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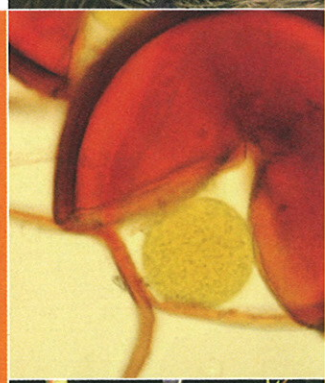

Timing of the Breeding Season and Survey of the Blue Penguin (*Eudyptula minor*) Between the Taramakau and Mokihinui Rivers, West Coast, South Island, New Zealand.

by

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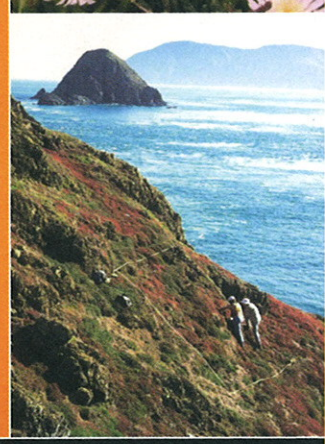

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Prepared for:

West Coast Blue Penguin Project

April 2006

Contents

Abstract

A survey of the Blue Penguin (*Eudyptula minor)* was conducted between the Taramakau River and the Mokihinui River on the West Coast of the South Island, New Zealand from 1 October 2005 until 24 January 2006.

The primary aim was to map the distribution of penguins within the study area, estimate population size, document the timing of the breeding season and identify threats.

There is a discontinuous population of penguins scattered within the study area and colony size varies from large colonies (of around 50 burrows) to isolated birds. These preliminary findings suggest that threats (especially dogs and mustelids) are the major influences on the population size and distribution of the penguins.

Most chicks hatched in late November and fledged in early January. Adults began moulting in early December and some were still moulting when fieldwork finished on 24 January 2006. Insufficient information was gathered on the times at which eggs were laid, but additional data shows that early eggs were present in early September.

1. Introduction

The Blue Penguin *(Eudyptula minor*) is the smallest of all the penguin species (Reilly 1994). In New Zealand, Blue Penguins are known to breed on islands and coasts of the North Island from Northland to the Waikato area on the west coast and are found as far south as Gisborne on the east coast. In the South Island penguins occur south of Karamea on the West Coast and south of Oamaru on the East Coast, as well on Stewart Island and islands near Fouveaux Straight (Taylor 2000). Blue Penguins also breed in southern parts of Australia where they are most common in southern New South Wales, Victoria, Tasmania and South Australia (Davis et al 2003). They have also been sighted, but are not as common in Queensland and Western Australia (Davis et al 2003).

Blue Penguins breed colonially, semi colonially and as isolated pairs (Merchant and Higgins 1990). Broadly speaking, eggs are incubated for around 40 days, and chicks usually have a nestling period of around 48-63 days (Davis et al 2003). The young then leave the nest and go to sea at night, and from this time are independent of the parents.

The breeding season has been studied at different locations and its timing varies slightly across the species' range (Davis et al 2003). For most of New Zealand, egg laying occurs from September to November, yet in Otago eggs are not laid until February to May. In South-East Australia the breeding season begins August/September, while in Western Australia the breeding season begins in April (Merchant et al 1990).

Blue Penguins feed on small shoaling fish, cephalopods and, less commonly, crustaceans. Blue Penguins are pursuit divers with the mean diving depth being around 30m. Penguins mostly forage at sea from dawn to around one hour before dusk (Merchant and Higgins 1990).

There are a number of threats to the Blue Penguin. Threats in both New Zealand and Australia include predation by mustelids and dogs. Ferrets and stoats take eggs and chicks and sometimes attack adult penguins (Taylor 2000). Dogs (and foxes in Australia only) are able to dig out penguin burrows leaving adults and chicks very susceptible to attack or death. Feral cats may attack and kill adults and chicks (Taylor 2000). Trampling on burrows by cattle, sheep, goats and deer may be a problem where burrows are close to farmland. Human disturbance is thought to be less of a risk as most surviving blue penguin colonies are thought to be in remote locations yet the encroachment of coastal settlements poses a huge threat to Blue Penguins (Taylor 2000). Road kills are also a problem where penguin burrows are close to the road. Threats to the Blue Penguin at sea include being caught in set nets, and possibly pollutants such as chemicals, plastics and oil spills (Taylor 2000).

Many Blue Penguin colonies are subsequently declining on the mainland of both Australia and New Zealand where there is no management of colonies and no predator control. In locations with predator control and habitat restoration efforts

such as nest boxes (such as the Oamaru colony), populations have been stable or are increasing.

The current IUCN ranking for Blue Penguins is lower risk – near threatened.

Previous conservation action in New Zealand (as recognised by Taylor 2000) in both the North and South Islands has focused on predator control. Perhaps the most carefully managed colony in New Zealand is the Oamaru colony which has had nest boxes added as well as a tourism venture set up which helps protect the penguin's habitat and raises public awareness. Many conservation efforts have been made in different areas of Australia including protection of some colonies, research, and management of pests in many areas. The population of the Blue Penguins in Australia is estimated to be around 500,000 individuals which are distributed over a wide area (Davis et al 2003).

Research on the Blue Penguin in the past has consisted of studying its biology, breeding cycles and population distributions. Future research and monitoring actions needed are to monitor the long-term population and breeding trends at several colonies, investigation of breeding areas including colony size and breeding pair numbers. Foraging ecology, the impact of mammalian predators and the taxonomy of the Little Blue Penguin are also areas in need of research (Taylor 2000).

On the West Coast of the South Island, Blue Penguin numbers are thought to be declining.

The need for information on the distribution, status and conservation needs of the West Coast penguins is recognised by concerned community members throughout the West Coast. In 2004, the West Coast Blue Penguin Project Group (WCBPPG) was formed – a community group with the conservation of the Little Blue Penguin in mind. The aims of this group are to initiate research in the above areas so that effective management plans can be put in place for the conservation of the West Coast Blue Penguins, and to raise public awareness of Blue Penguins both on a wide scale and locally.

The research reported here marks the first efforts of the WCBPPG to formally investigate the distribution of and threats to the Blue Penguin.

2. Aims and Objectives

The intentions of this project were to:

- Build on a preliminary survey conducted during October and November of 2005, returning to the locations which showed signs of Blue Penguin presence and conducting further searches of these areas.

- Conduct a census of the known colonies along the coast.

- To obtain detailed information on the timing as well as the success of the breeding season.

- To assess potential threats to the Blue Penguin in the survey area.

- To construct a map which illustrates the distribution of the Blue Penguins throughout the surveyed area.

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3. The Study Area

All of the field work for this project was undertaken in the area beginning at the Taramakau River Mouth (E2356207, N5847809) and ending at the mouth of the Mokihinui River (E2421157, N5964389). This area contains around 150 km of coastline and was chosen as it was seen to be a workable area for the amount of personnel employed. It was also the area which was considered to have the most human activity potentially threatening the Blue Penguin along the West Coast.

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4. Methods

4.1. Survey of the Study Area

The study area was first surveyed by Dawn Mazzagetti and Paul Sutton between 1 October and 11 November 2005. The priority for their survey was to locate areas where Blue Penguins were present.

For this, the area was split into two sections. Dawn surveyed the area beginning at Charleston (E2380919, N5922029) and ending at the mouth of the Mokihinui River (E2421148, N5964418). Paul surveyed the remainder of the area which began at the Taramakau River mouth (E2356252, N5847809) and ended at the mouth of the Four Mile River (E2378278, N5915533). Most accessible areas were visited twice during this time. Robyn Blyth then resurveyed areas where Dawn and Paul had found penguins or penguin signs during November and December 2005 and January 2006, and had identified as the most promising locations for additional work.

Signs of the presence of penguins included footprints on sandy or pebbly beaches, guano and scratch marks in coastal vegetation, eggs or eggshells and hearing or seeing birds.

Surveys were done both during the day as well as at night. Daytime surveys involved walking the coastline and searching for footprints along the beach. To accurately locate footprints, tides needed to be taken into consideration. In many areas it needed to be low tide in order to see any footprints at all, whereas in other areas the beach area was wide enough to see footprints even at high tide. Once footprints were discovered they were followed which occasionally led to a live bird, a burrow or a tunnel-like gap in the vegetation.

Night work applied to any work carried out after dusk. It involved walking the coastline with a torch and looking for signs of penguins and listening for calls. Live birds were occasionally seen this way and burrows were found as penguins were often moving towards or near their burrows when spotted.

