

Final Report to the Research Advisory Group of the Grassy Ecosystem Reference Group.

Project Title:

**Distribution and conservation status of the Corangamite
Water Skink (*Eulamprus tympanum marnieae*) on the Victorian
Volcanic Plain.**

Garry Peterson
Department of Zoology
La Trobe University
Bundoora

Summary

The Corangamite Water Skink, *Eulamprus tympanum marnieae* is a recently described subspecies of the Southern Water Skink, *Eulamprus tympanum tympanum*. Endemic to the Victoria Volcanic Plain, *E. t. marnieae* is a habitat specialist inhabiting localities that combine deeply fissured basaltic rock piles with remnant arboreal vegetation and permanent or ephemeral lakes east and northwest of Lake Corangamite.

Only ten extant populations of *E. t. marnieae* are known with most being extremely small and patchily distributed, and, with the apparent disappearance of 2 populations, the lizard is considered "endangered". Probable reasons for the decline and threats to existing populations include a combination of factors, including habitat loss and degradation, stochastic genetic processes and intergradation with the nominal species *E. t. tympanum*.

Prior to 1996, *E. t. marnieae* was only known from 3 small isolated populations, two of which were assumed to be extinct. Targeted surveys to determine the distribution and abundance of *E. t. marnieae*, the extent of intergradation with *E. t. tympanum* and the proximity of these populations to *E. t. tympanum* in southwestern Victoria were undertaken during 1996/97 and in particular by the Corangamite Water Skink Recovery Team during 1997/98. These surveys resulted in the discovery of previously undocumented *E. t. marnieae* populations, as well as a number of populations intermediate in scalation and colour characters between the two subspecies. All of these newly discovered populations, as well as two of the three historical populations, were associated with regions of the Later Newer Basalts.

During 1998/99 further surveys were directed at areas of potential habitat at the western extremities and northern fringes of the Victorian Volcanic Plain. A total of 197 sites were surveyed, with the majority associated with regions of the Later Newer Basalts, or with the water bodies and watercourses that dissect the Volcanic Plain or the foothill forest and woodlands on its northern border. No additional populations of *E. t. marnieae* or intermediates were discovered at any of the 197 sites surveyed. *E. t. tympanum*, on the other hand, was found at a total of 16 sites, 8 of which were associated with 3 previously undocumented populations on the Volcanic Plain.

E. t. tympanum was associated with two regions of the Later Newer Basalts towards the western extreme of the Volcanic Plain. These two regions were within the cool temperate thermal zone of southeastern Australia and were, or historically would have been, vegetated by moist woodlands, providing an ideal environment for *E. t. tympanum*. The Later Newer Basalts inhabited by *E. t. marnieae*, on the other hand, are within the warm temperate thermal zone, which suffers dry arid summers. *E. t. marnieae* seems to handle these conditions by retreating into a cool moist microhabitat provided by the surrounding lakes and deeply fissured basaltic barriers.

Most other regions of Later Newer Basalts and water bodies and courses surveyed within the warm thermal zone of the Volcanic Plain lacked any substantial areas of suitable habitat, in particular large basalt rock aggregations. Suitable habitat was surveyed in a region of the Later Newer Basalts southwest of Lake Goldsmith, but no animals were found. A similar situation has also been found at some sites within a

region inhabited by *E. t. marnieae*, and their absence from these sites and from the Lake Goldsmith sites could be due to extinction.

No intermediate populations were discovered along the northern fringes of the Volcanic Plain, and no further evidence was found to suggest that integration had previously occurred here, apart from the intermediates from Mt Emu Creek discovered during the 1997/98 survey.

The status of *E. t. marnieae* as an endangered taxon appears justified with its current geographical distribution restricted to three isolated regions of the Later Newer Basalts east and northwest of Lake Corangamite in central southwestern Victoria. All 10 extant populations are patchily distributed throughout these regions, with most populations small and fragmented. It seems that *E. t. marnieae* has recently undergone a decline with the apparent extinction of two populations, and it appears that it may also have disappeared from other sites that appear suitable both within, and just north of its current range.

round weathered basalt boulders, and the site was very similar to the *E. t. marnieae* site at Lake Bolac. Riparian vegetation was also present at this site, in particular *Eucalyptus camaldulansis*.

