

Fig. 1. Immature emperor penguin at Peka Peka Beach, Kapiti coast, 21 Jun 2011. Photos: A & C, Colin Miskelly (Te Papa); B & D, Richard Gill (DOC).

least 8 sightings at 54° 00' S to 54° 50' S; Marchant & Higgins 1990). In addition, 2 satellite-tracking penguins, S-1 and S-2, tracked from the Mawson Coast and Ross Sea, East Antarctica, revealed that they foraged up to 1200 km north of the pack ice, at latitudes up to 54° 14' S and 56° 54' S (Kooyman *et al.* 1996; Kooyman & Ponganis 2008; Wienecke *et al.* 2010).

We report the discovery of the northernmost known emperor penguin on land (and the 2nd most northerly record), from the south-west coast of the North Island, New Zealand (40° 50' S), and describe the bird's subsequent care and release back to the wild.

OBSERVATIONS AND CARE

Discovery

In the early afternoon of 20 Jun 2011 a caller informed the Department of Conservation (DOC); the bird was seen in the surf at Paraparaumu Beach, about 47 km north-east of Wellington. A few hours later, what is presumed to be the same bird came ashore at Peka Peka Beach (40° 50' S 175° 03' E) 8 km north-west of Paraparaumu Beach, and was taken into care by Peka Peka resident Christine Wilton, and was held at the Peka Peka Wildlife Sanctuary, managed by Clint Purches.

On the morning of 21 Jun, PMS contacted CMM and Alan Tennyson, who compared the immature emperor penguin (A. patagonicus) with emperor penguins. In the company of Alan Tennyson, CMM & PMS drove to Peka Peka Beach, where they were met by Richard Gill. The bird was on the

tideline, about 50 m north of where it had been the previous day. The bird was taken into care, and its shape and pale colouration of its auricular patches (which are more brightly coloured in adults). This bird was the northernmost emperor penguin ever recorded in New Zealand's Records.

Television and print media had already been alerted to the presence of a large penguin at Peka Peka Beach, and 2 camera operators and a reporter arrived to interview CMM & PMS alongside the bird. As a result, the presence of an extreme vagrant emperor penguin was announced to the nation on the afternoon and evening of 21 Jun, and the story was subsequently reported on by over 600 media outlets worldwide.

In situ observations and management

There was unprecedented interest in the emperor penguin, both when it was on the beach at Peka Peka, and after it was taken into care. Thousands of people, including many New Zealand bird-watchers, visited the beach to see the bird over the next 4 days (Fig. 2). Initial concerns over the vulnerability of the bird to unrestrained dogs proved unfounded, as the sheer number of people visiting the bird provided protection from dogs during daylight hours. This protection was extended by a 24-hour vigil by Peka Peka community members, supplemented by security guards funded by Kapiti Coast District Council. The overall care programme was co-ordinated by DOC, which is responsible for the welfare of self-introduced vagrant birds, based on the provisions of the Wildlife Act (1953). The



Fig. 2. Crowd gathered to view the emperor penguin at Peka Peka Beach, 24 Jun 2011. Photo: Colin Miskelly (Te Papa).

main focus of the care programme was to protect the penguin from over-enthusiastic admirers, with a cordon maintained around the bird (initially 5 m, later 50 m) and to ensure that it always had access to the sea.

Initially bright-eyed, alert, and in apparent good condition (CMM, *pers. obs.*), the emperor penguin lay prone on the sand most of the time it was on the beach, rarely standing upright. From 21 Jun, the penguin occasionally moved down to the water's edge to eat sand. Initially it appeared that it was drinking sea water, but it was soon apparent that the bird was also consuming wet sand (Fig. 3).

Concern over the potential impact of sand consumption led DOC to seek advice from wildlife health experts at Massey University and Wellington Zoo. As it was not known whether the bird would regurgitate sand itself, it was decided not to intervene unless there was an apparent decline in the bird's condition.

