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THE OUTRIGGER BOAT MOTIFS IN ROCK ART OF SOUTH-EAST SULAWESI: TRACES OF AUSTRONESIAN MARITIME TECHNOLOGY IN INDONESIA

M. Sabri, R. Cecep Eka Permana, Suryanto, Muh. Aprisal Oka, Wa Ode Rawianti, Meliati, Ninin Junika, Risnawati, La Ode Darma, Saswal Ukba, Muh. Ardian Syah, Ersu Dwi Riyanto and Adhi Agus Oktaviana

Abstract. Austronesian dispersal models emphasise maritime capability, yet empirical evidence for early watercraft remains limited. This study uses a material–visual approach, considering rock art as a key dataset for reconstructing pre-Historic maritime technology. A comparative morphological analysis of outrigger boat depictions from North Konawe and Muna Island, Southeast Sulawesi, reveals regional variation in hull form and outrigger architecture. North Konawe images include single and double outrigger configurations drawn in black pigment, whereas Muna Island shows single outrigger boats with curved hulls in reddish-brown pigment. These patterns highlight early Austronesian boat diversity across different mobility environments.

1. Introduction

Southeast Asia comprises the mainland and various island territories. The majority of the region's population speaks Austronesian languages, the world's second-largest language family (Bellwood 2016). The migratory history of these people remains a compelling subject of scholarly inquiry. Archaeological and linguistic evidence indicate that Austronesian speakers began migrating from Taiwan to the Philippines approximately 5000–4500 years ago, reaching Sulawesi around 4000 years ago, before gradually dispersing to neighbouring islands such as Borneo, Maluku, Nusa Tenggara and Java (Simanjuntak et al. 2016). According to Bellwood (2016), these early populations primarily subsisted on agriculture and marine resources, practised animal domestication, constructed wooden houses, produced pottery and developed canoe-building technologies. Their advanced navigational skills and maritime technology were pivotal in enabling long-distance migrations across the archipelago.

The question of Austronesian origins remains one of the most enduring and debated topics in historical linguistics and archaeology. Scholars from a wide range of disciplines have sought to unravel both the ancestral homeland of Austronesian speakers and the pathways through which their languages and cultures dispersed across the vast expanse of Southeast Asia and the Pacific. While most researchers traditionally point to eastern China or northern Vietnam as the linguistic homeland, the precise routes of migration

continue to be contested. An alternative perspective, proposed by Solheim, suggests that Austronesian speakers may have originated from Southeast Asia itself, particularly the northeastern regions of Indonesia and the Philippines (Solheim II 1984). Although this view has gained limited acceptance, it offers a compelling lens through which to interpret the rich material culture left by these communities. One of the key questions in the debate on Austronesian language dispersal is why these languages spread across such a vast area, particularly in island environments. Bellwood (1984) proposed several hypotheses emphasising population growth as the primary driver of the migration of Austronesian speakers from their homeland in Southern China to other regions. According to him, this movement likely occurred gradually, involving processes of assimilation with indigenous populations in the Indo-Malayan region. In contrast, Meacham (1995) envisions a deliberate, large-scale movement driven less by demography than by inter-island voyaging, fishing and trade networks connecting the Philippines and Indonesia. Despite their differing emphases on the primary drivers of Austronesian mobility, both perspectives converge on the critical role of maritime technology, highlighting seafaring innovations as a key factor enabling the successful spread of languages across vast oceanic zones.

Horridge (2008) shows that Austronesian-speaking communities produced pottery and finely polished, hafted axes and domesticated pigs, dogs and chickens.

They also demonstrated strong maritime skills and widespread inter-island dispersal, reflecting a culture oriented toward seafaring. Early watercraft were likely rafts constructed from large bamboo stems, equipped with two-masted triangular woven sails and supported by loosely arranged rigging (Johnstone 1988; Horridge 2008). Canoes evolved from hollowed tree trunks, and subsequent integration with bamboo rafts led to outrigger and double-hulled canoes, extending the Austronesian maritime reach across the Pacific. Horridge suggests that the earliest Austronesian vessels were primarily dugout canoes with a single windward outrigger or, occasionally, double hulls, optimised for navigating shallow coral reefs. For longer voyages, larger outrigger canoes carried families, fire and agricultural implements. These vessels featured triangular sails mounted on two masts with inclined spars, lacked pulleys, fixed rudders and advanced steering mechanisms (Horridge 2006, 2008). Outrigger technology enhanced stability by attaching floats on one or both sides, reducing instability in open waters (Hornell 1943), increasing buoyancy (Abramovitch 2005), and improving control of pitching, rolling and heaving (Aguilar 2006). Consequently, outriggers were instrumental in sustaining the maritime traditions of Southeast Asian communities.

Although several scholars have proposed hypotheses regarding the early forms of boats used by Austronesian speakers, archaeological evidence has so far provided limited and insufficient information. This scarcity primarily stems from the inherent vulnerability of wooden vessels, which rarely survive long-term soil deposition. Given that these vessels were primarily constructed from wood, their preservation over extended periods is naturally constrained. Nevertheless, several boats, tentatively identified as *sampan*-type vessels, have been uncovered along the southeastern coast of China. These artefacts have been documented at several sites, including Kuahuqiao (dated back to 7700 BP), Maozigou (dated back to 3000 BP), and Maoshan (dated back to 4500 BP) (Tang et al. 2016). Notably, the vessel from Kuahuqiao is hypothesised to be a dugout canoe with a sail, as indicated by short wooden struts exhibiting mortise-and-tenon construction and remnants of bamboo matting, interpreted as components of a boat sail (Chunming 2021). It is important to note, however, that these materials were not recovered intact; rather, they were found in a fragmented state.

One of the alternative approaches to address the paucity of information regarding Austronesian maritime technology is the study of rock art, particularly motifs depicting boats. Rock art created by these people is commonly referred to as the Austronesian Painting Tradition (APT). These images are typically characterised by their occurrence within regions of Austronesian language distribution, often in remote and difficult-to-access locations and occasionally on high cliff faces. The motifs include spirals, solar

symbols, masks/faces, human figures, hand stencils and boats (Tanudirjo 2011; O'Connor et al. 2015; Leihiu and Permana 2019; Permana et al. 2019). These depictions are hypothesised to reflect the presence of Austronesian speakers during later periods. Boat motifs, in particular, are frequently represented in substantial numbers (Ballard 1988). Research by Sue O'Connor (2003) in Timor-Leste found that the motif constitutes the second-most frequently occurring imagery after human figures. Across Southeast Asia, boat depictions have been documented in several locations, including Thailand, Laos, Malaysia, and are widely distributed throughout Indonesia (Szabó et al. 2008; Tan 2014; Tan and Hoerman 2020). Within Indonesia, they have thus far been identified in multiple regions, including South (Sugiyanto 2014) and East Kalimantan (Sugiyanto 2010; Aubert et al. 2018), Maros (Permana 2009), Pangkajene Kepulauan (Eriawati 2003; Permana 2015; Sabri et al. 2025), Gowa (Permana 2015), North Konawe (Hakim et al. 2018), Muna (Oktaviana 2018; Permana 2023), east Nusa Tenggara (Yuwono et al. 2020), southwest Maluku (Kealy et al. 2018), southeast Maluku (Wattimena et al. 2022) and West Papua (Leihiu and Permana 2019).

Research on boat motifs in Southeast Asia rock art has generally revealed a wide range of depicted vessels, ranging from simple dugout canoes to boats equipped with sails. However, depictions of outrigger-equipped boats remain scarce and have received limited attention in scholarly publications. A study that specifically mentions the presence of boat motifs was conducted by Ingrid H. E. Pojoh and R. Cecep Eka Permana (2018, 2023), who documented several images of boats at the Liang (cave) Kabori Complex in Muna Island believed to feature outriggers. The paper was then referred to by the same author in other work (Permana and Pojoh 2020; Permana 2023). This research then led us to look at the possible depictions of outrigger boats in the area and its surroundings. Eventually, through this research, we have uncovered new evidence of rock art depictions of outrigger boats in the Matarombeo Karst Mountains of North Konawe Regency and within the pre-Historic cave complexes of Liang Kabori in Muna Regency, southeast Sulawesi. This research aims to provide a comprehensive account of these rock art representations in southeast Sulawesi, Indonesia. Additionally, the study examines the similarities and differences between the outrigger boat motifs found in North Konawe and those recorded on Muna Island. By doing so, it seeks to enhance understanding of the maritime technological expertise of Indonesian communities, highlighting its evolution across a broad and diverse geographical area.

