

A survey of lizards at Bushy Point, Otatara: using artificial cover objects to determine presence or absence

A. R. Caddy

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Abstract This survey was undertaken over a two month period during the summer of 2010-2011 and used a range of artificial cover objects (ACOs) to ascertain the presence or absence of lizard species at Bushy Point in Otatara, Invercargill. In forested areas closed-cell foam covers were placed on tree trunks, in shorter vegetation and forest/estuary edge habitats squares of corrugated roofing iron and short lengths of plastic tube were situated on the ground along transects. Checking of ACOs occurred on eight occasions for each of 240 sites, at a range of times of day and weather conditions. Over the course of the study 51 skinks (*Oligosoma polychroma* and *O. inconspicuum*) were found occupying corrugated tiles on 50 occasions and plastic tubing on one occasion. No lizards were found occupying foam covers, nor was any sign found at these sites.

Introduction

Located between the entrances of the Wahopai and Oreti rivers to Invercargill's New River Estuary (Figure 1), Bushy Point consists of a varied habitat of podocarp forest, diverse regenerating bush blocks and a well-established estuarine vegetation mix of shrubs and rushes. Most noteworthy is the intact progression from mudflats to old growth forest, representative of a once typical sequence of indigenous vegetation in the area (Cromarty & Scott, 1996). New River Estuary is included in the Awarua Wetland complex, a site of international significance under the Ramsar Convention.

Bushy Point Conservation Area is public conservation land vested in the Department of Conservation and managed locally by the Otatara Landcare Group (OLG). A portion of the area currently in pasture is progressively being planted and restored to link two regenerating totara and mixed shrub bush sections (OLG, 2009) while extensive mammal pest control work is also carried out by the Group who maintain 6km of trapping lines. Abutting the Conservation Area are two privately owned land parcels protected by Queen Elizabeth II Covenant which contain the most mature forest at Bushy Point, dominated by kahikatea and matai.

