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A Wet Strawman: A Response to Ward et al.

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Introduction

Ward et al. (2022) assert in their desktop study that we are “mistaken” in our interpretation of the artefacts at the Cape Bruguières Channel (CBC), Flying Foam Passage (FF) and Dolphin Island (DI) as evidence of cultural activity on a pre-inundation land surface (Benjamin et al. 2020 [CBC and FF]; Dortch et al. 2019 [DI]), and that we have failed to take account of local hydrodynamic processes that could have displaced artefacts and moved them over much greater distances than we have allowed for. They argue two key points in support: (1) that “these sites are in the intertidal zone” (p.1); and (2) that “many or all artefacts are likely to have been reworked” (p.1).

Supporting datasets

Ward et al. have relied on a hydrodynamic model with a parent 2500 m grid and a smaller nested 500 m grid (Ward et al. supplementary information). From this, they have derived modelled current movements at peak ebb and flood tides and generated a range of hypotheses of possible artefact movement in response to these current flows. They do not model currents at the seabed nor provide a justification for their bed roughness value of 0.0002 m. The smaller 500 m grid is almost five times larger than the width of the CBC reported in Benjamin et al., so there is no way this model could accurately represent current speeds in CBC, yet they still incorporate a grid cell over this site and model the current speed. The DI site

reported in Dortch et al. is located within a shallow embayment on the eastern side of the Flying Foam Passage and is not even captured in their grid. Large reef areas across the northern archipelago (immediately adjacent to CBC) are also completely unsurveyed. Nevertheless, this area is incorporated into the grid mesh. In their supplementary information, they also refer to RPS data with measured cyclonic current speeds that exceed 2 m/s on the North West Shelf. They do not provide a location for this measurement. Given that the North West Shelf covers an area of over 200,000 km² with tidal ranges of over 10 m in the north, we question how this value is even remotely relevant to the Murujuga sites.

It is axiomatic in geoarchaeological studies of underwater archaeological sites that the local conditions most relevant to archaeological site formation and deformation processes can vary over distances of as little as 10s or 100s of metres. The model proposed by Ward et al. is too coarse to be useful in contradicting our field-based, local-scale, analyses. Further, the model has not been validated by in situ measurements of current flow, bed rugosity/roughness, or other local data in the vicinity of the archaeological sites under scrutiny. Some of their modelled results are contradicted by our field observations. Despite their claim to have “conducted a thorough review of the geological, environmental and sedimentary setting of the archaeological sites and the region” (Ward et al., p.4), they have not visited the archaeological sites, the local shorelines, the intertidal zones, or the underwater and intertidal surfaces where the artefacts occur. They have presented no new field observations of their own about these sites' local environmental, hydrodynamic, sedimentary, or geomorphological context. Nor have they inspected the artefacts at first hand.

We argue that their model and the other regional data they rely on can do little to inform on the nature of local site formation processes or tidal currents at the sites we have investigated, or the impact of water currents on artefact movement, let alone overturn conclusions based on field observations and field data.

Intertidal or subtidal

The key site here is CBC, detailed in Benjamin et al., which has the greatest number of underwater artefacts. To establish if the channel completely drains or retains marine waters with a direct connection to the open ocean during low tides, a DHSC field team visited the site during the lowest astronomical tide (LAT) within a 5-year tidal cycle on 2 October 2019. It was clear that the channel does not completely drain but continues to flow and maintain its connection to the open ocean in the west. The reason that water levels are lower in the open ocean than within the channel during this low tide period is due to the constriction of the channel and the fact that the tide falls faster on the ocean (western) side than can be effectively drained from the broad, shallow reef flats to the east of the channel. This style of tidal asymmetry is typical in coastal-estuarine systems (e.g., Dronkers 1986; Basdurak et al. 2013). In relying on regional tidal data, Ward et al. have incorrectly interpreted the tidal range within the channel. The reality, based on observations in the field, is that the majority of the recorded artefacts in the channel are under water all the time, and the site never dries out even at the LAT.

A more serious objection to Ward et al. is their assumption, not stated but implicit, that artefacts in the intertidal or shallow subtidal zone must, by definition, be so disturbed that they can no longer be considered as being in their original context of use and discard. This assumption is sometimes accepted uncritically on the grounds of proximity to the adjacent shoreline and the greater exposure of the shoreline and the intertidal zone to turbulent wave action. However, there are many cases of independently dated sites in the modern intertidal zone in other parts of the world that demonstrably do belong to a pre-inundation land surface, just as there are examples of fully subtidal sites suspected of being displaced from the adjacent land surface and washed into the sea (Bayón and Politis 2014; Bailey et al. 2020a, 2020b; Bicho et al. 2020; Billard et al. 2020; Galanidou et al. 2020; Galili et al. 2020; Glorstad et al. 2020; Jöns et al. 2020; Peeters and Amkreutz 2020; Pieters et al. 2020; Radic Rossi et al. 2020; Westley and Woodman 2020). The key issue in every case is not whether artefacts are intertidal or subtidal, but whether they were first discarded by cultural activity on a pre-inundation land surface.

