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Geological and Archaeological Observations at Parengaroa (Skudders Beach), Kerikeri Inlet, Bay of Islands, NZ, Including the Occurrence of Chert, its Local Significance and Utilisation.

Chris Booth *(Kerikeri, Bay of Islands)*
Seabourne Rust *(Waimamaku, Hokianga)*

Introduction

Chert is a very general term for fine-grained siliceous sediment, of chemical, biochemical or biogenic origin. It is usually a dense, very hard rock, which splinters with a conchoidal fracture when struck. Most cherts are composed of fine-grained silica, and the majority contain only small quantities of impurities (Tucker 1991). Variations of these are sometimes given specific names, such as the darker coloured *flint* (usually associated with chalk deposits), and the more conspicuous red *jasper*. For a synopsis see references given in Ward et al. (2019).

Chert may be bedded, or nodular. Rather than an association with submarine volcanism, most of the former are now thought to have a biogenic origin, and derive largely from radiolarian and diatom oozes accumulated on the ocean floor, especially in abyssal areas below the carbonate compensation depth (CCD) (see Tucker 1991). Ancient bedded cherts are often massive and commonly deformed and folded. Their constituent silica skeletons of radiolarians and other microfossils are not usually well preserved. Nodular cherts tend to be associated with limestones and carbonate sediments. These show evidence of diagenetic processes as biogenic silica (for example sponge spicules) dissolves and is reprecipitated at nodule growth points.

Waipapa Group

Chert rocks occur across New Zealand in strata of different age, origin and lithology (Moore 1977). A variety of bedded and nodular cherts ranging in colour from red, brown, white to green can be found in Northland (Hayward 2017, Moore 1985, 1981).

Basement rock sequences in the Bay of Islands area include greywacke, basalt, argillite and chert belonging to the Waipapa Terrane, deposited in the deep sea east of Gondwana during the Permian- Triassic, 270-220 million years ago

(Hayward 2017). These Waipapa Group rocks have been deeply buried, accreted to the edge of Gondwana and subjected to low grade metamorphism, before eventually being uplifted again as part of the foundation of proto-Northland.

Kerikeri Area

Moore (1981) described ancient bedded chert and siliceous mudstones in Waipapa group sequences outcropping on Urupukapuka Island. We identified similar rocks exposed along a kilometre stretch of shoreline at Parengaroa (Skudders Beach), Kerikeri Inlet, in the vicinity of lat. -35.206, long. 173.985, grid refs. NZMS260 P05: 0048 6557 or AV29: 8963 0366. Here, numerous isolated boulders and pieces of hard, erosion-resistant, high silica content chert litter the highly weathered shore platform, along with local basalt rocks. They occur in a variety of shapes (rounded nodular cobbles to flat slabs), sizes (up to 1 m+ across) and colours; however most exhibit a brownish rind, and relatively smooth outer surface. Many chert rocks contain hollow subcircular holes 0.2-4 cm diameter that may represent tracefossil molds of burrows.

Lumps of chert can be observed eroding out of the bank east of Parengaroa (Skudders Beach), well above the high tide level and the Holocene sea level (+2-3 m); we suspect they have been sourced from once still higher stratigraphic horizons in the Waipapa Terrane sequence, of which softer sediments have been eroded away, leaving the more durable siliceous pieces of chert as relics resting on the shore platform, which has largely been formed over the last 7.5 ka (Hayward 2017).

A Note on Ballast

Exotic Chert can occasionally be found along shorelines in New Zealand where it was brought out by ship in small pieces among ballast material (near timber mill sites on the Hokianga harbour, or Balaena Bay in Wellington for example). These cherts are probably from England and tend to be nodular, typically the dark flinty -type, often shiny and translucent. Rare examples contain fossils or traces. While the presence of foreign chert remains a possibility at Kerikeri Inlet, they are likely to be in minor amounts and distinguishable from the extensive local deposits discussed herein.

