

Banks Peninsula Coastal Cliffs Aerial Vegetation Survey

Extract from 2012 survey with summary of pigs ear distribution - written by Di Carter, Regional Parks, Christchurch City Council. 20.07.2017

Background

An aerial survey of the Banks Peninsula coastline was undertaken by Christchurch City Council ranger staff in October 2012 to document the fauna and flora of the coastal cliff habitat.

The information gathered was used to identify sites of ecological significance for the Christchurch City Council's Banks Peninsula Ecological Study, and to provide distributional information of indigenous birds, indigenous vegetation communities and exotic weed spread to assist with developing a strategic approach to potential management of these sites.

The coastal cliffs of Banks Peninsula, are predominantly basalt with other rock compositions, and the cliffs formed with ledges, crevices and overhangs that provide varied habitats: from rocky surfaces to deeper soils, exposed dry surfaces to shaded wet surfaces, with salt spray or fresh water seepages. These habitats are considered to be rare ecosystems in a national context, see Landcare Research Manaaki Whenua, rare-ecosystems factsheet:

<http://www.landcareresearch.co.nz/publications/factsheets/rare-ecosystems/coastal/coastal-cliffs-of-basalt>

Vegetation Summary – general

Rock compared with vegetation cover:

For most of Banks Peninsula, rock is estimated to be approximately 80 - 90% of cliff surface cover, with approximately 10 - 20% vegetation cover, except for the larger bays in the NE sector where basalt coastal cliffs are minimal.

SW sector (Birdlings to Akaroa Harbour west)

Native compared with exotic vegetation:

Of total occurrences of vegetation on the SW coastal cliffs and bays, 94% native and 6% exotic vegetation

SE sector (Akaroa Harbour east to Le Bons Bay)

Native compared with exotic vegetation:

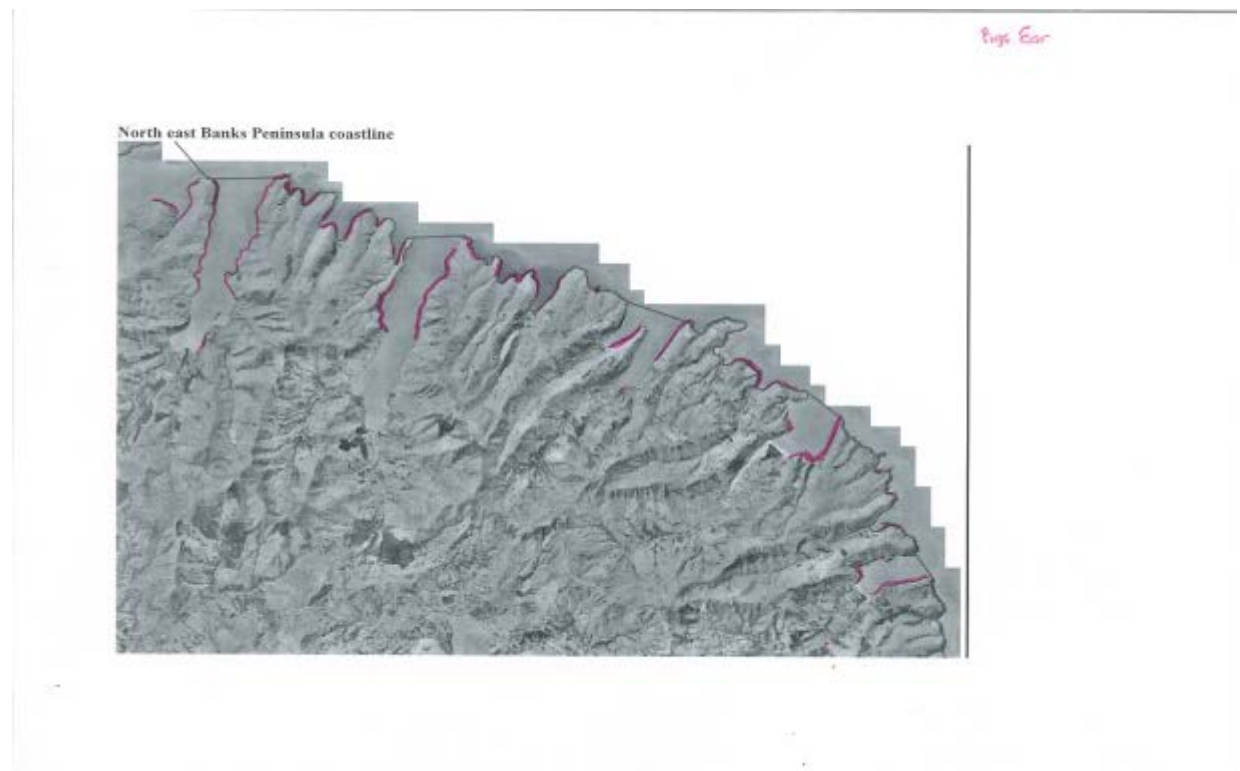
Occurrences of vegetation on the SE coastal cliffs and bays, 76% native and 24% exotic

