Full length article

Reuniting orphaned cargoes: Recovering cultural knowledge from salvaged and dispersed underwater cultural heritage in Southeast Asia

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ABSTRACT

Southeast Asia, with Indonesia at its core, was the epicentre of the most extraordinary expansion of global trade ever witnessed along the Maritime Silk Route. But this story is incomplete because many objects of trade, and the shipwrecks from which they originated, were salvaged and dispersed without adequate archaeological recording of the details of their find-spots. This article critically assesses the prevailing legislative and ethical landscape of underwater cultural heritage (UCH) in Indonesia, delineating the underlying tensions between economic interests and scientific imperatives. Our consortium of experts and heritage authorities proposes a resolution through the 'Reuniting Orphaned Cargoes' Project, which endeavours to re-establish the connection between two notable collections of Southeast Asian ceramics situated in Indonesia and Australia, tracing them back to the shipwrecks of their origins. Archaeological science can shed new light on the cultural significance of the two collections whilst also unveiling fresh insights into this defining epoch of world history. Moreover, this approach addresses unprovenienced UCH, and opens paths to implement and refine the operational guidelines of international heritage conventions that govern it. By reconnecting relevant communities with objects of material cultural heritage that languish in institutional and private collections, this ambitious project builds capacity and utilises UCH for sustainable development in Indonesia, and across Southeast Asia. If these objectives are realised, the project will enrich our understandings of the past and secure the preservation of UCH for generations to come.

1. Introduction

Cultural heritage constitutes one of the basic elements of civilisation and national culture [1]. While some nation states are beginning to signal new remedies to address plunder [2], with the advent of online platforms, the trade of illicit antiquities endures [3,4]. Notwithstanding new demand from China and the Gulf states, because of historical imbalances, cultural heritage has primarily been collected by institutions and citizens with links to former colonialist powers [5]. Threats to material objects are threats to culture, and the transfer of antiquities to

developed markets is a challenge to sovereignty and cultural dignity. It echoes the lived experience of inequality between the developing and the developed world [6].

Similarly, underwater cultural heritage (UCH) continues to be destroyed and exchanged for commercial gain. Vast institutional and private collections of UCH have been amassed from the Maritime Silk Route in a practice that reduces the value of these objects to the aesthetic and economic, overlooks their cultural and archaeological significance, and distances them from their communities of origin. This has particularly been the case in Southeast Asia and specifically Indonesia. Our

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multilateral project, 'Reuniting Orphaned Cargoes', funded by the Australian Research Council and comprising of archaeologists, heritage scholars and professionals, lawyers, and material scientists, aims to address this issue. It will do so by juxtaposing and critiquing the opposing values of UCH: economic and aesthetic versus scientific. The primary data source is an unstudied Indonesian public collection of trade ceramics, potentially the largest of its kind in the world, brought into conversation with a smaller, private Australian collection, purportedly of high monetary and aesthetic value, purchased on the antiquities market. This will enable the research team to ascertain the cultural and scientific value of 'grey' or 'orphaned' UCH.

1.1. The maritime silk route and Indonesia

Multifaceted conceptions of the 'Silk Route' or 'Silk Road,' which date to the 19th century and have gained strength as a "quintessentially modern concept" ([7]:4), encompasses both land and sea routes. Increasingly, the concept of the Silk Road has been theorised as a form of geoculture, with important strategic considerations in the 21st century. Recently, Tim Winter [7–9] has presented a compelling case that China's extensive Belt and Road Initiative (BRI) has significantly increased its application in various areas, such as international trade, diplomacy, infrastructure development, and statecraft, and notably as a narrative framework for cultural sector projects. The revitalisation of the Silk Road through the BRI merges a constructed geocultural idea of harmony, and open borders based on transcontinental and transoceanic exchange, alongside perhaps the most ambitious foreign policy effort ever undertaken by a single country [7–9].

The idea of the Silk Road and Maritime Silk Route offers scholars a valuable imaginary with which to consider hitherto underexamined regional and historical connections. These links often left scant records and have been overshadowed by historiographies centred around nation-states. Researchers employing Silk Route frameworks realise their utility in revealing the sophisticated trade networks that characterise the historical development of globalisation and the longstanding histories of cultural interconnectivity. Specifically, these perspectives emphasise the dissemination of ideas, technologies, religions, languages, social structures, and material culture between peoples and across geographical boundaries [10–12].

Indonesia, situated at the maritime crossroads of the Indian Ocean and the South China Sea, was *the* hub of the Maritime Silk Route. Embracing more water than land, Indonesia is arguably the first and greatest archipelagic state in the world [13]. Its territorial waters encompass approximately 3.2 million square kilometres, while its coastline spans over 95,000 kilometres, the second longest in the world. For centuries, Indonesian waters served as a medium for international trade, acting as both a transit point and a destination, facilitating the exchange of ideas, religions, languages, and goods [14]. To de-centre Sino-centric approaches and assert regional agency over these historic maritime routes, insular Southeast Asian nations, especially Indonesia, have recently opted to use the term 'Maritime Silk and Spice Route,' or simply 'Spice Route' [15,16]. This terminology is intended to reconstruct elements of Indonesia's cultural and historical narrative and better reflects the trade routes and their role in the region's history [17].

Significantly, the UCH of Indonesia is abundant and diverse [18,19]. It holds the history of the global maritime trade in its treacherous depths
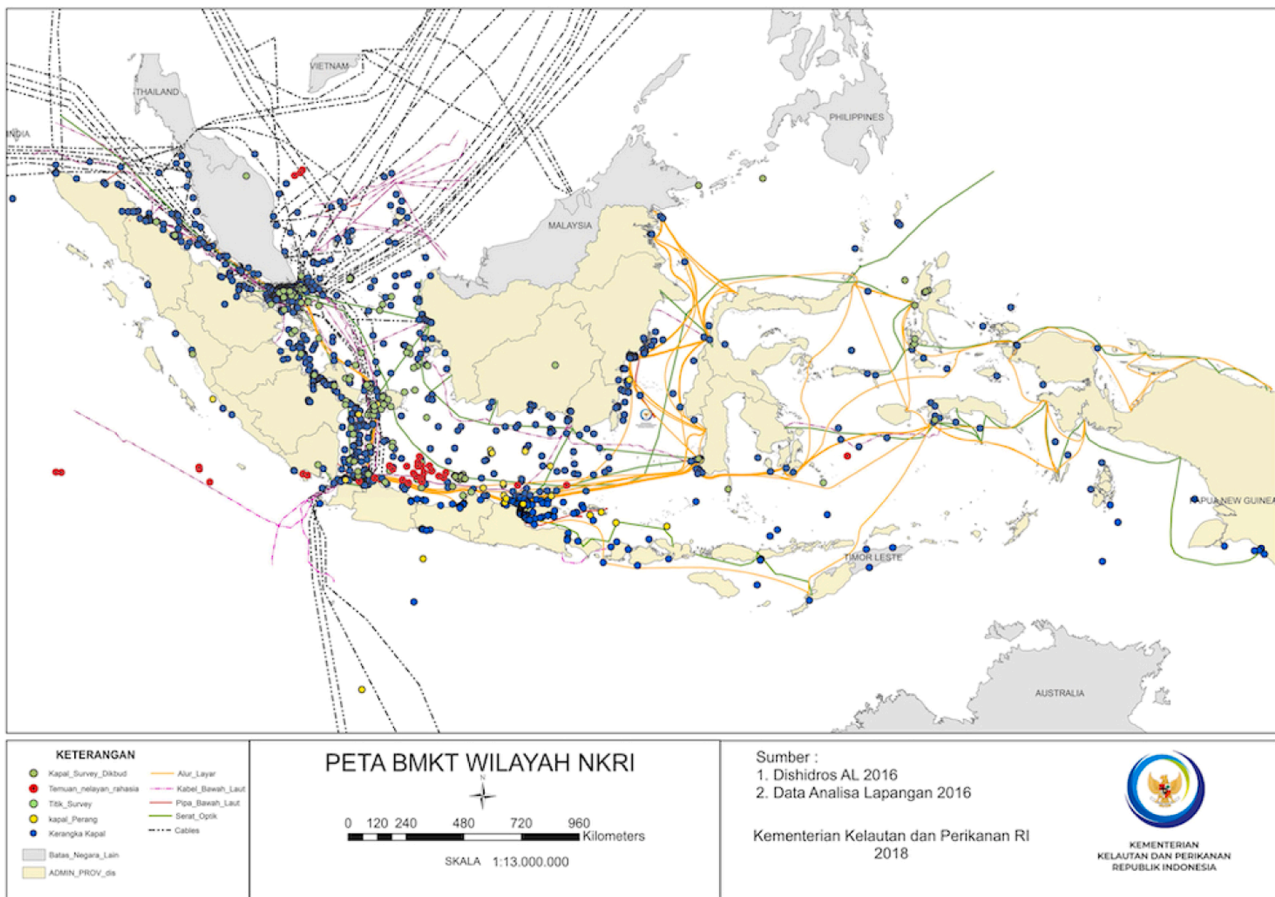

