Chapter 3: Sea-Bound Culture

3.1. Pleistocene seafaring [Case study: Islands on the edge: 42,000-year-old occupation of the Tanimbar islands and its implications for the Sunda-Sahul early human migration discourse]

Australian National University

Statement of Contribution

This thesis is submitted as a Thesis by Compilation in accordance with https://policies.anu.edu.au/ppl/document/ANUP_003405

I declare that the research presented in this Thesis represents original work that I carried out during my candidature at the Australian National University, except for contributions to multi-author papers incorporated in the Thesis where my contributions are specified in this Statement of Contribution.

Title: Islands on the edge: 42,000-year-old occupation of the Tanimbar islands and its implications for the Sunda-Sahul early human migration discourse
Authors: Hendri A. F. Kaharudin, Sue O'Connor, Shimona Kealy, Marlon N. Ririmasse
Publication outlet: Quaternary Science Reviews
Current status of paper: Published
Contribution to paper: Chief investigator, participation in fieldwork, data analysis, and manuscript writing.
Senior author or collaborating authors endorsement:

Sue O'Connor		20/02/2025
Co-author – Print Name	Signature	Date
Shimona Kealy		20/02/2025
Co-author – Print Name	Signature	Date
Marlon N. Ririmasse		23/02/2025
Co-author – Print Name	Signature	Date
Hendri A. F. Kaharudin		19/02/2025
Candidate – Print Name	Signature	Date

Endorsed

Sue O'Connor		15/05/2025
Primary Supervisor – Print Name	Signature	Date
Roald Maliangkay		15 May 2025
Delegated Authority – Print Name	Signature	Date

TEQSA Provider ID: PRV12002 (Australian University) | CRICOS Provider Code: 00120C 1

Quaternary Science Reviews 338 (2024) 108834

Contents lists available at ScienceDirect

Quaternary Science Reviews

journal homepage: www.elsevier.com/locate/quascirev

Islands on the edge: 42,000-year-old occupation of the Tanimbar islands and its implications for the Sunda-Sahul early human migration discourse

Hendri A.F. Kaharudin [a,b,*], Sue O'Connor [a,b], Shimona Kealy [a,b], Marlon N. Ririmasse [c]

[a] Archaeology and Natural History, College of Asia and the Pacific, The Australian National University, Canberra, 2601, Australia
[b] ARC Centre of Excellence for Australian Biodiversity and Heritage, The Australian National University, Canberra, 2601, Australia
[c] Pusat Riset Arkeologi Lingkungan, Maritim, dan Budaya Berkelanjutan, Organisasi Riset Arkeologi, Bahasa, dan Sastra, Badan Riset dan Inovasi Nasional, Jakarta, 12710, Indonesia

ARTICLE INFO

Handling editor: Donatella Magri

Keywords:
Wallacea
Coastal
Pleistocene
Fordata
Dispersal

ABSTRACT

Tanimbar is one of the main island groups in Wallacea included in Birdsell's early human migration routes from Sunda to Sahul, situated at the easternmost end of south Wallacea on Birdsell's Route 2A. Despite its geographic significance, the island group has not undergone thorough archaeological investigation. Here, we present the first evidence of Pleistocene human occupation in the Tanimbar Islands, dating back approximately 42,000 years, representing one of the oldest ages for human occupation in Wallacea. This finding aligns with records from islands in the west of Wallacea, suggesting rapid human movement through the region. The successful colonization of Tanimbar, like other islands in southern Wallacea, required advanced maritime technology. However, unlike other islands on Route 2A, the early occupants on Tanimbar had access to medium-sized terrestrial mammals, specifically macropods, which are now locally extinct. The faunal remains from the initial colonization period suggest exploitation of both terrestrial and marine resources. This early settlement of the Tanimbar's potentially enabled exploration of surrounding islands, supported by possible evidence of the movement of lithic raw materials and potentially the introduction of macropods from Sahul.

1. Introduction

The earliest evidence of human occupation on Sahul (Australia + New Guinea) indirectly demonstrates the use of seafaring techniques by modern humans. Since the islands to the north and west were never connected to the mainland, successful water crossings from mainland Southeast Asia were necessary. Birdsell (1957, 1977) initiated the study of early human movement patterns from Sunda to Sahul, gaining significant interest in the archaeological discourse. He proposed two main routes, north and south, from Sunda to Sahul across Wallacea, which remain a focus of current archaeological exploration (Birdsell, 1977). Although the northern route is generally preferred due to shorter and easier island crossings and intervisibility (Bird et al., 2019; Kealy et al., 2018), the southern route is considered favourable due to its proximity to the now submerged Sahul Bank islands, ecological niche hypotheses, and the greater number of reported sites with significant antiquity on both the Wallacean and Sahul sides (Bird et al., 2018; Norman et al., 2018; Kealy et al., 2017). However, the lack of archaeological evidence for modern humans in Wallacea predating their occupation of Sahul, continues to fuel the ongoing debate regarding the timing and pattern of their migration through this large archipelago. The colonization of Sahul, estimated to have occurred by 50,000 years ago (50 ka) and possibly as much as 65 ka, marks a significant milestone in the evolution of our species, driving the continued need for further research in this space (Allen and O'Connell, 2020; Clarkson et al., 2017; Summerhayes et al., 2010).

In the islands along the northern route, archaeological research has been ongoing since the 1960s, with Sulawesi in particular revealing a wealth of evidence of early human settlement. Three of the oldest U-Series dating results on rock art in South Sulawesi, specifically from Leang Karampuang, Leang Bulu Sipong 4, and Leang Tedongnge demonstrate minimum ages for modern human settlement by 51.2 ka, 48 ka, and 45.5 ka, respectively (Brumm et al., 2021; Oktaviana et al., 2024). However, the oldest dates from cultural deposits in the Maros-Pangkep karst region thus far come from the sites of Leang Burung 2 and Leang Bulu Bettue, with initial occupation dates of 35 ka and 40 ka, respectively (Brumm et al., 2017; Glover, 1981; Perston et al., 2022). It should be noted, however, that the Leang Burung 2 date was

* Corresponding author. Archaeology and Natural History, College of Asia and the Pacific, The Australian National University, Canberra, 2601, Australia.
E-mail address: hendri.kaharudin@anu.edu.au (H.A.F. Kaharudin).

https://doi.org/10.1016/j.quascirev.2024.108834
Received 22 April 2024; Received in revised form 9 July 2024; Accepted 9 July 2024

derived from freshwater shell; known to exhibit considerable variability in its ^{14}C reservoir effects (Fernandes et al., 2012), while the Leang Bulu Bettue date was obtained via U-Series dating of a bovid tooth that can be subject to open-system effects (Brumm et al., 2021), making these ages somewhat uncertain. Currently, the oldest radiocarbon dates from charcoal for modern human settlement in Sulawesi are from Goa Topogaro 2 in Central Sulawesi, with an occupation record extending to 42 ka (Ono et al., 2022). Nevertheless, as the recent discovery of Leang Karampuang demonstrates (Oktaviana et al., 2024), earlier dates will likely be forthcoming given Sulawesi's geographic location as the first island reached after early modern humans crossed the Wallace Line from Borneo.

To the east of Sulawesi, only a handful of islands along the 'northern route' have recorded evidence of occupation dating back to the period preceding the Last Glacial Maximum (LGM). These sites include Leang Sarru (36 ka) in the Talaud Islands, as well as Golo (39 ka) and Wetef (30 ka) in Gebe Island (Bellwood, 2019; Tanudirjo, 2001; refer to Kaharudin et al., 2020 for more recent calibration details). Several other islands, such as Morotai, Halmahera, Kayoa, Obi, Ambon, Buru, and Seram, have thus far only yielded occupation records from the Terminal Pleistocene to the Late Holocene (Bellwood, 2019; Lape et al., 2017; Latinis, 2005; Shipton et al., 2020). The necessity for further investigation on these smaller islands is apparent, although it is hindered by the challenges of accessibility and the generally constrained preservation potential of archaeological records in tropical ISEA (Kealy et al., 2016; Louys et al., 2017).

In the islands along the southern route, numerous sites in the Lesser Sunda Islands have reported occupation records extending back to around 40 ka or older. For instance, Liang Bua in Flores has evidence of modern human occupation dating to approximately 47 ka (Sutikna et al., 2016). Makpan, with an age of 40 ka, represents the current oldest occupation record in Alor (Kealy et al., 2020), while Timor boasts four sites—Laili (44 ka), Matja Kuru 2 (44 ka), Asitau Kuru (42 ka), and Lene Hara (42 ka)—with records dating greater than 40,000 years (Hawkins et al., 2017; O'Connor et al., 2010; Samper Carro et al., 2023; Shipton et al., 2019; Shipton et al., 2024). In addition to these early occupation records, some of the smaller islands of southern Wallacea have also produced Pleistocene occupation records but after the LGM: Kisar (16 ka; Hawkins et al., 2024) and Atauro (17 ka; Galipaud et al., 2016). However, until now there has been no report of Pleistocene occupation further east from the islands of Kisar and Timor in Wallacea (Fig. 1).

The Tanimbar Islands occupy the easternmost point of southern Wallacea. Birdsell (1977) identified them as a pivotal stepping stone on his hypothesised southern route to Sahul. Around 250 km to the east of

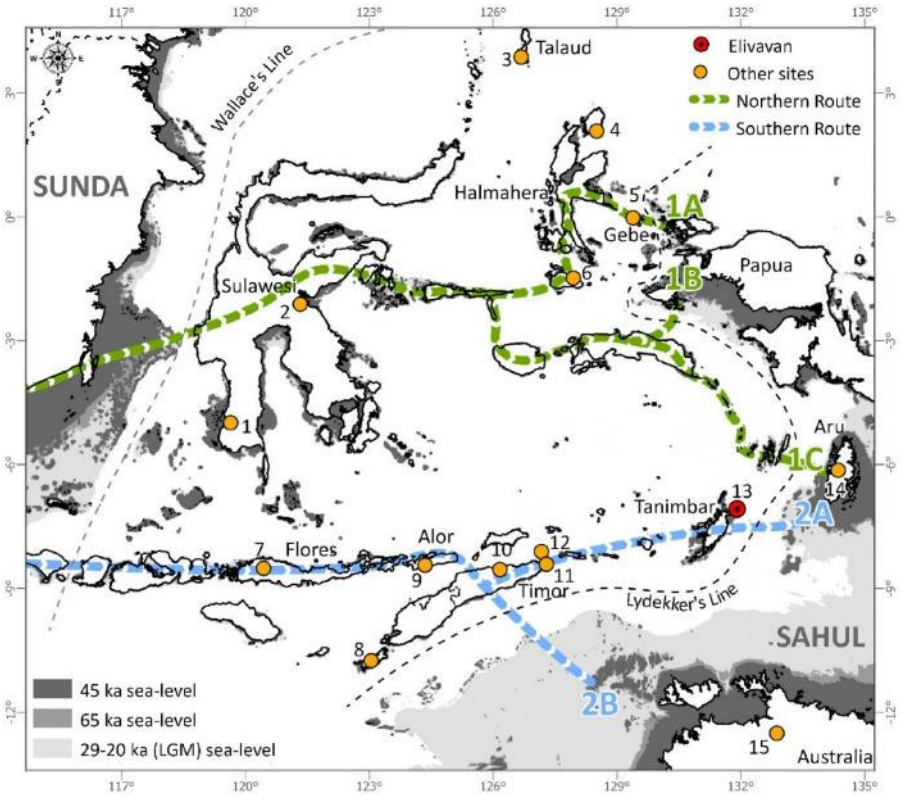

Fig. 1. Map of Wallacea, delineating Birdsell's northern and southern migration routes. The map also highlights the oldest Pleistocene sites on each island. Along the northern route, the following sites are indicated: 1) Leang Karampuang, Leang Tedongnge, and Leang Bulu Sipong 4, 2) Goa Topogaro, 3) Leang Sarru, 4) Daeo 2, 5) Golo, and 6) Kelo 6. On the southern route, the following sites are highlighted: 7) Liang Bua, 8) Lua Meko, 9) Makpan, 10) Laili, 11) Asitau Kuru, Lene Hara, Matja Kuru 2, 12) Here Sorot Entapa, and 13) Elivavan. The last two sites represent connections to Sahul: 14) Leang Lemdubu, currently in the Aru Islands but once connected to the mainland during the Pleistocene, and 15) Madjedbebe, the oldest known site in Sahul.

Tanimbar are the Aru Islands, which were part of the Sahul mainland during Pleistocene low sea levels (Fig. 1). While geographically close to the Sahul continental shelf, the Tanimbar Islands have been permanently isolated by a sea barrier since the earliest human occupation in Wallacea and before (Hall, 2013). In comparison to neighbouring islands in proximity to the Sahul shelf such as Halmahera, Seram, and Gebe to the north, and Timor, Rote, and Kisar to the south (Kaharudin et al., 2020; O'Connor et al., 2023; Ririmasse, 2016a, 2016b), the Tanimbar Islands have received relatively limited archaeological attention. A comprehensive archaeological exploration of the Tanimbar Islands has the potential to illuminate their prehistoric past, as well as offer insights into early human migration patterns in the region and inter-island connections.

Here we report the first Pleistocene occupation record from the Tanimbar island group, suggesting a continuation of the rapid dispersal and occupation of the southern Wallacea islands ca. 42 ka. In this report, we share the preliminary findings from our recent excavation of Elivavan rockshelter, situated on the south-west coast of Fordata Island, the northeastern island of the Tanimbar group. Our Elivavan excavation unearthed compelling evidence of early human activity, confirming its status as one of the earliest sites in the Wallacea region and the easternmost point along Birdsell's southern route. Notably, the site uncovered indications of extensive use of coastal invertebrates, such as molluscs, sea urchins, and crabs, alongside intriguing macropod remains.

2. Materials and methods

Archaeological investigations in Tanimbar were initiated by the Ambon Archaeological Center (Balai Arkeologi Ambon) in 1994, revealing significant archaeological potential across various periods, from prehistory through to the colonial era (Ririmasse, 2016a, 2016b). In particular, the Ambon Archaeological Center had previously identified the archaeological potential of the northern Tanimbar's and documented several prospective sites, including the site of Elivavan (Ririmasse, 2016b). In 2022, a team of researchers from the Australian National University (ANU) and RIJANG Research Indonesia, with support from the National Research and Innovation Agency (Badan Riset dan Inovasi Nasional or BRIN), embarked on an archaeological survey and excavation project in the Tanimbar Islands (Fig. 2). Our survey covered the south and east coasts of Yamdena island, the north coast of Larat island, and the south coast of Fordata island. While Yamdena and Larat predominantly featured vertical and littoral caves unsuitable for excavation due to freshwater sinkholes, eroded sedimentation, and collapsed formations, the hilly karst landscape of Fordata presented numerous promising sites for further exploration. We then returned to the previously identified site of Elivavan to conduct our excavation.

Elivavan, also known as Watu Eli, is a limestone rockshelter on the south-west coast of Fordata Island, approximately 500 m equidistant from Awear and Romean villages. In the local Fordata language, Elivavan (eli: vines/liana – vava: beneath; Drabbe, 1932) signifies a shelter nestled beneath the vines. Lush vegetation drapes over the limestone wall, which stands at a towering height of over 8 m, creating a shelter with a dripline spanning 2–4 m (Fig. 3). Positioned at an elevation of 50 m above the current sea level, Elivavan is approximately 280 m in a direct line from the current coastline. A considerable portion of Fordata Island is covered by dense rainforests with abundant small rivers and freshwater springs. The island lies adjacent to Larat Island, separated by a narrow and largely shallow strait abundant in marine resources, including fish, octopus, shellfish, crab, sea urchin, and trepang. During the Pleistocene, lowered sea levels would have only exposed a little more of Fordata's north-west coast, slightly increasing the distance to the coast from Elivavan, but fully exposing the shallow sea bed to the south – connecting Fordata island to Larat and the main island of Yamdena at this time.

A 1 × 1 m test excavation of Elivavan was undertaken in 5 cm spits,

Fig. 2. A) View of Elivavan rockshelter and the test pit location; B) The location of Elivavan rockshelter (yellow arrow) seen from the narrow strait between Fordata and Larat islands.

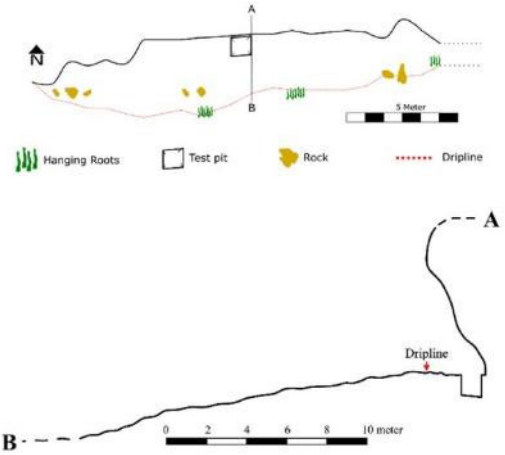

Fig. 3. Elivavan rockshelter site plan: aerial view (top) and lateral view (bottom). The test pit is located near the rockshelter wall.

reaching bedrock in spit 24 at a depth of −120 cm (Fig. 4). All excavated sediment was weighed before sieving through 1.5 mm mesh to retain small artefacts and faunal remains (e.g. fish bones and sea urchin). After both dry- and then wet-sieving, the remaining material was thoroughly dried and systematically sorted into categories, including lithics, pottery, bones, shells, sea urchins, crabs, plant remains, and land snails. Each group of archaeological findings was then weighed, and the Number of Identified Specimens (NISP) counted. Some of the bones and

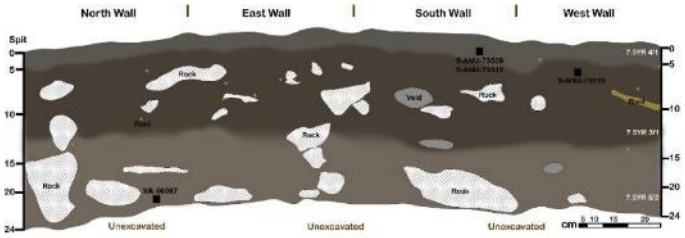

Fig. 4. Stratigraphic section of the Elivavan excavations revealed three distinct layers. The oldest occupation record was obtained from a shell sample in the lowest spit.

shells, particularly in the lower spits, exhibit significant calcification, introducing a potential bias when relying solely on weight for quantification. We present both the original and adjusted quantification values for weight and NISP per spit (see Kaharudin et al., 2019, 2023 for further details on the adjusted method). Adjusting the weight and NISP values is essential to minimize the quantification bias of faunal remains across the spits, considering the variability in spit sizes, which may not always precisely measure 5 cm in depth and 1 × 1 m in width due to circumstances of the deposit and human limitations. In particular, the abundance of rocks encountered in the Elivavan deposit and excavation wall resulted in a slightly irregular pit width, and thus irregularities in spit volume. The total sediment removed in this excavation amounts to 793.9 kg, not including discarded rocks which total 210.6 kg. The identification of bones and shells relied on the reference collections from ANU and RIJANG, while the macropod identification was conducted using the reference collection at the Australian Museum, Sydney.

A total of 9 charcoal and marine shell samples were collected and successfully analysed for radiocarbon dating. Four samples (S-ANU-73509, S-ANU-73510, S-ANU-73512, and Wk-56087) were collected in-situ, while the remainder were collected during the sorting process. These samples underwent analysis at the ANU Radiocarbon Laboratory in Australia and the Waikato Radiocarbon Dating Laboratory in New Zealand (Fallon et al., 2010; Hogg et al., 2013). Charcoal under 30 ka was purified using a standard acid-base-acid method to eliminate exogenous carbonates, humic acids, degraded charcoal, and dissolved carbonates. Shell samples were surface-cleaned, washed in an ultrasonic bath, and tested for recrystallization, specifically aragonite.

