

## The tale of the lighthouse-keeper's cat: Discovery and extinction of the Stephens Island wren (*Traversia lyalli*)

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**Abstract** The Stephens Island wren *Traversia lyalli* is widely quoted as having been discovered and promptly exterminated from its only locality, Stephens Island, New Zealand, by a single lighthouse keeper's cat. Examination of archival and museum records indicates that this account is oversimplified, and throws more light on the roles of the lighthouse keeper David Lyall, the dealer Henry Travers, and the ornithologists Sir Walter Buller and Walter Rothschild. Extinction of the wren was more extended than generally stated: 10 specimens were evidently brought in by a cat in 1894, but another two-four were obtained in 1895, and two-three more after that and possibly as late as 1899. Fifteen of these specimens are still held in museums. Cat predation probably was the main factor in the wren's extinction, but not necessarily by a single cat: cats became established on Stephens Island in 1894, increased rapidly and exterminated several other species before they were eliminated.

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Like the dodo (*Raphus cacullatus*), the Stephens Island wren (*Traversia lyalli*) is well-known for being extinct, and particularly for the manner of its extinction. As Gill (1991) concisely states it, 'The story goes that this bird was both discovered, and soon after eliminated, by a lighthousekeeper's cat.' This story, all the more dramatic for its brevity, has been recounted many times as the 'classic case' (Diamond 1984), even 'emblematic' (Quammen 1996) of the extinction of island species unadapted to mammalian predators.

However, the extinction of the Stephens Island wren may not have been quite so brief and simple a process as the version usually repeated has it. As well as the original published papers by Sir Walter Buller and Walter Rothschild from which the standard version is derived, there is further information in unpublished sources. Some of this has been drawn on in accounts of Stephens Island and the wren e.g., Medway (1972), Galbreath (1989), Brown (2000), but more can be gleaned from the Rothschild papers held by the Natural History Museum, London, and from surviving records of the early years of the Stephens Island lighthouse in the files of the Marine Department, now lodged in Archives New Zealand, Wellington. The records are frustratingly incomplete, but do give more details of the discovery and extinction of the wren.

These records, and information from the specimens still held in museums, provide a clearer picture of the trade in specimens of this species, and the number obtained as it declined to extinction.

### Discovery and naming of *Traversia lyalli*

The discovery and the extinction of *Traversia lyalli* were incidental consequences of the exploitation of Stephens Island (Takapourewa) as the site for a lighthouse guarding the western approaches to Cook Strait. Until this began, the island was rarely visited and remained largely unmodified, with intact bush cover and no introduced mammals. When the work gang arrived in April 1892 to begin constructing the lighthouse and its associated facilities, they found 'birds there in plenty', as one of the workers, F.W. Ingram, later recalled. His list included 'saddle-back, native thrush, native crow' and 'two kinds of wrens (very small birds)' (*Evening Post*, Wellington, 17 April 1926, p. 6)<sup>1</sup>. The workers may not have recognised the significance of the wrens, but word evidently did get out about the other birds: a natural history collector came to the island during this time to obtain specimens of them. His later account of this visit (*Evening Post*, Wellington, 11 June 1913, p. 4) was written under the pseudonym 'The Collector', but the details given, the particular Latin names

<sup>1</sup> 'saddle-back' = South Island saddleback (*Philesturnus c. carunculatus*); 'native thrush' = South Island piopio (*Turnagra c. capensis*); 'native crow' = South Island kokako (*Callaenas c. cinerea*)

used for the birds, and errors in them (such as 'Prion herker' for *Prion turtur*) reflecting the peculiarities of his handwriting, suggest that 'The Collector' was the Wellington natural history dealer Henry H. Travers. His account of 'native land birds at that time on the island' made no mention of any wren, but noted the abundance of saddleback and 'native thrush' (piopio) in particular. Specimens of both the latter from Stephens Island soon reached Sir Walter Buller, the foremost authority on New Zealand birds of the time. Buller referred to them at a meeting of the Wellington Philosophical Society in January 1893 and commented that 'it is to be hoped that these small island sanctuaries will be the means of preserving many of these rare forms' (Buller 1893). Unfortunately, he was not thinking of Stephens Island as an island sanctuary but was referring to the scheme being discussed at the time to make reserves of Resolution Island in the south and Little Barrier Island in the north and 'stock' them with birds such as saddleback and piopio, which were rapidly disappearing from the mainland. No-one at this time seems to have considered the possibilities of Stephens Island as a ready-made and naturally well-stocked island reserve requiring only minimal protection to keep it that way.

