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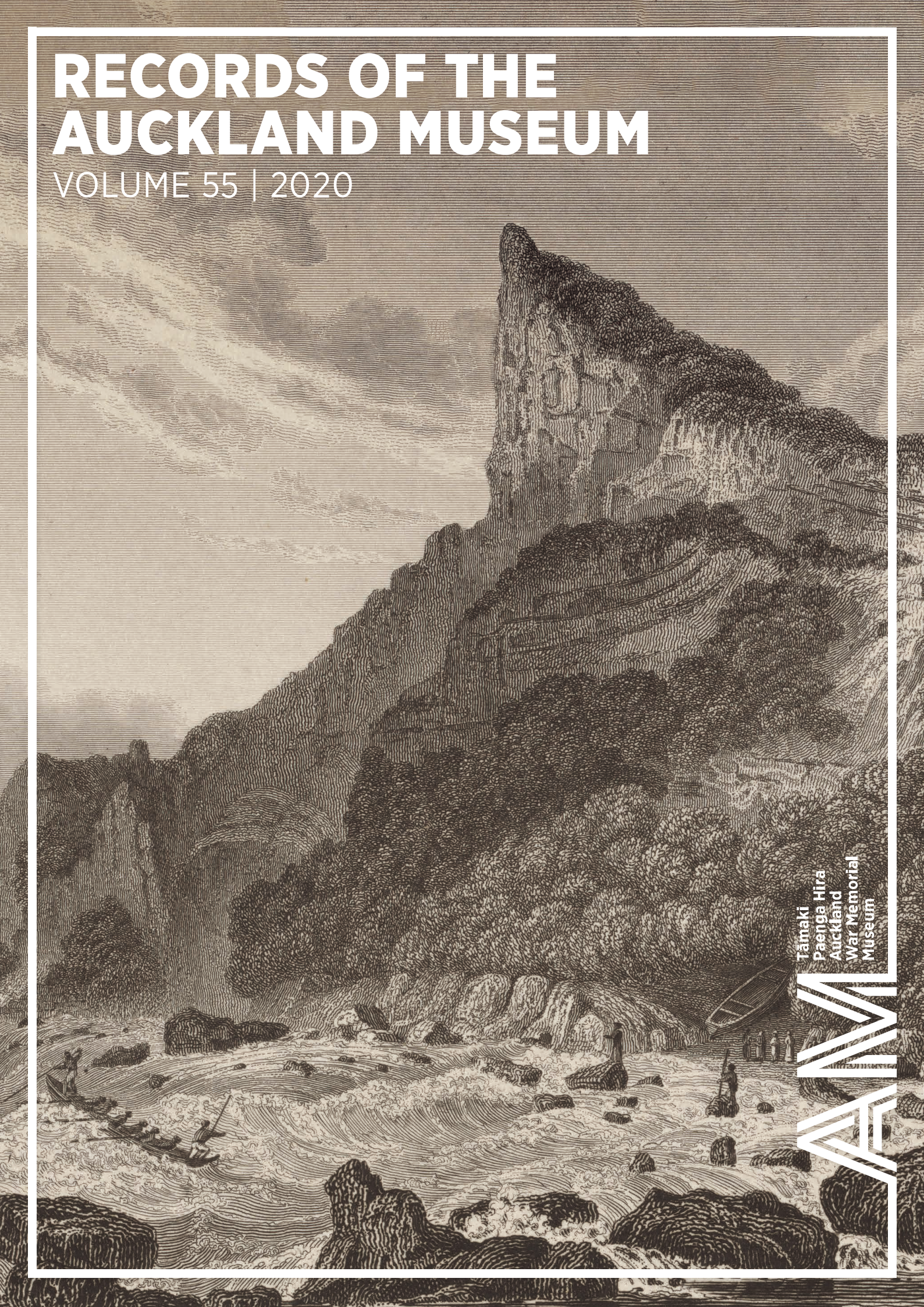

Tāmaki Paenga Hira Auckland War Memorial Museum

John Buchanan's pre-1880 Records and Illustrations of New Zealand Fungi

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Abstract
John Buchanan illustrated a range of non-lichenised fungi while botanising around Wellington. In 1874 he recorded the names of 52 fungi as an addition to a list of plants of Wellington province, based on his collections and illustrations of fungal specimens. All but one of Buchanan's known fungal illustrations, dating mostly from 1871 to 1877, are unpublished and are collated along with botanical illustrations in a bound volume labelled MS-41in the Manuscript Collection, Documentary Heritage, Auckland War Memorial Museum. Several illustrations are historically significant as they predate formal description of the species depicted. Buchanan's only mycological paper was the illustrated description of a new species *Cyttaria purdiei*, a name that will separately be epitypified and applied to a misidentified New Zealand species.

Keywords
mycology; mycota; new historical records; manuscript.