A blue penguin call recording was also used in some instances by Dawn and Paul to see if a bird would respond to a foreign call in the area. The recording was played with a hand held cassette player.

Data sheets (see Appendix for data sheet sample) were completed at every area visited which stated GPS points, a habitat description and what penguin presence was seen. It was also noted if there was no sign of penguins in the area.

Possible threats to Blue Penguins such as predators or competing species were noted.

Some locations within the study area were not surveyed. This was due to access problems; the area may have been too dangerous to access or permission was not granted for land which needed to be crossed to access the coast. These areas were:

- Deep Creek and Bromelaw Creek near Charleston as it was considered to dangerous to access alone.

- The area from Deep Creek to Needle Point as it was considered to dangerous to go to alone.

- Over Robyn Blyths study period the last bay in the Te Miko Area (E 2372818, N5901103) as access was not granted to go across the local farmer's land.

4.2. Timing of the Breeding Season

This fieldwork was carried out by Robyn Blyth between 11 November 2004 and 24 January 2005 with additional observations by Helen Chambers.

The method used to search for burrows was to firstly walk the particular location and search for any sign of penguin presence such as prints on the beach or small tunnels in the dirt or vegetation where penguins may have entered. Promising areas of coastal vegetation were then searched and a burrow was sometimes found. Burrows were

usually obvious from a few metres away. Leading up to the burrow was usually a worn track in the dirt or vegetation possibly with guano near or outside the burrow. Likely burrow locations consisted of holes in rock walls, caves and in vegetation where there was already some sort of natural infrastructure (such as a tree root or rocks in the ground).

When a burrow was found the GPS location was recorded, a marker was installed (in the form of a plastic tree marker or small wooden stake) and the burrow was checked for adult penguins, eggs or chicks. This was done with the use of a torch and if this method was unsuccessful (the burrow may have turned a sharp corner or was too long) a burrow scope was used. Some burrows were in locations which were hard to find and access. In these areas flagging tape was tied near the burrow or the access route to the burrow in order to be able to find it quickly next time.

Burrows found were monitored throughout the study period. The two main colonies (Camerons Beach and Charleston) were visited on regular occasions, with most visits occurring within a week to monitor the presence of eggs, chicks or adults. Burrows in other areas were also monitored, yet time intervals were more erratic. Burrows were checked, and after assessing the burrow a line of small sticks was erected so that on the next visit it could be seen whether or not anything had entered or left the burrow. Robyn Blyth also carried out a series of night searches at known colonies. For this she either listened on the beach or walked the area with a low beam torch looking for footprints and live birds.

15 adult penguins were banded. This was done by Kerry Jayne Wilson with the assistance of Laura Molles in September 2005, and Robyn Blyth in January 2006. DoC permission and a banding permit were gained (permit number 200520) prior to this. A list of banded birds and their locations is located in the Appendix.

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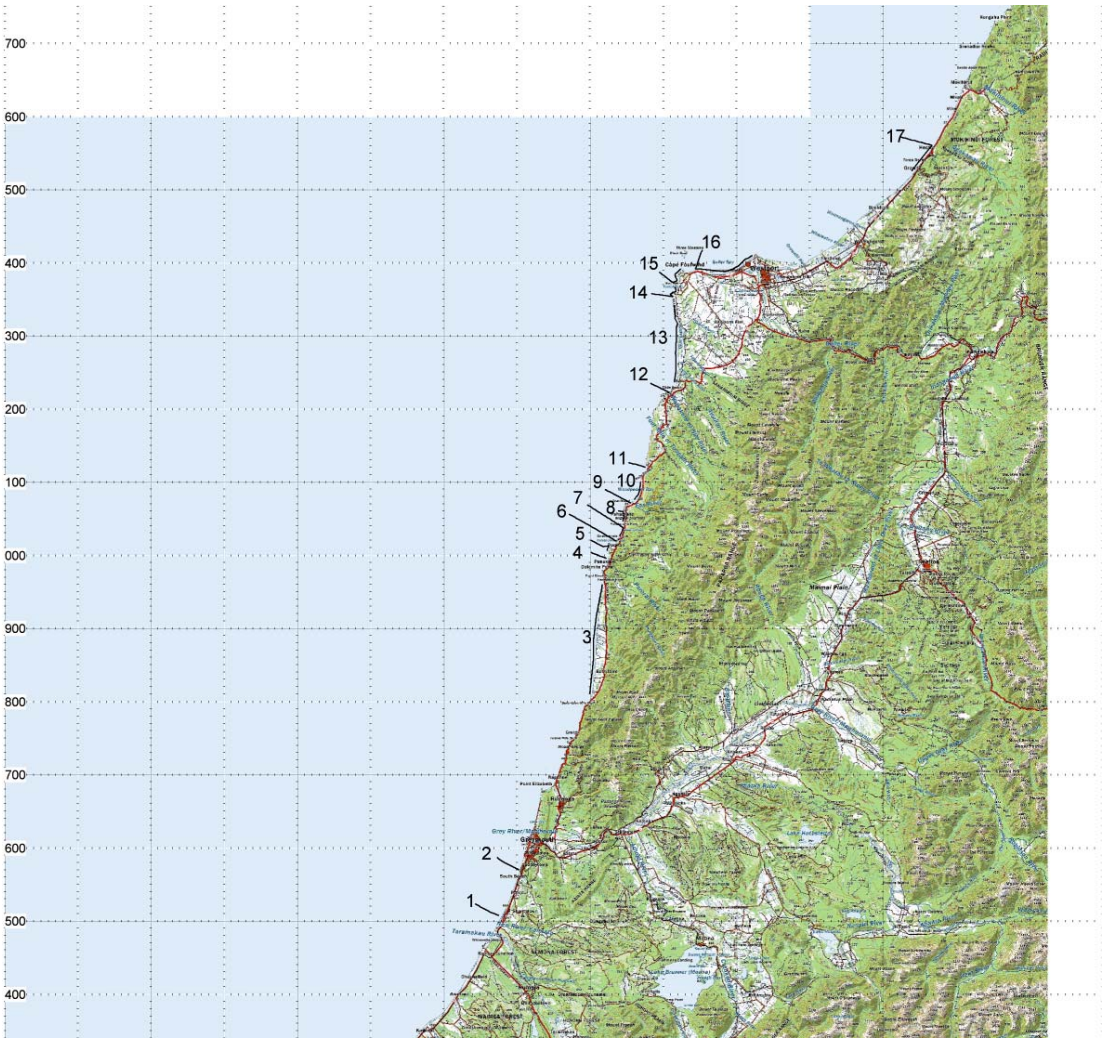
5. Results

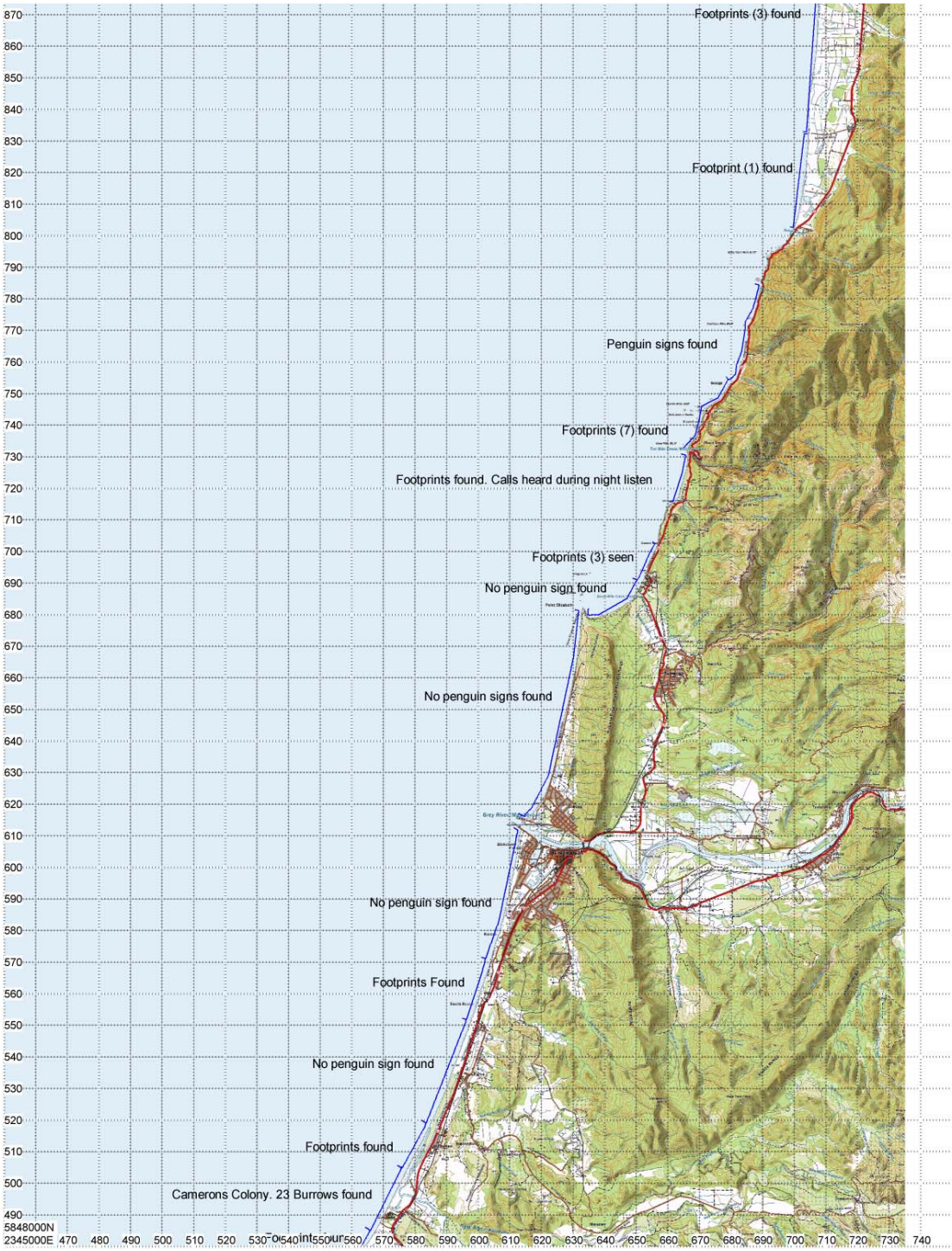
5.1 Map showing findings:

