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Cover image: *Mniodendron comatum*, an umbrella moss, with capsules.

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# Willie La Roche (1872–1942): Ship's engineer, shell collector and contributor to Auckland Museum's malacology collections

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**Abstract**
For much of the 1920s ship's engineer Willie La Roche (1872 – 1942) obtained specimens of terrestrial, fresh-water and marine molluscs, as well as bulk marine sediment samples, many of which came into the collections of Auckland Museum. This article gives a brief biography of W. La Roche as collector and contributor to Auckland Museum's marine invertebrate collection and highlights why his contributions were important.

**Keywords**
Willie La Roche; shell collecting; Northern Steam Ship Company.

## INTRODUCTION

Within any museum collection there will be names of contributors that crop up with greater frequency than others. One such name in the molluscan collection of Auckland Museum is that of Willie La Roche. La Roche was a ship's engineer with the Northern Steam Ship Company (NSS Co.) (La Roche family pers. comm., 2021; e.g., New Zealand Herald 1928), who appears to have started collecting shells relatively late in life, but who nevertheless left a worthy malacological legacy.

Auckland Museum's marine invertebrate collection contains at least 550 specimen lots of molluscs and four of brachiopods, as well as bulk samples from nine localities, that can be attributed to W. La Roche with certainty. A lot is here defined as one or more specimens of the same species which have identical collecting data and which have been catalogued together as a single unit of registration. The bulk samples, despite their designation, are not large in volume but consist of unsorted sediment or shell samples. Similarities in localities and collecting dates suggest that there may be many more specimens which could be attributed to La Roche but, because label data do not specifically record a source for these specimens, it is impossible to be certain. Although numerically not particularly impressive, the material stands out because it was the source of many previously undescribed taxa. It also provided information on offshore environments that, at the time, were not generally accessible to science.

Almost exactly two-thirds of the specimen lots are marine in origin while the remaining third consists of land snails and two lots of freshwater bivalves. The marine material largely came from northern localities, such as Taupo Bay, Whangaroa Harbour, Mangonui Harbour, Doubtless Bay and Rangaunu Bay, but some also came from near Great Barrier Island, off Ahipara, Opotiki and Whanganui. The non-marine specimens were mostly collected in the north of the North Island near Whangarei, Awanui and Hokianga, but also from around Auckland (including Waiheke Island), Kawhia, and with substantial numbers from the Whanganui and West Coast regions (Table 1). Furthermore, the marine lots contain 20 fossil lots, including the brachiopods, and these are all from the Pleistocene deposits at Castlecliff, Whanganui, with the remaining lots Recent in age.

Collectively the La Roche specimens contributed one new family, two new molluscan genera and 70 new species (Appendix 1), of which the family, genera and 63 species are still currently accepted taxa. The family Larocheidae Finlay, 1927, genera *Larochea* Finlay, 1927 and *Larochella* Powell, 1927, and the species *Mysella larochei* Powell, 1940, *Euchelus* (*Herpetopoma*) *larochei* Powell, 1926 (Fig. 1), *Aoteatilia larochei* Powell, 1940, *Splendrillia larochei* Powell, 1940, *Marginella* (*Glabella*) *larochei* Powell, 1932, *Laoma* (*Phrixgnathus*) *larochei* Powell, 1928, *Eulimella larochei* Powell, 1930, *Rissoina larochei* Finlay, 1930 and *Alcithoe larochei* Marwick, 1926 were all named in his honour (Appendix 1). They are represented in Auckland Museum by 69 primary types, 52 secondary types (Blom 2017, 2019, 2020) and more than 430 specimen lots in the general collections.

## WHO WAS WILLIE LA ROCHE?

Willie La Roche (6 September 1872 – 17 February 1942) was born at Khyber Pass Rd, Auckland and was the seventh of eleven children—three of whom died in infancy—of


Figure 1. *Euchelus* (*Herpetopoma*) *larochei* Powell, 1926, from La Roche's Whangaroa samples. (Courtesy of Auckland War Memorial Museum, MA72060, photographer Peter Quin).

Figure 2. Senior Engineer W. La Roche in 1909 in his Northern Steam Ship Co. uniform. (Courtesy of Auckland Libraries Heritage Collections 31-58315, photographer Herman Schmidt).

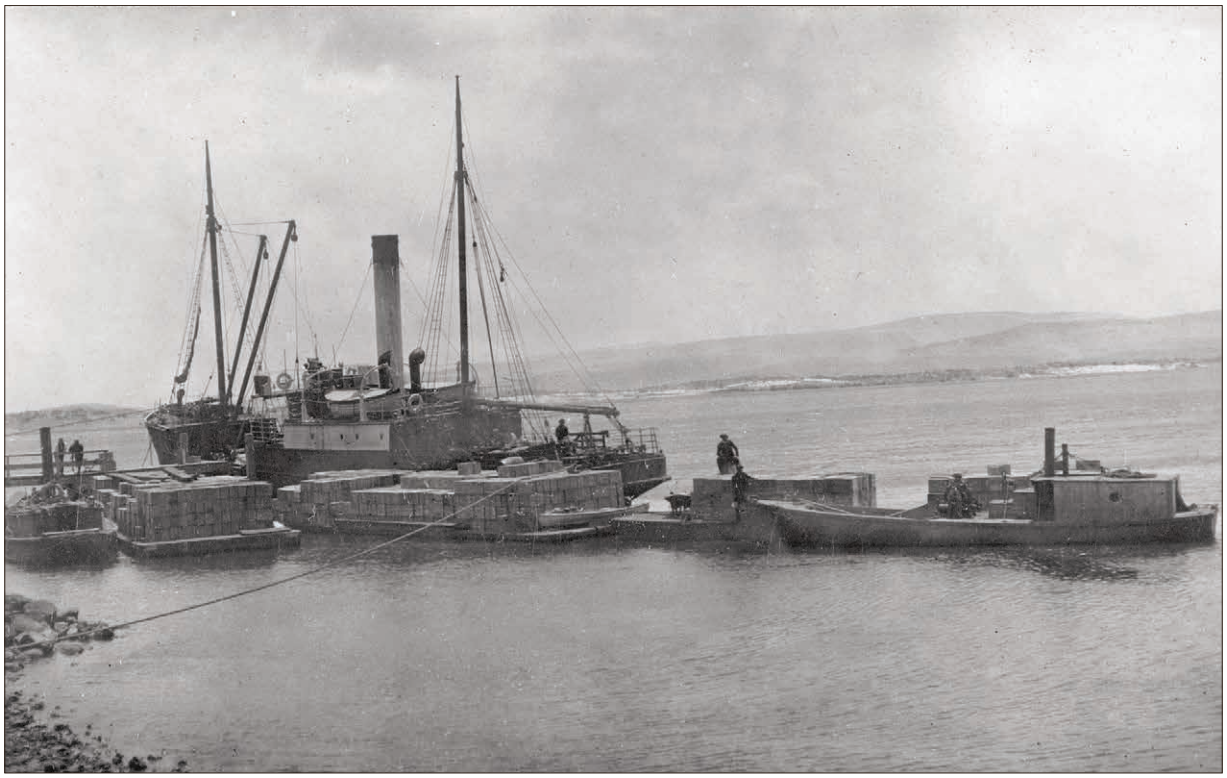

Figure 3. The SS *Arapawa* berthed at Port Waikato with barges and the SS *Tarawera* and SS *Erin* alongside. (Courtesy of Hamilton City Library, Heritage Collections).

Charles Walton La Roche and Caroline Hall. He married Ann Amelia Hume on 11 October 1879 at Grafton and they had six children, four of whom survived to adulthood (*Bay of Plenty Times* 1908a; Ancestry.com 2021).

Little is known of La Roche's early years, but as a young man he trained as a ship's engineer with the Northern Steam Ship Company (Fig. 2). This was at a time when the first full-powered steamships began routinely plying New Zealand coastal waters (Te Ara 2021) and he appears to have stayed with the NSS Co. until retirement (La Roche family pers comm. 2021).

The NSS Co. was incorporated in 1881 when a deal was struck with the much larger Union Steam Ship Company. The deal secured for the NSS Co. the northern trade routes from Opotiki along the east coast to Parengarenga Harbour in the north, and from Hokianga Harbour to Whanganui along the west coast (New Zealand Maritime Museum 2021). There is no definitive record of the ships on which La Roche served, but we know that he worked on the SS *Muritai* (*New Zealand Herald* 1908a), SS *Tasman* (*Bay of Plenty Times* 1908b), SS *Ngatiawa* (*Bay of Plenty Times* 1908a), SS *Aupouri* (*Wanganui Chronicle* 1919), SS *Rimu*

Table 1. Geographic localities at which W. La Roche collected specimens. Listed from north to south along the east coast of the North Island, followed by those from north to south along the west coast of New Zealand. For a large number of specimen lots depths and dates are unrecorded, but where available they are listed here, followed (in brackets) by the number of specimen lots which have these data. All localities are for marine specimens, except for one fossil site indicated as † and eight non-marine localities written in italics.

| Locality | # Specimen lots | Depths, (#) specimen lots | Dates, (#) specimen lots |
|---|---|---|---|
| **East coast** | | | |
| Piwhane/Spirits Bay | 1 | | |
| Parengarenga | 8 | | 1925 (4); 1926 (4) |
| *Awanui* | 29 | | 1920 (11); 1928 (13) |
| Rangaunu Bay, offshore | 64 | 9 m (3); 18 m (1); 22 m (50); 29 m (3) | 1920 (1); 1922 (19); 1925 (1); 1926 ( |
| Rangaunu Bay, Houhora | 11 | | 1925 (7); 1926 (1) |
| Rangaunu Harbour, Kaimaumau | 1 | | 1924 |
| Doubtless Bay, off Mangonui | 60 | 11 m (55); 15 m (2) | 1922 (46); Jun 1924 (4); 1929 (2) |
| *Whangaroa* | 6 | | |
| Whangaroa Bay | 67 | 13 m (3); 18 m (3) | 1922 (5); 1923 (1); 1924 (3) |
| Cavalli Islands | 3 | | |
| Matauri Bay | 1 | | 1925 |
| Bay of Islands, Opua | 1 | | 1920 |
| *Whangarei* | 20 | | 1920 (3), 1922 (1) |
| Whangarei | 2 | | 1920 (1) |
| Great Barrier Island | 9 | 11 m (5) | 1924 (4) |
| *Auckland* | 30 | | |
| Auckland | 10 | 36 m (3) | |
| Coromandel, west coast | 1 | | 1922 |
| Coromandel, east coast | 4 | | 1925 (1); 1926 (1); 1928 (1) |
| Tauranga | 6 | | |
| Mt Maunganui | 5 | 11 m (1) | |
| Whakatane 'Heads' | 1 | | 1923 (1) |
| Ohiwa | 1 | | |
| Opotiki | 18 | | 1921 (3); 1922 (4); 1923 (1) |
| Opotiki, offshore | 9 | 28 m (1); 30 m (1); 33 m (5); 55 m (1) | 1921 (5) |
| Tolaga Bay | 3 | | Oct 1924 (3) |
| Gisborne | 2 | | Sep 1924 (2) |

*– Table 1 continued over page*

| Locality | # Specimen lots | Depths, (#) specimen lots | Dates, (#) specimen lots |
|---|---|---|---|
| **West coast** | | | |
| Ahipara Bay | 11 | 42 m (11) | Jul 1925 (11) |
| *Kaitaia* | 1 | | 1920 |
| *Hokianga* | 51 | | 1920 (1); 1921 (25); 1923 (2); 1928 (6), 1932 (4) |
| Hokianga | 1 | | 1927 |
| Port Waikato | 1 | | |
| *Port Waikato* | 7 | | 1927 (2) |
| Raglan Harbour | 3 | | 1923 (2) |
| Raglan, offshore | 3 | 22 m (2); 37 m (1) | |
| Kawhia | 6 | | 1926 (2) |
| *Manawatu* | 1 | | |
| *Whanganui* | 44 | | 1927 (3); 1928 (21) |
| Whanganui† | 20 | Coastal cliff-section | Nov 1926 (4) |
| Whanganui, offshore | 8 | 18 m (8) | 1927 (8) |
| Wellington, Island Bay | 2 | | |
| *Westport* | 14 | | |
| Stewart Island | 2 | | |

(*Taranaki Herald* 1914) and SS *Arapawa* (*New Zealand Herald* 1928) (Fig. 3) amongst others.

Working on board a steamship was dangerous and not for the faint-hearted. The services ran day and night, in poor weather, had to accommodate the tides as many harbour entrances had bars, e.g., Manukau, Rangaunu Harbour, and ports of call were sometimes up narrow winding rivers, e.g., Awanui. As chief engineer on the SS *Tasman* in September 1909, Willie suffered the loss of half a finger on his right hand when it was caught in some machinery (*Bay of Plenty Times* 1909).

It appears he was wrecked—or nearly so—at least three times. At 4 am on 27 May 1908 in 'thick weather', the SS *Muritai* struck West Chicken [Lady Alice] Island on what is now called Muritai Point. The ship was lost (Fig. 4), but there was no loss of life as the passengers and crew were able to depart the steamer via a ladder from the bow onto the rocks (*New Zealand Herald* 1908b).

On 28 May 1911 while coming into the Manukau Harbour in fog the SS *Rimu* 'touched on south spit'. As result, as Chief Engineer, La Roche was called to a hearing with others of the crew. However, because the ship came free it was decided any further inquiry was unnecessary (Archives New Zealand 2020).

On 26 October 1928 he was almost wrecked a second time, on the Manukau Bar, on a return trip from Whanganui. The SS *Arapawa* (Fig. 3) arrived just before 9 am when she ran into trouble while crossing the bar when the engines failed after the spectacular disintegration of one of the cylinders due to a broken crankshaft bolt. Two anchors were dropped just in time to stop the disabled ship from foundering on the bar. However, she was pounded by breakers 'as she lay broadside on [and] great seas buried the decks every few minutes, flooded the engine room and the cook's galley' (*New Zealand Herald* 1928). The captain and crew were able to jury-rig enough sail to get them to relative safety while La Roche attempted unsuccessfully to get the engines restarted with the remaining two cylinders. After hours of tossing in the breakers they were finally rescued by the Anchor Line Steamer, SS *Alexander* and towed into Onehunga Wharf shortly before 7 pm (*New Zealand Herald* 1928). When Willie finally made it home and mentioned being nearly shipwrecked, his wife, who was busy playing cards with her friends, told him that his dinner was in the oven (La Roche family, pers. comm. 2021).

## LA ROCHE THE COLLECTOR AND DONOR

Little is known about when or why Willie La Roche started collecting shells. The earliest of his shells in the Auckland Museum Collections have a 1919 collecting date and he donated presumed Natural History specimens to at least one other institution. On 12 November 1919 the Wanganui Chronicle cited the donation of a 'marine eel' by Captain E.J. Keatley to Whanganui Regional Museum with the further reference that 'Captain Keatley has previously made a number of very acceptable donations. Another donor is Mr W. La Roche, the chief engineer of the Aupouri.' (*Wanganui Chronicle* 1919).

Despite the extensive holdings of La Roche specimens, no record has been found that La Roche

Figure 4. The SS *Muritai* aground on Muritai Point, Lady Alice Island.
(Courtesy of Auckland Libraries Heritage Collections, AWNS-19080604-5-1, photographer E. De Tourret).

donated his shells as a single collection directly to Auckland Museum. A check of the Museum's Annual Reports and acquisition registers show that he gave a box of fossils from coastal cliffs, west of the Whanganui River mouth in 1919; a fossil, *Cucullaea* specimen from Tolaga Bay in 1924; a *Tellina* fossil from Mercury Bay in 1925; the holotype of *Alcithoe larochei* Marwick, 1926 in 1925; some slugs from Parengarenga in 1926; a 'sea egg' from Stephenson Island in 1927; the holotype of *Turbonilla aoteana* Powell, 1930 from Great Barrier Island in 1930; and a 'collection of land snails from Whangarei' in 1932. No other records appear to exist for any further Natural History donations La Roche may have made, and it appears that the bulk of his material probably came to Auckland Museum via A.W.B. Powell.

On 14 December 1922, a 21-year-old A.W.B. Powell, who was appointed Auckland Museum's first Curator of Conchology and Palaeontology in 1929, read a paper before the Auckland Institute in which he described *Epitonium bucknilli*. This had been newly discovered by Dr Bucknill at Mount Maunganui, but Powell also credited La Roche for 'his invaluable assistance' in providing him with further specimens of the species from Whangaroa (Powell 1924).

Auckland was socially a small place in the 1920s and W. La Roche and A.W.B. Powell presumably knew each other through their respective memberships of the Auckland Institute and Museum. Powell joined in May 1920 as a 19-year-old and La Roche, along with his son William Ernest, were elected as members in February 1922 (Auckland Institute and Museum Minute Book 1916–1923). He is listed as a Life Member in 1931/32 until his death in 1942 (Annual Report of the Auckland Institute and Museum 1931/32).

Most of La Roche's known collecting dates fall between 1922 and 1930, the period when he was an Institute member. It is therefore tempting to speculate that he may have been influenced in his choice of hobby as a result of meeting Powell and like-minded amateur collectors, when he joined the Institute, but the land snails in his collection were all collected in 1920 and 1921, so prior to his membership. However, it is possible that he may have known Powell before then as Ernie (William Ernest) La Roche and Powell were of similar age (born 1 September 1899 and 4 April 1901 respectively). Both went to Auckland Grammar School when it was located half-way down Symonds Street at a site which is now part of the University of Auckland Campus (Auckland Grammar School 2021). At the time Auckland Museum was located less than a kilometre away in Princes Street, on the other side of the University grounds.

Powell had a long-standing association with Auckland Museum and was already part of a wide scientific network before his appointment as Curator of Conchology and Palaeontology in 1929. In 1916, aged 15, he had been made Honorary Curator by T.F. Cheeseman when the Museum was still at Princes Street and Cheeseman its sole curator (Cernohorsky 1988).

In 1929, when Auckland Museum moved to the new and larger building in the Auckland Domain and Powell became a permanent curator, his private collection of some 60,000 lots was deposited in the Museum by

special arrangement with the Museum Council (Powell *et al*. 1967). Therefore, if La Roche gave shells and bulk sediment samples to Powell before 1929 these would have come with him as part of the latter's private collection.

## LA ROCHE'S SAMPLES AND SAMPLING LOCALITIES

La Roche specimen lots came predominantly from marine localities, but there are also land snails from Northland, Auckland, Whanganui and Westport, two lots of freshwater bivalves from Northland and Manawatu, and a few fossils from the Whanganui area. (Table 1). Of the nearly 550 known La Roche specimen lots just under 50% (272) have no known collecting date. A further 40 of these can be date-matched to dated lots based on additional location and depth data.

Samples are presumed to have been mostly collected by him (e.g., Powell 1926, 1930a, 1930b, 1933b, 1940). However, he also obtained material from other mariners, such as "a fine haul of mollusca from 23 fathoms off Ahipara Bay" that he received in July 1925 from Mr D. Crawford, the engineer on the steam trawler *Serfib* (Powell 1927).

Many of the place names coincide with ports at which ships of the NSS Co. fleet called regularly, such as Mangonui, Whangaroa, and Rangaunu Bay, which crop up frequently (Fig. 5). Samples may have been collected during scheduled runs, but as the NSS Co. also ran very popular day or weekend excursions to bolster their income these may have provided further collecting opportunities.

The spread of localities and dates (Table 1) suggests that indeed many samples were collected opportunistically. Three location records in the Auckland Museum database which were created in the 1990s documented the five associated specimen lots (MA5112, MA14707, MA27865, MA67144 and MA72033) from Whangaroa as originating from the 'La Roche Expedition'. However, there is no mention of a 'La Roche Expedition' on any of the labels which accompany the specimens, nor in any of the Powell, Finlay or Marwick publications which refer to La Roche's contributions.

There is also considerable confusion around some of the northern localities, particularly those in the vicinity of Rangaunu Bay. Labels frequently use ungazetted names, such as Awanui Bay and Awanui Heads as well as the gazetted Rangaunu Bay and Rangaunu Harbour. It is not clear whether Awanui Bay is used interchangeably with the open-ocean Rangaunu Bay or the largely enclosed Rangaunu Harbour. However, neither Rangaunu Harbour nor Awanui Bay (= Rangaunu Harbour) are supported by the collecting depths given, which indicate the bulk of material was collected well offshore in Rangaunu Bay. All but seven of the 60 specimen lots are from 9 m (5 fathoms) or greater depth and the majority of these (44) are from 22 m (12 fathoms) water depth. This latter depth does not occur anywhere within Rangaunu Harbour (Fig. 6) and within Rangaunu Bay it is reached only at a distance of >4 km offshore.

In addition, Powell (1940) refers multiple times to La Roche specimens as coming from 'Off Awanui in 12 fathoms, Doubtless Bay'. The similarity between this depth and that of samples from Rangaunu Bay, suggests that he used 'Doubtless Bay' incorrectly. Particularly as the depth for all other La Roche's Doubtless Bay samples were given as 5–6 fathoms or 6–12 fathoms.

Similarly, Whangaroa Harbour and Whangaroa Bay appear to have been used interchangeably, but the few known depths associated with samples, as well as the species represented in them, indicate that they were collected offshore in Whangaroa Bay or the entrance to Whangaroa Harbour rather than the much shallower harbour itself.

The bulk samples come from nine different marine localities (Table 2) which duplicate some, though not all, of the localities listed in Table 1. This is unsurprising as presumably these are the original samples which were used to search for new species. However, there are also two bulk samples, from Whangamata and off-shore Otago, which do not appear to be represented in the Auckland Museum collection by corresponding specimen lots.

In conclusion, the majority of samples appear to have been collected opportunistically, but with three clusters of samples with similar data suggesting that some samples were obtained during deliberate dredging events (Tables 1, 2). These were at Rangaunu Bay, from 9–22 m depth in 1922; Doubtless Bay, off Mangonui, from 11–16 m depth in 1922; Whangaroa, from 13 m depth possibly also in 1922. Whether the 1922 collecting was a single 'La Roche Expedition' or not could not be verified.

The bulk samples also support the premise that La Roche's marine specimens came to Auckland Museum via Powell's own collection and not directly from La Roche. Many of the bulk sediment samples consisted of sediments accompanied by small glass tubes containing specimens sorted to class (Gastropoda and Bivalvia) or even to genus or species level, although none was named as such. The tubes were of the type used widely by Powell and all accompanying labels were in his handwriting. This suggests that Powell received his material as bulk sediment samples, which he then sorted for useful specimens. The unused sorted portions were then stored with the remaining sediments for potential future use.

La Roche may have predominantly given his bulk samples to Powell, but it is likely that he would also have shared these, either directly or indirectly, with members of Powell's scientific network. Both H.J. Finlay and J. Marwick also described species from La Roche's bulk samples. Finlay (1924) acknowledged receiving a specimen 'dredged by Mr. W. La Roche in 20 fathoms off Opotiki, Bay of Plenty' in a paper first read by Finlay before the Otago Institute on 12 December 1922 (Finlay 1924). Likewise, in a paper he first read before the Wellington Philosophical Society on 8 October 1924, Marwick (1926) described a new volute species, *Alcithoe larochei*, collected from 55 m (30 fathoms), off Opotiki, 'which was kindly forwarded by Mr W. La Roche, of Auckland.'

H.J. Finlay only infrequently credited other collectors either on his labels or in his publications. However, material from Doubtless Bay (from 11 m (6 fathoms)), Awanui [Raungaunu Bay] (from 22 m (12 fathoms)), and Taupo Bay figured large amongst his samples (e.g., Finlay

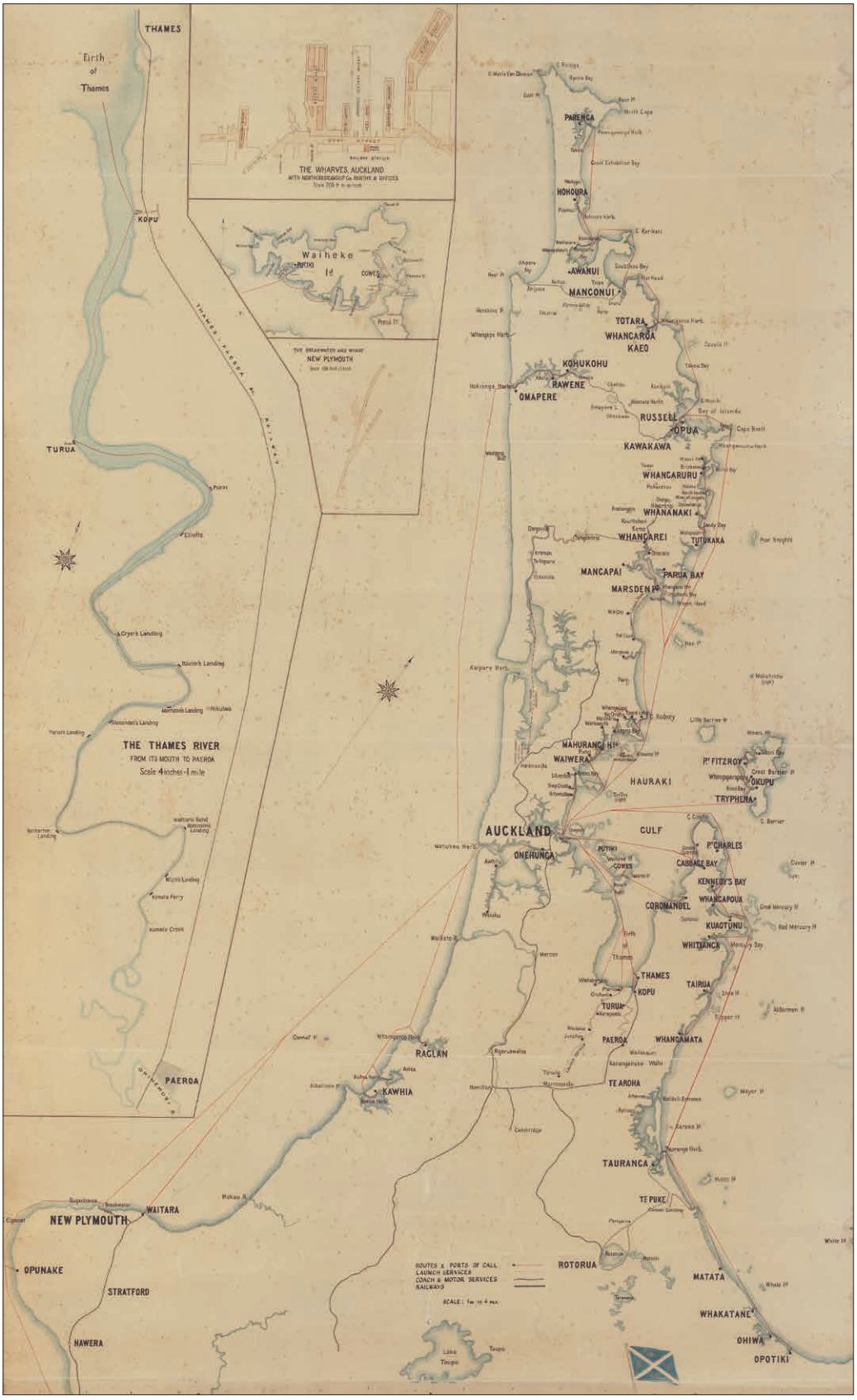


Figure 5. Map of the Auckland Province showing in red steamboat routes plied by the Northern Steam Ship Company after 1881. Insets: 1. Thames River from its mouth to Paeroa (scale: 4 inches = 1 mile); 2. The wharves, Auckland, with Northern Steamship Co. berths and offices (scale: 200 feet = 1 inch); 3. Waiheke Island; 4. The breakwater and wharf, New Plymouth (Courtesy of Auckland War Memorial Museum, G9081.P54).

Table 2. List of localities with depths for which some bulk sample is held at Auckland Museum. There is one fossil locality (†). All hand-written labels with the bulk lots are in A.W.B. Powell's hand and none records a collection date.

| Locality | Depth | # of samples |
|---|---|---|
| Northland, Awanui [Rangaunu] Bay | 5-12 fathoms [9-22 m] | 1 |
| Northland, Awanui [Rangaunu] Bay | 12 fathoms [22 m] | 1 |
| Northland, Awanui Heads [entrance to Awanui Bay] | none recorded | 1 |
| Northland, Kaimaumau | none recorded | 1 |
| Northland, Rangiawhia | none recorded | 1 |
| Northland, Doubtless Bay | none recorded | 1 |
| Northland, Doubtless Bay | 6-7 fathoms [11-13 m] | 1 |
| Northland, Doubtless Bay | 8 fathoms [15 m] | 1 |
| Northland, Doubtless Bay | 10 fathoms [16 m] | 1 |
| Northland, off Mangonui | 6 fathoms [11 m] | 2 |
| Northland, off Mangonui | 6-10 fathoms [11-16 m] | 2 |
| Northland, Mangonui Heads [entrance to Mangonui Harbour] | 6-10 fathoms [11-16 m] | 2 |
| Waikato, Whangamata | none recorded | 1 |
| Otago, 10 miles [16 km] ENE of Otago Heads [Taiaroa Head] | 50 fathoms [91 m] | 1 |
| † Manawatu-Whanganui, Castlecliff | coastal cliff-section | 1 |

1926, 1927, 1930). Given the similarities in sites and depths, it is assumed that he received this material either from Powell or directly from La Roche. Any La Roche-derived specimens in the Finlay Collection would have come to Auckland Museum in 1937 when H.J. Finlay sold his collection to the Museum (Powell *et al*. 1967).

