PACIFIC ISLANDS ENDANGERED CULTURAL HERITAGE SURVEY:

DOCUMENTING CULTURAL HERITAGE IN NIUE AND THE COOK ISLANDS

Atiu and Rarotonga Pilot Study

May-June 2023

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Acknowledgments

We would like to extend our thanks to the numerous individuals and organisations who have so generously supported our work on Rarotonga and Atiu. Their support and organisation of site visits, project presentations and individual meetings has been integral to the project.

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1. Introduction and Background

This report details the activities and outcomes of the 2023 Atiu and Rarotonga Pilot Study as part of The Pacific Islands Endangered Cultural Heritage Survey: Documenting Cultural Heritage in Niue and the Cook Islands. The project team consists of Dr Andrew Brown (Horizon Archaeology), Professor Jane Downes (University of Highlands and Islands), Professor Colin Richards (University of Highlands and Islands), Dr Lawrence Shaw (Forestry England), Francisco Torres, and Professor Kate Welham (Bournemouth University). The team were present on Atiu and Rarotonga from 30th May – 26th June 2023. A list of activities including the sites visited by the team are included as Appendix A.

1.2 Aims

The aims of the Atiu and Rarotonga Pilot Study in June 2023 were:

- To trial different methods of recording archaeological and historical sites (including modern and historic buildings) to explore how the results can enhance existing site records
- To identify any loss and change in sites
- To establish presence/absence of previously unrecorded sites

2. Archaeological context

There have been a small number of independent archaeological surveys and research projects conducted across the Cook Islands, primarily focused on pre-contact sites in Rarotonga. Early 20th century studies included work by Smith (1903) and Hiroa (1927). Canterbury Museum led a field survey in the 1960s and 70s (Bellwood 1978, Trotter 1974), followed by University of Auckland (Walter 1990, 1996), and Keio University, Japan (Chickamori et al 1996a, 1996b, Yamaguchi 2000). In the late 1990s Campbell (2001a, 2001b, 2002, 2006) used this work for the basis of his doctorate which identified *repotaro* linking to settlement sites across a number of valleys. Campbell recorded 72 sites, and noted they many were heavily overgrown and difficult to detail. Sites in the Maungaroa Valley have been subject to ongoing investigation by Walter (2017). The Canterbury team also recorded sites on Atiu (Trotter 1974) and Earthwatch conducted work on both Atiu and Rarotonga (Stephenson and Kurashina 1998).

3. Methods

A mixed methodological approach was adopted to deliver the site recording aspect of the pilot project and to trial the utility of different techniques on a variety of site types. Prior to our arrival it was identified that there would be several factors which may impact the ability to record sites. These included: dense vegetation and bush growth across previously known and unknown sites, detail and accuracy of previously recorded sites when integrated with modern mapping, and variable site types (e.g., terracing, platforms, caves, complexes, and historic buildings).

On Rarotonga work was undertaken to record new sites and test recording methods on a range of sites previously visited by the project team or other post-Trotter researchers. On Atiu work was undertaken to digitally locate sites previously recorded by Trotter in 1969 and Earthwatch in the 1980s (Stephenson and Kurashina 1998). The location of the Atiu sites that Trotter recorded are presented in map form (Trotter 1974, Figure 35) (Fig. 1). Trotter also provided plans for some site complexes such as Marau, but many sites that consist of multiple components (e.g., caves, mounds, platforms etc.) were only recorded as a single point on his location map.

The digitisation work conducted here has relied on the georectification of Trotter's map and plans against current Land Information New Zealand (LINZ) mapping for Atiu and Rarotonga (coordinate system, UTM 4S), enabling each site location to be transcribed as a shape file within a geographical information system (GIS). Additional meta data, such as the classes of monument used by Trotter (1974) (cave, mound, enclosure etc.), have been added to the attribute table of the site shapefile, allowing for further analysis of site types and distributions to take place.

When visiting known sites, a walk over approach, comparable to that set out by Historic England Level 2 Walk Over Surveys, was undertaken which included: a photographic record, measurement recordings, a sketch plan and written observations. A central Global Positioning System (GPS) point was also taken for each feature identified within the field. Where tree cover was too dense to gain reliable satellite correctional data for the GPS, mobile GPS was used instead. Recording work was also undertaken in a manner that allowed for information to be included within the 'Site Inventory' of Cultural and Historical Places in the Cook Islands held by the Cook Islands National Museum and Archives.

In support of fieldwork, the use of a DJI Mavic 2 drone was also implemented. The drone was equipped with both RBG and Near Infrared cameras and was used to assist in a number of ways. Firstly, high altitude imagery from 400ft were captured in the field to aid in the identification of previously recorded sites which were now hidden or partially hidden within bush (Fig. 2).

Once sites were identified on the ground in areas which were recognised as being relatively clear of vegetation, the drone was used to record images which could be processed into a photogrammetric 3D digital surface model (DSM). With a target overlap for the images of 60%, the final data were processed with photogrammetric software RealityCapture and Agisoft Metashape. Outputs include mosaiced orthographic aerial photos, point clouds, digital surface models, and 3D objects. Drone images were also used to create detailed 2D plans for significant sites (Fig. 3).

