

Investigating coastal archaeological vulnerability in Aotearoa New Zealand

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Coastal erosion poses a significant threat to archaeological sites in Aotearoa/New Zealand, as it can result in the permanent removal of these invaluable cultural and historical places. According to Heritage New Zealand, any place in Aotearoa associated with human activity that occurred before 1900 and provides or may provide evidence relating to the history of New Zealand through investigation by archaeological methods is considered an archaeological site. Approximately 12% (9054) of all known archaeological sites in Aotearoa are situated within 1 km of sandy coastlines.

The coastal areas of Poupouhenua Bream Bay, Marsden Pt, Northland have been under the watchful eye of Patuharakeke kaitiaki who are committed to monitoring the eroding archaeological sites and the taonga they contain. The increasingly severe weather conditions we are experiencing and expecting

are painting a picture where the future of these precious cultural treasures may be lost. To mitigate such losses, the Patuharakeke Taiao unit, as part of their larger Cultural Landscape Management Plan, has set out objectives to map and ground truth archaeological sites, and conduct further investigations and link their stories to them through story maps and cultural landscape mapping. Such an approach can help ensure the middens' survival for future generations.

My PhD research at the University of Auckland is being undertaken in collaboration with the Patuharakeke Iwi Trust board with the objective of studying an eroding midden to gain insights into the effects and prospects of such sites in the face of coastal erosion. To analyse an exposed foredune midden, excavation, sampling, and stratigraphic section drawing were implemented using

standard archaeological techniques (Figure 1 and Figure 3). Additionally, planform coastal change analysis was conducted over approximately 80 years, utilising both aerial and satellite imagery (Figure 3).

The key findings from the investigation were threefold:

1. Radiocarbon dating revealed midden 1 (Figures 1-3) is nearly two hundred years old (~180 y BP). The vegetation history contained within the midden showed 87% of local coastal vegetation at 180 BP was either Manuka, Kanuka or Pohutukawa, where Ti tree scrub dominated. Pohutukawa is particularly important to the local community and gives credence to local regeneration efforts and this finding indicates that these species have historically occurred in these coastal spaces.



Figure 1: (A) Kirstin Roth is shown excavating a potential seal bone (Photo: Simon Bickler). (B) A drone photo capturing the excavation and slumping to the south. (C) Also taken by drone, this shows the position of the midden in the foredune, facing north (Photo: Aaron Apfel). (D) A top-down view of the excavation. (E) A cleaned-up section of the eroding midden, facing west (Photo: Aaron Apfel). (F) Bugie Carrington, Xvavie Watson, and Matthew Barrett conducting a GPR survey of coastal dunes to provide further subsurface context.