These radiocarbon dates were then calibrated with a chronostratigraphic Bayesian model in the OxCal v4.4 platform (Bronk Ramsey, 2009a). These dates were recovered from the two main stratigraphic layers identified in the Elivavan deposit (Layers 2 & 3; Fig. 4). We therefore modelled each Layer as its own Phase within our multi-phase model, where dates and Phases were ordered based on stratigraphic position (see Supplementary Information 1/S1). As spit 12 includes the boundary between Layers 2 & 3, we relied upon the radiocarbon dates for samples S-ANU-73511 and Wk-56653 to place them in their respective Layers as both these samples were recovered from the sorting, not in situ. A double Boundary was placed between the two Phases to allow for discontinuities and changes to sedimentation rates between Layers 2 & 3. Within the model, the radiocarbon dates were calibrated using the Marine20 curve (Heaton et al., 2020a; Heaton et al., 2020b) for shell samples, and a mixed U (0,50) curve, combining the IntCal20 (Reimer et al., 2020) and SHCal20 (Hogg et al., 2020) curves, as recommended for terrestrial (i.e. charcoal) samples from the Inter-Tropical Convergence Zone (Hogg et al., 2020). For charcoal samples, we applied the *Charcoal Plus* t-type Outlier Model with a prior outlier probability of 10%, which is specifically designed to account for the inbuilt age of charcoal (i.e. old wood effect), while also allowing for some stratigraphic movement in an archaeological context (Bronk Ramsey, 2009b; Dee and Bronk Ramsey, 2014). The *General* t-type Outlier Model with a prior outlier probability of 5% was used for the marine shell samples, following commonly used modelling procedures for archaeological dates (Bronk Ramsey, 2009b; Wood et al., 2016).

3. Result

3.1. Chronostratigraphy

The excavations at Elivavan revealed three distinct stratigraphic layers (Fig. 4). The topsoil layer, Layer 1, corresponds to spits 1 to 3, exhibiting rich organic material with a predominantly dry moisture level. It consists of well-sorted, silty sand of a dark grey colour (7.5 YR 4/1), showing soft compaction and minor root disturbance. Layer 2 corresponds largely to spits 4 to 12, however, due to the sloping and uneven contact between Layers (Fig. 4), spits 4 and 5 overlap the contact between Layers 1 and 2 and so do include some small amounts of Layer 1 material. Similarly, spits 12 to 14 are considered transitional spits as they include varying combinations of both Layer 2 and 3 materials. As the upper, and majority Layer 2 transitional spit, we include the cultural assemblage recovered from spit 12 in our consideration of Layer 2 (and thus Phase 2) occupation, corresponding with the significant number of pottery fragments recovered here. Layer 2 presents a very dark grey colour (7.5 YR 3/1), and is characterized by well to moderately sorted, gravely sand with a soft level of compaction and a higher component of gravel sized particles compared to the previous layer. The third and final layer, Layer 3 (spits 13–24), has a brown colour (7.5 YR 5/2) and comprises well-sorted, gravely sand with moderate compaction. While a very small number of pottery sherds were recovered down to spit 16, based on their small size and significant reduction in abundance compared to the overlying spits of Layer 2, we consider these few fragments to be intrusive from the pottery-bearing Layer 2 into the aceramic Layer 3.

The sediment across all layers appears to be generally homogenous within each spit. Overall, the soil type exhibits soft to moderate compaction, making it relatively easy to excavate. Despite the dense rainforest surrounding the site, the occurrence of small roots in Layers 1 and 2 is minimal. The presence of rocks increases notably in Layers 2 and 3, particularly after spit 9. While the very sheer formation of the rock-shelter wall limits the amount of rock build-up due to roof-fall, we did observe portions of this wall in the process of exfoliation which would contribute to rock build-up on the floor, as well as a decently sized mound of rubble further along the escarpment and slightly uphill of our excavation which may have contributed to this rocky deposition. At the base of spit 24, we encountered rock which extended across the base of the excavation marking the end of the cultural deposit, at least across the extent of our excavation square.

Radiocarbon dating supports an initial occupation at Elivavan dating back to 42,230–40,695 cal BP (Wk-56087), marking the first dated occupation record from the Tanimbar Islands. The age estimate was derived from a marine shell (*Rochia nilotica*) sample collected in situ from the basal spit of the excavation, spit 24. This early date gains support from the three additional dates of similar antiquity from

overlying spits in the same Layer 3 (Table 1). All four shell samples from Layer 3 showed no evidence for recrystallization, supporting their visual assignment of anthropogenic origin at the time of excavation.

The chronostratigraphic sequence from the Elivavan excavation supports two distinct occupation phases (Fig. 5). An initial period of Late Pleistocene occupation, Phase 1 (Layer 3, spits 24–13/12), directly dating from ~41,501 cal BP until 34,161 cal BP (median dates), and modelled with a possible start date of 44,148 BP and end date of 31,322 BP suggesting a duration of up to ~12,800 years (Table 1, Fig. 5). In contrast, Phase 2 (Layers 2 & 1, spits 12–1) represents the Late Holocene occupation from 261 cal BP, or around 1600 AD to today (Table 1, Fig. 5). One shell sample (S-ANU-75237) from spit 10 dated to 1544 - 1294 cal BP, somewhat different from the charcoal samples immediately above and below in Layer 2.

Between Phase 1 and Phase 2, there is a chronostratigraphic hiatus—a significant gap of approximately 30 thousand years (Table 1, Fig. 5), which may be attributed to either insufficient sampling, a hiatus in occupation, or sediment removal. Our 1 × 1 m test excavation is likely inadequate in representing the complete occupation history of Elivavan, especially given its extent back into the Late Pleistocene (O'Connor et al., 2010). Despite an advantageous position proximal to the resource-rich coastline, Elivavan lacks an expansive sheltered floor area or a large chamber, features commonly found in many other prehistoric sites. As a result, Elivavan may not have been utilised as a permanent habitation site. This would increase the possibility both of missing part of the occupation record due to small sample size, but also the chance that the site was wholly abandoned for a period of time. Previously deposited sediments may also have been lost through erosion or other disturbances. It is also conceivable that during the Phase 2 period at Elivavan, occupants intentionally removed a portion of the top sediment layers within the cave to flatten the surface, fill other parts of the cave, or for agricultural purposes, thereby rendering the area more attractive to habitation (O'Connor et al., 2017).

The lone outlier date from Phase 2, derived from a shell sample (S-ANU-75237) indicating an age of 1544–1294 cal BP, may represent remnants of a lost sedimentary layer, supporting the existence of at least one occupation period between Phase 1 and Phase 2, even though the sediment itself is missing from our record. While no clear evidence of sediment loss was observed at Elivavan (e.g. breccia on cave walls, see O'Connor et al., 2010), the extensive 30 ka gap, coupled with the presence of S-ANU-75237, makes the complete abandonment scenario unlikely, and at least some degree of sediment loss probable. The significant difference in temporal coverage between the two Phases also indicates a substantial change in sedimentation rates at Elivavan from relatively slow sedimentation in Phase 1, to much more rapid in Phase 2. This further emphasised the substantial changes in depositional processes in play at Elivavan since its initial occupation over 40 thousand years ago.

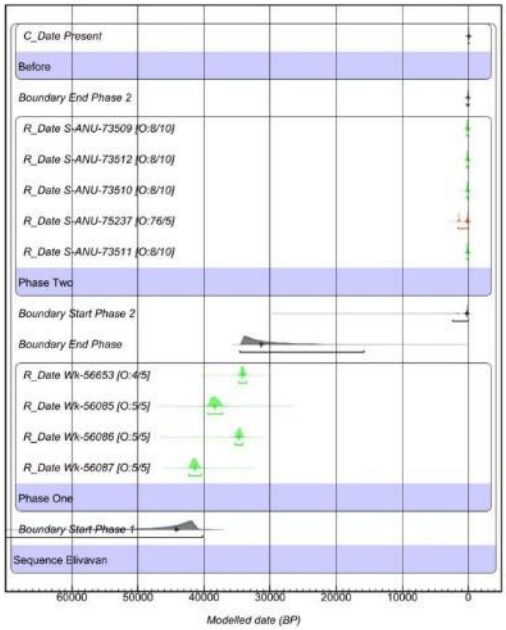

Fig. 5. Modelled dates for the different occupation phases at Elivavan based on the Bayesian analysis in OxCal v4.4. Radiocarbon calibrations coloured from green to red in increasing outlier probability. The brackets beneath the distributions indicate the 95.4% probability range. Prior and posterior outlier probabilities are provided in brackets following the sample name, formatted as [O: posterior/prior].

3.2. Artefacts

A total of 313 pottery fragments, weighing 481.2 g, were primarily recovered from the upper layers (spits 12–1), belonging to Phase 2 occupation (S2; Fig. 6). Four smaller pieces of pottery were found in spits 16–13, presumably intrusive as a result of bioturbation or shedding from the upper walls during excavation. Notably, among the pottery fragments, six pieces were adorned with either incised lines or indented patterns, all originating from spits 10 and 9 (Fig. 7). Some of the pottery also exhibited signs of coloured surfaces and sand tempering.

The deposit also yielded a small assemblage of lithic artefacts, consisting of 186 flaked pieces (264 g). Phase 1 yielded 49 pieces, with 137 originating from Phase 2 occupation (Fig. 6). The majority of the recovered lithic items were composed of limestone flakes (n = 184),

Table 1
Radiocarbon samples obtained from Elivavan. The radiocarbon dating results were calibrated using OxCal v4.4 (Bronk Ramsey 2009a, 2009b) with a combined curve of IntCal20 (Reimer et al., 2020) and SHCal20 (Hogg et al., 2020) calibration curves for charcoal, and Marine20 (Heaton et al., 2020a; Heaton et al., 2020b) for shell samples. The calibrated dates are presented at a 95.4% probability range. * indicates samples collected in situ.

Phase	Spit	Layer	Lab Code	Sample type	^{14}C Date ± error	F^{14}C% ± error	Calibrated date BP (*cal* BP)
2	3	2	S-ANU-73509*	Charcoal	119 ± 20	98.5 ± 0.2	261–24
	3	2	S-ANU-73512*	Charcoal	124 ± 22	98.5 ± 0.2	265–13
	5	2	S-ANU-73510*	Charcoal	145 ± 20	98.2 ± 0.2	275–0
	10	2	S-ANU-75237	Marine shell (*Veneridae*)	2027 ± 21	77.7 ± 0.2	1544–1294
	12	2	S-ANU-73511	Charcoal	140 ± 20	98.3 ± 0.2	271–6
1	12	3	Wk-56653	Marine shell (*Strombidae*)	30,490 ± 247	2.2 ± 0.1	34,630–33,655
	14	3	Wk-56085	Marine shell (*Strombidae*)	34,280 ± 398	1.4 ± 0.1	39,314–37,305
	18	3	Wk-56086	Marine shell (*Strombidae*)	31,045 ± 263	2.1 ± 0.1	35,234–34,185
	24	3	Wk-56087*	Marine shell (*Rochia nilotica*)	37,860 ± 626	0.9 ± 0.1	42,230–40,695

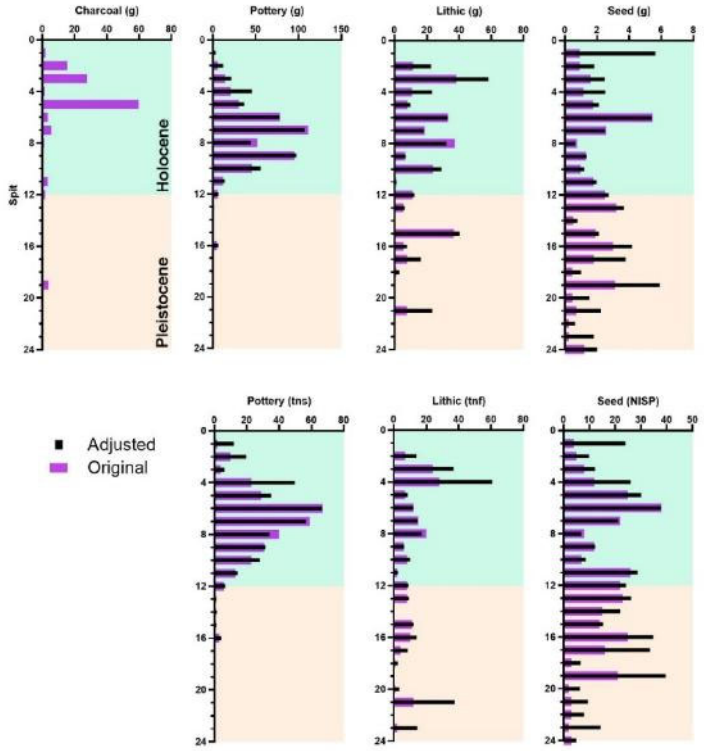

Fig. 6. Artefacts (lithic and pottery) and non-faunal remains (charcoal and seeds) recovered from Elivavan, shown in weight (top) and counted (bottom), as well as the adjusted analyses.

however 2 lithics made of red chert were recovered from spit 12 (Fig. 7). One of these chert artefacts in particular, was a large blade with evidence of retouch along one edge (Fig. 7).

3.3. Plant remains

A total of 319 plant remains (i.e. seeds and seed fragments, 462g) were recovered relatively consistently throughout all occupation phases, with 130 fragments identified in Phase 1 and 189 in Phase 2 (Fig. 6). Among the plant remains, the dominant finds were native hackberry (*Celtis* sp.) and galip nut (*Canarium* cf. *indicum*), both of which are still included in the local diet today (pers. obs.). In addition, 126g of charcoal was recovered from the top eight spits (predominantly Layer 1, Fig. 6).

3.4. Fauna

The Elivavan excavation yielded both vertebrate and invertebrate fauna, characterized by vertebrates, marine shells, crabs, sea urchins, and land snails (Fig. 8). Of the total vertebrate assemblage (NISP = 1973, Weight = 632.9g), the majority (53.6%) were identified as terrestrial in origin with only 5.8% marine (S3). The remaining 40.6% were unable to be identified further due to fragmentation but likely follow a similar trend. Interestingly, the majority of terrestrial vertebrates were identified as belonging to the family Macropodidae (Marsupialia: Diprotodontia) with NISP = 923. Classification was based on fragmented maxilla and mandible dentition (pers. comm. Kris Helgen), with postcranial fragments associated mostly based on size and identification to Mammalia. Small to medium sized rodents (NISP = 116) and fish (NISP = 114) were also recovered along with a few reptiles (Serpentes & Lacertilia, NISP = 18). Macropod remains are more abundant in the Phase 1 deposit (63%), with a total of NISP = 578 in Phase 1 compared with NISP = 345 in Phase 2 (Fig. 9). Conversely, the rest of the vertebrate remains were more prevalent in Phase 2, with 66% of rodents (NISP = 76) during Phase 2, 65% fish (NISP = 74), and 72% reptiles (NISP = 13).

Shellfish make up the majority of invertebrate remains at Elivavan (total NISP = 8,447, Weight = 8,904 g), recovered from the deposit, representing at least 24 different molluscan families within the assemblages (Fig. 10). These families include Arcidae, Cardiidae (*Tridacna* sp.), Mytilidae, Ostreidae, Veneridae, Nautilidae (*Nautilus* sp.), Neritidae, Haliotidae, Cypreidae (*Monetaria annulus*), Hipponicidae (*Sabia conica*), Littorinidae (*Littoraria* sp. and *Tectarius* sp.), Naticidae, Strombidae (*Conomurex luhuanus* and *Macrostrombus* sp.), Conidae, Muricidae (*Tylothais* sp.), Nassariidae, Tegulidae (*Rochia nilotica*), Trochidae (*Monodonta* sp.), Turbinidae, Cerithiidae (*Cerithium echinatum* and *Clypeomorus bifasciata*), Nacellidae (*Cellana radiate*), Planaxidae, Potamidae (*Terebralia sulcata*), and Chitonidae. The most common shellfish taxa recovered from Elivavan were Chitonidae, *Rochia nilotica*, and Neritidae (S4).

Slightly more marine shell was recovered from Phase 1 (NISP = 4,623), than Phase 2 (NISP = 3,824). While certain taxa displayed similar abundance during both Phase 1 and Phase 2, such as Cardiidae (Phase 1 NISP = 4; Phase 2 NISP = 7), Neritidae (200; 118), *Conomurex luhuanus* (26; 18), and Muricidae (17; 19), others demonstrated a

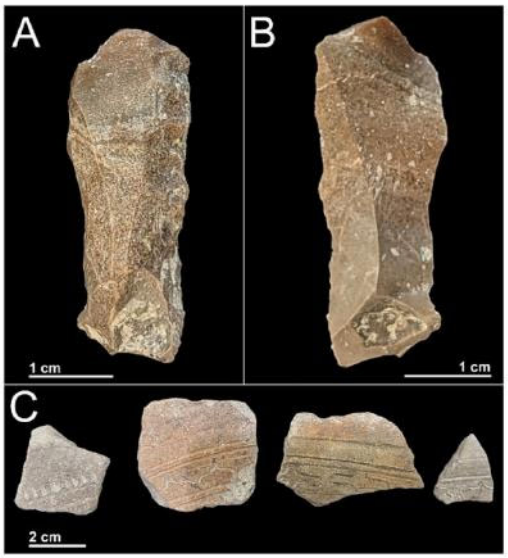

Fig. 7. A-B) Dorsal and ventral surface of the chert blade from spit 12 and C) several examples of decorated pottery from spit 9 featuring indented patterns and incised lines.

distinct difference between the two occupation periods. Taxa exhibiting significantly higher abundance during Phase 1, included Haliotidae (38; 4), *Tectarius* (42; 19), *Macrostrombus* (136; 59), *Rochia nilotica* (624; 60), Turbinidae (108; 52), Nacellidae (15; 1), and Chitonidae (815; 411). Conversely, other taxa including Conidae (1; 19), Nassariidae (6; 19), *Clypeomorus bifasciata* (2; 25), and *Terebralia sulcata* (8; 28), exhibited higher abundance during Phase 2. Additionally, Arcidae (0; 42), Veneridae (0; 179), and *Littoraria* (0; 9), only appeared during Phase 2 and are absent from Phase 1.

Crabs and sea urchins are the other marine-coastal invertebrates recovered from Elivavan. In contrast to shellfish, the abundance of crabs and sea urchins is higher in Phase 2 (Fig. 7), with 67.4% crab remains in Phase 2 (Phase 1 NISP = 940, Phase 2 NISP = 1,947), and 85.1% sea urchin remains (Phase 1 NISP = 30, Phase 2 NISP = 172). The crab assemblage is predominantly composed of coconut crabs (*Birgus latro*), recognized as land-dwelling or terrestrial crabs, though other marine crabs are also present, but the taxa could not be identified further. The sea urchin remains belong predominantly to the collector urchin, species *Tripneustes gratilla*.

Lastly, land snail shells were relatively abundant throughout the site (total NISP = 4,474), with the majority originating from Phase 2 (Phase 1 NISP = 1,393, Phase 2 NISP = 3,081). Three different species were identified, *Albersia tenuis*, *Pythia chrysostoma*, and *Achatina fulica*. However, these species are unlikely to have been part of the diet (Kaharudin et al., 2023). There is no ethnographic evidence supporting the consumption of this fauna in the region, nor is there any evidence of food processing on the remains. Their presence in the site may however be indirectly related to human activity through transportation to the site on gathered plant materials.

4. Discussion

4.1. Subsistence strategy

The faunal and plant remains recovered from Elivavan occur in higher abundance during Phase 1 (Pleistocene) of occupation, constituting 56% of the total assemblage, while Phase 2 (Holocene) comprises 44%. However, Phase 1 spans at least seven thousand years of occupation (possibly as much as 12,000 based on modelled start and end dates), in contrast to Phase 2, which covers only around three hundred years. This suggests that the sedimentation rate, and thus likely occupation intensity, in Phase 2 was significantly higher than in Phase 1. This heightened intensity could be attributed to either a larger population during Phase 2 or a more permanent occupation of the site. The more recent Phase 2 deposits have also likely undergone less compaction and decomposition than Phase 1, however we consider these elements to be less significant than overall sedimentation rate in contributing to these differences. The majority of the fauna recovered in Elivavan, especially the invertebrates (i.e. shellfish, sea urchin, and coconut crab), can still easily be found in proximity to the site, many of which are still exploited by the local villagers of Awear. This suggest that while the intensity of site use at Elivavan changed significantly between Phases 1 and 2, much of the subsistence strategies employed by the occupants remained the same.