Fig. 1. Location of shipwrecks in Indonesia as of 2018 mapping. Blue dots are registered wrecks from hydrographic and bathymetric surveys of the National Center of Hydrography and Oceanography, Indonesia. Light green dots indicate shipwrecks site explored by commercial salvage companies. Yellow dots are warship wrecks. Dark green dots indicate surveyed shipwrecks sites, conducted by the Ministry of Education and Culture. Red dots indicate shipwrecks sites reported by fishers. Map and all data courtesy KKP.

where vessels from China, India, Japan, the western Indian Ocean, Portugal, Spain, the Netherlands, England, and Southeast Asia were lost at sea along with their cargoes. According to 2022 data from the Ministry of Marine Affairs and Fisheries (Kementerian Kelautan dan Perikanan, KKP) there are over 700 recorded shipwrecks dating between the 10th and 20th centuries in Indonesia's territorial waters (Fig. 1). While the exact location of merely 170 wrecks is known through survey [20], only a handful have been studied completely. The true count of shipwrecks is believed to be significantly higher, perhaps in the thousands (Horst Liebner 2005 cited in [21]).

The wrecks, their cargoes, and their interpretations are important for what they tell us about Indonesian, Southeast Asian, and global identities over many centuries. While recent scholarship in global history during this time has revealed the deep religious, economic, political, and social role of trade ceramics as vehicles for the transmission and assimilation of artistic symbols, themes and designs [22], these studies tend to dismiss the role of Southeast Asia as an incidental commercial node, a passive recipient of inferior objects, or as a place where crafts, not art, were created [23]. Extant research has largely been dominated by studies devoted to connoisseurship that seek to identify types of wares or singularly unique finds; however, such scholarship has hitherto inadequately considered the relationship between ceramics and the social structures of Southeast Asia.

1.2. Researching orphaned UCH

While heritage authorities and academics recognise the cultural significance of this UCH [24], permissive legislation has diminished the value of these cargoes to the pecuniary, as they are traded in the antiquities markets. Furthermore, while there is much accomplished scholarship on the development, diversity, and marvel of pre-modern maritime global trade we argue that this knowledge is partial. A comprehensive examination of global trade across the Maritime Silk Route has been hindered because:

a) Its UCH has already been largely dispersed throughout the world without archaeological protocols and therefore excluded from scientific analyses; and
b) When heritage authorities have been able to accrue assemblages, decades of permissive legislation has prejudiced access to arguably the most culturally significant objects.

The unregulated removal of objects from historic shipwrecks can disturb and even destroy the most important cultural knowledge that could be gleaned from them: context [25]. Methodical recording of shipwrecked objects – where they lie in the hull and in relation to each other – can yield valuable insights into how the cargo was packed, where the vessel loaded its cargo and its intended trading destination. Failure to record stratigraphy at the time of recovery, however, results in the loss of such information forever.

Destruction of context due to inappropriate recovery methods also makes it difficult to determine provenience—that is, an object's place of origin. Archaeologists rely on contextual information to better understand and interpret provenience; thus, when such context is disturbed or destroyed, determining provenience is a far more difficult task. The concept of provenience is distinct from, although sits alongside, the concept of provenance, which refers to post-recovery histories of ownership and acquisition. Both provenience and provenance are important considerations for those working with cultural objects, including archaeologists who record and reconstruct the contextual surrounding environments to interpret the cultural significance of material cultural heritage, and art historians and museum curators who value knowledge relating to how objects are collected and acquired (see James Flexner [26] for a comprehensive discussion of context, provenience, and provenance).

Context is therefore essential to analyse and compare artefacts within and from different sites across time and space, thus interpreting their full scientific, historical, and cultural implications. Such is the importance of context that many maritime archaeologists advocate that UCH remains in-situ until adequate resources and expertise are available for proper excavation [27]. However, this best-practice approach may not always be feasible, especially in under-resourced countries where opportunistic looters typically have unfettered access to unprotected wrecks [18,28].

Separated from their origins and dispersed from each other, many known trade ceramics from the Maritime Silk route have become 'grey' or 'orphaned' [6,29,30]. We define 'grey' or 'orphaned' objects as cultural objects that have been recovered unethically, illegally, or in some other problematic way—for example, UCH that has been commercially salvaged rather than scientifically excavated. As a result of the methods by which they have been recovered, determining the provenance and provenience of such objects is difficult.

Although excavation and "interpretation at the trowel's edge" ([31]:58) remain coveted as the central methodology for all types of archaeological investigation [32,33], the discipline has long recognised that digging is unnecessary to generate new knowledge [34]. Barbara L. Voss [30] goes further and has convincingly demonstrated that researching orphaned collections is not simply a precursor to, but actively generates, innovative research. Additionally, examining the practice of collecting can reveal insights into how communities generate knowledge about their surroundings, providing a view on broader historical and social matters [35–37]. Correspondingly, in *Counterheritage* [38] Denis Byrne questions traditional views of agency concentrated by the 'Western sphere' and underscores the need for an ethnography of heritage and contemporary collecting in Asia (see also [5,39]). He suggests that while there's an explicable tendency to demonise this practice, its history and present activities in Asia and the West are intertwined and commensurate with archaeology and heritage, meriting scholarly examination. Finally, we posit that studying orphaned objects is an ethical responsibility, as their enduring preservation and utility can be strengthened, rather than weakened, through reflective practice [40].