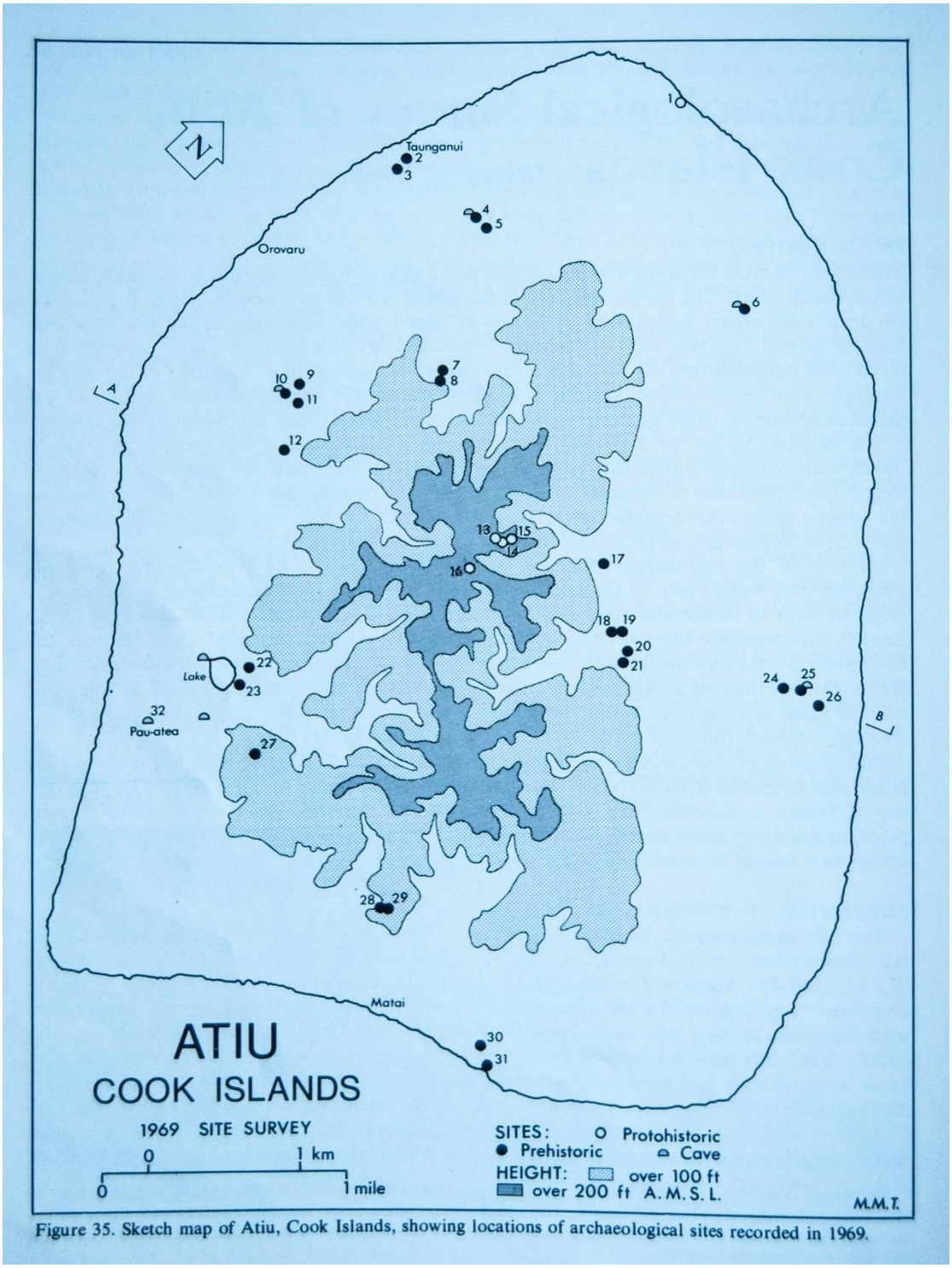


Figure 35. Sketch map of Atiu, Cook Islands, showing locations of archaeological sites recorded in 1969.

Figure 1: Location map of the archaeological sites recorded on Atiu by Michael Trotter 1969 (Trotter 1974, Figure 35). See Appendix B for site list.

Figure 2: An example of the high-altitude drone image of structures at Takauroa (Atiu) used to aid in the identification of features on the ground.

Figure 3: An example of the 2D plans created in GIS from drone imagery, Tua Iva Marae, Rarotonga.

In addition to recording sites found within open areas or dense vegetation, alternative recording techniques were adopted for sites such as historic buildings. Due to their more complex composition, the decision was taken to record these sites in a photogrammetric manner using a Nikon D3100 digital SLR camera. Once recorded, images were processed within RealityCapture to produced scaled, detailed, high-resolution 2D and 3D models of these sites (Figs. 4 and 5). Government restrictions were granted for drone flying in Atiu and Rarotonga (due to the 4Km buffer zone around the airport and flight path).

Figure 4: An example of a 3D record created via photogrammetric recording – detail of part of the front wall of Vairakiaia, Atiu.

Figure 5: An example of a 3D record created from data captured from via photogrammetric recording - screen capture of 3D record created of a structure at Arangirea, Atiu.

All data including drone images, 3D models, photographic records, and electronic copies of this report and our introductory and results presentations have been deposited with The Office of the Prime Minister as per the conditions of the Research Permit. Additional copies have also been lodged with The Cook Islands National Museum and Atiu Island Council.

4. Results

A total of 19 sites were recorded by the project. Details and photographs of each site are provided below.

4.1 Arangirea, Atiu

Trotter Sites 28 and 29 E593504 N7786808

E593533 N7786867

A basalt seat and coral backrest (Trotter 28) and a marae complex (Trotter 29) made up of multiple rectangular coral structures, and kiri-kiri spreads situated on a mound now covered in bush. The site was in fair condition, features were consistent with those reported by Trotter 1974. A detailed record of the site was made using photogrammetry.

Listed as Arangirea Marae on the Site Inventory of Cultural and Historical Places in the Cook Islands (Atiu 4).