Of the other 8 sites at which *E. t. tympanum* was discovered, all occurred within regions in which *E. t. tympanum* populations had previously been recorded (Table 1). These include 2 sites in the south of Buangor State Park, 2 sites in the south of The Grampians National Park and 3 sites within Mt Eccles National Park. The last site at Darlot Creek is just south of the Mt Eccles sites. The previously documented recorded from Mt Eccles, however, was based on a single specimen.

Both the population sites at Buangor State Park and The Grampians were found in typical *E. t. tympanum* habitat (i.e. areas within moist forest and woodlands with an open canopy and fallen logs, which are used as perches for thermoregulation and shelter). The sites around Mt Eccles, on the other hand, were within woodland areas but the lizards were utilizing the basalt rock aggregations as opposed to fallen logs.

4. Discussion

4.1 Distribution

Following extensive surveys of southwestern Victoria, in particular the Victorian Volcanic Plain since 1996, it appears that the current geographical distribution of *Eulamprus tympanum marnieae* is restricted to the Later Newer Basalts between Lake Bolac and Lake Colac in the central southwest. The extensive survey in areas of potential habitat at the western extremity of the Volcanic Plain and along its northern fringes during 1998/99 failed to find any additional *E. t. marnieae* populations or evidence of additional intergradation with the nominal species *E. t. tympanum*.

Of the areas examined during the 1998/99 survey, the regions of the Later Newer Basalts appeared to be the areas with the greatest potential for supporting additional populations of *E. t. marnieae*. However, rather than finding populations of *E. t. marnieae*, 2 of these regions in the southwest of the Volcanic Plain were inhabited by *E. t. tympanum*. Although geomorphologically similar to the Later Newer Basalts inhabited by *E. t. marnieae*, the Mount Rouse and Mt Eccles regions further west differ both in climate and vegetation and are more similar to the stony rises associated with Mt Porndon south of Lake Corangamite, which *E. t. tympanum* inhabit. These regions are within the cool temperate thermal zone of southeastern Australia with annual rainfall greater than 700mm and are, or in the case of the Mt Rouse flow would have most likely been, vegetated by moist herb-rich woodlands dominated by *Eucalyptus viminalis* (Gibbons and Gill 1964; Willis 1964, Powell 1967). These findings are not surprising though, seeing as throughout its range *E. t. tympanum* is restricted to the cool temperate thermal zone of southeastern Australia where it inhabits sites within moist woodlands and forest with fallen logs or rocky outcrops and an open canopy (Spellerberg 1972a, Mather 1978).

It was initially surprising that no *E. t. tympanum* were found inhabiting the Mt Napier flows following their discovery at Mt Rouse and at Mt Eccles given the similar habitat, climate and close

proximity. However, unlike the previous two regions, the basalt flows from Mt Napier do not reach the coastal woodlands inhabited by *E. t. tympanum* to the south. Historically this flow was surrounded by open grassy woodlands and swamp-scrub complexes (NRE 1997), neither of which are known to support *E. t. tympanum*. It therefore appears that *E. t. tympanum* was not able to colonize this region, unlike the Mt Eccles and Mt Rouse flows.

The Later Newer Basalts that *E. t. marnieae* are associated with, on the other hand, are within the warm temperate thermal zone of southeastern Australia with an annual rainfall of 550 mm or less and a dry arid summer (LCC 1976). Combined with a shallower and poorly integrated drainage system compared to the western Later Newer Basalts, and thus the extensive lake system, the climate is, and the original vegetation probably was, quite different than that further west. Information documenting the original vegetation of the regions inhabited by *E. t. marnieae* prior to European settlement has been difficult to find, but the shrub *Hymenathera dentata* is the dominant native species remaining, with the occasional solitary stands of *Eucalyptus camaldulansis*, *Acacia melanoxylon* or *A. mearnsii*. It is, however, unlikely that these regions were densely forested like the areas further west (Willis 1964, Powell 1967).

It therefore appears that the lake system combined with the deeply fissured basaltic rock piles provide a cool and humid refuge for *E. t. marnieae* during the hot arid summer months, thus allowing it to inhabit an area very different from that inhabited by its relative *E. t. tympanum*. This conclusion is supported by habitat studies by Peterson (1997) and Robertson *et al.* (1999).