INTRODUCTION

John Buchanan FLS (1819–1898) was born in Dunbartonshire, Scotland and apprenticed as a pattern designer in the calico printing trade (Adams 1990, 2002). He emigrated to Dunedin in 1852 (the 5th year of the Scottish settlement) and, following brief work in the Australian goldfields in Victoria during 1852, worked as a survey assistant and gold prospector in Otago. Through his friendship with botanist John Ross (Busby, Glasgow) to whom he sent plant specimens, and subsequent recommendation from Joseph D. Hooker, Buchanan was employed in 1862 as botanist and draughtsman for Sir James Hector's geological survey of Otago and West Coast. During his work, he collected plant specimens, and prepared maps, colour paintings of lakes and sounds and botanical illustrations (Tyler 2012). In 1865, Hector was appointed Director of the Colonial Museum in Wellington, employing Buchanan along with his other Dunedin staff. Buchanan lived in Thorndon for the next 20 years and contributed significantly to the Museum and the Wellington Botanic Garden. The latter was referred to by some as the 'Buchanan Garden' (Ridley 2016) or the 'Buchanical' gardens (Nathan 2019). His work involved botanical and geological trips throughout New Zealand, recording his collections in field-books, letters and reports (parts cited by Adams 1990), and writing 36 scientific papers and a folio treatment of NZ native grasses (Adams 1990). He became a Fellow of the Linnean Society of London (FLS) in 1876.

As an astute botanical observer, Buchanan also noticed fungal fruiting bodies during his many surveying trips, but to our knowledge his illustrations and records of fungi relate almost entirely to his botanising near Wellington. Fungi were mentioned in just two of his publications; one a list of species from Wellington (Buchanan 1874), the other a description of a new species (Buchanan 1886). With the exception of lichens, no fungal voucher specimens by Buchanan are known, with the authors having checked holdings of the New Zealand Fungarium (Landcare Research, Auckland) and of Kew Fungarium, London (Begoña Aguirre-Hudson, pers. comm.). Buchanan sent specimens of flowering plants, lichens, and other cryptogams to Ross and other professional contacts in Glasgow. Apparently lacking a mycological colleague in Glasgow, Buchanan sent few if any fungal specimens to Scotland for determination.

FUNGI OF THE WELLINGTON REGION

The main published evidence of his interest in fungi is his list of 52 species found during his botanising in and around Wellington (Buchanan 1874). He noted the unrecorded diversity of the cryptogams: '…The alpine forms [of cryptogams] are little known, and the whole, especially Fungi, still offer a rich field for further research in Wellington'. Having illustrated some of the fungi he was motivated to include a list of identified species: '… The Fungi I had intended to have left entirely out, but having drawings of some easily recognized species, they have, with a few others, been added'.

The illustrations that support Buchanan's 1874 list, however, were not published and were overlooked until Adams (2002) investigated the contents of an Auckland War Memorial Museum Manuscript Collection, Documentary Heritage volume MS-41, bearing handwriting by T.F. Cheeseman (L. Tyler, pers. comm.) including the wording 'J. Buchanan's Notes'. This volume of over 230 pages includes mostly pencil sketches with occasional colour paintings of plants and fungi. The 114 illustrations of fungi begin on p. 161 and extend over about 40 pages, occasionally interspersed with botanical illustrations. Beyond p. 201, the pages of MS-41 are not numbered; most illustrations are on odd-numbered pages. Those fungal illustrations that are dated are mainly from the period 1871–1877 (with two dated 1884 and 1885) when Buchanan was based in Wellington. While mushrooms dominate, he also drew other macrofungi (e.g., bracket, coral and gastroid species), and an occasional smaller ascomycete and rust fungus; the latter is one of a few coloured illustrations. Voucher specimens were apparently not preserved, although an unnamed fungus illustrated on p. 177 is annotated, along with two lichen specimens on p. 175, as 'Sent to Scotland'.

We assume that Buchanan himself identified the fungi included in his Wellington list. Where others had assisted him with identifications, e.g., James Stirton for the lichens, he gave due acknowledgment (Buchanan 1874). Hooker's (1867) collation of 217 species of fungi, as New Zealand's first mycota, was likely the main source of locally relevant information available to Buchanan.

Specimens illustrated in MS-41 are from his familiar, botanical-collecting locations around Wellington, which included the Botanic Gardens, Kaiwarra (now Kaiwharawhara), Porirua, Tinakori Hills, Dr Hector's garden (likely at Korokoro and later known as Percy Scenic Reserve – Hector's Family Album, 1903) and Mantell's garden (likely at Thorndon – National Library 1868). Outside Wellington, there is an illustration of an earthstar fungus from Taurangahika in the Whanganui region. For several species (e.g., *Ileodictyon cibarium* Tul. & C.Tul., basket fungus, kōpura whetū, Fig. 1), different growth stages are illustrated as habit drawings and in transverse section. This species was among the earliest newly described New Zealand fungi (Raoul 1844) with Buchanan's illustrations improving on the more superficial earlier images by Rev. Richard Taylor (Taylor 1855, pl. V, #6). Notes accompanying Buchanan's fungal illustrations, however, are sometimes rudimentary in comparison with his plants notes, but may include colour and habitat details, and sometimes location and date.