Ex situ care

On the morning of 24 Jun, the emperor penguin showed evidence of distress, holding its head in a less alert posture (with bill tip near the substrate), and was also reported to have swallowed large pieces of driftwood, although none was found during the 6 days (see below).

Arrangements were made to take the bird to the zoo in the back of a well-ventilated utility vehicle. ~40 kg of loose ice, with additional 2-kg bags of ice used to support the bird during the 45 min drive to the zoo in the back of a well-ventilated utility vehicle.

Soon after arrival, the penguin was anaesthetised and x-rayed, revealing a large mass of sand in its oesophagus and proventriculus (Fig. 4). Most of the sand was in its proventriculus required further



Fig. 3. The emperor penguin eating sand at Peka Peka Beach, 24 Jun 2011. Photo: Colin Miskelly (Te Papa).

removal. DNA-sexing of a feather sample revealed that the bird was male. He weighed 23.1 kg after c.2 kg of sand had been removed revealed a large number of small stones in his proventriculus (Fig. 5).

While at Wellington zoo, the penguin was kept in a 4 x 1.5 m air-conditioned room on a bed of crushed ice. A live video camera-feed from within the room revealed the penguin was eating sand. He was hand-fed whole juvenile salmon once a day, receiving about 2 kg per meal. When the outdoor air temperature dropped below 5° C, he was given access to, and swam in, a 4.5 x 4 m ambient-temperature outdoor pool. This occurred during record low temperatures in Wellington on 25 Jul, and again 14-20 Aug. By late Aug, he weighed about 27 kg, and was considered ready for release back into the wild.

Selecting a release site, and preparations for release

An advisory group chaired by PMS and comprising

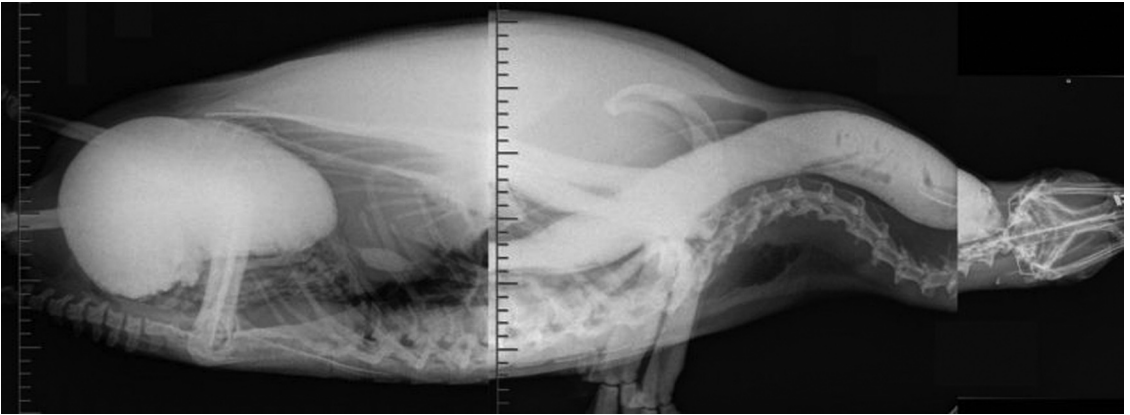


Fig. 4. Composite x-ray of the emperor penguin after its arrival at Wellington Zoo, showing its proventriculus (left, egg-shaped) and oesophagus (sausage-shaped) packed with sand. Head positioned to right. Image: Wellington Zoo.

