

History of Walter Buller's collections of New Zealand birds

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ABSTRACT: In 1871, 310 bird specimens were purchased by the Colonial Museum, Wellington, from the important nineteenth-century New Zealand ornithologist Walter Lawry Buller. This was the first large and representative collection of New Zealand birds obtained by the national museum, and it originally included type specimens of 11 species and 23 specimens of birds that are now extinct. Most of this collection (77%) was lost or destroyed in the nineteenth century, and today only 70 of the specimens have been located, with none having the locality and date of collection on the original label. Professional jealousy and a desire to conceal his sources may have been one reason for Buller's failure to label his specimens at the start of his career, although laxity in recording specimen data was prevalent in New Zealand at the time. Subsequently, the museum was unable to care for these specimens properly, mainly owing to inadequate provision by the government for the museum and its collections.

This contrasts with the professional care given to Buller's later collections of New Zealand birds by Rothschild's private museum in England, the American Museum of Natural History and the Carnegie Museum of Natural History. The latter two museums each have over 500 New Zealand bird specimens from Walter Buller, and these collections are well documented and still largely intact. Together they provide a precious record of the decline of most New Zealand endemic bird species during the late nineteenth century, which resulted from the introduction of mammalian predators.

In this paper, Buller's collections are used to document the decline and extinction of endemic New Zealand birds. Analysis of the 'Second' and 'Third' Buller collections showed a decline in the proportion of juveniles of extinct and threatened birds, which may indicate that predation of nests and young, rather than of adults, was a key step in the demise of many New Zealand mainland species.

Buller's assertion that he built up three separate collections of New Zealand birds is shown to be incorrect. Each of these three 'collections' was selected from Buller's own collection, which was not fully disposed of until his death. The number of specimens collected was relatively small, and no evidence was found of Buller's personal collecting, or collecting on his behalf, significantly impacting on any New Zealand bird species. Nor did Buller profit greatly from the sales of his bird collections.

KEYWORDS: Bird collections, New Zealand, Walter Buller, Colonial Museum, museum history, Walter Rothschild, specimen documentation, bird extinction, predation.

Introduction

Walter Lawry Buller (1838–1906) was the best-known nineteenth-century New Zealand ornithologist. His monumental bird books and numerous papers greatly enhanced knowledge of New Zealand birds and conservation issues. His observations on the effects of introduced mammals and of habitat destruction, and his promotion of island reserves, along with early support for the legal protection of birds, raised the profile of both ornithology and conservation in New Zealand and overseas. This awareness contributed to the revolution in attitude on environmental issues that characterised New Zealand, especially during the late twentieth century. In recent years, Walter Buller's scientific achievements have been overshadowed by his reputation as a bird collector and dealer. The inherent conflict between these activities was explored by Galbreath (1989). In this paper we document the subsequent history and fate of Buller's bird collections in the context of colonial ornithology.

Buller's grand ambitions

Walter Buller was born of missionary parents in Hokianga in 1838. His youthful interest in natural history soon developed into a passion for birds. He grew up speaking and writing Māori as well as English, and accompanied his father on some missionary journeys in northern New Zealand (Galbreath 1989). Following Walter's appointment as a resident magistrate (based first in the Manawatu, and later in Wanganui), the young man was able to travel widely, building up an unrivalled network of correspondents and collectors throughout New Zealand.

However, Buller lacked formal scientific or legal training and qualifications, neither of which were yet available in New Zealand. He constantly strove to become internationally recognised and established in both professions. At the age of 19, he arranged to be elected New Zealand's first Fellow of the Linnaean Society of London (on the nomination of Sir Joseph Hooker and others). Throughout the 1860s and 1870s, Buller actively sought (and received) many scientific honours from European institutions as a result of his correspondence with leading European naturalists. However, to become a qualified lawyer he needed to go to London for admission to the Bar.

His other grand ambition was to produce a large-format illustrated book on the birds of New Zealand, in the manner of John Gould's *Birds of Australia* (1840–48). To do that he needed to commission an internationally known artist and

find a London publisher who was prepared to take on such a large project. In 1867, the New Zealand government had declined to fund the project directly. His opportunity came in 1870 when, with support from Premier Sir William Fox, Buller was allowed 18 months' leave in London on half pay, plus a generous salary as secretary to the Agent-General for New Zealand, Dr I.E. Featherston.

Buller's most conspicuous achievement in London was the publication of *A history of the birds of New Zealand*, the first edition in 1872–73 and the second in 1887–88. These expensive large-format books (priced at 5 guineas for the first edition of 500 copies, and 10 guineas for the second edition of 1000 copies) were enthusiastically received (including by Sir George Grey and Charles Darwin), and were certainly the most splendid bird books ever published by a colonial naturalist. They are full of valuable observations about New Zealand birds made by Buller and his many correspondents, and remain as an essential record of bird life in New Zealand. However, it was the outstanding plates created by the young Dutch artist J.G. Keulemans that were the sensation of the day, ensuring that neither Buller's name, nor the unique character of New Zealand birds, would ever be forgotten. Keulemans did not visit New Zealand, and almost all of his illustrations were created from specimens that Buller and others provided. Nonetheless, his illustrations are regarded as iconic images of New Zealand birds, and are endlessly reproduced and copied on products ranging from breakfast cereal cards and postage stamps to websites. The images and texts of Buller's books did more to spread and popularise knowledge of New Zealand birds and their fragile conservation status than any publication before or since. They provided the iconography and foundation for the high level of interest in conservation and natural history in New Zealand today.

Buller's bird collections

Buller collected birds from his schooldays onwards. The period spanned by his collecting (1852–1903) coincided with the major period of extinction of New Zealand birds caused by European settlement and by the mammals that Europeans introduced (Tennyson & Martinson 2007: fig. 2). Buller's three main collections document that process.

Buller's account of his collections appears at the end of his last work (Buller 1906: 166–67). This was, until recently, the sole published source on the history of his collections. His remarks are given here in full, for we consider them to be

misleading in many details, and yet they provided a broad framework for this paper:

A devoted mother, who had never skinned a bird before, succeeded, with infinite trouble, in converting [several North Island kōkako *Callaeas wilsoni*] into four beautiful cabinet specimens ... The four specimens ... were ... the foundation of a collection which in after years assumed important proportions and was, on the publication of my first edition [*A history of the birds of New Zealand*, London], in 1872–3, presented by me to the Colony, when it straightway became the 'Type Collection' in the Colonial Museum.

My second collection was sold by me, on the publication of my second edition, in 1888, to the Hon. Walter Rothschild for the Tring Museum – on the assessment of Professor Newton, of Cambridge – for £1000; and my third collection, on the completion of this 'Supplement', to the Carnegie Museum, Pittsburgh, U.S.A., for a similar sum, the price having been arrived at after a careful valuation by Dr. Bowdler Sharpe [of] the British Museum. All three collections will, therefore, be available for the student of the future, when many, if not most, of the species will have passed away for ever.

This suggests the systematic building up and sale by Buller of three separate major collections of New Zealand birds.

The first of these collections was purchased by the New Zealand government for the Colonial Museum in 1871. However, when the senior author was appointed Curator of Birds at the National Museum of New Zealand in 1976, only a few second-rate skins, poorly made up and stained with chemical preservatives, could be identified as from Buller's 'First Collection'. Only one of them had detailed data and none had collector's labels. What had happened to the 'beautiful cabinet specimens' mentioned by Buller (1906: 166), on which he expected that future work might be based? Were most 'First Collection' specimens, 'on which the descriptive portion of the work is chiefly founded' (Buller to Stafford, 27 July 1867, *AJHR* 1871), still lying undetected and unlabelled as such in the museum's collection?

Where were the remainder of the 255 specimens listed by F.W. Hutton, in 'Papers relative to the transfer of Mr. Buller's Collection of New Zealand birds' (*AJHR* 1871)? Why were so few specimens attributed to Buller in the first museum bird register (1908–22), which listed a total of 1329? Were there any distinguishing characters for recognition of birds from Buller's collections? Clues could not be gained from knowledge of Buller's life and work because, despite his fame and importance, no biography of Buller was then available.

The first objective of the research communicated here was to identify and document remaining Buller Collection specimens at the Museum of New Zealand Te Papa Tongarewa. We also describe collection management and other work at the museum in the nineteenth and early twentieth centuries, and identify external factors that facilitated or undermined the museum's development. The second objective was to research and record the history and characteristics of Buller's major scientific collections of birds elsewhere, and to assess their significance in the context of his published work and for New Zealand ornithology.

Research and sources

Buller's books suggest that he was a prolific and careful correspondent, observer and collector. One imagines that these works were based on large and comprehensive collections, carefully labelled as to locality, source and date. Frustrated at not being able to identify specimens from the 'First Collection' in the Museum of New Zealand, we decided first to research Buller's other major collections, as listed in Buller (1905, 1906), to try to determine the characteristic features of the specimens and the overall presentation of the collections.

A chance meeting with entomologist and historian Ross Galbreath in 1979 provided the senior author with a vastly improved understanding of Buller's life and activities, and an opportunity to discover something of the missing collection. Galbreath made available a draft essay that he had just written on the life of Buller (Galbreath 1979). That essay was based on archival research and contained many new insights and details. It was later expanded into a full biography (Galbreath 1989). From 1979 on, correspondence between Galbreath and Bartle led to a better understanding of the history of Buller's collections and their dispersal (briefly described by Galbreath (1989: 322, Appendix D – the Buller Collections). We did not research the collection of 252 birds sold by Buller in 1885 to the London merchant S.W. Silver. These were all subsequently mounted and eventually passed to the Oxford University Museum, as documented by Galbreath (1989: 146, 325).

The senior author studied the Buller collections in Christchurch, New Zealand, and in the USA from 1977 to 1982. As a result of that work, and subsequent correspondence with Galbreath, he learned how to identify the earlier Buller specimens in the Museum of New Zealand collection, and to know to search for and recognise Buller's manuscript list of his 'First Collection'.

Abbreviations

AJHR = *Appendix to the Journals of the House of Representatives of New Zealand*

AMNH = American Museum of Natural History, New York, USA

CMNH = Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA

CMNZ = Canterbury Museum, Christchurch, New Zealand
coll. = collected by

MS = manuscript

NHM = Natural History Museum, London and Tring, England. Formerly British Museum (Natural History)

NMNZ = Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand. Formerly Colonial Museum (1865–1907), Dominion Museum (1907–73) and National Museum of New Zealand (1973–92)

OR. = Bird collection registration prefix, NMNZ

WTU = Alexander Turnbull Library, Wellington, New Zealand

Conventions

Throughout this paper the nomenclature, taxonomy and sequence of bird names follow the *Checklist of the birds of New Zealand* (Checklist Committee 1990) and Holdaway *et al.* (2001), except where original names of types regarded now as junior synonyms are cited. In the appendices, junior synonyms appear as used in the original MS lists. Authorship and date of species have mostly been omitted. Subspecies of endemic taxa have been mostly elevated to species, after Holdaway *et al.* (2001). Listing of conservation status by subspecies follows Hitchmough *et al.* (2007), except that simplified composite terms are used in Table 1 and appendices 2–5, such as ‘extinct’, ‘extinct on the mainland’ and ‘threatened’. Also noted are new colonists and stragglers. In this paper the term ‘juvenile’ is used in a broad sense to describe all non-adult specimens, not only those in the first pennaceous plumage (Marchant & Higgins 1990: 29). Locality names are cited as precisely as possible, with the general district given where these locations are not well known. Spelling of individual place-names, and allocation of them to districts, is according to Dollimore (1957).

Canterbury Museum, Christchurch

In 1977, the senior author first examined Buller’s relatively well-labelled and well-preserved collection of 285 specimens held in the Canterbury Museum (Galbreath 1989: 324).

That collection had not been acquired until 1922, long after Buller’s death, just at the dawn of the modern period of systematic recording of collection data and adequate housing of bird collections in New Zealand museums. Canterbury Museum’s Buller Collection of birds was purchased for £500 from Laura Madocks (1870–1934), Buller’s daughter, who sold it on behalf of her sister-in-law, Mrs Leo Buller (CMNZ Archives, Box 17, Director’s correspondence). Walter left this collection jointly to both of his sons, but Leo soon inherited the remainder from his brother Percy, who died in 1910 (Galbreath 1989: 310).

Laura believed that the collection was worth more than its insured value of £1000, and was surprised when the Canterbury University Council (who oversaw the CMNZ) initially offered only £425. However, she had decided that her father would wish the birds to be returned to the ‘colony’ (CMNZ Archives, Box 17, Director’s correspondence).

The collecting dates range from 1859 to 1903. Some dates are after Buller returned to England in 1899, and show that he was active in purchasing New Zealand birds right up to the end of his life. However, the majority were collected ‘around 1892’ (R.P. Scofield, pers. comm. 2008), and are thus mostly contemporary with the larger collection of 588 specimens sold to the Carnegie Museum of Natural History in 1905. The labels used were also identical. Further work documenting the Buller Collection of birds at the Canterbury Museum is being undertaken by CMNZ staff, and so the collection is not described here in detail.

**American Museum of Natural History,
New York**

The senior author visited the American Museum of Natural History from 12 October to 12 November 1982. Numerous specimens were found from the Rothschild Museum, labelled as ‘Received from Sir Walter Buller’, and bearing numbered tags. But there was more than one sequence of numbered tags! Many dates of receipt by Rothschild were in the early 1890s, not 1888, as stated by Buller (1906: 166). This was our first knowledge that Buller had made multiple sales of birds to Rothschild, contrary to Buller’s account (cited above).

Staff in charge of the AMNH bird collection suggested to the senior author that he refer to the ‘Rothschild’s MS catalogue’ of the Buller Collection, held in the Department of Ornithology, AMNH. However, the original entries in this handwritten catalogue were not in Rothschild’s hand,

but in Buller's familiar rounded script. Here was Buller's original catalogue of his '*Second Collection*', carefully retained – but previously unrecognised – in New York. The chances that such a catalogue might survive after the passage of 100 years and the burning of the Rothschild ledgers and collection archives by NHM officers in the 1960s (Rothschild 1983: 299) had seemed slight.

The entire catalogue was painstakingly copied by hand, line for line, into a ring-bound book, as the original was in different scripts and in variously coloured inks and pencil, which had faded. Copies of the original entries were made on one side only so that the identity, modern name, present location, registration number and notes could be entered opposite. However, recording current registration numbers and data required the sighting of specimens as there was no database. A full search of the genera *Ixobrychus*, *Coturnix*, *Anthornis* and *Bowdleria*, as well as for known type specimens (Greenway 1973), was made. Remaining time was insufficient to locate and record data from other Buller specimens scattered through the main AMNH collection of about a million bird skins (Lanyon 1995: 113) stored over seven floors in systematic order.

Other than this sale catalogue (Buller & Rothschild MS 1888) and specimen labels, further documentation of sales from Buller to Rothschild was not found at the AMNH. Four letters and attachments concerning shipments of birds to Rothschild were found in a single letterbook of Buller's for 1892 at the NMNZ. This letterbook has now been transferred to the WTU collection. Galbreath provided us with transcripts of letters from Buller to Rothschild concerning sales in 1893–95, taken from originals in the NHM archive of Rothschild correspondence. These letters are all individually cited below in the 'References' under 'Unpublished sources'.

Research at the AMNH revealed that original Buller Collection labels were of standard format, with alphanumeric codes to further details in the sale catalogue (Buller & Rothschild MS 1888). However, these original Buller labels did not identify Buller (or anyone else) as the source, and the data provided were minimal. Without the Rothschild Museum labels proclaiming 'Sir Walter Buller Coll.', the source of individual specimens could be in doubt. Finding the MS sales catalogue provided the confirmation needed. It was thus believed that a similar list might still be found for the unrecognised '*First Collection*' in the Museum of New Zealand.

Carnegie Museum of Natural History, Pittsburgh

Before 1982, no New Zealand ornithologist had studied Buller's '*Third Collection*' at the Carnegie Museum of Natural History. Little was known in New Zealand about this collection, although local curator the late Kenneth C. Parkes was aware of its importance and was active in describing some of its highlights (e.g. Parkes 1974; Medway 2004b). Because W.E. Todd, Custodian of Recent Vertebrates in 1905, had wisely registered the entire Buller Collection in a single consecutive series immediately after it was received, and because the bird collections of the CMNH were progressively entered into a database in the early 1980s, CMNH staff were able to send a printout of the electronic catalogue of the Buller Collection to the senior author in New Zealand in June 1982.

There are about 154,000 bird skins in the CMNH (Parkes 1995), and the Buller Collection is not segregated from the main systematic collection. Nevertheless, during the week of the visit by the senior author (18–23 November 1982), it proved possible to locate and check the identification and label data of all remaining specimens (574) against the catalogue printout. Correspondence concerning the acquisition and the remains of the sale catalogue was located and also studied. These items had been damaged by water and were difficult to decipher.

Museum of New Zealand Te Papa Tongarewa, Wellington

Research findings from the study of Buller's '*Second*' and '*Third*' collections in the USA provided direction and focus for the identification of Buller Collection specimens at the Museum of New Zealand. We needed to search for numbered specimens, without other information on the label, and a sale catalogue or list that would provide a key to the numbering system and an inventory of the collection. Buller had recorded:

I did not give any particulars of locality & c., when I handed my collection of New-Zealand birds over to the Colonial Museum; but a number was affixed to each specimen, corresponding to that on my list. With Dr. Hector's concurrence, and for obvious reasons, all further information was reserved for my own work, then in course of preparation. (Buller 1874: 119; Hutton 1874: 135)

Mention of a 'list' of 255 bird skins was made in the 'Memorandum' enclosed with James Hector's letter to William

Gisborne (Colonial Secretary) of 21 November 1871 (*AJHR* 1871). The published list of 255 specimens (Sub-Enclosure to Enclosure No. 6, Hector to Cooper (Colonial Undersecretary), 3 August 1871, *AJHR* 1871), 'drawn up by Captain Hutton in compliance with my instructions', gives only the species name, number of specimens and a few notes on them, but no catalogue numbers. That printed list may have been based on an undiscovered handwritten MS list prepared by Buller. Such a list was located by Galbreath in his extensive study of the National Archives during the course of researching his biography of Buller in 1984–85, but he felt that a 'manuscript list which is the key to the numbering' might still be found at the museum (R.A. Galbreath, pers. comm. to Bartle, 18 February 1985).

Manuscript sources

By chance, in 1985 the senior author discovered a missing list (Buller MS 1871a) in an old loose folder labelled 'New Zealand Birds: Museum Collections' among miscellaneous papers in the then NMNZ Bird Department. This undated list was entitled by Buller 'Catalogue of W. Buller's collection of New Zealand birds'.

The first page of the list is illustrated in Fig. 1, and a transcription of the entire list, with the addition of modern names, is given in Appendix 1. The list consists of eight lined foolscap sheets (with a one-page 'Appendix'), plus additional birds listed in an undated two-page 'Memo for Dr Hector'. In all, 310 specimens are listed. These are numbered (except for those in the 'Memo') and listed in systematic order in Buller's handwriting.

It appears that species names were listed first and the numbers added afterwards. We suspect the list was originally composed as a list of New Zealand bird species, of which specimens were then allocated to the Colonial Museum. It was not a complete inventory of Buller's existing collection. The birds sold to the Colonial Museum were selected from a larger collection to form a representative ('typical') series, rather than being simply all the specimens in Buller's collection at the time, contrary to the report by Hector to the Colonial Secretary on 21 November 1870 (*AJHR* 1871).

Forty-seven specimens listed in these documents are described as being 'mounted in Cases A, B or C'. Species names are capitalised when they are derived from proper names e.g. *Novae Zelandiae*, *Gouldi*. Age and sex are given for more than half of the specimens, but no localities (except sometimes a region, e.g. 'South Island'), dates or collectors are specified. This list has been annotated to indicate that

New Zealand quail *Coturnix novaezealandiae* (No. 105, from the South Island, and No. 106, from the Auckland Province) were taken by Buller on 1 February 1875, and a lesser knot '*Tringa canutus* (from Canterbury)' presented by Buller 'in exchange [for the] quails'.

In the additional two-page undated handwritten list from Buller entitled 'Memo for Dr Hector', an extra 39 unnumbered specimens are recorded, under two headings: 'I. Common birds omitted in present list' and 'II. Birds added to original collection'. Two of them are mounted birds, one each for 'Case A' and 'Case C'.

Additions to the cases are puzzling. Two cases were prepared for the 1865 Dunedin Exhibition and then placed 'on deposit' with the Colonial Museum from 1866 (*Annual Report* 1867: 12). If Buller's 'Appendix' and the undated handwritten 'Memo for Dr Hector' were drawn up by Buller in Wanganui before he shipped 'the Bird skins' to Wellington in June 1871 (Galbreath 1989: 94) – as would seem likely – why did he add mounted specimens that were *already* in cases at the Colonial Museum? It seems most likely that most mounted specimens remained at the Colonial Museum and Buller's various lists simply record their transfer of ownership.

Four other files in this folder list specimens of New Zealand birds in the Colonial Museum. Two are in Hutton's handwriting, one is in an unknown hand, and a fourth was written by R.B. Gore. In the first three lists, species are recorded in the systematic order adopted by Hutton (1871). Within three months from beginning work as zoologist at the Colonial Museum, Hutton produced a comprehensive *Catalogue of the birds of New Zealand* (Hutton 1871), much to the chagrin of Buller (Galbreath 1989: 99). Buller, in trying to prevent publication of findings based on his collection, had labelled his specimens only with numbers. Although Buller's (1871a) MS catalogue list of the species' names was sent direct to Hector, we suspect that Hutton was given access to Buller's list, because all the names that Buller (1872–73) used appear in Hutton's (1871) *Catalogue*, albeit sometimes as synonyms (e.g. *Xenicus haasti*). We do not know the order in which Hutton's two lists were prepared. The four lists are described further below:

1. An untitled list in Hutton's writing (Hutton undated a). This list is important, because it is the first MS list of both the scientific and *vernacular* names of New Zealand birds, which Hutton (1871) published in his *Catalogue*. As it does not include Henry Travers' important Chatham Island

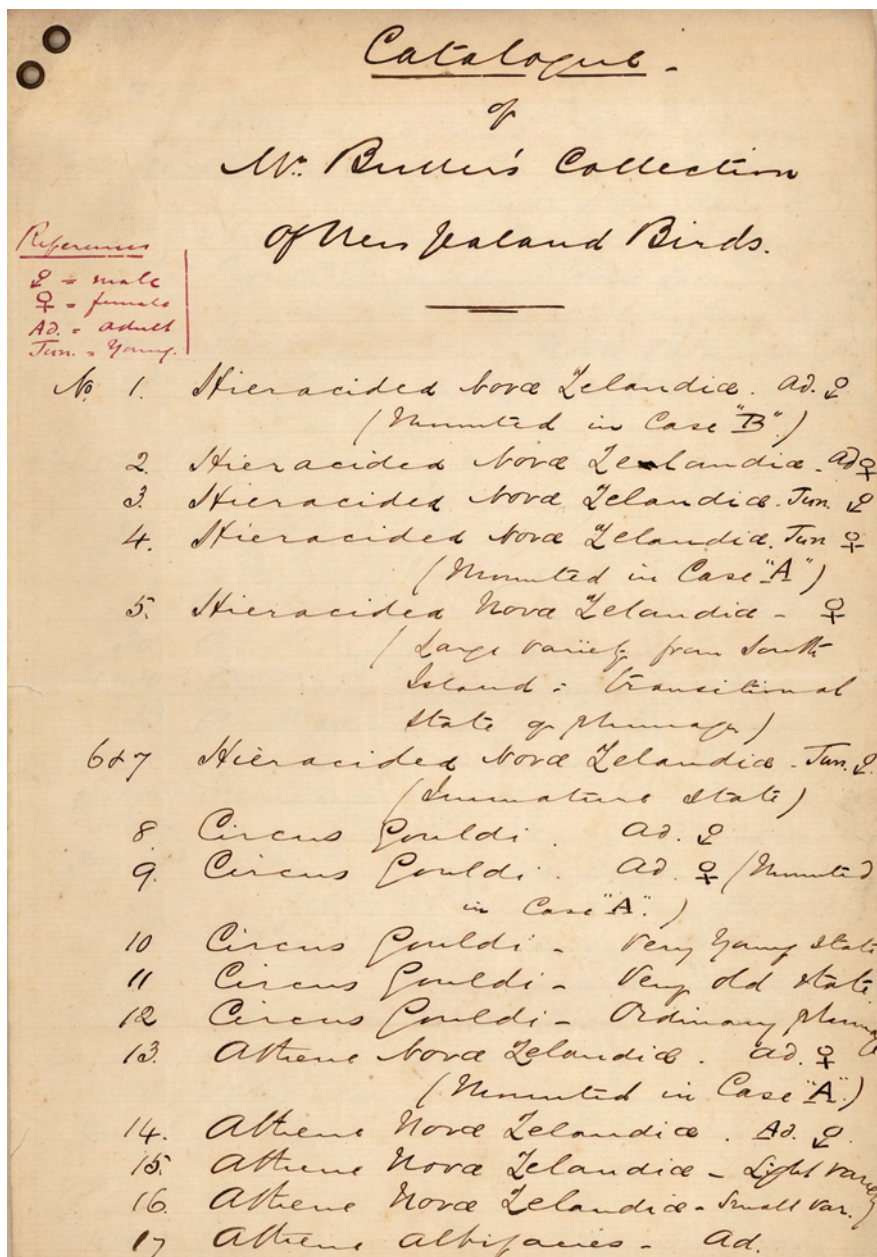


Fig. 1 First page of Buller's 'First Collection' catalogue (Te Papa archives MU000094/001/0445).

collection, received in 1872 (Hector 1873), it most likely dates from 1871. The number of specimens in the Colonial Museum collection is given. Two species from the Buller Collection represented *only* by mounted specimens (laughing owl *Sceloglaux albifacies* and stitchbird *Notiomystis cincta*) are listed separately at the end, without a number. This suggests that Hutton drew up this list mainly on the basis of the skin collection, without counting (or labelling) the mounted specimens in the cases A, B and C, which were probably on display. In contrast, *Xenicus longipes*, *Sphenoeacus*

punctatus and *Xenicus gilviventris* also appear separately at the end, without any specimens being listed, even though they were represented by skins in the Buller Collection (Buller MS 1871a). Did Hutton not record the quantity of specimens of these species because they had already been lent back to Buller?

