

David G. Chapple *Editor*

# New Zealand Lizards

 Springer

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*For Kira and Nicole*

# Foreword

Like many young Australians of my generation, my first trip overseas was to New Zealand, when I was 20 years of age. But unlike most of my compatriots, my journey was driven by my fondness for reptiles. I was invited to join a scientific expedition to Stephens Island, in the middle of Cook Strait, to study the almost-mythical Tuatara. I was entranced by these large dragon-like creatures—spectacular survivors of a once-mighty evolutionary lineage, clinging to existence on the rocky shores of a few windswept islands. In my undergraduate lectures, I had heard all about the lordly Tuatara, as well as the desperately endangered Stephens Island Frog. But I was astonished when, halfway through the trip, I found a small, elegantly striped gecko. Until then, I was blissfully unaware of the lizards of New Zealand. Distracted by the few living survivors of archaic groups, I had forgotten—or more likely, never realised—that New Zealand is also home to a spectacular evolutionary radiation of lizards.

My ignorance reflected a widespread phenomenon: until recently, the lizards of New Zealand were the epitome of a neglected group. Neglected by science, neglected by the public, and neglected by wildlife managers. Despite their astonishing diversity—we now know there are more than 100 species—the New Zealand lizards for long lived in the shadow of the Tuatara, their more famous reptilian relative. Thankfully, that situation has changed. An explosion of recent research has illuminated the remarkable evolutionary success of lizards in New Zealand, and revealed a host of fascinating stories . . . as well as grim tales of extinction, and uplifting narratives of bold and successful new approaches to conservation.

Two major groups—the geckos and the skinks—have evolved to exploit the opportunities available to a small scaly New Zealander. In the process, they have diversified into a stunning variety of animals, with an astonishing range of sizes, shapes, behaviours, and ecologies. Many skinks are sombre brown, but some are boldly patterned. The geckos take it further, with some species garishly adorned with vivid lime-green bodies, yellow eyes, and bright blue tongues. Some are heavysset, some are slender. Some are active by day, some by night. Some are forest dwellers, some live in the high cold grasslands, and some forage in the intertidal

areas around seabird colonies. Most of them eat insects of one kind or another, but many have a fondness for nectar, and play an important ecological role in pollinating New Zealand's native plants.

The unique challenges of life in New Zealand have fashioned distinctive ecologies in lizards as well. In the cold climates that prevail, most lizards (geckos as well as skinks) reproduce by live-bearing rather than egg-laying; by keeping her babies within her body, a pregnant female can seek out the warmest places so her offspring develop more rapidly. But even so, pregnancy can be a drawn-out affair in the frigid high country of the South Island (sometimes lasting more than a year). Many New Zealand lizards live their lives at a slower pace than similar-looking species in other parts of the world. The giant Duvaucel's Gecko doesn't reach maturity until it is at least 6 years old and then produces a litter of two offspring every second year for the next 50 years or so. It's life in the slow lane. If you live in New Zealand, that small lizard you see in your garden may well be older than your children, and perhaps even older than you.

Taking things slowly and efficiently is a superb evolutionary strategy if you live on a cold island where sunlight and food are hard to find. In refuges where predators cannot threaten them, New Zealand lizards can attain remarkably high population densities. But that same slow-paced lifestyle is a catastrophe when humans arrive with their rats, cats, ferrets, stoats, and weasels. Slow reproductive rates mean that after it is hammered by exotic predators, a lizard population may never recover. And with no history of exposure to mammalian predators over evolutionary time, New Zealand's lizards have been sitting ducks for the ravenous newcomers. Fossil evidence, reviewed in this book, reveals that New Zealand has already lost some of its largest and most spectacular lizard species.

But there are good news stories also, amidst the doom and gloom. After decades of benign neglect, a virtual tsunami of taxonomic, ecological, and conservation-oriented research has swept over the New Zealand reptile fauna—led by the authors of the chapters in this book. Prompted by new technologies, new ideas, growing public interest, and a new generation of researchers, our knowledge of the New Zealand reptile fauna has increased dramatically. This book brings together that avalanche of information. It tells us what we know about New Zealand lizards, what we don't know, and how best we can go about understanding and conserving these remarkable animals.