Macropods were clearly the focus terrestrial fauna exploited at Elivavan, appearing in both Phase 1 and Phase 2 since the initial occupation until the topmost layer of occupation. Macropods encompass a diverse group of marsupials endemic to Sahul, including kangaroos, wallabies, and lesser-known species such as pademelons, quokkas, and dorcopsis. Intriguingly, no known macropods exist on the island today, and there is no oral history indicating their presence in Fordata or the broader Tanimbar Islands region. In the late 19th century, various European explorers, including Henry Ogg Forbes and W. R. Baron van Hoëvell, documented the faunal diversity in the Tanimbar Islands. However, none of their accounts mention the presence of macropods (Forbes, 1885:336; Hoëvell and Baron, 1890:175). Our findings, however, indicate the presence of macropods on Fordata island during Phase 2, dated from the 17th century AD to today. The remains are significantly abundant from spit 3 to 12, with just a single identified fragment from spit 1. This suggests that macropods likely became locally extinct relatively recently, possibly only a few decades before European arrival.

Mandibular and maxillary materials recovered from Elivavan indicate the presence of at least two distinct macropod species (pers. comm. Kris Helgen). Species of macropod currently inhabit nearby Aru island, New Guinea, Australia. Previously, no known translocations of animal species endemic to Sahul into Wallacea occurred before the Holocene. Similar to the *Dorcopsis* remains recovered from Golo Cave on Gebe Island to the north (Flannery et al., 1998), the presence of these macropods raises questions about how they arrived on the island—either through natural or anthropogenic means—and what caused their later disappearance.

Currently, the oldest known evidence of animal translocation by humans is the cuscus (*Phalanger orientalis*) recovered from Matenbek, New Ireland, which was translocated from Sahul and dated to 24 ka (Summerhayes et al., 2017). Around the same period, between 20 and 24 ka, there is evidence suggesting possible human introduction of wild boar (*Sus scrofa*) in Okinawa Island (Kawamura et al., 2016). If the macropods recovered from Elivavan were introduced through anthropogenic means, this would represent the earliest evidence of animal translocation by humans. This topic will be explored further in an upcoming publication.

In terms of the types of fauna exploited, there is little variation between the two phases, with the exception of shellfish taxa. Exploitation intensity of macropods is similar in both Phase 1 and 2 despite the significantly shorter time span of Phase 2 than Phase 1; further supporting a high occupation intensity scenario with intensive exploitation during Phase 2. This intense phase of macropod exploitation may have led to the depletion and eventual extinction of local macropod populations on Fordata island. Given that Fordata is only 79 km^2, medium-large faunal populations would be particularly susceptible to over-exploitation. In contrast, rodent and reptile exploitation is more

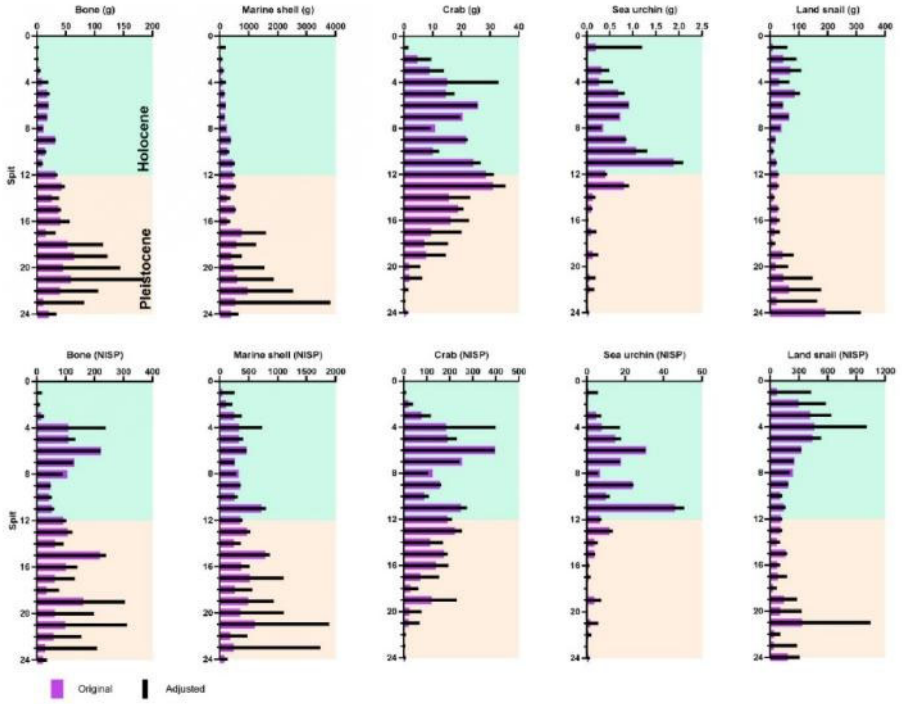

Fig. 8. Faunal remains recovered from Elivavan excavation: bone, marine shell, crab, sea urchin, and land snail. Data shows in weight (top) and NISP (bottom) as well as the adjusted analyses.

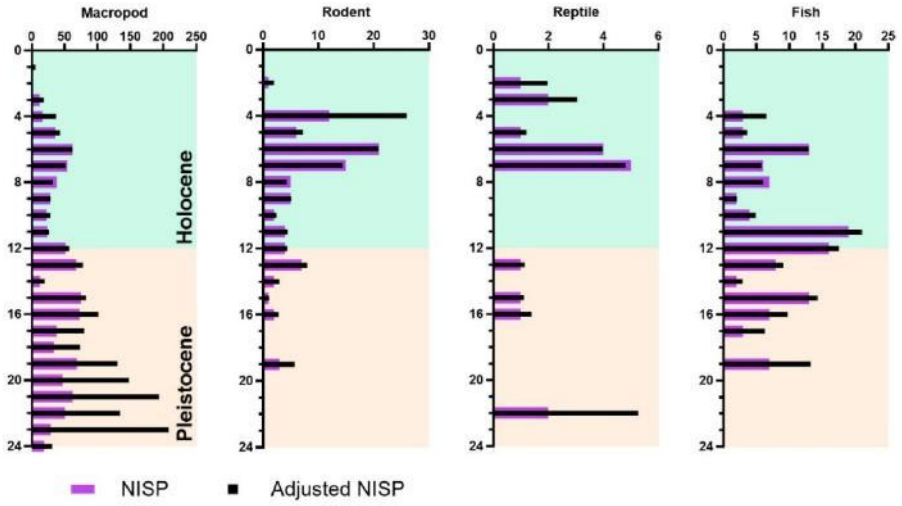

Fig. 9. NISP on each identified vertebrate fauna remains recovered in Elivavan.

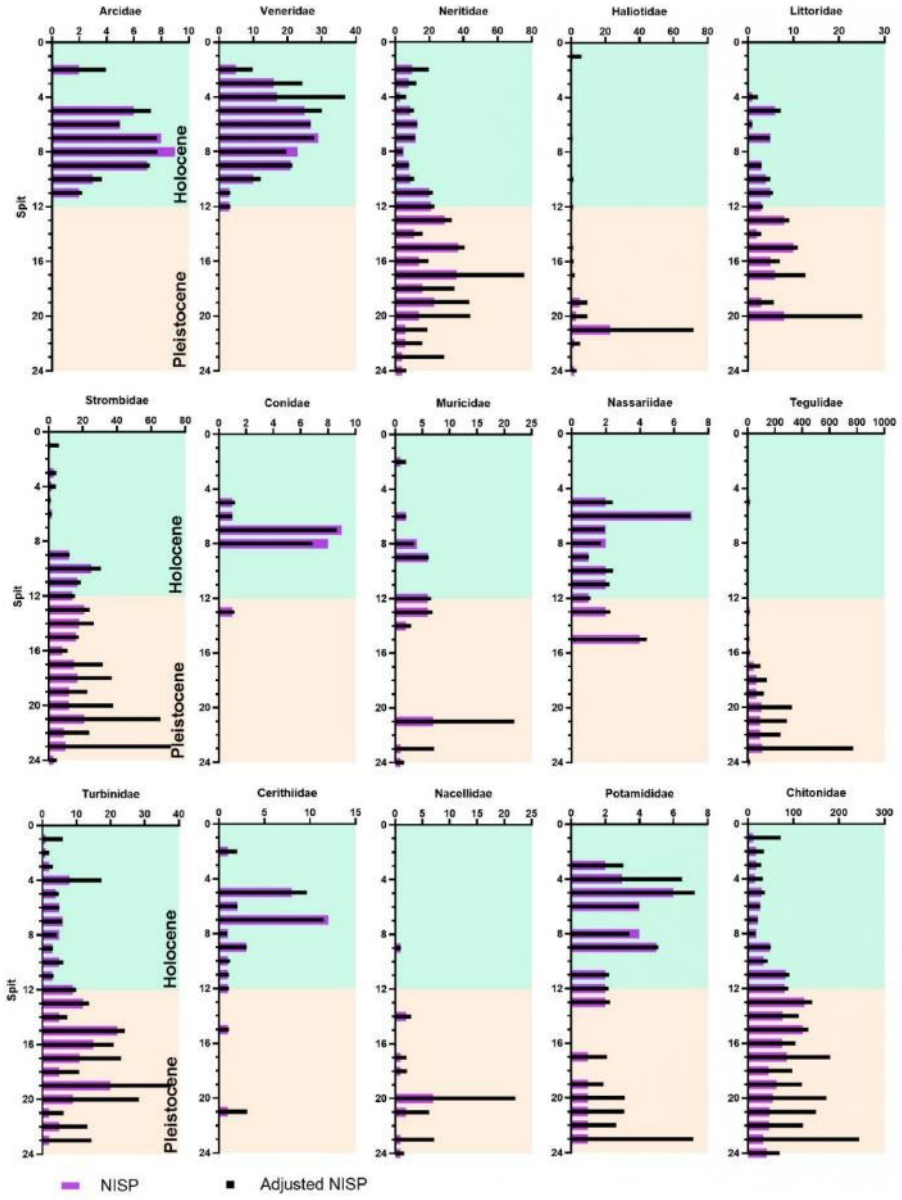

Fig. 10. NISP on identified shell remains most commonly found in Elivavan by family. For more detailed identification see Table S3.

pronounced in Phase 2, possibly increasing as an alternative in response to declining macropod availability. The rise in rodent abundance is also indicative of increased intensity in human occupation and land clearing on the island more generally (Aplin et al., 2011).

The shellfish taxa recovered in Elivavan suggest exploitation primarily of coral reefs, sandy bottoms, and intertidal marine environments. The lack of certain marine invertebrates, such as limpets (Patellidae) and barnacles (Cirripedia), often found in high amounts at other coastal sites (Kealy et al., 2020; O'Connor et al., 2019), indicates a scarcity of rocky shores or hard surfaces in the marine environment near Elivavan. However, the majority of shellfish taxa that showed higher recovery during Phase 1, such as Haliotidae, *Macrostrombus*, *Rochia*

nilotica, Turbinidae, and Chitonidae, do suggest exploitation in rocky foreshore environments, although with less intensive wave action that favoured by barnacles. Conversely, Phase 2 shellfish exploitation leans toward intertidal sand flats or estuaries, supported by certain taxa, including Arcidae and Veneridae, which were restricted to Phase 2. This shift towards more protected and sandy environments closely mirrors the coastal ecology found near the Elivavan today.

Chert lithics discovered in Elivavan suggest the possible movement of raw material, as no source of chert is known from Fordata. The documented nearest chert sources are situated on Ungar and Laibobar Islands, to the west of Yamdena Island (Jasin and Haile, 1996; Kaneko et al., 2007). These islands lie more than 60 km away from Elivavan. The most convenient route to reach them involves watercraft travel along the north and west coast of Yamdena, as opposed to a land route through the dense interior rainforest. This chert might also be a by product of trade among the inhabitants of Ungar, Laibobar, or Yamdena with the inhabitants of Fordata. Unfortunately, both chert blades recovered from Elivavan were obtained from spit 12 at the border of Layer 2 and Layer 3, making it uncertain whether the artefacts belong to the Phase 1 or Phase 2 occupation periods. Similar chert blades were also recovered from Asitau Kuru, Timor-Leste, from layers dated to 44 ka (Pleistocene), Early to Mid-Holocene, and into the Neolithic period (Shipton et al., 2019).

4.2. Occupation record and early human migration

The Elivavan occupation record, dating back to 42 ka, provides compelling evidence of early modern human occupation at the southeastern-most point of Wallacea. In the context of the initial colonization of Sahul, Birdsell (1977) initially favoured the southern route with a final crossing either from Timor or the Tanimbar's. Latter proponents of the southern route consistently identified Timor and Rote as the likely final stopovers before crossing to the north coast of Australia (Bird et al., 2018; Chappell, 1993, 2000). One of the major supporting lines of evidence for this southern, Timor crossing is the abundance of Late Pleistocene occupation records recovered from the island (see Hawkins et al., 2017; O'Connor et al., 2010; Samper Carro et al., 2023; Shipton et al., 2019). Our new occupation record from Elivavan, now aligns the occupation record of the Tanimbar Islands with those of similar Late Pleistocene antiquity on the other islands further west, such as Timor, Alor, and Flores (Kaharudin et al., 2020).

The similarities in the antiquity of first settlement across the Lesser Sunda islands and Tanimbar strongly suggest that the dispersal in the region occurred relatively rapidly. The islands throughout Lesser Sunda, including Lombok, Sumbawa, Sumba, Flores, Lembata, Alor, Wetar, Rote, and Timor, are closely situated with narrow seas separating them by less than 50 km. Furthermore, they exhibit a high level of absolute inter-visibility, indicating that one island is visible from the shore of another (Kealy et al., 2017). Navigating between these islands can be accomplished with simple maritime technology. However, upon reaching Timor, the landscape changes, featuring only small islands such as Moa, Sermata, and Babar, with a larger sea gap to cross to reach Tanimbar. Notably, Babar serves as the last island in southern route of Wallacea before reaching Tanimbar, with a distance of ~100 km between them during the possible occupation window (i.e. 65-40 ka; Kealy et al., 2018). Additionally, Tanimbar is not visible from Babar or other neighbours including the Kai islands and Aru/Sahul (Kealy et al., 2017). This implies that migrating to Tanimbar involved significantly higher risks compared to reaching most other islands in Wallacea. Moving eastward from Tanimbar, lowered sea levels in the period 65-40 ka would have extended the western edge of the Sahul coast beyond present-day Aru, resulting in a connecting sea voyage of just 130–150 km (Kealy et al., 2017). To the south at this same time period, the distance from Tanimbar to the north coast of Australia was in fact, equidistant to the distance from Timor to Australia (~220–280 km; Kealy et al., 2017, 2018).

Nevertheless, the specific origin of Elivavan inhabitants remains uncertain. There are currently no known Pleistocene occupation records east of Kisar and Timor before reaching Tanimbar. Alternatively, rather than dispersal from the west via the southern route, it is possible that Tanimbar's first occupants originated from New Guinea to the east. The occupation record from Liang Lemdubu in the Aru Islands (which were part of the Sahul shelf during the Late Pleistocene), the closest Sahul site to Elivavan, only recovered an occupation record since 27 ka (O'Connor et al., 2005). However, it is established that New Guinea has been inhabited since at least 50 ka (Summerhayes et al., 2010), and possibly earlier if the dates from Madjedbebe are taken to represent occupation of Sahul as a whole (Clarkson et al., 2017). This proposition is reinforced by genetic evidence indicating migration from Sahul to Wallacea around 15 ka (Purnomo et al., 2021). Although there is currently no evidence verifying Late Pleistocene back migration from the Sahul shelf into Wallacea, it remains a plausible possibility and has been suggested previously by several researchers (Bellwood, 1998; Norman et al., 2018).

The colonization of Sahul presumably did not stem from a singular landing event but rather unfolded through a gradual arrival sequence involving small groups over an extended period (Allen and O'Connell, 2020; Bird et al., 2019). Such an island-hopping scenario would lead to the establishment of persisting coastal communities throughout the archipelago. Assuming this scenario took place via the northern route, as proposed by prevailing models (Bird et al., 2019; Kealy et al., 2018), these Wallacean communities, having developed maritime subsistence strategies, might not readily relinquish their entire identity, even after arrival in New Guinea (Northern Sahul) with the prospect of more abundant terrestrial resources. If these communities ventured south along the now-submerged west coast of Papua and Aru, actively engaging in sea fishing, there is a high likelihood they would eventually explore back west, reaching the Tanimbar Islands. Following coastlines would have expedited a directed population expansion, ensuring access to predictable resources (Erlandson and Braje, 2015).

Numerous sites in Wallacea record early reliance on coastal subsistence strategies by their initial occupants, particularly beyond Flores on the southern route and Sulawesi on the northern route. On the southern route, sites on the islands of Alor, Rote, Timor, and Kisar, document a substantial quantity of marine resources, such as fish, shellfish, crab, and sea urchin, and show a minimal reliance on terrestrial resources, particularly during the Pleistocene (Kaharudin et al., 2019, 2024; Mahirta, 2003; Mahirta et al., 2004; O'Connor et al., 2010; Samper Carro et al., 2016). These islands on the southern route are generally lacking in larger terrestrial fauna, with only smaller fauna such as rats, lizards, snakes, frogs, bats, and birds. While some of these islands did have giant rats (i.e. Alor & Timor, Louys et al., 2018) these are only medium-sized terrestrial fauna and are absent from the smaller island faunas such as Kisar (Hawkins et al., 2017; Kealy et al., 2020). In contrast, the northern route not only offers marine resources but also a higher abundance of medium to large terrestrial fauna, including cuscus and macropods (Bellwood, 2019; Shipton et al., 2020).

Tanimbar is located on Birdsell's southern route but exhibits characteristics of the northern Wallacean islands, with the availability of medium-sized mammals (i.e., macropods), coconut crabs, and rainforest vegetation (Hamilton et al., 2024; Wicaksono et al., 2017). These features provide greater food source opportunities from both inland and coastal ecosystems, making it an attractive settlement locality. The settlement of the Tanimbar Islands itself suggests that the colonists had developed advanced maritime technology by ~42 ka, considering the need to cross a water barrier of more than 100 km, regardless of the direction from which they came. This is also supported by evidence of the potential translocation of chert raw material from nearby islands, and even perhaps the macropods from Sahul. There is currently little to discriminate the earliest occupation on the northern and southern islands making it impossible at this point to determine which route was first used to reach Sahul (Kealy et al., 2018). However, the pattern of dates across southern Wallacea, in particular new evidence from Laili in

Timor (Shipton et al., 2024), does indicate that people moved rapidly through this portion of the Wallacean archipelago after ~47-45 ka (Kealy et al., 2016; Shipton et al., 2024), and our Elivavan record aligns well with these records. Further research in this previously under-studied region will hopefully shed further light on the origins of the early Tanimbarese.

5. Conclusion

Elivavan provides valuable insights into prehistoric human occupation, subsistence strategies, and migration patterns in Wallacea. The site preserves occupation records during the Pleistocene (Phase 1) and Holocene (Phase 2) periods. Notably, macropods, the most consistently exploited terrestrial animals in the sequence, are no longer present in Tanimbar today, raising questions about their mysterious presence and local extirpation. Faunal exploitation differences between the phases, particularly in shellfish species, and the shift in exploitation patterns from rocky and reefal habitats in Phase 1 to intertidal sand flats and estuaries in Phase 2, provide insights into changing environments and subsistence responses.

The Elivavan occupation record, dating back to ~42,000 years ago, demonstrates significant human antiquity at the southeastern-most point of Wallacea. Based on occupation records across Wallacea, it underscores the rapid dispersal of modern humans across the archipelago. Considering the risks involved in reaching Tanimbar, the development of advanced maritime technology and the availability of predictable food resources would have been a necessity for successful colonization. Lastly, despite its location among southern route islands, Tanimbar exhibits characteristics associated with the northern route, such as the availability of macropods, coconut crabs, and rainforest vegetation. This may have allowed frequent exploration of surrounding islands, as supported by possible evidence of movement of chert from other islands as well as macropods from Sahul.

Author contribution

Conceptualisation: H.A.F.K., S.K., S.O., M.N.R. Research permit and Planning: H.A.F.K., M.N.R. Data collection: H.A.F.K. Analysis: H.A.F.K., S.K. Writing: H.A.F.K., S.O., S.K., M.N.R.