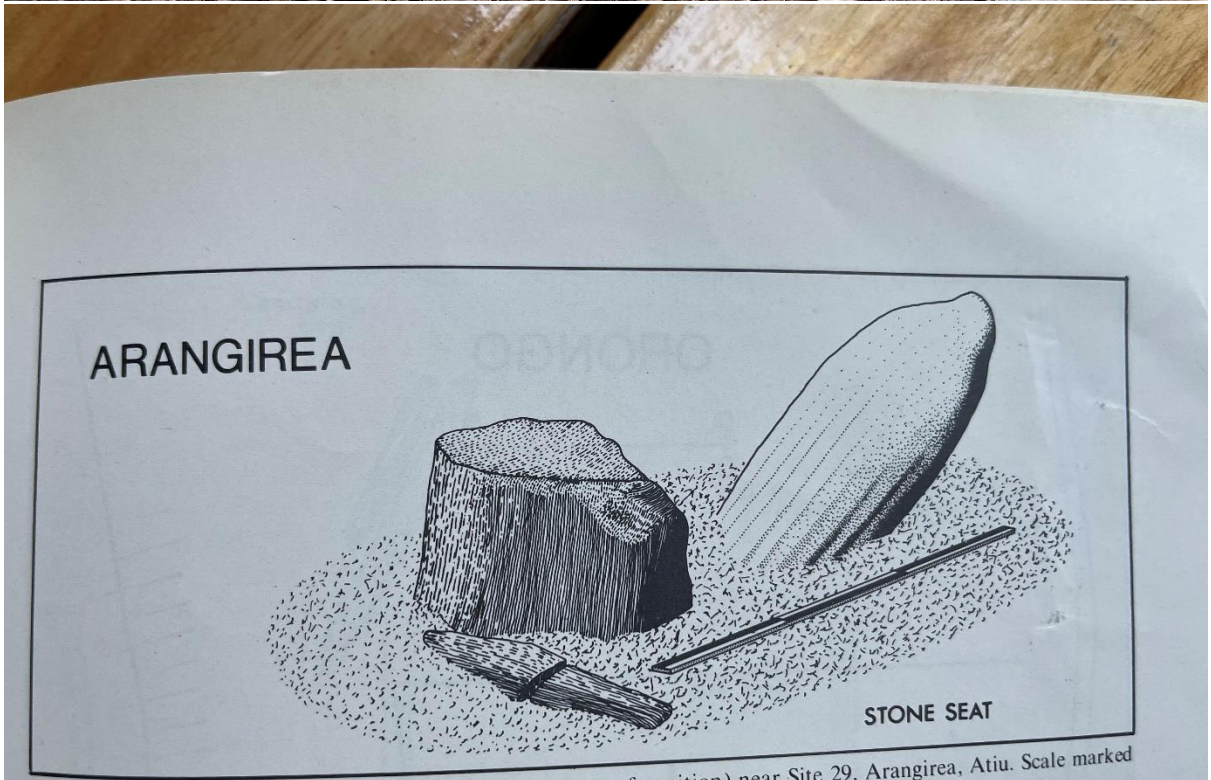


Figure 44. Basalt stone seat with stalactite backrest (out of position) near Site 29, Arangirea, Atiu. Scale marked in feet.

lower ends of volcanic ridges. At Site 12 a layer of black soil containing charcoal and coral gravel [illegible] thick extended for about twenty metres in a road bank; it was [illegible] soil. Site 22 was similar but

4.2 Atiu Harbour, Taunganiu

E 589992 N7790632

The site of a natural sea passage and location of the modern harbour opened in 1975 (Kautai et al 1984). Construction of the site was reputed to have damaged the nearby site of Orongo Marae. Photographic record and video made of site.

Listed as Taunganiu Landing on the Site Inventory of Cultural and Historical Places in the Cook Islands (Atiu 3).

4.3 Burial above Tumai Landing, Atiu

E590426 N7787546

A burial located directly above Tumai landing adjacent to a track. Constructed with coral blocks and recumbent stalactites. Similar coral blocks are found at the landing. There was no evidence of lime cement in the structure suggesting the site is likely to pre-date the arrival of missionaries in the 1820s (Kautai et al 1984: 155). Photographic record made of site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.4 Cook Islands Christian Church, Atiu

E 592148 N7788944

The Atiu Cook Islands Christian Church erected in the mid-1800s (Kautai et al 1984: 144). Large coral slabs can be seen in the foundations of the building at the back of the structure. The front foundations are covered with lime cement. This structure may therefore have originally been sited on an existing marae. Situated at the back of the building are graves made of large coral slabs, and a range of stalactite structures and loose stalactites. A number of the coral slabs were noted to have anthropomorphic modification as observed in those within the wall of the structure at Vairakaia. Photographic record made of site, including drone-based photogrammetry.

Listed as Atiu Cook Islands Christian Church on the Site Inventory of Cultural and Historical Places in the Cook Islands (Atiu 10).


MARINA

4.5 Katara, Atiu

Trotter Site 27 E 592194 N7786990

Recorded by Totter (1974: 119) as a marae with scattered coral and a large fallen stalactite. The site appears broadly as described with the large stalactite evident as well as evidence of stone structures. The site is covered in bush and subject to vegetative overgrowth and disturbance by pigs as noted in the 1980s by Kautai et al (1984: 3). Photographic record and video were made of the site.

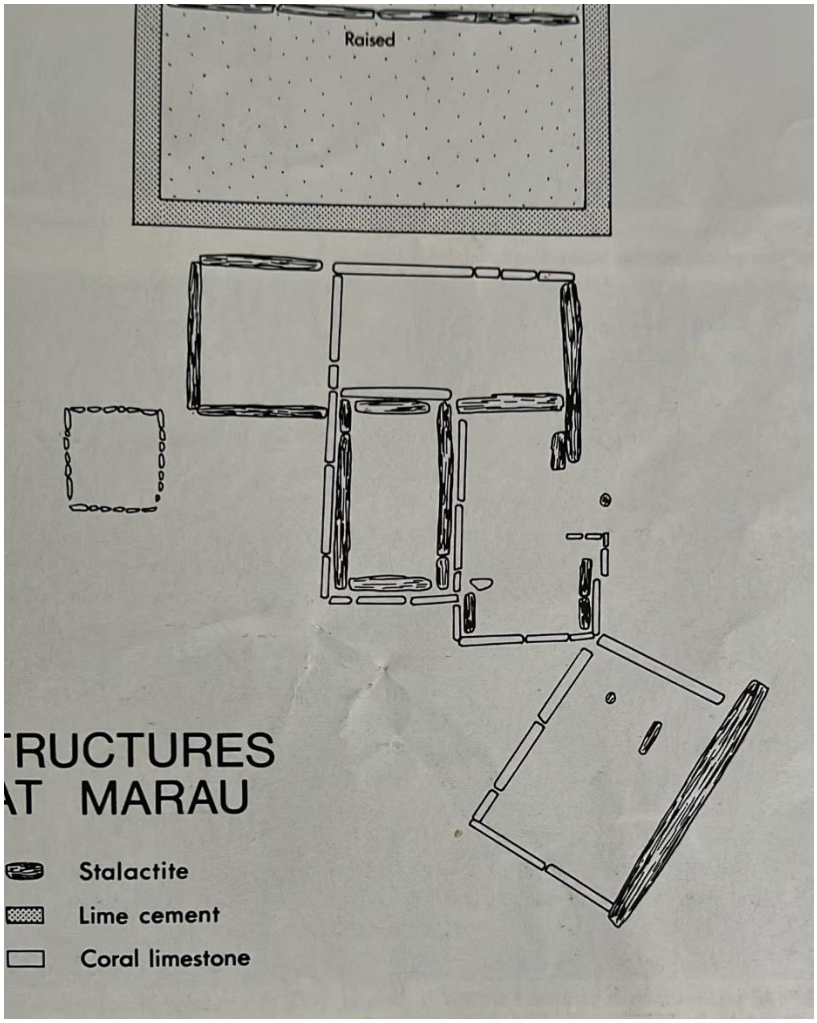
Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