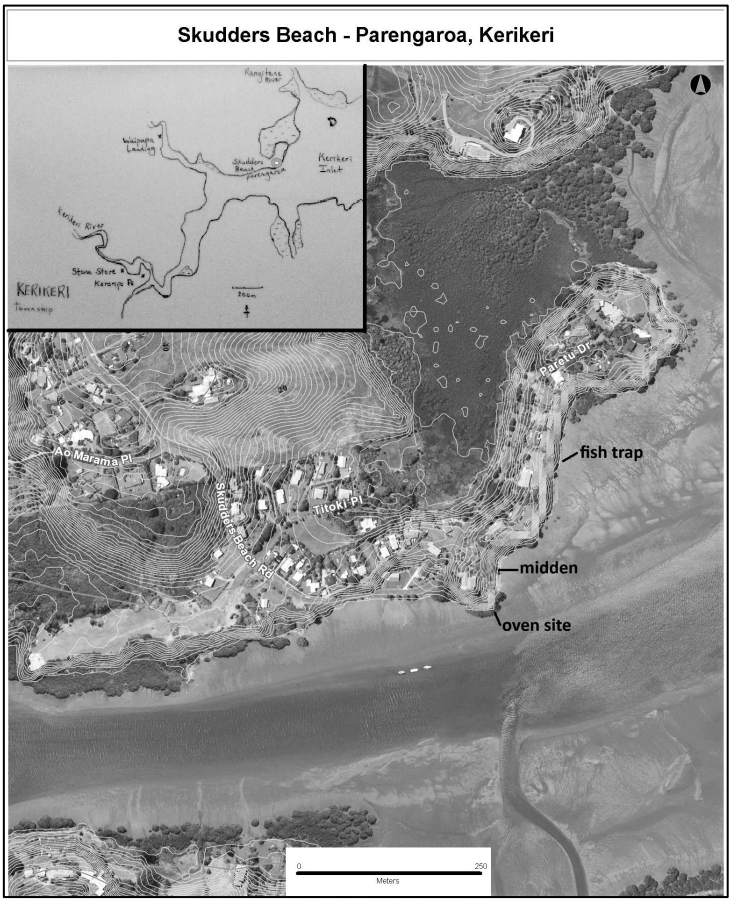

Figure 1- Map image showing some key features of the locality with insert sketch map of the area.

The Presence of Local Chert and its Historical Significance

We made our observations of the Parengaroa (Skudders Beach) area in 2019, on one occasion accompanied by local Kaumatua Syd Kingi (now 88 years old), and others. The end of the Skudders Road headland is called "Paretu" meaning a point above a cliff. William and Agnes Skudder lived on the southern point of the headland. Syd recollected less muddy sedimentation along the shore in earlier days:

> "*Even that current remnant of green grass at the eastern end of the beach under the huge old macrocarpa tree actually extended some distance further south (into the estuary) and had a small camping ground on it …all eroded away now. There was sand on the beach then…all gone now…just mud*" (pers.comm). Syd remembers the shark of Moa Kingi hanging drying in the trees at his house in the 1950's. "*The shark was split open like a smoked fish. To eat the dried flesh they would cut chunks off and cook on a piece of iron over hot embers*."

Chert cobbles were immediately noticed along the foreshore of Parengaroa Beach where man-handleable cobbles (ie 64-256 mm across) had been packed into a roughly-constructed low seawall. Along the shore about 50 m~ further east a 1 tonne~ siliceous slab (with broken off portion) was noted. This had recently eroded/fallen 50 cm~ out of the escarpment behind.