Due to the circumstances of their collection, neither the objects nor the repercussions of the collection process have been previously available for systematic archaeological examination. Within this context, the 'Reuniting Orphaned Cargoes' project examines two large ceramic collections of grey UCH to establish their original cultural and historical contexts and to re-establish links to their communities of origin. Drawing attention to problematic salvage and the antiquities trade is critical but foregrounding historical and archaeological value is our priority. Therefore, this project is not only concerned with how these objects came to be salvaged, but what to do with them now, and — more urgently — what to do when more resurface.

2. UCH protections in Southeast Asia

To mitigate cultural loss, the trade of cultural heritage is governed by international and country-specific laws (e.g., [1,41–44], for analysis see [45]). These national laws have limited jurisdiction, however the international laws apply only to signatory states, and all are enforced unpredictably. Additionally, efforts to protect UCH from exploitation have lagged behind regulatory frameworks that prevent the looting and trade of antiquities from terrestrial sites.

To address this issue, the international community adopted the *2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage* (henceforth the 2001 Convention) and the *Operational Guidelines for the Convention on the Protection of Underwater Cultural Heritage* (henceforth The Guidelines) [43,45–47]. Nonetheless, the 2001 Convention's strict criteria pose considerable challenges and are, in some instances, impossible to meet [29,45,48,49]. Among all Southeast Asian countries, only Cambodia has ratified the 2001 Convention to date.

2.1. Salvage and dispersal of UCH in Southeast Asia

Instead of endeavouring to comply formally with the 2001 Convention, many countries have instead chosen to manage UCH through domestic legislation. Nevertheless, the enforcement of these laws is arbitrary and restricted in scope, as they can be ambiguous and open to interpretation. In Indonesia, two decades (1989—2010) of permissive legislation facilitated the commercial salvage of artefacts from the seafloor without applying systematic archaeological methods [50].

Across Southeast Asia, there has been a marked increase in both commercial and illicit salvage activities, including but not limited to trade ceramics. Byrne [38] describes the extent and interrogates the complexity of this process and the social agency of local diggers and collectors in the Philippines and Thailand beginning in the 1960 s and continuing to this day. Objects of cultural heritage are typically recovered from poorly protected sites by economically disadvantaged communities and are then distributed by intermediaries, dealers, and auction houses to both public institutions and private collectors. Due to the ease of divisibility, durability, and commercial viability of shipwreck cargoes in Southeast Asian waters, they are especially susceptible to such activities.

Detached from their historical and cultural origins, their cultural value changes, and habitually diminishes; for international institutions and collectors can only appreciate them for their aesthetic and economic qualities. Collectors are part of this practice as a means of heritage appreciation and symbolic status accumulation (Bourdieu 1986, Byrne 2014, 2016), resulting in numerous private collections and connoisseur societies dedicated to trade ceramics found in the region. Collectively, in the public domain, art institution collections contain hundreds of thousands of trade ceramics obtained through permitted and illegal salvage.

2.2. UCH protections in Indonesia

Indonesian heritage legislation governing UCH has generally been inconsistent [29,49,51,52] (Fig. 2) (on Indonesian heritage legislation in general see [53–55]). While the vastness of the Indonesian coastline and the multitude of sites ensure enforcement is a perennial problem, the predominant limitation to protection arises from the juxtaposition between the potential economic value and the intrinsic heritage significance of the objects [18]. Prior to 1999, maritime archaeology in Indonesia was overseen by both the Ministry of Education and Culture (Kementerian Pendidikan dan Kebudayaan) and the Coordinating Ministry for Political, Legal, and Security Affairs (Kementerian Koordinator Bidang Politik, Hukum, dan Keamanan). Currently, jurisdiction over this domain is shared, albeit indistinctly, between the Ministry of Education and Culture and the Ministry of Marine Affairs and Fisheries (Kementerian Kelautan dan Perikanan, or KKP) [50].

Due to the high costs associated with this sub-field, and the lack of clear jurisdiction and institutional responsibility, maritime archaeology remains under-resourced. As a consequence, it tends to receive less attention compared to terrestrial archaeology. Furthermore, laws implemented to administer maritime archaeology were devised to enable the Indonesian government to profit from the economic value of shipwrecks by permitting the salvage and dispersal of their cargoes [29]. This legislation has led to the further commodification and subsequent fragmentation of the nation's underwater cultural heritage.

The *Geldermalsen* wreck, discovered and salvaged in the 1980 s is perhaps the most emblematic case of irretrievable cultural loss resulting from salvage in Southeast Asian waters. A mid 18th-century Dutch East India ship carrying tea, porcelain, and gold bound for Batavia, the *Geldermalsen* site was salvaged near Indonesia's Riau Islands by a private individual with no agreement with the Indonesian Government, utilising methods that held no scientific or interpretative value for archaeology. Part of its cargo was sold and dispersed by Christie's in 1986 for 16 million USD [24,56,57].

In the wake of the *Geldermalsen's* initial salvage, an Indonesian team, including one of the nation's few (at the time) maritime archaeologists, Santoso Pribadi, embarked on a mission to pinpoint its location. Pribadi, an alumnus of the SEAMEO SPAFA underwater archaeology training program in Thailand, successfully identified the wreck and retrieved a few artefacts from it. Tragically, during a subsequent dive, Pribadi went missing under circumstances that are still unclear [58,59]. His disappearance had a chilling effect on Indonesian maritime archaeology and advocacy for UCH protections. Indonesia lost a skilled practitioner and the event also hinted at the potential perils when economic and cultural values of UCH collide.

The tainted narrative of this shipwreck persisted into the new millennium, during which pecuniary gain ostensibly remained the prevailing impetus for renewed salvage operations. In 2005 and 2006 the Regency of Bintan (Indonesia) issued permits to Adikencana Salvage for the survey and salvage of a site known as *Karang Heliputan No.2* (a.k.a. *Geldermalsen*) located on Karang Heliputan Reef (also known as Admiral Stellingwerff Reef) [60]. The absence of rigorous scientific methods during the salvage process has led to an ambiguity regarding the scientific and cultural value of the salvaged materials, some of which are currently held by KKP.

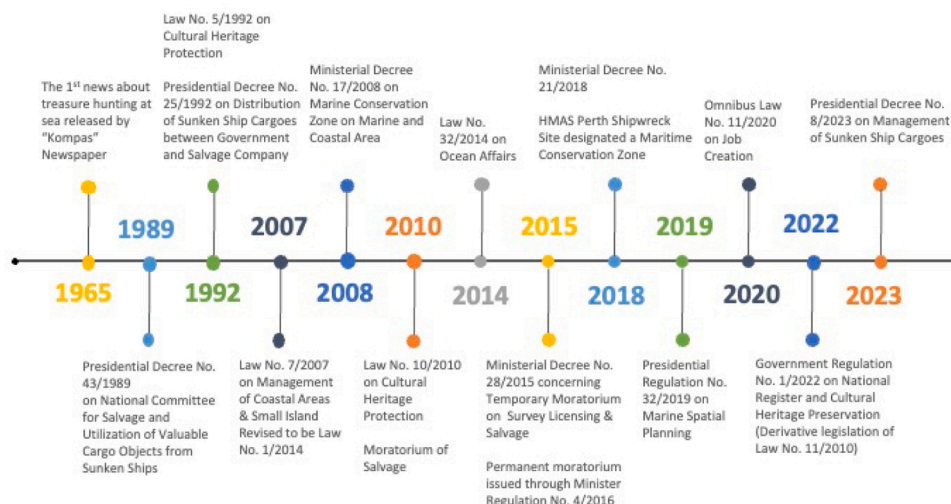The case of the of the *Geldermalsen* motivated the Indonesian

Fig. 2. Timeline summary of Indonesian legislation pertaining to UCH. Graphic: Nia Naelul Hasanah Ridwan.