## SIGNIFICANCE OF THE LA ROCHE DONATIONS

Until well into the 20th century marine scientists working in New Zealand waters were hampered by the lack of opportunities to sample anything but shallow coastal waters. As Powell (1927: 295) noted in reference to material obtained from 42 m (23 fathoms) by D. Crawford of the steam trawler *Serfib*, 'Palaeontological workers in New Zealand are greatly handicapped through lack of recent deep-water faunal lists.'

A 1904 meeting of the Australasian Association for the Advancement of Science, held in Dunedin, led to dredging expeditions being organized off Port Chalmers in 183–549 m (100–300 fathoms) of water, and Great Barrier Island in 201 m (110 fathoms). The southern expedition was unsuccessful due to rough weather and the loss of gear, but the latter yielded 'about a third of a ton of sea-bottom' (Hedley 1906).

However, prior to La Roche's collecting, offshore material was mostly serendipitously provided through the goodwill of mariners such as Captain John Bollons, who for many years captained New Zealand government steamers which supplied lighthouses and remote islands. He had an interest in natural history, collected specimens on some of his journeys and made these available to others (Wikipedia 2021).

Unsurprisingly, the very limited information available to New Zealand scientists during the early parts of the 20th century had skewed hypotheses on New Zealand marine biogeography and palaeobiogeography. La Roche's samples provided comparative material which allowed refinement of these (e.g., Powell 1927, 1933a). The 'about one gallon of shells and shell fragments' which were caught up in the trawl nets of the ST *Serfib* from 42 m (23 fathoms) off Ahipara were the first from the west coast of New Zealand. Though not collected by La Roche, he secured the sediments from Mr D. Crawford, the *Serfib*'s engineer, and made them available to Powell. The species which were discovered challenged existing biogeographical and palaeobiogeographical hypotheses. Species which had previously been found only in deeper water were occurring in much shallower waters: 'The above indicates that our deeper-water species do not occupy narrow zones, so that any one species cannot be taken as always representing a definite depth.' (Powell 1927: 295).

Similarly, based on the marine fossils it contained, the ~160 m thick sequence of Pleistocene sedimentary strata along the Castlecliff coast, Whanganui, was previously thought to have been deposited in 183 m (100 fathoms). However, species represented in the

Figure 6. The SS *Apanui* coming into the Northern Steam Ship Company's wharf at Awanui, Northland. The Awanui Channel leading up into the Awanui River, was for the most part less than 2 m deep. (Courtesy of Whangarei District Libraries, Heritage Collections, Florence Keene Photograph Collection).

*Serfib* sediments were also represented in the Castlecliff sequence. As Powell (1927: 295) wrote: 'From solely a faunal argument therefore the Castlecliff beds in the light of the Ahipara results are just as typical of depths between 20–25 fathoms.'

Therefore, apart from contributing a disproportionate number of new taxa, La Roche's samples were also significant because they provided a rare glimpse into otherwise inaccessible environments, and so extended our knowledge of New Zealand's natural history.

Finally, his material continued to yield new taxa long after his death in 1942. As late as 1965 Ponder (1965) described a new species of *Eatoniella* from a sample collected by La Roche from Doubtless Bay.

## ACKNOWLEDGEMENTS

I would like to thank the La Roche family for their generous access to family history. A big thank you to my colleagues Zoe Richardson and Severine Hannam for help respectively with locating images and bulk sediment samples, and to Keith Giles at Auckland Libraries, Rowan Miller at Hamilton City Libraries and Leanne Ferris at Whangarei District Libraries for their very prompt help with sourcing historical images. Also my thanks to Hugh Grenfell for reading the draft and for helpful suggestions, and to the referees, Brian Gill and Kerry Walton.

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# An historic album of New Zealand bryophyte specimens

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**Abstract**
An album entitled 'New Zealand Mosses' was purchased by Auckland Museum from a London antiquarian bookseller in 2014. The album comprises 120 pages each with a mounted plant specimen. Of the specimens, 117 are bryophytes comprising 81 mosses, 35 liverworts and one hornwort. In addition, there are two seaweeds, one flowering plant, and one blank page. Almost all specimens are here identified to species level, and the remainder to genus level. The bryophytes are all common lowland species in New Zealand today. Locality of collection is given on all but two pages; they are principally from the northern North Island, but include the single South Island locality, Pelorus. All localities would be accessible from the coast. From the publication dates of the plant names used, production of the album is likely to have occurred between 1854 and 1867. A review of early bryological exploration of New Zealand is provided, as well as a discussion of moss collectors active in the mid-19th century. We provide evidence that the specimens in the album were collected by a traveller on H.M.S. *Pandora* during its part in the 1848–1856 Great Survey of New Zealand, perhaps by the ship's surgeon, Dr John Jolliffe.

**Keywords**
19th Century; Auckland Museum; bryophyte; moss album; New Zealand; John Jolliffe; H.M.S. *Pandora*

## INTRODUCTION

In 2014 Auckland Museum purchased an album (Fig. 1) of pressed plant specimens from the London antiquarian booksellers Bernard Quaritch Ltd. It was described as 'A catalogue of New Zealand Mosses ca. 1850' (hereafter referred to as 'The Album'). Owing to the generosity of the seller, who believed the rightful place for this unique object was in New Zealand, the asking price of £2500 was reduced to £1,600.

Earlier the same year Auckland Museum had unsuccessfully bid for The Album at Bonhams Fine Art Auction 21752 'Printed Books, Maps and Photographs' in Oxford, 25 June 2014.

The catalogue details were as follows:

> Lot 364 NEW ZEALAND - MOSSES "New Zealand Mosses", [mid nineteenth century] estimate £200 – 300 "New Zealand Mosses", approximately 120 mosses mounted one per page (recto only), each with latin name and place of discovery in a neat miniscule hand, on stubs, contemporary green calf, upper cover with gilt borders enclosing the red morocco gilt lettering label on upper cover, 8vo, [mid nineteenth century] Footnotes: Bound in an unusual green calf wedge/ cheese-shaped binding, a collection of mosses from New Zealand, each identified with latin name and place found; Wangaroa, Hokianga River, Manukan [*sic*] Harbour, Bay of Plenty, Hick's Bay, Waiheki Island, Auckland, Pelorus, and others.

The present paper documents the identity of the plant specimens in The Album, provides evidence of The Album's date and speculates on its origin. Although having a cover title 'New Zealand Mosses', and although the majority of specimens are indeed mosses, approximately one third were found to belong to other plant groups, and four botanical specialists have contributed to this study. By way of context, a brief account of early bryological exploration in New Zealand is given.

## METHODS

The specimens were studied by Jessica E. Beever (mosses), John E. Braggins (liverworts and hornworts), Wendy A. Nelson (seaweeds) and Ewen K. Cameron (vascular plant), in order to ascribe to each specimen its current botanical name.

The Album (Auckland Museum accession number 2015.6.1) and its contents were photographed in the Auckland Museum Herbarium. As pages are not numbered in The Album, the image numbers are used for reference, abbreviated to #001 to #125. All images


Figure 1. The Album 'New Zealand Mosses'. © Auckland Museum CC BY.

are available at https://commons.wikimedia.org/wiki/New_Zealand_Mosses. Many of the specimens could be identified to species level from the images. When this was not possible further study was made with the aid of a WILD M3C Heerbrugg Switzerland dissecting microscope mounted on a long arm. When necessary, and if it could be done without significant damage to the integrity of specimens, fragments were removed for examination of water mounts with a Leitz Laborlux 3 compound microscope. Thus, details of leaf structure were ascertained. These included, as appropriate for definitive identification, leaf marginal ornamentation, the nature of a costa, cell surface ornamentation, cell wall features, and toothing of any scale appendages.

Digitised versions of the *Flora Novae-Zelandiae* (Hooker 1854) and the *Handbook of the New Zealand Flora* (Hooker 1867) were accessed to research bryophyte names, collectors and localities, in order to obtain some insight into bryological activity in New Zealand in the mid-19th century, and to search for any comparability with The Album. The method has limitations owing to errors in transcription, e.g., 'Rhizogonium' read as 'Bhizogonium' and 'Jolliffe' read as 'Jollitfe'. In addition, in the case of species entries for which there must have been many specimens to hand, neither collectors nor localities are individually named. For example, for *Hypnum aciculare* [= *Ptychomnion aciculare*] the relevant information reads 'In all the islands; very common about the roots of trees in the woods.' (Hooker 1854: 110).

We have not attempted to trace records from herbarium databases of specimens. In many cases, as for example in the Natural History Museum (BM) in London the historic collections, unless recognised as type specimens, have not yet been entered into collection databases (Len Ellis pers. comm. 2021), and New Zealand specimens are often labelled merely 'N. Zd.', lacking any more precise locality.

Current names were accessed from information on changes in bryophyte names in Ngā Tipu o Aotearoa – New Zealand Plants (Allan Herbarium 2000).

## RESULTS AND DISCUSSION

### Structure of The Album

The Album (Fig. 1) is a small volume, with cover dimensions of 14 cm × 11.5 cm. Nevertheless, it contains 120 pages, giving a spine thickness of 10 cm. Features of its structure have been determined as follows: it is professionally produced with marbled end papers; the paper is machine-made; the cover is cow skin leather; The Album was bound first (recessed cord binding) and the specimens added later; binding indicates a date of mid to late 19th century (David Ashman pers. comm. 2021). Numerous pages bear the imprint of De la Rue printery, which was established in London in 1821 (De La Rue 2021). No tape or stitching is evident, and it is assumed that the attached specimens are glued, perhaps with 'strong gum mixed with flour-paste' as recommended by

William Hooker to one of his British collectors, Edward Hobson, for moss exsiccatae (Secord 2019).

## Contents of The Album

In almost all cases a single species of a pressed plant appears on each page (e.g., Figs 2–9). Localities (Tables 1, 2; Fig. 10) are given on all but two pages.

Latin binomials, or genus only, are provided as original identifications on 78 pages (Tables 1, 2). Apart from 'New Zealand Mosses' on the front cover, there is no other printed wording, including no title page.

In spite of The Album's cover title, the 120 plant specimens (Tables 1, 2) are not all mosses. There are 81 mosses, and 36 other bryophytes, namely 35 liverworts and one hornwort. In addition, there are two seaweed specimens and one dicotyledonous vascular plant. The seaweeds, both red algae, are species of *Plocamium* and *Polysiphonia* respectively (Wendy Nelson pers. comm. 2021). The flowering plant is *Scleranthus biflorus* (J.R.Forst. et G.Forst.) Hook.f. (Ewen Cameron pers. comm. 2021), a low growing perennial in the Caryophyllaceae, which even today is described as a 'moss-like' plant (Naturally Native NZ Plants 2022). Specimens on 113 pages could be identified to species level (albeit three tentatively), and the remaining seven to genus level. Fifty-one plant families are represented; most frequently for mosses the Lembophyllaceae and Brachytheciaceae with seven and six specimens respectively, and for liverworts the Marchantiaceae and Plagiochilaceae each with four specimens. Specimens have not been mounted in any taxonomic order.

For only six mosses and two liverworts are the names given in The Album still appropriate. Most moss names and nearly half of the liverwort names used, while correct at the time (or with minor spelling errors), have been superseded; 14 mosses and three liverworts are, however, judged to be misidentified.

All bryophytes in The Album are known members of the current New Zealand flora, as listed by Gibb *et al.* (2021) and are regarded as native (indigenous). None is listed as threatened in the Department of Conservation's New Zealand Threat Classification System (de Lange *et al.* 2020; Rolfe *et al*. 2016).

A striking feature of The Album is the quality of the specimens. This is particularly evident in some liverworts which have their delicate and short-lived fruiting structures intact, e.g., *Trichocolea rigida* #021, *Schistochila appendiculata* #049, *Lepidolaena clavigera* #058 and *Pallavacinia tenuinervis* #088.

## Date of assembly of The Album

Publication dates (Table 2) of the bryophyte names used in the original identifications were ascertained from the literature. These provide an earliest limit, and probable latest limit for the date of production of The Album.

For liverworts, the earliest publication date is 1753 (Linnaeus, *Species Plantarum*) for *Anthoceros punctatus* and *Jungermannia*. The latest is 1854 in W. Mitten's account for the liverworts (*Hepaticae*) in *Botany of the Antarctic Voyage, Part II Flora Novae-Zelandiae* (Hooker, 1854) for *Lepidozia spinosissima*.

From the liverwort names we are therefore able to place production of The Album as post 1854.

From the moss names a probable window for production can be ascertained. Ten different works, all European, provide the initial publication date of the names used in The Album. The earliest date is 1801 (Hedwig, *Species Muscorum Frondosorum*), for *Fumaria* [*Funaria*] *hygrometrica*, *Hypnum smithianum* [*smithii*], *Hypnum spiniforme*, *Hypnum distichum*, *Polytrichum commune*, *Hypnum aciculare*, *Weissia controversa*, and *Leskea filiculaeforme* [*filiculaeformis*]. The latest publication date is again 1854, in W.M. Wilson's account for the mosses in *Flora Novae-Zelandiae* (Hooker 1854). Moss names used in The Album that were first published in that work are *Catharomnion ciliatum*, *Fissidens ligulatus*, *Homalia falcifolia* (as *Omalia falcifolia*), *Hookeria nigella, Hypnum furfurosum*, *H. patale and H. remotifolium*. Thirteen years later Hooker's *Handbook of the New Zealand Flora* (Hooker 1867) was published, becoming the definitive work regarding New Zealand plants. In many cases, names had changed owing to taxonomic or nomenclatural progress between the 1854 and 1867 publications. None of the 1867 revised names was used in The Album. Examples include *Cyathophorum pennatum* (*Hookeria pennata* in The Album), *Hypnum chrysogaster (Hypnum patale* in The Album), *Hypopterygium filiculaeforme* (*Leskea filiculaeforme* in The Album), and *Tortula calycina* (*Tortula flexuosa* in The Album).

In summary, Hooker (1854) is the latest publication source for any of the names used in The Album (Table 2). In addition, that work contains descriptions of all species in The Album that are correctly named. Either the identifier/s of the specimens in The Album did not have access to Hooker (1867) or had named the specimens prior to that date.

On nomenclatural grounds we therefore place the production of The Album as likely to be between 1854 and 1867. This corresponds well with, and gives more precision to, the auction catalogue date of 'mid nineteenth century', and the deduction from the nature of the binding as 'mid to late 19th C.'.

## Collection localities

Localities are given for 118 specimens (Tables 1, 2; Fig. 10). These are not necessarily in modern spelling, but all are identifiable, as follows: Waiheki Island [Waiheke Island], Kiri-kiri falls [Kerikeri Falls], Wangaroa and Wangeroa [Whangaroa], Parakaraka Bay of Islands [ Pakaraka] and Murcury Bay [Mercury Bay]. Localities are predominantly in the north of the North Island, with only one, 'Pelorus', from the South Island. No localities are given for the two seaweeds, but today they are found on rocky substrates and are fully marine (Wendy Nelson pers. comm. 2021). Although localities given are mostly imprecise, all are compatible with collection having taken place using sea transport, with short excursions inland, viz., to Kerikeri Falls, Waitangi Falls and Pakaraka. There is no geographic order in the pages of The Album.

Table 1. Statistics for The Album.

| | Mosses | Liverworts | Hornworts | Seaweeds | Flowering plants | Total |
|---|---|---|---|---|---|---|
| Pages | 81 | 35 | 1 | 2 | 1 | 120 |
| Pages with localities | 81 | 35 | 1 | – | 1 | 118 |
| Pages with taxon identification | 59 | 18 | 1 | – | – | 78 |
| Extant name used | 6 | 2 | – | – | – | 8 |
| Earlier name used | 39 | 13 | – | – | – | 52 |
| Misidentifications | 14 | 3 | 1 | – | – | 18 |
| With structures related to sexual reproduction | 57 with sporophytes | 32 with perianths or coelocaules | 1 with sporophyte | 1 with cystocarps | – | 90 |

## Specimen selection

Almost all the plant specimens are species of moderate to large stature, or with conspicuous fruiting structures at the time of their collection. In the genus *Fissidens* for example, only two species have been collected, *F. rigidulus* and *F. asplenioides*, which are the largest of the common species in the genus. It is apparent that a real effort was made to collect fertile specimens, as 57 of the 81 mosses, 32 of the 35 liverworts and the single hornwort bear sexual reproductive structures (Table 1). Of the liverworts that do not, *Chandonanthus squarrosus* (#028) and *Dendromastigophora flagellifera* (#053) are especially large and striking species. Two pages have a fragment of a second species included: *Megaceros* ?*leptohymenius* (#029) has a fragment of *Heteroscyphus allodontus*, and *Lepidolaena clavigera* (#058) has a fragment of a species of *Radula*. These small fragments of plants are most likely to have been collected with the *Megaceros* and *Lepidolaena*, but, as nothing is known of the collecting techniques adopted, it is not possible to conclude that these were *in situ* in the field together, rather than being examples of later contamination.

In addition to these two pages with included fragments, there is one mixed page (#038) with robust shoots of two very similar mosses given equal prominence, namely *Thuidiopsis furfurosa* and *Thuidium laeviusculum*. Here two species names (in genus *Hypnum*), have been applied, 'remotifolium' and 'purpurosum', bracketed and queried. *Hypnum remotifolium* had been recorded by Hooker (1854: 357) for New Zealand, although the presence of the species in New Zealand is now doubted (Fife 2020) and Hooker's records are likely misapplied. Regardless, that moss is in a different family, the Brachytheciaceae, and most unlikely to be mistaken for a *Thuidium* or a *Thuidiopsis*. We have been unable to trace any moss epithet 'purpurosum', and the script used for 'f' elsewhere in The Album (e.g., *Hypnum bifarium* #008) does not resemble the 'p' in 'purpurosum'. Notwithstanding these complications, we assume that the specimen has been in part correctly annotated as *Hypnum furfurosum*, and the presence of two taxa was not recognized.

There is some duplication in The Album, with nine moss species and three liverwort species appearing on two pages.

All the bryophytes are common species in New Zealand today. They are found in a variety of lowland habitats, especially in forest but also in scrub, swamps, and streams, or on open ground. Species may be epiphytic or terrestrial on soil or rock.

## Contemporary fern albums and the existence of British moss albums

The similarity of The Album to those produced in the well-documented Victorian craze for albums of ferns deserves comment. As Hayward and Rickard (2019: 1) note in their lavishly illustrated book *Fern Albums and Related Material*, 'travellers and emigrants to the far reaches of the British Empire arrived to find an exciting range of new flowering plants and ferns to gather for their personal collections and to send home to relatives. This was particularly so in New Zealand, where a small industry developed producing fern albums for sale.' Albums were made 'by a local stationer or selected from an increasing range of scrap albums and collecting albums that were being produced in large numbers.'

Bryophytes, being a much less conspicuous element of the vegetation, less well known, and less attractive as pressed specimens, at least to the general public, did not experience a similar surge in interest. Mosses were sometimes given a decorative role in fern albums. Goulding (1977), in her study of New Zealand fern albums, notes that typically the mounted fronds 'sprang from a base of bright green [dyed] mosses … added as

decoration.' The scientific plant name is usually given for ferns, but 'no names are given for the lowly mosses'. An example is shown in Fig. 3.28d of Hayward & Rickard (2019: 83), where the frond base of *Hymenophyllum scabrum* is decorated with pinnae of other ferns and shoots of a pleurocarpous moss.

Albums of mosses in their own right are much less common. We are aware of some albums of named British mosses (see, for example, Godfrey 2010; Hayward & Rickard 2019). The best-known British creators of moss albums (and to a much greater extent, of fern albums) are Joseph Flintoft (1796–1860) and his son Joseph James Flintoft (1826–1877), who produced albums from about 1850 onwards. Of the Flintoft moss albums, only one is known with a dated title page, namely 1858 (Hayward & Rickard 2019: 40). The covers of two Flintoft moss albums and the dated title page are illustrated as Fig. 2.31 (Hayward & Rickard 2019: 41).

As is the case for ferns, collections of loose-leaf exsiccatae of mosses were also produced in Britain. An example is described in detail by Hayward & Rickard (2019: 32), and its front cover illustrated in their Fig. 2.22a. A gilt embossed title *Mosses of Derbyshire collected by John Tym* on the cover is not dissimilar to that of The Album's *New Zealand Mosses.* John Tym (1829–1910) advertised such portfolios for sale, the earliest dated found being 1851. Of those seen by Hayward & Rickard (2019), although generally titled *Mosses of Derbyshire*, most also contained ferns and lycopods. In these portfolios scientific names on printed labels were attached to the sheets, including those for mosses. The concept of such exsiccatae persists to the present day, whereby fully labelled sets of loose-leaf mounted specimens are distributed and intended to be used as reliably identified reference collections (Malcolm & Malcolm 2006). Clearly, The Album is not in this category.

## Early bryological exploration of New Zealand

The earliest Northern Hemisphere collectors of mosses in New Zealand, those whose specimens made their way into the first published annals of this country's bryology, are likely to have been the naturalists on James Cook's voyages to New Zealand between 1769 and 1777. Johannes Hedwig's *Species Muscorum Frondosorum,* published in 1801, included the description of two moss species, *Bryum dichotomum, Leskea [Weymouthia] mollis* and possibly also a third, *Hypnum [Rhaphidorrhynchium] amoenum*, from New Zealand but with collectors unknown (Fife 1985). Joseph Banks and Daniel Solander, naturalists on the *Endeavour* with James Cook on his First Voyage to New Zealand collected mosses in the vicinity of Ship Cove, Marlborough Sounds, as an excerpt from Banks' journal for 25 January 1770 (Beaglehole 1962: 459) indicates:

> 25. D$^{r}$ Solander and myself (who have now nearly exhausted all the Plants in our neighbourhood) went today to search for Mosses[1] and small things, in which we had great success gathering several very remarkable ones.

With editor's footnote:

> [1]The MS "Catalogue of the plants of Cook's First Voyage in the order in which they were loosely placed in the drying books in which they were brought home" lists 33 bryophytes for Tierra del Fuego but none for New Zealand.

Despite the apparent lack of extant specimens, at least some of the New Zealand moss collections from this voyage are now in the herbarium of the Natural History Museum, London (BM). Some were studied and named by Ernst Ludwig Heim (1747–1834) pre-Hedwig, but others are likely scattered undatabased throughout the general BM moss collections – their existence not yet noted (Len Ellis pers. comm. 2019).

While the senior author was examining New Zealand mosses in BM in 2008, one of these came to light, a specimen of *Weissia controversa* Hedw., lacking modern identification and labelled 'Nova Zelandia J.B.'. The handwriting and the water-mark of the sheet enabled Curator of Bryophytes, Len Ellis, to confirm that 'J.B.' was indeed Joseph Banks, adding another early record to New Zealand's bryophyte flora.

A well-documented collection of New Zealand mosses and liverworts was later made by Archibald Menzies, surgeon on the Vancouver Expedition, during a three-week stay in 1791, at Dusky Sound in Fiordland (Fife 1985). J.D. Hooker in his Preface to the *Handbook of the New Zealand Flora* (Hooker 1867: 9) described Menzies as 'a very assiduous collector of Flowerless plants, who procured many species of ... *Musci*, and *Hepaticae*, most of which are described at length, and beautifully illustrated in [William] Hooker's *Musci Exotici*.'

William Jackson Hooker and his son, Joseph Dalton Hooker were successive directors of the Royal Botanic Gardens Kew, spanning the years 1841 to 1885 in that position. Together with specialists William Wilson (mosses) and William Mitten (hepatics, i.e., liverworts) they became the foremost authorities on New Zealand bryophytes (Engel & Glenny 2008; Fife 1985), with their work published in Hooker (1854) and Hooker (1867).

The following botanists were all active 19th century collectors of bryophytes in New Zealand: Daniel Bolton, William Colenso, Joseph D. Hooker, Charles Knight, John Jolliffe, Francis Logan, David Lyall, Augustus Oldfield, Etienne Raoul and Andrew Sinclair. Specimens were shipped back to England (or to Paris in the case of those of Etienne Raoul) where they were studied, described and illustrated. Most of them remain in northern hemisphere herbaria today, although some are found in New Zealand herbaria, notably WELT (Te Papa Tongarewa) and AK (Auckland War Memorial Museum).

As The Album is a previously unknown addition to extant collections from early bryological activity in New Zealand, it is worth researching who its collector/s, assembler/s and identifier/s might have been.