Once around the southern point of the headland there is small bay with a narrow, somewhat sandy beach and wide, gently sloping shore platform. Syd Kingi pointed out an early excavated terrace above the beach. At the high tide area of the platform was a scattering of visible chert lithic material. This was where a perfect conchoidal chert cutting or sawing tool 'knife' was recovered - the sharp edge of which has been deliberately serrated. At the base of the escarpment behind the site, a large shell midden, up to 2 metres thick x 20m~ long, dominated (>80%) by cockle shells (*Austrovenus stuchburyi*) with minor pipi (*Paphies australis*) plus charcoal and rare chert and small obsidian fragments, is eroding onto the beach. The shellfish represented are estuarine species, obviously an important locally-utilized food resource.

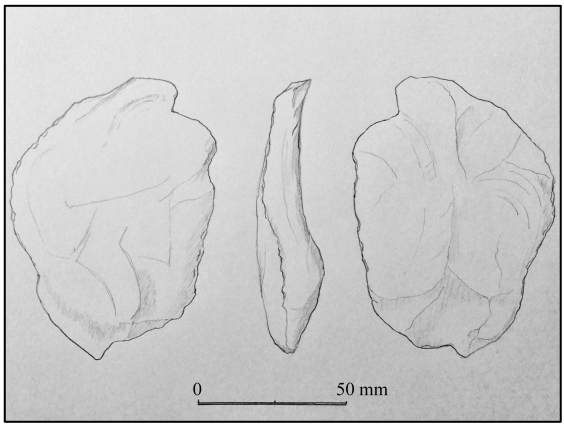

Figure 2. Close up of chert cutting tool, line drawing.

Numerous chert cobbles and slabs occur further northeast for some 800 m, widely distributed across the broad, low-sloping intertidal platform, intermixed with Kerikeri basalt. Cherts in this area are mostly brown to red to white in colour and

are dull opaque, with exterior surfaces of the blocks smooth with highly weathered rusty brown rinds. All along the high tide mark there is evidence of probable worked chert lithic material: knapped sharp pieces with fresh faces, and tool performs, mostly 4 – 10 cm in length, plus cores and broken blanks, predominantly of poor quality, expected of debitage (left-overs/rejects) 10 to 20 cm across. Also present were what appear to be sub-spherical hammerstones, both siliceous and basaltic, with the chert examples having rounded pitted surfaces from being struck, able to be held comfortably, being approximately 15-20 cm diameter and weighing around 1kg. One large example appears to have broken in half and continued to be used on its edge. These, and the occurrence of smaller broken chert pieces (shatter) and debitage suggest that this shoreline was the likely place of at least the early stages of chert tool manufacture.

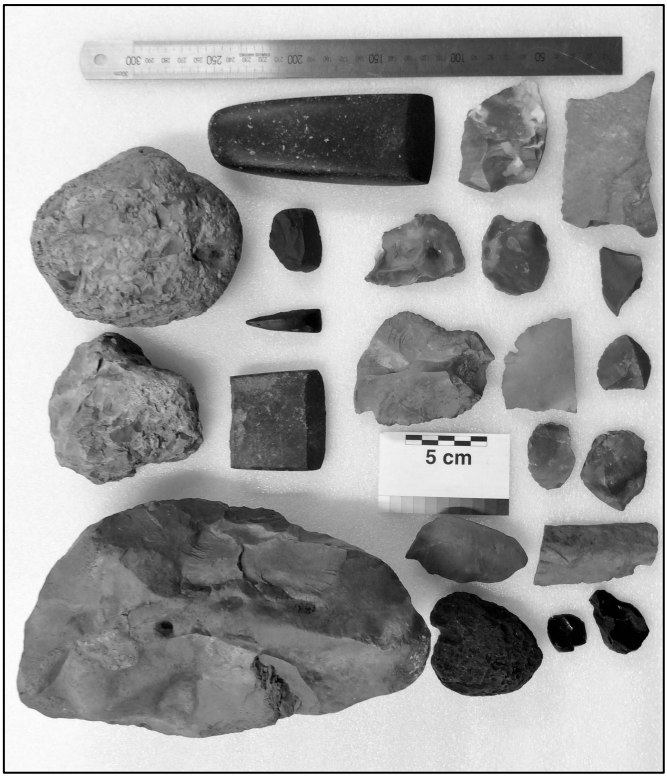

Figure 3. Assortment of artifacts including chert lithics and hammerstones, pieces of obsidian, basaltic and argillite adze and a complete pounamu chisel.