Government to manage and mitigate the effects of treasure hunting by regulating the disposition of archaeological objects found at sea by introducing legislation (Presidential Decree No.43/1989, [61], Fig. 2) that permitted the commercial survey and salvage of valuable objects (*benda berhaga*) from shipwrecks in Indonesian waters. Additionally, the National Shipwreck Committee for Salvage and Utilisation of Valuable Cargo Objects from Sunken Ships (Panitia Nasional Pengangkatan dan Pemanfaatan Benda Berharga Asal Muatan Kapal Yang Tenggelam, or PanNas BMKT) was established to oversee the regulation, management, and offering of recommendations related to private salvage operations, including the authorization of survey and salvage permits [50].

2.3. Economic vs. cultural value in Indonesian legislation

Although not without issues, it appeared as if Indonesia was on course to some kind of practical protection and methods to salvage UCH with a minimum of archaeological protocols that recognised their scientific value. This trajectory, however, encountered complexities with the introduction of Presidential Decree No.25/1992. This decree, serving as the technical execution of the salvage stipulations outlined in Presidential Decree No.43/1989, dictated a division of salvaged objects between the state and private salvors. Article 1 of the decree permitted the sale of historically valuable objects, barring those deemed to possess cultural heritage value. Furthermore, if the state decided that certain privately salvaged cargoes had cultural heritage value, then they would compensate the salvage company [62]. No definitions of cultural heritage value were specified.

Moreover, the intended effect was to claim 50% of the salvaged materials or reap 50% of the gross proceeds of object sales which were to be deposited in the State Treasury regulated by the Minister of Finance [29,51,57,62]. This commercial salvage system endured from 1989 to 2010. Debate amongst Indonesian government and heritage bodies regarding the benefits of entrepreneurial participation and the introduction of new heritage legislation through Law No. 11/2010 on Cultural Heritage led to a moratorium on commercial salvage, implemented temporarily in 2010 and then permanently in 2016 [44,63]. Some argue the moratorium had the opposite effect, resulting in renewed looting of underwater sites [49,51,64,65]. Data on the objects recovered during the permissive commercial salvage period is limited. What is known, however, is that many thousands of salvaged objects, dating from the 9th to the 19th centuries, ended up in the possession of the Ministry of Marine Affairs and Fisheries (Kementerian Kelautan dan Perikanan, or KKP).

Law No. 11/2010 on Cultural Heritage [44] represented the most noteworthy advance in Indonesian law governing archaeological artefacts on both land and sea. Nevertheless, this legislation is complex, remains subject to interpretation, and is not implemented on the ground [29,66]. While the legislation includes conditions mandating that fishers and salvors report discoveries of wrecks and UCH, and the retention of significant and scarce artefacts for museum preservation, pressing concerns have emerged from the definition of cultural heritage, leading to an apposition against potential economic value. To be designated as *cagar budaya* (cultural heritage), the following criteria must be satisfied: a minimum age of 50 years; represent a stylistic era spanning at least 50 years, possess special meaning for history, science, education, religion, and / or culture; *and* possess cultural value for strengthening national identity (Article 5, italics added for emphasis).

Demonstrating that cultural heritage meets each of these criteria is stringent and the definitions are so indiscernible as to have little, or contested, significance [18,29,51,57,64]. The high proportion of non-Indonesian objects common to the Indonesian Maritime Silk Route has further compounded the likelihood of their neglect and dispersal. The legal status and cultural value of Thai, Chinese, and Vietnamese ceramics are obscure, as defined by Indonesian law, which specifies protection of objects that 'strengthen national identity' [29,44,67] (see also [68]). Notably, no UCH has been set aside by Indonesian museums

on the pretext of 'cultural heritage value' or 'special meaning' [64]. Furthermore, Article 12 (2) stipulates that individuals can possess or oversee cultural heritage when the state's requirements for the quantity and nature of such heritage are met. This raises the critical question of how these requirements are evaluated.

While other provisions dictate that the state shall oversee all cultural items with unspecified ownership (Article 15) and the prohibition of non-permanent foreign residents from owning or exporting cultural heritage (Article 14) [44], another concern is implementation. When it comes to enforcement institutional responsibility is lacking and unclear. Law No. 11/2010 entrusts the Ministry of Education and Culture with the duty to research, protect, and preserve cultural heritage sites, including underwater sites (Article 1 (38)). However, Law No. 27/2007 (revised by Law No. 1/2014), Ministerial Decree No. 17/2008, and Law No. 32/2014 also allocate similar responsibilities to the Ministry of Marine Affairs and Fisheries [69–72].

Arguably, the most significant challenges to implementation of Law No. 11/2010 are embedded within its foundational structure, starting from Article 1, and repeated throughout. Article 1 mandates that Cultural Heritage be officially defined through a process of '*penetapan*' (transl. determination / stipulation). For UCH to receive protection, it must undergo an evaluation, then be ranked according to its significance at national, provincial, or regency/municipal levels. This classification determines if the UCH attains the status of cultural heritage, and the assessment is carried out by a panel of cultural heritage experts appointed by the Ministry of Education and Culture. While existing Indonesian legislation falls short in adequately defining cultural value, the clandestine trade capitalising on economic value persists.

2.4. Challenges in implementing legislation and achieving restitution

While the illicit and unethical nature of dispersed cultural heritage can be straightforward – they are from known terrestrial archaeological sites, there is undeniable association with both heritage and contemporary identity, and the presence of explicit legislation – the status of UCH, in contrast, largely remains unresolved. The sites of UCH remain under-researched, and when identified, their protection proves logistically challenging to monitor and police. Prosecution and claims for looted and grey UCH are rare, and when restitutions proceed, they are partial and costly. Significantly, they require broad interpretations of relevant legislation [48].

An extraordinary, but notable instance of restitution pertains to trade ceramics from Indonesian territorial waters. In 2001, Australia returned over 71,000 illegally exported trade ceramics from Indonesia, salvaged from the 19th-century Chinese vessel *Tek Sing*, sunk off Bangka Island [73,74]. The *Tek Sing* was salvaged by the same individual as the *Geldermalsen* but without the requisite permits required by Presidential Decree No.25/1992 and Presidential Decree No.43/1989. Although a majority of the items were auctioned within the European Union, when objects were detected in Australia by the Australian Customs Service, they were earmarked for seizure under the Protection of Movable Cultural Heritage Act 1986 (Cth). Seven containers were confiscated and repatriated to Indonesia after verifying their illicit exportation [48]. In 2022, a further 333 *Tek Sing* ceramics, which had been removed in a subsequent dive were also returned [75]. The location of the returned *Tek Sing* objects is unknown and they are not available for academic study or public display and interpretation.