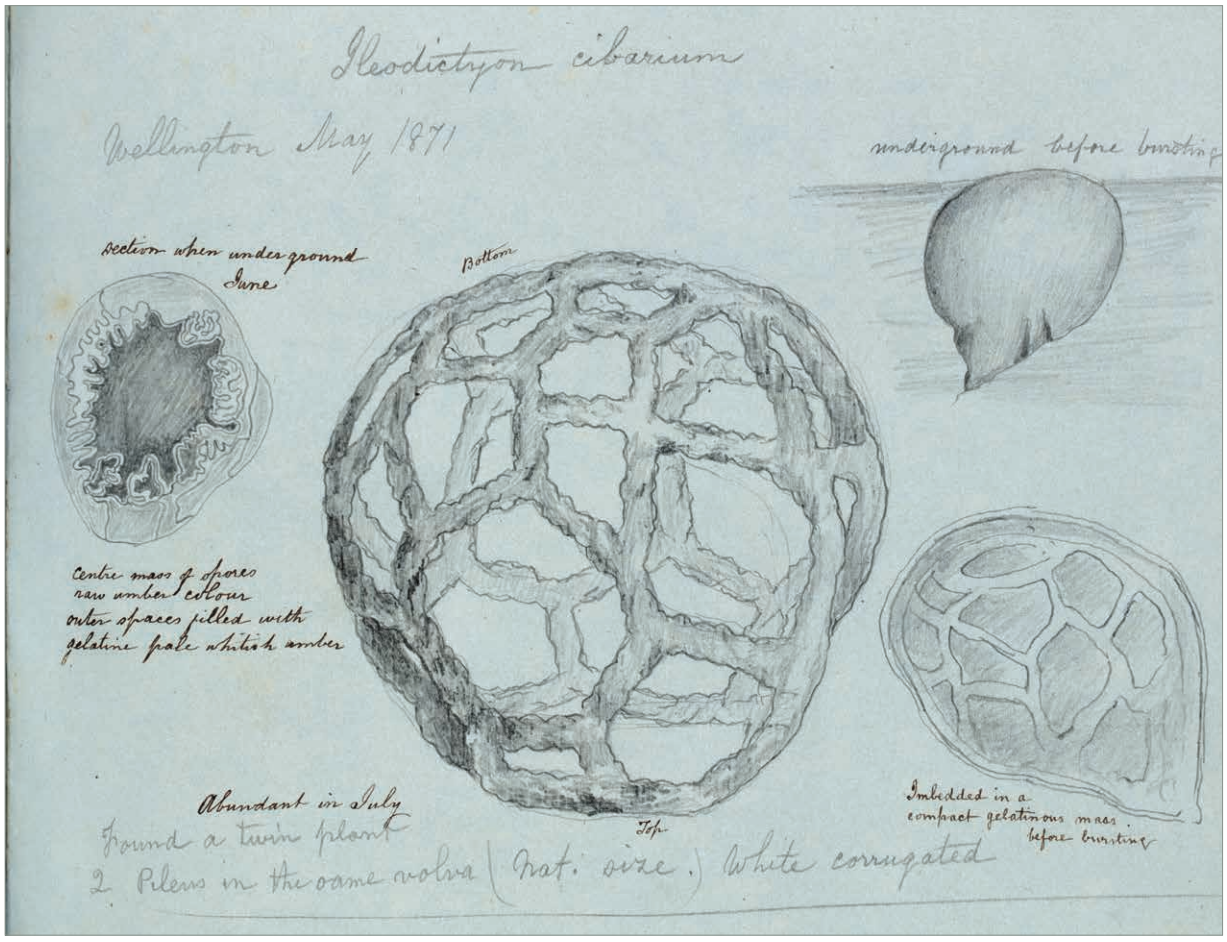

Figure 1. *Ileodictyon cibarium* – basket fungus, kōpura whetū. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: 161.

For some species, microscopic features are illustrated. MS-41 includes tracings by Buchanan of drawings of microscopic features from Berkeley (1845), suggesting he used Berkeley's drawings to assist his own interpretation of spores, basidia, and asci. We note that some of Buchanan's drawings of spores have misinterpreted large contaminant spores for those of the target species (e.g., a multiseptate spore in Fig. 2).

Coloured illustrations were prepared for two fungi. *Puccinia otagense* (Linds.) McKenzie & Padamsee (Fig. 3, as *Aecidium tragopogonis*), is a native pathogenic rust fungus that causes deformation of *Clematis* spp., earlier described and illustrated by Lindsay (1867) and later found to be conspecific with three other named native rust fungi each recorded on different host plants (Padamsee & McKenzie 2017). *Gyromitra tasmanica* Berk. & Cooke (Fig. 4) was collected in 'Dr Hector's Garden' and possibly illustrated in colour as a tribute to his mentor. To our knowledge, neither illustration was published by Buchanan or his associates.

