Notornis, 2015, Vol. 62: 219-230
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Disseminations which established Canada goose (*Branta canadensis*) throughout New Zealand

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Abstract Of 4 importations of Canada goose *Branta canadensis* into New Zealand, 2 (in 1905, 1920) resulted in breeding. Commencing in 1907, multiple and repeated releases of the 1905 geese and their progeny had, by 1922, established flocks of several hundred distributed along the eastern Canterbury and Otago foothills of the Southern Alps. Thereafter, the geese spread widely but remained resident and breeding only in the South Island. Establishment of Canada geese in North Island commenced in 1969 with the first of 4 transfers by the Wildlife Service, collectively totalling 280 birds from Canterbury's Lakes Ellesmere and Forsyth, to coastal Wairoa lakes and nearby locations. The Wildlife Service assisted numerous other transfer and release initiatives, of at least 800 birds, in North Island in the 1970s and 1980s, principally by Wellington and Auckland Acclimatisation Societies, Ducks Unlimited, and private waterfowl enthusiasts. At the same time it supported transfers of 450 geese to the South Island's West Coast. From these multiple releases Canada geese have become widespread in rural New Zealand.

Imber, M.J.; Williams, M. 2015. Disseminations which established Canada goose (*Branta canadensis*) throughout New Zealand. *Notornis 62 (4): 219-230.*

Keywords Canada goose, *Branta canadensis*, introduction, acclimatisation, New Zealand

INTRODUCTION

Of the 7 exotic waterfowl species now with feral populations in New Zealand (Robertson *et al.* 2007), 2 have become ubiquitous – mallard (*Anas platyrhynchos*) and Canada goose (*Branta canadensis*). Both have colonised not just New Zealand's rural areas and remote hill country but have established within urban precincts. Whereas mallard competed with and has largely genetically subsumed the native grey duck (*A. superciliosa*) in the process (Williams & Basse 2006), the Canada goose has expanded within a pastoral landscape devoid of native competitors and significant predators and wherein agricultural innovation has constantly improved the quality and abundance of its fodder (Spurr & Coleman 2005). These 2 acclimatised species are now amongst New Zealand's 3 most ubiquitous waterfowl (Robertson *et al.* 2007).

The mallard's introduction and acclimatisation was a long and drawn out process, featuring approximately 19 importations (of at least 650 birds and eggs), and with over 30,000 bred in captivity

Received 10 July 2015; accepted 16 November 2015
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and released (Dyer & Williams 2011). It was a most determined and costly effort. By contrast, the Canada goose's establishment arises from just 2 importations, in 1905 and 1920, totalling 60 birds (Thomson 1922, Imber 1971). However, like the mallard, the Canada goose did benefit from considerable assistance to aid its establishment with numerous attempts being made to create feral populations from few or many propagules in single or repeated releases. It is the intent of this paper to chronicle this effort to the extent that surviving records and fading memories allow.

SOURCES OF INFORMATION

The primary sources of information about the early breeding and disseminations of Canada geese were the minute books and annual reports of New Zealand's many former acclimatisation societies, especially North Canterbury Acclimatisation Society (NCAS). Although early introductions of fauna by acclimatisation societies were summarised by Thompson (1922) and later chronicled by McDowell (1994), each Society's records are the primary, and in many instances the only, recorder of detail. Where used, these sources are identified in the text by the Society's initials and year(s) of report (e.g. NCAS 1905). The post-1969 disseminations of Canada geese into North Island have been traced in the archived files of the Internal Affairs Department (IAD) held in the National Archives of New Zealand, Wellington. In these, valuable details of transfer and liberation permits are retained, as well as other supporting correspondence and records of bureaucracy. Files are identified in the text by their archived reference number (e.g., IAD 11/5/1). Records of geese banded by Wildlife Service and acclimatisation society staff are preserved in the banding schedules, now held in the Department of Conservation bird banding office, and these have been consulted extensively. Geese were first banded at Lake Ellesmere in 1957 and have been so ever since. Birds caught there, and at nearby Lake Forsyth, for transfer elsewhere were required to be banded and their release sites recorded on the banding schedules, and mostly this was done. Information sourced from the schedules is identified in the text as "*DoC Banding*". Further information concerning North Island disseminations has been obtained from some of the Wildlife Service and acclimatisation society staff involved, and assumes their lingering clarity of memory. Distribution records of Canada geese in North Island 1940-1970 have been gleaned from the Ornithological Society of New Zealand's (OSNZ) classified summarised notes records published in its journals *New Zealand Bird Notes* and *Notornis*. These are referenced in the text as *NZBN* or *Notornis* followed by volume and page number (e.g. *NZBN* 1:69, *Not*. 7:194). Newspaper and magazine reports sometimes capture detail not recorded elsewhere and these have been referenced in the text by the publication's name, date or publication number (e.g. *NZ Herald* 12 January 1931, or *Flight* 1981 #31).

Place or regional names referred to in the text may be located in most substantive New Zealand atlases (e.g. Bradley 1999). Details of acclimatisation society districts are summarised in McDowall (1994).

THE INTRODUCTIONS

Thomson (1922) reported 2 pre-1900 introductions (1876, 3; 1879, 15) by the Wellington Acclimatisation Society (WAS) which referred to them as "Maine geese" (WAS 1887), a 1905 importation of 50 birds from central USA by the Tourist and Health Resorts Department (THRD)(THRD 1905), and a 1920 importation of 10 from Vancouver, Canada by NCAS (NCAS 1921). No others have been identified despite Long (1981) and Lever (2005) asserting an introduction was made into Canterbury in 1950. Sources quoted for these assertions (Delacour (1954) by Long (1981); Oliver (1955) by Lever (2005)) are entirely silent on the matter, and so too are Lamb (1967) and annual reports of the NCAS.

Imber (1971) examined the 1905 and 1920 importations in detail to determine which of the then recognised subspecies of Canada goose was introduced to New Zealand. He concluded that the 1905 birds were of the largest race *B. c. maxima* but was unable to identify the 1920 birds. The 1920 birds were reported as smaller than those of the 1905 importation (E. Stead quoted in Delacour 1954); this and the source location led Delacour (1954) and Lever (2005) to speculate they may have been cackling geese (*B. hutchinsii*).