Another case in 2014 is demonstrative of the multifaceted preconditions and complex construal of law required to protect UCH. In that year, a KKP surveillance unit intercepted a fishing boat engaged in unauthorized salvage operations in Numbing, Bintan, within the Riau Islands. The direct arrest operation resulted in the apprehension of the boat's captain and the seizure of approximately 3680 artefacts as evidence. This illicit salvage activity was in violation of Law No. 1/2014, an amendment to Law No. 27/2007 on the Management of Coastal Areas and Small Islands. This legislation deems shipwreck cargos as marine

resources, the exploration of which mandates an official permit. The Riau Islands High Prosecutor's Office subsequently oversaw the case, which was adjudicated in the Tanjungpinang District Court. The court issued a definitive judgment, sentencing the accused to nine months imprisonment. Additionally, the confiscated artefacts were entrusted to the local government of the Bintan Regency [76,77].

The cases of the *Tek Sing* and in Numbing underscore the vulnerable status of UCH. Notably, the UCH from Numbing could only be protected under the definition of an economic marine resource, contrary to its scientific value as UCH. When the provenience of the majority of dispersed trade ceramics remains unknown, and neither they nor their sites of origin are registered by Indonesian heritage authorities, they are beyond protective legislation and lack formal mechanisms for restitution.

2.5. A return to permissive salvage of UCH in Indonesia?

Rather than elucidating the status of UCH, demarcating jurisdiction, and providing clear avenues for implementation, the recent suite of Indonesian legislation further obfuscates the situation. In an apparent contradiction of Law No. 11/2010, Law No. 32/2014 on Marine Affairs classifies underwater objects as natural resources, not heritage, framing their salvage as a maritime industry [72]. This legislation provides provisions for community participation, emphasising preservation, conservation, and restoration of the cultural value, maritime concepts, and customary law of UCH (Article 70). However, it simultaneously underscores economic interests by allowing the management, sale, and purchase of UCH, provided there is a government permit in place (Article 27) [50].

In 2020, the Republic of Indonesia implemented Law No. 11 on Job Creation (widely known as the Omnibus Law), which subsequently re-establishes the potential for lawful salvage operations [49,50,78]. While Indonesian heritage authorities are anticipated to formulate supplementary technical guidelines prior to the resumption of salvage endeavours, the cultural significance of UCH seems to be persistently eclipsed by economic interests. Furthermore, the 2020 legislative framework is poised to engender a proliferation of ambiguously classified UCH.

There remains significant uncertainty around the constitutionality of the Job Creation Law [79]. In November 2021, Indonesia's Constitutional Court ordered the revision of the Job Creation Law within two years of the court's ruling and suspended the issuing of new implementing regulations [80]. The full implications of this ruling are still unknown, but it has already led to confusion around the status of Indonesia's shipwreck management policies and whether the nation may again revert to a moratorium on commercial salvage [50].

In 2022, Government Regulation No. 1 again mandated the exploration, discovery, and registration of UCH [81]. Such activities must be reported to KKP and coordinated with an appropriate research institution. While this regulation reaffirms the retention of significant and rare artefacts within Indonesia, the characterisations of UCH again remain indefinitely articulated. Additionally, in early 2023, Presidential Decree No. 8 concerning the Management of Valuable Cargoes from Sunken Ships came into force. This regulation served to implement the Job Creation Law. According to the Decree No. 8/2023, commercial salvage remains permissible, albeit exclusively for non-protected cultural objects. Accordingly, the Ministry of Education and Culture is mandated to carry out an assessment before proceeding with the permit approval process. Additionally, the updated regulation stipulates that companies must pay a non-tax state revenue fee of 1.1 billion rupiah and cover any environmental costs that may arise from the salvage operation [82].

It is possible that the commercial salvage sector will seek to oppose the 2023 Decree, particularly due to its implied protections for cultural objects. The industry may contend that the salvage of non-protected cultural objects would yield inadequate returns on investment. All the while, unauthorised salvage and commercial trade of Indonesian UCH continues, with reports of uninterrupted plunder and sale of UCH, specifically trade ceramics, to markets in Indonesia, Singapore, and beyond [83,84].

3. Two collections, one story

As Indonesia continues to update its laws with a renewed focus on the economic benefits of UCH, there remain gaps in enforcing existing regulations. Meanwhile, the emergence of additional quantities of grey UCH is anticipated and the dispersed collections already held by both the Indonesian government and in private hands remain unexamined for their cultural significance. An ancillary way forward is to reunite two categories of grey of UCH that were disconnected from their plural scientific values from the moment of retrieval from the sea-floor: the Michael Abbott Collection of Trade Ceramics in Australia and the KKP Collections in Indonesia. These collections are not 'complete'; they are not representative of an entire shipwreck or site. On the contrary, the incompleteness of these collections is central to the challenge of working with orphaned UCH. Can partial information from cargoes, recovered without adherence to archaeological principles, be successfully used to develop reliable and new narratives about the past. If so, which methodologies are optimally suited for such an endeavour? This project is ground-breaking in its assertion that orphaned objects and incomplete collections retain scientific merit and collectively can shed valuable new light on the stories of the Maritime Silk Route.

3.1. Working with grey collections

An understandable response from the maritime archaeological, curatorial, and heritage advocacy communities to collections of grey UCH recovered through illegal or permissive salvage and subsequently dispersed throughout the world has been to ignore, malign, or view them with deep suspicion [85,86]. Some argue that working with such collections of UCH validates commercial salvage and values, and more worryingly leads to additional looting. The link between salvage, auction houses, and commercial exploitation of Chinese porcelain is attested, and infamous examples include the shipwrecks *Geldermalsen* and *Tek Sing* [18,48,87]. Therefore, in the absence of contextual analysis and additional cultural interpretation, research and publications of UCH, particularly of trade ceramics, are perceived by some as being limited to the authentication of objects to establish an economic value, or as a pretext for sale [88].

Indeed, when illicit actors 'collide or collaborate' with licit actors such as academics and cultural institutions a great challenge is to align research with contemporary ethical standards [89–91]. Knowledge-based ethical environments allow scholars to make informed choices about the probity of working with grey material cultural heritage [88]. Significantly, we propose that the capacity to research orphaned UCH is the greatest opportunity to effect positive change. The alternative to researching, publicising, and seeking paths to restitution will see objects and collections continue to be dispersed, enter, return, and circulate in the antiquities market without scrutiny and interpretation.

3.2. A dispersed collection of grey UCH in Adelaide, Australia

Collecting constitutes a social activity that generates values within specific collective contexts [35–37] and research that tracks the life stories of objects and collections during their accumulation offers insights into how cultural knowledge and meanings change [92] (cf. [93]). Correspondingly, the recovery of UCH and the establishment of numerous private assemblages and organisations focused on the exchange and connoisseurship of trade ceramics has experienced significant growth in the past half-century or more, demonstrating how objects traded and used as utilitarian and cultural commodities in the ancient world have accumulated social capital in the present. One private

collection of trade ceramics is that amassed by Mr Michael Abbott AO KC in Adelaide, South Australia.