2. An untitled list in Hutton's writing (Hutton undated b). This is a provisional list of New Zealand species, whether or not they are represented in the museum. It includes species such as *Aplonis zealandicus*, which Hutton (1871: 17) had

never seen. Again, most mounted specimens and birds on loan to Buller are not included. This list cannot have been drawn up from the MS lists of the 'First Collection', because the nomenclature is different, following O. Finsch (Hutton 1871: vi). As in Hutton (undated a), specimens that were already held at the Colonial Museum are included, as well as those in the Buller Collection. This list does not include specimens from Travers' 1872 collection, and so it presumably dates from 1871 as well. The species *Procellaria lessonii*, noted by Hutton (1871) as absent from the collection, has been added in what appears to be Hector's handwriting: 'Chatham Islands, 5 May 1874, caught by W. Hunt'.

3. An untitled, undated list, in an unknown hand (Anonymous c.1873). This more comprehensive list of 451 specimens, showing the size of the Colonial Museum collection at the time, was prepared in about 1873. The newly described *Cabalus modestus* Hutton, 1872, and *Graculus featherstoni* (Buller, 1873) are listed as new species in the collection. Chatham Island specimens and 'young' birds are specially indicated.

4. A list in Gore's hand, entitled 'Catalogue of the type collection of birds' (c.1874). Gore was the clerk and curator of the Colonial Museum collections between 1865 and 1901 (Burton 1965). Species are listed according to the numbering system used in Buller's (1871a) MS list, but not sequentially, suggesting that the list is an inventory. Several specimens are listed as 'not named' or 'not labelled'. Only one specimen is specifically credited to Buller, but other collectors ranging from W.F.E. Liardet to [Bishop] Octavius Hadfield (1814–1904) are listed. Specific dates for specimens range from April 1870 to July 1874, suggesting that the list was composed after Hutton left the Colonial Museum in 1873. This is the only list containing specimen localities, dates and collectors' names. We used this list extensively in Appendix 3 because it is usually the last record of specimens once present in the museum, but now missing.

The folder containing these lists (now Te Papa archives MU000208/003/0012) had been made from a foolscap envelope and labelled by W.R.B. Oliver. Oliver had removed all these bird collection lists from the centralised NMNZ correspondence files, perhaps with the aim of documenting a history of the bird collections of the Colonial Museum. This work was apparently begun in the 1930s (the earliest note in the folder is dated 1929), but not completed. A draft handwritten table in Oliver's script, also in the folder, listed annual bird collection acquisitions from 1869 to 1876, including Buller's 'First Collection'.

When Oliver retired in 1947, R.A. Falla took over his workroom. It appears that Falla found the folder and handed it to the newly appointed curator of birds, F.C. Kinsky, in about 1965. Much material was passed from Falla to Kinsky at this time (Bartle & Yaldwyn 2001). Kinsky was unfamiliar with the handwriting, and because few of the lists were titled or attributed, they were soon put aside and forgotten.

In the Te Papa archives there are other relevant documents, as follows:

1. A handwritten list (Gore undated). Although this list is titled 'Catalogue of birds contained in four cases bought of Mr Buller', only three cases are recorded (numbered as I, III and IV), and the list is incomplete. We believe that missing 'Case II' was probably Buller's 'Case C'.

'Case I' appears to be equivalent to Buller's 'Case B' – though two specimens listed by Buller are omitted, and three other species are listed instead. Together, the contents of Gore's 'Case III' and 'Case IV' contain most of the species in Buller's 'Case A'. Such differences suggest that birds were frequently moved in and out of Buller's cases.

2. A letter and a list in Buller's hand of about 45 specimens loaned to Buller on 19 May 1871 to take to London for illustration (Buller MS 1871b). Some of these specimens were definitely returned and are today in the collection (e.g. the syntype of *Xenicus haasti*), but others (e.g. laughing owl and North Island piopio *Turnagra tanagra*) are no longer present. A feature of this list is that it is dated *before* the Buller Collection was acquired (14 June 1871) by the Colonial Museum. Therefore, the birds listed (all but two being skins) were presumably still in Buller's possession.

3. A list of 25 bird skins sent by Hector to Finsch in Bremen, on 31 May 1873 (Hutton 1873). Many of these birds were certainly returned, and some labels show notes initialled by Finsch.

Identification of Buller specimens in the Museum of New Zealand collections

After the discovery of the numbered list (Buller MS 1871a), we re-examined the NMNZ collection and identified several specimens with old labels that seemed likely to be part of Buller's 'First Collection' (Figs 2, 3). As the numbers on the labels closely matched the Buller list, we concluded that these birds were indeed part of the original Buller Collection.

The labels attached to the 69 specimens so far located and seen from the 'First Collection' are very distinctive. They are of high-quality greyish-brown card, rectangular in shape, most being about 77 mm in length and 15 mm in height.



Fig. 2 Label typical of Buller's 'First Collection'. No. 64, to which Hutton added '*Keropia crassirostris* ♀' in 1871 (label reattached with modern thread; skin refurbished; now NMNZ OR 1460, South Island piopio *Turnagra capensis*).

They are slightly variable in size. All have copper alloy eyelets 5 mm in diameter. They were mostly attached with a distinctive thick green and white woven thread. There are numbers on each label in identical format (e.g. 'No. 64'), written in block letters (Fig. 2). The numbers are in Indian ink and probably in Buller's hand. In general, they correspond with the list (Buller MS 1871a), but there are a few discrepancies. Buller left the rest of the label blank.

Most of these labels now also have the species name and often the age and sex added in Hutton's hand. Hutton's pen and cursive handwriting are very different from the thick, neat, block letters used by Buller to number the specimens. However, because no locality, date or collector's name appeared on these labels, Kinsky had segregated some of the specimens, along with others without data, into cardboard boxes labelled 'specimens without data – to be discarded'. It was not apparent from the museum catalogue at the time that these specimens had once been part of the Buller Collection. However, once the characteristics of these labels were recognised, the specimens were removed from the boxes and put back in the main collection, and the catalogue records updated.

In Appendix 1, we listed specimens in the numerical order of Buller's list, and not in modern systematic order. Then, after searching through the entire collection for the distinctive Buller labels, we compiled a list of the remaining specimens (Appendix 2). Where information on particular specimens could be found in Buller's or other publications, we added it to the labels and catalogue. Missing specimens are listed in modern systematic order in Appendix 3, including Buller's specimen numbers. In effect, Appendix 3 is a list of specimens based on Appendix 1, minus those listed in Appendix 2.

Results

'First Collection' – Colonial Museum, Wellington

History of the collection

In addition to resourcing Buller's time in England, the New Zealand government was persuaded by Hector, on Buller's request, to provide an additional £300 to help fund publication of his book (Hector to the Colonial Secretary,

2 August 1870, *AJHR* 1871). This amount was ostensibly for the purchase of Buller's 'complete' collection of New Zealand bird skins, nests and eggs, along with the mounted birds already deposited (i.e. on long-term loan) in the Colonial Museum (Hector to the Colonial Secretary, 21 November 1870, *AJHR* 1871).

Many specimens stated by Buller to be in his collection at the time (Buller 1872–73) were never offered to the Colonial Museum, as agreed. Such specimens were not listed by Buller as part of his 'donation', nor were any nests or eggs (Buller MS 1871a). There is uncertainty regarding the number and species of specimens involved. A total of 255 skins and 10 mounted specimens is incorrectly given for donation No. 480, as officially listed (*AJHR* 1871). Buller's collection of mounted birds located on the upper floor of the Provincial Government offices was transferred on loan to the Colonial Museum in 1865 (Dell 1965: 1), and it was accessioned in June 1871 as part of the Buller Collection purchase.

The acquisition of Buller's '*First Collection*' for the Colonial Museum was supported by the Colonial Secretary partly to deflect criticism of the government's generous and unusual arrangements in funding Buller's trip to Britain. In this respect, the Secretary's strategy did not succeed. Not long after Buller set sail (6 October 1871), a fierce debate broke out in Parliament concerning the New Zealand government's financing of Buller's projects in London (New Zealand Parliament 1871). The Colonial Secretary attempted to use the colony's part-funding of Hooker's *Handbook of the New Zealand flora* (1864–67) as a precedent, but that did not appease Buller's critics, who argued that the arrangement was overly generous and self-serving.

At first, the acquisition was defined as a 'purchase' (Hector to the Under Colonial Secretary, 3 August 1871, *AJHR* 1871; Hutton 1871); but in Hector's second letter (*AJHR* 1871) and in the published papers relating to the transaction in the *AJHR* (1871), it is described as a 'transfer'. Buller himself (letter to Hector, 20 December 1870, *AJHR* 1871) wished the deed to be described as a 'presentation' (i.e. a donation), and in this he seems to have succeeded, for it is publicly listed as donation No. 480, dated 4 June 1871 (*Annual Report* 1871: 9). Later, both Hector (*AJHR* 1871) and Buller (letter to Haast, 28 March 1872) claimed that the fee paid to Buller by the government for the collection was a 'grant in aid' towards the publication of his book, rather than for the purchase of the collection, as described in the earlier documents.

The average value of Buller's bird specimens in 1870 was deemed to be less than £1 per specimen. Hector had considered £300 to be an overestimate of the value of the collection, said to number '253 specimens, 79 of them common species'. In this valuation he was supported by T.H. Potts, who was against collecting and trading in birds. Nevertheless, Hector 'strongly urged' that the birds be purchased for the Colonial Museum, suggesting that 25 copies of Buller's book be included for public libraries in the colony (Hector to Gisborne, 2 August 1870, *AJHR* 1871).

We found that there were 310 specimens (see Appendix 1) in Buller's '*First Collection*'. This differs from Galbreath's (1989: 323) figure of 265 partly because we have included the 47 birds mounted in 'Cases A, B and C' (discounted by Galbreath on the basis that they were already in the museum), as it was evidently Buller's intention to include them as part of his '*First Collection*'. Altogether, 52 mounted birds were acquired by the Colonial Museum from Walter Buller. Fifty of these are listed in Appendix 1, and there was also a New Zealand quail and a greater frigatebird *Fregata minor*.

On the other hand, we reduced the total by two because no specimen was assigned to two numbers (see Appendix 1, nos 57 and 195). Also excluded are several birds received subsequently by the Colonial Museum from Buller (e.g. a mounted white-bellied sea eagle *Haliaeetus leucogaster* NMNZ OR 1341; Buller 1872–73: 16). We found no list of the eggs and nests that were to have been included in the '*First Collection*' (Hector to Gisborne, 21 November 1871, *AJHR* 1871) and have not been able to identify firmly any of them from Buller in the museum today. Today, only 70 specimens (including a blue penguin *Eudyptula minor* sent in 1969 on exchange to the Alexander Koenig Museum, Bonn) survive from the '*First Collection*', leaving 240 missing or unidentifiable – 77% of the original purchase.

The collection today

a) Specimens still present in the museum

The 69 Buller specimens that were found in the NMNZ collection are listed in Appendix 2. Included are:

1. Four type specimens as follows: the lectotype of both *Bruchigavia melanorhyncha* Buller, 1869 (Fig. 3), and *Larus bulleri* Hutton, 1871; two syntypes of *Xenicus haasti* Buller, 1869; and the holotype of both *Mimus carunculatus* Buller, 1865, and *Anthochaera bulleri* Finsch, 1867 (see Tennyson & Bartle 2008 for details). There are also possible syntypes of *Podiceps hectori* Buller, 1865, and *Nestor occidentalis* Buller, 1869.



Fig. 3 Heavily stained lectotype of *Bruchigavia melanorhyncha* Buller, 1869 (original thread; now NMNZ OR 2387, Black-billed gull *Larus bulleri*).

2. Four extinct taxa: bush wren *Xenicus longipes*; South Island kōkako *Callaeas cinerea* (two); North Island piopio; and South Island piopio *Turnagra capensis*.
3. Twenty-two threatened species represented by 45 specimens.
4. Four stragglers: greater frigatebird; nankeen night heron *Nycticorax caledonicus*; Australian spotted crake *Porzana fluminea*; and red wattlebird *Anthochaera carunculata*.
5. Two new colonising species: the white-faced heron *Ardea novaehollandiae* (two); and silvereye *Zosterops lateralis*.

The condition of specimen NMNZ OR 2387 is described in detail (Fig. 3) to exemplify how Buller's 'First Collection' specimens were prepared, and why so many of them were damaged and probably discarded in the late nineteenth century. This specimen is the lectotype of the endemic black-billed gull, first named *Bruchigavia melanorhyncha* by Buller (1869) and correctly renamed *Larus bulleri* by Hutton (1871) (Tennyson & Bartle 2008: 197). It shows how poorly prepared were most specimens from Buller's 'First Collection'. Fat and other tissues were not completely removed from the wing and head, with consequent leakage and staining, ultimately causing reduction in skin strength. Incomplete

removal of tissues has attracted insect attack, although in this specimen the effect of their damage has been largely confined to the feet. Strict quarantine (and the use of fumigants) has effectively protected all NMNZ bird specimens against insect attack since 1936.

Like most specimens in Buller's 'First Collection', this bird does not have an internal wood or wire frame and is thus liable to fall apart when handled. The age of the specimen is not the problem, for there are considerably older skins and mounts from other sources in the NMNZ collection that show no such damage. Morris (1981) described how, under stable conditions, a mounted African grey parrot *Psittacus erithacus* could survive for over 300 years, from 1702. This is believed to be the oldest stuffed bird in existence today.

Other larger specimens from Buller's 'First Collection' are also badly stained and discoloured by the chemicals used by Buller to protect them from insect attack. Galbreath (1989: 25) suggested that Buller might have sourced his taxidermy methods from Waterton's (1825) *Wanderings in South America*, which recommended soaking the skin in mercuric chloride, and from Swainson (1840), which recommended coating the inside of the skin with arsenical

soap. The development of arsenical soap in 1793 and its impact on subsequent longevity of specimens in Europe was described in Bartle (1993). Until 1965, arsenical soap was generally used to coat the insides of the larger bird and mammal skins prepared at the NMNZ. However, Sharpe (1906: 80) had already discovered that specimens treated with harsh chemicals eventually fall to pieces. Moreover, in a definitive experiment, Arevad *et al.* (1981) evaluated 11 chemical treatments in preventing damage to house sparrow *Passer domesticus* skins confined with different insect pests. Species use included the museum beetle *Anthrenus museorum*, carpet beetle *Anthrenus verbasci*, book louse *Liposcelis* sp. and clothes moth *Tineola bisselliella*. The skins were regularly examined and damage assessed over 3½ years. Under these conditions, arsenical soap was found to be completely ineffective in preventing insect attack.

Buller often incorrectly referred to his specimens as ‘types’, and to his collection as a ‘type collection’ (e.g. Buller 1875a: 202). In this, he was followed by Gore, but not the better educated Hutton. Buller’s knowledge of what constituted a type specimen seems to have been hazy (for background, see Tennyson & Bartle 2008). Any description of his specimens as types should be treated cautiously. Contrarily, his actual types were mostly not labelled as such.

b) Missing specimens

Most specimens listed in Buller’s (1871a) MS list are missing (see Appendix 3). A few may have lost their original labels and others were probably discarded as being apparently without data. There is no evidence that any of the 52 mounted specimens listed in Appendix 1 were labelled by Buller, nor is there any record of the fate of his three cases of mounted birds. Some of the specimens were redistributed into the main mounted bird displays (e.g. the surviving red wattlebird), presumably when the museum moved to its new building at Buckle Street in 1936. Retaining data over many decades for mounted birds that are exhibited in dioramas and other assemblages is difficult.

Among the skins, 73% of those belonging to extinct or threatened species (e.g. four huia *Heteralocha acutirostris*, two kākāpō *Strigops habroptilus* and a Chatham Island fernbird *Bowdleria rufescens*) are missing, compared with 89% of the more common breeding species. This suggests that specimens were lost accidentally (e.g. through insect attack), rather than given away, exchanged, or loaned and not returned. Only three Buller Collection specimens are recorded as exchanged: two New Zealand quail, back to

Buller himself; and the blue penguin to the Alexander Koenig Museum in 1969 (see above).

The most important missing specimens are:

1. Primary type specimens of seven species: *Anas gracilis* Buller, 1869; *Rallus featherstoni* Buller, 1865; *Gallinago pusilla* Buller, 1869; *Nestor occidentalis* Buller, 1869; *Platycercus alpinus* Buller, 1869; *Sphenoeacus rufescens* Buller, 1869; and *Anthornis auriocula* Buller, 1865 (see Tennyson & Bartle 2008 for details).
2. Eighteen individuals of nine extinct species: six New Zealand quail; one laughing owl; one bush wren; one Chatham Island fernbird; one Chatham Island bellbird *Anthornis melanocephala*; one South Island kōkako; four huia; two North Island piopio; and one South Island piopio.
3. One hundred and sixteen individuals representing 39 threatened species.
4. Four alleged stragglers: one nankeen night heron; one corncrake *Crex crex*; one long-tailed skua *Stercorarius longicaudus*; and one willie wagtail *Rhipidura leucophrys*.
5. Five new colonists: two grey teal *Anas gracilis* and three silvereyes.

We have checked all of New Zealand’s major bird collections and some overseas collections for missing specimens of Buller’s ‘*First Collection*’, but have not detected any. It is possible that some specimens survive in Europe. We hope that those caring for New Zealand bird collections will check birds for distinctive ‘*First Collection*’ Buller labels (Fig. 2), in case some of them are the lost specimens (Appendix 3).

‘*Second Collection*’ – Rothschild Museum, Tring

History of the collection

In the late nineteenth and early twentieth centuries, by far the largest and best-documented collection of birds in the world was that of Walter Rothschild (1868–1937), at Tring, England. From childhood, Rothschild was very interested in natural history, collecting insects, birds and other animals, and he founded his museum as a teenager (Rothschild 1983: 1). He was one of the first people to appreciate Darwin’s theory on the importance of natural selection to within and between species variation in determining evolutionary pathways and hence phylogenies. He was also the first museum curator to understand fully the importance of collecting large series of specimens of the same species to

show the variation on which natural selection works, and was pleased to say: 'I have no duplicates in my collection' (Rothschild 1983: legend to colour plate VIII, and p. 316). Reflecting Rothschild's understanding of the importance of age, sex and locality, all birds in the Rothschild Collection carried detailed labels on which this information was recorded, as standard practice. By 1900, the bird collections of the British Museum (Natural History) – now the NHM – although rich in type specimens, were weaker in series of well-documented bird skins than those of Rothschild (Bartle 1993). In contrast, the importance of series of specimens of birds to illustrate variation with age, sex and locality was not fully understood in New Zealand until quite recently. Harold Hamilton (1885–1937) was among the first to express the need for the national museum to have extensive series of specimens of each bird species – not just individual specimens to illustrate eye-catching differences in plumage or colour phase (*Annual Report* 1921).

Rothschild obtained large numbers of New Zealand birds from his own collectors, such as Henry Palmer, as well as by purchase from New Zealand dealers such as Sigvard J. Dannefaerd, William Smyth (d. 1914) and Henry H. Travers. In his first paper, published when he was only 23 years old, Rothschild (1891) described the rare parea (fruit pigeon) of the Chatham Islands (collected for him by Palmer) as a new species, *Carpophaga chathamensis* Rothschild, 1891. When his collection was still in an early stage of development, Rothschild purchased 728 birds from Buller from 1888 to 1895, including captive birds and specimens in alcohol. This figure is based on the number of specimens listed in the Buller & Rothschild MS (1888), and the subsequent shipments documented in the correspondence listed below in the 'References' under 'Unpublished sources'. In 1912, Rothschild's great collection was further augmented through his purchase of 45,000 Australasian birds from the taxonomist Gregory M. Mathews. At that time, Mathews' Collection was not only the largest collection of Australian birds, but it also included many specimens from New Zealand as well as over 160 types of Australian and New Zealand birds (Hartert 1929). These specimens were very well cared for and documented by Rothschild and his staff. Rothschild published his own in-house journal, *Novitates Zoologicae*, which contained papers by him and his staff describing hundreds of new species of birds and insects from his collection. Forty-two volumes of this journal were published between 1894 and 1948 (Rothschild 1983; Maggs Bros Ltd 2008).

For 40 years, Walter Rothschild was blackmailed by a ruthless aristocrat who had once been his lover (Rothschild 1983: 92), and in 1932, after decades of financial stress and mismanagement, he was forced to sell his collection of 280,000 bird skins to the American Museum of Natural History, to help pay off his blackmailer (Rothschild 1983). By then, the Rothschild Collection contained 2165 type specimens of birds from all over the world, as well as the numerous specimens from Buller and other New Zealand collectors. At the peak of the development of his bird collection (1890–1908), Rothschild purchased specimens from over 400 collectors, covering most countries of the world (Rothschild 1983: 155). In 1932, the Whitney family financed the purchase by the AMNH of the Rothschild Collection of bird skins for US\$225,000 (Lanyon 1995). Excluded from the sale were Rothschild's collection of 200,000 birds' eggs, his 200 ostriches, rheas and cassowaries, birds preserved in alcohol, and his valuable library of 30,000 scientific books (Rothschild 1983: 2, 302). These were left to the NHM in his will.

Rothschild's early interest in birds from remote islands was encouraged by Alfred Newton, his professor at Cambridge (Rothschild 1983: 73). In November 1888, when Buller (who was in London at the time) offered young Rothschild his '*Second Collection*' of nearly 500 skins of New Zealand birds for £1000, the offer was accepted. Rothschild's acceptance was based on the advice and a valuation by Newton of the collection as listed by Buller. Rothschild (1907: 24) later denied that he paid £1000 for it, as asserted by Buller (1905: 167). Apparently, several of the rarest specimens on Buller's list were not supplied (Galbreath 1989: 168).

