

History and causes of the extirpation of the Providence petrel (*Pterodroma solandri*) on Norfolk Island

DAVID G. MEDWAY

25A Norman Street, New Plymouth, New Zealand
dmedway@xtra.co.nz

Abstract The population of Providence petrels (*Pterodroma solandri*) that nested on Norfolk Island at the time of 1st European settlement of that island in 1788 was probably > 1 million pairs. Available evidence indicates that Europeans harvested many more Providence petrels in the years immediately after settlement than previously believed. About 1,000,000 Providence petrels, adults and young, were harvested in the 4 breeding seasons from 1790 to 1793 alone. Despite these enormous losses, many Providence petrels were apparently still nesting on Norfolk Island in 1795 when they are last mentioned in documents from the island. However, any breeding population that may have survived there until 1814 when Norfolk Island was abandoned temporarily was probably exterminated by the combined activities of introduced cats and pigs which had become very numerous by the time the island was re-occupied in 1825.

Medway, D.G. 2002. History and causes of the extirpation of the Providence petrel (*Pterodroma solandri*) on Norfolk Island. *Notornis* 49(4): 246-258.

Keywords Norfolk Island; Providence petrel; *Pterodroma solandri*; human harvesting; mammalian predation; extirpation

INTRODUCTION

Norfolk Island (29° 02'S, 167° 57'E; 3455 ha), an Australian external territory, is a sub-tropical island in the south-west Pacific. The highest points are Mt Bates (321 m) and Mt Pitt (320 m). 460 ha surrounding Mt Pitt now comprises part of Norfolk Island National Park. Norfolk Island has a permanent human population of c. 2000. Europeans first set foot on Norfolk Island when 2 boatloads from James Cook's HMS *Resolution* landed at Duncombe Bay during the afternoon of 10 October 1774. Wales (in Beaglehole 1961: 869) recorded that the shore party saw no inhabitants, nor any evidence for former occupation. However, there is now ample evidence of former habitation of Norfolk Island by Polynesians (Anderson & White 2001), but the available evidence does not support any long-term occupation of the island by those people.

On 6 March 1788, Philip Gidley King and 22 others started the European settlement of Norfolk Island at the present Kingston. On 4 October 1788, King (1786-1790: 236-237) climbed Mt Pitt and discovered the site of a large breeding colony of petrels. He observed that "within a mile of the summit of Mount Pitt the ground which is a red earth is full of very large holes & at every step I fell

in to a hole which was concealed by the birds making their burrows slant-wise". From the summit, King had a view of the whole island and part of its coast "which exhibited a striking scene of a luxuriant natural fertility the whole Island being one continued thick wood". The upper portions of the valleys, and the higher parts of the hills, were still forested in 1835 (Backhouse 1843: 251). For many years after 1st European settlement, all the summit area of Norfolk Island was known only as Mt Pitt. It is called Mt Pitt here.

When King (1788-1799: 43-45) wrote to Governor Phillip at Port Jackson on 30 June 1789, he enclosed a general account of the state of the settlement on Norfolk Island. It was no doubt from this account that Collins (1798-1802: I: 77; in Fletcher 1975: I: 63), Judge Advocate and Secretary of the colony at New South Wales, learned that "A species of bird also had been met with which burrowed in the ground, and had been seen in such numbers about the summit of Mount Pitt, the highest hill on the island, that they were contemplated as a resource in any future season of distress, should they be found to visit the island at stated periods, and to deposit their eggs on it". Access to the breeding colony was made much easier after October 1789 when a road was cut from the settlement to Mt Pitt, and from there to Anson Bay (King in Bach 1968: 250).

Latham (in Phillip 1789: 161) described and illustrated his "Norfolk Island Petrel" from a

specimen that must have been among the "several entirely new things" which Latham told Pennant on 16 August 1789 he had "lately fallen in with from *New Holland*" (Latham 1789). Latham said that his bird inhabited Norfolk Island where it "burrows in the sand like a rabbit, lying hid in the holes throughout the day, and coming out of evenings in quest of food." Latham's description of the "Norfolk Island Petrel" is better than that of Gould (1844) based on a specimen collected by Gould himself at sea in Bass Strait in 1839. Gould applied the presently-accepted name *Procellaria* (now *Pterodroma*) *solandri*. Latham's description formed the basis of *Procellaria phillipii* of Gray (1862). Murphy & Pennoyer (1952) considered that Latham's "Norfolk Island Petrel", and therefore Gray's *Procellaria phillipii*, was "undoubtedly" *Pterodroma solandri* (Gould, 1844).

The specimen on which Latham based his description must have arrived on board HMS *Golden Grove* which sailed for England from Port Jackson on 19 November 1788 (Phillip 1789: 142; Collins in Fletcher 1975: 38). The *Golden Grove* had been at Norfolk Island from 13-29 October 1788, and reached Port Jackson on 10 November 1788 (Nobbs 1988: 212). The vessel was, therefore, at the island very shortly after King visited Mt Pitt on 4 October 1788. October is very late for Providence petrels to be ashore, but Bell (Hindwood 1940) collected several adult Providence petrels in October 1913 presumably from, or near, their burrows on Lord Howe Island. It is possible, therefore, that King collected a specimen of Providence petrel at Mt Pitt on 4 October 1788, and that it was this specimen which Latham described as the "Norfolk Island Petrel". The fate of Latham's specimen is not known, but it has the distinction of probably being the 1st of c. 1,000,000 of its kind to be killed by humans on Norfolk Island within the next few years.

The population of Providence petrels nesting on Norfolk Island in 1788 was very large. Available evidence confirms that it was rapidly and significantly reduced by human harvesting for food. Whitley (1934) and, to a much lesser extent, Iredale (1929), presented some of that evidence, but no complete account of the human harvesting of Providence petrels for food on Norfolk Island has been published. The evidence, some of the most important of which has not been considered or published before now, indicates that many more Providence petrels were killed by Europeans on Norfolk Island than has previously been believed. It was a biological disaster similar to the "spoyle and havock" of the Bermuda petrel or cahow (*Pterodroma cahow*) which, on the Bermudas, was "killed and scared away very improvidently by fire, diggeinge, stoneinge, and all kinds of murtheringes" (Verrill 1902; Beebe 1935).

Together, the evidence from Norfolk Island provides a record which, as Whitley (1934) said, is unique in the annals of ornithology. It is the most complete record of the nature and extent of human harvesting for food, in this instance by Europeans, of an insular breeding population of petrel. In addition, the evidence relating to the Providence petrel on Norfolk Island provides an insight into the probable size of the breeding populations of at least some petrels on many islands of the South Pacific before human intervention. It also indicates how rapidly even very large petrel populations could be decimated by humans. The decimation may not have happened as rapidly everywhere as it did on Norfolk Island, but large petrel populations on some islands may have been extirpated within a few decades of human settlement.

The records of 1790

Collins (1798-1802: I: 96; in Fletcher 1975:I: 78) observed how Governor Phillip, in February 1790, because of the state of the settlement at Port Jackson, announced his determination to send a large body of convicts, together with 2 companies of marines, to Norfolk Island. Phillip expected immediate advantages from this measure, including "the assistance that was occasionally obtained from the birds which settled on Mount Pitt".

HMS *Supply*, accompanied by HMS *Sirius*, arrived at Norfolk Island on 13 March 1790. The *Sirius* was wrecked there on 19 March 1790, when the human population on the island was 149 (Nobbs 1988: 5). By the time the *Supply* left for Port Jackson on 24 March 1790, the population had increased to 507 (Bradley 1969: 220), at which level it remained until HMS *Justinian* and HMS *Surprize* arrived on 7 August 1790. King left the island on the *Supply* and did not return until 4 November 1791.

