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## **Korero Around Sources of Obsidian Artefacts Found in the Bay of Islands and Other Parts of Northland**

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### **Introduction**

Obsidian (matā, natural volcanic glass) was widely used by pre-Contact New Zealand people to cut, trim and scrape and is, accordingly, found in archaeological sites around much of the country. Of at least 30 geographically distinct sources, those in mainland Northland known to have been made use of are Pungaere (Kaeo) and Huruiki (Figure 1) (Shephard et al. 2011; Moore 2012a, b; McAlister 2017a). (For Pungaere: ‘Although the source region has been named Kaeo, Jones [2002: Fig. 3.10] reports finding four sources extending 11 km south from Kaeo stream through Waiare to Pungaere.’ [Sheppard et al. 2011: 46] – and this cluster of sources was distinct from others also close to Kaeo.) In Northland there is also ‘Poor Knights Islands’ obsidian, but the actual source is yet to be conclusively identified (James Robinson, Heritage New Zealand, pers. comm. 2018).

‘Source areas’ were the basis of ‘supply zone territories’ (the area immediately around a single source where it was directly accessed and beyond which there was a major drop in frequency of that source, indicating a change from supply zone to ‘contact zone’) and ‘procurement areas’ (geographic regions where people accessed a common set of sources, they in turn subdivided into ‘primary sources’ that comprise >50% of an assemblage, and ‘secondary sources’ with <50% [McCoy et al. 2010: 174]). Presumably, in supply zones people were willing and able to visit the sources themselves, whereas those in contact zones obtained smaller quantities by exchange with trade partners in supply zones (Scott 2007: 58). Most supply zone territories were relatively small (up to tens of kilometres), but Mayor Island obsidian is unique in being present in remarkably high frequencies (sometimes >50%) hundreds of kilometres from source (McCoy et al. 2010: 174), particularly in early times. This wide dispersion - at least in part - reflects its high quality (Moore 2012b: 19).

Archaeologists are rightfully concerned over reading too much into serendipitous surface cultural finds of any description. Accordingly, obsidian-finds of most significance are typically those rich in context including stratigraphic provenance.

Nevertheless, various workers such as McCoy et al. (2010) and Moore (2012a, b) have recently shown how surface finds of obsidian without provenance (apart from their find- and source-locations) can provide valuable insight into social arrangements, and should not necessarily be ignominiously disregarded.

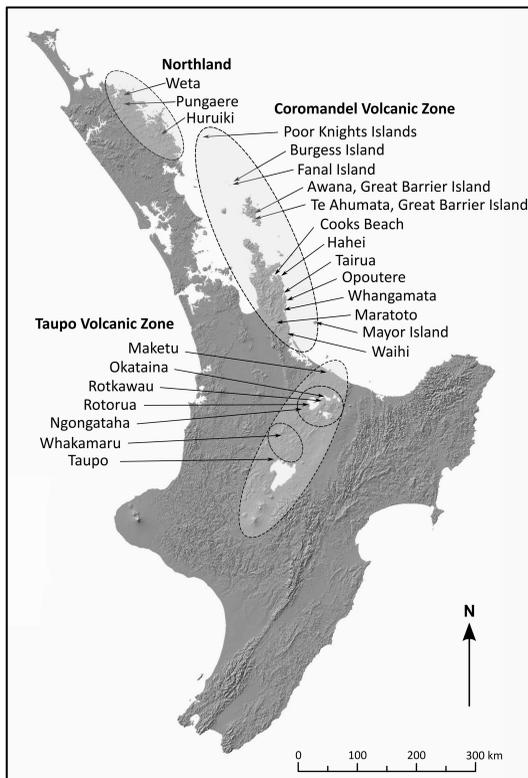


Figure 1. Geographically distinct sources of New Zealand obsidian. The only Northland sources known to have been used archaeologically are Pungaere and Huruiki.