Our archival research has shown that from 1890 to at least 1895 Buller shipped birds – both captive and as skins and mounts – to Rothschild at least once every year. The latter's niece, Miriam Rothschild, believed that before the First World War almost all of Walter Rothschild's entire annual salary from the bank N.M. Rothschild & Sons, estimated at £5000, was spent on his collections, taxidermists, artists, curators and publications. During these years he continued living with his mother at Tring Park (Rothschild 1983: 100). In 1894–95, Buller's sales of live New Zealand birds and skins to Rothschild returned £692 (Buller to Rothschild, 12 September 1895). Thus the average price that Buller received for his specimens from Rothschild was little more than £2 each, with live birds fetching more. However, by this time Buller was already wealthy, owning town properties

(mostly in Wellington) worth nearly £14,000 (Galbreath 1989: 146). According to the prices that Buller reported paying his own collectors, any profit on the sale of birds must have been negligible compared with his property interests.

Based on the collecting dates recorded on specimens in Buller's CMNH collection, the peak in Buller's later purchases of New Zealand birds occurred between 1890 and 1896 (Fig. 5). At this time his collecting seems to have been principally driven by his perception of an enthusiastic and appreciative market in the form of Rothschild, rather than the need for specimens for his own research, since both editions of *A history of the birds of New Zealand* had been completed. Although Buller continued to publish prolifically up to 1896, his collecting during these years was not focused on research for the *Supplement*, as he claimed (Buller 1906: 166). Except for seabirds, most birds he purchased during this period were replacements for those he had sold, and many were from the same localities (see Appendices 4 and 5). After 1896, Buller's bird research declined and he published only four papers on birds, two of them merely notes, according to Galbreath's bibliography (1989: 319). In 1899, he returned to live in London permanently, where the *Supplement* (Buller 1905, 1906) was written (Galbreath 1989: 254).

Therefore, apart from the sale of his 'Second Collection' to Rothschild in 1888, subsequent shipments by Buller were not of birds on which the second edition of *A history of the birds of New Zealand* was based, as he implied in his *Supplement* (Buller 1906: 166). They were, in fact, birds collected for pecuniary interests or to promote his status as a supplier. Already, Rothschild had better series of most New Zealand species than any other museum, as Buller knew (Buller to Rothschild, 10 February 1895).

By falsely stating that he had built up three discrete collections of New Zealand birds, one for each edition of his book, Buller (1906: 166) was trying to establish himself primarily as a scientist and writer, rather than as a supplier of bird specimens to those who could afford them (Galbreath 1989). None of the collections was discrete. With Hector's consent, he was able to recover some of his most valuable specimens (like New Zealand quail) from the 'First Collection', exchanged by Hector for widespread and common species like the lesser knot *Calidris canutus*. It is thus likely that some of these same specimens were incorporated in Buller's 1888 sale to Rothschild. Thereafter, Buller's perception of Rothschild's interests was paramount in the development of his collections. Similarly, some specimens on which the second

edition of his book was based were withheld from the 'Second' and 'Third' collections for his sons, and were ultimately sold by the family to the CMNZ.

Nonetheless, for the sake of simplicity, we have treated each 'collection' as though it was a discrete entity. For example, we have discussed all Buller's sales to Rothschild (1888–95) under the heading 'Second Collection', even though most of these specimens were sold (and probably collected) after his book (Buller 1887, 1888a) was published. We use Buller's terminology (Buller 1906: 166) and treat all Buller Collection specimens listed in the Buller & Rothschild MS (1888: sales 1888–92) as comprising the 'Second Collection', including also the additional sales to Rothschild in 1893–95, as documented in the correspondence cited. The most notable of these specimens are listed in Appendix 4.

The collection today

a) Description of the labels and catalogue

In the collections of the AMNH there are still many New Zealand specimens bearing distinctive Museum W. Rothschild labels inscribed 'Sir Walter Buller collection N° ...' on the reverse. However, in 1982 only one AMNH specimen carrying an original label with data in Buller's handwriting was located: an extinct Chatham Island fernbird, now numbered 258995, collected in 1892. Therefore, this bird was not part of the original collection purchased by Rothschild in November 1888. That original label measures 59×23 mm, has a metal eyelet, and is printed on good-quality paper with completed fields and printed legends reading: 'Name ...', 'Locality ...', 'Date ...' and 'Sex ...'. There is no space for the collector's name, and the words 'Buller Collection' do not appear. Identical labels were subsequently found attached to many Buller Collection specimens in the CMNZ (Fig. 4) and the CMNH (Fig. 6), but not to any birds sold by Buller prior to 1892. Buller seems to have had a large batch of these labels printed when he was in London in 1892, probably as a result of presumed criticism by Rothschild of the lack of documentation of the Buller specimens he received in 1888–91.

Attached to most specimens recorded on the Museum W. Rothschild labels as 'ex-Buller' are small keyhole-shaped tags, 22.5 mm in length, bearing only a number and letter written in black ink in Buller's script, e.g. '10c'. No other information is given on these tags. Most, if not all, of the birds sold to Rothschild presumably carried these tags. They are often attached with bright purple thread (Fig. 4). Although these tags provided no useful information, Buller



Fig. 4 Numbered tag (with distinctive purple thread), plus typical post-1892 Buller Collection label, reattached with modern thread (ex-Canterbury Museum; now NMNZ OR 12692, Chatham Island snipe *Coenocorypha pusilla*).

consistently used them from 1888 onward. Identical alphabetic suffixes for the same species on such tags at the CMNH indicate that they were attached at the time of sale, long after the specimens were acquired and the original field labels removed. Because neither the Rothschild sales catalogue (see below) nor Buller's manuscript catalogue at the NMNZ provided detailed data on the specimens listed, we concluded that Buller's first two bird collections were unlabelled when in his possession. Therefore, when he came to prepare sales lists or catalogues, most specimen data had already been lost, apart from unique individuals that he could identify (e.g. stragglers and extreme rarities).

Different tags are attached with thick straw-coloured string to a few specimens from the first sale to Rothschild in 1888. These are oblong in shape and about 50 mm in length, although this varies, suggesting that they may have been cut individually from a strip. They are made from waxed paper, and bear nothing more than the Buller catalogue numbers, e.g. '19c', written in Buller's hand. There is no evident feature in common for specimens with such labels.

The numbers on both types of tags are not registration

numbers, but are species numbers with an alphabetic suffix indicating the specimen within each species. The species numbers are based on those in Buller's (1882) *Manual*. Taking the example of tag 10c mentioned earlier, this indicates that it is the third specimen of species No. 10, the tūi *Prosthemadera novaeseelandiae*.

The catalogue (Buller & Rothschild MS 1888) found in the AMNH is a specially bound MS, entitled 'Birds of New Zealand. Catalogue of Sir Walter Buller's Collection' in gold lettering on the spine. Previous AMNH staff, such as Greenway (1973), had erred in describing it as Rothschild's 'manuscript catalogue' and were unaware that the 1888 listings were in Walter Buller's, not Rothschild's, handwriting (Greenway 1973: 215, 237). Hence Greenway's mistake in thinking that Rothschild ought to have 'mentioned [the type of *Phalacrocorax rothschildi* Forbes, 1893] in his manuscript catalogue'. Rothschild would have had no reason to list this specimen here, for he must have acquired it later, from Henry O. Forbes. Greenway (1973: 328) also lists Buller's catalogue in his 'Literature cited', with Rothschild incorrectly given as the sole author. Green-

way was probably confused because Rothschild added more recent specimens, also purchased from Buller, to the original sequence using the original numbering system. Those additions also included additional specimens from other collectors in New Zealand.

On the flyleaf of the catalogue, Rothschild wrote: 'Sir Walter Buller transferred his collection to me by purchase in 1888 November & since then it has been added to variously'. On additional blank pages, opposite the printed species accounts, the specimens sold to Rothschild in November 1888 (month of receipt, presumably) are listed in Buller's handwriting in black ink, with spirit specimens listed in red ink (now in the NHM collection at Tring). The 483 specimens listed by Buller are mostly study skins, but also included are spirit specimens, a few mounted specimens and a small number of skeletons. No eggs are listed, and it seems that Buller kept all of these for his 'son's collection'. The current location of this important collection of New Zealand eggs, including those from many extinct species, is not known, but some, or all, of them may be in the NHM collection at Tring (Knox & Walters 1992: 180).

Also listed in the catalogue in Rothschild's handwriting (in black ink) are many additional New Zealand specimens obtained over the following four years. Notable among them are important specimens purchased by Palmer in New Zealand in 1889, and others collected by him on the Chatham Islands in July, August, November and December 1890. Rothschild gave those specimens new alphabetic suffixes, which followed on sequentially from those of Buller's shipments of 1888, 1890 and 1891. In addition to New Zealand specimens sourced from Buller and Palmer, Rothschild also listed birds sourced from C. Robinson and W. Hawkins (New Zealand collectors), Francks (an Auckland dealer), Castang, Brazenon, G.M. Matthews and the Cambridge University Museum (1889). Specimens subsequently disposed of by exchange were noted by Rothschild or simply deleted. The last entry in the catalogue (October 1892) is in an unknown hand – not that of Rothschild or Ernst Hartert – perhaps Alfred Minall? Not included are 95 birds sent in late 1892 (Buller to Rothschild, 15 September 1892) and later shipments from Buller on 3 February 1893, 10 February 1895 and 12 September 1895 (see letters from Buller to Rothschild in WTU and NHM archives).

Very few collecting localities are given in the catalogue, even though Buller (1887, 1888a) mentioned many of them in his books. Not all of Buller's 1888 collection consisted of specimens from New Zealand. Australian specimens of some

species were also supplied, which had been recorded as stragglers to New Zealand. Where Buller had straggler specimens from New Zealand, these were provided. No exact localities, dates or collectors are listed for specimens sourced from Australia.

Only age and sex are listed for most New Zealand specimens, and even these details are suspect – especially the balanced ratios of 'male', 'female' and 'immature', which are too consistent to be plausible. The month and year of collection are not given, except for one Australian straggler. These omissions are remarkable, because often the data were known – for example, for the little spotted kiwi *Apteryx owenii* from Mt Hector in the Tararua Range, North Island, collected in 1875 (Buller 1888a: 328). This specimen (listed in Buller's catalogue for Rothschild) is now in the NHM collection, registered as 1939.12.9.1480, and, like some kiwis and many other ratites, was evidently held back by Rothschild from the sale to the AMNH and instead bequeathed by him to the NHM. For later shipments, listed by Rothschild from Buller or other collectors, the month and year are always given. However, it is likely that these entries refer to the date of receipt, not collection, as many batches of specimens are listed with the same date.

Why were the data not provided in Buller & Rothschild's (1888) MS sale catalogue, or on the labels? By comparing location, source or descriptive notes given in that catalogue with specimen data published by Buller, we were able to establish the year of collection for 38 of the 483 specimens sold in November 1888. Dates ranged from 1856 to 1886, with a peak in the 1880s (especially in 1882 and 1883).

b) Collection details

Unlike Rothschild, Buller never developed a clear understanding of the importance of series of specimens from different localities for the study of geographic variation, although he did understand that it was important to collect conspicuously variable species such as kākā *Nestor meridionalis* and weka *Gallirallus australis*. In the 'Second Collection', the best-represented species are weka (39), kākā (23), kākākāpō (13) and huia (8). But there are few specimens of less spectacular taxa – only three fernbirds *Bowdleria punctata*, for example. Furthermore, mainland species were better represented than island forms. Absent from the 1888 collection were, for example, the white-capped mollymawk *Thalassarche cauta*, the white-headed petrel *Pterodroma lessonii*, the Pitt Island shag *Stictocarbo featherstoni*, the New Zealand snipe *Coenocorypha* spp., the southern skua *Catharacta skua*

lonnbergi and the Antarctic tern *Sterna vittata*. These species were recognised by Buller (1882) and several of them are abundant. Most are found in coastal waters as well as on outlying islands. In contrast, several species that breed elsewhere and occur only as strays in New Zealand were included – but not species introduced by humans (except for an Egyptian goose *Alopochen aegyptiacus* from Lake Te Aute, Hawke's Bay). Introduced bird species are not described in Buller's three books on New Zealand birds. Seabirds and other birds that are found only on outlying islands were more frequently included in the later sales to Rothschild. This shows that, from 1889, Buller increasingly collected for Rothschild according to a list of desiderata (Buller to Rothschild, 3 February 1893).

In Appendix 4, notable specimens sold by Buller to Rothschild between 1888 and 1892 are listed. Several species that are now extinct are included. Localities, dates and sources for little-known or extinct species are included if given in the catalogue (Buller & Rothschild MS 1888). The number of juveniles of extinct and endangered forms is listed as evidence of continued successful breeding. Specimens of new avian colonists are also included.

At least seven specimens collected before 1871 were sold to Rothschild in 1888, thus proving that specimens were withheld by Buller from the sale of the 'First Collection' to the Colonial Museum. This contravened the spirit as well as the explicit terms of the 'Memorandum of articles to be handed over' attached to Hector's letter to the Colonial Secretary (21 November 1870) confirming approval for the sale (*AJHR* 1871), and Buller's letter accepting those conditions (Buller to Hector, 20 December 1870, *AJHR* 1871). A further four birds sold to the CMNH in 1905 were also from this early period, as well as specimens now in the CMNZ, purportedly from Buller's son's collection (Galbreath 1989: 324).

It is therefore evident that Buller retained a collection of his best-known specimens and did not dispose of all of his bird collection each time a major book was completed, as he asserted in his *Supplement* (Buller 1906: 166). Rothschild was incensed that several of the promised rarer specimens were not supplied (Galbreath 1989: 168), and Miriam Rothschild (1983: 100) refers to her uncle's 'row with Sir Walter Buller' over specimens. Many specimens identifiable from Buller's books – including several of his type specimens (Tennyson & Bartle 2008) – are not in the collections of the NMNZ, AMNH, CMNH or CMNZ. Their absence is not the result of losses, because they are not listed in his extant

sales catalogues in the NMNZ and AMNH. All CMNH Buller specimens are registered and can be accounted for.

Certainly, Buller kept many exceptionally interesting specimens aside for his 'son's collection', although the 37 references to 'my son's collection' in Buller (1887, 1888a) mention only eggs. Some are great rarities today, like the two eggs of the laughing owl. However, none of the specimens sold by Laura Madocks (Buller's daughter) to the CMNZ in 1922 were eggs (CMNZ archives; R.P. Scofield, pers. comm. 2008). We made no attempt to track down those eggs. Although not listed in Buller's catalogue (Buller & Rothschild MS 1888), at least some Buller Collection eggs were left to the NHM by Rothschild (Knox & Walters 1992: 180; 1994: 171). Whether Rothschild obtained them direct from Buller, or from the family in London after his death, is not known.

Buller (1888a: 243) refers to his elder son, Leo (born 1863; Galbreath 1989: 310), skinning a Parkinson's petrel *Procellaria parkinsoni* obtained from Māori hunters, who had captured it 'far inland' in the Manawatu district (i.e. Tararua or Ruahine ranges). Thus, it seems that Leo's collection not only included eggs and skins from his father, but also specimens collected and prepared by Leo himself when he was in his twenties.

c) Sources of specimens and cataloguing

Only a few collectors' names were recorded by Buller in the catalogue (Buller & Rothschild MS 1888). No birds are listed as collected by him, although in his book (1887, 1888a) he is not shy in describing the birds he shot. The following collectors are listed in the sale catalogue: Julius F. von Haast and Hector (New Zealand museum directors); Liardet and Smyth (taxidermists); Gilbert Mair, Andreas Reischek and W.W. Smith (naturalists and collectors); and Charles H. Robson (a lighthouse-keeper). Buller's acquisition of specimens from Haast and Hector indicates that these European-born museum directors considered commercial trade in New Zealand bird specimens to be perfectly acceptable, even when neither succeeded in building comprehensive collections for their own institutions. Nor did they need the money – both men were paid high salaries for the time (Burton 1965). Neither man was noted for his detailed ornithological field labels, but the same cannot be said of Reischek, whose consistently and carefully labelled birds are now deposited in the Naturhistorisches Museum in Vienna and Linz, Austria, and in New Zealand museums. The field labels of Reischek's bird specimens are often the

most detailed nineteenth-century New Zealand bird labels at Te Papa. It is regrettable that Buller removed them from the specimens he had purchased from Reischek. Although Buller (1887, 1888a) scarcely mentions Reischek, it is evident from Buller's locality and date information in the sale catalogue (Buller & Rothschild MS 1888) that many more specimens were purchased from Reischek than are attributed to him. This is especially the case with birds from remote and mountainous regions such as Fiordland, which Buller visited only once, by ship (Galbreath 1989: 237).

Seventy-three specimens were listed as 'figured in B.[irds] of N.[ew] Z.[ealand] 2 ed. [Buller 1887, 1888a]' in the sale catalogue (Buller & Rothschild MS 1888). It is possible that not all of these birds were actually figured by J.G. Keulemans, who also used specimens from the Rothschild Collection and the NHM. Unfortunately, Keulemans did not add labels to the specimens he illustrated or label his watercolours with specimen details, as did more recent bird artists such as George E. Lodge (Fleming 1982: 4). A number of specimens was also listed in the sale catalogue (Buller & Rothschild MS 1888) as 'types'. However, most of these listings are incorrect, as Hartert discovered when he was preparing his *Types of birds in the Tring Museum* (Hartert 1925, 1926, 1929). In several places Hartert has added written remarks in his small, neat script (mostly in black ink but sometimes in pencil), often initialled 'E.H.', to the Buller & Rothschild MS (1888) sale catalogue. Those remarks correctly challenge Buller's listings of specimens labelled *Ocydromus brachypterus* Buller, 1878, and *Ocydromus finschi* Hutton, 1873, as 'types'. When it comes to the alleged 'type' specimen of *Procellaria affinis* Buller, 1875, listed in the sale catalogue, Hartert scathingly notes: 'This is nonsense, because the type is, acc.[ording] to Sir W. Buller, in the Canterbury Museum! See B.[irds] of N.[ew] Z.[ealand] vol. II.'

Variations in style of handwriting and pens used by Buller in listing the 483 birds in the sale catalogue (Buller & Rothschild MS 1888) indicate that his original entries were compiled over a period of time, perhaps 1882–88, as his *Manual* was printed in 1882. Evidence of an attempt to sell the collection for the best price is suggested by Buller's frequent (and not accurate) listing of birds as 'figured', 'in fine plumage', etc. Unlike Buller's books, other publications and letters, which are almost always well written and carefully phrased, the sales catalogue was carelessly compiled, with words left out and inconsistent formats. It is a tragedy that so few data were recorded in the catalogue or on the

labels of these specimens, and thus unsurprising that Rothschild was not prepared to buy birds from Buller after 1895. Rothschild later avoided basing new names for New Zealand birds on Buller specimens, instead selecting examples from different sources that were better documented.

'Third Collection' – Carnegie Museum of Natural History, Pittsburgh

History of the collection

This collection was taken to London by Buller when he left New Zealand in August 1899. It was intended for sale from the outset, as indicated by the list sent on 28 August 1902 to Richard B. Sharpe, Assistant Keeper of birds at the British Museum (Natural History), London (attached to Buller to Holland, 2 May 1905). The transcript of Sharpe's valuation of £1000 for the collection is dated 12 December 1905 (error for 1902). After some delay, the collection was offered for sale at that price by Buller to W.J. Holland, Director of the Carnegie Museum of Natural History, on 2 May 1905. It formed Accession No. 2830 of the CMNH. Two payments of £500 were received in London for the collection: the first on 14 September 1905, and the second on 8 September 1906. The second payment was received by Percy Buller, as Walter had died in July 1906.

A typed list of the specimens for sale was completed and signed by Buller on 12 September 1904, entitled 'A classified list of Sir Walter Buller's Collection of New Zealand birds'. It was annotated by Buller in red ink and symbols for male and female (♂ and ♀) were added in black ink. Included were several skeletons and some mounted birds. Written in red ink is: 'Memo. Each specimen has a label attached to one leg, and on the other leg a check No. [such as] 5a on a white tag.'

All the original documents relating to this sale and purchase were damaged or destroyed about 1980, when an old sewer pipe burst in the store at the CMNH in which they were kept (K.C. Parkes, pers. comm. 1982). Fortunately, copies of a few letters were made by an Auckland Museum botanist, Jeanne H. Goulding, during a visit in 1965, and have been used by us, courtesy of Brian J. Gill. Some of the originals are still readable, especially under ultraviolet light, and relevant data from them are included above. Unfortunately, Buller's typed catalogue of the collection was virtually destroyed.

This collection seems to have shrunk during its passage from London to Pittsburgh. Rothschild (1907: 24) tells us,

incorrectly claiming Buller's (1905, 1906) *Supplement* as his source, that there were '625 specimens'. This slip of the pen reveals that it was probably Rothschild himself who was the 'unnamed British prospect' who refused to purchase the collection in 1904 (Galbreath 1989: 324), rather than the British Museum (Natural History), to which the collection was never formally offered. On 12 December 1902, Sharpe had advised Buller (in a letter attached to Buller to Holland, 2 May 1905) that he was unable to arrange a sale to the British Museum (Natural History), 'as the Treasury says "no" to every proposal', correctly observing that it would be the last chance the British Museum would ever have to make their collection of New Zealand birds complete. Sharpe recommended that Buller offer the collection instead to the Zoological Museum at Dresden, Germany, or to one of the great museums in the USA. Buller ultimately took the latter course.

Buller himself, in the 'abridged' list attached to Sharpe's valuation of 12 December 1902 (Buller to Holland, 2 May 1905), said that there were 'over 600 first-class specimens', although only 274 were separately listed in that letter. When the collection was received, there were 588 specimens, of which only five were mounted, the balance being study skins. Subsequently, 13 specimens were disposed of by the CMNH on exchange with other USA museums and one (a Fiordland penguin *Eudyptes pachyrhynchus*) was discarded.

The average value of only £2 per specimen provided by Sharpe (valuation of 12 December 1902, attached to letter from Buller to Holland, 2 May 1905) seems very low. Many specimens of extinct and rare species were included, and the prices payable to collectors in New Zealand may have been up to £20–26 each for extreme rarities such as laughing owls, if Buller can be believed (letter to Rothschild, 12 September 1895). However, eight South Island piopio from Stephens Island were purchased for only 1 guinea each (Buller to Rothschild, 12 September 1895). Sharpe further discounted the value of this collection – by almost 30% – to reach what he called a 'fair price' for it. Perhaps Sharpe considered that the lack of collection data devalued the specimens? Unfortunately, he left no record of his thoughts on this question. Sharpe, who had acquired many important bird collections for the NHM over the preceding 32 years (Sharpe 1906), regarded 'the extreme prices paid for New Zealand birds' as excessive (letter from Sharpe to Buller, 12 December 1902, attached to Buller to Holland, 2 May 1905).

The collection today

Label data for the CMNH Buller Collection are much more complete in comparison with the specimens sold by Buller to Rothschild. A factor in this might have been that most were collected not long before the sale (see Fig. 5). However, we consider that a much more important reason for the improvement was criticism by Rothschild of the quality of Buller's specimens and of their lack of documentation, as well as Rothschild's consequent refusal to purchase further birds from him. Unfortunately, we have only indirect evidence for this dissatisfaction, as copies of Rothschild's letters to Buller were destroyed, along with Rothschild's account books and collector's diaries (Rothschild 1983: 299). The best clue is the published remark by Hartert (1926: 346) on the inadequacy of Buller specimen label data. Thus, it may be that the criticism of Rothschild was primarily responsible for the great improvement in documentation that is evident for Buller's '*Third Collection*' at the CMNH.

Among the 588 Buller Collection specimens catalogued at the CMNH by W.E.C. Todd, only 43 (7%) have no indication of date of collection – not even the year. For all others, the year is given, and on 41 the month of collection appears on the label. Exact dates are given for a further nine, collected between 13 October 1891 and 2 December 1902. Because this collection is largely dated, it is possible to analyse when it was built up and, hence, its principal purpose.