The Stephens Island lighthouse began operating on 29 January 1894, with a staff of three keepers. With their families and a teacher for the children there were 17 people living on the island, and bush was cleared and sheep and cattle brought in to establish a farm. One or more cats were also brought to the island. The evidence on how many cats, and when, will be discussed below, but at some time during 1894 a cat began bringing in small birds to one of the keeper's houses. One of the assistant keepers, David Lyall, was interested in natural history and he saved the specimens and evidently skinned them. Although no correspondence or other record from Lyall himself has been found, the sequence of events can be reconstructed from the account in Buller (1896): when the government steamer *Hinemoa* called at the island on its regular supply run, Lyall gave a skin to the second engineer, A.W. Bethune, to take to Wellington to show to Sir Walter Buller. Bethune often brought Buller specimens from *Hinemoa*'s voyages to lighthouses and the subantarctic islands, but this one interested Buller more than most. As he put it, 'There is probably nothing so refreshing to the soul of a naturalist as the discovery of a new species. You will readily understand, therefore, how pleased I was at receiving, through the kind offices of Mr Bethune, the skin of a bird from Stephen Island which was entirely distinct from anything hitherto known' (Buller 1896).

Records of Buller's movements, and of *Hinemoa*, suggest that this specimen probably reached Buller

in July 1894. At the Wellington Philosophical Society on 25 July, and again on 5 September, Buller exhibited other specimens 'kindly lent to me by Mr Bethune' (Buller 1895a,b), but he withheld any mention of the new species in order to publish a description in *Ibis*, the journal of the British Ornithologists' Union. According to Buller, Bethune agreed to lend him the wren so that he could send it to London to have an illustration prepared to accompany the paper (Buller to Rothschild 10 Feb. 1895, Rothschild Papers, Natural History Museum, London).

Buller evidently also received a note from Lyall: in his paper for *Ibis* he commented that 'my correspondent on the island... has seen three examples, all of which were brought in at different times by the cat', and added that 'I hope shortly to receive further specimens of this interesting form' (Buller 1895c).

But it seems that word of the wrens and their possible commercial value had got out, and Lyall had been persuaded to supply someone else instead: Henry Travers. Travers often supplied Buller with specimens (he had recently returned from a collecting expedition on *Hinemoa* sponsored by Buller), but when he received nine skins of the wren from Lyall he knew where he could get a better price for them. For some time he had also been supplying birds to the Hon. Walter Rothschild of Tring, in England, who was much wealthier than Buller, and well-known for his determination to acquire rare species for his private museum, not just in ones and twos, but in large series. In fact, Buller too had been selling large numbers of skins and live birds to Rothschild, including, just at this time, a consignment of eight live piopio from Stephens Island (listed in Buller's account dated 18 October 1894, Rothschild Papers, Natural History Museum, London). When Travers received the wrens from Lyall he wrote offering them to Rothschild:

'I have thought it better to forward the 9 specimens of the new *Xenicus* at once, so that in case you accept my offer, you can place them before any of your scientific friends, in order to prevent any chance of its being described here, although I do not think it is likely, as the locality is only known to myself and the man who is collecting for me. In the event of your accepting my offer, I shall be glad if you will cause the name of Mr D. Lyall, Lighthouse Keeper Stephens Island, to be mentioned as the discoverer, & that it was forwarded to you by me. It was found on Stephens Island and I quote the finder's words "The rock wrens are very hard to get, and in a short time there will be none left. I have never seen many of them, and I think they cannot have been very common at any time".' (Travers to Rothschild 9 October 1894, Rothschild Papers, Natural History Museum, London).