Declaration of competing interest

We confirm that this paper: "**Islands on the Edge: 42,000-Year-Old Occupation of the Tanimbar Islands and its Implications for the Sunda-Sahul Early Human Migration Discourse**" constitutes original research which has not been published or under consideration elsewhere. There are no known conflicts of interest.

Data availability

Raw data associated with this study is included in the associated supplementary information files.

Acknowledgement

This research was funded by the ARC Centre of Excellence for Australian Biodiversity and Heritage (CE170100015), the 2022 Australian Archaeological Association Student Research Grant Scheme (SRDS), and the ANU School of Culture, History and Language HDR research funding. We extend our gratitude to the team at Badan Riset dan Inovasi Nasional (BRIN) for their valuable assistance during our time in Ambon. Special acknowledgments are due to Devi Mustika Sari, Fairuz Azis, and Gilar Wicaksono for their crucial contributions during the Tanimbar fieldwork. Thanks to Kris Helgen for his advice on macropod identification and for providing access to the macropod reference collection at the Australian Museum. Thanks to Yuni Suniarti for her advice and assistance in identifying marine shells and land snails. We are grateful to Yongky Souisa for assisting us and providing local guidance during our transit in Saumlaki. We also express our sincere appreciation to Lambertus Wermasubun and the entire Awear community for their warm hospitality and assistance throughout the Elivavan excavation. Finally, we also thank the two anonymous reviewers whose comments helped improve this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.quascirev.2024.108834.

References

Allen, J., O'Connell, J.F., 2020. A different paradigm for the initial colonisation of Sahul. Archaeol. Ocean. 55 (1), 1–14.
Aplin, K.P., Suzuki, H., Chinen, A.A., Chesser, R.T., Ten Have, J., Donnellan, S.C., Austin, J., Frost, A., Gonzalez, J.P., Herbreteau, V., Catzeflis, F., 2011. Multiple geographic origins of commensalism and complex dispersal history of black rats. PLoS One 6 (11), e26357.
Bellwood, P., 1998. Human dispersals and colonizations in prehistory – the Southeast Asian data and their implications. In: Omoto, K., Tobias, P.V. (Eds.), *The Origins and Past of Modern Humans – towards Reconciliation* (Recent Advances in Human Biology 3). World Scientific, Singapore, pp. 188–205.
Bellwood, P., 2019. The Indonesian-Australian archaeological research project in the northern Moluccas. In: Bellwood, P. (Ed.), The Spice Islands in Prehistory: Archaeology in the Northern Moluccas, Indonesia. ANU Press, Canberra, pp. 1–15. Terra Australis 50.
Bird, M.I., Beaman, R.J., Condie, S.A., Cooper, A., Ulm, S., Veth, P., 2018. Palaeogeography and voyage modeling indicates early human colonization of Australia was likely from Timor-Roti. Quat. Sci. Rev. 191, 431–439.
Bird, M.I., Condie, S.A., O'Connor, S., O'Grady, D., Reepmeyer, C., Ulm, S., Zega, M., Saltré, F., Bradshaw, C.J., 2019. Early human settlement of Sahul was not an accident. Sci. Rep. 9 (1), 8220.
Birdsell, J.B., 1957. Some population problems involving Pleistocene man. Cold Spring Harbor Symp. Quant. Biol. 22, 47–69.
Birdsell, J.B., 1977. The recalibration of a paradigm for the first peopling of greater Australia. In: Allen, J., Golson, J., Jones, R. (Eds.), Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia, and Australia. Academic Press Inc, London, pp. 113–167.
Bronk Ramsey, C., 2009a. Bayesian analysis of radiocarbon dates. Radiocarbon 51 (1), 337–360.
Bronk Ramsey, C., 2009b. Dealing with outliers and offsets in radiocarbon dating. Radiocarbon 51 (3), 1023–1045.
Brumm, A., Langley, M.C., Moore, M.W., Hakim, B., Ramli, M., Sumantri, I., Burhan, B., Saiful, A.M., Siagian, L., Suryatman, Sardi, R., 2017. Early human symbolic behavior in the late pleistocene of Wallacea. Proc. Natl. Acad. Sci. USA 114 (16), 4105–4110.
Brumm, A., Oktaviana, A.A., Burhan, B., Hakim, B., Lebe, R., Zhao, J.X., Sulistyarto, P.H., Ririmasse, M., Adhityatama, S., Sumantri, I., Aubert, M., 2021. Oldest cave art found in Sulawesi. Sci. Adv. 7 (3), eabd4648.
Chappell, J., 1993. Late Pleistocene coasts and human migrations in the Austral region. In: Spriggs, M., Yen, D.E., Ambrose, W., Jones, R., Thorne, A., Andrews, A. (Eds.), *A Community of Culture, the People and Prehistory of the Pacific*. Department of Prehistory. Australian National University, Canberra, pp. 43–48.
Chappell, J., 2000. Pleistocene seedbeds of western Pacific maritime cultures and the importance of chronology. In: O'Connor, S., Veth, P. (Eds.), East of Wallace's Line: Studies of Past and Present Maritime Cultures of the Indo-Pacific Region, Modern Quaternary Research in Southeast Asia, vol 16. Balkema, Rotterdam, pp. 77–98.
Clarkson, C., Jacobs, Z., Marwick, B., Fullagar, R., Wallis, L., Smith, M., Roberts, R.G., Hayes, E., Lowe, K., Carah, X., Florin, S.A., 2017. Human occupation of northern Australia by 65,000 years ago. Nature 547 (7663), 306–310.
Dee, M., Bronk Ramsey, C., 2014. High-precision Bayesian modelling of samples susceptible to inbuilt age. Radiocarbon 56 (1), 83–94.
Drabbe, P., 1932. *Woordenboek der Fordaatsche taal*.'s Gravenhage: Martinus Nijhoff, Weltevreden: Albrecht [Verhandelingen Bataviaasch Genootschap 71.].
Erlandson, J.M., Braje, T.J., 2015. Coasting out of Africa: the potential of mangrove forests and marine habitats to facilitate human coastal expansion via the Southern Dispersal Route. Quat. Int. 382, 31–41.
Fallon, S.J., Fifield, L.K., Chappell, J.M., 2010. The next chapter in radiocarbon dating at the Australian National University: status report on the single stage AMS. Nucl. Instrum. Methods Phys. Res. Sect. B Beam Interact. Mater. Atoms 268 (7–8), 898–901.
Fernandes, R., Bergensam, S., Hartz, S., Grootes, P.M., Nadeau, M.J., Melzner, F., Rakowski, A., Hüls, M., 2012. Mussels with meat: bivalve tissue-shell radiocarbon age differences and archaeological implications. Radiocarbon 54 (3–4), 953–965.
Flannery, T.F., Bellwood, P., White, J.P., Ennis, T., Irwin, G., Schubert, K., Balasubramaniam, S., 1998. Mammals from Holocene archaeological deposits on Gebe and Morotai islands, northern Moluccas, Indonesia. Aust. Mammal. 20 (3), 391–400.

Forbes, H.O., 1885. A naturalist's wanderings in the eastern archipelago: a narrative of travel and exploration from 1878 to 1883. Low, Marston, Searle & Rivington. London.
Galipaud, J.C., Kinaston, R., Guillaud, D., 2016. Aleti Tuun Bibi: Contextualizing a new rock art site in East Timor and the wider Asia-Pacific region. Asian Persp. 128–147.
Glover, I.C., 1981. Leang Burung 2: an upper Paleolithic rock shelter in South Sulawesi, Indonesia. Mod. Quat. Res. Southeast Asia 6, 1–38.
Hall, R., 2013. The palaeogeography of Sundaland and Wallacea since the late Jurassic. J. Limnol. 72.
Hamilton, R., Amano, N., Bradshaw, C.J., Saltré, F., Patalano, R., Penny, D., Stevenson, J., Wolfhagen, J., Roberts, P., 2024. Forest mosaics, not savanna corridors, dominated in Southeast Asia during the last glacial maximum. Proc. Natl. Acad. Sci. USA 121 (1), e2311280120.
Hawkins, S., O'Connor, S., Maloney, T.R., Litster, M., Kealy, S., Fenner, J.N., Aplin, K., Boulanger, C., Brockwell, S., Willan, R., Piotto, E., 2017. Oldest human occupation of Wallacea at Laili Cave, Timor Leste, shows broad spectrum foraging responses to late Pleistocene environments. Quat. Sci. Rev. 171, 58–72.
Hawkins, S., Zerika, G.A., Kinaston, R., Firmando, Y.R., Sari, D.M., Sumiarti, Y., Lucas, M., Roberts, P., Reepmeyer, C., Maloney, T., Kealy, S., Stirling, C., Reid, M., Barr, D., Kleffmann, T., Kumar, A., Yuwono, P., Litster, M., Husni, M., Ririmasse, M., Mahirta, Mujabuddawat, M., Harriyadi, O., Connor, S., 2024. Earliest known funerary rites in Wallacea after the last glacial maximum. Sci. Rep. 14 (1), 282.
Heaton, T.J., Köhler, P., Butzin, M., Bard, E., Reimer, R.W., Austin, W.E., Bronk Ramsey, C., Grootes, P.M., Hughen, K.A., Kromer, B., Reimer, P.J., Adkins, J., Burke, A., Cook, M.S., Olsen, J., Skinner, L.C., 2020a. Marine20—the marine radiocarbon age calibration curve (0–55,000 cal BP). Radiocarbon 62 (4), 779–820.
Heaton, T.J., Köhler, P., Butzin, M., Bard, E., Reimer, R.W., Austin, W.E.N., Bronk Ramsey, C., Grootes, P.M., Hughen, K.A., Kromer, B., Reimer, P.J., Adkins, J., Burke, A., Cook, M.S., Olsen, J., Skinner, L.C., 2020b. Marine20 The marine radiocarbon age calibration curve (0-55,000 CAL BP). Radiocarbon 62 (4), 779–820.
Hoëvell, G.W.W.C., Baron, van, 1890. De Afdeeling Babar, *Tijdschrift voor Indische Taal-, Land en Volkenkunde* 33.
Hogg, A.G., Heaton, T.J., Hua, Q., Palmer, J.G., Turney, C.S., Southon, J., Bayliss, A., Blackwell, P.G., Boswijk, G., Bronk Ramsey, C., Pearson, C., Petchey, F., Reimer, P., Reimer, R., Wacker, L., 2020. SHCal20 Southern Hemisphere calibration, 0–55,000 years cal BP. Radiocarbon 62 (4), 759–778.
Hogg, A., Turney, C., Palmer, J., Southon, J., Kromer, B., Ramsey, C.B., Boswijk, G., Fenwick, P., Noronha, A., Staff, R., Friedrich, M., 2013. The New Zealand kauri (Agathis australis) research project: a radiocarbon dating intercomparison of Younger Dryas wood and implications for IntCal13. Radiocarbon 55 (4), 2035–2048.
Jasin, B., Haile, N., 1996. Uppermost Jurassic-lower Cretaceous radiolarian chert from the Tanimbar islands (Banda arc), Indonesia. J. Southeast Asian Earth Sci. 14 (1–2), 91–100.
Kaharudin, H.A.F., Alifah, A., Ramadhan, L., Kealy, S., 2020. A review of archaeological dating efforts at cave and rockshelter sites in the Indonesian Archipelago. Journal of Indo Pacific Archaeology 44, 80–112.
Kaharudin, H.A.F., Ananda, G.A.R., Prasetya, W.H., Wibisono, M.W., Yuwono, J.S.E., 2023. Hunter-gatherers in labyrinth karst: an early Holocene record from Gunung Sewu, Java. Archaeological Research in Asia 33, 100427.
Kaharudin, H.A.F., O'Connor, S., Kroh, A., Kealy, S., 2024. Supple or delicacy: sea urchin exploitation over the last 40,000 years at Makpan cave, Alor Island. J. I. Coast Archaeol. 1–28.
Kaharudin, H.A.F., Mahirta, Kealy, S., Hawkins, S., Boulanger, C., O'Connor, S., 2019. Human foraging responses to climate change; Here Sorot Entapa rockshelter on Kisar island. Wacana, Journal of the Humanities of Indonesia 20 (3), 7.
Kaneko, Y., Maruyama, S., Kadarusman, A., Ota, T., Ishikawa, M., Tsujimori, T., Ishikawa, A., Okamoto, K., 2007. On-going orogeny in the outer-arc of the Timor–Tanimbar region, eastern Indonesia. Gondwana Res. 11 (1–2), 218–233.
Kawamura, A., Chang, C.H., Kawamura, Y., 2016. Middle Pleistocene to Holocene mammal faunas of the Ryukyu Islands and Taiwan: an updated review incorporating results of recent research. Quat. Int. 397, 117–135.
Kealy, S., Louys, J., O'Connor, S., 2016. Islands under the sea: a review of early modern human dispersal routes and migration hypotheses through Wallacea. J. I. Coast Archaeol. 11 (3), 364–384.
Kealy, S., Louys, J., O'Connor, S., 2017. Reconstructing palaeogeography and inter-island visibility in the Wallacean Archipelago during the likely period of Sahul colonization, 65–45 000 years ago. Archaeol. Prospect. 24 (3), 259–272.
Kealy, S., Louys, J., O'Connor, S., 2018. Least-cost pathway models indicate northern human dispersal from Sunda to Sahul. J. Hum. Evol. 125, 59–70.
Kealy, S., O'Connor, S., Mahirta, Sari, D.M., Shipton, C., Langley, M.C., Boulanger, C., Kaharudin, H.A.F., Patridina, E.P.B.G.G., Algifary, M.A., Irfan, A., Beaumont, P., 2020. Forty thousand years of maritime subsistence near a changing shoreline on Alor Island (Indonesia). Quat. Sci. Rev. 249, 106599.
Lape, P.V., Aziz, F.A., Ekowati, D., Huff, J., Handoko, W., Huwne, A., Lahallo, M., Latupapua, S., Oktaviana, A.A., Peterson, E., 2017. Reframing the Island Southeast Asian Neolithic: Local vs regional adaptations. In: Prasetyo, B., Nastiti, T.S., Simanjuntak, T. (Eds.), Austronesian Diaspora: A new Perspective. Gadjah Mada University Press, Yogyakarta, pp. 65–76.
Latinis, D.K., 2005. Cave use variability in central Maluku, Eastern Indonesia. Asian Perspectives 44 (1), 119–136.
Louys, J., Kealy, S., O'Connor, S., Price, G.J., Hawkins, S., Aplin, K., Rizal, Y., Zaim, J., Tanudirjo, D.A., Santoso, W.D., Hidayah, A.R., 2017. Differential preservation of vertebrates in Southeast Asian caves. Int. J. Speleol. 46 (3), 6.
Louys, J., O'Connor, S., Higgins, P., Hawkins, S., Maloney, T., 2018. New genus and species of giant rat from Alor Island, Indonesia. J. Asia Pac. Bus. 11 (4), 503–510.
Mahirta, 2003. *Human Occupation on Rote and Sawu Islands, Nusa Tenggara Timur*. Ph.D. Thesis. Australian National University, Canberra.
Mahirta, Aplin, K.P., Bulbeck, D., Boles, W.E., Bellwood, P., 2004. Pia Hudale rockshelter: a terminal pleistocene occupation site on Roti island, Nusa Tenggara Timur, Indonesia. In: Keates, S.G., Pasveer, J.M. (Eds.), Quaternary Research in Indonesia, Modern Quaternary Research in Southeast Asia 18. A.A. Balkema, Leiden, pp. 361–394.
Norman, K., Inglis, J., Clarkson, C., Faith, J.T., Shulmeister, J., Harris, D., 2018. An early colonisation pathway into northwest Australia 70-60,000 years ago. Quat. Sci. Rev. 180, 229–239.
O'Connor, S., Barham, A., Spriggs, M., Veth, P., Aplin, K., St Pierre, E., 2010. Cave archaeology and sampling issues in the tropics: a case study from Lene Hara Cave, a 42,000 year old occupation site in East Timor, Island Southeast Asia. Aust. Archaeol. 71 (1), 29–40.
O'Connor, S., Aplin, K., Szabó, K., Pasveer, J., Veth, P., 2005. In: O'Connor, S., Spriggs, M., Veth, P. (Eds.), The Archaeology of the Aru Islands, Eastern Indonesia, 22. Terra Australis, Canberra, pp. 171–204.
O'Connor, S., Barham, A., Aplin, K., Maloney, T., 2017. Cave stratigraphies and cave breccias: implications for sediment accumulation and removal models and interpreting the record of human occupation. J. Archaeol. Sci. 77, 143–159.
O'Connor, S., Mahirta, Kealy, S., Boulanger, C., Maloney, T., Hawkins, S., Langley, M.C., Kaharudin, H.A.F., Sumiarti, Y., Husni, M., Ririmasse, M., 2019. Kisar and the archaeology of small islands in the Wallacean Archipelago. J. I. Coast Archaeol. 14 (2), 198–225.
O'Connor, S., Shipton, C., Kealy, S., 2023. The southern route to Sahul: modern human dispersal and adaptation in the pleistocene. In: Ono, R. and Pawlik, A. (Eds.), The Prehistory of Human Migration - Human Expansion Out of Africa and Across the World. IntechOpen. https://doi.org/10.5772/intechopen.113906.
Oktaviana, A.A., Joannes Boyau, R., Hakim, B., Burhan, B., Sardi, R., Adhityatama, S., Hamrullah, Sumantri, I., Tang, M., Lebe, R., Ilyas, I., Abbas, A., Jusdi, A., Mahardian, D.E., Noerwidi, S., Ririmasse, M.N.R., Mahmud, I., Duli, A., Aksa, L.M., McGahan, D., Setiawan, P., Brumm, A., Aubert, M., 2024. Narrative cave art in Indonesia by 51,200 years ago. Nature 1–5.
Ono, R., Sofian, H.O., Fuentes, R., Aziz, N., Ririmasse, M., Geria, I.M., Katagiri, C., Pawlik, A., 2022. Early modern human migration into Sulawesi and Island adaptation in Wallacea. World Archaeol. 54 (2), 229–243.
Perston, Y.L., Moore, M.W., Suryatman, N.F.N., Burhan, B., Hakim, B., Hasliana, N.F.N., Agus Oktaviana, A., Lebe, R., Mahmud, I., Brumm, A., 2022. Stone flaking technology at Leang Bulu Bettue, South Sulawesi, Indonesia. Archaeol. Ocean. 57 (3), 249–272.
Purnomo, G.A., Mitchell, K.J., O'Connor, S., Kealy, S., Taufik, L., Schiller, S., Rohrlach, A., Cooper, A., Llamas, B., Sudoyo, H., Teixeira, J.C., 2021. Mitogenomes reveal two major influxes of Papuan ancestry across Wallacea following the Last Glacial Maximum and Austronesian contact. Genes 12 (7), 965.
Reimer, P.J., Austin, W.E., Bard, E., Bayliss, A., Blackwell, P.G., Ramsey, C.B., Butzin, M., Cheng, H., Edwards, R.L., Friedrich, M., Grootes, P.M., Guilderson, T.P., Hajdas, I., Heaton, T.J., Hogg, A.G., Hughen, K.A., Kromer, B., Manning, S.W., Muscheler, R., Palmer, J.G., Pearson, C., van der Plicht, J., Reimer, R.W., Richards, D.A., Scott, E. M., Southon, J.R., Turney, C.S.M., Wacker, L., Adolphi, F., Büntgen, U., Capano, M., Fahrni, S.M., Fogtmann-Schulz, A., Friedrich, R., Köhler, P., Kudsk, S., Miyake, F., Olsen, J., Reinig, F., Sakamoto, M., Sookdeo, A., Talamo, S., 2020. The IntCal20 Northern Hemisphere radiocarbon age calibration curve (0–55 cal kBP). Radiocarbon 62 (4), 725–757.
Ririmasse, M., 2016a. Arkeologi Kepulauan Tanimbar Hasil Penelitian 2011-2014 dan Arah Pengembangannya. Naditira Widya 10, 41–52.
Ririmasse, M., 2016b. Arkeologi Kepulauan Tanimbar bagian utara: Tinjauan potensi di Pulau Fordata dan Pulau Larat Maluku Indonesia. Kapata Arkeologi 12, 43–58.
Samper Carro, S.C., Raymond, C., Weisbecker, V., O'Connor, S., 2023. Big questions for small animals. Taphonomic analysis of small vertebrates in Matja Kuru 2 (Timor Leste) during the late pleistocene. Quaternary Science Advances 12, 100102.
Samper Carro, S.C., O'Connor, S., Louys, J., Hawkins, S., Mahirta, 2016. Human maritime subsistence strategies in the lesser Sunda islands during the terminal pleistocene-early Holocene: new evidence from alor, Indonesia. Quat. Int. 416, 64–79.
Shipton, C., O'Connor, S., Jankowski, N., O'Connor-Veth, J., Maloney, T., Kealy, S., Boulanger, C., 2019. A new 44,000 year sequence from Asitau Kuru (Jerimalai), Timor-Leste, indicates long-term continuity in human behaviour. Archaeological and Anthropological Sciences 11, 5717–5741.
Shipton, C., O'Connor, S., Reepmeyer, C., Kealy, S., Jankowski, N., 2020. Shell Adzes, exotic obsidian, and inter-island voyaging in the early and middle Holocene of Wallacea. J. I. Coast Archaeol. 15 (4), 525–546.
Shipton, C., Morley, M., Kealy, S., Norman, K., Boulanger, C., Hawkins, S., Litster, M., Withnell, C., O'Connor, S., 2024. Abrupt onset of intensive human occupation 44,000 years ago on the threshold of Sahul. Nat. Commun. 15 (1), 4193.
Summerhayes, G.R., Field, J.H., Shaw, B., Gaffney, D., 2017. The archaeology of forest exploitation and change in the tropics during the Pleistocene: the case of Northern Sahul (Pleistocene New Guinea). Quat. Int. 448, 14–30.
Summerhayes, G.R., Leavesley, M., Fairbairn, A., Mandui, H., Field, J., Ford, A., Fullagar, R., 2010. Human adaptation and plant use in highland New Guinea 49,000 to 44,000 years ago. Science 330 (6000), 78–81.
Sutikna, T., Tocheri, M.W., Morwood, M.J., Saptomo, E.W., Jatmiko, Awe, R.D., Wasisto, S., Westaway, K.E., Aubert, M., Li, B., Zhao, J.X., Storey, M., Alloway, B.V., Morley, M.W., Meijer, H.J.M., van den Bergh, G.D., Grün, R., Dosseto, A., Brumm, A., Jungers, L.J., Roberts, R.G., 2016. Revised stratigraphy and chronology for Homo floresiensis at Liang Bua in Indonesia. Nature 532 (2016) 366-369.