2. Methodology

This study employs a qualitative descriptive approach rooted in post-positivist philosophy, emphasising interpretative analysis of data (Sugiyono 2013; Murdiyanto 2020). The research process involved data

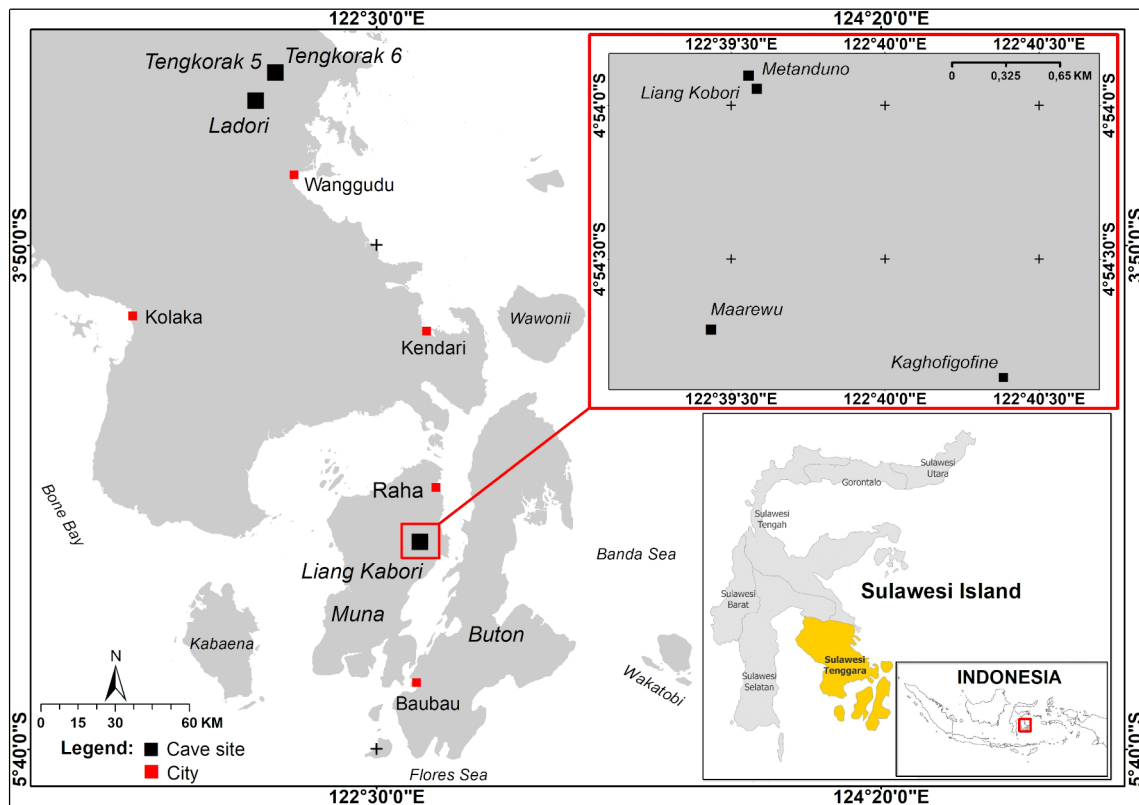


Figure 1. Map of the locations of the sites discussed in the article. Maps by MS, (2025).

collection, analysis and interpretation (Creswell 2009). It should be emphasised that descriptive research is generally a type of research that aims to produce systematic descriptions and classifications of samples from the archaeological record (Gibbon 2014). In the study of rock art imagery, researchers position themselves as both the first and the last observers of the images under examination. Consequently, the observer's perception and intellectual framework exert a decisive influence on the construction of the image's narrative (Dobrez 2011). Moreover, what the researcher seeks to articulate ultimately constitutes, in essence, an alternative interpretation. This stance is grounded in the recognition that we can never ascertain with certainty the precise meaning the original artist intended to convey (Maynard 1977). Such a condition is primarily attributable to the paucity of ethnographic data concerning ongoing image-making practices that share cultural continuities with the past, as well as to the rupture of informational linkages connecting past knowledge with the present.

Data collection in this study is divided into a literature review encompassing findings from previous studies and other relevant sources related to rock art apparently depicting outrigger boats. Meanwhile, field observation was conducted by gathering data through direct observation of cave sites featuring outrigger boat motifs, documenting the images both descriptively and pictorially. The site descriptions included information on the morphology of the rock art, techniques used, spatial placement, and the current

condition of the images. Subsequently, photographs were taken using a Sony a6400 mirrorless camera with a 10-cm scale for reference. In the data processing stage, image processing and enhancement were performed using ImageJ with the DStretch plugin, followed by digital redrawing in Adobe Photoshop to produce accurate visual representations (Harman 2005; Oktaviana 2016). Comparative analysis with motifs from other sites, including Muna Island, was conducted to contextualise the findings regionally. By systematically documenting and analysing the outrigger boat motifs, this study provides the first detailed visual and morphological dataset of this motif in southeast Sulawesi, offering new insights into the spatial distribution and cultural significance of boat representations in Indonesian rock art.

3. Results and discussion: the images of black outrigger boats in North Konawe

Rock art in the North Konawe region is geographically concentrated within the Matarombeo Karst Mountains. Studies conducted on rock art in this area have consistently reported the presence of boat motifs across nearly all painted cave sites. These depictions exhibit considerable diversity, ranging from simple dugout canoes and sail-equipped boats to the distinctive outrigger boats (Hakim et al. 2018; Hidayatullah 2023; Oka 2022; Rawianti 2022; Sabri 2020, 2024; Sabri and Permana 2024). In particular, references to outrigger boats have been briefly mentioned in several publications (Sabri 2020, 2024; Oktaviana et al. 2021),

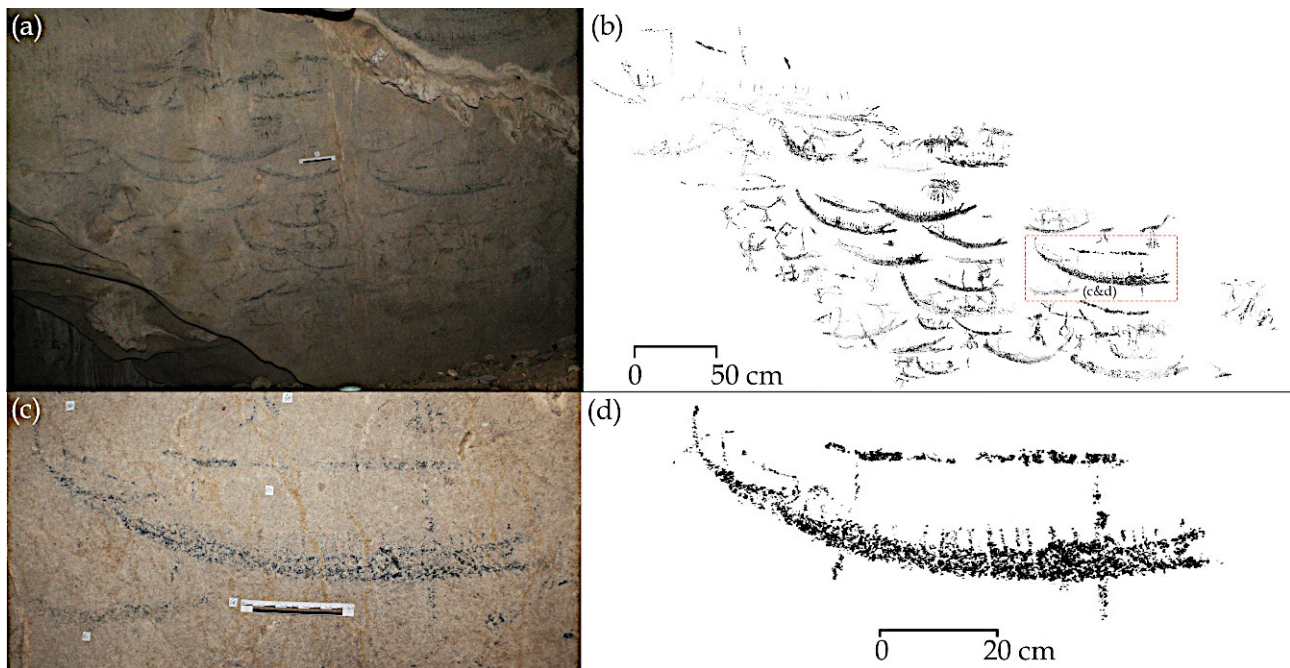


Figure 2. Condition and sketch of the first panel (a–b) and the original image and sketch of the first outrigger boat in Gua Ladori (c–d) (source: (a–c) MS, 2024 and (b–d) MS, 2024 modified by authors, 2025).

yet a comprehensive and detailed analysis of these motifs remains absent. Field observations conducted in this study identified three cave sites in North Konawe that feature outrigger boat images: Gua Ladori, Gua Tengkorak 5 and Gua Tengkorak 6 (Fig. 1).

