

The katipō (*Latrodectus katipō*) population of Marlborough's eastern coast

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Introduction

Katipō spiders are a small dune-dwelling species that form a tunnel-like retreat built from strong silk amongst dune plants. Outside is a series of strands that connect plant stems and the ground and are under tension to catch prey. Their web is attached to open sand, in areas of sparse plant cover (Griffiths 2001). They are highly specialised, feeding on invertebrates that are blown or move into their web. Threat status in 2012 was 'At Risk, Declining' (Sirvid et al 2012).

Following the observation of a small number of katipō at Marfells Beach, including within the newly uplifted dune, two visits were made to formulate a survey method and location for a school Science Fair project by Eve Anderson. These allowed skills to be learned in finding katipō and their webs, plant species names and choosing locations for surveying.

The aim was to find the distribution pattern within the dune with respect to distance from the high tide mark and the habitat preference. It was also sought to find out the extent that the newly uplifted dune from the 2016 Kaikoura earthquake supported katipō.

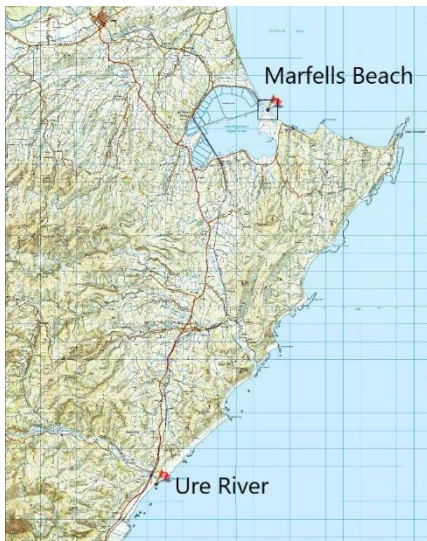
Following conversations with Mike Aviss at Marlborough District Council and Sally and Rob Peter, farmers of Cape Campbell, a plan was made to also find the extent of the population at Marfells Beach and survey the coast for other populations from the northern extent of Lake Grassmere to the Ure River. Monitoring was carried out by Mark and Eve Anderson.

Survey methods

Three intensive surveying visits took place to record the distribution of katipō within the dune at Marfells beach in July and August 2019. This was done by laying out 30 m tape measures in transect lines from the high tide mark at 5 m intervals and repeating this process to survey 12 quadrats of 150 m² on each occasion in three areas (Figure 1). Every plant, driftwood and other suitable habitat, was searched where possible. Each of the three sessions took around 4 hours. The area surveyed was known to contain katipō from previous visits. Area 1-3 (Figure 1) were all spinifex dominated dunes north-west of the campsite and two other sampling sites even further north-west. Plant type was recorded for each sighting.

Following much greater success than anticipated, contact was made with Mike Aviss, biodiversity coordinator at Marlborough District Council and Rob and Sally Peter of Cape Campbell and it was decided to walk as much of the coast as was possible from the Ure River to the northern extent of Lake Grassmere over a number of weekends to assess katipō distribution along the coast (Figure 2).

Figure 2. Map of coastal survey for katipō



katipō in them at Marfells Beach. Driftwood was also checked. Only habitat in the established foredune was checked, unless otherwise stated, due to known preferences of katipō. Once katipō were located, a 30-minute search was begun by two observers and the number of distinctive katipō webs was recorded. Webs were counted

Figure 1. Map of location of Marfells Beach survey



As the observers walked along the coast, dunes were checked periodically, irrespective of dominant plant species. Careful checking was carried out of any native plants, especially spinifex (*Spinifex sericeus*), pīngao (*Ficinia spiralis*), matagouri (*Discaria toumatou*), sand coprosma (*Coprosma acerosa*) and porcupine shrub (*Melicytus sp.*) and any area of sparse marram or steep banks of marram overhang.