Tanudirjo, D., 2001. Islands in between: Prehistory of the Northeastern Indonesian Archipelago. Australian National University, Canberra. Ph.D. thesis.
Wicaksono, S.A., Russell, J.M., Holbourn, A., Kuhnt, W., 2017. Hydrological and vegetation shifts in the Wallacean region of central Indonesia since the last glacial maximum. Quat. Sci. Rev. 157, 152–163.
Wood, R., Jacobs, Z., Vannieuwenhuyse, D., Balme, J., O'Connor, S., Whitau, R., 2016. Towards an accurate and precise chronology for the colonization of Australia: the example of Riwi, Kimberley, Western Australia. PLoS One 11 (9), e0160123.

3.2. *Maritime identity [Case study: Living Seaward: Maritime Cosmology and the Contemporary Significance of Natar Fampompar, a Stone Boat Ceremonial Structure in the Village of Sangliat Dol, Tanimbar Islands]*

Australian National University

Statement of Contribution

This thesis is submitted as a Thesis by Compilation in accordance with https://policies.anu.edu.au/ppl/document/ANUP_003405

I declare that the research presented in this Thesis represents original work that I carried out during my candidature at the Australian National University, except for contributions to multi-author papers incorporated in the Thesis where my contributions are specified in this Statement of Contribution.

Title: Living Seaward: Maritime Cosmology and the Contemporary Significance of Natar Fampompar, a Stone Boat Ceremonial Structure in the Village of Sangliat Dol, Tanimbar Islands
Authors: Hendri A. F. Kaharudin, Gilar Wicaksono, Fairuz Azis, Shimona Kealy, Devi M. Sari, Marlon N. R. Ririmasse, and Sue O'Connor
Publication outlet: Ethnoarchaeology
Current status of paper: Published
Contribution to paper: Chief articipation in fieldwork, data analysis, and manuscript writing.
Senior author or collaborating authors endorsement:

Gilar Wicaksono		20/02/2025
Co-author – Print Name	Signature	Date
Fairuz Azis		20/02/2025
Co-author – Print Name	Signature	Date
Shimona Kealy		20/02/2025
Co-author – Print Name	Signature	Date
Devi M. Sari		25/02/2025
Co-author – Print Name	Signature	Date
Marlon N. R. Ririmasse		25/02/2025
Co-author – Print Name	Signature	Date
Sue O'Connor		20/02/2025
Co-author – Print Name	Signature	Date
Hendri A. F. Kaharudin		19/02/2025
Candidate – Print Name	Signature	Date

Endorsed

Australian National University

Sue O'Connor		15/05/2025
Primary Supervisor – Print Name	Signature	Date
Roald Maliangkay		15 May 2025
Delegated Authority – Print Name	Signature	Date

Routledge
Taylor & Francis Group

Ethnoarchaeology

Journal of Archaeological, Ethnographic and Experimental Studies

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/yeth20

Living Seaward: Maritime Cosmology and the Contemporary Significance of Natar Fampompar, a Stone Boat Ceremonial Structure in the Village of Sangliat Dol, Tanimbar Islands

Hendri A. F. Kaharudin, Gilar Wicaksono, Fairuz Azis, Shimona Kealy, Devi M. Sari, Marlon N. R. Ririmasse & Sue O'Connor

To cite this article: Hendri A. F. Kaharudin, Gilar Wicaksono, Fairuz Azis, Shimona Kealy, Devi M. Sari, Marlon N. R. Ririmasse & Sue O'Connor (20 Aug 2024): Living Seaward: Maritime Cosmology and the Contemporary Significance of Natar Fampompar, a Stone Boat Ceremonial Structure in the Village of Sangliat Dol, Tanimbar Islands, Ethnoarchaeology, DOI: 10.1080/19442890.2024.2391699

To link to this article: https://doi.org/10.1080/19442890.2024.2391699

Published online: 20 Aug 2024.

ETHNOARCHAEOLOGY
https://doi.org/10.1080/19442890.2024.2391699

Living Seaward: Maritime Cosmology and the Contemporary Significance of Natar Fampompar, a Stone Boat Ceremonial Structure in the Village of Sangliat Dol, Tanimbar Islands

Hendri A. F. Kaharudin[a,b,c], Gilar Wicaksono[c], Fairuz Azis[c], Shimona Kealy[a,b], Devi M. Sari[c,d], Marlon N. R. Ririmasse[e] and Sue O'Connor[a,b]

[a]Archaeology and Natural History, College of Asia and the Pacific, Australian National University, Canberra, Australia; [b]ARC Centre of Excellence for Australian Biodiversity and Heritage, The Australian National University, Canberra, Australia; [c]RIJANG Research Indonesia, Sleman, Indonesia; [d]Departemen Arkeologi, Fakultas Ilmu Budaya, Universitas Gadjah Mada, Yogyakarta, Indonesia; [e]Pusat Riset Arkeologi Lingkungan, Maritim, dan Budaya Berkelanjutan, Organisasi Riset Arkeologi, Bahasa, dan Sastra, Badan Riset dan Inovasi Nasional, Jakarta, Indonesia

ABSTRACT

Natar Fampompar is a stone boat ceremonial structure (*natar*) in the village of Sangliat Dol on Yamdena Island, Tanimbar Islands, Island Southeast Asia. Located in the village center, it is the only Tanimbarese *natar* that continues to be used for clan meetings and ceremonial events. As such, it arguably represents the most significant cultural site for understanding Tanimbarese tradition. This article documents the Natar Fampompar and six associated cultural heritage sites. We discuss their historical origins and relevance to the people of Sangliat Dol; how maritime cosmology and maritime identity are evident in social organization, settlement organization, ceremonies, and people's daily lives; and the function of *natar* before and after the introduction of Christianity. Initial archaeological work is reported. Finally, this research raises the issue of heritage theft and sale, particularly the carved prow stones of the Natar Fampompar, and how the people of Sangliat Dol hope for their return.

KEYWORDS

Stone boat; maritime cosmology; Austronesian; heritage theft; petroglyphs; shell ornaments; Maluku province; Indonesia

Introduction

The Tanimbar Islands are located in the Maluku Province of Indonesia. The island group is comprised of at least 81 individual islands. The largest islands are the most populated, including Yamdena, Selaru, Sera, Larat, and Fordata (BPS 2023). The Tanimbars are located at the eastern extent of the southern Wallacean island chain, surrounded by the Banda Sea to the north, Arafuru Sea to the east, Timor Sea and Pacific Ocean to the

CONTACT Hendri A. F. Kaharudin hendri.kaharudin@anu.edu.au Archaeology and Natural History, College of Asia and the Pacific, Australian National University, Canberra 2601, ACT, Australia ARC Centre of Excellence for Australian Biodiversity and Heritage, The Australian National University, Canberra, 2601, ACT, Australia RIJANG Research Indonesia, Sleman, 55581, Indonesia

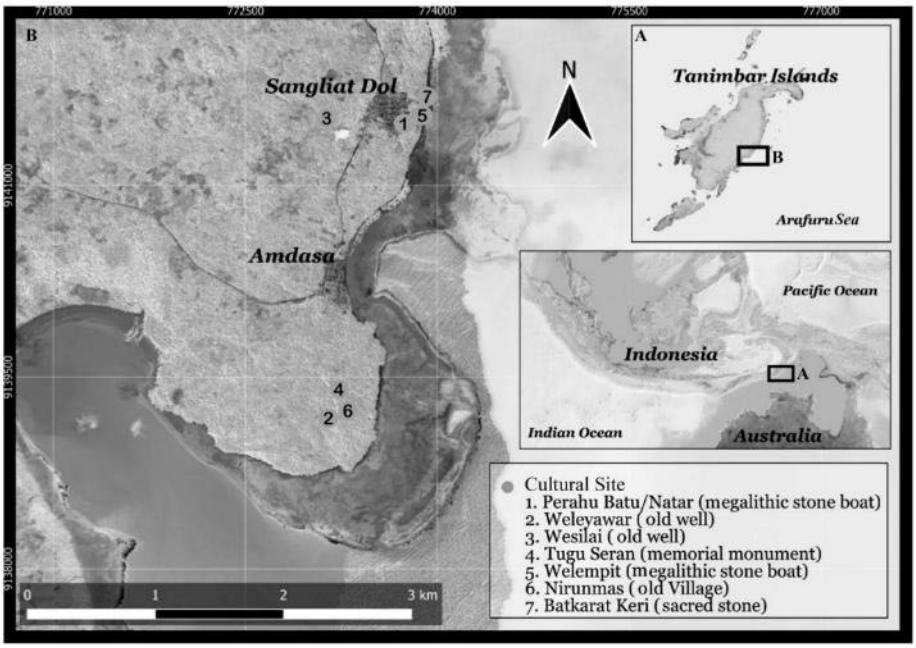

Figure 1. Maps showing the location of the Tanimbar Islands (A); the village of Sangliat Dol (B) on the east coast of Yamdena Island in the Tanimbar Islands; and the seven cultural sites associated with the village of Sangliat Dol. Sites 1, 3, 5, and 7 are in the village area. Sites 2, 4, and 6 are located on a hill south of the old settlement of Amdasa.

south, and Babar Islands to the west (Figure 1). Recent archaeological research indicates that the Tanimbars have been occupied by humans for at least 42,000 years (Kaharudin et al. 2024a). The nomenclature "Timur Laut" and "Timor Lao," translating to "the far east," is used by local Moluccans to describe the island group and frequently appears in historical literature. Notably, the majority of settlements on Yamdena Island are concentrated along the east coast, a distribution pattern that Forbes (1885) posits may have influenced the appellation, Timor Lao (Forbes 1885, 331–332).

The Tanimbar Islands are renowned for their stone boat structures, prominently featured in the center of many villages, including Sangliat Dol, Arui Bab, Amdasa, Atubul, Lorulun, and Wermatang (Ririmasse 2013; HAFK, personal observation). However, only the stone boats in Sangliat Dol and Arui Bab remain largely intact, and only the Sangliat Dol structure still is actively used for ritual and other ceremonial events. Located on the east coast of Yamdena Island, the village of Sangliat Dol hosts two stone boat structures, Natar Fampompar and Natar Welempit. This article explores the maritime cosmology of Sangliat Dol and details the architecture and use of these stone boats in local rituals and ceremonies.

In Island Southeast Asia (ISEA), boat symbolism is deeply ingrained across various cultures, evident in language, artistic expressions, and social structures (Ballard et al. 2004; Manguin 1986). Strong relationships between people and the sea can be traced back to the Pleistocene with the arrival of the first modern humans in the region,

which required purposeful voyaging (Bird et al. 2019; Kealy, Louys, and O'Connor 2018). The burial site of Tron Bon Lei on the island of Alor, approximately 700 km to the west of Tanimbar, revealed the earliest link between cosmology and fishing in the form of fishhook grave goods dated approximately 12 ka (O'Connor et al. 2017; Samper Carro et al. 2022). Archaeological findings across the region consistently reveal significant dependence on marine resources for subsistence (e.g. Kaharudin et al. 2019, 2024b; Kealy et al. 2020; O'Connor, Ono, and Clarkson 2011, 2019). ISEA is also renowned for its rock art, which frequently depicts boats, fish, and other maritime motifs, particularly on the islands of Babar, Kei, Kisar, Lembata, and Timor (Ballard et al. 2004; Handoko et al. 2018; Lape, O'Connor, and Burningham 2007; O'Connor 2003; O'Connor et al. 2018a, 2018b, 2020, 2023).

Boats are closely associated with the afterlife in the artistic expressions of ISEA cultures. In South Sulawesi, boat-shaped coffins are prevalent, symbolizing the transportation of the deceased to the spiritual realm (Duli 2013). Similarly, stone structures resembling boats served as burial markers; for example, 19 such burials with boat-shaped stone markers have been identified on Batanes Island in the Philippines (Valientes 2019). At the Ohoidertawun (also known as Dudumahan) rock art site on Kei Kecil Island, boat motifs feature prominently, depicting dancing warriors adorned with feathered headdresses, accompanied by drums and distinct prow-to-stern decorations. These motifs are often linked to the symbolism of the ship of the dead (Ballard et al. 2004). This dominance of boat symbolism led Ballard (1992) to consider such motifs one of the characteristics of his definition of the Austronesian Painting Tradition. In view of the occurrence of some motifs in the painted rock art repertoire which he thought had affinities with those on Dong Son bronzes dating to after 2000 BP, Ballard (1992, 98) reasoned that the Austronesian Painting Tradition might be associated with a later Austronesian diaspora rather than an initial spread through eastern ISEA.

Boat symbolism in the Tanimbars is deeply integrated in daily village life today, with socio-political structures often conceptualized using nautical terms. Various parts of houses are referred to with maritime terminology, such as keel and rudder (Manguin 1986). Despite their coastal location and rich maritime heritage, most villagers now primarily rely on agriculture for their income, while still maintaining a strong spiritual connection to the sea. In Sangliat Dol, the stone boat structure, known as the *natar*, is centrally located and serves as both the village square and ritual center. It is frequently used for cultural ceremonies and meetings among elders to address important community issues. Similarly, although the stone boat structure in Arui Bab is now surrounded by trees and tall grass, historical photographs reveal that it was once situated at the village center (see Drabbe 1940, Figures 67 and 89). Even though the majority of the Tanimbar population, including those in Sangliat Dol, has converted to Catholicism and Protestantism, the *natar* and boat symbolism remain integral to their cultural identity and continue to play a vital role in their social behaviors and cultural practices.

Previous Research

The Maluku Islands, known for their valuable spices such as cloves, nutmeg, and mace, were central to the global spice trade, attracting Arab, Indian, and Chinese traders long before European involvement. The Portuguese, followed by the Dutch, sought control

over this lucrative trade, with the Dutch East India Company eventually establishing a harsh monopoly through military force and strategic control (Ellen 2003). Unfortunately, the pre-European history of Tanimbar is largely undocumented with limited records hinting at early Chinese interactions with the Maluku Islands as far back as the seventh century (Groeneveldt 1960, 117). Unlike other Maluku islands (e.g. Ternate, Tidore, Banda, and Ambon), the European historical documentation is limited as the Tanimbars remained largely detached from the major spice routes (Ellen 2003; Meilink-Roelofsz 1962; Pires 1944, 204–205). European exploration in the sixteenth century is recorded, notably by Portuguese historical figures like Martim Afonso de Melo, but direct evidence is unknown (De Faria y Sousa 1695, 277; Thomaz and Filipe 1995; Urban 2009). By the seventeenth century, the Dutch East India Company traded with Tanimbar, establishing Dutch authority since first contact in 1629 (Riedel 1886, 272). Captain Owen Stanley encountered Tanimbar in 1839 during visits to Arafuru Sea islands (Stokes 1846, 438–478). Tanimbar's historical narrative also is intertwined with the trade boom in trepang (large sea cucumbers) from the eighteenth through the early twentieth centuries, as Macassan traders harvested trepang from its waters for centuries (Schwerdtner Máñez and Ferse 2010; Sutherland 2000, 89).

Scientific exploration in the Tanimbars dates back to the late nineteenth century when Henry Ogg Forbes visited Ritabel village on Larat Island, documenting various aspects of Tanimbar society (Forbes 1885, 298–387). His work included detailed observations and collections of the local flora and fauna, contributing significantly to the understanding of the region's biodiversity. Forbes also recorded ethnographic information, detailing the customs, social structures, and daily life of the Indigenous peoples he encountered. Similarly, W.R. Baron van Hoëvell recorded observations of Tanimbar culture and wildlife during his journey to the Kei Islands (van Hoëvell 1890a).

In the twentieth and twenty-first centuries, humanities-based research in linguistics and anthropology gained prominence. *Het leven van den Tanémbarees* by Petrus Drabbe, a Dutch missionary, stands as an early comprehensive ethnography covering Tanimbarese culture (Drabbe 1940). Drabbe also compiled dictionaries on Austronesian languages spoken in Tanimbar during the 1920s and 1930s (Drabbe 1926a, 1926b, 1932a, 1932b). Additionally, Susan McKinnon's *From a Shattered Sun* (1991) provides an in-depth study of Tanimbar's kinship and customs.

Archaeological research on the earliest settlements in Island Southeast Asia (ISEA) is well-documented, though many of these original settlement sites are now abandoned (Lape 2006; O'Connor, McWilliam, and Brockwell 2020; Schapper 2019; Veth et al. 2005). Since 1994, limited archaeological survey and excavation by the Balai Arkeologi Ambon (Ambon Archaeological Center) have documented archaeological deposits, highlighting the potential for archaeological research in the Tanimbar Islands (Ririmasse 2013, 2016a, 2016b). This article focuses on the village of Sangliat Dol and its surroundings, reporting previously undocumented cultural sites and discussing their meanings based on local narratives and how the tradition has changed over time.

Methods

In June and July 2022, an archaeological survey was conducted in the Tanimbar Islands with the primary objective of recording cultural sites and artifacts in Sangliat Dol, as

the last remaining village on Yamdena Island with intact monuments related to significant cultural heritage. This study aims to explore how the community perceives and integrates these heritage elements into their daily lives, while also documenting the ongoing use and ceremonial practices that persist despite the community's adoption of Christianity. Additionally, this research provides a general overview of the village system in Tanimbar, examining the roles of village officials and the spatial layout and orientation of the houses. This is beneficial for archaeology as it exemplifies how early sedentary villages were formed after a period of occupation by smaller nomadic groups in Tanimbar. The documentation of traditional attire in Sangliat Dol also shows how people today continue to use marine resources for their ornaments and their involvement in trading with neighboring islands. The arrival of Austronesian-speaking peoples in the region, and their associated technologies (i.e. pottery) and domesticates, are often associated archaeologically with a shift toward village settlement (Brockwell et al. 2023; O'Connor et al. 2019). Thus, understanding the continued importance and symbolism of the sea and seafaring can improve our understanding and interpretation of early cultures and cosmology in the Tanimbar Islands and ISEA more broadly.