Primary or secondary context

Ward et al. claim that the 270 artefacts recorded at CBC are likely to have been transported and are no longer in their primary context. They criticize our reference to the material as being “in situ”. However, we have not claimed that the underwater material has undergone no movement since the time when it was discarded. We use the term “in situ” to mean that the artefacts were used and discarded by cultural activity on a pre-inundation land surface, as opposed to representing more recent material eroded from a primary context on the modern shore edge and displaced into the sea. This is clear from the context of our original discussion. The decisive evidence, in our view, is the evidence of the artefacts themselves, which have intact edges and surfaces and show no traces of the rounding and battering that would have modified artefacts subject to repeated wave action and tidal movements over 10s to 100s of metres and over thousands of years. We have observed artefacts modified in this way elsewhere in the Dampier Archipelago but not at the sites under discussion here. Ward et al. downplay this evidence by referencing taphonomic literature on experimental studies of movement and modification of Lower Palaeolithic stone tools and bones in fluvial sediments in Africa and Europe and orientation studies of Upper Palaeolithic surface tools in China. These examples are neither relevant to the geomorphic context of the CBC artefacts nor to our interpretation of them. We therefore consider Ward et al.’s assumptions about the scale of artefact movement, at best unproven.

Ward et al. (p. 21) also hypothesize that wave action could have re-worked artefacts from the seabed in the CBC and re-deposited them on the calcarenite terrace on the southern bank of the channel. We have not observed this hypothesized wave action. Observations at CBC during large westerly swell events show that waves are completely dissipated before they can reach the channel. The belief that such waves could have moved material landwards is purely conjectural. Direct observational data by the DHSC team in the form of drift dives at peak tidal flow, recorded by video and tracked by GPS attached to the divers by a float, returned diver drift speeds of approximately 1.0 m/s. This compares with Ward et al.’s

modelled current speed in the channel of <0.1 m/sec. Even at the highest observed current speeds, artefacts of pebble to cobble size were seen to remain stable on the seabed, while finer sand-size particles could be observed saltating along the seabed. Had current speeds been fast enough to move the artefacts, we would expect some evidence of sorting across the hook of the channel, since faster current speeds are typically experienced on the outer bend of a channel rather than the inner bend (De Swart and Zimmerman 2009). This is not the case, and the distribution of artefacts appears to be random with respect to any observed or hypothesized water movements.

Even if it were demonstrated that the artefacts had undergone substantial post depositional movement, or showed evidence of significant water-rolling, this would not be sufficient to falsify the hypothesis that they were originally used and discarded on a pre-inundation land surface. There are many such examples in other parts of the world (e.g., Easton et al. 2021), and Ward et al. (p. 23) refer approvingly to other such examples. In taking a narrow definition of “in situ” and repeatedly treating evidence of post-depositional movement as incompatible with evidence for the cultural use of a pre-inundation landscape, Ward et al. are confusing two different issues.

Geomorphic interpretation of CBC

Ward et al. elaborate a complex series of hypothetical scenarios involving varying episodes of sediment infill and erosion in the CBC. These involve many unknowns, but no new observational, geochronological, or sedimentological data from within the channel are presented in support. Both the observed current speeds in the CBC and the more extreme high-energy events hypothesized by Ward et al. suggest that the channel is very unlikely ever to have been a sedimentary depocenter, and the rest of the argumentation built around that concept is largely conjectural. Our field observations indicate a bounding geology of deep red Pleistocene-age aeolianite forming the north bank and channel floor where the artefacts are located and a younger calcarenite terrace along the southern bank of the channel of late Holocene age. The artefacts on the calcarenite terrace are spatially concentrated around the remains of circular structures built from slabs of calcarenite. They were demonstrably unaffected by the passage of Cyclone Veronica in 2019 (Benjamin et al., Figure 13) and neither here nor elsewhere in the local region have we observed evidence of large-scale disturbance or patterning that would be expected to result from repeated wave action or intense cyclone activity over hundreds to thousands of years as suggested by Ward et al.