These target plants or areas were developed over time after finding

Figure 3. Katipō retreat and catching strands of silk inside matagouri



rather than katipō, due to the unique tunnel-like shape of the retreat and connected catching web (Figure 3). Over 100 katipō were located inside webs before webs alone were counted to give confidence in the counts. The search effort involved pulling apart leaves of the dune plants to look for the webs and locating the cocoon-shaped retreat. Some searches, particularly small areas of pīngao took less than 30 minutes due to the small area of habitat. In some locations, the area was measured to allow a density per hectare to be calculated.

Results of Marfells Beach survey

Number of katipō found in our survey

At Marfells Beach, surveys in areas 1, 2 and 3 found 76, 66, and 30 webs or katipō respectively in each survey of 12 quadrats of 150 m². This is a density of 172 katipō in 5400 m² or 318 per hectare. (Range 166-422 katipō per hectare)

Each quadrat ranged from 0-11 webs/katipō with an average of 4.3 per quadrat.

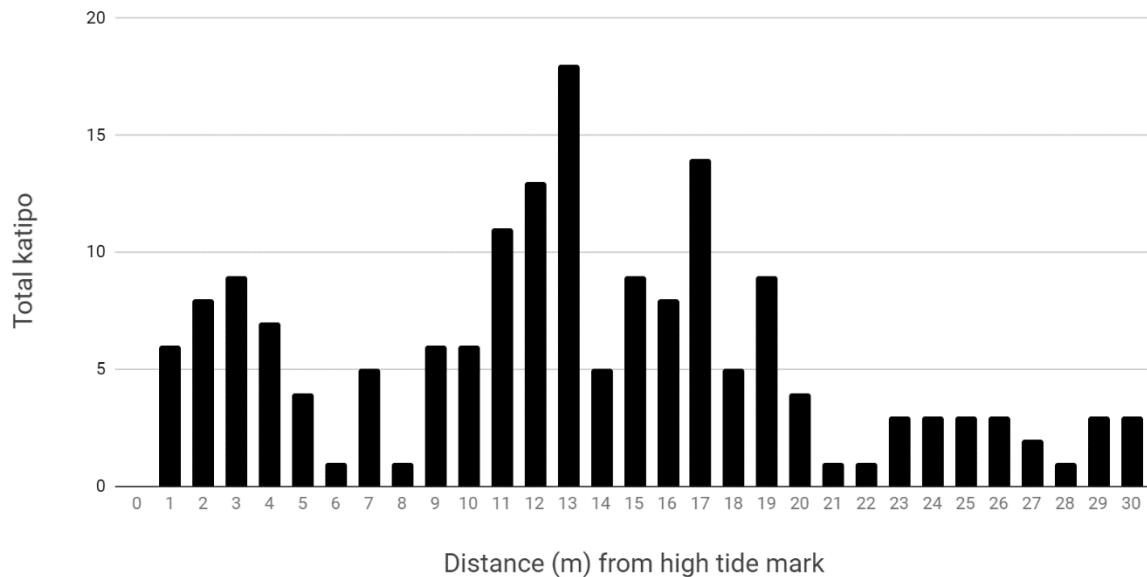
Location of katipō within the dune system

The katipō were found from less than 1 metre from the high tide mark within the new dune uplifted by the 2016 Kaikoura earthquake to 30 metres into the dune system (Figure 4).

Thirty sightings of webs or katipō were found in the new dune area out of 172 in total.

After the new dune system, from 0-4 metres, numbers of katipō webs decrease between the new and old dune, where plants are sparse. There was an increase in katipō webs as the older foredune reached its crest, represented by the peak at 13 metres. After this point, the dune varies depending on location. In two areas (areas 2 and 3), the dune descends from this crest and is populated by marram grass. In area 1, the dune flattens out at the crest and is populated by marram grass. In area 1, the dune flattens out at the crest and

Figure 4. Total katipō from the high tide mark



katipō sightings continue at this plateau, which is dominated by spinifex, represented by the second peak of spider sightings at 17 metres.