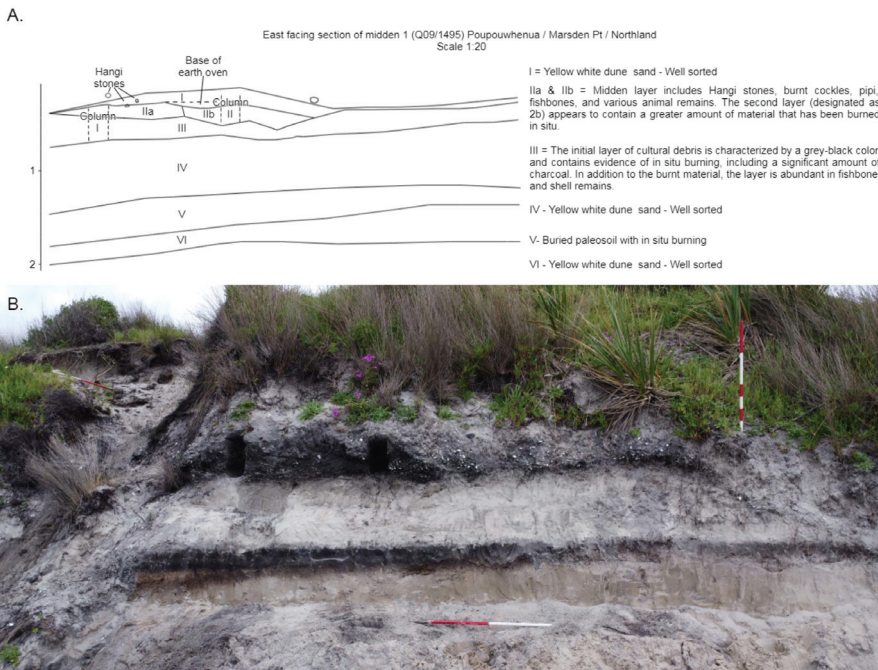


Figure 2: (A) The illustration shows the various layers of the foredune undergoing erosion, as well as the column sampling procedure utilised for 14c dating. (B) Stratigraphy of the east-facing foredune illustrated above, which features a midden layer (upper black layer).

2. The combination of historical coastal change analysis and radiocarbon dating from the midden was a novel approach in our research. The midden proved to be a valuable tool in determining the maximum landward extent of historic trends of coastal erosion. This is because the preservation of an archaeological site within a foredune indicates that coastal erosion has not progressed landward of the site location since the creation of that site. In this way, dating foredune archaeological sites can temporally extend historical analyses of coastal change based on aerial photography, such as that undertaken in this study (Figure 3).

Using the middens as a reference point, we were able to analyse Marsden Point beach change between 1942 and 2021 (Figure 3). The analysis indicates a declining pattern in the distance between the shoreline and the centroid of the midden over time. Specifically, the distance has decreased from approximately 42 meters in 1942 to around 3 meters in 2020. By examining the age of the well-preserved midden, it has been determined that the coastline has not advanced towards land beyond midden 1 for a minimum of 180 years. Persistent foredune erosion over the

past ~80 years has led to the exposure of these archaeological sites, indicating a continued and persistent trend of coastal retreat.

The finding of chronic foredune erosion is significant, as it suggests that the issue is not merely a short-term phenomenon,

but a long-term process that poses an ongoing threat to cultural, social, economic and ecological features along the coast. This information can help inform coastal management strategies, by highlighting the need for proactive measures to mitigate and adapt to the effects of erosion and ensure the preservation of important sites.

3. The ongoing erosion of the dunes is a worrying issue, particularly when severe storms such as Cyclone Gabrielle strike (Figure 4). Analysis of the site post-Cyclone Gabrielle indicated that further erosion has occurred and resulted in the removal of midden 2 (Figure 3) and a significant section of midden 1 (the Marsden Point shoreline, affected by Cyclone Gabrielle, has been made publicly available through the Coastal Change Portal, data.coastalchange.nz). Consequently, erosion has progressed to the extent that even the midden deposited in 1800 is now being affected.

The research and excavation findings provide crucial insights into the geomorphological processes of the coastal environment, where archaeological and cultural sites contribute to our understanding of coastal change. The study highlights the importance of collecting information and