Lieutenant William Bradley from the *Sirius* remained on Norfolk Island until 11 February 1791. Sometime before 20 April 1790, Bradley (1969: 199-200) gave the first detailed account of the Mt Pitt birds and the part they played in feeding the humans on the island:

"Parties were allowed to go for Birds, for the Seamen, Marines & Convicts twice a week each & limited not to bring more than a proportion of 3 for each man. These Birds are very numerous and burrow in the ground about the Hills particularly about Mount Pitt which is the highest land in the Island; It was the practice before we came to dig them out of their holes in the day time, but the people now take them as they settle in the evening & early part of the night & were they not restricted they could bring away almost any number.... It feeds at Sea & although such incredible numbers settle on the Hills to get into their Holes at the approach of night, a great number has been taken in the day time by being dug out with grubbing hoes or brought out by tarrier dogs, they lay but one Egg which is larger than that of the Common

Hens, they are said to be in & about this Island from March to August, when the young are ready to fly they all go off together these Birds are a great resource to us, they enable us to go on with the Cultivation of the land for the Crops which we must soon depend on if we are not relieved & which I fear will not keep us without feeling the pangs of extreme hunger”.

Nagle (in Dann 1988:124-125), a sailor who had also been on the *Sirius* and remained on Norfolk Island until February 1791, later wrote at some length about these birds and how the people on the island went about obtaining them:

“The mount pitters were about the size of a pigeon but fuller in the body, with a hawk bill and webbed footed. They breed in the vallies at Mount Pit, the ground being entirely undermined by them. Every evening, over head like the chimney birds, with a great chattering, as soon as dusk, they drop to the ground and look for their holes. These birds, seemingly as God would have it, was the saving of us, as it was the chief living we had while they lasted, beside the wild mountain cabbage tree that grew on the island. Our method of living while we could forage was thus: we would first get pine nuts, which was plentiful, and split the pine for torches, one small one to seek the birds with when on the Mount, and one large one to bring us home with. We would go out in the afternoon and reach the Mount by dusk, I suppose about 4 or 5 miles up hills and down steep vallies, having the trees marked all the way. If we once got out of the foot path and the marks of the trees on our return, we would have to remain all night. When we arrived at the Mount, we would knock up a fire and wait till the birds begin to fall. There would be sailors, soldiers, and convicts, to the amount of 50 or 60 of a night. By calculation there would not be less than 12 or 14 hundred destroyed of a night. When they begin to drop, we would go down into the valleys, and the more we hollowed “ho, ho, ho,” the birds would come running, crying out “ke, ke, ke,” thinking it was their mate or their young, and by that means every man would take home what he thought sufficient in his knapsack, which would be from 20 to 30 at least if not more. When completed, every man would light his torch and set out homeward, all in a line, as the path was small, and in this season of the year was heavy rains. By the time we got to the town, would be about 11 or 12 o’clock at night, all wet and muddy. Coming down the hill, it was equal to a lumination, 40 or 50 torches all in rotation, one after the other, until we descended to the foot of the hill into the town and disappeared”.

Hindwood (1940) and Warham (1988) reported that people can lure Providence petrels nesting on Lord Howe Island to the ground by calling, and that birds on the ground will approach the caller and even climb on to them. A photograph taken on Lord Howe Island in 1913 or 1914 (Hindwood 1940; Hutton 1991: 66), shows Providence petrels on Roy Bell, with 1 even standing on his head.

On 20 April 1790, it was ordered that a specified amount of salt provisions was to be deducted from each person’s weekly allowance, and parties were permitted to get Mt Pitt birds every day to make up the deficiency (Bradley 1969: 201). Clark (in Fidlon & Ryan 1981: 128) also recorded that this stopping of meat was “on Account of the Privilege being granted to kill Birds the Restriction on birds being taking off and was impossible to prevent the Sailors and convicts from killing the Birds when the[y] pleased in the room of the Said half pound of meat every body will have a great abundance of Birds.” Clark (in Fidlon & Ryan 1981: 128) recorded that, 3 days earlier, patrols had found a convict out of his hut contrary to orders and in possession of a haversack containing 68 Mt Pitt birds.

Lieutenant Ralph Clark of the Royal Marines had also arrived at Norfolk Island on the *Sirius* on 13 March 1790 and remained on the island after that vessel was wrecked, leaving on 22 November 1791. On Norfolk Island, Lt Clark was appointed Quartermaster-General and Keeper of the Public Stores. In this capacity he recorded “as nearly as I have been able the number of Mount Pit Birds that were brought into Camp” by the marines, sailors, and convicts in 1790 (Clark in Fidlon & Ryan 1981: 293). Clark visited Mt Pitt at least 4 times, on the evenings of 2 June 1790, 11 April 1791, 19 May 1791, and 20 May 1791 (Clark in Fidlon & Ryan 1981: 139, 193, 200).

The Mt Pitt birds were obviously extremely abundant at this time. On 2 May 1790, Clark (in Fidlon & Ryan 1981: 131) recorded that “the Birds at Mount Pit last night were So thick that the[y] came down a little after Sun Set like a Shower of Hail — my Servant was there and killed himself 193 Birds — it is a great Blessing that we have these Birds in Such abundance”. On the same date, Bradley (1969: 202) noted “the Birds taken at Mount Pitt being found very sufficient to supply every person, orders were given not to shoot any Birds on the Island during the continuance of the Mount Pitt Birds”. This must be the “General order given out Respecting the Birds” to which Clark (in Fidlon & Ryan 1981: 130) referred on 1 May 1790.

On 14 May 1790, Bradley (1969: 202-203) recorded a further reduction in rations which took effect the next day, and noted that “The parties for Birds were now increas’d & allowed to bring in as many as they thought proper there not yet appearing to be the smallest decrease in their numbers”.

Clark (in Fidlon & Ryan: 135) reported on 19 May 1790 that “a party intended to have gone to Mount Pit to day Consisting of Captains Hunter and Johnstone Lieuts Creswell and Kellow to Splend the day there and to have taking 16 men belonging to the Sirius Ships Company to have Cut

down trees on Mount Pit which Major Ross very properly I think put a Stop too on account of there intending to have cut down trees there as he Said the greatest part of our present Subsistence we get from there from the Birds that Resort to that place and as the Cutting the trees down there might be the means of making them leave the Island much Sooner than the[y] otherwise would therfore desird that no tree there might be cut down without his permission on which the above party put off there Excursion [to] the mount."

Two days later (21 May 1790), Clark (in Fidlon & Ryan: 136) recorded that "a Complaint was made to Major Ross to day that Some of the Convicts [go] to Mount Pit only for the Sake of the Birds Eggs the[y] Catch the birds and them that have no Eggs the[y] let goe again and them that are with Egg the[y] Cut the Egg out of them and then the[y] let the Poor Bird fly again which is one of the Cruelles things which I think I Ever herd — I hope that Some of them will be Caught at this Cruel work for the Sake of making ane example of them."

On 22 May 1790, Bradley (1969: 203) noted "A practice being made known which several of the people going for Birds had, of destroying them for the sake of the Egg after they had taken as many birds as they wanted to carry away & leave the Birds laying about so as to become a nuisance round the hills, the parties were not allowed to go out till 3 in the afternoon & to return by 10 at night, these Birds were now so plenty that the people could get as many as they wanted & the practice of destroying & throwing away the Bird having been put a stop to, they seldom brought in any but those with the Egg in them, letting the others go again after taking them: Our people generally return about 8 o'clock loaded, they have between 3 & 4 miles to go for them to Mount Pitt & the hills about it". On the same day an order was issued "Respecting the people going to mount Pit and taking with them Dogs, tools or Implements and distroying the Birds there Cruely and Wantenly" (Clark in Fidlon & Ryan 1981: 136).