The geese imported in 1905 were distributed by the THRD to 5 acclimatisation societies (6 birds to Wellington, and 10 birds each to North Canterbury, South Canterbury, Otago, and Southland), and 2 were placed in the Rotorua government grounds (THRD 1905). These numbers differ slightly from those recorded by Thomson (1922) and by some of the societies themselves (e.g. 11 to Southland (Stock 1916), 8 to North Canterbury (NCAS 1921)). The birds imported in 1920 were retained by NCAS.

INITIAL PROPAGATION AND RELEASES IN SOUTH ISLAND

Seven of the 13 acclimatisation societies existing in South Island during the early 20th Century were active in breeding and/or liberating Canada geese. Their 1905-1930 annual reports are the source references for the following summary of their activities, and of the numbers released, and where, as listed in Appendix 1.

North Canterbury Acclimatisation Society (NCAS)
The 8 birds received in 1905 were placed in the Society's grounds in Hagley Park, Christchurch. After 2 years without breeding, 6 were transferred to a lake at the Townsend (formerly Moore) property, "Glenmark" at Waipara, which, then having an island in its centre, was considered suitable breeding habitat. This move was immediately successful and breeding occurred at the end of 1907 and annually thereafter, with 3 broods being reared in 1908. In 1909, the pair retained at Hagley Park reared their first brood (of 4) and subsequently bred annually till 1919-20, raising 33 young in all.

During 1909-10 the first liberation into truly feral habitat was made; 10 geese from Glenmark were transferred to Lake Sumner. This was followed by the release of 3 young birds at Mt White Station (probably Lake Letitia) in 1910-11 and another 6 on Lake Sumner in 1911-12. Thereafter a number were liberated annually (Appendix 1). By 1920, 94 had been released at 18 locations, their distribution being throughout the Society's district but mainly in the Southern Alps eastern foothills, from Lake Guyon in the north to Lake Coleridge in the south. The birds liberated were progeny of both the Hagley Park pair and those at Glenmark.

NCAS sought to import further geese in 1913 but was advised, when the matter was referred to the THRD, that the desired effect (*i.e.,* to secure a "change of blood") could be achieved more economically by exchanging birds with other societies as it was understood birds of the original importation were not closely related. This advice was taken and 4 geese were exchanged, 2 with Otago and 2 with Southland.

NCAS again sought to import geese in 1919 and with support from the Department of Internal Affairs ordered 20 pairs from a supplier in Vancouver, Canada. Five pairs eventually arrived in early 1920 of which 3 pairs were released immediately onto protected local waters near Lake Ellesmere and 2 pairs retained in captivity at Hagley Park. The aged 1905 pair still at the park, together with 6 of their young, was then released onto Lake Coleridge. The new captive stock commenced breeding with 2 initial progeny being released onto Lake Ellesmere and another 2 sold to the Otago Acclimatisation Society.

NCAS began selling geese to other societies and individuals (£5 per pair). In 1921, 65 were captured at Glenmark, of which 30 were sold to other acclimatisation societies (Opotiki, Hawera, Hobson, Ashburton, South Canterbury, Waimate and Otago) and the remainder liberated elsewhere in its district. Although this trade continued intermittently for most of the decade no records remain beyond 1924 in which year 10 were sold to Ashburton Acclimatisation Society. The great majority of these sales, and resulting liberations, were of birds descended from the 1905 importation.

Progeny of the Canadian importation were liberated only in the Lake Ellesmere region and at Lake Coleridge (Appendix 1). Although the last liberations recorded in NCAS annual reports were those of 1922-23 it is likely more followed because geese were retained and bred at Hagley Park at least until 1926.

The geese were well established in North Canterbury within a decade of their first liberation. The NCAS annual reports 1921-1924 record the development of seasonal migration between the Canterbury foothills and Lake Ellesmere ("a flock visits the lake every year"), and large summer aggregations (300 on Lake Sumner, 300-400 on Lake Ellesmere and "increasing rapidly"). So rapid was this increase that Canada geese were declared game in 1925 for the first week of May, and with a daily limit of 2 per hunter.

Ashburton Acclimatisation Society
There is no reference to acclimatisation of Canada geese in any of this Society's annual reports. However, 12 birds were sold to the Society by NCAS between 1921 and 1924 (NCAS 1924). In an article concerning back country birds (*Ashburton Guardian* 10 July 1937), J. Brown records "Some years ago 3 prs (of Canada goose) were liberated at Lake Heron, their wings being pinioned……and a little later the same number were liberated on the Maori Lakes".

Establishment and spread of Canada geese in this Society's district was as rapid and successful as it had been in North Canterbury. The above newspaper article records "mobs of up to 500 can be frequently seen" and that "on Lake Swamp (at head of Lake Heron) they have so greatly multiplied that they are now a perfect nuisance".

South Canterbury Acclimatisation Society
Referring to the 10 geese received in 1905, the Society's 1907 annual report stated "The Canadian geese have been liberated on the lakes in the McKenzie country as they showed no disposition to breeding in captivity." In 1921, 4 geese, almost certainly progeny of the 1905 importation, were purchased from NCAS, and as there are no subsequent comments about these birds in captivity it is surmised that they too were released onto the McKenzie country lakes.

Waimate Acclimatisation Society
This Society purchased 4 birds from NCAS in 1921 and distributed a pair each to 2 local persons keen to breed them. No further details were reported.

Otago Acclimatisation Society (OAS)
The 10 geese received in 1905 were held at the Society's game farm and hatchery at Clinton but no eggs were laid in the first 2 years, and 2 died. Eggs laid in 1907 proved infertile. Four birds were then removed to the Government poultry farm at Milton whereupon 5 young were reared in 1909 and subsequently released on Telford's lagoon, Waiwera in late 1911. The outcome of that release was not recorded.

Surviving birds at Milton were returned to Clinton in 1912 to join the 2 (non-breeders) still there. Eleven young were raised in the subsequent 2 years and, in February 1915, 12 geese were released at the head of Lake Hawea. Two birds were also added to those at Waiwera. In 1917 breeding at Lake Hawea was confirmed, and a pair sent to Minaret Station at Lake Wanaka also raised young. In 1920, 20 goslings were seen at Lake Hawea.