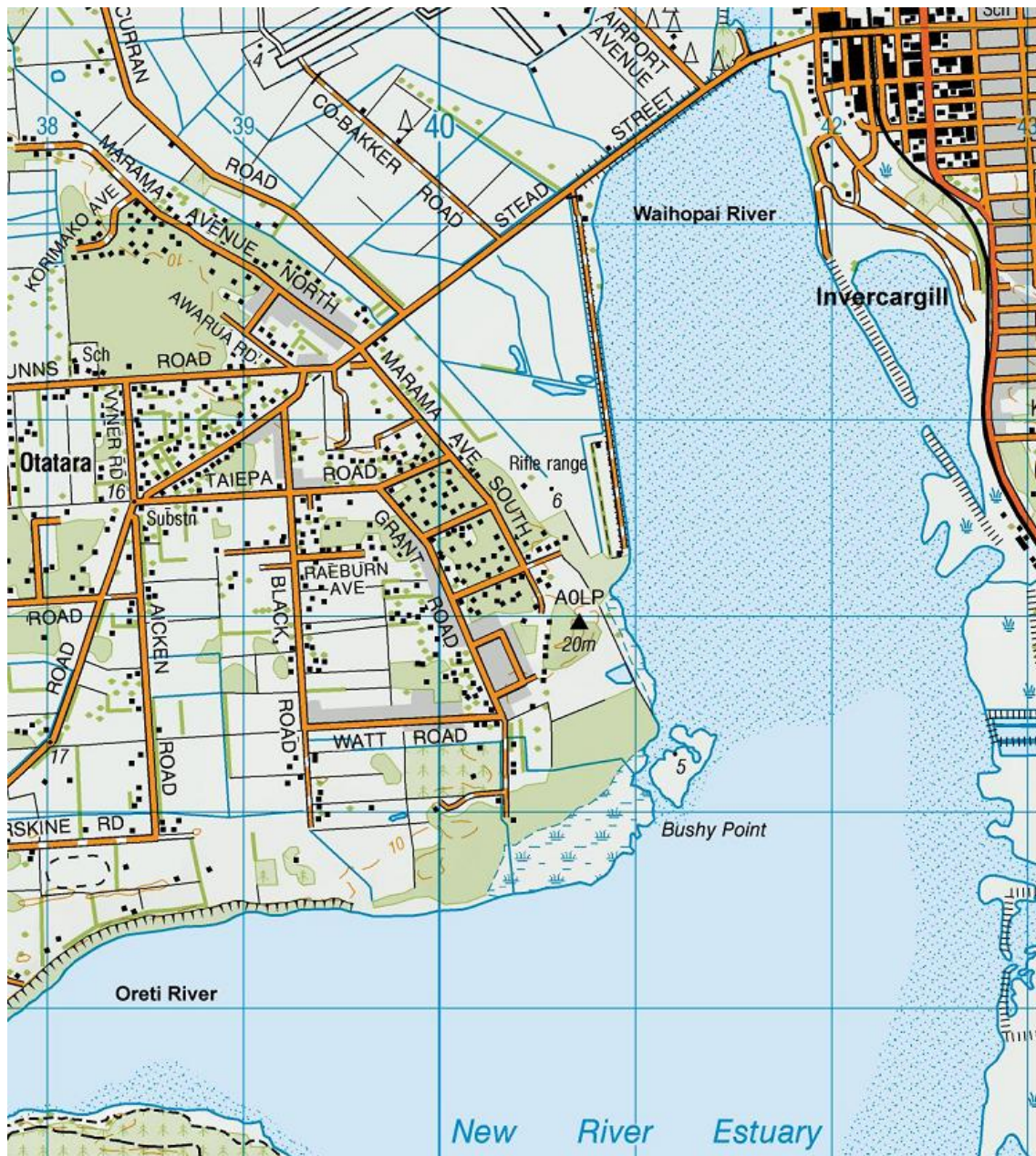


Figure 1: Bushy Point located at New River Estuary near Invercargill (LINZ, 2009).

While the bird populations at Bushy Point are monitored by the Regional Council (Environment Southland [ES]), lizards have not been formally surveyed or monitored at any point in the past. Although protected by legislation for a number of years, lizard species (other than tuatara, *Sphenodon* spp.) have been largely ignored in conservation in New Zealand, although there have been recent increases in effort to monitor, manage and enhance populations, particularly on offshore islands (Towns, Daugherty & Cree, 2001). On the mainland lizards are exceptionally vulnerable to habitat disturbance and destruction as well as predation by introduced mammals (Jewell, 2008).

The most recent and proximate surveys for lizards near Bushy Point involved direct searching: visual scanning of sites and parting of vegetation. In 1997 a group of researchers found four skink species and two gecko species in

Catlins/Southland coastal bush sites (Tocher, Jewell & McFarlane, 2000). Significantly in this study, the two gecko specimens found (*Hoplodactylus granulatus* and *H. maculatus*) were resident in non-pristine forest areas, that is roadside bush and regenerating scrub. A second survey, in 2001, involved direct searching of a number of areas across Murihiku (Southland), including four sites at Otatara and Sandy Point (Edmonds & Jewell, 2001). In 9.5 person hours spent at these four sites only two lizards were seen, both juvenile common skinks (*Oligosoma polychroma*). The authors cited high conservation priorities and the “ideal” potential habitat for geckos seen during the survey, and recommended further surveys been undertaken (Edmonds & Jewell, 2001, p.37).

Sightings of skinks at Bushy Point are not uncommon and there has been one reported sighting of a gecko in regenerating bush several years ago (C. Rance, OLG, 2010, pers. comm.). A survey in this area would establish baseline data on which future monitoring and research may be built. Better knowledge of lizard abundance and distribution at Bushy Point would lead to a more complete understanding of the ecology of the area and may influence conservation and management efforts. Identification of established lizard populations could potentially open up funding options for OLG and create a point of interest within the community, the involvement of which is a priority for the Group.

The objectives of this study are:

- 1) To determine the presence or absence of skinks and geckos at Bushy Point
- 2) To identify the species of skinks or geckos found to be present

Methods

This survey was undertaken by a single researcher within a two month period in summer, 2010-2011. Transect lines were chosen for their accessibility and diversity of habitat, and efforts were made to include representations of all vegetation types existing at Bushy Point and to obtain data from across the entire Conservation Area and covenant parcels. Transect lengths varied, with ACO sites for each numbering between four and 29.

In order to survey an adequately sizeable proportion of the area, artificial cover objects (ACOs) were chosen over direct searching methods, reducing the time needed at each site visit. ACOs were selected over more traditional pitfall traps which commonly cause a percentage of mortality (Enge, 2001) deemed to be unacceptable for studying these protected animals. Artificial retreats are attractive to lizards as they heat up in the sun, providing a place to warm up as well as to hide and, as lizards are able to freely move out of the refuge, they are a low impact option for monitoring (Clark, 2006).