Captain John Hunter of the *Sirius*, was on Norfolk Island from 13 March 1790 until 11 February 1791. During this time he visited Mt Pitt at least once, on 24 April 1790 (Clark in Fidlon & Ryan 1981: 129). Hunter (1793: 181-183; in Bach 1968: 125) wrote at some length about the Mt Pitt birds and the resource they provided:

"In the month of April we found that Mount Pitt, which is the highest ground on the island, was, during the night, crowded with birds. This hill is as full of holes as any rabbit-warren; in these holes at this season these birds burrow and make their nests, and as they are an aquatic bird, they are, during the day-time, frequently at sea in search of food; as soon as it is dark, they hover in vast flocks over the ground where their nests are.

Our people, (I mean seamen, marines, and convicts) who are sent out in parties to provide birds for the general benefit, arrive upon the ground soon after dusk, where they light small fires, which attract the attention of the birds, and they drop down out of the air as fast as the people can take them up and kill them: when they are upon the ground, the length of their wings prevents their becoming able to rise, and until they can ascend an eminence, they are unable to recover the use of their wings; for this purpose, nature has provided them with a strong, sharp, and hooked bill, and in their heel a sharp spur, with the assistance of which, and the strength of their bill, they have been seen to climb the stalk of a tree sufficiently high to throw themselves upon the wing. This bird, when deprived of its feathers, is about the size of a pigeon, but when clothed, is considerably larger, for their feathers are exceedingly thick; they are web-footed, and of a rusty-black colour; they make their holes upon the hills for breeding their young in; they lay but one egg, and that is full as large as a duck's egg. They were, at the end of May, as plentiful as if none had been caught, although for two months before there had not been less taken than from two to three thousand birds every night; most of the females taken in May were with egg, which really fills the whole cavity of the body, and is so heavy that I think it must fatigue the bird much in flying. This *bird of Providence*, which I may with great propriety call it, appeared to me to resemble that sea bird in England, called the Puffin: they had a strong fishy taste, but our keen appetites relished them very well; the eggs were excellent. We were highly indebted to Providence for this vast resource; but as these singular advantages could only be for a season, we reflected, with pain, that they must have an end, and that in all probability this would be the case before we got a relief."

Clarke (in Fidlon & Ryan 1981: 139) went to Mt Pitt on 2 June 1790 to "See them Catch the Birds — we got to the mount a little befor Sun Set — at Sun Set the Air was as thick with them as knats are in a fine Summers Evening in England — I Caught above two hundred of them but as I only wanted them that had Eggs I let them all goe Except 27 who were with Eggs — we Staid about one hour and a half for to get these Birds after which we lighted our Torches and and Came home about $\frac{1}{2}$ after Eight."

Clarke resided at Charlotte Field (later Queenborough) from 27 June 1790 until 17 July 1790 where he supervised the clearing of ground and the erection of huts on c. 40 ha of treeless ground, covered only by vines, which had been discovered shortly before. He noted (in Fidlon & Ryan 1981: 144) that the 1st Mt Pitt birds killed by people from there were 451 caught on the night of 27 June 1790. On 19 July 1790, Clark recorded that, while he had been at Charlotte Field, no account had been kept of the number of birds which the people at Kingston had brought in. Clark regretted

this lack of records, and that he would not be able to get an account because the people no longer reported to the guard house as they had previously done (Clark in Fidlon & Ryan 1981: 148).

Bradley (1969: 205) recorded on 29 June 1790 that "The Birds at Mount Pitt are yet taken in the usual quantities without appearing to have diminished in their numbers, which has already far surpass'd everything we can have an Idea of, but the Divine Hand of Providence". Bradley (1969: 206) also recorded that on 19 July 1790 the reduced state of the provisions store made it absolutely necessary that the issuing of salt provisions, however small, should be stopped while any birds were to be had. Accordingly, on 19 July 1790 a Proclamation was issued by the Lieutenant-Governor and Council (in Britton 1892: 364) to the effect that so long as there were enough birds at Mt Pitt, and because the fishing season was approaching, no more salt beef or pork would be issued. Hunter (1793: 185; in Bach 1968: 127) also recorded that, because no more than 10 or 12 days salt provisions were left "and as birds, though growing scarce, were yet still to be had", it was necessary to stop the salted provisions when there were birds to be caught.

By 3 August 1790, "the Birds now became scarce & the young being nearly ready to fly are about to leave the Island" (Bradley 1969: 206). Most fortuitously, the *Justinian* and *Surprize*, with provisions for the relief of the island and c. 200 convicts, arrived at Norfolk Island on 7 August 1790. Hunter (1793: 189-190; in Bach 1968: 130) considered "The arrival of supplies for our relief at this very critical juncture, was truly comfortable, and a strong instance of the kindness of Divine Providence to us: for our great and indeed only resource began to fail us very fast, - the Mount Pitt birds, on which it may justly be said we had for a very considerable time principally lived, were now very scarce; many people who went out to catch them, were frequently, after remaining a whole night on the ground, where they were, during the plentiful season, so very numerous, contented to bring in six or eight birds, and were sometimes unable to find one."

On 24 August 1790, Clark (in Fidlon & Ryan 1981: 282) wrote to his friend Beveridge and sent him a Mt Pitt bird saying "I have taken the Liberty to Send you....a mount Pit Bird (not on Account of the Beauty of its Plumage) of which it has non but on Account of its being one of the Birds that has preserved the lives of five hundred and odd persons for these Several months past." In a letter of 26 August 1790, Clark (in Fidlon & Ryan 1981: 284) advised his friend Kempster that "The Mount Pit Birds have been the greatest friends that ever any of us Know for I may with truth Say that the[y] have Saved all our lives — the greatest part of us

Should have been long agoe in our graves if it had not been for these birds — Since April last there has been no less one night with a nother than between four and five Thousand Killed — I Shall Return my thanks for them the longes day I have to live — the[y] are all nearly gone the[y] Just last-ed untill the arrival of the Ships". Several months later, in a letter of 11 February 1791 to Captain Campbell of the Marines at Port Jackson, Clark (in Fidlon & Ryan 1981: 292-293) referred again to the great blessing the Mt Pitt birds had been in 1790:

"if it had not been for the great abundance of Birds which resorted to Mount Pit about Sun Set the greatest part of use would have been in our Graves before the Arrival of the above Ships - - you will hardly believe me when I inform you that from the latter end of April untill the Middle of July no Smaller a number on a very moderate Computation than five thousand was Killed a night - - I have often know Seven and Eight thousand, particularly on the Sunday Evenings brought into Camp by the Sailors, Marines and Convicts (male and female) which number was caught in a few hours - - there never was a Bird Caught untill one hour after Sun Set and every body was obliged to leave [the] mount before ten o Clock - - they never came in from Sea (or where ever the[y] come from for that I doe not no) untill about Sun Set when the[y] generally hoverd about the mount for ane hour before the[y] came down which was a[s] thick as a Shour of hail - - this Account will make the Old Storry of Moses being in the Wilderness be a little more believed Respecting the Shour of quails - - every body heer ous there existance to the Mount Pit Birds."