The challenges are considerable. Small lizards still don't evoke the same thrill as a Kiwi or a Tuatara. Genetic research is telling us that many New Zealand lizards are restricted to very small areas, often on small islands where the twin threats of invasive predators and a changing climate may be catastrophic. But at the same time, we have learned an enormous amount about how best to study these animals and how to conserve them. New Zealanders have led the way in working out how to eradicate rats from offshore islands: a critically important conservation tool once regarded as impossible, but now used routinely around the world.

Most importantly, this authoritative volume brings together the experts on New Zealand lizards, to provide an exciting snapshot of a unique fauna. A fauna that was ignored for so long has now emerged from beneath the shadow of its

renowned reptilian neighbour. And our new understanding of New Zealand lizards is not just relevant to local issues. In many ways, the New Zealand reptile fauna provides an ideal opportunity for research into broader issues of wildlife biology and faunal conservation and management. These are lizards with a distinctly iconoclastic New Zealand approach, breaking many of the rules by which the more orderly lizards of other continents live out their lives. The chapters in this book use New Zealand examples to challenge and extend modern ideas in fields as diverse as evolution, ecology, physiology, and adaptive management.

It's the book I wish I had all those years ago, when I encountered my first New Zealand lizard on Stephens Island.

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April 2016

Rick Shine

# Preface

I arrived in New Zealand in November 2004, fresh out of my PhD, to complete a postdoctoral fellowship at Victoria University of Wellington, in association with the Allan Wilson Centre for Molecular Ecology and Evolution. The aim of my postdoc was to investigate the phylogenetics, biogeography, and evolution of New Zealand skinks. Knowing virtually nothing about New Zealand lizards at this stage, I was stunned by both their ecological and species diversity, but conversely, by their lack of morphological diversity. Becoming familiar with the lizard fauna was a steep learning curve, hampered by the limited published information available on most New Zealand species and the relative inaccessibility of much of what was actually known. A substantial proportion of the knowledge of New Zealand lizards was contained within unpublished student theses, reports to the Department of Conservation, and other grey literature sources. This was in stark contrast to my native Australia, where there had been numerous authoritative field guides and other texts on its reptile fauna (e.g. the various editions of Harold Cogger's 'Reptiles and Amphibians of Australia'). Such summaries of the New Zealand lizard fauna were sadly lacking, apart from a few pocket guides (e.g. Gill and Whitaker's 'New Zealand Frogs and Reptiles').

I also became aware of the massive taxonomic impediment that was present in New Zealand. Forty-five lizard species were described at the time (28 skinks, 17 geckos), but a further 33 putative species were known, though not described. Thus, 43 % of the known lizard fauna was awaiting formal description. This not only masked the true diversity of the native lizard fauna, preventing broader global recognition of New Zealand as a lizard hotspot, but it failed to prompt the ecological, evolutionary, and physiological research that was required to enhance our knowledge of New Zealand lizard species. Hence, as I commenced my project on the origin and evolution of New Zealand skinks, I found myself, by necessity, drawn into taxonomic research. I rapidly developed a strong interest for the topic, and my taxonomic research continues through to today (see Chap. 4).

As I set about my background reading and literature searches for my postdoc project, I started taking notes on each scientific paper that I read. As the document quickly extended out to over 200 pages (and this was just for the skinks!!), I started

to entertain thoughts about writing a book on New Zealand skinks. The initial idea was for something along the lines of the ornithological, Handbook of Australian, New Zealand and Antarctic Birds (HANZAB) series, which provides summary descriptions of all that was known about each species at the time of publication. But it quickly became clear that there were too many knowledge gaps for such an enterprise, and other research priorities (e.g. publishing papers, getting myself another postdoc/academic job) soon distracted my focus. Although I moved back to Australia in July 2007 to commence another postdoc, I continued to actively publish on New Zealand lizards over the next decade. But with the completion of Trent Bell's 'New Zealand Lizards Database' (<http://nzlizards.landcareresearch.co.nz/Default.aspx>), essentially an online HANZAB for all New Zealand lizard species, the idea slowly faded into the background.