Map 1. Shows the locations of where evidence of Blue Penguins was found within the study area.

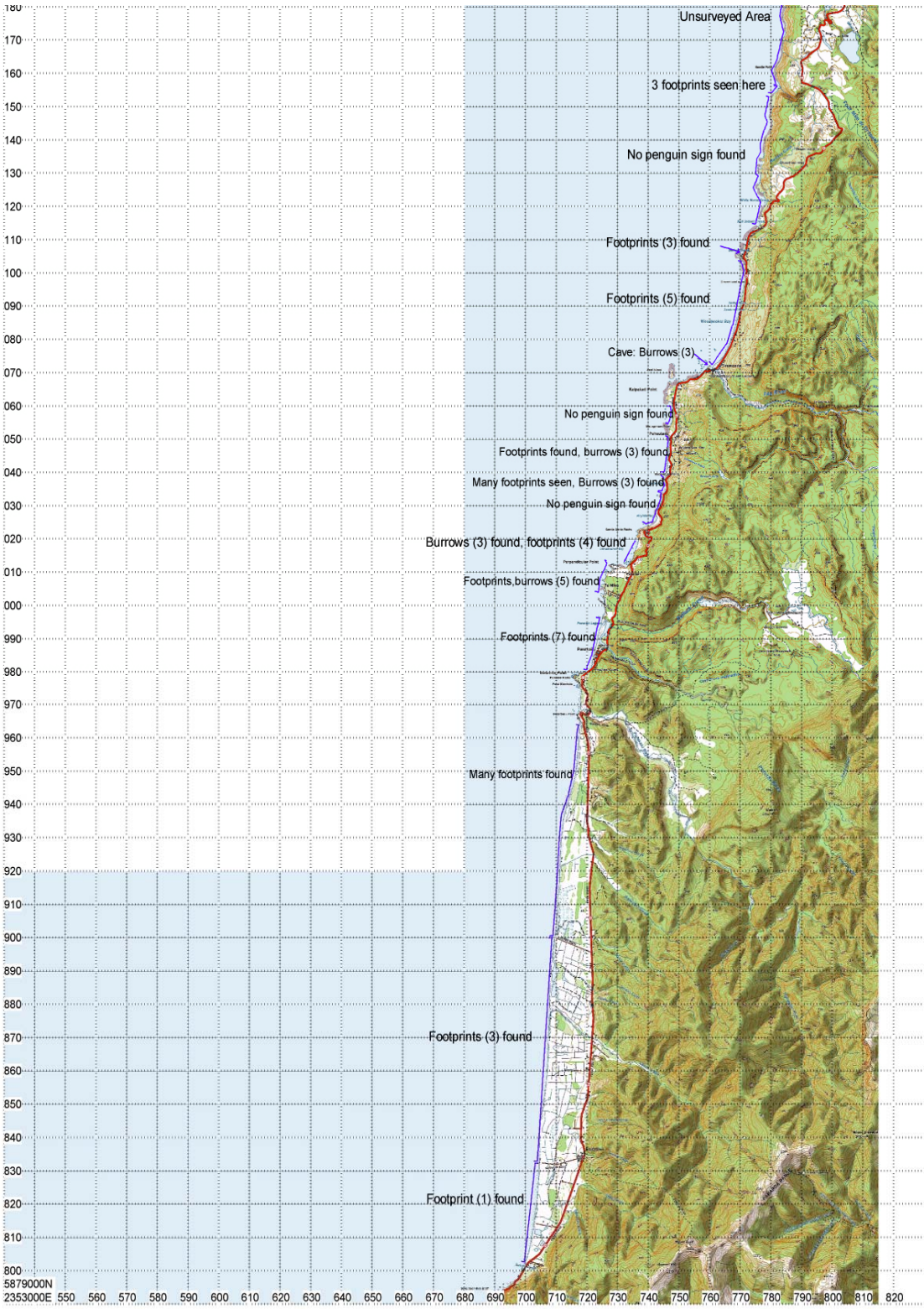


1- Camerons Beach
2- Karoro Beach
3- Pakiroa Beach
4- Pororari Beach
5- Te Miko Area
6- Irimahuwhero Bay
7- Meybille Bay Area
8- Limestone Creek Area
9- Fox River Cave
10- Woodpecker Bay
11- White Horse Creek
12- Charleston
13- Nine Mile Beach
14– Tauranga Bay
15– Cape Foulwind
16– Carters Beach
17- Hector/ Granity Area

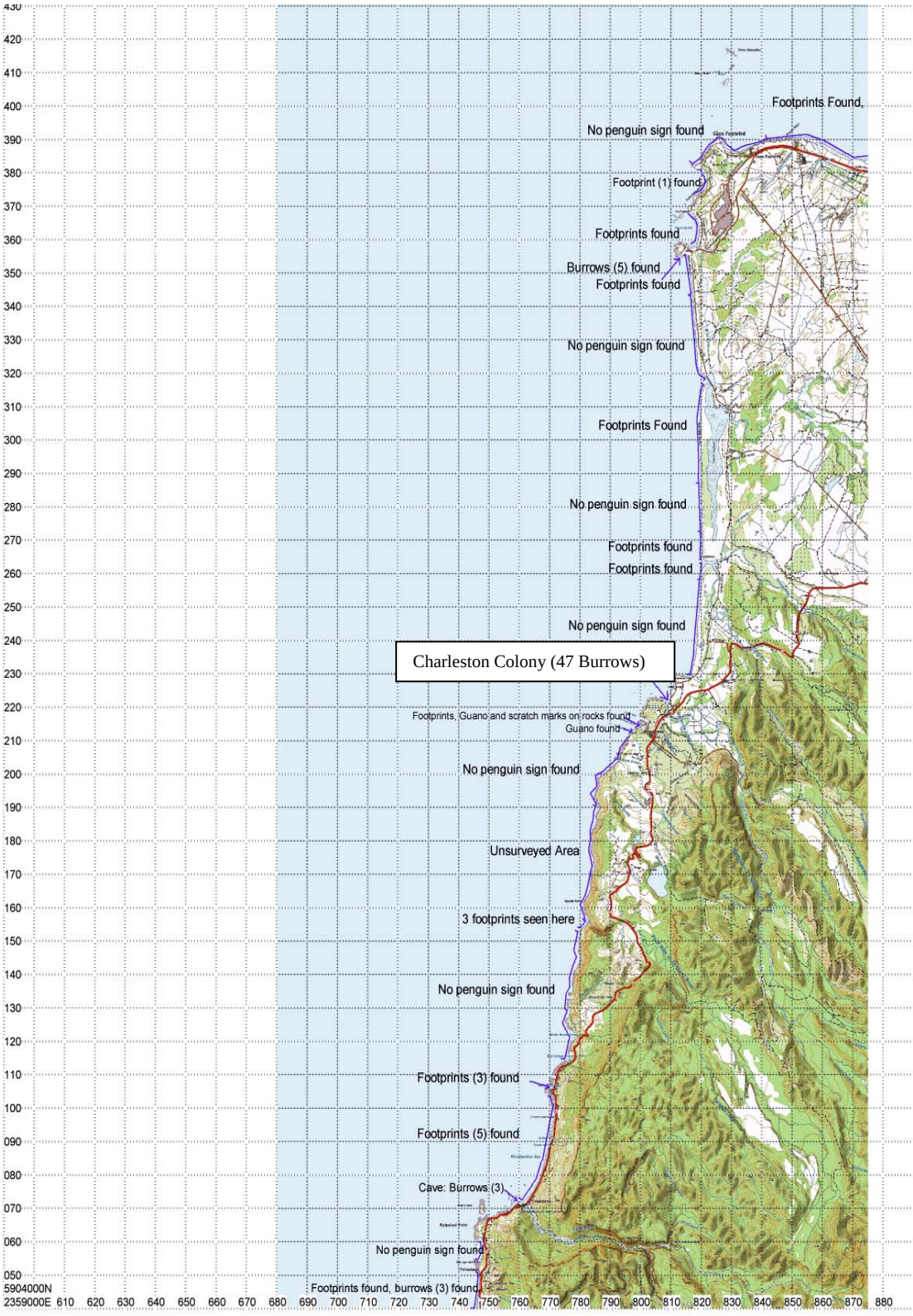
Map 2- Shows the findings (for a segment of the study area) from the survey carried out over the study period.