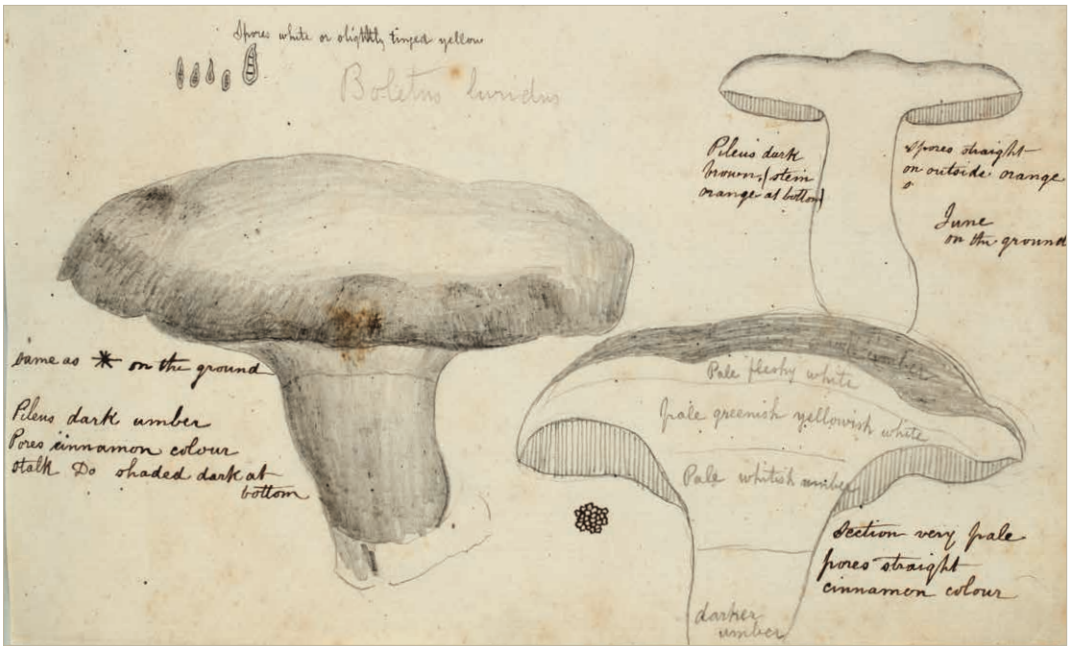

Figure 2. *Suillus quiescens* – suggested identification. Note also contaminant multiseptate spore (upper left). John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: 197.

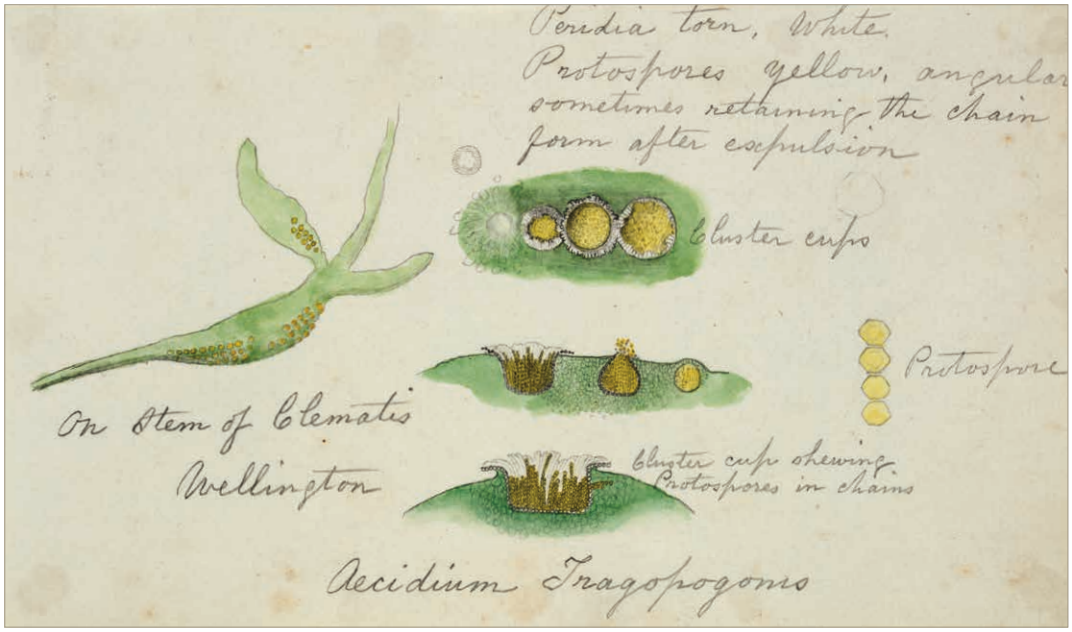

Figure 3. *Puccinia otagense*. Padamsee & McKenzie (2017) suggested that this illustration dates from c. 1875, and shows distortion of the host *Clematis* stem, and reproductive stages of the fungus – aecia, spermagonia and aeciospores (protospores). John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 213.

Figure 4. *Gyromitra tasmanica*. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 227.

HISTORICAL SIGNIFICANCE OF BUCHANAN'S ILLUSTRATIONS

The illustrations in MS-41 are historically important as few pre-1900 illustrations of New Zealand fungi are known, even of common species; the drawings are also of artistic merit. Sometimes Buchanan's illustrations cannot be identified with confidence as diagnostic features and associated collection data are lacking or confused. Having attempted reassessment of identity where possible, we find that Buchanan's illustrations in MS-41 provide the first records of 20 species that were not formally named until several years to decades later (Table 1). *Cyclocybe parasitica* (G. Stev.) Vizzini (Fig. 5), for example, is a common indigenous mushroom of large size with a characteristic hanging veil, parasitic on a range of native and introduced hardwood trees. It is edible and was known to Māori as tawaka (Fuller *et al*. 2004; Buchanan *et al*. 2017). Colenso (1891) and following authors referred to *tawaka* as the exotic *Agaricus pudicus*, and it was not until Stevenson (1982) compared New Zealand and Australian material with related species of *Agrocybe* that the Australasian species was recognized as new, as *Agrocybe parasitica* G. Stev. *Amanita australis* G. Stev. (Fig. 6), *Russula acrolamellata* McNabb (Fig. 7), and *Crinipellis novae-zelandiae* G. Stev. (≡ *Lentinula novae-zelandiae* (G. Stev.) Pegler; Fig. 8) are three other examples where Buchanan's illustrations were almost a century ahead of the species descriptions.