We found the Parengaroa chert to break with force producing conchoidal fractures and sharp edges and speculate that this was locally utilized by possibly pre-European and later Maori. Stone tool expert D. Bonica, skillfully demonstrated that a Parengaroa coarse-grained 'poorer quality' chert blank can easily be modified to allow the knapping-off of a highly usable 'knife'. Knapped pieces with sharp edges could have then been transported elsewhere and utilized as cutting, slicing and scraping implements for fish preparation, working flax and wood. Very similar lithic material found in the intertidal zone at Hororoa Point on the opposite shoreline of the Kerikeri Inlet, including some perfectly shaped conchoidal 'knives', are presumed to originate from this Parengaroa chert source. Other Bay of Islands material in the Booth collection, from Taranaki Island for example, may also have originated here.

Other Lithic Material

Several pieces of obsidian were also found on the foreshore, including a sharp worked piece and a larger naturally rounded, eroded/colluvial sample, consistent with a Pungaere/Waiare source. Although possibly removed by collection bias, the amount of obsidian is minor compared to the abundance of chert, with little shatter present, hence less likely to have been worked here. A finely crafted basalt adze was also recovered, plus fragments of an argillite tool and a small pounamu chisel (Booth catalogue # 54S1), found slightly further north. These artifacts, along with our chert samples, are now held as part of the Booth Whānau Collection in Te Kōngahu Museum of Waitangi, Northland.

Pipi Steaming Oven:

The bedrock of the headland at Parengaroa is predominantly highly-weathered Waipapa Group sediments (ie.yellowish-brown clay formed from eroded sandstone, argillite and mudstone). In the headland is a modified natural alcove with features consistent with the remnants of a shellfish (cockle - tuangi) steaming oven. The oven appears to have been cut into a soft bedrock high tide notch-shelf at the back of an alcove 1.6 m high that is protected from both easterly and westerly winds. At high tide level it is 2.5 m wide x 2 m deep. To the left, a shelf 1.5 m wide x 0.5 m deep appears to have been cut into the bedrock at a similar level to the oven.

As a child, Syd Kingi had sheltered in the alcove, though he said it had very much changed over the years - he remembered the alcove having a much smaller entrance like a cave entrance and thinks the roof has collapsed sometime in the past. As children they used to shelter in there when rain fell, though his parents

warned him to "*stay clear as it was an old Maori place*". Bill Edwards commented that the oven looked to be cut by steel tools, though it was noted how soft the bedrock is and we postulated that a stone tool could achieve the same results. It could be that the oven was renovated over many years. Similar features at Whiorau Bay and at the entrance to the Waikino Inlet (C & J. Booth pers. comm.) are both associated with large cockle - tuangi beds and suggest that a handy permanent oven in a sheltered, fire proof site would be usual in such popular cockle - tuangi gathering areas, consistent with the large Parengaroa (Skudders Beach) midden described earlier.

Figure 4. AM Booth examines the pipi-steaming oven alcove.

Also nearby to the oven site, some 25 m to the north-east on the shore platform, is a very rectangular depression measuring 1.0 x 0.6 m that appears to have been cut into the bedrock. It is approximately 0.2 m deep and currently holds water when the tide is out and could have been used for rinsing or soaking. Eighty-seven year-old local Constance Valmae LeClerc was born in 1933 into a small cottage close to the sea at the northern end of the first beach past the oven site. The cottage was later taken by barge around to Skudders Beach. Recollections by Valmae LeClerc suggest the 'basin' was actually cut into the bedrock by Valmae's Dad, John LeClerc, for her to sit in when just a baby.

