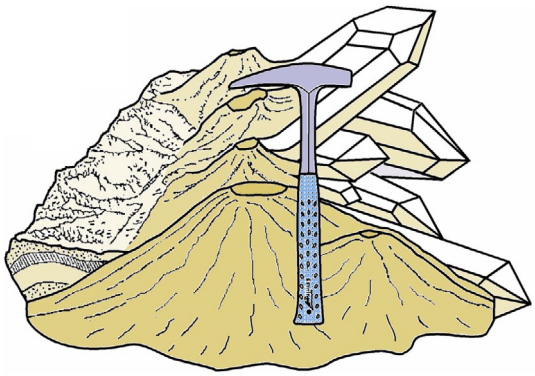


Geocene

Auckland GeoClub Magazine
Number 44, February 2026

Editor: Jill Kenny

CONTENTS

Instructions on use of hyperlinks and hyperlinks	*last page*	16
SPHERULITIC JASPER (“POPPY JASPER”) BENEATH A LATE EOCENE UNCONFORMITY, RESERVE POINT, WHANGĀREI HARBOUR	Bruce W. Hayward	2 – 6
FIRST RECORD OF A TREE TRUNK MOULD AND CAST AT TAKAPUNA FOSSIL FOREST	Bruce W. Hayward	7 – 8
ORIGINS OF TWO SHELL DEPOSITS AT SCOTTS LANDING, MAHURANGI HARBOUR, NORTHERN AUCKLAND	Bruce W. Hayward, Vicki Moon, Willem de Lange	9 – 10
SHALLOW SUB-SEA-FLOOR SILL OF CRETACEOUS AGE, WHATUWHIWHI, NORTHLAND	Bruce W. Hayward	11 – 13
LETTER TO THE EDITOR: INTERPRETATION OF A MID-SLOPE LANDFORM ON MT HOBSON (ŌHINERAU): QUARRY OR PALEO-LANDSLIDE?	Bruce W. Hayward, Martin Brook	14 – 15
Corresponding authors’ contact information		16

Geocene is a periodic publication of Auckland Geology Club, a section of the Geoscience Society of New Zealand’s Auckland Branch.

Contributions about the geology of New Zealand (particularly northern New Zealand) from members are welcome. Articles are lightly edited but not refereed.

Please contact Jill Kenny jill.kenny@xtra.co.nz

SPHERULITIC JASPER ("POPPY JASPER") BENEATH A LATE EOCENE UNCONFORMITY, RESERVE POINT, WHANGĀREI HARBOUR

Bruce W. Hayward

Over the past few decades, Auckland Geology Club has made several visits to the shoreline on the south side of the tip of Reserve Pt on the north side of Whangārei Harbour (Fig. 1). On the earlier visits, it was mainly to examine the garnet-bearing andesite intrusion (Day *et al*. 1992) and the Late Eocene nephelinite lava flow (Allen 1951). Later we also searched the nearby Late Eocene sandstone for more examples of the fossil starfish that Mike Eagle had described as a new species (Eagle 2006). On a more recent visit with Whangārei Rock and Gemstone Club members, we picked up red jasper pebbles on the beach, some of which clearly had small spheroids within them.

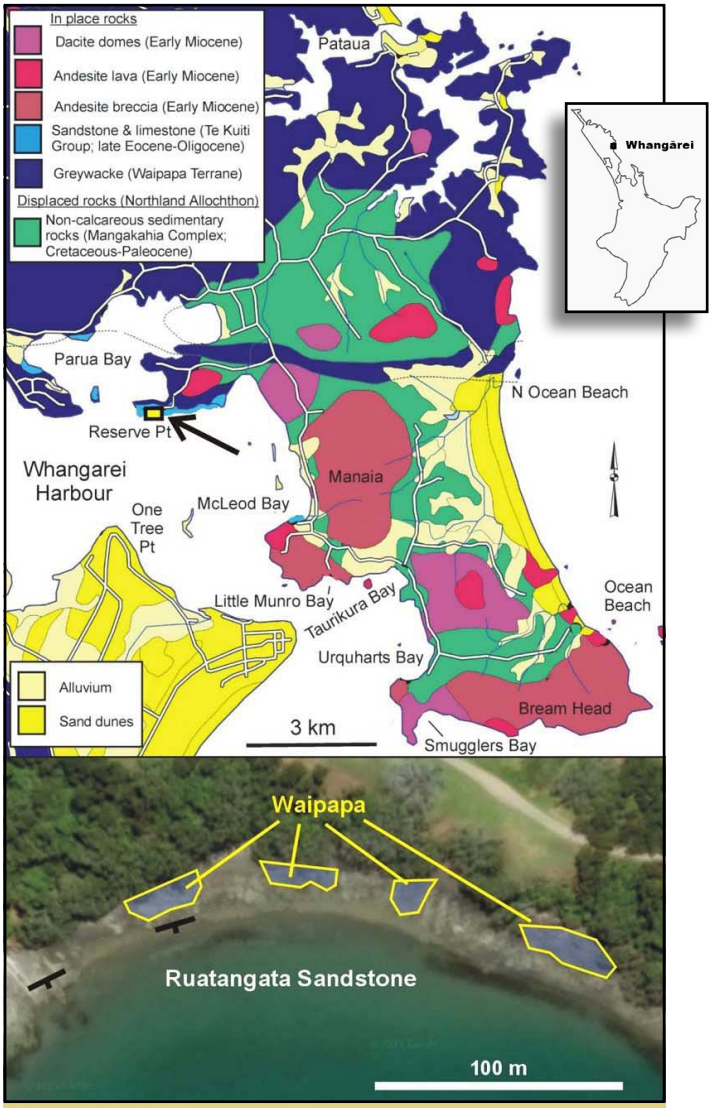


Fig. 1. Geological map of Whangārei Heads and arrowed location of the study site on the south side of the tip of Reserve Pt. The photo shows the location of the four windows of Waipapa greywacke basement exposed from beneath the overlying south-dipping Ruatangata Sandstone.



Fig. 2. View west at low tide across the study site, south side of Reserve Pt. Windows of greywacke outcrop beneath the shade of some of the trees, with overlying Ruatangata Sandstone forming the seaweed-covered, low-tide shore platform on left.

In October 2025, I returned to more closely examine the rocks exposed nearby and determine from whence the jasper pebbles were eroding.