According to Buller (1896, p. 341, footnote), Travers sent the wrens to Rothschild 'Some weeks

after my specimen had reached the editor of the *Ibis*, and whilst Mr Keulemans was preparing a drawing of it'. However, Rothschild moved quickly on receiving the wrens from Travers, and used a faster route to publication than Buller had done. As Rothschild (1907) told it, he wrote a paper for the British Ornithologists' Club describing the new species, and sent his museum curator, Ernst Hartert, to the Club's next meeting on 19 December to present it. When Hartert did so the Club President, P.L. Sclater (who was also editor of *Ibis*), pointed out that Buller's paper describing the same species was already in press in *Ibis*, but Hartert insisted he had no authority to withdraw Rothschild's paper. It was duly published in the Club's *Proceedings* when they were printed only 10 days later, on 29 December (Rothschild, 1894). The issue of *Ibis* containing Buller's paper (with Keulemans's fine coloured lithograph, which obviously had taken some time to produce) did not appear until the following April (Buller 1895c). Rothschild's name for the new species, *Traversia lyalli*, thus took priority over Buller's name *Xenicus insularis*.

Buller and Rothschild sniped at each other for years afterward about this. Buller (1905) still refused to accept Rothschild's name, suggesting that Rothschild should have acted the gentleman and stood back when told that Buller's paper was already in press. Rothschild (1907) agreed that it was hard luck on Buller being pipped at the post, but countered by insinuating that Buller was not really a gentleman, but was like Travers, a trader in specimens (Rothschild 1907). Their bitter arguments in print are fully related by Fuller (1987).

In naming the wren Rothschild not only took Travers's hint and named the species after him and Lyall, but also followed Lyall and used the vernacular name of Stephens Island 'rock wren' (Rothschild 1895). Rothschild did not confuse it with the rock wren *Xenicus gilviventris*, but others, possibly including Lyall, did. Edward Lukins, who visited Stephens Island in 1894, included 'Rock Wren (*Xenicus Gilviventris*)' in his list of the birds of the island (*Colonist*, Nelson, 27 October 1894). From the details given in his report (leaving Nelson by Anchor Co. steamer on a Wednesday afternoon and joining Wallace Webber's mail run to Stephens Island the next day) Lukins's visit can be dated to 11-12 October – shortly after Lyall had sent the consignment of nine wrens to Travers. Given that Lukins presented his extensive list of 31 species as those 'found on the Island' rather than actually seen by him, it seems likely that he drew on the records of Lyall, or others, on the island. The order of the birds on the list and the names used suggest that it was drawn up using Buller's *Manual of the birds of New Zealand* (1882), which Lyall certainly made use of (see his comments quoted in Buller (1899, p. 32)).

Perhaps he identified the island's birds from the *Manual* and its monochrome illustrations, and did not yet recognise that the wren was a new species.

Almost as soon as the discovery of *Traversia lyalli* became publicly known with the appearance of Rothschild's paper there were suggestions that the bird was already extinct. On 16 March 1895, Christchurch's *Press* carried an editorial about it, criticising the taking of cats to Stephens Island and commenting that

'there is very good reason to believe that the bird is no longer to be found on the island, and, as it is not known to exist anywhere else, it has apparently become quite extinct. This is probably a record performance in the way of extermination. The English scientific world will hear almost simultaneously of the bird's discovery and its disappearance before anything is known of its life-history or its habits.'

Indeed, while Buller and Rothschild had been scrambling to name the species, and Lyall and Travers to obtain specimens for them, very little had been recorded about the living birds. Buller (1895c) noted only that 'My correspondent on the island informs me that the bird is semi-nocturnal in its habits'. Travers reported slightly more extensive comments in a letter to Rothschild:

'I was told...that the most likely time to find it was the winter, as it was during that time the cat brought most of the specimens to the house. Living specimens have been only twice seen, and on each occasion the person who saw it had no gun; he stated that it was running around the rocks like a mouse, and was so quick in its movements that he could not get near enough to hit it with a stick or stone' (Travers to Rothschild, 7 March 1895, Rothschild Papers, Natural History Museum, London).

On the basis of these observations, Rothschild (1895) stated that the wren 'did not fly at all'; subsequently Rothschild (1907) also noted structural features, such as 'the weak character of the wing, which points to flightlessness' – a conclusion rejected by others until Millener (1989) confirmed it from skeletal evidence. Millener (1984, 1989) also confirmed, from cave deposits, another suggestion first made by Rothschild (1907): that *Traversia lyalli* was relict on Stephens Island and had once been widespread on the New Zealand mainland.