In August 1790, an officer on the *Sirius* also wrote at length (Anon. in Britton 1892: 397-402) about the Mt Pitt birds:

"No doubt you will wonder when I tell you that the same Tasks were performed on these very reduced Rations as when on full allowance; but this was owing to a Divine and providential resource from and about Mount Pitt, which place supplied the whole Settlement with Birds from the latter end of March till the middle of August. The Bird is a specie of the Petrel, which comes to this Island about the beginning of March, when they burrow under Ground for laying. They were at first taken out of their Holes in the Day, but soon after we found Night to be the Time for slaughter, as our whole Horizon (in the Woods) was then covered with them, and there was no walking without kicking them before you. The Mould being soft and loose on the Mount, they found no difficulty in scratching their Way. Their holes are about 3 feet long, and on a gradual descent. About the middle of April there were vast numbers of Eggs taken, both from the Holes and Birds, which, if possible, were now thicker than ever. It would be impossible for me to give an account of either the Quantity of Birds or Eggs. I can only say that while the Birds laid them (which was from the middle of May to the beginning of June) there was no scarci-

ty in any part of the Town, and were bartered at a very cheap rate. On the 19th of April the Birds became so very plentiful (and our Store so lean) the Governor issued out a conditional Order that if every person would give up half a pound of his salt Meat a Week they might kill and bring home as many Birds from the Mount as they pleased (as long as it did not interfere with their Work), being before this restricted by allowing only so many Persons to go out at a time This being agreed to, instantly took place, and the slaughter and nightly havoc is beyond Description. It is worthy of Remark that these Birds were coming in when our sad and melancholy Catastrophe happened, and were very scarce at the arrival of the relief. Nothing could have been better timed, and, though rather paradoxical, everything happened as favourably as could be: the Birds as above; the Ship being cast away in the only spot where there would be the least Chance of saving either our People or the Provisions, all our Men keeping health to the last, and our Crops in a most flourishing State at the relief's arrival. As I have enclosed a drawing of the Bird, I shall give no further description. We had, besides our Friends, the Pittites (the Vulgar Appellation), another very capital resource if the weather would have permitted fishing, which in this Season of the Year is so very unsettled that on an average we have had but 3 fine Days out of 15 fit for fishing. Therefore, our reliance on this very precarious resource was of little note when compared to the Birds, which were to be had in any number for going for. They are very fine eating, exceeding fat and firm, and, I think (though no Connoisseur), as good as any I ever eat."

When the *Supply* arrived at Port Jackson on 26 February 1791, bringing with it Hunter and most of the officers and crew of the *Sirius*, Collins (1798-1802: I: 150-151; in Fletcher 1975: I: 124-125) recorded:

"We now found that our apprehensions of the distressed situation of that settlement until it was relieved were well founded. The supply of provisions which was dispatched in the *Justinian* and *Surprise* reached them at a critical point of time, there being in store on the 7th of August, when they appeared off the island, provisions but for a few days at the ration then issued Their salt provisions were so nearly expended, that while a bird or a fish could be procured no salt meat was issued What their situation might have been but for the providential supply of birds which they met with, it was impossible to say; to themselves it was too distressing to be contemplated. On Mount Pitt they were fortunate enough to obtain, in an abundance almost incredible, a species of aquatic birds, answering the description of that known by the name of the Puffin. These birds came in from the sea every evening, in clouds literally darkening the air, and, descending on Mount Pitt, deposited their eggs in deep holes made by themselves in the ground, generally quitting them in the morning, and returning to seek their subsistence in the sea. From two to three thousand of these birds were

often taken in a night. Their seeking their food in the ocean left no doubt of their own flesh partaking of the quality of that upon which they fed; but to people circumstanced as were the inhabitants on Norfolk Island, this lessened not their importance; and while any Mount Pitt birds (such being the name given them) were to be had, they were eagerly sought. The knots of the pine tree, split and made into small bundles, afforded the miserable occupiers of a small speck in the ocean sufficient light to guide them through the woods, in search of what was to serve them for their next day's meal".

On 1 March 1791, a few days after the arrival of the *Supply* at Port Jackson, Governor Phillip (in Watson 1914: 227) reported to Lord Grenville that "from the 15th of May until the beginning of August, when the ships sent from hence arrived there with provisions, the weekly ration had been reduced ... the immense quantity of birds (puffins) which resort to that island in April and continue there until the end of July or the beginning of August having supplied them with animal food. These birds burrow in the ground about Mount Pitt, where they deposit their eggs, and are in such numbers that three and four thousand birds have been sometimes killed in one night".

The records of 1791

There were 627 people on Norfolk Island on 11 February 1791 (Bradley 1969: 222). When he left Norfolk Island that month, Bradley (1969: 221-222) considered "The Birds which so providentially afforded us subsistence from March until August, when relief arrived from Port Jackson cannot again be expected for some years, from the vast number of Eggs & young Birds that were destroyed & the ground in which they burrowed being torn up: But for a small number of Inhabitants the Birds may always [be] a resource in case of accident happening to a ship with supplies or other failure".

Nevertheless, Clark (in Fidlon & Ryan 1981: 189) recorded that the birds had returned to the island by 22 March 1791. Two of the convicts collected 23 when they went to Mt Pitt that night to see if the birds had come in. Despite what Bradley thought, the Mt Pitt birds were seemingly as numerous in 1791 as they had been in 1790. Clark (in Fidlon & Ryan 1981: 189, 190) said on 25 March 1791 that "the people Say that the[y] See no difference in the Birds that the[y] are as numerous as ever" and, on 1 April 1791, "the people that went to Mount Pit for Birds last night Say that the[y] are Remarkably plenty". Clark (in Fidlon & Ryan 1981: 193) was at Mt Pitt on 11 April 1791 when he went there from Charlotte Field to see the birds come in at sunset:

"we got to the mount about five oClock we had not been there above ten Minutes before the

Air was full of them - - the greatest number came from the NE to SE: after flying about a Quarter of an hour the[y] came down like a Shour of hail which lasted about half an hour when very few Remained in the Air - - without going three Yards one way or the other I Kild 53 and if I wish to have Kild more I might have Kild four times that number - - the moment that the[y] light the[y] make for there holes where the[y] Sit for a little while chattering and another comes out of the hole which did not fly away as I Expected for I thought that there was a Relief - I Staid untill about half after ten".

The only other reference to the Mt Pitt birds in 1791 is also by Clark who noted on 21 May 1791 that he slept "at Charlotte Field last night and the night before and went both Evening to Mount Pit to See if the Birds have any particular hole which I am Convinced the[y] have from the Birds which I marked on Thursday Eveng. coming back to the Same hole last night with the mark on there leggs which I put on them the night before — I Caught Ten Birds with Eggs in them" (Clark in Fidlon & Ryan 1981: 200).

The records of 1792

King returned to Norfolk Island on 4 November 1791. There were 1098 people on the island on 28 January 1792, and 1155 by August 1792 (King 1791-1794: 30, 68). The 1100 or so persons resident on Norfolk Island during the 1792 breeding season of the Mt Pitt birds were on reduced rations. Full rations were not restored until a ship arrived on 26 August 1792 with stores and provisions (King 1788-1799: 117). However, as King (1788-1799: 95,98-99) advised Dundas, Chief Secretary of State, on 8 May 1792, the "Providential Resource" provided by the Mt Pitt birds had materially assisted in preventing the people on the island from feeling any inconvenience from the reduction of the ration. He continued:

"The Mount Pitt Birds....are Birds of Passage. They make their Appearance in March - This year, they came in on the 21st of March, when, in order to give every one an equal Chance of availing themselves of this Providential Resource, at the reduced Ration we were at, I found it necessary to change the Hours of Labour so as to leave off work at 4 in the Afternoon, when every one had it in his power to be at the Mount before dark, at which Time, the Birds descend to get into their Holes, which occupy the Mount so completely that, it is like a continued Warren. In these Holes, the Birds lay their Eggs, and hatch their young. To do which, they descend at dark, when the People who are waiting for them knock them down with Sticks as they descend, and others are taken out of their Holes to which they are directed by the Birds answering their Call. Those Birds that escape being taken in the Night, leave their Holes in the Morning, & climb up the Trees, from whence they take their Flight for the Day, in quest of Food,

until the Evening, when they again descend. These Birds are the size of a wild Duck, and web-footed. They are used in Soups, and are broiled, both of which, and many other, Ways, they are excellent Food, and are so great a Resource, that, few feel any Inconvenience from the present reduced Ration, but those who are naturally indolent. From 8, to 1600 are caught in a Night".