Most of the dated specimens in the CMNH Buller Collection (458 birds, or 78%) were collected between 1888 and 1895, while Buller was still active in selling birds to Rothschild. This adds weight to the argument that this collection was primarily built up for sale to Rothschild and not for new research towards the *Supplement*, as implied by Buller (1906: 166). Fig. 5 shows that this collection was built up rapidly, after Buller's return from London in May 1890. Except for 1893, when he was setting up displays in the New Zealand court at the Imperial Institute in London (Galbreath 1989: 193), and in 1897 (February–August), when he was arguing in defence of his land acquisition in the Native Appellate Court (Galbreath 1989: 229), Buller was energetic in acquiring new specimens. However, once he had left New Zealand permanently, only six more birds were collected for him. An additional 35 birds (6%) were from previous years ('1860s'–1889), when the '*First*' and '*Second*' collections were being built up.

Not all '*Third Collection*' birds are New Zealand specimens. There is a skin of the typical race of Leach's petrel *Oceanodroma leucorhoa*, which flew on board the SS *Doric*,

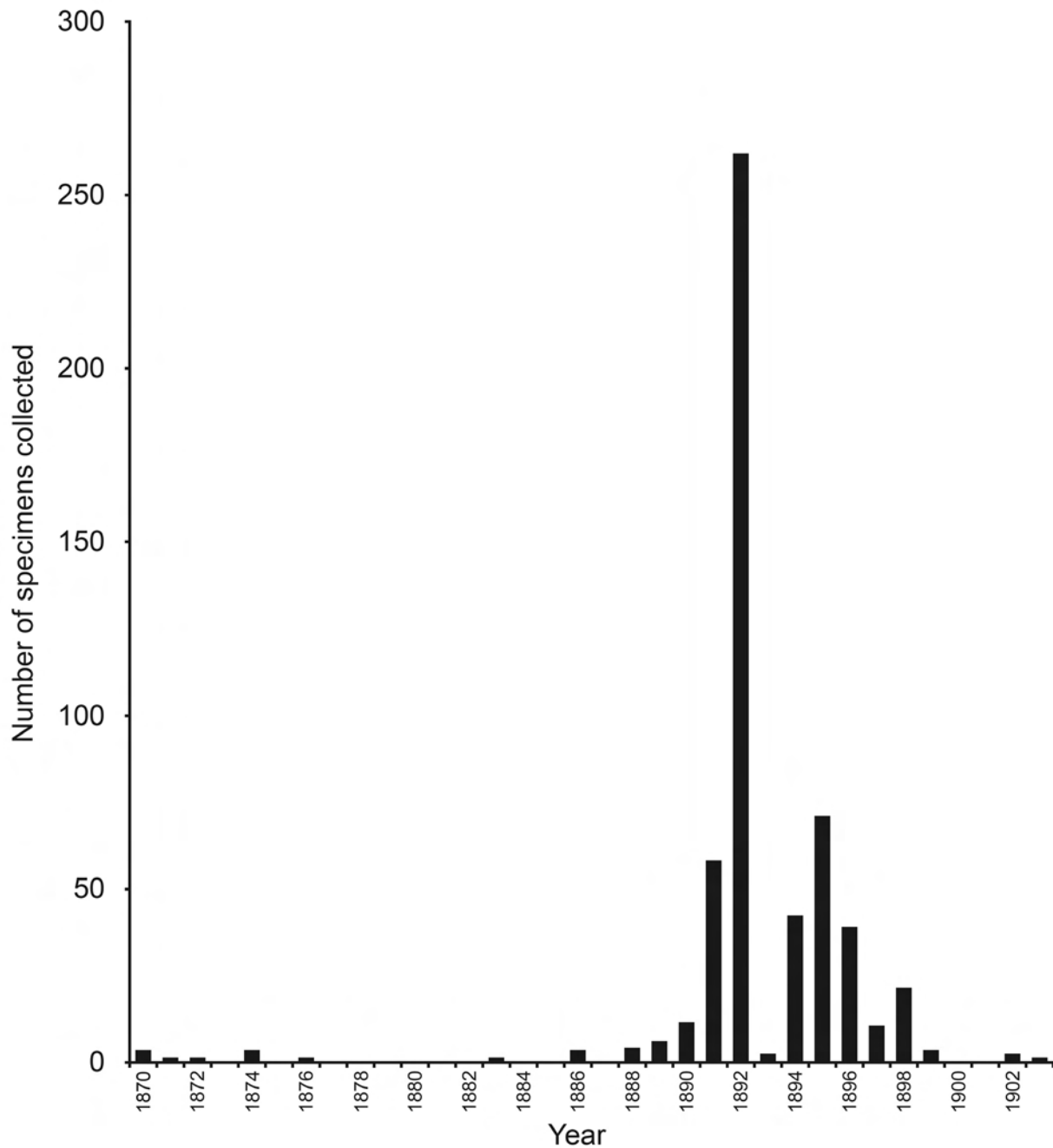


Fig. 5 Carnegie Museum of Natural History Buller specimens, plotted by year of collection.

60 miles (100km) west of the Cape Verde Islands on 4 February 1894, as well as eight Australian specimens and one from the Pacific Islands. Many are from New Zealand offshore and outlying islands: 38 from the subtropical Kermadec Islands (Raoul and Curtis islands); 89 from Mokohinau, Cuvier, Stephens, Snares, Bounty, Antipodes, Auckland and Campbell islands; and seven from Macquarie

Island. Most of these islands were regularly checked for castaways by the New Zealand government steamers *Hinemoa* and *Tutanekai*. Twenty-six specimens came from the Chatham Islands, and 13 others were collected at sea.

Included in the collection are a number of rare stragglers to New Zealand, including the first and only specimen of an Oriental grey heron *Ardea cinerea jouyi*, a tawny owl *Strix*



Fig. 6 Specimens from Buller's 'Third Collection' in the Carnegie Museum of Natural History. New Zealand quail *Coturnix novaezelandiae* – male (upper) CMNH 24223; female (lower) CMNH 24225. For collection data see Appendix 5. This is believed to be the first published colour photograph of this extinct species.

aluco from Wellington, collected by A. Turnbull in March 1896 (record not accepted today as being of a wild bird, Checklist Committee, 1990), a lesser frigatebird *Fregata ariel* from Cape Farewell (no date), a nankeen night heron from Westland (1860s, exact date not recorded), an Australian avocet *Recurvirostra novaehollandiae* from Marlborough (1874), a greenshank *Tringa nebularia* from Otago (1888), and a red wattlebird from Rahoitu, Taranaki (1882).

Overall, the quality of the CMNH specimens is higher than for the earlier collections. These differences have been amplified by excellent collection care since the specimens were purchased. For example, a great difference is evident if the New Zealand quail specimens shown in Fig. 6 are compared with the black-billed gull shown in Fig. 3. Yet, we believe that all three birds were collected in the 1860s (see appendices 2 and 5).

Highlights of the collection are 40 specimens of extinct New Zealand species, such as one Auckland Island merganser *Mergus australis*, three New Zealand quail, two Chatham

Island rails *Cabalus modestus*, three Chatham Island fern-birds, one New Zealand little bittern *Ixobrychus novaezelandiae*, three laughing owls, eight bush wrens, one Stephens Island wren *Traversia lyalli*, four Chatham Island bellbirds, six South Island piopio, six huia and two South Island kōkako. A few of these specimens have subsequently been sent to other North American museums and are no longer in the collection, but full records are still available for them at the CMNH.

A number of valuable 'Third Collection' specimens mentioned in the *Supplement* (Buller 1905, 1906) were not included in the sale. Perhaps Buller just could not bear to part with such treasures. This helps to explain the wide range and high quality of the Buller Collection birds that were ultimately sold to the CMNH. R.P. Scofield (pers. comm. 2008) believes that they represented Buller's 'favourite specimens'.

Unlike Buller's 'First' and 'Second' collections, all CMNH Buller specimens have localities recorded on their labels. Although many of these are very broad (e.g. North Island,

South Island, 'Nelson' [Nelson Province = northern South Island, extending from Punakaiki on the West Coast to Kaikoura on the east] and 'Otago District'), these standard descriptors often suggest the source of the specimen. For example, 'Nelson' was a common geographical descriptor on the bird labels of Henry Travers (1844–1928), who collected over much of the Nelson Province in his youth and later purchased many specimens from commercial taxidermists in Nelson (records in Te Papa archives). Similarly, 'Otago District' or 'Otago Coast' on the label may indicate that the specimen had been purchased from the Dunedin taxidermist Smyth, who failed to specify precise localities on most of his labels. The Otago Provincial District originally extended from Fiordland to Oamaru and south to Invercargill. Although the original provinces were subdivided in 1859 and abolished in 1876 (Dollimore 1957: xii), they remained in general use as regional descriptors until after the Second World War.

Sources of specimens

Unlike the 'First' and 'Second' collections, very few of the 'Third' and CMNZ Buller collections were collected by Buller himself. According to the *Supplement* (Buller 1906), most of his personal collecting was done in the Wanganui, Manawatu, Wellington and Wairarapa districts, and in Hawke's Bay. Based on this information, when the CMNH catalogue locality records were analysed, only about 90 birds (15%) in Buller's 'Third Collection' were found to have come from those areas and hence were likely to have been collected by him or his sons. The years of collection of these specimens range from 1874 to 1898, with most collected in 1892.

Buller's most important source of specimens for his 'Third Collection' were collectors on board the government steamer *Hinemoa*, which visited offshore islands (to service lighthouses) and outlying islands (in search of castaways), from the Kermadec group in the north to the New Zealand Subantarctic Islands and Macquarie Island in the south. At least 134 specimens (23%) are from this source.

Next in numerical importance are specimens from Smyth, the commercial taxidermist who operated from Caversham, Dunedin. There are 116 Otago specimens – apparently all from Smyth – in Buller's 'Third Collection'. Most are study skins, but a few are mounts. The year of collection ranges from 1888 to 1896, but most are labelled 1892, thus contributing to the peak of collecting (Fig. 5) in that year. However, none has an exact date. There are also many of Smyth's speci-

mens at the NMNZ, which were directly purchased for the Dominion Museum by Professor William B. Benham, after the death of Smyth, at an auction of '500 rare native and foreign birds' on 18 November 1915 (Director's correspondence in the Te Papa Archives).

We think that many Buller Collection specimens in the CMNH and in the CMNZ are attributable to the collecting of English-born Jonathan Brough (1839–1927), based on the dates and remote localities recorded on the labels. Although Brough is not acknowledged on any specimen labels, he is mentioned in the *Supplement* (Buller 1906: 104) as an important collector and valued correspondent of Buller. Analysis of localities recorded for CMNH specimens showed that 60 specimens (10% of the entire collection) are labelled from the following areas in the Nelson Province: Pelorus Woods [= Pelorus River valley], Tasman Mountains, Karamea, Buller River and 'Nelson Mountains'. We believe that most of these specimens were collected by Jonathan Brough, who worked in all these localities and collected extensively for Buller.

In 1866, Brough arrived in Nelson to search for gold (Newport 1962: 94). Although he continued prospecting, from 1877 he also took up contracting to establish telegraph lines and roads through the then almost impassable forested mountains and hill country of the Nelson Province. He was a keen naturalist and good taxidermist, and kept quite detailed dairies (Newport 1962: 94). During the years 1881–96, he worked in the upper Wairau and Buller river valleys, and in the Pelorus Woods in winter.

From 1859, the Wangapeka Valley leading into the Tasman Mountains from the east attracted gold prospectors, and by 1887 there were around 400 people living nearby (Newport 1962: 217). There was pressure to establish a packhorse track through to the West Coast and, from 1895 to 1899, Brough was given a contract to build it (Newport 1962: 240). Many labourers were employed and birds were probably hunted to provide fresh meat. In 1898, Brough had a little A-frame hut built high above the headwaters of the upper Karamea Valley with a magnificent view out over the wilderness. Here he wrote his diary and letters and prepared his bird skins. This hut – known as 'Brough's Tabernacle' – survived until recently. Birds labelled 'Karamea', 'Tasman Mountains' and 'Nelson Mountains' in Buller collections held in CMNH and CMNZ were collected in that area (see Appendix 5). To prevent damage, Brough often caught birds in hand-nets (Buller 1906: 106). As a result, his skins are in better condition than many others in the Buller

collections. They lack staining from chemical preservatives and the documentation is better. However, the sex of Brough's specimens (as recorded on Buller's labels) often appears incorrect, not agreeing with known plumage characters (e.g. for the rifleman *Acanthisitta chloris*).

From 1881, Brough corresponded with Buller and supplied him with zoological specimens, especially birds (Newport 1962: 405; Ramsay 1971). His notes on the steep decline of native birds in the Wangapeka–Karamea River area during the 1890s make depressing reading, especially concerning those that are now extinct. Brough attributed this decline primarily to introduced stoats *Mustela erminea*, weasels *Mustela nivalis* and ferrets *Mustela furo*. His remarks are quoted in full by Buller (1906: 104). 'Third Collection' birds attributable to Brough on the basis of locality are dated between 1891 and 1899 and are among the most valuable specimens in Buller's collections (see Appendix 5). This is partly because of the relative precision of the localities and dates on the labels, which allow retrieval of further information on them from Brough's surviving diaries, now held in the Nelson Museum. Since then, few or no birds have ever been collected at these remote localities.

Thirty specimens from the Chatham Islands are also present in Buller's 'Third Collection'. Although Buller visited the islands in 1855 or 1856, he collected few birds (Buller 1872–73: 97; Galbreath 1989: 31). The Chatham Islands specimens in the 'Third Collection' date from 1876 and from 1891 to 1899. Judging from their localities and dates, Buller purchased them from several collectors, including W. Hawkins (early 1890s) and J.W. Pepper (late 1890s). Other noteworthy specimens are 20 birds from Stewart Island collected in 1896 by O. Marklund. These were the first that Buller had been able to obtain from that locality.

Another important source of specimens was government lighthouse-keepers. During the 1880s, Robson collected specimens for Buller from Portland Island and Cape Maria van Diemen. In the 1890s, Buller received at least 18 skins from offshore islands ranging from the Mokohinau Islands south to Stephens Island. Analysis of localities from the 'Third Collection' at the CMNH reveals that all Buller's offshore island specimens either came from islands with lighthouses or government rangers (e.g. Little Barrier Island and Kapiti Island). Galbreath & Brown (2004) believed that lighthouse-keeper D. Lyall was Buller's main source for birds from Stephens Island (listed in Appendix 5). The dates of Stephens Island birds in the CMNH (1892–96) coincide with Lyall's period on the island.

Some localities on labels of 'Third Collection' birds at the CMNH are questionable. Both a Buller's shearwater *Puffinus bulleri* and two flesh-footed shearwaters *Puffinus carneipes* are recorded from Mokohinau Island (1889 and 1892, respectively), where neither bred. Perhaps they were collected at sea nearby or flew into the lighthouse. The *Hinemoa* regularly visited Mokohinau during those years to service the lighthouse and provide supplies for the lighthouse-keepers (Galbreath & Brown 2004). Also, two yellow-eyed penguins *Megadyptes antipodes* are labelled 'Bounty Islands, 1892', where this largely coastal species does not occur.

Frequency of juveniles among extinct and threatened species

Many mainland land and freshwater bird species in Buller's 'Second' and 'Third' collections were collected from localities where they no longer occur, either because the forest has been since cleared for agriculture, or because the birds were eliminated by predators and perhaps disease (e.g. Bartle & Sagar 1987). Such specimens are listed in appendices 4 and 5. The current distribution of terrestrial bird species in New Zealand was mapped by Robertson *et al.* (2007). Comparing the distribution of endemic birds in pre-human times (Robertson *et al.* 2007: map, p. 410) with the current distribution (Robertson *et al.* 2007: map, p. 399) shows that most endemic birds have disappeared from much of their former range on the New Zealand mainland, and this process is still continuing (Robertson *et al.* 2007, p. 500). Documented historical collections can thus provide valuable information on the past distribution of New Zealand birds.

Following the introduction of the most destructive mammalian predators in the nineteenth century, it has been hypothesised that several bird species persisted only because of the longevity of adults (e.g. King 1984: 127). The hypothesis is that long after populations ceased replacing themselves owing to a loss of all young birds to predators, adults would remain. In Buller's collections held in the USA, we noticed that the proportion of juvenile extinct and threatened species appeared lower in the 1890s (Appendix 5) compared with the 1880s and before (Appendix 4).

To examine whether this trend was significant, numbers of adults and juveniles of 17 species of land and freshwater birds that are today extinct or threatened are listed in Table 1. Only specimens collected on the mainland are listed. Juveniles were identified only by catalogue listings or by plumage coloration and size, and their numbers may therefore have been underestimated.

Data in Table 1 allow a direct comparison of the frequency of juveniles between the two collecting periods. For all species of which juveniles were collected, except the South Island saddleback *Philesturnus carunculatus*, the proportion of juveniles dropped. To test for statistical significance, a one-tailed version of Fisher's exact test (Zar 1984: 390) was used to examine the probability that the proportion of juveniles in Table 1 had declined by chance. The ratio of juveniles declined from 17.5% in the 'Second Collection' to 6.2% in the 'Third Collection', and the degree of this decline approached statistical significance (left-tail, $p=0.054$). Cumulative totals of specimens from each collection and age category ('Second Collection' adults and juveniles and 'Third Collection' adults and juveniles, total $n=163$) were used because the samples were too small to test for the trend within each species. To improve resolution of trends for individual species where juveniles were included in at least one collection (Table 1), a sign test (Zar 1984: 386) of the probability that the trend was by chance showed a significant (one-tailed test, $p=0.011$) decline in the frequency of juveniles between the two periods.

By the 1890s, no juveniles were collected for 87% of the mainland species listed in appendices 4 and 5 that are now threatened or extinct. This suggests that predation of nests and young was just as important as adult mortality in the ultimate demise of a number of New Zealand birds. It provides support for Atkinson's (1985: 69) contention that the arboreal ship rat *Rattus rattus*, introduced to New Zealand in 1858–65 (Atkinson 1985: table 1), was a primary agent in the extinction of many bird species, even in remote parts of the New Zealand mainland. However, although ship rats raided nests, the adults of many such birds ultimately succumbed to predation – especially by feral cats *Felis catus*, present from the 1830s (King 1990: 335), and stoats, present from 1885 (King 1990: 293) – as graphically illustrated by Tennyson & Martinson (2007: fig. 3).

Notes on individual species

Nine species listed in Table 1 (except the South Island saddleback) showed a decline in frequency of juveniles between 1859–86 and 1891–98, and five of these were extinct on the mainland by the early twentieth century. The remainder (little spotted kiwi, North Island weka *Gallirallus australis greyi*, kākāpō and South Island bush wren *Xenicus longipes longipes*) are now also extinct or threatened on the mainland. In the 'Third Collection' there are no juveniles of any of these nine species, except for little spotted kiwi and huia. In another seven extinct or threatened species, there were no juveniles in either collection (Table 1).

No skin or mount of a North Island saddleback *Philesturnus rufusater* was sold by Buller to Rothschild or to the CMNH (see appendices 4 and 5). A careful reading of Buller's publications suggests that he only ever had two skins, from the Wairoa River (Kaipara), dated 1852. One of them was later mounted and donated to the Auckland Museum in 1855, but is now lost (B.J. Gill, pers. comm. 2008). Buller (1887: 20) also says that he donated an egg of this species to the Colonial Museum, one of a clutch of three collected by Hutton on Little Barrier Island on 27 December 1868. None is identifiable at the NMNZ as from Buller today, although there are three old North Island saddleback eggs without data in the collection. Buller never recognised the North Island saddleback as a discrete taxon, which perhaps explains why he apparently did not try harder to obtain more specimens of that species.

Saddlebacks were common throughout North Island forests before 1870 (Oliver 1955: 514), being abundant even near Wellington in 1855 (Buller 1906: 161). They disappeared from the North Island much more rapidly than kōkako, probably because they favour ground feeding and often breed and roost in cavities near the ground (Oliver 1955: 514; Lovegrove 1996: table 9). These behaviours made them particularly susceptible to cat predation, even on islands that had few other predators, such as Little Barrier, Great Barrier and Cuvier. Cats became feral on Little Barrier Island in the 1870s (Hamilton 1961: 132; Miskelly 1988: 278) and saddlebacks were last seen there in 1882 (Hamilton 1961: 173). The rapid decline of North Island saddlebacks on the mainland preceded the introduction of mustelids and occurred 20 years earlier than in the South Island (Oliver 1955: 514). Buller (1888b: 17) records that saddlebacks had 'now entirely disappeared from the North Island, being met with only in some wooded islands in the Hauraki Gulf'.

In contrast, the South Island saddleback was the only species listed in Table 1 to show an increase in the number of juveniles collected in the 1890s. Also notable is that more than half of the mainland South Island saddlebacks in the NMNZ collected from 1890 to 1905 are juveniles (7 out of 13). Thus, there is no proof that productivity declined in this species before its extinction on the South Island mainland, which is estimated to have occurred in 1905 (Hooson & Jamieson 2003: 191).

Buller (1906: 135) described South Island piopio as 'fast expiring' in the South Island, but they still abounded on Stewart Island in 1896 (Buller (1906: 162), contra Checklist Committee (1990). Buller also recorded (1906: 165) that

Table 1 Comparison between Buller's 'Second' and 'Third' collections to show a decline in number of juveniles of extinct and threatened land and freshwater bird species, obtained on the New Zealand mainland.

	'Second Collection' (collected 1859–86)		'Third Collection' (collected 1891–98)		Current status on mainland
	adults	juveniles	adults	juveniles	
South Island brown kiwi	5	0	3	0	Threatened
Little spotted kiwi	8	2	5	1	Extinct
New Zealand little bittern	2	0	1	0	Extinct
Brown teal	4	0	2	0	Threatened
New Zealand quail	3	1	3	0	Extinct
North Island weka	2	2	6	0	Threatened
Kākāpō	11	2	5	0	Extinct
Orange-fronted parakeet	2	0	2	0	Threatened
Laughing owl	6	1	3	0	Extinct
South Island bush wren	5	1	8	0	Extinct
Yellowhead	3	0	6	0	Threatened
North Island kōkako	4	0	2	0	Threatened
South Island kōkako	2	0	2	0	Extinct
South Island saddleback	11	1	8	2	Extinct
Huia	6	2	5	1	Extinct
North Island piopio	2	1	1	0	Extinct
South Island piopio	4	1	3	0	Extinct
TOTALS	80	14	65	4	n = 163

Brough still found them in the 'Nelson district' [upper Karamea River] in 1895 or 1896. The NMNZ has two South Island piopio obtained by L.J. Vangioni from near Queenstown in 1893, and four obtained by H.H. Travers from the Nelson district in August 1897. It thus appears that they, too, were widespread until about 1900. After the introduction of mustelids (on the mainland) and feral cats (on Stephens and Stewart islands), these fine songsters declined precipitously, becoming extinct by about 1905 (Tennyson & Martinson 2007).

The mainland decline of both of the above species was later than for their congeners in the North Island. Perhaps this reflected the slower rate of forest clearance in the South Island and, as a consequence, a temporary buffering of the effects of introduced mammalian predators.

Discussion

Difficulties faced by the Colonial Museum

In 1865, the Colonial Museum and Laboratory was founded in Wellington by the New Zealand government on the initiative of James Hector. Hector was appointed Director of the Museum, the Colonial Laboratory and the Geological Survey. He was also the only qualified government field geologist and naturalist before the brief but productive employment of F.W. Hutton in 1871–73 and Alexander McKay from 1873 (Burton 1965). Initially, there were four staff, none an ornithologist, and none with qualifications or previous museum training. The official priority of developing geological collections at the Colonial Museum restricted the growth of other collections. By the time Hector retired,

there were 112,000 palaeontological specimens, with 30,000 on display (Burton 1965: 34). Throughout the nineteenth century, the Colonial Museum had few staff and inadequate collection housing (Dell 1965; Roberts & Paulin 1997; Kell 2001; Tennyson & Bartle 2008).

In addition to his main work in geological mapping and mineral surveys, Hector was the only government medical officer and had to report on all major disease outbreaks in the colony. From 1867 he also became Manager of the New Zealand Institute and the editor of its journal and, in 1885, he was appointed the first Chancellor of the University of New Zealand (Dell 1965). These responsibilities were too diverse for one man to manage effectively.