Other scientific issues

Ward et al. raise some other less significant issues, for example, concerning radiocarbon dates, comparison of artefact assemblages, and inferences about site function. None of the evidence discussed is decisive either way, and we do not pursue it.

Media publicity

Ward et al. are highly critical of the publicity surrounding our findings, but it is unclear how this criticism relates to the validity of our conclusions. Their imputation appears to be that we have cut corners or ignored evidence to gain short-term and unwarranted publicity. If that is the accusation, we reject it. Our findings were subject to peer review in international journals and are the outcome of a systematic program of research carried out according to the best standards and understandings of the day, and one in which Ward and Ross were themselves early participants (Benjamin et al. 2018; Veth et al. 2019). The publicity came later, and we set no store by it. Our interest is in partnering with Indigenous Traditional Owner and custodian communities to deliver evidence-based interpretations of cultural landscapes, and in promoting the field of Indigenous underwater cultural heritage and encouraging others to participate in it. Our primary focus is on the field data and reasonable interpretations of it, not on being the first or finding the oldest. Publicity is unavoidable in an age when funding bodies and research institutions are under pressure to produce headline results. We note that Ward et al. have engaged in publicity themselves, issuing a press release to bring attention to their work (e.g., <https://www.archaeology.org/news/10654-220628-australia-stone-tools>).

Scientific method

Ward et al. summarise their attempt to cast doubt on our conclusions in a decision tree of exhaustive detail and complexity. This sets standards for thresholds of acceptance and demonstration of underlying assumptions that we suspect most archaeological interpretations would struggle to meet. Closer examination shows that the decision tree is based on the belief that “In dynamic sedimentary environments such as NW Australia, it is logical that artefacts need to be considered as being in the secondary (2ry) context (red boxes) until proven otherwise.” (Ward et al. p. 22, Figure 3). A logical argument is only as good as the assumptions that underpin it. In this case, it is based on an unwarranted assumption of sweeping generalisation across a vast territory without supporting evidence. The further requirement asserted by Ward et al. (2022, p.22) that all identifiable assumptions should be tested and verified in advance of interpretation offers a very narrow definition of scientific method and one more likely to stultify new research and field investigations than to encourage them. No scientific investigation beyond the most basic descriptive level can proceed without making certain assumptions. These are typically untestable or untested and often unrecognized at the time and persist until new evidence made possible by such an investigation ultimately requires their modification or abandonment.

No amount of statistical or methodological sophistry can obscure the difference between field observation and measurement, assumption, hypothesis and theory; nor can it disguise the fact that Ward et al.’s own critique is based on a large number and variety of assumptions and hypothetical scenarios, some unacknowledged by themselves, some improbable – for example, that people might have waded into the intertidal zone to obtain and use lithic raw materials (Ward et al., p. 19) when the entire terrestrial

landscape abounds in a cornucopia of lithic raw material – others based on analogies with distant times and regions, none tested against local field observations in the vicinity of the sites themselves, and some actually rejected by our own field observations.

The fundamental flaw of their critique is a reliance on general concepts and a hydrodynamic model that is both too coarse to be appropriate to the analysis of archaeological site formation processes and inconsistent with our local field observations. The proliferation of resulting hypotheses in Ward et al. offers, at best, statements of possible processes and their possible impact on archaeological sites, and at worst pure speculation. None are supported by new field observations; ultimately that is the only way that differences of opinion in a field-based science such as geoarchaeology can be resolved. We suggest that the use of Occam's razor is appropriate in these circumstances – that the interpretation that comes closest to the truth is likely to be the one that makes the fewest assumptions and relies on the fewest number of ancillary hypotheses.

It may well be that we will never achieve 100% certainty about the status of artefacts that are surface finds without means of direct and independent radiometric dating. We also recognize that the nature of the finds, their local context and the processes involved are quite different for the three sites under discussion here and require different sorts of investigation. On the presently available evidence, we reject Ward et al.'s critique and stand by our original interpretations until such time as new and relevant data are forthcoming to further confirm or refute them.

Ethical issues

It should also be clear that in their quest to diminish the significance of these underwater cultural heritage sites by claiming they are neither subtidal nor in their primary context, Ward et al. failed to engage with the local Traditional Owners and custodians of the Murujuga community or to consider the impact of their arguments on the interests of this Aboriginal community. Instead, they give the disclaimer that their “work is based on technical analysis of new scientific data and critical review of previous published research, and our resulting interpretations relate to the physical aspects of the cultural sites in question rather than of the Traditional Owners or their culture” (Ward et al., p. 24).