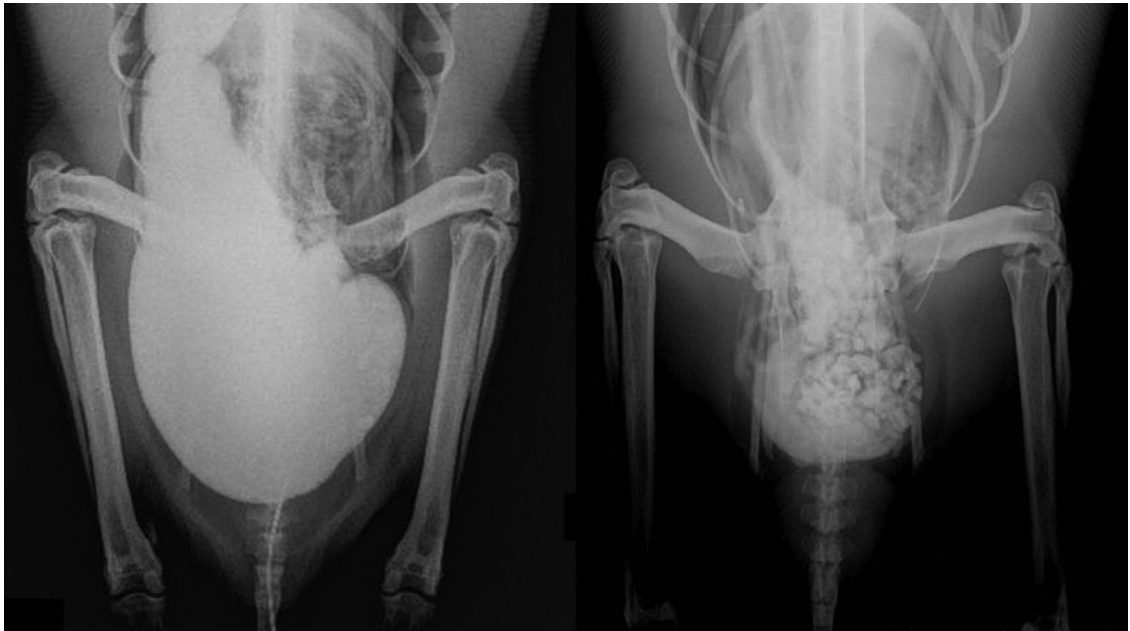


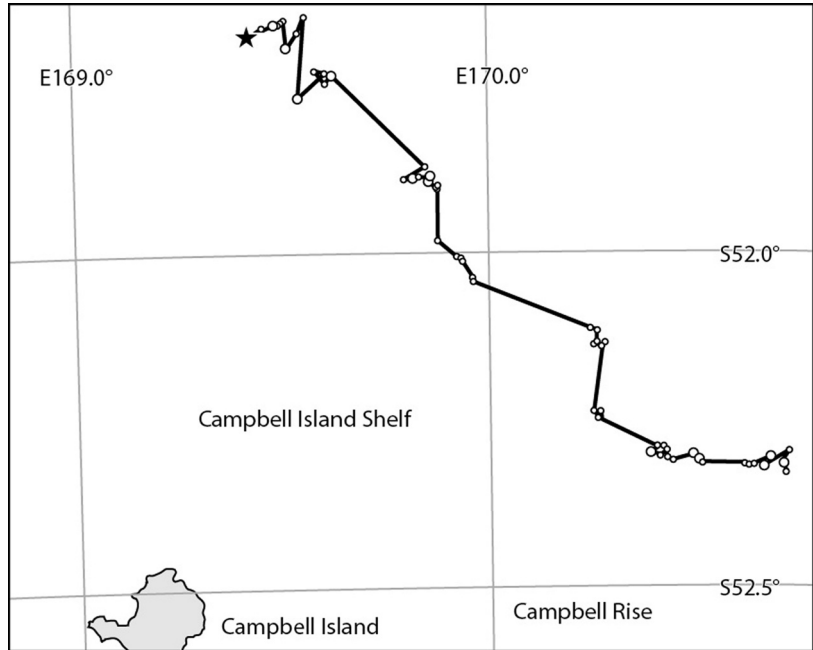
Fig. 5. + μ 1/4²©«” 3 μ 21”±· μ 1, , ¶ 2©«” ”° 3” μ 3”±^a, ± ¥’© μ ” ”© ±±§ ±©” μ μ 2«. ¶ 2° ±¶ « , ¶«±^a ¶«2° ±^a ± mass of small stones remaining after sand was removed. The intestine is positioned between the proventriculus and the pelvis, anterior at top. Image: Wellington Zoo.