Overall, the rock art discovered in North Konawe is situated across two districts, namely Oheo and Wiwirano. Within Oheo, the site identified is Gua Ladori, whereas in Wiwirano, the sites comprise Gua Tengkorak 5 and Gua Tengkorak 6. The following sections provide a detailed account of each site, accompanied by an in-depth description of the outrigger boat motifs depicted in the rock art.

a. *Gua Ladori*

Gua (cave) Ladori is situated at the foot of the Matarombeo Karst Mountains. It is relatively remote, located approximately 5 km from the nearest settlement, Bendewuta Village, and can only be accessed by navigating the river using traditional boats. The cave preserves a variety of archaeological materials, among which the rock art found on the walls and ceilings is particularly significant (Sabri and Permana 2024). Research conducted by M. Sabri (2020) on the rock art at Gua Ladori identified a total of 222 motifs, encompassing representations of humans, animals, boats, geometric patterns and abstract designs. All the motifs are rendered in black, likely produced using a charcoal-based pigment. Among the motifs, depictions of boats are the most numerous, with 32 individual images documented. Notably, two of these depict outrigger boats, located on separate panels. The first outrigger boat depiction is located on the right wall of the cave chamber, at a height of 102 cm

above the floor. The image appears together with other motifs, including human figures, boats, animals, and geometric and abstract forms. The outrigger boat is positioned on the lower right side of the panel. The vessel was depicted with a single outrigger placed above the hull. On top of the hull, there are 16 vertical lines, accompanied by an abstract form at the left end of the boat. The lines are considered to represent human passengers, reflecting everyday scenes of boat use in which individuals seated on a vessel, when viewed from the side, may visually appear as simple vertical lines. In many depictions of boats with human passengers (although not always), human figures illustrated with complete bodily attributes generally represent individuals in a standing position. Unlike other elements associated with boats, such as masts, this attribute is usually depicted in relatively similar shapes, widths and heights. The hull measures 89 cm in length and 18.15 cm in width. The outrigger has a length of 50.5 cm with a line thickness of 1.8 cm. It is illustrated above the hull at a distance of 14.4 cm from the keel. This boat has a shape where the right end is forked and curved upwards while the end on the left side is flatter with a tapered tip. The form of the vessel shows similarities to the outrigger canoe from Bali (*jukung*) and Manado (*londe*) (Horridge 1981, 1987). The condition of the image remains relatively well preserved, although the pigment has begun to fade and areas of pigment flaking are present (Fig. 2).

The second boat depiction was identified on the right wall of the cave chamber at a height of 112 cm above the chamber floor. The image portrays a double-outrigger boat with passengers represented by ten vertical lines positioned above the boat, which

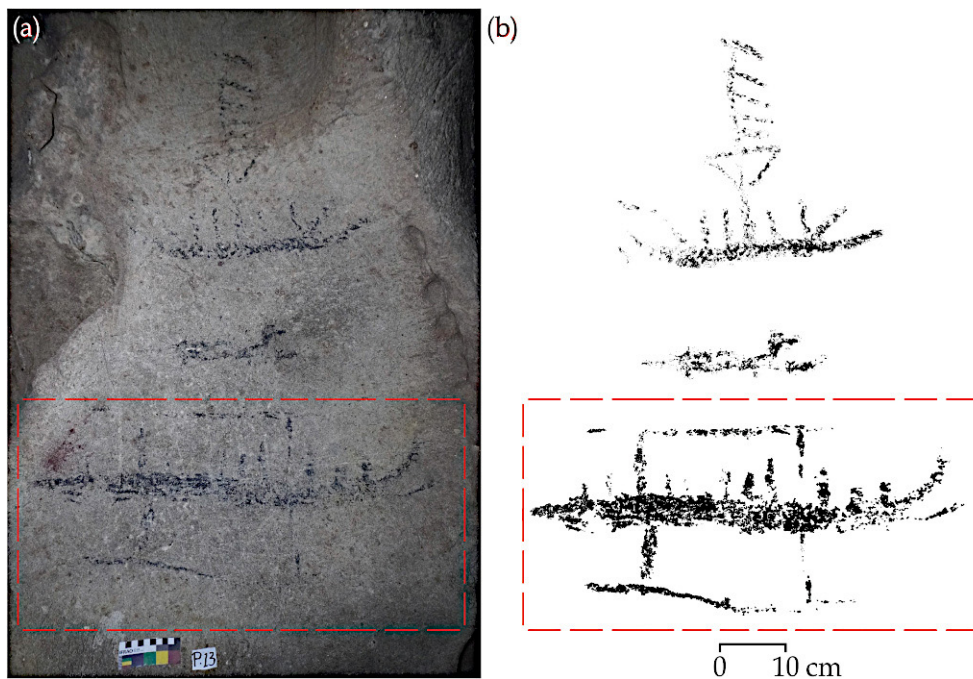


Figure 3. Photo (a) and sketch of rock art panel (b) with an outrigger boat motif in Gua Ladori (source: (a) MS, 2024 and (b) MS, 2024 modified by authors, 2025).

remain partially observable. These vertical lines are depicted with nearly uniform height, although several have undergone deterioration. The hull of the vessel is illustrated in a relatively horizontal orientation, measuring 71.72 cm in length with a hull width of 7 cm. The outriggers are rendered with notable clarity, including the outrigger booms connecting the outrigger float and the main hull. A distinct difference is visible between the two outriggers: the outrigger positioned above the hull appears straight, whereas the other displays a wavy shape. The right end of the boat appears to

be forked and curved upward, making it appear higher than the hull, while the left end appears horizontal, parallel to the hull, and tapers toward the tip. The overall condition of the image is intact, although it is starting to show signs of damage. Overall, the depiction remains largely intact, although signs of deterioration have begun to appear (Fig. 3).

b. Gua Tengkorak 5

Gua Tengkorak 5 is situated within Wawontoaho Village, Wawirano District. The site rests at the foot of Bukit (hill) Karst Tengkorak, approximately 200 m

south of the main road, and can be accessed easily on foot along the hillside. Geographically, it is framed by karst mountains to the north and east, while oil palm plantations occupy the southern and western surroundings, creating a striking contrast between natural and cultivated landscapes. Morphologically, the cave is horizontally oriented toward the southwest and comprises two distinct levels of chambers. The lower chamber is a spacious area aligned with a natural water source just outside the entrance, offering a functional and symbolic connection between water

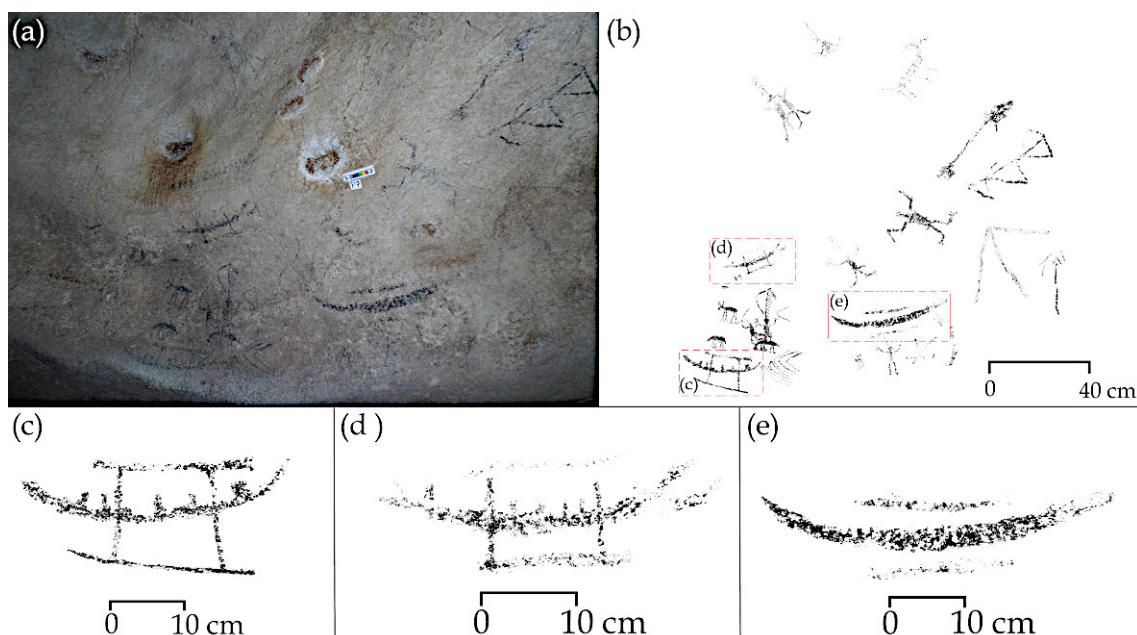


Figure 4. Photo and rock art panel sketch (a–b) and sketches of the Gua Tengkorak 5 outrigger boat (c–d) (source: (a) MS, 2024; (c–e) MS, 2024 modified by authors, 2025).

and human activity. Above this, the second chamber hosts the rock art panel, where three striking depictions of outrigger boats are found on the ceiling of the passage. All images are rendered in black pigment using a scraping technique. The first boat image (c) on this site was documented at a height of 60 cm from the floor of the cave passage. The vessel is depicted with a double outrigger and five 'passengers', represented by vertical line figures of relatively similar height but varying width. The boat's hull appears curved, measuring 36 cm in length with a hull width of 2 cm. The left side of the vessel is noticeably broader than the right and gradually tapers toward the right end. The right extremity of the boat is also illustrated as slightly higher than the left. Both outriggers are connected by two outrigger booms. The outrigger positioned above the hull is rendered straight, while the outrigger beneath the hull appears inclined and is longer than the first. Notably, the lower outrigger increasingly extends farther from the hull toward the right side of the vessel. The upper outrigger measures 20 cm in length and 1 cm in width, whereas the lower outrigger measures 24 cm in length and 0.5 cm in width. Despite signs of gradual fading and surface exfoliation, the image remains observable (Fig. 4).