Fungal material sent for identification to Kew by early New Zealand collectors was often misinterpreted (e.g., by J.D. Hooker, M.C. Cooke) as widespread species known already from the Northern Hemisphere. Colenso (1885), quoting Joseph Hooker's response to his fungal specimens, wrote: '…While many of them are already well-known to science from other countries; on the other hand, almost all the species you have now sent are new to the islands of New Zealand, and thus give an idea how vast a number of widely distributed forms remain to be collected.', and in Colenso (1887):

Figure 5. *Cyclocybe parasitica* – tawaka. Conspicuous veil not evident on this specimen, but rough sketch on p. 222 shows an expansive veil. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 219.

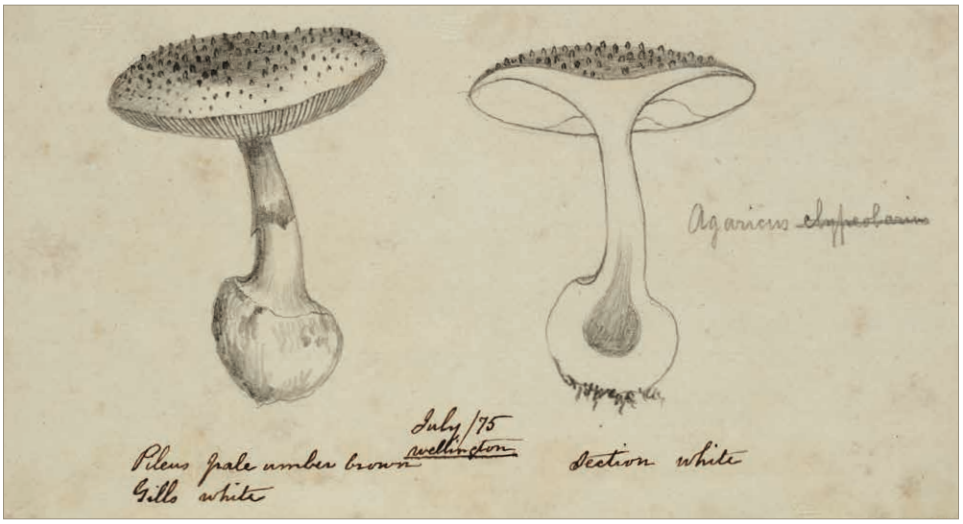

Figure 6. *Amanita australis*. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: 195.

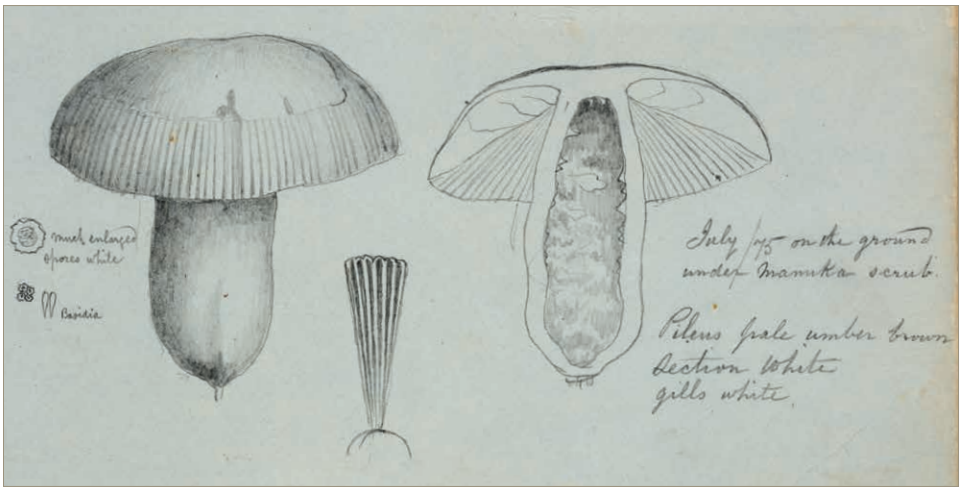

Figure 7. *Russula acrolamellata*. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 203.

'…a total of 179 species [of fungi] are new to the New Zealand flora; and of these only 18 species have been determined as new to science'. Subsequently, it has become evident from more detailed studies that many New Zealand fungi are endemic and only superficially similar to their northern relatives.

Early illustrations of ectomycorrhizal fungi that are obligate associates of particular host tree species can contribute new knowledge about the timing of host-fungus associations. Buchanan's illustration of *Thelephora terrestris* Ehrh. (Fig. 9) under exotic pines in the Botanic Gardens indicates early recognition of this introduced fungus accompanying its Northern Hemisphere host. His drawing of a bolete that we suggest could be the introduced *Suillus quiescens* T.D. Bruns & Vellinga (Fig. 2) if also collected under pines, would predate its description in its North American homeland by over 120 years. An especially large and conspicuous bolete illustrated by Buchanan as a full page (Fig. 10) lacks host data but was first formally recorded from New Zealand in the 1960s as *Phaeogyroporus portentosus* (Berk. & Broome) McNabb (McNabb 1968); it is now considered to belong in the genus *Phlebopus* but is phylogenetically distinct from named species. On the other hand, the lack of an illustration in MS-41 of *Amanita muscaria* (L.) Lam., the conspicuous mushroom with red caps and white spots so common today under pines and oaks, correlates with the later introduction to New Zealand of this ectomycorrhizal species, first reported here in 1937 (McKenzie 2004).