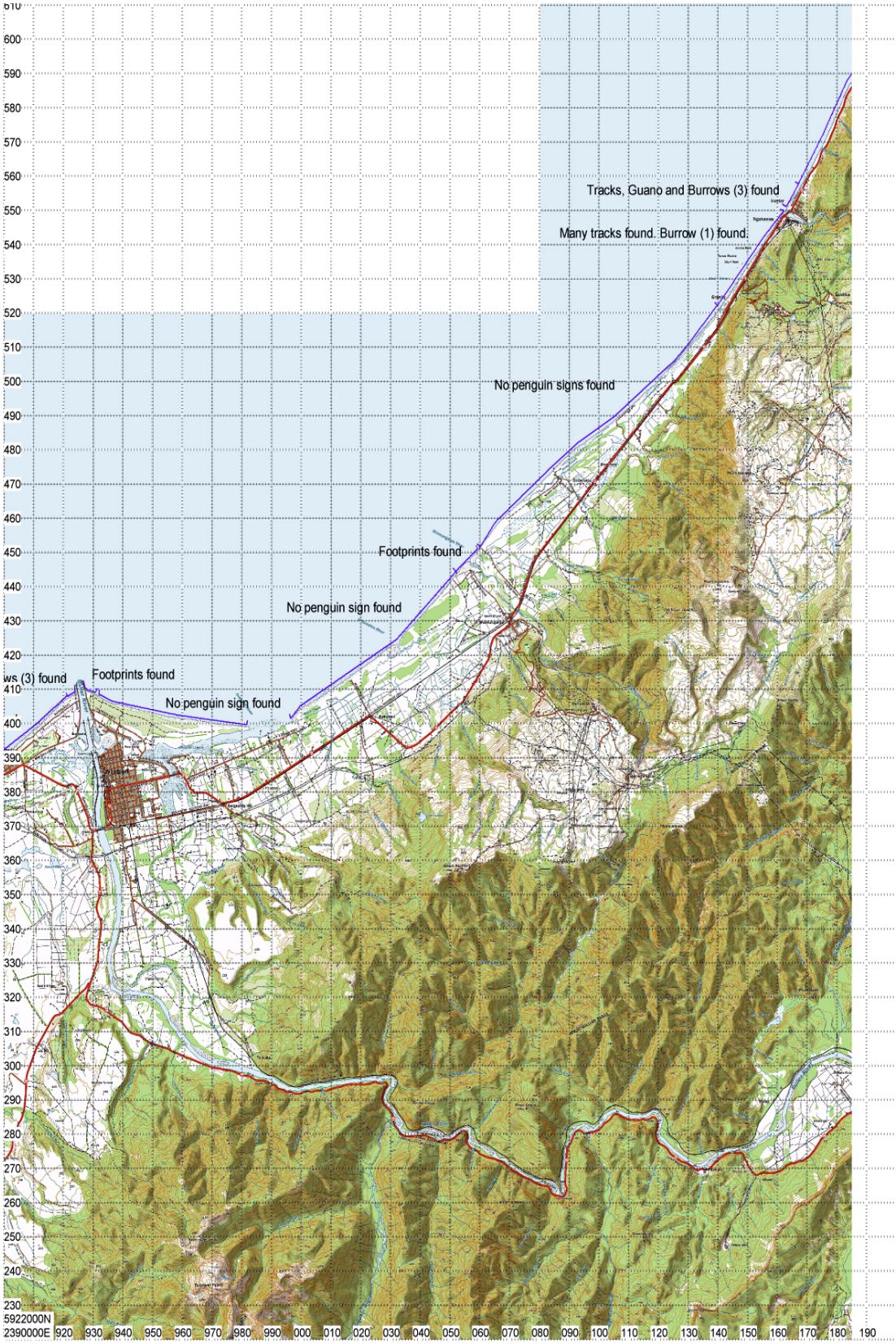
Map 3- Shows the findings (for a segment of the study area) from the survey carried out over the study period.



Map 4- Shows the findings (for a segment of the study area) from the survey carried out over the study period.



Map 5 - Shows the findings (for a segment of the study area) from the survey carried out by over the study period.



Map 6 - Shows the findings (for a segment of the study area) from the survey carried out over the study period.

Map 7- Shows the findings (for a segment of the study area) from the survey carried out over the study period.

5.2. Results by location:

1. Camerons

The Camerons area begins at the mouth of the Taramakau River (E2356252, N5847809) and continues north until the mouth of the New River is reached (E2358442, N5851739).

Camerons consists of a sandy beach with plentiful driftwood of all sizes. Backed onto this is a dense covering of vegetation consisting mostly of gorse, blackberry, flaxes, Mahoe and Marram grass. It was in this vegetation that fourteen burrows were found, while the remaining nine were found further inland on private property.

This area was surveyed initially in early October by Paul Sutton who visited the site five times. These visits consisted of three night listens where footprints were found each time; two adults were also found on one occasion. The other two visits were beach walks during which Paul found footprints and burrows. As substantial evidence of Blue Penguin activity was found, this site was then extensively searched by Robyn Blyth in November, December and early January. The site was visited thirteen times during the project – seven of which included burrow checks, the remaining six visits involving beach walks and night listens. A total of twenty-three burrows were found at this site. These burrows were labelled PA1 – PA23.

Potential threats to the Blue Penguin in this area are dogs, tracks of which were almost always found up and down the beach; additionally, stray dogs were seen roaming the beach during the day. Weka, as well as their prints, were found to be reasonably abundant – especially north of the Ted McGrath walkway. Quad bikes were often seen and heard driving up and down the beach during night listens – at approximately the same time that penguins were returning from sea. Stoat and cat prints were constantly found on the sand, and they may also threaten the Blue Penguin.

2. Karoro

Karoro is located just south of Greymouth with the southern most part of the beach in this survey area beginning at (E2359853, N5855363) and continuing north until (E2360705, N5858103) is reached.

Karoro contains very similar habitat to the Camerons site. It is comprised of a sandy beach, plentiful in driftwood and has a dense vegetation verge comprised of mainly gorse, blackberry and flax.

This area was surveyed initially by Paul Sutton on two occasions – both visits being beach walks. Paul found footprints on both occasions with the largest amount found being eleven prints all around the same area.

This area was revisited by Robyn Blyth in November and December and footprints were found around the same area. No burrows were found here. A total of six hours was spent surveying this area.

Observed potential threats at Karoro were dogs, people, quad bikes, stoats, cats and Weka. All of these threats were evident from tracks on the beach as well as being seen first hand during the survey.

3. Pakiroa Beach

Pakiroa Beach begins at (E2369757, N5879886) and continues north until Razorback Point is reached (E 2371747, N5896456).

Pakiroa beach is a long sand and stone beach with a varying width of vegetation running along it containing flax, gorse and blackberry. Backed onto this is a mix of flat pasture and bands of wetlands and lagoons.

This whole beach was surveyed by Paul Sutton in late October where it was visited three times (two beach walks and one night listen). Footprints were seen by Paul in most places where there was a substantial buffer zone between the beach and the farmland/wetlands.