The second outrigger boat depiction (d) is located at a height of 80 cm from the floor of the cave passage, positioned directly above the first boat image. The boat is illustrated with a double outrigger and five 'passengers' represented as vertical line figures on the hull. The hull of the boat appears to curve upward, with bifurcated extensions at both ends. The right end of the boat is depicted as higher than the left and appears broader, with a longer forked extension. The hull measures 36 cm in length with a width of 2.5 cm. It is noticeably wider on the right side and gradually tapers toward the left end. Both outriggers are connected by two outrigger booms placed at the ends of each outrigger float. The outrigger positioned beneath the hull appears clearer and thicker, measuring 16 cm in length and 1 cm in width, whereas the outrigger above the hull is thinner and more faded, measuring 17 cm in length and 0.3 cm in width. In addition, the lower outrigger appears relatively straight compared with the upper outrigger. The image shows signs of deterioration because of surface exfoliation. The third boat depiction (e) is situated at a height of 70 cm from

the floor of the cave passage, positioned to the right of the two previously described boats. This vessel is illustrated with a double outrigger and without passengers. The hull appears to curve upward and tapers toward the bow, resembling the form of a simple canoe-like boat. The left end of the vessel is depicted as higher and more pointed than the hull and the right end, which appears thicker and straighter. The hull measures 47 cm in length with a width of 3 cm. No outrigger struts connecting the outriggers to the hull are depicted. This condition raises the possibility that the image was either unfinished or intentionally rendered in such a form for a particular purpose. Nevertheless, the position of the two outriggers, which appear parallel and of relatively similar size, strengthens the indication that they indeed represent boat outriggers. The outrigger on the upper side of the hull measures 27 cm in length and 1 cm in width, whereas the outrigger on the lower side measures 19 cm in length and 0.9 cm in width. The condition of the image remains relatively good, although signs of fading and exfoliation have begun to appear.

c. Gua Tengkorak 6

Gua Tengkorak is also situated at the base of Bukit Karst Tengkorak, approximately 50 m from Gua Tengkorak 6. Consequently, the geographic and environmental conditions of both caves are closely similar. This site comprises a horizontal cave featuring a network of interconnected passages leading to the main chambers. Archaeological evidence within the site includes ceramic fragments and shell remains on the chamber floors, as well as hundreds of rock art images on the walls and ceilings. Among these, two depictions of outrigger boats were identified on separate panels. Both images are rendered in black and made with a linear scraping technique. The first boat image is located on the wall of the cave chamber at a height of 35 cm above the floor (Fig. 5). The vessel is depicted with a single outrigger positioned beneath the hull and accompanied by several 'human passengers', of whom three figures are visible. The hull curves upward, with an overall length of 99 cm and a mid-hull width of 5 cm. The hull appears broader toward the right end and gradually narrows toward the left. The right extremity of the boat is illustrated as higher than both the central hull and the left stern

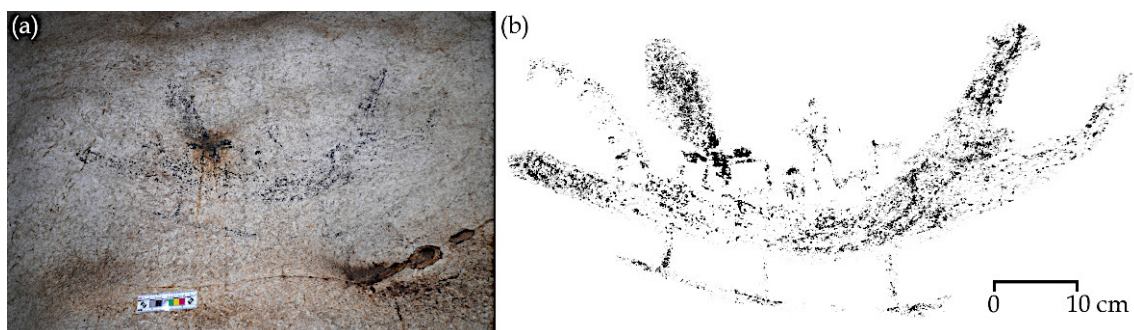


Figure 5. Photo and sketch (a, b) of the first outrigger boat in Gua Tengkorak 6 (source: MS, 2024).

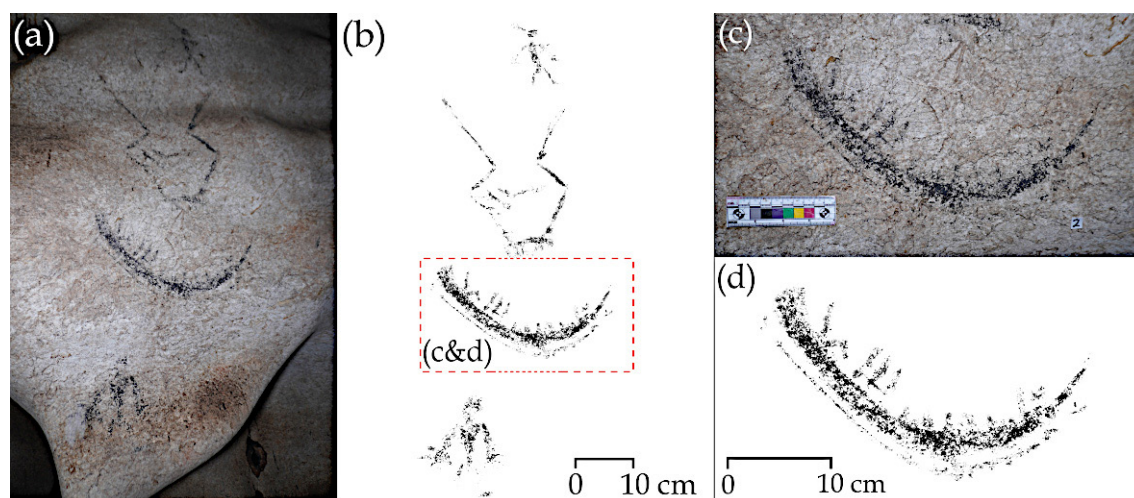


Figure 6. Photo and sketch of rock art panel (a–b), photo (c) and sketch of the second outrigger boat motif (d) in Gua Tengkorak 6 (source: (a–d) MS, 2024 modified by authors, 2025).

end, and this section appears forked with a relatively wide spacing between the branches. In contrast, the left stern end shows no bifurcation but features an attribute resembling a pennant or streamer inclined toward the left. The outrigger is connected to the hull by three outrigger booms, although the central boom is extremely faded. The outrigger measures 37 cm in length and 1.3 cm in width. It is also evident that the distance between the outrigger and the hull increases progressively toward the right side. The largest human passenger is depicted larger than the others and bears a headdress resembling a tassel inclined to the left. The passenger at the far right appears to be standing and has no headdress. The remaining passenger is positioned in the middle at the lowest point and is also depicted without a headdress. Although the form of the vessel remains identifiable, parts of the image have faded and exhibit considerable deterioration.

The second boat image (c, d) was identified on the overhanging wall of a triangular-shaped cave passage at a height of 60 cm above the cave floor. The image occurs in association with two 'human' figures and a motif resembling a container (Fig. 6). The vessel is depicted with a single outrigger positioned beneath the hull. The outrigger is rendered as a curved element following the contour of the boat's hull. The hull itself is illustrated with an upward curvature, measuring 29 cm in length and 2.3 cm in hull width. The boat carries 'passengers' represented by twelve vertical lines of varying height but relatively uniform width. A number of vertical lines in the left side end area of the boat appear higher. The left side of the hull is depicted significantly wider and higher than the hull and stern on the right side, which appear lower and gradually taper toward the extremity. The outrigger lies at a distance of only 1 cm from the keel of the boat. Meanwhile, the connecting elements between the hull and the outrigger are not clearly depicted. Overall, the image remains relatively well preserved, although certain areas exhibit exfoliation and fading.