Totalling approximately 2300 objects, this assemblage was purchased from dealers and antique markets in Indonesia between 1966 and 2016 and has uncertain provenance and provenience. While the objects were acquired and transported legally in accordance with relevant Indonesian and Australian laws they were disconnected from their archaeological contexts and remain objects of grey UCH. With examples manufactured in China, Thailand, Vietnam, and Indonesia, dating between the 9th and 20th centuries, the Collection is probably the largest of its kind in Australia, and its method of acquisition and scope are equivalent to the holdings of the Freer Gallery of Art, Smithsonian Institution (see [94] approx. 1000 objects) and the Southeast Asian Ceramics Museum, Bangkok University ([95], approx. 2000 objects). While Abbott has previously made fractional donations of comparable artefacts to institutions such as the Art Gallery of South Australia (AGSA), the National Gallery of Australia, the National Gallery of Victoria, the Museum and Art Gallery of the Northern Territory, and the Western Australian Museum [96], the current Collection represents a range of significant objects resulting from over four decades of collecting.

From an archaeological perspective, this collection, and others like it, are legally permissible, but questions of ethics arise [5,88,93,97]. In addition to marine encrustations and glaze conditions, information from antique dealers supplied to Abbott indicates that the majority of the objects likely originated from submerged sites and shipwrecks situated in the Riau Archipelago, Eastern Java, the Bangka Belitung islands, and Southern Sulawesi (Abbott pers. comm. August 2019, December 2021, August 2022). In 2022 Flinders University accepted the donation of Abbott's trade ceramics as the centrepiece of the Southeast Asian Ceramics Archaeology Laboratory (SEACAL) to rediscover their archaeological context and directly address problematic salvage and dispersal of grey UCH from Southeast Asia (Fig. 3).

3.3. The KKP Collections at Cileungsi and the Marine Heritage Gallery, Jakarta, Indonesia

In the two decades following the implementation of Presidential Decree No.43/1989, PanNas BMKT granted over 70 licenses for survey operations, through which various enterprises retrieved commercial quantities of UCH [66,98]. The process of issuing licenses was a complex system that involved numerous responsible divisions of the Indonesian government [29]. Ultimately, the cargoes of thirteen shipwrecks were salvaged, totalling in excess of 460,000 objects of UCH. However, the division and distribution of this UCH remains incomplete. KKP currently has over 138,000 artefacts classified as state assets, in line with Treasury Ministerial Decree No.71/2020. However, an additional 7000 objects are still pending confirmation. Additionally, once the distribution between the salvors and the government is finalised, an estimated 85,000 more items will be added to state collections. This will increase the total

number of UCH artefacts under KKP's care to more than 230,000 [99].

Although its salvage and dispersal did not entirely follow the prescriptions of the Presidential Decrees, the *Belitung* cargo is perhaps the most well-known of those artefacts divided between Indonesia and another party. The western Indian Ocean-style vessel represents the oldest known maritime archaeological evidence of trade between the Middle East, Southeast Asia, and China. Discovered by local fishermen, around 60,000 artefacts were retrieved during two seasons in 1998 and 1999 by Seabed Explorations, 53,227 of which were later were sold to Singapore for US$32 million [100]. Renamed the Tang Shipwreck Collection, the objects are now held by the National Heritage Board, with a selection of key pieces on permanent display at the Asian Civilisations Museum [29]. Meanwhile, approximately 7000 of the 60,000 salvaged objects were seized by the Indonesian Government and transferred to a storage warehouse in Cileungsi, West Java [101] and all objects have now been re-inventoried and a selection are on public display (Figs. 4, 5).

The Indonesian *Belitung* holdings are just one of numerous orphaned cargo sets stored in the KKP warehouses, which is likely the largest single collection of artefacts from the Maritime Silk Route in the world. Spanning Indonesian territorial waters from the Riau Islands to the Karimata Strait and the Java Sea, the collection includes trade ceramics, metal objects, jewellery, coins, and cannons, with objects crafted in every corner of the globe. Management of a collection of this magnitude remains a challenging and ongoing task for KKP. As an incremental step to recognise the value of its orphaned collections. In March 2017, the KKP established the Marine Heritage Gallery at its Jakarta offices, with selected examples of UCH drawn from the Cileungsi warehouses [102] (Fig. 5). The purpose of the gallery is to increase public and government officials' awareness of the cultural and historical significance of Indonesia's UCH. While inventory and conservation are ongoing for objects that remain at Cileungsi, significantly, none have been subject to scientific analyses or contextual interpretation to consider their cultural value.

4. Reuniting orphaned cargoes

Facing orphaned UCH warrants critical enquiry to address several concerns. The fundamental precondition to work collaboratively with Indonesian heritage authorities and local communities must meet their needs. Enhancing the prominence of local voices can attempt to equalise power dynamics, facilitate more effective implementation, and mitigate the adverse consequences of top-down approaches dictated by external, institutional, and governmental agendas (see [84,103]). Also, while the project leverages archaeological science including elemental analysis and machine learning to create narratives around UCH, it must also be

Fig. 3. Dr Muja Hiduddin and Fatimah Rahman lead a passili ceremony at the Southeast Asian Ceramic Archaeology Laboratory (SEACAL) at Flinders University, September 20th, 2022; Photo: Priyambudi Sulistiyanto.

Fig. 4. Trade ceramics in the storage of the KKP Cileungsi warehouses, West Java. Image courtesy: Ministry of Marine Affairs and Fisheries, Indonesia.

Fig. 5. The Marine Heritage Gallery (located at Mina Bahari Building 4, 2nd floor, Ministry of Marine Affairs and Fisheries, Jalan Batu, Gambir, Jakarta Pusat). Image courtesy: Ministry Marine Affairs and Fisheries, Indonesia.

open to incorporating local knowledge and cultural perspectives, which may not always align with scientific methods. Lastly, the project's goal of reintroducing these narratives for sustainable management should be explicitly defined to clarify what sustainability means in this context and who benefits from such management strategies (on recent approaches to knowledge co-production and empowerment see a recent edited volume by Stephen Acabado and De-Wei Kuan [104]).

4.1. Indonesian practice on orphaned UCH and alternative approaches to heritage ownership

Presently, KKP employs three approaches to manage commercially salvaged collections. First, it maintains a comprehensive database of all cargoes housed at Cileungsi. Second, it promotes research by inviting the academic community to undertake specific research related to these collections. Lastly, it ensures public accessibility to these artefacts via the Marine Heritage Gallery and local government museums or galleries. Another path is to consciously addresses the hundreds of thousands of objects from the Maritime Silk Route that were not, and will not be, afforded the opportunity for in-situ preservation or excavation with optimum archaeological protocols.

To date, there have been no attempts to appropriately value or leverage the remains of salvage or plunder left to heritage authorities, or those acquired on the antiquities market. An additional, yet under-utilised strategy that has demonstrated efficacy in the in-situ preservation of sites is the encouragement and empowerment of local communities [19,105–107]. If authorities and academics can harness the cultural significance of salvaged and dispersed collections of UCH alongside their communities of origin, this could potentially enhance their protection. The approach of this project is to work hand-in-hand with Indonesian heritage authorities and local communities and employ archaeological science to generate hypotheses about orphaned UCH, then reintegrate these narratives to serve as a foundation for sustainable management of UCH within the Southeast Asian context.