Table 2. Plant identifications and collection localities.

| Image number | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #006 | Sphagnum | Pelorus | *Sphagnum cristatum* | moss | Sphagnaceae | |
| #007 | | Pelorus | *Lepidolaena taylorii* | liverwort | Lepidolaenaceae | |
| #008 | Hypnum bifarium | Waiheki Island. N.Z. | *Pyrrhobryum bifarium* | moss | Rhizogoniaceae | 1818 |
| #009 | Hookeria pennata | Auckland. N.Z. | *Cyathophorum bulbosum* | moss | Hypopterygiaceae | 1808 |
| #010 | Dicranum, candidum | Hokianga River. N.Z. | *Leucobryum javense* | moss | Leucobryaceae | 1805 |
| #011 | Neckera setosa | Hokianga River. N.Z. | *Cyrtopus setosus* | moss | Cyrtopodaceae | 1818 |
| #012 | Dicranum. Menziesii | Manukau Harbour N.Z. | *Dicranoloma fasciatum* | moss | Dicranaceae | 1844 |
| #013 | Hypnum smithianum | Hokianga River. N.Z. | *Hypopterygium didictyon* | moss | Hypopterygiaceae | NA |
| #014 | Hypnum hispidum. | Auckland. N.Z. | *Echinodium hispidum* | moss | Echinodiaceae | 1844 |
| #015 | Campylopus | Bay of Plenty. N.Z. | *Campylopus clavatus* | moss | Dicranaceae | |
| #016 | Phyllogonium elegans | Manukau Harbour N.Z. | *Orthorrhynchium elegans* | moss | Orthorrhynchiaceae | 1844 |
| #017 | | Waiheki Island N.Z. | *Schistochila balfouriana* | liverwort | Schistochilaceae | |
| #018 | Plagiochila Gigantea | Waiheki Island. N.Z. | *Plagiochila trispicata* | liverwort | Plagiochilaceae | 1840 |
| #019 | Trichocolea tomentella | Coromandel. N.Z. | *Trichocolea rigida* | liverwort | Trichocoleaceae | 1831 |
| #020 | Dicranum Billiardeiri? | Coromandel. N.Z. | *Dicranoloma billardierei* | moss | Dicranaceae | 1802 |
| #021 | Trichocolea tomentella | Coromandel. N.Z. | *Trichocolea rigida* | liverwort | Trichocoleaceae | 1831 |
| #022 | | Waiheki Island. N.Z. | *Plagiochila colensoi* | liverwort | Plagiochilaceae | |
| #023 | Trichocolea lanata | Coromandel. N.Z. | *Leiomitra lanata* | liverwort | Trichocoleaceae | 1838 |
| #024 | | Manukau Harbour. N.Z. | *Rhynchostegium muriculatum* | moss | Brachytheciaceae | |

1 Original spelling of localities.
2 Modern names follow Gibb *et al.* (2020) for mosses, liverworts, and hornworts.
3 Date of publication of name used in The Album.

| Image number [4] | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #025 | | Kiri-kiri falls. Bay of Islands. N.Z. | *Lepidolaena taylorii* | liverwort | Lepidolaenaceae | |
| #026 | Tortula. flexuosa | Coromandel. N.Z. | *Barbula calycina* | moss | Pottiaceae | 1819 |
| #027 | | Waiheki Island. N.Z. | *Lobatiriccardia* sp. | liverwort | Aneuraceae | |
| #028 | | Pelorus | *Chandonanthus squarrosus* | liverwort | Anastrophyllaceae | |
| #029 | Anthoceros punctatus | Hokianga River. N.Z. | *Megaceros ? leptohymenius* | hornwort | Dendrocerotaceae | 1753 |
| #030 | | Waiheki Island. N.Z. | *Bazzania tayloriana* | liverwort | Lepidoziaceae | |
| #031 | | Pelorus | *Lembophyllum clandestinum* | moss | Lembophyllaceae | |
| #032 | Hypnum ?penpusosum/ ?remotifolium | Murcury Bay. N.Z. | *Thuidiopsis furfurosa* | moss | Thuidiaceae | 1854 |
| #033 | | Pelorus | *Weymouthia mollis* | moss | Lembophyllaceae | |
| #034 | Bartramia tormentosa | Kiri-kiri falls. Bay of Islands. N.Z. | *Breutelia pendula* | moss | Bartramiaceae | 1817 |
| #035 | | Pelorus | *Acrocladium chlamydophyllum* | moss | Lembophyllaceae | |
| #036 | | Waiheki Island. | *Polytrichadelphus magellanicus* | moss | Polytrichaceae | |
| #037 | Hookeria rotundifolia | Wangaroa. N.Z. | *Distichophyllum crispulum* | moss | Daltoniaceae | 1844 |
| #038 | Hypnum ?purpurosum/?remotifolium | Hokianga River. N.Z. | *Thuidium laeviusculum* & *Thuidiopsis furfurosa* | moss | Thuidiaceae | 1854 |
| #039 | Hypnum spiniforme | Wangaroa. N.Z. | *Rhizogonium novae-hollandiae* | moss | Rhizogoniaceae | 1801 |
| #040 | Leskia ericoides | Pelorus. | *Cladomnion ericoides* | moss | Ptychomniaceae | 1818 |
| #041 | | Auckland. N.Z. | *Rhynchostegium tenuifolium* | moss | Brachytheciaceae | |
| #042 | Polytrichum commune. | Hokianga River. N.Z. | *Polytrichum commune* | moss | Polytrichaceae | 1801 |
| #043 | Fumaria[5] hygrometrica | Hokianga River. N.Z. | *Funaria hygrometrica* | moss | Funariaceae | 1801 |

4 See Appendix for link to image of each page in the album. Identified by image number.

5 Generic name likely a trivial confusion between the flowering plant name ‘Fumaria’ and the moss name ‘Funaria’, and is scored as an extant name.

| Image number [4] | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #044 | Hookeria nigella | Wangaroa. N.Z. | *Achrophyllum dentatum* | moss | Daltoniaceae | 1854 |
| #045 | | Waiheki Island. N.Z. | *Bazzania adnexa* var. *adnexa* | liverwort | Lepidoziaceae | |
| #046 | Hypnum cochlearifolium | Pelorus | *Weymouthia cochlearifolia* | moss | Lembophyllaceae | 1816 |
| #047 | | Hick's Bay. N.Z. | *Echinodium hispidum* | moss | Echinodiaceae | |
| #048 | Hypnum distichum or Rhizogonium | Pelorus | *Rhizogonium distichum* | moss | Rhizogoniaceae | 1801 |
| #049 | Gottschea appendiculata | Waiheki Island. N.Z. | *Schistochila appendiculata* | liverwort | Schistochilaceae | 1844 |
| #050 | | Pelorus | *Wijkia extenuata* | moss | Sematophyllaceae | |
| #051 | Racomitrium Spectabile | Hokianga River. N.Z. | *Racopilum strumiferum* | moss | Racopilaceae | NA |
| #052 | Hypnum menziesii | Hokianga River. N.Z. | *Sciadocladus menziesii* | moss | Pterobryellaceae | 1818 |
| #053 | Sendtnera scolopendra. | Coromandel. N.Z. | *Dendromastigophora flagellifera* | liverwort | Mastigophoraceae | 1845 |
| #054 | Hypnum (spininervium?) | Manukau Harbour. N.Z. | *Hypnodendron arcuatum* | moss | Hypnodendraceae | 1818 |
| #055 | Hypnum aciculare | Coromandel. N.Z. | *Ptychomnion aciculare* | moss | Ptychomniaceae | 1801 |
| #056 | | Parakaraka Bay of Islands | *Pogonatum subulatum* | moss | Polytrichaceae | |
| #057 | | Wangaroa. N.Z. | *Plagiochila banksiana* var. *banksiana* | liverwort | Plagiochilaceae | |
| #058 | Jungermannia | Waitangi Falls. Bay of Islands. | *Lepidolaena clavigera* | liverwort | Lepidolaenaceae | 1753 |
| #059 | Weissia controversa | Wangaroa. N.Z. | *Weissia* sp. (not *W. controversa*) | moss | Pottiaceae | 1801 |
| #060 | Hypnum furfurosum | Waitangi Falls. Bay of Islands. | *Thuidiopsis furfurosa* | moss | Thuidiaceae | 1854 |
| #061 | Hypnum Arbuscula | Hokianga River. N.Z. | *Camptochaete deflexa* | moss | Lembophyllaceae | 1819 |
| #062 | | Waitangi Falls. Bay of Islands. | *Tayloria octoblepharum* | moss | Splachnaceae | |
| #063 | | Hokianga River. N.Z. | *Hymenodon pilifer* | moss | Orthodontiaceae | |
| #064 | Hypnum spinener[?]ium? | Wangaroa. N.Z. | *Camptochaete deflexa* | moss | Lembophyllaceae | 1818 |

| Image number [4] | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #065 | Funaria. (in pencil: "(calvescens)" | Auckland. N.Z. | *Bryum* sp. | moss | Bryaceae | 1801 |
| #066 | Hypnum cochlearifolium | Hokianga River. N.Z. | *Weymouthia cochlearifolia* | moss | Lembophyllaceae | 1816 |
| #067 | | Waiheki Island. N.Z. | *Heteroscyphus coalitus* var. *coalitus* | liverwort | Lophocoleaceae | |
| #068 | Hookeria quadrifaria | Waiheki Island. N.Z. | *Achrophyllum quadrifarium* | moss | Daltoniaceae | 1808 |
| #069 | Dicranum (setosum?) | Manukau Harbour N.Z. | *Dicranoloma menziesii* | moss | Dicranaceae | 1844 |
| #070 | Bryum | Wangaroa. N.Z. | *Rosulabryum subtomentosum* | moss | Bryaceae | |
| #071 | Funaria. | Coromandel. N.Z. | *Entosthoson subnudus* var. *gracilis* | moss | Funariaceae | |
| #072 | | Wangaroa. N.Z. | ?*Platyhypnidium austrinum* | moss | Brachytheciaceae | |
| #073 | Hypnum comosum | Kiri-kiri falls. Bay of Islands. N.Z. | *Mniodendron comatum* | moss | Hypnodendraceae | 1807 |
| #074 | Hypnum leptorynchum. | Wangaroa. N.Z. | *Ctenidium pubescens* | moss | Hypnaceae | |
| #075 | | Wangaroa. N.Z. | *Sematophyllum jolliffii* | moss | Sematophyllaceae | |
| #076 | Lepidozia spinosissima | Pelorus | *Lepidozia spinosissima* | liverwort | Lepidoziaceae | 1854 |
| #077 | Hypnum leptorynchum, var.? | Wangaroa. N.Z. | *Hypnum chrysogaster* | moss | Hypnaceae | NA |
| #078 | Hypnum marginatum | Pelorus | *Hypnodendron marginatum* | moss | Hypnodendraceae | 1844 |
| #079 | Leskea filiculaeforme | Manukau Harbour. N.Z. | *Dendrohypopterygium filiculiforme* | moss | Hypopterygiaceae | 1801 |
| #080 | Hypnum | Coromandel. | *Pyrrhobryum paramattense* | moss | Rhizogoniaceae | |
| #081 | Leskea concinna | Hokianga River. N.Z. | *Lopidium concinnum* | moss | Hypopterygiaceae | 1818 |
| #082 | | Pelorus | *Riccardia filicina* | liverwort | Aneuraceae | |
| #083 | | Poverty Bay. N.Z. | *Scleranthus biflorus* | flowering plant | Caryophyllaceae | |
| #084 | | Waiheki Island. N.Z. | *Plagiochila intertexta* | liverwort | Plagiochilaceae | |

| Image number | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #085 | | Wangaroa. N.Z. | *Pendulothecium auriculatum* | moss | Neckeraceae | |
| #086 | | Auckland. N.Z. | *Metzgeria furcata* | liverwort | Metzgeriaceae | |
| #087 | Madotheca stangeri | Coromandel. N.Z. | *Porella elegantula* | liverwort | Porellaceae | 1845 |
| #088 | | Auckland. N.Z. | *Pallavacinia tenuinervis* | liverwort | Pallaviciniaceae | |
| #089 | Symphogyna Hymenophyllum | Waiheki Island. N.Z. | *Symphyogyna hymenophyllum* | liverwort | Pallaviciniaceae | 1836 |
| #090 | Jungermannia Phyllanthus | Waikato River. N.Z. | *Symphyogyna subsimplex* | liverwort | Pallaviciniaceae | 1818 |
| #091 | Bartramia radicalis. tenuis. | Wangaroa. N.Z. | *Philonotis tenuis* | moss | Bartramiaceae | 1805 |
| #092 | Lencodon [Leucodon] bartramodes | Pelorus | *Cryptopodium bartramioides* | moss | Rhizogoniaceae | 1818 |
| #093 | | Hick's Bay. N.Z. | *Brachythecium ?plumosum* | moss | Brachytheciaceae | |
| #094 | | Pelorus | *Distichophyllum crispulum* | moss | Daltoniaceae | |
| #095 | Dicranum. | Pelorus. | *Dicranoloma dicarpum* | moss | Dicranaceae | |
| #096 | Polytrichum commune | Pelorus | *Polytrichum commune* | moss | Polytrichaceae | 1801 |
| #097 | | Coromandel. | *Wijkia extenuata* | moss | Sematophyllaceae | |
| #098 | Marchantia | Wangaroa. N.Z. | *Asterella tenera* | liverwort | Aytoniaceae | |
| #099 | Marchantia. | Hick's Bay. N.Z. | *Marchantia pileata* | liverwort | Marchantiaceae | |
| #100 | Omalia falcifolia | Wangaroa. N.Z. | *Pseudotaxiphyllum falcifolium* | moss | Hypnaceae | 1854 |
| #101 | | Wangaroa. N.Z. | *Rhaphidorryhnchium amoenum* | moss | Sematophyllaceae | |
| #102 | Marchantia | Bay of Plenty. N.Z. | *Asterella australis* | liverwort | Aytoniaceae | |
| #103 | Marchantia | Hokianga River. N.Z. | *Marchantia berteroana* | liverwort | Marchantiaceae | |
| #104 | | Waiheki Island. N.Z. | *Spruceanthus olivaceus.* | liverwort | Lejeuneaceae | |

| Image number [4] | Original Identification | Locality [1] | Modern Identification [2] | Plant group | Family | Date [3] |
|---|---|---|---|---|---|---|
| #105 | Marchantia. | Poverty Bay. | *Asterella australis* | liverwort | Aytoniaceae | |
| #106 | Marchantia. | Hokianga River. N.Z. | *Marchantia foliacea* | liverwort | Marchantiaceae | |
| #107 | Marchantia. | Bay of Plenty. N.Z. | *Marchantia berteroana* | liverwort | Marchantiaceae | |
| #108 | Funaria? | Wangaroa. N.Z. | *Bryum* sp. | moss | Bryaceae | |
| #109 | | Hick's Bay. N.Z. | *Leptodictyum riparium* | moss | Amblystegiaceae | |
| #110 | Trichosmum setosum | Auckland. N.Z. | *Ditrichum difficile* | moss | Ditrichaceae | 1842 |
| #111 | | Hick's Bay. N.Z. | *Leptoscyphus compactus* | liverwort | Lophocoleaceae | |
| #112 | | Waiheki Island. N.Z. | *Heteroscyphus allodontus* | liverwort | Lophocoleaceae | |
| #113 | | Hick's Bay. N.Z. | *Fissidens rigidulus* var. *rigidulus* | moss | Fissidentaceae | |
| #114 | | Hick's Bay. N.Z. | *Tridontium tasmanicum* | moss | Pottiaceae | |
| #115 | Hypnum patale | Wangaroa N.Z. | *Hypnum chrysogaster* | moss | Hypnaceae | 1854 |
| #116 | | Hick's Bay. N.Z. | *Rhynchostegium tenuifolium* | moss | Brachytheciaceae | |
| #117 | Hypnum leptorynchum | Pelorus. | *Rhynchostegium tenuifolium* | moss | Brachytheciaceae | 1812 |
| #118 | Macromitrium. | Manukau Harbour N.Z. | *Macromitrum prorepens* | moss | Orthotrichaceae | 1819 |
| #119 | Catharomnion. | Wangaroa. N.Z. | *Catharomnion ciliatum* | moss | Hypopterygiaceae | 1854 |
| #120 | Fissidens ligulatus. | Wangaroa. N.Z. | *Fissidens asplenioides* | moss | Fissidentaceae | 1854 |
| #121 | Leptostomum macrocarpum. | Wangeroa [sic] | *Leptostomum macrocarpon* | moss | Leptostomataceae | 1814 |
| #122 | Leucodon calycinus. (Hook.) Dicnemon calycinus (Brid) | Manukau Harbour. N.Z. | *Dicnemon calycinum* | moss | Dicnemonaceae | 1818, 1824 |
| #123 | Catharomnion ciliatum. | Wangaroa. N.Z. | *Catharomnion ciliatum* | moss | Hypopterygiaceae | 1854 |
| #124 | | | *Plocamium* sp. | red seaweed | Plocamiaceae | |
| #125 | | | *Polysiphonia* s.l. | red seaweed | Rhodomelaceae | |
| #126 | empty page | | | | | |


Figure 2. *Lepidolaena clavigera*, a delicate liverwort, retaining very fragile sporophytes.


Figure 3. *Lepidozia spinosissima*, a large, finely dissected liverwort, bearing remnant perianths.

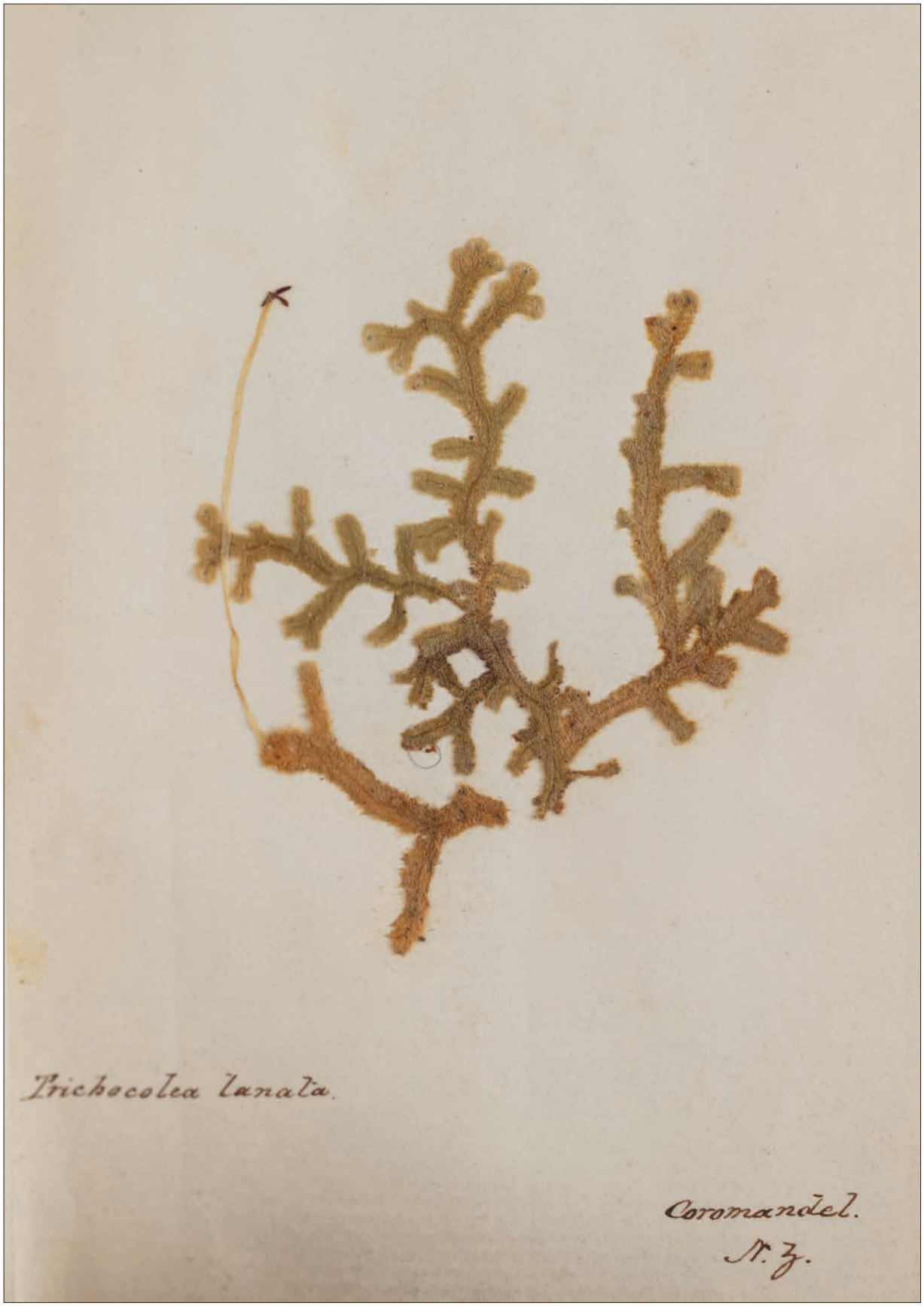


Figure 4. *Leiomitra lanata*, a distinctive liverwort, like fingers of green velvet, endemic to New Zealand and found throughout, with sporophyte. © Auckland Museum CC BY. [#023]


Figure 5. *Schistochila appendiculata*, one of the largest leafy liverworts, with sporophytes.


Figure 6. *Sphagnum cristatum*, a common moss in swamps, with capsules. © Auckland Museum CC BY. [#006]


Figure 7. *Mniodendron comatum*, an umbrella moss, with capsules. © Auckland Museum CC BY. [#073]


Figure 8. *Dendrohypopterygium filiculiforme*, an umbrella moss, with capsule. © Auckland Museum CC BY. [#079]


Figure 9. *Thuidiopsis furfurosa* (central plant), with capsules and *Thuidium laeviusculum* (lateral plants).

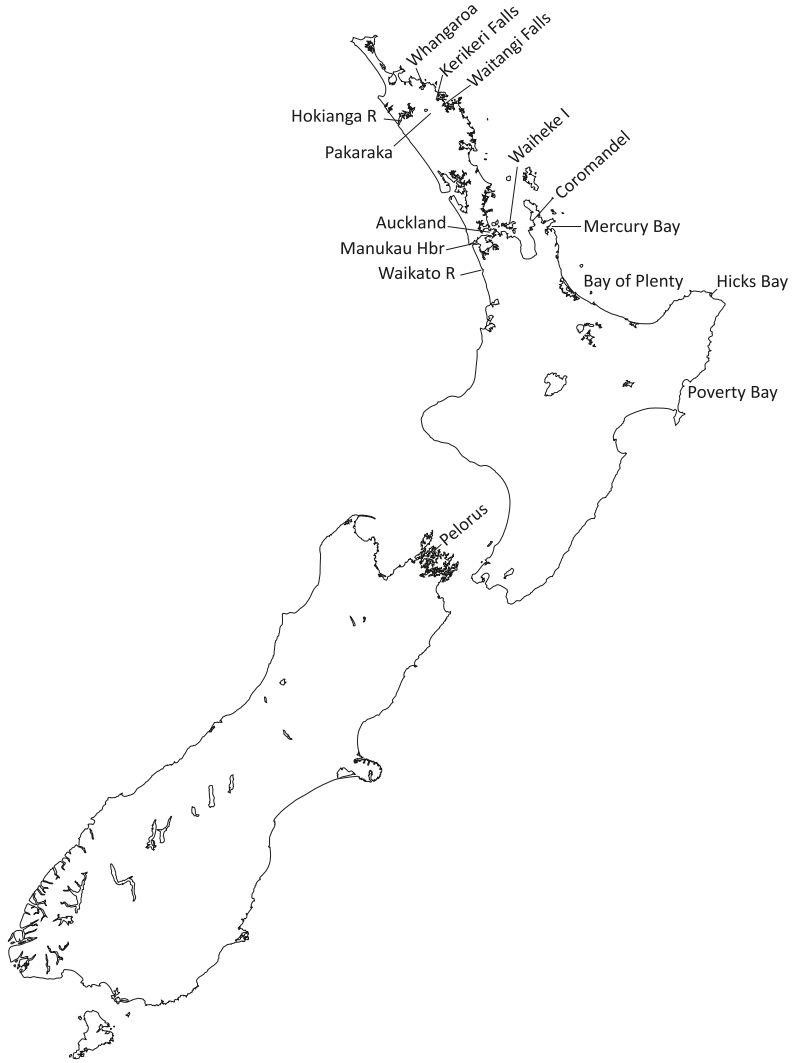


Figure 10. Map of New Zealand showing collection localities (with modern spelling).

## Possible collectors for The Album

It is a striking feature of The Album that all bryophyte localities are easily accessible from the coast (Fig. 10), with indications of approach being from the sea, e.g., 'Hokianga R', 'Manukau Hbr' and 'Waikato R'. All are from the northern North Island, with the notable exception of 'Pelorus', located in the Marlborough Sounds at the north of the South Island. Bearing this in mind, some speculation is possible on who may have collected the specimens in The Album.

Of active bryophyte collectors of the relevant period, those who were resident in New Zealand and had numerous opportunities to collect inland are less likely to be candidates for the role of The Album's coastal collector. Into that category fall Daniel Bolton (Godley 2003), William Colenso (St George 2009), Charles Knight (Galloway 2013), Francis Logan (Godley 1999) and Andrew Sinclair (Molloy 1990). Augustus Oldfield collected primarily in Australia (CHAH 2022), with only two specific New Zealand moss localities cited by J.D. Hooker in his two great New Zealand botanical treatises (1854; 1867), namely Bay of Islands and Port Cooper [Lyttelton]. E.F.L. Raoul has 12 bryophyte specimens cited by Hooker (1854; 1867), all from Akaroa. Occasional individual collections cited by Hooker (1854; 1867) match those in The Album, e.g., Sinclair collected *Hypnum bifarium* at 'Waikehi' (Hooker 1854: 96), and the same species was collected as #008 with locality 'Waiheki' in The Album, but no overall pattern of comparability has been found with the above collectors.

Two other plant collectors were ship-board travellers — the surgeons Dr David Lyall and Dr John Jolliffe on the ships *Acheron* and *Pandora* respectively, during the Great Survey of New Zealand (1848–1855), the first systematic and detailed maritime survey of the entire coastline and harbours of New Zealand (Byrne 2007; Maling 1999; McKinnon *et al*. 1997).

Admiralty policy at the time was to encourage 'the collection of information upon scientific subjects by the officers, and more particularly by the medical officers when upon foreign service' (Byrne 2007: 76). Both Lyall and Jolliffe were avid collectors, in accordance with Admiralty policy, and no doubt also with their own inclinations. Many bryophyte specimens were shipped back to Kew, becoming voucher specimens for study by Mitten, Wilson and Hooker (Hooker 1854, 1867). In his preface to the *Handbook of the New Zealand Flora*, Hooker (1867: 11) acknowledges 'Captain Stokes, R.N. in H.M.S. Acheron, [who] surveyed the coast of New Zealand …' and who 'was accompanied by Dr. Lyall, who made very large and excellent collections, especially of Flowerless plants [which include bryophytes], on various parts of the coast, but chiefly of the Middle [South] Island.' Hooker (1867: 11) also acknowledges 'Capt. Drury R.N., [and] Mr. Jolliffe, who contributed interesting and important collections which are embodied in the 'Flora Novae-Zelandiae'.' There is a handsome certificate, reproduced by Byrne (2007: 264), acknowledging the contribution of 'An interesting collection of Botanical Specimens for the Museum, collected by Mr Jolliffe from Commander Drury, collected in New Zealand.' and signed 'W.J. Hooker, Director, Royal Gardens Kew, July 2. 1853.'

We have focussed attention on the itineraries of these two ships, and the evidence provided by specimen collections from their surgeons.

The survey work was begun by the *Acheron* (1848–1851), a steam-powered paddle-wheeler of 722 tons, under the command of Captain (later Admiral) John Lort Stokes. Greatly to the disappointment of Captain Stokes (Byrne 2007: 54), the *Acheron* was paid off at the end of 1851, and David Lyall arrived back in England in 1852 (Lyall 2010: 35). The *Acheron* was replaced by H.M.S. *Pandora*, a 319-ton brig relying on sail alone, commanded by Captain Byron Drury (Byrne 2007; Maling 1999). The completed chart for the whole of New Zealand was an amalgamation of the work of the two ships, published as Chart No. 1212 by the Hydrographic Office of the Admiralty, 3 March 1856, reproduced by both Maling (1999: 151) and Byrne (2007: xiv) and available online as a corrected version (Great Britain Hydrographic Department 1874).

Details of the portions of the *Acheron-Pandora* Survey accomplished by each ship are given in contemporary accounts; e.g., for the *Acheron*:

> Large and detailed plans have been made of the Gulf of Shouraka [Hauraki Gulf], including Waimate [Waitemata], Waikeke [Waiheke], and the River Thames [Thames Estuary], Mercury Bay, Poverty Bay, Hawke Bay, all the ports and anchorages in Cook's Straits excepting the **Pelorus River** [authors' bold], Port Cooper [Lyttelton], Akaroa, Otago, Molineux Harbour [mouth of Clutha River], on the east coast of the Middle Island [South Island]; and the numerous and deep sounds on its south-west part, viz. Preservation Harbour, Chalky Bay, Dusky Bay, Doubtful Harbour, and that most remarkable feature of the coast, Milford Haven. (Anon. 1852).

And for the *Pandora*, Captain Drury noted in his report:

> The information is, with the exception of the report upon the Pelorus, confined to the Northern Island, as my predecessor, Captain Stokes, had been engaged upon the investigation of the coast of the Middle Island [South Island], and other southern portions of the Colony. (Drury 1854: 4).

A newspaper article (Anon. 1852) describes the coastline apportioned to each of the survey ships. On the withdrawal of the *Acheron*

> all that now remain to be done, as we are informed, are the following portions of the North Island, containing about 500 miles of coast:– The north extreme, from the Bay of Islands and the west coast to Cape Egmont, at the northern entrance of Cook's Straits, and a portion of the north-east coast between Tauranga and East Cape, with the ports of Wangarooa [Whangaroa], Okiahangtea [Hokianga], and False Okiahanga [False Hokianga = Herekino], Kiapara [Kaipara], and the entrance of Port Manukao [Manukau Harbour]. Cook's Straits require a little detail on the south shore, about Pelorus River.

The combined chart of this last region (a section from Admiralty Chart 2054) is reproduced in the *New Zealand Historical Atlas* (McKinnon *et al*. 1997: Plate 35), and clearly labelled 'Cook Strait, 1849–1851, Surveyed by H.M.S.V. *Acheron*, Pelorus Sound by H.M.S. *Pandora* 1853'.

In summary, evidence has been found that the *Acheron* visited the following five localities named in The Album: Waiheke, Mercury Bay, Poverty Bay and Waitemata (as Waimate) encompassing Auckland, and with River Thames [Thames Estuary] perhaps encompassing Coromandel, but did not include Pelorus.

Jolliffe, on the *Pandora*, visited all coastal localities given in The Album, as evidenced by his Diary (Jolliffe 1851–1856a), and summaries of his Medical Notebook and Journals (Coster 1980).

In addition, while visiting the Bay of Islands in September 1853, he drew two sketches of 'Kerikeri Falls', and a year later in September 1854 a sketch of 'Waitangi Falls.' No record has yet been found of his visiting Pakaraka further inland, at that time the farm of missionary Henry Williams (Louise Furey pers. comm. 2021) and a likely source of hospitality for pākehā visiting the Bay of Islands. William Colenso, albeit a prodigious walker, mentions walking from Kororareka on the coast in the Bay of Islands to Pakaraka and back within a day (Colenso [1839]: 166).

Thus, opportunities to collect in certain localities named in The Album were available to those on board both the *Acheron* and the *Pandora*, but with a more complete coverage for those on the *Pandora*.

In addition, evidence from specimens collected by the surgeons on the *Acheron* and the *Pandora*, gives further insight into who may have collected for The Album. Bryophyte sections in Hooker (1854) and Hooker (1867) are substantial, comprising pages 57–172 and 393–549 respectively. Although certainly providing an incomplete record of their individual collections, digital searches of these pages have given further relevant information.

A search for 'Lyall' revealed 179 mentions. Among the many localities for bryophyte specimens attributed to Lyall, only Auckland also features in The Album, and the species do not match.