At the back of a 15 m-wide, gravelly beach on the south side of Reserve Pt (Figs 1–2) are four windows eroded through the overlying, south-dipping Ruatangata Sandstone (Late Eocene, ~35 million years old). These windows expose outcrops (~20 x 8 m in size) of the underlying Waipapa Terrane that is unconformably overlain by the in-situ (autochthonous) Eocene sandstone (e.g. Isaac *et al*. 1994).

Unconformity

The four windows expose the irregular tops of high points/stacks in the Waipapa greywacke that may in fact be up-faulted after deposition of the overlying Ruatangata Sandstone – the limited exposure makes it difficult to determine. In most places the contact is directly overlain by 0.5–1 m-thick boulder/cobble conglomerate (Figs 3–4) with the large, rounded clasts composed of various indurated lithologies eroded from the Waipapa basement rocks. The basal conglomerate is overlain by thick beds of coarse sandstone and pebbly greywacke conglomerate, which then passes up into bedded calcareous, glauconitic sandstone that in places is sufficiently calcareous to be classed as sandy limestone (Fig. 5).

Waipapa Terrane lithologies

The two western-most windows consist of dark grey, fine-grained, altered basalt (spilite) overlying a thin-sequence of green-grey, fine sandstone (greywacke) and dark grey

mudstone (argillite). The two eastern-most windows mostly consist of weakly bedded, dark grey argillite and some interbedded, grey-green, fine sandstone (greywacke). The Waipapa Terrane rocks are indurated and sheared and cut by many joints and possible faults. Bedding is difficult to recognise.

No clear pillows are visible in the basalt (spilite) and in one part it is cut by a 50 cm-thick zone of pebble breccia (Fig. 6). In a number of scattered locations within the spilite there are lenses of red jasper (chert), usually irregular in shape and up to 40 cm across and 10 cm thick (Figs 6–8). This jasper is usually massive or somewhat



Fig. 3. Exposure of the unconformable contact of bedded Ruatangata Sandstone (upper left) overlying dark-coloured Waipapa argillite. Width of photo 2 m.

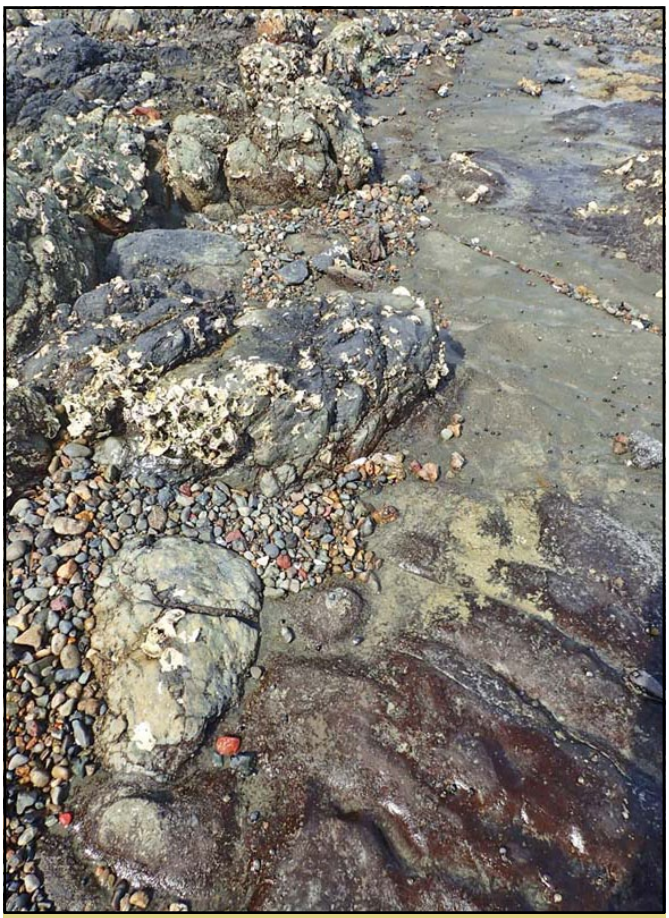


Fig. 4. Rounded boulders of Waipapa basement rocks with a matrix of sandstone sitting on the contact between the basement greywacke (top left) and Ruatangata Sandstone (right). Width of photo 1 m.