While orphaned cargoes are regarded for their monetary value they have been explicably prejudiced from scholarship. However, this discrimination has not stemmed the pillage and contemporary trade of UCH or sufficiently addressed the loss of cultural knowledge. Transcending the conventional dichotomies of private versus public and local versus global ownership, there exist alternative paradigms for conceptualising and managing the ownership of cultural heritage [38,108]. For example, in *Against Culture Property* John Carman observed that in Britain, archaeological materials have evolved from being viewed as symbolic heritage to being considered an economic resource [108]. While UCH in Southeast Asia has always been considered an economic

resource, Carmen's theoretical recognition of different ownership structures might allow for the exploration of alternate frameworks for heritage objects, particularly focusing on communal property models. One approach is the concept of 'cognitive ownership' of intellectual property, a notion suggesting shared communal interest in heritage sites, defined as any individual or group's implicit claim to a cultural site [108,109]. These interests, ranging from economic to spiritual, may sometimes be conflicting. By granting multiple cognitive ownership systems, heritage objects can be protected by diverse stakeholders, even if their values clash. This multifaceted approach to heritage conservation also aligns with an environmental sustainability agenda, which couples cultural heritage with natural heritage and landscapes [110].

In Indonesia, pilot programs for local UCH management that have proven successful have implicitly incorporated the principles of multi-faceted cognitive ownership and aligned them with environmental stewardship. Notably, plural community values and appreciate of UCH has long-term implications, ensuring its conservation, and incorporating it into policy-making. A key to preservation success lies in the intertwined efforts of communities, institutions, and stakeholders. Simultaneously, the government has a duty to develop UCH resources for community welfare and safeguard them from potential harm [111–114].

4.2. Community UCH management: success of customary marine tenure at Tulamben, Bali

Frameworks of community management have been used to great effect for the USAT Liberty wreck – a US Army transport ship torpedoed by a Japanese submarine in 1942 – in East Bali, where KKP programs and local Customary Marine Tenure (CMT) have significantly benefited the Tulamben community and protected UCH [19,105–107]. CMT is a traditional system of resource management deeply rooted in local historical contexts [115]. Inherent to CMT are attributes such as delineated geographic domains, orchestrated accessibility, community-based oversight, and governance by customary authorities [116]. This system integrates unwritten rules and local environmental knowledge to regulate community access to marine resources. CMT's regulations mitigate potential conflicts arising from resource competition, especially as dependency on natural resources grows [117]. At Tulamben, CMT extends beyond the tourist resource regulation, influencing broader societal behaviours, and may provide a model for integrating awareness of orphaned UCH into management of associate UCH.

Since the late 1980 s, the rise of underwater tourism has propelled the *Liberty* wreck to be the focal point for diving in East Bali. To protect the *Liberty* wreck and its surroundings, the community adopted '*awig-awig*' a set of customary laws [105]. This set of rules, intertwined with

local beliefs, conserves resources within their territory and reflects UCH public awareness [118,119]. According to community leaders, the *awig-awig* is indispensable for harmonious living in Tulamben, emphasizing moral over physical sanctions. The regulations include protections for the coral reefs, surrounding stones, beachside flora, and not removing any remains from the shipwreck. Violations lead to significant moral sanctions, including societal ostracism and exclusion from religious practices.

In the broader context of Bali, *awig-awig* holds paramount importance due to its traditional roots, even more than national laws, and is in line with Law No. 22/1999 Regarding Regional Authority. Each Balinese village has its unique *awig-awig*, symbolizing its distinct identity. Violations can lead to severe repercussions, including the grave penalty of permanent exile, which is considered worse than physical death [105, 120]. Leveraging orphaned or grey collections to enhance awareness of UCH and to augment or implement CMT represents a promising avenue for exploration. Emerging initiatives within specific regions of the Indonesian archipelago appear particularly promising in this regard.

4.3. Orphaned UCH and fishing communities in Karawang, Abang, and Tidore

While the legislative framework and its implementation is either lacking or in flux, the biggest challenge and opportunity is to produce contextual narratives about orphaned UCH alongside local communities for bottom-up sustainable protection of Indonesian UCH. KKP initiatives located in Karawang (West Java), Abang (Riau Archipelago), and Tidore (Maluku Islands) showcase the potential for local communities to achieve sustainable benefits from understanding the historical value of shipwreck cargoes.

Fishers in Karawang targeted a site in nearby Subang and looted more than 1 ton of coins and metal artefacts from the Vereenigde Oostindische Compagnie (Dutch East India Company / VOC) and Dutch Colonial periods. Fishers sold the artefacts on to middlemen as scrap metal, unaware of their cultural value. In an oblique but successful approach rather than prioritising the protection of UCH, KKP initially underscored the potential economic advantages to be derived from marine tourism. The local community accepted support from KKP to initiate programs related to mangrove tourism, and additional ongoing long-term educational and outreach initiatives including public lectures and exhibitions, have resulted in shifting community attitudes towards UCH. The community now acts as overseers for marine heritage and ecotourism, under supervision from the West Java Agency for Fisheries and Marine Affairs. KKP has provided resources to establish the Tangkolak Information Centre in Karawang that provides maritime history, culture, and tourism information, and local shipwreck diving tours. Managed by local youth and fishers, this centre is visited by hundreds every weekend.

At Abang and Tidore, KPP was able to focus entirely on UCH and implemented a series of awareness programs, including training sessions and seminars. Emphasising the potential for marine tourism, these initiatives were supplemented by training programs in the first-aid for salvaged UCH, specifically de-salination procedures, and the establishment of a mini-gallery within the Abang village head's office. This gallery not only showcased the area's rich heritage but also served as a magnet for diving enthusiasts. Rather than extracting the underwater artefacts, the KKP promoted the idea that these items, especially trade ceramics, are best appreciated in their natural setting, enhancing shipwreck tourism.

At Tidore, KPP launched an underwater photography competition at a shipwreck site. Tourists were briefed on the importance of non-intrusive exploration, with directives against touching or taking objects. Local residents were trained as tour guides, bolstered by the KKP's provision of knowledge, infrastructure, and diving equipment. Even celebrities have visited the area (Fig. 6). KKP ensures regular monitoring of UCH at Tidore and maintains a strong collaborative relationship with village heads, who, in turn, report back. Initiatives such at Karawang,

Fig. 6. Musician, celebrity, and activist Akhadi Wira Satriaji (Kaka) of Jakarta rock band Slank, diving at Tidore (Malaku Islands). Image: Tidore Dive Centre.

Abang, and Tidore are precisely those which the 'Reuniting Cargoes Project' can furnish with new interpretations from orphaned UCH that will enhance community comprehension, promote public accessibility, reinforce legal protections, and intensify protection against economic exploitation.

4.4. Rediscovering cultural value with archaeometry

Our proposed innovation is to evaluate the scientific and cultural value of orphaned UCH and integrate with nascent but demonstrated cultural heritage management approaches. By machine learning and archaeometric approaches to simultaneously assess a collection deemed not commercially viable (KKP Collections at Cileungsi) and another dispersed specifically for profit (SEACAL at Adelaide) can re-discover the depositional contexts and associative meaning. We have a comprehensive understanding of the shipwrecks associated with the KKP Collections, and by utilising comparative archaeological methodologies, it becomes feasible to ascertain the hitherto unknown shipwrecks from which the SEACAL Collection originated. This is the first time that such a goal has been attempted with dispersed UCH. When these collections are examined together it is feasible to grasp the scale, scope, and severity of the impact of commercial salvage.