It appears that surprisingly low numbers of northern-New Zealand archaeological assemblages have been analysed for source (e.g., Brassey and Seelenfreund 1984; Seelenfreund and Bollong 1989; Moore 2012a, b; McCoy and Carpenter 2014; McCoy et al. 2010, 2014; Moore and Coster 2015; Phillipps et al. 2016), and the Central Index of Archaeological Sites collection is not extensive (McCoy et al. 2010: 175). With this in mind, our main

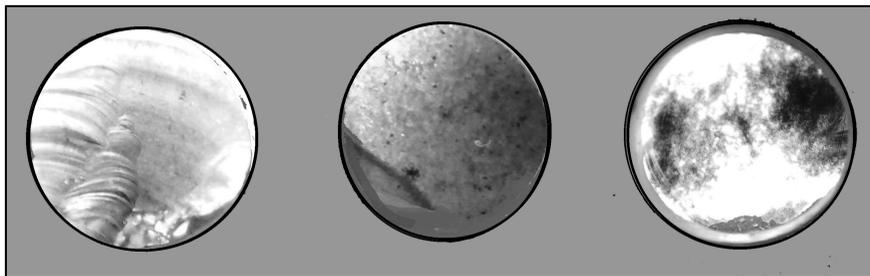
aims are 1) to draw to the attention of the archaeological community the 111 obsidian artefacts from Northland that exist in the Booth Whanau Collection (housed in Te Kōngahu Museum of Waitangi) and for which there is an X-ray fluorescence- (XRF-) assigned source; and 2) for the Bay of Islands in particular, to compare and contrast source-locations with those derived (using both XRF and transmitted light [TL] techniques) for other collections, including those referred to in published results.

## Methods

All 111 pieces of obsidian in the Booth Whanau Collection with known Northland collection-sites (Tom Bowling Bay in the north to Mitimiti/Bay of Islands in the

south) were assigned a source-location based on XRF (McAlister 2017a). (Note however that this count comprehensively understates the actual encounter rate of obsidian, it having been commonly seen yet seldom collected.) Because of the diversity of source suggested for eastern parts of the Bay of Islands, a further 57 flakes from the surface there (Whiorau Bay, from another private collection) were analysed using XRF (McAlister 2017b).

For yet other Bay of Islands obsidian collections available to us, our assignments of source-locations were based primarily on colour under TL (e.g., Moore 2012a, b). Moore (2012b) summarised the colour and related features visible under TL for northern-New Zealand obsidians according to source-location, but we necessarily developed our own colour-code specific to the light-source we used. With a 6000 lumen headlamp held in close contact with the reverse side of the flake to be analysed, the tones seen with the naked-eye were bright green (Mayor Island); olive green (Pungaere); grey (Cooks Beach and Hahei); and blue to blue-grey (Huruiki, Poor Knights Islands and Fanal Island) (Figure 2). Because of overlap in colour among our Huruiki, Poor Knights Islands and Fanal Island samples, we possibly overestimated the frequency of Huruiki obsidian. However, the XRF analyses suggested these three sources were rare and therefore any misidentifications should not have skewed our results markedly. (That we found tones of blue for Huruiki and elsewhere, whereas Moore [2012a: 266] reported tones of grey, almost certainly stems from the use of physically different light sources, and points to a research opportunity to further tune the use of TL in obsidian-source characterisation.)



*Figure 2. X-ray fluorescence-confirmed Mayor Island obsidian (left) was bright green; Pungaere (middle) olive green; and Huruiki (right) a tone of blue under the transmitted light used in this study. See the rear cover of this issue of AINZ for colour reproduction of this figure.*

## Results and Discussion

For the Northland-wide obsidian in the Booth Whanau Collection analysed by XRF: 1) Pungaere was by far the most frequent source, followed by Mayor Island; and 2) for the east coast, there was suggestion of increasing diversity in source with distance south (Figure 3, Table 1). These results are generally consistent with the TL-determinations of Moore and Coster (2015: 1) for locations on Aupouri Peninsula, in the northern part of our collection-area.

The supply zone territory for Pungaere obsidian took in this entire area. The frequency of Mayor Island obsidian in the collection pointed to the entire area being within the contact zone for that source; and the southern part of our study area was within either the contact or supply zone for Huruiki obsidian.