In 1921 OAS purchased 8 birds from NCAS anticipating they were birds of new pedigree, but only 2 were, the remainder having been retrieved from Glenmark and thus were descendents of the 1905 importation. Held initially at Clinton, they were released the following year at Lake Hawea. The head of Lake Hawea and the Hunter Valley soon became a stronghold of the species for in 1922 "a flock of over 100 was counted there", and " a flock of over 200" in 1923. The Society's 1924 annual report gives a first indication of pending farmer antagonism towards the geese…."Your Council appreciates the forbearance shown by the run holders in the vicinity….whose turnips have suffered from visits paid by the birds". There follows suggestions their numbers had risen rapidly to 600 by 1925 and so the birds became game the following year (daily limit 2 per hunter). Hunting was expected to disperse the flock and thus extend the range of geese in the district.

A final liberation occurred in 1926-27 when an unspecified number were captured in the Hunter Valley and 9 released on Lake Waihola and 8 at the Mahinerangi Dam. Neither release was referred to subsequently.

Lakes District Acclimatisation Society
This Society, in 1922, received a consignment of young geese from the Southland Acclimatisation Society for initial housing in the Queenstown gardens. Nothing further was reported.

Southland Acclimatisation Society (SAS)
After 2 years in captivity at the Society's hatchery the 11 geese received in 1905 had failed to breed and in August 1907 were released at Middle Flat between Lakes Monowai and Manapouri. Although the record of this release did not include number, the presence of 5 birds at the hatchery in 1908 suggests that the release was intended to be of 6 birds, but 2 died on the journey to the lakes. Stock (1916) however suggests differently by listing 11 being released in 1907. A further 3 were released at the lake in 1909 after another year of unsuccessful breeding at the hatchery. In 1909 a pair with 6 goslings was seen on the Waiau River, a short distance downriver from Lake Manapouri.

There is no record of the pair retained at the hatchery having bred and in 1913 they were exchanged for a pair from NCAS. Liberations of captive-reared birds resumed in 1918 (Appendix 1) and extended till 1922 when SAS had to vacate its Clinton hatchery and all game birds were released.

INITIAL PROPAGATION AND RELEASE ATTEMPTS IN NORTH ISLAND

Five acclimatisation societies and the government (via its Tourist and Health Resorts Department in Rotorua) made early efforts to establish Canada geese in North Island. These have been traced by examining each society's annual reports 1905-1930.

Hobson Acclimatisation Society
This Society purchased 8 birds from NCAS (NCAS 1922). However, their fates were not recorded in any of the Society's annual reports.

Auckland Acclimatisation Society (AAS)
Two attempts appear to have been made to establish Canada geese in the Auckland district. In 1919 the THRD agent at Rotorua reported that "Mr Whitney has presented the Auckland Society with a flock (of Canada geese) for liberation (IAD 47/4/5). Although this is not corroborated by any references in the Society's annual reports, Canada geese were reported as "not having been seen for some time" (AAS 1923). A possible source of Whitney's flock could not be identified.

In 1928-29, 3 birds were purchased and passed to a local member for breeding (AAS 1929). A comment that there were "very few" Canada geese in the district (AAS 1932) hints at possible releases and Sullivan (1997) suggests these may have been in the Kaipara Harbour area.

Opotiki Acclimatisation Society
In 1921-22 this Society purchased 2 pairs from NCAS (NCAS 1922) but there is no record of their fate.

Tourist and Health Resorts Department, Rotorua
The 2 birds retained at the Rotorua government grounds in 1905 proved both to be ganders and after one was swapped for a goose from NCAS in 1907, the resulting pair raised 3 goslings in their first attempt (IAD 47/4/5). They and their descendants' subsequent fates may have been covered by a

report, dated June 1919 (IAD 47/4/5) that "…all the geese we liberated some years ago perished in the last Waimanga eruption". This eruption occurred in 1917 and presumably the release site was Lake Rotomahana into which the Waimanga thermal valley descends.

In 1942, Internal Affairs Department permitted the transfer of 10 to 12 geese from OAS to a private property at Rotorua (IAD 47/4) but no confirmation of this transfer occurring has been found nor any reference to feral Canada geese in the area at that time.

Hawera Acclimatisation Society
The single pair purchased from NCAS in 1921 (NCAS 1922) was never referred to again.

Wellington Acclimatisation Society (WAS)
The Society's 6 birds from the 1905 importation initially went to its Paraparaumu game farm. Four were then "sent to Mr Bidwell for liberation on the Wairarapa lake" (WAS minutes 12 Apr. 1905) and the other 2 were last referred to in a letter (IAD 47/4/5) of 9 July 1908 stating …"these birds have gone away and have not again returned as they did last year".

In 1927 OAS sold WAS 10 birds captured in the Hunter Valley (OAS 1927). The fates of these birds are not documented in WAS records, but they were probably released onto Lake Heaton near Bulls because, between 1930 and 1941, there were regular reports in the Marton section of the WAS annual reports of the progress of a small flock there (*e.g.,* "about a dozen" in 1933, 25 in 1936). From 1937 to 1941 the reports indicate birds were dispersing to other lakes nearby. Thereafter, however, the birds disappeared, their last recorded sighting being in January 1943 (*NZBN* 1:69).

NORTH ISLAND SIGHTINGS TO 1970

In the OSNZ classified summarised notes distribution recording scheme 1942-1970 (see various issues of *NZ Birds Notes* and *Notornis*), records of Canada geese in North Island are rare. A single bird sighted at Clevedon and another at Marton, both in 1943, are the only pre-1950 records in this scheme. Likewise, 1950s records are few; of 5 flying along the New Plymouth coast in 1955 (*Notornis* 7:78), 1 at Matata in Bay of Plenty in 1957 (*Notornis* 7:194) and at Waipaoa River, Gisborne in 1959 (*Notornis* 8:202).

Despite more observers submitting species reports to the scheme, goose sightings in the 1960s remained rare. At Lake Whakaki, Wairoa 3, and later 9, geese were seen in 1960 (*Notornis* 9:73). Other 1960s reports were summarised (*Notornis* 19(supp)) as being "of single birds and small parties, mainly in the autumn and winter" with sightings from Northland (2 in Kerikeri in 1963, 8 in Ngawha in 1968, 10 in Ahipara in 1969) the latter 2 sightings suggestive of a persisting flock. Waikato sightings (1 at Lake Whangape in 1964, 1 at Mercer in 1965, 1 at Whangamarino in 1966) may allude to a resident individual.