From 1881, a shortage of space in the main (unheated) museum building resulted in the vulnerable natural history reference collections being stored in a damp 'stock room' (Roberts & Paulin 1997) infested with insects and mice. Fortunately, many herbarium specimens remained packed in their original (1876) zinc-lined packing cases until the 1950s (Kell 2001), which gave them better protection than was available for the birds.

Vital political and financial support for the work of the museum and the Geological Survey was actively eroded after 1886 by the influential populist R.J. Seddon, a Member of Parliament and, later, Premier. That lack of support resulted in facilities under Hector's direction becoming run down (Burton 1965). From 1892, remaining professional staff were transferred to the now separate Geological Survey and Mines Department. Hector was left to operate the Colonial Museum and care for the collections with the help of R.B. Gore and one or two assistants. The budget was cut to a level insufficient even for maintenance of the wooden building (Burton 1965), and the failure of the Colonial Museum to document and care for Buller's '*First Collection*' resulted from those inadequate facilities, staff and resources.

Was the population of New Zealand in the late nineteenth century large enough to support a professionally run museum? The European population of New Zealand was 171,000 in 1864 (Te Ara 2007), larger than that of Chicago and comparable with Boston at the time (Gibson 1998). Yet, both North American cities succeeded in establishing fine and well-funded museums, suggesting that the importance of museums for natural sciences, culture and heritage was more fully appreciated there than in colonial New Zealand. By 1891, when the European population of New Zealand exceeded 624,000 people (Te Ara 2007), Premier Seddon had slashed funding for the Colonial Museum to a devastatingly low level (Burton 1965: 37).

Development of professional collection care at the Dominion Museum

In 1907, under new direction from Augustus Hamilton, the Colonial Museum was renamed the Dominion Museum. In 1914, Hamilton appointed his son Harold, aged 29, to be Assistant Zoologist (*Annual Report* 1915). An immediate start was made on cataloguing and labelling the remaining collection of New Zealand bird skins and mounts, renamed in accordance with the list of Mathews & Iredale (1913). Previously, there had been no dedicated staff caring for the zoological collections, apart from Hutton.

Despite an interruption caused by war service in France (1916–19), Harold Hamilton's initiatives led to the bird-skin collection being described as 'in good order' (Hamilton in *Annual Report* 1922). These improvements were built upon by W.R.B. Oliver (Senior Scientific Assistant 1920–28; Director 1928–47), who purchased the first nine modern steel cabinets for the skin collection in 1928 (*Annual Report* 1929). The standardised separate natural history registers and labels introduced by Oliver used sequential registration numbers for each specimen. Oliver's system was both simpler and more advanced than those used by other New Zealand museums and by the NHM, and it remains in current use today.

Oliver's appointment represented the institutionalisation of professional standards of museum care. In 1936, the bird collection was rehoused in an insect-free dedicated store-room in the newly constructed stone building on Mt Cook. The much larger building proved to be far drier and vastly superior in every respect to the old Colonial Museum building (Dell 1965), which was soon demolished. The period of neglect that caused the loss and destruction of Buller's '*First Collection*', along with many other perishable natural history specimens, had finally ended.

Inadequacy of early New Zealand bird collections for research

The failure of the Colonial Museum to document and care for natural history collections adequately was partly because it lacked expert users who might pressure the government to provide the resources needed for good storage, laboratory facilities and record-keeping. Research in New Zealand on birds during the nineteenth century was, by necessity, of an amateur nature. At the monthly meetings of the Wellington Philosophical Society (later a branch of the New Zealand Institute and the governing body of the Colonial Museum

before 1907) there was plenty of interest in, and informed debate about, New Zealand ornithology, as shown by reports in the *Proceedings of the New Zealand Institute*. However, the lack of proper storage and documentation of New Zealand museum bird collections was not raised.

Before 1936, no New Zealand bird collections were large enough for comprehensive taxonomic work. Partly because of that, most currently recognised scientific names for New Zealand birds were published by European, Australian and North American naturalists (Checklist Committee 1990). New Zealand birds were mostly named by naturalists who visited the Pacific on voyages of discovery (e.g. Forster, Sparrman, Bauer, Lesson, Garnot, Quoy, Gaimard, Hombron, Jaquinot, Giglioli, Filhol), curators of foreign museums to whom collections were sent (e.g. Shaw, Wagler, Kuhl, G.R. Gray, Gould, Ogilvie-Grant, Schlegel, Lorenz, Pelzeln, Murphy), and naturalists of independent means or with sponsors (e.g. Bonaparte, Rothschild, Hartert, Salvin, Tristram, Mathews, Iredale). Altogether, 77% of currently recognised species names of extant New Zealand birds were first coined and described by foreign naturalists. It was a German scientist, J.F. Gmelin, who named the most species, although his names are only Latinised versions of the English names given by John Latham to the birds collected during Cook's voyages (Walters 2003).

Among the currently recognised extant and historically extinct bird taxa first described by New Zealand ornithologists, more were named by Buller (11 taxa), followed by Hutton and R.A. Falla (six taxa each), than anyone later. Many names published by New Zealand ornithologists in the nineteenth century turned out to be junior synonyms of older names. This was principally because most early natural history literature was unavailable in the colony before the gifting to the nation of the libraries of businessman Charles Carter and merchant Alexander Turnbull in 1890–96 and 1918, respectively (Sutherland 2007; Traue 2007), and also because there were few comparative specimens in New Zealand museums.

Faced with those problems, and the concentration of natural history expertise in Europe and North America, it is unsurprising that most nineteenth-century New Zealand naturalists exchanged or sold their rarest and most interesting specimens to European and North American museums, collectors and dealers. To the modern New Zealand researcher, the exchange of irreplaceable specimens of rare or threatened species for skins or mounts of common European or American species seems irresponsible. However,

overseas export and exchanges of New Zealand birds made good sense in the nineteenth century, as there was a feeling in the colony that better use would be made of specimens in northern hemisphere museums. Until naturalists could obtain university education and professional employment in New Zealand, natural history research and the collections that underpinned it were bound to remain in colonial subjugation.

Neglect of bird collections by New Zealand museums in the colonial period

Although the lowest point of bird collection care for New Zealand was certainly attained at the government-run Colonial Museum between 1881 and 1914, conditions at other New Zealand museums in the nineteenth century were also very unsatisfactory. Between the Auckland Museum's foundation in 1852 and the completion of a purpose-built facility in 1876, only inadequate premises were available, and Gill (1999) reports that no birds were catalogued before 1898. Among the earliest bird acquisitions (35 mounted specimens, in 1856), only five survive today. Most of the losses occurred in the nineteenth century (Gill 1999).

Many early specimens, including types, also disappeared from the Canterbury Museum collections during the nineteenth century (R.P. Scofield, pers. comm. 2008). However, by 1922 storage was much improved, and Walter Buller's children (in London) were happy to see his remaining specimens lodged in the CMNZ (Madocks to Stead, 26 July 1921).

Buller's decision to sell his New Zealand bird specimens to northern hemisphere collectors and museums after 1871 may appear at variance with his support for New Zealand museums. In his address to the Wellington Philosophical Society on 21 August 1895 (Buller 1896: 332), he stated that 'Foreign museums are being enriched whilst our local museums are practically at a standstill'. After remarking on the 'huge' numbers of New Zealand specimens that Rothschild had accumulated, Buller (1896: 333) noted that he 'makes excellent use of them, being himself one of the most active of our working ornithologists'. Buller (1896: 333) thought the 'zoological museum at Tring is one of the most perfect of its kind in the world'. In contrast, Buller (1896: 334) found it 'little short of a scandal that, owing to the lack of proper departmental aid, scientific classification should be neglected' at the Colonial Museum. Moreover, Buller (1896: 334) felt disappointed that there was insufficient

space to display the collection of 'upwards of three hundred mounted specimens of indigenous birds' properly. He wrote (1896: 335) that 'fully half of those exhibited are not named at all', and that some of the names used were obsolete. Nowhere did Buller consider that he might actively play a part in rectifying that state of affairs.

Regarding bird collections in New Zealand museums, Buller (1896: 334) thought it 'surely high time that an effort was made to collect for each, before it is too late, a complete series of our existing native birds'. In this, he believed the Colonial Museum should take the lead. Earlier, he had written to Rothschild (Buller to Rothschild, 10 February 1895) that New Zealand museums were 'not enterprising enough to send hunters into the mountains, and will not pay the price when there happens to be a specimen on the market'. He maintained that 'they will have reason to regret it ere long, for all our wingless birds are doomed'.

Buller was not the only collector who had little faith in the local museums. Directors of the main museums (Hector and von Haast) actively collected birds for export on government-funded expeditions to the mountains. Data in our appendices show that both Hector and von Haast sold or exchanged specimens with Buller, who then sold them on to Rothschild. Other New Zealand collectors of the time, such as H.H. Travers, Dannefaerd, Reischek, Lyall and Hawkins, among others, kept their finest specimens for export to northern hemisphere museums and collectors. Only F.W. Hutton, Curator of the Otago Museum in 1873–79 and of CMNZ in 1892–1905, perhaps because of his involvement in university teaching, seems to have been 'the odd man out' in putting the needs of the local museums ahead of overseas specialists by not exporting valuable specimens (Dawson 1994).

Lack of ornithological literature and comparative material in New Zealand were two good reasons to favour depositing new or important specimens in the much larger and better resourced northern hemisphere museums. The great knowledge of the nomenclature and taxonomy of New Zealand birds that O. Finsch – based at natural history museums at Leyden and Bremen between 1861 and 1904 (Mearns & Mearns 1998: 89) – brought to his reviews of the work of Buller and Hutton reflected his access to the outstanding collections and libraries of these large institutions. Export of rare bird specimens to major northern hemisphere 'centres of excellence' continued until the 1950s, although at a reduced pace after the First World War. From that time on, New Zealand zoologists were encouraged to visit such

centres to study unique material such as type specimens. They returned with a broader vision for collection-based museum research and were able to implement their newly gained knowledge of professional standards of labelling, cataloguing and collection care.

Failure to document bird collections by colonial naturalists

Proper collection care involves the cataloguing of specimens to track loans, losses, etc. The scientific value of specimens is low unless collection data are attached. Hartert's comments express the frustration of those who have worked with birds from Buller collections. In trying to resolve the status of a new albatross (*Thalassogeron salvini* Rothschild, 1893) received from Buller, Hartert (1926: 346) wrote:

Unfortunately work with New Zealand sea birds and others is often hampered by the unscientific labelling. Very often neither exact localities, nor coloration of bill, iris, and feet, nor the sex, nor the condition of sexual organs, whether caught on breeding place or at sea, is indicated; *not in one instance are all these important details on any specimen of the Buller Collection* [authors' emphasis].

To that list of omissions we would add the exact date of collection. This information is vital for studies of plumage and moult. A slight improvement in recording dates of collection becomes evident when Buller's three main collections are compared. Only one 'First Collection' specimen and only one of the 728 'Second Collection' specimens are properly dated. Although the 588 'Third Collection' specimens are somewhat better documented, many have no date.

The lack of specimen documentation contrasts with the wealth of detail in Buller's publications. In view of his statement (Buller 1906: 166) – that these 'three collections' consecutively formed the basis for each of these works – their lack of data is remarkable. The catalogues and numbered labels that accompanied each collection when sold were apparently written at the time of sale. The arrangement of species and numbering systems used in the two surviving original Buller catalogues (at the NMNZ and AMNH) are in systematic, not chronological, order. All birds are numbered by species, not according to date of acquisition. The specimens are then listed within species by age, sex, plumage characters and specimen type. Perhaps Buller considered that such a system was optimal for sale purposes, but Rothschild, Hartert, Sharpe and Todd were not impressed.

Surprisingly, neither Galbreath (1989) nor the present authors have come across any description of a Buller collection being shown to visitors, or of their reaction. Existing independent assessments of the Buller collections include Rothschild's evaluation of the specimens as 'useless' (Buller to Rothschild, 12 September 1895). W.J. Holland (Director, CMNH) was 'not happy about the condition' of these specimens (Buller to Holland, 5 September 1905). Laura Buller (Madocks to Stead, 26 July 1921) describes how she had unpacked Buller's son's collection and found it 'in perfect condition'. The letters of Buller and his family contain no mention of cabinets or drawers, suggesting that the collection of bird skins was never available for study, but kept in boxes, ready for sale.

Prior to 1892, most Buller collection specimens were largely undocumented on the label. After this date his new standard labels had spaces for 'species', 'locality', 'date' and 'sex', but not for collector or other details. Such labels were filled out by Buller – apparently from memory – for the CMNH and the CMNZ collections. In no cases are the original collectors identified, not even Buller himself. The most obvious explanation for this was to prevent the purchaser dealing directly with Buller's collectors. However, he is quite open about the sources of his specimens in his books (Buller 1872–73, 1887, 1888a, 1905, 1906) and in his correspondence (e.g. Buller to Rothschild, 12 September 1895). Hence, it seems that Buller's failure to record collectors was the result of sloppiness and poor record-keeping, rather than an attempt to conceal information.

Procedures that alienate specimens from their provenance were characteristic of commercial taxidermists and dealers like Liardet, Dannefaerd and Smyth (New Zealand), A. Boucard and Verreaux Bros (Paris), and W.F.H. Rosenberg (London). Tens of thousands of bird skins were sold annually to museums and collectors all over the world by the last three dealers, yet very few specimens from such sources carried accurate or complete labels (Mearns & Mearns 1998: 99). In contrast, German and Austrian scientific field collectors like Dieffenbach and Reischek labelled specimens in the field and published detailed accounts of their natural history based on direct observations. These well-documented specimens provide a valuable legacy of the history of New Zealand birds, and will for ever be useful for research. Unfortunately, the bird collections of Walter Buller are, in general, of the former type, owing to their lack of documentation. Sadly, they have not proved to be as useful as he thought for the 'student of the future', especially in comparison with his published work.

Conclusions

Key findings

1. Walter Buller did not label his specimens except for sale. He removed all collectors' labels.
2. None of the three Buller collections studied was adequately labelled. Specimens in the 1871 '*First Collection*' carried only numbered tags.
3. A vital first step in the identification of Buller collection specimens was to match the distinctive numbered tags attached to the birds with the system used in his sale lists.
4. Buller did not catalogue his specimens. The sale lists that he provided (which he called 'catalogues') contain rudimentary information and last-minute additions and deletions. They appear to have been hastily prepared.
5. Buller had a poor understanding of the concept of type specimens. Most of his type specimens were not labelled as such. Contrarily, specimens listed as 'types' in the sale catalogues were often not types.
6. Most of Buller's '*First Collection*' was lost and very likely destroyed at the Colonial Museum in the late nineteenth century owing to a shortage of resources and to neglect. This loss included several types and irreplaceable specimens of rare and extinct species.
7. Buller's version of the development – and of the later disposal – of separate collections for each of his three major books is very misleading. Analyses of specimen collection dates for the three collections show that the prime purpose of acquisition of most specimens was for sale, not research. The major peaks in collecting were not immediately prior to the preparation of his books.
8. Rothschild's interest in New Zealand birds was a particularly important factor motivating Buller during the main period of his collecting, from 1886 to 1896.
9. For each collection Buller's objective was the same – acquisition of every recognised species of New Zealand endemic bird. Each of the main collections included almost all of them. For the three collections studied, Buller concentrated on threatened mainland bird species first and on seabirds last.

Walter Buller's bird collections in retrospect

Walter Buller is widely regarded as having traded in large numbers of New Zealand birds, profited greatly from this trade, and contributed to the demise of several bird species

through his collecting. The information presented in this paper shows all three of these assumptions to be wrong. Buller's tendency to exaggerate the size and importance of his collections in publications and correspondence has helped fuel these misconceptions.

It is now clear, despite his protestations to the contrary (Galbreath 1989), that Buller regularly traded in birds from 1871 to 1905, but the numbers of specimens were not great. Compared with the collections of A.O. Hume in India (102,000 specimens), J. Dwight in the USA (65,000), or Mathews in Australia (30,000) (Mearns & Mearns 1998), Buller's total collecting efforts were slight. Reischek took at least 2278 birds (including nests and eggs) to Austria after his 12 years in New Zealand (Westerskov 1990), and we estimate that he collected at least another 1000, when his sales to Buller, Rothschild and to New Zealand museums are considered. Nearly all of these specimens were collected, prepared and documented by Reischek himself.

Buller's sales to the four institutions discussed in this paper (Colonial Museum, Rothschild Museum, CMNH and CMNZ) totalled about 2230 specimens, collected over some 50 years, for which he or his family received at most £3492. Allowing for inflation, the average price per specimen (£1.57) was quite similar to that paid to John Gould for his collection of Australian birds by the Philadelphia Academy of Natural Sciences in a previous era (Stone 1938). If £10–26 was paid to collectors for rare species (Buller to Hector, 27 December 1871; Buller to Rothschild, 12 September 1895), then it is likely that Buller did not significantly profit from his collections, and may even have lost money on them.

Finally, there is no evidence that Buller's collecting activities contributed to the decline or extinction of any New Zealand species. Seven bird species were certainly exterminated in New Zealand during Buller's time, and many others declined greatly, as recorded in his books. However, this period coincided with the main phase of European settlement, with the clearance of forest for farming and with the spread of several mammalian predators, particularly mustelids (stoats, ferrets and weasels) introduced to control the plague of rabbits *Oryctolagus cuniculus*. The arrival of ship rats and the introduction of cats to several important mustelid-free islands (Little Barrier, Great Barrier, Stephens and Stewart) also led to many bird extinctions (King 1984). Buller supported removing huia from the dangers of the mainland to predator-free island reserves, although he continued to collect them (Galbreath 1989). However, the total number of huia collected by Buller (only 24 altogether, sold

by Buller or his family to the Colonial Museum, Rothschild Museum, CMNH and CMNZ) pales into insignificance alongside the 646 reportedly shot in a single month by Māori feather-hunters in northern Wairarapa in the 1880s (Buller 1887: 14).

Buller's contribution to New Zealand ornithology lay in documenting the variety, unique character, habits and distribution of New Zealand birds in his great books. These works first brought to the world the beauty of New Zealand birds and the uncertainty of their survival. In contrast, the value of Buller's collections was undermined by his failure to develop high standards for the preparation and labelling of his specimens and by the inability of the New Zealand government to care for them. Improved standards set by Rothschild at his private museum probably resulted in the better documentation of Buller specimens in the CMNH and in the CMNZ. But many important Buller collection specimens – including many types – had by then been lost for ever.

Ornithology was Buller's passion and his hobby. He never sought to develop his skills in a museum context. His amateurishness and unsystematic approach to collecting specimens characterised locally born New Zealand ornithologists during the nineteenth century. Buller failed to prepare and document his specimens adequately, but his collections – in conjunction with his published work – testify to the devastating impact of humans and introduced predators on the avifauna of New Zealand in the nineteenth century.

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Appendix 1:

Catalogue of Buller's 'First Collection' sold to the Colonial Museum

Entries are listed by Buller Collection number and arranged as follows:

1. Current English and scientific names.
2. Scientific name and author as given by Buller in the original list.
3. Buller number, age (ad. = adult; juv. = juvenile) and sex of specimen, whether mounted, and other notes from Buller's lists (MS 1871a).

Notes

1. This list follows the original format closely, with modern names added.
2. Within species, as originally listed, it is often unclear which number is associated with which specimen. For example, Buller lists wrybill nos 123 and 124, and notes that a male and female are represented. We assign numbers in the order in which Buller lists specimen details. In this example he listed the male before the female, and thus we list the male as 123 and the female as 124.
3. Eleven specimens are listed by Buller in an appendix, with numbers bearing a superscript letter that fit into the main sequence. In this list these specimens have been integrated into the main numbered sequence.
4. The manuscript on which this list is based is referenced as Buller (1871a).

New Zealand falcon *Falco novaeseelandiae*

Hieracidea Novae Zelandiae

- 1 ad. ♂, mounted in case B
- 2 ad. ♀
- 3 juv. ♂
- 4 juv. ♀, mounted in case A
- 5 ♀, large variety from South Island, transitional state of plumage
- 6 juv. ♂, immature state
- 7 juv. ♂, immature state

Australasian harrier *Circus approximans*

Circus Gouldi

- 8 ad. ♂
- 9 ad. ♀, mounted in case A
- 10 very young state

11 very old state

12 ordinary plumage

Morepork *Ninox novaeseelandiae*

Athene Novae Zelandiae

13 ad. ♀, mounted in case A

14 ad. ♂

15 light variety

16 small variety

Laughing owl *Sceloglaux albifacies*

Athene albifacies

17 ad., mounted in case C

Sacred kingfisher *Halcyon sancta vagans*

Halcyon vagans

18 ad.

19 juv.

Huia *Heteralocha acutirostris*

Heteralocha Gouldi

20 ad. ♂, mounted in case C

21 ad. ♀, mounted in case C

22 juv. ♀

22^A juv. ♂

Tūi *Prothemadera novaeseelandiae*

Prothemadera Novae Zelandiae

23 ad. ♂, mounted in case A

24 ad. ♂

25 albino, mounted in case C

Stitchbird *Notiomystis cincta*

Pogonornis cincta

26 ad. ♂, mounted in case A

27 ad. ♀, mounted in case A

Bellbird *Anthornis melanura*

Anthornis melanura

28 ad. ♂, mounted in case A

29 ad. ♀

Chatham Island bellbird *Anthornis melanocephala*

Anthornis auriocula

30

Bellbird *Anthornis melanura*

Anthornis ruficeps Pelzeln (= *A. melanura*)

31

32

Red wattlebird *Anthochaera carunculata*

Anthochaera Bulleri (Finsch)

33 mounted in case C

Bush wren *Xenicus longipes*

Xenicus longipes

34 ad. ♂

35 ad. ♀

Rock wren *Xenicus gilviventris*

Xenicus Haastii

36 ad. ♂

37 ad. ♀

Yellowhead *Mohoua ochrocephala*

Orthonyx ochrocephala

37^A mounted in case A

38 ad. ♂, mounted in case C

Rifleman *Acanthisitta chloris*

Acanthisitta chloris

38^A ad. ♂

Yellowhead *Mohoua ochrocephala*

Orthonyx ochrocephala

39 ad. ♀, mounted in case C

Rifleman *Acanthisitta chloris*

Acanthisitta chloris

39^A ad. ♀

Whitehead *Mohoua albicilla*

Orthonyx albicilla

40 ad. ♀, mounted in case A

Rifleman *Acanthisitta chloris*

Acanthisitta chloris

40^A juv.

Whitehead *Mohoua albicilla*

Orthonyx albicilla

41 ad. ♂

Fernbird *Bowdleria punctata*

Sphenoeacus punctatus

42

Chatham Island fernbird *Bowdleria rufescens*

Sphenoeacus rufescens

43

Grey warbler *Gerygone igata*

Gerygone flaviventris

44 mounted in case A

45 mounted in case C

46 juv.

Brown creeper *Mohoua novaeseelandiae*

Certhiparus Novae Zelandiae

47 ♂

48 ♀

Silvereye *Zosterops lateralis*

Zosterops lateralis

49 ad. ♂, mounted in case A

50 ad. ♀, mounted in case A

51 ♂

52 ♀

South Island tomtit *Petroica m. macrocephala*

Petroica macrocephala

53 ad. ♂

54 ad. ♂

55 ad. ♀

North Island tomtit *Petroica macrocephala toitoi*

Petroica toitoi

56 ad. ♀, mounted in case A

Omitted number

57

Tomtit *Petroica macrocephala*

Petroica Dieffenbachi (= *P. macrocephala*)

58 ♂

South Island robin *Petroica a. australis*

Petroica albifrons

59 ad. ♂

60 ad. ♀

North Island robin *Petroica australis longipes*

Petroica longipes

61

New Zealand pipit *Anthus novaeseelandiae*

Anthus Novae Zelandiae

62

South Island piopio *Turnagra capensis*

Turnagra crassirostris

63 ♂

64 ♀

North Island piopio *Turnagra tanagra*

Turnagra Hectori (= *T. tanagra*)

65

66 local variety?