A similar digital search for 'Jolliffe' or 'Joliffe' revealed 30 mentions, of which five match the species and locality in The Album (Table 3). Given that these species are common and widespread in New Zealand today, with the exception of *Sematophyllum jolliffii*, the matching of five records could be coincidental.

The chronology of the *Pandora* (Byrne 2007: 272) indicates that Pelorus was visited from 28 January to 25 March 1854. During that time Jolliffe undertook two overland journeys, firstly to Nelson and secondly to the Wairau Plains (Byrne 2007: 210, 211). William Colenso, in a letter to J.D. Hooker (St. George 2009: 306–307) mentions, somewhat disparagingly, Jolliffe (as 'Joliffe') collecting plants, thus:

> Waitangi, Hawke's Bay
> N. Zealand, Feby 23/55
> My dear Dr Hooker … A number of the Nelson Examiner (Cook's Straits Paper) of Jany. 6/55, now before me, contains an account of a 'Journey from the head of the Pelorus (River) to the Wairau Plains, by Mr Blackney', having annexed a 'Summary of the remarks of Dr Joliffe on the Botany &c., of that estuary'. Both gentlemen I presume belong to H.M.S. "Pandora". The Doctor's Botanl. list seems to contain but little novelty. He says – "The nikau palm … Of Mosses, Jungermanniæ, Liverworts & Lichens more than 140 kinds were collected, the greater No. of them [also] being found in the N. Island." He also gives a list (Native names) of Trees & shrubs: – all common. The Pandora is expected here shortly to survey; if I gain the Doctors' [*sic*] acquaintance, I will know his ferns &c, and report, but doubtless his collections will come under your eye.

Apparently, Colenso did not 'gain the Doctors' acquaintance'. No evidence has been found that these contemporary collectors ever met (Ian St. George pers. comm. 2021), nor that Colenso ever collected at Pelorus. The only mention of Pelorus in Colenso's voluminous letters, itineraries and notes compiled by St George (2009) is the single entry quoted above.

Direct examination of the newspaper (*Nelson Examiner and New Zealand Chronicle* 1855) referred to by Colenso, shows that, while there is detailed documentation by Jolliffe of some trees and shrubs, there is no list of the 'more than 140 kinds of Mosses, Jungermanniae, Liverworts & Lichens', rather, Colenso has quoted verbatim the statement in the newspaper. Nevertheless, this entry suggests that Jolliffe was not collecting at random but had the skill to distinguish more than 140 kinds of bryophytes and lichens. As a

Table 3. Comparable records in The Album and Hooker's New Zealand publications.[1]

| Album image | Album identification *[Modern identification]* | Album locality | Hooker Species (reference) | Hooker locality for Jolliffe specimen |
|---|---|---|---|---|
| #050 | *[ Wijkia extenuata]* | Pelorus | *Hypnum extenuatum* (1867: 482) | Pelorus |
| #075 | *[Sematophyllum jolliffii]* | Wangaroa | *Hypnum jolliffii*[2] (1867: 474) | Northern and Middle islands |
| #092 | Lencodon bartramodes[3] *[Cryptopodium bartramioides]* | Pelorus | *Cryptopodium bartramioides* (1867: 446) | Pelorus |
| #106 | Marchantia *[Marchantia foliacea]* | Hokianga River | *Marchantia foliacea* (1854: 168, 1867: 545) | Hokianga |
| #120 | Fissidens ligulatus[4] *[Fissidens asplenioides]* | Wangaroa | *Fissidens asplenioides* (1867: 407) | Wangaroa |

1 Hooker (1854, 1867)
2 Previously undescribed species named by Mitten in honour of Jolliffe
3 Earlier name, mis-spelt but correct identification
4 Earlier name, correct identification

collector, Colenso himself has had a mixed reputation. Bryologist George Scott described him as 'enthusiastic but indiscriminative' (Scott 1971: 739), and J.D. Hooker himself in writing to Colenso, states 'I assure you that miscellaneous scraps such as you sent and all so carefully numbered are not worth the time and trouble of looking over.' (St George 2009: 6). Notwithstanding this comment, Hooker dedicated his *Flora Novae-Zelandiae* to him along with Andrew Sinclair and David Lyall, and there are 749 mentions of Colenso's name in the published works (Hooker 1854, 1867). The present authors believe, that although a prodigious collector, Colenso lacked the delicacy needed to provide specimens of the calibre found in The Album, and for that reason alone would exclude him as its potential collector.

Postage of specimens by ship from New Zealand to England at that time was routine, as witness the numerous packages Colenso sent to Hooker (St George 2009). Hence the W.J. Hooker acknowledgment of Jolliffe specimens in July 1853, more than 2 years prior to the final departure of *Pandora* from New Zealand on 18 Feb 1856 (Byrne 2007: 273), is not anomalous.

Another possible collector for The Album on the *Pandora* is her master, Captain Drury. An electronic search for 'Drury' in Hooker (1854, 1867) revealed a single mention, as 'Capt. Drury, R.N.', in the list of people who 'contributed interesting and important collections.' (Hooker 1867: 11). Perhaps Captain Drury was listed only because of his role in sending Jolliffe's specimens to Kew.

Captain Drury's wife is another possible collector on the *Pandora*. Permission was granted by Francis Beaufort, Hydrographer of the British Admiralty, evidently with some reluctance, for 'Mrs Drury and her Maid Servants' to join the voyage on the *Pandora*. His letter to Captain Drury, reproduced by Byrne (2007: 89), states that 'although I cannot but think that wives are always productive of mischief while on board … I withdraw all opposition to y$^{r.}$ wish … but with the clear understanding that when once arrived on your station they are to reside on Shore.'

Whether this latter directive was obeyed is not known but mentions of Mrs. Drury in Jolliffe's transcribed diary (Jolliffe 1851–1856a) indicate that she did undertake some travel within New Zealand. On April 6th [1852] in Auckland, Jolliffe records 'This morning made some calls with Capt. and Mrs. Drury on several persons including Mrs. Wynyard, the Governor's lady.' While the *Pandora* was anchored at Waiheke to 'fill up with water which is very good and plentiful', members of the Travers family who were on another vessel anchored nearby 'came on board to dine with Captain and Mrs. Drury' (Jolliffe 1851–1856a: 30). Additionally, with her husband and Dr Jolliffe, Mrs Drury visited the mission station at Maraetai, Waikato Heads, staying with the missionary's wife for a week while the survey of that area was carried out (Byrne 2007: 158), and Archdeacon Williams' mission station at Whakato, near Gisborne (Byrne 2007: 159).

Relevant to speculation presented here on the identity of the collector for The Album is the knowledge that John Jolliffe prepared a personal album, 'New Zealand Mosses', with c. 185 pages of pressed specimens from various parts of New Zealand, now held in the Mitchell Library, Sydney (Jolliffe 1851–1856b), which could profitably be the subject of further research.

Examination of images of a few pages indicates that Jolliffe's personal album is not simply a duplicate of The Album, and furthermore the handwriting differs. Nevertheless, there are similarities; images from it reproduced by Byrne (2007: 217) include '*Hypnum marginatum*' the species featuring as specimen #078, in The Album, in both cases collected at 'Pelorus'.

## Assembler of The Album

The collector, assembler and identifier of specimens in The Album were not necessarily the same person. There is little evidence relevant to its assembly, except that, as there is no geographic order to the pages, it can be assumed that specimens were not mounted into The Album progressively during the voyage, but rather the assembler had all the dried material on hand. As noted above (David Ashman pers. comm. 2021), the specimens were added to a pre-bound album. Identification may have taken place after assembly of The Album, or while specimens were still loose between collecting sheets prior to mounting.

## Possible Identifiers for The Album

In contrast to the high quality of collecting and mounting, identification of the specimens has many shortcomings. There is an indication of some familiarity with bryophyte taxonomy, as authority names are sometimes appended. However, only 78 of 117 specimens of bryophytes are given any identification even to genus level, and there are 18 misidentifications (Table 1).

In some cases, misidentification could have been due to confusion between similar species, e.g., *Dicranum menziesii* (#012) is a misidentification for *Dicranoloma fasciatum*. The polysetous perichaetium and the sheathing perichaetial bracts, clearly seen, are good discriminating features between the species. *Dicranoloma menziesii* was not recognised by the identifier on another page (#069) but tentatively named '*Dicranum (setosum)?*'. *Dicranoloma fasciatum* was known at the time, collected in the Bay of Islands by both J.D. Hooker and Sinclair (Hooker 1854: 66). *Dicranum setosum* has a description and reference to an illustration (Hooker 1854: 66), so information for full identification was available at that time. *Dicranoloma* was later segregated from *Dicranum* (section *Leucoloma*) for the mainly Southern Hemisphere members of the genus (Klazenga 2003), so is a trivial distinction in the present context.

*Hypnum smithianum* (= *Leptodon smithii*) (#013) is misidentified *Hypopterygium didictyon*. The palmate fronds and elongate setae readily distinguish *H. didictyon* from *L. smithii*.

Two specimens are identified tentatively in The Album as *Hypnum spininervium* (#054, #064). The former specimen is the closely related *Hypnodendron arcuatum*, but the latter is the more distantly related *Camptochaete deflexa*.

*Racomitrium Spectabile* (#051) for *Racopilum spectabile* is perhaps a case of name confusion between two completely unrelated mosses.

The lack of identification of mosses in the Polytrichaceae, a family of large and distinctive species, would be surprising in a scholarly work. Of the four specimens in The Album, two are correctly identified as *Polytrichum commune* (#042 and #096). Two others are unnamed; the specimens of *Polytrichadelphus magellanicus* (#036) and *Pogonatum subulatum* (# 056) are both readily identifiable from the stature of their shoots, shape of the capsules, and the stance of the dry leaves.

Among the liverworts, catch-all generic names, *Jungermannia* for the leafy liverworts and *Marchantia* for the thallose species, have been applied without further identification. The distinctive *Chandonathus squarrosus* (#28) is un-named, even although the earlier synonym *Jungermannia squarrosa* (Hooker 1854: 127) was available.

Several names in the Album have spelling errors e.g., *Bartramia tormentosa* [*tomentosa*] (#034), *Lencodon bartramodes* [*Leucodon bartramioides*] (#092) and *Leskia* [*Leskea*] *ericoides* (#040), but *Leskea concinna* (#081) is correct. These examples perhaps indicate that the scribe did not have a good knowledge of the names.

Overall, it is likely the identifications were not the work of an expert; the inclusion of two seaweeds and one flowering plant without comment supports this view. We conclude that neither The Album, nor its contents before mounting, passed through the hands of W.J. Hooker nor his son J.D. Hooker at the Royal Botanic Gardens, Kew. Nor is it likely to have been seen by William Wilson, Britain's leading bryologist in the mid-19th century (Lawley 2008), nor by William Mitten who was also recognised as a leading British authority on bryophytes at that time, 'supported (and paid) by the Hookers at Kew' with a 'focussed and broad knowledge of global mosses and liverworts' (Scott 2019).

The identifier/s must have been of lesser stature and, with the handwriting not identified, we are unable at this stage to ascertain who may have identified the specimens in The Album. If John Jolliffe was the collector, it may be that, although primary collections went to Kew, and others went to his personal album, specimens in The Album are duplicates/spares too good to throw away. These may have been identified by himself, perhaps as loose notes with the specimens, or by another botanist. Although Jolliffe must have had a very good collecting eye, we do not yet know how skilful he was as an identifier. Study of his personal Album (Jolliffe 1851–1856b) could shed further light on these unknowns.

## CONCLUSION

There is good evidence that the specimens in The Album were collected from H.M.S. *Pandora* during the Great Survey of New Zealand, 1851 to 1855, and the most likely candidate is the ship's surgeon, John Jolliffe. This conclusion is supported both by contemporary sources (Anon 1852; Colenso [1839]; Drury 1854; Great Britain Hydrographic Department 1874; Hooker 1854, 1867; Jolliffe 1851–1856a, b; *Nelson Examiner and New Zealand Chronicle* 1855), and by authoritative modern accounts (Byrne 2007; Maling 1999; McKinnon *et al*. 1997). Those records show that the ship, or Jolliffe himself, visited all localities named in The Album, except Pakaraka. The date when *Pandora* worked the coasts of New Zealand, from 1851 to 1856, is compatible with the dates for The Album derived both from the bryophyte names used i.e., between 1854 and 1867, and from structural features of the book itself, given by appropriate experts as mid to late 19th century.

It is established that Jolliffe was a prodigious collector of New Zealand mosses and liverworts that found their way to the Hookers of Kew, and for which he was given individual thanks by both W.J. Hooker (Byrne 2007: 264); and J.D. Hooker (Hooker 1867: 11). The existence of a substantial personal album of 'New Zealand Mosses' (Jolliffe 1851–1856b), not yet examined in detail, further attests to his zeal as a bryophyte collector and herbarium maker.

The quality of the specimens in The Album, including delicate and ephemeral fruiting structures, is impressive. However, from the errors and omissions in the naming of the specimens we suggest that it did not pass through the hands of any of the foremost bryologists of the day. Nevertheless, this volume is a significant record of the non-vascular flora at a time when bryological exploration of New Zealand was still in its infancy.

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**APPENDIX 1:** URL links to each image number.

| Image Number | URL – hyperlink |
|---|---|
| #006 | https://commons.wikimedia.org/wiki/File:New_Zealand_Mosses_Am_media-v-838736.jpg |
| #007 | https://commons.wikimedia.org/wiki/File:New_Zealand_Mosses_Am_media-v-838737.jpg |
| #008 | https://commons.wikimedia.org/wiki/File:New_Zealand_Mosses_Am_media-v-838738.jpg |
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# Vegetation, vascular flora, and fauna of Motueka and Poikeke Islands, Eastern Coromandel Peninsula, Northeast New Zealand

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**Abstract**
The vascular flora, vegetation and fauna of Motueka and Poikeke Islands, eastern Coromandel Peninsula, northeast New Zealand, are described based on five visits to the islands during 1989, 2004–2008. Their combined flora totals 107 vascular species (76% indigenous) and 6 bryophytes. Seven vegetation associations are described. The islands lie 0.9 km off the coast and possess a rich indigenous vascular flora including both typical mainland and island species. The vegetation is in an advanced stage of succession after past disturbances, although there were recent rockslides on Motueka. Twenty-six naturalised vascular species are present, but only four of these are considered environmental weeds. Twenty-four species of birds, Norway rat, one possible historic reptile observation and brief observations on invertebrates are reported. A kōrero on the cultural origin of the islands is included.

**Keywords**
Motueka; Poikeke; islands; eastern Coromandel; vegetation; vascular flora; weeds; seabirds; Norway rat.

## INTRODUCTION

New Zealand's offshore islands are important habitats for endemic flora and fauna, supporting some relict populations (Towns & Ballantine 1993; Gibbs 2016). Conservation biology has focused on islands because some ecological processes are less altered on them and because they can be restored by reducing or eliminating pressures on them, especially from invasive plants and animals (Towns *et al.* 1997). Islands in northern New Zealand have also been important for Māori as sites of permanent settlement or seasonally occupied and managed for crops and harvests of resources such as seabirds (Bellingham *et al.* 2010). Therefore, restoring islands needs an information base of understanding the islands' histories and biogeography. It is important to document islands' floras and faunas since they are likely to be dynamic as successions occur on them (Wilmshurst *et al*. 2014) and since distributions of many species are poorly understood (Chapple & Hitchmough 2016; Gibbs 2016).

In this study we document the flora and fauna of two northern New Zealand islands for which there is little published information, and which have some floristic features that are unexpected, often thought more typical of islands further from the mainland. Motueka and Poikeke are islands that lie 0.9 km off Cathedral Cove on the eastern coast of the Coromandel Peninsula, 2.0 km north of Hahei, at 36° 49′ S, 175° 48′ E (Fig. 1). The smaller island, Poikeke, is 150 m southwest of Motueka and is joined by a rocky reef exposed at low tide (Fig. 2). Motueka covers 6.0 ha (Taylor 1989) and measures approximately 500 m × 180 m (long axis roughly west–east), highest point 66 m ASL. Poikeke (1.0 ha), is roughly oval, 150 m long × 70 m across, and 22 m ASL and is marked as a pā site on the topographic map (NZ Topo50 BA35-Whitianga). The islands lie within the 900 ha Te Whanganui-A-Hei (Cathedral Cove) Marine Reserve which was gazetted in 1992. Both islands are eroded remnants of a rhyolite dome that erupted during the Miocene, 7–8 Ma, and are composed entirely of


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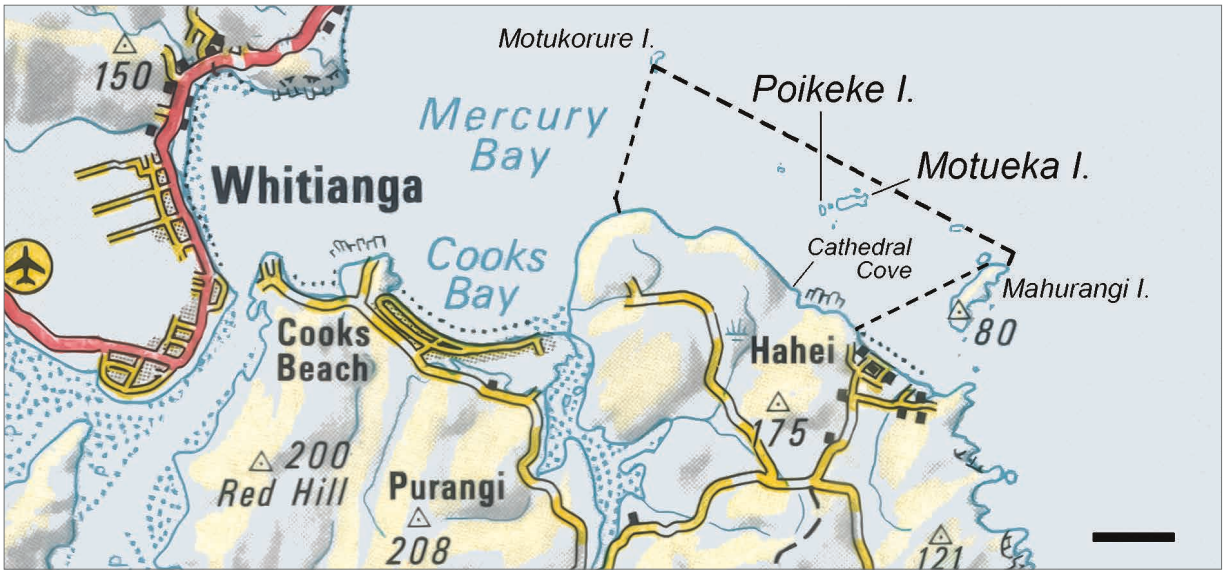


Figure 1. Location of Motueka and Poikeke Islands and boundary of the Te Whanganui-A-Hei (Cathedral Cove) Marine Reserve off Cathedral Cove (marked by - - -), eastern Coromandel Peninsula. Topo map (1:250000) modified by Joshua Salter. Scale bar = 1 km

Figure 2. Poikeke viewed from Motueka at low tide showing the exposed connecting intertidal reef. Photo: 21 Mar 2008. Unless otherwise stated all photos are by EKC.

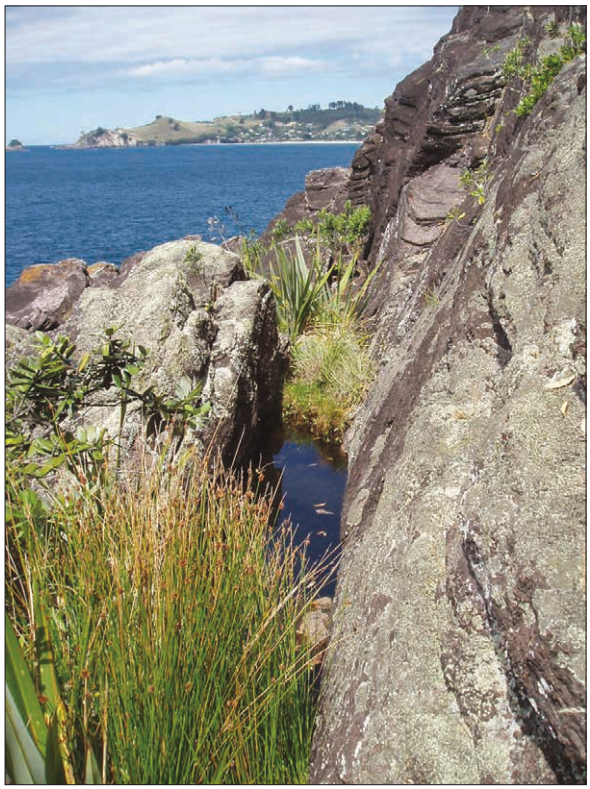

Figure 3. A few brackish rock pools with associated vegetation of *Ficinia nodosa*, stunted pōhutukawa, *Isolepis cernua* and harakeke at the eastern end of Motueka just above the high tide level was the only free water observed. Photo: 1 Mar 2005.

Figure 4. EKC and PJB being rowed by David Towns from the boat to the northern rocky shore of Motueka. The lack of beaches made landing challenging at times but their absence has helped to protect both islands from human visitors. Photo by M.S. Durrett: 17 Apr 2004.

flow-banded rhyolite (Moore 1976, Phil Moore pers. comm., 2006). Much of the islands is steep and quite eroded with many loose rocks, making it difficult to traverse the steeper slopes. Rockfalls appear to be frequent. Except for a few brackish rock pools just above the spring high tide level at the east end of Motueka (Fig. 3), no other sources of water (e.g., small streams, seeps) were seen during our summer-autumn visits. The rocky islands' coastline is devoid of beaches (Fig. 4).

Motueka and Poikeke are places of spiritual, cultural, customary, ancestral and historical significance to Ngāti Hei, who have mana whenua over these motu, and which are administered by the Ngāti Hei Trust.

> Tu ana i te takere nui o te waka Te Arawa ee
> Ko wai – ko wai
> I te taumata tanga a Tangaroa ee
> Ki uta ngā manu, tohorā ki tai
> Ka poua, poua, poua te toko
> Hei, Waitaha,Tuhukea nei
> Ko wai ko wai
> Ngā uri a Pūhaorangi nei
> Kia ita, kia ita, kia ita ee hii!

In ancient times, Motueka was commonly known as Te Kuraetanga o taku Ihu, named by Hei, a rangatira (chief). It was common for highborn rangatira to proclaim islands and everything in proximity by comparing or likening such landmarks to the tapu of their own physical attributes: in the case of Motueka to the tā-moko radiating from the bridge of his nose (the kōrero is further detailed in Appendix 1).

Lieutenant James Cook landed on Poikeke, without the botanists Joseph Banks and Daniel Solander, on 15 November 1769 when it was an occupied island pā and commented on its occupation (Beaglehole 1955, Moore 1976, see Appendix 2). When Joseph Banks passed near Motueka, the name he recorded was Motu Iki (Beaglehole 1955: p.201 footnote); it has also been referred to subsequently as Pigeon Island (see Moore 1976 for a discussion about names for the island). Ngāti Hei prefers Motueka as its current name.

## METHODS

Motueka and Poikeke Islands were visited by four of the authors on five occasions during 1989, 2004–2006. GAT and AJDT participated in an informal three-day survey of several of the islands off Cathedral Cove in March 1989, including Motueka (3 hrs on 4–5 March) and Poikeke (1 hr 15 mins on 3–4 March), recording vascular plants, birds and trapping for rodents. EKC and PJB were part of a group of 4–7 people that visited Motueka on 17 April 2004 (5 hrs), 1 March 2005 (6 hrs),

Motueka and Poikeke on 2 March 2006 (6 hrs), and NW Motueka 21 Feb 2008 (1 hr). The main purpose of the latter visits was to set up and record data from four 10 ×10 m forest plots on Motueka as part of a Marsden Fund project 'Impacts of alien organisms on ecosystem function' (Fukami *et al.* 2006), while one of us (EKC) searched the islands widely in an attempt to record the vascular flora, different vegetation types, avifauna and miscellaneous biota. Sixty-six vascular plant and bryophyte vouchers collected by the authors are housed in the Auckland Museum herbarium (AK). Additional observations were made in October 2021 by Department of Conservation staff (Claire Wooldridge and Marie Everth pers. comm. 2021) on Motueka of a vascular plant, rat and nesting seabirds.

Plant names largely follow Ngā Tipu o Aotearoa – New Zealand Plants (https: nzflora.landcareresearch.co.nz, accessed 10 October 2021), and bird names largely follow the Checklist of the Birds of New Zealand (Gill *et al*. 2010).

### Previous published biological records and collections

Little has been previously published on the flora or fauna of Motueka or Poikeke Islands apart from a brief forest canopy description, three species of seabird bones and a rat bone all recorded on Poikeke, and a possible historical tuatara (*Sphenodon punctatus*) observation on Motueka (Moore 1976). Based on GAT and AJDT's visit, Waugh *et al*. (2013) recorded the breeding of tītī/sooty shearwater (*Ardenna grisea*) on Poikeke, and Miskelly *et al*. (2019) recorded hundreds of ōi/grey-faced petrel burrows (*Pterodroma gouldi*) on Motueka and Poikeke and Norway rat (*Rattus norvegicus*) on Poikeke. The only previous collection of any kind located were land snails (*Rhytida greenwoodi*) collected on Motueka in 1947 held in Museum of New Zealand Te Papa Tongarewa.

Our observations and collections are combined and presented below, including the previous records and collections.

## RESULTS

### Vegetation of Motueka

Both islands are steeply cliffed with little vegetation on their north, east and west sides, apart from one steep forested valley on the NW side of Motueka (Fig. 5). However, the southern sides and the summit ridges of both islands are generally well-forested almost to sea level (Fig. 6). Seven vegetation communities on Motueka and a general account of Poikeke are described below. The two broadleaf forest areas on Motueka and the summit forest of Poikeke are more advanced in their succession than the rest of the islands' vegetation. Past disturbances would include pre-European clearing by Māori, fire, windthrow, slumping and general erosion. The 1944 aerial photograph (966/51, NZ Aerial Mapping Ltd) is poor quality because of shadowing; however, it does indicate a similar amount of forest cover as the period of our surveys.

The islands are prone to summer–autumn droughts as witnessed during our April 2004 and February 2008 visits with some woody species exhibiting wilting and

Figure 5. Oblique aerial view looking SSW over Motueka Island (foreground) with Poikeke to the right (near high tide); Hahei Beach behind, Coromandel Peninsula. Photo: Lloyd Homer, GNS Science # 64289, Feb 1976. Reproduced with permission.

Figure 6. Motueka and Poikeke Islands near high tide, showing their well-forested southern sides, looking due north, from Cathedral Cove carpark road. Photo: 18 Jan 2015.

leaf loss, e.g., hangehange (*Geniostoma ligustrifolium*), māhoe (*Melicytus ramiflorus*) and rangiora (*Brachyglottis repanda*). Also, the six dead tree fern (mamaku *Cyathea medullaris*) bases were probably a result of a previous drought. A similar die-off of tree ferns on Te Haupa/Saddle Island (Hauraki Gulf) was blamed on droughts, and it was speculated that these species may be unable to persist on islands that lack permanent freshwater (Tennyson & Taylor 1999).

### Broadleaf forest south-facing slope

The canopy of the south-facing forest on a rocky slope (c. 30º) was 6–8 (–10) m tall, containing kohekohe (*Didymocheton spectabilis*), karaka (*Corynocarpus laevigatus*), māhoe, whārangi (*Melicope ternata*), tawāpou (*Planchonella costata*), pūriri (*Vitex lucens*) and parapara (*Ceodes brunoniana*). The rocks piled up to 1m high on the uphill side of the largest tree found, a pūriri c.1m in diameter (Fig. 7), indicated the instability of these slopes. The main understorey shrubs were kawakawa (*Piper excelsum*), hangehange, coastal karamū (*Coprosma macrocarpa*), rangiora and houpara (*Pseudopanax lessonii*) – the latter three species more common in forest gaps. Forest composition and structure in two, subjectively placed 100 $m^2$ plots in this forest type is detailed in Appendix 3. The main ground plant amongst the rocks was huruhuruwhenua/shining spleenwort (*Asplenium oblongifolium*) and less commonly *Pteris carsei*. Seedlings of most of the canopy species were present except pūriri. Taupata (*Coprosma repens*) and karo (*Pittosporum crassifolium*) c. 4 m tall dominated the coastal fringe.

Figure 7. Rocks piled up on the uphill side of the largest pūriri seen (c.1 m DBH), lower-mid slope, south side of Motueka. Photo: 1 Mar 2005

### Broadleaf forest north-facing slope

Between tall pōhutukawa (*Metrosideros excelsa*) (c.16 m tall) there was an even canopy c.10 m tall on a steep face of kohekohe, parapara, māhoe and locally tūrepo/large-leaved milk tree (*Streblus banksii*); with a shrub layer of kawakawa, coastal māhoe (*Melicytus novae-zelandiae*), houpara and rangiora; and ground cover of huruhuruwhenua, houpara seedlings and, very locally, *Pteris carsei*. Seabird burrows were locally common. Forest composition and structure in two subjectively placed 100 $m^2$ plots in this forest type is detailed in Appendix 3.