4. The images of outrigger boats on Muna Island

As previously outlined, depictions of outrigger boats have also been documented in several studies within the Liang Kabori area of Muna Island. Research conducted by Pojoh and Permana in 2018 revealed representations of outrigger boats in both Gua Metanduno and Liang Kabori (Pojoh and Permana 2018; Permana and Pojoh 2020; Permana 2023). This identification is primarily based on the presence of horizontal lines along one side of the boat hull motif. To further investigate these claims, the authors conducted direct field observations of both caves. Moreover, a more comprehensive field observation was undertaken across multiple caves in the region to identify additional occurrences of outrigger boat rock art motifs. The observation resulted in the identification of two additional sites featuring outrigger boat depictions, namely Gua Maarewu and Gua Kagofighofine. The descriptions of each site and the associated boat imagery found on Muna Island are presented as follows.

a. Gua Metanduno

Gua Metanduno is located in Liang Kabori Village, Lohia District, Muna Regency, Southeast Sulawesi Province. The site is relatively easy to access by two-wheeled and four-wheeled vehicles from the nearby settlement, approximately 0.92 km to the south. The cave entrance faces north and extends to a depth of about 30 m. The chamber floor is uneven and scattered with numerous limestone boulders. The cave exhibits high humidity, although the natural light intensity remains relatively adequate. Hundreds of images depicting diverse motifs occur on the walls and ceiling of the chamber. A depiction of a presumed outrigger boat (Fig. 7) appears on the southern section of the cave ceiling. The image was executed using a reddish-brown pigment. It occurs within a single panel together with another boat image, a 'sun motif' at the upper right, and an additional boat image at

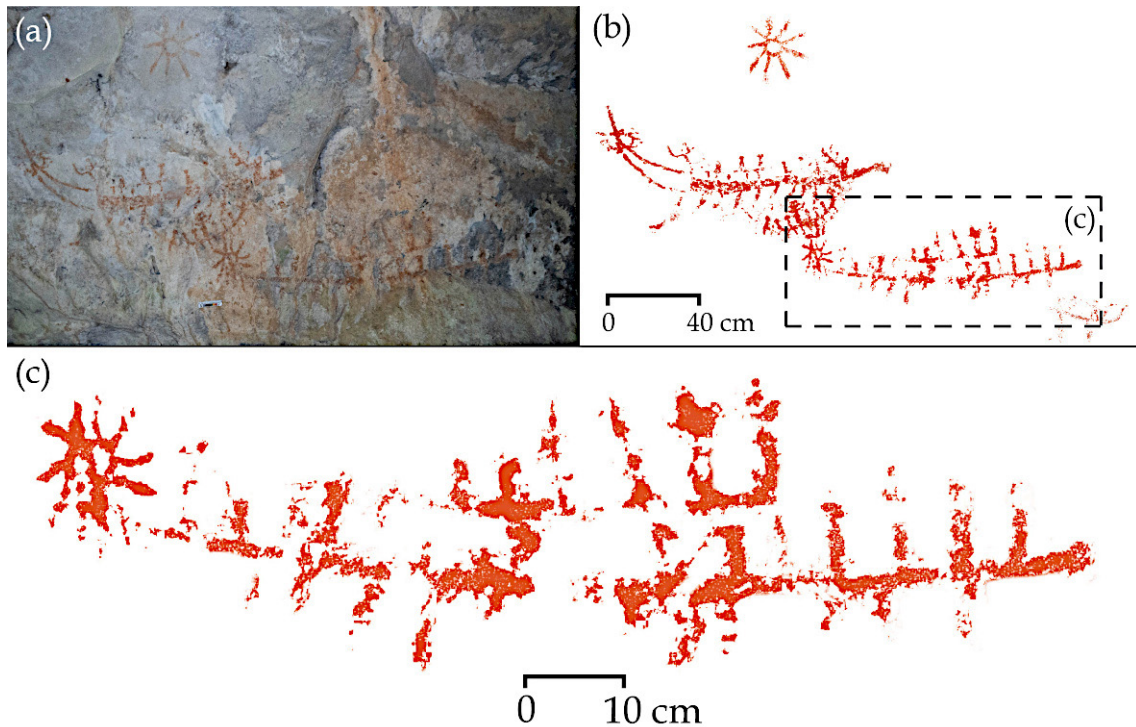


Figure 7. Photo and sketch of rock art panel (a–b) and sketch of an outrigger boat (c) in Gua Metanduno (photo and sketch by MS, 2025).

the lower right. The boat is depicted with a sun-like figure at the left end of the vessel. A series of vertical lines represents the ‘passengers’. The hull measures 112 cm in length and 2 cm in width. An element that may represent the outrigger is positioned above the main body of the boat, measuring 32 cm in length with a line thickness of approximately 1.5 cm. This feature consists of a horizontal line connected to several vertical lines, with six vertical lines still visible above it. Although positioned along the side of the main hull, similar to previously described outrigger depictions, the severely deteriorated condition of the painting complicates its identification. This feature may also represent part of the main hull or another attribute that can no longer be clearly recognised. The uncertainty results from damage to several parts of the image caused by exfoliation.

b. *Liang Kabori*

Liang Kabori is located at an elevation of 216 m above sea level. The site is a horizontal cave whose entrance faces westward. Light intensity inside the chamber is relatively low, accompanied by high humidity. The cave floor gently slopes toward the central area and is scattered with numerous limestone boulders. Hundreds of rock art images are distributed across the cave walls and ceiling. A depiction interpreted as an outrigger canoe is recorded on the wall at the northern end of the chamber, rendered in a red-dish-brown pigment. The presumed outrigger canoe (Fig. 8) appears on a single panel together with other motifs, including anthropomorphous, zoomorphic and ‘abstract’ figures. The boat appears to possess a

single outrigger positioned beneath the hull. The hull itself is represented by a straight line, thicker and higher on the left side and thinner, lower and more faded on the right. The hull measures approximately 30 cm in length and 1 cm in width. Above the hull are several vertical lines, one of which, positioned at the far right, resembles a human figure. The element interpreted as the outrigger measures approximately 18 cm in length and is connected to the hull by eight lines measuring about 15 cm in length and 1 cm in width. Two of these lines appear to intersect the horizontal line interpreted as the outrigger. As observed at Gua Metanduno, the condition of the imagery at this site has also suffered considerable deterioration. Consequently, the identification of the element interpreted as an outrigger leaves other possibilities open, despite the presence of several attributes—such as the connecting lines between the outrigger and the hull and the vertical lines possibly representing the outrigger—within the composition.

c. *Gua Maarewu*

The site is situated approximately 1.5 km south of Liang Kabori. The surrounding environment is characterised by teak (*Tectona grandis*) and a diversity of climbing plants, reflecting a semi-forested landscape. The cave itself is horizontal, with an entrance oriented toward the east, allowing moderate natural light penetration while maintaining relatively low humidity levels. Rock art is distributed across both the walls and the ceiling, presenting a variety of motifs. Notably, three representations of outrigger canoes are identified on two separate panels. The first depiction illustrates a single-outrigger boat bearing seven ‘human’ figures

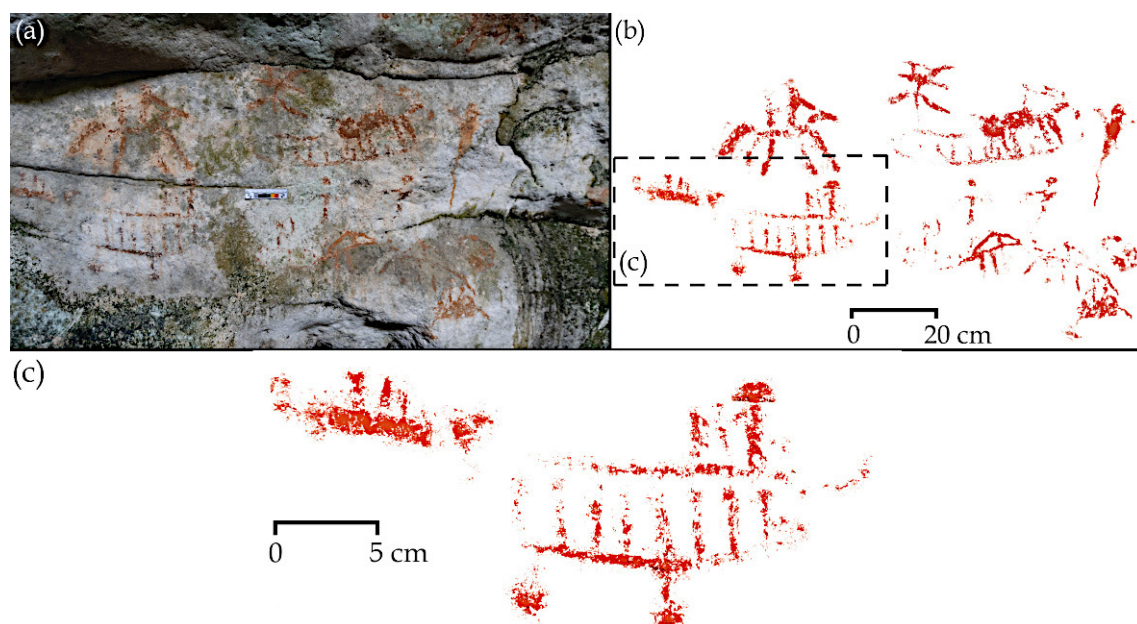


Figure 8. Photo and sketch of rock art panel (a–b) and sketch of an outrigger boat motif (c) in Liang Kabori (photo and sketch by MS, 2025).