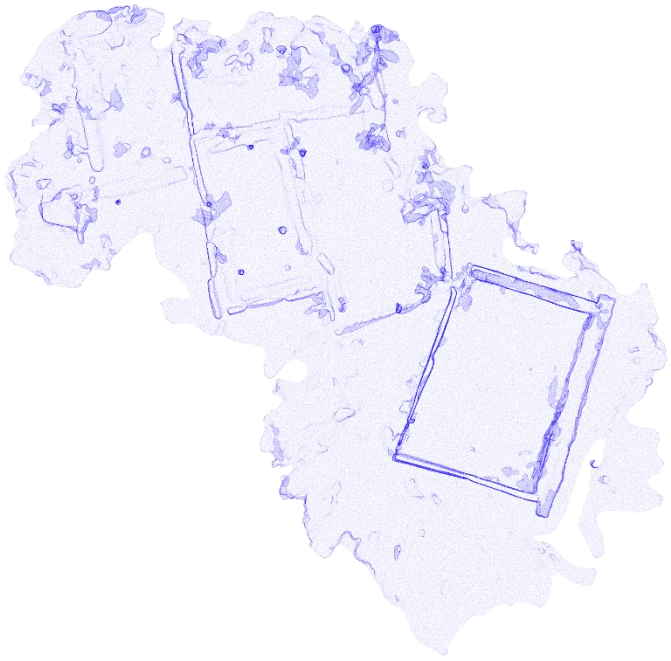
4.6 Marau, Atiu

Trotter Site 9 E 590699 N7788834

A large complex of impressive stone and coral-built structures and surrounded by upstanding stalactites. The site was described on our visit as Orongo Marae (Mokoero). Totter (1974) details two adjacent sites Marau and Orongo and the structures recorded here appear to match the former, 'an important ceremonial complex of eight rectangular structures' Trotter (1974:118). Currently covered in bush and medium sized trees. Some 'rounding off' of features from clearance and cultivation has occurred, but features remain in fair condition. Photographic record and 3D models were made of the site.

Not listed separately on the Site Inventory of Cultural and Historical Places in the Cook Islands, although may be incorporated in Orongo Marae (Mokoero) (Atiu 1).





Trotter (1974, Figure 46) (above) and structures recorded at Marau by the project team.

4.7 Memorial marking the centre of Atiu

E 592176 N7788967

Lime cement covered memorial dating to 1870, situated adjacent to the Cook Islands Christian Church. Photogrammetric recording and 3D model created.

May be the 'Memorial Stone' listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.8 Memorial marking the Missionary Landing Site on Atiu

E591011 N7791897

A semi-circular rough coral wall enclosing a large coral block painted with white lime cement. Situated on the roadside. Memorial created in 2023 to celebrate the 200-year anniversary of the arrival of the Good News in Atiu. Photographic record taken of the site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.9 Modern Investiture Marae, Atiu

E 592230 N7788781

Coral block and stalactite-built marae used for investitures in modern times. Located next to Ngamaru Ariki's Palace. Photographic record made of site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.10 Burial site located behind Ngamaru Ariki Palace

E 592194 N7788787

Large burial vault constructed of coral blocks. This site is similar to those described by Trotter (e.g. Paikea (Trotter 14)). Photographic record made of the site.

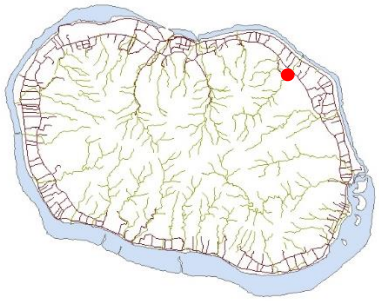
Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.11 Te Apiripiri, Atiu

Trotter Site 16 E592328 N7788841

A site in open ground made up of numerous recumbent stalactites that mark out a large area adjacent to a modern house in the centre of Atiu. Noted as Te Apiripiri the place where the Gospel was first proclaimed (Kauti et al 1984: 3). Trotter records this marae as Apiripiri. A video was made of the site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.



4.12 Oro Vena Marae, Rarotonga

E422329 N7653858

Modern marae next to the Tupapa Road, Rarotonga. The marae was constructed in 2022. Photographic record and drone photography made of the site.

Not Listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.13 Orongo (Mokoero), Atiu

Trotter Site 11 E590807 N7788781

Trotter (1974:118, Figure 45) describes this site as ‘a marae constructed from large coral blocks with some stalactites and a row of markers or seats of stalactites’, his plan of the site in 1969 depicts a two long walls, one over 40m in length. The site has lost definition due to vegetation and disturbance, but the remains of the long wall can still be observed, and some stalactites are evident. Photographic record made of the site.

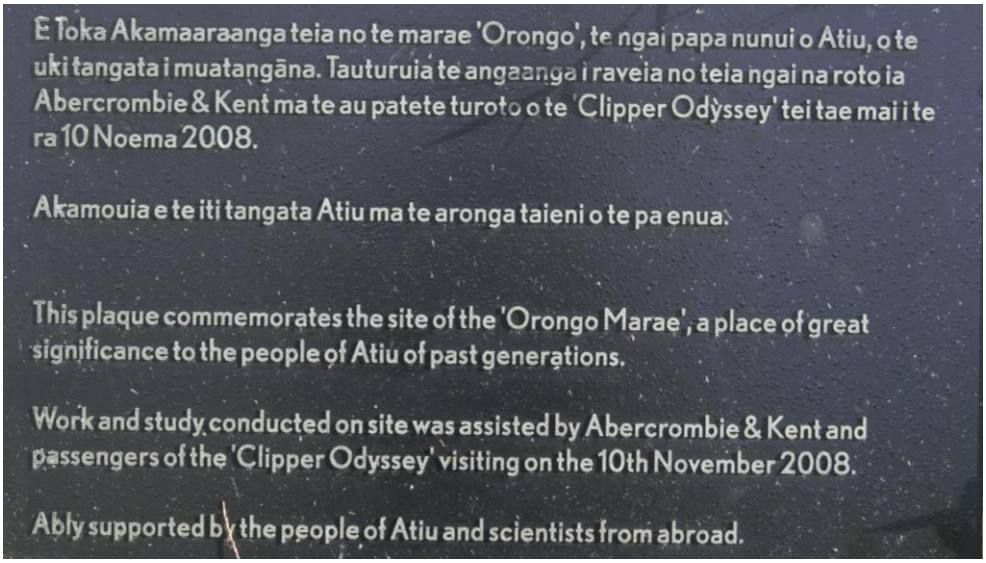
Listed on the Site Inventory of Cultural and Historical Places in the Cook Islands as Orongo (Mokoero) (Atiu 1) and may incorporate the closely adjacent site of Maurau (see above).

