


Elevated Enclaves

Biodiversity Enhancement for Living Roofs - A Collaborative Research Project



Ornate skink (*Oligosoma ornata*)
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Prosthetic Habitat for Lizards

Through the research undertaken to date of temperature and vegetative cover on the WCC living roof, provision of some form of artificial or enhanced habitat and refuge opportunity is likely to be required to ensure survival and success of a skink population on the living roof.

Given the limitations in a living roof context of conventional habitat enhancement (such as onduline or wood piles), investigation into the development of an artificial habitat refuge particularly suited for the living roof scenario was considered to be an important success factor for ensuring appropriate habitat requirements at all times of the year for skinks.

The artificial habitat refuge is being developed as a potential substitute for the typical refuges and habitats that would otherwise be afforded by the features within a natural environment. Such a device is being conceptually termed by the researchers as a prosthetic habitat. In this context a prosthetic habitat is an artificial substitute, designed for functional and/or aesthetic reasons, and can be either removable or permanent.



Exploded 3-D View of the Layers of the Prosthetic Habitat

The prosthetic habitat that has been developed, provides both functional substitutes for primary habitat requirements for skinks while also being aesthetically appropriate for the living roof environment and functionally suitable for the particular conditions the artificial habitat would be subject to on the living roof.

A design team consisting of undergraduate Product Design students were briefed by the research team on the range of habitat requirements of skinks and the particular extreme conditions encountered on living roofs. This then formed the 'client brief' that the students used to develop early solutions and sketch prototypes. The range of environmental factors necessary for skink survival became the cornerstone of the project. These factors included shelter, refuge, food, territory, water, warmth, aesthetics and monitoring.

The most suitable concept that emerged from the early design phase developed the premise of establishing a layered approach to the habitat, enabling a variety of distinct environment conditions to be available to the skinks for self-regulation of temperature and humidity. Furthermore, this basic concept can potentially support the persistence of suitable environmental conditions throughout the year in otherwise inhospitable contexts.

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Living roofs have been identified as providing significant potential for urban biodiversity within a range of living roof literature.

However, research to date has focused on natural and ad-hoc plant, insect and bird colonisation of living roofs as opposed to specific opportunities for relocation of endangered species. There has been no research within the New Zealand context on biodiversity opportunity. The initial results from the research undertaken in the first 3 years of the WCC living roof project indicate that this NZ native living roof provides insect diversity which might sustain lizard populations. Internationally, there is a limited resource of habitat biodiversity research on living roofs (particularly those with native plant species (compared with the more common sedum roofs).

Since 2004, Rodney, Waitakere, ARC and other councils have applied consent conditions regarding rescue, relocation and habitat restoration for urban lizards on small developments (down to single-lot size). This generates many lizards that need to be put somewhere. However, there is no evidence that relocation of skinks to other locations assists either the relocated skinks or the resident lizards that are inevitably present.

Living roofs are potential ideal sites to establish populations of skinks: they are not walked on by people, represent new habitat, are unlikely to have the pest mammal issues that the more 'terrestrial' habitats have, free of the introduced rainbow skink, and can be designed to provide climatic conditions suitable for lizards and should be capable of supporting viable lizard populations. Living roofs can therefore be permanent reservoirs for less common local species and have the particular advantage of keeping lizards within iwi boundaries - retaining local taonga in local places.

The collaborative research project led by Renee Davies of Unitec Institute of Technology and in partnership with Landcare Research, Tonkin & Taylor Ltd, Entecol Ltd and Waitakere City Council will provide quantifiable data on whether an existing New Zealand native living roof has the required insect and plant structure and diversity to support a lizard population. It will also investigate ways to optimise the habitat and refuge potential of the living roof through the use of designed habitat objects.

Research Questions

1. Can living roofs provide for increased New Zealand flora and fauna biodiversity in urban environments?
2. Can optimal habitats be provided while improving and maintaining aesthetic roof landscapes?
3. Can a NZ native living roof provide habitat conditions suitable for relocation of NZ native lizard species?
4. Can built habitat objects located on living roofs contribute to optimal habitat and refuges for New Zealand lizard species and their associated insect food sources?

This project seeks to...

Identify the specific habitat requirements of New Zealand lizard species and confirm whether these conditions exist or can be created (using habitat objects) on living roofs.

Quantify the insect population and vegetation cover that is provided by an existing 500square metre living roof (Waitakere City Council building).

Develop a range of prototype habitat objects which may assist the creation of optimal habitats for New Zealand lizard species on living roofs.

Lead to future research investigation and phases of the project which will include but not be limited to: native lizard relocation onto living roofs and associated monitoring and investigation of success of relocation.

