

Biodiversity monitoring in Cape to City: lizards and invertebrates

Preliminary report to Hawke's Bay Regional Council

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Introduction

The Cape to City conservation initiative involves controlling invasive predators in a rural / peri-urban landscape. A principal aim is to restore native biodiversity. Predator control is being conducted by Hawke's Bay Regional Council (HBRC), and the response of native birds is being monitored by an ecological consultant (J. McLennan). Monitoring of native lizards and invertebrates is being conducted by Landcare Research. This preliminary report describes the design and establishment of biodiversity monitoring lines, and reports on baseline numbers of lizards and invertebrates detected during the pre-control phase of the Cape to City programme. This report addresses Te Mata a Maui contract milestone 2.2: *Biodiversity response monitoring and analysis of preliminary data from C2C footprint. Design and rollout of biodiversity monitoring system in pest-controlled and untreated areas, including restored habitats along Maraetotara River. Produce progress report by June 30, 2016.*

Methods

Monitoring design

Monitoring of native biodiversity was designed by J. McLennan and Landcare Research, in consultation with HBRC (Norbury & McLennan 2015). Biodiversity monitoring was designed to sample two broad habitat types: forest and open 'rough' habitat. We define forest as areas covered by a tree canopy; open 'rough' habitat refers to areas with no canopy but with some wildlife habitat features such as long grass, shrubs, fallen timber or rocks (Norbury & McLennan 2015).

Rollout

Between November 2015 and January 2016, biodiversity monitoring lines were established both within the Cape to City area (Fig. 1) and in an adjacent non-treatment area (with no predator control) for comparison. These consisted of various devices for detecting wildlife:

- tracking tunnels for lizards and invertebrates
- tree wraps (Bell 2009) for arboreal lizards
- artificial cover objects (ACO's) for terrestrial lizards
- frass funnels (Sweetapple & Barron in prep) for tree canopy invertebrates, and
- artificial retreats (weta houses) for other arboreal invertebrates

Most monitoring lines included two or more types of monitoring device. The numbers of monitoring lines containing each device type are summarised in Tables 1 and 2. Monitoring lines were 80 m long and separated by at least 50 m (but usually >100 m) for spatial independence.