NE sector (Le Bons Bay to Camp Bay, Lyttelton Harbour)

Native compared with exotic vegetation:

Of occurrences of vegetation on NE coastal cliffs and bays, 87% exotic and 13% native

Vegetation Summary – pigs ear distribution



From the survey information, pig's ear distribution on the coastal cliffs of Banks Peninsula is confined to the NE bays, from Lyttelton Harbour to Le Bons Bay. The distribution pattern appears to indicate wind dispersal from the NW, with the NW facing headlands having dense pigs ear and density reducing as spread occurs inwards towards the bay. In deeper bays, such as Port Levy and Pigeon Bay, there appears to be a possible circulation pattern that reduces the spread into the bay, and instead circulates the seed to the opposite (west) side of the bay.

Pigs ear was not observed on coastal cliffs in the SW and SE sectors of Banks Peninsula.

Pest plant control – pigs ear

There is potential to contain the spread of pig's ear on Banks Peninsula, south along the coast from Le Bons Bay and east along the coast from Birdlings Flat. There is also some interest from landowners to contain the spread inland onto pastoral land (see supporting e-mail from Hamish Menzies, Menzies Bay, and also verbal support from Noel Donaldson, Chorlton).

Mature pigs ear plants can be effectively controlled using grazon + boost, at gorse and broom knapsack rates. The seed life is unknown at this stage, but from control on a small, isolated population at the junction of Prices Valley and the Christchurch Akaroa highway, seedlings are still occurring 4 years after initial control in February 2013.

The Toxicity of *Cotyledon orbiculata* (Pig's Ear) to Livestock

The succulent plant *Cotyledon orbiculata*, known commonly as Pig's Ear, is a common sight on the headlands and coastal areas of Banks Peninsula. A member of the Crassulaceae family of plants, it originates in South Africa and was introduced to New Zealand as an ornamental garden plant in the early 1900's. Over the last century it has spread rapidly and since 2008 has been listed as an Unwanted Organism on the National Pest Plant Accord[1], meaning that it cannot be brought into the country or propagated, but no official measures are currently being undertaken to eradicate or control it.

It is known to occur throughout much of the drier, more coastal areas of New Zealand, with hotspots in Canterbury, Wellington and Auckland. On Banks Peninsula, it is thought to have spread from the Sumner region around the Northern and Eastern Bays, with an isolated hotspot at Birdling's Flat. The preferred habitat of the species is warm, dry areas of bare rock, loess banks or sparse vegetation up to around 450m, and it also occurs in sparse tussock grassland. With our current knowledge of the species, we expect their spread to continue around the headlands and inland to the bays, as its high production of wind-dispersed seeds allow for easy colonisation of new areas.