### Pōhutukawa forest

The tallest vegetation on the summit plateau east of the middle of the island was pōhutukawa 8–14 m tall, with some trees reaching c. 22 m tall, with individual stems 25–50 cm diameter and one with a basal diameter of 1.5 m. All pōhutukawa were branched from near the base, indicating that they had established in the open. On the western margin of this pōhutukawa canopy and sloping down to the south was a pure stand of karo c. 8 m tall. Below this pōhutukawa and karo canopy was a gap (Fig. 8) down to a dense shrub layer 1–2 m tall. This layer was dominated by coastal karamū, with coastal mahoe, rangiora, houpara, hangehange, and sapling kohekohe, māhoe and karaka. Kōwharawhara (*Astelia banksii*), huruhuruwhenua, rengarenga (*Arthropodium cirratum*) and harakeke/flax (*Phormium tenax*) were the main groundcover species. Because the karo stems in the subcanopy were even-sized they could be a cohort that germinated and grew beneath the pōhutukawa canopy, possibly in response to a disturbance event that opened the canopy, e.g., a wind storm, after which the canopy has since regrown. The karo cohort is probably <30 years old, based on stem size and likely growth rates.

#### Exotic pines

At the eastern end of the island a stand of naturalised maritime pines (*Pinus pinaster*) was present, estimated to number 30 trees 1.5–10 m tall, on a rocky clifftop down to sea level. The larger trees were on the upper slopes (Fig. 9). Tiny seedlings were frequent, mainly on the lower open slopes. The understorey was open with occasional shrubs of karo, houpara and pōhutukawa. Pine needles and bare rock dominated the ground, with a scattering of danthonia species (*Rytidosperma* spp.) and *Asplenium haurakiense*. Away from this locality only one other pine was seen on the island – a seedling near the middle of the summit plateau.

#### Cliff scrub

The eroding north-facing steep (c. 60º) slopes supported a variety of shrubs and herbaceous species. The two main shrubs were pōhutukawa (to 6 m tall) and karo (1–2 m tall); houpara (Fig. 10), coastal māhoe and coastal karamū were also present. The main smaller species, often on narrow ledges, included ferns (huruhuruwhenua, *Asplenium haurakiense*), grasses (cocksfoot *Dactylis glomerata*, danthonia species); native spinach

Figure 8. A 6 m-vegetation gap between 8 m-tall karo canopy with a dense shrub layer < 2 m tall dominated by coastal karamū. Mid-Motueka, upper S-facing slope. Photo: 1 Mar 2005.

Figure 9. Invasive maritime pines to 10 m tall and with cones, eastern end of Motueka among pōhutukawa. Photo: 1 Mar 2005.

Figure 10. Houpara, one of the commonest woody plants, with young fruit. Photo: 1 Mar 2005.

(*Tetragonia trigyna*), *Peperomia urvilleana*, knobby clubrush (*Ficinia nodosa*), herbaceous daisies (*Senecio hispidulus*, *Hypochaeris radicata*), and low shrubs of koromiko (*Hebe pubescens*) near the clifftops.

### Summit scrub

On the western side of the summit on level land was a shrubland, 1.5–2.5 m tall, measuring c.8 × 5 m, dominated by mingimingi (*Leucopogon fasciculatus*) and rārahu/bracken (*Pteridium esculentum*), with occasional māpou (*Myrsine australis*), houpara, kōwharawhara and a tawāpou. A few other ferns (huruhuruwhenua and *Asplenium haurakiense*) were present. The shrubland margin was dominated by taller pōhutukawa and whārangi. It is interesting that there is no tea tree (*Leptospermum* or *Kunzea* spp.) present and mingimingi appears to be locally filling that ecological gap. The low stature of the vegetation and the presence of rārahu indicates some type of recent disturbance, possibly a local fire or a storm uprooting vegetation.

### Disturbed site from a recent rockslide

At the foot of tall cliffs by the western end (north side, Fig. 11) was a disturbed site from a rockslide through a coastal fringe forest c. 6 m tall on a talus slope 6–10 m across. Several paths c. 4 m across had been flattened through the forest (Fig. 12), which included pōhutukawa, karo, houpara, taupata, parapara and a low ngaio (*Myoporum laetum*). Judging by the vegetation, the disturbance was perhaps 2–4 years before our visit in 2004. The rocky disturbed area was dominated by pōporo/small-flowered nightshade (*Solanum americanum*) (Fig. 13), *Senecio hispidulus*, and fleabane (*Erigeron sumatrensis*); with occasional lush plants of inkweed (*Phytolacca octandra*), catsear (*Hypochaeris radicata*), native grasses (*Anthosachne kingiana* and *Dichelachne crinita*), harebell (*Wahlenbergia vernicosa*), mats of native spinach, a few clumps of island cutty grass (*Cyperus insularis*) and a single young plant of poroporo (*Solanum aviculare*).

### Vegetation of Poikeke

Unlike Motueka, Poikeke is a flat-topped island (probably levelled by Māori – see Appendix 2), and gently slopes down to the south side, but is otherwise steeply cliffed. The plateau forest canopy is dominated by tawāpou with abundant houpara usually of less stature than the tawāpou (Fig. 14), the former with many broken heads, reaching c. 12 m-tall and stems to 40 cm DBH, and houpara to 8 m and 30 cm DBH. Coastal karamū, māhoe, and hangehange are also present. Karo 4–5 m tall was common near clifftops along with smaller plants of coastal māhoe and emergent pōhutukawa 10(-12) m tall. Huruhuruwhenua is the dominant ground fern among the abundant petrel burrows. A single maritime pine was noted. Moore (1976) recorded a mixed forest 5–10 m tall, including karaka, pōhutukawa and five-finger (as *Neopanax arboreus* (= *Pseudopanax arboreus*) – not seen by us, more likely to be *Pseudopanax lessonii*, the commonest woody plant present).

### Observations on islet on east side of Poikeke

The narrow islet c. 4 m asl and 12 m long (Fig. 15), lying 10 m off the east side of Poikeke was briefly surveyed on 2 March 2006. Ten vascular species were recorded (listed in Appendix 4), all were indigenous and included native sea spurrey (*Spergularia tasmanica*). Prostrate taupata and karo to 1.5 m tall were the only woody species present. All these species are reasonably tolerant of saltwater. Two old gull nests were observed, most likely karoro/black-backed gull (*Larus dominicanus*), and the abundance of guano suggested the islet was a popular seabird roost.

## Flora

### Vascular flora of Motueka and Poikeke

The combined vascular flora of both islands is 107 species (76% are native species), Motueka has 105 species (75% native), and Poikeke 61 species (84% native) (see Table 1 and Appendix 4). Forty percent of

Figure 11. Recent rockslides were evident through the fringe forest on the talus slope at the foot of the summit cliffs by the western end of Motueka. Photo looking SE: 1 Mar 2005.

Figure 12. Recent rockslide, involving boulders to c. 1 m across, breaking and flattening branches through the coastal forest fringe of pōhutukawa, karo, houpara, taupata, parapara and ngaio on the talus slope below the cliffs. East end of Motueka, north side. Photo: 2 Mar 2006.

the species records are supported by herbarium vouchers held in the Auckland Museum (AK, and listed in Appendix 4). Unsurprisingly the larger island supports the larger flora, in fact 46 species (43%) were only on Motueka, 59 species (54%) were present on both islands. One species (*Adiantum cunninghamii*) was found only on Poikeke and another (*Spergularia tasmanica*) only on the islet on the eastern side of Poikeke.

## The 'island' element of the flora

The flora of Motueka and Poikeke has two different northern New Zealand elements to it. The occurrence of unnamed large-leaved forms on northern offshore islands of common mainland 'normal-leaved' forms of shrubs and trees has been commented on by Hamilton and Atkinson (1961), Beever (1986), Taylor (1986) and Cameron and Young (2019). Three species, rangiora,

Figure 13. The path of the rockslide was dominated by herbaceous species, especially pōporo/small-flowered nightshade and fleabane. Note – poroporo bottom left. East end Motueka north side. Photo: 2 Mar 2006.

Figure 14. Tawāpou and houpara dominated forest on the flat summit of Poikeke. Photo: 2 Mar 2006.

Figure 15. Narrow islet on east side of Poikeke at around mid-tide, supported a vascular flora of 10 species, all indigenous, including native sea spurrey which was not recorded on the two main islands. Photo: from Poikeke with Motueka in the background: 2 Mar 2006.

Table 1. Vascular flora totals of Motueka and Poikeke Islands according to plant groupings and native or naturalised status.

| Plant group | Motueka | Poikeke and Poikeke islet | Combined |
|---|---|---|---|
| Native ferns | 9 | 6 | 10 |
| Native dicot trees and shrubs | 26 | 16 | 26 |
| Native dicot herbs | 16 | 12 | 17 |
| Native climbers and related trailers | 5 | 3 | 5 |
| Native monocots (except sedges & grasses) | 8 | 3 | 8 |
| Native sedges | 7 | 5 | 7 |
| Native grasses | 8 | 6 | 8 |
| Naturalised conifers | 1 | 1 | 1 |
| Naturalised dicot trees and shrubs | 3 | - | 3 |
| Naturalised dicot herbs | 13 | 8 | 13 |
| Naturalised monocots: grasses | 9 | 1 | 9 |
| Totals (% native) | 105 (77) | 61 (79) | 107 (76) |

taurepo (*Rhabdothamnus solandri*) and kawakawa in northern New Zealand frequently have larger leaves on these islands than occur on their mainland counterparts. Sapling rangiora had leaves to 422 × 306 mm in length and width, with a petiole to 140 mm. This is shorter but wider than large leaves recorded from Tuhua/Mayor Island in the outer Bay of Plenty by Taylor (1986) where the leaf lamina measured 545 × 265 mm. Kawakawa with overlapping leaf bases and generally larger and shinier leaves on Motueka and Poikeke than the mainland plants is the undescribed 'Hauraki Gulf form' of Gardner (1997) that occurs from the Hauraki Gulf south to Tuhua/Mayor Island (Gardner 1997; Rhys Gardner, pers. comm. 2008). Taurepo all had rather orbicular leaf blades to 60 × 46 mm, which are comparable to the leaf size from Taranga and Hauturu Islands, the largest leaves recorded (cf. Beever 1986, fig. 1).

There is another group of northern 'island' species that are now mainly restricted to offshore islands because of their subtropical nature and/or because rodent browsing has all but eliminated them from the adjacent mainland coast. On Motueka and Poikeke these include coastal māhoe, tūrepo/large-leaved milk tree, parapara (Fig. 16) and tawāpou. The attractive ground fern *Pteris carsei* could also be included here because it is most common and most luxuriant on the islands of northeast New Zealand. However, it also occurs less commonly on the mainland generally as far south as Awhitu on the west coast and southern Coromandel Ranges/Bay of Plenty on the east coast (Brownsey *et al.* 2020) where the plants are generally smaller and hybridisation with *P. saxatilis* can be frequent (EKC pers. obs.).

Figure 16. Parapara with large leaves and green fruit (centre), tawāpou behind and pōhutukawa foreground. Forest, west end Motueka on north side. Photo: 21 Feb 2008.

### Bryophytes

Five mosses and a liverwort were collected from Motueka during our visits. These were later identified as: *Fissidens curvatus* var. *curvatus* (AK 287913), *Frullania solanderiana* (AK 286204), *Macromitrium brevicaule* (AK 290053), ?*Rhynchostegium tenuifolium* (AK 286207, 301800), *Sematophyllum homomallum* (AK 290052) and *Thuidiopsis furfurosa* (AK 288305). This list will be far from complete.

## Vertebrate Fauna, Miscellaneous Invertebrates and a Fungus

### Rats

Based on field work in 1971–72, Moore (1976) recorded a pelvic bone of a rat (*Rattus* sp.) on Poikeke. GAT & AJDT trapped an adult female and an immature female Norway rat (*Rattus norvegicus*) on Poikeke, and they also had mouse and rat traps sprung without catching any rodents on Motueka in March 1989. Evidence of rats was present on both islands during our 2004–08 visits: droppings (matched the size typical of Norway rats), ground husking stations of chewed karo and houpara fruit, and tips of fleshy horokaka /native ice plant (*Disphyma australe*) leaves appeared to be chewed by rats (Fig. 17). Department of Conservation staff (Marie Everth pers. comm. 2021) noted evidence of rats still being present on Motueka in October 2021.

Figure 17. The damaged tips of fleshy horokaka/native ice plant suspected to have been chewed by Norway rats. Lichen-encrusted coastal rocks Poikeke, 2 Mar 2006.

### Birds

A total of 24 bird species were recorded on or next to Motueka and Poikeke Islands; 20 are native and four are exotic species (see Appendix 5). In 1971–72 Moore collected bones of kuaka/common diving petrel (*Pelecanoides urinatrix*), ōi/grey-faced petrel and probable kawau tikitiki/spotted shag (*Stictocarbo punctatus*) on Poikeke (Moore 1976). Department of Conservation staff (Marie Everth pers. comm. 2021) observed an ōi/grey-faced petrel egg (rat-chewed) and adult ōi feathers on Motueka in October 2021. All other observations were made during our combined visits.

### Reptiles

Reptiles were not seen during our visits, but Moore (1976) reported on an apparent sighting of tuatara (*Sphenodon punctatus*) on Motueka by Mr H. Harsant in the 1910s–1920s. JJD is unaware of tuatara ever being on Motueka.

### Miscellaneous invertebrates

The land snail, *Rhytida greenwoodi* was collected by F.G. Thomson & K. Thomson (A.C. O'Connor collection), March 1947, Motueka, 4 vouchers, Te Papa M.115512. Occasional shells of this indigenous snail in NW-facing forested slopes on Motueka were found eroding out of a talus slope at the western end of the island (April 2004).

Kutukutu/antlion lacewing (*Weeleus acutus*) larval traps in soft dry soil were locally common on the south end of Poikeke (March 2006).

The white butterfly (*Pieris rapae*) was seen in a shrubby area, clifftop near summit, Motueka (March 2005), perhaps attracted to the wild turnip (*Brassica rapa* subsp. *sylvestris*).

The honeybee (*Apis mellifera*) was seen in a shrubby area, clifftop near summit, Motueka (March 2005).

The German wasp (*Vespula germanica*) was seen in a shrubby area, clifftop near summit, Motueka (March 2005).

Salt pool mosquitos (*Opifex fuscus*) were present in the brackish rock pools at the east end of Motueka (March 2005).

### Fungus

Orange pore fungi (*Favolaschia calocera*) were present on wood in forest, Motueka (March 2005).

## DISCUSSION

## Flora

### Environmental weeds

Of the 26 naturalised exotic species recorded on the island only four would qualify as environmental weeds warranting control: maritime pine, needlebush (*Hakea sericea*), boxthorn (*Lycium ferrosissimum*) and loquat (*Rhaphiolepis bibas*). Apart from loquat the other three species require open sites, and because of the eroding nature of the steep faces Motueka will permanently have open sites and be prone to invasion of such weed species from the adjacent mainland. Being closer to the mainland, Poikeke has the potential to act as a stepping-stone for some weed species. However, the distribution of the four environmental weeds, which were all confined to Motueka except for a single maritime pine, suggests this was not the case for these four species.

Maritime pines were common on the adjacent mainland cliffs, and they are the most likely source of wind-blown seed. They have established on the most distant end of Motueka from the mainland, which presumably is related to that end being more open than the rest of this island and Poikeke, and therefore more prone to pine invasion. They are presumed to be a recent arrival because they were not observed in 1989. The presence of these pines increases the island's fire risk (Perry *et al*. 2014; Wyse *et al*. 2018).

Needlebush was locally common along the north side of the rather open ridge east of the summit and a single plant grew near the east end. Its seeds are wind-blown. All plants in the 2000s were <1 m tall. The species was also recorded in 1989 as 'several shrubs on steep open site'. It was not recorded on Poikeke. Needlebush also increases the fire risk (Perry *et al*. 2014; Wyse *et al*. 2018).

Boxthorn was present as a single group of c. 8 unhealthy looking plants to 3 m tall at the east end of Motueka Island. The species was also recorded in 1989 as a 'local patch'. It was not recorded on Poikeke. Boxthorn is usually spread by frugivorous birds eating the small fleshy fruit – tūī, blackbird, starling, silvereye and kererū were all recorded on these islands.

Loquat was recorded after our visits as a single well-established seedling in the mid-forested slope on the south side of Motueka and uprooted by Department of Conservation staff (Claire Wooldridge pers. comm. 2021) in October 2021. Kererū are the most likely seed vector and they were observed both times when the southern forest of Motueka was visited by EKC & PJB (April 2004, March 2005).

Because of their proximity to the mainland Motueka and Poikeke are biologically connected to the mainland. They are well within the reach of wind-blown seeds, birds with seed ingested or attached externally, or floating seeds on inshore currents. Environmental weeds present on the adjacent mainland coast which pose a threat to Motueka/Poikeke (EKC pers. obs., Jan 2015) include: coastal banksia (*Banksia integrifolia*), cotoneaster (*Cotoneaster glaucophyllus*), Chinese privet (*Ligustrum sinense*), polygala (*Polygala myrtifolia*), blackberry (*Rubus fruiticosus* agg.), veldt grass (*Ehrharta erecta*), and pampas grasses (*Cortaderia jubata*, *C. selloana*). The nearby town of Hahei, only 2 km distant, has a resident population of c. 300 people and a large pool of garden plant species, including the phoenix palm (*Phoenix canariensis*). Sullivan *et al*. (2005) showed that there is a correlation between the numbers of weeds in native forest fragments in northern New Zealand and the distance to the nearest large town. Loquat recently reaching Motueka shows this danger – could phoenix palm be next? Phoenix palm is known to naturalise on small northern islands in the Hauraki Gulf (Cameron 2010: fig. 18, Cameron 2021) and has locally established on the coast east of Whitianga (Fig. 18).

### Indigenous flora

Just as Motueka is subject to arrivals from the adjacent mainland of exotic species (see above), native species are also likely to be arriving. Porokaiwhiri /pigeonwood (*Hedycarya arborea*) is suspected to be a recent arrival because no adults were seen on the island and it is absent from Poikeke. Māpou could possibly be a recent arrival on Motueka as no adults were observed; however, adults were present on Poikeke which is the likely seed source for Motueka. Conversely, only two juvenile plants of parapara were seen on Poikeke and adults were present on Motueka.

Figure 18. Naturalised spiny phoenix palms along the coast east of the outer Whitianga Harbour mouth, c. 8 km west of Motueka Island. Photo: 2 Mar 2006.

### Comparison of the indigenous vascular floras with eight nearby small undisturbed islands

Taylor *et al*. (1990) compared the indigenous vascular floras of 12 small undisturbed northern New Zealand islands. Eight of these are from the Mercury Islands and Ruamāhua /Aldermen Islands which lie within 30 km of Motueka/Poikeke and with a similar eastern aspect: Atiu/ Middle 13 ha (Cameron 1990); Green 2.3 ha (Atkinson 1964); stack west of Green 0.1 ha (Taylor *et al*. 1990); Black Rocks 2.0 ha (Taylor *et al*. 1990); Old Man Rock 0.7 ha (Atkinson 1962); Hongiora/Flat 3.3 ha (Taylor *et al*. 1990); Nga Horo/Hernia 3.4 ha (Court *et al*. 1973); and Half 1.6 ha (Court *et al*. 1973). Compared with these eight islands, Motueka/Poikeke are unusual in containing many indigenous species not normally associated with small northern New Zealand islands They include four ferns (*Adiantum cunninghamii, Blechnum filiforme, Cyathea medullaris, Pteris carsei*), four dicotyledons (*Ceodes brunoniana, Haloragis erecta, Rhabdothamnus solandri, Vitex lucens*) and two monocotyledons (*Earina mucronata, Rhopalostylis sapida*). The distance from the mainland of the eight islands varies from 2.5 to 19.5 km. The reason for the presence of these species on Motueka and Poikeke appears to be their proximity to the mainland and therefore receiving a higher 'rain' of mainland seed.

Considering that parts of the vegetation are quite young, indicating fairly recent disturbance, it is surprising on islands so close to the mainland that both mānuka (*Leptospermum scoparium*) and kānuka (*Kunzea robusta*) are absent, even though both are common on the adjacent mainland. Atkinson (2004) proposed models for forest succession on northern New Zealand islands, in which either pōhutukawa or kānuka (both small-seeded, wind-dispersed Myrtaceae) dominates as the initial coloniser and noted that it is rare for both species to be equally common. Successions on Motueka and Poikeke (in which pōhutukawa apparently dominated) lend support to Atkinson's model. The mechanisms by which pōhutukawa or kānuka dominates in early succession, often to exclude the other, may be related to any or all of substrate type, soil compaction, timing of dispersal, and proximity of seed sources, and require detailed investigations. Atkinson (2004) considered that successions on islands in which pōhutukawa dominated were often poor in woody species. That is not the case on either Motueka or Poikeke. On Motueka, the distinct tree communities developing under pōhutukawa may be determined by aspect, slope stability, soil depth, and potentially moisture availability. Moreover, ground ferns such as *Polystichum* spp. and *Adiantum* spp., which are often common on such islands, are absent or nearly absent. Perhaps the rocky slopes are too mobile for some terrestrial fern species.

Other 'island' species that might be expected on Motueka/Poikeke include Cook's scurvy grass (*Lepidium oleraceum*) which is present on four of the eight islands of the Mercury and Aldermen Islands noted above, and *Parietaria debilis* which is present on three of them. Both these species were also present on Motukorure (Centre) Island (Fig. 1), only 3.3 km northwest of Motueka (GAT pers. obs., March 1989).

### Impact of Norway rats

Norway rats may affect successional processes, by preying on burrowing seabirds and limiting their disturbance regime and nutrient input (Fukami *et al*. 2006) and potentially through seed and leaf predation. For example, kiore (*Rattus exulans*) ate seeds of various tree species, including tūrepo and karo, reducing their recruitment on northern New Zealand islands (Campbell & Atkinson 2002). Tūrepo was locally present as established trees on Motueka but we did not observe seedlings. If Norway rats have been long present on Motueka then it is unlikely that they have depressed recruitment of karo (Fig. 8, cf. Campbell & Atkinson 2002). However, Norway rats prey on tree seeds in other countries in which they have been introduced (e.g., Shepherd & Ditgen 2013), and studies are needed to determine whether Norway rats depress seedling recruitment of New Zealand trees, including tūrepo and karo (Grant-Hoffman *et al.* 2010). The suspected chewing of horokaka/native ice plant leaves by rats on Motueka/Poikeke backs the theory that this plant may be suppressed by Norway rats, which probably eat it for moisture (Tennyson & Taylor 1999). Could the reason that the fleshy-leaved native sea spurrey that was only recorded on an islet adjacent to Poikeke be because of rat browsing? Two of the authors (EKC & GAT) have frequently observed sea spurrey occurring on islets too small to support rats, or only on larger islands without freshwater where it is confined to ledges inaccessible to rats. Palaeoecological and new surveys of Motueka and Poikeke could also reveal whether kiore were present on these islands in the past, potentially affecting the successions on the islands.

## Threatened and At-risk Species

This follows the New Zealand Threat Classification System of Townsend *et al*. (2008).

### Vascular plants

Following the ranking of de Lange *et al*. (2018) there are two 'Nationally Vulnerable' species (pōhutukawa, poroporo); three 'At-risk – Declining' (rauhuia *Linum monogynum*, island cutty grass *Cyperus insularis*, blue wheatgrass *Anthosachne kingiana*); and two 'At-risk – Relict' (parapara, tūrepo/large-leaved milktree). Although pōhutukawa is one of the commonest trees on the islands and adjacent mainland, it is considered Threatened because of the arrival the invasive fungus, myrtle rust (*Austropuccinia psidii*) to New Zealand. Primarily an island sedge of northern New Zealand, *Cyperus insularis* was recorded on Motueka along with a possible hybrid which "has the right head shape for *C. insularis*, but the dark blotch of *C. ustulatus*" (Peter de Lange pers. comm. 2006). The 'dark blotch' is present on the distal ends of the culm of *C. ustulatus*, whereas *C. insularis* is green, or rarely pale brown in this area (Heenan & de Lange 2005: table 1). Hybridisation was unrecorded in their paper.

### Birds

Following the ranking of Robertson *et al*. (2021), seven of the bird species reported from Motueka/Poikeke are considered Threatened or At-risk: two 'Nationally Vulnerable' (kawau tikitiki/spotted shag, taranui/Caspian tern *Hydroprogne caspia*); four 'At-risk – Declining' (tītī/sooty shearwater, kororā/blue penguin *Eudyptula minor*, tarāpunga/red-billed gull *Larus novaehollandiae*, tara/white-fronted tern *Sterna striata*); and one 'At-risk – Relict' (kuaka/common diving petrel). The Poikeke population of tītī/sooty shearwaters is notable because, while this species is widespread, it is scarce and declining at northern New Zealand colonies (Waugh *et al*. 2013). Kuaka/common diving petrel bones found on two separate trips suggest that this species may be attempting to nest on Poikeke, however, the species is unlikely to succeed while Norway rats are present. A probable kawau tikitiki/spotted shag bone identified in 1976 (Moore 1976) possibly indicates the former presence of this species on Poikeke. This species has declined in northern New Zealand and was locally extinct as a breeding species on the entire Coromandel coast by the 2000s (Rawlence *et al*. 2019).

### Fauna

Motueka and Poikeke Islands have birds typical of the Coromandel coast. However, islands such as these act as refuges for nesting petrels. Despite the presence of Norway rats, these islands support a population of hundreds of nesting ōi/grey-faced petrels. While this petrel is common in northern New Zealand, the Motueka/Poikeke population is important because it no longer survives on the eastern Coromandel mainland (nesting on the adjacent mainland has not been reported for decades) (Miskelly *et al.* 2019). Other seabirds nest here (tītī/sooty shearwater, kororā/blue penguin, karoro/black-backed gull) or potentially nest here (kuaka/common diving petrel, shags, terns and tarāpunga/red-billed gull). With restoration (including eradication of rats), these islands would likely become significantly more important for seabirds.

We did not detect any reptiles on the islands, presumably because of the presence of Norway rats, however a systematic search for lizards is needed. The historic record of tuatara is tantalising and quite likely correct. Tuatara are on several other islands in the region (e.g., Crook 1973) but they have not survived anywhere with Norway rats (Newman 1986; Towns & Dougherty 1994).

## CONCLUSIONS

For such small, steep islands it was surprising to find such diverse broadleaf forest of good stature on the steep central slopes on both the north and south sides of Motueka Island and the summit of Poikeke. The flora contains a good range of 'island' species and plant forms (large leaf size) more commonly found on more

Figure 19. Favoured roost trees in 2008 of kāruhiruhi/pied shags in pōhutukawa above a sea tunnel on the west side of Poikeke. Photo looking east: 21 Feb 2008.

remote islands, which was unexpected given the islands' close proximity to the mainland. Most plant species are regenerating well except for a few of the 'island' species. Naturalised plants are generally present in low numbers and only four species are recommended for management, two of which increase the flammability of the islands. The proximity of the islands to areas with large seasonal tourist numbers poses risks through introductions of predators (rodents, and rainbow skink, *Lampropholis delicata*) and through igniting accidental or deliberate fires that could reset successions, potentially favouring colonisation by pyrogenic weeds such as pampas grasses and pines from the adjacent mainland. Of the petrels, at least ōi/grey-faced petrels are still attempting to nest on Motueka and Poikeke. The eradication of Norway rats would assist both their breeding success and provide opportunities for smaller species like common diving petrels to nest. This would restore indigenous ecosystem processes on the islands. Source colonies of petrels are abundant on the islands both to the north of Mercury Bay (such as the Mercury Islands) and to the south (such as the Aldermen Islands) (Taylor *et al*. 1990; Taylor 2000a, 2000b). The effects of Norway rats on the flora remain unclear. However, Norway rats are very likely to impact on the intertidal biota – part of the marine reserve. Taylor & Thomas (1993) found that 70% of 20 Norway rat stomach remains analysed from Breaksea Island in Fiordland contained marine fauna (35% shellfish and 40% fish). Navarrete & Castilla (1993) found in the central Chile coast that Norway rats preyed on 40 different intertidal species, including both mobile (crabs) and sessile species (limpets); and on the Aleutian Islands in Alaska, Kurle *et. al.* (2008) compared islands with and without Norway rats and demonstrated that the invasive rats directly reduced bird (glaucous-winged gull *Larus glaucescens* and black oystercatcher *Haematopus bachmani*) densities through predation, indirectly causing invertebrates to significantly increase and fleshy algal cover to reduce.