TRANSFERS TO WAIROA, NORTH ISLAND 1969-1976

Advocacy by the Bay of Plenty Fishing and Shooting Federation in early 1968 to the Department of Internal Affairs' Conservator of Wildlife at Rotorua lay behind an initiative to establish Canada geese in North Island (IAD 45/52/21). The Federation proposed 2 release sites, near Bowentown at the head of Tauranga Harbour, and Matata Lagoon and its nearby Tarawera River wetlands. However, Wildlife Service officers considered the sequence of 4 coastal lakes at Wairoa were a better prospect for population establishment because they provided adjacent year-round grazing for pinioned birds, their isolation provided security, and the surroundings better replicated some of the coastal Canterbury habitat occupied by geese *e.g.* Lake Forsyth, Wainono Lagoon (IAD 45/52/21).

A press report (*NZ Herald* 30 November 1968) emphasising that geese *may* be brought to North Island was considered as public consultation, and the eliciting of just one critical letter of response taken to justify public acceptance of the idea (IAD 45/52/21). Despite some initial reticence at senior levels within the Internal Affairs Department, including by its Minister, formal approval for the release was granted on 19 February 1969. However, considerable preparatory work had been done: in early January 1969, 50 geese were caught at Lake Ellesmere, removed to the NCAS Greenpark game farm where they were pinioned, and transported north to the Department's Ngongotaha game farm near Rotorua. After almost a month in captivity they were taken to Wairoa on 16 February 1969 and released on Ngamotu Lagoon (IAD 46/52/21).

The subsequent history of this population establishment attempt is recorded in the fulsome records on archived file IAD 11/5/1, from which the following summary is derived.

All 50 geese released in 1969 remained at the lagoon during the following 9 months. No breeding was detected in late 1969 and some birds started to disperse following the re-growth of their wing feathers (clearly some birds had been wing-clipped rather than pinioned). A supplementary release of 25 pinioned birds obtained from the sedentary Lake Forsyth population, took place on 29 January 1970.

Breeding in late 1970 produced 20-25 fledglings and a subsequent population assessment indicated

most of the birds released at Ngamotu Lagoon over the previous 2 years were still present. However, throughout 1971, birds began dispersing north as far as Gisborne, and south to Napier and the Ngarururoro River mouth. Geese had by then distributed themselves onto all 4 Wairoa lakes and moved freely between them, often via the sea. The loss of 6-8 birds during the 1971 hunting season sparked a protection initiative that was to have significant consequences for the legal status of geese everywhere (see Discussion).

No breeding was detected in the spring of 1971 and further dispersal was noted. Counts throughout 1972 indicated a gradual reduction in numbers to a minimum of 36 in August 1972. This prompted another transfer, of 44 birds from Lake Forsyth, to another of the Wairoa lakes, Big Ohuia Lagoon, on 31 January 1973. Nesting activity was identified later in the following spring, including on the hillsides above Little Ohuia Lagoon, and by the end of the year the local population was assessed to be 106. By mid-1975, 98 geese were resident.

A final transfer of geese to the Wairoa lakes was made on 13 January 1976 when 189 Lake Ellesmere geese were flown by RNZAF aircraft from Wigram to Rotorua and subsequently transported to Wairoa. Approximately 120 geese were released onto Ngamotu, Big and Little Ohuia Lagoons, and approximately 40 geese at sites further north on the East Coast (Tiniroto Dam, Putere lakes, and near Ruatoria). A minimum of 20 geese from this consignment were released at Hatepe and on Hinemaiai Dam in the Lake Taupo catchment.

With 240 geese having been transferred to and released at Wairoa, and another 40 released nearby, their regular monitoring by Wildlife Service staff ceased, although annual banding of moulting geese at Wairoa persisted for another 2 decades (*DoC Banding*). Subsequently this population was used to transfer geese to other North Island locations (*DoC Banding*). For example, in 1978 4 geese were transferred to Ohinewairua Station near Taihape and 6 geese to Ashurst and Rewa near Palmerston North, in 1982 8 geese were sent to Ruatiti near Raetihi, and in 1983 10 geese to Lake Rotoroa. However, not all transfers appear to have been recorded in the banding files (*e.g.* transfer of at least 20 birds to a farm dam near Ohakune in 1981 and ~30 birds to a dam at Karioi in 1982; MW, *pers. obs.*). The liberation at Karioi proved so successful that within 10 years 90 geese were caught and banded there (*DoC Banding*).

OTHER TRANSFERS TO NORTH ISLAND

Waterfowl permit holders

Under section 53 of the Wildlife Act 1953, authority could be obtained by private citizens or organisations to hold protected and game waterfowl in captivity. Where this authority was provided to acclimatisation societies they often arranged for individuals to exercise this authority on their behalf. Based on surviving files in National Archives, at least 4 North Island permit holders held Canada geese in their collections prior to the Wairoa transfers (Auckland Zoo, Hilldale game farm at Hamilton, and individuals at Hamilton, Rotorua and Wairoa; IAD 46/42, 46/9/1, 46/13/33). A pair was also held at the Wildlife Service's game farm at Ngongotaha. However, this list is undoubtedly incomplete (*e.g.* pairs were then held in captivity on behalf of Tauranga Acclimatisation Society; see below).

Following the initial transfer to Wairoa, the Wildlife Service received a flood of requests from North Island permit holders to add geese to their collections. While the Wairoa initiative was underway these were met spasmodically. For example, in 1970 4 pairs were sent to North Island permit holders, at Pauatahanui, Claudelands (Hamilton), Karori (Wellington) and to the municipal Virginia Lake at Whanganui (IAD 11/5/1). In 1971, another pair was sent to Virginia Lake and 2 pairs to a councillor of the Waimarino Acclimatisation Society near Ohakune (IAD 11/5/1). In 1973 2 pairs were supplied to New Plymouth City Council for release at Lake Mangamahoe, New Plymouth (IAD 11/5/1). However, once the Wairoa transfers ceased, the permit holder requests were addressed in full. In 1977 a total of 60 geese, sourced from Lake Forsyth, were sent to permit holders in Coromandel, Opunake, New Plymouth, Stratford, Tirau, Ngaruawahia, and Te Aroha *(DoC Banding)*; in 1978 62 geese, also from Lake Forsyth, were distributed to Levin, Matahiwi, Mt Bruce, Masterton, Paraparaumu, Upper Hutt, Waitakaruru (near Thames), and Tauranga; in 1979 almost 100 birds were despatched, mostly as pairs, to landowners in Northland (Ruawai), Bay of Plenty (Coromandel, Matamata, Matata, Tauranga, Te Aroha, Hauraki, Rotorua), Waikato (Tirau, Ngaruawahia, Te Awamutu), Wellington (Palmerston North, Johnsonville, Paraparaumu, Eastbourne, Trentham, Upper Hutt), and Dannevirke (*DoC Banding*, IAD 11/5/1).