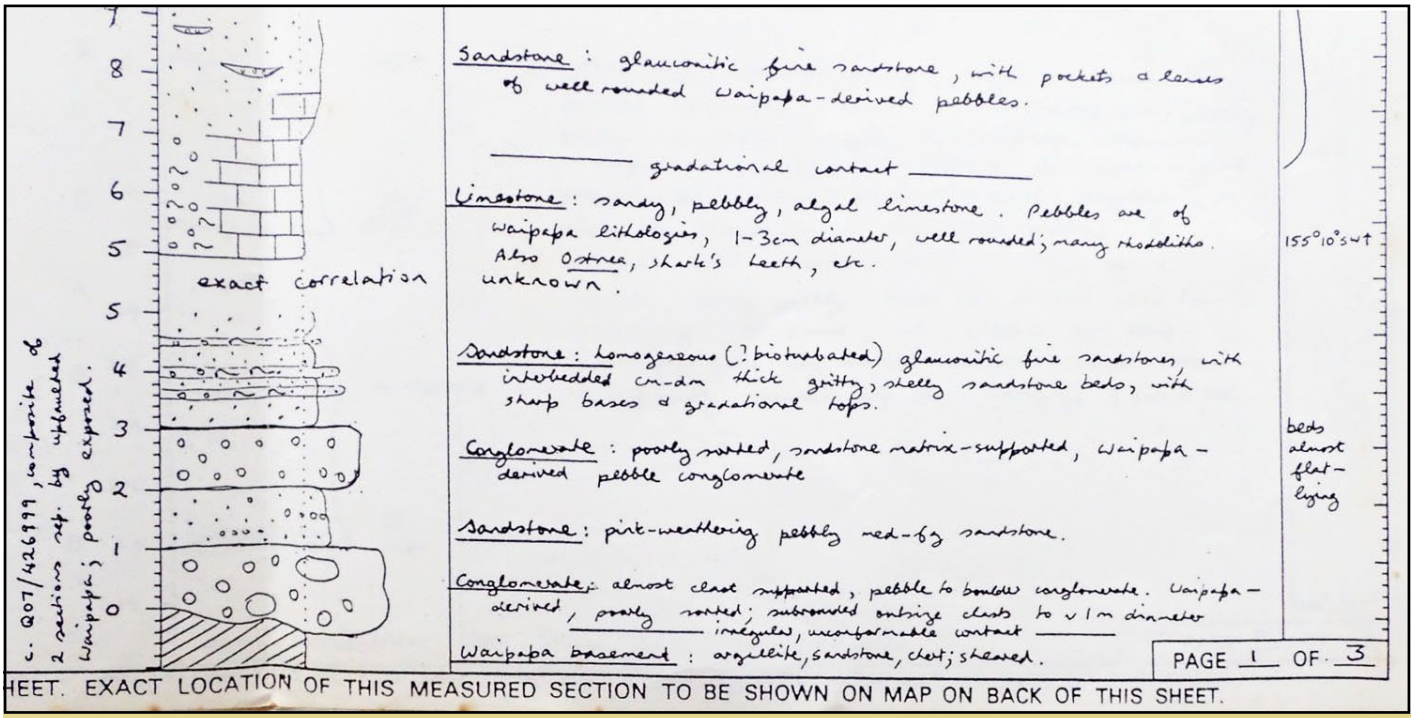


Fig. 5. Descriptive column of the lower 9 m thickness of the Ruatangata Sandstone sequence that unconformably overlies the Waipapa Terrane basement rocks on the south side of Reserve Pt. This unpublished column was made by the late Mike Isaac in 1990 as part of field work for the Northland Cretaceous-Cenozoic sedimentary basins programme (Isaac *et al*. 1994).

blotchy – broken into subrectangular chunks 1–10 mm across.

Spherulitic jasper

Although not seen in-situ, some of the cobbles and pebbles of jasper in the beach gravel at Reserve Pt are composed of small balls (spherules) of red jasper, close-packed but often with a grey, siliceous matrix. The spherules are highly variable in size (1–5 mm diameter) and shape (perfect spheres to irregular cuboids) (Figs 8–13). Allen (1951) noted their presence and referred to them as "spherulitic red jasperoid quartz". Hopgood (1957) described these same rocks in much more detail and recognised their association as lumps or "xenoliths" of "banded haematitic chert" caught up in the spilite. He inferred that when the chert was invaded by the ocean floor basalt flow, it existed as a gel. He suggested that hydrothermal fluids from the lava "dissolved" the amorphous silica and it recrystallised as radiating acicular crystals forming spherulites with concentric shells.



Fig. 6. Basaltic (spilitic) pebble breccia with a brecciated red chert lens within the western window of Waipapa basement. Shoe provides scale.



Fig. 7. Lens of red chert (jasper) conformable within bedded greywacke sandstone with both cut by white quartz veinlets. Shoe provides scale.



Fig. 8. Irregular lenses of red chert sheared in with greywacke sandstone, cut by white quartz veinlets. Width of 60 cm.



Fig. 9. Small cobble of spherulitic jasper on the beach at Reserve Pt. Width of photo 12 cm.



Fig. 10. Spherulitic jasper from Reserve Pt, with regular spherulites 1–2 mm in diameter. Ruler with 1 mm divisions.

Although uncommon, various forms of spherulitic jasper such as these, have been given a wide variety of names by gemstone collectors and others. Spherulitic refers to the radiating needle-like crystals that form the spherules, whereas another name applied to them is “spheroidal jasper”, which has no connotation that the balls are made of radiating crystals. One rare variety, composed of coloured spherules of chalcedony, comes from Madagascar and is known as “ocean jasper”. Another orange-red variety is orbicular “poppy jasper” from the Olympic Peninsula of Washington State (Wikipedia 2025). All these take a wonderful polish and are much sort after by collectors.

Recent studies (e.g. Gutzmer *et al*. 2001) supported Hopgood’s (1957) hypothesis and indicate that the spherulitic jasper “crystallised at temperatures below 200ºC in the sub-seafloor environment in siliceous sediments of hydrothermal origin that provided an ample source of silica and iron oxide” in association with weakly metamorphosed ocean-floor basanites.

The Reserve Pt spherulitic jasper is pretty much identical to cobbles eroded from a similar suite of Waipapa Terrane rocks at the south end of Ponui Island (Fig. 14) and seen during an Auckland Geology Club in 2012. These are also very similar in appearance to some of the Olympic Peninsula “poppy jasper”. Recently, images of similar “poppy jasper” or “firestone” have appeared on Facebook from around Nelson and Southland in the South Island of New Zealand. The Olympic poppy jasper also occurs in association with basalt lava and I assume that from the South Island would also do so.



Fig. 11. Pitted surface of spherulitic jasper from Reserve Pt, with abundant tiny spherulites, ~ 1 mm diameter. Ruler with 1 mm divisions.



Fig. 12. Wet cobble of spherulitic jasper from Reserve Pt, with regular and irregular-shaped spherulites. Ruler with 1 mm divisions.



Fig. 13. Small dry cobble of spherulitic jasper from Reserve Pt, with irregular sub-cuboid spherulites. Ruler with 1 mm divisions.



Fig. 14. Two pebbles of spherulitic jasper from Ponui Island, Auckland. Width of photo 10 cm.

Conclusion

This short section of coastline on the south side of Reserve Pt is among the most interesting and diverse geologically in New Zealand.

References

Allen LR 1951. The geology of Whangarei Heads, Northland. *Transactions of the Royal Society of New Zealand* 79: 294–318.

Day RA, Green TH, Smith IEM 1992. The origin and significance of garnet phenocrysts and garnet-bearing xenoliths in Miocene calc-alkaline rocks from Northland, New Zealand. *Journal of Petrology* 33: 125–161.

Eagle MK 2006, A new Asteroid (Forcipulatida: Zooasteridae) from the Eocene of Whangarei, Northland, New Zealand: *Records of Auckland Museum* 43: 81–96.

Gutzmer J, Pack A, Lüders V, Wilkinson JJ, Beukes NJ, van Niekirk HS 2001. Formation of jasper and andradite during low-temperature hydrothermal seafloor metamorphism, Ongeluk Formation, South Africa. *Contributions to Mineralogy and Petrology* 142: 27–42.

Hopgood AM 1957. Spherulitic Jaspilite form Whangarei Heads: *Transactions of the Royal Society of New Zealand* 85: 131–134.

Isaac MJ, Herzer RH, Brook FJ, Hayward BW 1994. Cretaceous and Cenozoic sedimentary basins of Northland, New Zealand. *Institute of Geological and Nuclear Sciences Monograph* 8, 203 pp.