King (1791-1796: 21-22) had expanded on these matters in his journal under the date March 1792, among which he also mentioned the method introduced to provide a share of birds for those who, for various reasons, were not able to obtain them for themselves:

"On the 21st the Mount Pitt Birds began to appear in vast Quantities. From the reduced State of the Ration, I found it necessary, in order to give every one an equal chance of availing themselves of this resource, to change the Hours of Public Labor, Vizt. from Day-light, 'till half past Nine, & from Noon, 'till Four in the Afternoon; by which Alteration, every one had it in their power, to be at the Mount before Dark; at which time, the Birds descend to gain their Burrows, wherein they lay their Eggs. Some are knocked down with Sticks as they descend, & others are taken out of their Holes, to which the People are directed, by the Bird answering a particular Noise. Those which escape being taken, leave their holes in the Morning, & take their Flight for the Day, descending every Night, but in Stormy Weather the greatest Quantities are taken, Those Birds, which altho' a little strong, are very good eating; & are found to be a very great Resource, as upwards of Sixteen Hundred are caught each Night: Altho' the Ration is so much reduced, there are not many who feel much Inconvenience from it Soon after the Birds came in, a Representation was made to me, that some of the Settlers, went in the Day time, & destroyed a Number of Birds, with their Dogs, which was depriving those who were working, of that advantage, & would in the end, deprive the Island of that Resource. An order was given, to prevent any Person from resorting to the Mount before 4 O'clock in the afternoon, and in Order to preserve that valuable resource, I directed that in future those Birds should be considered as Game, & those Freeman, or Settlers, who wantonly destroyed them, would be punished or fined; & all Convicts who might disobey the Order, would be severely punished, which has put an effectual Stop to those Practices. As there are many poor Objects among the Convicts, who are lately arrived, & unable to procure Birds for themselves, & the Duty of watchmen & Overseers, not permitting them to be absent, I ordered each Person returning from the Mount, to give up One Bird, out of every Ten, they had caught; which with the addition of Rice, was made into a very good Soup for those who could not go to the Mount".

William Paterson arrived on Norfolk Island with King when he returned on 4 November 1791. On his arrival in New South Wales shortly before, Paterson had been assigned to command the

detachment of troops on Norfolk Island. He remained on the island until 7 March 1793. Finney (1984: 60-62, 68-69) has given details of Paterson's natural history activities while he was on the island. Paterson was present throughout the 1792 breeding season of the Mt Pitt birds and gave an account of them. It seems to have been written about the same time as King's journal entry quoted above, because Paterson also mentions birds being shared with those who were not able to visit Mt Pitt. Paterson considered (1791-1793: v-vi) that of the birds of Norfolk Island to which he referred:

"The Mount Pitt bird (species of the Petrell) is the most usefull the season of their comming to this Island is in March and tis supposed they come from New Caladonia but that is merely conjecture, they however come in vast numbers - Mount Pitt is the principal part of the Island to which they resort and the soil being of a deep light Earth is more adapted for their making their holes in the daytime they go to Sea and return regularly when it becomes dark on the Island when the People are generally waiting their Arrival they catch them by means of a torch which is made of the pine Knots the birds come down to the light and are immediately siezed an put into a bag, some Thousands have been taken in one Night If it was not for these birds at this small allowance of Provision many of the Convicts must Die for want Those that are not able to go into the woods recieve a Certain proportion from the others".

In late September 1792, Collins at Port Jackson learned that (Collins 1789-1802: I: 233; in Fletcher 1975: I: 196):

"The great havoc and destruction which the reduced ration had occasioned among the birds frequenting Mount Pitt had so thinned their numbers, that they were no longer to be depended upon as a resource. The convicts, senseless and improvident, not only destroyed the bird, its young, and its egg, but the hole in which it burrowed; a circumstance that ought most cautiously to have been guarded against; as nothing appeared more likely to make them forsake the island The convicts in general wore a very unhealthy cadaverous appearance, owing, it was supposed, not only to spare diet, but to the fatigue consequent on their traversing the woods to Mount Pitt, by night, for the purpose of procuring some slender addition to their ration, instead of reposing after the labours of the day."

The records of 1793

There were 1028 people on Norfolk Island in May 1793 (King 1788-1799: 152). In his letter to Lieutenant-Governor Grose of 30 March 1793, King (1788-1799: 143) advised that the Mt Pitt birds had been taken in "Quantities" 9 days earlier. King (1791-1794: 110) also referred to this in his journal entry for 21 March 1793, although the entry was obviously written later as he was able to refer to a continuation of the Mt Pitt birds "in great

Quantities" after that date. He said "The Mount Pitt Birds made their annual appearance, upwards of Two Thousand have been caught this night, & as they continued in great Quantities, I found it necessary to profit of the Resource of those Birds to make a saving out of the Salt Provisions as the Birds are now so very plentiful, I gave an Order to Change that Proportion to remain in force untill August when the Birds go away."

King's annotated copy of Hunter (1793) is now in the National Library of Australia. The following entry, written in October 1793, appears on p. 183: "The Mount Pitt birds still continue very numerous, from March to June 1793 2800 were caught each night on an average". As the breeding season of the Mt Pitt birds ended in August, King's comment in October that they were still very numerous obviously refers to the breeding season that had just ended.

The records of 1794

There were 1025 persons on Norfolk Island on 19 March 1794 (King 1788-1799: 205). There appears to be only 1 brief comment relating to the Mt Pitt birds in 1794, but it is of considerable significance. Under date May 1794, King (1791- 1796: 145) wrote: "*It is to be remarked, that the Mount Pit Birds are as numerous as ever, notwithstanding upwards of Two Hundred thousand have been killed yearly*".

The records of 1795

King (1791-1796: 198-199) wrote in his diary for 27 March 1795:

"The numerous Birds that have visited this Island, yearly, and generally about this time, being a Subject of some Curiosity, I desired those who frequented Mount Pit, to observe the exact time of their Coming in, as nearly as possible: From these I was informed, that it was with some difficulty they could catch Two or Three Birds, before the night of the 21st when they came in great numbers; Each man catching in the Course of an Hour from 20 to 26 Birds, on that and some Succeeding nights; However, their Coming on a Certain day, may be improbable; Yet it is certain they always make their Appearance about the middle of the month. In 1791 & 1792 These Birds were a very Providential relief to many; But the great profusion of all kinds of provision, and stock, now on the Island, renders this advantage of little Consequence, and very few care to avail themselves of that resource; which Three years ago, in all probability, saved many lives - As those Birds are now uninterrupted, That resource will keep increasing."

There is no written evidence that humans on Norfolk Island ever again availed themselves in a meaningful way of the resource offered by the Providence petrels which nested on Mt Pitt. Indeed, there are no known records of the Providence petrel in life on Norfolk Island after 1795. Therefore, some

factor or factors other than human harvesting must have been responsible for the demise of the species as a breeding bird on the island.

Cats (*Felis catus*) on Norfolk Island

Feral cats have been a major factor in the reduction or extermination of breeding populations of small and medium-sized petrels. For example, cats on Raoul Island in the Kermadec group fed to a large extent on black-winged petrels (*Pterodroma nigripennis*) and wedge-tailed shearwaters (*Puffinus pacificus*) as they came ashore to nest, and cats undoubtedly played a major role in exterminating the island's formerly very large Kermadec petrel (*Pterodroma neglecta*) breeding population (Merton 1970). Cats on Little Barrier Island off northern New Zealand preyed heavily on adult and young Cook's petrels (*Pterodroma cookii*), and predation by them was the main cause of breeding failure of black petrels (*Procellaria parkinsoni*) on the island (Imber 1973, 1987). Cats on Herekopare Island off southern New Zealand fed mainly on petrels, and the very large population of diving petrels (*Pelecanoides urinatrix*) which bred on that island was probably exterminated by them (Fitzgerald & Veitch 1985).