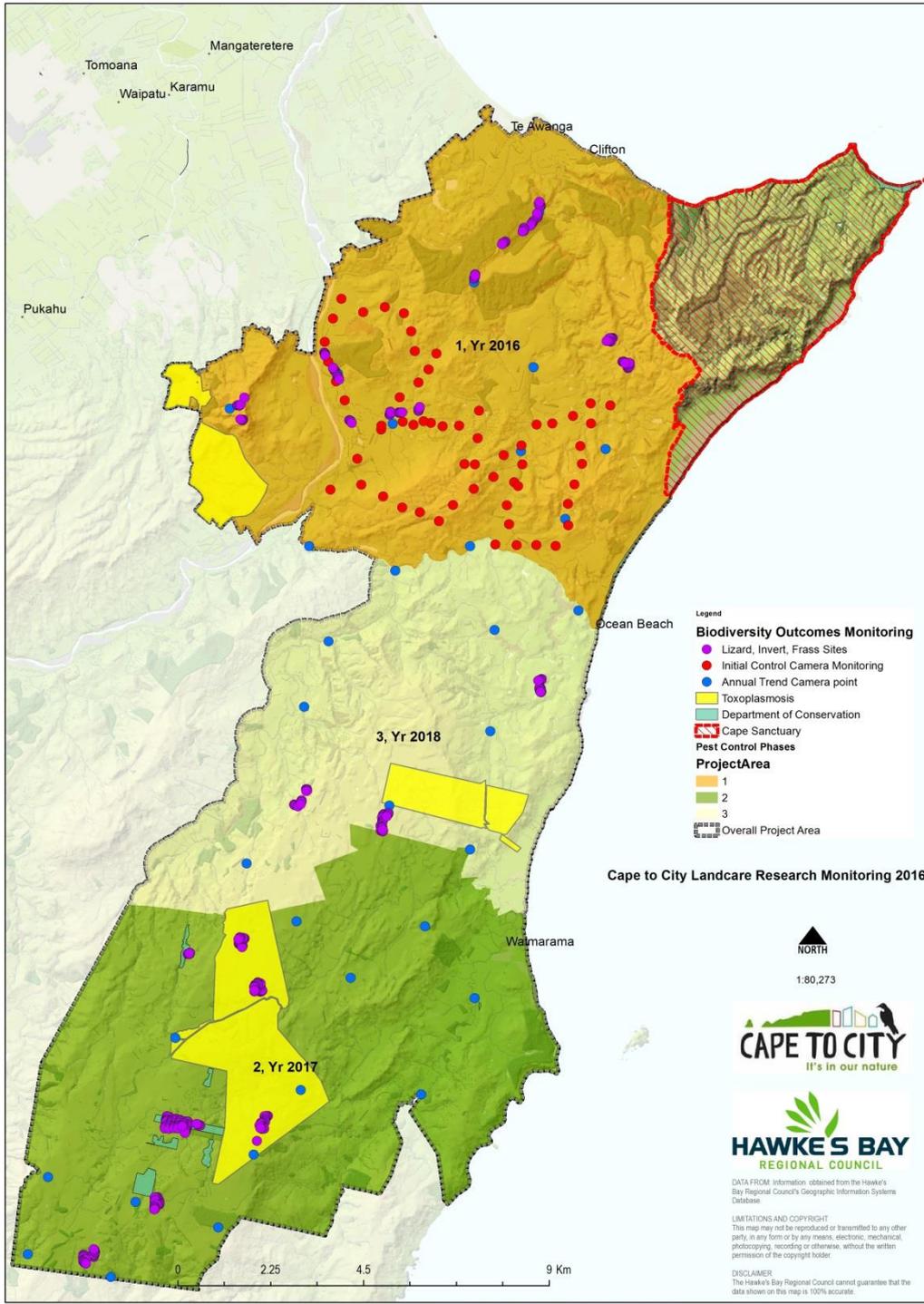


Fig. 1. Map showing the locations of monitoring devices used by Landcare Research in the Cape to City Area.

Table 1. Number and type of survey sites for monitoring lizards (from Norbury & McLennan 2015).

<i>Cape-to-City</i>	<i>Cape-to-City</i> Non-treatment
50 lines of artificial retreats in open areas (5 per line)	Up to 30 lines of artificial retreats in open areas (5 per line)
50 lines of track tunnels in open areas (5 per line, same lines as above)	Up to 30 lines of track tunnels in open areas (5 per line, same lines as above)
20 lines of track tunnels in forest patches proposed for rat control (5 per line)	20 lines of track tunnels in forest patches proposed for rat control (5 per line)
20 lines of tree wraps in forest patches proposed for rat control (5 per line, same lines as tunnels in forest patches)	20 lines of tree wraps in forest patches proposed for rat control (5 per line, same lines as tunnels in forest patches)

Table 2. Number and type of survey sites for monitoring invertebrates (from Norbury & McLennan 2015).

<i>Cape-to-City</i>	<i>Cape-to-City</i> Non-treatment
50 lines of artificial retreats (5 per line, same retreats as lizards)	Up to 30 lines of artificial retreats (5 per line, same retreats as lizards)
50 lines of track tunnels in open areas (5 per line, same tunnels as lizards)	Up to 30 lines of track tunnels in open areas (5 per line, same tunnels as lizards)
20 lines of track tunnels in forest patches proposed for rat control (5 per line, same tunnels as lizards)	20 lines of track tunnels in forest patches proposed for rat control (5 per line, same tunnels as lizards)
20 lines of weta houses in forest patches proposed for rat control (5 per line, same lines as tree wraps for lizards)	20 lines of weta houses in forest patches proposed for rat control (5 per line, same lines as tree wraps for lizards)
20 lines of funnel traps in forest patches proposed for rat control (2 per line, same lines as above)	20 lines of funnel traps in forest patches proposed for rat control (2 per line, same lines as above)

Artificial cover objects

Artificial cover objects were placed 20 m apart (five ACO's per line) in open 'rough' habitats, and along bush-pasture margins. ACO's consisted of three Onduline® tiles stacked on top of each other with spacers to ensure a gap of 5–10 mm between layers. Vegetation under the ACO's was trimmed to 5 cm. The tiles were weighed down with rocks or branches and left in place for at least three weeks before checking.