*Table 1. Frequency of source (%) for surface-collected Northland obsidian in the Booth Whanau Collection assigned using X-ray fluorescence and shown in Figure 3. (In parentheses are frequencies of source for collections made at the same or nearby locality, based on transmitted light and reported by Moore [2012b: 20, 22]. 'Grey' refers to obsidian from Huruiki and certain other sites to the south.)*

|                         | Mitimiti        | Tom Bowling<br>(Waikuku +<br>Kowhai) | Berghan Pt<br>to Tikitiki | Within Bay of<br>Islands | Totals     |
|-------------------------|-----------------|--------------------------------------|---------------------------|--------------------------|------------|
| <b><i>n</i></b>         | <b>36 (124)</b> | <b>4 (271)</b>                       | <b>23</b>                 | <b>48</b>                | <b>111</b> |
| <b>Pungaere</b>         | 81 (89.5)       | 50 (39.1)                            | 70                        | 81                       | 86         |
| <b>Mayor I.</b>         | 19 (6.5)        | 50 (45.0)                            | 26                        | 8                        | 19         |
| <b>Huruiki</b>          |                 |                                      |                           | 8                        | 4          |
| <b>Cook's<br/>Beach</b> |                 |                                      |                           | 2                        | 1          |
| <b>Hahei</b>            |                 |                                      | 4                         |                          | 1          |
| <b>'Grey'</b>           | (4.0)           | (15.9)                               |                           |                          |            |

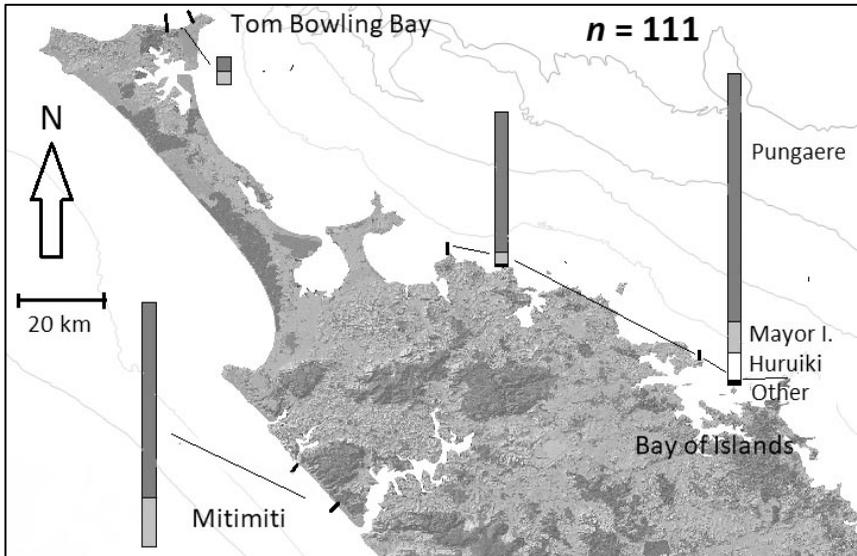


Figure 3. Sources of obsidian in the Booth Whanau Collection assigned by X-ray fluorescence (data are from Table 1).

### Bay of Islands Obsidian

Bay of Islands obsidian with source information includes not only that shown in Figure 3, but also pieces in other private collections, as well as the published results from previous studies (Table 2; Figures 4 and 5). Most pieces are from serendipitous shore collections and are presumed, at least to a certain extent, to represent the entire duration of occupation of the locality. Bay of Islands seems a geographic nexus in that it appears to be within the supply zone territory for Pungaere obsidian; with the exception of a single flake from Tauroa Point (Phillipps et al. 2016), it is the northern boundary for the supply zone of Huruiki obsidian; and it is within the contact zone for Mayor Island and other southern sources.

a) Along northwest shores (1-5 in Figures 4 and 5), obsidian from Pungaere (the closest source, geographically) dominated (82-100%, irrespective of the [limited] chronological information). Clearly the supply zone territory for the Pungaere source took in this part of the Bay of Islands, and Pungaere was the primary procurement area for this part of the Bay. The frequency of Mayor Island obsidian (up to 18%) pointed to this part of the Bay of Islands being within the contact zone for this source, but for Huruiki obsidian it was essentially beyond the contact zone.