Other items of interest in MS-41 include an occasional new host record, as in Buchanan's data on the edible wood decay fungus *Auricularia cornea* Ehrenb. (wood ear, Taranaki wool, hakeka, Fig. 11). Noting its

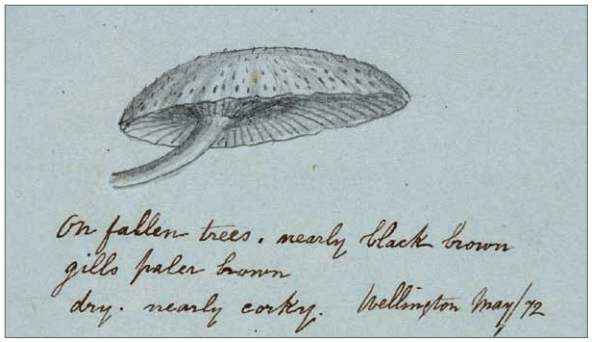

Figure 8. *Lentinula novae-zelandiae* (= *Crinipellis novae-zelandiae*) – New Zealand 'shiitake'. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: 175.

Figure 9. *Thelephora terrestris*. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 224.

Figure 10. *Phlebopus* sp. (= *Phaeogyroporus portentosus*). John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 209.

commercial harvest and export trade to China (see also Drabble 1996; McKenzie 2004), Buchanan illustrated a specimen collected from whale bone; to our knowledge this is the only New Zealand record of a non-plant substrate for this species.

As an artist at the Colonial Museum, Buchanan illustrated many papers in the first 19 volumes of the journal *Transactions and Proceedings of the New Zealand Institute* (Sampson 1985) and is credited as New Zealand's first scientific illustrator (Nathan 2019). Colenso's papers in the *Transactions* (e.g., Colenso 1885, 1887) reported new fungal records for New Zealand based on Colenso's collections sent to J.D. Hooker at Kew and identified by M.C. Cooke. Colenso's papers may have stimulated Buchanan's interest in describing fungi himself. The last illustration in MS-41, dating from about 1885, is annotated: "… This should be called *Agaricus adhaerans* N. Sp. J.B." although Buchanan did not publish this. In 1886 Buchanan published his sole mycological paper on a new species of *Cyttaria*.

Cyttaria purdiei Buchanan

Buchanan (1886) described and illustrated *Cyttaria purdiei* Buchanan, naming it in honour of his Dunedin botanical friend Alexander Callander Purdie (1824–1899) (Scholefield 1940: Vol. 2, 189). The species can be separated by its pear-shaped fruitbodies and lack of the enlarged supporting galls of host tissue associated with *C. nigra* Rawlings and *C. pallida* Rawlings, two other NZ species. It was also described and illustrated as having red beech *Fuscospora fusca* (as *Fagus fusca*) as host, whereas the other three species, including New Zealand material labelled *C. gunnii* Berk. occur on silver beech *Lophozonia menziesii* (Rawlings 1956; McKenzie *et al*. 2000; Peterson *et al*. 2010). Authenticated specimens of *C. purdiei* were not indicated by Buchanan (1886).

Since publication, the name *C. purdiei* has been mostly ignored or cited as a synonym of *C. gunnii.* The latter was considered an Australasian species until Peterson & Pfister (2010) differentiated Australian and New Zealand material of *C. gunnii* as separate non-sister clades. Since *C. gunnii* was first described from Tasmania, the name has been misapplied for the New Zealand taxon and a new name is needed. Peterson & Pfister (2010) judged that *C. purdiei* could not be a candidate for the New Zealand '*C. gunnii*' due to inadequacies in Buchanan's description and illustration, and the lack of type material. There is little doubt, however, that Buchanan's illustration refers to the species misidentified as *C. gunnii* in New Zealand, despite the erroneous host. In a future publication we will designate Buchanan's illustration as a lectotype for *C. purdiei* and nominate an epitype.

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We appreciate the opportunity provided by the Auckland War Memorial Museum to reproduce and publicise the contents of MS-41, since so few illustrations of fungi are available from this era of early European history in New Zealand. We also thank Linda Tyler (University