That's how things remained until August 2014, when Springer contacted me about publishing a book on New Zealand reptiles. I had an academic job at Monash University (Melbourne, Australia), and as Alison Cree has recently published an amazingly comprehensive book on Tuatara (Cree 2014 *Tuatara: biology and conservation of a venerable survivor*. Canterbury University Press), it seemed like the timing was right for a similarly comprehensive book on the New Zealand lizards. Whilst the taxonomic impediment was still prevalent (57 described, and 47 undescribed, extant taxa), numerous molecular studies had provided strong support for the formal recognition of these putative taxa and clarified the phylogenetic relationships among species (see Chap. 4). But importantly, the book represented an opportunity to complete the first detailed synthesis of our knowledge of the New Zealand lizard fauna and make information from unpublished sources more widely available. I drew upon my network of friends and colleagues to write chapters on every aspect of the New Zealand lizard fauna, including the history of discovery, fossil record, taxonomy, biogeography, ecology, reproduction and life history, diseases, physiology, sampling methods, conservation, and invasive species. Each chapter, and indeed the overall book, aims to provide a synthesis of the current state of knowledge, identify key gaps, and stimulate and guide future research on New Zealand lizards.

Bringing the New Zealand lizard book to fruition involved the support, encouragement, and assistance of a plethora of people. Firstly, I'd like to thank Verena Penning and Dhayanidhi Karunanidhi from Springer for their invaluable help in putting the book together. Kelly Hare and Alison Cree provided advice during the initial planning stages of the book. I'll be forever indebted to Charlie Daugherty for providing me with the opportunity to work on New Zealand lizards and for taking a chance on me for my first postdoc. I've never had a research project more thoroughly supported, than during my time in New Zealand. I'm extremely appreciative of Peter Ritchie for his involvement in the skink research programme and for mentoring me on how to run a research programme and supervise graduate students. My skink research programme benefited from major contributions from Libby Liggins, Stephanie Chapple, Kelly Hare, Kim Miller, and Shay O'Neill. I thank the late Tony Whitaker for his amazing enthusiasm and for sharing his wealth of knowledge during my New Zealand lizard research. I also acknowledge my diverse

array of collaborators, including Rod Hitchmough, Geoff Patterson, Dianne Gleeson, Dave Towns, Nicky Nelson, Trent Bell, Shawn Laffan, Giovanni Di Virgilio, and Reid Tingley. I thank Brian Gill, Raymond Coory, Benno Kappers, and Shai Meiri for their help and assistance during my New Zealand lizard research.

A special thank you to all of the contributors to the book and your efforts in summarising our currently knowledge of the New Zealand lizard fauna. This book was greatly improved through the input from a range of external reviewers for each chapter, including Kelly Hare, Rod Hitchmough, Marc Jones, Sue Jones, Nicky Nelson, Glenn Shea, Mike Thompson, Dave Towns, and Graham Wallis. I'm particularly indebted to Nicole Schumann for her assistance with copy-editing many chapters. Finally, this book would not have been possible without the endless love, encouragement, and support of my wife, Nicole, and daughter, Kira, as well as Daisy, Toby, and all of the other furred and feathered members of our family.

Clayton, VIC, Australia

David G. Chapple

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David G. Chapple

# Chapter 1

## Synthesising Our Current Knowledge of New Zealand Lizards

David G. Chapple

**Abstract** The New Zealand lizard fauna, comprising of skinks (Scincidae: Eugongylineae) and geckos (Diplodactylidae), is the most diverse squamate reptile assemblage of any cool temperate region on Earth. It is characterised by its ecological, evolutionary and physiological diversity, rather than its morphological diversity. New Zealand lizards have traditionally been underappreciated, and the recognised fauna (both described and undescribed) has almost trebled since the 1980s, from 38 to 104 taxa. A range of factors have delayed research and broader recognition of the New Zealand lizard fauna, particularly the fact that 45 % of recognised species remain undescribed. This book brings together the world's leading experts on this group of lizards to produce the first authoritative overview of the history, fossil record, taxonomy, biogeography, ecology, life history and reproduction, diseases, physiology, sampling methods and conservation of New Zealand lizards. In doing so, it highlights what is currently known, what is not and where future research efforts should be directed. It is hoped that by showcasing New Zealand lizards and the diverse array of ecological, evolutionary and physiological adaptations that the fauna possesses, the book will stimulate research on this group of lizards, particularly in the areas of greatest need or importance.