ACOs may be of a variety of materials including concrete, metals, and organic fibres. Roofing material available in sheets and cut into tiles is increasingly popular for lizard monitoring in open habitats, in particular, Onduline, which is a fibrous and lightweight product, has increasingly been used to create triple-layered ACOs (Clark, 2006; Hoare, O'Donnell, Westbrooke, Hodapp & Lettink, 2009; Wilson, Mulvey & Clark, 2007). In a comparative study of the effectiveness of triple-layered Onduline and corrugated iron and single-layered concrete retreats, Lettink and Cree (2007) found that skinks had no preference, being found in each of the cover types in equal numbers, however geckos strongly preferred Onduline. In this survey corrugated iron was used in open habitats, but with a single layer only, for ease of handling and due to time and finance restrictions. A small number of black plastic tubes were also employed when corrugated iron was not available for use.

For surveying arboreal lizards monitoring standards are not well-established and new ideas and designs are still being trialled. Over the last several years Landcare Research has been developing the use of closed-cell foam as a mimic for tree bark microhabitats. This material is very lightweight and easy to secure in place, and a recent trial has shown improved rates of gecko detection when compared with other methods, including direct searching, even in areas with low population densities (Bell, 2009). This survey has employed foam of the same thickness and cut to the same size as that used by Bell (2009).

Individual cover sites along transects were chosen based on predetermined spacing in order to eliminate selection bias on the part of the researcher. Once placed, ACOs were left undisturbed for the longest practicable length of time (given the period available) before checking for occupying lizards began. Due to the short time frame of the study it was not possible to visit sites only in optimal weather conditions, therefore checking occurred in a range of weathers and temperatures. It was also not feasible to perform site checks at a consistent time of day, although these all occurred between 9am and 4.30pm with preference given to the middle of the day as lizards may be more likely to use cover objects when the ambient temperature has warmed (Hoare et al., 2009).

In open habitats, in pasture grass at bush and estuary margins, an initial round of 35 black plastic tubes (300mm long x 65-80mm in diameter) and 29 corrugated iron tiles (450mm x 250mm) were laid approximately 25m apart on transect lines. These ACOs were left in place for four weeks before checking was carried out between January 16 and February 1, 2011. Each of these sites was checked for occupying lizards eight times on non-consecutive days. A second round of open habitat monitoring involved 80 corrugated iron tiles of Colorsteel Endura (300 x 300mm, Figure 2) again laid 25m apart on new transects. These remained in place for two weeks prior to checking, with eight non-consecutive checks occurring between January 28 and February 14. Two ACOs were checked only six times following removal by suspected vandals and a further two ACOs were replaced after their removal, in what is thought to be less than 24 hours.



Figure 2: Typical open habitat ACO placement (lower left)

In forest habitats closed-cell foam pieces (1m x 400mm x 3mm thick) were attached to tree trunks using string

tied at the top, bottom and middle (Figure 3). A section of foam of approximately 15mm was folded in toward the trunk at the top of the cover to reduce infiltration by rain water. The tree species fitted with foam covers were varied and in a small number of cases these were tied around multiple trunks in close proximity, where a single large trunk was not easily accessed. 96 foam ACOs were placed approximately 50m apart on mammal trapping lines and were left undisturbed for three weeks before commencement of checks. Each site was checked for lizards (and lizard sign) eight times at intervals of at least three days between January 14 and February 11, 2011.



Figure 3: Typical forest ACO placement

Results

Open habitats. During 1148 checks of open habitat sites on ten transects skinks were found to be occupying ACOs on 51 occasions (4.44% of total checks; Table 1). 50 of these were at corrugated iron ACOs and one at a plastic tube ACO, and all were the sole occupant. These sightings were recorded at 26 different sites overall (18.6% of sites), at which a mean average of 1.96 skinks was established during the checking period (a positive result at 24.52% of checks at these sites). The highest rate of positive findings was four at a site (a positive result at 50% of checks) over the study period. This occurred at three separate sites, located on transects 1, 3 and 5, all within the main (north eastern) part of Bushy Point. Only one transect, transect 9, located at the south end of Grant Road, had a positive check rate of over 10% (Table 2). Three transects, with a combined total of 42 sites, had no skink sightings at ACO sites.

Of the 51 skink finds 43 (84.31%) were common skinks (*Oligosoma polychroma*); five (9.8%) were cryptic skinks (*O. inconspicuum*); and three (5.88%) were unidentified. The 51 sightings include one of a juvenile cryptic skink with an estimated snout-vent length (SVL) of 50mm. No geckos were sighted in open habitat ACOs.