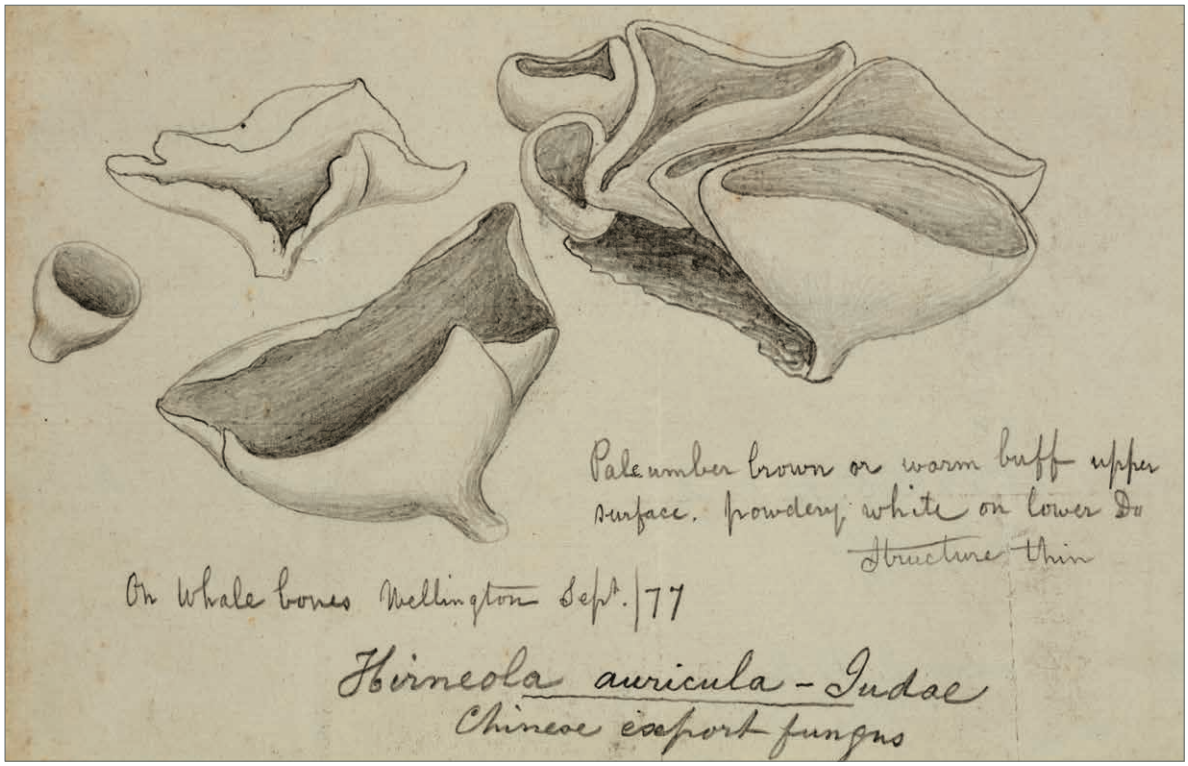

Figure 11. *Auricularia cornea* – wood ear, hakeka, reported from whale bones. John Buchanan Botanical Notebook, 1866–1886. Auckland War Memorial Museum Tāmaki Paenga Hira. MS-41: s.n. 220.

Table 1. List of fungal basionyms and dates of publication for those identifiable species illustrated in Buchanan's MS-41 that predate, by years to decades, their description as new species. Current names or other nomenclatural comments are indicated, and some of Buchanan's illustrations have been reproduced.

Agrocybe parasitica G. Stev. 1982 – current name: *Cyclocybe parasitica* (G. Stev.) Vizzini 2014, see Fig. 5

Amanita australis G. Stev. 1962 – see Fig. 6

Armillariella limonea G. Stev. 1964 – current name: *Armillaria limonea* (G. Stev.) Boesew. 1977

Ascobolus raripilus W. Phillips 1878 – current name: *Cheilymenia raripila* (W. Phillips) Dennis 1960

Clavulina brunneocinerea R.H. Petersen 1988

Clavulinopsis sulcata Overeem 1923

Crinipellis novae-zelandiae G. Stev. 1964 – current name: *Lentinula novae-zelandiae* (G. Stev.) Pegler 1983, see Fig. 8

Galerina patagonica Singer 1954

Gyromitra tasmanica Berk. & Cooke 1878 – see Fig. 4

Hydnum crocidens var. *badium* McNabb 1971

Laccaria fibrillosa McNabb 1972

Lycoperdon compactum G. Cunn. 1926 – current name: *Morganella compacta* (G. Cunn.) Kreisel & Dring 1967

Lycoperdon perlatum sensu G. Cunn. 1944 – current name: *Lycoperdon* sp., requires re-evaluation

Mycena roseoflava G. Stev. 1964

Phaeogyroporus portentosus sensu (Berk. & Broome) McNabb 1968 – current name: *Phlebopus* sp., requires re-evaluation

Psilocybe asperospora Cleland 1934 – current name: *Lacrymaria asperospora* (Cleland) Watling 1979, requires re-evaluation

Russula acrolamellata McNabb 1973 – see Fig. 7

Secotium porphyreum G. Cunn. 1924 – current name: *Cortinarius porphyroideus* Peintner & M.M. Moser 2002 *sensu lato*

Secotium virescens Massee 1890 – current name: *Clavogaster virescens* (Massee) J.A. Cooper 2015

Suillus quiescens T.D. Bruns & Vellinga 2010 – suggested identification, see Fig. 2

of Auckland) and the late David Galloway (Dunedin) for recognizing the significance of MS-41 and inviting this paper as part of their November 2012 symposium in Dunedin on the life of John Buchanan. This paper was initially contributed for the proceedings of that symposium, but those were not published.

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REFERENCES

Adams, N.M. 1990. 'Buchanan, John', Dictionary of New Zealand Biography. Te Ara – the Encyclopedia of New Zealand, https://teara.govt.nz/en/biographies/1b42/buchanan-john (accessed 16 June 2020).

Adams, N.M. 2002. John Buchanan F.L.S. botanist and artist (1819–1898). *Tuhinga* 13: 71–115.

Berkeley, M.J. 1845 ('1847'). Fungi. In, Hooker, J.D. *Flora Antarctica. Part I. Botany of Lord Auckland's Group and Campbell's Island.* London. Pp. 169–175 + Pls LXVII–LXVIII.