Eradication of Norway rats would have significant benefits to these islands by helping to restore the seabird-driven ecosystem processes that are present on other mammal-free islands in the region and should be a management priority in the near future.

Because of its proximity to the mainland, we recommend monitoring of the island every two years checking for establishment of new exotic plant and animal species. A spring survey could be beneficial in recording biota previously over-looked during our summer-autumn surveys.

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## **APPENDIX 1:** Kōrero on the origin of Motueka

The korero begins with the famous basalt (karā) mountain Maunga Tāhanga (Tā – to strike, hanga – to build or make). In Ngāti Hei lore the karā of Tāhanga was so valued and famous that the legendary taniwha of greenstone, Poutini, had heard of this mountain and came to claim Tāhanga as his own. Poutini wanted to put Tāhanga under his spell and turn Tāhanga into his precious pounamu so that the maunga would exalt his mana all over the North Island. This angered the goddess Hine-Tua-Hōanga as she proclaimed her mana was more powerful than that of Poutini because it was sandstone that was used as the grinding stones (hōanga) to shape pounamu into its smooth lines further justifying that her power was even greater than that of the mischievous taniwha Poutini so she set about driving the intruding Poutini far from her kāinga.

Hine-Tua-Hōanga did not want the greenstone people residing in her rohe, for her people were of the sandstone – the sandstone people. So, she ordered her two pet sharks Ruamanowai and Aninihi to attack Poutini and drive him from Tāhanga so they chased him around to Raupuha (Matapaua Bay) then to Puhiwai then on to Waitaia. Poutini then fled south toward Tuhua (Mayor Island) to seek refuge from the infuriated Hine-Tua-Hōanga. Poutini thought then perhaps Tuhua would fall under his spell which of course was famous as the source of the best Tūhua (obsidian) in all of Aotearoa. The fins of the two pet sharks of Hine-Tua-Hōanga can be clearly seen today and are known as Motu Mango (The Twins) between Waitaia and Matapaua Bays.

Relentless in her pursuit of Poutini, Hine-tua-Hōanga gave chase. As she sped toward Tuhua she ordered her pet sharks to guard Tāhanga. The memory of her pursuit can be seen by the trail of island sentinels she left behind in her wake while heading for Tuhua: the Mercury Island group, Ohinau Island group including Motueka, and the Ruamāhua Island group. All these groups of islands were more customarily known to Ngāti Hei as Nga Tapuwae O Hine-Tua Hōanga (the footsteps of Hine) to ensure that Poutini would not circle back to cast his magic on Tāhanga should she be distracted. The islands and towering rocks (teka) from Aotea (Great Barrier) to Tuhua were her sentinels and the descendants of Hei have carried the spiritual mana of the deity of Hine-Tua-Hōanga through the ages as kaitiaki and ahi kā to this day.

Ngāti Hei were the proprietors of Tāhanga. Hine-Tua-Hōanga was the personified form relative to Maunga Tāhanga. Ngāti Hei were people of stone. They were experts in fashioning adzes, drills and taonga of all sizes and shapes and were known for building stone structures and stairways that guarded their gardens and pā that can still be seen to the trained eye.

**APPENDIX 2:** From Lieutenant James Cook's journal (Beaglehole 1955: 201–202) in 15 November 1769

"The Island [Poikeke] we landed upon was very small, yet there were upon it a Village the inhabitants of which received us very friendly. This little Village was laid out in small Oblong squares, and each pallisaded round. The Island afforded no fresh Water and was only accessible on one side: from this I concluded that it was not choose for any Conveniency it could afford them, but for its Natural Strength."

**APPENDIX 3:** Forest composition in four 100 $m^2$ plots established on Motueka in 2004 (N-facing) and 2006 (S-facing)

Two on the north-facing slopes and two on the south-facing slopes (all living stems ≥2.5 cm diameter at 1.35 m height measured). Tree species are listed in each plot in descending order of basal area (a proxy for biomass) and by their stem density (mean values calculated across the two plots in each forest type). The plots were subjectively located in forested areas not dominated by pōhutukawa.

| | Basal area ($m^2$ $ha^{-1}$) | Stem density $ha^{-1}$ |
|---|---|---|
| South-facing plots (mean aspect = 118°, slope = 18°) | | |
| *Corynocarpus laevigatus* | 17.84 | 400 |
| *Didymocheton spectabilis* | 9.16 | 3500 |
| *Coprosma macrocarpa* | 5.63 | 2400 |
| *Melicope ternata* | 1.14 | 500 |
| *Pseudopanax lessonii* | 0.97 | 700 |
| *Melicytus ramiflorus* | 0.87 | 200 |
| *Ceodes brunoniana* | 0.74 | 250 |
| *Piper excelsum* | 0.21 | 200 |
| *Brachyglottis repanda* | 0.18 | 100 |
| *Geniostoma ligustrifolium* | 0.15 | 150 |
| Undetermined | 0.05 | 50 |
| Total | 36.94 (range 25.46 – 48.41) | 8450 (range 7600 – 9300) |
| North-facing plots (mean aspect = 298°, slope = 32°) | | |
| *Didymocheton spectabilis* | 9.69 | 800 |
| *Ceodes brunoniana* | 8.44 | 700 |
| *Melicytus ramiflorus* | 6.06 | 500 |
| *Coprosma macrocarpa* | 3.27 | 1400 |
| *Planchonella costata* | 2.07 | 150 |
| *Streblus banksii* | 1.83 | 50 |
| *Piper excelsum* | 1.00 | 650 |
| *Brachyglottis repanda* | 0.61 | 250 |
| *Pseudopanax lessonii* | 0.18 | 100 |
| *Corynocarpus laevigatus* | 0.10 | 50 |
| *Geniostoma ligustrifolium* | 0.07 | 50 |
| *Melicope ternata* | 0.07 | 50 |
| Total | 33.41 (range 26.30 – 40.51) | 4750 (range 3500 – 6000) |

**APPENDIX 4:** Vascular flora of Motueka and Poikeke Islands and their status if Nationally Threatened or At-Risk

Abundance generally is noted by a five-tiered scale for each taxon. Records are also given for Poikeke islet by registering Pi in a separate column, together with herbarium sheet numbers where voucher specimens exist. Voucher specimens are lodged in the Auckland Museum (AK).

Key:

***a*** = abundant ***c*** = common ***o*** = occasional

***l*** = local ***s*** = scarce (< 5 plants seen) * = naturalised species

M = Motueka P = Poikeke Pi = islet on east side of Poikeke

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| **Ferns** (10 + 0) (= native + naturalised) | | | | | | |
| *Adiantum cunninghamii* | | | P | | | huruhuru |
| *Asplenium haurakiense* | M | M | P | P | | ***lc***, mainly rocky partly open areas. AK 290812. A single collection from clifftops under pohutukawa canopy on Motueka may be *Asplenium flaccidum*, AK 290754. |
| *Asplenium oblongifolium* | M | M | P | P | | huruhuruwhenua/shining spleenwort. ***o***–***a***, terrestrial in forest |
| *Blechnum filiforme* | | M | | | | pānako, thread fern. 2 terrestrial patches (10 x 1 m & 0.3 x 0.2 m), upper S-facing forest |
| *Cyathea dealbata* | | M | | | | ponga. ***l*** plant with 2 m trunk, upper S-facing forest, W end |
| *Cyathea medullaris* | | M | | | | mamaku. 2 live plants with trunks to 1 m tall, and 6 dead bases; upper S-facing forest slope |
| *Lecanopteris pustulatum* | M | M | P | P | | kōwaowao/hound's tongue. ***o***, terrestrial, partly open forest |
| *Pteridium esculentum* | M | M | P | P | | rārahu/bracken. ***lc***, in patches, open areas, bush margins |
| *Pteris carsei* | M | M | | | | coastal brake. ***l***, mainly S-facing forested slopes. AK 290800 |
| *Pyrrosia elaeagnifolia* | | M | P | P | | leather-leaf fern. ***o***, terrestrial, rupestral and epiphytic. |
| **Conifers** (0 + 1) | | | | | | |
| *Pinus pinaster** | | M | | P | | maritime pine. M: ***l***, c.30 trees 1.5–10 m tall, open E end, seedlings common by adults; also, single seedling halfway along summit ridge. P: single 1.5 m tall tree with cones, basal diameter 13 cm, exposed N ridge. AK 290716 & 290828 |
| **Dicot Trees & Shrubs** (26 + 3) | | | | | | |
| *Brachyglottis repanda* | M | M | | | | rangiora. ***lc***; canopy gaps, to 5 m tall, leaf blades of all plants rather large and shiny above; sapling leaves to 422 x 306 mm. AK 290776 & 290840 |
| *Carmichaelia australis* | M | M | P | P | | mākaka, North Island broom. M: ***o***, to 4 m tall, semi-open sites, upper forest margins. P: 3 plants to 2 m tall. AK 290819 |

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| *Ceodes brunoniana* At-risk – Relict | M | M | P | P | | parapara. M: ***lc***, forest, especially S and NW sides, canopy trees to 8 m tall, with stems to 50 cm diameter. Fruiting adults present but no seedlings. P: 2 juveniles only, 0.5 & 2.0 m tall. AK 289750. |
| *Coprosma macrocarpa* subsp. *minor* | M | M | P | P | | coastal karamū. ***o–la***, forest understorey. AK 290815 |
| *Coprosma repens* | M | M | P | P | Pi | taupata. ***o–lc***, low plants in exposed sites to erect canopy trees to 4 m tall fringe of S boulder beach of M |
| *Corynocarpus laevigatus* | M | M | P | P | | karaka. M: ***c***, S-side in forest, seedlings to canopy trees; l at NW end coastal slope. P: 6 saplings (no adults) close together c.1 m tall, in forest |
| *Didymocheton spectabilis* | M | M | | | | kohekohe. ***c***, as canopy trees; ***la*** as seedlings carpeting in places |
| *Geniostoma ligustrifolium* | M | M | P | P | | hangehange. ***o***, forest understorey; leaves rather fleshy on plants close to the coast. AK 290810, 290835 & 295198 |
| *Hakea sericea* * | M | M | | | | needlebush. ***lc***, low plants (<1 m tall) on open summit ridge, mainly near W end. AK 286263 |
| *Hebe pubescens* subsp. *pubescens* | M | M | | | | koromiko. ***o***, upper open slopes. AK 286150 & 290705 |
| *Hedycarya arborea* | | M | | | | porokaiwhiri/pigeonwood. ***o***, seedlings and saplings in forest (no adults seen) |
| *Leucopogon fasciculatus* | M | M | | | | mingimingi. ***lc***, upper open sites |
| *Lycium ferrocissimum** | M | M | | | | boxthorn. ***l***, ***c***. 8 plants to 3 m tall, all unhealthy, E open slope over c.10 m x 10 m. Recorded as 'local patch' in Apr 1989. AK 290748 |
| *Melicope ternata* | M | M | P | P | | whārangi. M: ***lc***, mainly upper slopes as small canopy trees on S-side and summit ridge; ***o*** throughout. P: ***s***, in forest. AK 290838 |
| *Melicytus novae-zelandiae* | M | M | P | P | | coastal māhoe. ***o***, mainly close to coast, as low shrubs to small trees 4 m tall. AK 290822 |
| *Melicytus ramiflorus* | M | M | P | P | | māhoe. ***o–lc***, canopy trees throughout |
| *Metrosideros excelsa* Nationally Vulnerable | M | M | P | P | | pōhutukawa. ***a***, commonest and tallest trees, to 22 m tall with branches to 50 cm diameter on summit ridge. |
| *Myoporum laetum* | | M | | | | ngaio. ***l***, prostrate shrubs in exposed sites to canopy trees, coastal, NW side |
| *Myrsine australis* | M | M | P | P | | māpou. M: ***o–lc***, seedlings and saplings, upper forest slopes and W end coastal slope – 3 m tree tallest seen. P: ***lc***, especially on W end, to 6 m tall |
| *Pimelea urvilleana* | | M | | | | pinatoro. ***s***, E end only, coastal rocks in open |
| *Piper excelsum* subsp. *excelsum* "Hauraki Gulf form" | M | M | P | P | | kawakawa. ***c***, in forest; an undescribed form with over-lapping leaf bases and large shiny leaf blades "Hauraki Gulf form" (see Gardner 1997: 301); the petioles were either green or reddish. AK 290794, 290797, 290799 & 292312 |

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| *Pittosporum crassifolium* | M | M | P | P | Pi | karo. ***c***, coastal fringe and rocky outcrops, seedlings scarce |
| *Planchonella costata* | M | M | P | P | | tawāpou. M: ***o–lc***, all size classes, including canopy trees. P: ***c***, plateau forest, trees to 12 m tall, 40 cm DBH |
| *Pseudopanax lessonii* | M | M | P | P | | houpara. ***o–lc***, mainly as canopy trees on steep coastal slopes; seedlings ***la***. AK 290782 |
| *Rhabdothamnus solandri* | M | M | | | | taurepo. ***l***, understorey shrubs to 1 m tall, upper S forest, rocky slopes at foot of bluffs; leaf blades orbicular (to 60 x 46 mm) and flowers the normal red-orange. AK 290769 & 290826 |
| *Rhaphiolepis bibas* * | | | | | | loquat. M: a single well-established seedling (uprooted), mid-forested slope on south side (observation by DoC, Oct 2021) |
| *Solanum aviculare* Nationally Vulnerable | | M | P | | | poroporo. M: single young plant, rock fall site, NW coast. AK 295173. |
| *Streblus banksii* At-risk – Relict | | M | | | | tūrepo/large-leaved milktree. ***s***, 7 m canopy tree and a few saplings, forest, N-side only; ripe seed on a 2 m bush. AK 290842. |
| *Vitex lucens* | M | M | | | | pūriri. ***s***, a few canopy trees on S-side only, to 16 m tall and 1 m DBH; no seedlings |
| **Dicot Herbs** (17 + 13) | | | | | | |
| *Brassica rapa* subsp. *sylvestris* * | M | M | ?P | | | wild turnip. M: ***l***, semi-open steep shrubby slope, N-side below summit. AK 286149 & 290806 |
| *Centaurium erythraea* * | M | M | | | | centaury. ***l***, E open slopes |
| *Chenopodium trigonon* subsp. *trigonon* | M | M | P | P | | pig weed. ***o***, open coast. AK 295200 |
| *Cirsium vulgare* * | M | M | P | | | Scotch thistle. M: ***s***, canopy gap |
| *Crepis capillaris* * | M | M | P | | | hawkesbeard. M: ***s***, open site |
| *Dichondra repens* | M | M | P | P | | creeping dichondra. ***o***, semi-open sites |
| *Erigeron sumatrensis* * | M | M | P | P | | fleabane. ***o***, open sites |
| *Euchiton sphaericus* | | M | | P | | star cudweed. ***l***, open sites. AK 290744 & 290833 |
| *Haloragis erecta* | M | M | P | P | | toatoa/shrubby haloragis. ***l***, forest gaps and margins |
| *Hypochaeris radicata* * | M | M | P | P | | catsear. ***o***, open and disturbed sites. AK 290660 & 290702 |
| *Leontodon saxatilis* * | | M | P | | | hawkbit. M: ***l***, open sites |
| *Linum monogynum* At-Risk – Declining | | M | | | | rauhuia. ***o***, lower open coastal slopes. |
| *Lobelia anceps* | | M | P | P | | punakuru, shore lobelia. ***l–lc***, coastal fringe, especially at E end by rock pools on M |

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| *Lysimachia arvensis* s.l. * | | M | | | | pimpernel. ***l***, flower colour not seen, E open slopes |
| *Medicago nigra** | | M | | | | bur medick. 3 seedlings, margin of rock pool, upper splash zone at E end |
| *Orobanche minor* * | M | M | P | | | broomrape. ***o***, open sites |
| *Oxalis rubens* | M | M | | | | dune oxalis. ***l***, open slopes |
| *Peperomia urvilleana* | M | M | P | P | | ***o–la***, rocky, mainly shaded forest steep slopes. AK 290802 |
| *Phytolacca octandra* * | M | M | | | | inkweed. ***l***, lower open forest slopes, N-side. AK 301854 |
| *Polycarpon tetraphyllum* * | M | M | | | | allseed. ***o***, open slopes |
| *Pseudognaphalium luteoabum* | M | M | | | | pukatea, Jersey cudweed. ***s***, single open site, NW coast. AK 295174 |
| *Samolus repens* | M | M | P | P | Pi | mākoako/sea primrose. ***l***, mainly coastal rocks E end, and also on N coast |
| *Salicornia quinqueflora* | M | M | P | P | Pi | ureure/glasswort. ***l***, N and S coastal rocks (splash zone) |
| *Senecio diaschides* | | M | | | | fireweed. ***1***, semi-open, shrubby ridgetop; AK 290830 |
| *Senecio hispidulus* | M | M | P | P | | fireweed. ***o–lc***, open sites. AK 290706 & 290791 |
| *Senecio lautus* | M | M | P | P | Pi | shore groundsel. ***o***, coastal rocks. AK 295172 |
| *Solanum americanum* | M | M | P | P | | pōporo/small-flowered nightshade. ***o***, open sites. AK 290753 |
| *Sonchus oleraceus* * | M | M | P | P | | pūhā, sow thistle. ***o***, open sites |
| *Spergularia tasmanica* | | | | | Pi | native sea spurrey. ***lc***, only seen on small rocky islet on E side of Poikeke. AK 295199 |
| *Wahlenbergia vernicosa* | | M | | | | coastal harebell. ***o***, open slopes, rocky slip site, flowers mauve. AK 290714 |
| **Dicot Climbers and related Trailers** (5 + 0) | | | | | | |
| *Calystegia soldanella* | M | M | | | | panahi, shore bindweed. Single patch 3 m long, on coast at W end of island |
| *Clematis paniculata* | M | | | | | puawānanga/white clematis |
| *Disphyma australe* | M | M | | P | Pi | horokaka/native ice plant. ***o***, coastal fringes and exposed summit ridge on M |
| *Muehlenbeckia complexa* | M | M | P | P | | pōhuehue/wire vine. ***o***, small patches, open and partial shade, upper slopes |
| *Tetragonia trigyna* | M | M | P | P | | kokihi/climbing native spinach. M: ***lc***, open sites. P: ***s***, clifftop. AK 290673 |

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| **Monocots (except Sedges & Grasses) (8 + 0)** | | | | | | |
| *Arthropodium cirratum* | M | M | P | P | | rengarenga. ***c***, open and semi-open rocky sites. AK 290774 |
| *Astelia banksii* | M | M | P | P | | kōwharawhara. ***c***, open and semi-open rocky sites |
| *Astelia hastata* | | M | | | | kahakaha. single large terrestrial clump, upper rocky bluffs, S-facing |
| *Dianella nigra* | | M | | | | tūrutu. ***o***, semi-open rocky sites; AK 290703-04 |
| *Earina mucronata* | | M | | | | peka-a-waka. 3 large terrestrial clumps on rocky bluffs, S side of western highpoint; stems to 70 cm long. AK 290771 |
| *Phormium tenax* | M | M | P | P | | harakeke/NZ flax. ***o***, open rocky sites and understorey where light is high |
| *Rhopalostylis sapida* | | M | | | | nikau. 3 trunkless plants, largest with leaves to 1.5 m long, S forest |
| *Thelymitra longifolia* | | M | | | | māikuku/white sun orchid. ***l***, semi-open sites, summit ridge. AK 289510 |
| **Monocots**: Sedges (7 + 0) | | | | | | |
| *Carex flagellifera* | M | M | P | P | | mānaia/Glen Murray tussock. M: ***l***, S and W coast. P: ***o***, forest margin. AK 290761 |
| *Carex testacea* | | M | | P | | speckled sedge. M: ***l***, upper forest slope, S-side. P: ***lc***, plateau forest margins. AK 290825 & 295196 |
| *Cyperus insularis* At-risk - Declining | ?M | M | ?P | | | island cutty grass. 2 patches, open sites at E end. AK 290648. |
| *Cyperus insularis* × *C. ustulatus* | | M | | | | ***l***, NW end, rockslide site. "Has the right head shape for *C. insularis*, but the large dark blotch of *C. ustulatus*" PJ de Lange (pers. comm. 2006). AK 295176 |
| *Ficinia nodosa* | M | M | P | P | Pi | wīwī/knobby clubrush. ***lc***, open sites, coast and upper rocky sites |
| *Gahnia lacera* | | M | | | | tarangārara/bamboo sedge. 2 clumps, both in upper S-facing shrubby slopes near summit ridge. AK 290756 |
| *Isolepis cernua* | | M | P | P | Pi | slender clubrush. ***l***, E end, especially by rock pools. AK 290715 |
| **Monocots**: Grasses (8 + 9) | | | | | | |
| *Aira caryophyllea* * | | M | | | | silvery hair grass. ***lc***, open summit ridge. AK 290824 |
| *Anthosachne kingiana* subsp. *multiflora* At-risk – Declining | M | M | | | | blue wheatgrass. ***l***, N-facing slopes, sunny open sites, plants glaucous. AK 290671. |
| *Anthoxanthum odoratum* * | M | M | P | | | sweet vernal. M: ***s***, open rocky site, N side |
| *Avena barbata* * | | M | | | | slender oat. ***l***, open sites E end |

| Plants groups | M 1989 | M 2004-08 | P 1989 | P 2006 | Pi 2006 | Comments from 2004-08 observations (unless otherwise stated). Herbarium vouchers (AK) |
|---|---|---|---|---|---|---|
| *Bromus catharticus* * | | M | | P | | prairie grass. ***l***, semi-open sites |
| *Dactylis glomerata* * | M | M | | | | cocksfoot. ***lc***, sunny, open slopes |
| *Dichelachne crinita* | M | M | P | P | | long-hair plume grass. ***o***, open sites |
| *Holcus lanatus** | | M | | | | Yorkshire fog. ***s***, open site |
| *Lachnagrostis billardierei* | | M | | | | sand wind grass. ***o***, open rocky sites |
| *Lachnagrostis littoralis* subsp. *littoralis* | ?M | M | | P | Pi | ***l***, S coast, bare rocks, splash zone. P; ***lc***, coastal rocks. AK 290767 |
| *Lolium arundinaceum* * | | M | | | | tall fescue. ***l***, open and semi-open rocky slopes |
| *Oplismenus hirtellus* | M | M | P | P | | panic grass. ***o***, shaded sites. AK 295195 |
| *Poa anceps* | M | M | P | P | | broad-leaved poa. ***c***, sward-forming in open sites, plants glaucous. AK 290655 |
| *Rytidosperma biannulare* | M | M | | | | danthonia. ***c–la***, open sites. Recorded in 1989 as *Rytidosperma* sp. AK 290658 |
| *Rytidosperma unarede* | | M | P | P | | danthonia. M: ***o***, open sites. P: ***lc*** clifftops. Recorded in 1989 as *Rytidosperma* sp. AK 295197 |
| *Sporobolus africanus* * | | M | | | | ratstail. ***s***, open coastal cliffs at west end of island |
| *Vulpia bromoides* * | M | M | | | | vulpia hair grass. ***lc***, open summit ridge and steep coastal slopes |

**APPENDIX 5:** Birds recorded on Motueka and Poikeke Islands and their status if Nationally Threatened or At-Risk

Key: * = naturalised species

| Name | Motueka | Poikeke |
|---|---|---|
| tītī/sooty shearwater (*Ardenna grisea*) At-risk – Declining | Colour of feathers and recent droppings suggested that some of the burrows were probably this species; x 1 tibiotarsus bone (Mar 1989) | x 1 half-grown chick in burrow; x 3 humeri (Mar 1989) |
| kuaka/common diving petrel (*Pelecanoides urinatrix*) At-risk – Relict | | Humeri and tibiotarsi (Moore 1976); tibiotarsus bone (Mar 1989) |
| ōi/grey-faced petrels (*Pterodroma gouldi*) | x 2 large broken eggs, 100s of burrows – most were probably this sp. (Mar 1989); burrows locally common, especially NW forest slope, adult in burrow (Apr 2004); rat-chewed egg (Oct 2021) | 6 bones + eggshells (Moore 1976); 100s of large burrows, most, probably this sp.; x 4 humeri and 5 other bones (Mar 1989); burrows throughout forest, probably this sp. (Mar 2006) |
| kororā/blue penguin (*Eudyptula minor*) At-risk – Declining | Burrow, 20 m ASL, NW side (Feb 2008) | |

| Name | Motueka | Poikeke |
|---|---|---|
| tākapu /Australasian gannet (*Morus serrator*) | x 1 just offshore (Mar 1989) | |
| kāruhiruhi/pied shags (*Phalacrocorax varius*) | x 1 on coastal rock, E end (Mar 2004); x 6 on intertidal rocks between Poikeke (Feb 2008) | x 10 on rocky outcrop (Mar 1989); c.12 in a roost pōhutukawa tree on W cliff, by a sea tunnel, Fig. 19 (Mar 2006 and Feb 2008) |
| kawau paka/little shag (*Phalacrocorax melanoleucos*) | | x 1 on adjacent rock outcrop (Mar 1989) |
| kawau tikitiki/spotted shag (*Stictocarbo punctatus*) Nationally Vulnerable | | Probable juv. humerus (Moore 1976) |
| kāhu/swamp harrier (*Circus approximans*) | Overhead, NW coast (Feb 2008) | |
| karoro/black-backed gull (*Larus dominicanus*) | x 1 flying (Mar 1989); x 1 coastal rocks (Mar 2005) | x 1 shoreline (Mar1989); pair on N ridge; x 2 old nests on islet on E side of Poikeke, presumed to be this sp. (Mar 2006) |
| tarāpunga/red-billed gull (*Larus novaehollandiae*) At-risk – Declining | x 1 (Mar 1989) | x 1 (Mar 2006) |
| taranui/Caspian tern (*Hydroprogne caspia*) Nationally Vulnerable | x 1 flying offshore (Mar 1989) | x 1 shoreline (Mar 1989) |
| tara/white-fronted tern (*Sterna striata*) At-risk – Declining | Flying close to island (Mar 2005) | fishing close by in small groups and roosting on Poikeke (Mar 2006) |
| kererū/native pigeon (*Hemiphaga novaeseelandiae*) | x 1 S forest (Apr 2004); x 2 S forest, feeding on kawakawa and karaka fruit (Mar 2005) | Femur (Mar 1989) |
| kōtare/sacred kingfisher (*Todiramphus sanctus*) | x 1 (Mar 1989) | |
| warou/welcome swallow (*Hirundo neoxena*) | x 1 (Mar 1989); present (Apr 2004) | x 1 (Mar 1989) |
| tauhou/silvereye (*Zosterops lateralis*) | Present (Mar 1989, Apr 2004, Mar 2005) | x 2 (Mar 1989) |
| riroriro/grey warbler (*Gerygone igata*) | Few (Mar 1989); present (Apr 2004, Feb 2008) | x 2 (Mar 1989); present (Mar 2006) |
| blackbird (*Turdus merula*) * | x 2 heard (Mar 1989); present (Apr 2004) | |
| pīwakawaka/fantail (*Rhipidura fuliginosa*) | Present (Apr 2004) | |
| tūī (*Prosthemadera novaeseelandiae*) | Present (Apr 2004, Mar 2006) | |
| house sparrow (*Passer domesticus*) * | Heard (?) (Mar 1989) | |
| chaffinch (*Fringilla coelebs*) * | Heard (?) (Mar 1989) | |
| starling (*Sturnus vulgaris*) * | Heard (Mar 1989) | |

# Mason wasps (*Pison* species, Hymenoptera: Apoidea: Crabronidae) in Aotearoa New Zealand

John W. Early Auckland War Memorial Museum Tāmaki Paenga Hira

**Abstract**
Four species of *Pison* are recorded from Aotearoa New Zealand and include the relatively recently detected *P. peletieri* (2001) and *P. marginatum* (2020). All species are illustrated and a key to enable identification is provided. Information on the nest structure and prey of *P. peletieri* is given.

**Keywords**
*Pison marginatum*; *Pison morosum*; *Pison peletieri*; *Pison spinolae*; *Pison westwoodii*; *Melittobia*, new record.

## INTRODUCTION

The wasp family Crabronidae is represented in Aotearoa New Zealand by 14 species in 4 genera. They are solitary wasps that hunt and paralyse various insects and spiders with which they provision their nest cells as food for their larvae. *Pison* species specialize in preying on various spiders. Many species make nest cells from mud earning them the common name of mason wasps. Within the New Zealand Crabronidae, the genus *Pison* is easily recognised by the conspicuous notch in the inner margin of the compound eye (Fig. 1). Notched eyes are also found in the introduced *Vespula, Polistes*, *Ancistrocerus gazella* and *Paralastor* sp. but these belong to the Vespidae.