Robyn Blyth visited this area on 1 December and found small clusters of two or three footprints mostly at the northern end of the beach.

A total of around 12 hours was spent surveying this site.

Potential threats observed in this area consist mostly of dogs and people, especially at the northern end of the beach as Razorback Point seems to be a popular fishing and tourist area.

4. Pororari Beach

Pororari Beach begins at (E2372128, N5898138) and continues north until the mouth of the Pororari River is reached (E2372488, N5899616).

Pororari Beach is a sandy beach which is backed by the Pororari River on the north side and a small verge of vegetation followed by houses/accommodation on the south.

Paul Sutton carried out two beach walks in late October. Paul found around 15 sets of footprints right along this beach.

Robyn Blyth carried out one night listen and one beach walk of this area in early December during which much less activity was seen. No calls were heard at night and only three footprints were seen on the beach the next morning.

A combined total of approximately six hours was spent by Paul and Robyn surveying this area.

Potential threats to Blue Penguins in this area may come largely from humans. As a major tourist destination on the West Coast this beach has a large amount of human activity on the beach each day. Traffic may also be an issue where the beach comes very close to the road at the southern end.

5. Te Miko and North of the Truman Track

The Te Miko area begins at the beach end of the Truman Track (E2372505, N5900321) and continues north until Perpendicular Point is reached (E2372713, N5901213).

Te Miko is comprised of a series of three pebble bays. These bays are separated by small rock outcrops and coastal vegetation. Backing on to this beach is steep cliffs topped with coastal scrub.

This area was visited by Paul Sutton three times; of his visits were beach walks. Upon all of his visits, Paul found footprints, guano, and scratch marks on rocks. One burrow was also found on one occasion. Robyn Blyth then revisited this area and found a total of six burrows (labelled TB1-TB6). These burrows were monitored throughout the study period and were visited on five occasions. Unfortunately, access to the northern-most bay was denied by a local farmer, and therefore Robyn was unable to search this area for burrows. A total of six birds were banded in this area (see Appendix for details on birds banded).

A total of eight and a half hours was spent surveying and monitoring this area. This is inclusive of both Paul and Robyn's surveying time.

The main threats to the penguins in this area were observed to be people. Trumans Track is a well-known tourist destination for many, and all burrows are reasonably accessible- especially two which are located in a large cave.

6. Irimahuwheri Bay (Perfect Strangers Bay)

This area begins at Perpendicular Point (E2373232, N5901203) and ends at the Gentle Annie Rocks (E2373682, N5901938).

Irimahuwheri Bay is a pebble bay at the base of a steep slope- which is densely vegetated forest consisting mainly of Tree Ferns, Supplejack, Kiekie and Nikau Palms. The burrows which were found were in close vicinity to each other and located at the edge of the forest margin.

This area was surveyed twice by Paul Sutton on 2 and 5 November 2005 and was revisited twice by Robyn Blyth on 10 November 2005 and again on 18 November 2005. A total of three burrows (labelled PS1-PS3) were found at this location, as well as four sets of prints of the beach. A total time of around six hours was spent surveying this location.

Weka and Stoats were observed as the potential threats in this area. As the beach is rather difficult to get down to, the concentration of human activity in this area is thought to be relatively low.

7. Meybille Bay Area

This area starts at the southern end of Meybille Bay (E2374187, N5902484) and ends at Mutokuku Point (E 2374566, N5903763).

This area is a mix of sandy bays and rocky headlands with numerous limestone caves and fissures. Beaches are backed onto coastal scrub covered hillsides. On many parts of this stretch of coast, the beach and State Highway 6 are very close together.

This area was visited by Paul Sutton once on 1 November 2005 and Robyn Blyth revisited the area twice in mid December. In a total of approximately nine hours spent searching the area, small numbers of footprints were seen with the most penguin activity being observed in and around the cave system at Motukuku Point. Here four burrows were found in close proximity to each other in a rocky outcrop on the southern side of the cave. One burrow was also found behind the cave.

Scratch marks were also found on rocks very close to the roadside, suggesting that penguins may burrow on the side of the road opposite the beach. This side of the road was surveyed, yet was unsuccessful in finding penguin signs.

Possibly the most likely threat to the Blue Penguin in this area is traffic. A number of road kills have been reported in this area in the past. Dogs may also be another threat. Upon one of Robyn Blyths surveys she encountered a dog roaming the beach and unaccompanied by an owner.

The amount of human activity on the beach is minimal, so people are not likely to be a major threat in this area.

8. Limestone Creek

This area is part of Pahuatane Beach which (for this survey) begins just north of Motukuku Point (E2374573, N5903988) and continues north until Mangahura Point is reached (E2374723, N5906133).

The Limestone Creek area contains a sandy beach which is backed onto a varying width of coastal vegetation and then to State Highway 6. Down the northern end of this area the vegetation width increases and develops into a thicker cover on a steep hillside around 30 metres from the road.

This area was visited once by Paul Sutton on 1 November 2005 and revisited multiple times by Robyn Blyth in November and December 2005 and January 2006. The most penguin activity occurred down the northern end of this beach- where the vegetation begins to increase and the hill slope gradient increases. Here numerous footprints were seen and three burrows (labelled LC1-LC3) were found.

The main threat to Blue Penguins here is traffic on State Highway 6. Other threats are people using the beach, and dogs.

9. Fox River Cave

Fox River Cave is located at (E2376059, N5907096). The cave contains one main passage which begins just north of a series of baches and continues until it reaches the sea. Branching off this main passage are two smaller passage ways in which three penguins and their burrows (labelled FR1-FR3), footprints and guano were seen. One bird was banded in this area (see Appendix for details on banded birds).

This cave was visited once by Paul Sutton on 3 November 2005 and was monitored by Robyn Blyth right throughout her part of the survey.

Possibly the main threat to the penguins in this cave is people. During this survey people were often seen exploring inside the cave, sometimes with dogs. Other threats may be stoats or possums entering the cave and endangering the penguins.

10. Woodpecker Bay

Woodpecker Bay begins at the mouth of the Fox River (E2376073, N5907198) and continues north until Belfast Creek is reached (E2377108, N5910693) Woodpecker Bay is a sandy beach which backs onto a small width of coastal vegetation until State Highway 6 is reached.

This area was surveyed by Paul Sutton on 4 November 2005 and Robyn Blyth revisited the area on 7 December 2005. A total of three hours was spent surveying this area.

Three sets of footprints were found during both surveys.

Possible threats to Blue Penguins in this area are people, dogs and traffic.

11. White Horse Creek Area

This area begins on the beach near the southern most bach at Red Jacket Creek (E2377623, N5911398) and ends at the northern end of the White Horse Creek Beach (E2377865, N5912277). Within this area are two main beaches which are divided by a rocky headland. Both areas contain a sandy beach which backs onto dense coastal scrub vegetation.

This area was visited by Paul Sutton once on 4 November 2005 when a small number of prints were found. It was also revisited by Robyn Blyth on 10 December 2005, when only one set of footprints was seen at Red Jacket Creek. A total of four hours was spent surveying this area.

The most likely threat to Blue Penguins in this area is traffic – mostly down the southern end of this area. Paul Sutton found one dead penguin which had been struck by a vehicle during his search near this area.

12. Charleston

Charleston contains possibly the highest known population of Blue Penguins in the study area, with around 51 burrows found within a small area. The colony is located at (E2380919, N5922029).

The colony is situated on a series of hill slopes in mixed coastal vegetation. Within this vegetation are 51 burrows (labelled C1-C51) which tend to be located under tree stumps, between rock fissures or under rock outcrops in the ground. Thirteen nest boxes are also located in this area, seven of which were used at some stage during the study period. Two birds were banded in this area (see Appendix for details on banded birds).

Robyn Blyth visited this area on a regular basis and the burrows were monitored from early November 2005 until mid January 2006. The Charleston colony was visited nine times in total. Helen Chambers also monitored these burrows once a week from 10 September 2005.

Other observations made by Paul and community members indicate that there are other small colonies around the Charleston area such as Joyce Bay and the south side of the Nile River.

Possibly the biggest threat to Blue Penguins in this area is stoats – of which numbers are unknown. Minimal human activity occurs in this area with only some local residents and fisher people using this area.

13. Nine Mile Beach

Nine mile beach is approximately 13 km in length. It begins just north of Parsons Hill (E2381578, N5923030) and continues north until the beach ends – near the beginning of Okari Road (E2381473, N5935563). Nine Mile Beach is a sandy beach and is backed by farmland and roads. Many areas of the beach contain steep sandy inclines and tall grasses. The Totara and the Okari River mouths are both located along Nine Mile Beach.