All Australian research involving Aboriginal culture is enmeshed in deep ethical considerations, articulated in the AIATSIS Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020; <https://aiatsis.gov.au/sites/default/files/2020-10/aiatsis-code-ethics.pdf>) and researchers are bound by university codes of conduct that closely follow this national code (e.g., UWA's Research Integrity Policy). It is an ethical and professional requirement for all researchers in whatever discipline, and all researchers are expected to abide by its requirements and take the precautionary route. This is something that can and should be done without compromising scientific integrity. The AIATSIS Code refers to the use of “new or pre-existing data”, to research that “concerns Aboriginal and Torres Strait Islander

peoples' lands or waters" (AIATSIS 2020, p 6–7), and to "scientific and environmental research" (AIATSIS 2020, p. 22). Principle 4 states that:

Indigenous peoples' connection to Country is essential to identity and cultural survival. For many Indigenous cultures, the land and waters not only sustain life, but are themselves alive and in relationship with people — to harm Country is to harm people. In this regard, there is no difference between the ethical considerations in scientific and social research (AIATSIS 2020, p. 21.).

Ward et al. are well aware that their publication has come at a time when the Murujuga Aboriginal Corporation is dealing with highly complex compliance issues relating to industrial development on the North West Shelf where their cultural authority and heritage governance is critical to their legal and social standing. Coastal Indigenous communities everywhere are increasingly concerned about their sea rights and the offshore dimension of their cultural heritage. In Australia, in contrast to countries which have ratified the UNESCO Convention on the Protection of the Underwater Cultural Heritage, or which have national legislation and formal protocols for collaboration with offshore industries (Salter et al. 2014; Dromgoole 2020; Peeters et al. 2020), the Indigenous Underwater Cultural Heritage is not automatically protected by Australian Federal legislation, nor by State regulations in Western Australia. Ward et al.'s opinion that the artefacts have nothing to do with underwater cultural heritage is in direct contradiction of community views about the continuity of land and sea country connections. We do not advocate that social and political considerations should be allowed to suppress or distort scientific results. Rather, we emphasise that scientific debate must be cognisant of the ramifications for Indigenous communities as well as the requirements and standards of scientific investigation; it is four decades since the point was made that Australian archaeology is Aboriginal people's heritage – not just scientists' playground (Langford 1983).

Conclusion

Research on the archaeology of underwater landscapes has had to fight for many decades against a prevailing scepticism that nothing worthwhile is likely to have survived and that investigating the cultural heritage of submerged landscapes is a waste of resources that could be better devoted to projects elsewhere. This scepticism often takes the form of demands for standards of proof and justification that would not be applied in other branches of archaeology and continues to be articulated by armchair critics ignorant of recent developments in the field (see, for example, Bailey 2014; Lemke 2021a, 2021b). In their attempts at a wholesale dismissal of our field investigations and interpretations, based on extremely weak scientific foundations, Ward et al. inevitably provide fuel for those who believe that this type of underwater research is a waste of time and money and should not be funded. Their critique is detrimental to the development of this entire field of archaeology, as well as damaging to the rights and interests of coastal Indigenous communities throughout Australia.

We agree with Ward et al. that the investigation of underwater site formation processes and the development of improved methods for doing so are essential ingredients in the future development of the discipline. We are also aware that such investigations need to consider relevant and locally specific oceanographic and meteorological processes and do not underestimate the challenges involved. However, we do not believe that it is appropriate to use desktop applications of geoarchaeological principles and generalised models or conjectural hypotheses to undermine existing field observations, especially without new and alternative field observations. In our view, investigating the taphonomic aspects of underwater research is better served by accumulating site-specific case studies in a bottom-up approach (e.g., Cook Hale et al. 2021, 2022) rather than by applying top-down theoretical principles. For instance, flume experiments to better understand the impact of varying current speeds on the movement of artefacts and the modification of their surfaces, combined with additional field studies of geophysical and geomorphological variables at the local scale, are areas that we continue to pursue.

Above all, what is needed is continued investigation and exploration of now-submerged cultural landscapes in partnership with Indigenous Traditional Owner and custodian communities. Where one or several sites have been discovered, it is likely that many more await discovery, and that new material will be found in different geodynamic contexts and at greater depths. Building a comparative knowledge-base at both landscape, local and site scales will help move the discipline forward to the benefit of all interested in Indigenous underwater cultural heritage and its contribution to an improved understanding of the earliest histories of the Australian continent. This field of research is still in its infancy in Australia and in need of positive collaboration across the widest possible range of skills, individuals, institutions, and interests. We urge Ward et al. to apply their knowledge in constructive contributions to this new and exciting research agenda, rather than ill-founded and inconclusive attempts to find fault with existing field investigations.

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