67 local variety?

New Zealand fantail *Rhipidura fuliginosa*

Rhipidura flabellifera

68 ad.

69 juv.

New Zealand fantail *Rhipidura fuliginosa*

Rhipidura melanura

70

New Zealand fantail *Rhipidura* sp.

Rhipidura Swainsoni MS

71 mounted in case A

North Island kōkako *Callaeas wilsoni*

Callaeas Wilsoni

72 ad. ♂

73 ad. ♀

74 juv.

South Island kōkako *Callaeas cinerea*

Callaeas olivascens Pelzeln (= *C. cinerea*)

75

South Island kōkako *Callaeas cinerea*

Callaeas cinerea

76 ad. ♂

77 ad. ♀

Saddleback *Philesturnus carunculatus* or *P. rufusater*

Creadion carunculatus

78 ♂, mounted in case A

Red-crowned parakeet *Cyanoramphus novaeseelandiae*

Platycercus Zelandiae

79 ad. ♂, mounted in case A

Yellow-crowned parakeet *Cyanoramphus auriceps*

Platycercus auriceps

80 mounted in case A

81 coloured variety

Orange-fronted parakeet *Cyanoramphus malherbi*

Platycercus alpinus

82 (Haast)

South Island kākā *Nestor m. meridionalis*

Nestor meridionalis

83 large South Island variety

84 large South Island variety

Kākā *Nestor meridionalis*

Nestor meridionalis

85 green variety, mounted in case A

86 scarlet variety, mounted in case C

87 yellow variety, mounted in case C

88 albino

South Island kākā *Nestor m. meridionalis*

Nestor superbus

89

Kea *Nestor notabilis*

Nestor notabilis

90

South Island kākā *Nestor m. meridionalis*

Nestor occidentalis

91 ♂

92 ♀

Kākāpō *Strigops habroptilus*

Strigops habroptilus, 4 specimens exhibiting slight variations in size and colour

93

94

95

96

Long-tailed cuckoo *Eudynamys taitensis*

Eudynamys taitensis

97 mounted in case A

98 mounted in case C

99 juv.

Shining cuckoo *Chrysococcyx lucidus*

Chrysococcyx lucidus

99^A mounted in case A

99^B juv.

New Zealand pigeon *Hemiphaga novaeseelandiae*

Carpophaga Novae Zelandiae

100 ♂, mounted in case A

101 spotted variety

New Zealand quail *Coturnix novaeseelandiae*

Coturnix Novae Zelandiae; another writer (?Hector) has noted that nos 105 and 106 were exchanged back to Buller for a lesser knot from Canterbury in February 1875

102 ad. ♂, South Island

103 ad. ♀, South Island

104 juv. ♂, South Island

105 juv. ♀, South Island

106 ad. ♂, province of Auckland

South/Stewart Island brown kiwi *Apteryx australis* subsp.

Apteryx Australis

107 ♂

108 ♀

North Island brown kiwi *Apteryx mantelli*

Apteryx Mantelli

109 ad. ♂, mounted in case A

110 ad. ♂

111 ad. ♀

112 younger ♂

113 younger ♀

114 ♀

Little spotted kiwi *Apteryx owenii*

Apteryx Oweni

115 ad. ♂

116 ad. ♀

117 young

New Zealand dotterel *Charadrius obscurus*

Charadrius obscurus

118 ad., mounted in case B

119 winter plumage

120 summer plumage

Banded dotterel *Charadrius bicinctus*

Charadrius bicinctus

121 young state

122 chick

Wrybill *Anarhynchus frontalis*

Anarhynchus frontalis

123 ♂

124 ♀

White heron *Egretta alba*

Ardea flavirostris, 5 specimens in different states – male, female and young

125

126

127

128

128^A

Reef heron *Egretta sacra*

Ardea sacra, 3 specimens – one with deformed bill

129

130

131

- White-faced heron** *Ardea novaehollandiae*
Ardea Novae Hollandiae
 132
 133
- Nankeen night heron** *Nycticorax caledonicus*
Nycticorax Caledonicus
 134 ♂, from Australia
 135 ♀, shot in Wellington
- Australasian bittern** *Botaurus poiciloptilus*
Botaurus poicilopterus, a series illustrating the differences of plumage
 136 ad. ♂, mounted in case B
 137
 138
 139
 140
- Bar-tailed godwit** *Limosa lapponica*
Limosa Novae Zelandiae
 141 ad. ♂, mounted in case B
 142
 143
- Black stilt** *Himantopus novaezelandiae*
Himantopus Novae Zelandiae (Gould)
 144
 145
- Chatham Island snipe** *Coenocorypha pusilla*
Gallinago pusilla
 146
- North Island weka** *Gallirallus australis greyi*
Ocydromus Earli
 147 ♂, mounted on stand in Colonial Museum
 148 ♀, mounted on stand in Colonial Museum
 149 ♂
 150 ♀
 150^A juv.
 151 very young state
 152 partial albino
- Weka** *Gallirallus australis*
Ocydromus Australis, a series of fine specimens showing the tendency in this species to vary
 153
 154
 155
 156
- 157
 158 light alpine variety
- Western weka** *Gallirallus a. australis*
Ocydromus nigricans, alive in aviary – to be stuffed and forwarded
 159 ♂
 160 ♀
- Banded rail** *Rallus philippensis*
Rallus assimilis (= *R. pectoralis*)
 161 ad. ♂
 162 ad. ♂
 163 ad. ♀
 164 ad. ♀
 165 very young state
 166 doubtful whether obtained in New Zealand
- Corncrake** *Crex crex*
Rallus Featherstoni
 167 mounted
- Marsh crake** *Porzana pusilla affinis*
Ortygometra affinis
 168 ad. ♂
 169 ad. ♀
 170 doubtful if obtained in New Zealand
- Australian crake** *Porzana fluminea*
Ortygometra fluminea
 171 of doubtful authenticity but said to have been killed in Auckland Province
- Spotless crake** *Porzana tabuensis plumbea*
Ortygometra tabuensis
 172 ad.
 173 juv.
- Pūkeko** *Porphyrio melanotus*
Porphyrio melanotus
 174 [this no. was omitted from Buller's original list, but a specimen did exist because it was present in the collection c.1874 (Gore MS c.1874)]
 175 ad.
 176 ad.
 177 ad.
 178 very young state
 179 chick
 180 albino variety

Paradise shelduck *Tadorna variegata**Casarca variegata*

181 ad. ♂

182 ad. ♀

183 ad. ♀

184 young state

185 young state

Grey duck *Anas superciliosa**Anas superciliosa*

186 young state

187 young state

Brown teal *Anas chlorotis**Anas chlorotis*, different ages and sexes

188

189

190

191

Grey teal *Anas gracilis**Anas gibberifrons*

192 ♂

193 ♀

Brown teal *Anas chlorotis**Anas chlorotis*

194 young

Omitted number

195

New Zealand shoveler *Anas rhynchos variegata**Spatula variegata*

196 ad. ♂, mounted in case B

197 ad. ♂

198 ad. ♂

199 ad. ♂

200 ad. ♀

201 ad. ♀

202 juv. ♂

203 juv. ♀

Blue duck *Hymenolaimus malacorhynchus**Hymenolaimus malacorhynchus*

204 ♂

205 ♀

206 variety from South Island

207 young state

New Zealand scaup *Aythya novaeseelandiae**Fuligula Novae Zelandiae*

208 ♂

209 ♀

210 ♂

211 ♀

212 light variety

Australasian crested grebe *Podiceps cristatus australis**Podiceps cristatus*212^A ad. ♂

213 ad. ♀

214 juv.

New Zealand dabchick *Poliocephalus rufopectus**Podiceps rufipectus*

215 ♂, mounted in case B

216 ♀, mounted in case B

217 ad. state

218 ad. state

219 younger state

220 younger state

Blue penguin *Eudyptula minor**Spheniscus minor*

221 mounted in case B

222

Blue penguin *Eudyptula minor**Spheniscus undinus*

223

Fiordland crested penguin *Eudyptes pachyrhynchus**Eudyptes pachyrhynchus*

224 mounted in case B

225

Common diving petrel *Pelecanoides urinatrix**Pelecanoides urinatrix*

226

Little shearwater *Puffinus assimilis**Puffinus assimilis*

227 young, mounted in case B

228 ad.

Antarctic fulmar *Fulmarus glacialis**Procellaria glacialis*

229

Fairy prion *Pachyptila turtur*

Prion turtur
230, mounted in case B
231

Broad-billed prion *Pachyptila vittata*

Prion vittatus
232

Skua *Catharacta/Stercorarius* sp.

Lestris sp.
233

Southern black-backed gull *Larus dominicanus*

Larus dominicanus
234
235

Red-billed gull *Larus novaehollandiae scopulinus*

Larus scopulinus
236

Black-billed gull *Larus bulleri*

Larus melanorhynchus
237 ♂
238 ♀

White-fronted tern *Sterna striata*

Sterna frontalis
239
240 young

Black-fronted tern *Sterna albostrata*

Sterna antarctica
241 ad.
242 young
243 young

Australasian gannet *Morus serrator*

Sula serrator
244

Greater frigatebird *Fregata minor*

Fregata aquila
245

Black shag *Phalacrocorax carbo*

Graculus carboides
246 ad. state
247 ad. state
248 ad. state
248^A variety

Little shag *Phalacrocorax m. melanoleucos*

Graculus melanoleucus?
249

Pied shag *Phalacrocorax varius*

Graculus varius
250
251
252

Spotted shag *Stictocarbo p. punctatus*

Graculus punctatus
253
254

Little shag *Phalacrocorax melanoleucos brevirostris*

Graculus brevirostris
255
256
257

Little black shag *Phalacrocorax sulcirostris*

Graculus stictocephalus
258
259

Shag sp. *Phalacrocorax/Leucocarbo* sp.

Graculus sp. 'ocean shag'
260
261

Shag sp. *Phalacrocorax/Leucocarbo* sp.

Graculus sp. 'rock shag'
262

Unnumbered specimens in
'Memo for Dr Hector'

(Te Papa archives MU000094/001/0445)

'I. Common birds omitted in present list'

New Zealand falcon *Falco novaeseelandiae*

1 *Hieracidea Novae Zelandiae* (Colln containing several)

Sacred kingfisher *Halcyon sancta vagans*

2 *Halcyon vagans*

Tūi *Prothemadera novaeseelandiae*

1 *Prothemadera Novae Zelandiae* (Colln containing two)

Bellbird *Anthornis melanura*

1 *Anthornis melanura* ♀

Whitehead *Moboua albicilla*

1 *Orthonyx albicilla*

Fernbird *Bowdleria punctata*1 *Sphenoeacus punctatus***Grey warbler** *Gerygone igata*2 *Gerygone flaviventris***North Island tomitit** *Petroica macrocephala toitoi*1 *Petroica toitoi* ♂**North Island robin** *Petroica australis longipes*2 *Petroica longipes***New Zealand pipit** *Anthus novaeseelandiae*1 *Anthus Novae Zelandiae***New Zealand fantail** *Rhipidura fuliginosa*2 *Rhipidura flabellifera***Broad-billed prion** *Pachyptila vittata*2 *Prion vittatus* (one in collection)**Black-fronted tern** *Sterna albostrata*1 *Hydrochelidon albostrata***Grey duck** *Anas superciliosa*2 *Anas superciliosa***White-fronted tern** *Sterna striata*1 *Sterna frontalis***'II. Birds added to original collection'****Yellowhead** *Mohoua ochrocephala*1 *Orthonyx ochrocephala*, mounted in case A**North Island kōkako** *Callaeas wilsoni*1 *Callaeas olivascens?* (North)**Kākā** *Nestor meridionalis*1 *Nestor meridionalis*, canary-coloured variety, mounted in case C**Shining cuckoo** *Chrysococcyx lucidus*1 *Chrysococcyx lucidus*, young**New Zealand quail** *Coturnix novaeseelandiae*1 *Coturnix Novae Zelandiae*, North Island**North Island brown kiwi** *Apteryx mantelli*1 *Apteryx Mantelli***Little spotted kiwi** *Apteryx owenii*1 *Apteryx Owenii***Nankeen night heron** *Nycticorax caledonicus*1 *Nycticorax Caledonicus***North Island weka** *Gallirallus australis greyi*2 *Ocydromus Earli*, young states**Western weka** *Gallirallus a. australis*2 *Ocydromus nigricans***Banded rail** *Rallus philippensis*2 *Rallus assimilis*, including very young state**Fairy prion** *Pachyptila turtur*2 *Prion turtur***Black shag** *Phalacrocorax carbo*1 *Graculus carboides*, variety**Pied shag** *Phalacrocorax varius*1 *Graculus varius***Appendix 2:****Remaining 'First Collection'
bird specimens at Te Papa**

Entries are listed in taxonomic order and arranged as follows:

1. Current registration number, current English and scientific names, and conservation status (after Hitchmough *et al.* 2007).
2. Buller Collection number on label and specimen type.
3. Dominion Museum A. registration number (see Tennyson & Bartle 2008: 187), if allocated.
4. Hutton information on label (usually a scientific name and often the age and/or sex).
5. Type status and extra information, with its source, in square brackets.

Notes

1. Arrangement of specimens is by taxonomic order following Checklist Committee (1990), and then by registration number within species.
2. Buller provided no information on labels apart from the collection number.
3. ad. = adult; imm. = immature; juv. = juvenile.

OR 1221 Australasian crested grebe *Podiceps cristatus australis*. Threatened

Buller No. 213, study skin

A. 1278. Hutton: *Podiceps cristatus* ♀[ad. (Buller MS 1871a); possible syntype of *Podiceps hectori* Buller, 1865 (see Westerskov 1977)]

OR 1224 Australasian crested grebe *Podiceps cristatus australis*. Threatened

Buller No. 214, study skin

A. 1275. Hutton: *Podiceps cristatus* juv.

[possible **syntype** of *Podiceps hectori* Buller, 1865 (see Westerskov 1977)]

OR 1227 Australasian crested grebe *Podiceps cristatus australis*. Threatened

Buller No. 212, study skin

A. 1273. Hutton: *Podiceps cristatus* ♂

[ad. Although this specimen is numbered 212, we presume that it is 212^A because 212 should be a New Zealand scaup (Buller MS 1871a); possible **syntype** of *Podiceps hectori* Buller, 1865 (see Westerskov 1977)]

OR 5336 Blue penguin *Eudyptula minor*. Threatened

Buller No. 223, study skin

A. 1044. Hutton: *Spheniscus undina*

[Sent on loan to Otto Finsch (Hutton 1873); '*Eudyptula minor*, Gml. var. *undine*, Gould – I can not allow *undine* as a good species' (written on label by Finsch); presumably it was this individual's beak that was figured by Buller (1877: plate 15, fig. 4)]

OR 791 Black shag *Phalacrocorax carbo*. Threatened

Buller No. 248^A, study skin

A. 791. Hutton: *Graculus Novae Hollandiae* juv.

OR 816 Little shag *Phalacrocorax melanoleucos brevirostris*

Buller No. 259, study skin

Probably A. 816. Hutton: *Graculus brevirostris* juv.

[A fully dark juvenile. Although Buller MS (1871a) had listed No. 259 as a little black shag, Hutton (1871: 81) considered that Buller had misidentified 'the specimen called *G. sulcirostris* [= *Phalacrocorax sulcirostris*]', and that it was 'nothing but the young of *G. brevirostris* [= *Phalacrocorax melanoleucos brevirostris*}'. In his book, Buller deleted the little black shag from the New Zealand fauna (Buller 1872–73: xv). Gore's MS (c.1874) separately listed two specimens, both numbered 259, as '*Graculus brevirostris* juv' and as '*Graculus melanoleucos* juv' [both = *Phalacrocorax melanoleucos*]. Perhaps there were two different specimens of this species with the same number]

OR 823 Spotted shag *Stictocarbo p. punctatus*

Buller No. 253, study skin

A. 823. Hutton: *Graculus punctatus*

OR 582 Greater frigatebird *Fregata minor*. Straggler

Buller No. 245, ex-mount. No original label

[juv. collected February 1863 at Castlepoint by a Māori fisherman and forwarded to Buller by George Moor/Moore (Buller 1865, 1872–73: 339, 1892); probably ♀, judging from the culmen length]

OR 623 White-faced heron *Ardea novaehollandiae*. New colonist

Buller No. 132, study skin

A. 626. Hutton: *Ardea Novae Hollandiae*

[presumed to be one of the pair that Buller 'obtained in the Porirua Harbour', Wellington, in April (Buller 1872–73: 232), probably in 1865 (Oliver 1930: 361)]

OR 624 White-faced heron *Ardea novaehollandiae*. New colonist

Buller No. 133, study skin

A. 627. Hutton: *Ardea Novae Hollandiae*

[Presumed to be one of the pair that Buller 'obtained in the Porirua Harbour', Wellington, in April (Buller 1872–73: 232), probably in 1865 (Oliver 1930: 361)]

OR 619 White heron *Egretta alba*. Threatened

Buller No. 125, study skin

A. 619. Hutton: *Ardea flavirostris*

OR 621 White heron *Egretta alba*. Threatened

Buller No. 128, study skin

A. 623. Hutton: *Ardea flavirostris*

OR 625 White heron *Egretta alba*. Threatened

Buller No. 126, study skin

A. 622. Hutton: *Ardea flavirostris*

OR 626 White heron *Egretta alba*. Threatened

Buller No. 128^A, study skin

A. 621. Hutton: *Ardea flavirostris*

OR 2213 Reef heron *Egretta sacra*. Threatened

Buller No. 129, study skin

A. 630. Hutton: *Ardea sacra*

OR 2214 Reef heron *Egretta sacra*. Threatened

Buller No. 131, study skin

A. 632. Hutton: *Ardea sacra*

OR 4774 Nankeen night heron *Nycticorax caledonicus*.

Straggler

Buller No. 134, study skin

Possibly A. 113. Hutton: *Nycticorax caledonicus*

[♀ shot in Wellington, ♂ from Australia (Buller MS 1871a);

Gore's list notes that No. 134 and another specimen from Australia are in the collection, therefore No. 134 is probably the Wellington specimen (Gore MS c.1874); the Wellington specimen was collected in 1856 (Buller 1891)]

OR 635 Australasian bittern *Botaurus poiciloptilus*.

Threatened

Buller No. 140, study skin

A. 636. Hutton: *Ardea poiciloptera*

[New Zealand (in an unknown hand on the label)]

OR 643 Australasian bittern *Botaurus poiciloptilus*.

Threatened

Buller No. 139, study skin

A. 634. Hutton: *Ardea poiciloptera*

OR 2220 Australasian bittern *Botaurus poiciloptilus*.

Threatened

Buller No. 138, study skin

A. 633. Hutton: *Ardea poiciloptera*

OR 2096 Paradise shelduck *Tadorna variegata*

Buller No. 185, study skin

A. 1232. Hutton: *Casarca variegata* juv.

OR 2164 Grey duck *Anas superciliosa*. Threatened

Buller No. 186, study skin

A. 1245. Hutton: *Anas superciliosa* juv.

OR 4603 New Zealand shoveler *Anas rhynchosotis variegata*

Buller No. 203, study skin

A. 1265. Hutton: *Rhynchospis variegata* juv. ♀

OR 1804 New Zealand falcon *Falco novaeseelandiae*.

Threatened

Buller No. 7, skin

A. 499. Hutton: *Hieracidea Novae Zealandiae* juv. ♂

OR 4794 New Zealand falcon *Falco novaeseelandiae*.

Threatened

Buller No. 5, study skin

A. 505. There is no Hutton information on the label [♀ South Island (Buller MS 1871a); ad. ♀, received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); presumably the specimen figured opposite p. 1 (Buller 1872–73: 2); present in collection c.1874 (Gore MS c.1874)]

OR 2241 Banded rail *Rallus philippensis assimilis*.

Threatened

Buller No. 162, study skin

A. 550. Hutton: *Rallus pectoralis*

[ad. (Buller MS 1871a)]

OR 2242 Banded rail *Rallus philippensis assimilis*.

Threatened

Buller No. 164, study skin

A. 545. Hutton: *Rallus pectoralis*

[ad. (Buller MS 1871a)]

OR 2251 Banded rail *Rallus philippensis assimilis*.

Threatened

Buller No. 165, study skin

A. 547. There is no Hutton information on the label

[very young (Buller MS 1871a)]

OR 2252 Banded rail *Rallus philippensis assimilis*.

Threatened

Buller No. 163, study skin

A. 548. Hutton: *Rallus pectoralis*

[ad. (Buller MS 1871a)]

OR 4758 Banded rail *Rallus philippensis assimilis*.

Threatened

Buller No. 166, study skin

A. 551. Hutton: *Rallus pectoralis* locality doubtful

OR 2281 North Island weka *Gallirallus australis greyi*.

Threatened

Buller No. 151, study skin

A. 585. Hutton: *Ocydromus Earli* juv.

OR 2268 Buff weka *Gallirallus australis hectori*. Extinct on mainland

Buller No. 158, study skin

A. 571. Hutton: *Ocydromus Earli* (alpine variety)

[*Ocydromus troglodytes* ♂ (in an unknown hand on the label)]

OR 2271 Buff weka *Gallirallus australis hectori*. Extinct on mainland

Buller No. 156, study skin

A. 574. The Hutton information is broken off the label

[*Ocydromus troglodytes* ♂ (in an unknown hand on the label)]

OR 2225 Spotless crane *Porzana tabuensis plumbea*.

Threatened

Buller No. 173, study skin

A. 600. Hutton: *Ortygometra tabuensis*

[juv. (Buller MS 1871a)]

OR 2227 Marsh crake *Porzana pusilla affinis*.

Threatened

Buller No. 168, study skin

A. 592. Hutton: *Ortygometra affinis* New Zealand [ad. (Buller MS 1871a)]

OR 2233 Marsh crake *Porzana pusilla affinis*.

Threatened

Buller No. 169, study skin

A. 591. There is no Hutton information on the label [*Porzana pusilla affinis* (in an unknown hand on the label); ad. New Zealand (Buller MS 1871a)]

OR 4205 Australian spotted crake *Porzana fluminea*.

Straggler

Buller No. 171, study skin

A. 593. Hutton: *Ortygometra fluminea* Pro[vince] of Auckland?

OR 4770 Pūkeko *Porphyrio melanotus*

Buller No. 178, study skin

A. 609. Hutton: *Porphyrio melanotus* juv.

OR 2297 Black stilt *Himantopus novaehollandiae*.

Threatened

Buller No. 144, study skin

A. 690. Hutton: *Himantopus melas* juv.

OR 4733 Black stilt *Himantopus novaehollandiae*.

Threatened

Buller No. 145, study skin

A. 689. Hutton: *Himantopus melas* juv.

OR 2390 Red-billed gull *Larus novaehollandiae scopulinus*. Threatened

Buller No. 236, study skin

A. 749. Hutton: *Larus scopulinus*

OR 2387 Black-billed gull *Larus bulleri*. Threatened

Buller No. 238, study skin

A. 745. Hutton: *Larus melanorhynchus* type Buller *Larus Bulleri* Hutton

[♀ (Buller MS 1871a); South Island, lectotype of *Bruchigavia melanorhyncha* Buller, 1869 and *Larus bulleri* Hutton, 1871 (Tennyson & Bartle 2008)]

OR 4621 Black-fronted tern *Sterna albobriata*.

Threatened

Buller No. 242, study skin

A. 721. Hutton: *Sterna antarctica* [young (Buller MS 1871a)]

OR 4622 Black-fronted tern *Sterna albobriata*.

Threatened

Buller No. 243, study skin

A. 723. Hutton: *Sterna antarctica* [young (Buller MS 1871a)]

OR 4627 Black-fronted tern *Sterna albobriata*.