Wikipedia 2025. Orbicular jasper. https://en.wikipedia.org/wiki/Orbicular_jasper

Return to Contents page

FIRST RECORD OF A TREE TRUNK MOULD AND CAST AT TAKAPUNA FOSSIL FOREST

Bruce W. Hayward

I have visited Takapuna fossil forest dozens of times and each time I visit, I claim I see yet another feature, but maybe I had just forgotten. On my last visit in November 2025, I walked right over a feature at Thorne Bay and only on my return along the same route did I look down and discover the first example of a basalt cast of an *in-situ* tree trunk, still inside a mould of it, captured in the surrounding basalt flow (Fig. 1). The lava flow was erupted from Pupuke Volcano (Fig. 2) about 200,000 years ago (Hayward 2019).

Moulds of *in-situ* tree trunks are common at Takapuna Reef itself where lava, about 1 m deep, flowed through a standing forest and cooled and solidified around the basal portions of the trunks of trees with a diameter of ~20 cm or more. After forming the cylindrical moulds, the rest of the molten lava flowed away leaving the moulds standing proud (Hayward & Hayward 1995). The tree trunks must have been set on fire and incinerated away before the moulds were filled with volcanic ash that was erupted later from the Pupuke Volcano vent.

Further north, the lava flow was 3–4 m thick when it flowed into the forest and here there are no moulds of trees smaller than ~ 80 cm diameter. A few large diameter (0.8–1.6 m) vertical tree trunk moulds that were filled with volcanic ash (tuff) are present (Hayward 2021). These are inferred to have been straight-sided, non-tapering trunks of kauri trees.



Fig. 1 Looking down on the top of the cylindrical basalt mould and cast of an in-situ tree at Thorne Bay, Takapuna.

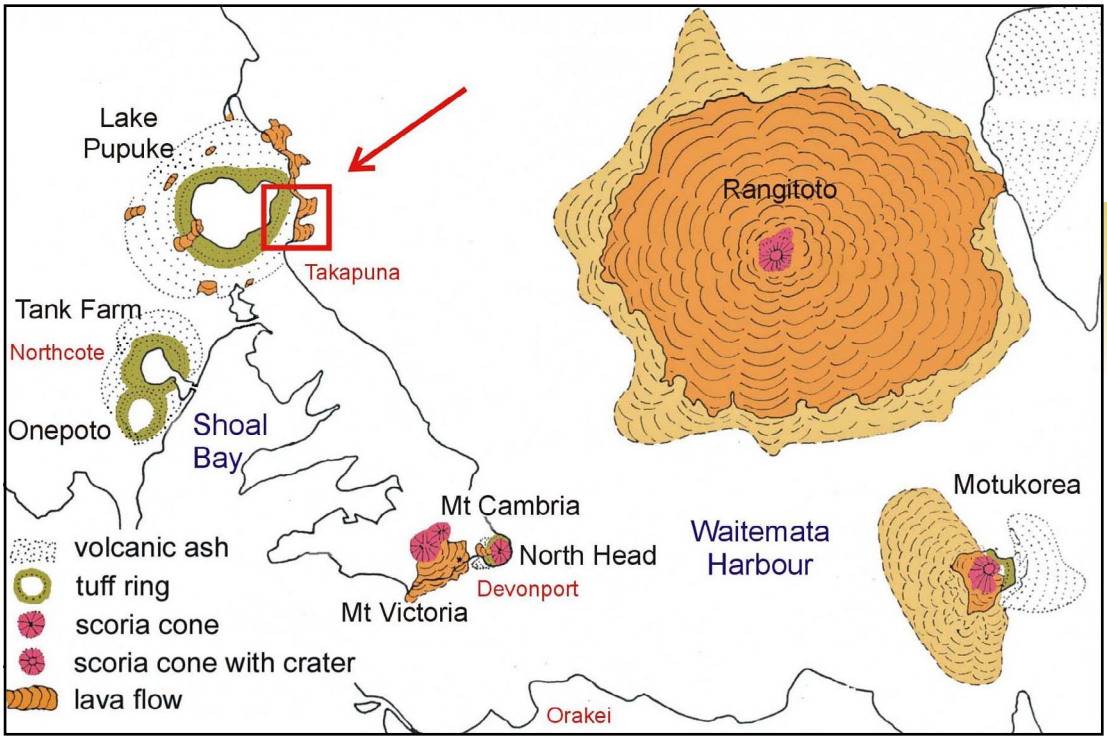


Fig. 2. Map of northern part of the Auckland Volcanic Field showing location of Pupuke Volcano and the location of the lava flows in Fig. 3 (arrowed box).