Dawn Mazzagetti surveyed this area in October 2005. Her surveys were comprised of beach walks during the night. Dawn found numerous clusters of footprints along the beach and sighted two adult penguins.

Robyn Blyth then revisited this area on two occasions in early December 2005 and found many tracks but no burrows were found.

A total of approximately 10 hours was spent surveying this area.

Threats to the Blue Penguin in this area are relatively minimal. Weka prints were observed by both Dawn and Robyn Blyth and toward the northern end dog prints were observed.

14. Tauranga Bay

The Tauranga Bay Area begins at the northern end of Nine Mile Beach (E2381473, N5935563) and continues north until the end of the Tauranga Bay beach (E2381728, N5936793). Tauranga Bay is comprised of a sandy beach which backs onto a thin strip of grass vegetation before the road and then continues onto farmland or bush. Both ends of Tauranga Bay contain rocky headlands with mixed vegetation containing grasses, flaxes and gorse.

This area was surveyed by Dawn Mazzagetti on two separate occasions in early October 2005. Dawn found approximately six sets of tracks on her visits. These were located both in the middle of the bay as well as right down the northern end of Tauranga Bay (near the start of the walk to sea colony).

Robyn Blyth then revisited the area a total of five times during December 2005. These visits consisted of four daytime investigations and one night listen. Upon surveying the area Robyn consistently found six to seven sets of prints down the northern end of the bay. She also found sets of prints on the beach on the southern side of the south headland. This led to five burrows (labelled TB1-TB5) which were then monitored throughout the continuation of her fieldwork.

A total of nine hours were spent by both Dawn and Robyn surveying this area.

Tauranga Bay receives a substantial amount of tourism and because of this people may be seen as a threat to penguins. Other observed possible threats are dogs and Weka.

15. Cape Foulwind

Cape Foulwind consists of a series of three small bays all of which are a mix of sand and gravel. Backed onto this is a thick covering of flax and marram grass which leads to steep hill slopes containing various coastal scrub species. Cape Foulwind begins at (E2381758, N5937303) and finishes at (E2382554, N5939043).

This area was searched by Dawn Mazzagetti once in October 2005 and revisited by Roby Blyth in late November 2005.

Minimal evidence of penguin activity was found in this area, with only two sets of footprints found by Robyn in one of the bays.

Threats to Blue Penguins in this area are people, dogs, Weka, stoats and fur seals.

16. Carters Beach

Carters Beach begins at the western head of the Buller River mouth (N5940924, E2392454) and continues westward until Kawau Point is reached (N5939010, E2354879). Scattered driftwood is present throughout this sandy beach which then leads on to a dense scrub/bush margin comprised of gorse, flax, and blackberry. This margin is dense and varies in width; at some stages along the beach this margin has completely gone. Behind this is bare grass or farmland occupied by cattle.

This area was initially surveyed by Dawn Mazzagetti during October and November 2005. Robyn Blyth revisited the area on multiple occasions between November 2005 and January 2006. A total of three burrows were found at this location and labelled CB1-CB3.

The potential threats existing to the Blue Penguin in this area are mainly from human activity. Many people recreate along the beach with horses, quad bikes, and dogs. Cattle from the surrounding farmland were seen escaping from their paddocks on two occasions during night listens and they were free to roam the beach.

Weka and stoats also populate this area, which may also be a risk to the survival of the penguins. An area close to the beach is presently being subdivided. Numerous footprints have been found along the stretch of coast parallel to the subdivision yet no burrows were found. It may be that the burrows are located further inland.

17. Hector and Granity

The northern most signs of Blue Penguins were found around the Hector/Granity region starting at (E2414008, N5952220) just south of Granity and continuing north until the northern end of Hector is reached (E2416648, N5955805).

The beach at this location is comprised of a mix of sand and stones. Backed onto this is a reasonably thin width of vegetation. This is then followed by houses. The Ngakawau River Mouth separates Hector and Granity.

Dawn surveyed this area on two separate occasions and observed footprints which were scattered along the beach leading to houses and vegetation patches close to the shore.

Robyn Blyth visited this area on four separate occasions (three beach walks and one night listen) in late December 2005 and early January 2006 and found many possible burrow sites close to and under houses. She also consistently found about 11 sets of footprints along the beach. During Robyn's night search she heard barking calls out at sea but did not see any sign of Blue Penguin activity.

A total of approximately 10 hours was spent surveying this area.

Threats to the Blue Penguin in this area may be from humans, Weka, stoats and dogs.

5.2 Timing of the Breeding Season

Table 5.1.This table shows the data from burrows which were occupied at stages during the study period. Data has been taken from all burrows surveyed throughout the coast.

	6/11/05-12/11/05	13/11/05-19/11/05	20/11/05-26/11/05	27/11/05-3/12/05	4/12/05-10/12/05	11/12/05-17/12/05	18/12/05-24/12/05	25/12/05-31/12/05	1/1/06-7/1/06	8/1/06-14/1/06	15/1/06-21/1/06	22/01/06-28/01/06
No. Eggs	4 (10%)	1 (3%)	1 (9%)	1 (1.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
No. Chicks	2 (5%)	7 (18%)	3 (27%)	10 (16.6%)	9 (11.5%)	3 (8.8%)	5 (6.80%)	2 (3.7%)	2 (2.40%)	2 (1.3%)	0 (0%)	1 (1.36%)
No. Moult	0 (0%)	0 (0%)	0 (0%)	2 (3.3%)	10 (12.8%)	9 (26.4%)	9 (12.3%)	3 (5.60%)	10 (12%)	6 (8%)	0 (0%)	6 (8.21%)
No. Adults	9 (22.5%)	6 (13%)	3 (27.20%)	8 (13.3%)	18 (23%)	16 (47%)	10 (13.7%)	4 (7.5%)	10 (12%)	6 (8%)	0 (0%)	6 (8.21%)
No. Empty Burrows	31 (77.5%)	36 (80%)	5 (45%)	41 (68%)	57 (73%)	23 (68%)	55 (75%)	44 (83%)	66 (75%)	59 (79%)	0 (0%)	68 (93%)
Total no. of burrows visited	40	45	11	60	78	34	73	53	83	75	0	73
No. of chicks fledged since last visit	0	0	0	0	1	3	1	2	7	0	0	1

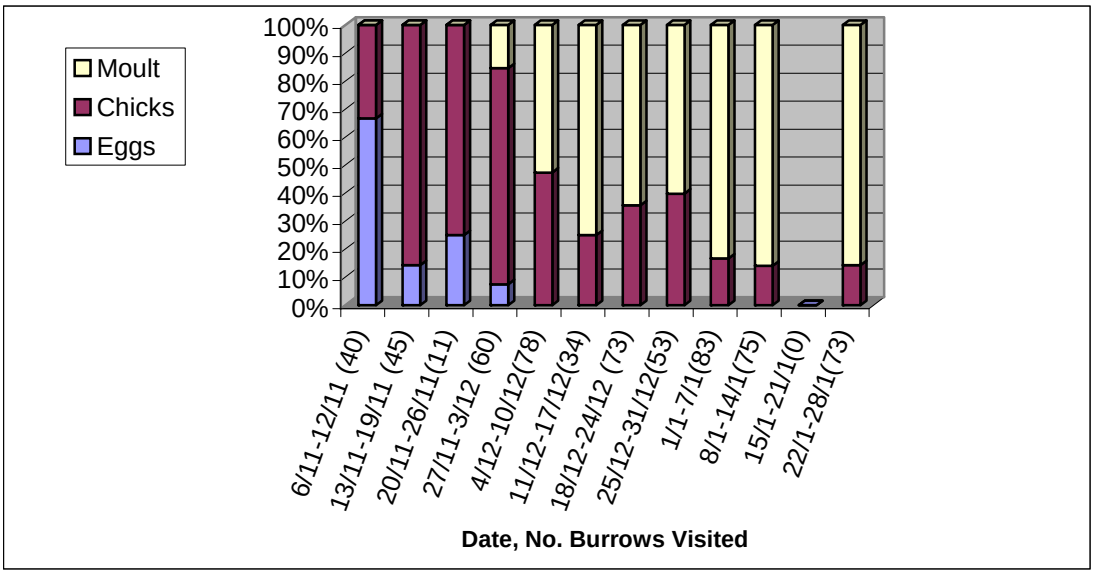
Throughout each time period in this table (seven days) the burrows visited have shown results that provide some indication about the timing of the breeding season. These results show that no eggs were laid after 12 November 2005. From this study it is uncertain when egg laying began, but additional information from the Charleston burrows gathered by Helen Chambers (see Appendix for data) shows that eggs were being laid before 12 September 2005.