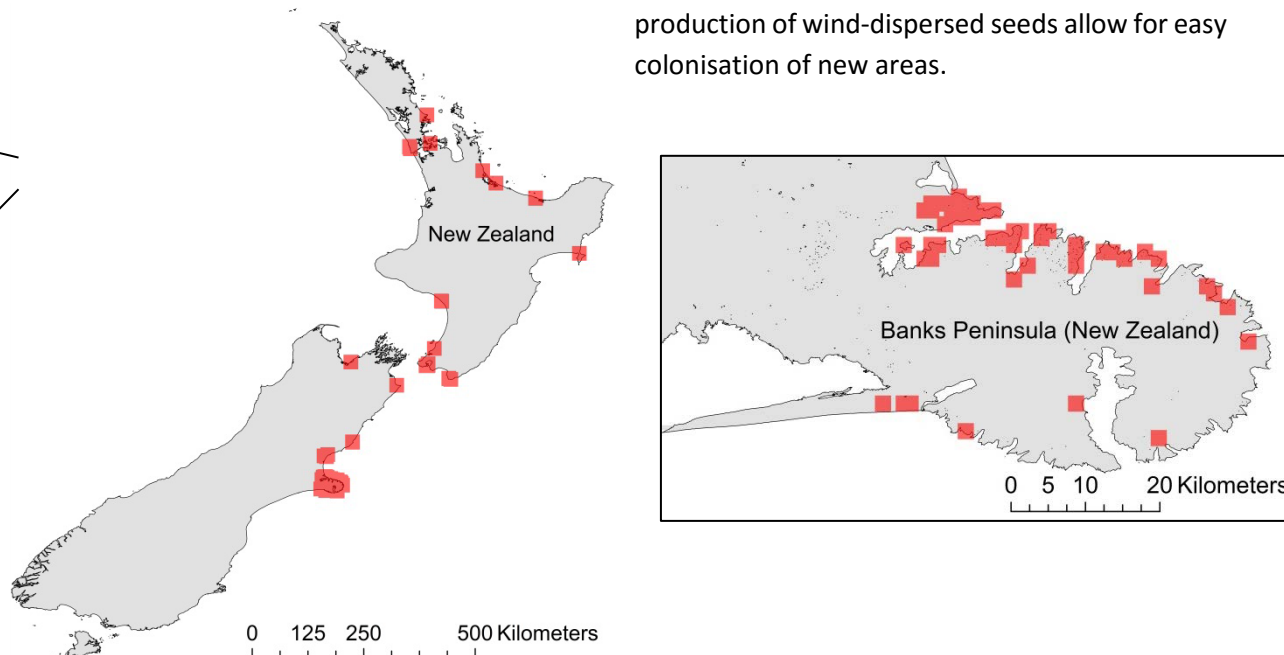


Fig. 1) Recorded presences of *Cotyledon orbiculata* in New Zealand and Banks Peninsula. Data obtained from local and national herbaria, surveys and personal communication with local residents.

Aside from the detrimental effect on local biodiversity, the spread of *C. orbiculata* is cause for concern as it is known to be toxic to livestock if ingested. *C. orbiculata*, along with other species in the same genus and plants in the *Kalanchoe* and *Tylecodon* genera, causes acute cardiac toxicity and a chronic disease of the nervous system which is known in South Africa, where the disease was first recorded, as Krimpsiekte[2]. In the Canterbury region, the only known toxic succulent of the Crassulaceae family is *C. orbiculata*. Other pest species in the same family, such as *Aeonium* species, are not thought to be toxic*.

Cardiac Glycoside Poisoning

*With the exception of one recorded human poisoning in Italy by accidental ingestion of *Aeonium sedifolium* – this particular species is not present in New Zealand (Colombo et al., 2009).

Cardiac glycoside poisoning is well known in southern Africa where it accounts for 33% of annual cattle deaths from plant poisoning[2]. Outbreaks are most often reported in sheep, goats and cattle but cases have also been reported in horses, poultry, antelope, seals and dogs[3]. It has also been implicated in accidental deaths from traditional herbal medicines in humans[4]. The meat of animals which have ingested the plant is also poisonous, and dogs are especially sensitive to this secondary poisoning[5]. The toxin in *C. orbiculata* is called a bufadienolide[6] and is present throughout the whole plant, which is most toxic during the flowering period[5]. Environmental factors also influence toxicity, for example the plant is more toxic when growing on sandy soils than clay[7].

Poisoning can be either acute or chronic and is dependent of the dose and duration of exposure, as well as the animal in particular[8]. Acute poisoning is usually caused by ingestion of large doses and is less commonly reported; it affects some or all of the respiratory, cardiovascular, gastrointestinal and nervous systems and leads to either death or recovery within days[2]. Symptoms include colic, ruminal stasis (absence of gastrointestinal contractions), bloating and diarrhoea, posterior paresis (hind leg partial paralysis), difficulty breathing, rapid panting and apnoea (temporary suspension of breathing). Death is usually due to cardiac damage[8].