Tauranga Acclimatisation Society

In 1969, the Society requested 100 Canada goose eggs from the Wildlife Service "to raise geese for release in its district" (IAD 11/5/1). Although no records were found to indicate any response to this request, Scott (1982) states "…. By 1969 the Canada geese at Turners at Katikati were breeding and 50 eggs were sent to Mr Cave (a pheasant breeder at Katikati) to help raise a breeding stock for release".

In 1972, 26 geese, sourced from Lake Forsyth, were transferred to "Pahoia, Tauranga" and labelled in the banding records as "experimental birds" (*DoC Banding*). Pahoia is a central tidal arm of the Tauranga Harbour and near Katikati. Scott (1982) stated that "…by 1974 Canada geese were breeding on ponds" and "….The birds have spread throughout the district with several small flocks being seen during the 1982 season".

Taranaki Acclimatisation Society

Twelve pairs, sourced from Lake Forsyth, were supplied to this Society in 1977 and subsequently distributed to landowners near Stratford, Opunake and New Plymouth (*DoC Banding*). Nine eggs were delivered from Christchurch in 1979 to a landowner near Hawera (IAD 11/5/1). In 1980, Taranaki Acclimatisation Society transferred 6 geese from Lake Mangamahoe to Hawera (*DoC Banding*), at which time about 80 geese were reported as distributed across 9 locations in Taranaki (IAD 11/5/1).

Wellington Acclimatisation Society and Ducks Unlimited (NZ) Inc.

WAS was an early recipient of geese from Canterbury to supply permit holders in its region; in 1973 it received 12 birds for distribution to unidentified recipients (IAD 11/5/1). By 1975, 8-10 geese were living at Lake Wairarapa where they were reported as forming small skeins flying about the lake's southern shoreline during the hunting season (WAS 1976). WAS provided 5 pairs to permit holders at Opiki, Johnsonville, Wellington, Waikanae and Paraparaumu in 1976 (*DoC Banding*), but the origin of these birds is unspecified. In 1979, 13 pairs from Lake Ellesmere were distributed to permit holders in the Wellington and Horowhenua areas by Wildlife Service staff (IAD 11/5/1, *DoC Banding*) and similarly 4-6 pairs in 2 subsequent years within Horowhenua, Taihape and southern Hawkes Bay.

WAS received, in 1980, a permit to "obtain alive, transfer to and propagate Canada geese at properties in the Wairarapa" that was without numerical or time limits but came with the proviso that the establishment of populations in a free flying state must have the prior agreement of the provincial executive of Federated Farmers (IAD 11/6/2). The Society obtained 30 geese directly from NCAS in 1982 (WAS 1982) and later reported (in October 1984; IAD 11/5/1) that it then had 204 pinioned geese distributed to 34 landowners, that about 200 free-living adults were in the hill country, and about 50 established and breeding at Lake Wairarapa. However, this report overlooked populations already established elsewhere, for WAS had earlier that year rounded up and banded 125 moulting and fledgling geese at a Mount Bruce property (*DoC Banding*).

Other WAS activities appear to have been undertaken in conjunction with Ducks' Unlimited (DU), a then recently-formed grouping of waterfowl permit holders and enthusiasts and which had observer status on the WAS Council. Whilst DU shared the initiative to establish Canada geese locally, it also sought to transfer pairs of geese to its members elsewhere in the North Island and it was able to do this by eventually obtaining transfer permits in its own name (IAD 11/5/1).

DU's activities commenced in 1977 with their receipt of 12 birds from Lake Forsyth, and then a further 25 and 28 birds in subsequent years, all under permits issued to WAS. The majority of birds were pinioned and placed at locations in the Homewood, Bideford and Mount Bruce regions of Wairarapa. In 1979 DU reported in its magazine *Flight* that ~120 pinioned birds were by then in the Wairarapa (*Flight* 3/79, #21, p.14) which, if correct, clearly suggests earlier and unrecorded releases in the district.

In 1980, receipt of 30 geese from Canterbury was reported (*Flight* 1/80, #23), and a similar number in 1981 (*Flight* 1/81, #27), the latter sourced from Isaac Wildlife Trust's Peacock Springs reserve at Christchurch. In 1982 DU received 76 birds (*Flight* 3/82, #33) mostly from Peacock Springs, and 23, 40, 42 and 50 birds in the subsequent years, respectively (*DoC Banding*, IAD 11/5/1). Not all were distributed in Wairarapa however. Some were sent to DU members elsewhere (*e.g.* Napier, Fielding, Otorohanga, Auckland) and some of the banded birds were later reported shot at Waikato locations (*DoC Banding*).

When, in 1987, DU ceased its transfer initiative it claimed that since 1976 it had transferred nearly 500 geese (*Flight* 1/87, #51), although only 286 were recorded in its name in the bird banding schedules. In February 1988, DU recorded it had transferred 50 geese from Lake Wairarapa to northern Manawatu (*Flight* 4/88, #58), including to Lake Heaton near Bulls (J. Cook, *pers. comm.*) where geese had persisted during 1931-1941 (see above).

Auckland Acclimatisation Society

In 1976 AAS sought from the Wildlife Service a supply of Canada goose eggs from goose populations then subjected to nest destruction in the Canterbury foothills. Instead it received a permit to obtain, hold, but not liberate, an unspecified number of moulting geese (IAD 11/5/1). In January 1977, AAS and Wildlife Service staff captured 200 moulting geese at Lake Pukaki (*DoC Banding*) and these were subsequently flown by the RNZAF from Timaru to Hamilton where they were held in captivity for a period, pinioned or wing-clipped,

and later disseminated to supportive farmers throughout King Country, Waikato and Thames. This took place against a background of vociferous opposition from Waikato Federated farmers and some of the hunter's clubs within the Society itself (Sullivan 1997; R. Strickland, *pers. comm*.; IAD 11/5/1). AAS obtained a further 17 pairs from Lake Ellesmere in 1979 (*DoC Banding*) and these too were given to supportive farmers. Disseminating flight-impaired pairs was not viewed as "liberation" and no constraints were placed on what their flighted progeny might do (AAS 1977).