Habitat preference

The katipō were found mostly in spinifex (102), the dominant plant in the foredune in the area studied, with less found in marram (54), which dominates the newly uplifted dune and the landward side of the foredune in areas 2 and 3. Small numbers were found within plants of red-purple ragwort/*Senecio elegans* (7), Iceplant/*Carpobrotus edulis* (6) and under logs (10)

Results of East Coast survey

Katipō observations

Katipō are found from just south of Needles Point to the northern extent of Lake Grassmere (Figure 7). Counts were highest at Canterbury Gully (Figure 5), the steep marram dune one kilometre south of Cape Campbell (Figure 6), in a medium area of matagouri and pīngao south of Needles Point and in both the foredune and back dune at Marfells Beach. Aside from Cape Campbell, high counts were only recorded where the habitat is spinifex, pīngao, matagouri, sand coprosma or porcupine shrub. The area at Canterbury Gully has a density of at least 500 katipō per hectare (estimated 1200 m²). The small back dune area of porcupine shrub, spinifex and pīngao at Marfells Beach has a density of approximately 2500 katipō per hectare (measured as 150 m²).

Figure 5: Diverse dune at Canterbury Gully



Figure 6: Cape Campbell marram dune



Beach).

Despite finding no katipō in searches of marram dominated dunes along the east coast elsewhere, the highest counts in the whole east coast survey were between marram roots and under overhanging stems on the steep dune south of the Cape Campbell lighthouse (Figure 6).

Pīngao is a good indicator of katipō presence on the east coast. Six locations where pīngao was found, also had populations of katipō. Where matagouri exists alongside pīngao, high densities were observed (South of Needles Point, Canterbury Gully and the backdune at Marfells

Figure 7. Table of katipō observations on the Marlborough East Coast

Area label on map	Area of coast (S to N)	Position	Habitat sampled	Number of katipō webs
A	Ure River to Needles Point	41°52'27.2"S, 174°9'19.1"E	Medium sized area of matagouri and approx. 20 small pīngao plants on hillside	40*
B		41°52'26.9"S, 174°9'26.9"E	Small patch of pīngao on foredune	2
C	Needles Point near Ward Beach to Long Point	41°49'05.7"S, 174°12'10.3"E	Area of spinifex and small area of pīngao adjacent	6*
D	Boo Boo stream to Canterbury Gully	41°45'40.3"S, 174°14'57.8"E	Pīngao, sand coprosma and matagouri (Canterbury Gully)	64
E	North of Canterbury Gully to Cape Campbell	41°45'11.6"S, 174°15'42.8"E	Pīngao and matagouri patch	20
F		41°44'20.1"S, 174°16'31.5"E	Steep dune for approx. 400 m with katipo under overhanging marram south of Cape Campbell	98
G	Cape Campbell to Marfells campsite	41°43'36.6"S, 174°13'43.8"E	Small area of spinifex south of Mussel Point	14*
H	Marfells campsite to northern end of Lake Grassmere	41°43'19.5"S, 174°11'47.6"E	Largest area of spinifex foredune on east coast that stretches 2 km from campsite to saltwater intake	30
I		41°43'06.7"S, 174°11'21.9"E	Patch of pīngao, porcupine bush and spinifex in back dune in area of 150 m ²	38