b) Along southeast mainland shores (7 and 8 in Figures 4 and 5), Pungaere obsidian was present to the extent (29-48%) that this area appears to also lie within the supply zone territory for that source. But there was overlap: Huruiki obsidian was also present in significant proportion (35-39%), so presumably this area was within the supply zone territory of that obsidian. The data are consistent with this part of the Bay of Islands being within the contact zone for Mayor Island obsidian (16-25%), as well as for other sources to the south. When it comes to procurement areas, all obsidian types were secondary sources, none having exceeded 50% in frequency-presence.

c) Our evidence suggests that the islands of Ipipiri (9 and 10 in Figures 4 and 5) were probably (with up to 72% presence) within the supply zone for Pungaere; and within the supply or contact zones for Huruiki (14-17% frequency) and Mayor Island obsidians (14-46%). For procurement areas, Pungaere was a primary source.

d) The shore with greatest variety in source-location was in the southeast - Whiorau Bay (8 in Figure 4), with six sources; lowest variety was in the northwest, with most often only one or two sources.

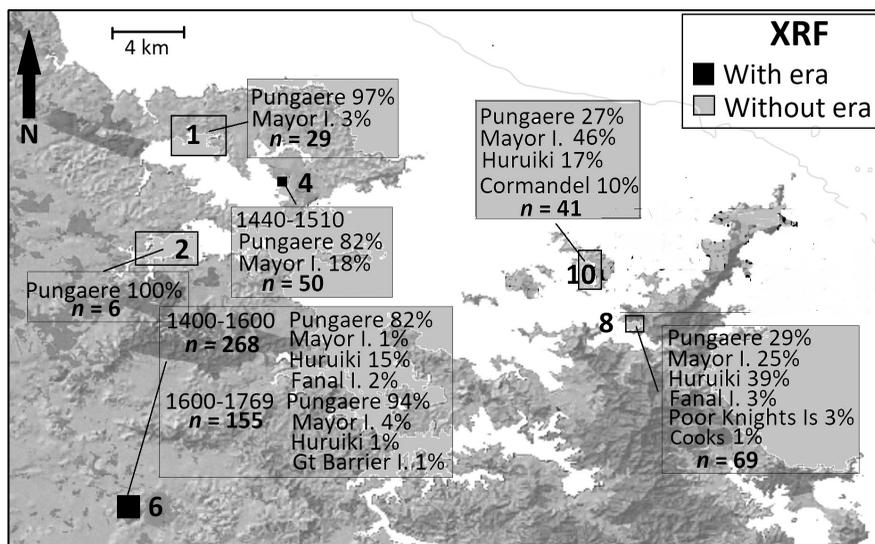
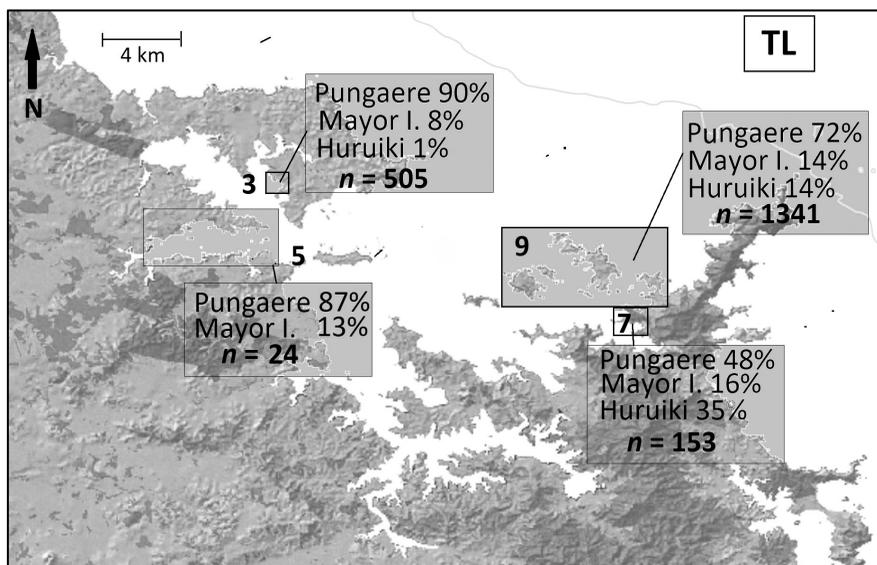