Our team conducted a thorough survey of seven named cultural sites in and around the village of Sangliat Dol, based on information provided by the villagers. We consulted with village elders regarding any cultural or archaeological sites near the village and requested the village head to appoint a guide to lead us to these locations. During our fieldwork, we documented surface architecture and artifacts, and we observed community ceremonies. To capture the local narratives associated with these cultural sites, we interviewed the village head, the traditional lore keeper, the traditional landowner, and the caretaker of the *natar*. We also formally surveyed and then mapped the two *natar* sites in Sangliat Dol (Natar Fampompar and Natar Welempit) and the *titar*, a large stone stairway that marks the historical entrance to Sangliat Dol village territory. This mapping was conducted using a theodolite and dumpy levels to accurately document horizontal distance and elevation. Additionally, we excavated a 1-by-1 m test pit beside Natar Fampompar to assess the presence of any remaining original cultural stratigraphy in the area. The excavation was documented using the theodolite, with all recovered sediments sieved through 1.5 mm mesh to ensure recovery of even very small cultural artifacts.

Cultural Sites of Sangliat Dol and Surroundings

We recorded seven cultural sites in the village of Sangliat Dol and its surroundings (Figure 1 and Figure 2): two stone boat structures, two old wells, a sacred stone, a memorial monument, and an old village site. To visit these sites, a ritual was required that involved *sopi* (traditional alcoholic beverages), cigarettes or tobacco, and betel nut. These items are used as offerings to the ancestors and for protection from bad omens. These cultural sites are considered to be sacred, and ownership is shared by the people from three villages, Sangliat Dol, Amdasa, and Sangliat Krawain. Their oral history acknowledges that they are descendants of the same ancestors and share a single *petuanan* (a body of customary law). This shared *petuanan* means that the descendants share communal rights to land, waters, trees, crops, and wild animals. In the Yamdenan language, *dol* means sea or seaside, while *krawain* means water or

Figure 2. Cultural sites belonging to the people of the villages of Sangliat Dol, Amdasa, and Sangliat Krawain: (a) Natar Fampompar, the stone boat ceremonial structure; (b) Weleyawar, a stone well at a spring that provides freshwater; (c) Wesilai, another stone well that provides freshwater; (d) Tugu Seran, a stone marker commemorating a conflict; (e) Batkarat Keri, an overgrown sacred stone; (f) Natar Welempit, the other stone boat structure; and (g) Nirunmas, the ancestral village site.

water jar. According to oral history, the people of Sangliat Krawain village originally inhabited the villages of Amdasa and Sangliat Dol but were forced to relocate due to an outbreak of contagious disease. This led the people of Sangliat Krawain to establish a new village in search of accessible water sources, forming the third village in the process.

This contagious disease is recounted in oral history as a skin disease, which may have been smallpox or leprosy. Captain Owen Stanley reported leprosy on the island (Stokes 1846, 457), and early European sources mentioned smallpox epidemics in neighboring Maluku islands like Ternate in 1558 and Ambon in 1564 (Boomgaard 2003, 591–593). Smallpox outbreaks had devastating effects across Tanimbar and other Indonesian islands from the sixteenth to the twentieth centuries (Boomgaard 2003; Kolff 1840,

260), with Tanimbar losing half of its population to smallpox in the mid-nineteenth century and experiencing severe outbreaks again in the early twentieth century (Goudswaard 1863, 101–103; Tillema 1921, 21–22; van Eijbergen 1864, 166). Additionally, a cholera outbreak in the mid-nineteenth century in Tanimbar and surrounding islands significantly impacted the mortality rate (Tillema 1921, 47–49).

The people of Sangliat Dol recognize that the two stone boat structures in their village, Natar Fampompar and Natar Welempit, belong to the people of all three villages, following *petuanan* (Figure 2a and f). Sangliat Dol villagers have the responsibility to look after these sites as representatives of the three villages. Natar Fampompar is located in the center of the village of Sangliat Dol. It is surrounded by the houses of every clan member in the village. With the prow (the foremost part of the bow) facing east toward the sea, the Natar Fampompar is 18 m long with a maximum width of 10 m. This stone boat ceremonial structure currently reaches a height of 1.6 m at the prow and 1.2 m at the stern (Figure 2a). However, the prow once extended significantly higher (Figure 3), before the carved stone blocks at the top of the prow were stolen in 2002. Only the bottom blocks of the prow remain.

While the Natar Fampompar structure appears to be relatively unmodified since its original construction, with the exception of the theft, the surrounding ground has been modified, flattened, and paved in recent years. Old photographs indicate that the original structure was more exposed at the base and the ground around the stern once sloped down toward the boat (Figure 3). The interior of the Natar is filled with soil to produce a surface representing the deck of the boat about 1 m above the ground. The width of the rock wall around the hull is approximately 30 cm. The distance from the Natar Fampompar to the coast is approximately 150 m, separated by the large stairway (*titar*), consisting of 108 stone stairs that historically marked the spiritual entrance to Sangliat Dol village territory (Figure 3). While modern roads have changed where one enters the village today, the stair is still considered to be the spiritual entrance to the village, and it leads directly from the coast up to the Natar Fampompar.

Natar Welempit is another stone boat (Figure 2f) in Sangliat Dol. It is located down by the coast on the north side of the Natar Fampompar's stairway. Unlike Natar Fampompar, Natar Welempit has never been used for ceremonies, but it is considered sacred, because it is the location of a spring that serves as the primary freshwater source for the village. The stone construction of the symbolic hull of this boat is similar to the stone construction of Natar Fampompar. However, it has not been filled with soil to create a level surface for ceremonies, unlike the larger *natar*. In the middle of Natar Welempit, there is a relatively new concrete structure for holding springwater. Its markings suggest construction in 1979 (visible in Figure 2f). This water is used mostly for drinking and cooking, while people use rainwater or a nearby creek for washing. Like Natar Fampompar, Natar Welempit faces east toward the sea, but it is closer to the sea, about 30 m away (Figure 4). Natar Welempit is smaller than the Natar Fampompar, about 14 m long and 8 m in maximum width. The height of Natar Welempit varies due to its location on sloped terrain; the maximum height of the remaining blocks of the prow reach about 1.7 m. The interior space is covered with rough courses of stone blocks that create a stone platform above (see Figure 2f). There are no carvings on any part of Natar Welempit, including the prow.

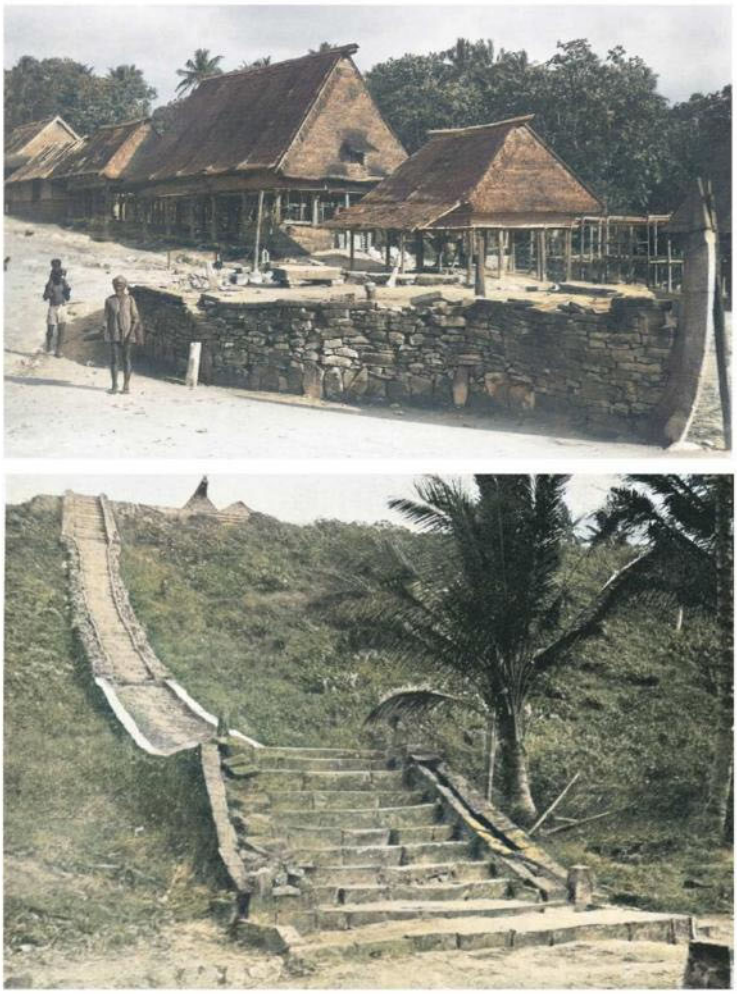

Figure 3. Historic images. The stone boat Natar Fampompar with its complete prow (above). The stone stairway (*titar*) at the spiritual entrance to the village of Sangliat Dol (below). Photos taken by Petrus Drabbe (1940) and colorized using Img2go.

Wesilai is an old well that provides a source of freshwater further inland (Figure 2c). This well is located near a creek surrounded by agricultural land. The people of Sangliat Dol, Amdasa, and Sangliat Krawain still use this water when they go farming or hunting. Next to the well, the villagers have built seating, a resting area, and a prayer nook holding a Virgin Mary statue.

The fourth cultural site located in the village of Sangliat Dol is Batkarat Keri, a sacred stone approximately 2.4 m high, just a few meters north of Natar Welempit (Figure 2e). When we visited in 2022, this site was overgrown with vines and tall grass. Pregnant women are forbidden by village elders from lingering around this site; otherwise, according to local lore, their offspring will be born deformed with their tongue sticking out.

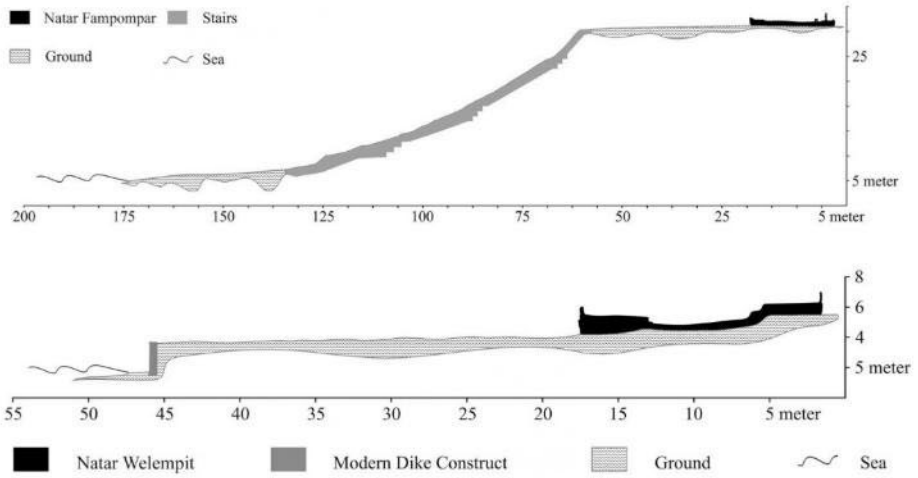

Figure 4. Elevation profiles of the two stone boat structures in the village of Sangliat Dol, showing distance to the shore. Top: Natar Fampompar is located in the center of the village, where it is the focus of culture and tradition. Bottom: Natar Welempit is located closer to the beach, at the freshwater source closest to the village.

The other three cultural sites are located uphill from the village on the peninsula, about 3 km south of Sangliat Dol and 1.5 km south of the old village site of Amdasa (Figures 1, 2b, d, and g). An abundance of shell and pottery fragments, likely remnants from past occupations, are scattered along the walking path to these sites. These sites are technically abandoned and surrounded by forest and agricultural land, and few people are familiar with the route today. To navigate this path, it was necessary for the village head to appoint a knowledgeable guide who regularly farms in the surrounding fields and is familiar with the area.

Tugu Seran is a memorial of past conflict among some villagers (Figure 2d). An inscription at the base of the memorial states "4 Juni 1919," presumably the time when the event took place. According to oral history, the conflict was about land ownership and caused blood to be shed. Any conflict during that time would have risked grim results, because headhunting was still a common practice in the region (Drabbe 1940). Tugu Seran is located near Weleyawar, which is believed to be one of the oldest wells in the area. The well is a stone structure built around a freshwater spring, located near a small creek (Figure 2b). This well is still actively used by those villagers going to farm their fields.

Nirunmas is the ruins of an old settlement. The local people believe that Nirunmas is their earliest settlement before it was moved to a different location, more than once, before the people of Nirunmas finally subdivided into the triumvirate: Sangliat Dol, Amdasa, and Sangliat Krawain. Similar to Sangliat Dol, Nirunmas is a hilltop settlement with a clear view of the coastal area. The main area consists of a level ground surface that measures approximately 10 by 10 m surrounded by the occasional ruins of rock structures of varying sizes (Figure 2g). The level ground surface is assumed by local Sangliat Dol elders to be the village square that once had a similar

function to the Natar Fampompar in Sangliat Dol, while the houses were built nearby. A few meters away from the level ground surface, there are stacked layers of natural and modified stone blocks, possibly collapsed, that may have formed part of a former entranceway or fortification. The ruins mostly are overgrown with trees and other vegetation. There are a few angular boulders with flat, horizontal surfaces on the site, one engraved with a depiction of two boats. Both boats are represented by thin engraved outlines of simple hulls (Figure 5). One includes a mast, and the other has a number of pecked depressions within and below the hull. Unfortunately, most traditional buildings in Tanimbar, including forts, were made of wood, so structures are unlikely to be preserved (de Vries 1900, 494; Schapper 2019). However, this site has potential for future archaeological excavations to investigate further the oral histories of Sangliat Dol as well as settlement patterns in the Tanimbars more generally.

Natar and the Maritime Cosmology of Sangliat Dol

Natar Usage and Sangliat Dol Settlement Patterns

In the past, boats and voyaging played a crucial role in the lives of Tanimbarese people, serving as their primary mode of transportation. While the main island of Yamdena now has a modest road network and motor vehicles are increasingly abundant, interisland connections for most people in Maluku today continue to rely heavily on maritime transportation (HAFK, personal observation). The traditional boats of Tanimbar are characterized by distinctive features, including removable carved prows and stern boards (McKinnon 1988). However, beyond their practical use, boats hold significant ritual importance. In the past, specific boat types were crafted for ceremonial purposes, such as alliance renewals, warfare, and interisland trade. The noteworthy outrigger class of boats, featuring the large dugout canoe, is known for both sailing and rowing. Carved from a single tree trunk, these canoes, adorned with decorative prow boards, were once widespread but are now uncommon in the Tanimbar Islands (McKinnon 1988).

Figure 5. Boat petroglyphs engraved on the horizontal surfaces of large stone blocks in the ruins of the old settlement of Nirunmas. Both boats have simple engraved hulls. The boat on the left has peck marks nucleated within and near the hull. The boat on the right has an engraved mast.

The prows of Tanimbar traditional boats are often adorned with figureheads representing diverse maritime traditions. These embellishments typically carry symbolic meanings related to the boat's purpose, history, or cultural identity, representing concepts such as protection, navigation, or elements of the boat owner's beliefs (Neich 1984; Waite 2000). The design usually reflects the cultural identity and traditions of the boat owner or community, serving as a visible representation of their heritage and values. They also play a role in ceremonies or rituals, further emphasizing their significance (McKinnon 1988; Riedel 1886, 289–290).

Despite any known record of when the Natar Fampompar in Sangliat Dol was built, the location of a stone platform in the center of the village is known to be common in many Tanimbar villages. These stone platforms symbolize the unification of dispersed groups into a single village, providing a space for ceremony, ritual, and meetings among clan representatives. The stone platforms are known as *natar* in Yamdena and *didalan* in Fordata (McKinnon 1991, 68). In 1839, Captain Owen Stanley narrated his encounter with a similar stone platform when he visited Olilit, another village on the east coast of Yamdena Island less than 35 km south of Sangliat Dol (Stokes 1846, 459):

> … there was a circular space marked out by a row of stones placed on the ground, and which appeared to be set aside for religious purposes, as they seemed unwilling we should set foot within it. Here the natives soon afterwards assembled in considerable numbers, and were for some time engaged in serious discussion.

While these stone platforms are always viewed and understood symbolically as a boat, some villages, including Sangliat Dol and Arui Bab, have taken this symbolism a step further, building a stone boat (*natar sori*) structure with an ornamented stern and prow (McKinnon 1991, 68). Today, *natar* in most villages are abandoned. People use government offices to conduct their community meetings, while ritual and ceremonial events are more commonly celebrated at the public spaces in front of the local church.

At the time when Christianity was introduced, Tanimbarese recognized their own transcendent deity. While the majority of the population have now converted to Christianity, some still follow and acknowledge this earlier faith. This god is addressed by many names such as *Mele* (Noble One), *Ratu*, *Ratu das*, or *Ratu-desar* (Supreme Lord) in Yamdena or *Ubila'a* (Supreme Ancestor) in Fordata (Drabbe 1940; McKinnon 1991, 42–45; Pangemanan 2014, 201). This pre-existing belief made the idea of the Christian god introduced by missionaries in 1910 (Pangemanan 2014) more easily accepted by the Tanimbar peoples. Sangliat Dol has had a Christian church since at least 1927 (Pangemanan 2014, 178). Like most villages on the island today, religious ceremonies are held in the church. However, unlike other villages who moved their ritual centers to the church, the people of Sangliat Dol still use the Natar Fampompar for this purpose.

Currently, Natar Fampompar is used mainly for important meetings among the village representatives, such as the election of the village head or the opening of new agricultural land. There are four big *soa* (clans) in Sangliat Dol, and each *soa* representative has their own seat on the Natar Fampompar (Figure 6). Each *soa* consists of one or more *matarumah* (house/kinship group). Soa Aryesam has five *matarumah*: Aryesam, Luturmase, Sainlolin, Koisine, and Angwarmase. Soa Masriat has three: Buksaluembun, Naralyawan, and Sainyakit. *Soa* Buwariyat has nine: Sorlury, Lamere,

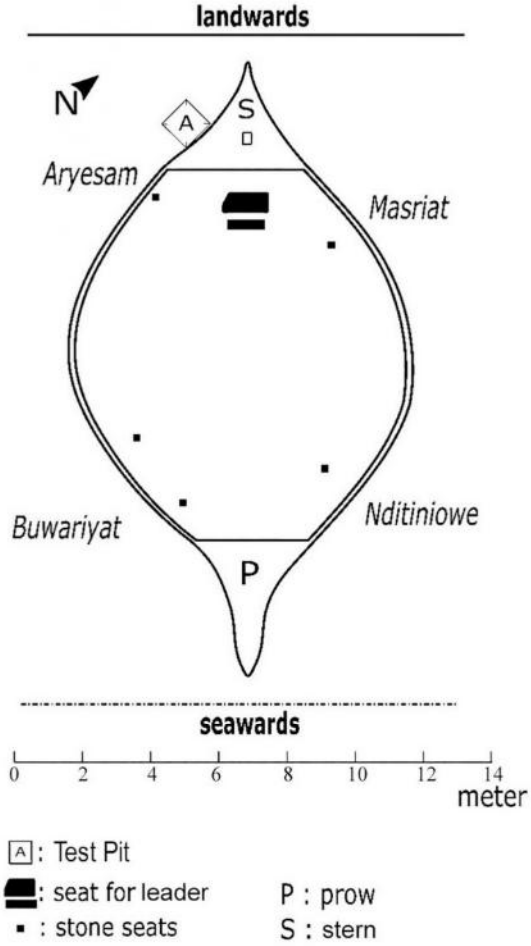

Figure 6. Plan of the Natar Fampompar. Each stone seat is labeled with the name of the *soa* (clan) whose representative sits there during village meetings and ceremonies.

Buarnirun, Fenanlampir, Batviyan, Ratuanak, Takndarlere, Ngilawane, and Batmanlusy. Last, Soa Nditiniowe only has one *matarumah,* which is Ayowembun, who are believed to be the first house to have settled in Sangliat Dol.