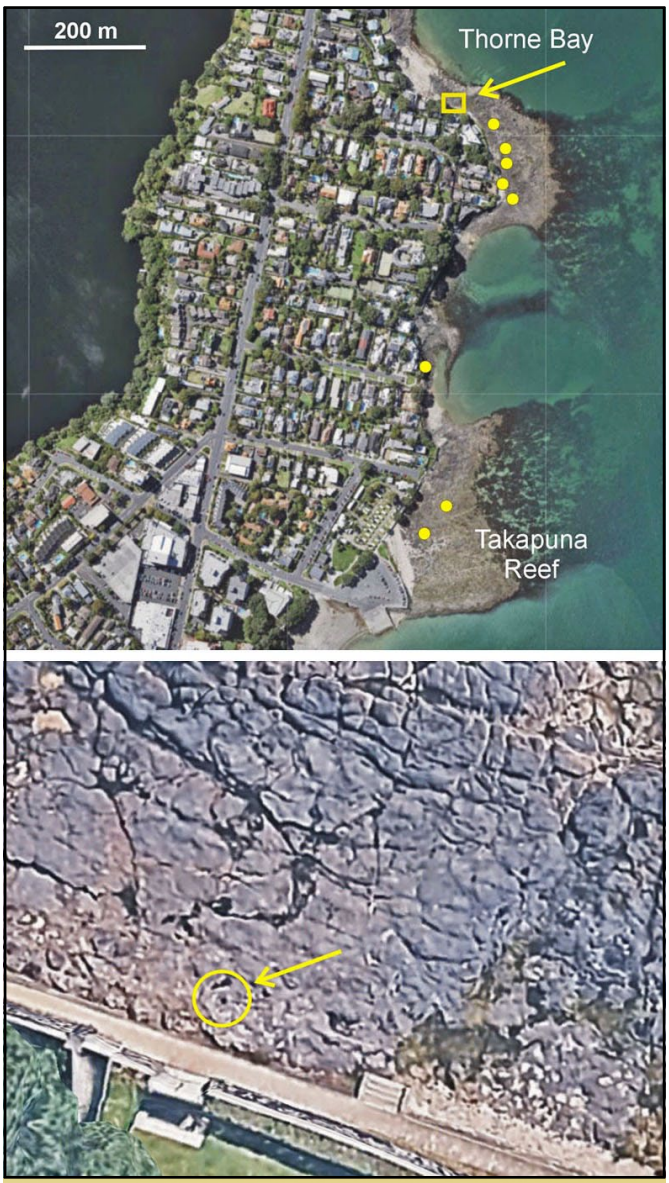


Fig. 3. Location (arrowed and circled) of tree trunk mould and cast made of basalt, Thorne Bay, Takapuna fossil forest. Yellow dots are locations of large tree trunk moulds (Hayward 2021).

In the low cliffs above a concrete sewer line just south of the end of O'Neill St, there are a number of flat-lying moulds of branches of tree trunks with diameters of <40 cm. The upper part of these cliffs consists of a number of irregular, thin lava flows, and in one of these there is a flat-lying branch mould (30 cm diameter) that is almost entirely filled with a basalt cast (Hayward *et al.* 2011, p. 20). The wood must have mostly incinerated away before the mould was entered by molten lava from a later flow. This is the only basalt cast I knew of at Takapuna fossil forest until my recent visit.

The newly recognised mould (at 36°46'42.9"S 174°46'37.9"E) in the extensive lava flow that forms the reefs around Thorne Bay is located 1 m from the concrete high tide walkway and 3 m west of a set of small concrete steps (Fig. 3). This 75 cm diameter, cylindrical mould differs from all other vertical basalt moulds at Takapuna in that it is filled with tight-fitting basalt. For this to have formed, the wood of the tree trunk must have incinerated away prior to the arrival of a later, thin lava flow that filled the hollow mould before solidifying to basalt. This younger flow has been eroded off at Thorne Bay.

Next time you visit New Zealand's best example of a fossil forest preserved in a lava flow, look for this unusual feature at Thorne Bay.

References

Hayward BW 2019. *Volcanoes of Auckland: A field guide*. Auckland University Press, 335 p.

Hayward BW 2021. Moulds of nine inferred kauri tree trunks in basalt lava flows, Takapuna Fossil Forest. *Geocene* 27: 7–11.

Hayward BW, Murdoch G, Maitland G 2011. *Volcanoes of Auckland: The Essential Guide*. Auckland University Press, 234 p.

Hayward JJ, Hayward BW 1995. Fossil forests preserved in volcanic ash and lava at Ihumatao and Takapuna, Auckland. *Tane* 35: 127–142.

Return to Contents page

ORIGINS OF TWO SHELL DEPOSITS AT SCOTTS LANDING, MAHURANGI HARBOUR, NORTHERN AUCKLAND

Bruce W. Hayward[1], Vicki Moon[2] and Willem de Lange[2]

[1] Geomarine Research
[2] University of Waikato

On the 2025 Geoclub Christmas field trip to Scotts Landing, Mahurangi, we came across an unusual and interesting exposure in a low eroding bank at the landward (northern) end of Casnell Island (Fig. 1). Casnell Island and the adjacent end of Scotts Point are composed of eroding Early Miocene Waitematā Sandstones and the two are separated by a 150 m wide gap that is covered by sea water at high tide (Fig. 2). At lower tides one can see that the connection is primarily a shore platform also composed of Waitematā Sandstone, but in places with a narrow mid-high tide shell bank on top (surficial tombolo) (Fig. 3).

In the exposure, there are two levels of shell deposits (Fig. 4). The lower level has two lenses of slightly iron-stained shell, densely packed with many broken shells of local origin (Fig. 5) - similar in composition to the unstained shells of the nearby thin modern tombolo. This level is currently approximately 1 m above the top of the modern shell bank linking the island to the mainland. Its stained and weathered condition and its elevation suggest that it was likely deposited here during the mid Holocene high stand

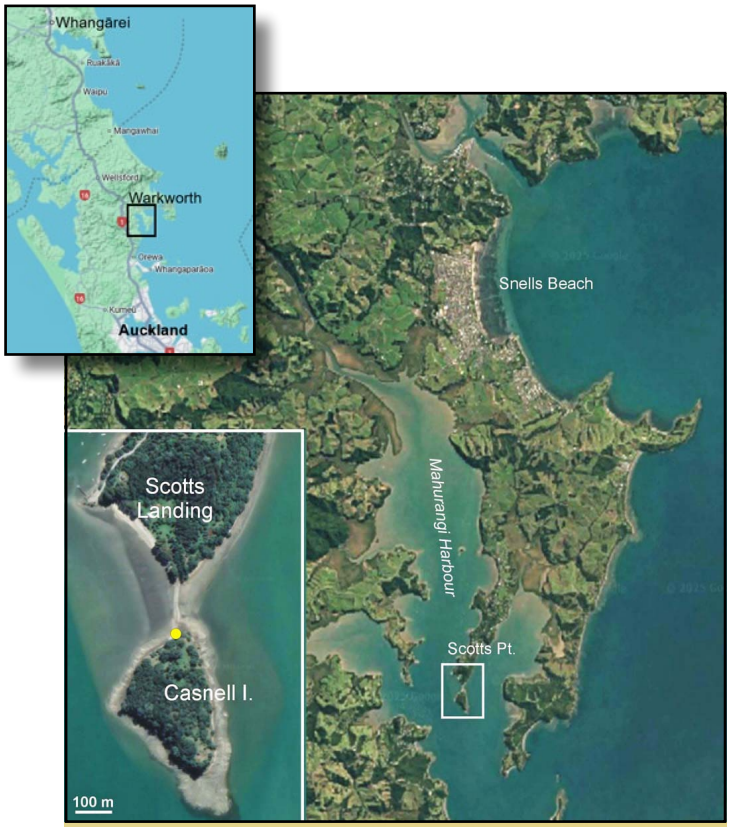


Fig. 1. Location of Scotts Landing and Casnell Island, Mahurangi Harbour.
And shell layers exposure (yellow dot in the lower left map).



Fig. 2. View from the northeast showing Casnell Island separated from Scott Point by sea at high tide. The study exposure is circled. Photo: Bruce Hayward.



