragmented and rendering them difficult to identify. Superimposition indicates that the stencils were created prior to the mid-Holocene APT motifs. Furthermore, they apparently have a complimentary distribution, with the stencils generally located deeper in the cave. It is therefore concluded that the hand stencils are a chronologically distinct artistic tradition of painted rock art that pre-dates the APT.

Evidence of human occupation within Lene Hara dates from ~43,000 cal. BP, ochre was being processed at the site by ~35–33,000 cal. BP, a pigment layer within a piece of calcite from the cave wall has been dated to between ~29,300 and ~24,000 years ago, and hand stencils are recognised as part of Pleistocene painting traditions elsewhere in Island South-east Asia. It is therefore considered most likely that many, if not all, of the hand stencils identified here are also of Pleistocene age; a hypothesis further supported by the high disparity in preservation states of the stencils and the Holocene APT motifs at the site.

This raises the prospect of early art being present elsewhere on the island of Timor, and suggests further work, to both explore for new painted art sites and to reconsider those already known, should be a future research goal. This needs also to include further examinations for samples amenable to absolute dating techniques, enabling the hypothesis of Pleistocene painted rock art on Timor to be fully tested. The identification of early art on the island has important implications for our understandings on the origins and spread of art in Island South-east Asia, and research projects aiming for a comprehensive understanding should now include the study of rock art in Timor and neighbouring islands rather than focussing solely on the northern dispersal route to Australia.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ara.2020.100191.

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