Prior to the 1977 initiative, however, small numbers of Canada geese were already present and breeding in Waikato. For example, 11 geese, including one breeding pair, were observed on Lake Waikare in late 1976 (IAD 11/5/1). In 1981, 98 geese were counted at 3 locations around the lake (MW, *pers. obs*.), which might be confirmation of a rumoured release of some of the 1977 geese at the lake (J. Dyer, *pers. comm*.). Two aerial surveys of Canada geese in Waikato in 1986 indicated 460-524 were free-living with most concentrated around Lakes Waikare and Waahi, and lesser numbers at Lakes Rotongaro, Areare and Ohinewai. Nesting was confirmed on 2 peninsulas at Lake Waikare, along Lake Waahi's shoreline, and also at south Whangamarino and Horsham Downs (AAS 1986).

Post-1985 transfers

Apart from the disseminations recorded above, no records of any others post-dating 1985 have been found. However, this is not to suggest none occurred. Complaints from farmers about aggregations of moulting geese depredating pastures and fodder crops were often responded to by some acclimatisation societies and their successor Fish & Game Councils by trapping and either removing some of the birds, or by killing them (McDowall 1994; MW, *pers. obs*.). Birds removed would have been wing-clipped prior to release elsewhere.

FURTHER SOUTH ISLAND TRANSFERS

North Canterbury Acclimatisation Society

In the early 1970s, NCAS distributed pairs of Canada geese to farmers and society members on Banks Peninsula and across lowland Canterbury (*DoC Banding* , IAD 11/5/1) with the expectation that resulting progeny would disperse and provide hunting opportunities beyond the narrow flight lines followed by geese moving between their hill country breeding areas and their coastal moulting sites. Banding records are incomplete but indicate the distribution of approximately 60 birds in 1970, and approximately 40, 34, 12 and 52 in subsequent years, respectively (*DoC Banding*).

Southland Acclimatisation Society

In 1962 SAS captured 70 geese in the Hunter Valley and released them on Waituna Lagoon. Breeding was confirmed there in 1965 and a small population had established by 1968 (R.R. Sutton, *pers. comm*. to MJI).

A 1975 survey of geese in Southland recorded ~80 geese at Waituna Lagoon and ~120 in the Lake Luxmore area but noted "a variety of small flocks of tame or semi-tame Canada geese kept by farmers which in total would exceed the wild populations. The demand for stock birds continues" (SAS 1975). The Society sought to meet this demand and captured 66 geese in January 1977 at Swan Lake near Omarama (*DoC Banding*). These were pinioned and subsequently distributed to supportive farmers across the Southland plains to "hold" the birds on the Society's behalf. There was no requirement to pinion any subsequent offspring.

West Coast Acclimatisation Society

This Society initially sought geese for distribution throughout its region in 1976 (IAD 11/5/1). In January 1977 it received 68 birds captured at Lake Ellesmere and released them on 8 properties at Taramakau, Barrytown, Westport and Ahaura. The following year, 219 birds were captured at Lake Ellesmere, most were wing-clipped, and all subsequently released in small numbers at Lake Brunner, Lake Haupiri, Waipuna, Ahaura, Kokiri, Barrytown, Taramakau, Candlelight and Birchfield. In 1979 a further 127 birds captured at Lake Ellesmere were transferred and released after being wing-clipped, at Lake Brunner, Lake Haupiri, Kaimata Dam, New River, Blaketown lagoon, Cobden Dam, Lake Ryan, and Barrytown (*DoC Banding*). This initiative was repeated one further time in 1980 when another 88 birds were transferred from Lake Ellesmere and released at some of the previously-used release sites (*DoC Banding*).

DISCUSSION

The Canada goose has proved a most successful species, both in its native North American range and in a number of northern European countries into which it has been deliberately released, or has subsequently colonised (Long 1981; Boyd & Dickson 2005; Lever 2005). New Zealand is its only southern hemisphere population. Its ever-burgeoning populations within and beyond its native range are a consequence of pastoralism, predator reduction or absence, and a developed tolerance of human presence that has promoted its modern expansion in urban environments (Allan *et al.* 1995; Boyd & Dickson 2005).

In New Zealand, its initial 2 introductions, both of which failed, can be viewed in the context

of an active acclimatisation movement keen to establish familiar or exotic species not just for sport but for surrounding the immigrant populace with fauna and flora from "home'. The successful 1905 introduction however, had an economic imperative and was part of the THRD's initiative to make New Zealand a tourism destination. Importation of the geese was the work of its very active North American agent T. E. Donne, who also championed big game mammal introductions (Donne 1924). In the acclimatisation societies, to whom the geese were immediately given, the government had willing accomplices to foster its tourism intent even if their motives differed (McDowall 1994).

Characteristics of South and North Island establishment

The early dissemination of Canada geese as, mostly, 1-3 pairs released into remote and rarely-visited Canterbury foothill valleys proved remarkably successful at establishing feral populations. In effect, each release was a separate acclimatisation attempt. Strong and extended family bonds, and a tendency to natal philopatry (Boyd & Dickson 2005), are characteristics of Canada geese that undoubtedly made population establishment from so few propagules simpler and ultimately more successful than for the many smaller and dispersive ducks species that were tried (Thompson 1922). The likelihood that all birds released would have been wing-clipped or pinioned to prevent their immediate dispersal would also have increased the probability of establishment by limiting dispersal. Wairoa apart, the initial establishment of Canada geese at most North Island sites followed a similar pattern of expansion from just 1-2 pinioned or wing-clipped pairs but whereas the initial South Island releasees were left to fend for themselves, those in North Island were mostly supported by assiduous human protection afforded to the resultant family groupings and nascent flocks, at least initially (MW, *pers. obs.*).

South Island environments into which the geese were initially released, and ultimately thrived, were remarkably similar to wild parts of their native range – tall grassland with open aspect and with adjacent water bodies e.g. lakes, broad open riverbeds providing food and security. Furthermore, these environments underwent significant seasonal change with winter snow cover, in particular, being a stimulus for geese to move to more benign winter quarters. Indeed it was these very characteristics in common with the goose's native habitat that led to the selection of the early release sites (E. Stead in Delacour 1954).