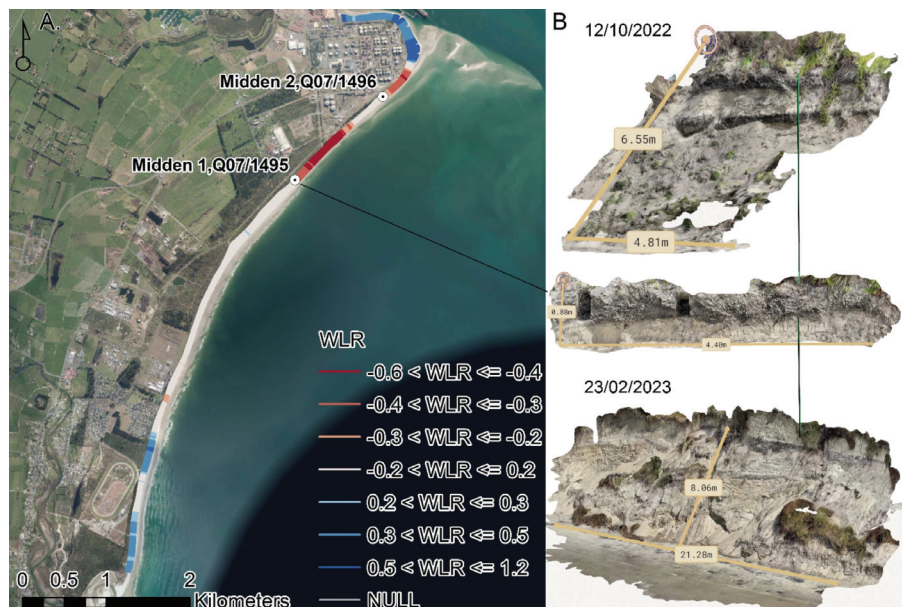


Figure 3: Location of middens on the coast of Poupuwhenua Bream Bay. (A) A weighted linear regression (WLR) analysis conducted to determine the rate of ~80 years coastal change along the coast of Poupuwhenua Bream Bay. (B) 3-D scans of the midden 1 (Q09/1495) within the foredune, before and after Cyclone Gabrielle. The Marsden Point shoreline, affected by Cyclone Gabrielle, has been made publicly available through the Coastal Change Portal (data.coastalchange.nz).

kōrero contained in middens before they succumb to the effects of ongoing coastal erosion. The sites not only help us learn about the past, but also act as valuable teaching tools to educate the local community about coastal landforms and cultural heritage.

During the excavation, we seized the opportunity to engage with the Patuharakeke youth and organised an outreach day for high school students to join us and learn about the excavation process. A range of teaching stations were set up in the field to explore different aspects of the excavation, including coastal geomorphology, faunal analysis, drone survey, ground-penetrating radar (GPR), 3D scanning, and section drawing (Figure 2).

This kind of community engagement is critical to building awareness and understanding of the importance of preserving coastal environments and cultural heritage sites. The findings from the excavation and the outreach event not only advance our scientific knowledge, but also help build relationships with local communities and support ongoing efforts to promote cultural and environmental conservation. The students were highly engaged, and the questions and reflections they brought up were thought-provoking. They inquired about the preservation of these sites, the knowledge that can be gained from middens, and the dynamic nature of coastal change. It was an excellent opportunity to share knowledge and encourage future generations to be mindful of their cultural and natural heritage.

Acknowledgements

We owe much of the success of this excavation and resultant findings to the local help we received from the Patuharakeke Taiao unit Kaitiaki and Iwi Trust board, including Mere Kepa, Julianne Chetham, Ari Carrington, Xzavier Watson, and Bugie Carrington, and volunteers Matthew Barrett, Kirstin Roth, Aaron Aphel, Simon Bickler, and Lovleen Acharya Chowdhury.

Additionally, I am grateful for the support of my supervisors, Mark Dickson, Emma Ryan, Murray Ford, and Daniel Hikuroa, and the funding and access provided by The University of Auckland, The Resilience to Nature's Challenges National Science Challenge (Coastal Programme), Department of Conservation (DOC), and the New Zealand Coastal Society. Their contributions were instrumental in making this project a success.



Figure 4: The illustration displays the effects of Cyclone Gabrielle on Poupuwhenua/Breambay in multiple perspectives: (A) A comparison of pre (2022)- and post-cyclone (2023) conditions, with an increased exposure of midden 1 and its removal from the foredune. (B) A top-down perspective, highlighting the loss of the coastal berm and vegetation. (C) An oblique landscape perspective facing north, showing the modified slope of the foredune following the cyclone. (D) The final view illustrates the angle of the foredune and the slumping of vegetation as the dune adjusts to post-cyclone conditions, with a visible black layer (in the red box) representing the slowly eroding midden.

Editor's note

You might have noticed that this issue of *Coastal News* has arrived somewhat later than is usual. This was due to the impacts of the January Auckland flooding event and February's Cyclone Gabrielle – most of the contributors to this issue are based in the upper North Island and many were impacted directly, either personally or through their work. The NZCS and the *Coastal News* Editor are grateful to all those who were still able to contribute, despite the trying conditions and extensive impacts, and we wish them a speedy recovery.