The two areas of Later Newer Basalts northeast of Lake Corangamite are in the same climatic zone as the Later Newer Basalts and associated lake system inhabited by *E. t. marnieae* (Spellerberg 1972b). These basalts, however, are more weathered than those to the west, with a gentle topography and few exposed basalt barriers or large aggregations on the rises (Gibbons and Gills 1964, Ollier and Joyce 1964). Those basalt boulders that are exposed are rounded and nearly completely buried in the soil. These areas are also well drained by a number of watercourses that dissect them, and as a result contain no standing water bodies. Therefore, the deep fissures and cool moist microhabitat that appear to enable *E. t. marnieae* to inhabit the basalt regions east and northwest of Lake Corangamite and tolerate the arid summer conditions are apparently lacking. Similar areas of Later Newer Basalts to those northeast of Lake Corangamite surveyed during 1997/98, in particular the area just northwest of Winchelsea, also were not inhabited by *E. t. marnieae*.

The only Later Newer Basalt region surveyed where it was rather surprising that *E. t. marnieae* was not recorded is the region southwest of Lake Goldsmith. At a number of the sites examined the habitat appeared very similar to that inhabited by *E. t. marnieae* throughout its range (i.e. deeply fissured basaltic rock piles with permanent lakes and *H. dentata*), however, no animals were recorded. A similar situation also occurs at some sites within the Lake Bolac/Nerrin Nerrin region.

The Lake Goldsmith region was historically separated from the three regions of the Later Newer Basalts inhabited by *E. t. marnieae* to its south by grassland complexes. No watercourses connect the Lake Goldsmith region with any of the other three regions either. Therefore, *E. t. marnieae* may not have been,

historically, able to migrate north to the Lake Goldsmith region due to the lack of dispersal routes. On the other hand, the sites in the Lake Goldsmith region may have become extinct and could not be recolonized. This appears to be the case with the sites in the Lake Bolac/Nerrin Nerrin region with sites that are not inhabited lying, in some case, less than 2 km from inhabited sites, suggesting difficulties with recolonization even over short distances. Detailed microhabitat analyses are planned to compare these sites to sites inhabited by *E. t. marnieae* throughout its range.

The failure to find any additional populations of *E. t. marnieae* associated with water bodies or watercourses, away from the Later Newer Basalts on the Volcanic Plain seems to be due to both the lack of suitable habitat and dispersal routes. At all water bodies examined no large basalt rock aggregations were found, with the exception of Lake Burrumbeet, thus they lacked the habitat that appears to allow *E. t. marnieae* to persist in the warm temperate region of the Volcanic Plain. Dispersal along watercourses and colonization of water bodies like what may have occurred at Lake Bolac would have also been difficult. Apart from the fact that few watercourses dissect the Later Newer Basalts inhabited by *E. t. marnieae*, those that do, run in a north-south direction and exhibited not suitable habitat. No watercourses run west or east from these Later Newer Basalts therefore denying *E. t. marnieae* dispersal routes through the grassland complexes in these directions.

Lake Burrumbeet was the only water body examined with large basalt rock aggregations, with the site appearing very similar to the *E. t. marnieae* site at Lake Bolac. Like the Lake Bolac population, it also appears that the population of *E. t. tympanum* at this site has migrated along watercourses that lead to the lake from populations that inhabit more suitable habitat to the north or south. It also appears that *E. t. tympanum* is utilizing the aggregations in a similar way as *E. t. marnieae* does.

Although the Victorian Volcanic Plain was extensively surveyed, no further evidence was found to indicate any intergradation between *E. t. marnieae* and *E. t. tympanum* along its north fringes. The intermediate populations discovered along Mt Emu Creek during the 1997/98 survey provide the only evidence to suggest this. All other watercourses within and on the fringe of the Volcanic Plain when surveyed did not have any real suitable habitat present. At best, stands of riparian vegetation were left, but no rock aggregations or structural habitat that the lizards could utilize for shelter from, in particular climate extremes, were present.

With the areas where the woodlands of the Volcanic Plain abut the foothill forest of the northern ranges, apart from the fact that no additional *E. t. marnieae* populations were found on the northern margins, no *E. t. tympanum* populations were found associated with the dry foothill forest along most of the southern boarder of the northern range. All populations of *E. t. tympanum* discovered during this survey and other populations recorded previously in the southern regions of the northern range have only been associated with areas of moist foothill forest, sedge-rich woodlands or inland slopes woodlands all of which receive annual rainfall greater than 650 mm. This indicates that a barrier, in the form of dry foothill forests separate the areas of potential habitat of both subspecies along most of the northern border of the Volcanic Plain, thus preventing contact between the two taxa, and any subsequent intergradation.