provided recommendations on the bird's ongoing care, possible release sites, and transport options to reach the preferred release site. Suggestions from media commentators at the time ranged from euthanasia, release back at Peka Peka Beach, and retention in captivity, through to taking the bird all the way to Antarctica. This last option was ruled out following advice from the New Zealand \tilde{z} ±¶ μ 1/4²©1² μ 1²± ± · ±¶¶ ±±§ ' μ 2§” ¥±¶¶”S 2± restrictions on wildlife introductions to Antarctica under the Antarctic Treaty, to which New Zealand is a signatory.

The advisory group was unanimous that the penguin be returned to the wild in subantarctic seas south of New Zealand as soon as practicable after he was deemed to be in good health. The area chosen for his release was considered to be close to the northern limit of the typical at-sea distribution of juvenile emperor penguins, based on satellite tracking studies (Kooyman *et al.* 1996; Kooyman & Ponganis 2008; Wienecke *et al.* 2010).

An opportunity to deliver the penguin to high- \tilde{z} ±, §” ¶¶ ¶¶ ¶ 3 μ 21-§”§ ¥1/4±³”±^a¶ ¶«” μ ¶¶ research trip utilising the National Institute of

Fig. 6. Track taken by the emperor penguin after its release on 4 Sep 2011. The release site is marked with a star. Signals from the satellite tag ceased on 9 Sep. Image based on track provided by Sirtrack.



Water and Atmospheric Research (NIWA) research vessel *Tangaroa*, scheduled for Aug-Sep 2011. Before the penguin was moved from Wellington Zoo, a 24 mm-long microchip transponder was inserted under the skin of his right thigh, and a Sirtrack K2G was glued to the exterior surface of feathers on his lower back, following Australian Antarctic Division and weighed 95 g (about 0.4% of the penguin's bodyweight).

Release to the wild

The emperor penguin was placed in a customised open-top crate and loaded on to the open deck of the *Tangaroa* on 29 Aug. For the next 5 days the vessel travelled 1200 km south-southwest from Wellington. On the morning of 4 Sep 2011, the penguin was released down the stern ramp of the *Tangaroa* at 51° 42' S 169° 24' E, 78 km north of Campbell I, in water 285 m deep. This was 76 days after the bird came ashore, and 72 days after he was taken into care. He was released c.1250 km south of Peka Peka Beach, and c.1100 km north of the Antarctic pack ice.

Post-release monitoring

Signals from the satellite tag were received from polar orbiting satellites operated by the National Oceanic and Atmospheric Administration (NOAA, USA) via the Argos Data

Collection and Localisation System (Service Argos 1996). For 5 days after his release, the emperor penguin was tracked moving in a south-easterly direction, covering about 113 km from the release site at a mean rate of about 1.2 km h⁻¹ (29.3 km d⁻¹; Fig. 6).

Campbell I is on the northern edge of the east-northeast near the island at a mean surface NIWA, *pers. comm.* to CMM). When passive drift due to the ACC is taken into account, the penguin probably swam about 91 km south-southeast at a rate of 1.1 km h⁻¹ (26.9 km d⁻¹) after release.

Signals from the satellite tag were received at 0812 h on 9 Sep 2011, when the penguin was at 52° 19' S 170° 43' E (Fig. 6).

DISCUSSION

The emperor penguin that came ashore at Peka Peka Beach in Jun 2011 was the 2nd bird of this species recorded from New Zealand. The 1st was a bird in adult plumage that came ashore at Oreti Beach, Southland on 5 Apr 1967, and which was released (Henderson 1968). The Peka Peka bird, found 580 km farther north, was within a few km of the northernmost recorded sighting of the species. That the coast of Argentina on 15 Sep 1975 (Rumboll & Jehl 1977).