#### **The trade in specimens and the extinction of *Traversia lyalli***

Was the wren really exterminated promptly with its discovery in 1894 as suggested by the *Press*, and repeated in most accounts since? The records of specimens obtained by Buller and Travers indicate that the process of extermination may have been a little more extended.

After Buller and Travers received their initial specimens of the wren in 1894 they each pressed Lyall for more. In February 1895, before Buller learned that he had been beaten in the naming of the wren, he wrote to Rothschild mentioning that 'The Stephens Island man...has not sent me yet any specimens of *Xenicus islandicus*, but seems confident about getting them, (Buller to Rothschild, 10 February 1895, Rothschild Papers, Natural History Museum, London). But Buller had been beaten again (perhaps he was not offering Lyall enough ?): two weeks earlier Travers had also written to Rothschild announcing that he was sending a jar containing 'the only other specimen of the bird that my correspondent has been able to secure - it is in spirit' - i.e. an entire, unskinned bird in alcohol (Travers to Rothschild, 24 January 1895, Rothschild Papers, Natural History Museum, London). Travers later sent his account charging Rothschild £5 for this specimen (Travers to Hartert, 24 December 1895, Rothschild Papers, Natural History Museum, London). However, it was not in the consignment received by Rothschild and although Travers promised on several occasions afterward to replace the missing wren, he never did, and Rothschild had to be content with his original nine specimens.

In March 1895 Travers reported to Rothschild that he had obtained another specimen, also in spirit:

'I have recently returned from a special trip to Stephens Island where I went to have a good hunt for more specimens of *Traversia Lyalli*, but unfortunately without success. I hunted the island over and round and as I had three men with me who formed my boat crew, and some of the residents of the island, you can imagine we made a thorough search.... I did not get any specimens of the bird I went specifically for, although Mr Lyall's boy gave me a specimen that had been found just alive by the owner of the cat that had caught the others, and this his father had put into spirit' (Travers to Rothschild, 7 March 1895, Rothschild Papers, Natural History Museum, London).

By November, Travers reported that 'My friend Mr Lyall informs me (a few days ago) that he has not seen another specimen of the *Xenicus* and believes it to be quite extinct.... I however have the two specimens in spirits that I have mentioned to you' (Travers to Hartert 28 November 1895, Rothschild Papers, Natural History Museum, London).

Despite Lyall's pessimistic view, *Traversia lyalli* may not yet have been quite extinct: further specimens reached both Travers and Buller for several years after this. The suggestion of extinction was, however, used by Travers for commercial advantage. In the same letter to Hartert, Travers stated that as the species was 'certainly to my mind extinct' he would now ask 'at least £50 each' for

his two specimens. But even Rothschild jibbed at such a price and Travers later trimmed it back to £12 (Travers to Hartert, 13 May 1896, Rothschild Papers, Natural History Museum, London). Since he had charged Rothschild £5 for the missing spirit specimen only a few months earlier, this still represented a considerable premium for the extinction of the species. To place such prices in perspective, the lighthouse keepers on Stephens Island were earning an average of £140 a year at this time (*Appendices to the Journal of the House of Representatives* 1896, H-15 p. 15).

In August 1895, when he finally included the wren in one of his regular papers to the Wellington Philosophical Society, Buller argued that rare birds should not be collected for 'trade purposes', but that specimens should still be obtained for museums, especially 'a complete type-collection for the Colonial Museum' (Buller 1896). That may have been his position in public, but privately he still continued to seek specimens for his own collection; indeed the high prices Buller and Rothschild were prepared to pay made it difficult for any public museum to compete.

In the same August 1895 paper, Buller noted that he had recently 'had the opportunity of examining a female specimen' of the wren, different from the original specimen Bethune had lent him, which he now suggested had been a male (Buller 1896). Buller evidently obtained the female specimen for his collection - when he later reprinted the 1895 paper he altered the phrase quoted above to indicate that he 'had secured' it (Buller 1905).