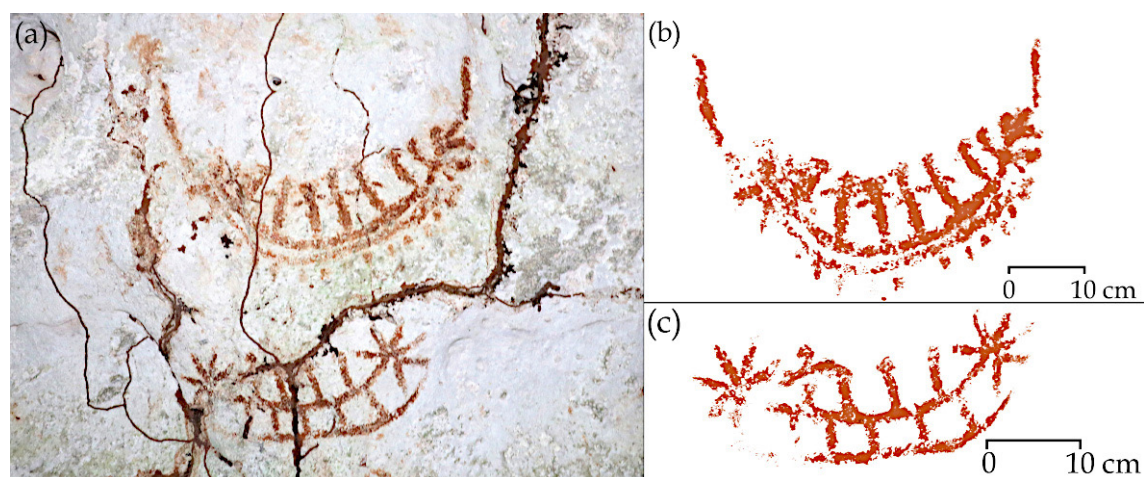


Figure 9. Photo of rock art panel (a) and sketch of an outrigger boat (b–c) in Gua Maarewu (photo and sketch by MS, 2025).

(Fig. 9b). The hull measures 57 cm in length and 1.6 cm in width, curving upward with the right end higher. The outrigger is approximately 48 cm long and 1.5 cm wide, depicted with a curved line beneath the hull following its shape. This form resembles the second canoe recorded at Gua Tengkorak 6. The outrigger is positioned 2 cm from the keel and is connected to the hull by vertical lines. At both ends of the canoe, branching ornaments and upward-extending lines are present. The anthropomorphs above the canoe average 10 cm in height, with body widths of 1.5 cm. The condition of the imagery remains relatively well-preserved, although some areas are beginning to fade.

The second boat depiction presents a single-outrigger canoe carrying four 'passengers', represented by vertical lines presumed to depict humans (Fig. 9c). The hull measures 34 cm in length with a line thickness of 1.4 cm, curving upwards and decorated with

sun-like motifs at both ends. The hull appears higher at the right end compared to the left. The outriggers are connected to the hull by five outrigger booms. Measuring 36 cm in length and 1.5 cm in thickness, the outrigger is drawn beneath the hull. It is mostly straight in the central section but curves upward toward the right end, which tapers to a smaller, pointed tip. The imagery remains quite clear for observation, although some areas show signs of flaking. The third boat depiction (Fig. 10) illustrates a single-outrigger canoe carrying two human figures. The hull is drawn with an upward curve, featuring sun-like motifs at both ends. It measures 48 cm in length, with a mid-section width of 3 cm, and the left end rises higher than the right. The outrigger is 48 cm long and 1.3 cm wide at its midpoint. Positioned beneath the hull, it follows the curvature of the canoe and is connected by 11 clearly visible outrigger booms. These connecting

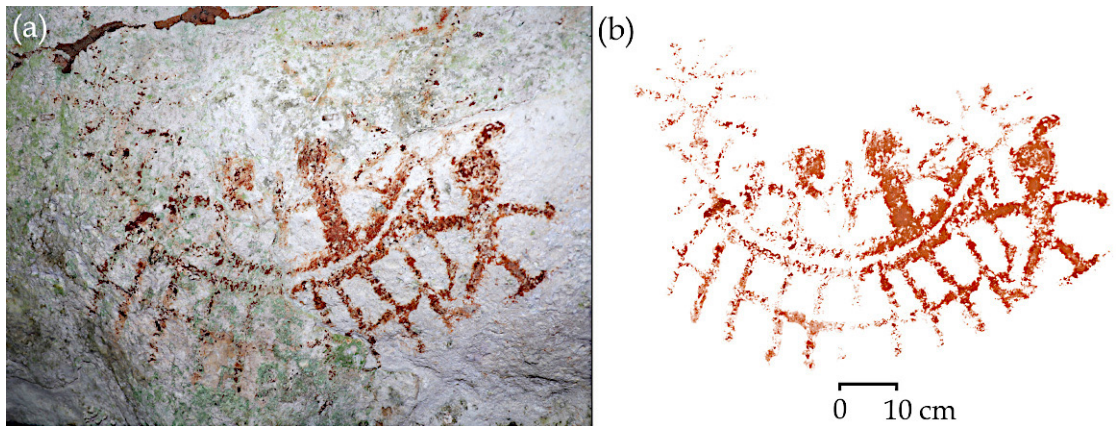


Figure 10. Photo (a) and sketch of the third outrigger boat (b) in Gua Maarewu (photo and sketch by MS, 2025).

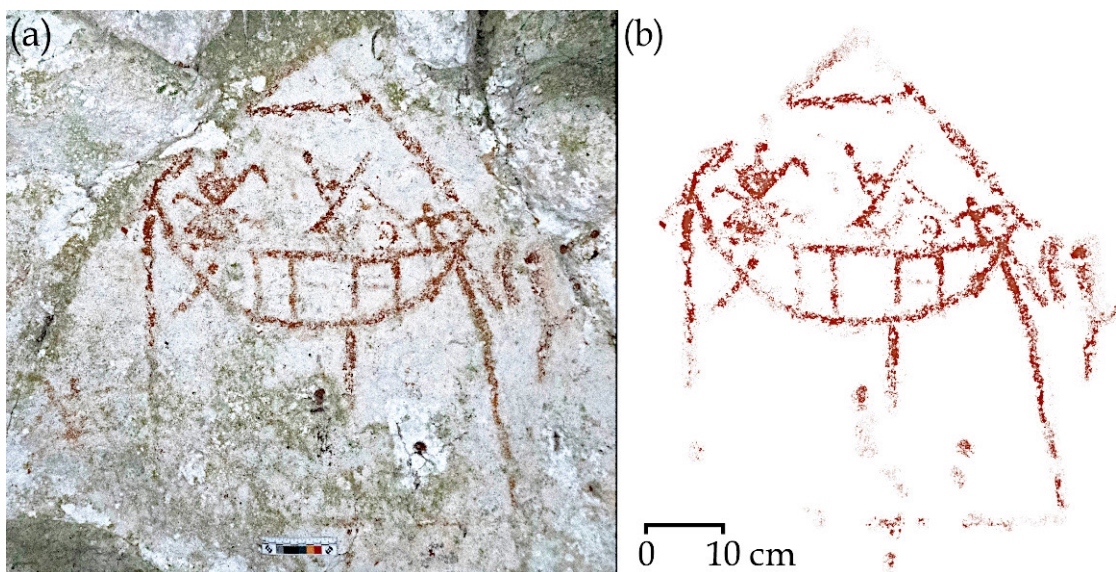


Figure 11. Photo (a) and sketch (b) of an outrigger boat image in Gua Kagofighofine (photo and sketch by MS, 2025).