Within Canterbury, a pattern of seasonal movement between foothill breeding sites and coastal moulting and over-wintering sites developed within about 10 years of initial releases (NCAS 1921 *et seq.*). The 2 principal post-breeding aggregations were at Lake Sumner and Lake Ellesmere where, as early as 1922, 3-400 geese were reported in summer at each and said to be "increasing rapidly" (NCAS 1922). However, Lake Ellesmere soon became the principal location at which most of the population overwintered, where potential foods included the lake's extensive *Ruppia spiralis* beds, lakeside pastures, and cereal cropping further afield. Historically, little or no breeding has occurred at Lake Ellesmere (MJI, *unpubl.*), the birds of breeding age migrating back to the foothills in spring leaving juveniles and sub-adults at the lake. This separation of non-breeding and breeding components of the population developed only to a limited extent elsewhere in the South Island. It can be seen as aiding the more rapid increase of Canada geese in Canterbury than anywhere else in South Island.

In North Island population expansion from Wairoa, and also in coastal Wairarapa and in Waikato, arose by radial spread from initial sites of release, and later supplemented by year-round occupation and breeding at some of the larger waters (*e.g.,* Lake Wairarapa, Lake Waikare). Benign pastoral environments, especially on fertile flats, were available year-round and no seasonally-induced patterns of movement have ever been reported. Even moulting aggregations occurred, initially, on water bodies at or close to their breeding sites. Only once populations expanded did larger moulting aggregations develop at larger farm dams or lakes, these sites also being surrounded by extensive pastoral flats. Breeding and non-breeding components of developing North Island populations tended to remain together year-round and extended family groups established (MW, *pers. obs.*).

The other profound difference was the socio-political climate under which goose introduction and disseminations took place in the 2 islands. The late 19th and early 20th centuries were times of acclimatisation fervour but interest in the geese soon waned as farmer complaints about pasture and supplementary crop damage becoming louder and widespread. A mere 5 years separated the initial hunting of the goose and it being stripped of protective gamebird status. As McDowall (1994) tells it, the history of the Canada goose's first 50 years in New Zealand was one of considerable tension between hunters and South Island high-country farmers. It is telling that most North Island, and several South Island Acclimatisation Societies, soon desisted from efforts to bring geese to their regions once this conflict emerged. In retrospect, therefore, it seems extraordinary that this tension was to be completely ignored by a government agency, the Wildlife Service, when it supported

and participated in, the introduction of the goose to where it had not yet colonised, the entire North Island.

The Wildlife Service's role in North Island initiatives

The Wildlife Service, the agency within the Internal Affairs Department responsible for administering wildlife matters nationally, also functioned as an acclimatisation society in 2 regions, in Rotorua - Taupo - East Coast region of North Island and the former Lakes District Acclimatisation Society region surrounding Queenstown and Wanaka in South Island. Its game management services, however, extended beyond these 2 regions to provide technical and operational support to all acclimatisation societies. Thus, its decision to introduce geese to its North Island region could be viewed as in keeping with its operational mandate to serve the gamebird enthusiasts of its region. However, the administrative apprehension with which the request from its Rotorua-based Wildlife Conservator for the goose's introduction was received and responded to (as evidenced from the archived IAD files examined) seems slight and decidedly uncritical. Furthermore, advice provided by Wildlife Service's officials to its Minister to justify its intention is remarkably sanguine about its ability to "control" the geese should they become a problem. Any caution that the history of South Island conflicts (McDowall 1994) might have induced is not apparent in the file records.

Once the Wairoa introduction commenced, the Wildlife Service allocated considerable resources to ensure its success. Regular monthly monitoring followed the slow establishment of the population, and led to annual requests for supplementary releases, not all of which were granted. Nevertheless, the ability, twice, to fly nearly 200 geese to North Island using RNZAF aircraft, hints of simpler times and close institutional connections.

It was concern first expressed in 1970 by the Rotorua-based Wildlife Conservator about the unprotected status of the Wairoa geese, and more fervently advocated when several of the geese were shot in 1971, that ultimately led to nationwide reinstatement of the goose as a gamebird, a status it was deprived of in 1931 (IAD 11/5/1, Spurr & Coleman 2005). After some delicate consultation with South Island Federated Farmers the change in status came into effect in May 1973 (*NZ Gazette 18 Jan. 1973*) but had with it an agreed 3 year moratorium on further North Island liberations and a subsequent review. A compromise outcome of the eventual review introduced a requirement for all transferred birds to be rendered flightless, and no liberations undertaken without prior consultation with, and agreement from, regional executives of Federated Farmers. Thereafter, all permits issued by Wildlife Service for the transfer of geese to North Island stated these requirements. However, the goose was "out of the bag" and the unenforceable requirements were mostly ignored. For the initial sake of protecting a single introduction attempt, Canada geese once again became a gamebird and the exclusive responsibility of acclimatisation societies and the Wildlife Service nationwide, and a major management problem returned to them. This was not altered until the unprotected status was reverted to in 2011 (*NZ Gazette 12 May 2011*).

Following the Wairoa initiative, the Wildlife Service was no longer able to bat away applications by other North Island acclimatisation societies, interest groups, agencies or individuals on account of the potential conflict between geese and agriculture. Acclimatisation fervour resurfaced. Widespread supply of pairs to interested landowners was matched by similar interest from at least 5 North Island acclimatisation societies (Waimarino, Taranaki, Tauranga, Wellington, Auckland), all of whom distributed pairs to supportive landowners who, technically, looked after the birds on their behalf. The initiative by Ducks Unlimited was supported by the WAS but DU, nevertheless, transferred and distributed the geese in its name, including to many of its members outside of the Wellington acclimatisation district. In South Island, Southland and West Coast Acclimatisation Societies sought birds for transfer. Effectively, the Wildlife Service was obliged to respond positively to every request for geese that met the permitting requirements under the Wildlife Act 1953 and, on this controversial matter, was unable to act as the impartial wildlife administrator it might have been expected to be beyond advising of the permit conditions. It also turned a blind eye when some acclimatisation societies, intent on establishing the goose as game in their districts, deliberately chose not to consult with Federated Farmers and distributed wing-clipped geese to anyone willing to "hold" them (IAD 11/5/1). The Canada goose thereafter became a nationally-distributed species (Robertson *et al.* 2007).