**Keywords** Biogeography • Conservation • Disease • Ecology • Fossil record • Gecko • Life history • Physiology • Reproduction • Sampling methods • Skink • Species discovery • Taxonomy

### 1.1 The New Zealand Lizard Fauna

Nestled in the south-west Pacific, New Zealand is a large archipelago that displays the faunal signatures of both its Gondwanan origins and more recent oceanic influences (Daugherty et al. 1993; Gibbs 2006). New Zealand was one of the last

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countries on Earth to be discovered, and likewise, the full extent of the faunal diversity present within the archipelago is only just starting to be appreciated. This is no better exemplified than in lizards, with just 38 species (21 skinks, 17 geckos) recognised in the early 1980s (Newman 1982). This number has now increased to 104 extant species that are formally, or informally, recognised (61 skinks, 43 geckos; Hitchmough et al. 2016a, b). Whilst this ranks the native lizard fauna of New Zealand as one of the most diverse squamate reptile assemblages of any cool, temperate region on Earth, this diversity, along with the vast array of ecological, evolutionary and physiological adaptations exhibited by New Zealand lizards, has been largely underappreciated, both within the country and beyond its shores.

The presence of the tuatara (*Sphenodon punctatus*) in New Zealand, the sole survivor of a once diverse reptilian order (Cree 2014), may have diverted attention from the lizard fauna. After all, the New Zealand lizard fauna comprises skinks (Scincidae; Eugongylinae) and geckos (Diplodactylidae), which are common and widespread throughout the world, particularly in the Australasian and Pacific regions (Pianka and Vitt 2003; Wilson and Swan 2013; Cogger 2014). Our limited knowledge of New Zealand lizards might also be a matter of numbers; a relatively small human population (4.68 million as at April 2016; [http://www.stats.govt.nz/tools\\_and\\_services/population\\_clock.aspx](http://www.stats.govt.nz/tools_and_services/population_clock.aspx)) means that there are comparatively few researchers to study such a diverse fauna. Indeed, there are only eight universities in New Zealand, though a substantial proportion of herpetological research has been conducted by government agencies (e.g. Department of Conservation, Landcare Research or the former Ecology Division, Department of Scientific and Industrial Research and Wildlife Service) and environmental consultants.

Whilst these factors have limited the volume of research that has been conducted on New Zealand lizards, much of what is known is also not freely available as it is contained within unpublished student theses, government reports, environmental consultant reports and other grey literature (Whitaker and Thomas 1989). Some information still remains in people's filing cabinets, on their computers or locked away in their minds. This book aims to collate all of this scattered knowledge into a single location and synthesise it into the first comprehensive summary of New Zealand's remarkable lizard fauna. It brings together the world's leading experts on the group to produce an authoritative overview of the history, fossil record, taxonomy, biogeography, ecology, life history and reproduction, diseases, physiology, sampling methods and conservation of New Zealand lizards. In doing so, it highlights what is known, what is not and where future research should be directed.

Unfortunately, no book on New Zealand lizards can escape the taxonomic impediment that currently exists. Museums, traditionally the drivers of taxonomic research throughout the world, have been strangely silent on New Zealand lizards. Aside from Charles McCann at the Dominion museum (Te Papa Tongarewa, Museum of New Zealand), who completed the only major taxonomic revision for the fauna (McCann 1955), taxonomic research has been left to university and government researchers, or unpaid enthusiasts (Shea 2016; Hitchmough et al. 2016b). Thus, just as it is problematic to study species that you are not

aware exist, it is difficult to enhance your knowledge of a fauna if recognised species actually represent a complex of several species. Extreme examples of this are Hardy's (1977) *Leiopisma nigriplantare maccanni* (McCann's *Leiopisma zelandica*), which is now recognised as 19 distinct taxa, and McCann's (1955) *Hoplodactylus pacificus*, which has since been separated into 21 taxa (Table 1.1 lists the species recognised by McCann (1955) and Hardy (1977) and the taxa that are now recognised within each of these species; also see Chapple and Ritchie (2013)). This has made it difficult to link information between the composite taxa and currently recognised species. Such instances of uncertainty are highlighted throughout each chapter. Although there have been some disparate views on how to deal with the taxonomic impediment in New Zealand lizards (Jewell 2008; Chapple and Hitchmough 2009), all authors in this book follow the taxonomy outlined in the most recent Department of Conservation Threat List for reptiles (Hitchmough et al. 2016a). Since 45 % of the recognised, extant lizard fauna (104 species) remain to be described (Hitchmough et al. 2016b), this book follows the inherent practice in New Zealand of using tag names (e.g. *Dactylocnemis* 'Matapia Island', *Oligosoma* aff. *chloronoton* 'West Otago') when referring to these taxonomically indeterminate (unnamed or undescribed) taxa.