Threatened

Buller No. 241, study skin

A. 726. There is no Hutton information on the label [ad. (Buller MS 1871a); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

OR 1983 Kākāpō *Strigops habroptilus*. Extinct on mainland

Buller No. 93, study skin

A. 490. Hutton: *Strigops habroptilus*

OR 1985 Kākāpō *Strigops habroptilus*. Extinct on mainland

Buller No. 94, study skin

A. 488. There is no Hutton information on the label [Received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874). A Reischek label is attached to this specimen with the following information, '♀ ad, collected 6 Aug 1884 at Dusky Sound by Reischek' – the data on this label conflict with the specimen being part of Buller's 1871 collection. We believe that the Reischek label has been attached to the bird in error because the Buller label retains the original green and white striped string attaching it to the specimen's leg, whereas the string on the Reischek label has been replaced. Some of the Reischek information (location and sex) has been associated with this specimen since at least 1923 because it was written by H. Hamilton in the museum's A. register]

OR 1124 Kākā *Nestor meridionalis* subsp. Threatened

Buller No. 91, study skin.

A. 443. There is no Hutton information on the label [Received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874). Buller listed nos 91 and 92 as *Nestor occidentalis*. We now believe these are the 'missing' syntypes of *Nestor occidentalis* Buller, 1869, collected in Fiordland by Hector. Recently, Tennyson & Bartle (2008) believed these syntypes to be lost, because no Buller specimens of South Island kākā could be found in the Te Papa

collection and we had identified the bird labelled by Buller as 'No. 91' as a North Island kākā. However, Buller (1906: 74) specifically recorded that kākā from the Nelson district and the West Coast of the South Island are 'hardly distinguishable in size and colour from those of the North Island'. Additional information on the occurrence of *Nestor occidentalis* in the South Island is provided by Oliver (1955: 547), and a similar distribution has been found with some kiwi taxa (Shepherd & Lambert 2008). We therefore now consider No. 91 to be a **syntype** of *Nestor occidentalis* Buller, 1869, and consider that further work on the distribution of kākā taxa is urgently required]

OR 11564 Long-tailed cuckoo *Eudynamis taitensis*.

Threatened

Buller No. 99, study skin

A. 414. Hutton: *Eudynamis tahitiensis*/*Urodynamis taitensis* juv.

OR 1787 Morepork *Ninox novaeseelandiae*

Buller No. 15, study skin

A. 424. There is no Hutton information on the label [South Island (Dominion Museum register); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

OR 5104 Rifleman *Acanthisitta chloris*. Threatened

Buller No. 40^A, study skin

A. 372. Hutton: *Acanthisitta chloris* ♀ [juv. (Buller MS 1871a)]

OR 5105 Rifleman *Acanthisitta chloris*. Threatened

Buller No. 38^A, study skin

A. 373. Hutton: *Acanthisitta chloris* ♂ [ad. (Buller MS 1871a)]

OR 5106 Rifleman *Acanthisitta chloris*. Threatened

Buller No. 39^A, study skin

A. 370. Hutton: *Acanthisitta chloris* juv. [ad. ♀ (Buller MS 1871a)]

OR 5086 Bush wren *Xenicus longipes*. Extinct

Buller No. 35, study skin

A. 379. Hutton: *Xenicus (Stokesi) longipes* ♀ [ad. (Buller MS 1871a)]

OR 5094 Rock wren *Xenicus gilviventris*. Threatened

Buller No. 37, study skin

A. 382. Hutton: *Xenicus Haasti* Buller = *gilviventris* ♀ [ad. ♂ (Buller MS 1871a) but probably juv. ♀, collected in the Southern Alps in the 1860s by J.F. Haast, **syntype** of *Xenicus haasti* Buller, 1869 (Tennyson & Bartle 2008); sent on loan to Otto Finsch (Hutton 1873); '*Xenicus gilviventris* Pelzeln – No doubt' (written on label by Finsch); present in collection c.1874 (Gore MS c.1874)]

OR 12586 Rock wren *Xenicus gilviventris*. Threatened

Buller No. 36, study skin

A. 384. Hutton: *Xenicus gilviventris* Rock Wren ♀ [Collected Southern Alps, 1860s, J.F. Haast; **syntype** of *Xenicus haasti* Buller, 1869 (Tennyson & Bartle 2008); ad. (Buller MS 1871a) but may be juv. (J.A. Bartle pers. obs.); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

OR 1667 Brown creeper *Mohoua novaeseelandiae*

Buller No. 48, study skin

A. 310. Hutton: *Certhiparus novaeseelandiae* ♀

OR 1668 Brown creeper *Mohoua novaeseelandiae*

Buller No. 47, study skin

A. 311. Hutton: *Certhiparus novaeseelandiae* ♂

OR 1707 South Island fantail *Rhipidura f. fuliginosa*

Buller No. 70, study skin

A. 289. Hutton: *Rhipidura tristris* [Black plumage phase]

OR 5192 South Island tomtit *Petroica m. macrocephala*

Buller No. 53, study skin

A. 238. Hutton: *Petroica dieffenbachii* ♂ [ad. (Buller MS 1871a); sent on loan to Otto Finsch (Hutton 1873); '*Myiomoira* Reichb. *macrocephala*, Gml. ♂. This orange breasted form is the true *macrocephala* Gml.' (written on label by Finsch and quoted by Buller 1875b); present in collection c.1874 (Gore MS c.1874)]

OR 5198 South Island tomtit *Petroica m. macrocephala*

Buller No. 55, study skin

A. 235. Hutton: *Petroica macrocephala* ♀ [ad. (Buller MS 1871a)]

OR 1743 South Island robin *Petroica a. australis*

Buller No. 60, study skin

A. 246. Hutton: *Petroica albifrons* ♀ [ad. ♂ (J.A. Bartle pers. obs.)]

OR 1686 Silvereve *Zosterops lateralis*. New colonist
Buller No. 52, study skin
Hutton: *Zosterops dorsalis* ♀

OR 1331 Red wattlebird *Anthochaera carunculata*.
Straggler
Buller No. 33, mount
Hutton label: ‘*Anthochaera carunculata?* Matakana –
Auckland *Mimus carunculatus* Buller type’
[ad., collected at Matakana (location ambiguous – Australia
or New Zealand) on or before 1855, I. St John, **holotype**
of *Mimus carunculatus* Buller, 1865, and **holotype** of
Anthochaera bulleri Finsch, 1867 (Tennyson & Bartle 2008);
figured by Laishley in the 1860s (Sibson 1987). Buller
obtained the specimen from the Auckland Museum in 1868
(Galbreath 1989: 89). Sent on loan to Otto Finsch (Hutton
1873); present in collection c.1874 (Gore MS c.1874)]

OR 5050 North Island kōkako *Callaeas wilsoni*.
Threatened
Buller No. 74, study skin
A. 158. Hutton: *Glaucopis Wilsoni* juv.

OR 172 South Island kōkako *Callaeas cinerea*. Extinct
Buller No. 75, study skin
Probably A. 172. Hutton: *Glaucopis olivascens*
[juv. (see Buller 1872–73: 152); received by Buller on loan
from the Colonial Museum 19 May 1871 (Buller to Hector,
19 May 1871); present in collection c.1874 (Gore MS
c.1874)]

OR 5069 South Island kōkako *Callaeas cinerea*. Extinct
Buller No. 77, study skin
A. 167. Hutton: *Glaucopis cinerea* ♀
[ad. (Buller MS 1871a)]

OR 217 North Island piopio *Turnagra tanagra*. Extinct
Buller No. 66, study skin
Probably A. 217. Hutton: *Keropia tanagra*
[‘*TURNAGRA HECTORI*’ written in an unknown hand
on the label. By 1895, this was apparently the only North
Island piopio specimen remaining in the Colonial Museum
(Buller 1896)]

OR 1460 South Island piopio *Turnagra capensis*. Extinct
Buller No. 64, study skin
Hutton: *Keropia crassirostris* ♀

Appendix 3:

Missing specimens from the ‘*First Collection*’ and their data

Entries are listed in taxonomic order following the Checklist
Committee (1990), and arranged as follows:

1. Number of specimens missing, current English and
scientific names, and conservation status (after Hitchmough
et al. 2007).
2. Buller Collection number, age (ad. = adult; juv. =
juvenile), sex of specimen, and other notes from Buller’s
lists (MS 1871a).

Notes

1. The manuscript on which this list is based is referenced
as Buller (1871a).
2. Type status and extra information with its source is given
in square brackets.
3. Within species, as originally listed, it is often unclear
which number is associated with which specimen. For exam-
ple, Buller lists wrybill nos 123 and 124, and notes that a
male and female are represented. We assign numbers in the
order in which Buller lists specimen details. In this example,
he listed the male before the female, and thus we list the
male as 123 and the female as 124.
4. Specimen noted as ‘mount’ if so listed in Buller (1871a)
MS; otherwise assumed to be a study skin.

Seven North Island brown kiwi *Apteryx mantelli*.

Threatened

109 ad. ♂ mount

110 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

111 ad. ♀ [received by Buller on loan from the Colonial
Museum 19 May 1871 (Buller to Hector, 19 May 1871);
present in collection c.1874 (Gore MS c.1874)]

112 young ♂ [present in collection c.1874 (Gore MS
c.1874)]

113 young ♀ [present in collection c.1874 (Gore MS
c.1874)]

114 ♀ [present in collection c.1874 (Gore MS c.1874)]

Unnumbered

Two South Island brown kiwi *Apteryx australis*.

Threatened

107 ♂

108 ♀

Four little spotted kiwi *Apteryx owenii*. Threatened

115 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

116 ad. ♀ [present in collection c.1874 (Gore MS c.1874)]

117 young [present in collection c.1874 (Gore MS c.1874)]

Unnumbered

Six New Zealand dabchicks *Poliiocephalus rufpectus*.

Threatened

[One of the missing dabchicks was collected in 1852 at Lake Hurupaki, Whangarei, by W.G. Mair (Buller 1872–73: 351)]

215 ♂ mount

216 ♀ mount

217 ad. [present in collection c.1874 (Gore MS c.1874)]

218 ad. [South Island, present in collection c.1874 (Gore MS c.1874)]

219 young [present in collection c.1874 (Gore MS c.1874)]

220 young [present in collection c.1874 (Gore MS c.1874)]

One fluttering shearwater *Puffinus gavia*228 ad. [listed by Buller (MS 1871a) as '*Puffinus assimilis*', but reidentified as '*Puffinus gavius*' [= *Puffinus gavia*]; present in collection c.1874 (Gore MS c.1874)]**One little shearwater *Puffinus assimilis*?** Threatened227 young mount [listed by Buller (MS 1871a) as '*Puffinus assimilis*', but it may have been *Puffinus gavia*, as he later thought these species to be conspecific (Buller 1872–73: 318)]**One common diving petrel *Pelecanoides urinatrix***

226 [probably the bird that Buller found on Waikanae Beach in September 1863 (Buller 1872–73: 313); present in collection c.1874 (Gore MS c.1874)]

One Antarctic fulmar *Fulmarus glacialoides*

229 [presumably the 'dying' bird that Buller found on the beach near the mouth of the Turakina River (Buller 1872–73: 301); present in collection c.1874 (Gore MS c.1874)]

Three fairy prions *Pachyptila turtur*?230 mount [possibly a mount from the 'Buller coll.' registered as *Pachyptila belcheri* NMNZ OR 879, destroyed because of damage 7 February 1978]

2 unnumbered

Two Antarctic prions *Pachyptila desolata*?231 [listed by Buller (MS 1871a) as a fairy prion but reidentified as '*Prion banksii*' [= *Pachyptila desolata*], present in collection c.1874 (Gore MS c.1874); however, Buller at one point considered *Prion banksii* Smith to be the fairyprion '*Prion turtur*' (Buller 1875b); present in collection c.1874 (Gore MS c.1874)]232 [listed by Buller (MS 1871a) as a broad-billed prion but reidentified as '*Prion banksii*' [= *Pachyptila desolata*] and sent on loan to Otto Finsch (Hutton 1873)]**Two broad-billed prions *Pachyptila vittata***

2 unnumbered

Two blue penguins *Eudyptula minor*. Threatened

221 mount

222 [registered as '*Eudyptula m. albosignata*' NMNZ OR 5337 and formerly as A. 1053; possibly this individual's beak is that figured by Buller (1877: plate 15, fig. 3); exchanged to the Alexander Koenig Museum, Bonn, Germany, in June 1969 (Dominion Museum register)]**Two Fiordland crested penguins *Eudyptes pachyrhynchus*.**

Threatened

224 mount

225 [present in collection c.1874 (Gore MS c.1874)]

One Australasian gannet *Morus serrator*

244 [presumably the adult that Buller found 'asleep' on the coast 'between Manawatu and Otaki' (Buller 1872–73: 324); present in collection c.1874 (Gore MS c.1874)]

Four black shags *Phalacrocorax carbo*. Threatened

246 ad. [present in collection c.1874 (Gore MS c.1874)]

247 ad. [present in collection c.1874 (Gore MS c.1874)]

248 ad. [present in collection c.1874 (Gore MS c.1874)]

Unnumbered

Five pied shags *Phalacrocorax varius*

250 [present in collection c.1874 (Gore MS c.1874)]

251 [present in collection c.1874 (Gore MS c.1874)]

252 [present in collection c.1874 (Gore MS c.1874)]

262 [juv., listed by Buller (MS 1871a) as a 'rock shag' but reidentified as '*Graculus varius*' [= *Phalacrocorax varius*]; present in collection c.1874 (Gore MS c.1874)]

Unnumbered

One little black shag *Phalacrocorax sulcirostris*? New colonist258 [Hutton (1871: 81) stated that he had not 'seen any specimens of this bird', and in 1872–73 Buller deleted the little black shag from the New Zealand fauna (Buller 1872–73: xv). So this specimen may have been misidentified by Buller (1871a); it was present in collection c.1874, but listed simply as '*Graculus*?' in Gore's MS (c.1874)]

Four little shags *Phalacrocorax melanoleucos*

249 [listed in Buller MS (1871a) as the nominate form *melanoleucos*, and so the specimen was presumably in the pied plumage phase]

255 [present in collection *c.*1874 (Gore MS *c.*1874)]

256 [present in collection *c.*1874 (Gore MS *c.*1874)]

257 ['black shag' received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection *c.*1874 (Gore MS *c.*1874)]

Three spotted shags *Stictocarbo p. punctatus*

254 [present in collection *c.*1874 (Gore MS *c.*1874)]

260 [♂, '*Graculus punctatus*' = *Stictocarbo p. punctatus*; received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection *c.*1874 (Gore MS *c.*1874); originally identified by Buller as an 'ocean shag' (Buller MS 1871a)]

261 [juv., '*Graculus punctatus*' = *Stictocarbo p. punctatus*, present in collection *c.*1874 (Gore MS *c.*1874); originally identified by Buller as a 'rock shag' (Buller MS 1871a)]

One white heron *Egretta alba*. Threatened

127 [present in collection *c.*1874 (Gore MS *c.*1874)]

One reef heron *Egretta sacra*. Threatened

130 [present in collection *c.*1874 (Gore MS *c.*1874); presumably this was the specimen with the 'deformed bill' (Buller 1871a), because Buller specimen nos 129 and 131 have normal bills]

Two nankeen night herons *Nycticorax caledonicus*.

Straggler

135 [♀ shot in Wellington, ♂ from Australia (Buller MS 1871a); Gore's list notes that No. 134 and another specimen from Australia are in the collection, therefore No. 135 is probably the Australian specimen (Gore MS *c.*1874)]

Unnumbered [possibly the Westland specimen in Carnegie CMNH 24474, as this bird was collected in the 1860s (see Appendix 5) and was apparently already missing from the Colonial Museum *c.*1874 (Gore MS *c.*1874)]

Two Australasian bitterns *Botaurus poiciloptilus*.

Threatened

136 ad. ♂

137 [present in collection *c.*1874 (Gore MS *c.*1874)]

Four paradise shelducks *Tadorna variegata*

181 ad. ♂ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); ♀, present in collection *c.*1874 (Gore MS *c.*1874)]

182 ad. ♀ [received by Buller on loan from the Colonial Museum, 19 May 1871 (Buller to Hector, 19 May 1871); juv., present in collection *c.*1874 (Gore MS *c.*1874)]

183 ad. ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]

184 young [present in collection *c.*1874 (Gore MS *c.*1874)]

Four blue ducks *Hymenolaimus malacorhynchus*.

Threatened

[Probably some of these are part of the 'fine series of specimens in the various states of plumage' that Buller obtained in the 'autumn of 1863' in the 'upper gorges of the Manawatu river' (Buller 1872–73: 263)]

204 ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]

205 ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]

206 South Island [♂, present in collection *c.*1874 (Gore MS *c.*1874)]

207 young [present in collection *c.*1874 (Gore MS *c.*1874)]

Three grey ducks *Anas superciliosa*. Threatened

187 young [present in collection *c.*1874 (Gore MS *c.*1874)]

2 unnumbered

Two grey teal *Anas gracilis*. New colonist

192 ♂ [presumed to be a **syntype** of *Anas gracilis*, either shot by Buller in the Oroua Stream, near its junction with the Manawatu River in 1866, or from Napier in 1866–68 (Buller 1869, 1872–73: 250–51; Tennyson & Bartle 2008; received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

193 ♀ [data as for No. 192, see above; present in collection *c.*1874 (Gore MS *c.*1874)]

Five brown teal *Anas chlorotis*. Threatened

188 [♂, present in collection *c.*1874 (Gore MS *c.*1874)]

189 [♀, present in collection *c.*1874 (Gore MS *c.*1874)]

190 [♂, present in collection *c.*1874 (Gore MS *c.*1874)]

191 [♂, present in collection *c.*1874 (Gore MS *c.*1874)]

194 young [♀, present in collection *c.*1874 (Gore MS *c.*1874)]

Seven New Zealand shovelers *Anas rhynchos variegata*

196 ad. ♂ mount

197 ad. ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]

198 ad. ♂ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection *c.*1874 (Gore MS *c.*1874)]

199 ad. ♂

200 ad. ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]

201 ad. ♀ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871);

present in collection *c.*1874 (Gore MS *c.*1874)]
202 juv. ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]

Five New Zealand scaup *Aythya novaeseelandiae*

208 ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]
209 ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]
210 ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]
211 ♀
212 light variety [juv., present in collection *c.*1874 (Gore MS *c.*1874)]

Five Australasian harriers *Circus approximans*

8 ad. ♂
9 ad. ♀ mount
10 very young
11 ad. [present in collection *c.*1874 (Gore MS *c.*1874)]
12 [♀, present in collection *c.*1874 (Gore MS *c.*1874)]

Six New Zealand falcons *Falco novaeseelandiae*.

Threatened
[One of the missing falcons was collected in the Kaipara district *c.*1862 (Buller 1887: 216)]
1 ad. ♂ mount [presumably the ad. ♂ shot in 1859 in the Karori hills, Wellington (Buller 1872–73: 10)]
2 ad. ♀ [collected in the South Island by Travers; present in collection *c.*1874 (Gore MS *c.*1874)].
3 juv. ♂ [♀, received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]
4 juv. ♀ mount
6 juv. ♂
Unnumbered

Six New Zealand quail *Coturnix novaeseelandiae*. Extinct
102 ad. ♂ South Island [present in collection *c.*1874 (Gore MS *c.*1874); this specimen was registered as a mount in the museum's A. register No. 522 between 1908 and 1923 (see Tennyson & Bartle 2008: 187)]

103 ad. ♀ South Island [present in collection *c.*1874 (Gore MS *c.*1874)]

104 juv. ♂ South Island [present in collection *c.*1874 (Gore MS *c.*1874)]

105 juv. ♀ South Island [in another hand (Hector's?) it is noted that nos 105 and 106 were exchanged back to Buller for a lesser knot from Canterbury in February 1875. This knot was collected in the South Island (Buller 1872–73: 195) during or before 1871 (see Hutton 1871: 77)]

106 ad. ♂ Province of Auckland [see also note under No. 105]

Unnumbered North Island

Three banded rails *Rallus philippensis*. Threatened

161 ad. ♂
2 unnumbered, 1 very young

Eight North Island weka *Gallirallus australis greyi*.

Threatened
147 ♂ mount
148 ♀ mount
149 ♂ [North Island, received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection *c.*1874 (Gore MS *c.*1874)]
150 ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]
150^A juv.
152 partial albino [present in collection *c.*1874 (Gore MS *c.*1874)]
2 unnumbered young

Eight western weka *Gallirallus a. australis*. Threatened

153 [South Island, received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]
154 [present in collection *c.*1874 (Gore MS *c.*1874)]
155 [present in collection *c.*1874 (Gore MS *c.*1874)]
157 [present in collection *c.*1874 (Gore MS *c.*1874)]
159 ♂ dark phase [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); southwest coast of Otago, present in collection *c.*1874 (Gore MS *c.*1874); see also notes under No. 160]
160 ♀ dark phase [nos 159 and 160 are presumed to be the pair referred to in Buller (1872–73: 175); these were acquired from his brother (John Buller), who bought them alive from a dealer in Dunedin in 1869]
2 unnumbered dark phase

One corncrake *Crex crex*. Straggler

167 mount [holotype of *Rallus featherstoni* Buller 1865, killed near Nelson in about 1855, from I. St John (see Tennyson & Bartle 2008); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

One spotless crane *Porzana tabuensis plumbea*.

Threatened
172 ad.

One marsh crane *Porzana pusilla*. Threatened

170 Not from New Zealand [present in collection *c.*1874 (Gore MS *c.*1874)]

Six pūkeko *Porphyrio melanotus*

- 174 [present in collection *c.*1874 (Gore MS *c.*1874)]
 175 ad
 176 ad. [present in collection *c.*1874 (Gore MS *c.*1874)]
 177 ad. [present in collection *c.*1874 (Gore MS *c.*1874)]
 179 chick [present in collection *c.*1874 (Gore MS *c.*1874)]
 180 albino [present in collection *c.*1874 (Gore MS *c.*1874)]

Three New Zealand dotterels *Charadrius obscurus*.

- Threatened
 118 ad. mount
 119 winter plumage [present in collection *c.*1874 (Gore MS *c.*1874)]
 120 summer plumage [present in collection *c.*1874 (Gore MS *c.*1874)]

Two banded dotterels *Charadrius bicinctus*. Threatened

- 121 young [present in collection *c.*1874 (Gore MS *c.*1874)]
 122 chick [present in collection *c.*1874 (Gore MS *c.*1874)]

Two wrybills *Anarhynchus frontalis*. Threatened

- 123 ♂ [present in collection *c.*1874 (Gore MS *c.*1874)]
 124 ♀ [present in collection *c.*1874 (Gore MS *c.*1874)]

One Chatham Island snipe *Coenocorypha pusilla*.

- Threatened
 146 [holotype of *Gallinago pusilla*, collected on 'a small rocky islet off Chatham Island' by Charles Traill (see Tennyson & Bartle 2008)]

Three bar-tailed godwits *Limosa lapponica*

- [One of the missing godwits may have been the 'albino' shot by Buller at the Ohau [river mouth], Horowhenua, in the spring of 1862 (Buller 1872–73: 199)]
 141 ad. ♂ mount
 142 [present in collection *c.*1874 (Gore MS *c.*1874)]
 143 [present in collection *c.*1874 (Gore MS *c.*1874)]

One long-tailed skua *Stercorarius longicaudus*? Straggler
 233 [ad., shot on a Horowhenua Beach on 30 April 1864 by Buller (Buller 1888a: 66); tail figured by Buller (1879); listed by Buller (MS 1871a) as '*Lestrís* sp.' but this specimen is now considered most likely to be *Stercorarius longicaudus* (Melville 1985); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); examined by European bird experts Otto Finsch and Howard Saunders (Buller 1879); missing from collection by 1914 (Melville 1985)]

Two southern black-backed gulls *Larus dominicanus*

- 234 [present in collection *c.*1874 (Gore MS *c.*1874)]
 235 [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection *c.*1874 (Gore MS *c.*1874)]

One black-billed gull *Larus bulleri*. Threatened

- 237 ♂ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

One black-fronted tern *Sterna albobristata*. Threatened

Unnumbered

Three white-fronted terns *Sterna striata*. Threatened

- 239 [no data]
 240 young [present in collection *c.*1874 (Gore MS *c.*1874)]
 Unnumbered

Two New Zealand pigeons *Hemiphaga novaeseelandiae*.