OPEN HABITAT TRANSECTS					
Transect	ACO sites	Location	Lizard sightings at ACOs (incidental sightings)		
		From To	<i>O. polychroma</i>	<i>O. inconspicuum</i>	Total
1	24	E2150369, N5408323 Eastern fence-line between pasture grass and regenerating estuary edge (bracken, manuka, gorse, broom, lupin)	6	1	0
2	9	E2150312, N5407225 West edge of main bush, replanted area (pasture grass, cabbage trees, pittosporum, bracken)	0(1)	0(1)	0
3	17	E2150332, N5407479 North edge of main bush, between pasture grass and replanted/regenerating bush edge (cabbage tree, bracken)	6(1)	1	2
4	14	E2150783, N5407661 East edge of main bush, between replanted/regenerating bush (cabbage tree, bracken) and estuary (rushes, sedges)	4	1	0
5	24	E2150368, N5408077 Edge of totara bush, between pasture grass and regenerating bush (totara) on hilly sand	15	2	1
6	4	E2150384, N5407541 Man-made pond edge, in pasture grass and recently planted shrubs	2(2)	0	0
7	8	E2150188, N5407198 Rance's covenant, in replanted bush (cabbage tree, flax, toetoe, pittosporum)	1	0	0
8	4	E2150206, N5406868 Gamble's covenant, in estuary edge bush (cabbage tree, sedge, manuka)	0	0	0
9	11	E2150107, N5406900 End of Grant Rd, in pasture grass with occasional flax, coprosma	9	0	0(2)
10	29	E2150096, N5406618 South estuary edge, in pasture grass with occasional flax, coprosma at river/ tidal estuary edge	0(1)	0	0
Total			43(5)	5(1)	3(2)
					51(8)

Table 1: Open habitat transect summary

In addition to the above, incidental sightings of skinks on pathways occurred on eight occasions. Of these five were common, one cryptic and two unidentified. Of the unidentified incidental sightings one was a juvenile with an estimated SVL of 25mm. Two incidental sightings were recorded on transect lines where no lizards were found at ACO sites.

CHECKS ON TRANSECTS IN OPEN HABITATS

Percentage of positive checks

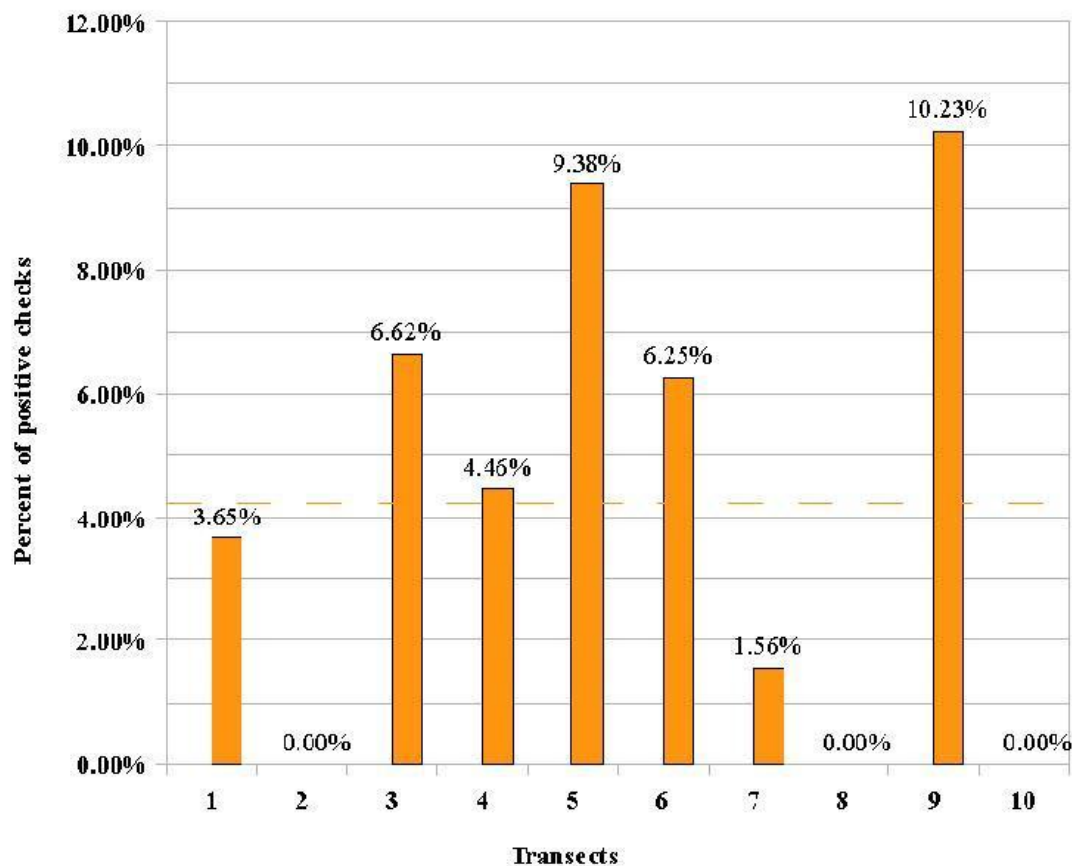


Table 2: Percentage of positive checks on transects in open habitats

Forest habitats. 768 foam ACO checks were carried out during which no lizards or lizard sign were found.