Buller (1905) briefly summarised his further dealings in specimens of the wren: 'Besides a pair in my son's collection, I purchased a specimen from Mr Henry Travers for Canon Tristram'. The date of the purchase for Tristram (Canon H.B. Tristram, a notable English ornithologist with a large private collection) is not known, but must have been some time before October 1898, when Tristram in turn sold the specimen to the Liverpool Public Museum (Fisher 1981). As for the pair in Buller's son's collection, Buller's statement leaves it uncertain who supplied them, or when. Similarly, it is not clear what happened to the original specimen Bethune had lent to Buller, the type of his *Xenicus insularis*. Although Buller often managed to retain specimens lent to him, in this case it may have gone back to Bethune. Bethune had evidently been building up his own collection: in December 1895 he left a number of cases of bird skins at the Colonial Museum for safekeeping while he went overseas (295/1895, item 109, box 10, MU000095, Te Papa archives). The fate of this collection after it was uplifted from the museum in 1897 is unknown, although Bethune's collection of birds' eggs went to Edgar Stead and thence to Canterbury Museum (Wilson 1959, pp. 6-7).

Buller (1905) indicated a total of three specimens of *Traversia lyalli* in his and his son's collections. This at least is confirmed by the holdings now in the Carnegie Museum, Pittsburgh, and the Canterbury Museum, Christchurch, respectively. However, the labels on these specimens (all in Buller's hand) raise further questions. The skin in the Carnegie Museum, labelled as 'female', could be the female specimen Buller referred to in August 1895 and later 'secured', although it is dated '1894'. The two in the Canterbury Museum from Buller's son's collection are labelled as male and female, and both with the date '1899'. This seems improbably late as a date of collection, especially as according to Buller (1905) all the specimens of *Traversia lyalli* had been obtained by Lyall – who in fact left Stephens Island for another lighthouse posting in June 1896 (Stephens Island letterbook, ML Stephens Island 3/1, Archives New Zealand). We can only speculate about how these various scraps of evidence can be reconciled. Might Lyall have retained some specimens for later sale when he left Stephens Island – or perhaps made arrangements for any further wrens the cat brought in to be sent on to him? Or, in view of Buller's rather cavalier attitude toward the labelling of his specimens (Galbreath 1989), should his dates be regarded as unreliable? In the absence of any further evidence on this point, the possibility remains that they do accurately represent the date of collection, and wrens were still being taken in 1899.

The records of Travers's trade in specimens are also difficult to reconcile, and it is not clear how many he obtained. Travers referred to two spirit specimens in 1895 (or three, if one was really lost in transit to Rothschild). He sold one to Buller for Tristram and subsequently, in September 1898, wrote to Sir James Hector at the Colonial Museum that he still had one specimen (Travers to Hector, 5 September 1898, IA1 1898/2511, Archives New Zealand, Wellington). However, Buller (1905) claimed that Travers, after selling him the specimen for Tristram, later offered him *two* more. Not a great deal of reliance can be placed on any of these claims (in particular, Travers's evasions about the 'missing' spirit specimen and his unfulfilled promises to replace it cast doubt on all his statements), but they do again raise the possibility that specimens were still being obtained after September 1898.

The records of Travers's subsequent dealings leave it uncertain whether he had one specimen or two after 1898. In 1901, when the Duke and Duchess of Cornwall and York were about to visit New Zealand, Travers negotiated to sell 'a collection of skins of Native Birds of N.Z. to the Govt. for the sum of £155.15.0 and his specimen of the Stephen's Island Wren for £35 for presentation to Royal Visitors' (emphasis added, quoted from