Fig. 3. View south across shore platform and partial shell tombolo (left) linking Casnell Island to Scott Point at low tide. The shell lenses are exposed inside the circle. Photo: Bruce Hayward, 2025 Geoclub visit.



Fig. 4. Two levels of shell lenses in eroding bank at north end of Casnell Island, Scotts Landing.



Fig. 5. The lower level of slightly iron-stained shell is inferred to have accumulated as part of a thin shell bank between Casnell Island and the mainland when sea level was higher during the mid Holocene sea level high stand. Photo: Christine Major



Fig. 6. The higher level shell lens in a grey soil matrix is inferred to be midden (rubbish heap) from pre-European Māori cooking on a terrace higher up the slope. Photo: Christine Major

of sea level, when high tide was 1–2 m above present between about 6000 and 3000 years ago (Hayward 2023). Its location directly above the southern end of the modern thin shell tombolo suggests that this was part of an earlier version of the tombolo when sea level was higher.

The lower level of shell is separated from a higher shell lens by about 1 m thickness of talus soil (Fig. 4) that has come down from the steep slope above. This lens has scattered shells in a grey, charcoal-rich soil that also contains scattered small cobbles of rounded locally-derived sandstone (Fig. 6). Instead of being broken, the majority of the shells are whole, single valves of the bivalves pipi and cockle that still live today intertidally in the adjacent harbour flats. This has all the characteristics of a pre-European Māori midden - probably the debris raked out from umu on a terrace some distance above up the slope. We cannot speculate on a precise age, but undoubtedly it was deposited here sometime between 700 and 200 years ago.

This is an unusual exposure with two levels of shell lenses with contrasting origins, well worth a visit if you ever get to Scotts Landing.

Reference

Hayward BW 2023. Is Auckland sinking? *Geoscience Society of New Zealand Newsletter* GA4: 12–16.

Return to Contents page

SHALLOW SUB-SEA-FLOOR SILL OF CRETACEOUS AGE, WHATUWHIWHI, NORTHLAND

Bruce W. Hayward

In May 2019, an Auckland Geology Club group visited the point at the north end of Tokerau Beach, Whatuwhiwhi, on the north side of Doubtless Bay, Northland (Fig. 1). We admired the thin beds of indurated mudstone and sandstone (Fig. 2) of the early Cretaceous Tokerau Formation type section (Isaac *et al*. 1988), intruded in a few places by regular vertical sheet dikes of early Miocene diorite. Within and overlying the Tokerau Formation are pillow lava sheets of altered basalt (spilite). But the feature that had us scratching our heads and examining it closely was an irregular, gently tilted sheet of massive basalt seemingly sandwiched within the Tokerau Formation beds.



Fig. 1. Top left: Location of basalt sill intruding Tokerau Formation sedimentary rocks and overlain by a sheet of basaltic pillow lava on the west side of the point at the north end of Tokerau Beach. Bottom right: White rectangle shows location of top left map at north end of Tokerau Beach, at Whatuwhiwhi at the southwest corner of Cape Karikari (black square in top right map).



Fig. 2. Thin-bedded, indurated sandstone and mudstone of the Tokerau Formation, Whatuwhiwhi. Width of photo 2 m.

This area was mapped by Hay (1975) who proposed the Tokerau Formation for these and similar rocks in the Doubtless Bay map sheet. Isaac *et al.* (1988) mapped and described the rocks along the Whatuwhiwhi coastline in more detail. They inferred these thin-bedded sandstones and mudstones were deposited as distal turbidites, possibly at bathyal depths at the foot of a submarine slope. Isaac *et al*. (1988, p. 27) wrote - "*At one locality, a … basalt sill passes into a dyke which followed a fault plane before continuing again at a higher stratigraphic level.*" Could this be what we were examining?

Description

Close examination by the author in 2025, of the semi-conformable, 1–1.5 m-thick basalt body within the Tokerau Formation (Fig. 3) showed it to be an intrusive sill and not a seafloor flow within the sequence. The lower contact was mostly conformable on top of a hard 10–30 cm-thick, indurated sandstone bed, although the sill contact jumps across the bedding in several places. In one exposure, this lower contact is displaced by small faults with throws of 10–40 cm (Fig. 4).

The upper contact is commonly more irregular than the lower contact, sometimes with intrusional mini-tongues or flames of basalt into the sedimentary rocks (Fig. 5). In one place, the contact between the basalt sill and the sedimentary strata is complex and appears to involve



Fig. 3. 1 m-thick, massive basalt sheet (across middle of photo) within thin-bedded Tokerau Formation sandstone and mudstone, Whatuwhiwhi. Width of photo 3 m.



Fig. 4. Faulting displaced lower contact of the basalt sill (bleached by weathering) conformable on top of a 30 cm- thick, indurated sandstone bed. These faults post-date sill intrusion. Width of photo 1.5 m.



Fig. 5. Bleached and weathered basalt tongues intruding bedded grey sandstone and mudstone at the upper contact of the sill. The massive grey-brown rock in the lower left is also basalt but not as bleach-weathered, possibly as it was originally not as glassy as that above. Height of photo 1 m.



Fig. 6. Complex thrust-faulted contact between light-coloured, weathered basalt and grey Tokerau Formation sedimentary rocks with smooth contacts between the two lithologies. It is not clear whether the apparent thrusting occurred during or some time after sill emplacement. Width of photo 2 m.

several wedges of Tokerau Formation being thrust into the basalt sill (Fig. 6).

Inferred intrusional depth of basalt sill

The upper contact of the basalt sill is separated from a 5 m+-thick sheet of basalt pillow lava by 8 m of Tokerau Formation sandstone and mudstone (Figs 7–9). The sill and the pillows appear to be identical in composition and the logical conclusion is that while the pillow lava was being extruded onto the seafloor, the same basalt magma was being intruded as a sill beneath, pushing the shallowly buried strata apart (and upwards). Before compaction, the intervening 8 m thickness of strata may have been ~15 m thick. Thus, we have an estimate of the depth beneath the seafloor that the basalt sill was intruded. The flames and other irregularities in the upper contact indicate that the sediment was still relatively soft, although the occurrence of thrust wedges of sandstone in contact with the sill (Fig. 6) suggests that the sandstone beds may have been more competent at the time of magma intrusion.