Chicks had begun to hatch also before this survey began. Helen Chambers' information shows that the first chick was seen newly hatched in Charleston on 12 September. When burrows were first monitored two chicks were present. The number of chicks began to gradually increase and numbers peaked (to 10 chicks) between 27 November and 3 December 2005.

Chicks then began to fledge between 27 November and 3 December and continued to do so progressively from these dates with chick numbers dropping steadily as time went on. The total number of chicks found in the study area was twelve. The biggest number of chicks fledging their nest during any time period was seven. This occurred between 31 December and 7 January.

Throughout the study period, a total of 32 penguins were found in moult. Moult was first seen to be occurring on 2 December 2005 where two birds were observed to be moulting. Moult was then observed after this date at each time interval throughout the remainder of the study period; six birds were found in late stages of moult on the last observation (25 January). The time which birds took to moult varied between 14 and 21 days. Most penguins appeared to take closer to 14 days to moult.

Figure 5.1 Shows the percentage of eggs, chicks and adults moulting in occupied burrows over the study period.



6. Discussion

Changes in Population

Information on Blue Penguin population numbers in Westland is very limited. Evidence to suggest that penguin population numbers are declining come mainly from anecdotal sources. Many people spoken to by Paul Sutton, Dawn Mazzagetti and Robyn Blyth indicated that penguin numbers have decreased during the last 30 – 40 years. In addition, census forms issued by the West Coast Blue Penguin Project Group (WCBPPG) have indicated a decline in penguin numbers.

The only known census of the West Coast Blue Penguin population was carried out by Thornton et al (1991) who surveyed population numbers and the distribution of penguins in the Paparoa National Park. The findings from that study indicated a small, scattered population in the area (from July to October 1991). This is similar to the findings in this report – yet comparisons between these two reports are limited as they were conducted at different times of the year. The only comparable months are September and October.

Data from those two months for the two studies show similar results. Burrows were found in our study at similar places and in relatively similar numbers as were found in 1991. Although this evidence is very limited, it does suggest that the population of Blue Penguins in the Paparoa National Park area has stayed relatively constant. Habitat has changed little with stoats and road kills being the key threats in the area.

Elsewhere in New Zealand, population numbers are declining on the main islands of the Chatham Islands (but are stable on both Rangatira and Star Keys Islands) (Taylor 2000). In the North Island, the largest colonies are located on the northern offshore islands including Hen and Chickens, Little Barrier, Great Barrier, Mercury and Aldermen Islands (Taylor 2000). In the South Island, the largest known colonies are located between the Waitaki River and Nugget Point. Populations have declined on predator free offshore islands (Taylor 2000). This may mean that declines are linked to events in the marine environment.

Distribution of the Blue Penguin

Findings from this study suggest that there is a discontinuous population of Blue Penguins from the Taramakau River Mouth to the mouth of the Mokihinui River. There were large colonies (containing around 50 burrows), smaller clusters of penguins and isolated individuals or breeding pairs along the coast. Based on anecdotal evidence (Hughes 2005), it may be assumed that the Blue Penguin has previously occupied a much larger proportion of the study area. The isolated pairs or clusters of small numbers of birds may be the last remaining birds of once larger colonies.

Broadly speaking, penguin numbers were highest where human activity was low. In areas where there was very high human activity (such as Punikaiki Beach) little or no signs of penguins was found. In many areas of the coast no sign of penguins was evident in habitats that appeared suitable. Examples of this were in Paparoa National Park where no sign of penguins were found in many bays (such as Meybille Bay and

White Horse Creek Bay). These areas appeared to be good habitat for penguins as there is minimal human disturbance, sandy/pebbly beaches for safe landing sites and the area which backs onto the beach contains habitat in which burrows could easily be constructed.

Habitat:

Blue Penguins use a wide range of habitats in both New Zealand and Australia (Fortescue 1995). Burrows found in this study were at the rear of sand dune systems, under and around rocks, in sea caves and on headlands and were not usually found more than around 100m from the sea. Burrows were most abundant in areas where there was some sort of natural infrastructure such as in between rocks or under an object such as driftwood or in sand dunes.

Rocky or semi rocky areas seemed to contain fewer birds than the sandy/pebbly beached areas. Methods which were used to locate penguins may have also accounted for this –on rocky and very stony areas penguins may have been present, yet our search methods did not pick this up.

There appeared to be very little correlation between the habitat which Blue Penguins used, and Blue Penguin numbers. In some cases such as Perfect Strangers Bay there were many good areas for penguins to burrow, there was good exit area to shore from the sea and little human presence, yet signs of Blue Penguins were scarce.

The birds occupy such a wide range of habitats (e.g. some close to human inhabitants with the constant danger of predators or threats associated with humans) and therefore it may be other influences (for example where they are able to find food at sea) that determines the locations where they live.

Threats to the Penguins:

During this study a number of potential threats were identified in each area that Blue Penguins were found. Weka and dogs appeared to be the most frequently observed potential threat. Other potential threats observed were mustelids, traffic, quad bikes and human influences such as recreational activities and housing developments. Research into the impact of mammalian predators on Blue Penguins is required, and threats are likely to vary somewhat from area to area.

Many locations within the study area are thought to be good habitat for penguins, yet signs of birds in these areas were scarce. This may be due to such areas being most favourable to predators. An example of this is in the Paparoa National Park where large areas of suitable habitat appears unused. Stoat prints on the sand or wet mud within the forest floor were commonly seen. Stoats are able to live in any habitat which contains adequate prey (King 2000). Stoats avoid areas which have significant human disturbance. Many areas in the Paparoa National Park region have little human visitation, thus making the habitat favourable for stoats. The Charleston Colony is very similar to much of the habitat found in the Paparoa National Park area, yet Blue Penguins are far more abundant due to the presence of traps which have been

successful in catching stoats, rats and Weka – all species which may predate penguins.

The influence of Weka on the Blue Penguin is unknown, yet both Dawn and Robyn noticed that areas where Weka were common had very few penguins. A penguin chick was seen (by a worker at Holcim) in the mouth of a Weka near Carters Beach. The Weka is classed as a threatened species (DOC 2005). This means that the Weka is of greater conservation concern than the Blue Penguin.

Feral cats are widely distributed in many parts of New Zealand and occur in many habitats. Cats are known to prey on Blue Penguins on offshore islands (King 2005), and no doubt on the mainland also. The distribution of cats within the study area is unknown, yet it is assumed that the population of cats is greater closer to human settlements. Cats are thought to play a major role in the decline of some Blue Penguin colonies, such as the colony at Flea Bay on Banks Peninsula (Williamson 2002) and thus may be a threat to colonies within the study area.

Dogs are known to have a significant impact on Blue Penguins (Stahel and Gales 1987) and there have been anecdotal accounts of attacks on penguins by dogs within the study area. It is not unknown how much dogs have and will influence penguin populations yet footprints and dogs (both accompanied and unaccompanied by an owner) were found in many accessible areas searched in this study.

At least some of these threats are evident in most areas where penguins were present. Ferrets are more of a problem in the Flea Bay colony (on Banks Peninsula) because of the extensive grasslands surrounding the colony.

Critique of Methods:

Another reason why more penguins were found in some areas than others may relate to the methods used. The most often used method of finding penguin signs by Dawn, Paul and Robyn was to search for footprints on beaches. This possibly gives an unreliable indication of bird presence as well as their numbers as there are many variables which influence the results such as weather – tracks can be washed away by rain, tracks may disappear when swept away by the tide, and the differing coarseness of materials on the beach – tracks are hard to see when material on the beach is coarse.

This may mean that Blue Penguins were present in areas where there was thought to be none. Whilst Robyn was trying to get an insight into the timing of the breeding season she was continually finding new burrows. Ideally, it would have been beneficial for all burrows to have been found before the monitoring began. This would have led to more accurate results. Ideally, if it had been possible, Robyn should have also begun her fieldwork earlier than November, as she would have been able to obtain some data on the timing of egg laying.

During night searches only a very small part of the surveyed area could be observed at any one time. Information collected at night was also biased toward areas which were easily accessible.

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Appendix

Table 1. Common names and scientific names for species mentioned in this report.