We suggest that the Peka Peka penguin is known about plumage development of emperor to breeding colonies at 3-6 years-old (Williams 1995, p.159). Pre-breeding emperor penguins are presumed to complete their annual moult as opportunities to examine the plumage of marked birds of known age until they are fully adult and return to breed. The Peka Peka bird had a darker chin and throat plumage as dark as the Peka Peka bird (Lauren DuBois, pers. comm. to CMM).

Emperor penguins have long been known to swallow stones (Peale 1848; Slater 1888; Stewart 1934; Murphy 1936; Clarkson 1988), although the reasons for them doing so remain unclear of previous reports of emperor penguins consuming sand, emperor penguins consume snow as a water-source and to aid thermoregulation (Buchet et al. 1986; Kooyman 1993; Robin et al. 1998). Most emperor penguins would never encounter sand, and we suggest that the bird that came ashore on Peka Peka beach mistook wet sand for snow, and consumed it

The level of public and media interest in this penguin, dubbed 'Happy Feet' by Christine Wilton and the media, was unprecedented for a vagrant bird in New Zealand (Anon 2011). The breadth and impact of the Happy Feet social phenomenon is beyond the scope of this paper; we hope that others can do this topic justice. The level of public interest led to intense scrutiny of decisions made by DOC, particularly in relation to levels of intervention in what was otherwise a natural event (extreme vagrancy). This included criticism of the length of time that the penguin was left at Peka Peka Beach before he was taken into care, whether he should have been retained permanently in captivity, and the choice of release site. Much of this discussion on Facebook, and the Te Papa and Wellington Zoo weblog sites. For a sample, see the 670+ feedback comments on the 10 Te Papa 'global penguin' blogs tepapa.govt.nz, search 'global penguin').

The question that most commentators asked was less than 5 days after the bird was released. We are

its deployment. The 2 most plausible scenarios are that the bird was consumed by a predator, or that on 33 emperor penguins in Antarctica resulted in the bird could allow his detection if he arrived at an emperor penguin colony where scientists scan birds to detect the presence of microchips. However, this is extremely unlikely given that his course of travel was towards the rarely-visited Marie Byrd Land coast of Antarctica. Several of the 6 emperor penguin colonies reported from Marie Byrd Land were only detected by satellite imagery (Fretwell & Trathan 2009; Fretwell et al. 2012), and have never been visited in person.

ACKNOWLEDGEMENTS

We thank Department of Conservation Kapiti-Poneke District Council for maintaining a watch on the penguin and for crowd control while the bird was on the beach. The Wellington Zoo veterinary team did a sterling job nursing him back to health, and the wider zoo team managed fundraising and media liaison. John Wyeth (Wellington Hospital) performed the endoscopy, and the x-rays were performed by almon was donated by The New Zealand King Salmon Co. Ltd. We thank Barbara Wienecke (Australian Antarctic Division) for provision of information, Gareth Morgan KiwiSaver facilitated donations to Wellington Zoo Trust to cover husbandry costs, and sponsored the Argos satellite data downloads. The satellite data was reproduced here. Lauren DuBois (SeaWorld) provided information on ageing immature emperor penguins; Mark Campbell I.; Jeremy Rolfe (DOC) drafted the map. We thank Gerald Kooyman, Paul Sagar and Barbara Wienecke for their helpful comments on this manuscript.

LITERATURE CITED

Anonymous 2011. Happy Feet's incredible journey: the story of the world's most famous penguin. Auckland, Penguin Books.