Domestic cats had gone wild on Norfolk Island by 1795. In an entry for 1 June 1795, King (1791-1796: 205) recorded that the grounds belonging to the settlers and other individuals were for the most part overrun with weeds, which provided cover for rats, but many of those "destructive vermin" were destroyed by cats and dogs. Just a few weeks later, in August 1795, King (1791-1796: 219) was able to comment it was extraordinary that there was scarce a rat to be found when, not more than 6 weeks before, they were so numerous as to threaten to destroy all the grain. He believed many of the rats had been destroyed "by the abundance of Dogs, and Cats, both tame and wild".

In his report of 18 October 1796, King (in Bladen 1895: 152) said "innumerable quantities" of fowls and many turkeys were wild in the woods, where they were breeding. A few years later, in 1800, Myers (1817: 217-218) noted "several" wild cats in the forest. They were very destructive to the poultry. The cats were "continually in search of the eggs and chickens, which they instantly destroy". When Backhouse (1843: 273) was on Norfolk Island in March-April 1835, he was advised that wild cats lived at the cliffs in summer, and in winter visited poultry-yards, feeding on birds, rats, and mice. Wild cats continue to visit the cliff tops to feed on birds. For example, in 1969 at the Captain Cook Memorial, the remains of 57 black-winged petrels were found at 1 site, probably the work of 1 cat (Schodde *et al.* 1983: 72). In 1978 and 1979, Tarburton (1981) found hundreds of

cat-killed carcasses littering the breeding colonies of wedge-tailed shearwaters on the island, and Hermes *et al.* (1986) reported that feral cats take many little shearwaters (*Puffinus assimilis*) which now rarely breed on Norfolk Island.

Pigs (*Sus scrofa*) on Norfolk Island

Pigs are detrimental to nesting petrels, including Providence petrels (Harris 1970; Strange 1980; Coulter 1984; Hutton 1991; Taylor 2000; Medway 2001). Schodde *et al.* (1983: 83) considered that human hunting "combined with the depredations of introduced pigs (which by 1796 numbered 15,000) proved too much" for the Providence petrel on Norfolk Island. This statement was repeated by Lindsey (1986: 190) and Bartle *et al.* (1993). However, the figure of 15,000 pigs on Norfolk Island by 1796 is demonstrably incorrect. Clearly, it was based by Schodde *et al.* (1983: 83) on the figure given by Hoare (1969: 25) from King's report of 18 October 1796 (in Bladen 1895: 150). All of the figures given by Hoare for stock on the island at that time are incorrect as a result of mis-reading King's report. In the "Statement of live stock in possession of government and private individuals" as at 18 October 1796, King in fact gave the number of swine as being government 710 and individuals 4125, a total of 4835 living, the number he also gave (King 1791-1796: 300) for hogs on the island as at September 1796. King recorded that 4972 swine had been killed and taken away. Hoare's figure of 14,642 comes from incorrectly adding those 4 figures together, thus arriving at a total number of swine on the island 3 times greater than it actually was.

Pigs were a most valuable source of meat for people on Norfolk Island in the 1790s. Pigs on the island, whether they belonged to the government or to individuals, were carefully confined and fed within large enclosures. As King (in Bladen 1895: 151) reported on 18 October 1796:

"On most part of the 9472 acres not cleared of timber the trees and underwoods are covered with the most succulent herbage, which, with the fern and other soft roots, afford the best of food for swine. Several individuals have taken advantage of this convenience by inclosing from 10 to 100 acres of the uncleared parts, into which they turn their swine. Several individuals have from 20 to 150 confined in this manner that require no other attention or care than giving them a sufficiency of maize to accustom them to their owners' call An extensive enclosure of 100 acres is made on Norfolk Island, on account of Government, within which there are upwards of 400 swine when counted last month (in September). In this inclosure they are fed with maize, on which, and the herbage, they increase and thrive very well".

Turnbull (1805:1: 95-96), who spent 10 months on Norfolk Island in 1801-1802, noted that Major

Foveaux, Commandant at the island at that time, had been assiduously employed in "fencing in some low valleys, which by means of streams running through them have a most superior herbage. These valleys are used as a kind of open folds for the hogs of the settlement. Being allowed a daily portion of maize, these animals fatten in a very short time, and the governor of Norfolk Island has thus been enabled to supply Port Jackson with animal food, at a time when they were very much put to it for that article."

When Myers (1817: 217) was on Norfolk Island in 1800 he amused himself "in what way I thought most pleasing, generally in the woods shooting wild Goats and Poultry". There may have been a few wild pigs on the island then because Myers (1817: 218) recorded that on one occasion a boat's crew went to Phillip Island "to bring wild Hogs; They being more easily taken there, than at the colony ..". However, there is no evidence that pigs were present in sufficient numbers in the Mt Pitt area of Norfolk Island in the 1790s for them to have seriously affected the Providence petrels nesting there.

The temporary abandonment of Norfolk Island

Norfolk Island was abandoned on 28 February 1814. William Hutchinson, who was responsible for evacuating the island, reported to Governor Macquarie on 10 March 1814 (Hutchinson in Watson 1916: 165) that "the Whole of the Stock that could not be taken for Slaughter have been shot and Otherways destroyed, except a few wild Hogs and Goats, and from the Circumstance of my having left about a Dozen of Dogs, Male and Female, there Can be no doubt when the latter Animals become pressed with Hunger the Whole of the former will be extirpated". Hutchinson further reported that all the buildings were set on fire and completely destroyed. He had much pleasure in assuring the governor "that there remains no inducement for human beings of any kind to visit that place".

Nevertheless, Norfolk Island was re-occupied on 6 June 1825 by a detachment of troops, and convicts. It seems it was the dogs which had been left on the island, rather than the pigs and goats which they were supposed to destroy, which had died out during the previous 11 years. Sir Thomas Brisbane (in Watson 1917: 698) informed Earl Bathurst on 1 August 1825 that "Captain Turton of the 40th Regiment, the Commandant at Norfolk Island, reports very favorably of its present state, as to live stock which is in great abundance; particularly pigs, which he states to be beyond all calculations; Goats are also very numerous".

When Backhouse (1843: 273) was on Norfolk Island 10 years later, in March-April 1835, he was

advised that "When the Island was re-occupied, for a penal settlement, Pigs, Goats, Barn-door-fowl, Pigeons, Cats, Rats, and Mice, had become very numerous. Percival, who was sent here soon after the penal settlement was established, told us that the pigs and goats were chiefly destroyed in the first two yearsPigs and goats, in a wild state, consequently, soon became extinct."

Conditions during the 11-year abandonment of Norfolk Island from 1814 probably did not allow the breeding population of Mt Pitt birds, if it still survived by 1814, to recover from the losses of the 1790s. Marchant & Higgins (1990:1A: 427) suggested that goats were also involved in the extermination of the Providence petrel on Norfolk Island. Goats apparently did become very numerous after the island was abandoned, but the combined depredations of "very numerous" cats, and of pigs whose numbers became "beyond all calculations", were probably sufficient to exterminate any breeding population of Providence petrels remaining on Norfolk Island.

The number of Providence petrels harvested by humans on Norfolk Island

How many Providence petrels were killed by people on Norfolk Island in 1789 is not known, but the number was probably relatively small because only c. 100 people were on the island during the Providence petrel breeding season of that year, and human diet was only occasionally supplemented by Mt Pitt birds at that time (Nobbs 1988: 5; Collins 1798-1802: I: 96; in Fletcher 1975: I: 78).