Discussion

While the presence of a population of skinks at Bushy Point has been established, the findings of this study may only loosely reflect the size of that population. Marking of individuals found was not undertaken, therefore it is not possible to know how many were recaptured over the course of the survey. A study carried out by Wilson et al. at Macraes Flat (2007), found skinks were recaptured a small percentage of the time, although geckos

displayed a higher likelihood of recapture. Skinks found at adjacent ACO sites are thought very unlikely to be the same individual.

The two species found during this survey, the common (*Oligosoma polychroma*) and cryptic (*O. inconspicuum*) skinks, have been identified using the same habitat and under conditions that were not discernibly different. Skinks found were of varying size, reflecting populations that include several generations. Two juveniles were seen, and there have been informal sightings of gravid individuals (Chris Rance, OLG, 2011, pers. comm.).

The common skink is just that; common throughout New Zealand, although it may be that the species will be taxonomically divided further following more research (Jewell, 2008). The specimens found include both the dark and striped morphs, but not the Awarua Wetlands morph. The cryptic skink, known only to the lower half of the South Island, is also common locally (Jewell, 2008) and was seen displaying typical chestnut-tan colouring with striping that did not continue the length of the tail. Although it is possible that further skink species are present, it is thought to be unlikely due to the lack of rocky habitat.

The short term nature of this survey may have had a bearing on the lack of success in forest habitats at Bushy Point. It is to be hoped that a study spanning months or years would find geckos within this area. As Tocher et al. (2000) found, geckos are found in regenerating habitats in Southland, in addition to those that are pristine, and it is thought that the lack of ongoing disturbance and low instances of public access to Bushy Point would be at least somewhat ideal for these species.

Although a negative result for geckos is discouraging, it is thought that it is worthwhile to continue to survey for their presence at this site. Their detection is notoriously difficult (Bell, 2009) and experimentation with the materials used and sites at which covers are located may be needed before any specimens are found. The positive detection of geckos at Bushy Point would be an interesting ecological find for local conservation organisations and the Otatara Landcare Group.

Recommendations

- Although formal recording and analysis of weather and time-of-day data was not within the scope of this survey, some general observations were made. Skinks were found in higher numbers in medium-warm temperatures but not very warm temperatures (approx. $>20^{\circ}\text{C}$) and rarely in cold temperatures (approx. $<12^{\circ}\text{C}$). Depending on the conditions it may be beneficial to delay checks until late morning/early afternoon, or earlier if the day is very warm. Skinks were found in covers during light rain showers but sustained, heavy rain tended to lower the number of sightings.
- The corrugated iron ACOs used seemed to need fairly direct sunlight to warm sufficiently to attract skinks. This was particularly so at the totara block edge transect (transect 5), which curved around the bush edge, with ACOs distributed roughly evenly between the northern and southern edges of the block. During checks when the sun was striking the south side (obliquely) in the morning more skinks were found in the covers there, while the opposite was the case in the afternoon.
Note that these observations, as with those on temperature and weather, were typical, but did not hold true in every case.
- In open habitats double or triple layered ACOs may yield a higher detection rate for skinks. It is important however, that individuals are very quiet when approaching and checking sites and this

should be kept in mind when designing cover objects as well as when choosing sites.

- In forest habitats it is the opinion of the researcher that a more positive selection of foam cover sites should have taken place. Rather than adhering to a predetermined spacing for sites, covers could be placed where conditions such as light, aspect and vegetation type are optimum. This may necessitate closer consultation with a person experienced in this type of monitoring or with good knowledge of the habits and preferences of the lizard species most likely to be found.
- Although the string holding foam covers in place lasted well through the course of the survey, a longer term study is likely to require alternative fixings such as screws or nails. It may be helpful to liaise with other organisations undertaking lizard monitoring, such as the Bluff Hill/Motupohue Trust.

Acknowledgements

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Figure 4: *Oligosoma polychroma* found at corrugated iron ACO under totara at bush edge