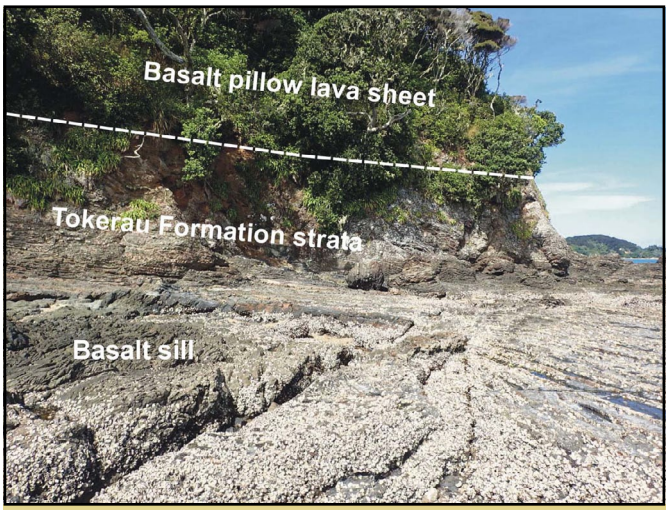


Fig. 7. Relationship between the basalt sill, separated by 8 m of thin-bedded sandstone and mudstone (Tokerau Formation) from an overlying sheet of basalt pillow lava.



Fig. 8. Tokerau Fomation sandstone and mudstone conformably overlain by a 5 m+-thick sheet of basalt pillows. Height of photo 10 m.

The possibility that this complex thrust-faulted contact was made somewhat later than during the sill intrusion cannot be excluded. Certainly, the steeper small faults that displace the lower sill contact (Fig. 4) are later deformation features.

Discussion

Since sediment deposition and sill and pillow lava emplacement, the sequence has had a chequered history. The basalt has suffered metasomatic alteration to spilite, possibly by passing hydrothermal fluids while shallowly buried on the sea floor. The whole sequence has been buried by numerous kilometres of later rock that has indurated and compacted the strata. It has subsequently been uplifted and possibly displaced south-westwards as part of the Northland Allochthon emplacement in the Late Oligocene, although there is some debate as to how far the Karikari block has been moved (Hayward 2017). It has then been intruded by diorite and andesite dikes and the Karikari pluton in the Early Miocene, followed by further uplift and erosion through to the present time.



Fig. 9. Close up photograph of the conformable contact of two pillow lava lobes over thin-bedded sandstone and mudstone, Whatuwhiwhi. Width of photo 2.5 m.

It is interesting to note that although they were emplaced only about 20 m apart, the magma extruded onto the sea floor was entirely in pillow lobe form, whereas the magma intruded into the sediment beneath has no lobate form and was entirely massive.

There are not many places in the world where it is possible to infer the depth beneath the surface at which a sill was intruded and to be able to compare the physical form of the magma that solidified within the seafloor sediments with that which solidified only a few metres above, on top of the same sediments.

References

Hay RF 1975. Sheet N7 Doubtless Bay, Geological Map of New Zealand, 1: 63360, New Zealand Geological Survey, Department of Scientific and Industrial Research.

Hayward BW 2017. Out of the Ocean into the Fire. History in the rocks, fossils and landforms of Auckland, Northland and Coromandel. *Geoscience Society of New Zealand Miscellaneous Publication* 146, 336 p.

Isaac MJ, Brook FJ, Hayward BW 1988. The Cretaceous sequence at Whatuwhiwhi, Northland, and its paleogeographic significance. *New Zealand Geological Survey Record* 26: 32 p.

Return to Contents page

LETTER TO THE EDITOR

INTERPRETATION OF A MID-SLOPE LANDFORM ON MT HOBSON (ŌHINERAU): QUARRY OR PALEO-LANDSLIDE?

Bruce W. Hayward and Martin Brook

In Geocene 42, Bertelli & Brook (2025) used Lidar to identify a distinctive mid-slope depression beneath large exotic trees on the northeast slope of Ōhinerau/Mt Hobson. They searched the European history of the maunga in which two World War I quarries were recorded on the privately-owned northern slopes (Fig. 1), but found no record of any other quarry. After comparing the diagnostic characteristics of quarries and landslides with the Mt Hobson depression, they concluded their depression was most likely an old landslide with large trees growing over it (Bertelli & Brook, 2025).



Fig. 1. 2009 aerial view over the northern slopes of Mt Hobson showing the location of the depression under the high trees (orange) and the location of the two early 20th century quarries (yellow) now a private tennis court and the higher house site. Photo: Bruce Hayward.

We note that the diagnostic characters of a quarry cited in Table 1 of Bertelli & Brook (2025) are largely those of quarries in hard rock rather than those of quarries in loose scoria where the quarry sides can readily degrade to scree slopes.

At the time BWH was consulted and said he had no recollection of a quarry at this site (11 Mar 2025 email). Subsequent searching by BWH, however, has turned up evidence that leads us to reconsider the earlier conclusion of a landslide origin. It is recorded that in 1877, quarrying had begun on the slopes of Mt Hobson (Kermode *et al.* 1992, p. 43) and this precipitated local opposition that resulted in cessation of quarrying and creation of Mt Hobson Domain (1880) (Hayward *et al*. 2011, p. 133). The two known/recorded quarries (Hayward *et al*. 2011, p. 132) are on private land and known to have been active in the first decades of the 20th century and are unlikely to be the one referred to in 1877. The depression on the northeastern

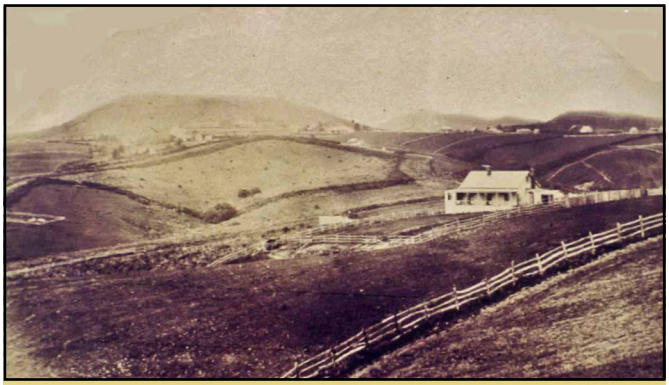


Fig. 2. Mid nineteenth century photo from Parnell of the profile of Mt Hobson with no large trees visible on the northern slopes (left). Photographer and year unknown.

slopes is the only possible quarry within the crown land that was gazetted as reserve in 1880.