Of all the people on Norfolk Island in 1790, Clark was undoubtedly in the best position to know even approximately how many Providence petrels might have been killed by humans that year. As noted above, Clark, as Quartermaster-General and Keeper of the Public Stores, kept a record, as nearly as he could, of the Mt Pitt birds brought in to the settlement by the marines, sailors, and convicts. The specific figures are given in his journal (Clark in Fidlton & Ryan 1981), and they have also been published by Whitley (1934) so are not repeated here. In total, Clark (in Fidlton & Ryan 1981: 147) recorded 172,184 Mt Pitt birds being brought to the settlement between 10 April and 15 July 1790.

However, it is obvious from available evidence that Clark's recorded total must be regarded as an *absolute minimum* for the 1790 breeding season. It is clear that he did not record all of the birds brought in. For instance, on 16 May he recorded only the number of birds brought in the previous evening "of which I have been able to get an Account" (Clark in Fidlton & Ryan 1981: 134). On some days he did not include the numbers taken by some of the people: for example, on 25 April he did not

know how many the convicts had brought in the previous evening (Clark in Fidlon & Ryan 1981: 130). Clark's total does not include the number of birds taken, for example, before 10 April when his records began, or the number of birds taken by people from Kingston while he was at Charlotte Field from 27 June to 17 July, or the number of birds taken after 17 July when parties no longer reported to the guard-house, or the number of birds killed at the nesting grounds for their eggs and whose carcasses were thrown away.

Nevertheless, Clark has provided the best evidence of the approximate number of Providence petrels killed on Norfolk Island in 1790. On 26 August 1790, Clarke (in Fidlon & Ryan 1981: 284) said that "Since April last there has been no less one night with a nother than between four and five Thousand Killed". On 11 February 1791, he implied an even greater total when he said that "from the latter end of April untill the Middle of July no Smaller a number on a very moderate Computation than five thousand was Killed a night - I have often know Seven and Eight thousand, particularly on the Sunday Evenings brought into Camp" (Clark in Fidlon & Ryan 1981: 292). His "latter end of April" probably started on 20 April when restrictions on taking birds were lifted, and from when "the slaughter and nightly havoc" became "beyond Description" (Bradley 1969: 201; Clark in Fidlon & Ryan 1981: 128; Anon. in Britton 1892: 398). Clark's "middle of July" was probably 16 July after which he did not keep any records.

If Clark's lower (26 August 1790) estimate of between 4000 and 5000 birds killed each night is accepted, then 348,000 - 435,000 Providence petrels were killed during the 87 days between 20 April and 16 July 1790. It seems that the 507 people on Norfolk Island at that time between them ate 348,000 - 435,000 Providence petrels over 87 days. This is not an improbable number to be eaten considering that the birds were used in "Soups, and are broiled, both of which, and many other, Ways, they are excellent Food" (King 1788-1799: 98).

King was in the best position to assess how many Mt Pitt birds were harvested on the island. There is no reason to doubt his May 1794 estimate that more than 200,000 Mt Pitt birds had been killed each year. Presumably, King was referring to the birds killed from 1790 to 1793 which was the period of greatest human need. His estimate is in accordance with the evidence. Clark's evidence indicates that at least 348,000 - 435,000 birds were killed in 1790. In 1791, more people were on Norfolk Island during the breeding season of the Mt Pitt birds than were there during that of 1790, the meat ration was reduced because the birds had come in (Clark in Fidlon & Ryan 1981: 189), and

there is no indication that any restrictions were placed on the number of birds which could be taken, or the frequency of their collection. There were even more people on the island during the 1792 breeding season, again rations were reduced, and again there is no indication that any restrictions were imposed. The 2800 recorded by King as being caught on average each night between March and June of 1793 indicates that at least 250,000 Mt Pitt birds were taken that year. The record is silent in this respect after 1793.

Therefore, the available evidence suggests that c.1,000,000 Providence petrels, adults and young, were taken for food on Norfolk Island in 1790-1793. In addition, an unknown number of eggs were taken in 1790, burrows were destroyed, and the breeding habitat was damaged by excessive and uncontrolled human activity over several years. The level of harvesting and habitat damage was greater than any population of petrels, no matter how large, could possibly sustain indefinitely. The Mt Pitt birds may have appeared to be as numerous as ever in May 1794, but, despite appearances, the breeding population of Providence petrels on Mt Pitt had been reduced significantly by the slaughter and destruction of the preceding 4 years.

The remains of c. 1,000,000 Providence petrels killed by Europeans must have been disposed of in or near Kingston. In 1984, 2 extensive lenses of bird bones were found in the course of an excavation at the First Settlement township site near Kingston Pier. The bones of Providence petrels were abundantly represented among them, inclose proximity to First Settlement debris (Meredith 1985: 40; Varman in Nobbs 1988: 154-158).

Conclusions

A very large population of Providence petrels nested around the summit of Norfolk Island when Europeans settled the island in 1788. Their nightly return in the early part of the breeding season in the 1790s must have been a truly remarkable sight. Although c.1,000,000 Providence petrels, adults and young, were harvested between 1790 and 1793 they were said to be "as numerous as ever" in 1794, and they appeared again in "great numbers" in 1795 when they are last mentioned on the island. Therefore, it is possible that several million Providence petrels bred on Norfolk Island when Europeans arrived. Probably by 1825 at the latest, predation by people and introduced mammals had extirpated the population, and the species was not seen breeding again at the Norfolk group for over 150 years.

ACKNOWLEDGEMENTS

I am grateful to staff of the State Library of New South Wales, Sydney and the National Library of Australia, Canberra for providing access to the various manuscripts referred to in this paper. Sue Superville and David Linney, at different times of the Hector Library at the Museum of New Zealand, Wellington, provided me with several published works required for this research. I am also grateful to Margaret Christian and, in particular, to Richard Holdaway whose constructive suggestions have considerably improved the text.