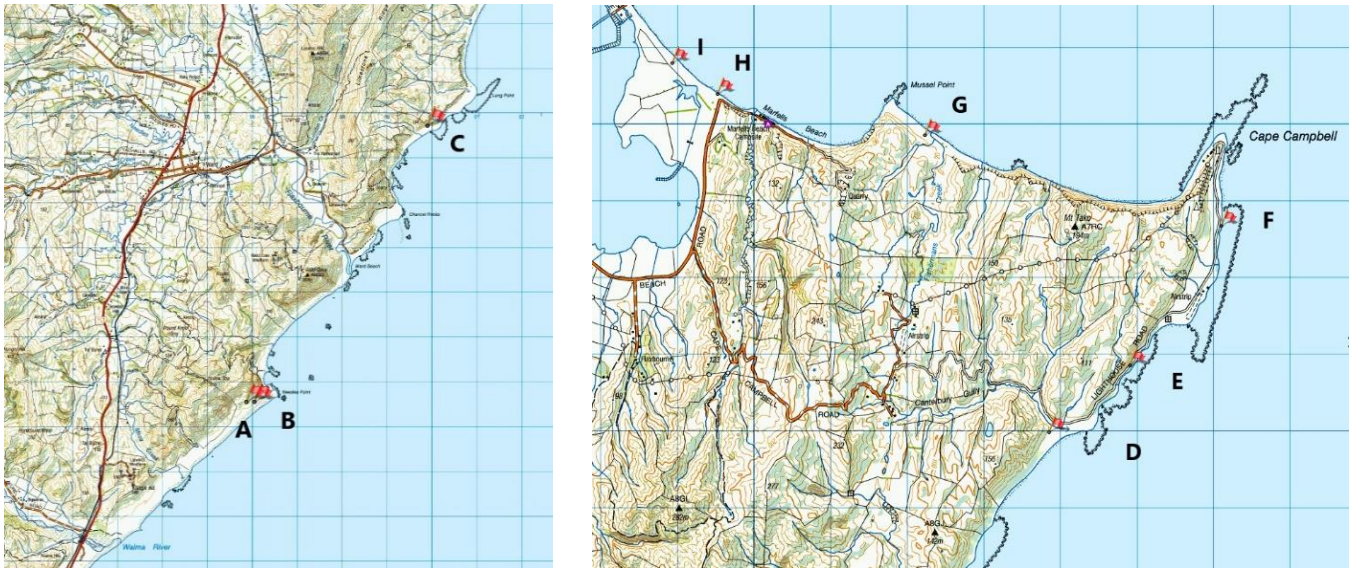
*1 person and 1 hour

Potential katipō habitat without observations

With few exceptions, sand dunes containing either spinifex or pīngao were inhabited by katipō. There are numerous small areas of spinifex between Boo Boo Stream and Canterbury Gully where katipō were not observed but appeared suitable as habitat. There are also three small and isolated areas of pīngao between The Ure River and Needles Point without katipō.

For the east coast survey, observations were entirely made in the established dune system. The dominant plant species growing in the new dune is marram grass in small clumps and not expected to host katipō. It should be noted that non-observance of katipō may not mean that they are absent.

Figure 8: Map of katipō locations – Ure River to Lake Grassmere



Discussion

The Kaikoura earthquake of 2016 created a 1 metre uplift (Clark K, 2017) of the dunes at Marfell's Beach. The observations of 30 of 172 (17%) katipō seen in the new dune at Marfell's Beach shows that they have colonised this new habitat within three years. The new dune consists of sparse clumps of marram grass, which currently have a low enough density for katipō to build webs between stems. Should the marram grasses continue to spread in this area, creating the familiar dense swathe of marram grasses, it is assumed that the conditions required by katipō will be lost (Griffiths 2001), due to the increase in ground cover, as is seen in the marram-dominated back dune at this location.

The densest area for katipō sightings at Marfell's Beach is on the seaward side of the dune crest in the established dune. In this area, spinifex grows in a manner where there are spaces between stems or leaves for webs to be built and sand underneath to attach the web onto.

Beyond the crest, the spinifex often continues, but possibly due to the reduced volume of windblown prey, numbers of webs decrease. Where marram begins to dominate the dune after the crest, conditions are unsuited to katipō and none were found in marram in these areas.