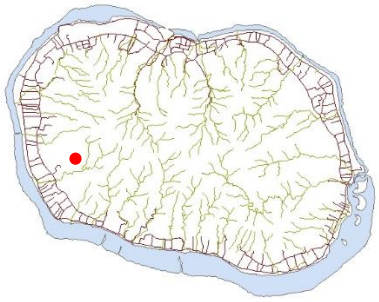
4.14 Orongo-i-Tai, Atiu

Trotter Site E590077 N7790493

This site has been largely destroyed by the construction of the new harbour in the 1970s. Trotter (1974:117) lists habitation (Trotter 2) and occupation (Trotter 3) areas in the area. Photographic record made of the site.

Listed on the Site Inventory of Cultural and Historical Places in the Cook Islands as Orongo Marae (Atiu 2).





4.15 Raemaru Cluster, Rarotonga

Trotter Site 54 E415755 N7651138

E415891 N7651038

E415802 N7650848

A range of sites located in the Raemaru near the Muriavai stream. This area was recorded by the Canterbury Museum Team (Trotter 1974: 72). The sites are currently being recorded by Dr Gareth Walters and will aid the UNESCO World Heritage Site Tentative List preparations. Photographic record made of the site.

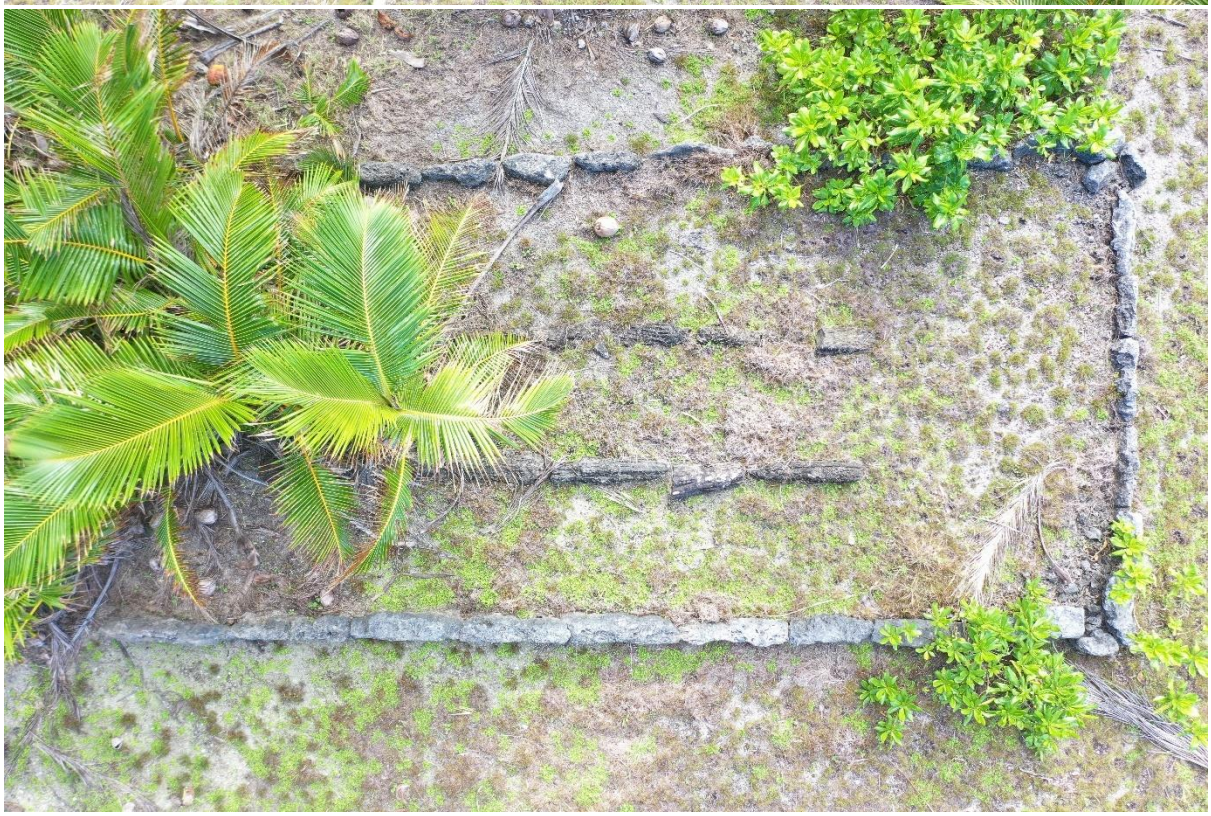
Listed on the Site Inventory of Cultural and Historical Places in the Cook Islands as a Cluster of Structures near Raemaru (RAR 54).

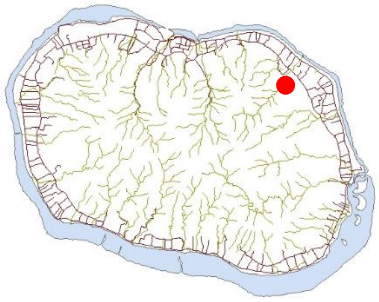
4.16 Takauroa, Atiu

E594700 N7786617

A large complex of rectangular block-built structures and platforms at Takauroa. Some of the structures are located in open ground, but others next to the coastal road are under heavy vegetation. The site was investigated by Earthwatch in the 1980s (Stephenson and Kurashina 1998). Trotter (1974:119) lists an occupation site marked by coral gravel (Trotter 31) which appears to be in the same location as this site although the remains are far more extensive than described by him at the time. Photographic record, drone photography and 3D models made of the site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.





4.17 Tua Iva Marae, Rarotonga

E422082 N7653299

A large marae constructed of basalt blocks. The site has recently been cleared by Tenga Mana and his family. Reported by Campbell in the late 1990s (2001a) who notes that this site may have been assigned to Te Papa-i-Vaiari (RAR27) by the Canterbury Museum Team. The location of Tua Iva appears to be ~300m from the record of RAR27 in Totter. Photographic record, drone photography and 3D models and 2D plans made of the site.

Not listed in the Site Inventory of Cultural and Historical Places in the Cook Islands but may be incorporated in RAR27 Papa-i-Vaiari.