Figure 4. Assigned sources for the six collections of obsidian from within the Bay of Islands using X-ray fluorescence (Table 2).

e) For the single inland site, Pouerua (6 in Figure 4), Pungaere obsidian dominated (>80%) throughout the known occupation period (1400-1769 AD), indicating that the site was within the Pungaere supply zone territory, and that Pungaere was the primary procurement source (McCoy et al. 2014). During the first phase of occupation (1400-1600 AD), there was also ‘unfettered direct access to local sources as far away as Fanal Island’, and Huruiki was an important source (15%) (McCoy et al. 2014: 574). In contrast, in the second stage (1600-1769 AD), during what was probably the most intense period of conflict in the region, there was restriction of direct access across the board. Overall, these results are similar to the data for the northwest shores of the Bay of Islands, but the lower frequency of Mayor Island obsidian (1-4%) may reflect less access to waka-deliveries.



*Figure 5. Assigned sources for the four collections of obsidian from within the Bay of Islands determined by transmitted light (Table 2).*

*Table 2. Obsidian collections from within the Bay of Islands referred to in Figures 4 and 5 (postal addresses as at August 2018). XRF, assigned by X-ray fluorescence examination; TL, assigned by transmitted light examination; WEB, W.E. Booth analysis*

|           | <b><i>n</i></b> | <b>Context</b>            | <b>Location</b>                      | <b>Present whereabouts</b>                                                                                                                             | <b>Reference</b>                 |
|-----------|-----------------|---------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>1</b>  | 29              | Beach surface             | Te Tii                               | Booth Whanau Collection, Te Kōngahu Museum of Waitangi                                                                                                 | XRF, McAlister (2017a)           |
| <b>2</b>  | 6               | Beach surface             | Upper Kerikeri Inlet                 | Booth Whanau Collection, Te Kōngahu Museum of Waitangi                                                                                                 | XRF, McAlister (2017a)           |
| <b>3</b>  | 50<br>5         | Beach surface             | Patunui                              | Raewyn Hansen collection, RD1 Kerikeri                                                                                                                 | TL, WEB                          |
| <b>4</b>  | 50              | Excavation (1440-1510 AD) | Patunui                              | ?                                                                                                                                                      | XRF, McCoy & Ladefoged (2012: 6) |
| <b>5</b>  | 24              | Beach surface             | Kerikeri Inlet                       | Maria & David Manning collection, PO Box 73, Kerikeri (9) plus Kiwi North Museum, Whangarei (15)                                                       | TL, WEB                          |
| <b>6</b>  | 42<br>3         | Excavation (1400-1769 AD) | Pouerua                              | ?                                                                                                                                                      | XRF, McCoy et al (2014: 472)     |
| <b>7</b>  | 15<br>3         | Beach surface             | Mostly Whiorau, but also Omakiwi Bay | Kathy O’Neill collection, Rawhiti, RD4 Hikurangi 0184                                                                                                  | TL, WEB                          |
| <b>8</b>  | 69              | Beach surface             | Whiorau Bay                          | Ron & Rangi Higgison collection C/o Rhonda Lawrence, Rawhiti, RD4 Hikurangi 0184 (57) plus Booth Whanau Collection, Te Kōngahu Museum of Waitangi (12) | XRF, McAlister (2017a, b)        |
| <b>9</b>  | 13<br>41        | Beach surface             | Eastern Bay of Islands               | Arana Rewha collection, Rawhiti, RD4 Hikurangi 0184                                                                                                    | TL, WEB                          |
| <b>10</b> | 41              | Beach surface             | Urupukapuka/Entico (Otiao) bays      | ?                                                                                                                                                      | XRF, McCoy et al (2010: 175)     |

The geographic extents of obsidian supply zones we determined for the Bay of Islands fit well with those estimated by McCoy et al. (2010: 178) based on data from Pouterua and Urupukapuka Island. Their distance to source model predicted a maximum distance north of 36 km for Huruiki obsidian, and – in line with this – we found very few pieces of Huruiki obsidian in the northwest of the Bay of Islands (40 km from source). The equivalent value was 52 km south for Pungaere obsidian, but because our sampling extended only a little south of Urupukapuka, and because our samples were essentially from only within their Area C, we cannot add much to the procurement areas shown in McCoy et al. (2010: 180).