The genus *Pison* has a wide distribution with species native to all continents except North America and Antarctica; most species are found in the Southern Hemisphere (Bohart and Menke 1976). A recent revision (Pulawski, 2018) recorded 163 species from Australia. By contrast Aotearoa New Zealand has but one endemic

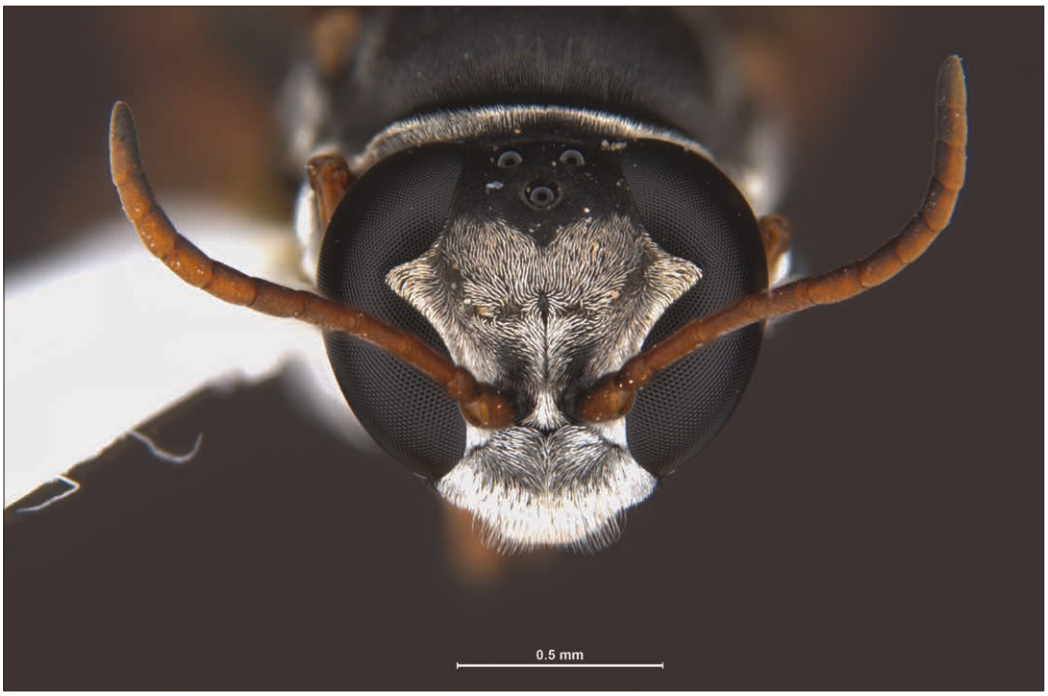



Figure 1. *P. peletieri* head in frontal view. Scale line = 0.5mm.

species, *P. morosum* Smith, 1856 although the long-established adventive Australian *P. spinolae* Shuckard, 1838 is more commonly encountered (Callan, 1979; Harris, 1994). This paper records two additional species which have established more recently – *Pison peletieri* Le Guillou, 1841 and *P. marginatum* F. Smith, 1856.

## THE SPECIES

### *Pison spinolae*

*Recognition.* This is the largest of the four species (female body length 11.0 – 16.0 mm, male 9.0 – 12.0 mm (Harris 1994)) and the only species to have long, erect, wispy, white hairs on the head, mesosoma, ventral surface of coxae, tibiae, femora and the sloping anterior face of the first metasomal tergite (Figs 2, 3). In all other species setae on the body are short and/or appressed. The depressed posterior margins of the first three metasomal tergites are covered with dense appressed silvery-white setae giving the metasoma a banded appearance.

*Distribution.* This Australian species was accidentally introduced around 1880 (Callan 1979) and is now common throughout Aotearoa New Zealand. In Australia it is found in all states including Norfolk I., but not yet from the Northern Territories. It is also recorded from Indonesia (one record from West Papua) (Pulawski, 2018).

*Nesting habits and prey.* The mud nest cells of this species are commonly encountered in exterior crevices and corners of houses, but also indoors in folds of curtains and blinds near open windows. The presence of a female is indicated by a buzzing sound as she constructs nest cells and provisions them with paralysed orbweb spiders (Araneidae). Details of biology and prey species can be found in Callan (1979), Cowley (1961, 1962) and Harris (1994). Despite its Australian origin it is sometimes referred to as the New Zealand mason wasp.

### *Pison morosum*

*Recognition.* This species is similar in appearance to *P. spinolae* being entirely black, but lacks long erect hairs, is smaller (female length 7.5 – 11.5 mm, male 5.5 – 8.0 mm (Harris 1994)) although there is some size overlap, and the metasoma does not have a banded appearance (Figs 4, 5).

*Distribution.* This is the only endemic *Pison* species in Aotearoa New Zealand and is found throughout the country including the Chatham Is (specimens in the New Zealand Arthropod Collection, Macfarlane 1979).

*Nesting habits and prey*. Nest cells are made in old galleries made by various wood-boring insects (Siricidae, Curculionidae, Cerambycidae). Its biology and nesting behaviour are well documented by Harris (1994) and Laing (1988).

### *Pison peletieri*

*Recognition.* This adventive Australian species is easily recognised in Aotearoa New Zealand by its colour. The head and mesosoma are black but the metasoma, tibiae and tarsi of the legs are a rusty reddish brown (Figs 6,7). It is the smallest of the four species with female length 6.2 – 7.7 mm, male 5.3 – 5.6 mm (Pulawski 2018). It was first detected in Auckland in March 2001 (MAF Biosecurity Authority 2004) and provisionally identified as *P. ruficorne* F. Smith, 1856 which was subsequently synonymised under *P. peletieri* Le Guillou, 1841 by Pulawski (2018).

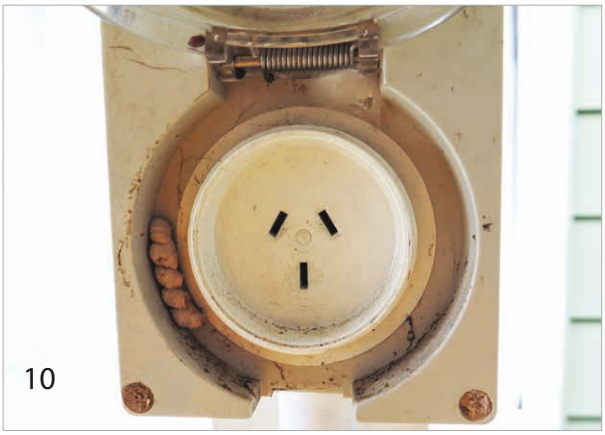
*Distribution.* This species has a wide geographical distribution in Australia being found in all states except Tasmania (Pulawski 2018). From its original detection in the Auckland CBD in 2001, observations on iNaturalist (www.inaturalist.nz) show that it is now widespread across greater Auckland with records also from Northland (Whangārei) to Waikato (Pokeno, Te Aroha). Although aware of its presence in central Auckland I did not observe it in my garden some 15 km distant until the summer of 2015/16.

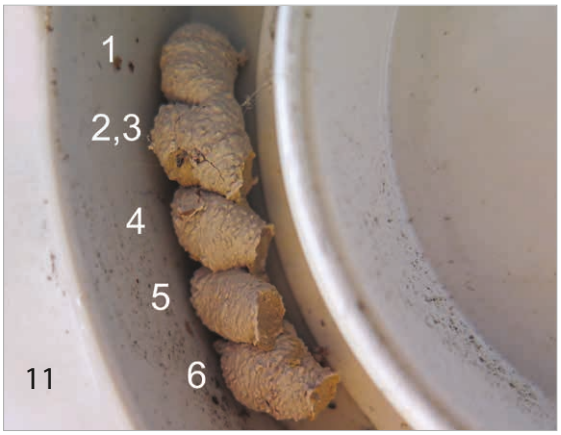
*Nesting habits and prey.* Like many other *Pison* species, *P. peletieri* constructs a nest of several mud cells and, from the few available observations, is versatile in their configuration which is determined by the shape of the chosen space. In early January 2019 I first observed a cluster of six mud cells in a seldom-used outside power socket in the carport. The flask-shaped cells were located in a groove around its perimeter and underneath the spring-loaded cover (Fig. 10). The only point of entry for a female wasp is a small gap behind the cover and at the bottom of the electrical socket. At first glance there appears to be only five cells but cells 2 and 3 were joined side by side; cells 1 and 4–6 were discrete (Fig. 11). The cells were made from a pale brownish-grey mud that has been built up piece by piece and not plastered over so that they have a wrinkled appearance. Each cell had its entrance/exit plugged by a yellowish mud of a different and coarser texture, containing small sand grains (Figs 12, 13). In March 2019 I removed the cells. Cells 4–6 were successfully extracted intact but cells 1–3 fell and shattered on the concrete below. Cell 4 was opened to reveal a yellow prepupa within its cocoon (Fig. 14). No spider remains were found apart from a pair of chelicerae and part of one leg. Cells 5 and 6 were kept in the lab at a constant 21°C to await emergence of adult wasps to confirm their identity. In both cases an exit hole was chewed through the yellow plug (Fig. 13). A male wasp emerged from one cell sometime over the period 13 Oct – 6 Nov 2019, and a female at 09:00 on 18 Nov 2019.

A single dead female *Melittobia* sp (Eulophidae) was found in the broken remains of cells 1–3. *Melittobia* species are recorded as pupal parasitoids of *P. spinolae* (Cowley 1961, Cumber 1953, Donovan 1976) and *P. morosum* (Macfarlane and Palma 1988).

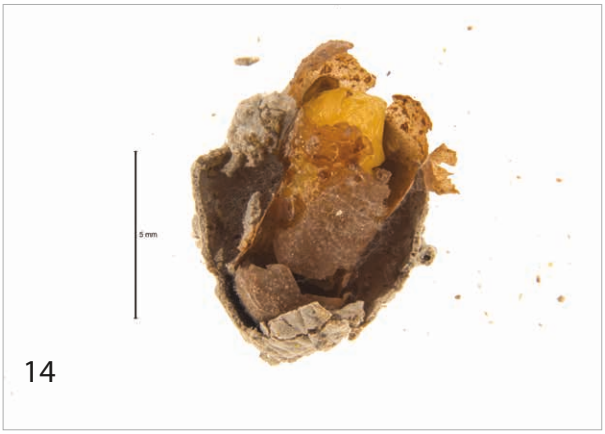
A different manner of nest cell construction was observed on two occasions at Warkworth by David Wilson who posted several photos online (https://iNaturalist.nz observations 37940721, 72975801, 72975802). Cells were constructed in a linear manner in the mortar groove between adjacent bricks in a wall. The observation made


Figures 2–9. *Pison* species in lateral and dorsal views. 2, 3 *P. spinolae*; 4, 5 *P. morosum*; 6, 7 *P. peletieri*; 8, 9 *P. marginatum*. Scale line 2–5, 8 = 2.0 mm; 6, 7, 9 = 1.0 mm.






Figures 10–14. Nest cells of *P. peletieri*. 10, 11, cells *in situ*; 12, 13, cells 5 and 6 before (12) and after (13) emergence of adults; 14, cell 4 showing fragmented cocoon and yellow prepupa. Scale line 12-14 = 5.0mm

in January 2020 shows a constriction between adjacent cells. In the April 2021 observation of three nest cells the centre cell was the last to be constructed. This cell was provisioned with eight *Maratus griseus* (Salticidae) and a single specimen of *Clubiona* sp (Clubionidae). Olwyn Green (pers. com. 2021) reported that all nest cells made on the outside walls of her house in West Auckland contained Salticidae. Other small spiders (Theridiidae and possibly Tetragnathidae) in addition to Salticidae were recorded by David Wilson (December 2021, https://inaturalist.nz/observations/103450309). I have frequently observed this species actively hunting on shrubs and bare cultivated garden soil. There is no published information on nesting behaviour or prey selection in Australia.

### *Pison marginatum*

*Recognition.* This species has a black head and body although parts of some legs may be a dark reddish brown in some specimens (Figs 8, 9). It has a banded metasoma like *P. spinolae* but the bands of appressed hairs on the posterior margins of tergites 1–5 appear pale brown to the naked eye or pale brownish gold depending on the intensity of incident illumination. The setae are in fact silvery white under direct bright light, but the pale brown appearance comes from the brown colour of the integument showing through. *Pison marginatum* is smaller than *P. spinolae*, female length 9.5 – 11.7 mm, males 7.5 – 12.6 mm (Pulawski 2018) although there is some overlap. The colour of the banding and absence of long wispy white setae on the head and body readily distinguishes *P. marginatum* in Aotearoa New Zealand.

Voucher specimens are in the Auckland Museum collection with accession numbers AMNZ96495-96498, 96507, 96508, 96514, 96517, 152019-152023, 173682. Additional images can be found by searching at https://www.aucklandmuseum.com/discover/collections/search.

*Distribution.* This species was first recognised from yellow pan trap samples collected in my garden in Kelston, West Auckland (36.892106°S, 174.664168°E) from December 2020 to February 2021, a sampling programme initiated in May 2020 during COVID-19 lockdown and continued monthly. It was absent from March to September but reappeared in October 2021. A specimen was also recorded from Auckland's Stanmore Bay (36.624043°S, 174.735575°E) in early January 2021 (https://inaturalist.nz/observations/67634694). An earlier record from February 2020 in Hawkes Bay (Waipatiki Beach, 39.300327°S, 176.973481°E, https://inaturalist.nz/observations/39511111) may also be this species. The wide separation of Auckland and Hawkes Bay locations suggests that either it may have been present in Aotearoa New Zealand but unrecognised for quite some time and has expanded its distribution, or that there may have been more than one incursion.

Pulawski (2018) showed that the distribution of *P. marginatum* extends across all states of Australia, Indonesia, Malaysia, the Philippines, Micronesia, Melanesia and Polynesia to Hawai'i making it one of the most widespread species of the genus.

*Nesting habits***.** Nest cells have not yet been observed in Aotearoa New Zealand. Williams (1927) reported that it (as *P. hospes*) adapted old mud nests of *Sceliphron* (Sphecidae) on rocky banks in Hawai'i but did not record prey species. In Canberra, Australia A.C.T., Evans, Matthews and Hook (1980) observed nest cells made in trap nests, with araneids and an oxyopid spider as prey, and that there were two generations per year.

## KEY TO SPECIES

The following key should enable accurate identification of the four species now found in Aotearoa/New Zealand.

1 Head and mesosoma black, metasoma rusty reddish brown by contrast (Figs 6, 7) ……*P. peletieri*

1' Head, mesosoma and metasoma entirely black (shades of brown if present restricted to posterior marginal bands of metasomal terga) ……2

2 Head and body with long, erect, wispy white setae (Fig. 2)……*P. spinolae*

2' Head and body without long, erect, wispy white setae, at most with appressed short white setae in places ……..……....3

3 Posterior margins of all metasomal tergites brown and with pale brownish bands of appressed setae (Fig. 9)…… *P. marginatum*

3' Metasomal tergites entirely black and without banded appearance (Figs 4, 5) …… *P. morosum*

## DISCUSSION

The recent establishment of *P. peletieri* and *P. marginatum* has doubled the number of *Pison* species present in Aotearoa New Zealand. More observations and data are needed for *P. marginatum* and *P. peletieri* to determine the number of generations per year, nesting behaviour, nest structure, and prey preferences. The latter is essential to determine their likely impact on Aotearoa New Zealand's spider populations. Limited observations indicate that *P. peletieri* prefers jumping spiders (Salticidae). Given the wide geographic distribution of *P. marginatum* it probably won't be very specific. Prey choice will most likely be determined by whatever spiders are found in the habitats where they prefer to hunt, and which are of a size they are able to handle and carry back to nests.

Both will surely become more widely distributed in Aotearoa New Zealand. As well as natural range expansion, mason wasps are good hitch hikers because of their adaptability to make nest cells in all kinds of cavities and grooves in both natural and human-made objects which are easily transported by shipping (Bohart and Menke 1976). This is probably the way that *P. spinolae* arrived here from Australia. Dispersal by shipped cargo seems the most likely way *P. marginatum* spread so far and wide from Australia across the Western Pacific islands to Hawai'i and most recently here to Aotearoa New Zealand. The source of the wasps could either be Australia or one of the Pacific island nations where it is established. Given its wide geographical distribution it is perhaps a wonder that it didn't find its way here much sooner. Another species with a similarly wide geographic range is *P. westwoodii* Shuckard (Pulawski 2018) and is also a likely candidate for future establishment.

## ACKNOWLEDGEMENTS

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# Rediscovery of a bust of Ferdinand Ritter von Hochstetter

Hugh Grenfell

**Abstract**
The provenance of a 19th century plaster replica bust of Ferdinand Ritter von Hochstetter (1829–1884) at the Auckland War Memorial Museum (AWMM) is discussed. Early 20th century newspaper records, original Museum paper records and other research were used to point to a likely original source. While Museum digital data recognised that the bust was of Hochstetter no other information was known.

**Keywords**
Hochstetter; Auckland Museum; Julius von Haast; bust.

## INTRODUCTION

Much has been written about the enormous contributions of the German geologist Ferdinand von Hochstetter to New Zealand science and his time here between 1858 and 1859 (e.g., Kermode 1992; Johnston & Nolden 2011; Johnston, Nolden & Hoke 2012; Nolden & Nolden 2013). The Auckland War Memorial Museum has had a bust of Hochstetter in its collections since 1919 (Fig. 1) but the provenance was apparently lost. It is proposed that the AWWM bust originally belonged to the Reverend Dr Arthur Guyon Purchas.

In April 1857 the Austro-Hungarian naval frigate SMS *Novara* left Trieste in the Adriatic on a two-year global scientific voyage. She was authorised to do so by Archduke Maximilian I and commanded by Bernhard von Wüllerstorf-Urbair. On board with other scientists was a young 28-year-old geologist Christian Gottlieb Ferdinand Hochstetter (later Ferdinand Ritter von Hochstetter when he was knighted) from Esslingen near Stuttgart. Hochstetter had been employed by the Imperial Geological Research Institute (the Geologische Reichsanstalt) since 1852 and had an established reputation. When Hochstetter arrived in Auckland on the 22 December 1858 he would have had no idea that he was to spend the next nine months in New Zealand and the enormous impact he would have on our geological and natural history knowledge.

Significantly a day before the *Novara* arrived another German, Johann Franz Julius Haast (later Sir Julius von Haast, 1822–1887), reached Auckland on the SS *Evening Star*. Hochstetter and Haast soon met up, shared many adventures together over the next few months and became lifelong friends (Nolden 2013). Haast remained in New Zealand after Hochstetter left from Nelson in October 1859 and went on to an illustrious career in Canterbury, founding the Canterbury Museum among other things (Maling 1990).

While in Auckland, Hochstetter quickly made many friends and relied on their local knowledge to guide his explorations. One of these was the polymath Reverend Arthur Guyon Purchas (1821–1906). Purchas was a founding member of the Auckland Institute in 1867, a Council member for many years and President in 1880. He had discovered the Drury Coalfield near Auckland in 1858 (Hochstetter 1867; Kear 1959), and the Provincial Government was keen to survey it. Purchas was instrumental in persuading Hochstetter to stay in New Zealand (Hochstetter 1867a: 11) and survey the field (Hochstetter 1859).

Hochstetter clearly had great respect for Purchas as shown by the following (Hochstetter 1867: 258).

> Captain Wing, the obliging pilot of Manukau Harbour, had offered me his excellent whale boat, for a cruise upon the waters of the Manukau, and promised to accompany me with my friends, the Rev. Mr. Purchas and Captain Ninnis of Onehunga. Our place of rendez-vous was Onehunga. I had made my appearance there two days previous, for the purpose of roaming, in company of Mr. Purchas, over the environs of the town. Before I begin to describe the country, I may be allowed to dedicate a few lines to the cherished memory of that noble-hearted man. Endowed with an extraordinary talent of observation, and exerting himself with an untiring zeal and energy in the most different directions, Mr. Purchas has rendered great services to the colony by the share, justly due to him, in the discovery and management of the coalfields in the vicinity


https://www.aucklandmuseum.com/discover/research/publications/records/vol56/rediscovery
DOI: https://dx.doi.org/10.32912/ram.2022.56.5

> of Auckland, as well as by the invention of a new method of preparing from the leaves of Phormium tenax, the well-known New Zealand flax, so highly valued for its durability and tenacity. That worthy man attends with equal credit to his spiritual functions; and Onehunga is indebted to him for a beautiful school-house built of massive basalt-stone. In his agreeable company I spent many a pleasant day, and in the circle of his amiable family I passed many a happy evening. Whenever I went to visit the cheerful parsonage, homely situated in a small garden, I was always certain to meet with some little surprise; for the children also, after the example of their energetic parent, rivalled each other in industry for collecting curiosities, and had always something reserved for me, such as butterflies, beetles, or shells. Thus I am indebted to his family for many friendly services and also for valuable contributions to my collections.

Hochstetter apparently stayed in touch with Purchas and what he was doing until the end of his life (e.g., Nolden 2013: 205). Apart from the Hochstetter bust discussed in this paper, AWMM also has a plaster bust of Purchas (Accession no. 1965.78.530) made by his daughter Gertrude W. Purchas in 1890 and possibly inspired by Hochstetter's bust.

## NEW INFORMATION

I first became aware that a bust of Hochstetter had been donated to the Auckland Institute and Museum when researching the early Curators of the Museum and accidentally came across an article in the *New Zealand Herald*, May 1919. In those days significant donations to the Museum were reported monthly through the local broadsheets. The piece mentioned donations by a 'Dr C. Purchas', including 16 Egyptian curios (including a bronze statuette of Isis and the infant Horus and a canopic jar lid (AWMM Catalogue nos 13158 & 13148) and a plaster bust of 'Dr Hochstetter'. Dr C. Purchas was Arthur Challinor Purchas (1860–1941), one of the four sons and six daughters of Hochstetter's friend, the Reverend Dr Arthur Guyon Purchas. He was an ophthalmic surgeon and a Major in the Medical Corps of the New Zealand Expeditionary Force during WWI serving in the Middle East.

I then searched the AWMM Collections online website and was rewarded at that time by a single image of a bust said to be of Hochstetter (catalogue no. M1963). Further enquiries revealed that no other data was available apart from the fact that the bust was originally part of the Geology Collection and then transferred to the Applied Arts Department at about the time the first addition to the Museum's Domain site was being completed in the late 1960's. A further search of the Annual Reports of the Auckland Museum and Institute for 1918–19 and 1919–1920 revealed 'an interesting collection of 16 Egyptian antiquities' from Dr A.C. Purchas (AIM Annual Report 1919–20: 10, 27), but curiously the bust is not mentioned. There is also no mention of it in the handwritten accession records for 1918–19 or 1919–20. However, the AMI Letter-book contains a letter from the Curator Thomas Cheeseman to Dr A.C. Purchas (Letter-book 5: 1909–1920; MUS-1996-6-5) dated 2/6/1919. The letter thanks Purchas for the donation of '17 Egyptian articles, also of a plaster bust of Dr. Hochstetter and the barometer used by him'.

Some of the Egyptian objects are on display in the Ancient Worlds Gallery. The reference to the barometer is intriguing since it is not mentioned in the Herald article nor the Annual Reports of the time. If it really is the barometer used by Hochstetter during his explorations to measure altitude then it would be the Gay-Lussac type barometer made by Heinrich Kappeller, Wien (as seen from similar barometers by Kappeller online it will be clearly marked) and loaned to him by the Imperial Austrian Geological Survey (Kaiserlich Königliche Geologische Reichsanstalt, Wien), No.10 (see Hochstetter 1864: 187). To date no barometer matching these details has been found in the AWMM Collections.

The AWMM bust (Fig. 1) has traces of the original title, Ferd. R. v. Hochstetter (Ferdinand Ritter von Hochstetter). Ritter, meaning rider or horseman in Middle High German (and ridder in Middle Dutch) is the equivalent of hence the English title of Knight. Ritter von in this case refers to the hereditary knighthood bestowed on Hochstetter by the Austrian Emperor (Franz Joseph I) in 1884, the same year Hochstetter died (Fleming 1990).

## OTHER HOCHSTETTER BUSTS

Additional internet searches revealed a full-sized plaster version of the Hochstetter bust at the Museum of Natural History Vienna (Naturhistorisches Museum Wien) (Fig. 2B) and another in bronze at the grave of Hochstetter and his wife Georgiana (née Bengough) at the Vienna Central Cemetery (Wiener Zentralfriedhof) (Fig. 2C). The Museum of Natural History plaster bust was commissioned by the Viennese Geographical Society as part of their jubilee in 1881 (Nolden 2013: 204) before Hochstetter's death in 1884. The name of the sculptor, Viktor Oskar Tilgner (1844–1896), is on the back of the bust (see images at http://objekte.nhm-wien.ac.at/objekt/th337/ob336).

Hochstetter reported to Haast that the smaller copies were being made in April 1882 (Nolden 2013: 206). The smaller scale busts (42 x 28 cm) could be purchased for a subscription of 'at least 10 gulden' and were widely distributed (Nolden 2013: 204). When Hochstetter's body was moved in the early 20th century from a Protestant cemetery on the outskirts of Vienna to the more prominent Wiener Zentralfriedhof the bronze version was made (pers comm. S. Nolden) and is very likely derived from the plaster original.

Hochstetter writing to Haast in August 1882 said he is sending him four copies of the bust (one full size and three smaller) (Nolden 2013: 208). The full size bust appears to now be in Canterbury Museum and was purchased by subscription in 1883 (Accession no. CM C1883.9, pers comm. P. Scofield). The whereabouts of the three small busts is unknown. It is possible that one

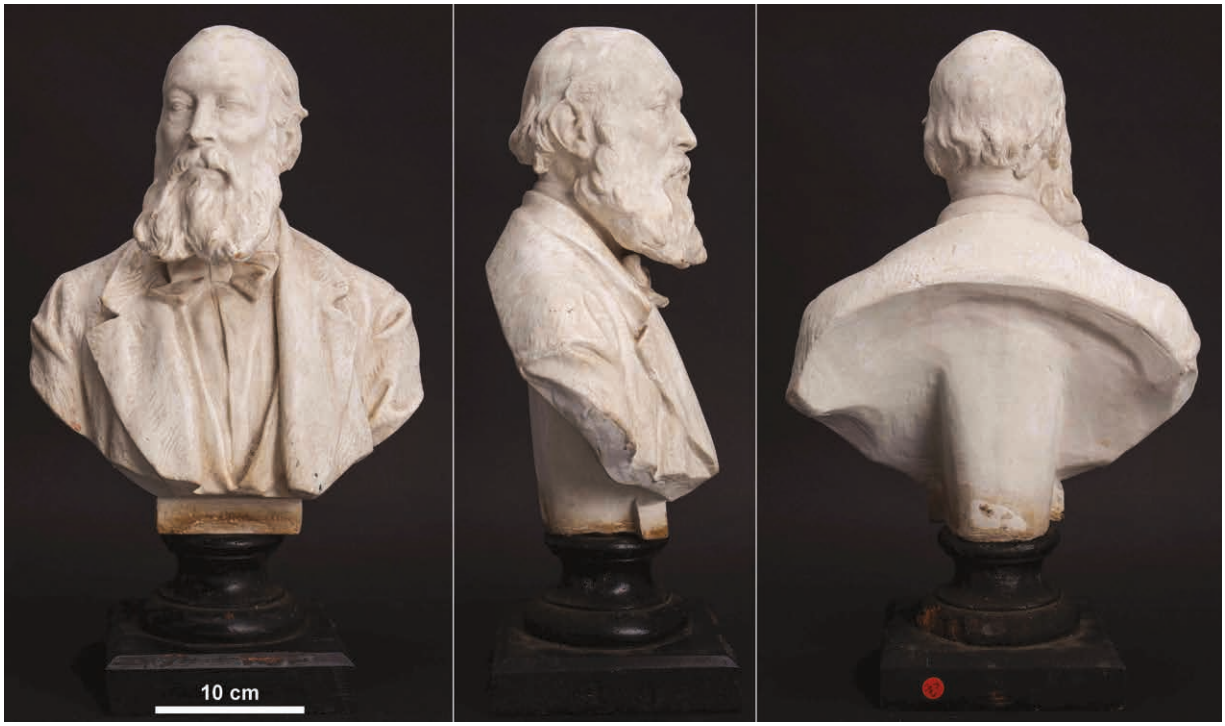


Figure 1. Plaster replica bust of Ferdinand Ritter von Hochstetter, c.1882. Auckland Museum M1963 © Auckland Museum CC BY.

was sent onto Purchas by Haast but it is equally likely that one was gifted to Purchas by Hochstetter (or his wife Georgiana) or that Purchas bought one by subscription himself. Whatever the scenario, this means either two or three busts are missing.