- Threatened
 100 ♂ mount
 101 spotted variety [present in collection *c.*1874 (Gore MS *c.*1874)]

Two kākāpō *Strigops habroptilus*. Extinct on mainland

- 95 [no data]
 96 [present in collection *c.*1874 (Gore MS *c.*1874)]

Three South Island kākā *Nestor m. meridionalis*.

- Threatened
 83 [South Island, present in collection *c.*1874 (Gore MS *c.*1874)]
 84 [South Island, present in collection *c.*1874 (Gore MS *c.*1874)]
 89 [the only specimen that Buller (MS 1871a) described as *Nestor superbus*, so possibly the specimen referred to by Buller (1873–74: 41), which was collected on Banks Peninsula]

Six kākā *Nestor meridionalis* subsp. Threatened

- 85 green variety, mount
 86 scarlet variety, mount [presumably the bird referred to by Buller (1872–73: 43), which 'was obtained nearly twenty years ago in the Wanganui district']
 87 yellow variety, mount
 88 albino [presumably the 'almost pure albino' referred to by Buller 1872–73: 42); present in collection *c.*1874 (Gore MS *c.*1874)]
 92 ♀ [presumed to be a syntype of *Nestor occidentalis* Buller, 1869; collected in Fiordland by James Hector (see Appendix 1, No. 91)]
 Unnumbered canary-coloured variety, mount

One kea *Nestor notabilis*. Threatened

90 [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

One red-crowned parakeet *Cyanoramphus novaezelandiae*

79 ad. ♂ mount

Two yellow-crowned parakeets *Cyanoramphus auriceps*. Threatened

80 mount

81 coloured variety [presumably the 'abnormally coloured' specimen purchased alive by Buller in the 'summer of 1863' in the Manawatu district (Buller 1872–73: 61); present in collection c.1874 (Gore MS c.1874)]

One orange-fronted parakeet *Cyanoramphus malherbi*.

Threatened

82 [presumed to be a **syntype** of *Platycercus alpinus* Buller, 1869, collected by Haast from 'forests of the Southern Alps' (see Tennyson & Bartle 2008); present in the Colonial Museum c.1874 (Gore MS c.1874)]

Three shining cuckoos *Chrysococcyx lucidus*

99^A mount

99^B juv.

Unnumbered young

Two long-tailed cuckoos *Eudynamys taitensis*.

Threatened

97 mount

98 mount

Three moreporks *Ninox novaeseelandiae*

13 ad. ♀ mount [NMNZ OR. 1340 was in the museum collection during the 1960s (Dominion Museum register) but missing by May 2008]

14 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

16 small [present in collection c.1874 (Gore MS c.1874)]

One laughing owl *Sceloglaux albifacies*. Extinct

17 ad. mount [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

Four sacred kingfishers *Halcyon sancta vagans*

18 ad.

19 juv.

2 unnumbered

One bush wren *Xenicus longipes*. Extinct

34 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

Two New Zealand pipits *Anthus novaeseelandiae*

62 [present in collection c.1874 (Gore MS c.1874)]

Unnumbered

Two fernbirds *Bowdleria punctata*. Threatened

42 [no data]

Unnumbered

One Chatham Island fernbird *Bowdleria rufescens*.

Extinct

43 [**holotype** of *Sphenoeacus rufescens*, collected on Mangere Island, Chatham Islands, by Charles Traill (see Oliver 1955; Tennyson & Bartle 2008) in 1868; Buller 1872–73: 131, figured opposite p. 128]

Three whiteheads *Mohoua albicilla*

40 ad. ♀ mount

41 ad. ♂

Unnumbered

Four yellowheads *Mohoua ochrocephala*. Threatened

37^A mount

38 ad. ♂ mount

39 ad. ♀ mount

Unnumbered mount

Five grey warblers *Gerygone igata*

44 mount

45 mount

46 juv.

2 unnumbered

Four fantails *Rhipidura fuliginosa*

68 ad.

69 juv.

2 unnumbered

One willie-wagtail *Rhipidura leucophrys*. Straggler

71 mount. [Gore MS (undated) notes a '*Rhipidura motacilloides*' (= willie-wagtail, Sharpe 1879: 340) and we presume this refers to specimen No. 71. Buller (1872–73) does not mention the willie-wagtail, and so he apparently knew that this specimen was not from New Zealand. On the other hand, Hutton (1871) reports that a specimen of '*Rhipidura motacilloides*' in the Colonial Museum was 'said to have been obtained in the Auckland Province'. There is uncertainty as to the provenance of this missing specimen]

Two North Island tomtits *Petroica macrocephala toitoi*

56 ad. ♀ mount

Unnumbered ♂

One South Island tomtit *Petroica m. macrocephala*

54 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

One tomtit *Petroica macrocephala* subsp.

58 ♂ [present in collection c.1874 (Gore MS c.1874)]

Three North Island robins *Petroica australis longipes*

61 [no data]

2 unnumbered

One South Island robin *Petroica a. australis*

59 ad. ♂ [present in collection c.1874 (Gore MS c.1874)]

Three silvereyes *Zosterops lateralis*. New colonist

49 ad. ♂ mount

50 ad. ♀ mount

51 ♂ [present in collection c.1874 (Gore MS c.1874)]

Two stitchbirds *Notiomystis cincta*. Threatened

26 ad. ♂ mount

27 ad. ♀ mount [presumably the female collected by Buller in either the Hutt Valley or Makara, Wellington, in the 1860s (Buller 1887: 104)]

Five bellbirds *Anthornis melanura*

28 ad. ♂ mount

29 ad. ♀

31 [no data]

32 [no data]

Unnumbered ♀

One Chatham Island bellbird *Anthornis melanocephala*.

Extinct

30 [juv. ♂, collected near Waitangi, Chatham Island, in 1855 by Buller, **holotype** of *Anthornis auriocula* Buller, 1865 (see Tennyson & Bartle 2008); possibly collected 1856 (Galbreath 1989: 31)]

Four tūi *Prothemadera novaeseelandiae*

23 ad. ♂ mount

24 ad. ♂

25 albino mount [presumably the 'beautiful albino' obtained 'some years ago in the Wanganui district' (Buller 1872–73: 88)]

Unnumbered

Three North Island kōkako *Callaeas wilsoni*. Threatened

72 ad. ♂ [presumably the 'fine male' shot by Buller in the 'Upper Manawatu' (Buller 1872–73: 152 and figured opposite p. 152); received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

73 ad. ♀ [present in collection c.1874 (Gore MS c.1874)]

Unnumbered, North Island [as this specimen was described as '*Callaeas olivascens?*' (Buller MS 1871a), it was presumably a juvenile (see Buller 1872–73: 152)]

One South Island kōkako *Callaeas cinerea*. Extinct

76 ad. ♂ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

One saddleback *Philesturnus carunculatus* or *P. rufusater*.

Threatened

78 ♂ mount

Four huia *Heteralocha acutirostris*. Extinct

[One of the missing ♀ huia was collected in the Wairarapa (Buller 1872–73: 68, figured opposite p. 63)]

20 ad. ♂ mount [presumably the ad. ♂ shot in the 'summer of 1867' in the Ruahine Ranges (Buller 1872–73: 67–68, figured opposite p. 63)]

21 ad. ♀ mount

22 juv. ♀ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

22^A [♂ young, received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871)]

Two North Island piopio *Turnagra tanagra*. Extinct

65 [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); see also note under No. 67]

67 [present in collection c.1874 (Gore MS c.1874); specimen nos 65 and 67 were no longer in the Colonial Museum in 1895 (Buller 1896); see also Appendix 1, No. 66)]

One South Island piopio *Turnagra capensis*. Extinct

63 ♂ [received by Buller on loan from the Colonial Museum 19 May 1871 (Buller to Hector, 19 May 1871); present in collection c.1874 (Gore MS c.1874)]

Appendix 4:

Notable specimens sold by
Buller to Rothschild 1888–92
from the 'Second Collection',
and supplementary sales

Each entry is arranged as follows:

1. Current English and scientific name, type status, and conservation status (after Hitchmough *et al.* 2007).
2. Number of specimens, their age and sex, locality and date of collection if available, collector's name if known, and registration numbers from institutions where they are kept at present.

Notes

1. Additional information, not in Buller & Rothschild MS (1888) or on label, added in square brackets. This is based on specimen examination or sourced from Buller (1887, 1888a), unless otherwise indicated.
2. ad. = adult; juv. = juvenile; imm. = immature.

Little spotted kiwi *Apteryx owenii*. Extinct on mainland 10, including 2 juv. One North Island [Mt Hector, Tararua Range] specimen [December 1875, M. Carkeek]; now NHM 1939.12.9.1480, ex Rothschild Collection

Buller's shearwater *Puffinus bulleri*. Holotype 1 ad. ♂, Waikanae River mouth, 1 October 1884; AMNH 527592

King penguin *Aptenodytes patagonicus*. Straggler 1 ad. ♂, Stewart Island

Yellow-eyed penguin *Megadyptes antipodes*. Threatened 7, including 1 young

Erect-crested penguin *Eudyptes sclateri*. Syntype 1 ad. ♂, Auckland Islands; AMNH 525790 (Greenway 1973: 215)

Auckland Island shag *Leucocarbo colensoi*. Lectotype 1 ad. ♂ [contra Hartert (1925: 273)], Auckland Islands, 1885 [Burton]; AMNH 730048

New Zealand little bittern *Ixobrychus novaezelandiae*. Extinct 1 ad. ♂ and 1 ♀ [Hokitika, May 1871]. These specimens were not found in the AMNH or NHM in 1980–82 and thus may be lost

Brown teal *Anas chlorotis*. Threatened 4 ad., including 2 from Dusky Sound [coll. Reischek (Buller 1888a: 258)]

Auckland Island merganser *Mergus australis*. Extinct 1 ad. ♂, Auckland Islands

New Zealand quail *Coturnix novaezelandiae*. Extinct 4, including 1 juv., Kaiapoi, 1859 [Buller], Whangarei, 1860 [Mair], Canterbury, 1861 [Haast]

Grey ternlet *Procelsterna cerulea*. New colonist [The first New Zealand record, shot at Cape Maria van Diemen in early 1882 by lighthouse-keeper C.H. Robson (Buller 1888a: 78). Incorrectly listed by Buller in the sales catalogue (Buller & Rothschild MS 1888) as from Portland Island, where Robson was posted the following year]

Kākāpō *Strigops habroptilus*. Extinct on mainland 13, including 5 ♀ and 2 juv. One from the 'Southern Alps'. Rothschild added 1 specimen from Milford Sound and 3, including 1 juv., from Jackson's Bay [coll. C. Robinson]

Orange-fronted parakeet *Cyanoramphus malherbi*. Threatened 1 ad. ♂ and 1 ♀

Laughing owl *Sceloglaux albifacies*. Extinct 7, including 2 mounted birds and 1 chick [probably all from Albury, near Timaru, 1881, W.W. Smith (Buller 1887: 201)]

Fork-tailed swift *Apus pacificus*. Straggler, only New Zealand specimen then known 1 ad. [Whitecliffs, New Plymouth, December 1884, W.B. Messenger (Buller 1887: 116)]

South Island bush wren *Xenicus l. longipes*. Extinct 6, including 1 juv. from Dusky Sound [coll. by Reischek?]

Welcome swallow *Hirundo tahitica neoxena*. New colonist, the third New Zealand specimen 1 ad. ♀ [Opawa River, near Blenheim, 9 June 1878, J.R.W. Cook (Buller 1887: 75)]

New Zealand robin *Petroica australis* 8, including specimens from Little Barrier Island and the Forty-mile Bush, near Eketahuna, North Island

Silvereye *Zosterops lateralis*. New colonist 6

Chatham Island bellbird *Anthornis melanocephala*.

Extinct

4, including 2 juv.

South Island saddleback *Philesturnus carunculatus*.

Extinct on mainland

12, including 1 imm.: 2 from the Taipo River, near Otira [1873 and 1875], 1 from Banks Peninsula, and 1 probably from Catlins, Otago

Huia *Heteralocha acutirostris*. Extinct

8, including 2 juv.

North Island piopio *Turnagra tanagra*. Extinct

3, including 1 juv.

South Island piopio *Turnagra capensis*. Extinct

4, including 1 juv.

Appendix 5:

Selected ‘*Third Collection*’ specimens from the Carnegie Museum of Natural History

Each entry is arranged as follows:

1. Current English and scientific name, and conservation status (after Hitchmough *et al.* 2007).
2. Number of specimens, their age and sex, locality and date of collection if available, type status and collector’s name if known, Carnegie Museum registration numbers.

Notes

1. Additional information, not on label, is added in square brackets. This is based on specimen examination or sourced from Buller (1905, 1906), unless otherwise indicated.
2. ad. = adult; juv. = juvenile; imm. = immature.

South Island brown kiwi *Apteryx a. australis*. Threatened
3 ad., Otago, 1891 [W. Smyth?]; CMNH 24195–7

Stewart Island brown kiwi *Apteryx australis lawryi*
6 ad., Stewart Island, 1896 [O. Marklund]; CMNH
24198–203

Little spotted kiwi *Apteryx owenii*. Extinct on mainland
6, including 1 juv.: 3 from South Island 1892; 1 from South
Island West Coast 1892; 1 juv. from Jackson Bay, South

Westland 1892; 1 ad. ♂ from Buller River 1895 [J. Brough?];
CMNH 24215–9, 24222

Flesh-footed shearwater *Puffinus carneipes*. Not breeding
at this locality

2, Mokohinau Island, 1892, Reeves (lighthouse-keeper);
CMNH 24310, 24311

Buller’s shearwater *Puffinus bulleri*

[Unlabelled **holotype** of *Puffinus zealandicus* Sandager, 1890
(Buller 1905: 101)]

1, Mokohinau Island, [January 1886] 1889; CMNH 24302

Black petrel *Procellaria parkinsoni*. Extinct on mainland
2, spurs above Heaphy River, December 1892, C. Robinson
(Buller 1905: 28); CMNH 24318–9

White-naped petrel *Pterodroma cervicalis*. No longer
breeding at this locality

4: 3 ad. and 1 chick, [Raoul Island] Kermadec group, 1892–
95 [A.W. Bethune?], [discussed by Buller (1905: 114)];
CMNH 24327–30

Kermadec petrel *Pterodroma n. neglecta*. No longer
breeding at this locality

8 ad., [Raoul Island] Kermadec group, 1890–95 [A.W.
Bethune?], [discussed by Buller (1905: 115)]; CMNH
24331–8

Pycroft’s petrel *Pterodroma pycrofti*

1 ad. ♀, Hauraki Gulf, 1897; CMNH 24342

Macaroni penguin *Eudyptes c. chrysolophus*. Straggler

1 ♂ [more likely ♀, based on size], Macquarie Island, 1897;
CMNH 24293

Lesser frigatebird *Fregata ariel*. Straggler

1 ♀ [recorded incorrectly on label as ♂ (Buller 1906: 50)],
Cape Farewell [15 April 1901, Captain Fairchild (Buller
1906: 50)]; CMNH 24551

Pied shag *Phalacrocorax varius*. New locality

1 ad. ♂, Auckland Islands, 1896; CMNH 24516

Little black shag *Phalacrocorax sulcirostris*. New colonist

2, [Waitangi River] Bay of Islands, [July] 1897 [A.T. Pycroft
(Buller 1906: 41)]; CMNH 24538–9

King shag *Leucocarbo carunculatus*. Threatened

2 ad., [White Rocks] Queen Charlotte Sound, [July] 1892
(Buller 1906: 26); CMNH 24517–8.

Chatham Island shag *Leucocarbo onslowi*. Threatened
2 ad., Chatham Islands, 1898; CMNH 24521–2

Pitt Island shag *Stictocarbo featherstoni*. Threatened
2, Chatham Islands, 1892; CMNH 24536–7

Oriental grey heron *Ardea cinerea jouyi*. Straggler
1 first-year bird, off East Coast of New Zealand, 1898
(Parkes 1974); CMNH 24467

Nankeen night heron *Nycticorax caledonicus*. Straggler
1 ♀, Westland, 1860s; CMNH 24474

New Zealand little bittern *Ixobrychus novaezelandiae*.
Extinct
1 ad. ♀, South Island, 1891; CMNH 24475

Brown teal *Anas chlorotis*. Threatened
1 ad. ♀ and 1 partially white ad. ♂ (Buller 1906: 12), the
latter apparently incorrectly labelled 'Otago', Manawatu,
1892 [G. Mair]; CMNH 24491–2

Blue duck *Hymenolaimus malacorhynchus*. Threatened
2 ad., Upper Pelorus [River, Marlborough], 1892
[J. Brough]; CMNH 24506–7

Auckland Island merganser *Mergus australis*. Extinct
1 ad. ♂, Auckland Islands, 1894 [A.W. Bethune?]; CMNH
24509

New Zealand falcon *Falco novaeseelandiae*. Threatened
5 ad. and 2 juv.: 4 from Ohinetahi, Governors Bay, Banks
Peninsula, 1870; CMNH 24561–7

New Zealand quail *Coturnix novaezelandiae*. Extinct
3 ad. [island in Blueskin Bay, just north of Dunedin, c.1867,
A.C. Purdie (Buller 1905: 35)]; CMNH 24223–5

Chatham Island rail *Cabalus modestus*. Extinct
2 ad., Mangere Island, Chatham Islands, 1891 [W. Hawkins
(Buller 1905: 45)]; CMNH 24269–70. [Spurs on the carpal
flexure of the wings are 1.8 mm in length]

North Island weka *Gallirallus australis greyi*. Threatened
6 ad.: 4 from the Rangitikei district [R.A. Wilson (Buller
1905: 48)]; 2 from Wellington [Horowhenua], 1892;
CMNH 24246–51

Buff weka *Gallirallus australis hectori*. Extinct on
mainland
6: 2 from Waimate, South Canterbury, 1897; 3 from Otago,
1891–92; CMNH 24258–9, 24260–1, 24264

Variable oystercatcher *Haematopus unicolor*. New
locality; new breeding site
1 partly downy fledgling, Snares Islands, 1892; CMNH
24424

Red-necked avocet *Recurvirostra novaehollandiae*. New
record, straggler
1 ad. ♀, Marlborough, 1874; CMNH 24444

Southern New Zealand dotterel *Charadrius o. obscurus*.
Threatened
1 ad. ♂, [700 m] Stewart Island, 1895 [Marklund] (Buller
1905: 175); CMNH 24426

Greenshank *Tringa nebularia*. New record, straggler
1 ♂, Otago, 1888; CMNH 24550

South Island kākā *Nestor m. meridionalis*. Threatened
and extinct east of Southern Alps
2 ad. ♂: 1 from Kaikoura, November 1892; 1 from Catlins,
Otago, 1897; CMNH 24579, 24583

Kākāpō *Strigops habroptilus*. Extinct on mainland
5 ad., 0 juv.: 1 ♂ and 1 ♀ from Milford Sound, 1891 and
1892; 1 ♂ from [west] Otago, 1891; 1 ♂ from West Coast,
1895; 1 mounted ♂ [by size] from South Island, no date;
CMNH 24573–6, 24194

Orange-fronted parakeet *Cyanoramphus malherbi*.
Threatened
2 from Otago, 1892; CMNH 24595–6

Laughing owl *Sceloglaux albifacies*. Extinct
2 ad. from Otago, 1895 and 1903; plus 1 ad. ♂ from Blue-
skin Bay [Otago], May 1874 [not 1894 as labelled]
[W. Smyth], (Buller 1906: 64); CMNH 24568–70

Tawny owl *Strix aluco*. Failed introduction
1 [ad., Wellington, March] 1896 [A. Turnbull (Buller 1905:
xlii)]; CMNH 24572

South Island bush wren *Xenicus l. longipes*. Extinct
8 ad.: 1 from the South Island, 1892; 4 from the [upper]
Karamea [River], 1895 [J. Brough]; 2 from the 'Nelson
Mountains' [= upper Karamea River], 1896 [J. Brough]; 1
from the 'Tasman Mountains' [= upper Karamea River],
1899 [J. Brough] (Buller 1905: 104); [empty nests recorded
by Brough (Newport 1962: 240, 405)]; CMNH 24630–7

Rock wren *Xenicus gilviventris*. Threatened
1 ad. ♂, 'Nelson Mountains' [probably Mt Kendall, upper
Karamea River (Buller 1906: 109; Newport 1962: 240)],
1896 [J. Brough]; CMNH 24638

Stephens Island wren *Traversia lyalli*. Extinct

1 ad. ♀, Stephens Island, 1894 [D. Lyall]; CMNH 24639

Chatham Island fernbird *Bowdleria rufescens*. Extinct

3 ad.: Chatham Islands, 1 from 1891 and 2 undated [1 purchased in London (Buller 1906: 133)]; CMNH 24736–8. [Rothschild received 12 specimens from his collector Henry Palmer in November 1890 (Buller & Rothschild MS 1888), and this species was extinct by about 1892 (Tennyson & Martinson 2007)]

Yellowhead *Moboua ochrocephala*. Threatened

6 ad.: 2 from ‘Otago District’, 1892 [W. Smyth]; 4 from ‘Pelorus Woods’ [= Pelorus River, Marlborough], 1894 [J. Brough]. CMNH 24724–9. [This species no longer occurs naturally in Marlborough, but persists in small numbers in eastern Otago (Robertson *et al.* 2007)]

North Island robin *Petroica australis longipes*. Locally

extinct in Auckland

3 ad., including two from Auckland, 1886 and 1888; CMNH 24655–7

Chatham Island bellbird *Anthornis melanocephala*.

Extinct

4 ad., Chatham Islands, 1892 (2) [W. Hawkins?], 1897 (1), 1898(1); CMNH 24704–7

Red wattlebird *Anthochaera carunculata*. Straggler

1 ad., Rahoitu Camp (Taranaki), 1892 [collected by Mr Avery (Buller 1887:107)]; CMNH 24694. [This specimen is more reliably documented than the pre-1855 specimen listed in Appendix 1, the New Zealand origin of which Buller (1887) had begun to doubt]

North Island kōkako *Callaeas wilsoni*. Threatened

2 ad., including 1 from the Tararua Range, 1892; CMNH 24780–1

South Island kōkako *Callaeas cinerea*. Extinct

1 ad. from Nelson and 1 from Otago, 1892; CMNH 24778–9

South Island saddleback *Philesturnus carunculatus*.

Extinct on mainland

12, including 3 juv.: notably 3 from the ‘Otago District’, 1891 and 1892 [W. Smyth]; 2 from Stephens Island, 1892 [collected by H.H. Travers (Medway 2004a: 203), contra Medway (2004a: 205) these birds are not catalogued ‘February 1892’, which would have been before work on the lighthouse began and before Travers’ first visit]; 1 from

‘Nelson’, 1892; 2 from Canterbury, 1892; 1 from [the upper] Karamea [River], 1895 [J. Brough]; 1 from Preservation Inlet February 1896; CMNH 24760–71

Huia *Heteralocha acutirostris*. Extinct

6, including 1 juv.: 3 from the Puketoi Range; 1 from the Ngarara Range; 2 from the Makuri Range [eastern Wairarapa–Southern Hawke’s Bay districts]. All collected in 1892 (one given as February, another as 28 November); CMNH 24772–7

North Island piopio *Turnagra tanagra*. Extinct

1 ad. ♀, Hunterville [district], 1890; CMNH 24757. [Buller (1906: 134) says he received only one other specimen after 1888 from the Makuri Range, northern Wairarapa, but he refers to other reliable records from the early 1890s from upper Wanganui River east to the Puketoi Range, northern Wairarapa]

South Island piopio *Turnagra capensis*. Extinct

2 ad., 3 imm.: 1 ad. ♂, Lake McKerrow, Fiordland, September 1894; 1 imm. ♂, Stephens Island, Cook Strait, 1894 [D. Lyall?], the **holotype** of *Turnagra capensis minor* Fleming, 1915; 1 imm. ♀, Stephens Island, Cook Strait, 1895 [D. Lyall?]; 1 ad. ♀ from the ‘Otago District’, 1895 [W. Smyth?]; 1 imm. ♀ from ‘South Island’, no date; CMNH 24752–6