The bufadienolides in the plant also have a cumulative effect, meaning that the toxin builds up in the animal's system over time, causing the chronic disease Krimpsiekte or 'shrinking disease'. This disease is thought to affect only sheep and goats [8]and is also known as 'cotyledonosis'[5]. The chronic form is the more usual form of poisoning in South Africa, and affects mainly the nervous system of the animal. If large doses are consumed, death can be immediate, but the disease can occur more slowly with low continuous intake. As the disease develops symptoms can include; depression, bloating,



pose, reproduced from [9]

regurgitation, tongue paralysis, salivation, frothing at the mouth and recumbency (frequent lying down). As it reaches the full form of the disease, animals assume a characteristic 'shrinking' pose of an arched back with the feet together under the body, and head hanging down. They will lag behind the flock with the neck dangling, and may tire quickly[8] . Some animals also show torticollis (twisted neck). With this form of the disease, mortality is reported to be as high as 90% [8].

Fig.2) Sheep affected by Krimpsiekte assuming the typical

Reports and Clinical Studies

The majority of reports of cardiac glycoside poisoning are through circumstantial evidence, usually where known poisonous plants have been found grazed after a mass poisoning. Determining cardiac glycoside poisoning as the cause of death through toxicology reports has proven difficult in the past but recent studies have attempted to identify more reliable techniques[3]. A number of dosing trials have taken place with sheep, goats and cattle using plants containing cardiac glycosides, and their toxic effect has been confirmed[2, 10, 11]. Tests of *C. orbiculata* leaves show high levels of cardiac glycosides present in the plant[3], and there have also been a small number of trials that have induced Krimpsiekte in animals using intra-venous dosing of the isolated toxin[12, 13].

Despite the widespread effect of the disease in South Africa, there have not yet been any reported poisonings in New Zealand. A magazine article from 1962 shows that it is known to poison poultry in Australia[14], but the disease seems to be relatively unheard of in this part of the world. It is known to be poisonous in the USA, where it is listed on the poisonous plants database[15] and there are reports of at least two known flock poisonings in California, where in one case three sheep died from ingesting only prunings of *C. orbiculata* thrown into the pasture[5]. Anecdotal evidence in New Zealand often suggests that sheep and cattle avoid the plant; however, I have personally observed sheep occasionally grazing on the leaves and flower-heads on Banks Peninsula.

What to do

C. orbiculata is very easy to identify; it is usually less than 60cm tall, has obovate (teardrop shaped) silvery-green succulent leaves and thick, semi-woody branching stems. The leaves are opposite, up to 11cm long and get their silvery colour from a white bloom (powder) that covers the leaves. Pinkish bell-shaped flowers grow on multiple inflorescences, the stalks of which can be up to 1m high. Likely places for it to occur are on rocky outcrops, on bare soil or loess banks, or sparse dry tussock grassland. We believe it is spreading from the headlands, so coastal areas are more likely habitat than further inland.

There are no confirmed treatments for cardiac glycoside poisoning, but success has been reported when dosing poisoned calves with activated charcoal, electrolyte replacement solution and antiarrhythmic drugs, curing 9/11 animals when given within 24 hours, and 2 out of 4 when given within 36 hours[16]. Another study reports a potential vaccine for Krimpsiekte, although this is still in the developmental stages[9].

If you find this plant and choose to remove it, it should not be done by hand. The plant can re-root very easily from any cuttings and loose material, which can spread it more rapidly. Instead, it can be treated with herbicide and removed once it is dead. We are in the process of trialling different combinations of herbicide, but we appear to have had preliminary success with Grazon, and Metsulfuron with the additive Silmax, at the manufacturer's recommended concentrations.



Fig. 3) Pig's ear in flower at Pigeon Bay, Banks Peninsula



Fig. 4) Close up of Pig's ear flower-head at Birdling's Flat, Banks Peninsula



Fig.5) Large Pig's ear population in winter on Godley Head above Taylor's Mistake, Banks Peninsula

References:

1. MPI, *National Pest Plant Accord*, M. Biosecurity, Editor. 2008: Wellington. p. 10.
2. Kellerman, T.S., *Poisonous plants*. Onderstepoort Journal of Veterinary Research, 2009. **76**: p. 19-23.
3. Schultz, R.A., T.S. Kellerman, and H.V.D. Berg, *The role of fluorescence polarization immunoassay in the diagnosis of plant-induced cardiac glycoside poisoning livestock in South Africa*. Onderstepoort Journal of Veterinary Research, 2005. **72**: p. 189-201.
4. McVann, A., et al., *Cardiac glycoside poisoning involved in deaths from traditional medicines*. South African Medical Journal, 1992. **81**: p. 139-141.
5. Fuller, T.C. and E.M. McClintock, *Crassulaceae, Stonecrop Family*, in *California Natural History Guides*, A.C. Smith, Editor. 1986, University of California Press: Berkely, CA. p. 124-125.
6. Botha, C.J., et al., *Krimpsiekte, a Paretic Condition of Small Stock Poisoned by Bufadienolide-containing Plants of the Crassulaceae in South Africa*, in *Toxic Plants & Other Natural Toxicants*, T. Garland and A.C. Barr, Editors. 1998, CABI: New York, NY. p. 407-411.
7. Pretoria, U.o. *Poisonous plants of South Africa (Botanical Names) - Veterinary Science Library*. 2012 [cited 2012 23/11/12]; Available from: <http://www.ais.up.ac.za/vet/poison/bnames.htm#Cotyledon>.
8. Botha, C.J. and M.L. Penrith, *Poisonous plants of veterinary and human importance in southern Africa*. Journal of Ethnopharmacology, 2008. **119**: p. 549-558.
9. Botha, C.J., et al., *A potential krimpsiekte vaccine*. Onderstepoort Journal of Veterinary Research, 2007. **74**: p. 307-314.
10. Bamhare, C., *Suspected cardiac glycoside intoxication in sheep and goats in Namibia due to Ornithogalum nanodes (Leighton)*. Onderstepoort Journal of Veterinary Research, 1998. **65**: p. 25-30.
11. Masvingwe, C. and M. Mavengwa, *Kalanchoe lanceolata poisoning in Brahman cattle in Zimbabwe: the first field outbreak*. Journal of the South African Veterinary Association, 1997. **68**(1): p. 18-20.
12. Botha, C.J., et al., *Toxicokinetics of cotyledoside following intravenous administration to sheep*. Journal of the South African Veterinary Association, 2003. **74**(1): p. 7-10.
13. Anderson, L.A., et al., *Isolation and characterization of and some observations on poisoning by bufadienolides from Cotyledon orbiculata L. var. orbiculata*. Onderstepoort Journal of Veterinary Research, 1985. **52**(1): p. 21-24.
14. Smith, J.P.C., *These weeds can poison your poultry*. Agricultural Gazette New South Wales, 1962. **73**(3): p. 136-142.
15. USFDA. *FDA Poisonous Plant Database - Cotyledon orbiculata*. 2012 [cited 2012 21/11/2012]; Available from: <http://www.accessdata.fda.gov/scripts/plantox/TextResults.cfm?dls=11&q=Cotyledon%20orbiculata&pn=10&sc=>.
16. McKenzie, R.A. and P.J. Dunster, *Curing experimental Bryophyllum tubflorum poisoning of cattle with activated carbon, electrolyte replacement solution and antiarrhythmic drugs*. Australian Veterinary Journal, 1987. **64**(7): p. 211-214.

Pig's ear

Cotyledon orbiculata



Identification

- A succulent
- Leaves are opposite; powdery grey-green with red margins
- Clusters of orange, bell-shaped drooping flowers about 2.5 cm in length on stalks 60 cm tall



Cross-section of a pig's ear flower Photo: Jon Sullivan

Control

There is limited information on controlling this pest. Trials by Christchurch City Council have found Grazon™ at gorse rates with Boost™ penetrant was effective.

Use all herbicides in accordance with the manufacturer's instructions and ensure no herbicide comes into contact with other plants, the soil or waterways.



Single pig's ear plant Photo: Jon Sullivan

Where is it found?

Pig's ear used to be sold in the nursery trade so can be found in home gardens. It has jumped the garden fence and naturalised in mainly coastal areas.

Why is it a problem?

Pig's ear competes with and replaces native species in coastal environments and can be poisonous to stock. It is spread by seed and plant fragments.

Status

Pig's ear has been declared an unwanted organism under the Biosecurity Act 1993, which makes it illegal to knowingly release, spread, display or sell, breed, propagate or otherwise distribute plants or part thereof.



Pig's ear in flower Photo: S. Timmins (DOC)