- Buchet, C.; Dewasmes, G.; Lemaho, Y. 1986. An electrophysiological and behavioral study of sleep in emperor penguins under natural ambient conditions. *Physiology & Behavior* 38: 331-335.
- Cawkell, E.M.; Hamilton, J.E. 1961. The birds of the Falkland Islands. *Ibis* 103a: 1-27.
- Clarkson, P.D. 1988. Glacier erratics from the Brunt Ice Shelf. *British Antarctic Survey Bulletin* 8: 1-10.
- Comité National Français des Recherches Antarctiques 1983. *Recherches Antarctiques* 33: 57-87.
- Downes, M.C.; Ealey, E.H.M.; Gwynn, A.M.; Young, P.S. 1959. The birds of Heard Island. *Australian National Antarctic Research Expeditions report series B, 1*: 1-135.
- Falla, R.A. 1937. Birds. *Report of the British, Australian and New Zealand Antarctic Research Expedition 1929-31. Series B 2*: 1-304.
- Fretwell, P.T.; LaRue, M.A.; Morin, P.; Kooyman, G.L.; Porter, C.; Trathan, P.N. 2012. An emperor penguin of a species from space. *PLoS ONE* 7(4): e33751.
- Fretwell, P.T.; Trathan, P.N. 2009. Penguins from space: faecal stains reveal the location of emperor penguin colonies. *Global Ecology & Biogeography* 18: 543-552.
- Hall, R. 1910. Occurrence of the king penguin in Tasmania. *Emu* 9: 250-251.
- Hamilton, J.E.; Roberts, B. 1954. The emperor penguin in the Falkland Islands. *Ibis* 96: 315.
- Henderson, L.E. 1968. First record of the emperor penguin in New Zealand. *Notornis* 15: 34-35.
- Kooyman, G.L. 1993. Breeding habitats of emperor penguins in the western Ross Sea. *Antarctic Science* 5: 143-148.
- Kooyman, G.L.; Kooyman, T.G.; Horning, M.; Kooyman, T.G. 1997. Emperor penguin colonies in the western Ross Sea. *Nature* 383: 397.
- Kooyman, G.L.; Ponganis, P.J. 2008. The initial journey of juvenile emperor penguins. *Aquatic Conservation: Marine and Freshwater Ecosystems* 17: S37-S43.
- Marchant, S.; Higgins, P.J. (eds.), 1990. *Handbook of Australian, New Zealand and Antarctic birds*. Ratites to Ducks, vol. 1. Melbourne, Oxford University Press.
- Murphy, R.C. 1936. *Oceanic birds of South America*. New York: American Museum of Natural History.
- Peale, T.R. 1848. *U.S. exploring expedition during the years 1838-1842*. Volume 8. Mammalia and ornithology: 5-299. Philadelphia.
- Reynolds, P.W. 1935. Notes on the birds of Cape Horn. *Ibis* 13(5): 65-101.
- Robin, J.-P.; Boucontet, L.; Chillet, P.; Groscolas, R. 1998. Behavioral changes in fasting emperor penguins: evidence for a "refeeding signal" linked to a metabolic shift. *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology* 274: R746-R753.
- Rumboll, M.A.E.; Jehl, J.R. Jr. 1977. Observations on pelagic birds in the South Atlantic Ocean in the austral spring. *Transactions of the San Diego Society of Natural History* 19: 1-16.
- Slater, P.L. 1888. Notes on the emperor penguin. *Ibis (5th series)* 6: 325-334.
- Service Argos, 1996. *User manual*. Washington DC: Service Argos.
- Shirihai, H. 2002. *A complete guide to Antarctic wildlife: the birds and marine mammals of the Antarctic continent and the Southern Ocean*. Degerby, Finland: Alula Press Oy.
- Shirihai, H. 2007. *A complete guide to Antarctic wildlife: the birds and marine mammals of the Antarctic continent and the Southern Ocean*. 2nd edn. London: A & C Black.
- Stewart, D. 1934. Anorthoclase crystals as an index of the migration of penguins. *American Journal of Science*. 27: 454-456.
- Venegas, C. 1978. Chinstrap penguin (*Pygoscelis antarctica*) and macaroni penguin (*Eudyptes chrysolophus*) in Magellanes, Chile. *Anales del Instituto de la Patagonia* 9: 179-183.
- Wienecke, B.; Raymond, B.; Robertson, G. 2010. Maiden emperor penguin colonies in the Weddell Sea. *Marine Ornithology* 27: 97-100.
- Williams, T.D. 1995. *The penguins*. Oxford, UK: Oxford University Press.