Each *soa* is designated their own roles and responsibilities in community social organization and ceremonies. The Aryesam clan holds the position of sacrificer, the Masriat clan is the traditional landowner, the Buwariyat clan holds the position of the speaker (*pembicara besar*), and the Nditiniowe clan holds the position of the herald (*pembicara kecil*). Traditionally, the herald is considered the "father" (*bapa*) of the village for community affairs, such as warfare. The sacrificer, on the other hand, is the "mother" (*mama*) who takes care of internal affairs when most people are at sea (see also de Jonge and van Dijk 1995, 76–78). The maritime cosmology is deeply implicated in family identities, as well. For instance, the family name Sorlury is

derived from the word *sori luri* which means the bow of the boat, and the family name Buarnirun is from *buar nire* meaning lots of big fish. However, despite the proximity of the village to the coast, most people in Sangliat Dol are currently farmers and only a few are still engaged with fishing as a livelihood. Today, fishing is considered too dangerous and uncertain, and so it is only performed by younger village members. Additionally, the closest large market where villagers can sell their fresh fish is in Saumlaki more than 45 km away, which is problematic for such perishable goods.

Generally, there are three significant positions with titles in the modern village hierarchy in Tanimbar, the *kepala desa* (village head) who is the elected representative for modern governance, *kepala adat* (traditional lore keeper) whose family are the custodians of traditional knowledge, oral histories, and law, and the *tuan tanah* (traditional landowner) whose family traditionally own the lands around the village. The term *tuan tanah* does not imply that a house (*matarumah*) has direct ownership of the land and the ability to sell it, but rather signifies its ritual authority and rights over a particular piece of land.

In Sangliat Dol, the *kepala desa* position is currently held by the Sorlury family. The election for *kepala desa* is conducted every six years, and a person can be elected a maximum of three times. The *kepala adat* position is held by the Ayowembun family. There is no fixed period for how long a person can be in this position; a new person often is appointed when the previous one is deceased or too old, and they can be from any family or clan. On the other hand, the *tuan tanah* is and always will be from the Masriat family. This position is inherited through generations and mostly passed onto a male family member.

The Yamdenan term for *tuan tanah* is *pnuwe nduan*, also commonly known as *riribun rerengyar*, signifying "the one who owns a seat in a war canoe or party boat." This terminology, *pnuwe nduan* as *riribun rerengyar*, underscores the maritime integration with the village, which revolves around the *natar*. Foreign visitors who wish to conduct any activity in the *natar* must have permission from the *tuan tanah* and perform a ritual involving *sopi*, betel nut, and tobacco. *Tuan tanah* also holds the authority to guide the village's relocation in case of necessity, determine house locations for newcomers, and lead welcoming ceremonies for intervillage marriages.

The position of each clan's seat within Natar Fampompar is representative of the settlement pattern of the village (Figure 6). The Natar Fampompar faces the sea (eastward), and the houses face the Natar. The houses are aligned with the prow of the *Natar* Fampompar and with the *titar* stairway that serves as the spiritual entrance to the village. The Aryesam clan's seat within Natar Fampompar is located on the starboard (right) side off the stern (rear), and their clan's houses are built on the right side of the village, away from the coast. On the opposite side of the Aryesam clan, the Masriat clan's seat within Natar Fampompar is located on the port (left) side of the stern, and their houses are built on the left side of the village, away from the coast. Similarly, Buwariyat and Nditiniowe places are located respectively on the right and left sides of the village and the Natar, to the front, closer to the coast.

Tanimbarese traditional houses are commonly regarded as representations of boats on land, with their inhabitants metaphorically considered as the crew. Many of the old houses have been renovated but the main plan of the house remains the same (see de Jonge and van Dijk 1995, 72, Figure 5.2; McKinnon 1991, 86, Figure 5.1). Their

structural components are akin to various parts of a vessel, including the keel, mast, sail, and rudder (Manguin 1986, 190). The architecture resembles sizable vessels, their fronts oriented toward the sea. The pointed gable ornaments on both sides facing the sea and land are called *kore*, the identical term used for the beautifully carved frontal panels attached to boats and the stone boat (de Jonge and van Dijk 1995, 74).

Natar Fampompar is frequently used for clan meetings, marriages, funerals, and welcoming ceremonies (Figure 7). In marriages, if the husband or wife of the couple is from outside of the village, he or she will have to walk on the st*airs* of the *titar* through the entrance as a symbol of entry and becoming part of the village. During a funeral, the villagers will carry the coffin from the house of the deceased past Nat*ar* Fampompar and then to the cemetery as a form of respect for their ancestors. Usually, marriage and funeral ceremonies also involve the church, and the local priest typically is present during the ceremonies involving the Natar Fampompar. Welcoming ceremonies are often performed at the Natar when visitors from the government and their representative officers come to the village. Guests are seated around the prow while the village representatives sit in their traditionally designated places.

Before the advent of Christianity, traditional funerary practices in Tanimbar also exhibited profound maritime symbolism. While the inhabitants of the Leti Islands, as well as Luang and Sermata islands, were laid to rest in a fetal position, wrapped in linen fabric, and placed directly in the ground (in Kisar and Romang islands, this often occurred within houses), those in the Tanimbar and Babar islands were placed in coffins resembling canoes. These special coffins were occasionally positioned on platforms near the seashore or in trees, later transferred to rocky locations or buried (Perry 1914; van Hoëvell 1890b, 207). Their burial treatment exhibited distinctions based on social status. Regular individuals were laid to rest in canoe-coffins with their

Figure 7. (a) Marriage, (b) funeral, and (c) welcoming ceremonies at the Natar Fampompar and *titar* stairway of Sangliat Dol. In addition to the *kepala desa* (village head), *kepala adat* (traditional lore keeper), and *tuan tanah* (traditional landowner), the local Catholic priest often is involved in these ceremonies. Photo credits: Herman Koisine (a and c) and Hendri Kaharudin (b).

heads facing east, while chiefs and other notable people received a more prestigious burial on platforms, aligning the canoe in the same direction. This nuanced approach underscores two categories of individuals with differing forms of disposal and orientations (Jacobsen 1896, 209; Riedel 1886, 306; van Doren 1863, 85).

The belief in an afterlife on Nitu Island in the western Tanimbars emphasizes the cultural significance of westward movement for the deceased (Riedel 1886, 281; van Hoëvell 1890b, 208). The association of boats with burial practices is evident in numerous Austronesian communities across the islands of Southeast Asia. The orientation of the deceased often serves as a symbol indicating the direction in which the soul is believed to be traveling (Perry 1914). In this context, the boat functions as a vessel transporting the departed soul across bodies of water to the realm of the dead. This land of the dead is frequently situated on a small island, sometimes upstream, downstream, or in a transcendent location (Valientes 2019).

The significance of boats in Tanimbar culture is also evident in their traditional dances. The *Tnabar Ila'a* (or "great stomp") is a performance that symbolizes the importance of boats in ancestral migration narratives. This dance is often performed inside or in front of *natar*. During this dance, a large, open, boat-shaped circle is formed by men and women, and it is exclusively showcased during significant events such as royal coronations, village inaugurations, inter-village alliances, and gatherings promoting peace and unity. Within the circle, drummers play a variety of drums, including the "front drums" (*tival ulu*) and "back drums" (*tival muri*), alongside a large three-legged drum (*nfeffik babat*). Positioned at the back, the lead singer (*kuat*) guides the rhythm, while some formations incorporate four or more women mimicking the flight of noble frigate birds, with their arms extended. In the middle, community leaders act as captains, steering the symbolic village boat and ensuring a steady course (Kartomi 1994; McKinnon 1988; 1991, 75–76).

Traditional Attire

Aspects of the traditional clothing of Sangliat Dol villages reflect their close relationship to the sea and maritime culture. In particular, the motifs used in Tanimbarese woven cloth (*ikat*) often depict a fish pattern or related fishing activity. For instance, the *wulan lihir* (crescent moon) pattern is associated with the ideal time to go fishing and reef gleaning (Balik and Hetharie 2022). Additionally, nassa shells (Nassariidae) are often sewn onto the woven cloth as additional decoration (Figure 8). Both males and females can wear these woven cloths, usually as part of the body garment but men also often wear them as headdress (*indar*). Despite these associations, Tanimbar is one of the few places in eastern Indonesia where woven cloth shares just a minimal relation to customs and beliefs. This lack of a strong interconnection between cloth and cultural beliefs is perhaps because Tanimbarese only developed their weaving culture at the end of the nineteenth century (ten Hoopen 2022). Previously, cloth was imported from Timor, Kisar, and the surrounding islands. Only people who traveled to these islands had access to woven cloth, while everyone else wore clothing made of beaten tree bark (van Vuuren 2009; ten Hoopen 2022).

Figure 8. Nassa shells (Nassariidae) sewn onto traditional woven cloth made by Sangliat Dol villagers. Items from the private collection of Mr. Hironimus Ayowembun, Sangliat Dol.

Different types of shells are used to make jewelry. Cowrie shells (*Ovula ovum*) are typically used as a necklace (*wangpar*) with wire and bamboo used to make the main frame of the necklace, bound with string, with the shells tied on top (Figure 9a). Sometimes processed *kima* (*Tridacna* spp.) fragments also are used for decoration (Drabbe 1940). Conch shell (usually *Conus*) is the most common shell used for armbands (Figure 9b–d), which are sometimes decorated with lines and other geometric patterns. Shell armbands are typically worn by women, whereas men prefer tusk armbands, the value of which increases with their length (McKinnon 1991, 171). Elephant tusks, on the other hand, are even more precious and are often used as trading items (Sutherland 2021, 373).

The metal jewelry worn in Tanimbar also reflects their interaction with the surrounding island groups (Figure 10), with many types including gold and silver. Drabbe (1940, 112) described the goldsmith work in Tanimbar at length, but this craft had almost vanished entirely by the 1970s (McKinnon 1991, 181), with high quality gold pendants and earrings mostly imported from the surrounding islands (e.g. Kisar and Luang). The earrings were usually made by casting, instead of forging, using coins as raw materials. Unfortunately, there is no information as to what coins they were using (de Jonge and van Dijk 1995, 113). *Lelbutir* is one of few native earrings from Tanimbar (Figure 10a,b), and shares many similarities with Babar and Luang jewelry in both the shape and production techniques (de Jonge and van Dijk 1995, 114). Traditionally, different styles of jewelry were worn by men (Figure 10a,b) and women (Figure 10c–h).

Figure 9. (a) Shell collar and (b, c, and d) shell armbands. Collars are usually worn by men, and armbands are usually worn by women. Items from the private collection of Mr. Hironimus Ayowembun, Sangliat Dol.

Cultural Sediments and Site Engravings

A 1 × 1 m test pit was opened outside the west wall of Natar Fampompar's stern, at the request of the local council (see Figure 6 for location of test pit). Unfortunately, the upper layers of the site have been disturbed. The ground surface around Natar Fampompar is currently covered by 7 cm thick concrete pavers. Below the pavers, there is a layer of approximately 5 cm of beach sand which was presumably brought in by the villagers to level the site in preparation for the pavement construction. The original sediments below this sand consist of limestone clay. After 25 cm of excavation, only a single fragment of Chinese ceramic was recovered in this otherwise sterile deposit. The excavation was then abandoned due to no further indications of cultural materials below. This small excavation, however, does confirm that Natar Fampompar was built directly on the ground surface with no evidence for any underlying structures. The lack of cultural deposits below the 10 cm of disturbed topsoil surrounding Natar Fampompar supports the oral history that the stone structure was built when the village was established, not at a later date on top of subsequent settlements. Unfortunately, the only possible way to determine the age of Natar Fampompar would be by excavating the inner fill of the structure and recovering material suitable for dating. This would provide an age for the materials used as filling during original construction, and thus a maximum date for Natar Fampompar. However, such an excavation inside Natar Fampompar is not permitted due to its sacred status.

Figure 10. Tanimbar traditional metal jewelry worn by Tanimbarese men (a and b) and women (c-h). Items from the private collection of Mr. Herman Koisine, Sangliat Dol.

The engravings on Natar Fampompar are now heavily weathered, but distinctive patterns can still be seen. The prow is the only part of Natar Fampompar where rich scrollwork and complex geometric engravings were observed (Figure 11a). Otherwise, most of the stone blocks that comprise the Natar Fampompar are plain, although a few have engravings. One of the stone blocks has a bird/chicken engraving (Figure 11b) while the majority are geometric (Figure 11c) and patterns of nucleated peck marks (Figure 11d-e). Similarly, the majority of the *titar* stairway is comprised of plain stone slabs, although some stringer capstones exhibit geometric patterns (Figure 11f). One of the tread stones in the upper half of the *titar* bears an engraving on its vertical surface depicting two hands and arms with linear patterns on the forearms (Figure 11g).

The geometric, bird, fish, and anthropomorphic patterns featured in the Natar Fampompar and *titar* complex (Figure 11 and Figure 12), as well as the boat-shaped depictions in the old settlement of Nirunmas (Figure 5), are widespread motifs within Austronesian-influenced communities. These motifs manifest not only in engravings and painted rock art but also on various wooden and bronze artifacts (Calo 2014; de O'Connor et al. 2018c, 2023; Ruyter et al. 2023). Boats are one of the most commonly

Figure 11. Engravings on the Natar Fampompar (a-e) and the stone stairway of Sangliat Dol (f and g).

occurring motifs in the engraved art of the Wallacean islands occurring from Flores in the west and in the Lesser Sunda Islands (Malonda 2020; O'Connor et al. 2018c; Verhoeven 1956, 1079). Many of these engraving panels also feature peck marks and designs made up of nucleated peck marks (Malonda 2020; O'Connor et al. 2018c).

The boats originating from Tanimbar and Kei showcase distinct carved prow and stern boards, while those from Aru boast animal or fish ornaments on the stern (de Jonge and van Dijk 1995, 70; Geurtjens 1921, 311). The prows of Tanimbarese boats exhibit intricate open fretwork dominated by double S-shaped spirals and single spirals, which are characteristic of Tanimbarese sculpture, like the Natar Fampompar prow (see Figure 12). This distinctive asymmetrical pattern, featuring three-grouped single spirals, creates a captivating wave-like effect, as observed on their carved prow boards in traditional boat designs (McKinnon 1988; de Ruyter et al. 2023). Carvings of resplendent roosters and sharks on these prow boards convey symbolic energy,

Figure 12. The prow, or *pamaru*, of the stone boat Natar Fampompar. The top blocks of the prow were stolen in 2002. Photo credit: David Leffman, 1998.

evoking images of nobility, wealth, power, and the intensity of a cockfight. These prow boards serve ritual purposes, describing the world's creation and the origin of villages with stone boat ritual centers, as recounted in Tanimbarese narratives. These narratives reveal an undifferentiated world shrouded in darkness until the creation of stone boats marks a transformative moment (McKinnon 1988).

Conservation Issue: Stolen and Sold

Many of the cultural artifacts of Sangliat Dol such as gold and silver pendants, shell jewelry, tusk armbands, and carved wooden statues have been either stolen or sold to foreigner collectors. A few artifacts are kept by families and stored in their traditional houses; among them are elephant tusk, wood carvings of the village plan, and some glazed Martaban storage jars. Old portraits taken by Drabbe (1940, fig. 110) show that there used to be wooden figurines on the *titar* stairway. The local people of Sangliat Dol report that they were stolen and presumably sold several years ago. A significant number of Tanimbarese artifacts and wood carvings can be found in museums or art exhibitions around the world, with the Tanimbares carving skill recognized throughout history. Forbes (1884, 19) once stated:

> Of the intellectual characteristics of the Timor-Laut people I have formed no mean opinion. They are very clever carvers of wood and ivory; the "frame-heads" of their prahus especially

> attract attention by the elegance of the devices and the excellence of the workmanship. The central pillars in their houses are also most elaborately carved. They are intelligent workmen, and quick at understanding.

The most precious lost artifacts from Sangliat Dol are the blocks from the prow of Natar Fampompar, known as the *pamaru* (Figure 12). The *pamaru* exhibited extensive engravings, featuring intricate scrollwork, and depictions of fish alongside geometric motifs (de Jonge and van Dijk 1995). According to Sangliat Dol villagers, the top blocks of the *pamaru* were stolen in 2002, initiating continuous efforts to reclaim them. As the *pamaru* is considered to be the soul of the village and holds profound importance in the lives of the people of Sangliat Dol, the entire community was deeply affected by its theft, and they remain hopeful for its eventual return. Despite reporting the theft to local police and government officials, the case remains unresolved to this day.

Currently, Sangliat Dol is officially recognized as a tourist village in the Tourism Area Development Plan of the Tanimbar Islands Regency (Ayowembun, Herlambang, and Santoso 2021). The village warmly welcomes both local and international tourists, occasionally hosting cruise ships that anchor on the east coast. The villagers enthusiastically offer guided tours, showcasing *natar* and traditional houses while donning their traditional attire. They extend a warm welcome with *Tnabar Ila'a* dancing. Some residents have embraced tourism by developing handicrafts, creating opportunities to sell their products to visitors. As tourism flourishes, there is a noticeable increase in local awareness and appreciation of cultural heritage.

Sangliat Dol village officials are attempting to register their *natar* as a national heritage site. In doing so, they hope the Indonesian government will give greater attention to their attempts to recover the *pamaru*, as well as their continued conservation efforts in general. In recent years, the Indonesian government has provided Tanimbar villages with funds for financing community development and empowerment, aimed at improving the quality of life of rural communities and alleviating poverty. Some of these funds received by Sangliat Dol village are used for maintenance, conservation, and construction of tourist facilities at their *natar* complex.

Conclusions

The Tanimbar island group exhibits a profound traditional connection with the sea, as evidenced by ethnographic sources, material culture, and oral histories. Maritime symbolism permeates the spiritual, cultural, and daily lives of the Tanimbarese. Sangliat Dol stands out as one of the few villages in the Tanimbar Islands that has preserved both its traditional cultural sites and the associated practices, making it a unique location for ethnographic enquiry. The cultural sites remaining in Sangliat Dol include the old settlement (Nirunmas), old wells (Weleyawar and Wesilai), a memorial monument (Tugu Seran), a sacred stone (Batkarat Keri), and two stone boat structures (Natar Fampompar and Natar Welempit). Among these, Natar Fampompar is notably the last structure actively utilized for daily activities, meetings, and ceremonial events.

As one of the last practicing maritime societies in Tanimbar, Sangliat Dol is also facing a conservation issue where many of their artifacts have been stolen and/or sold to foreign collectors. The most precious was the top of the *pamaru*, the prow of their Natar

Fampompar, stolen in 2002. The people of Sangliat Dol are still hoping that their *pamaru* will be located and returned to them.

Acknowledgements

Thanks to David Leffman for granting permission to include his photo of the *pamaru*. We are grateful to Yongky Souisa for assisting us and providing local guidance during our transit in Saumlaki. We also thank Cornelis Sorlury (Kepala Desa), Hironimus Ayowembun (Ketua Adat), Stephanus Masriat (Tuan Tanah), Herman Yoseph Koisine (caretaker of Natar Fampompar), and all the villagers of Sangliat Dol for their help and welcome during our stay. Lastly, thank you to the editor and anonymous reviewers for their valuable comments for improving this manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research is funded by the ARC Centre of Excellence for Australian Biodiversity and Heritage (CE170100015) awarded to SO, 2022 Rhys Jones Fieldwork Award and ANU School of Culture, History and Language HDR research funding awarded to HAFK.

Notes on contributors

Hendri A. F. Kaharudin is a PhD candidate at Australian National University. His research is focused on the maritime subsistence strategies of people in the Indo-Pacific during the Pleistocene and Holocene.

Gilar Wicaksono is a researcher at RIJANG Research Indonesia. He completed his BA at the Universitas Gadjah Mada and is involved in prehistoric and Hindu-Buddhism research and cultural heritage activities in Indonesia.

Fairuz Azis is a researcher at RIJANG Research Indonesia. He finished his BA at the Universitas Gadjah Mada. He is involved in prehistoric underwater archaeological research and conservation projects.

Shimona Kealy is a postdoctoral researcher at Australian National University whose research focuses on the prehistory of Island Southeast Asia. She is particularly interested in early human arrival and movements throughout the Wallacean Archipelago.

Devi M. Sari is Masters student at Universitas Gadjah Mada whose current research is focused on prehistoric archaeology in West Java. She has expertise in the analysis of mollusk remains and artifacts.

Marlon N. R. Ririmasse is the head of the Research Center for Environmental Archaeology, Maritime Archaeology, and Cultural Sustainability of the National Research and Innovation Agency in Indonesia. He has been involved in diverse archaeological research projects, especially in eastern Indonesia.