Checking of ACO's was conducted between 8 am and 5 pm, when lizards are most likely to be active. The tiles were turned over one at a time, and any lizards were identified and counted. The presence of any invertebrates was also noted.

Tracking tunnels

Tracking tunnels were placed 20 m apart with five devices per line, and left in place for at least 3 weeks before the first survey. Tracking ink was applied to the middle of the tunnel floor, with a blob of peanut butter in the middle of the ink to attract animals. Tracking papers were pinned to either end of the tunnel floor and retrieved after 3 days. Tunnels were left in place between surveys. Marked tracking papers were labelled with date, line number and tunnel number, and tracks were identified using field guides (Agnew 2009; Gillies & Williams unpubl).

Tree wraps

Tree wraps were attached to tree trunks 20 m apart, with five devices per line, and left in place at least three weeks before the first survey. The devices were left in place between surveys. Tree wraps are checked by gently peeling them back from one side, identifying and counting any lizards and invertebrates under the cover (Bell 2009).

Weta houses

Weta houses were attached to tree trunks at chest height, using the nearest suitable tree to each tree wrap. Invertebrates in the weta houses were counted and classified as weta, spiders or other.

Frass funnels

Frass funnels were placed at the second and fourth point of a monitoring line, and were set only in areas intended for rat control (Norbury & McLennan 2015). Funnels were placed as close as possible to the trunks trees, using the same trees as the tree wraps described above. Funnels were set on the north-facing side of the trunk (Sweetapple & Barron in prep). Funnels were left in place two months before being checked. The contents of each funnel were emptied into a zip-lock bag, labelled with date, line number and funnel number, and stored frozen for later sorting.

All of the above mhe monitoring lines were checked for the first time in March 2016 in order to sample native biodiversity in the treatment and non-treatment areas before predator control began.

Results

Artificial cover objects

Artificial cover objects detected two species of gecko (forest gecko *Hoplodactylus granulatus* and common gecko *Woodworthia maculata*) in the Cape to City area. Common geckos were also detected in two ACO's in the non-treatment area (Table 3).

Table 3. Numbers of geckos found in artificial cover objects (ACO's) in the Cape to City treatment and non-treatment areas. Figures in brackets show the number of ACO's that detected each species.

Species	Treatment	Non-treatment
Forest gecko <i>Hoplodactylus granulatus</i>	7 (3)	0
Common gecko <i>Woodworthia maculata</i>	1	2 (1)

Tracking tunnels

Although primarily intended for lizards and invertebrates, tracking tunnels detected a wide range of native and invasive animals (Fig. 2). Rodents were the most commonly encountered species in the tracking tunnels, and were widespread in both the treatment and non-treatment area. More weta were tracked in the treatment area, and geckos were tracked only in the treatment area. However, due to small sample sizes, the statistical significance of these results cannot be assessed.