4.18 Tumai Landing Quarry, Atiu

E590448 N7787500

An outcrop of naturally occurring large coral blocks that appear to have been subject to quarrying. The blocks are very similar in nature to those used in many sites on Atiu. Photographic record, drone photography and 3D models made of the site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

4.19 Vairakaia Marae, Atiu

Trotter 20 E593440 N7789210

Trotter records a 37m long wall of coral limestone slabs and two short side walls (Trotter 1974: 118, Figure 49). A number of the slabs have rounded anthropomorphic protrusions. Also, other unrecorded breakage of further 'heads' was observed. The site is adjacent to the road and in fair condition, but some blocks show damage and breakage, and parts of the front wall are falling forward leaving it vulnerable to collapse. Photographic record and 3D models made of the site.

Not listed on the Site Inventory of Cultural and Historical Places in the Cook Islands.

5. Conclusions and Future Work

The pilot project has been proved successful in two ways. First, through an engagement with local communities and organisations it has been possible to identify key areas of cultural heritage that may be developed and enhanced by future work. This includes the Cultural and Historical Sites Register held by the Cook Islands National Museum and Archives in Rarotonga. Created in c.2015 it constitutes ~218 cultural heritage sites primarily situated on Rarotonga. There is a small quantity of accompanying data including imagery, but there has not been capacity to significantly enhance this list including obtaining geolocation data for many of the sites. The Cultural and Historical Sites Register lists 10 sites on Atiu, of which five or potentially six were visited by the team to obtain additional data, with up to 9 new additions that can be incorporated into the record. New additions are also made to the list on Rarotonga with the recording of Tua Iva and Oro Vena maraes. Furthermore, discussions with colleagues in Cook Islands Infrastructure who have been supporting the Ministry of Culture heritage recording work, have highlighted the importance of multi-functional and open source-data to enable different government departments to make best use of any material collected.

Secondly, we have been able to test the previous site records and trial a range of recording techniques and establish appropriate methodologies for future work. Sites visits conducted on Atiu and Rarotonga (see Appendix A) identified that, while the maps derived from Trotter (1974) provide a good indication of where many sites can be located, the granularity of the data is not always sufficient to identify all the sites in a particular area.

The combination of walk over and drone-based survey has proved to be a productive approach to recording sites. The use of aerial imagery obtained by drone has proved a valuable addition to the field methodology, especially when attempting to geolocate detailed plans previously produced by Trotter (1974). However, in some instances, even the lower-level vegetation growth proved challenging for the photogrammetric software, resulting in variable output quality. Photogrammetric recording proved to be an extremely successful approach in building recording, importantly enabling a record without the need for invasive techniques.

The recording of additional sites which have not been noted formally indicates the potential of further survey to identify more sites to add to the cultural heritage record for the Cook Islands. Future site survey will utilise drone-based methods and former site records but will rely heavily on systematic pedestrian survey supported by our project partners. This may also be augmented by use of the recent Lidar data captured for the Cook Islands and productive discussions were had with Antoine Nia (Cook Islands Infrastructure) and Jake Langdon (now Cook Islands Meteorological Service) about the potential of these data to support heritage surveys. The Lidar data have a good coverage of the islands except for Suwarrow. Further analysis of the Lidar dataset would help identify previously recorded sites and improve the spatial accuracy with which they are recorded. Moreover, Lidar data may facilitate easier assessment of the composition of previously recorded sites and the threats that they face and enable the identification of previously unknown archaeological sites. It is our ambition that the project will be able to make better use of these data during future visits through an established memorandum of understanding with the Cook Islands Government.

Damage was apparent at several of the sites visited. Vegetation growth and animal foraging had damaged several of the sites visited, and we were also regularly informed by members of the community about different levels of destruction at heritage sites from bulldozing, a common technique used for clearing land for planting. This is an important observation as just a modest increase in agricultural, or infrastructural or housing development (for instance driven by increasing tourism), would have a significant detrimental effect on the survival of archaeological sites. In this respect, it

should not be forgotten that the current record is biased towards conspicuous sites and therefore less visible remains which may represent important aspect of the Cook Island's early history are likely to remain to date unrecorded.

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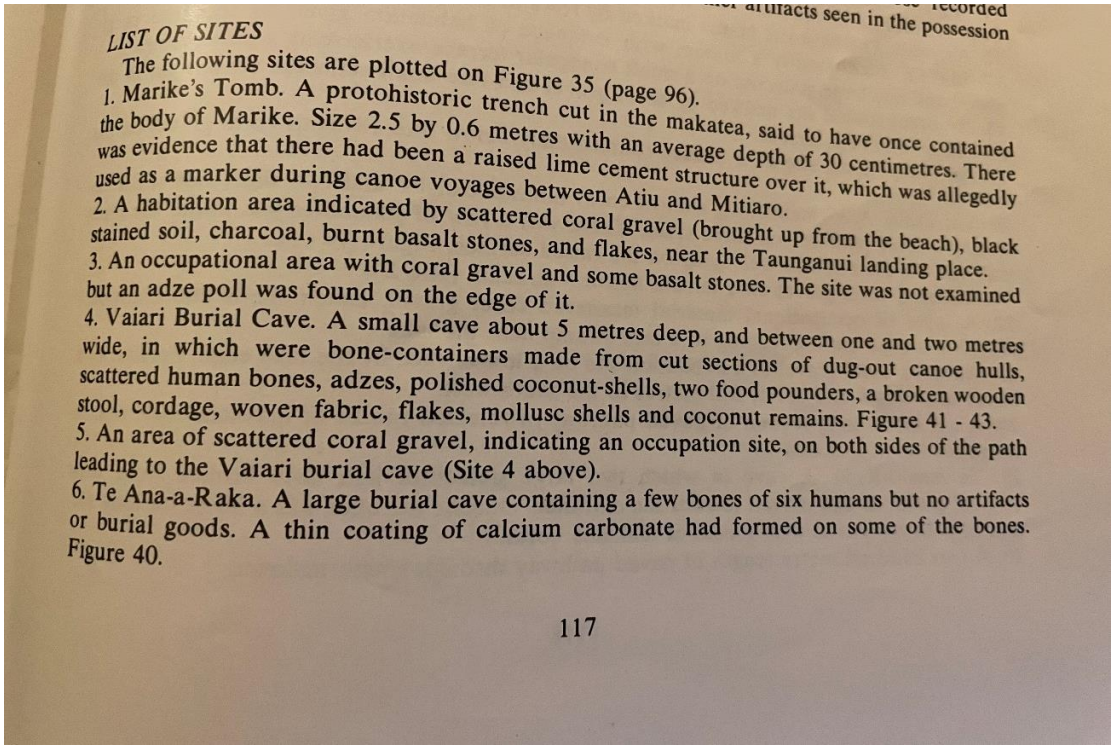
Appendix A: List of activities conducted by the project team