Sue O'Connor is a Distinguished Professor at Australian National University. She currently is conducting major archaeological research projects in Indonesia and Timor-Leste investigating the earliest evidence for human settlement along potential pathways through Wallacea.

References

Ayowembun, Edoardus, Suryono Herlambang, and Jo Santoso. 2021. "Studi Potensi Wisata Cagar Budaya Desa Sangliat Dol." *Jurnal Stupa* 3 (2): 3261–3276.

Badan Pusat Statistik (BPS). 2023. *Kabupaten Kepulauan Tanimbar dalam Angka 2023*. Saumlaki: Badan Pusat Statistik Kabupaten Kepulauan Tanimbar.

Balik, Agustina, and Yosia Hetharie. 2022. "Strengthening and Utilizing Original Tanimbar Woven Fabric as a Form of Preservation of Traditional Cultural Expression." *SASI* 28 (1): 1–11. https://doi.org/10.47268/sasi.v28i1.678.

Ballard, Chris. 1992. "Painted Rock Art Sites in Western Melanesia: Locational Evidence for an 'Austronesian' Tradition." In *In State of the Art: Regional Rock Art Studies in Australia and Melanesia, AURA Occasional Publication Number 6*, edited by Jo McDonald and Ivan P. Haskovec, 94–106. Melbourne: Australian Rock Art Research Association.

Ballard, Chris, Richard Bradley, Lise Nordenborg Myhre, and Meredith Wilson. 2004. "The Ship as Symbol in the Prehistory of Scandinavia and Southeast Asia." *World Archaeology* 35 (3): 385–403. https://doi.org/10.1080/0043824042000185784.

Bird, Michael I, Scott A. Condie, Sue O'Connor, Damien O'Grady, Christian Reepmeyer, Sean Ulm, Mojca Zega, et al. 2019. "Early Human Settlement of Sahul Was Not an Accident." *Scientific Reports* 9 (1): 1–10. https://doi.org/10.1038/s41598-018-37186-2.

Boomgaard, Peter. 2003. "Smallpox, Vaccination, and the Pax Neerlandica: Indonesia, 1550-1930." *Bijdragen Tot De Taal-, Land- En Volkenkunde* 159 (4): 590–617. https://doi.org/10.1163/22134379-90003743.

Brockwell, Sally, Andrew McWilliam, Shimona Kealy, Mirani Litster, Sam Cooling, Stuart Hawkins, Michelle C Langley, et al. 2023. "New Archaeological Discoveries in North-Central Timor-Leste Indicate Sociocultural Adaptations to Landscape Change During the Holocene." *The Journal of Island and Coastal Archaeology*, 1–34. https://doi.org/10.1080/15564894.2023.2248590

Calo, Ambra. 2014. *Trails of Bronze Drums across Early Southeast Asia: Exchange Routes and Connected Cultural Spheres.* Pasir Panjang: ISEAS.

De Faria y Sousa, Manuel. 1695. *The Portuguese Asia: Or, the History of the Discovery and Conquest of India by the Portuguese.* Translated into English by John Stevens. London: C. Brome.

Doren, Jan Baptist Josef van. 1863. "De Tenimbar-eilanden." *Bijdr. Taal-, Land-Volkenk* 2:61–101.

Drabbe, Petrus. 1926a. *Spraakkunst der Fordaatsche Taal.* Verhandelingen Bataviaasch Genootschap, Vol. 67. Weltevreden and Gravenhage: Albrecht and Martinus Nijhoff.

Drabbe, Petrus. 1926b. *Spraakkunst der Jamdeensche Taal.* Verhandelingen Bataviaasch Genootschap, Vol. 67. Weltevreden and Gravenhage: Albrecht and Martinus Nijhoff.

Drabbe, Petrus. 1932a. *Beknopte Spraakkunst en Korte Woordenlijst der Slaroeëesche Taal.* Verhandelingen Bataviaasch Genootschap, Vol. 71. Weltevreden and Gravenhage: Albrecht and Martinus Nijhoff.

Drabbe, Petrus. 1932b. *Woordenboek der Fordaatsche taal.* Verhandelingen Bataviaasch Genootschap, Vol. 71, *Part* 2. Weltevreden and Gravenhage: Albrecht and Martinus Nijhoff.

Drabbe, Petrus. 1940. *Het Leven van den Tanembarees: Ethnografische Studie over het Tanembareesche Volk*. Verhandelingen Bataviaasch Genootschap, Vol. 71, *Part* 2. Leiden: E. J. Brill.

Duli, Akin. 2013. "The Mandu Coffin: A Boat Symbol of Ancestral Spirits among the Enrekang People of South Sulawesi." *RIMA: Review of Indonesian and Malaysian Affairs* 47 (1): 115–138.

Eijbergen, H. C. van. 1864. "Aanteekeningen der Verrigtingen van den Ambtenaar ter Beschikking van den Gouverneur der Moluksche Eilanden Belast met Eene Zending naar de Zuidwester-Eilanden, bij Besluit van den 10 den Mei jl. no 4." *Bijdragen tot de Taal-, Land- en Volkenkunde van Nederlandsch-Indië* 12:129–196. https://doi.org/10.1163/22134379-90000943

Ellen, Roy. 2003. *On the Edge of the Banda Zone.* Honolulu: University of Hawai'i Press.

Forbes, Henry Ogg. 1884. "On the Ethnology of Timor-Laut." *The Journal of the Anthropological Institute of Great Britain and Ireland* 13:8–31. https://doi.org/10.2307/2841996.

Forbes, Henry Ogg. 1885. *A Naturalist's Wanderings in the Eastern Archipelago: A Narrative of Travel and Exploration from 1878 to 1883.* London: Low, Marston, Searle & Rivington.

Geurtjens, P. H. 1921. *Uit een Vreemde Wereld of het Leven en Striven der Inlanders op de Kei-eilanden.* Hertogenbosch: Teulings.

Goudswaard, A. 1863. *De Papoewa's van de Geelvinkbaai.* Schiedam: H.M.A. Roelants.

Groeneveldt, Willem Pieter. 1960. *Historical Notes on Indonesia and Malaya Compiled from Chinese Sources.* Jakarta: Bhratara.

Handoko, Wuri, Godlief Arsthen Peseletehaha, Andrew Huwae, and Tofan Gayum Rumaf. 2018. "Kaimear Island Rock Art Site at Kur Island in West Kei Islands Region, a New Discovery in Eastern Indonesia." *Kapata Arkeologi* 14 (2): 123–134. https://doi.org/10.24832/kapata.v14i2.531.

Hoëvell, G.W.W.C. Baron van. 1890a. "Tanimbar en Timor-Laut-Eilanden." In *Tijdschrift voor Indische Taal-, Land- en Volkenkunde*, edited by J. Brandes and J. H. Abendanon, *Part 33*, 160–186. Batavia: Albrecht & Rusche.

Hoëvell, G.W.W.C. Baron van. 1890b. "Leti Eilanden." In *Tijdschrift voor Indische Taal-, Land- en Volkenkunde*, edited by J. Brandes and J. H. Abendanon, *Part 33*, 200–232. Batavia: Albrecht & Rusche.

Hoopen, Peter ten. 2022. *Ikat from Timor and Its Outer Islands: Insular and Interwoven.* Leiden: Sidestone Press.

Jacobsen, Johan Adrian. 1896. *Reise in die Inselwelt des Banda-Meeres.* Berlin: Mitscher und Röstell.

Jonge, Nico de, and Toss van Dijk. 1995. *Forgotten Islands of Indonesia: The Art and Culture of the Southeast Moluccas.* Leiden: Periplus.

Kaharudin, Hendri A.F, Mahirta, Shimona Kealy, Stuart Hawkins, Clara Boulanger, and Sue O'Connor. 2019. "Human Foraging Responses to Climate Change: Here Sorot Entapa Rockshelter on Kisar Island." *Wacana* 20 (3): 525–559. https://doi.org/10.17510/wacana.v20i3.783.

Kaharudin, Hendri A.F, Sue O'Connor, Shimona Kealy, and Marlon N. Ririmasse. 2024a. "Islands on the Edge: 42,000-Year-Old Occupation of the Tanimbar Islands and Its Implications for the Sunda-Sahul Early Human Migration Discourse." *Quaternary Science Reviews* 338:108834. https://doi.org/10.1016/j.quascirev.2024.108834.

Kaharudin, Hendri A.F., Sue O'Connor, Andreas Kroh, and Shimona Kealy. 2024b. "Staple or Delicacy: Sea Urchin Exploitation Over the Last 40,000 Years at Makpan Cave, Alor Island." *The Journal of Island and Coastal Archaeology*, 1–28. https://doi.org/10.1080/15564894.2024.2324308

Kartomi, Margaret J. 1994. "Is Maluku Still Musicological Terra Incognita? An Overview of the Music-Cultures of the Province of Maluku." *Journal of Southeast Asian Studies* 25 (1): 141–171. https://doi.org/10.1017/S0022463400006718.

Kealy, Shimona, Julien Louys, and Sue O'Connor. 2018. "Least-Cost Pathway Models Indicate Northern Human Dispersal from Sunda to Sahul." *Journal of Human Evolution* 125:59–70. https://doi.org/10.1016/j.jhevol.2018.10.003.

Kealy, Shimona, Sue O'Connor, Mahirta, Devi Mustika Sari, Ceri Shipton, Michelle C. Langley, Clara Boulanger, et al. 2020. "Forty-Thousand Years of Maritime Subsistence near a Changing Shoreline on Alor Island (Indonesia)." *Quaternary Science Reviews* 249:106599. https://doi.org/10.1016/j.quascirev.2020.106599.

Kolff, Dirk Hendrik. 1840. *Voyages of the Dutch Brig of War Dourga: Through the Southern and Little-Known Parts of the Moluccan Archipelago, and along the Previously Unknown Southern Coast of New Guinea, Performed during the Years 1825 and 1826.* Translated into English by G.W. Earl. London: J. Madden.

Lape, Peter V. 2006. "Chronology of Fortified Settlements in East Timor." *Journal of Island & Coastal Archaeology* 1 (2): 285–297. https://doi.org/10.1080/15564890600939409.

Lape, Peter V., Sue O'Connor, and Nick Burningham. 2007. "Rock Art: A Potential Source of Information About Past Maritime Technology in the Southeast Asia-Pacific Region." *International Journal of Nautical Archaeology* 36 (2): 238–253. https://doi.org/10.1111/j.1095-9270.2006.00135.x.

Malonda, Jofel Eliezer. 2020. "*Pahatan Cadas Situs Liang Pu'en Kabupaten Lembata, Nusa Tenggara Timur*." Undergraduate thesis. Fakultas Ilmu Budaya, Universitas Udayana.

Manguin, Pierre-Yves. 1986. "Shipshape Societies: Boat Symbolism and Political Systems in Insular Southeast Asia." In *In Southeast Asia in the 9th to 14th Centuries*, edited by David G. Marr and A. C. Milner, 187–213. Singapore: Institute of Southeast Asian Studies and Research School of Pacific Studies, Australian National University.

McKinnon, Susan. 1988. "Tanimbar Boats." In *In Islands and Ancestors: Indigenous Styles of Southeast Asia*, edited by Jean Paul Barbier and Douglas Newton, 152–169. Munich: Prestel-Verlag.

McKinnon, Susan. 1991. *From a Shattered Sun: Hierarchy, Gender, and Alliance in the Tanimbar Islands.* Madison: University of Wisconsin Press.

Meilink-Roelofsz, Marie Antoinette Petronella. 1962. *Asian Trade and European Influence in the Indonesian Archipelago between 1500 and about 1630.* The Hague: Martinus Nijhoff.

Neich, Roger. 1984. "Samoan Figurative Carvings and Samoan Canoes." *The Journal of the Polynesian Society* 93 (2): 191–197.

O'Connor, Sue. 2003. "Nine New Painted Rock Art Sites from East Timor in the Context of the Western Pacific Region." *Asian Perspectives* 42 (1): 96–128. https://doi.org/10.1353/asi.2003.0028.

O'Connor, Sue, Shimona Kealy, Julien Louys, Hendri A.F. Kaharudin, Antony Lebuan, and Stuart Hawkins. 2018a. "Unusual Painted Anthropomorph in Lembata Island Extends Our Understanding of Rock Art Diversity in Indonesia." *Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA)* 35 (1): 79–84.

O'Connor, Sue, Shimona Kealy, Lucas Wattimena, Adam Black, Mohammad Husni, and Mahirta. 2023. "Sailing the Deep Blue Sea: The Rock Art of Wetang Island, Maluku Barat Daya, Indonesia." *The Journal of Island and Coastal Archaeology* 18 (3): 398–425. https://doi.org/10.1080/15564894.2021.1991056.

O'Connor, Sue, Mahirta, Shimona Kealy, Adam Black, Marlon Ririmasse, Stuart Hawkins, Mohammad Husni, et al. 2020. "The Rock Art of Kisar Island, Indonesia: A Small Island with a Wealth and Diversity of Artistic Expression." *Journal of Indo-Pacific Archaeology* 44:19–51. https://doi.org/10.7152/jipa.v44i0.15645.

O'Connor, Sue, Mahirta, Shimona Kealy, Clara Boulanger, Tim Maloney, Stuart Hawkins, Michelle C. Langley, et al. 2019. "Kisar and the Archaeology of Small Islands in the Wallacean Archipelago." *The Journal of Island and Coastal Archaeology* 14 (2): 198–225. https://doi.org/10.1080/15564894.2018.1443171.

O'Connor, Sue, Mahirta, Julien Louys, Shimona Kealy, and Sally Brockwell. 2018c. "New Engraving Finds in Alor Island, Indonesia Extend Known Distribution of Engravings in Oceania." *Archaeological Research in Asia* 15:116–128. https://doi.org/10.1016/j.ara.2017.12.004.

O'Connor, Sue, Mahirta, Sofia C Samper Carro, Stuart Hawkins, Shimona Kealy, Julien Louys, and Rachel Wood. 2017. "Fishing in Life and Death: Pleistocene Fish-Hooks from a Burial Context on Alor Island, Indonesia." *Antiquity* 91 (360): 1451–1468. https://doi.org/10.15184/aqy.2017.186.

O'Connor, Sue, Andrew McWilliam, and Sally Brockwell. 2020. "*Forts and Fortification in Wallacea: Archaeological and Ethnohistoric Investigations.*" In *Terra Australis*, edited by Sue O'Connor, Andrew McWilliam, and Sally Brockwell, 53. Canberra: ANU Press.

O'Connor, Sue, Rintaro Ono, and Chris Clarkson. 2011. "Pelagic Fishing at 42,000 Years before the Present and the Maritime Skills of Modern Humans." *Science* 334 (6059): 1117–1121. https://doi.org/10.1126/science.1207703.

O'Connor, Sue, Daud Tanudirjo, Marlon Ririmasse, Muhammad Husni, Shimona Kealy, Stuart Hawkins, and Alifah Alifah. 2018b. "Ideology, Ritual Performance, and Its Manifestations in the Rock Art of Timor-Leste and Kisar Island, Island Southeast Asia." *Cambridge Archaeological Journal* 28 (2): 225–241. https://doi.org/10.1017/S0959774317000816.

Pangemanan, Frits H. 2014. *Masuknya Agama Katolik di Awear, Pulau Fordata, Tanimbar (MTB).* Yogyakarta: PT Kanisius.

Perry, W. J. 1914. "The Orientation of the Dead in Indonesia." *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 44:281–294. https://doi.org/10.2307/2843355.

Pires, Tomé. 1944. "*The Suma Oriental of Tomé Pires: An Account of the East, from the Red Sea to Japan, Written in Malacca and India in 1512–1515.*" In *Translated into English by Armando Cortesão*, edited by Tomé Pires. London: Hakluyt Society.

Riedel, Joh Gerard Fried. 1886. *De Sluik- en Kroesharige Rassen Tusschen Selebes en Papua*. The Hague: M. Nijhoff.

Ririmasse, Marlon. 2013. "Materialisasi Identitas: Monumen-Monumen Perahu Batu di Kepulauan Tanimbar." *Amerta* 31 (1): 25–38.

Ririmasse, Marlon. 2016a. "Arkeologi Kepulauan Tanimbar Hasil Penelitian 2011-2014 dan Arah Pengembangannya." *Naditira Widya* 10:41–52.

Ririmasse, Marlon. 2016b. "Arkeologi Kepulauan Tanimbar Bagian Utara: Tinjauan Potensi di Pulau Fordata dan Pulau Larat Maluku Indonesia." *Kapata Arkeologi* 12 (1): 43–58. https://doi.org/10.24832/kapata.v12i1.318.

Ruyter, Mick de, Daryl Wesley, Wendy van Duivenvoorde, Darrell Lewis, and Iain Johnston. 2023. "An Moluccan Fighting Craft on Australian Shores: Contact Rock Art from Awunbarna, Arnhem Land." *Historical Archaeology* 57 (1): 1–10. https://doi.org/10.1007/s41636-023-00398-z.

Samper Carro, Sofia C., Sue O'Connor, Mahirta, Shimona Kealy, and Ceri Shipton. 2022. "Talking Dead. New Burials from Tron Bon Lei (Alor Island, Indonesia) Inform on the Evolution of Mortuary Practices from the Terminal Pleistocene to the Holocene in Southeast Asia." *PLoS One* 17 (8): 0267635. https://doi.org/10.1371/journal.pone.0267635.

Schapper, Antoinette. 2019. "Build the Wall! Village Fortification, Its Timing and Triggers in Southern Maluku, Indonesia." *Indonesia and the Malay World* 47 (138): 220–251. https://doi.org/10.1080/13639811.2019.1554778.

Schwerdtner Máñez, Kathleen, and Sebastian C.A. Ferse. 2010. "The history of Makassan trepang fishing and trade." *PLoS One* 5 (6): 11346.

Stokes, John Lort. 1846. *Discoveries in Australia.* London: T. and W. Boone.

Sutherland, Heather. 2000. "Trepang and Wangkang: The China Trade of Eighteenth-Century Makassar c. 1720s-1840s." In *In Authority and Enterprise among the Peoples of South Sulawesi*, edited by Roger Tol, Kees van Dijk, and Greg Acciaioli. 73–94. Leiden: KITLV Press.

Sutherland, Heather. 2021. *Seaways and Gatekeepers: Trade and State in the Eastern Archipelagos of Southeast Asia, c. 1600–c. 1906.* Queenstown: NUS Press.

Thomaz, Luis, and F. R. Filipe. 1995. "The Image of the Archipelago in Portuguese Cartography of the 16th and Early 17th Centuries." *Archipel* 49 (1): 79–124. https://doi.org/10.3406/arch.1995.3038.

Tillema, Hendrik Freerk. 1921. *Kromoblanda: Over't Vraagstuk van "Het Wonen" in Kromo's Groote Land 3.* The Hague: Uden Masman.

Urban, Frank. 2009. "Did the Portuguese Know of Australia's Tiwi Islands Prior to 1606?" *Globe. International College of Dentists* 63:42–56.

Valientes, Edwin A. 2019. "The Archaeology and Meaning of the Boat-shaped Stone Markers in Vuhus Island, Batanes Province, Northern Philippines." *Hukay* 21:1–25.

Verhoeven, T. 1956. "The Watu Weti (Picture Rock) of Flores." *Anthropos* 51:1077–1079.

Veth, Peter, Sue O'Connor, Matthew Spriggs, Widya Nayati, Ako Jatmiko, and Mohammad Husni. 2005. "The Ujir Site: An Early Historic Maritime Settlement in Northwestern Aru." In *In Terra Australis 22: The Archaeology of the Aru Islands, Eastern Indonesia,* edited by Sue O'Connor, Matthew Spriggs, and Peter Veth, 85–93. Canberra: ANU Press.

Vries, J. H. de. 1900. "Reis door Eenige Eilanden-Groepen der Residentie Amboina." *Tijdschrift van het Nederlandsch Aardrijkskundig Genootschap (2)* XVII:467–502. 593–620.

Vuuren, Marianne van. 2009. *Ikat From Tanimbar.* Bangkok: Orchid Press.

Waite, Deborah. 2000. "An Artefact/Image Text of Head-Hunting Motifs." *The Journal of the Polynesian Society* 109 (1): 115–144.