Old Pathway on Shore Platform

We observed the traces of what appears to be an old pathway approximately 0.5-0.8 m wide that has worn down over the years into the soft bedrock of the shore platform below the escarpment, following or just above mid-tide level. It is clearly visible running immediately northeast around the bluff from the oven site and soon reappears across the small bay and continues toward the 'fish trap' site. It has a gentle curvature and cuts across the natural North-South oriented jointing in the platform bedrock. In some places it has eroded away, especially near the corner of the bluff where tidal current movement would be more rapid. Sid Kingi has no recollection of any livestock moving across this area.

Figure 5. A section of the curved pathway cut into the shore platform.

Unidentified Stone Arrangements and a Suspected 'Fish Trap'

Some 200 metres northeast of the Parengaroa headland oven site are some striking arrangements of stone on the foreshore. We speculate that the curved stone feature, comprised of basalt and chert cobbles and boulders, arranged into a arc of some 10+ m wide, on the intertidal shore platform is possibly a Maori 'fish trap' of indeterminate age, perhaps used for flounder which were once very common here. Comparable features with similar dimensions are known from

elsewhere in NZ (e.g. Trotter & McCulloch 2000). The smaller constituent rocks appear to be slightly scattered, probably by natural erosion, but with the possibility of some being removed, perhaps even incorporated into the nearby 'groyne.'

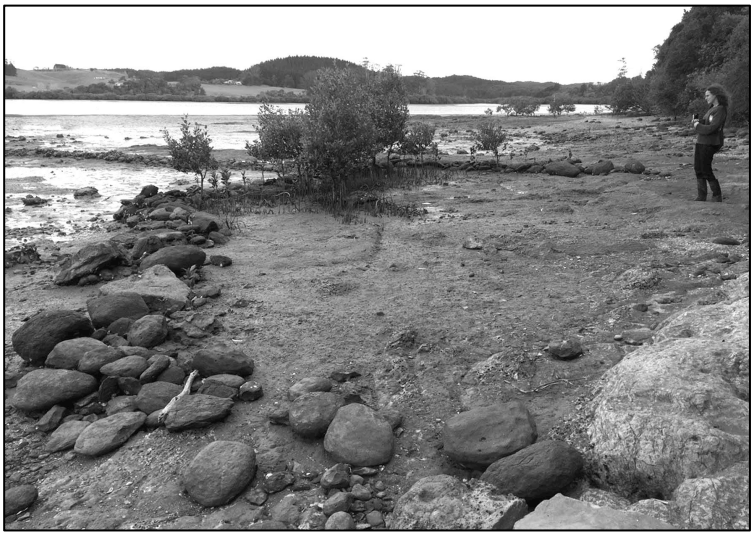

Figure 6. Fish trap site with large blocks of chert and basalt resting on the shore platform.

The linear 'groyne' feature, comprised of basalt and chert boulders and about 1 metre wide, extends some 20 m across the platform into the bay. We suspected this was a more recent feature, perhaps used to access watercraft. Valmae LeClerc is pretty sure her Dad and/or her grandfather built the groyne as she remembers coming alongside the structure at high tide to avoid the deep mud. Valmae's Dad, John LeClerc, was a mechanical engineer and is said he could turn his hand to anything including building the stone groyne, possibly in the 1930's. She thinks her Dad retained the associated fish trap (from earlier use possibly by Maori) for catching fish in conjunction with the groyne. According to Valmae, John LeClerc would "*easily catch snapper all around here, and especially from their wee cottage at night where he would set a line and tie it to a bell at the house*" (pers comm. 2020). Rows of mostly basalt boulders along the high tide level near the suspected pathway are what appear to be attempts to reinforce the former shoreline by John LeClerc.