Date	Activity
31st May 2023	Meeting with Tenga Mana, Paul Moate and Antoine Nia (Infrastructure Cook Islands) to discuss LiDAR coverage and heritage recording.
1st June 2023	Meetings with Makiuti Tongia and Tou Unuia to discuss the archaeology and heritage of Atui, and project partner Dr Debi Futter-Puati (Campus Director, USP Rarotonga) and Dr Heather Worth at USP Rarotonga.
2nd June 2023	Introductions to Executive Officer, Atiu Island Council; Ngamarau Ariki; Honourable (Mrs) Vainetutai Rose Toki-Brown; Joseph Akaruru
3rd June 2023	Visit to heritage sites around Atiu (Arangirea, Takauroa, and Orongo (recorded by Totter (1974) as Marau) with Executive Officer Maara Tiari and Mataiapo Tinokura. Sites assessed for use of 3D recording methods.
5th June 2023	Reception with Ngamarau Ariki and Rongomatane Ariki and their families, and visit to the modern investiture marae and Vairakaia.
6th June 2023	Presentation to Atiu Island Council to present the findings of the pilot project and future planned work. Visit to CICC, Orongo, the new installation to celebrate the arrival of the first missionaries, the Mayor's marae, Tumai landing and Vairakaia to trial 3D recording of these sites.
7th June 2023	3D metric recording of the CICC Church, Atiu. Visit to heritage sites and Atiu Information Centre with George Matariki. Invitation to Atupare Marae for the event to celebrate the visit of Dame Cindy Kiro, New Zealand Governor General. Introduction to Mr Puna Rakanui, Clerk of the House of Ariki.
8th June 2023	Field visit with Antoine Nia (Infrastructure Cook Islands) to CICC Avarua and Tua Iva Marae. Trialling of drone-based recording and discussion of heritage recording approaches.
9th June 2023	Visit to Arai-te-Tonga with representatives of the landowning families, Nga Pu Tapere o Tupapa Maraerenga, Te Aronga Mana o Arai Te Tonga ete au Atu Enua ote Koutu Arai Te Tonga.
13th June 2023	Meeting with Ngatuaine Maui (Ministry of Culture) to discuss heritage record and World Heritage Site Tentative Listing application for the cultural landscape of the Maungaroa Valley, Rarotonga.
15th June 2023	Project Presentation to the Annual General Meeting of Kotou Nui, Avarua. Meeting with project partner Debi Futter-Puati, Campus Director USP Rarotonga.
17th June 2023	Visit to Te Ara Cultural Experience Museum and meeting with Stan Wolfgramm.
20th June 2023	Visit to Tua Iva Marae and Tupapa Valley water catchment area with Tenga Mana.
21st June 2023	Presentation to Infrastructure Cook Islands, Rarotonga. Introduction to Jake Langdon the Project manager of the Cook Islands Lidar Project. Discussion of Lidar acquisition and heritage site protection.
22nd June 2023	Public presentation at University of the South Pacific, Rarotonga
23rd June 2023	Visit to Maungaroa Valley, Raemaru Cluster with Ngatuaine Maui (Ministry of Culture) and introduction to Donald Munro.
24th June 2023	Visit to Oro-Vena Marae and trialling of drone-based recording.
26th June 2023	Deposition of Project Report and data with the National Cook Islands Museum and Archives, and Office of the Prime Minister.

Appendix B: List of Sites recorded by Trotter on Atiu (1974:117-119)



LIST OF SITES

The following sites are plotted on Figure 35 (page 96).

1. Marike's Tomb. A protohistoric trench cut in the makatea, said to have once contained the body of Marike. Size 2.5 by 0.6 metres with an average depth of 30 centimetres. There was evidence that there had been a raised lime cement structure over it, which was allegedly used as a marker during canoe voyages between Atiu and Mitiaro.
2. A habitation area indicated by scattered coral gravel (brought up from the beach), black stained soil, charcoal, burnt basalt stones, and flakes, near the Taunganui landing place.
3. An occupational area with coral gravel and some basalt stones. The site was not examined but an adze poll was found on the edge of it.
4. Vaiari Burial Cave. A small cave about 5 metres deep, and between one and two metres wide, in which were bone-containers made from cut sections of dug-out canoe hulls, scattered human bones, adzes, polished coconut-shells, two food pounders, a broken wooden stool, cordage, woven fabric, flakes, mollusc shells and coconut remains. Figure 41 - 43.
5. An area of scattered coral gravel, indicating an occupation site, on both sides of the path leading to the Vaiari burial cave (Site 4 above).
6. Te Ana-a-Raka. A large burial cave containing a few bones of six humans but no artifacts or burial goods. A thin coating of calcium carbonate had formed on some of the bones. Figure 40.