entry for letter 1901/1700 in Colonial Secretary's Department inward correspondence register, IA 3/1/58, Archives New Zealand; the actual letter is missing). Under the agreement reached, Travers packed up several boxes of bird-skins and delivered them to the Colonial Museum. There is no record of the species actually supplied, so it is not certain that the Stephens Island wren was included. However, this seems very possible given that Travers was paid £200, which tallies with his total price for the collection with the wren, plus some extra for live birds he also supplied (IA1 1908/2766, Archives New Zealand). The live birds may have been presented to the royal visitors, but the skin collection was not; instead, it lay forgotten in the Colonial Museum until 1904, when Augustus Hamilton, the new director after Sir James Hector's retirement, investigated boxes in his office and found the bird-skins still wrapped as Travers had delivered them. Hamilton noted that many of the 227 skins had become damaged by insects and he had to discard 40 of them (A. Hamilton memo, 23 August 1904, IA 1908/2766, Archives New Zealand, Wellington). Unfortunately, again no record was kept of the species discarded or retained; at this time the museum did not have any system for recording accessions. The museum (now the Museum of New Zealand Te Papa Tongarewa) does hold a specimen of *Traversia lyalli*, but in the absence of any record at all of its provenance, it remains uncertain whether it came with Travers's collection for the royal visitors, or from some other source.

If it did come from Travers, then he must have had two specimens as Buller (1905) stated: in 1905 Travers sold one to the Otago Museum which was displayed at the November meeting of the Otago Institute (*Transactions and Proceedings of the New Zealand Institute* 38, 1906, p. 604).

Altogether, the comments by Buller and Travers about their trade in specimens of *Traversia lyalli* are confusing – sometimes, it seems, deliberately so – but they do indicate that after the initial 10 specimens were obtained between February and October 1894, 2-4 more reached Buller and Travers by August 1895 and another 2-3 between then and 1899. The latter specimens may have been collected some time earlier, but even allowing for this uncertainty it seems more likely that *Traversia lyalli* declined to extinction over several years at least, rather than being exterminated promptly on its discovery in 1894 as has generally been stated.

#### **How many specimens were taken, and where are they now?**

Most specimens of *Traversia lyalli* mentioned in the early records can be clearly accounted for. Rothschild's nine, after various sales, gifts and

exchanges, are now dispersed between the Natural History Museum in London (three, registered as 1895.10.17.13 and 1939.12.9.76-77), the American Museum of Natural History in New York (four: AM 554502-5), the Academy of Natural Sciences in Philadelphia (one: 108,631) and the Museum of Comparative Zoology in Cambridge, Massachusetts (one: MCZ 249,400). Buller's three are now in the Carnegie Museum, Pittsburgh (one: 24639) and Canterbury Museum, Christchurch (two: AV917-8). Tristram's specimen is now in the Liverpool Museum (B18.10.98.10). The Colonial Museum, now the Museum of New Zealand Te Papa Tongarewa, Wellington still has one specimen (5098). The Otago Museum, Dunedin, has two on its registers (AV739, AV7577, but this may be a duplication; only one specimen is actually present. Thus, 15 specimens are still extant. It is possible that these constitute all that were ever taken, although there could have been several more, given the uncertainties about the fate of the first specimen loaned to Buller by Bethune and the specimen Travers claimed was lost in transit to Rothschild. In view of the very high monetary value placed on them it seems unlikely that any further specimens were collected and left unsold and unknown.

#### **What caused the extinction of *Traversia lyalli*?**

Although it is most commonly asserted that the species was exterminated by the lighthouse-keeper's cat, several other causal factors have been suggested.

One suggestion has been that 'the small population became extinct almost immediately, more probably through collecting than, as suggested in most accounts, destruction by the lighthouse keeper's cat' (Turbott, 1990; see also Worthy & Holdaway, 2002). Suspicion about the activities of collectors – i.e. Lyall and Travers – is understandable, but there is no direct evidence against them. Travers certainly made strenuous efforts to try to obtain specimens, sailing to Stephens Island in a small boat on at least two occasions in the quest. However, there seems no reason to disbelieve his reports to Rothschild that on each occasion he failed to find any wrens. Lyall appears to have obtained all the 15 or so specimens obtained, and it is entirely plausible that all of them were brought in by the cat. As Travers described the process, 'Mr Lyall's boy gave me a specimen that had been found just alive by the owner of the cat that had caught the others, and this his father had put into spirit' (Travers to Rothschild 7 March 1895, Rothschild Papers, Natural History Museum, London). From the reported observations of the behaviour of the birds it seems clear that cats would have been more effective at hunting these small, mouse-like, semi-nocturnal, flightless birds than any human collector.