Machine learning has shown increasing promise in stylistic analysis of archaeological materials [121–123]. When combined with advances in computer vision, machine learning can accurately differentiate between different categories by analysing patterns, colours, brushstrokes, and shapes [124–126]. Machine learning allows the seriation of unknown assemblages into a stylistic continuum where separate classes can be assigned in a post-hoc manner [122,127]. While traditional 'supervised' machine learning (ML) approaches have been successful via training on extensive, fully labelled data sets (e.g. [128]), in archaeology these exhibit limited applicability because the task of object classification is one wherein archaeologists typically excel and archaeological analyses seldom possess access to extensive background datasets, representing discrete classes of interest with the number of samples required for robust 'supervised' approaches [122].

More commonly, and in our case where the basic ceramic typological schemas are known, the need for statistical approaches arises to distinguish the discrete similarity of one object to another. Correspondingly, 'self-supervised' ML approaches such as Deep Metric Learning (DML) have been developed to learn from unlabelled data and focus on the latent mathematical space of a neural model rather than classification outputs [129]. These approaches do not produce discrete classes when deployed on a given dataset but instead arrange datasets into a spectrum of similarity allowing archaeologists the ability to group similar objects based on only limited samples [122,127]. Moreover, DML based

'self-supervised' are robust to datasets containing incomplete examples, and digital artefacts which may otherwise interrupt learning [127,130]. Significantly, this methodology provides a robust statistical comparison between UCH from known and unknown contexts to reconnect orphaned UCH with their original shipwrecks and might expand this strategy to other dislocated UCH collections (Fig. 7).

Similarly, the service of scientific techniques to address archaeological provenience is well established. By generating a range of material signatures from the KKP collection, we can consider the relatedness of the material of the unprovenienced SEACAL UCH. The uniquely large assemblages and a significant proportion of duplicates advances the likelihood of replicable analytical methods. Established techniques like neutron activation analysis (NAA), x-ray fluorescence (XRF/pXRF), and x-ray diffraction (XRD), isotopic fingerprinting, and laser ablation-inductive coupled plasma-mass spectrometry (LA-ICP-MS) can be employed to deduce primary provenience and ceramic production technology, despite their inherent limitations [131–135]. While prioritising non-destructive methods, destructive analytical techniques will be used only on vessels approved by all project partners and will focus on incomplete vessels.

An experimental component of the project is to explore methods that can recognise secondary or tertiary depositional contexts on the seafloor. Micro-computed tomography (Micro-CT) scans can identify specific flora and fauna species on ceramic surfaces, and analysis of isotopic ratios can be mapped against species distributions in Indonesian brackish, fresh, and ocean waters to infer the deposition location [136, 137]. In addition to marine growth remaining on objects at Cileungsi, Indonesian-led research has catalogued the rich biodiversity at various shipwreck sites allowing for comparative studies. At Tidore, the Karang Kapal Barrier Reef, and at the Sophie Rickmers wreck site numerous marine species have been recorded growing on the surface of submerged artefacts [138–141].

Incorporating new archaeometric data and narrative content into the Cileungsi databases will enrich the quality of information, offering refined classification tools for discerning both provenance and provenience. Moreover, the interpretation of these collections resonates with KKP's fundamental duty towards the UCH, rejuvenating Indonesia's narrative of its maritime legacy. This, in turn, deepens community appreciation of the nation's historical trajectory and its role in shaping the cultural landscape.

5. Conclusion

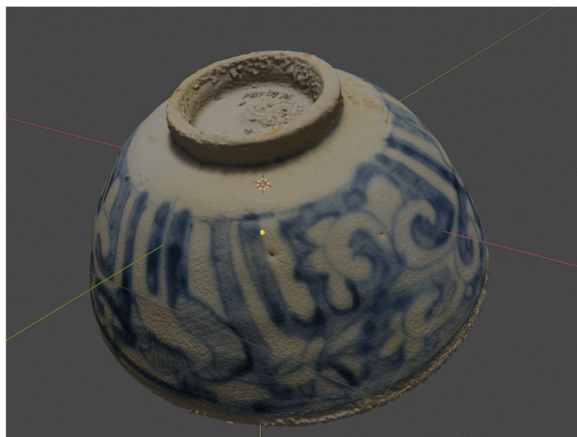Since the introduction of the 1970 and 2001 UNESCO Conventions the ethical landscape of cultural patrimony has irrevocably shifted underneath collections and custodians of material cultural heritage. Calls for former colonial powers, cultural institutions, and collectors to provide redress endure. While immense quantities of unprovenienced Southeast Asian UCH have been dispersed by salvage and looting to public and private collections locally and worldwide, it largely remains exempt from protection, marginally addressed in scholarly discourse, and continues to be recovered without appropriate archaeological protocols. Legislation in Indonesia pertaining to UCH has shown marked inconsistencies. A central obstacle to its effective safeguarding is the tension between the objects perceived commercial worth and their intrinsic cultural significance. Evaluating orphaned collections further underscores this challenge, demanding new theoretical and methodical approaches that transcend the rudimentary dichotomy of economic versus cultural values.

By researching grey collections, 'Reuniting Orphaned Cargoes' responds to calls from KKP to discover and articulate the plural values of Indonesian UCH in its possession and held by collectors and institutions worldwide. Correspondingly, the project employs novel methods of machine learning and archaeometry, including elemental analyses, isotopic fingerprinting, and microstructural analyses, to retrieve and enhance the cultural, historical, archaeological, and underwater depositional contexts of otherwise anonymous ceramics and integrate them with community initiatives to leverage value from UCH. Provenience research will afford communities with links to UCH relevant historical narratives about the Maritime Silk Route to regain a degree of control and assert ownership over their unique, meaningful, and irreplaceable cultural property for cultural heritage tourism and sustainable development. Successful Indonesian programs paved the way to integrate customary marine tenure, environmental management principles, and a multifaceted understandings of cultural heritage values, which often present as nuanced and occasionally conflicting. Further opportunities may exist to restitute archaeological heritage for sustainable development.

While the retrieval, exploitation, and trade by salvors, often funded by foreigners, is expected to continue, new and multiple narratives about Indonesia and Southeast Asia's role in global maritime histories can be utilised by communities of origin and a cohort of regional practitioners and heritage authorities who manage orphaned UCH. The project will provide a model for how orphaned collections can be reconstituted and reconceived, something rarely attempted for terrestrial collections and never for UCH. Addressing orphaned collections cannot wait any longer, as new orphaned objects will emerge, and it is essential for heritage authorities to be equipped with the interpretive tools necessary for their reclamation.

CRediT authorship contribution statement

Fig. 7. Photogrammetric image of porcelain bowl, manufactured in Zhangzhou, late 16th – early 17th century, purchased in Indonesia between the late 1960 s – early 2000 s, shipwreck unknown (ABT0976, SEACAL). Image: Jarrad Kowlessar.

Curation, Writing – Original Draft, Writing – Review & Editing, Project administration. **Jarrad Kowlessar**: Methodology, Software, Formal analysis, Investigation, Data Curation, Writing – Original Draft, Writing – Review & Editing. **Mark Staniforth**: Conceptualization, Methodology, Investigation, Writing – Review & Editing, Funding acquisition.

Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

Data Availability

The data that has been used is confidential.

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