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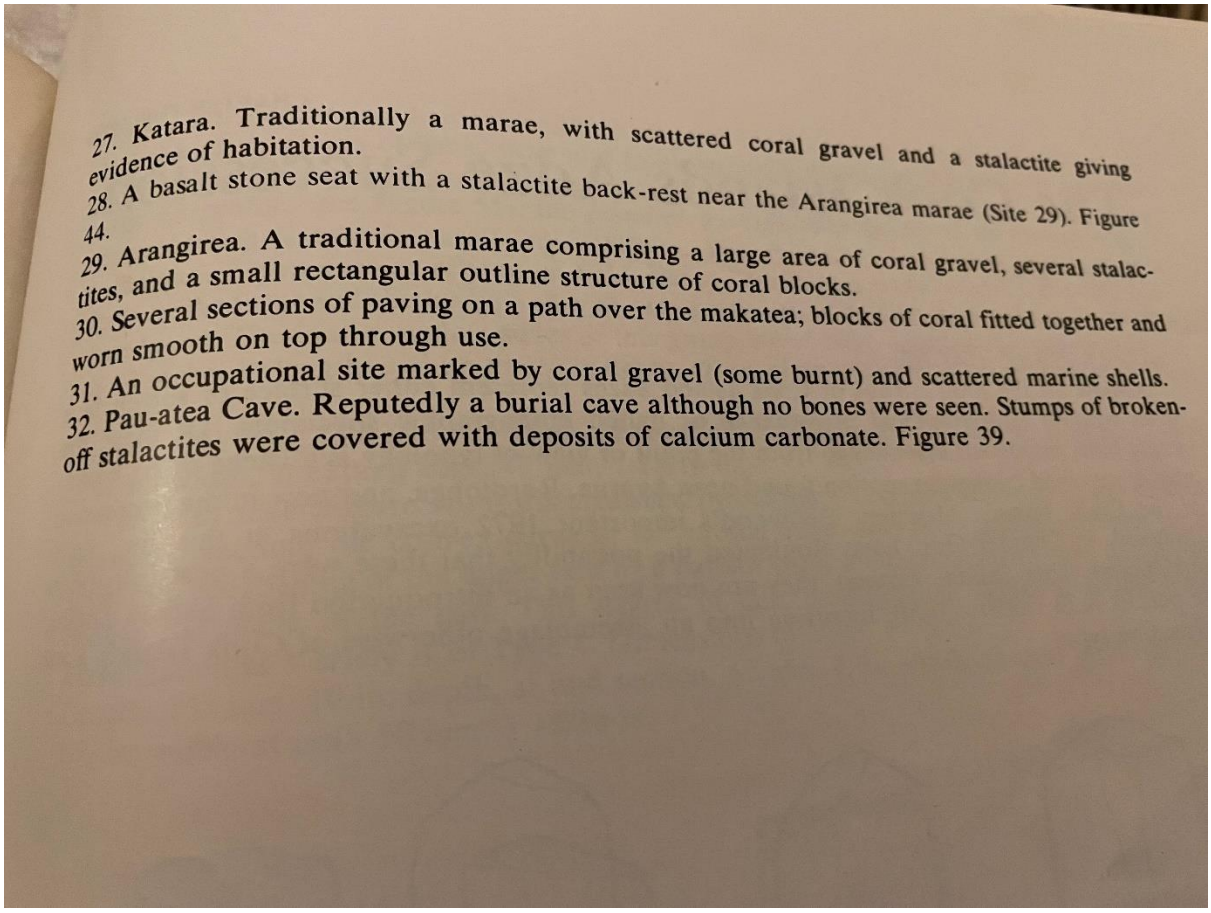
Appendix B cont.: List of Sites recorded by Trotter on Atiu (1974:117-119)

7. An earth oven 1.2 metres in diameter and 50 centimetres deep containing charcoal and burnt basalt stones, located when preparing the ground for coffee plants. Blackened soil and burnt stones on the surface indicated that there were others nearby.
8. A five metre long wall of rough coral blocks on the hillside above the previous site (Oven, Site 7). There were a few small basalt stones beside it.
9. Marau. An important ceremonial complex of eight rectangular structures outlined on the ground with slabs of coral limestone and sections of stalactites. The largest had been plastered with lime cement and enclosed a platform. Coral gravel had been placed on this platform and scattered around the structures. There were also some sections of stalactite and large basalt stones near the structures. Figures 46 - 48.
10. Te Ana-o-Kuekue. A burial cave containing small groups of human bones, many placed in crevices, but no artifacts or burial offerings apart from several pieces of decaying wood which appeared to have come from canoe hulls, and one end-piece of a canoe-hull bone-container.
11. Orongo. A marae with walls made mainly of rough coral blocks with some stalactites, and a row of markers or seats of stalactites. Figure 45.
12. A layer of black soil containing charcoal, burnt basalt stones and coral gravel visible at a depth varying from 25 centimetres to 60 centimetres in a road bank. There was a dry stone wall of coral blocks and some stalactites on the slope above the road - possibly part of an enclosure to retain pigs.
13. A rectangular structure of stalactites lying on the ground, with the surface slightly raised (10-15 centimetres) within the walls, and scattered coral gravel outside. Size, four metres by eight metres.
14. Paikea. An impresssive protohistoric burial vault on a rectangular platform, both built of coral limestone slabs, and with lime cement used on the vault structure. Coral gravel on the platform surface. No bones remaining in vault (which had been opened) but some decaying wood, metal objects and some glass bottles. Figures 53, 54.
15. A protohistoric burial vault built largely of lime cement, standing on a rectangular platform of coral limestone slabs and with coral gravel on the surface.
16. Apiripiri. Protohistoric marae marked by rows of stalactites lying on the ground.
17. Manoa. Traditionally a marae, with evidence of habitation given by scattered coral gravel and one large stalactite on a small triangular terrace overlooking a taro swamp.
18. An occupational site marked by coral gravel and one small stalactite set upright in the ground on a sea-cut terrace.
19. An occupational site on a terrace (immediately below Site 18) with coral gravel on the surface.
20. Vairakaia. A 37 metre long wall of coral limestone slabs, and two short side walls enclosing a level platform on three sides. There was a row of stalactites just inside the main wall and the eastern side wall lying on the raised surface. Figure 49 - 52.
21. Scattered coral gravel on a terrace above Vairakaia (Site 20).
22. A layer of occupational material (scattered coral gravel, beach shells and charcoal) visible in a road cutting leading to a taro swamp near the lake.
23. Scattered coral gravel of a habitation site on a low terrace by the lake edge. Portion of a basalt adze was found about 200 metres to the south-west.
24. A ten metre long section of paved pathway of selected pieces of makatea coral over a rough section of makatea.
25. Te Ana-o-Kovi. A cave in which two large stalactites had been broken from their original positions and moved toward the entrance. Outside the cave was a 30 metre long section of pathway paved with pieces of makatea coral.
26. A two hundred metre length of paved pathway through rough makatea.

Appendix B cont.: List of Sites recorded by Trotter on Atiu (1974:117-119)



27. Katara. Traditionally a marae, with scattered coral gravel and a stalactite giving evidence of habitation.
28. A basalt stone seat with a stalactite back-rest near the Arangirea marae (Site 29). Figure 44.
29. Arangirea. A traditional marae comprising a large area of coral gravel, several stalactites, and a small rectangular outline structure of coral blocks.
30. Several sections of paving on a path over the makatea; blocks of coral fitted together and worn smooth on top through use.
31. An occupational site marked by coral gravel (some burnt) and scattered marine shells.
32. Pau-atea Cave. Reputedly a burial cave although no bones were seen. Stumps of broken-off stalactites were covered with deposits of calcium carbonate. Figure 39.