There have also been suggestions, for instance by Holdaway (1996) and Worthy & Holdaway (2002), that loss of habitat from clearance of the island's bush cover was a more important factor than cat predation. But again the evidence does not support this proposition. Certainly much of the bush on the island was eventually cleared, but this does not seem to have progressed far enough by 1894-95, when the wrens were declining toward extinction, to be considered a major causal factor. Bush clearance evidently began in 1879 when a Marine Department work gang cleared a track to the proposed lighthouse site. More clearing must have been done during construction of the lighthouse and its associated buildings in 1892-93, although the few anecdotal reports that have survived from this period give no details. After the lighthouse began operating the Principal Keeper reported in March 1894 that the men were 'felling & clearing bush in the Paddock fenced in by Mr Scott' and in April that they were 'felling bush in the Paddock, logging and burning fallen timber along the tramline' (Stephens Island letterbook, ML Stephens Island 3/1, Archives New Zealand). However, it seems that the further clearing which removed most of the rest of the island's bush cover was not completed for some years. Edward Lukin described the island in October 1894 as 'bush clad' – although it should be noted that he seems to have been mainly interested in the indigenous life of the island and made no mention of cleared paddocks, sheep, or cats (*Colonist*, Nelson, 27 October 1894). Similarly, Dr G. Thilenius, who spent the month of November 1898 collecting natural history specimens on the island, described how a 'thick growth of vegetation with a height of about ten feet covers the island to the upper rims of the sea-cliffs' (Thilenius, 1899, as translated by Schmidt, 1952). Other records and recollections of the destruction of the bush cover have been summarised by Medway (1972) and Brown (2000), who each also concluded that it was of less significance than cat predation in the extinction of *Traversia lyalli*.

In considering whether cat predation was the major factor in extinction of the wren, another question is relevant: was there just the one lighthouse-keeper's cat, or was there a larger population of cats preying on the birds? The idea that the wren was exterminated by a single lighthouse-keeper's cat was first published by Rothschild (1905, 1907) and has been much repeated since. However, Rothschild's source – Travers – actually took a different view. In notes on 'Native Birds of New Zealand' (undated but probably written in the 1920s) he wrote of the Stephens Island wren that 'a cat was the first into bring it to notice, having deposited one at the door of one of the lighthousekeepers who happened to

be an enthusiast in native birds. The cats however, soon made short work of the remainder' (Travers's manuscript notes, MSY 3430, in Royal Forest & Bird Protection Society Records, MS-Group-0206, Alexander Turnbull Library, Wellington). Other early writers such as Hutton and Drummond (1904) and Thomson (1922) also refer to the wren being exterminated by 'the cats'. Medway (1972), in his summary of the historical record concerning Stephens Island, came to the same conclusion.

Certainly, within a few years of the lighthouse being established, there was a growing population of cats on the island and other birds such as piopio and saddleback were rapidly disappearing. The question is – how early was there a population of cats rather than a single lighthouse-keeper's cat? Recollections from F.W. Ingram, one of the workers constructing the lighthouse in 1892-93, suggest that there were no cats on Stephens Island in that period (*Evening Post*, Wellington, 17 April 1926, p. 6). Obviously there was at least one cat present by mid 1894, when it brought in the wrens to the keeper's door. There are several anecdotal accounts of how this came about. O.R.H. Hope, who visited the island as a boy when his father had the contract to deliver mail there in 1898-1901, considered that the cats on the island 'came about by the wife of one of the keepers wanting a cat, so one of the crew of the "Hinemoa" brought her a female one. This was put in a sugar bag and given to one of the children to take up to his mother. On the way, child-like, the bag was opened to see what it looked like. Out jumped the cat, and off it went into the bush' (O.R.H. Hope, 'Recollections of Stephens Island', Nelson Provincial Museum).

A slightly different version was recorded by Henry Travers in 1898:

'I was on Stephens island about 4 years ago and the above bird [Piopio], saddlebacks of both species, robins & other birds were common, but more especially the former as they were in 100s. Now there is not one of the former or second & only very few of the others, all due to the fact that a she cat heavy in kitten was taken from the French Pass in a bag by the owner, with the intention of its being thrown over from the boat on the way to the island. But as bad weather came on, the cat was forgotten until the island was reached, when in the hurry of landing the bag with the cat in it was put ashore, and one of the men not thinking, cut open the bag and let the cat out. The island is now swarming with cats' (Travers to Hector 27 December 1898, IA1 1898/251, Archives New Zealand, Wellington).