## 1.2 An Overview of *New Zealand Lizards*

The book comprises 12 contributed chapters covering every aspect of the biology of New Zealand lizards. In Chap. 2, Shea (2016) provides an authoritative overview of the history of discovery of New Zealand lizards, from first contact with Māori through to the present day. He discusses the distinct phases of species discovery and the factors that have influenced our understanding of lizard diversity in New Zealand. The chapter also provides an important historical context within which to consider the biology, ecology and conservation of the native lizard fauna. For instance, the first detailed study of a New Zealand lizard species was not conducted until the 1950s (Barwick 1955, 1959), illustrating just how much knowledge has been generated over the last six decades.

In Chap. 3, Worthy (2016) presents the first comprehensive review of the fossil material that exists for New Zealand lizards. Whilst the pre-Quaternary fossil record for lizards is limited, the Quaternary fossil record provides a vital indication of the prehuman diversity and distribution of New Zealand lizard species and a baseline with which to assess the impact of humans and introduced mammals on the native lizard fauna.

New Zealand lizards are characterised by their ecological and taxonomic, rather than morphological, diversity. Chapter 4 (Hitchmough et al. 2016b) provides an overview of the taxonomy of native skinks and geckos and the recent molecular work that has led to the almost trebling of the known lizard fauna over the last three decades. Chapter 5 (Chapple and Hitchmough 2016) demonstrates that geckos colonised New Zealand during the Eocene or Oligocene (40.2–24.4 mya), prior to

**Table 1.1** A comparison of species recognised by McCann (1955) and Hardy (1977), the two major taxonomic reviews for New Zealand lizards and the species that are currently recognised (Hitchmough et al. 2016a, b)

Previous taxonomy	Current taxonomy
<b>McCann (1955)</b>	
<b>Geckos</b>	
<i>Naultinus elegans</i> (4)	<i>Naultinus elegans</i>
	<i>Naultinus punctatus</i>
	<i>Naultinus grayii</i>
	<i>Naultinus</i> ‘North Cape’
<i>Hoplodactylus duvaucelii</i>	<i>Hoplodactylus duvaucelii</i>
<i>Hoplodactylus pacificus</i> (21)	<i>Dactylocnemis pacificus</i>
	<i>Dactylocnemis</i> ‘Matapia Island’ <sup>a</sup>
	<i>Dactylocnemis</i> ‘Mokohinau’
	<i>Dactylocnemis</i> ‘North Cape’
	<i>Dactylocnemis</i> ‘Poor Knights’
	<i>Dactylocnemis</i> ‘Three Kings’
	<i>Toropuku stephensi</i>
	<i>Toropuku</i> ‘Coromandel’ <sup>a</sup>
	<i>Woodworthia chrysosiretica</i> <sup>a</sup>
	<i>Woodworthia maculata</i>
	<i>Woodworthia</i> ‘Central Otago’
	<i>Woodworthia</i> ‘Cromwell’
	<i>Woodworthia</i> ‘Kaikouras’
	<i>Woodworthia</i> ‘Marlborough mini’
	<i>Woodworthia</i> ‘Mount Arthur’
<i>Woodworthia</i> ‘Otago/Southland large’	
<i>Woodworthia</i> ‘pygmy’ <sup>a</sup>	
<i>Woodworthia</i> ‘Southern Alps’	
<i>Woodworthia</i> ‘southern mini’	
<i>Woodworthia</i> aff. <i>maculata</i> ‘Muriwai’ <sup>a</sup>	
<i>Woodworthia</i> cf. <i>brunnea</i>	
<i>Hoplodactylus granulatus</i> (8)	<i>Mokopirirakau granulatus</i>
	<i>Mokopirirakau</i> ‘Cascades’ <sup>a</sup>
	<i>Mokopirirakau</i> ‘Cupola’ <sup>a</sup>
	<i>Mokopirirakau</i> ‘Okarito’
	<i>Mokopirirakau</i> ‘Open Bay Islands’ <sup>a</sup>
	<i>Mokopirirakau</i> ‘Roys Peak’ <sup>a</sup>
	<i>Mokopirirakau</i> ‘southern forest’
<i>Mokopirirakau</i> ‘southern North Island’	
<i>Heteropholis rudis</i>	<i>Naultinus rudis</i>
<i>Heteropholis tuberculatus</i>	<i>Naultinus tuberculatus</i>
<i>Heteropholis gemmeus</i>	<i>Naultinus gemmeus</i>
<i>Heteropholis stellatus</i>	<i>Naultinus stellatus</i>
<i>Heteropholis nebulosus</i>	<i>Mokopirirakau nebulosus</i>