LITERATURE CITED

- Anderson, A.J.; White, P. (ed.). 2001. The prehistoric archaeology of Norfolk Island, Southwest Pacific. *Records of the Australian Museum supplement* 27.
- Bach J. (ed.). 1968. *An historical journal of events at Sydney and at sea 1787-1792 by Captain John Hunter....* Sydney, Angus & Robertson in association with The Royal Australian Historical Society.
- Backhouse, J. 1843. *Narrative of a visit to the Australian colonies*. London, Hamilton, Adams.
- Bartle, J.A., Hu, D.; Stahl, J.-C.; Pyle, P.; Simons, T.R.; Woodby, D. 1993. Status and ecology of gadfly petrels in the temperate North Pacific. pp. 101-111 In: Vermeer, K.; Briggs, K.T.; Morgan, K.H.; Siegel-Causey, D. (ed.). *The status, ecology, and conservation of marine birds of the North Pacific*. Ottawa, Canadian Wildlife Service special publication.
- Beaglehole, J.C. (ed.). 1961. *The journals of Captain James Cook on his voyages of discovery. The voyage of the Resolution and Adventure 1772-1775*. Cambridge, Hakluyt Society.
- Beebe, W. 1935. Rediscovery of the Bermuda cahow. *Bulletin of the New York Zoological Society* 38: 187-190.
- Bladen, F.M. (ed.). 1893. *Historical records of New South Wales. II: Grose and Paterson 1793-1795*. Sydney, Government Printer.
- Bladen, F.M. (ed.). 1895. *Historical records of New South Wales III: Hunter 1796-1799*. Sydney, Government Printer.
- Bradley, W. 1969. *A voyage to New South Wales. The journal of Lieutenant William Bradley RN of HMS Sirius 1786-1792*. Sydney, Trustees of the Public Library of New South Wales.
- Britton, A. (ed.). 1892. *Historical records of New South Wales 1(2): Phillip 1783-1792*. Sydney, Government Printer.
- Collins, D. 1798-1802. *An account of the English colony in New South Wales with remarks on the dispositions, customs, manners, &c. of the native inhabitants of that country ...* 2 vol. London, T. Cadell Jun. & W. Davies.
- Coulter, M.C. 1984. Seabird conservation in the Galapagos Islands, Ecuador. pp. 237- 244 In: Croxall, J.P.; Evans, P.G.H.; Schreiber, R.W. (ed.). *Status and conservation of the world's seabirds. International Council for Bird Preservation technical publication no. 2*. Cambridge, International Council for Bird Preservation.
- Dann J.C. (ed.). 1988. *The Nagle journal. A diary of the life of Jacob Nagle, sailor, from the year 1775 to 1841*. New York, Weidenfeld & Nicolson.
- Fidlon, P.G.; Ryan, R.J. (ed.). 1981. *The journal and letters of Lt. Ralph Clark 1787-1792*. Sydney, Australian Documents Library in association with the Library of Australian History.
- Finney, C.M. 1984. *To sail beyond the sunset. Natural history in Australia 1699-1829*. Adelaide, Rigley Publishers.
- Fitzgerald, B.M.; Veitch, C.R. 1985. The cats of Herekopare Island, New Zealand: their history, ecology and affects on birdlife. *New Zealand journal of zoology* 12: 319-330.
- Fletcher, B.H. (ed.). 1975. *An account of the English colony in New South Wales with remarks on the dispositions, customs, manners, etc. of the native inhabitants of that country by David Collins*. 2 vol. Sydney, A.H. & A.W. Reed, in association with the Royal Australian Historical Society.
- Gould, J. 1844. Description of *Procellaria solandri*. *Proceedings of the Zoological Society of London, Part xii*: 57.
- Gray, G.R. 1862. A list of the birds of New Zealand and the adjacent islands. *Ibis* 4 : 214-252.
- Harris, M.P. 1970. The biology of an endangered species, the dark-rumped petrel (*Pterodroma phaeopygia*), in the Galapagos Islands. *Condor* 72: 76-84.
- Hermes, N.; Evans, O.; Evans, B. 1986. Norfolk Island birds: A review 1985. *Notornis* 33: 141-149.
- Hindwood, K.A. 1940. The birds of Lord Howe Island. *Emu* 40: 1-86.
- Hoare, M. 1969. *Norfolk Island. An outline of its history 1774-1968*. Brisbane, University of Queensland Press.
- Hunter, J. 1793. *An historical journal of the transactions at Port Jackson and Norfolk Island with the discoveries which have been made in New South Wales and in the southern ocean* London, John Stockdale.
- Hutton, I. 1991. *Birds of Lord Howe Island past and present*. Coffs Harbour Plaza, New South Wales, The Author.
- Imber, M.J. 1973. The petrels of Little Barrier. *Wildlife - a review no. 4*: 5-9.
- Imber, M.J. 1987. Breeding ecology and conservation of the black petrel (*Procellaria parkinsoni*). *Notornis* 34 : 19-39.
- Iredale, T. 1929. The bird of Providence. *Australian zoologist* 5: 358-361.
- King, P.G. 1786-1790. *A narrative of the preparation and equipment of the First Fleet, the voyage to New South Wales in H.M.S. Sirius, events in N.S.W. and Norfolk Is., and the voyage to England in H.M.S. Supply*. Mitchell Library, State Library of New South Wales, Sydney. Ms. C115.
- King, P.G. 1788-1799. *Letterbook: Norfolk Island*. Mitchell Library, State Library of New South Wales, Sydney. Ms. C187.
- King, P.G. 1791-1794. *A journal of transactions on Norfolk Island in the Pacific Ocean between November 4th 1791 & Novr 6th 1794*. Mitchell Library, State Library of New South Wales, Sydney. Ms. A 1687.
- King, P.G. 1791-1796. *Journal kept while Lieutenant-Governor of Norfolk Island, November 1791 - October 1796*. National Library of Australia, Canberra. Ms 70.
- Latham, J. 1789. *Letter from Latham to Thomas Pennant dated 16 August, 1789*.
- National Library of Australia, Canberra. Ms 9/110 (copy in Alexander Turnbull Library, Wellington Micro. Ms 414-6).
- Lindsey, T.R. 1986. *The seabirds of Australia*. North Ryde, New South Wales, Angus & Robertson.

- Marchant, S.; Higgins, P.J. (Co-ordinators).1990. *Handbook of Australian, New Zealand and Antarctic birds*. Vol. 1A. *Ratites to ducks*. Melbourne, Oxford University Press.
- Medway, D.G. 2001. Pigs and petrels on the Poor Knights Islands. *New Zealand natural sciences* 26: 87-90.
- Meredith, C.W. 1985. The vertebrate fossil fauna of Norfolk Island, and the phylogeny of the genus *Pterodroma*. Unpubl. PhD thesis, Department of Zoology, Monash University, Clayton, Victoria, Australia.
- Merton, D.V. 1970. Kermadec Islands expedition reports: a general account of birdlife. *Notornis* 17 : 147-199.
- Murphy, R.C.; Pennoyer, J.M. 1952. Larger petrels of the genus *Pterodroma*. *American Museum novitates* no. 1580: 1-43.
- Myers, J. 1817. *The life, voyages and travels of Capt. John Myers, detailing his adventures during four voyages round the world; his various enterprizes on the Coast of South America, and exhibiting a most instructive description of the north-west trade*. London, Longman, Hurst, Rees & Co.
- Nobbs, R. (ed.). 1988. *Norfolk Island and its first settlement, 1788-1814*. Sydney, Library of Australian History.
- Paterson, W.1791-1793. *Notes on the natural history of Norfolk Island*. Dixon Library, State Library of New South Wales, Sydney. Ms filed with ZDL PXXI.
- Phillip, A.1789. *The voyage of Governor Phillip to Botany Bay, with an account of the establishment of the colonies of Port Jackson & Norfolk Island, compiled from authentic papers*. London, John Stockdale.
- Schodde, R.; Fullagar, P.; Hermes, N. 1983. *A review of Norfolk Island birds: past and present*. Australian National Parks & Wildlife Service special publication 8. Canberra, Australian National Parks & Wildlife Service.
- Strange, I. J. 1980. The thin-billed prion, *Pachyptila belcheri*, at New Island, Falkland Islands. *Le Gerfaut* 70: 411-445.
- Tarburton, M.K. 1981. Seabirds nesting at Norfolk Island. *Notornis* 28: 209-211.
- Taylor, G. A. 2000. *Action plan for seabird conservation in New Zealand*. *Threatened Species occasional publication no. 17*. Wellington, Department of Conservation Biodiversity Recovery Unit.
- Turnbull, J. 1805. *A voyage round the world in the years 1800, 1801, 1802, 1803, and 1804; in which the author visited the principal islands in the Pacific Ocean, and the English settlements of Port Jackson and Norfolk Island*. 3 vol. London, A. Maxwell.
- Verrill, A.E. 1902. The "Cahow" of the Bermudas, an extinct bird. *Annals and magazine of natural history* 9 (7th series): 26-31.
- Warham, J. 1988. Responses of *Pterodroma* petrels to man-made sounds. *Emu* 88: 109-111.
- Watson, F. (ed.). 1914. *Historical records of Australia. Ser.1: Governors' despatches to and from England*. Vol. 1: 1788-1796. Canberra, Library Committee of the Commonwealth Parliament.
- Watson, F. (ed.).1916. *Historical records of Australia. Ser.1: Governors' despatches to and from England*. Vol.VIII. 1813-1815. Canberra, The Library Committee of the Commonwealth Parliament.
- Watson, F. (ed.). 1917. *Historical records of Australia. Ser.1: Despatches to and from Sir Thomas Brisbane*. Vol. XI. 1823-1825. Canberra, The Library Committee of the Commonwealth Parliament.
- Whitley, G. 1934. The doom of the bird of Providence. *Australian zoologist* 8: 42-49.