The large exotic trees that now grow over the depression were not present in early photographs of the mid-19th century (Fig. 2). In later photographs they can be seen to be growing through time to the large size of today. This indicates they were planted in the late 19th century, consistent with planting to help hide the quarry scar after the Domain was created.

A well-known quarry on the northern slopes of neighbouring Te Kōpuke/Mt St John that commenced in 1876 (Fowlds, 1928, p. 15; Kermode *et al*. 1992, p. 45) shares a number of features with the Mt Hobson depression. They both extend all the way to the crest of the scoria cone slope, with the deepest part at mid-upper slopes, and both had a narrowed chute down to the road (Mt St John and Remuera roads) at the foot of the steep slopes (Figs 3 & 4). Quarrying was presumably started at the top and gravity used to deliver scoria to carts on the road below. Both have no remaining vertical or steep faces exposing scoria. Mt St John quarry is also hidden now beneath large, planted trees.

The Mt Hobson depression that has been inferred to be a landslide by Bertelli & Brook (2025) is excavated much deeper (up to 5 m) into the mountainside than the many 2023 landslides on Maungakiekie/One Tree Hill (Abazu *et al*. 2025) and several on Mt Hobson. The 2023 landslides all began at mid slope levels and many began in water-saturated spoil that had been dumped on the outer edges of pre-European terraces and largely involved only the surficial < 1 m of soil. They did not penetrate into the fresh loose scoria beneath, unlike the larger and deeper depression on Mt Hobson.

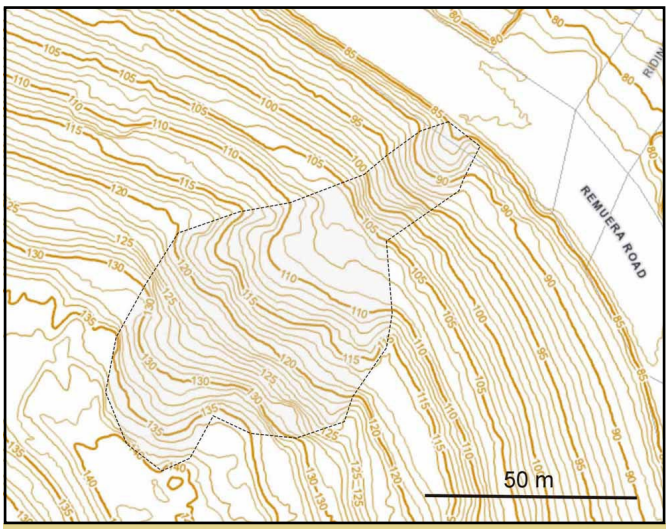


Fig. 3. 1 m contours on northeastern slope of Mt Hobson with the depression in focus outlined. From Auckland Council GIS web site.

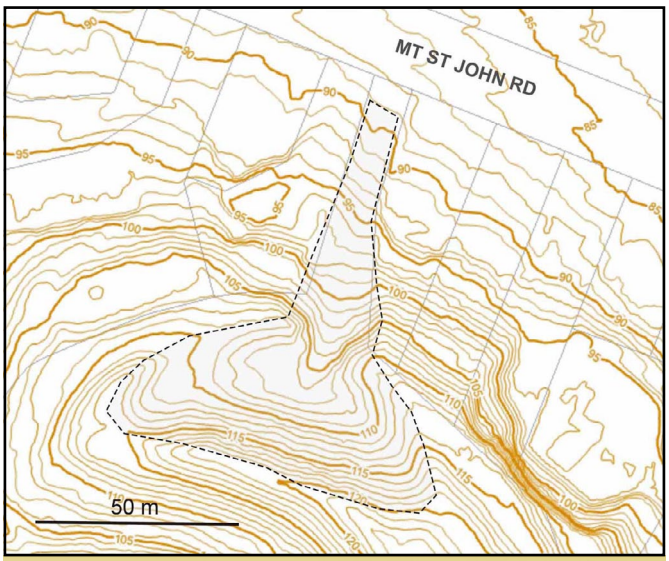


Fig. 4. 1 m contours on northeastern slope of Mt St John with the disused quarry extent outlined. From Auckland Council GIS web site.

Our conclusion is that an 1870s quarry is a more likely explanation for this Mt Hobson depression.

References

Abazu G, Brook MS, Druskovich B, Brideau MA, Hayward BW 2025. Rainfall-triggered landslides from the January 2023 1-in-200 year storm at Maungakiekie / One Tree Hill, Auckland, New Zealand. *New Zealand Journal of Geology and Geophysics* 68 (5): 1049–1063.

Bertelli, B., Brook, M. 2025. Interpretation of a mid-slope landform on Mt Hobson (Ōhinerau): quarry or paleo-landslide? *Geocene* 41: 12–14.

Fowlds GM, Chambers P, Knight CR, Powell FE, Blake EV, McArthur MG, 1928. Auckland's Unique Heritage. 63 wonderful volcanic cones and craters/ An appeal to save them. *Auckland Town Planning Association*, 26 p.

Hayward BW, Murdoch G, Maitland G 2011. *Volcanoes of Auckland: The Essential Guide*. Auckland University Press. 234 p.

Kermode LO, Smith IEM, Moore CL, Stewart RB, Ashcroft J, Nowell SB, Hayward BW 1992. Inventory of Quaternary volcanoes and volcanic features of Northland, South Auckland and Taranaki. *Geological Society of New Zealand Miscellaneous Publication* 61, 100 p.

Return to Contents page

HYPERLINK INSTRUCTIONS

Hyperlinks have been added to the contents page numbers column (coloured blue) to simplify finding each article. To activate a hyperlink, click on the coloured page number and you will be sent to the article beginning on that page.

At the end of each article there is another coloured hyperlink, which will take you back to the contents page.

If you wish to return to the previous page you were reading, and you have Windows operating system and standard Adobe Reader, just right click and chose 'previous view' on the drop-down menu, if it is available, or you can use a shortcut Alt + left arrow. For Macintosh or Ubuntu operating systems, contact the Editor for instructions.

Other hyperlinks (coloured darker blue) take you from reference citations in the text to the Reference list at the end of each article. Again, you can find where you had been reading by using Alt + left arrow. Blue hyperlinks in the Reference lists take you to web sites.

Return to Contents page

CORRESPONDING AUTHOR'S CONTACT INFORMATION

Bruce W. Hayward Geoclub Member, **b.hayward@geomarine.org.nz**