(continued)

**Table 1.1** (continued)

Previous taxonomy	Current taxonomy
<i>Heteropholis manukanus</i>	<i>Naultinus manukanus</i>
Not discovered in 1955/recognised by McCann	<i>Tukutuku rakiurae</i>
	<i>Mokopirirakau cryptozoicus</i>
	<i>Mokopirirakau kahutarae</i>
	<i>Hoplodactylus delcourti</i>
<b>Skinks</b>	
<i>Leiopisma grande grande</i>	<i>Oligosoma grande</i>
<i>Leiopisma grande otagense</i>	<i>Oligosoma otagense</i>
<i>Leiopisma grande waimatense</i>	<i>Oligosoma waimatense</i>
<i>Leiopisma fallai</i>	<i>Oligosoma fallai</i>
<i>Leiopisma homalonotum</i>	<i>Oligosoma homalonotum</i>
<i>Leiopisma suteri</i>	<i>Oligosoma suteri</i>
<i>Leiopisma oliveri</i> (2)	<i>Oligosoma oliveri</i>
	<i>Oligosoma townsi</i>
<i>Leiopisma smithi smithi</i> (2)	<i>Oligosoma smithi</i>
	<i>Oligosoma smithi</i> ‘Three Kings, Te Pahi, Western Northland’
<i>Leiopisma smithi numerale</i>	<i>Oligosoma smithi</i>
<i>Leiopisma festivum</i>	<i>Oligosoma lineoocellatum</i>
<i>Leiopisma aeneum</i> (3)	<i>Oligosoma aeneum</i>
	<i>Oligosoma hardyi</i>
	<i>Oligosoma levidensum</i>
<i>Leiopisma moco</i>	<i>Oligosoma moco</i>
<i>Leiopisma zelandica</i> (19)	<i>Oligosoma polychroma</i>
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 2’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 3’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 4’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 5’
	<i>Oligosoma inconspicuum</i>
	<i>Oligosoma</i> aff. <i>inconspicuum</i> ‘North Otago’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>inconspicuum</i> ‘Okuru’ <sup>a</sup>
	<i>Oligosoma burganae</i>
	<i>Oligosoma toka</i> <sup>a</sup>
	<i>Oligosoma repens</i> <sup>a</sup>
	<i>Oligosoma longipes</i> <sup>a</sup>
	<i>Oligosoma</i> aff. <i>longipes</i> ‘Southern’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>longipes</i> ‘Rangitata’ <sup>a</sup>
	<i>Oligosoma maccanni</i>
	<i>Oligosoma notosaurus</i>
	<i>Oligosoma stenotis</i>
	<i>Oligosoma tekakahu</i> <sup>a</sup>
	<i>Oligosoma microlepis</i> <sup>a</sup>

(continued)