Our data join those of Moore (2012b) and Moore and Coster (2015) in suggesting that the supply zone territory for Pungaere obsidian extended from the top of the country, south to and including the entire Bay of Islands. (Pieces of ‘Kaeo’ obsidian have been identified from at least as far south as Otago [Nobles 2015: 41].) On the other hand, Huruiki obsidian was not found to any significant extent any further north than southeastern Bay of Islands. It appears the contact zone for Mayor Island obsidian took in the entire northern part of Northland.

Our analyses of obsidian assemblages from the Bay of Islands contrast those of McCoy and Carpenter (2014: 12) who, in reference to assemblages from Bream Head and Mt Wellington (Auckland), concluded: ‘It would appear that Maori living on the North Island’s northeastern coast in the Late Period (1500–1769 A.D.) primarily obtained their obsidian through direct access to source areas on off-shore islands.’ With one exception (Urupukapuka – *see* Fig. 4), the majority of the obsidian from the 10 sites included in this study was from sources on the mainland (Pungaere and Huruiki).

The particularly rich variety in source-location for the shore collections of obsidian at Whiorau Bay, in the southeast of the Bay of Islands, was unexpected (Booth Whanau Collection [12 pieces] and Ron & Rangi Higgison Whiorau Bay Collection [57]; McAlister 2017 a, b). Most of the obsidian came from Huruiki, Pungaere and Mayor Island (respectively, 40, 28 and 25%), but small numbers also came from ‘Poor Knights Islands’ and Fanal Island (Figure 6), and Cooks Beach on Coromandel Peninsula.

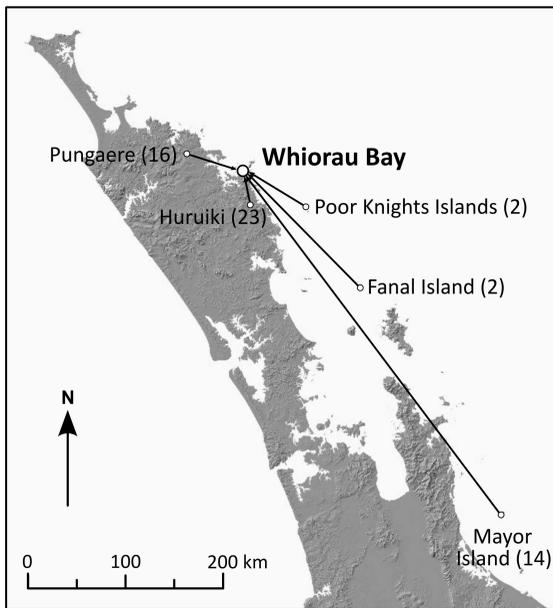
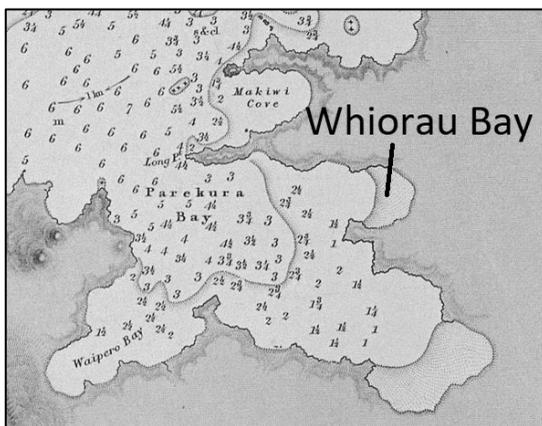


Figure 6. Obsidian sources identified for the Ron & Rangi Higgison Whiorau Bay Collection (8 in Figure 4) (n = 57). Artefact counts are shown in parentheses (McAlister 2017b).