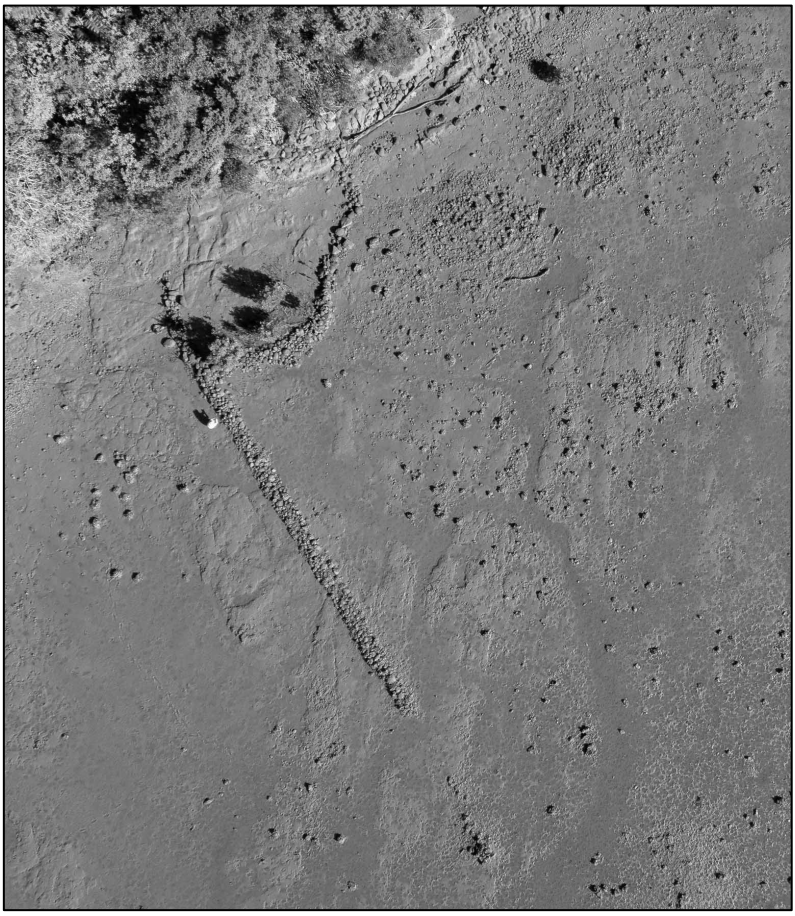

Figure 7. Aerial view of the curved 'fish-trap' and linear 'groyne'.

Other unusual concentrations and alignments of rocks on the shore platform off the northeast end of the Parengaroa-Paretu point can also be seen on aerial photographs. The origins of these piles of basalt and chert rocks is unclear, they are potentially related to human activity, perhaps the grouping together of building materials to await collection by boat. We noted several clear "channels" between rocks to the northeast that could have functioned as slipway areas.

The Stone Store

Brownish coloured Parengaroa–like chert cobbles and blocks, 10 – 40 cm across, can be seen with careful observation of the exterior of the iconic and historic Stone Store building in the Kerikeri Basin. They occur amongst the basalt cobbles, in addition to the imported Sydney sandstone, used in the early 1830s construction of Stone Store by masons Parrott, Edmond et al. In the ground floor of the Store, smaller pieces of chert are scattered throughout the predominantly basalt cobbled floor. Stone Store restoration manager for NZHPT Fergus Clunie agrees the chert is of particular interest, as use of this stone has not previously been recorded as far as we are aware. When the missionaries decided to build a stone storehouse they used the local basalt obtained from the Kerikeri Inlet, some transported using the mission cutter *Karere* (Easdale 1991). It is surmised that Parengaroa (Skudders Beach) in particular, is the source area for the chert found in the walls and floor of the Stone Store, but we are unclear whether the chert was accidentally included, or selected for, during collection of the basalt. Due to the rather random distribution in the Stone Store walls we suspect the former, whereby any durable stone found nearby was utilized.