Buchanan, J. 1874 ('1873'). Notes on the flora of the Province of Wellington, with a list of plants collected therein. *Transactions and Proceedings of the New Zealand Institute* 6: 210–235.

Buchanan, J. 1886 ('1885'). On *Cyttaria purdiei*, Buch. *Transactions and Proceedings of the New Zealand Institute* 18: 317, Pl. 11.

Buchanan, P., G. Stewart, H. Jacob 2017. Ngā Hekaheka o Aotearoa. A Guide for Teachers (bilingual). Huia Education, Wellington. 57 pp. http://www.huia.co.nz/huia-services/resources-for-teachers/nga-hekaheka-o-aotearoa/

Colenso, W. 1885 ('1884'). A list of fungi recently discovered in New Zealand. *Transactions and Proceedings of the New Zealand Institute* 17: 265–269.

Colenso, W. 1887 ('1886'). An enumeration of fungi recently discovered in New Zealand, with brief notes on the species novae. *Transactions and Proceedings of the New Zealand Institute* 19: 301–313.

Colenso, W. 1891 ('1890'). An enumeration of fungi recently discovered in New Zealand. *Transactions and Proceedings of the New Zealand Institute* 23: 391–398.

Drabble, D.A. 1996. *The Life and Times of Chew Chong*. Don Drabble, Eltham, New Zealand.

Fuller, R.J.M., P.K. Buchanan, and M. Roberts, 2004. Pp 81–118 in McKenzie, E.H.C. (ed.) *The Fungi of New Zealand / Ngā Harore o Aotearoa, Volume 1. Introduction to Fungi of New Zealand*. Hong Kong: Fungal Diversity Press.

Hector's Family Album 1903. Percy's Bush from Ratanui Drive. Te Papa, Reg. no. 0.042227 https://collections.tepapa.govt.nz/object/781674 (consulted 5 Oct. 2020).

Hooker, J.D. 1867. Fungi. Pp. 595–637, 755–756 in *Handbook of the New Zealand Flora*. London: Reeve.

Lindsay, W.L. 1867. Observations on new lichens and fungi collected in Otago, New Zealand. *Transactions of the Royal Society of Edinburgh* 24: 407–456.

McKenzie, E.H.C. (ed.) 2004. *The Fungi of New Zealand / Ngā Harore o Aotearoa, Volume 1. Introduction to Fungi of New Zealand.* Hong Kong: Fungal Diversity Press. 500 pp.

McKenzie, E.H.C., P.K. Buchanan, and P.R. Johnston 2000. Checklist of fungi on *Nothofagus* species in New Zealand. *New Zealand Journal of Botany* 38: 635–720.

McNabb, R.F.R. 1968. The Boletaceae of New Zealand. *New Zealand Journal of Botany* 6: 137–176.

Nathan, S. 2019. John Buchanan (1819–1898): New Zealand's first scientific illustrator. *Journal of the Royal Society of New Zealand* 49: 508–516. DOI: 10.1080/03036758.2019.1656261

National Library 1868. Photographs of St Mary's Cathedral from Mantell's garden …Mantell, John Buchanan, Mantell's son holding a croquet mallet and James Hector in Mantell's garden with St Mary's behind ca 1868. https://natlib.govt.nz/records/22775893?search%5Bi%5D%5Bplace_authority_id%5D=-322238&search%5Bpath%5D=items (consulted 5 Oct. 2020).

Padamsee, M. and E.H.C. McKenzie 2017. The intriguing and convoluted life of a heteroecious rust fungus in New Zealand. *Plant Pathology* 66: 1248–1257. DOI:10.1111/ppa.12672

Peterson, K.R. and D.H. Pfister 2010. Phylogeny of *Cyttaria* inferred from nuclear and mitochondrial sequence and morphological data. *Mycologia* 102: 1398–1416. DOI: 10.3852/10-046

Peterson, K.R., D.H. Pfister, and C.D. Bell 2010. Cophylogeny and biogeography of the fungal parasite *Cyttaria* and its host *Nothofagus*, southern beech. *Mycologia* 102: 1417–1425. DOI: 10.3852/10-048

Raoul, É.F.L. 1844. Choix de plantes de la Nouvelle-Zélande. Annales des Sciences Naturelles, Botanique, 3e Série 2: 113–123.

Rawlings, G.B. 1956. Australasian Cyttariaceae. *Transactions of the Royal Society of New Zealand* 84: 19–28.

Ridley, G. 2016. The ghost in 'my patch'. Spores, Moulds, and Fungi - Blog 91. https://sporesmouldsandfungi.wordpress.com/2016/07/24/the-ghost-in-my-patch/

Sampson, F.B. 1985. Early New Zealand Botanical Art. Auckland: Reed Methuen.

Scholefield, G.H. (ed.) 1940. *A Dictionary of New Zealand Biography. Vol. 2.* Wellington: Department of Internal Affairs.

Stevenson, G. 1982. A parasitic member of the Bolbitiaceae, *Agrocybe parasitica* sp. nov. *New Zealand Journal of Forestry* 27: 130–133.

Taylor, R. 1855. *Te Ika A Maui; or, New Zealand and its Inhabitants.* London: Wertheim and Macintosh.

Tyler, L. 2012. *Art in the Service of Science. Dunedin's John Buchanan 1819−1898*. For exhibition of same name, Hocken Library, Otago University, Dunedin, 22 Nov. 2012−9 Feb. 2013.

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