At Whiorau, cockles (*tuangi*, *Austrovenus stutchburyi*) are readily harvested at and below mid-tide level, and the bay contains one of the most important shellfish beds in the Bay of Islands (Booth 2017). Today's extensive low-water flats (around 14 ha) are reflected in the earliest chart (1849), suggesting the current

topography has existed throughout recent geological times (Figure 7). With quantities of shellfish available in a sheltered setting adjacent to the open sea, and with abundant freshwater, one can imagine Whiorau being a favoured waka stop-off point. Other explanations behind the rich diversity of obsidian here may lie in 1) although the single date available for the bay is Late Period (middens dated 1612-1896 AD; Bickler and Clough 2006), artefacts identified as ancient in style have been found there (Booth 2016), consistent with long-term visitation and/or occupation; and 2) Whiorau has several pa, and is close to Rawhiti, whose population density was high from early times through to the time of colonisation (e.g., Clunie n.d.; Salmond 1997).

Figure 7. Extract from Acheron's 1849 (Stokes 1849) chart of the eastern Bay of Islands indicating extensive intertidal flats in Whiorau and other parts of Parekura Bay – all of which still exist today.



Whiorau Bay is interestingly located, being within the supply zone for Pungaere obsidian but also close to the Huruiki source (and having possibly the highest frequency of Huruiki obsidian reported for any site beyond the quarry area itself). The pattern of decreasing proportions of Huruiki obsidian with increasing distance from source is shown in Figure 8.

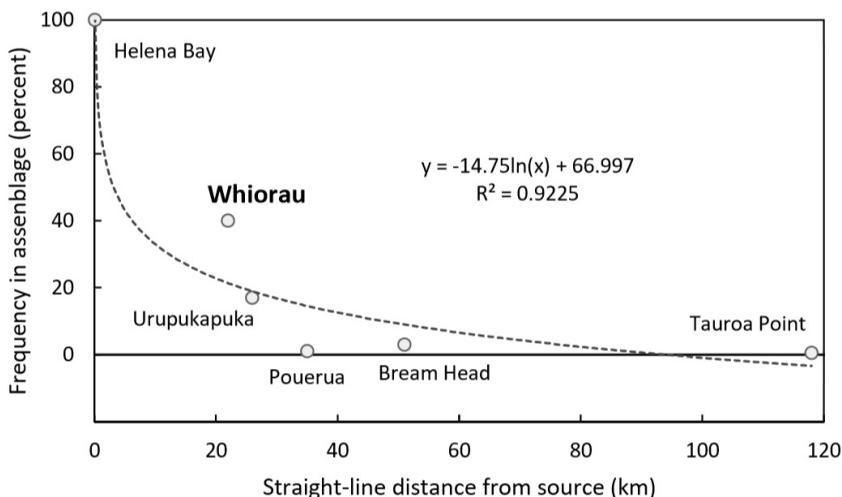


Figure 8. Proportions of Huruiki obsidian in selected Northland sites by distance to source. The best-fit logarithmic regression line is shown as a dashed line (McAlister 2017b, with the additional data from McCoy et al. [2010], McCoy and Carpenter [2014] and Phillipps et al. [2016]). Helena Bay is the geographical source; Bream Head is 75 km southeast of Whiorau Bay, and Tauroa Point is 110 km to the west.

## Conclusions

Our geochemical analysis of obsidian from the Booth Whanau Collection at Te Kōngahu Museum of Waitangi, together with obsidian examined from other assemblages, points to the Bay of Islands having been a nexus: it is the northernmost part of the supply-zone of Huruiki obsidian; it is towards the south of the supply-zone of Pungaere obsidian; and it is within the contact zone for Mayor Island as well as several other southern obsidian sources. In addition to long-term occupation, it is possible Whiorau Bay was an early stop-off point for voyaging waka, the embayment being close to open waters yet offering shelter, freshwater and – in particular – easily obtained shellfish. Perhaps it is not surprising, therefore, that this locality had the greatest variety of obsidian sources.

## Acknowledgments

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