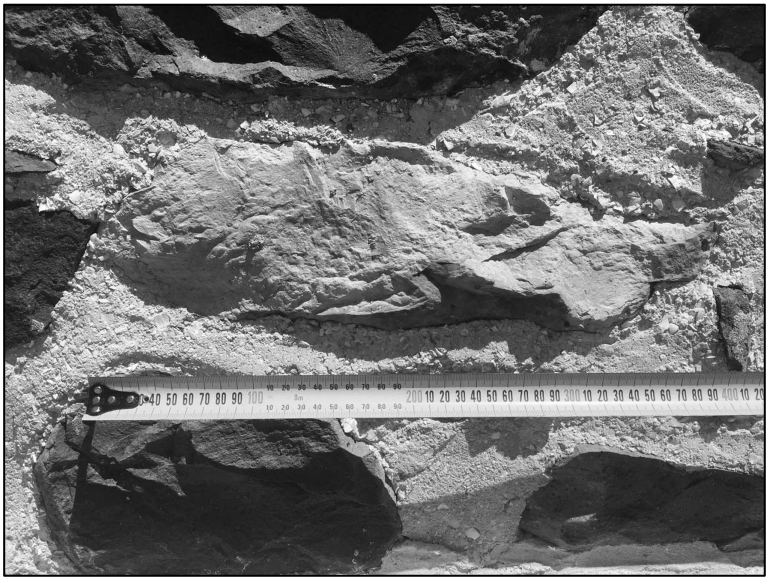

Figure 8. Chert blocks amongst darker basalt in the walls of the Stone Store.

The shell mortar in the Stone Store surely must also have come from an easily obtained local source; we suspect it may have been the extensive middens across the inlet at Hororoa. It is possible that as boats were ferrying the shell for mortar, the basalt and the chert were also conveniently loaded from Parengaroa for use in the building of the Stone Store.

Discussion

The Kerikeri Inlet area is of particular historic significance to New Zealand, for Pre-European Maori as well as early pakeha, including the missionaries who built the Stone Store, and later settlers. We highlight the use of a local stone as a resource and note the Parengaroa (Skudders Beach) chert deposits as an important, yet easily overlooked lithic material.

Moore (1977) discusses potential Maori use of chert in New Zealand and possible techniques for sourcing the rock, including laboratory techniques such as trace element analysis, currently beyond the scope of this study. He suggests for any archaeological occurrence, nearby chert deposits are worth investigating as the likely, local, origin (Moore 1977). Chert provenance studies in Australia are aided by the presence of identifiable microfossils in the chert (Ward et al. 2019). These are not recognisable in any of our ancient chert samples from Parengaroa thus far. Another Northland site with chert lithic material and some similarities to the Kerikeri locality was described by Fredericksen (1990).

In the case of Maori cutting implements, one might speculate the desirability, and hence exploitation, of local chert as a lithic material may have been especially significant at times when the perhaps more-highly valued obsidian was less obtainable due to trade restriction or other factors affecting supply.

Acknowledgements

John Booth provided welcome korero and kindly reviewed early stages of our manuscript. Dean & Debbie Wright generously took high resolution images of the site from a drone. Dante Bonica from the University of Auckland visited C. Booth in Feb. 2020 and gave a fascinating demonstration of working the chert. Te Kōngahu Museum of Waitangi housed and allowed access to our collected material. Yvonne Skudder Stephens, now 82 (born 1937) and her 87 year old cousin, Constance Valmae LeClerc shared their remarkable memories of the area. We thank all those who accompanied us to the locality including Bill Edwards (Heritage NZ), John, Amaru, Lena Huia and Anne-Marie Booth and Diane Yanakopulos. We felt very honoured that Syd Kingi joined us to view the cockle -

tuangi steaming oven then onto the first bay around the southern headland before returning home.

Author Contacts

chris@chrisbooth.co.nz
seabourne.rust@gmail.com

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