Common Name of Species	**Scientific Name of Species**
Plants:	
Blackberry	*Rubus fruticosus*
Gorse	*Ulex europeaus*
Kiekie	*Freycinetia banksii*
Mahoe	*Malicytus ramiflorus ssp. Ramiflorus*
Marram Grass	*Ammophila arenaria*
New Zealand Flax	*Phormium tenax*
Nikau Palm	*Rhopalostylis sapida*
Tree Fern	*Dicksonia fibrosa*
Supplejack	*Berchemia scandens*
Animals:	
Cat	*Felis catus*
Cattle	*Bos taurus*
Deer	*Cervus elaphus scoticus*
Dog	*Canis familiaris*
Ferret	*Mustela furo*
Goat	*Capra hircus*
Possum	*Trichosurus vulpecula*
Sheep	*Ovis aries*
Stoat	*Mustela erminea*

Table 2. This table shows the occupancy of the burrows located at Charleston throughout the study period.

Burrow	9/11/2005	18/11/2005	2/12/2005	8/12/2005	21/12/2005	4/1/2006	7/1/2006	25/1/2006
C1	FI	FI	FI	FI	FD	FI	FI (NU)	FI(NU)
C2	FD	FI	FI	FI	FD	FI	FI (NU)	FI(NU)
C3	FD	FI	FD (N)	FI	FI	FI	FI (N)	FI (feather)
C4	FI	FI	-	FD (N)	FD (N)	FD	1A (moulting)	A (moult)
C5	FD	1A, 1C	1A, 1C	C	FD	F	FI (N)	FD (N)
C6	FD	C	C	A (moult)	A(moult)	FI	FI	FD(N)
C7	FI	FI	FI	FI	FI	FI	FI	FD(N)
C8	FI	FI	FI	A	A (moulting)	FI	FI	
C9	1A	FI	FI	N	FI	FD	1A (moulting)	FD(feathers)
C10	FD	-	-	FD (feathers)	FI	A	FI (NU)	FI
C11	1A	FI	FI	1A	A	FI	1A (moulting)	FI
C12	FD	FI	FI	FI	FI	FI	FI	FD(N)
C13	FI	FI	FI	FI	FD	FD	FI	FI
C14	FD	FD	FD (N)	FD (N)	FD(N)	FI	FI	FD(N)
C15	FD	FD	FD (N)	FI	FI	A	FI	FD
C16	FD (N)	FD	FD (N)	A (moulting)	A (moulting)	FD (N)	1A (moulting)	FI
C17	FD (N)	FD	FD (N)	FD (N)	FD (N)	FI	FD (feathers)	FD
C18	FD (N)	FD	FD (N)	FI	FI	FD(feather)	FI	FD(feathers)
C20	FD	FD	FD	FD	FD	FD	FI	FI
C21	FD	FD	FD	FD	FD	FI	FI	FI
C22	FD	FD	FD	FD	FD	FD	FD (feathers)	FI
C23	-	-	FD	FD	-	FI	FI	FI
C24	FD	FD	FD	FD	FD	FD	FD (N)	FD(N)
C25	FD	FD	FI	FI	A (moulting)	FD	FD (N)	FI
C26	FD	FD	FD	FI	FD	FI	FI	A (moult)
C27	-	FD	FD	N	FI	FD	FI	FI
C28	-	-	FD	FI	-	FD	FI	FI
C29	FD	FD	-	-	-	-	FD (N)	-
C30	FD	FD	FD	FD	FD	-	FI	FI
C31	FI	FI	FD	FI	FD	FI	FI (NU)	FI
C32	-	FI	FI	FI	?	FD(feather)	?	FI

C33	FD	FD	FD	-	FI	-	FI	FD A
C34	FI	FI	FI	-	FI	-	?	FI
C35	FI	FI	FI	FI	FI	FI	FI	FI
C36	-	-	-	FI	FI	FI	?	-
C37	-	-	-	FI	FI	FI	FI	FI
C38	-	-	-	FI	FD	FI	FI	FI
C39	-	-	-	FI	FD	FI	FI	FI
C40	-	-	-	-	FI	FI	?	FI
C41	-	-	-	-	FI	FI	FI	FI
C42	-	-	-	-	?	FD	?	-
C43	-	-	-	-	?	?	FI	-
C44	-	-	-	-	?	FD	?	FI
C45	-	-	-	-	FD (Guano)	FD	FI	FI

A= Adult Penguin. C=Chick. N= Shows signs of use but not occupied. NU= Does not show any sign of use.

Table 3. Shows occupation of nest boxes located in Charleston throughout the study period.

Date of visit	9/11/2005	18/11/2005	2/12/2005	8/12/2005	21/12/2005	4/1/2006	8/1/2006	25/1/2006
C 1	1A,1E,1C	1A,1C	C	N	N (feathers)	Feathers	FD (N) feathers	NU
C 2	1A,2E	1A,2C	1A,2C	2C	2C	2C	1C	NU
C3	-	FI	FI	NU	NU	FI	FI (NU)	REMOVED
C4	-	NU	N	NU	NU	N (feathers)	N	NU
C5	-	NU	NU	NU	NU	A (moult)	A(moult)	NU
C6	-	NU	NU	NU	FD	FI	1A (moulting)	NU
C7	-	NU	NU	NU	FI	FI	NU	NU
C8	-	NU	NU	NU	FI	FI	NU	NU
C9	-	NU	NU	NU	FI	A	NU	NU
C10	-	-	NU	NU	NU	NU	NU	NU
Ca	-	-	N	N	N	1A	1A (moulting)	NU
Cb	-	-	NU	NU	NU	NU	NU	NU
Cc	-	-	NU	NU	NU	NU	NU	NU

Table 4 Data showing the occupation of the Camerons burrows throughout the study period.

Burrow	22/11/2005	30/11/2005	5/12/2005	13/12/2005	24/12/2005	6/1/2006	10/1/2006	24/1/2005
PA 1	NU	NU	NU	NU	NU	NU	N(feathers)	A (moult)
PA 2	N	N (FD)	N (FD)	N (FD)	N (FD)	N(feathers)	N (FI)	N (FI)
PA 3	-	-	-	-	-	-	NU	NU
PA 4	N	N	N	N	A	N	N(FD)	NU
PA 5	A	N	N (FD)	N(FD)	N	NU?	NU (FI)	NU
PA 6	N	A	N	N	N	N	N	N
PA 7	N (Guano)	N(FD)	A	A	N	N	N	N
PA 8	1A 1C	1A 1C	C	N	N	A(moult)	A (moult)	NU
PA 9	A	A	N	N	NU?(FI)	NU(FI)	NU(FI)	NU
PA 10	A	N	N	NU(FI)	NU(FI)	NU	NU	NU
PA 11	2A?	1a1c	2A?	N	N	A(moult)	A (moult)	A (moult)
PA 12	-	C?	-	N	N	NU(FI)	NU(FI)	NU
PA 13	-	N	A	A	N	N	N	N
PA 14	1A2C	1A2C	1A2C	1A1C	C	N	N	A (moult)
PA 15	-	1A 1C	1A 1C	1A 1C	1C	N	N	A (moult)
PA 16	-	-	N	N	A	A(moult)	A (moult)	N
PA 17	-	-	1A 1C	1C	1C	N	N (Guano)	NU
PA 18	-	-	A	A	A	N	N	NU
PA 19	-	-	A	A	N	N	N	NU
PA 20	-	-	C?	N	N	A(moult)	A (moult)	NU
PA 21	-	-	A?	N	N	A	A (FI)	NU
PA 22	-	-	N	N	A	N	N	NU
PA 23	-	-	N	A	A (moult)?	N	N	NU

A= Adult present. C= Chick present. N= Not occupied but shows signs of use. NU=Not used. The – in some parts of the table indicate that the burrow has not yet been discovered.

Table 5. Birds Banded throughout the study period.

Band	Date Banded	Flipper	Burrow	Weight(gm)	Bill Length (mm)	Bill Depth(mm)	Flipper (mm)	Mate
P36401	12-Sep-05		C5	1175				UB
P36402	12-Sep-05		CB1	1250				
P36403	12-Sep-05	L	CB2	1120				36404
P36404	12-Sep-05	R	CB2	1125				36403
P36405	13-Sep-05		C11		38.4	15.2	132	
P36406	13-Sep-05		DB1	1010	38.9	18.1	128	UB
P36407	15-Sep-05		FR3	1260	37.5	18.4		
P36408	15-Sep-05		Trumans Cave	1320	37.4	19.9	129	UB
P36409	15-Sep-05		Trumans Cave	1310	34.3	15.1	121	36410
P36410	15-Sep-05		Trumans Cave	1310	38.1	18.7	131	36409
P36411	15-Sep-05		Trumans Cave	1130	33.8	15.1	118	
P36412	15-Sep-05		TB1	1180	39.3	19.2	122	

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