Figure 9: Marram (left) and spinifex (right) at Marfell's Beach



Some introduced plants were seen to suit katipō, including small patches of iceplant/*Carpobrotus edulis* and red-purple ragwort/*Senecio elegans* due to their open-growing nature with spaces for web retreats and catching strands. Logs, traditionally used for monitoring katipō, have only been observed to be used as habitat in areas of the higher density populations and then rarely so. It is possible that the most common location of logs, between the high tide mark and the beginning of the established dune, is less suited to katipō than the seaward foredune. This makes logs a poor method of detecting katipō.

Recording high counts of katipō south of Cape Campbell on a steep marram dune was unexpected. The crest of the dune and beyond in this area was not checked, although it seems unlikely to provide suitable habitat due to the dense marram growth, so it is possible that the katipō are restricted to a very narrow band of the dune. The tangled nature of the roots and overhanging marram stems possibly allow the space for katipō retreats and catching webs to be constructed.

The Marlborough East Coast is of national significance for this species. In the only comparable study where density per hectare was measured (Costall and Death, 2009) the highest density observed was 21.8 katipō per hectare.

Considerably higher densities (by a factor of 10 at least) were observed in the back dune at Marfells Beach, at Canterbury Gully and the foredune at Marfells Beach. Strong winds in these open spaces and dunes where native plants grow to allow katipō webs to be built between stems and importantly over sand possibly enable these high densities. It is also probable that additionally, the diversity and abundance of invertebrates in these locations is significant in these areas. (Griffiths 2001) The only previous nationwide survey (Patrick 2002) also found the location south of Cape Campbell to be a significant location for this species, however, katipō were not detected at Marfells Beach at that time.

The spinifex foredune at Marfells Beach, extends for approximately 1.75 kilometres. The average density of 318 katipō per hectare in the first 30 metres of dune from the high tide mark, was measured by surveying approximately 10% of this spinifex dune. The size of this very active dune system, with a small area of rich diversity in the back dune, containing pīngao, porcupine shrub and spinifex is the most significant location on the east coast due to the habitat size and the density of katipō. Other areas, including Canterbury Gully, South of Needles Point and immediately south of Cape Campbell also recorded large counts in the east coast survey. At Canterbury Gully, the small habitat size currently restricts the population of katipō.

It is expected that whilst katipō have not been observed between Canterbury Gully and just south of Ward Beach, it is possible that they persist in either non-favourable habitat or in low numbers in habitat that was checked.

Recommendations

With the current lack or low management of introduced plants on the Marlborough coast, coupled with the creation of a new foredune, changes to the dunes are inevitable. Plant succession on the new dune seems to be in its early stages.

Figure 10: Marram establishment (foreground) within the spinifex foredune at Marfell's Beach



Currently, **reducing or removing marram which has colonised the new dune (See figure 9) should be an inexpensive priority** at Marfell's Beach. Planting of native dune plants could be carried out inexpensively with volunteer assistance. Towards the northern extent of the spinifex dune, marram invades the foredune and changes the shape of the dune, establishing taller dunes. **Some control of marram where it invades the established foredune would be beneficial** in maintaining the extent of the spinifex dune

(Figure 10). Marram is thought to be a major cause of katipō decline. The dense nature in which it grows which does not permit catching webs to be constructed between stems. Marram also displaces native sand binders and alters the shape and mobility of the dune (Costall, 2006).

Aside from the spinifex dune at Marfell's Beach, further south, habitat is more fragmented. Canterbury Gully is the only sizeable katipō population south of the marram dune near Cape Campbell. (Area F) Despite possibly having one of the densest populations anywhere on the east coast, the Canterbury Gully population is limited by the small area of suitable habitat and is not closely linked to other suitable areas. **The habitat here could be extended by removal of non-native dune plants and planting of dune shrubs and grasses. These plants could be pīngao, spinifex, sand coprosma, matagouri and porcupine shrub. These shrubs in particular are optimal for high densities of katipō webs to be constructed (Griffith, 2001).**

Should funding allow, fragmented areas of spinifex dune at Mussel Point, and south of Canterbury Gully could be extended. At Mussel Point, a small population of katipō persists and would benefit from reduction of marram in the area. South of Canterbury Gully, fragments of spinifex dune were large enough to host a population (although none were observed) and linking these areas may allow the dense population at Canterbury Gully to increase.