Whether the escaping female cat referred to by both Hope and Travers was the only cat brought to the island, and later left birds at the lighthouse keeper's door, is not made clear, but if any more were brought this could only have accelerated the

growth of a population of cats. Nor do the above accounts give any direct indication of when the first cat was landed, although Travers's reference to a boat from French Pass being caught by bad weather can be set against the reports of the principal keeper, who regularly recorded the boats visiting the island. In 1894 only one boat is recorded as visiting in bad weather: in February 'Mr Webber and two other men arrived here on the 17th from the French Pass, & were detained through stress of weather until the 20th.' Wallace Webber of Elmslie Bay, French Pass, was a regular visitor to Stephens Island, bringing mail, stores and farm stock. The inference that cats might have arrived on Stephens Island with his visit in February 1894 is a very tenuous one, but it does fit the available evidence. A single cat 'heavy in kitten' landed on the island then could certainly have originated the population of cats that later became apparent. During 1894 there would have been the original cat plus her litter, which in turn would have begun breeding by about a year later - male cats take longer than females, about 12-15 months, to reach breeding age (Turner & Bateson, 1988).

In fact, the first report of a population of cats on the island was just a year later, about February 1895. Buller (1905, p. [43]) quotes a letter from Lyall: 'I am sending you a rail, now very scarce. Saddlebacks are not very plentiful. Thrushes are fairly numerous, but in a short time there will not be many left, as the cats have become wild and are making sad havoc among all the birds.' This can be dated by comparison with Buller's letter to Rothschild on 10 Feb 1895 (in Rothschild Papers, Natural History Museum, London): 'The Stephen's Island man sends for my inspection specimens of the Rail....' Thus by early 1895 there were a number of cats on the island, and a noticeable effect on the birds. By November Travers reported that Lyall 'has not seen another specimen of the Xenicus and believes it to be quite extinct as even the thrushes and saddle backs which were at one time very numerous are now almost of the past' (Travers to Hartert, 28 Nov 1895, Rothschild Papers, Natural History Museum, London). When H. Schauinsland collected on the island in January 1897 he evidently obtained just one piopio, no saddleback and no wrens (Dunker 1953; Dawson & Dawson 1958).

By July 1897, the principal keeper commented in his report to the Marine Department that 'As there are a large number of cats running wild on the Island I think it would be advisable to employ some means to destroy them.' His request that the keepers be supplied with shotguns and ammunition for this purpose was acted upon, and from 1901, after further concern had been expressed about destruction of the Tuatara on the island, the keepers were paid a bounty of 1shilling

for each cat killed (Stephens Island letterbook, ML Stephens Island 3/1, Archives New Zealand). By 1912 the tally was over 700 (Ell to Bell 1 Nov 1912, IA1 14/18/4 pt 2, Archives New Zealand). In 1919 the bounty was raised to 5 shillings and with this added incentive the cats were eliminated. By 1925 it was reported that 'as far as the keepers are aware there are no cats on the island', and none have been recorded since.

## CONCLUSION

Overall, we conclude that it was primarily predation by cats that exterminated *Traversia lyalli* rather than collecting or habitat loss. It seems most likely that from a single pregnant female cat landed early in 1894 a small population of cats was preying on the birds and other life of the island by later that year, and rapidly increased in numbers in following years until the keepers took notice and began shooting them. They had a considerable impact on the land birds of the island: the flightless *Traversia lyalli* was only the first to disappear. Judging by the numbers of specimens obtained in 1894 and subsequent years, the species was reduced considerably in that first year and eliminated entirely within perhaps a few more years. Extermination was rapid, although probably not as rapid as usually stated, nor by a single cat. But although the extinction of the Stephens Island wren may not have been quite as dramatic as it has usually been portrayed, it was tragic enough. *Traversia lyalli* was only one of the casualties of human exploitation of Stephens Island, which could, with just a little more care, have remained a safe haven for this and other species now entirely extinct.

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