John Steele (pers comm.), author of a recent major biography of A.G. Purchas (Steele 2019), is not aware of a direct connection between Purchas and the bust.

In 2008 Hochstetter expert, Sascha Nolden, put together at the Auckland Library an exhibition marking the 150th anniversary of Hochstetter coming to New Zealand (Nolden 2008). Unfortunately, he was unaware at the time that busts of Hochstetter existed in New Zealand, let alone in Auckland. He carried, as hand luggage, another half-sized copy of the bust (Fig. 2A) on loan from the Geological Survey of Austria to New Zealand and then back again (pers comm. S. Nolden, 2020). The AWMM example is identical apart from condition (see Figs 1 & 2A) and a thicker basal wooden plinth apparently partially filled with a curious cement presumably to add weight to the base.

## ORIGINS OF THE HOCHSTETTER BUSTS

Because of the striking similarities I originally thought the bust might have been modelled from the photograph of Hochstetter (Fig. 2E, but without glasses for obvious reasons) taken by Victor Angerer, Wien (1839–1894). The photograph was probably taken in the early 1880's (pers comm. S. Jovanovic-Kruspel, 2020). However, research by Sascha Nolden on the correspondence of Julius von Haast reveals that the sculptor Victor Tilgner writing to Haast (dated 19 May 1885) states that "*Weil ich ein Lebensgroßes Modell seinerzeit nach der Natur modellirt habe*". This broadly translates as "*Because I created a life-sized model from life at the time*" (pers comm. S. Nolden, 2022). Also of a similar vintage to the photograph is a portrait (Fig. 2D) by Franz Rumpler (1845–1922) dated 1882 which itself is interesting in that it shows Hochstetter's fondness and connection to New Zealand right to the end. Hochstetter is surrounded by things Maori with a carved figure behind him and his right hand resting on a Māori cloak, a *wakahuia* and a *pounamu tiki*. The *tiki* is possibly that obtained by him from a Mrs Lewis from Cannstatt, Stuttgart in 1882 (see Nolden 2013: 207).

## CONCLUSION

Without supporting papers or letters between Arthur Guyon Purchas and Hochstetter or Haast or from within the Purchas family, it is not possible to definitively state that the AWWM bust originally belonged to the Reverend Dr Arthur Guyon Purchas. However, for the present this is the most likely provenance of the AWWM bust as part of Purchas' enduring friendship with Hochstetter who he survived by another 12 years.

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Figure 2. *A*) Half-size replica plaster bust borrowed from Austria by S. Nolden for Auckland Library exhibition in 2008. *B*) Full-sized plaster bust at the Naturhistorisches Museum Wien. *C*) Full-sized bronze bust at the Wiener Zentralfriedhof, early 20th century. *D*) Portrait with Māori artefacts, 1882. *E*) Photograph from the early 1880s.

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# Collection of books, pamphlets and serials donated by James Tannock Mackelvie, held at Auckland War Memorial Museum Tāmaki Paenga Hira

Paula Legel Auckland War Memorial Museum

## INTRODUCTION

Research initiated in 2019 to understand the scope of the book and pamphlet collection donated by James Tannock Mackelvie was triggered by the number of volumes uniformly bound and stamped with his name. No other collection of books donated to the Auckland Museum Library over the more than 150-year history has been custom bound in this way. It was then established that all the published books and pamphlets donated by Mackelvie held at the Museum are part of the Museum's collections and not held in trust for the Mackelvie Society. This note will enable an understanding of how this was determined.

A project is currently under way on an audit of all identifiable volumes donated by Mackelvie still held in the Heritage Publications collection of the Documentary Heritage Collections at Tāmaki Paenga Hira Auckland War Memorial Museum (the Museum), and to ensure these volumes are fully catalogued and explicitly identified as part of the Mackelvie Book and Pamphlet Collection. Further research using the Mackelvie Archive (NZMS 195-222) held in the Sir George Grey Special Collections at Auckland Libraries is the next step to completely understand the size and scope of Auckland Museum's Mackelvie book donations.

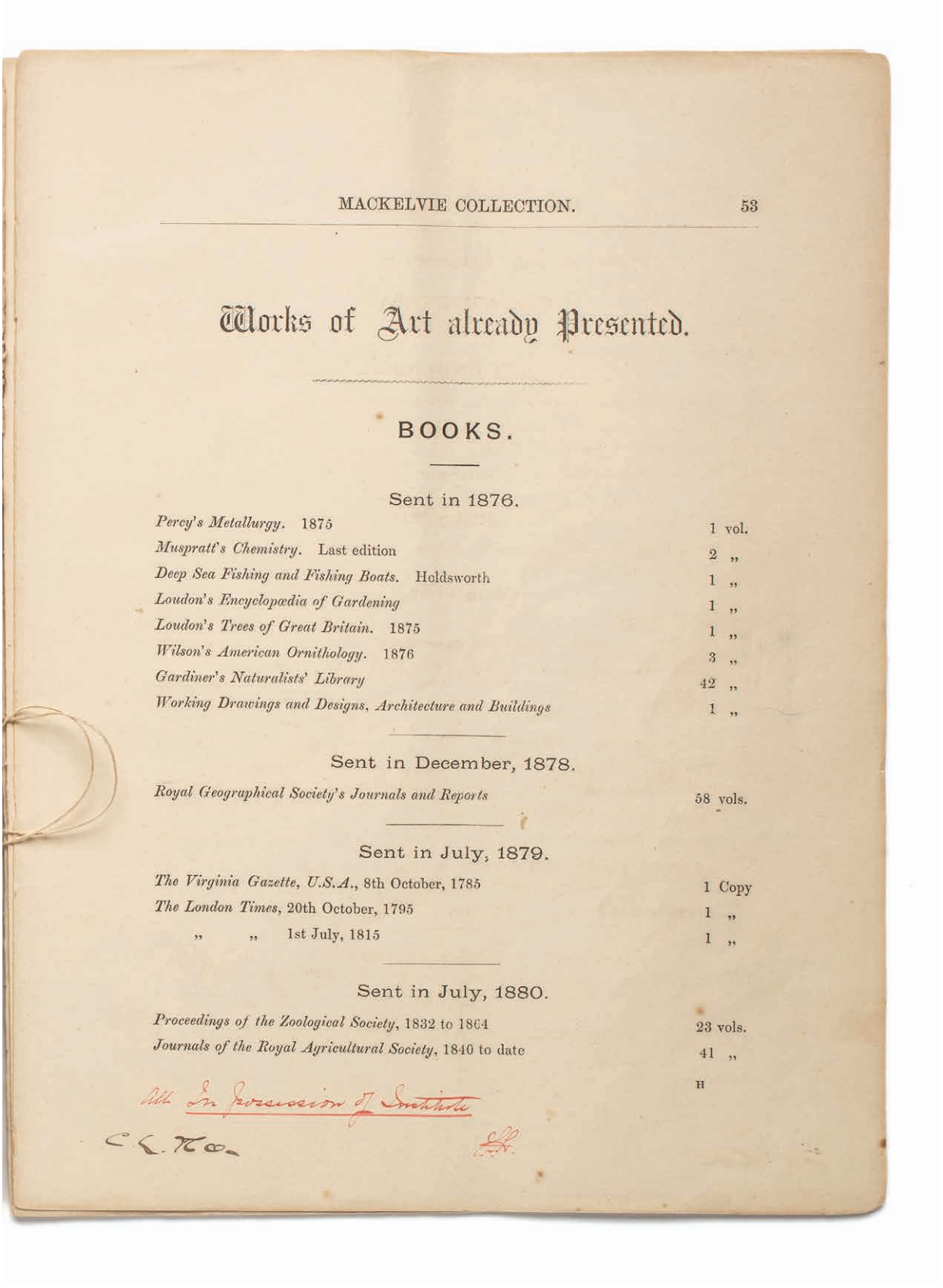
## BACKGROUND

From the very inception of the Museum in 1852, there was the intent to have a library (Park 1998: 14). Various reports in newspapers of the time including the *New Zealander* (26 October 1853 and 7 January 1854), confirm the desire to build a collection of scientific volumes and include donations such as those left to the colony by Sir Everard Home. A report in the *New Zealander* (17 January 1857) discusses the desire to establish an institute of practical science where research, preferably of particular relevance to Auckland, is undertaken, papers read before peers and published in volumes of transactions for the benefit of all. Mention is made of the Museum and how well aligned it was to an institute of science. However, this institute wasn't established until, as the *Daily Southern Cross* (7 November 1867) reported, the Auckland Philosophical Society was established on the 6th of November that year under the auspices of the New Zealand Society and incorporated as a branch of the New Zealand Institute. The institute was to house a museum, laboratory, and library. By March of the following year the organization was named the Auckland Institute (*Daily Southern Cross,* 11 March 1868), and by 1869 responsibility for the Museum had been passed to the Auckland Institute (*Daily Southern Cross*, 29 January 1869). Annual reports of the Institute from the beginning list purchases and donations to the library, with subscriptions of learned journals highlighted at the start of each published report.

James Tannock Mackelvie was born in Ardrossan, Scotland in 1824 and arrived in New Zealand in 1865, returning to England in 1871. Though in Auckland for a mere six years whilst a partner of Mackelvie, Brown, Campbell, and Co., he was active in the community, an early member of the Auckland Institute and Auckland Acclimatisation Society. Through his investment in gold mines he amassed a considerable fortune, which he expended indulging his interest in and passion for arts and culture. Dying in London in 1885 at the relatively young age of 61, Mackelvie never married, nor had children. In his will he bequeathed to the people of Auckland a collection of fine and applied arts and illustrated and rare books, to be managed by a trust in his name. Although it took some years for the terms of his will to be upheld, these collections are now housed at the Auckland Art Gallery Toi o Tāmaki (fine arts), Auckland War Memorial Museum Tāmaki Paenga Hira (applied arts) and Auckland Libraries (books) (McKay 2018: 17). The collection is celebrated on the website of the Mackelvie Society, a recently formed arm of the long-standing Mackelvie Trust (Mackelvie Society website).

The Museum holds several copies of the *Catalogue of the Mackelvie Collection* published in 1885 (N5297 CAT). Prepared by Mackelvie prior to his death, in the main the catalogue lists the wide range of material, including books, making up the Mackelvie Trust Collection (McKay 2018: 18). One of the copies held in the Museum archive is marked denoting which items went to each institution and shows that all the books went either to the Art Gallery, ELAM School or the Public Library. The last pages (53–60) list some items previously donated, and the books and serials are clearly marked as in possession of the Institute (Fig. 1). Thus, any titles Mackelvie donated to the Auckland Museum prior to his death are by default those donated directly to the Institute as noted in the Museum archives and acknowledged publicly via newspaper reports of the time.

Records of the Auckland Museum 56: 75–81 2022
https://www.aucklandmuseum.com/discover/research/publications/records/vol56/ mackelvie
DOI: https://dx.doi.org/10.32912/ram.2022.56.6



MACKELVIE COLLECTION. 53

# Works of Art already Presented.

## BOOKS.

### Sent in 1876.

| | |
|---|---|
| *Percy's Metallurgy.* 1875 | 1 vol. |
| *Muspratt's Chemistry.* Last edition | 2 „ |
| *Deep Sea Fishing and Fishing Boats.* Holdsworth | 1 „ |
| *Loudon's Encyclopædia of Gardening* | 1 „ |
| *Loudon's Trees of Great Britain.* 1875 | 1 „ |
| *Wilson's American Ornithology.* 1876 | 3 „ |
| *Gardiner's Naturalists' Library* | 42 „ |
| *Working Drawings and Designs, Architecture and Buildings* | 1 „ |

### Sent in December, 1878.

| | |
|---|---|
| *Royal Geographical Society's Journals and Reports* | 58 vols. |

### Sent in July, 1879.

| | |
|---|---|
| *The Virginia Gazette, U.S.A.*, 8th October, 1785 | 1 Copy |
| *The London Times*, 20th October, 1795 | 1 „ |
| „ „ 1st July, 1815 | 1 „ |

### Sent in July, 1880.

| | |
|---|---|
| *Proceedings of the Zoological Society*, 1832 to 1864 | 23 vols. |
| *Journals of the Royal Agricultural Society*, 1840 to date | 41 „ |



Figure 1. Catalogue of the Mackelvie Collection, page 53.

## DONATIONS TO THE MUSEUM AND THE AUCKLAND INSTITUTE LIBRARY

Mackelvie was a generous benefactor during his time in Auckland in that he was donating to the Auckland Museum prior to the bequest that forms the Mackelvie Trust Collection. The very first donation to the then Auckland Museum in 1865, within six months of Mackelvie's arrival in Auckland, was a mix of objects ranging from a Russian charm to an African leg ornament, a portion of the Red Sea telegraph cable and 113 coins (*Daily Southern Cross*, 14 December 1865). The first donation specifically to the recently renamed Auckland Institute Library, reported in the first Annual Report of the Auckland Museum (1868), was a set of photographs featuring machinery used to lay the transatlantic cable. In the Annual Report of the Auckland Institute 1876–1877, thanks are given to Mr. J.T. Mackelvie for a donation of 52 volumes of scientific works. Over the next eight years until his death in 1885, many books and journals were sent from London for the Auckland Institute Library.The collection donated to the original Auckland Museum and its successors by Mackelvie was not treated as a separate entity but rather was subsumed into the wider collecting areas of the institution. Consequently, this has impacted visibility to the wider Auckland community as items donated by Mackelvie**.** Donations to the Museum were often poorly documented prior to the start of the 20th century and it is only through Museum archives, correspondence and reports of the Institute that the history of Mackelvie's donations can be reconstructed.

Mackelvie, from his arrival in Auckland, involved himself in societies for the betterment of Aucklanders. He was a founding member of the Auckland Philosophical Society which became the Auckland Institute in 1868, and by 1881, as noted on the cover of the Annual Report of 1880–1881, the Auckland Institute and Museum. It is not clear if Mackelvie was a member of the Institute the entire time he was in Auckland, but his name appears on the earliest member lists in the Museum archive from 1871 to 1873 (MUS-1995-8) by which time he had returned to London. His support for the Auckland Institute is demonstrated from his first donation in 1865, after which Mackelvie donated a range of scientific and technical publications to support the research of Institute members in the development of extractive industries, agriculture, natural sciences, ethnology and archaeology. A letter (18 May 1881) to Thomas Cheeseman, the Museum's long-serving Curator, also emphasized the importance Mackelvie placed on the Institute and Museum having a comprehensive collection of all publications documenting knowledge and history of New Zealand. 'I remember you agreed with me as to the importance of this Collection and my idea is to make it as perfect as I can.'

A letter to Cheeseman from the previous year (6 September 1880) showcases a collector's awareness of the potential future value of the volumes. 'I have long thought that there will be a time, and not by any means far distant, when all the books on the early history of New Zealand will be considered valuable…'

On the 2 December 1878, Mackelvie wrote to Cheeseman regarding the donation of a complete series of the *Journal of the Royal Geographic Society of London*. This donation was acknowledged in the first Auckland Institute meeting of 1879. Mackelvie was also thanked for the donation of 150 West African artefacts and '…three magnificent volumes of Gray's Book on Birds; and several volumes of the Conchologia Iconica, a work that has just been published…' (*Auckland Star,* 3 June 1879*)*. By 1880, Mackelvie had sent 23 volumes of *Proceedings Zoological Society of London* from 1832 to 1864 inclusive, and 41 volumes of the *Journal of the Royal Agricultural Society of England* from its commencement in 1840 to date. He specifically wrote of having the volumes bound in London, in recognition of the limited resources of Auckland Institute.

The *New Zealand Herald* (16 November 1880) reported on the Institute's November meeting, when Mackelvie was thanked for a further donation and emphasis placed on the benefit of the material to the city.

> This is the third donation of books made by Mr. Mackelvie, in addition to numerous donations to the Museum. The Chairman said these books had arrived in the harbour but had not yet been placed in the library. These books were of great value—of the greatest value to persons engaged in agriculture. He held in his hand an index of the subjects treated, all of which were of the highest importance. These books were brought out free of cost by the New Zealand Shipping Company. This was not the first time the New Zealand Shipping Company had performed similar acts of kindness. He thought that a special vote of thanks was due to Mr. Mackelvie.

It would appear up until this time that Mackelvie was purchasing material directly himself, largely through John Wheldon, Natural History and General bookseller, based in Lincoln's Inn Fields, London. By 1881 he was using an agent, E.A. Petherick, to purchase on his behalf. Petherick worked closely with John Ramage & Co., Publishers, Wholesale Booksellers & Bookbinders, Warwick Lane, Paternoster Row, London.

Many of the volumes are still in bindings made to Mackelvie's specifications by London bookbinders John Ramage & Company; with maroon and blue marbled boards and endpapers, calf spines with gilt lettering for the title and a donor statement at the base of each spine, highlighting the donation to the Institute by J.T. Mackelvie (Figs 2 and 3). While many of the Mackelvie volumes are recognisable from the bindings, others lack the marbled boards but include a donor plate. Some volumes have had to be rebound due to their constant use, however a combination of accession numbers and library ownership stamps with the documentation strongly suggests their relationship to Mackelvie.

The binding undertaken in London makes many of the volumes donated by Mackelvie instantly recognisable and creates a visual sense of "collection" and relationship to Mackelvie, however that binding process will have

removed information on previous provenance and any interesting ownership history, particularly of the 17th and 18th century books. Heritage collections in libraries and museums value the books they hold as objects for the stories they tell about previous ownership and their material construct as well as the content.

All the while Mackelvie was also shipping other objects and artefacts such as those from the Swiss lake dwellings and articles of African cloth for the Institute's collection. His letters to Cheeseman indicate the complexity of collecting for an institution on the far side of the world when the only means to communicate was a letter, sent by sea, that could take many weeks or months for return correspondence. He requested that Cheeseman send him a marked-up list and further requested confirmation from Cheeseman as to which titles about New Zealand were already held in the Institute Library.

> I may tell you that up to now my Agent has procured for me 71 volumes referring to the History of New Zealand but there are many more required before I will be satisfied – by the way, it has occurred to me that you might have let me know what books you already possess on this subject, when I declared to you my intention of going into this matter as I may be taking much unnecessary trouble & spending more money than I need to. (18 May 1881)


Figure 2. Binding of the journal of the Royal Geographic Society of London. G7 JOU.


Figure 3. Donor plate in the journal of the Royal Geograhic Society of London.

On the 16th of June 1881 Mackelvie wrote to Cheeseman with a list of the 70 titles he had purchased to date for the Museum, including several bound volumes of pamphlets. The *New Zealand Herald* (14 July 1881) reported on the donation:

> As our readers are aware Mr. J. T. Mackelvie has on frequent occasions done good service to the Auckland Institute by supplying its library with sets of books which could only be completed in England. Recent advices from London state that he is at present engaged in trying to make a complete collection of all the books that have been published on New Zealand. This is a task that will take a long time to complete even partially. But we understand that the latest information on the subject showed that he had gathered together between seventy and eighty old books on the colony. If Mr. Mackelvie is even moderately successful in this task, he will have accomplished a work which will be of the greatest possible use when the history of the colonisation of New Zealand comes to be written. It is needless to state that the collection, when completed, is intended for the library of the Auckland Institute.

By September Mackelvie had purchased more titles, bringing the number to approximately 110. He had also organised the rebinding in preparation for shipping as his agent had run out of space to store the books. Included were the three titles officially documenting Captain James Cook's voyages, key titles to any collection on the European exploration of New Zealand and the Pacific. The books were duly dispatched in October.

> The number of books written about New Zealand are legend, and many of them, besides their historic value, have high literary merit. Yet of these books we have almost none. Mr. J. T. Mackelvie, with wise forethought, has determined that the books written about this colony shall be preserved. It was easier to make a collection in London than anywhere else, but if the task had been neglected for long these books would have perished. By the ship '*Roman Empire*', which sailed on October 12, about 150 volumes are expected, all of books devoted to New Zealand. This will, in after times, be Auckland's most cherished possession. They should be kept solely for reference. *New Zealand Herald* 19 January 1882

The New Zealand Herald article of 10 February 1882 (Fig. 4) listed the titles of books; 78 works consisting of 104 volumes, observing that some of the books were rare and must have cost considerable sums. Whilst primarily focusing on New Zealand publications, Mackelvie was also sending volumes on a wide range of subjects, though these are not always given the same trademark binding Mackelvie ensured of the New Zealand-related books. Newspapers, and the Annual Reports of the Auckland Institute and Museum often did not give these books the same detailed reporting, making it impossible to identify all titles donated.

The first consignment of the books on New Zealand purchased for the Auckland Museum by Mr. J. T. Mackelvie was unpacked yesterday. It will be seen from the list which we publish that it comprises some rare works, which must have cost considerable sums, as well as much trouble in finding where they were available. There are seventy-eight works, consisting of 104 volumes. The following is a list :—

Harris's Collection of Voyages (2 vols.), Owen's Extinct Birds of New Zealand (2 vols.), Bree's Illustrations of New Zealand, Sir G. Grey's Poems and Traditions of the Maoris, Swainson's New Zealand, Meade's Ride in New Zealand, Breton's Excursions in New South Wales, &c., Munday's Our Antipodes (3 vols.), Wilke's United States Exploring Expedition (5 vols.) Reid's Australian Goldfields, Nicholas' Voyage to New Zealand, Criuse's Ten Months in New Zealand, Hunt's Twenty-five Years in New Zealand, Our Race and Its Origin (Rev. R. Taylor), Wilson's Story of Te Waharoa, Savage's New Zealand, Maning's War in the North, Pamphlets on New Zealand, Field's New South Wales, Taylor's Past and Present of New Zealand, Polack's New Zealand (2 vols.), Wakefield's Adventures in New Zealand (2 vols.), Terry's New Zealand, Forster's Voyages with Cook (3 vols.), Collins' New South Wales, &c. (2 vols), Journal of Civilisation, Parkinson's Voyages, Cook's Voyages (4 vols.), Colonial Pamphlets, Earle's New Zealand, Johnstone's Maoria, The New Zealand Land Question, Ewes' Australia and New Zealand, Power's Sketches in New Zealand, Williams' Missionary Enterprise, Reminiscences of a Veteran (3 vols.), Shortland's Southern New Zealand, Young's Southern World, Swainson's New Zealand and the War, Thomson's Story of New Zealand (2 vols.), Hursthouse's New Zealand, Jameson's New Zealand, Puseley's Australia and New Zealand, Lang's New Zealand in 1839, Debates on New Zealand in the House of Commons, Grayling's War in Taranaki, Simmonds' Old England and New Zealand, Brodie's Past and Present of New Zealand, Firth's Conference with the King Natives, Yates' New Zealand, Cholmondeley's New Zealand, Adams' Spring in the Canterbury Settlement, Brown's New Zealand, Wade's Journey Through New Zealand, Maning's Old New Zealand, Marshall's Visits to New Zealand, Williams' New Zealand Dictionary, Selwyn's Letters from New Zealand, The Southern Cross and the Southern Crown, Reports of the New Zealand Company, Shortland's New Zealand Traditions, Rowe's Australian Group, Handbook for New Zealand, Ellis' Polynesian Researches (5 vols.), Fox's Six Colonies of New Zealand, Russell's Polynesia, The New Zealanders, The British Colonisation of New Zealand, New Zealand and the Cape of Good Hope, McKillop's Twelve Months in New Zealand, Reports of Missions, Local Government in New Zealand, Heywood's Travels in Australia and New Zealand, Auckland the Capital of New Zealand, Kennedy's New Zealand, Polack's Manners and Customs of the New Zealanders (2 vols.), Hursthouse's New Plymouth, Angas' Savage Life in New Zealand (2 vols.).

Figure 4. *New Zealand Herald*, Volume XIX, Issue 6313, 10 February 1882, Page 5 listing the titles of donated books.

A letter to Cheeseman in November 1881 revealed that Mackelvie had started working with Mr E.A. Petherick, a well-known agent specialising in locating and purchasing books relating to Australia and New Zealand. Petherick had supplied '63 volumes & 20 to 30 pamphlets – many very scarce and these are now in the hands of the binder for binding (crest as usual) & repairs & they will go out to you in the spring along with the two first volumes of the Challenger Expedition & Darwin's Earthworms & some other books.'

A letter of August 1882 mentions another delivery on its way on the ship *Loch Fleet* which was reported in the *New Zealand Herald* (20 November 1882). The numerous reports itemising every title can be seen as a reflection of the importance of the donations to the Institute.

A memo held in the Museum archives (MUS-1995-38-86) dated 18th October 1883 lists 45 volumes on New Zealand and several other titles on their way on the ship *Opawa*. A note regarding the *Opawa* delivery was published in the *New Zealand Herald* (2 February 1884).

> BOOKS ON NEW ZEALAND FROM
> MR. MACKELVIE.
>
> We have already noticed that Mr. Mackelvie had sent, by the ship Opawa, another consignment of books to augment the collection he formerly sent on New Zealand. The volumes have now been unpacked, and they are certainly a most valuable addition to what may be called our national library. Amongst the collection are six volumes of the Challenger's Expedition, in continuation of those which we have already received from the same gentleman. We may mention that each of these volumes is published at £2 10s. A number of the volumes consist of pamphlets, some old and some new, on the subject of New Zealand, but all are valuable for preservation. There are in all 14 volumes on colonial history.

Mackelvie was ambitious in his intent to acquire NZ books, and to Cheeseman (31st October 1883) he wrote of the involvement of E.A. Petherick.

> You will also find a copy of the York Gate Library [catalogue, still held], as it is called, being the Collection of S.W. Silver Esq. (York Gate being where he lives) on early voyages and discovery and tracing all colonial history. This has been presented to me by my friend Mr Petherick, the compiler who managed to obtain most of the works for Mr Silver and has also got for me most of my later acquisitions on Colonial History & I may have mentioned that his name having become known as a buyer of such works, he has had sent to him & has purchased many duplicates and is prepared to take in hand the collection of any similar parcels for other places in New Zealand or elsewhere that may desire it.

We can see that Mackelvie is utilising every avenue to ensure a comprehensive collection is sourced and gifted to the Auckland Museum and Institute Library. The above letter is the last held in the Museum archives which refers directly to collecting books for the Institute.

A further report in the *New Zealand Herald* (26 February 1884) regarding the donation of 45 books on New Zealand was followed by another in August of that year acknowledging a further gift (*New Zealand Herald,*18 August 1884). What wasn't reported but is apparent from allusions in his letters to Cheeseman, was that Mackelvie's health was poor.

The *Auckland Star* published an obituary on the 23rd of July 1885 lamenting his death and acknowledged the bequest of what was to be called the Mackelvie Collection to Auckland in Mackelvie's Will. The report of the Institute meeting of the 27th of July 1885 in the following day's *New Zealand Herald*, records an eloquent acknowledgement from the Chair recognising the significant impact on the fledgling Auckland Institute and Museum Library of James Tannock Mackelvie's generosity.

> The Late J. T. Mackelvie, Esq.—The Chairman said: Before commencing our usual business this evening I desire to say a few words expressing our deep regret at the loss we have sustained in the death of Mr. J. Tannock Mackelvie. For many years past—without exception—it has been the pleasant duty of my predecessors in the Presidential chair to gratefully acknowledge the receipt of some kind and valued gift to the Institute or, on behalf of the citizens of Auckland, as custodians, of some art treasure or object of beauty forwarded by Mr. Mackelvie. His name is familiar to you all. The objects he has so carefully collected are of the greatest value. Such gifts—such forethought must endear his name to us and keep his memory ever with us. So far as this Institute is concerned these gifts arrived when we were unendowed and unable to obtain such treasures other than by donation. Fortunately, we have a had kind friend who aided us when most required, to erect this building, furnish it, and by their generosity to place within it many of the treasures we see. With institutions as with men, the assistance which comes in adversity is ever the most fondly remembered, and we ever cling to the memory of the hand which in our infancy aided our infant steps. Some of these kind benefactors have left at for ever, but the names of Edmonston, Costley, and Mackelvie will not be forgotten, long after we in turn have passed away, the memory of these kindly deeds will endure.

## CONCLUSION

Research to date, utilising correspondence, and detailed lists in both the Annual Reports and reporting in the *New Zealand Herald* and *Auckland Star,* shows between 300 – 400 volumes, with significant focus on New Zealand history, Pacific exploration, natural sciences, and a range of learned journals were donated by Mackelvie. Mackelvie's intent was clear, he wished the people of

Auckland to have access to a collection that reflected the published history of New Zealand and provided a rich research resource for scientific, ethnographic, archaeological and agricultural endeavour. The books, pamphlets and journals were contributed to a core collection at the Auckland Institute Library and well able to provide that resource. Having the books on New Zealand uniformly bound and with clear acknowledgement of his donation strongly suggests he wished his name and generosity to endure. In that Mackelvie was successful, with the binding triggering the research of this note.

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