Population establishment

The introductions of exotic birds into New Zealand under the agency of acclimatisation societies has provided a rich data source for scholars interested in population establishment by invasion, deliberate liberation, or from small numbers of propagules (e.g. Veltman *et al.* 1996; Blackburn & Duncan 2001; Cassey *et al.* 2004; Moulton *et al.* 2011). Listings of numbers introduced e.g., by Thomson (1922) have often been taken as the number from which

the resulting national population was derived, rather overlooking the role of captive propagation, repetitive releases, translocations, and the multiplicity of population establishment attempts which lie behind some of the successful species introductions into New Zealand (see also Pipek *et al.* 2015).

Most early attempts by acclimatisation societies to establish game birds in New Zealand initially proceeded via captive propagation in order to increase numbers for release (Thomson 1922). More recent attempts to establish red-legged partridge (*Alectoris rufa*) and grey partridge (*Perdix perdix*) have followed the same route (McDowall 1994) and the mallard's introduction saw at least 30,000 bred and released (Dyer & Williams 2010).

It was birds from the 1905 importation that established Canada geese in New Zealand, and the captive propagation route to their establishment was essential. All of the 1905 geese failed to breed in their first 2 years of captivity in New Zealand, indicating that they were undoubtedly received as young birds. This being so, there is a strong possibility that they were also products of just a few family broods, given that was how many game farm dealers of the time operated (I. Gereg *pers. comm*. to MW, 2010), and the genetic pool was much smaller than that suggested from the number (50) received. Had these birds all been released into the wild immediately upon arrival, dispersals and deaths during the 2 years preceding any initial breeding attempts may have precluded the goose's establishment in many, perhaps all, places. It was the repeated releases of birds of breeding age, together with some younger birds, all most-likely wing clipped, and their subsequent linking up with other incipient releases that ultimately ensured the success of the goose's establishment in Canterbury.

Canada geese from the 1905 importation had, by 1920, established successful populations at a minimum of 5 locations (*e.g.,* at Lakes Manapouri and Te Anau in Southland, in the Hunter Valley at the head of Lake Hawea, and at Lakes Sumner and Guyon in eastern Canterbury). All received supplementary releases (Appendix 1). Those kept at Glenmark in Waipara would also have established locally had they not been used to supplement and fuel releases elsewhere. The Manapouri population may have arisen from just 7 released, Te Anau from 15, Lake Hawea from 12, Lake Sumner from 16 and Lake Guyon from 13. Unfortunately, the records of distribution in Canterbury are not matched by records of success of all releases and the outcome of the McKenzie country release (of 10 birds) by South Canterbury Acclimatisation Society is also unrecorded. Nevertheless, multiple releases at multiple sites, even of few propagules, ensured the establishment of Canada geese in South Island. Against this background the multiple efforts made to establish Canada geese at Wairoa, and elsewhere in North Island, almost seem excessive.

ACKNOWLEDGEMENTS

The initial part of this paper, a history of early introduction and dissemination of Canada geese in South Island, was drafted by Michael Imber in 1967 when a new appointee to the Wildlife Branch, Department of Internal Affairs. His response to what he perceived as unreasonable editorial criticism of the script by his then controlling officer was to "deposit" the manuscript in a deep drawer, never again for it to see light in his lifetime. MW has contributed further editorial input to that draft, rechecked all initial references, and added the account of subsequent goose releases into North Island and elsewhere in South Island. By this means, Michael's first professional script emerges as his last publication.

MW thanks his many informants - Jim Campbell, Neil Hayes, Diane Pritt, Ian Hogarth, Rowan Strickland, Peter Taylor, Ian Buchanan, Steve McGill, Bryan Williams, John Dyer - and also his many former colleagues who left insightful comments on old files. Mala Nesaratnam kindly provided access to banding schedules in the Department of Conservation Bird Banding Office, Ian Gereg of the Livingston Ripley Waterfowl Conservancy, Litchfield, Connecticut, USA, provided comments about historic game farm practices in USA and Jim Briskie added some nice editorial touches; I thank them all.

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Appendix 1. Liberations of Canada geese in South Island by acclimatisation societies 1905 – 1927.

North Canterbury Acclimatisation Society
1907, Glenmark Station, 6; 1910, Lake Sumner 10; 1910-11, Mt White Station 3; 1911-12, Lake Sumner 6; 1912-13, Mt Thomas Station 2, Mt White Station 4, Little River 2; 1913-14, Happy Valley 2, Lake Coleridge 4, Lake Blackwater 4, Lake Guyon 2, Halswell 2; 1914-15, Little River 1, Lake Guyon 6, Brackenfield 2; 1915-16, Glynn-Wye 4, Lake Blackwater 3; 1916-17, Lake Guyon 5; 1917-18, Glynn-Wye 8, Parnassus 4; 1918-19, Motukurara 2, Happy Valley 3, unknown 2; 1919-20, Lake Coleridge 7; 1920, Omihi Sanctuary 2, Motukarara 2, Tai Tapu 2; 1921, Gough's Bay 2, Lake Ellesmere 2, Lake Forsyth 6, Coalgate 6, Happy valley 2, Avon River 2; 1921-22, Loburn Domain 2, Omihi 2; 1922-23, Lake Coleridge 4. All 1920 releases, Lake Ellesmere in 1921 and Lake Coleridge in 1922-23 were of the 1920 imports or their progeny, all other releases were derived from the 1905 importation.

Ashburton Acclimatisation Society
1921, Lake Heron 2; 1924, Maori Lakes 10. Descendants of 1905 importation.

South Canterbury Acclimatisation Society
1907, "McKenzie country lakes" 10. Original 1905 imports.
Lakes District Acclimatisation Society
1922, Queenstown unknown. Descendants of 1905 importation.

Southland Acclimatisation Society
1907, Lake Manapouri 4; 1908-09, Lake Manapouri 3; 1917-18, Lake Te Anau 8; 1918-19, Lake Te Anau 7; 1920, Lake Ada 4; 1920-21, Lake Te Anau unknown; 1922, Mossburn 4, Lynwood Station unknown. All descendants of 1905 importation.

Otago Acclimatisation Society
1911, Waiwera 5; 1914-15, Waiwera 2; 1915, Lake Hawea 12; 1917, Lake Wanaka 2; 1918, Lake Hawea 4; 1922, Lake Hawea 8; 1927, Lake Waihola 9, Mahinerangi Dam 8. All descendents of 1905 importation except for 2 at Lake Hawea 1922 being from 1920 importation, and the 1927 releases comprised birds descended from both importations.