Habitat reduction and fragmentation has possibly lost or reduced populations on the east coast. This study has shown that very high densities can be found in quite small, isolated areas (Canterbury Gully), if the habitat is populated by native dune plants. **Some of the small areas of pīngao, particularly between the Ure River and Long Point and north of Canterbury Gully (Area E) would benefit from occasional plant monitoring** to check their persistence and to act if needed.

Future surveys at five-year intervals are worthwhile **to monitor any decline to the katipō population** as changes to dunes occur. Any monitoring could focus on the 4 metres from the crest of the dune towards the sea, where densities are highest and any areas of matagouri or pīngao in the backdune.

Katipō counts per 30-minute search by 2 observers in each area was less time intensive than recording observations in quadrats, although did not always permit density per hectare to be calculated. Observer skill is a huge factor in determining web sightings. However, training can be carried out quite quickly in showing how to detect the small details (catching stands, retreat web structure) that allow web observations to be made. It should be noted that bright sunshine can hinder web sightings; the low winter sun or overcast weather being preferable.

One method that has been used elsewhere to improve the ability of observers to monitor the presence of katipō is the installation of ACOs or artificial cover objects (Costall and Death 2010). **Wooden artificial cover objects could be placed near some of the remote sites, to enable much more simple detection of presence of katipō.**

Aside from habitat changes, the use of vehicles in the spinifex dune at Marfells beach is having a negative impact on katipō.

Several quad/4WD tracks run parallel and perpendicular to the dune system and result in habitat loss. In places, driftwood and grasses containing katipō webs were observed within these tracks. The area of habitat loss is not insignificant. There are advisory signs about dune use, but these are not legible from a passing vehicle.

Ideally, vehicle use would not occur in the spinifex dune at Marfells Beach. I would advise, if dune use cannot be stopped, that **much larger signs be added to the area asking for people to drive on the lower beach rather than inside the dune.** As a minimum, **the small area of pīngao and porcupine shrub in the backdune at Marfells beach, where densities are at their highest for katipō on this coast, should be monitored and gain increased protection, possibly by fencing.**

Further, the **removal of the structure (Figure 11) in the backdune at approximately 41°43'13.6"S, 174°11'29.8"E** may discourage vehicle use and littering of the dune. This structure may provide habitat for katipō, so care may be needed in its removal.

Finally, the key message for managers and landowners of the dune systems on Marlborough's eastern coast, is that these dunes allow a significant population of New Zealand's most well-known and iconic spider to persist. We are fortunate to have several

Figure 11: Vehicle tracks (top-left) leading to a small hut



fragments and one large area of native dune, which with adequate conservation, will allow this species to thrive.

Acknowledgements

Thanks to Eve, who tirelessly returned to the east coast for katipō monitoring during the winter of 2019 and whose data formed a large part of this report. Also, Naomi who shared many of the walks along the coast with me. The enthusiasm that Rob and Sally Peters showed for Eve's school Science Fair project, really encouraged us to continue to develop our monitoring along the east coast and extend the original project. Without them, the project would have been limited to Marfell's Beach. The use of the lighthouse accommodation allowed us great access to a long stretch of coast that would have been very difficult to access without and allowed my first night-viewings of katipō outside of their retreats in the catching part of the web, which was a thrilling experience I will never forget. Enthusiasm and knowledge about areas of native plants from Mike Avis was also a key part in encouraging and focussing our work. Thanks to Jan Clayton-Greene for her trust in us to study this species without causing harm or distress.

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