lines appear to pass through the outrigger float. The two seated passengers have their right arms extended, while their left arms grasp objects resembling shields. On the right side of the canoe, a standing human figure is depicted with splayed limbs, one hand appearing to hold the canoe's outrigger. Overall, the imagery remains relatively well-preserved, although some areas show flaking and fading.

d. *Gua Kagofighofine*

Gua Kagofighofine is situated approximately 2.71 km south of Liang Kabori. The site remains relatively inaccessible, as no formal access roads have yet reached this location, preserving its pristine condition. The cave is enveloped by a verdant assemblage of trees and climbing vegetation, creating a unique microenvironment. Internally, the cave comprises a horizontally oriented chamber, its floor strewn with limestone blocks. The entrance, facing south, spans 21 m, permitting substantial natural illumination, while ambient humidity remains comparatively low. Rock art motifs are extensively distributed across the walls,

ceiling, and limestone blocks of the chamber floor. Of particular significance is a painted depiction of an outrigger boat on the northern wall (Fig. 11). The image was executed in a reddish-brown pigment, probably using a brush technique. The rock art depicts an outrigger boat in this site, rendered with a single outrigger, carrying three 'human' figures standing on the hull. The top of the hull tapers in a way reminiscent of a sloping roof, which may indicate a protective covering for the people inside. Another possibility is that the object was part of a boat's sail. The hull measures 46 cm in length and 9 cm at its widest point. The outrigger, situated beneath the hull, extends 50 cm in length and 1.5 cm in thickness, positioned 17 cm from the main body. Despite the passage of time, the image remains largely legible, though some areas are partially obscured by lichen and show signs of surface flaking, offering a tangible connection to the people who once navigated these waters.

5. Comparison between outrigger boats from North Konawe and Muna Island

Detailed observations of outrigger boat motifs from the two investigated regions reveal pronounced differences between the representations in North Konawe and those on Muna Island. The most salient distinction pertains to colour: motifs from North Konawe are rendered in black, whereas those from Muna Island display a reddish-brown tone. Direct observation of the image pigments of the North Konawe pigments suggests that the images were produced by applying a dry colour pigment, such as charcoal, in a manner analogous to crayon, onto the panel surface. The technique is evidenced by the relatively coarse texture of the images and the irregular deposition of pigment, which closely follows the contours and porosity of the rock surface. Conversely, the Muna Island motifs appear to have been executed using a painting technique, likely with a brush or brush-like implement and wet reddish-brown pigments, resulting in a smoother and more homogeneously pigmented surface.

A further significant distinction is evident in the representation of the outrigger. In North Konawe, the outrigger is depicted with notable clarity, facilitating its unequivocal identification as an integral component of the boat. Conversely, on Muna Island, several depictions exhibit considerable ambiguity due to damage, which constitutes a primary obstacle in ascertaining whether the imagery genuinely represents outriggers or remains part of the hull itself. Such uncertainty is particularly apparent in the images from Gua Metanduno and Liang Kabori, where the presence of outriggers cannot be conclusively verified. Among the six documented images on Muna Island, three stand out for their relatively unambiguous depiction of outriggers: the second and third images in Gua Maarewu and the depiction in Gua Kagofighofine. Notably, the first image in Gua Maarewu resembles the second image in Gua Tengkorak 6, in which the outrigger is illustrated in close proximity to the hull. Its positioning beneath the keel, coupled with its apparent attachment to the outrigger beam, strongly suggests intentional representation, despite the minimal spatial separation. Moreover, this particular configuration is atypical in boat depictions across both regions, underscoring its significance. Additional insights emerging from this study concern the variation in outrigger configurations among boats. In North Konawe, outrigger boats can be systematically classified into two principal types: single-outrigger and double-outrigger boats. Single-outrigger boats are represented by three distinct images, each documented in Gua Ladori, Gua Tengkorak 5 and Gua Tengkorak 6. In contrast, double-outrigger boats are depicted in four images, with one from Gua Ladori and three from Gua Tengkorak 6. On Muna Island, however, outrigger boat motifs consistently display only a single outrigger. In terms of outrigger attachment, North Konawe boats employ two to three connecting beams, whereas Muna Island boats utilise

a larger number of beams to secure the outrigger to the hull. These structural variations likely reflect differences in vessel typology or functional purpose.

Of particular interest is the depiction of 'passengers' in most outrigger boats. Except for one image in Gua Tengkorak 5, all other boats feature passengers, either rendered as clearly anthropomorphic figures or as simplified vertical lines. The largest vessel, depicted in the first image from Gua Ladori, carries the greatest number of passengers and is proportionally larger than the other representations, suggesting it could accommodate more than ten individuals. Another notable attribute revealing a significant difference is the depiction of boat-end forms. Several boats in North Konawe portray one or both hull ends as bifurcated. Non-bifurcated ends typically taper gradually, whereas bifurcated forms appear broader. In contrast, depictions from Muna Island show different features. The second and third images in Gua Maarewu, as well as the image in Liang Metanduno, display a 'sun motif' at the end of the boat. One image in Gua Maarewu also presents 'ornamentation' at the end of the hull, resembling tassel-like elements extending upward. Within this study, classifying the hull's ends as prow or stern is highly difficult. A clear distinction normally requires the presence of a rudder or steering oar, as these elements are consistently located at the stern (Lape et al. 2007). However, none of the recorded boat images displays these attributes. The study nevertheless identifies a pattern in which one end of the boat is depicted higher than the other. Yet the end bearing a rudder or steering oar is not always represented lower than the prow. Regardless of this uncertainty, the differences between boats from the two regions extend beyond boat technology. They may also reflect certain symbolic aspects associated with the communities that produced them. This issue is discussed in the following section.

6. Rock art of outrigger boats: traces of culture and traditional maritime technology of Austronesian speakers in southeast Sulawesi, Indonesia

Based on research conducted on numerous boat rock art motifs across Southeast Asia, the majority of the boats depicted are assumed to be the dugout canoes, with a smaller proportion representing plank-built boats. The distinction between these types can be discerned through the illustrated profile of the hull, the relative proportions of the vessel, and accompanying attributes (see O'Connor 2008; O'Connor et al. 2022). In some instances, boat depictions incorporate specific attributes—such as sail configuration, stempost form, and particular ornamental features that enable identification of vessel type and regional affiliation (Taçon and May 2013; Sukkham et al. 2017; Chaw and Hsiao 2022; de Ruyter et al. 2023). Several studies in North Konawe have documented representations of both dugout and plank-built boats (Hidayatullah 2023; Sabri 2024). In particular, regarding the outrigger boats in this study,

the author found no direct evidence depicting plank-built boats, either in the form of multi-tiered hulls or identifiable characteristic features. The slightly curved hulls and outriggers, as seen in the first and third images at Gua Tengkorak 5, more closely resemble simple outrigger canoes. Nevertheless, the bifurcated forms observed on one or both outriggers in the depictions from Gua Ladori, the second image at Gua Tengkorak 5 and the first image at Gua Tengkorak 6, bear resemblance to outrigger boats from Manado (*londe/londi*) (Salam 2016) and Bali (*jukung*) (Horridge 1981, 1987; Ward 2025). This evidence suggests the possibility that these were canoe boats with ends joined by planks, subsequently shaped into bifurcated forms, akin to *jukung* construction (Parry 2000). Meanwhile, the second boat at Gua Tengkorak 5 exhibits a markedly curved hull and outrigger profile, distinguishing it from the other outrigger boat depictions. Depictions of outrigger boats with sharply curved hulls are instead found at Gua Kagofigofine and Gua Maarewu, on Muna Island.

Boats characterised by a markedly elevated, curved keel and bifurcated stemposts are likely to represent a more recent technological development, constructed through the integration of multiple timber beams and planks to achieve a sharp curvilinear form. Several such boat types are produced with keel or stempost extremities that curve upward. The stempost serves a primary functional role in deflecting water spray, thus preventing seawater from entering the hull during navigation (Wangania 1981; Utomo 2007). In maritime contexts in particular, this structural feature operates as an effective wave breaker (Chrismianto et al. 2014). Accordingly, the greater the upward curvature of the stem post, the lower the risk of water ingress into the hull. Their comparatively larger dimensions render plank-built vessels more suitable for inter-island transport and long-distance voyages. Such a choice is demonstrably more efficient than reliance on smaller dugout canoes, which accommodate only a limited number of passengers. Moreover, dugout canoes exhibit inherent limitations in terms of stability, especially when navigating waters characterised by strong currents.