**Table 1.1** (continued)

Previous taxonomy	Current taxonomy
<i>Leiopisma ornatum</i> (2)	<i>Oligosoma ornatum</i>
	<i>Oligosoma zelandicum</i>
<i>Leiopisma dendyi</i>	<i>Oligosoma nigriplantare</i>
<i>Leiopisma turbotti</i>	<i>Oligosoma nigriplantare</i>
<i>Leiopisma lineoocellatum</i> (6)	<i>Oligosoma lineoocellatum</i>
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘South Marlborough’
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘Mackenzie Basin’
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘Central Canterbury’
	<i>Oligosoma chloronoton</i>
	<i>Oligosoma</i> aff. <i>chloronoton</i> ‘West Otago’
<i>Leiopisma latilinearum</i>	<i>Oligosoma striatum</i>
<i>Leiopisma infrapunctatum</i> (8)	<i>Oligosoma infrapunctatum</i>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Alborn’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Chesterfield’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘cobble’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘crenulate’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Hokitika’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Southern North Island’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Westport’
<i>Sphenomorphus pseudornatus</i> (3)	<i>Oligosoma ornatum</i>
	<i>Oligosoma roimata</i>
	<i>Oligosoma aeneum</i>
Not discovered in 1955/recognised by McCann	<i>Oligosoma judgei</i>
	<i>Oligosoma pikitanga</i>
	<i>Oligosoma taumakae</i>
	<i>Oligosoma</i> ‘Whirinaki’
	<i>Oligosoma</i> sp. ‘Homer Tunnel’
	<i>Oligosoma northlandi</i> (extinct)
	<i>Oligosoma acrinasum</i>
	<i>Oligosoma alani</i>
	<i>Oligosoma macgregori</i>
	<i>Oligosoma whitakeri</i>
<b>Hardy (1977)—skinks</b>	
<i>Cyclodina aenea</i> (3)	<i>Oligosoma aeneum</i>
	<i>Oligosoma hardyi</i>
	<i>Oligosoma levidensum</i>
<i>Cyclodina alani</i>	<i>Oligosoma alani</i>
<i>Cyclodina macgregori</i>	<i>Oligosoma macgregori</i>
<i>Cyclodina oliveri</i> (2)	<i>Oligosoma oliveri</i>
	<i>Oligosoma townsi</i>
<i>Cyclodina ornata</i> (2)	<i>Oligosoma ornatum</i>

(continued)

**Table 1.1** (continued)

Previous taxonomy	Current taxonomy
	<i>Oligosoma roimata</i>
<i>Cyclodina whitakeri</i>	<i>Oligosoma whitakeri</i>
<i>Leiopisma acrinasum</i>	<i>Oligosoma acrinasum</i>
<i>Leiopisma chloronoton</i> (2)	<i>Oligosoma chloronoton</i>
	<i>Oligosoma</i> aff. <i>chloronoton</i> ‘West Otago’
<i>Leiopisma fallai</i>	<i>Oligosoma fallai</i>
<i>Leiopisma grande</i>	<i>Oligosoma grande</i>
<i>Leiopisma homalonotum</i>	<i>Oligosoma homalonotum</i>
<i>Leiopisma gracilicorpus</i>	<i>Oligosoma homalonotum</i>
<i>Leiopisma infrapunctatum</i> (8)	<i>Oligosoma infrapunctatum</i>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Alborn’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Chesterfield’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘cobble’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘crenulate’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Hokitika’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Southern North Island’
	<i>Oligosoma</i> aff. <i>infrapunctatum</i> ‘Westport’
<i>Leiopisma lineoocellatum</i> (4)	<i>Oligosoma lineoocellatum</i>
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘South Marlborough’
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘Mackenzie Basin’
	<i>Oligosoma</i> aff. <i>lineoocellatum</i> ‘Central Canterbury’
<i>Leiopisma moco</i>	<i>Oligosoma moco</i>
<i>Leiopisma nigriplantare nigriplantare</i>	<i>Oligosoma nigriplantare</i>
<i>Leiopisma nigriplantare maccanni</i> (19)	<i>Oligosoma polychroma</i>
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 2’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 3’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 4’
	<i>Oligosoma</i> aff. <i>polychroma</i> ‘Clade 5’
	<i>Oligosoma inconspicuum</i>
	<i>Oligosoma</i> aff. <i>inconspicuum</i> ‘North Otago’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>inconspicuum</i> ‘Okuru’ <sup>a</sup>
	<i>Oligosoma burganae</i>
	<i>Oligosoma toka</i> <sup>a</sup>
	<i>Oligosoma repens</i> <sup>a</sup>
	<i>Oligosoma longipes</i> <sup>a</sup>
	<i>Oligosoma</i> aff. <i>longipes</i> ‘Southern’ <sup>a</sup>
	<i>Oligosoma</i> aff. <i>longipes</i> ‘Rangitata’ <sup>a</sup>
	<i>Oligosoma maccanni</i>
	<i>Oligosoma notosaurus</i>
	<i>Oligosoma stenotis</i>
	<i>Oligosoma tekakahu</i> <sup>a</sup>

(continued)