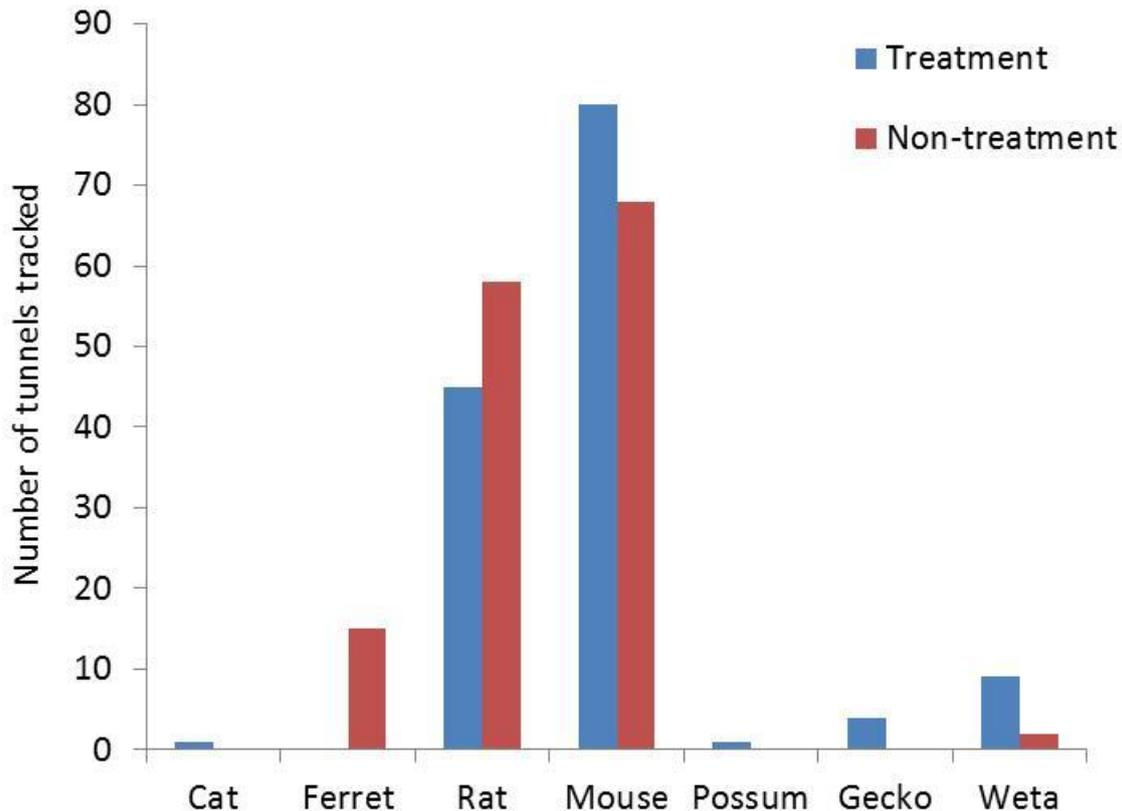


Fig. 2. Numbers of tracking tunnels detecting a range of taxa in the Cape to City treatment and non-treatment areas, March 2016.

Tree wraps

No lizards were detected under the tree wraps; however, invertebrates were counted under many of the devices. Collation of data is ongoing.

Weta houses

Collation of data is ongoing; however, invertebrates (including weta, spiders and others) were detected in about half of the weta houses.

Frass funnels

Frass funnels were established in one of the two areas planned for rat control. However, a decision has since been made not to control rats in this area (J. McLennan pers. comm.). The samples from these funnels have been stored frozen, and will be sorted later.

Frass funnels have now been established in the other area intended for rat control, and will begin to yield samples in November 2016.

Discussion

Baseline data on distribution and relative abundance have been obtained for native lizards and invertebrates, both in the Cape to City treatment and non-treatment areas. Continued sampling will allow detection of any trends.

The initial round of sampling has confirmed that all methods being used can detect lizards and/or invertebrates. It is not yet known whether the failure of tree wraps to detect arboreal lizards reflects absence or low abundance of these species, or simply a lack of sensitivity of the monitoring method. Bell (2009) reported greater success than we did in detecting geckos with similar devices, so it is possible that more time is needed before lizards begin to use these artificial covers; ongoing monitoring will clarify this.

The second round of biodiversity sampling is scheduled for November 2016. For some areas in the north of Cape to City, this will be the first sampling after predator control began. Predator control will not yet have commenced in some areas further south, allowing additional data to be collected pre-control.

Acknowledgements

Thanks to R. Dickson for preparing the map in Figure 1.

References

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- Sweetapple P, Barron M in prep. Frass drop for monitoring relative abundance of arboreal macro invertebrates in a New Zealand mixed beech forest.