The incorporation of outriggers constitutes a fundamental structural component of this category of traditional watercraft, particularly within archipelagic contexts. Haddon (1920) noted that double-outrigger vessels demonstrate enhanced stability and are therefore widely used in offshore environments, especially for trading activities, notwithstanding their comparatively limited manoeuvrability. In contrast, single-outrigger boats are typically utilised as small-scale fishing craft operating in nearshore waters. Furthermore, the presence of outriggers mitigates the risk of capsizing resulting from strong winds, high waves, sudden conditions of shifting and heavy rainfall (Haddon 1920; Whitley 1986). It may thus be inferred that outrigger boats were principally designed for offshore navi-

gation in waters characterised by stronger currents. Horridge (2006) further argued that the combination of a single-outrigger canoe and sail is unsuitable for lacustrine or fluvial settings. This technological adaptation enabled island-based communities in Indonesia to navigate between regions, gradually enhancing the role of outrigger boats not only in human mobility but also in maritime trade.

Shifting away from the technological dimension, another compelling aspect of the depiction of outrigger boats lies in the variation of decorative forms at the extremities of the stempost. Several vessels in North Konawe exhibit forked stempost tips, whereas on Muna Island, the forms range from sun-like motifs to tassel-like ornaments. Although these differences may, on one level, reflect technological considerations, such ornamentation may equally signify symbolic expressions representing the cultural identities of particular communities. The curved configuration of the prow or stern is intended to reduce wave resistance through hydrodynamic optimisation, thereby enabling the vessel to attain greater speed with lower energy expenditure (Burningham 1992). Meanwhile, the forked stempost form, which is widely distributed across eastern Indonesia and parts of Southeast Asia, reflects patterns of shared cultural transmission among Austronesian-speaking populations.

A comparable phenomenon is observed in the depiction of boats adorned with 'sun motifs' at the prow or stern, which reflects a symbolic expression of belief systems in Southeast Asia referred to as the 'Ship of Death'. Although interpreted in diverse ways across different regions, the representation of the boat and the sun within this framework is regarded as a significant symbol in rituals marking critical transitions in human life. Consequently, this symbol is frequently employed in various ceremonial contexts, including initiation rites, funerary practices and other pivotal events in the life of a community (Manguin 2001; Ballard et al. 2004). It is argued that the presence of this symbol represents Austronesian cultural traditions that developed in eastern Indonesia and the surrounding regions (Ballard et al. 2004). An ethnographic record from Dawera an Dawelor Island in Maluku documents the presence of plank-built boats bearing sun ornaments on the stern. Beyond signifying the position of a man as helmsman, this ornament also conveys notions of prestige, status and warfare (De Jonge and Van Dijk 1995; Hartatik 1999; De Jonge 2003; Refo 2019). Among the Kei and Tanimbar people, the tradition of depicting the shape of the sun (called the boat's eye) on the bow of the boat is also documented. This shape is believed to provide 'hot' energy to the bow to conquer anything it faces and provide safety in sailing (De Jonge and Van Dijk 1995; Appel 2012). Furthermore, this symbol also represents familial or group identity (Ballard 1988; Rawianti 2025). Another interesting fact is the use of sun ornaments on the tips of the boats of the Yami people of Orchid Island,



Figure 12. Outrigger boats on the Lalindu River (a), Muna Island (b), and Kendari Bay (c) (photo by MS, 2025).

Taiwan, who consider this symbol to be the eye of the boat (*mata-no-tatara*). At the top of the boat is a figure of the ancestral hero (*Magamaog*) decorated with black chicken feathers (Appel 2012). Research conducted by Wa Ode Rawianti (2025) demonstrates an association between boat and sun imagery and the contextual depiction of hunting and warfare scenes represented in the boat images at the Liang Kabori Cave Complex. This evidence not only reveals connections between the community of Muna Island and neighbouring regions but also illustrates the distribution of analogous symbolic forms that were very likely inherited from the ancestors of Austronesian-speaking populations.

Beyond the aforementioned considerations, this finding demonstrates that the cultural bearers of the rock art tradition possessed a refined skill in depicting outriggers on boats. The representation of an outrigger canoe demands a markedly different technique as it is not as easy as drawing a boat without outriggers; the outriggers can be seen if drawn as if seen from above (Lape et al. 2007). In two-dimensional boat motifs presented in horizontal view, the outrigger—structurally parallel to the hull—poses a particular representational challenge. From the identified outrigger boat motifs, it is evident that the artists adopted varied perspectives in their renderings. The outrigger is portrayed

either below or above the main body of the boat. By refraining from aligning the outrigger strictly parallel with the hull, the artist appears to have emphasised its structural distinctiveness. From the viewer's standpoint, this strategy produces a form that renders the outrigger immediately recognisable. Nevertheless, some images remain ambiguous, leaving it unclear whether they depict an outrigger or an extension of the hull. Ambiguity occurs when the outrigger is depicted close to the hull or when the image is significantly degraded. In Gua Metanduno and Liang Kabori, the surviving details are insufficient to definitively classify these images as outrigger boats.

From a chronological standpoint, the images under study remain undated in absolute terms. As a comparative reference, recent reassessments of Austronesian-period rock art in Southeast Asia provide relevant context. Aubert and colleagues, based on black-painted motifs from Maros-Pangkep and Sangkulirang-Mangkalihat, argue that small anthropomorphs, zoomorphs, boats and geometric figures belong to a later phase associated with the spread of Neolithic farming communities since at least c. 4000 BP. This position is supported by dating results of the black human motif from Leang Bulu Bettu (1583–1428 BP) (Huntley et al. 2021), Gua Sireh, Sarawak (1670–

1830 CE) (Huntley et al. 2023), and Hermoso Tuliao Cave (3570–3460 BP) (Jalandoni et al. 2021). A recent study from the Liang Kabori area further confirms relatively recent rock art. A black anthropomorphous motif at Gua Kagofighofine produced a minimum age of 0.3 ka, the youngest black-painted image dated in the region, while a reddish-brown anthropomorphous motif at Liang Pominsa produced a minimum age of 3.9 ka (Oktaviana et al. 2026). This latter result suggests that boat images with similar pigment characteristics, including the outrigger motifs of Liang Kabori, may derive from a comparable horizon. Overall, the evidence indicates that outrigger boat imagery formed part of the cultural repertoire of Austronesian-speaking communities in Southeast Asia from around 3000 years ago onward. Ceramic assemblages from Gua Ladori dated to the 14th–17th centuries CE (Sabri and Permana 2024) indicate continued site use in the later period.

Intriguingly, in both regions studied, outrigger boats continue to be found and utilised by local communities, although in forms that no longer precisely resemble those depicted in the rock art (Fig. 12). Furthermore, to the present day, communities in both regions are still developing lifeways that are strongly dependent on surrounding aquatic resources, derived from major river systems as well as marine fisheries. Consequently, boats have constituted a fundamental and enduring element of their cultural and economic systems. Within this context, the rock-art depictions of outrigger boats discussed in this study represent an original and novel line of evidence for understanding Austronesian maritime heritage in Southeast Sulawesi, offering insights of regional importance while also contributing to broader, global discussions on the deep history of seafaring traditions among Austronesian-speaking societies.

7. Conclusion

This research about the rock art depicting outrigger boats in North Konawe and Muna Regency has revealed significant insights into maritime technology in past eras, both within Indonesia and more broadly across Southeast Asia. This study discusses six depictions of outrigger boats discovered in the Matarombeo Mountain region of North Konawe. Additionally, several images indicating the use of outriggers found in Liang Kabori are presented for comparative purposes. The findings demonstrate that the depictions in North Konawe clearly illustrate outriggers, both single and double. It is hypothesised that most of these images represent simple dugout canoes, while some depict more complex boats constructed from plank and timber assemblies, allowing for larger dimensions. The latter type is also adorned with more elaborate ornamentation. These results provide a new understanding of the pivotal role outriggers likely played in maritime navigation across Indonesia—and potentially throughout Southeast Asia since ancient times.

Such interpretations are supported by the enduring significance of outrigger technology in archipelagic regions, where it continues to underpin local maritime practices to this day. This study further contributes empirical data on the morphological and technological variability of rock art motifs within the Indonesian archipelago and the broader Southeast Asian region.

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M. Sabri^{1*}, R. Cecep Eka Permana², Suryanto³, Muh. Aprisal Oka¹, Wa Ode Rawianti¹, Meliati¹, Ninin Junika⁴, Risnawati¹, La Ode Darma⁵, Saswal Ukba⁶, Muh. Ardian Syah¹, Ersi Dwi Riyanto⁴, Adhi Agus Oktaviana⁷

¹Yayasan Pusat Kebudayaan Sangia

²Faculty of Humanities, University of Indonesia

³ Faculty of Humanities, University of Hasanuddin

⁴ Faculty of Humanities, University of Halu Oleo

⁵Balai Pelestarian Cagar Budaya Wilayah XIX

⁶Faculty of Humanities, University of Nusa Cendana

⁷Badan Riset dan Inovasi Nasional

*Corresponding author sabrinov18@gmail.com

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